



THE UNIVERSITY *of* NORTH CAROLINA
GREENSBORO

Design and Construction Guidelines

Jan2011 Edition

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

01010. PROJECT ADMINISTRATION

1. UNCG ORGANIZATIONAL SUMMARY

The Designer's contract is with The University of North Carolina at Greensboro (UNCG), an agency of the State of North Carolina. The University department that Designers work with directly is the Facilities Design and Construction (FDC) Department, which manages the design and construction phases of projects. Any involvement with other University departments will be conducted through the Facilities Design and Construction Department.

2. STATE REQUIREMENTS

All design work shall comply with the procedures outlined in the North Carolina State Construction Manual (The Blue Book) prepared by the North Carolina Department of Administration's State Construction Office. Designers should familiarize themselves with the State Construction Office policies, guidelines, and other information. The intent of the UNCG Design & Construction Guidelines is to help Designers understand the particular needs and desires of the University and not duplicate or supersede State Construction Office requirements. There are many state agencies that have plan review authority, and these are explained in the North Carolina State Construction Manual.

- 2.1. **Building Codes:** References to codes or standards in these guidelines always mean the most recent version of that code or standard. The facility shall comply with the North Carolina Building Code. The Designer shall identify and reconcile disparities between state and local code jurisdictions. Changes in the work during construction resulting in non-compliance shall be the financial responsibility of the Designer to correct.
- 2.2. **OSHA Compliance:** The Designer shall be familiar with and implement the requirements of the Federal, Occupational Safety and Health Act, and Occupational Safety and Health Act of North Carolina, administered by the NC Department of Labor. These standards provide safeguards for the safety and health of all University employees and students.
- 2.3. **Sales Tax Reporting:** State law requires UNCG to report sales tax; therefore the following shall be included in a project's specifications:

With each Application for Payment submitted, Contractors must provide a statement of materials purchased for and/or used in the University project. Included should be the purchase date, type of property, University project name, North Carolina County of purchase, cost of property and county sales and use tax paid. Forms should include the period of time covered and should be signed and dated. You may use the form entitled "UNCG Contractor Statement of Property Purchased" or a comparable one so long as all information listed above is provided. This form is available for download from the "Resources" section of the FDC website.

Only those building materials, supplies, fixtures and equipment which actually become part of the building or structure are to be included on this form. The statement must also include the cost of any tangible personal property withdrawn from the Contractor's warehouse stock and the amount of county sales or use tax paid thereon by the Contractor. Similar statements by subcontractors must be obtained by the General Contractor and furnished to the University. In the event that several purchases are made from the same vendor, the certified statement must indicate invoice numbers. This statement of property and county tax paid is required by General Statute 105-164.14 (e).

The statement SHOULD NOT INCLUDE tax paid on supplies, tools and equipment used to perform contracts.

If no taxable materials have been used during the period, submit a form stating "No Taxable Materials This Period". Give all other information regarding project name and period covered and sign and date the form. This will let us know that the form has not simply been omitted.

- 2.4. For construction contracts funded in whole or in part with federal resources and exceeding \$2000, subcontracts must contain the clause: "no laborer or mechanic employed directly on the site of the work shall receive less than the prevailing wage rates as determined by the Secretary of Labor." The Project Manager from UNCG will be able to tell whether federal funds are being used.

3. UNIVERSITY AND DESIGNER

- 3.1. Designer's Representative: The Designer shall designate a Project Manager for all formal communications with the University and other agencies throughout the design and construction phases of the project.
- 3.2. Owner's Representative: The University will identify the Design Project Manager who will be the University's representative throughout the programming and design phases of the project. During these phases all communications shall be directed to this person and the Designer shall accept direction only from this person. It is the

Owner representative's responsibility to develop consensus and to resolve disparate input within the University.

During the bidding phase both the Design Project Manager and the Construction Project Manager will have responsibilities with the project. Both will be represented at the Pre-bid Conference and the Bid Opening.

After opening bids, when it is determined that the project is within budget, the University's Construction Project Manager will be the University's contact person for the remainder of the project. All direction and communication from the University during the construction phase shall be through the Construction Project Manager only.

- 3.3. Other University Departments with Project Involvement: There are other departments within the University from whom involvement may be required during the design and construction of the project. It is the responsibility of the Project Managers identified above to orchestrate the involvement of any other groups.
- 3.4. Program Statement: For large or complex projects, a program statement is prepared by the Facilities Design and Construction Department in cooperation with other University departments and, perhaps, with the Designer. It is the Designer's responsibility to incorporate all aspects of the program statement into the project. Therefore, it is essential at the beginning of design, that the Designer request and obtain clarification from the University regarding any question about the program statement.
- 3.5. Project Budget: There is a fixed budget for capital improvement projects which will be reflected in the Owner/Designer contract. The University believes the project is adequately budgeted for the scope of work and the Designer shall verify this before proceeding with design. If the Designer believes the budget is inadequate he shall advise the University in writing of the extent to which the scope must be reduced in order to design a quality, cost effective project for the available funds.
- 3.6. Project Schedule: In preparation for the Owner/Designer Contract negotiations, a design phase kickoff meeting will be scheduled by the Design Project Manager. One of the agenda items for this meeting will be review of the University's anticipated project schedule. The project schedule will include time periods required for each element in the design process including the start date, reviews, approvals, bidding, award of construction contracts, notice to proceed, construction duration, construction completion, and final inspection. Once agreed to by all parties, the Designer must adhere to the schedule. The University has a project tracking process and the Designer may be asked to provide a brief, monthly status report on work accomplished, and indicate any change to the original schedule.

01100. ALTERNATES

A limited number of alternates may be used as a means of insuring base bids within the available construction funds. Additive alternates are preferred to deductive alternates.

Care must be exercised to coordinate Plumbing, HVAC, Electrical and General Contract alternates. Alternates contingent upon one another should be given the same number, as: P-2, HVAC-2, E-2, G-2.

01200. PROJECT MEETINGS

See requirements in the N.C. Construction Manual (Section 111) for Preconstruction, Monthly Progress and Final Inspection Meetings.

Additionally:

1. PRECONSTRUCTION MEETINGS

The FDC Construction Project Manager will provide the Designer with a list of special UNCG items to be included with the Designer's normal agenda for the preconstruction meeting.

2. CONSTRUCTION PROGRESS MEETINGS

During construction the designated Project Manager for the Designer will attend weekly and monthly construction meetings to provide liaison and inspection services necessary to ensure compliance with plans and specifications. The Designer will take the Meeting Minutes for the monthly construction meetings and distribute to all attendees within three (3) days. Upon instructions of the Designer, the frequency of meetings may be increased or decreased as required by the progress of the work.

All in-house and contract consultants participating in the design of the project will attend weekly and monthly meetings while work related to their design is in progress.

3. PRE-INSTALLATION MEETINGS

The Designer will include in the project specifications a list of pre-installation meetings to be conducted by the General Contractor during construction, prior to start of installation of major building components. Examples of building components requiring pre-installation meetings may include, but not necessarily limited to, masonry wall construction, roof installation, window and curtain wall installation, foundation waterproofing, builders hardware installation, etc. Attendees to these meetings will be the Designer and any associated consultant(s), the Prime Contractor and involved

subcontractors, the Owner, and any specialized equipment or material supplier(s) or manufacturer(s). The purpose of these meetings is to review work related shop drawings, submittals, coordination drawings, installation and quality requirements, and coordinate the work among the various trades making sure that all required coordination issues are reviewed, considered and resolved prior to start of installation.

4. ELEVEN MONTH WARRANTY REVIEW

The Designer may be required to perform an eleven (11) month warranty review which will consist of the Owner and Designer, including his consulting engineers (PM&E), performing an on-site review of the project prior to the expiration of the twelve (12) month warranty period. The Designer is to provide a written list of warranty items to the General Contractor.

01210. CONSTRUCTION REQUESTS FOR PROPOSALS

The following steps should be followed as closely as possible in the change order process. Restraints, such as time, may require that some steps be accelerated by verbal or fax communications and documented later with the appropriate written or hard copy correspondence. In all cases the Designer should keep the State Construction Office representative and the University Construction Project Manager apprised of the status of change order items.

1. Proposal Request (AIA G709 form or equal) - issued by the Designer to all prime Contractors and copied to the University. The proposal request shall contain complete information, including texts and drawings, needed to make a fair and realistic proposal.
2. Proposal - from the Contractor in writing to the Designer (with a copy to the University) with a breakdown detailed enough to accurately evaluate the cost. The State Construction Office will require a detailed breakdown with the change order. Unit prices without fixed quantities may be acceptable in some emergency situations when the work needs to be done quickly, however a not-to-exceed figure will be required. The proposal shall include appropriate subcontractor proposals and effect, if any, on the work schedule or completion date.
3. Designer's recommendation - to the University (no copy to the Contractor) including a brief description of the request, cost of the proposal, date by which the Contractor requests a decision and the Designer's recommendation on whether or not to proceed with the change. It is the Designer's obligation to evaluate the proposal amount and verify that the cost is reasonable and consistent with current prices for doing the work. The Designer shall inform the Contractor if they believe the cost is excessive and have the Contractor re-submit as necessary in order to present a fair cost.
4. Owner's acceptance or rejection - to the Designer (with a copy to the Contractor) authorizing inclusion in a change order or disapproving the proposal.

5. Designer's notice to the Contractor (with copy to the University) - informing the Contractor of the final resolution. Prompt issuance of the change order may eliminate this step.
6. Change order - prepared by the Designer and follows the normal process as described in the project documents and the North Carolina Construction Manual. Note that it usually takes six weeks to execute a change order and that six originals should be prepared and then signed in the following order: Contractor, Designer, University, and State Construction. The Contractor cannot request payment for any change order work until the change order is fully executed with all four signatures and returned from State Construction. The Designer shall promptly notify the Contractor when the change order is returned and distribute the fully executed change order to the Contractor and surety.

01300. SUBMITTALS.

1. DESIGN SUBMISSIONS FOR REVIEW

The University will review design submissions (various phases of construction documents) from the Designer, usually within three weeks of receipt of the submittal. The submissions presented to FDC will be further distributed to all other appropriate University departments for their reviews. The Designer will submit a minimum of four (4) copies of review documents to the Design Project Manager. Reviews will be generalized and shall not be considered an office check of the drawings and specifications. The Designer shall be responsible for a complete office check of all phases of drawings and specifications.

Written comments will be returned to the Design Project Manager by the various University offices involved with the review. FDC will compile these comments with their own and will transmit the total list of University review comments to the Designer. The Designer will provide written responses to all review comments as part of the next design submission.

2. CONSTRUCTION SCHEDULE

For large or critical projects the University will hire an independent scheduling consultant to assist with the construction schedule. Facilities Design and Construction will provide a specification to include in the contract documents for this requirement.

01301. SPACE MANAGEMENT DRAWING REQUIREMENTS

1. POLYLINE REQUIREMENTS

Updated: November 5, 2014

Space Polyline – For every architectural floor plan provided to the University, the Architect shall provide polylines for the following:

Exterior Gross Polylines -the exterior gross area of a building floor is defined as all the area within exterior surface of exterior walls; i.e., the total constructed area of a building. This polyline shall be drawn on layer A-AREA-GROS. **Line color is to be cyan.**

Space/Room Area Polylines - shall be added to every space or room including vertical penetrations (stairs, elevators, shafts & chases) building service areas (restrooms, mechanical rooms, etc.) and circulation spaces. They will measure from the inside face of surfaces that form the boundaries of the designated areas. They shall be a closed line polygon with vertex points located at every interior corner of the space or room. Polylines shall not wrap into the door opening. Polylines shall go through building columns and minor projections. All polylines **for rooms** shall be drawn on layer A-AREA. **Line color is to be magenta. All polylines for vertical penetrations, building service areas and circulation spaces shall be drawn on layer A-AREA-COMN. Line color is to be red.**

2. DELIVERY OF FLOOR PLAN DRAWINGS

The design architect, vendor, or contractor is responsible for providing the UNCG's Facilities Design and Construction department with accurate drawings in an AutoCAD readable electronic format at three different times. The first deliverable will be at the Design Development stage. These drawings shall be to the above standard. The polylining standard applies to architectural floor plans only. The drawing shall be free of construction related notations including but not limited to dimensions, schedules, construction related notes, etc. All external reference drawings (xrefs) must be bound to the drawing. Architectural drawings must be on a CD or other mobile storage media capable of handling large files.

The second delivery will be at the bidding of Construction Documents, drawings should show room layouts and room numbering. Drawings will be marked to identify bid set and dated. The third delivery will be at the time of completion of the project. These as-built drawings must visually depict the final "move-in" condition of permanent architectural elements as represented in simplified floor plan format. Drawings will need to be polylined for this submission with no xrefs.

All drawings shall be prepared in accordance with the National CAD Standards available at: <http://www.nationalcadstandard.org/>. The National CAD Standards are defined by the following documents:

- CAD Layer Guidelines, published by the AIA
- Uniform Drawing System, Modules 1-3, published by CSI
- Plotting Guidelines developed by Coast Guard, published by CADD/GIS Technology Center
- NCS Project Committee Report(Resolves minor discrepancies among the above.)

01310. LAND SURVEYS

1. AIA Document G601 - Land Survey Agreement shall be used to secure the services of a surveyor. This document includes a request for a proposal, an agreement form for surveying services and a description of the information to be provided by the survey.
2. The drawings shall show complete information, being careful to include underground items, inverts, utility lines, plants, etc. The survey shall also indicate all abandoned underground utility lines and structures, identifying their original use and noting their source and termination locations. All symbols and abbreviations shall be clearly explained on the drawings.
3. All Surveys shall be oriented to the "UNCG Control Network". All boundary, topographic, and design surveys, and design drawings and digital files resultant of these surveys, shall be oriented horizontally, and vertically if containing elevations, to the UNCG Local Coordinate System for inclusion in the UNCG Geographic Information System. This orientation, within applicable accuracy standards, shall be inclusive of all geographic information presented as a result of these surveys.

Information pertaining to the location and coordinates of UNCG control Monuments on which the UNCG Local Coordinate System is based is available from the UNCG Facilities Design and Construction Office.

A minimum of (2) survey control points of semi-permanent material such as rebar or iron pipe oriented to this system shall be established at the project location. The coordinates of these points and the coordinates of the UNCG Control Monument on which they are based shall be labeled. The bearing and distance measured from at least one of the project control points to the UNCG Control Monument used shall also be labeled.

These requirements shall be in addition to all professional standards and requirements in effect at the time these design services are performed.

01340. SHOP DRAWINGS AND SAMPLES

1. SHOP DRAWINGS

The specifications shall list items for which shop drawings or samples are required. Two approved copies of shop drawings shall be submitted to the Construction Project Manager after the Designer has reviewed and stamped them.

2. SAMPLES

After consultation with the University, the Designer shall specify in the contract

documents items for which samples will be required and stipulate the number of each sample required. The Designer will specify that the Contractor is required to submit all color and material samples requiring Owner and Designer approval at the same time. All samples and color chips must be approved by the University. If samples are expensive or are complete assemblies suitable for inclusion in the work, e.g., precast concrete panels, door hardware, equipment; approved samples may be installed in the work. The Designer will incorporate all of the color and material samples from the General Contractor onto a Construction Phase Color Board for review and approval by the University.

3. MODELS AND PATTERNS

Specifications for ornamental work which require models or patterns, shall specifically stipulate that models and patterns become the property of the University after the ornamental work has been installed.

4. COORDINATION DRAWINGS

Coordination drawings are frequently used to coordinate trade installations, especially PME installations. When the Contractors request base drawings, the design team shall provide electronic AutoCad drawing files to the Contractor, in a version that is acceptable to the Contractor.

01500. TEMPORARY FACILITIES AND CONTROLS

1. TEMPORARY UTILITIES

Requirements are generally as stated in the General Conditions, Article 40. Contractors must arrange for and pay for all temporary utilities required for execution of the work unless directed otherwise by the University. Specifications shall be written to stress this point.

- 1.1. Plans for running temporary lines through University property shall be approved by the Designer and the University. If connections to University utilities are permitted, the Designer shall consult the University regarding services available and points of connections. Services may require metering through meters furnished by the Contractors with the University being reimbursed for utilities consumed.
- 1.2. Costs for providing temporary services shall be included in the Contractors' bids. Specifications shall clearly identify each Contractor's responsibility for the installation of service lines and payment for services, whether services are furnished by the utility company or by the University. The University will pay for steam and electricity supplied through the building's permanent utility connections. Temporary utilities for construction trailers and construction work will be provided by and paid for by the appropriate Contractor.

2. CONSTRUCTION AIDS

- 2.1. Elevators shall not be used for construction purposes unless written arrangements are made including:
 - 2.1.1. Protective covering of car interior, doors and entrance.
 - 2.1.2. Weekly cleaning and servicing by the elevator installer.
 - 2.1.3. Complete restoration of all elevator system components to like new condition.
 - 2.1.4. The repair and warranty period required by the contract will not be diminished by authorizing this use.
- 2.2. Existing elevators shall not be used during construction without permission of the University.
- 2.3. No elevators shall be loaded beyond their capacity.

3. BARRIERS

- 3.1. Ingress and egress for buildings: During University occupancy of buildings, all marked exits must be maintained to meet code requirements.
- 3.2. Construction fence should be clearly identified on the drawings and in the specifications. The location of the construction fence should be coordinated with the Owner during the design phase of the project.
 - 3.2.1. The location of the construction fence should not impede pedestrian or vehicle traffic. If necessary, alternative routes will have to be identified and shown on the drawings.
 - 3.2.2. All accessible entrance and/or fire exits must be maintained by the general Contractor during the period of construction in University occupied buildings.
 - 3.2.3. The construction fence shall not block or infringe upon emergency vehicle access, block fire hydrants, blue phones/emergency phones, PIVs, or Fire Department connections.
 - 3.2.4. The construction fence shall be a minimum of 6' - 0" high chain link fence with green privacy screen installed on the inside of the fence to obscure vision into the site. Chain link fence posts should be supported on surface

pedestals to prevent the need for post holes.

3.2.5. The Contractor will be responsible for maintaining the fence during construction and for removing the fence at the end of construction.

3.2.6. The Contractor will provide appropriate utility work barricades, construction fence, informational signage, etc. for excavations outside the construction fence area.

3.2.7. The Contractor will provide accident prevention signage per N.C. OSHA.

3.2.8. All Contractor parking shall be restricted to the fenced in area of the construction site.

3.3 Utility Protection: All valves, manholes, hand holes, etc, within the construction site must be protected at all times. Barriers shall be installed prior to any construction and shall remain until construction and site cleanup are complete. The barriers shall be of substantial material, minimum construction should consist of 4' high metal posts with orange construction fencing.

4. SITE SECURITY

Except during working hours, fence gates shall be kept locked by the Contractor at all times. Three keys to the gates shall be provided to the University for distribution to the Project Manager, University Police and the University Locksmith. An optional arrangement of locking the gate is with a chain and double padlock, one of which will be provided by the University for University access.

UNCG will supply only the security measures required for University operations. The Contractor shall provide the necessary security means to protect his work, materials, tools, and construction equipment. Watchman services shall be supplied by the Contractor as he deems necessary. Any watchman service set up by the Contractor shall be approved by the Owner. The Contractor shall be responsible for replacement of his materials, machinery, equipment, tools and supplies due to theft or mysterious disappearance. All tools and equipment shall be clearly marked with the Contractor's identification. All toolboxes shall be clearly marked by the Contractor.

5. TRAFFIC AND PARKING

5.1. Construction area access: If existing streets and roads on campus must be used for more than normal construction traffic, a plan of the traffic patterns must be worked out in cooperation with the University and shown on the project drawings.

5.2. Maintenance of traffic flow: The University's Project Manager must be notified at least one week in advance of any anticipated work affecting traffic flow. To assure

maintenance of flow and safety, a field inspection of the area shall be made jointly by the Designer, University, and Contractor prior to performing any work which would interrupt normal traffic patterns. The Contractor, whose work requires interruption of traffic, shall be required to post signs in all affected areas in sufficient numbers and with appropriate messages to warn motorists entering the construction zone and to alleviate conflicts and confusion among motorists or pedestrians. Temporary lanes shall be well marked, and obstructions, barriers, lane changes, or detours shall be indicated by appropriate signage at each point of potential confusion, as well as at each change in direction of a temporary route. University Police shall be notified in advance of the anticipated time of return to normal traffic patterns. Upon completion of construction affecting streets or traffic flow, but before temporary control devices and lane markings are removed, the area shall be restored to receive traffic in the normal pattern. If it is evident that traffic will become hazardous or restricted in any manner, uniformed special duty police officers must be provided by and at the Contractor's expense.

- 5.3. Parking: **Updated December 18, 2014.** The Designer shall review all changes to existing parking with UNCG Parking Operations & Campus Access Management (POCAM). Projects that permanently eliminate parking spaces on campus shall either replace the spaces with spaces similarly located on the campus, or pay into the parking fund balance account the then-current cost for an equal number of parking deck spaces. This cost will be reviewed with POCAM for each project.

Construction staging plans should be included in the Design Development submittal and developed in consultation with the Parking Operations & Campus Access Management regarding construction parking and/or use of parking facilities for construction staging. **Access to parking on campus is extremely limited. Carpooling or the use of alternative transportation is encouraged.** This cost for disruption of parking will be reviewed with POCAM for each project.

There may be projects on a case by case basis which may not follow this guideline. In this case, a letter of agreement or memorandum of understanding signed by all parties concerned documenting this charge shall be required.

- 5.4. Access to facilities: While the University is a publicly owned institution, its function and facilities are dedicated to serve specific operations and programs. Therefore, Contractor's personnel may be barred from using existing toilet, food service, or other facilities.

6. CONSTRUCTION AREA MAINTENANCE

- 6.1. Debris and weeds: **Updated December 18, 2014.** Site shall be well maintained including removal of debris. Debris shall be removed from University property. Use of University trash receptacles is prohibited. The Contractor must cut grass and weeds inside the project boundary as necessary to maintain a neat appearance at the

site. **Use only herbicides approved by the University. The use of pesticides is prohibited.**

- 6.2. Noise and dust control: In occupied buildings the Designer shall indicate areas for which noise and dust control must be provided and shall specify methods of control and responsibility for installation. If details of installations are involved, specify these in the applicable sections of the technical specifications.

7. PROJECT IDENTIFICATION

Normally a project identification sign is required. The University will determine the need for the sign. If a sign is required, the location and design shall be shown on the drawings. The sign should generally be white letters on a navy blue background with gold trim unless other design considerations are desired. A copy of the University standard project identification sign is available from the Design Project Manager. A shop drawing showing layout of the text is required. No additional signs identifying participants shall be permitted.

8. SITE LIMITS

The limits of the construction site, including staging and parking if appropriate, are to be clearly shown on the construction drawings.

01600. MATERIAL AND EQUIPMENT

1. MATERIAL STORAGE

Each Contractor shall provide weather-tight storage sheds, adequate to hold materials required on the site at one time, for materials which might be damaged by the weather. Outdoor storage of materials shall be confined to the area within the construction fence. Temporary storage structures shall be painted with at least one coat of paint; color shall be approved by the University. No signs except small identification signs are permitted on sheds. Corridors, stairs, and other public spaces shall not be used for storage.

2. SURPLUS MATERIAL AND EQUIPMENT

During a renovation where certain equipment, fixtures, or materials are to be removed by the Contractor, the Designer shall prepare a list of this equipment during the planning stage of the project and present the list to the Design Project Manager. The University will decide if the surplus equipment is salvageable. Salvageable equipment and fixtures that are removed will be transported by the Contractor to a designated location.

01700. PROJECT CLOSEOUT

1. PROJECT RECORD (AS-BUILT) DOCUMENTS

Updated: September 17, 2014

At least once per month, the Designer will review the Contractor's on-site as-built drawings to confirm that the drawings are being kept up to date. After final acceptance of the project, the Designer shall revise the construction document drawings to accurately record the project as-built. Identify the addenda, change order, alternate, etc. for each item. Label all as-built documents as "RECORD DOCUMENTS".

Two sets of white bond paper record drawings (one bound with durable covers and the other set provided loose), two copies of "bound" AutoCAD and PDF files of all project drawings, and Word copies of specifications on CAD storage media, and three copies of the Final Report are required. **On projects that are developed using BIM, deliverables must include one electronic copy of the Record (as-built) BIM in a Revit-supported format as a project record archive to document the as-constructed building and its components for use in future projects and O&M activities. The Record BIM must be delivered on DVD or other mobile storage media capable of handling large files. It is noted that all changes made to reflect the project as-built shall be made on the CAD media so the electronic media will print the same document as the hard-copy record drawings. All electronic** record documents shall be submitted with the paper record documents within 60 days of the project acceptance.

2. OPERATION AND MAINTENANCE DATA

Updated: September 17, 2014

Detailed requirements should be stipulated in the appropriate sections of the specifications. For items of General Construction, specify that information for care and maintenance be furnished for any item requiring more than ordinary custodial care. For mechanized and electrical equipment, specify that operation manuals be provided. **Note any items that relate to LEED Certification or N.C.G.S. 143-135.35 through 143-135.40 and on-going maintenance for sustainability and energy efficiency.** For special equipment stipulate that, in addition to operation manuals, the manufacturer provide demonstrations and operating instructions by factory trained employees to designated University personnel who will be operating the equipment. On projects involving complex operational systems, the Designer shall prepare and submit an overall detailed system operation guide to the University at the end of construction.

Two identical copies of operation and maintenance manuals shall be provided to the FDC Project Manager after review and approval by the Designer. They shall consist of manufacturers' operation and maintenance instructions, shop drawings or catalog cut sheets, and other data listed herein; all bound in 8-1/2" x 11" x 3" (maximum thickness) binders. Material shall be assembled as follows:

- 2.1. Binder cover, spine and title page stating: "UNCG (name of project)", "Operation & Maintenance Manual for (name of equipment or system(s))", "PREPARED BY (name of Contractor), (date)". Additionally, for the title page, include the names, addresses and phone numbers of the prime Contractor and major subcontractors or material suppliers.
 - 2.2. Table of contents ordered alphabetically (may be combined with title page). If the quantity of material is such that it requires more than one binder the manual may be divided into volumes and the table of contents in each volume shall list the total contents for all volumes. Material in the volumes should be grouped by systems as reasonably as possible (electrical might be in 3 volumes, for example power, lighting and alarm system).
 - 2.3. Contents with index tabs.
 - 2.3.1 Description of system contents, where located and how each part functions individually and concluded with a list of all equipment incorporated into the project with supplier's name, address, and phone number and service needed with reference to the data in the binder which describes proper service.
 - 2.3.2 Approved shop drawings and product data including parts and maintenance information.
 - 2.3.3 Manufacturer's operating instructions including how to start, stop and restart each piece of equipment, how to set temperature and humidity for normal operation, and caution notices.
 - 2.3.4 O&M Manuals and cut sheets must clearly identify make, model number, and serial number for each piece of equipment that is installed. Include belt size, filter size, motor HP and voltage.
3. DEMONSTRATION AND TRAINING

Prior to beginning equipment demonstrations and trainings, the O&M manuals shall be delivered to the Owner so they can be referenced by the maintenance personnel during the organized training sessions. Equipment start-up operations will not be considered part of the training sessions. The Equipment Contractor will develop a training schedule that minimizes disruption of the Owner's operations and assure the training of the Owner's multiple shift personnel. The Equipment Contractor will develop specific learning objectives for each training session. The Equipment Contractor will inform the Owner of the course content and coordinate the dates, times and durations of the instruction sessions. The Contractor will provide advance notice to the Owner a minimum of three (3) business days prior to each training session. Training will be provided by the equipment manufacturer's "service" representative. The subcontractor or sales

representative may be utilized for general overview of the entire building operation.

A video of each training session will be provided to the Owner. The video can be factory supplied or may be recorded on site during the training sessions. If recorded on site, the vendor will provide an experienced, professional videographer who has experience recording demonstration and training events similar to those required. Three reproducible electronic copies (DVDs or Thumb Drives) of the training video recordings will be provided to the Owner within seven (7) days after the completion of each training session. Each video will be labeled as follows:

- a) Name of project
- b) Subject of training session or demonstration
- c) Name and address of Manufacturer
- d) Name and address of Videographer
- e) Name and address of Contractor
- f) Date of video recording.

4. FINAL INSPECTION

Procedures shall be as outlined in the Construction Manual with the following additions:

- 4.1 The preliminary inspection shall include the Designer, Designer's consultants, Contractors and University.
- 4.2 The Designer's consultants shall participate in preliminary and final inspections and shall inspect their respective parts of the work. The Owner's, Designer's and consultant's punch lists shall be compiled into one punch list by the Designer.
- 4.3 Punch lists shall indicate which Contractor is responsible for each item and clearly indicate the location of each item.
- 4.4 Inspections of concealed areas shall be made when the areas are visually accessible.

5. LIQUIDATED DAMAGES

Refer to the NC State Construction Manual, Section 303, Article 23, for state requirements concerning liquidated damages. Reasonable amounts for liquidated damages vary according to real loss to the University, therefore each project must be considered on its own and the amount determined in conjunction with the University.

If it becomes apparent that a project will exceed its contractual completion time, the Designer shall notify the Contractor in writing and withhold from all subsequent applications for payment an adequate amount of money to cover the cost of liquidated damages that may be incurred.

01900. GENERAL DESIGN STANDARDS

The following items are listed for convenience to enumerate certain standards that the University expects in all projects.

1. MASTER PLAN AND UTILITIES MASTER PLAN

The University Master Plan and Utilities Master Plans shall be studied by each Designer to ensure the compatibility of design with Master Plan objectives. FDC will provide a copy of the Plans when appropriate to the project.

2. LIFE CYCLE COST AND MAINTAINABILITY **Updated: January 29, 2015**

Designers shall consider long-term durability and maintainability when selecting and specifying materials and equipment.

Life cycle cost including installation, maintenance, and disposal will be considered in the selection of building systems and equipment. The designer must develop life cycle cost studies and present the information for review by the University to assist with the selection of materials and equipment on major renovation and new construction projects.

In general, the Designer shall specify materials and equipment with which the Facilities Operations is familiar and prepared to operate and maintain utilizing existing methods and materials. Where a single proprietary manufacturer's product is listed it is because of the need for compatibility and the words "No substitution" will follow.

- 2.1 Serviceability and Accessibility to equipment shall be incorporated in the design of all new and renovated facilities. All building equipment, including VAV boxes, sensors, controls, duct detectors, dampers, light fixtures, valves, etc., that will require inspection, maintenance, or replacement over the service life of the building, shall be installed in locations that are safely accessible by service personnel. It is preferred that equipment be accessible from floor level if possible or a short ladder if necessary. The Designer will consider the location of the equipment with respect to the possible location of fixed furniture, or fixed seating, that may impact accessibility to the equipment. The Designer will consider the type of ceiling, and accessibility to the equipment through the ceiling. Access panels should be sized to allow maintenance access and removal of equipment, especially duct detectors, fire dampers, door controllers, and fire sprinkler equipment. Equipment should be positioned to minimize obstruction of connections and service elements by adjacent piping and duct runs. If necessary, the Designer will include in the design, work platforms and personal fall protection tie-offs to facilitate safe work access to and around the equipment. Door and window openings shall be sized to allow replacement of equipment within the space without structural modifications whenever possible. Design

drawings shall include a 1/4" scale or larger drawing showing the layout and elevations of equipment in primary mechanical rooms and electrical rooms.

Each mechanical/electrical room shall have at least one light on an emergency circuit. Gypboard, sprayed ceilings, or sprayed on fireproofing in mechanical rooms is to be avoided. Primary mechanical/electrical equipment rooms shall be located with access to the building exterior and allow for convenient service vehicle access and equipment removal. These spaces shall not be combined with custodian closets. All walls shall be constructed of concrete masonry units (CMU). Floor penetrations shall be core drilled and sleeved to three inches above the finished floor.

University policy requires that custodial spaces, and mechanical and electrical equipment rooms are not accessible to occupants of the building. It is therefore necessary that occupants' equipment and controls be located so that the occupants will not have to enter these rooms for routine operation of equipment. This includes fuses, circuit breakers, switches, valves, etc., that might serve departmental equipment.

Roof access must be as safe as possible. Code compliant permanent ladders or stairs must be built into the structure for all such access. 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. From the rooftop, permanent, exterior ladders may be provided to connect different roof levels. Ladders longer than 20 feet shall be caged in accordance with the Federal Occupational Safety and Health Administration (OSHA). For steep-sloped roofs, it is preferred that perimeter roof access from the ground level be provided, if possible, for access to gutters and other items requiring maintenance by a boom lift. On low-rise buildings, ladders that extend from grade to rooftop are discouraged. Roof access through windows is unacceptable.

2.1.1 Building Maintenance Systems: During the design of all facilities, consideration shall be given to the safety of personnel during future maintenance operations. Provisions shall be made to provide safe access and working platforms for the maintenance of roofs, rooftop-mounted HVAC units, elevated equipment, lighting, etc. New buildings will incorporate design elements that eliminate the need for supplemental fall restraint or fall arrest systems. For low-sloped roof sections, the incorporation of at least 45 inch parapet walls into the design is required as an edge treatment for both the control of water run-off, and the safety of maintenance personnel. Gravel stop edges and low parapets less than 45 inches shall be avoided. Methods of fall protection for existing buildings shall be evaluated on a case-by-case basis and recommendations for incorporation shall be discussed with Facilities Design and Construction. Analysis of the existing roof structure will be required as part of the evaluation process. When supplemental fall

protection is required, the Designer shall provide a design in accordance with OSHA requirements. The design of fall protection shall be included in the construction documents as part of the base bid. Permanent, supplemental fall restraint and fall arrest equipment shall be designed, fabricated, installed, tested, and certified by a firm specializing in this type of work. Drawings indicating all arrest elements shall be sealed by a North Carolina registered professional engineer. Recommendations shall be based on the type of roof and other project specific issues.

- 2.1.2 The Designer will meet with the FDC Design Project Manager and the UNCG Office of Safety to coordinate the identification, selection and design of building maintenance systems on all projects.
- 2.1.3 In buildings with new HVAC or Lighting System installations (New Buildings or Renovations) that require special knowledge to operate, the Design Engineer will provide operating instructions for the Owner. These instructions will include diagrams if required, written and illustrated for the use of laypersons unfamiliar with the operation of these systems. The instructions will be further developed and finalized after bidding once the final systems have been identified. The Design Engineer will work closely with the system contractor and manufacturer to define these instructions and they will be included as final deliverables at final inspection.
- 2.2 Supply Storage Room for Custodians shall be provided in every building of 40,000 square feet or larger. The room shall be at least 200 square feet in size, be located close to the freight or service entrance, have shelving on at least one wall, and have a minimum of three electrical outlets on each of the long walls.
- 2.3 Custodian Closets shall not be less than 60 square feet in size and shall have no dimensions less than six (6) linear feet. Provide one (1) custodian closet for each 15,000 - 18,000 square feet of building floor space with a minimum of one (1) for each floor. They shall not be located on a stair landing, inside another room, under stairways, or in narrow spaces. Passageways, mechanical equipment rooms, pipe chases, etc., shall not serve as custodian closets; nor shall elevator controls, electrical panels, telephone equipment, roof access hatches, etc. be located in custodian closets.

Each custodian closet shall have:

- 2.3.1 Hard surface walls.
- 2.3.2 Provide barrier-free, wall mounted, recessed cabinet, swing down, stainless steel eyewash stations with integral drain. Custodian closets to receive eyewash stations will be identified through discussions with Facilities

Operations, Housekeeping, and the University Safety Office departments. Eyewash stations will be located so that the swing down door will not be blocked from opening. Access to the unit must be kept clear of obstructions at all times. Installation will be based on the types of chemicals to be stored in the closet and the possibility that mixing of chemicals may occur in these locations.

- 2.3.3 A 36" door that swings out, not into the room. Where the door must swing into the room, a minimum of 80 square feet is required.
- 2.3.4 Hot and cold water. Faucet shall be threaded for a hose connection, mounted 36" above the floor and provided with a vacuum breaker before the threaded portion.
- 2.3.5 Ceramic or quarry tile mop sink located in one corner on the wall beside the entrance door. The floor shall be pitched to the receptor or a floor drain.
- 2.3.6 A GFI duplex receptacle in the "open" wall.
- 2.3.7 Adequate lighting, but no light fixtures or sprinkler heads located above mop receptor. **Provide occupancy sensors for lighting controls.**

2.4 Building Refuse

- 2.4.1 The University is concerned about the appearance of its campus; careful attention must be given to solutions for handling building waste. Refuse removal is contracted with an outside provider, but waste disposal will be included in review of project requirements at the outset of the design effort. Areas to hold trash and trash compaction devices will be screened. The University uses front loader trucks and containers; therefore, the location and screening should support that method of removal. Provisions will be made for proper separation of refuse for recycling as required under North Carolina General Statute 13A-309.
- 2.4.2 Recycling Rooms shall be provided for the collection of recyclable waste materials on each floor of a new facility or building renovation. Recycling rooms should be located off of a main corridor with nearby access to an elevator, an exterior delivery area or a loading dock. Recycling rooms should be no less than 11'-8" long x 6'-8" wide. Typical University collection containers are 2'-6" w x 3'-0" d x 3'-10" h.

- 2.5 Service Entrances shall be level with the street where possible. Where ground floor elevation is above street level at the service entrance, a loading platform with a minimum height of 3 feet shall be provided. An area shall be provided to accommodate service trucks with a minimum depth of 54 feet; 64 feet is preferred;

and a minimum width of 12 feet.

Factory-built laminated rubber dock bumpers shall be provided. Consideration should be given to the use of adjustable type dock levelers to accommodate the varying heights of truck beds.

- 2.6 Attic ventilation shall be such that good air flow is obtained for the entire cross section and is adequate by the code (as a minimum). It is desirable to have more than minimum ventilation when a dark roof is used. Mechanical ventilation may be required in borderline cases.
- 2.7 Mechanical Rooms should generally not be located above occupiable spaces because of the risk of water damage to the spaces below. When equipment is located above spaces where water damage could occur, provide water containment areas around all equipment, piping and devices capable of generating water to protect spaces below the mechanical room from damage. These water containment areas are in addition to drain pans that are provided with the individual pieces of equipment. Water containment areas shall have at least one floor drain adequate to drain the containment area, and have a minimum of 4" high perimeter curbs. A walkable applied waterproofing membrane shall be applied to the floor and turned up and over curbs. All floor penetrations within the curbed containment area shall be provided with curbs or sleeves, 4" minimum above finished floor, and sealed to prevent leakage of water to the space below.

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

02001. EXISTING TOPOGRAPHY

All new project site plans shall be developed from a new topographical map developed specifically for that project; not from "as-built" information or previous project grading plans. Accurate information is essential and "special" conditions such as the presence of asbestos, lead paint, underground tank leaks, contaminated soil, etc. shall be addressed.

02010. SUBSURFACE EXPLORATION

1. DESIGNER'S RESPONSIBILITIES

The Designer shall direct a soils exploration program (see N. C. Construction Manual, Section 204.1.c) as judged necessary in consultation with the University. The Designer shall contact Facilities Design & Construction and submit a Request for Proposals for soils exploration. Facilities Design & Construction will provide names of pre-qualified testing companies. This will include investigative work and surveyor reports, laboratory tests (including test borings), soil analysis (including load bearing capabilities) and related site analysis. The Designer shall study plans of existing underground utilities and shall locate borings to avoid these utilities. Bored holes are to be backfilled, finish graded and seeded. Submit two copies of the site exploration report to the University.

2. INFORMATION TO BE INCLUDED IN CONTRACT DOCUMENTS

Show all boring locations, cross sections and soil conditions. Also show all existing conduits, drains, utility lines, sewers, tunnels, cables, trees, paving, walks, foundations and other objects or obstructions, whether in use or abandoned. Facilities Operations will assist with identifying existing conditions by providing "as-built" drawings as available. Clearly indicate the project boundary.

02080. ASBESTOS ABATEMENT

1. Demolition, renovation or remodeling projects are likely to involve some asbestos abatement. The University will provide all current information on identified asbestos on any site. The Designer will conduct his own independent study to identify all asbestos containing materials. A separate prime construction contract may be appropriate for asbestos abatement work.

2. It is noted that the Designer shall provide a design for asbestos removal, if required, as part of the design contract as per the State Construction Manual.
3. The University requires the Designer to provide for asbestos abatement on structures on the site scheduled for demolition. All asbestos abatement work shall be done in compliance with the North Carolina Department of Environment, Health and Natural Resources; Asbestos Hazardous Management Branch.

02110. DEMOLITION

1. STRUCTURE REMOVAL

In open areas, foundations of structures shall be removed to a minimum of 3 feet below finish grade elevations. Where new structures will replace existing structures, indicate extent of foundation removal on the drawings. Existing slabs remaining under fill, minimum of 3'-0" below finish grade, for new structures shall be broken to provide for drainage and ground water equalization. Recycle demolished material to the greatest extent possible.

2. RELOCATED EQUIPMENT

Special concern shall be taken with equipment to be reused. Establish schedule for removal and reinstallation through the University. Relocation of existing equipment shall include:

- 2.1. Disconnecting and moving.
- 2.2. Restoration and capping of utilities at the old location.
- 2.3. Recording existing piping arrangements to facilitate reinstallation.
- 2.4. Replacing unsalvageable piping, ductwork and wiring, and furnishing any new piping, ductwork, and wiring as required to complete reinstallation, without additional cost to the University.

3. BLASTING

Every reasonable effort should be made to avoid blasting because of the close proximity of other structures. If blasting is utilized, control dust and excessive noise when surroundings require. Document conditions of adjacent structures, before and after blasting, when collateral damage is possible. Seismographic monitoring may be required on adjacent buildings.

02102. CLEARING AND GRUBBING

1. All objectionable growth shall be stripped. Debris resulting from stripping and clearing operations shall be promptly removed from University property and recycled to the greatest extent possible.
2. GRUBBING

Removal of trees and shrubs shall include the removal of stumps and roots to the extent that no root greater than 3 inches in diameter remains within 5 feet of an underground structure or utility line nor under footings or paved areas. Grubbing in open areas shall include removal of stumps and 3 inch or greater roots to 2 feet below finish grade elevations.

02210. SITE GRADING

1. GRADING

Maintain existing grade inside drip line of trees wherever possible. Do not allow open excavations in the vicinity of trees for longer than two days to prevent soil moisture reduction.

2. FINISH GRADING

Slopes shall be shallow enough to allow mowing (generally 1:3 or less); steeper slopes will be permitted only in areas where maintenance-free erosion control (groundcover planting, rip-rap, etc.) is planned. All areas disturbed by construction operations and not covered by building, paving, etc. shall be fine graded and seeded.

02220. EXCAVATING AND BACKFILLING

1. Excavations shall not be permitted which undermine the integrity of adjacent structures, paving or utilities.
2. Rock removal allowances shall be realistic estimates based on historical data for similar projects and the subsurface exploration data. Every allowance shall be accompanied by a Unit Cost to be used to adjust the contract if actual quantities are over or below the allowance quantity.

02225. TRENCH BACKFILL AND COMPACTION

Density of trench backfill shall be equal to densities specified for adjacent fill and backfill.

02226. STRUCTURE BACKFILL AND COMPACTION

1. BACKFILL

- 1.1. Backfill material shall be free of debris.
- 1.2. Excess material or topsoil not required nor permitted as fill shall be removed from University property at the contractor's expense.

2. Specify that soils be compacted to the following minimum densities determined by Standard Proctor Tests (ASTM D-698) unless special conditions override:

- 2.1. **ROAD BEDS AND PARKING AREAS:** 95% up to 12" below subgrade, 100% for upper 12" below subgrade. Compaction is required for the entire subgrade area for the full width and depth of slope of embankments supporting berms and pavement.

2.2. INSIDE THE STRUCTURES

- 2.2.1. **UNDER NON-STRUCTURAL SLABS ON GRADE, with normal loading:** 95%.

- 2.2.2. **UNDER FOUNDATIONS, ISOLATED PADS, AND FOOTINGS:** 100%.

2.3. OUTSIDE THE STRUCTURES

Extreme care shall be taken to obtain proper compaction in areas which abut walls, curbs, adjacent slabs, and other structures where use of mechanical compactors is difficult.

- 2.3.1. **FOUNDATION BACKFILL UNDER PLANTING BEDS AND LAWN:** The upper 2 feet of soil below finish grade - 90% maximum. Remainder of backfill - 95% if depth is less than 10 feet; - 100% if depth exceeds 10 feet.

- 2.3.2. **FOUNDATION BACKFILL UNDER PAVEMENTS:** 100%.

- 2.3.3. **UNDER PAVED PEDESTRIAN WALKS AND COURTS:** 95%.

- 2.3.4. **BACKFILL AROUND MANHOLES AND OTHER UNDERGROUND STRUCTURES:** 95% if depth is less than 10 feet; 100% if depth is more than 10 feet.

- 2.3.5. **UNDER LAWN AND PLANTING AREAS NOT ADJACENT TO STRUCTURES:** The upper 1 foot of soil below finish grade - 90% maximum. Remainder - 95%.

02230. SOIL COMPACTION CONTROL

1. Compaction control shall be provided for all fill, backfill, and embankments, both inside and outside the perimeter of the structure. Field compaction tests and related laboratory analyses shall be performed by a qualified independent laboratory (conforming to American Society for Testing and Materials standards), under the supervision of a registered professional engineer specializing in soils engineering. Soils proposed for fill, backfill, and embankments shall be analyzed by the soils engineer to determine acceptability; no soil shall be placed until it is approved by the soils engineer. A representative of the testing laboratory shall provide continuous inspection during placement and compaction operations; tests shall be made in a quantity that will assure uniform compaction and density of each course or lift of fill.
2. The University solicits proposals for the testing laboratory shortly after the receipt of construction bids. The Designer should contact the University prior to this time regarding any specific requirements for the proposal request. Note that this construction materials testing program is different from the soils exploration program in 02010.

02300. PILE FOUNDATIONS

1. Before a decision is made to use pile foundations, the Designer shall make a thorough examination of structures and occupancies and equipment adjacent to the site to determine what effect vibratory forces will have. Wood piles are prohibited.

2. INSPECTION SERVICES

The Designer shall devise tests of pile foundations and provide full time inspection of pile driving and caisson construction to assure conformance with the drawings and specifications.

02500. SITE DRAINAGE

Updated: December 23, 2014

1. SURFACE DRAINAGE

Slope sites to insure positive drainage without wet spots. Drain away from buildings, sidewalks and driveways.

2. In stairwells, areaways and similar locations where leaf clogging of conventional drains would be expected, provide scupper or dome type drains.
3. Reference City of Greensboro standards for storm drainage construction where applicable. Drain grates shall be designed to prevent bike tires from falling in them.

4. Consider the use of bioswales, bio-retention areas, and other storm water devices to treat and slow runoff water.

02550. SITE UTILITIES

Updated: December 12, 2014

1. COORDINATION OF DIVISIONS OF THE WORK

Care is required in preparation of documents to assure no overlapping and no gaps between the work for the various contracts. Each contractor shall be required to perform excavation, trenching, and backfill for his installations. Materials and compaction of fill materials shall meet the requirements stipulated in Division 2, regardless of who performs this work; therefore, in Divisions 15 and 16 the requirements for earthwork may be best specified by making reference to Division 2.

2. UTILITY LOCATOR

The Designer will note on the site utility installation drawings that all underground utilities will be made electronically locatable. The designer will provide specifications and drawings that detail how the utility will be made electronically detectable.

The Designer in bold print, on all site utility installation drawings, will provide a note stating that prior to digging, the contractor will contact "NC 811" at 1-800-632-4949 (www.nc811.org) to have all public utilities located and marked.

The Designer, in bold print, on all site utility installation drawings, will provide a note stating that prior to digging the contractor will contact a third party Underground Utility Location company, approved by the Owner, to locate and mark all of the University's underground utilities located in the area of excavation.

3. MANHOLES

Manhole frame, cover and grate castings shall include the name and location of the manufacturer. Covers shall be at finish grade and have cast identification of "STORM DRAIN", "SANITARY", "STEAM", "ELECTRICAL", "TELEPHONE", etc. as appropriate. Manhole covers 36" in diameter or greater shall be equipped with hooks for attaching chains to aid in removing them. Masonry manholes shall be parge coated inside and outside. Manholes are considered confined spaces and appropriate safety measures should be taken when entering them.

02600. PAVING AND SURFACING

1. This is a pedestrian oriented campus and as such, designs will be prepared with pedestrian traffic (including those with mobility impairments) as the highest priority.
2. The campus has a handicapped accessibility route designated to provide access throughout the campus. This route will be augmented by new construction and must remain intact during construction work or an alternate route shall be provided.
3. Roads, parking, service courts, subgrade and related work shall be constructed by road building firms fully qualified and equipped to perform the total work.

02610. PAVING

1. BASE DRAINAGE

Over impervious subbases, drainage trenches filled with stone shall be provided for drainage of the aggregate base. These drainage trenches shall be located at low points and at intervals of 100 feet or less.

2. PROTECTION OF SURFACE COURSE

After completion of surface course, no vehicular traffic or parking shall be permitted on the pavement until the surface has cured.

3. REPAIRS

Depressions and abutments to existing pavement shall be repaired by cutting out the surfacing to a minimum depth of one inch with vertical cuts, filling, and rolling the areas. Feathering of patches and abutments to existing pavement is prohibited.

4. CONCRETE PAVING

Heavy duty, reinforced concrete paving shall be used for loading dock and dumpster areas. Refer to Section 02760, Item 1.3.

02620. CURBS AND GUTTERS

1. CAST-IN-PLACE CONCRETE shall be used unless other design is required to match existing conditions. Minimum 28-day strength shall be 4000 psi with 4% to 6% entrained air.
2. EXPANSION JOINTS shall be specified and shown on the drawings.

3. Curbs shall pitch to catch or release water as required by adjacent paving grades. Pitch sections shall be clearly designated on the drawings.

02630. WALKS

1. Typical width shall be 6 feet for minor walks and 8 feet for major walks and walks that may have vehicular use.

2. **DESIGN CONSIDERATIONS**
Updated: December 24, 2014

Selection of paving material should be based on all of the following criteria as a whole:

- 2.1. Existing paving material in the vicinity.
- 2.2. Cost and economic factors.
- 2.3. Maintenance and durability.
- 2.4. Aesthetic value.
- 2.5. **Reduce the on-site heat island effect for non-roof hardscape surfaces by specifying High Solar Reflectance Index (SRI) materials for paving, or ensure that hardscape areas are shaded within the prescribed time period by the current LEED Rating System.**

3. **CONCRETE WALKS**

Typical concrete walks shall be 4 inches thick, 3000 PSI concrete with welded wire fabric over 4 inches of gravel base; designed suitable for vehicular use; and have a light broom finish perpendicular to traffic flow. Where a service vehicle is likely to drive on a wide walk, a 6 inch concrete thickness with appropriate welded wire fabric shall be used.

4. **BITUMINOUS WALKS**

Typical bituminous walks shall be a full 2 inch compacted thickness on a 4 inch compacted gravel base. The base and the bituminous material shall each be compacted to 98% of their test densities.

5. **MASONRY PAVERS**

When pavers are used, it is preferred to have them on a concrete, mortar or asphalt substrate rather than a sand bed.

6. COMPANION RAMPS

When a curb ramp is built on one side of a street, a companion ramp is required on the opposite side of the street. When project limits would normally end within a street intersection, the limits must be extended to allow construction of a companion ramp on the opposite side of the intersection.

02760. SITE FURNISHINGS

Updated 7/8/13 (Trash and Recycling Cans + Exterior Benches moved to Guideline #10000)

1. DUMPSTERS & COMPACTORS

The number, location and size of dumpsters and compactors must be evaluated for each specific project. The following information is for a typical dumpster or compactor on the UNCG campus:

- 1.1 Cost: Cost of dumpsters, recycling containers, compactors, etc. shall be included in the movable equipment budget for projects. Cost estimates will be available from Facilities Operations.
- 1.2 Location: Dumpsters, compactors and enclosures shall be located in close proximity to the service area of each building. Paved access for staff to deposit waste and vehicle access by a 20 cubic yard front load refuse truck shall be considered in the location. Provide truck turn-around route or access without creating a traffic hazard. At least 50' of straight clearance is needed for truck access to the dumpster/compactor. See attached drawings for specific dimensions and configurations. Provide highway grade paving for the route that the refuse truck will take to service the container. Locations shall reduce the visual impact of the dumpster. Built or landscaped screening shall be provided for each location. Gates or other devices requiring operator time are not desired. The dumpster/compactor screen should typically accommodate an 8yd front-load trash dumpster, an 8 yd co-mingled or cardboard dumpster (7' tall, 4'8" deep, 6' wide), and a 6 yd. front feed compactor (Vert-I-Pac or similar) with 3' clearance around each dumpster/compactor and 25' overhead clearance. Dumpsters will be provided by the project's moveable equipment budget. Compactors may be provided by the moveable or fixed equipment budget, but power for the compactor should be designed and provided in the project with final power connection by the contractor. A lockable fused disconnect switch should be provided within sight of the compactor's electrical panel box and not more than 50' from the compactor.
- 1.3 Pad: Provide a level concrete pad sized to accommodate the dumpster/compactor enclosure and a minimum 10' deep apron immediately in front of the enclosure for the dumpster truck's front wheels to sit on while emptying the container. The

pad and approach must be on the same plane. The pad and apron shall be 6" thick, 4000 psi minimum concrete reinforced with 6x6-W2.0xW2.0 WWF on 6" of compact aggregate and compacted subgrade. The pad and apron should be thickened to 14" at the edges with two horizontal #4 rebars placed over each other.

1.4. Piedmont Disposal Front Load Truck dimensions (truck currently in use at UNCG):

Height: 13'-3"
 Vertical Clearance: 18'-0"
 Width: 8'-0"
 Side Clearance needed: 12'-0" (two feet each side, total of 4 extra feet)
 Weight: 24 tons (empty)

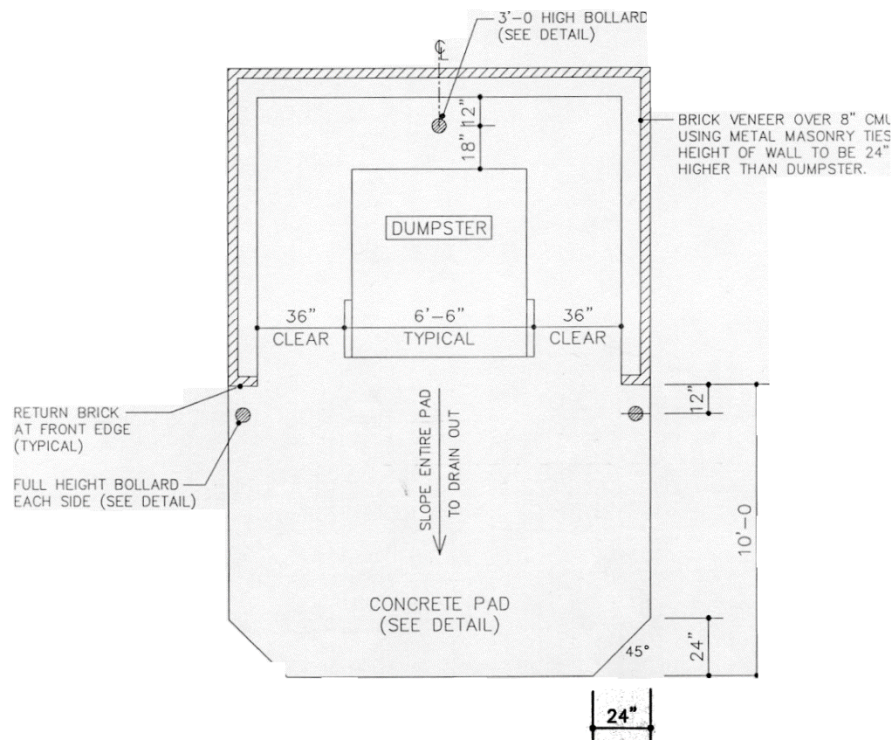
1.5. Bollard to be primed and painted safety yellow.

STANDARD DUMPSTER HEIGHTS & DEPTHS VARY. STD. WIDTH IS 6'-0" PLUS THE HANDLES. SIZE SCREEN ACCORDING TO UNIT USED.

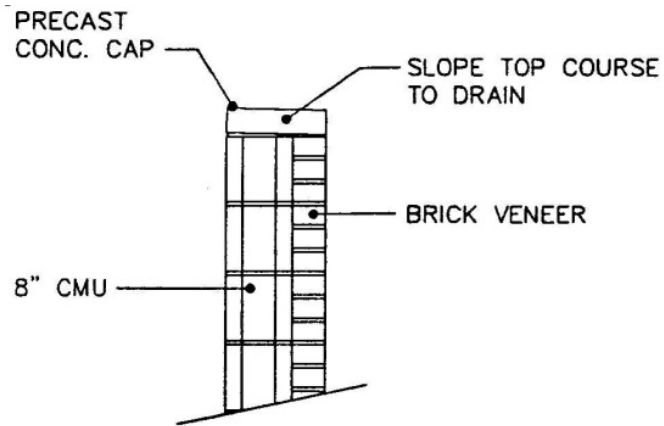
IF TWO DUMPSTERS ARE LOCATED WITHIN ONE ENCLOSURE ALLOW A MINIMUM OF 36" BETWEEN BOTH DUMPSTERS AS WELL AS OUTER SIDES.

SIZE	HT.	DEPTH	WDL
A	42"	36"	
B	48"	54"	
C	60"	66"	
D	80"	66"	

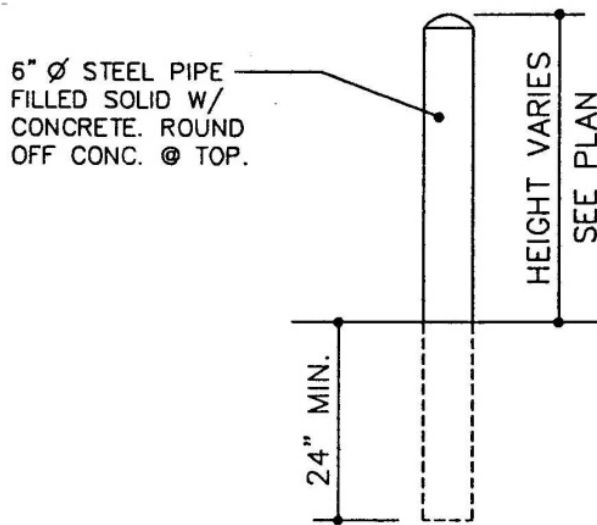
2 cu.yd. 4'
 8 cu.yd. 6'
 30 cu.yd. 8'



TYPICAL DUMPSTER PAD SCALE: 1/4" = 1'-0"
 W/ BRICK SCREEN WALL



TOP OF WALL DETAIL SCALE: 1/2" = 1'-0"
W/ BRICK SCREEN WALL



BOLLARD DETAIL SCALE: 1/2" = 1'-0"

02800. LANDSCAPING

Plant material selections must be made from stock indigenous to the specific locations where it will be placed. Persons selecting materials must be knowledgeable about the plants that will survive in the specific area. Refer to the Grounds Superintendent for assistance. Plant lists shall contain both common and technical names, quantities and plant delivery method (B&B, bare roots, etc.).

02820. LAWNS

1. GENERAL

- 1.1. Grades: The areas to be grassed will be at finished grade prior to seeding and this grade shall be maintained.
- 1.2. Guarantee: The contractor shall guarantee a live stand of permanent grass consisting of 95% coverage minimum for seeded grass with no bare spots greater than 1 square foot. Acceptance will be made after the grass has been mowed at least once by the Contractor and shows sufficient stand and cover as specified.

2. MATERIALS

Updated: December 23, 2014

- 2.1. A soil analysis shall be prepared by a testing agency approved by the Designer. The contractor shall provide all elements recommended by the analysis.
- 2.2. Permanent grass: Shall be 99% pure; 85% to 95% Turf type tall Fescue, such as Olympic or Rebel, sown at a rate of 5 lbs/1000 square feet. Red Fescue may be used for heavily shaded areas. All seed must be free of weed seed.
- 2.3. Fertilizer: Shall be a commercial fertilizer delivered in unopened original containers each bearing the manufacturer's guaranteed analysis. Any fertilizer which comes caked or otherwise damaged shall not be accepted. Fertilizer selection and application rate shall be determined by soil analysis. Lime shall be granulated agricultural limestone applied at a rate according to soil sample analysis. Small disturbed lawn areas that require reseeding shall receive 40 pounds of 5-10-10 fertilizer and 75 pounds of lime per 1000 sq. ft. of yard. **When available, use organic fertilizers in lieu of chemical fertilizers.**
- 2.4. Mulch: Shall be weed-free grain straw. Quantity shall be 3,300 pounds per acre (approximately 75 pounds per 1000 square feet) or 65 bales per acre (1-1/2 bales per 1000 square feet).

3. EXECUTION

- 3.1. Cultivation: Spread average 4" deep layer of topsoil after scarification to a depth of 6" minimum. Spread lime evenly at the rate determined by soil sample analysis and work it into the soil by plowing and cross plowing all areas to a minimum depth of 6" including new 4" topsoil. Pulverize the soil with a roller type pulverizer with 4" tines. Hand rake the soil to level and remove loose stones and other debris leaving a smooth friable condition suitable for seeding.
- 3.2. Fertilization: Apply fertilizer uniformly at specified rate with an approved distributor prior to seeding. Fertilizer shall be worked into the top three to four inches of the soil.
- 3.3. Seeding: Shall be with soil moist but not wet and broadcast by means which will insure uniform distribution and thorough coverage of the entire area. Seed shall be covered lightly (1/4") and rolled with a light roller or cultipacker to firm the seed in the soil. Mulch shall be applied to the area evenly and lightly. Areas which do not show a prompt "catch" or have been washed shall be reseeded for thorough coverage.

4. MAINTENANCE

- 4.1. Watering: The Contractor shall sufficiently irrigate seeded areas to maintain a continually moist condition until the seed has germinated and become established. Watering shall continue to assure maximum survival of grass till acceptance of work. One inch/week of water after grass is established is a minimum requirement.
- 4.2. Mowing: The Contractor shall conduct mowing operations to keep the lawn in a neat and well groomed appearance. The lawn shall only be cut when grass and soil are dry. Not more than 1/3 of the total leaf surface is to be removed at one mowing. It is not necessary to remove clippings if grass is mowed according to these specifications. Prior to acceptance, a final mowing shall be conducted. Mowing for Fescue shall be done with rotary type mower set at 3 inches. Bermuda should be cut at 1-1/2 inches.
- 4.3. Responsibility of lawn care: The care of the lawn shall be the responsibility of the Contractor until the Project is accepted. Lawn care shall include watering, feeding, and cutting consistent with general practice of care for the type of lawn. The Contractor shall fully maintain the lawn throughout the warranty period except for mowing and watering. Facilities Operations will be responsible for mowing and watering but this will in no way void the warranty.
- 4.4. Submittals: Submit soil analysis, seed and fertilizer data, and instructions for planting and care of the lawn for approval by Facilities Design & Construction, with copy to Grounds Superintendent, prior to purchase of material.

02831. TREE PROTECTION

1. GENERAL

It is desirable to save existing trees whenever possible. During design, the Designer should identify specifically those trees to be saved and those which must be removed. Trees which must be damaged by construction to the point that they have little chance to survive should be considered for removal. On projects that have a large amount of specimen trees the University normally requires the Designer hire a Natural Resource tree specialist as part of the team to prepare Natural Resource drawings. The Design Project Manager will help the Designer choose an acceptable consultant.

2. PROTECTION

- 2.1. All trees to remain are to have protective barriers set outside the drip line of the tree. Barriers shall be installed prior to any construction and shall remain until construction and site cleanup is complete. The tree protection barrier fence shall be made of 4'-0" minimum height woven wire fence of minimum 14.5 gauge with 6'-0" "T" bar metal fence posts with rebar caps on each post. Spacing between posts to be 10'-0" center to center maximum. Attach flagging to the fencing for visibility and use "Arctic" weight orange flagging. No construction material, debris or excavated material shall be stored within the barricade area.
- 2.2. Protect root system from compaction, flooding, erosion and noxious materials in solution from spillage of construction materials. Do not park vehicles under existing trees.

3. EXCAVATION AROUND TREES

- 3.1. Care must be taken in excavating foundations and installation of utility lines adjacent to trees that are to be saved.
- 3.2. Excavate within drip line of trees only where indicated on plans. If excavation will damage trees extensively, the trees should be removed and replaced.
- 3.3. Where trenching for utilities is required within the drip line, tunnel under or around roots by hand digging. Do not cut main lateral or tap roots. Cut smaller roots which interfere with a sharp pruning tool; do not chop or break.
- 3.4. Do not allow exposed roots to dry out before backfill is placed; provide temporary earth or moist burlap cover.
- 3.5. Any tree to remain that has had excavation within the drip line shall be pruned by a professional arborist according to the National Arborist Association Standards Class

IV -Cutting Back or Drop Crotch Pruning (see Sheet #2).

Cutting back or drop crotch pruning shall consist of the reduction of tops, sides, underbranches or individual limbs. This practice is to be undertaken only in cases of utility line interference, or where certain portions of the roots or root systems have been severed or severely damaged.

The following specifications shall apply:

- 3.5.1. All cuts shall be made sufficiently close to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub, so that closure can readily start under normal conditions. All cuts shall be clean. It is necessary to precut branches too heavy to handle to prevent splitting or peeling the bark. Where necessary, to prevent tree or property damage, branches shall be lowered to the ground by proper ropes or equipment.
- 3.5.2. Remove the weaker, least desirable, crossed or rubbed branches. Such removal should not leave holes in the general outline of the tree.
- 3.5.3. Treatment of cuts and wounds, with tree wound dressing, is optional except where open wounds in certain trees may attract insects that carry disease or allow fungus invasion. If such treatment is made, materials non-toxic to the cambium layer must be used, and care taken to treat only the exposed wood with a thin coat of dressing. Old injuries are to be inspected. Those not closing properly and where the callus growth is not already completely established should be traced where appropriate. If desired, for cosmetic purposes, the wound may be treated with a thin coat of wound dressing.
- 3.5.4. Generally, in reducing size (cutting back) not more than one-third of the total area should be reduced at a single operation. When cutting back, only drop crotch as much as necessary. Where practical, avoid cutting back to small suckers. All effort should be made to cut back to a lateral, one-third the diameter of the cut being made. In reducing overall size, attention is to be given to the symmetrical appearance. Top is to be higher and sides reduced in order to maintain a tree-like form. When cutting back trees, one should have in mind to make them shapely and typical of their species.
- 3.5.5. On thin bark trees, just enough limbs shall be removed to get the effect wanted without admitting too much sunlight to the trunk of the tree or the top of large branches. Care should be taken with the following species: lindens, maples, beeches, apples, oaks, and other trees susceptible to sunscald, growing in different geographical areas. The damage may be minimized by doing work on susceptible species during the dormant season.

- 3.5.6. In lifting the lower bottom branches of trees for underclearance, care should be given to symmetrical appearance, and cuts should not be made so large that they will prevent normal sap flow.
- 3.5.7. Periodical drop crotching or cutting back of silver maples, poplars, and other trees with brittle and soft wood is an established practice and has proven beneficial in maintaining the safety of these trees over long periods of growth. Other trees with soft and brittle wood growing in different geographic areas may be specifically named when it is common practice to control growth by cut-back. An alternate method in some situations for maintaining the safety of these trees would be cabling and bracing.

4. GRADING

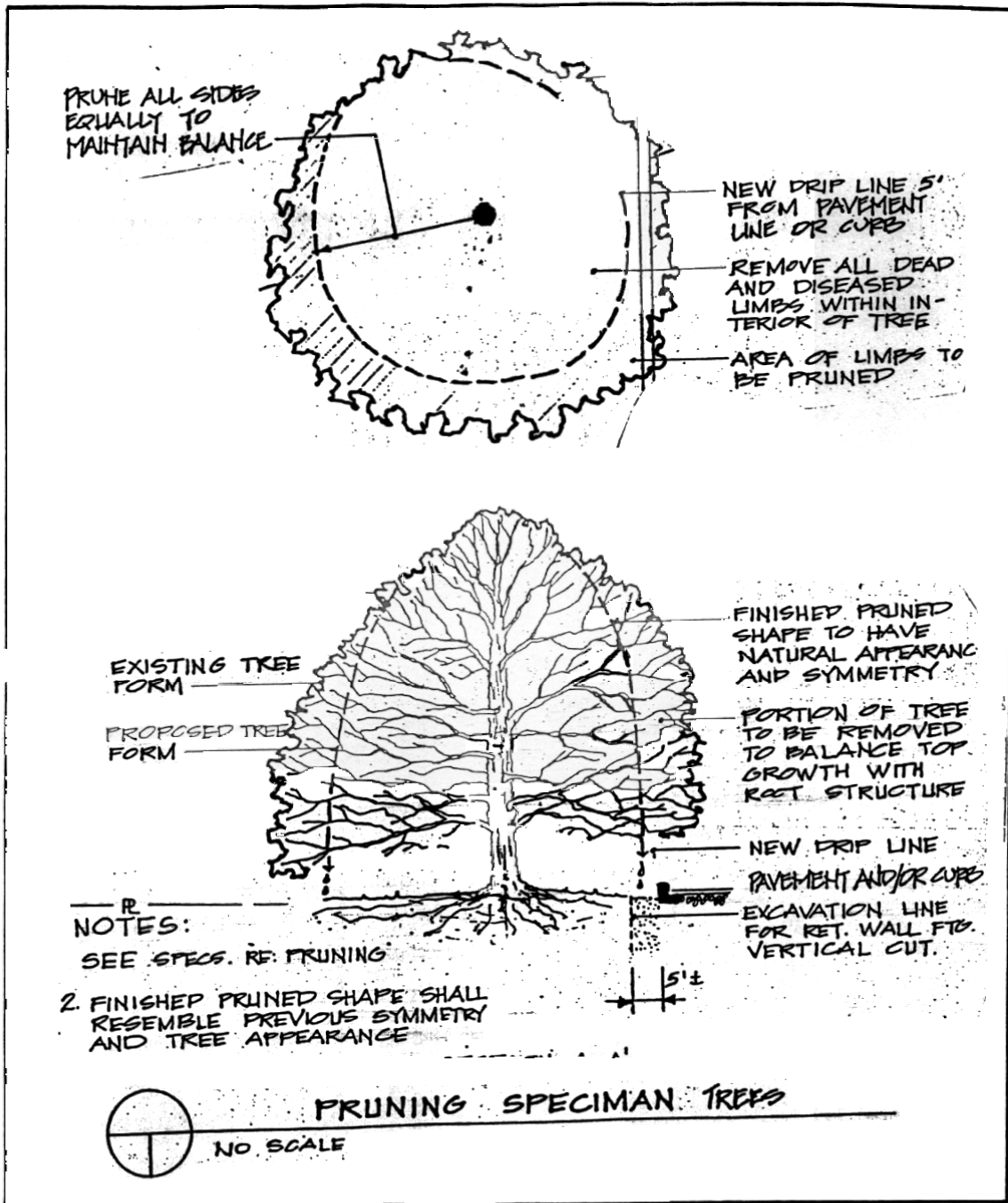
Maintain existing grade outside drip line of trees, unless otherwise indicated on plan. Do not leave open excavations in the vicinity of protected trees for longer than 2 days to prevent soil moisture reduction.


5. FERTILIZATION

The specifications shall define proper fertilization and the contractor shall fertilize affected trees during construction.

6. REPAIRS TO DAMAGED TREES

- 6.1. Repairs to damaged trees shall be performed by a professional arborist following the preceding instructions for pruning.
- 6.2. Trees damaged beyond repair or that do not survive will be removed by the contractor. A replacement cost will be determined by the Designer and paid by the contractor. The University will reserve the option of having the contractor replace the tree with one of equal size and quality.



TREE PROTECTION STANDARD		SHEET: 2	 <p>THE UNIVERSITY OF NORTH CAROLINA GREENSBORO PHYSICAL PLANT DEPARTMENT</p>
BY: M.M.	CHECKED:	WORK ORDER/PROJECT #:	
DATE: 11-15-88	SCALE:		

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03300. CAST-IN-PLACE CONCRETE

1. MIX DESIGNS shall be submitted by the Contractor to the engineer for approval well before they are needed for construction.
2. PROPER TRANSPORTING, CONVEYING, DEPOSITING AND CURING methods shall be clearly defined by the Designer.
3. HOT AND COLD WEATHER requirements shall be defined or clearly referenced.
4. ADMIXTURES
Updated: December 23, 2014
 - 4.1. Calcium chloride or admixtures containing chloride shall not be used.
 - 4.2. An approved air-entraining admixture shall be used for all concrete exposed to weather.
 - 4.3. Colored concrete shall be avoided. If desired by the Designer for some reason, it shall be discussed with FDC before specifying.
 - 4.4. **The use of fly-ash is encouraged when specifying concrete mix designs. The engineer shall evaluate the properties and the potential contributions in meeting the sustainable goals of the project.**
 - 4.5. When fly ash is specified, it shall be with tight tolerances on carbon. This is especially important when fly ash is used with air-entraining admixtures.
5. ALUMINUM CONDUITS AND PIPES shall not be embedded in any concrete.
6. CONTROL JOINTS, EXPANSION JOINTS AND CONSTRUCTION JOINTS shall be clearly defined using appropriate details. Control and expansion joints shall be coordinated with interior partition walls where possible.
7. METAL NOSINGS with non-slip surfaces shall be provided on all concrete steps.
8. COMPRESSION TESTS and related laboratory analyses shall be performed by a qualified independent laboratory (conforming to American Society for Testing and Materials standards) selected and paid for by the Owner in accordance with the North Carolina Construction Manual. The University solicits proposals for the testing laboratory shortly after the receipt

of construction bids. The Designer should contact the University prior to this time and provide the scope of work for testing as per the North Carolina Construction Manual and any other specific requirements for the proposal request.

9. REPAIR of defective concrete must meet the approval of both the structural engineer and Owner before the Designer gives approval for the repair. Durability, maintenance and aesthetics are factors to be considered.

03350. CONCRETE FINISH

Updated: December 23, 2014

1. A SAMPLE PANEL for exposed concrete may be required at the site prior to beginning production. The panel shall show all of the various finishing techniques required in the structure, i.e. joints, texture, color, workmanship, sandblasting, etc. The concrete used shall be provided from the project supplier and shall represent the approved project mix in all aspects. Panel shall be protected from construction operations, but shall be left exposed to the elements and left in place until all architectural concrete has been approved. Special attention shall be given to areas that routinely have caused concern in concrete construction such as:
 - 1.1. Adequate cover over reinforcing steel.
 - 1.2. Sealing and waterproofing.
 - 1.3. Proper drainage.
 - 1.4. Joints and connections.
 - 1.5. Protection of in-place work during construction, especially protection from vandalism. Both drawings and specifications shall note that the Contractor is responsible to protect the work and take whatever precautions necessary to assure the work is not vandalized (i.e. writing in flatwork). Vandalized work is not acceptable to the Owner.
 - 1.6. Proper dimension and sizing for embedded items.
 - 1.7. Coordination of the electrical and mechanical requirements for penetrations and across expansion joints.
2. INTERIOR CONCRETE FLOORS shall receive a durable finish to minimize staining and maintenance. Mechanical and electrical rooms are noted in particular. Any admixtures, hardeners or curing compounds shall be compatible with finish and adhesives or mastics used with the flooring system. **All adhesives and sealants used on the interior of the building must comply with the VOC requirements of South Coast Air Quality Management District Rule 1168.**

03400. PRECAST CONCRETE

1. **QUALITY ASSURANCE:** Precast manufacturing plants shall be certified by the Prestressed Concrete Institute's Plant Certification Program or meet equal qualifications. Visits to the precast plant by the Designer and Owner may be applicable to inspect the work process and quality. All welded connections shall be made by a certified welder.
2. **TESTING:** Precast manufacturers shall employ their own testing services with the Designer specifying frequency of testing.

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04200. UNIT MASONRY

Updated: December 23, 2014

1. The basis of design for brick and mortar will be made by the University and designer during the design phase based on the building and location. This is due to the University's long review and approval process for brick and mortar selections. The designer should include this scope of work in their design contract. **Preference shall be given to masonry that is manufactured regionally.**
2. The designer should include in the specifications the construction of up to 6 masonry sample panels (48" x 48") for selection of brick and 6 mortar sample panels (48" x 48") for selection of mortar color. Brick sample panels should be erected immediately after the Notice to Proceed in order to accommodate the sometimes lengthy approval process and not delay the contractor. **SAMPLE PANELS SHOULD CURE FOR AT LEAST 10 DAYS PRIOR TO REVIEW BY UNCG AND THE DESIGNER.**
3. The specifications should require construction of an exterior wall mockup panel. This panel should be a minimum of 4'-0" high by 5'-4" wide and provide all materials and finishes to be included in the exterior wall construction including interior and exterior wythes of masonry with required air space, reinforcements, brick ties, flashing, weeps, mortar netting, any precast banding or accents, special brick shapes or coursing, partial window frame installation, etc. using approved masonry materials and mortar. **THE MOCKUP SHOULD CURE FOR AT LEAST 10 DAYS PRIOR TO REVIEW BY UNCG AND THE DESIGNER.** The mockup will be used as the standard for judging workmanship. The contractor shall maintain the mockup in an undisturbed condition throughout construction. The contractor will be responsible for demolition and removal of the mockup at the end of construction, but only after the designer has approved removal.
4. In general, standard running bond coursing should be used for new masonry work unless required to match adjacent building brick coursing for existing buildings. Tooled concave or vee mortar joints are preferred over raked or flush joints unless required to match existing buildings. Special shapes shall be inspected by the designer for uniformity of size and color against the approved sample panel prior to installation.
5. The designer should note in the specifications that masonry walls or columns shall be adequately braced during construction.
6. The designer's construction documents should provide detail drawings and instructions to the contractor showing installation of all materials used in masonry wall construction.

Examples of details include structural connections, placement of reinforcement, ties and anchors, through-wall penetrations, installation of flashing, forming of end dams and corners, installation of termination bars, drip edges and expansion joints.

7. Weeps should be provided in head joints in exterior wythes of first course of masonry immediately above embedded flashing at a maximum of 24 inches on center. Provide cellular plastic weep vents, full height and width of head joints. Provide free-draining mortar netting designed to prevent mortar blockage of weeps and prevent bridging within the wall cavity.
8. Through wall flashing shall be pre-formed 22 gauge stainless steel. Bottom edge of flashing shall be hemmed and bent to form a drip edge. Flashing to have welded pre-formed corner (inside and outside) and end dams. Joints in long runs of flashing to be lapped 6" sealed between with silicone sealant, and lapped with a 6" wide strip of peel & stick centered over top exposed edge of the lap.
9. The designer shall indicate an adequate number of expansion and control joints both vertically and horizontally to avoid cracking and control movement in masonry construction.
10. On free-standing exterior masonry screen walls and retaining walls with brick caps, (not precast concrete or metal copings), use an integral polymeric admixture in mortar (at cap joints only) equal to "Krete Gard" mortar mix by Krete Industries, Inc.
11. Updated: July 24, 2013
The work of this section shall be bid and performed by a firm who is certified as a "North Carolina Masonry Contractors Association Certified Masonry Contractor" or installed under the direct supervision of individuals designated by the North Carolina Masonry Contractors Association Masonry Certification Program as a "CMP-Certified Masonry Professional" or "CME-Certified Masonry Executive" as described in the most current version or the NCMCA's "Guide to Masonry Contractor Certification." (North Carolina Masonry Contractors Association, PO Box 3463, Hickory, NC 28603-3463, 828-324-1564, information @ncmca.com)

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05000. METALS

1. DESIGN

- 1.1. Structures shall be designed with due regard for vibration, deflection and avoidance of ponding. It is noted that this criteria may govern over strength.
- 1.2. Take expansion and contraction into account in the design and detailing. Handrails and long members are noted in particular, especially when they span over an expansion joint in other materials.
- 1.3. Try to design column base plates for ease of installation, i.e. use anchor rods with nuts above and below base plate with $1-1/2" \pm$ space to grout after leveling.
- 1.4. Clearly define limits and type of paint for metal elements including primers. Shop painting is preferred. Preparation methods prior to applications of primers and paints shall be described in the specifications.
- 1.5. All exterior ferrous metals shall be hot-dip galvanized after fabrication. Field welds shall be ground and have cold galvanizing applied. The Designer should try to limit field welding on hot-dip galvanized pieces.
- 1.6. Specify that work be temporarily braced during construction until the structural system is adequate to brace itself.
- 1.7. Handrail pockets, sleeves or anchor plates shall be designed to shed water and prevent corrosion. Provide drawing details for installation and/or describe fabrication methods if critical to the finished product.

2. TESTING

- 2.1. Structural tests on welds, bolts, shear studs, etc. shall be performed by a qualified independent laboratory (conforming to American Society for Testing and Materials standards) selected and paid for by the Owner in accordance with the North Carolina Construction Manual. The University solicits proposals for the testing laboratory shortly after the receipt of construction bids. The Designer should contact the University prior to this time and provide the scope of work for testing and any other unique requirements for the proposal request. The Designer should contact Facilities Design & Construction during the design phase of the project to discuss testing frequency to be included in the specifications.

- 2.2. The structural design engineer shall clearly define and approve testing methods for both shop and field work. A preconstruction conference with the structural designer, metal fabricator and testing laboratory shall be held to clarify any testing requirements prior to fabrication. The designer shall designate critical pieces that should be approved at the fabrication shop with appropriate testing methods.
- 2.3. The Owner desires steel fabrication by an American Institute of Steel Construction (AISC) certified shop. If for some reason the Designer desires to not use a certified fabricator, they must explain the rationale to the Facilities Design and Construction Project Manager to get approval prior to completing the specifications. The use of a certified shop usually eliminates the need to visit the fabrication shop by the Owner and testing company.
- 2.4. Stored materials shall be stored in such a way as to permit access for inspection and identification and to protect them from deterioration.

3. QUALITY ASSURANCE

- 3.1. Visits to the fabrication plant by the Designer and Owner may be applicable to inspect the process and quality of the work.
- 3.2. All welded connections shall be made by a certified welder. The use of "pre-qualified welds" is encouraged.
- 3.3. The Designer shall be careful to avoid galvanic corrosion due to contact between dissimilar metals.

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06000. WOOD

Since the University has used very little wood in the past, most guidelines have been adequate; however some of the problem areas, primarily in roof and attic spaces, are noted below.

1. Truss bearing shall be noted in the construction documents and checked for adequacy and tolerances in the field. Also, refer to the NC Construction Manual, Design Criteria and Policies Section, for truss design requirements.
2. Wood roofs shall be designed such that adequate capacity exists for the future installation of slate shingles.
3. Plywood shall be correctly specified for its application and inspected during construction for conformance to specifications.
4. Nailing shall be carefully specified, especially for plywood sheathing. This includes nail size and spacing. Field-verify size and spacing of nails being used. It is noted that some gun nails are smaller in diameter than the corresponding common nail. Also, verify that the fastener specification is compatible with recommendations of the American Plywood Association.
5. Nails that miss the structural support are to be removed (i.e. nails that go through plywood sheathing and miss the rafter).
6. Attic ventilation shall be such that good air flow is obtained for the entire cross section and is adequate by the code (as a minimum). It is desirable to have more than minimum ventilation when a dark roof is used. Mechanical ventilation may be required in borderline cases.
7. Fire retardant roof framing or sheathing is not to be used.
8. For millwork or areas exposed to view, it is recommended to use wood with a moisture content of 19% or below to control shrinkage. The design shall take shrinkage into account if wood is allowed with a moisture content greater than 19%.
9. The design shall not allow timber to be exposed to weather or moisture such as direct contact with masonry or concrete. There shall be an air gap or metal separation from moisture where concrete or masonry attach to wood. Any wood in direct contact with concrete or masonry shall be treated to provide decay resistance as per the NC Construction Manual, Design Criteria and Policies Section, and any other code requirements.

10. Wood structures that are under construction shall be properly braced to prevent collapse or overturning. Trusses are noted in particular. The designer shall verify that the design has adequate blocking or bracing for the completed structure.
11. Wood that must be on the site prior to use shall be stored away from moisture and soil contact. This wood (especially wood flooring) shall be acclimated to the final environment for at least one week (or as required for the specific application) prior to installation such that the moisture content stabilizes to what it will be in the final environment. Millwork and wood doors shall not be delivered to the job site until needed and the building is sufficiently dried in and heated.
12. For wood with preservative or fire retardant treatment, the designer shall verify that the size and material type of each fastener shall be resistant to corrosion from the chemical preservative.
13. Do not use exposed, chromate copper arsenate (CCA) pressure treated wood.

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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.

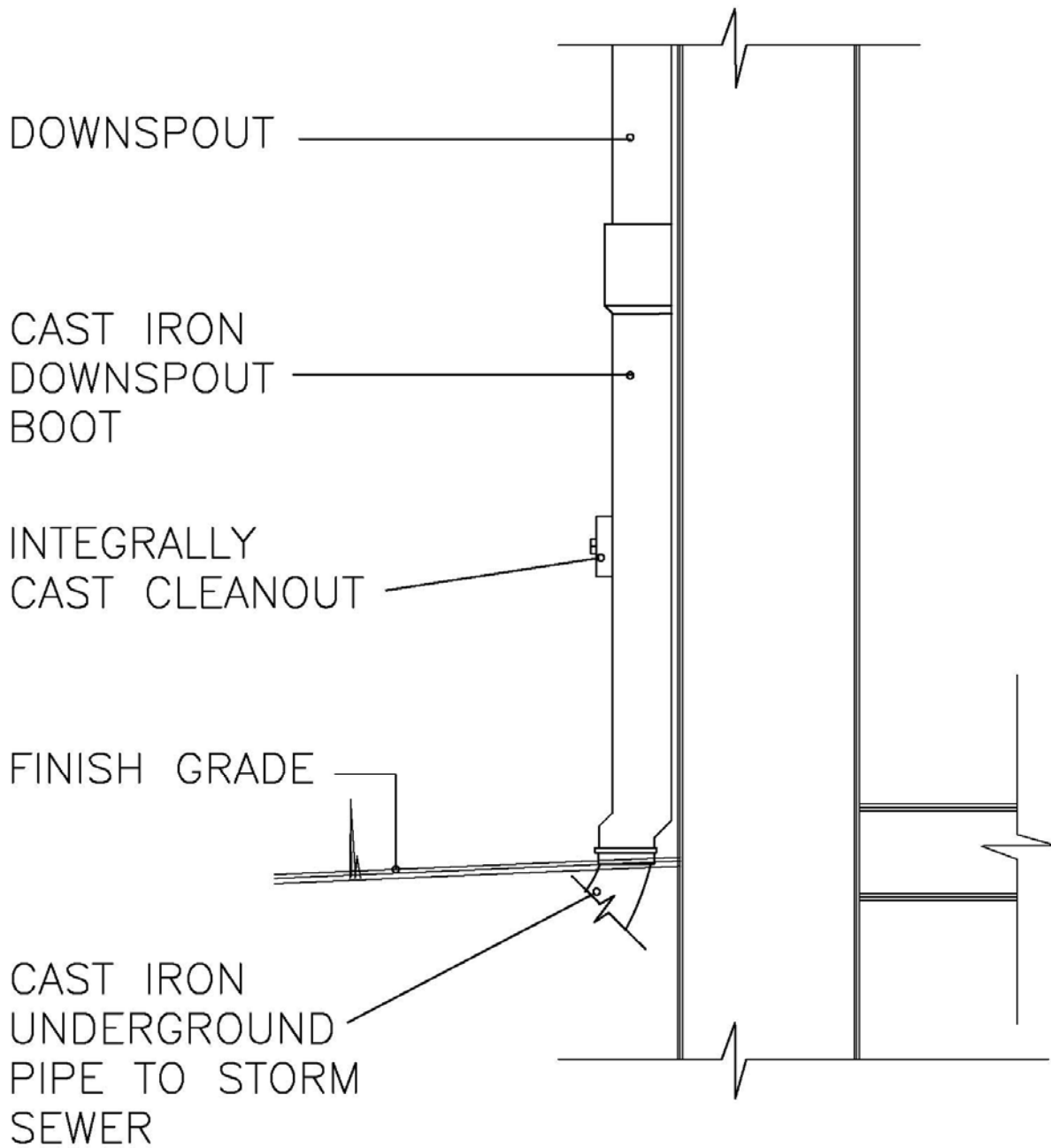
7. WARRANTIES

- 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.**

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

08100. DOORS

Updated: December 23, 2014

Early in the Design Development phase, the Designer will initiate the scheduling of a meeting with the University Locksmith, end user group and FDC design and construction Project Manager to review and discuss the hardware needs of the project including automatic doors, access controls, card readers, etc. Additional meetings may be necessary during or after the DD and CD review periods. The Designer will keep and produce all meeting minutes and will provide copies to all meeting attendees.

1. GENERAL INFORMATION

- 1.1. Public usage doors shall have a minimum width of 3'0".
- 1.2. Exterior doors shall be preferably aluminum or steel. Wood is acceptable if plastic faced, paint grade.
- 1.3. Narrow-stile doors will not be accepted; stile width shall be 3-1/2" minimum. Stile width may be greater than 3-1/2" to accommodate specified hardware.
- 1.4. Specifications shall clearly call for proper inserts to receive hardware (both wood and metal doors), provide for adequate reinforcing, and indicate gauge of door skin, inserts and reinforcing.
- 1.5. Inserts for steel doors shall be 3/16" minimum thickness. For aluminum doors, inserts shall be 1/4" minimum thickness.
- 1.6. Inserts shall be securely anchored in place and tapped to receive hardware. No loose inaccessible nuts will be permitted.
- 1.7. Where through-bolts are used to attach hardware to metal doors, spacer sleeves in doors shall be provided to prevent collapse of the door.
- 1.8. Doors shall have a minimum height of 6'-8".
- 1.9. Steel doors and frames shall be minimum 16-gage thickness provided with a 3/16" reinforcing channel welded into place behind the hinge straps. Tap all mounting screws through the reinforcing channel.

- 1.10. Provide 1/8" steel reinforcing for all other mortised and surface mounted hardware.
- 1.11. All doors shall be certified to have asbestos free cores.
- 1.12. Designer shall consult with the Design Project Manager, UNCG Lock Shop, and Architectural Hardware Consultant (AHC) to determine the appropriate level of weather protection for all exterior openings, including but not limited to door sweeps and weather stripping.
- 1.13. Provide handicapped accessible automatic door openers (pneumatically operated) on at least one main entrance to each major University building for allowing more severely handicapped persons greater access beyond that required by building codes.
- 1.14. There shall also be at least one set of automatic door openers (pneumatically operated) or an "airport entry" (no doors) on a set of toilets (men/women) on the main or most used accessible floor of the building. All other interior doors are to be set to operate at or below a 5 pound push/pull pressure.
- 1.15. Provide electronic security controls on at least one main entrance to each major University building for allowing authorized access to buildings after hours.

Hardware for steel and aluminum entrance doors shall be specified in detail, and this hardware shall be included in regular finish hardware schedule as material to be furnished by the finish hardware supplier and not by the door manufacturer. Hardware attached to metal doors shall be attached with through-bolts having spacer sleeves to be backed up by inserts of sufficient weight and thickness to insure permanent fastening with conventional screws.

Heavy duty mortise locksets with dead latches are preferred. Minimum throw of latch shall be 3/4". Inside trim shall include a turn knob to permit egress when door is locked. Dead bolts are not acceptable except in special cases such as stores, snack bars, etc.

Where panic devices are required, outside trim shall be pull and cylinder (no movable knob or handle) with cylinder dogging inside. Rim type panic devices are required. Vertical rod hardware is not acceptable.

Closing of entrance doors shall be by a closer of adequate size and not exposed to the weather. Closer shall be mounted in an inverted overhead position or in a parallel arm position. Surface mounted overhead closers are preferred. The use of floor closers is prohibited. Closer shall have a back check feature.

Butt mounting is preferred. Where pivots are required, intermediate pivots shall be provided.

Pulls on exterior doors shall be of a design that will not create a lever action at the point of

attachment to door.

2. STAIR DOORS

- 2.1 Stair doors to the outside shall have panic devices.
- 2.2 Stair doors to the inside of the building shall have closers, latches and stops. Latches shall be activated by panic devices equipped with rim type panic devices.
- 2.3 Stair doors opening onto roofs or into mechanical penthouses shall be equipped with a self locking lockset having free knob on the roof or mechanical area side with access by key only. Doors shall be equipped with closers. In the case of doors opening onto roofs, closer shall be mounted out of the weather.

3. ROOF ACCESS DOORS

Roof access doors from areas other than stairs shall be equipped in the same manner as those from stairs.

4. DOORS TO MECHANICAL, CUSTODIAN, TRANSFORMER AND ELEVATOR MACHINE ROOMS

Doors to these rooms shall have self-locking locks with free knobs on the inside with access by key only. Elevator machine room and transformer vault doors shall be equipped with door closers. Exterior mechanical room doors shall have closers. Refer to Section 17 of this guideline which pertains to hardware on doors to hazardous areas.

5. ELECTRICAL ROOMS

All electrical rooms with equipment rated 1200 amperes or more that contain overcurrent devices, switching devices or control devices shall have minimum 36" x 80" doors at each end of the working space. Each door shall open in the direction of egress and be equipped with panic devices.

6. TELECOMMUNICATION ROOMS

All telecommunication rooms shall be equipped with electronic locks with proximity card readers. Refer to Guideline Section 16722, Electronic Door Access & Monitoring, for additional related information.

7. CORRIDOR DOORS

Corridor doors which are required to be fire doors or smoke doors may be equipped with magnetic hold-open devices. It is preferred that doors be so equipped when doors will be frequently used and subject to the abuse of heavy traffic.

8. DOUBLE DOORS

Double doors to individual rooms shall have keyed, removable mullions, manual flush bolts on the inactive side, mortise lock on the active side and shall be paired LH and RH.

9. DOOR SIGNS

Door signs and numbers will be provided by the appropriate construction contract. Signs and numbers will not be attached to the door.

10. DOOR NUMBERS

Door numbers shall be assigned in the door schedule and shall be coordinated with the floor level and room numbers to which they open. Include doors to all spaces: service closets, electrical and mechanical spaces, bathrooms, etc.

11. FRAMES

Interior door frames shall be hollow metal shop primed and field painted. Knock-down frames are acceptable only on renovations provided all joints are mitered, welded and ground smooth.

Exterior frames shall be hollow metal, shop primed and field painted, or storefront aluminum.

Door frames shall be reinforced with a 3/16" welded channel behind the hinge straps to receive hardware.

Dry storage shall be provided for doors and frames. If frames are open on the job site, they shall be raised above the ground, wrapped in a weather tight plastic film and covered with canvas. Covering shall be tied down to prevent its being blown off. Steel doors shall not be delivered until they can be placed in a dry area.

12. PAINTING

Updated: December 23, 2014

1. Before finish paint is applied to doors and frames, all abraded areas shall be thoroughly sanded and re-primed.
2. Paints and coatings used on the interior of the building shall not exceed the VOC content limits established in the South Coast Air Quality Management District Rule 1113.

08300. DOOR HARDWARE

1. GENERAL

The architect shall furnish with his final working drawings and specifications when submitting for review, a folio containing manufacturer's cut sheets and other descriptive data describing in detail all hardware items specified to be furnished. This package will be reviewed by the University locksmith.

During construction when receiving shop drawings the architect shall obtain from the Contractor and furnish with the hardware submittal, a second folio containing cut sheets and other descriptive data describing in detail all hardware items which the Contractor proposes to furnish. All drawings, submittals, cut sheets, etc. shall be reviewed and approved by the University locksmith prior to approval.

In summary, all submittals regarding hardware items shall be accompanied by manufacturer's cut sheets, descriptive data, etc.

The Contractor shall provide competent craftsmen skilled in the installation of hardware. Each workman shall demonstrate his proficiency by installing hardware on one door. This door will be inspected and approved by the architect and the University locksmith before further hardware installation continues.

Specifications shall require that the hardware supplier have available locally a qualified hardware consultant who shall be available to the Contractor and the architect so that consultation and installation problems can be promptly handled. Minimum job site visitation by the hardware consultant shall include one visit during installation and one visit after hardware is installed. The requirement is not intended to shift the responsibility of inspection of the work away from the architect or to relieve the Contractor of the responsibility of providing competent craftsmen and making proper installation of the hardware.

2. RENOVATIONS TO EXISTING ENTRANCE AND HIGH TRAFFIC DOORS

- 2.1. Provide complete new hardware set including ball bearing hinges.
- 2.2. Replace door and frame if it does not provide sound mounting for new hardware.
- 2.3. All exterior doors will be capped and finished to match the door finish.

3. SPARE HARDWARE

Provide spare hardware items (locksets, cylinders, exit alarms and devices) with the job. Items and quantities for each job should be determined by consultation with the University locksmith.

4. LOCKSETS, TRIM

Heavy duty builder's hardware mortise locksets will be acceptable. All locksets shall be Corbin to match the University standard. Mortising for locksets shall be neat and accurate. The mortised slot shall be neither too loose nor too tight. Screws shall be installed in properly sized pilot holes. Screws shall not be driven with a hammer nor spun out with power screw driver.

Hardware shall be tightly mounted, properly fitted and correctly aligned.

The lock function on all locksets shall permit the knob on the side opposite the lock cylinder to be free to operate the latch.

4.1. Corbin mortis type locksets (2000 series) with through bolted roses shall be specified as follows:

4.1.1. 2057 storeroom function for mechanical rooms, electrical rooms, telephone cable rooms, custodial closets and storerooms.

4.1.2. 2051 entry functions for offices and conference rooms.

4.1.3. 2065 function for dorm rooms and areas needing deadbolt security.

4.1.4. 2055 classroom function.

4.2 Trim to match existing styles in use.

4.3 Finish US26D or US32D where appropriate. US10 may be substituted on renovations to better coordinate with existing hardware.

5. CLOSERS

Closers without hold-open feature shall be provided. If necessary to hold door open, other means shall be provided.

Overhead door closers shall be mounted with through-bolts where attached to the door. Solid blocking reinforcement shall be provided in the door jamb for attachment of closer or closer arm. Mounting of the closer may be on the door, inverted on frame, or if parallel arm position is used, care shall be taken to specify a closer of adequate size. Semi-concealed and floor closers are not acceptable.

Closers shall be prevented from hitting walls or other surfaces when doors are opened to full swing. Minimum full swing shall be 90 degrees.

- 5.1. Acceptable brands are Corbin DC 2000 series or LCN 4000 series.
- 5.2. Finish - SBL; DBL may be used on renovations to coordinate with existing hardware.
- 5.3. Mounting - Wood screws in solid wood blocks; machine screws tapped into 1/8" thick reinforcing plate; sexnuts, bolts and reinforcing plate when mounted over mineral core.

6. PUSH/PULLS

Push/pull finishes shall match other hardware used.

7. MUTES (SILENCERS)

All frames shall be provided with silencers or mutes (minimum 3 per door).

8. THRESHOLDS

Thresholders shall be provided for all thresholds to be anchored to concrete floors. Expansion shields of any kind will not be acceptable. Thresholds shall be caulked for waterproofing and to deaden sound. Fully secured anchors shall be installed at each recess provided. Dummy blanks will not be used.

9. STOPS

Overhead stops are not permitted. Knob bumpers mounted on dry wall construction shall be backed up by a stud or intermediate reinforcement.

Floor stops shall be positioned a proper distance from the hinged edge of the door. Stops shall be located 2/3 the width of the door from the hinged edge and never less than 1/2 the width of the door.

Doors may be held open by means of magnetic holders or, select hold-open features on door closers. See other specific requirements regarding entrance doors and corridor doors.

10. CYLINDERS, CORES, KEYS

- 10.1. All locks shall be great grand master keyed to the existing Corbin system. A factory bitting list shall be provided documenting keying used on project including 25 spare key changes per master. All exterior and exit device cylinders shall be Corbin removable core.
- 10.2. Provide two plain bow keys factory stamped "DO NOT DUPLICATE" per cylinder.

- 10.3. Specific keying requirements to be determined and checked by the University locksmith.
- 10.4. All master keys to be delivered directly to the University locksmith by the hardware distributor.
- 10.5. Provide a minimum of 200 plain bow, manufacturer's original key blanks in each key section used on the job.

11. EXIT DEVICES, FIRE DEVICES

Panic devices shall be installed where required by code.

- 11.1. Exit devices to be rim type device and provide optional built in exit alarm feature. All exit devices, alarmed and standard, to be the same model: Von Duprin Model 99 or Model 33.
- 11.2. Use key removable mullions on pairs of doors.
- 11.3. No vertical rod devices unless specifically required by code, i.e. oversize doors.
- 11.4. Pull side trim - latching fire doors (stairs, corridors) lever handle - no key cylinder.
- 11.5. Pull side trim - locking doors - NL (key and pull) or DT (pull only) function only - only one NL function per pair, set or bank of doors.
- 11.6. Finish matching US26D - i.e. US28XUS32D. US10ANXUS10 may be used on renovations to coordinate with existing hardware.
- 11.7. Use cylinder dogging where dogging is required.

12. FLUSH BOLTS

Where flush bolts are required, dust-proof strikes shall be provided for the foot bolts. Automatic flush bolts are not acceptable unless approved by University locksmith.

13. HINGES

All doors shall have a minimum of three hinges, except those wider than 3'0" shall have four hinges. Doors wider than 3'0" or which have closers shall have ball bearing joints.

14. LOCKS FOR YARD HYDRANT CABINETS

Slot-type locks that are operable with a screw driver shall be provided whenever possible. Key locks in walkway cabinets are not acceptable.

15. BUTTS

15.1. All exterior butt hinges to be non-removable pin ball bearing.

15.2. Finish US26D.

16. AUTOMATIC OPERATORS

Auto-equalizer (pneumatic) operators are required on ADA entrances and bathrooms. We prefer LCN 4820 Series operators.

17. DOORS TO HAZARDOUS AREAS

17.1. Doors that lead to areas that may prove dangerous to visually impaired persons (e.g. doors leading to loading docks or platforms, mechanical rooms, electrical rooms, etc.) shall be made readily identifiable to the touch by a textured surface on the door handle, knob, pull or other operating hardware device.

17.2. Textured surfaces may be made by knurling, roughing or by applying an abrasive surface to the door operating hardware.

18. SECURITY ACCESS

18.1. The University uses the Blackboard Transact One-Card Access Control System to provide and monitor access into buildings from the exterior and to certain interior spaces such as telecom rooms. The Designer should include a discussion of this scope of work in the meeting(s) with the University Locksmith and FDC Design Project Manager early in the Design Development phase of the project. This system should be included in the project as a Preferred Brand Alternate and as one of the three manufacturers in the base bid.

18.2. The Designer should refer to Section 16000 for additional information and to coordinate electrical issues for this work. The specifications should include shop drawings for the security hardware installation and coordination with standard hardware prior to door frame approval. The needs of the security hardware equipment should be reflected and specifically noted on the door frame submittal.

18.3. The Designer should require a pre-installation conference with all Contractors involved with this work including the Designer and FDC construction project manager soon after the Notice to Proceed.

19. **KNOX BOXES**

Updated: April 24, 2013

The University does not use knock boxes for emergency access into buildings. The University Police are first responders to any emergency and will provide whatever access is required.

08700. WINDOWS

1. GENERAL

Energy conservation must be given prime consideration when incorporating fenestration into building design.

Window materials and glazed areas should be compatible with design objectives of each project. Aluminum window systems must be provided with an anodized finish or a "Duramar" (or fluoropolymer finish). Stools should be metal, masonry, natural stone, or cast stone.

Provision shall be made to allow for exterior cleaning of all windows with minimum inconvenience and hazard; e.g., double hung windows or windows which open into building. (Removable sash features have not proven satisfactory.)

2. PLATE GLASS

Glass shall be 1/4" minimum thickness, clear, polished plate. Glass of 1/8" thickness will not be accepted.

3. TEMPERED GLASS OR SAFETY GLASS

Where tempered glass is used, glazing stops which will cover the mill marks in the glass shall be provided.

All doors with full glazing and any exit or entrance doors with over six square feet of glass shall be glazed with fully-tempered glass which passed the test requirements of USAS Z 97.1 - 1966.

4. INSULATING GLASS

Low-e, clear, insulating glass is generally preferred to conserve energy. All insulating glass used shall be vacuum sealed to prevent condensation between the two glass layers.

5. WIRE GLASS

Wire glass which is specified to have Underwriter's Laboratories, Inc. approval shall have the label left on the glass. The Owner will remove the labels after acceptance of the

building.

Wire glass shall have wire strands which run diagonally at 45 degrees to the floor.

6. SCREENS

6.1. Insect screens shall be included on all operable windows for residence halls.

6.2. Security screens shall be provided on all first floor windows of residence halls.

7. WINDOW REPLACEMENT AND/OR RESTORATION PROJECTS

Clearly delineate in the scope of work what parts of existing windows are to be replaced and/or restored. Clearly identify accessories such as curtains and blinds that are included in the project. If existing weights are reused, use nylon (as opposed to cotton) sash cord to carry the weights.

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09001. GENERAL

Updated: December 23, 2014

The Designer shall consider specifying low or no VOC products for interior finishes, where appropriate and economically feasible. All adhesives, sealants, paints and coatings used on the interior and exterior of buildings must comply with the VOC limits established in the South Coast Air Quality Management District Rules 1113 and 1168.

Maintenance stock for each color, type, pattern, etc. of the following materials (and others as appropriate) shall be provided. Each is to be packaged, protected, identified and stored by the Contractor at a location to be indicated in the specifications.

1. Carpet – 10 square yards
2. Ceiling Tile – 4 boxes
3. Wall Covering – 1 full roll
4. Tile (floor, wall, etc.) – 1 box

09002. COLORS

Updated: June 12, 2013

Color presentation boards will be developed by the Designer and presented to FDC and the end user for approval twice during the course of the project: once for approval of the basic design, as part of the Design Development Phase; and once during the Construction Phase using the actual color and material submittals provided by the Contractor. For the construction color boards, the Designer will select color and material samples based on the original, approved color and material boards. The Designer will include in the specifications and as part of the pre-construction meeting agenda direction to the General Contractor to provide all color and material samples as soon as possible following the start of construction. The color board presentations will be arranged by the FDC Design and Construction Project Managers, respectively.

In an effort to make the submittals consistent, UNCG has prepared the following requirements for all color board submittals by the Designer. These color boards will be submitted twice, once during the Design Phase and again during the Construction Phase. The requirements for each submission are the same and are as follows:

1. The background board color is to be a neutral gray.
2. Colors or materials that will be next to each other in the building shall be placed adjacent to one another on the board with no gap in between. This may require some creative placement on the board which is OK. Use your creativity!
3. Colors and/or samples should be of a representative or proportional size to indicate the overall feeling of the space – (i.e. do not have a smaller wall sample next to a large rubber base sample). Pictures or other representations of the overall floor pattern should be shown along with actual samples.
4. Have a color board or portion of a board dedicated to each “major” space in the building. If you have 20 classrooms or offices that are all similar in size and function, one representative board will suffice for all of them. However, each space that has a different purpose or special condition needs to have its own board.
5. The front of the boards should include a label with the project name and should identify the “major” space being presented. A separate sheet of paper may be passed around to the viewers as a key to understanding the boards when viewed at a distance.
6. It is recommended that samples be attached with Velcro for ease in changing or viewing adjacent samples.
7. Some standard colors used by the University are as follows:
 - a) UNCG official colors - gold (Pantone Matching System (PMS) 116), navy (PMS 281) and white
 - b) Exterior signage - terra cotta (Munsell Palette 7.5R 3/6) background. **Matte Finish.**
 - c) Interior signage - white letters on warm gray (PMS 404) or cool gray (PMS 421)
 - d) Exterior equipment and fixtures such as posts, bicycle racks, railings and bollards - Benjamin Moore Black Walnut #13361
 - e) Mechanical room color codes
 - e.1) Piping
 - Chilled water – lime
 - City water (domestic) - light blue
 - Condensate - medium blue
 - Fire protection – red
 - Gratings & Platforms - medium gray
 - High pressure steam - light orange
 - Hot water - dark blue
 - Low pressure steam – yellow

- Natural gas – turquoise

Stencil labels may be required when many pipes of the same general character must be differentiated from one another such as steam pipes of various pressures. Coded banding systems without lettering to differentiate pipes from one another may not be used.

- e.2) Other mechanical room surfaces
- Ceilings & Walls - white
 - Floors - dark gray
 - Hand rails - safety yellow

Other colors may be more appropriate to the specific location or be governed by OSHA standards and each situation shall be considered individually. Stencil labels are also required where color blindness or poor lighting conditions render color coding ineffective. Fluid flow direction shall be indicated by arrows painted on the piping.

09100. STUCCO

Stucco use should be avoided at ground level where it may be easily damaged. Stucco used in locations such as soffits shall be glass-fiber reinforced type.

09500. ACOUSTICAL TREATMENT

Noise control as measured by decibel reduction through partitions and floors shall be thoroughly reviewed during the design.

09510. ACOUSTICAL CEILINGS

Updated: December 23, 2014

Acoustical ceiling tile shall not be installed until work above ceilings has been completed and temperature and humidity will be maintained as indicated for final occupancy. Two by two grid configurations are preferred. Tile selection shall be based on standard types by national suppliers and costs of maintenance and replacement must be considered in the selection. Concealed grid systems, such as tee-and-spline systems, which are not accessible, are not acceptable. Access to all utilities shall be provided to the fullest extent possible regardless of the ceiling type used.

Mineral fiber and fiberglass ceiling tiles are 100% recyclable and should be recycled on each renovation project where feasible. All new ceiling tile should be specified to meet the specific attributes required for the project, including the consideration for high recycled content.

09700. FLOORING

Updated: December 23, 2014

The following flooring materials are preferred at the locations indicated:

1. High traffic areas such as lobbies and corridors - high wear resistant material such as ceramic tile or terrazzo. **Consider the use of other durable, rapidly renewing materials in appropriate locations.**
2. General purpose rooms - vinyl composition tile. **Consider substituting bio-based tile in appropriate locations.**
3. Offices, conference, auditorium aisles (with permanent seating), teacher lounges, music or language listening rooms – carpet. **Preference is for carpet tiles to ease the cost of replacing damaged sections. Designer to consider the recycled content and recyclability when specifying these products.**
4. Bathrooms and showers - ceramic tile
5. Food service areas - quarry tile or antibacterial cement
6. Laboratories - monolithic systems with no seams or cracks
7. Mechanical, storage and custodial rooms - sealed concrete with steel trowel finish (See Section 1900.2.7 for mechanical room floors above occupied areas)
8. Computer rooms - raised removable panels supported on interconnecting grids and pedestals providing an under-floor plenum for air distribution and utilities (where the extra utilities access needed for these rooms is not provided some other way)

Address all transitions between flooring materials, especially carpet to resilient flooring, with detailed designs, thresholds, or resilient nosing accessories. All transition elements must meet ADA requirements for wheeled traffic.

Base boards should generally be rubber (except in wet or high humidity areas), set on top of the flooring, with pre-molded inside and outside corners.

09900. PAINTING

Standard paint finishes preferred by the University are:

1. Walls - eggshell
2. Doors - gloss
3. Door and Window Trim - gloss
4. Ceilings - flat
5. Mechanical Room Walls - epoxy paint on block
6. Mechanical Room Floors - multi-coat sealer adequate for wear and dust protection on concrete
7. Mechanical Room Equipment - Glidden Glid-Guard Alkyd Gloss Enamel #4500 or equal (except boilers and burners - Glidden Glid-Guard Silicon-Alkyd Enamel #5539 or equal)

Items especially noted to be painted:

1. Paint grade woodwork should be painted, not stained.
2. Visible surfaces on interior of ducts behind louvers, diffusers, registers and grills shall be primed and painted (typically flat black enamel).
3. Painting of all insulated piping shall be clearly put in the general construction specifications since this contract contains the majority of painting. Colors are noted in 09002.

Items typically not to be painted:

1. Ducts, conduit and mechanical equipment where concealed from view and not susceptible to rusting.
2. Items completely finished at the factory.
3. Stainless steel, aluminum, copper and other non-ferrous metals.
4. Prefinished millwork and casework.
5. Acoustical tile and grid system.

09950. WALL COVERING

The following wall covering materials are preferred at the locations indicated:

1. High traffic areas such as corridors and stairwells - enamel paint
2. Bathrooms and showers - ceramic tile
3. Food service areas - quarry tile

When special wall finishes are used, the University shall be provided with maintenance instructions.

Use of vinyl wall covering is discouraged and must be limited to specially approved areas.

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10160. TOILET AND SHOWER PARTITIONS

Solid (homogenous color, not coated or laminated) plastic toilet and shower partitions are preferred over other materials such as steel or laminates and should be hung from the ceiling where possible. Provide heavy duty stainless steel trim and hardware with self closing door hinges. Latches that do not depend on precision alignment of door and wall to operate are preferred.

10400. SIGNAGE

The Designer is responsible for incorporating into the design the following signage and graphics: room identification, directories, directional signage, exterior building identification and parking regulation signage. All should be handled in accordance with the University's Signage Program, a copy of which is available from FDC Design Project Manager. The Designer is responsible for developing compatible graphics for any required applications not addressed by the Signage Program, including a directory map, if needed. The Designer shall indicate locations for emergency egress route plans and occupant load signs (for assembly spaces greater than 49 persons) that will be produced and installed by the University's Facilities Operations Department. The Designer shall provide floor plans in CAD format that can be used to produce 8 1/2" x 11" emergency plans.

Numbering: All spaces shall have assigned numbers as designated by the Office of Space Management. It is desirable that the construction numbering system be retained throughout the life of the facility. The Designer therefore is to submit a numbering system no later than the design development stage. FDC will provide OSM with a working copy of the drawings at or before the Schematic Design (SD) review to apply UNCG room numbering protocol. OSM will also be involved in the final drawing review before going out to bid. For minor remodeling projects, the project manager will request room numbers from OSM during the design phase. Following are general guides for space numbering in all buildings.

1. Room numbers shall be 3 to 4 numerical digits with optional alpha suffixes and prefixed with the floor level number. For example, "201" for second floor rooms, or "415J" for rooms on the fourth floor. The level using the number 1 as its first digit shall be the primary level entered at grade. In below grade levels, room numbers should begin with 0. Avoid floor names that may project a negative image such as "Basement or Sub-Basement". Some buildings may have floors with a significant number of rooms. In that case, four numerical digits with an optional alpha code should be used. The first digit will identify the floor, the second digit will identify the section of the building and the last two will identify the room. For example "2301" for second floor rooms, or "2301A".

2. Numbers “100” or “200,” etc. will be reserved for numbering corridors; therefore, room numbers will begin with “101,” “102,” etc., and shall move around the floor in a logical fashion. For example, corridors on the third floor might be 300A, 300B, 300C, 300D. Consistency of corridor numbers from floor to floor is desirable and shall be maintained if at all possible.
3. Staircases shall be uniquely numbered. Staircase numbers shall maintain consistency from floor to floor. For example, first floor staircase is “ST1-1”, at second floor it is “ST1-2”. A sign must be installed on each floor for each staircase.
4. Elevators shall be uniquely numbered and maintain consistency from floor to floor. For example first floor elevator is EL1-1, at second floor it is EL1-2.
5. Room numbers will begin at the main entrance and are to follow a simple, logical sequence which takes into account building circulation patterns. Room numbers should flow in ascending order from one end to another in buildings with one primary dividing corridor, with odd numbered rooms on one side (generally left/west/north) and even on the other (generally right/east/south). Room numbers should follow in ascending order in a clockwise direction from the main entrance in buildings with circular or more complex corridor systems. Some buildings may have floors with too many significant rooms to be numbered. In that case, four numerical digits with an optional alpha code should be used. For example, “2001” or “2001A” for second floor rooms.
6. Rooms with modular partitions (cubicles) are to be assigned one room number. Cubicles and partitions within will be assigned an alpha suffix following standard room numbering protocol. For examples: 215 is the suite number with cubicles numbered 215A, 215B, etc.
7. Begin room numbers with a digit or character designating the floor level. Do not use decimals or fractions to designate intermediate levels. Non-numeric floor level codes shall follow the alpha list below where appropriate and may, in some cases need to add a digit as well. For example, a building with a mezzanine may have level “M”. A building with two mezzanine levels may have floors “M1” and “M2”.

C	CONCOURSE	Concourse Level
M	MEZZANINE	Partial Floor Above Base Floor Plan

8. Make the room numbering sequence flexible to allow for expansion or renovation. Several room numbers shall be reserved or skipped for large spaces to allow for future additions or division. When adding to buildings, do not duplicate numbers in the original building.
9. Room numbers across hallways should be sequential.
10. Combinations of letters and numbers shall be used to identify dependant spaces, such as closets. Combinations of a letter and numbers may also be used to identify rooms in a

suite. For example, a storage closet entered from room “312” can be numbered as “312A”. Avoid I, O and Q, which may be interpreted as numbers.

11. Make the room numbering system as consistent as possible from floor to floor. Rooms on different floors with the same digits in the last 2 positions shall be located in about the same plan location in the building as long as this does not create other inconsistencies or major difficulties.

10800. TOILET & BATH ACCESSORIES

1. Toilet and bath accessories shall be selected and specified on the basis of prevention of communicable diseases. Individuals shall not have to touch anything after they have washed their hands. The Designer shall schedule a meeting to consult with the FDC Design Project Manager for project-specific questions and situations.
2. The University will furnish automatic paper towel dispensers to be installed by the Contractor at locations described in the contract documents.
3. The University will furnish automatic hand-soap dispensers to be installed by the Contractor at locations described in the contract documents.
4. Toilet tissue holders shall be stainless steel equipped to hold two rolls and furnished with locked covers and theft resistant spindles. The typical dispenser is the Bobrick surface-mounted multi-roll toilet tissue dispenser, model # B-2888.
5. Provide coat hooks inside toilet partitions.
6. Provide a 12” wide shelf in all toilet rooms to accommodate books and bookbags. The length of the shelf shall be proportionate to the length of the lavatory countertop.
7. A minimum of one waste receptacle with a minimum 18 gallon capacity shall be provided for every two lavatories. Capacity and number of receptacles shall be appropriate to the number of fixtures and building type. Locate receptacles adjacent to the exit of each toilet room. Receptacles shall not use flaps or doors to control deposit of waste. Women's restroom stalls shall include sanitary napkin receptacles.
8. Provide battery powered, sensor activated controls for faucets on lavatories. Provide battery powered, sensor activated flush valves for water closets and urinals.
9. Provide a mirror above each lavatory or one continuous mirror above multiple lavatories.
10. The entrance to toilets on the main floor shall try to be designed to avoid installation of doors (similar to airport-style toilets). If airport-style toilets are not practical, use automatic openers on doors with sufficient space for the door to swing out without causing a safety hazard, (i.e. in a protected area not in the general line of traffic in a hallway).

10900. WARDROBE SPECIALTIES

Coat and hat racks or hooks, installed in a manner not be hazardous to pedestrians, are required in classroom and office buildings.

10910. FIRE EXTINGUISHERS

All facilities shall be provided with 10 lb. nominal charge, ABC multi-purpose dry chemical portable fire extinguishers along with other types and sizes as required. Extinguishers in public areas should be mounted in recessed or semi-recessed cabinets capable of holding the extinguisher without the use of hooks or brackets. Locked cabinets with means of emergency access (striker, etc.) should be provided in areas especially susceptible to malicious use. Hooks (where cabinets are not used) for extinguishers should extend 2 1/2" from the wall with the turned up portion at the end 3/8" wide and 1/2" tall (all dimensions + 1/8"). Any hooks used must be designed for the extinguisher they are provided with. All portable extinguishers should be in visible locations and free from obstructions. Signage shall be provided to indicate the extinguisher location where visual obstructions cannot be avoided.

10920. BIKE RACKS

Updated: July 8, 2013

1. Designer shall review Campus Bike Rack Master Plan. Bike racks should be furnished at each major facility and shall be installed in a convenient, accessible and safe manner. Racks should not interfere with pedestrians or other site furnishings. Racks should be placed near the building entrance without causing conflicts with the path of pedestrian egress.
2. "Individual" racks shall be hot dipped galvanized, 2.375" OD, 36" high inverted "U" shape, ASTM schedule 40 steel pipe, with black thermoplastic coating installed on concrete pads. **Depending on the project, hot dipped galvanized may be the final finish.** Install individual racks by core drilling new concrete pads. For existing concrete surfaces, furnish racks with integral base plates and install with stainless steel anchor bolts. Multiple racks should be installed to allow at least 30" minimum spacing between racks and 36" minimum clearance from adjoining structures or other vertical surfaces. (Acceptable manufacturers include Huntco Supply, Portland OR; DERO, Minneapolis MN; Madrax of Trilary, Middleton WI; SARIS, Madison, WI; or approved equal).
3. "Stadium" racks shall be fabricated of similar materials as the individual racks noted above, except the inverted U shapes shall be pre-fabricated on two channel bases in sizes to hold two to sixteen bicycles. Install stadium racks with stainless steel anchor bolts and washers on existing concrete surfaces through pre-drilled holes in the channel bases.

10930. TRASH AND RECYCLING CANS

Updated: July 8, 2013 (moved from Guideline #02760 SITE FURNISHINGS)

The design of all facilities will include provisions for exterior trash and recycling receptacles. The designer will consult with the FDC Design Project Manager in determining the number and location of trash receptacles for each project. Receptacles shall be placed in pairs, one for trash and one for recyclable waste. Typically each trash/recycling station will consist of a 4" thick concrete pad sized to accommodate two identical round ornamental metal containers, each holding a 36-gallon receptacle. Where exterior trash/recycling receptacles are to be included as part of a project, their location shall be shown on the construction drawings and included in the project specifications by the designer.

1. Trash cans – shall be side door opening 36 gallon litter receptacles, Victor Stanley, Inc. (VS) raised dome lid type S-2, latching side door, and non-locking latch. Color shall be the manufacturers standard VS Tavern Square Green. Include a 2 ¼" high steel band label around the can with a clear background and white lettering "Trash Only." All shall match existing receptacles currently used on campus. Provide a 36-Gallon High-Density plastic liner sitting on a protective, rodent-resistant 1/8" thick steel plate cover.
2. Recycling cans – shall be side door opening 36 gallon litter receptacles, Victor Stanley, Inc. (VS) raised dome lid type S-2, latching side door, and non-locking latch. Specify plaques with lettering "Recycle," plaque size 16 3/8" x 6", max label size 13" x 5". Plaque should be white, lettering should be Navy Blue. Specify decal labels for lid label with lettering "Recycle" on top label, 2 recycling symbols on the side labels and "Comingled" on the bottom label. White background with navy lettering. Color shall be the manufacturers standard VS Tavern Square Green. All shall match existing receptacles currently used on campus. Provide a 36-Gallon High-Density plastic liner sitting on a protective, rodent-resistant 1/8" thick steel plate cover.

10940. EXTERIOR BENCHES

Updated: July 8, 2013 (moved from Guideline #02760 SITE FURNISHINGS)

The design of all facilities will include an evaluation of the need for exterior benches for pedestrian seating. The designer will consult with the FDC Design Project Manager in determining the need for pedestrian seating. If seating is determined to be required the designer will provide recommendations for the number, location, and placement of exterior benches for each project and also recommend whether the benches should be painted metal or wood. Benches shall be placed in convenient locations along major pedestrian pathways (painted metal bench) and in quiet, contemplative settings (exterior wood bench) such as pocket parks or garden areas. Typically, benches will be anchored to a concrete pad adjacent to a sidewalk, and positioned so as not to obstruct pedestrian traffic. In some cases benches may be located close to waste and recycling receptacles.

The University typically uses either a wood or painted metal bench, depending on location and

design of the exterior space or route. The University standard exterior wood bench is the Meridian - Teak Wood Bench by “Country Casual.” The University standard painted metal bench is the Victor Stanley Inc., “Steelsites RB Bench” Model RB-28, with powder coat finish, color matching Victor Stanley – “Tavern Square Green.” Both benches are typically 96 inches in length or as appropriate for the location. A proprietary alternate will be included on the project bid form for the selected style of bench to be used.

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11000. GENERAL PROVISIONS

Capital improvement project equipment is in one of two categories:

Fixed (built-in) Equipment is defined as equipment that will become an integral part of the project by the fact that it will require connections with the structural, mechanical, plumbing, electrical or data systems. It is acquired through the construction contracts and is in the project construction budget. This includes such items as shelving, food service equipment, unit kitchens, cabinets, laboratory work benches, fume hoods, landscape furniture/cubicles, and fixed seating. The specifications shall clearly define which Contractors have responsibilities relative to equipment receiving, inventory and installation (including utility hook-ups and testing).

Moveable Equipment is generally defined as equipment that does not have a permanent attachment to the building's systems. Usually, there is a budget for moveable equipment within the total project authorization. This equipment will be purchased by the University directly and is not part of any construction contract. Most of the items will be purchased by the University's Purchasing Department and, therefore, are governed by state purchasing regulations (i.e., competition is required on large or numerous items and a specific brand or model might not be obtained due to the bid process). In some instances, the end user will opt to purchase Moveable Equipment utilizing a separate Budget Source and the cost for Moveable Equipment may not be included in the total project authorization.

There may be a preliminary list of moveable equipment in the project's program statement and the Designer may be asked to help develop the final moveable equipment list.

It is generally desirable to install the moveable equipment after most of the construction is complete. Some of the equipment may require connections to the project structure or utilities; therefore allowances for connections shall be made in the project design (power, data, water, waste, etc.). Both specifications and drawings shall clearly define who is responsible for receiving, installing and connecting the equipment.

11480. VENDING EQUIPMENT

Vending areas shall be provided at each major facility. FDC will coordinate vending area requirements to be included in the design. Connection requirements of equipment (power, data, water, etc.) shall be provided to the Designer and included in the design. Equipment shall be provided by the University or vending companies having contracts with the University. Requirements for a typical vending area are as follows:

1. Space shall be provided for four (4) individual vending machines, excluding washers and dryers in residential areas.
2. Each vending machine requires a 20amp duplex receptacle fed by an individual 20 amp circuit.
3. All water and electrical/data outlets should be 18 inches above finished floor level.
4. Floor finishes should be hard surface (ceramic tile, etc.).
5. Each vending machine requires a single data outlet, including washers and dryers.
6. Each vending machine requires a minimum width of 42 inches and a minimum depth of 36 inches. There should be an allowance of 2 inches from each end wall and between each machine. There should be an allowance of 4 inches behind each machine.

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12001. GENERAL

Updated: December 23, 2014

The Designer shall consider specifying and selecting furnishings with an emphasis on material life cycle costs, durability, recycled content, recyclability and materials with low emissions for use indoors.

12002. FURNITURE SELECTION

The Designer will assist in the selection and purchase of furnishings for new construction and renovation projects. The Designer, with input from the University End Users and FDC Department, will develop furniture plans and cost estimates for University review at the Design Development and Construction Document submission stages. Selection of furnishings will be based on the needs of the End Users and will be in keeping with the overall project design.

Once the furniture plans and purchasing budget have been approved, the Designer will work with FDC and the University Purchasing Department to develop bid documents for the University Purchasing Department to issue for bidding.

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.

14200. ELEVATORS

1. All multi-story buildings should be equipped with at least one elevator to allow for the movement of physically impaired persons and equipment between floors. The minimum capacity for any elevator shall be 2500 lbs.
2. In multi-story buildings, at least one elevator should serve the penthouse and/or basement mechanical equipment rooms. This elevator should be a service/hospital type.
3. For low-rise buildings, with a maximum travel distance of less than 45 feet, the use of conventional, in-ground hydraulic elevators is preferred. No telescoping hydraulic elevator systems should be used. Hole-less hydraulic elevators may be considered for travel distances less than 15 feet.
4. For buildings where the travel distance exceeds 45 feet, geared traction elevators are preferred. The use of machine room-less (MRL) elevators systems should also be evaluated for these projects.
5. A separate freight elevator should be provided in buildings, or portions of buildings, where movement of large objects, materials or heavy equipment is likely to occur on a regular basis.
6. Design elevator systems that are consistent with the program requirements of the project and fulfill the basic building functions and occupant load. For accessibility concerns in the event of an elevator malfunction, and for the general efficiency of the occupants, two elevators shall be considered for buildings of four stories or more. For added efficiency, a duplex elevator system should be evaluated when multiple elevators will be installed.
7. Elevators for parking structures and other open spaces should be designed in a sheltered area where rain and snow cannot reach the elevator entrances or hoistways.
8. For elevator modernization projects, UNCG recommends the Designer employ the services of an Elevator Consultant.
9. **DESIGN CRITERIA**
 - 9.1. Designers should obtain and use the “Elevator Specifications Guides” for hydraulic and traction elevators developed by the North Carolina Department of Labor – Elevator Division to assist them when preparing elevator specifications.

- 9.2. The major elevator components should be the products of one manufacturer of established reputation, except they may be the products, either wholly or in part, of another manufacturer of established reputation provided such items are engineered and produced under coordinated specifications. It is a requirement that any elevator manufacturer shall have their product approved by the North Carolina Department of Labor – Elevator Bureau, prior to bidding.
- 9.3. Provide non-proprietary microprocessor based elevator control systems that are serviceable and maintainable by any qualified maintenance provider. All such systems shall be free from secret codes and decaying circuits that must be periodically reprogrammed by the manufacturer.
- 9.4. The manufacturer shall furnish, and turn over to the Owner, any and all diagnostic tools and/or instruments, and all software or written operation and instruction manuals needed to use the diagnostic tools for adjusting any and all computer parameters, and/or troubleshooting the equipment provided. These diagnostic tools shall be provided at no additional cost to the Owner.
- 9.5. The Contractor shall provide the Owner’s selected representative(s) with training on the use of the diagnostic tool(s) and operation of the elevator system.
- 9.6. Auto Lowering
 - 9.6.1. The Controller should include an auto lowering system which, in the event of a power failure, will cause the car to descend to the next lowest level.
 - 9.6.2. In buildings with generator supplied emergency power, auto lowering should be accomplished using an emergency power circuit to operate the elevator auto lowering controls.
 - 9.6.3. In buildings without generator supplied emergency power, auto lowering should be powered from a storage battery.
- 9.7. Provide all required clearances and allow ample room for servicing, maintaining, and removing equipment without disassembly of the equipment.
- 9.8. Car Enclosures
 - 9.8.1. Elevator car doors should be protected by infrared screen-type detector/reversal devices at all car door entrances.
 - 9.8.2. Car light fixtures should utilize PL or T-8 type fluorescent lamps with electronic ballasts. Ballasts and all other lighting equipment should be accessible from inside the car enclosure.

9.8.3. Raised, embossed stainless steel panels for rear and side walls of cab are preferred.

9.8.4. Pads and hooks

9.8.4.1. Pads shall be fire-resistant quilted canvas conforming to ASME A17.1.

9.8.4.2. Provide pads for the rear wall, side walls and car front returns with openings for the car operating panels.

9.8.4.3. UNCG prefers protective pad hooks made of brushed finish stainless steel, vandal-resistant type and permanently mounted by the elevator Contractor at the sides, rear and fronts of the car enclosure.

9.8.4.4. Preferred floor finishes are VCT, raised design rubber floor tile, or modular carpet.

9.8.5. Car railings shall be stainless steel.

9.9. Hoistway Entrances: UNCG prefers hoistway entrances and doors made of satin finish stainless steel.

9.10. Signal and Operating Fixtures: All signal and operating fixtures should be vandal resistant stainless steel and all cover plates should be #4 brushed stainless steel.

10. GUARANTEES, SERVICE AND MAINTENANCE

10.1. Warranty: The elevator Contractor shall guarantee the materials and workmanship against defect due to faulty materials or faulty workmanship or negligence for a period of 12 months following the date of final acceptance of the project. Where items of equipment or material carry a manufacturer's warranty for any period in excess of 12 months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. Defective materials, equipment or workmanship shall be replaced without additional cost to the Owner within the stipulated guarantee period.

10.2. Maintenance: Starting at the date of final acceptance of the project, the elevator Contractor shall provide an all-inclusive, systematic inspection, preventive maintenance and repair program for each elevator, including 24-hour emergency callbacks for a period of 12 months concurrent with the project warranty period. The requirements of this maintenance and call-back service shall be equivalent to the provisions of the current campus-wide Full Preventive Maintenance Contract for elevators and dumbwaiters administered by UNCG Facilities Operations.

- 10.3. Use of Elevator during Construction: The Elevator shall not be used for building construction purposes unless specifically allowed by the Owner.
- 10.4. If the Contractor is allowed to use the elevator prior to substantial completion of the project, the elevator warranty and service period shall not be compromised and shall begin with the date of acceptance for the entire project as defined in the General Conditions of the Contract.

11. SPECIAL FEATURES

- 11.1. UNCG prefers a “hands free,” vandal resistant type telephone integral with the car operating panel and wired back to the elevator machine room. The final connection of the telephone circuit in the controller is to be made by the elevator Contractor and must be coordinated with UNCG.
- 11.2. Provide an Independent Service switch, key operated, located in each car operating panel.
- 11.3. The stop switch in the car must be wired to the alarm bell.
- 11.4. When a floor lockout key switch is required to limit access to mechanical penthouse or basement floor landing, the car operating panel shall have a factory-installed momentary contact switch capable of receiving a Corbin/Russwin cylinder matching the building lock cylinders and compatible with the University master key system.
- 11.5. Graphics indicating “In case of fire, do not use elevators, use stairways” are to be integral with, and permanently engraved on, the stainless steel face plate of the call button station at each floor.
- 11.6. In addition to any other sets required by the specifications, the Elevator Contractor shall provide one (1) set of full-sized, plastic laminated, as-built wiring diagrams. This set shall be wall mounted in the machine room. The minimum size of the wiring diagrams shall be not less than 17 inches by 21 inches.

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15001. GENERAL INFORMATION

Updated: December 18, 2014

On July 31, 2013, the University adopted *Getting to Zero: The UNCG Climate Action Plan* (see <http://fac sustainability.uncg.edu/climate-change/> for more info). The Energy Use Intensity (EUI) represents the energy consumed by a building relative to its size. Current EUI goals for new construction are:

1. Laboratory buildings: 169 kBTU/gsf
2. Residence halls: 68 kBTU/gsf
3. Classroom buildings: 56 kBUT/gsf

15050. BASIC MATERIALS AND METHODS

1. The Designer is referred to Division 1 of these guidelines for information concerning maintainability and energy conservation. All valves, VAV boxes, air handlers, air distribution equipment, etc. shall be provided with proper access for operation and maintenance.
2. The Designer is urged to utilize central and total air conditioning. Return air shall be ducted; ceiling return air plenums shall not be used. Outside air shall be positively controlled and shall be utilized for cooling where applicable.
3. On water-cooled systems, water shall not be wasted. Where year around operation is expected, provisions shall be made to prevent freezing and to allow for low temperature ambient operation.
4. Waste heat recovery shall be considered when appropriate for energy conservation.
5. The University's intent is to utilize chillers that use an environmentally safe refrigerant that will be readily available and cost efficient for future recharging. The University prefers centrifugal or other energy-efficient Trane, McQuay or Carrier brand chillers using non-CFC refrigerants. Selection of centrifugal chillers should be based on potential rebates from the Duke Energy Company rebate program. Chillers are selected on 20-year life cycle cost. Chillers shall be installed such that the noise level 6' away from the chiller shall be 90 db or less. Sound attenuating blankets or covers may be required in order to achieve this noise level rating. The University's preference is for the Designer to confirm available capacity and tie onto the University's central chiller plant.
6. Hot-dipped galvanized steel or concrete shall be used for outside mechanical equipment

supports. Details of mechanical supports shall be shown on the drawings. Rooftop equipment should be minimized to reduce roof damage and access requirements. If rooftop mounting is unavoidable, use bolted, hot-dipped galvanized steel support structure with "feet" integrated into roofing system instead of a structure welded together on site.

7. MECHANICAL IDENTIFICATION

- 7.1. Mechanical equipment shall be labeled with name, number as designated on Designer's contract documents, service and operational requirements, safety and emergency precautions, design capacity and other design parameters such as pressure drop, entering and leaving conditions, rpm, etc. Ductwork shall be identified as supply, return, exhaust, intake or relief with signs and arrows showing service and direction of flow. Pipe shall be identified with colored signs and arrows indicating its respective system and direction of flow. See Division 9002, Colors, for equipment and piping color schedule. New equipment will be pre-painted by the equipment supplier before shipment.
 - 7.2. All valves (except plumbing fixture faucets, convenience hose bibs, shut offs at plumbing fixtures, and similar rough-in connections of end-use fixtures) shall be provided with 19-gage polished brass valve tags with stamp-engraved piping system abbreviation and sequenced valve numbers. Valve tags shall be attached with brass chains or S-hooks.
 - 7.3. Valve schedules shall be mounted in glazed display frames at the facility and shall include valve number, piping system, system abbreviation (as shown on valve tag) and location of valve (room or space). Valves intended for emergency shut-off and similar special uses shall be marked by "flags" in the margin of the schedule.
 - 7.4. Permanent, bright colored, continuous plastic tape, intended for direct-burial, shall be installed 8" below finished grade directly over all buried utilities. Tape shall be printed to most accurately indicate type of buried utility. Provide tracer wire/tape for all non-metallic utility pipes.
8. The General Contractor shall pay for temporary filters and/or roll media over return air grills as needed during the construction phase prior to the project's acceptance. The HVAC Contractor shall install all filters and roll media provided by the General Contractor and operate HVAC equipment including temporary thermostats as required to give temperature and humidity ranges to do the finish operations. The time which the HVAC equipment is used to complete the finish work of the project is not to be included in the guarantee period of the equipment.

15060. PIPE AND PIPE FITTINGS

1. Supply and waste run-out piping shall be exposed wherever possible. Supply run-outs shall be valved at point of connection to main or riser and valves shall be accessible for

maintenance.

2. Water supply lines, both hot and cold, sizes 3" and larger, shall be ductile iron where installed underground. All other water lines shall be copper. Copper lines 1-1/2" and larger shall be sweat-joined with silver solder, and smaller lines with a lead-free product equivalent in strength to 95-5 tin/antimony solder. Water lines shall be tested and shown to withstand 150 psi hydrostatic pressure.
3. Hot water lines shall be free to expand without rubbing against adjacent building materials.
4. Sanitary and laboratory sewers from buildings shall be in separate lines. Dilution of acid waste is desirable. Both sanitary and laboratory wastes shall empty into a manhole within ten feet of the building at invert elevation of the manhole. Waste cleanouts shall be accessible for maintenance.
5. Interior floor drains shall empty into the sanitary sewer and exterior drains into the storm sewer. Where floor drains are subject to receiving large amounts of hot water (such as a boiler plant), care shall be taken to properly flash vent pipes to prevent steam from entering the roofing material.
6. Insulation shall be used on all cold water supply lines including cooling water for air conditioning. Waste lines shall also be insulated where "sweating" would be detrimental. All floor drains receiving condensate from mechanical equipment shall be insulated where exposed to interior conditioned air.
7. Water meters reading in cubic feet shall be located in the primary mechanical room of each building where they are easily accessible to a meter reader. Meters shall be installed with a 3-valve bypass. Provide submeters for mechanical equipment and irrigation systems.

15120. CONTROL VALVES

1. Provide isolation valves to isolate at least each riser, bathroom, hose bib, every branch off of main lines, and each terminal device such as a VAV (Variable Air Volume) box with reheat coil. All isolation valves are to be accessible for operation and maintenance. Include isolation valves at locations designated by the Owner.

2. STEAM CONTROLS FOR HEATING SYSTEMS

- 2.1. Controls for regulating heating of individual spaces shall be considered where applicable. Regulating valves shall be equipped with a standard globe valve on the initial side and a standard gate valve on the low or discharge side. A bypass around the regulating valve equipped with a globe valve one half of the size of pipe on the initial side of the regulating valve shall be provided. The safety valve shall be set for not more than 15 psi above operating pressure. The safety valve shall have a releasing capacity equal to 55% of the regulating valve. The discharge shall be

pipled to the outside of the building to a point that will cause neither personal hazard nor property damage and shall be piped down to within 18" of finished grade.

- 2.2. A standard steam gauge shall be placed on each side of the regulating valve to indicate initial and reduced pressure. The dials shall be graduated approximately 75% to 100% above actual working pressure. Each gauge shall be identified and mounted on a panel at a location for easy group reading.
- 2.3. Temperature control valves, where used, shall be by the same manufacturer as the temperature controls.
- 2.4. Steam shall not be used on heating equipment when a modulating control is used.
- 2.5. Steam pressure reducing valves shall be by Spence Regulator (Preferred-Brand Alternate) to comply with campus standards. Reduction from 125 psig shall be in two stages. All valves are to be easily accessible for manual operation and maintenance.
- 2.6. No high-pressure steam is to be used inside buildings for heating equipment. Where high-pressure steam enters the building, it shall immediately be reduced in pressure to low-pressure steam for "terminal" equipment. High pressure to medium pressure to low pressure.

15170. METERING

Updated: June 11, 2013

The University operates utility distribution systems for potable water, steam/condensate and chilled water. Natural gas is provided by Piedmont Natural Gas Company. Cost distribution for utilities is accomplished through a metering system and a prorated assignment of cost.

1. Steam costs are generally allocated based on metering condensate returned to the central system. Each building shall be provided with a high temperature condensate meter designed for this severe service. Provide a Kent TM meter or equal of appropriate capacity on the discharge side of the condensate pump and include isolation valves, meter bypass, a square head rate cock to control flashing, and a digital pickup that is tied into the building automation system. Should a particular application require actual metering of the steam flow, insertion type meters of appropriate design should be provided. Coordinate with UNCG Facilities Operations for a current list of acceptable condensate meter and steam meter manufacturers.
2. Potable Domestic Water metering shall be by turbine or nutating disk meter with magnetic drive. Meter to be located in mechanical room, easily accessible, read in hundreds of cubic feet and provide output that is tied into the building automation system.
3. Non-sewered water (consumed but not returned to the sewer, e.g. irrigation, cooling tower

- makeup, etc.) should be metered at its source. Meter should be located in mechanical room, easily accessible, read in hundreds of cubic feet and provide output that is tied into the building automation system.
4. Chilled Water (where pumped to another facility through a loop system) flow, temperature differential and energy consumption shall be measured and calculated for both the main building and any isolated structure. Output shall be in BTUH or Ton hours, be available at the unit, and be tied to the building automation.
 5. Natural Gas metering shall comply with all requirements of Piedmont Natural Gas. The natural gas supply pressure provided inside a building shall be the lowest that will meet the required pressure at natural-gas-consuming equipment.
 6. Utilize Appendix A to these Guidelines, the “Facilities Operations Utility Setup Guide,” for specifying, connecting, and reporting details for all utility meters.

15180. INSULATION

1. The thickness of pipe insulation shall be carefully evaluated to determine the most effective insulation.
2. Insulation of pipes in concealed spaces shall be protected from deterioration by use of a banded asphalt-impregnated felt jacket or other suitable material. In areas where insulated pipes are subject to physical abuse, an aluminum or canvas covering shall be applied around the insulation. All heating distribution supply and return mains (steam or hot water) shall be insulated. Uninsulated mains or run-outs shall not be used as heat sources. Chases and stack areas carrying heating lines in the building shall be adequately ventilated to prevent transfer of waste heat. Calcium silicate insulation shall be used on all high pressure steam services.

15460. PLUMBING FIXTURES

Updated: December 18, 2014

1. Water closets and urinals shall be vitreous china wall hung. A battery-powered automatic, pressure-type water saving flush valve, shall be used on urinals and water closets. Water closets shall be siphon jet action with 2 1/2" waterway. Closet bowls shall be of the elongated pattern. Coordinate with UNCG Facilities Operations for a current list of acceptable flush valve manufacturers. Water closets shall be low-flow 1.28 gallons per flush or less. Urinals should use the least amount of water that is reasonable (pint per flush). Designer should discuss this during Design Development.
2. Plumbing fixture stops shall have handwheels; except as noted otherwise. Key stops are not acceptable.

3. Showers shall be factory-assembled, surface-mounted, vandal-proof units of standard length; shall have a non-scald pressure mixing valve, with single spindle and pressure-actuated piston contained in spindle, integral stops, 1/2" copper tubing to limit of unit and institutional head bracket fitting. Shower heads shall have flow-limiting devices (**2.5 GPM or less**). Bathtubs shall include shower enclosure.
4. Lavatories in rest rooms of public facilities shall be porcelain enameled steel and equipped with outlet devices which limit the flow of hot water to a maximum of the current water efficiency standard (**0.5 GPM or less**).
5. Hose bibs shall be threaded for a 3/4" hose, have a removable "T" handle and a non-removable vacuum breaker. Exterior hose bibs shall have covered boxes with locking devices. One bib should be located at each building corner, and in the center of any side of the building exceeding 200 feet in length.
6. Water coolers with compressors remotely located away from the drinking fountain are not to be used. Drinking fountains shall be a complete self-contained split level unit with an integral bottle filler kit. **Install at least one bottle-filling station per building.**
7. Floor sinks should be used in all Mechanical Spaces and Housekeeping Closets.

15500. FIRE PROTECTION - GENERAL

1. Include work related to Fire Protection within the scope of the Plumbing Contract except for fire extinguishers which are in Division 10 as part of the General Contract.
2. Installation shall comply with the latest version of the North Carolina State Construction Office standards.
3. Tests on wet or dry pipe sprinkler systems and fire pumps shall be performed by the Contractor in the presence of Designer, UNCG and Industrial Risk Insurer representatives.
4. Note that the University is served by the City of Greensboro Fire Department, who requires that all Fire Department Connections (FDCs) be 4" Storz. Consult the University for determining which station is designated First Responder.
5. Post indicating valves located in areas subject to damage shall be protected by concrete filled bollards. Always tie the post indicating valve into the existing or new fire alarm system.

15510. SPRINKLER EQUIPMENT

1. STATE REQUIREMENTS

- 1.1. Protection of building occupants from injury is foremost in consideration of fire extinguishing systems.
 - 1.2. All automatic sprinkler systems shall meet the North Carolina State Construction Office requirements for Automatic Sprinkler Systems and applicable NFPA Standards.
2. UNIVERSITY REQUIREMENTS
- 2.1. Sprinkler piping shall be Schedule 40 seamless black iron pipe (ASTM A53/A53M).
 - 2.2. On dry pipe systems, pipe size shall be 1 1/4" minimum and have a low pressure switch to detect any loss of air pressure. Connect switch to fire alarm system as a distinct zone. Air compressor shall be on a dedicated electrical circuit.
 - 2.3. New buildings and major renovations shall be 100% sprinkled unless non-sprinkled areas are separated by four-hour rated construction.
 - 2.4. Extra Hazard Group II is the minimum acceptable design density for flammable or hazardous materials storage areas and laboratories. Extra Hazard Group I is the minimum acceptable design density for laboratories not classified as hazardous materials laboratories.
 - 2.5. In Extra Hazard Applications, 100 square foot area coverage per sprinkler head will be the maximum allowed.
 - 2.6. Inspector test valves shall be as remote as possible for each zone, have piped-in drainage to allow for testing without the use of hoses or special adapters, be located in stairwells or other easily accessible location and contain a sight glass for visual inspection of the flow.

15531. FIRE HYDRANTS

1. Fire hydrants shall have a compression type main valve, open counter clockwise and closing with line pressure. Nominal main valve opening shall be 4 1/2", with bronze to bronze seating and 6" mechanical joint supply inlet with cast iron American Water Works Association gate valve for isolation of the hydrant. Hydrants shall have one 4 1/2" pumper nozzle and two 2 1/2" hose nozzles all with American National Standard threads. Other hydrant features shall be a breakable safety stem coupling and breakable safety flange design, dry top design, a weather cap/shield around the operation nut and a 4 1/2' bury body. The interior of the hydrant base and all ferrous metals of the lower valve plate assembly shall be coated with a minimum of 4 mils of fusion bonded or brush applied liquid epoxy. The liquid epoxy shall be American Water Works Association approved for potable water. Barrel to be painted red (Glidden Radiant Red or equal); top and outlet covers to be painted reflective white. Bonnet to be coated with two coats of primer and one coat of 3M

#7216 Codit paint. Hydrants shall comply with American Water Works Association standard C-502 including compliance to the maximum permissible loss of head for hydrants.

2. Hydrants shall be Mueller Centurion, American Mark 73-5, Kennedy K-81A or M&H Model 929.
3. Each hydrant shall be provided with a two cubic foot gravel sump at the drain outlet.

15720. STEAM SPECIALTIES

1. Steam is provided by the University's steam plant at 125 psi and generally reaches the buildings at this pressure.
2. Wherever possible, all pipe work (including steam, condensate lines and traps) shall be installed in a manner that will permit the condensate to drain by gravity from the steam side to the return lines.
3. On 125 psig steam distribution system piping, valves, fittings, flanges, etc. shall be rated at 250 psig up to and through the first reducing valve.
4. Steam condensate piping and fittings shall be Schedule 80.
5. Steam line gaskets shall be Flexitallic brand.
6. Provide two manhole covers (30" over sump pit and 36" over ladder) on each steam manhole for egress and ventilation. Covers shall be reinforced for vehicle loads and set at grade or provided with a minimum of 24" soil cover where required to be below grade, such as a playing field. Provide steel ladder to 6" below cover in lieu of cast-in-place steps. Show detail of knockout panel for future line connections. Run rebar through knockout panel. Indicate sump location. Provide "U" bend or mushroom-top vent to nearest protected location. Provide cast iron gravity drains to nearest storm sewer. Use sump pumps only where gravity drains are not possible. Waterproof all manhole structures to keep ground water out. Provide a 120 Volt duplex grounded GFCI electrical receptacle in each manhole.
7. Duplex pumped condensate receivers shall have a minimum discharge pressure of 75 PSIG to tie into and properly operate with the campus pumped condensate loop.

15800. AIR DISTRIBUTION

1. Careful consideration shall be given to velocity and direction of air supplies and noise.
2. Suitable throwaway filters shall be specified.

3. Heating and cooling media shall be available to each air handling unit or mixing box. Change from heating to cooling shall be accomplished automatically.
4. Controls shall be provided on outside air to provide adequate ventilation based on ASHRAE standards and use of the space. See also Section 1900.4, Energy Conservation.
5. Appropriate exhaust air shall be provided to prevent pressure build-up in buildings.
6. Provide makeup air to all spaces that have mechanical exhaust.
7. Opposed blade dampers with gasketed blade edges shall be used where air flow is controlled or completely shut off.
8. Air intake and exhaust grilles shall have hardware cloth on the outside. Stationary weatherproof louvers shall be provided in air intake ducts. Air systems utilizing large quantities of outside air shall be provided with outside air prefilters accessible through a plenum or filter rack.
9. Air distribution shall be balanced and placed in proper operation by skilled personnel trained and experienced in air distribution systems. The Contractor will be required to show proof of the competence of personnel used for air balancing. Testing and balancing shall be performed in accordance with Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) standards.

Air balance reports shall be supplied to the Designer and the University prior to final inspection. For State Construction Office projects, the final test & balance report shall be reviewed and approved by the Designer prior to the final inspection.
10. Internally lined ducts are not permitted.
11. Diffusers need to have 90 degree elbows to transition from flex duct, primarily to prevent crimping of the flex duct and the resultant choking of air flow.
12. A minimum of three (3) sets of HVAC filters shall be supplied by the Contractor for all Air Handling Units: (1) Startup Set, (2) Test and balance set, and (3) Attic Stock Set for the University's use.

15900. HVAC CONTROLS AND INSTRUMENTATION

The HVAC control system shall provide each building with a standalone environmental and energy control system that is responsive to the needs of its occupants as well as provide optimal energy use for the University. Each HVAC equipment room shall have stand alone direct digital control (DDC) of its equipment. The campus wide facility management system communicates between buildings over the campus network.

1. Provide dedicated circuits for 120V control power to controllers. Provide the electrical panel board name, location, and circuit number on mechanical and electrical plans. All control wiring shall be installed in conduit.
2. Mount all DDC control devices in UL listed panels. Show each DDC controller on mechanical plans within equipment rooms in relation to other equipment in the same room. Specify mounting height of control panels.
3. All control panel wiring terminations shall be on terminal blocks. No wire nuts are allowed within panels.
4. Show location and height for all HVAC control thermostats on plans. All thermostats shall be box mounted in walls, unless noted otherwise.
5. Show location of all HVAC field-mounted control devices on plans such as duct static sensors, night low limits, timed-override switches, emergency stop switches, outdoor air temperature and humidity sensor, etc. Specify mounting height of each device.
6. Show a separate detail of how each DDC controller ties together into the network within the building and then into existing campus DDC system, i.e. network riser diagram. Include a specific note that describes the campus data network connection to the DDC controller.
7. Show each DDC controller input/output for digital and analog points in table format in either specification booklet or on mechanical plans.
8. Installed DDC system must be compatible and communicate with existing campus control network.
9. Provide spare pneumatic in-line filter at each pneumatic control panel. Provide dehumidifier with drain line piped to a floor drain for controls air compressor.
10. Provide 0-20 psig pneumatic air gauge at each control valve, damper, electric to pneumatic transducer, and at main air feeds into control panels.
11. Paint all control junction boxes and cover plates dark or navy blue.
12. 100% outdoor air units shall have end switches on outdoor air dampers interlocked with fan for safety.
13. Before any training can be scheduled with UNCG personnel, controls contractor shall walk through every control panel on project with general contractor and mechanical contractor to verify that control wiring, numbering, and labels match as-built drawings.

14. Provide with O&M manuals a section of graphic schematic printouts.
15. HVAC control sequence of operation shall be included on mechanical plans or specifications, stating set points for supply air temperature, space temperature, etc., and whether each unit set point is controlled by supply air temperature, return air temperature, space temperature, etc.
16. All utility meters provided with digital outputs shall be connected to building DDC controls, including hardware, software, and graphics necessary for campus energy analysis by Facilities Operations.

These guidelines are updated periodically. Users of the guidelines are encouraged to check this site as needed to be sure of having the most current edition. Comments and suggestions concerning improvements to this section of the guidelines may be submitted to jrwatter@uncg.edu.

16000. GENERAL PROVISIONS – ELECTRICAL

Updated: December 18, 2014

UNCG uses the latest edition of the North Carolina State Construction Office document, *Electrical Guidelines and Policies*, as its basic electrical design standard. A copy of this document is available on the State Construction Office web site. UNCG's electrical guidelines provide special, campus specific requirements.

The UNCG facilities groups are especially concerned with maintenance and long term sustainability of the systems on campus. All designs should incorporate materials and designs that will help us use and operate campus systems for many years into the future. The designer should pay particular attention to those areas on campus where corrosion of metals, deterioration of materials (especially plastics due to ultraviolet light), and corrosive chemicals are present, and design systems using materials that will withstand these harsh environments. Harsh environments as discussed here include all areas that are external to buildings. All fasteners and mounting struts installed in these areas shall be made of either hot-dipped galvanized steel or 300 series stainless steel. If steel materials are used, the designer shall specify that any cut material shall be cold galvanized. Equipment such as electrical outlet boxes, cabinets, conduits, support systems, etc. shall be discussed with the University's Design Project Manager for specific information on campus corrosion requirements.

Designers shall identify and evaluate all opportunities for using energy-efficient systems or products (EPA Energy Star certified or equivalent) in buildings.

During design, consult with the Design Project Manager on appropriate locations for occupancy sensors to control lighting and energy usage based on current ASHRAE/IES Standards.

Appropriate areas include, but are not limited to, offices, classrooms, copy rooms, restrooms, storage areas, conference rooms, break rooms, corridors, filing areas, and other spaces.

Light-emitting diode (LED) fixtures are recognized for their contributions towards lowering energy consumption, reducing maintenance, increased durability, and efficient distribution of light. The use of these fixtures is encouraged after careful evaluation of the economic feasibility and the desired light quality.

16110. RACEWAYS

1. There shall be a minimum of one spare conduit for each wiring system in a ductbank. Conduits for primary service shall be concrete-encased schedule 40 PVC. Conduits shall be

installed with as few bends as possible and all bends shall be long-radius type. Bell ends shall be installed at manholes. All conduits shall slope toward manholes. Conduit in the ductbank shall be supported on spacers to provide three inches of concrete on all sides of each conduit. All spare conduits shall be left clean with a suitable nylon pull string in place and plugged or capped to prevent rodent entry.

2. Minimum conduit size shall be 3/4" for interior and 1 1/4" for exterior wiring. This requirement includes flexible conduit. Exception: 1/2" flex may be used for motor make-up and finished lighting connections with a maximum length of 6 feet.
3. 1 1/4" schedule 40 PVC may be used for underground exterior lighting circuits not less than 24" deep with 3" sand under and 6" sand over.
4. All underground conduit shall be installed with warning tape above it and approximately 12" below grade.

16120. CONDUCTORS

1. Conductors serving two separate power systems (i.e., 208Y/120 volt and 480Y/277 volt) shall not be mixed in the same raceway, pull box or junction box. Exception: Where control wiring is a different voltage than power for the same system.
2. One set of the electrical riser diagrams shall be mounted near the main switchgear under clear protective material.

16134. PANELBOARDS

1. All panelboards shall be for bolt-in type breakers. Only copper bus bars shall be used.
2. No single phase panels shall be installed in a three phase system.
3. In general, panels shall have 25% spare capacity, consisting of spare breakers and/or spare spaces. Spare spaces shall be provided with hardware installed from the manufacturer.
4. No information relative to the overcurrent devices provided with switchboards or panels shall be considered proprietary by the manufacturer. All overcurrent devices containing solid-state trip units shall be set by the manufacturer, and the University shall be provided with the technical information, test equipment and training necessary to test and adjust each unit.

16150. MOTORS

Updated: December 18, 2014

1. Energy efficient motors shall be specified unless shown to be economically undesirable. **Energy Star rated motors are preferred.**
2. New motors 20 HP and above shall include start-up and adjustment by the supplier and training for the Owner's personnel.

16300. POWER TRANSMISSION

1. The Duke Energy transformers at the University substation receive power at 24,000 volts. The secondary side of the Duke Energy transformers provides 12,470Y/7,200 volt Wye connected 3 phase, 4 wire power to the university's point-of-delivery metal clad switchgear. UNCG distributes this power throughout the campus in five underground 12.47 KV loops in a 3 phase, 4 wire configuration to individual building transformers.
2. All electrical service and distribution shall be installed underground in PVC conduit encased in concrete ductbanks. Ductbank routing shall be located in consultation with the Facilities Design and Construction and Facilities Operations departments. Compare all ductbank routes with UNCG Master Plan and review with Design Project Manager.
3. For system reliability and to meet various load requirements, the buildings are served by a looped cable system. New facilities shall be designed so as to permit inclusion in one of the existing loops. The loop to be used, and manhole in which connections are to be made, shall be designated in project meetings.
4. Typical equipment to accommodate the looped feeder cable concept includes air-break switches, fused switch combinations, and radial fed pad mounted transformers.
5. All operations of primary voltage switches on the existing electrical distribution system will be performed by the Facilities Operations department or a qualified firm under the direction of Facilities Operations. The University will schedule all service interruptions to make utility connections. All interruptions shall be during non-class periods where at all practical. Any overtime costs shall be at the Contractor's expense.

16350. MANHOLES

1. Manholes shall be located and sized to allow workable pulling tension on cables. Minimum size shall be 7' x 9' x 6' 6" high for telephone and 8' x 14' x 8' high for power systems. Manholes shall be installed with entrances slightly above finished grade level to prevent the entry of surface water.
2. Manholes shall be precast concrete or poured-in-place, reinforced to withstand H-20 loading as per AASHTO Standard Specifications for Highway Bridges. Ladder rungs shall be on 12"

centers and the top rung not more than 12" below the entrance. Manholes shall be supplied with knockouts, inserts, pulling irons and risers suitable for the service intended. Joints in manhole walls, risers and duct entrances shall be grouted with cement, or a gasket seal applied between precast sections, to provide a waterproof structure.

3. Covers shall be round, 30" diameter, heavy duty with the word "ELECTRIC", "TELEPHONE", etc. cast in the cover as applicable.
4. A driven copper clad steel ground rod shall be installed in each manhole for bonding all hardware and cable sheaths.
5. Manholes shall have gravity drains whenever possible. When this is not possible, sump pumps and 18" diameter sump holes shall be provided. Pumps shall be submersible, 1/3 HP, single phase, 120 volt, 60 Hertz, and shall have a minimum capacity of 46 gpm at 20 foot head, through a 1 1/4" discharge and shall be complete with check valve and union. Pumps shall be actuated by an attached 1/2 HP rated float switch equipped with a waterproof, oil resistant cord of proper length and a bronze operator rod.

16405. ARC FLASH

UNCG is committed to providing a safe and healthy work environment. As part of a comprehensive electrical safety program, UNCG has implemented an Arc Flash Hazard Analysis program for all equipment.

For equipment whose voltage is less than 600 volts, the design team is not required to perform any calculations. UNCG's Facilities Operations department will determine the Personal Protective Equipment needed and install signage displaying approach distances and PPE requirements. Auxiliary Services and the Housing and Residence Life departments will coordinate with Facilities Operations to install signage on equipment below 600 volts.

For equipment whose voltage is greater than 600 volts, a Flash Hazard Analysis by the Electrical Engineer or their Representative is required on each project. Flash Protection Boundary calculations will also be included in the Flash Hazard Analysis. The design team will send the required calculations to the University Design Project Manager, who will then send the information to the Facility Operations Department. Facilities Operations will then determine the Personal Protective Equipment needed, and will install signage that indicates approach distances and PPE requirements.

16440. METERING

Updated: 6/11/2013

The purpose of electrical metering is to allow the University to accurately measure and verify electrical energy consumption and demand (both monthly peak and instantaneous) for the project

facility. This information will be monitored and retained in the campus energy management system, via the campus network, at a central location in the Facilities Operations Department. Each design team should discuss their project needs with the Facilities Design and Construction Project Manager to make sure appropriate meters are specified, and also to obtain any campus updates concerning metering. The electrical designer should also coordinate with the person creating the Form of Proposal and have a Preferred Alternate added for the Nexus and Shark Meters.

The electrical design specifications should include the following requirements:

1. Specify an Electro-Industries Nexus 1262 meter as the main building meter. Locate the meter in an enclosure adjacent to the main switchboard or main distribution panel.
 - 1.1 The meter socket shall be for a Form 9S meter, 13T (13JAW) socket, rated 20 amperes 600 volts, prewired, ringless, with one piece cover, painted gray, UL Listed, provided with bridge for mounting test switches, suitable for copper conductors. Mount the meter socket (meter base) beside the main distribution panel and extend wires from the current transformer compartment to the meter socket. In the meter socket, provide a 10 pole test switch, 4 handles tied to voltage, 6 handles for current, nickel plated, with cover for test switches. Test switches must meet ANSI C12.9.
 - 1.2 Specify 0.3% accuracy current transformers in the switchboard or panelboard, connected through shorting blocks to terminal strips. Also specify fuses and fuse blocks for the meter's voltage connections.
 - 1.3 For each Nexus 1262 meter, provide one data outlet immediately adjacent to the meter socket. The Nexus 1262 meter has a 10 inch pigtail that will plug directly into this outlet once installed.
2. For submeters, specify an Electro-Industries Shark 200 series meter, with an INP100S option (100 base T Ethernet card). Also specify a hinged enclosure for this meter, current transformers, test switches, circuit breakers for voltage connections, and a 120 volt power supply connection. Input voltage wires must be protected with 0.1 ampere fuses, and the 120 volt power supply wires must be protected with a 3 ampere slow blow fuse. For each Shark 200 meter, provide a data cable with a male RJ-45 connector that will be plugged into the meter's female Ethernet port.
3. Specify that the electrical contractor shall turn over all meter(s) to the UNCG Construction Project Manager a minimum of four (4) weeks prior to the provision of permanent power. UNCG will return the meters within a two (2) week period once IP addressing has been completed. Also include in the specifications that permanent power will not be turned on to any facility until the main building meter is installed and is operational. This is critical to the University so all electrical consumption will be properly recorded.

4. Specify that the electrical contractor shall be responsible for programming the Nexus meters with UNCG's standard display template, and that the contractor will also be responsible for programming all the needed electrical parameters into both the Nexus and Shark meters. The contractor will also install and complete the installation, leaving the meters ready for operation. Note: The actual programming of the meters could be performed by the manufacturer.
5. Coordinate with the mechanical engineer and specify that the HVAC controls contractor shall provide the necessary software, programming, graphics, points, etc. to input the data from the electric meters to the campus Tridium/Vykon Energy Management System for graphing, charting, and trending the data. The data to be monitored and displayed is energy usage (kW-hr), instantaneous demand (kW), and month-to-date peak demand (kW). All energy management metering issues must be resolved prior to final inspection.
6. Specify that an independent 3rd party test and verify the meter installation for proper operation, and provide a test report for each meter to the electrical contractor, UNCG's Construction Project Manager, and if applicable to the project's commissioning agent.
7. Utilize Appendix A to these guidelines, the "Facilities Operations Utility Meter Setup Guide", in specifying, connecting, and reporting details for all utility meters.

16480. BRANCH CIRCUITS

1. A 120 volt, 20 amp electrical receptacle shall be provided every 50' in corridors, on each stairway landing and close to exterior doors for use with maintenance equipment. These shall be connected to a dedicated circuit.
2. Provide circuit(s) in mechanical equipment rooms for wall outlets every 20' that are fed from the standby generator circuit (if a generator is installed in the facility).

16510. INTERIOR LIGHTING FIXTURES

1. Lighting levels shall correspond to the following standards unless greater illumination levels are needed to meet safety and security requirements, or it is determined that specific visual tasks require either more or less illumination:
 - 1.1. Offices and classrooms, general use: 50 foot-candles.
 - 1.2. Laboratories, drafting rooms and similar close-task areas: 75 to 100 foot-candles.
 - 1.3. Corridors and stairs: 10 foot-candles.
 - 1.4. Lobbies, lounges, waiting rooms, storage and service areas: 20 foot-candles.
 - 1.5. Shop areas: 30 foot-candles, with task lighting as required.

- 1.6. Lecture halls and auditoriums: In accordance with the latest I.E.S. Handbook.
 - 1.7. Parking ramp interior: 5 to 10 foot-candles in traffic lanes, 3 to 5 foot-candles in parking areas and 20 to 30 foot-candles at the entrance and exit.
 - 1.8. Temporary site lighting for construction areas: Sufficient such that University Police may observe the entire area with a minimum of 3 foot-candles.
2. Lighting shall be accessible for relamping, cleaning and other maintenance. The location of fixtures over hazardous substances, mechanical equipment and laboratory benches shall be avoided and the lighting placed on the circumference of such equipment but properly directed. Special provisions shall be made for lamps located in high-ceiling areas or over auditorium seating for lowering or otherwise accessing for maintenance.
 3. Stairwell lights shall be wall mounted fixtures which can be reached by hand from the landing floor or located over the landing to permit the safe use of ladders. The maximum height shall be 10 feet if stairwell lights must be ceiling mounted.
 4. Fluorescent fixtures and low mercury lamp bulbs not requiring disposal as hazardous waste are generally required. Use of the more efficient high intensity discharge (HID) fixture is encouraged where practical. Incandescent lamps, because of their poor efficiency, shall be used only where more efficient lamps are unsuitable (e.g., spot-lights). The use of chandeliers shall be avoided except in renovation projects where such fixtures are existing.

16520. EXTERIOR LIGHTING FIXTURES

1. Site lighting shall be wired on a separate circuit, contactor, photocell. Site lighting shall not be connected to a circuit for stairway, porch, etc. lights. The photocell for site lighting shall be on the outside of the building not higher than 10 feet and easily accessible for maintenance.
2. Each light pole shall have a handhole for access to wiring connections and an engraved aluminum tag riveted to the pole denoting the pole number. The number schedule will be provided by Facilities Operations to coordinate with existing circuit designations. All pole bases shall be poured in place with the top of the concrete approximately six inches above grade with chamfered edges. Wire entrances to bases shall be made using 90° PVC elbows. Pole base shall be anchor bolt type and include ground rod poured integral to base. Connections in each handhole shall be made using a connector similar to the Ilsco PED multi-tap bar series of connectors, and shall be insulated with the appropriate Ilsco bar covers. Individual weatherproof in-line fuseholders shall be used to provide power to each fixture, so that each fixture may be isolated in the event of a fault from the other fixtures in the circuit.
3. Fixtures shall be high-pressure sodium of appropriate wattage, high power factor with ballasts or standard design. Fixtures shall be designed to suit standard ballasts of several manufacturers without modifications for installation.

4. Fixtures and poles approximately 12 to 30 feet high for pedestrian and street areas (not parking lots) shall be:
 - 4.1 Fixtures: high pressure sodium, painted black, without finial, with multitap ballast for applications up to 277 volts, and without fuses. A NEMA Type V horizontal beam pattern (circular) is to be used except where special conditions warrant otherwise. House- side shields will be used where appropriate. Fixtures up to 150 watts shall be Holophane Fluted GranVille (#GVU-100HP-MT-B-5-N-N-U-S/LU100; Holophane Dwg. US-2590) and fixtures from 250 to 400 watts shall be Holophane Washington (#WA-250HP-MT-B-4-B-WHS120 (if needed); Holophane Dwg. US-1452).
 - 4.2 Poles: fluted, painted black, with weatherproof fuses inside the bases. Poles up to 16 feet high shall be Holophane Wadsworth extruded aluminum shaft and cast aluminum base (12' pole model #: W12F4/17-CA/BK). Poles higher than 16 feet shall be Holophane Columbia tapered steel shaft with cast iron base (20' pole model #: C20FT16AZ/24CSB-CIS/PP-BC(1.0X10.5)-T(3.0X3.0)-2BA30B/1/B0-CA/BK-(1)PGK; Holophane Dwg. US-2627). Banner arms will be provided only on poles higher than 16 feet, only when specifically requested, and will be factory installed. Pole factory primed and field painted to match the light fixture color.

16670. LIGHTNING PROTECTION

1. Each building shall be considered individually to determine the necessity for lightning protection. When required, a complete lightning protection system shall be installed in accordance with UL and NFPA codes, and a UL Listed Lightning Protection system shall be installed.
2. Steel frame buildings shall be grounded through a low resistance ground system whether or not a lightning protection system is installed.

16700. TELECOMMUNICATIONS SYSTEMS

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1. TELECOMMUNICATIONS SYSTEM

UNCG telecommunications wiring conforms to current ANSI/TIA/EIA standards, and the latest Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual. Using these standards during the design and installation of telecommunications systems will generally provide a system that will be acceptable for smaller installations. However, the University will generally require new buildings and renovation projects to be designed and have construction administration observations performed by a Registered Communications Distribution Designer (RCDD). The entire telecommunications cabling system shall be designed and stamped by an RCDD. The installation by the contractor shall be a turnkey installation, with the exception of electronic components, which will be furnished and installed by the University.

All University systems are based on a cabling system that is not vendor proprietary and that conforms to ANSI/TIA/EIA telecommunications cabling standards, National Electrical Code, and BICSI guidelines. UNCG follows the general cabling industry practice of using a structured cabling system that will wire a building for information needs without knowing specifically what equipment will be utilized. This type of installation is geared for long-term stability and flexibility, and is based on the idea of wiring the building once for the communications system, and not having to add additional cabling at a later date.

In general telephone, data, and video wiring shall occupy the same entrance facility room and telecommunication rooms. Design to BICSI/TDMM, latest edition, and compliance.

The latest edition of the following standards and codes shall be used in all aspects of the telecommunications system: (Reference BICSI/TDMM, ANSI/TIA/EIA latest edition)

ANSI/NFPA-70	National Electrical Code
ANSI/TIA/EIA-568B	Commercial Building Telecommunications Cabling Standards for buildings, 100 Ohm Balanced Twisted-Pair cabling, and Optical Fiber Cabling
ANSI/TIA/EIA-569	Standard for Pathways and Spaces
ANSI/TIA/EIA-526	Measurement of Optical Power Loss of Fiber cable
ANSI/TIA/EIA-607	Commercial Building Grounding and Bonding Requirements for Telecommunications
ANSI/TIA/EIA-606A	Administration Standard for the Telecommunication Infrastructure of Commercial Buildings
ANSI/TIA/EIA-758	Outside Plant Telecommunications Cabling
ADA of 1990 "Title IV"	Americans with Disabilities Act
BICSI/TDMM, latest edition	Building Industry Consulting Service International Telecommunication Distribution Methods Manual

The size and numbers listed in this document for the various aspects of the telecommunications system are minimums, and where the ANSI/TIA/EIA standards or the BICSI manuals require larger quantities, the larger quantity shall be provided.

2. MAIN DISTRIBUTION FRAME (MDF) Updated: December 18, 2014

Entrance conduits will be extended from the University manhole or pull box into the main communications equipment room, usually on the lower level of the building. Provide a minimum of four 4" conduits stubbed no higher than 4" AFF with bushings, for all buildings. One of the conduits shall be filled with three inner-ducts (two 1.5" and one 1") equipped with pull strings. Another conduit is dedicated for Telephone Company cabling equipped with pull-strings. The remaining conduit(s) shall be empty except for a footage delineated pull tape.

A dedicated telecommunication room (MDF) shall be large enough to house equipment, controllers, LAN racks, fiber optic equipment **and** telephone lines.

The contractor shall provide racks with adequate space for all rack mounted components and the installation of active components, which are provided by UNCG. Rack count and exact location to be determined by UNCG. Provide 7' floor mounted open equipment racks with 19" mounting space. Each equipment rack shall be equipped with two vertical cable managers (CPI-30095-501) or equivalent. In general, the floor mounted open equipment rack requires a foot print of 31" wide by 24" deep with minimum working clearances of 36". Provide 16" ladder type cable runways from wall-to-wall across each floor rack and on the wall perimeter. Each rack shall have an individual bonding connection to the telecommunication grounding bus bar (# 6 insulated minimum).

Provide dedicated 20 amp electrical circuits to a quad outlet receptacles (NEMA 5-20) 120 volt one mounted on the ladder type cable tray every **other** rack and the other two spaced at 6' intervals on perimeter walls. (Do not use surface mounted conduit on walls). Provide a minimum of two 208 volt NEMA L5-30 receptacles mounted on the ladder rack above the racks.

Telephone: The local telephone company provides UNCG with cabling into buildings, entrance protection blocks, and demarcation connecting blocks. The contractor shall provide all other connecting blocks, wiring, wire management, terminations, testing, identification, etc. for a complete installation. Terminate building riser voice cabling on M66-1-50 connecting blocks mounted on appropriate colored backboards in the main telecommunications closet (MDF) located adjacent to the telephone company blocks provided by the contractor and in the IDF (telecom riser rooms). **UNCG will mark the backboard prior to the Contractor installing anything as to where they should mount their backboards and associated equipment.**

Data: The University, in existing buildings, will generally reuse existing Fiber optic cabling to the building however each Building should be reevaluated prior to installation. The contractor shall provide fiber optic cabling for new construction and in certain other instances. Verify outside backbone fiber through Facilities Design and Construction. Electronic active

components and associated patch cabling is provided by UNCG. Any necessary optical fiber cabling and all other internal building components shall be designed by the engineer (RCDD) and provided by the contractor.

Flooring: All flooring in all Telecommunications rooms shall be Vinyl Composition Tile (VCT).

Install adequate lighting and cover three of the perimeter walls with ¾" AC grade plywood, painted on both sides with two coats of white intumescent paint. Alternatively, ¾" fire retardant plywood may be used and painted with regular white paint, as long as the fire retardant stamping on each sheet of plywood is left unpainted and is clearly visible. The designer shall indicate on project drawings that the plywood shall be completely painted prior to mounting anything on the walls. The grade "C" surface shall be installed against the wall. All screws must be flush mounted.

3. INTERMEDIATE DISTRIBUTION FRAME (IDF)

Updated: December 18, 2014

The dedicated telecommunication room (IDF) shall be large enough to house equipment, controllers, LAN racks, fiber optic equipment **and** telephone lines. For larger buildings it is desirable to have a room on each floor and in alignment (stacked) for multiple floors.

Provide three 4" riser conduits to connect the IDF- to the MDF, along with all necessary fiber, copper, and grounding riser cables. Electronic active components and data patch cables for data wiring shall be provided by UNCG. Racks for voice cabling and equipment shall be provided by the contractor in the IDF rooms. From the IDF cables will run from racks via cable pathways, to wall outlets, in a star topology. Provide racks as described in the MDF section of this guideline. Minimum slack required in the MDF/IDF is 10' in a figure eight position.

Provide a minimum of two 120 volt NEMA 5-20**R wall** receptacles and two **quad** NEMA 5- 20**R** electrical outlets in each IDF **mounted above the racks on the ladder type cable tray**.

Install adequate lighting and cover three of the perimeter walls with ¾" AC grade plywood, painted on both sides with two coats of white intumescent paint. Alternatively, ¾" fire retardant plywood may be used and painted with regular white paint, as long as the fire retardant stamping on each sheet of plywood is left unpainted and is clearly visible. The designer shall indicate on project drawings that the plywood shall be completely painted prior to mounting anything on the walls. The grade "C" surface shall be installed against the wall. All screws must be flush mounted.

NOTE: No tie wraps will be accepted in the MDF or IDF's, Velcro only.

4. BUILDING BACKBONE

Updated: December 18, 2014

Provide an un-spliced cable containing 12 **strands 62.5** multi-mode and 12 **strands** single-mode

fibers (minimum), and a 100 or more pair category 3 cable (if there are 100 voice jacks in an IDF, provide at least 30 percent more copper pairs) from the MDF to each IDF (in a star topology). Run the fiber in inner-duct. Provide a minimum of three 4" conduit risers between telecommunication rooms stubbed 4" above finished floor with bushings. Fill two of the 4" conduit with two 1.5" inner-duct, one 1" inner-duct, and a footage delineated pull tape. Locate backbone cabling in cable trays, and where runs go through equipment rooms or inaccessible areas, provide a minimum of three 4" conduits. Provide a Telecommunications Bonding Backbone (TBB) # 6 insulated minimum.

4.1 Backbone Terminations

4.1.1 Fiber

The fiber shall be terminated using SC type anaerobic cure connectors or fusion splice pigtails. Uni-cam terminations are not allowed.

4.1.2 Copper

The copper backbone cable shall be terminated on 66-style blocks on the backboard. Use full 66 boards for all applications. Provide adequate spool boards and mount them above or below the 66 fields.

5. HORIZONTAL CABLING

Updated: December 18, 2014

Horizontal cabling shall be configured so that each outlet is directly connected to a telecommunication room. Category 6 cable length limit is 90 meters from the IDF patch panel to outlet jack. All terminations shall be made with a non impact termination tool. Center-hung aluminum cable trays with dual-width rungs are preferred over conduit for pathways to distribute, support, and provide cabling access. Walls shall have a 4" square box with a 1" (minimum) conduit run to above the ceiling. Cables shall be run un-spliced from the wall outlet to the patch panel in the IDF. Where cables are not installed in raceway, support the cables with proper hangers at an interval of 5', 4', 5' etc. For those cables that run in conduit back to a closet, 1" shall be the minimum size. Plenum-rated cable shall be used in all applications. All penetrations must be properly fire stopped.

5.1 Cables

Cables used shall be Category 6 (tested and characterized to 600 MHz) white in color for voice and blue in color for data. All cables shall be plenum rated.

5.2 Outlets

All outlet cables shall be terminated in a RJ45 type jack, Category 6 rated with 568B configuration (white jacks for voice and black jacks for data).

5.3 Closet Terminations

All cables shall be terminated on rack mounted Category 6 angled patch panels.

5.4 Racks

A rack shall generally have a fiber optic enclosure at the top (or allocate two units of space), a 48 port Category 6 patch panel **with horizontal wire managers** beneath the fiber enclosure (voice). **The voice cables will terminate in rack one, data starting in rack two.** A typical rack shall have no more than **four** patch panels **with wire management** to allow adequate space for switching equipment (provided and installed by owner). The contractor will provide floor racks in each MDF/IDF (each Telecommunications rack will have a foot-print of 31" (wide) x 24" deep with 3'0" clearance front and back. This allows 31" for the width (including wire-management), 24" depth for equipment, and 36" clearance for workspace. Provide each rack with pre- specified number of 48-port patch panels, wire management, etc. Provide mounting space at the top of each rack in MDF/IDF for a future fiber optic patch panel. (Position patch- panels - beginning at the third slot from the top). Terminate horizontal voice cabling (originating at the face-plates) on these rack- mounted patch panels. **For each voice jack, provide a four pair solid conductor patch cable with a RJ45 mod plug at the patch panel, the other end shall be terminated on a 66-style block on the backboard. All four pairs shall be terminated.**

6. WORK SPACE CONFIGURATION

Updated: December 18, 2014

A typical outlet is defined as consisting of three category 6 cables, **(1) white (voice) and (2) blue (data)** in a four port faceplate with Category 6 jacks **(white for voice and black for data)**. All horizontal cabling requires 1' of slack above ceiling.

6.1 Offices

Each office space shall be provided with one typical outlet. Large offices may be required to have two or more typical outlets. Provide one typical outlet for 100 sq ft of office space.

6.2 Classrooms, Lecture Halls, Auditoriums, and Conference Rooms

Each room will be provided with a minimum of one **quad** outlet **(one voice, three data)**. The outlet shall be located in a convenient location near the front of the room. For Conference rooms (1) typical outlet shall be located in a floor box and (1) outlet located on the front wall.

6.3 Computer Laboratories

There should be an adequate number of data cables to support the number of computers.

6.4 Study Areas

Study carrels and other private, single person study areas will be provided with one **data connection** per location.

- 6.5 Residence Hall Rooms
The first bed in a room shall be provided with an outlet consisting of 1- data and 1-CATV (cable television) connection. Each additional bed in a room shall be provided with an outlet consisting of 1 data.
- 6.6 Point-of-Sale
Each location shall be provided with one outlet consisting of one typical outlet.
- 6.7 Vending Machines
Each vending machine shall be provided with an individual data connection.
- 6.8 Common Areas
Areas where students can reasonably be expected to stay for a period of time between classes, at night, etc. (such as general sitting lobbies) shall be provided with a typical outlet, located adjacent to a 120 volt receptacle.
- 6.9 Spaces Not Listed
Other spaces shall be evaluated by the University and may be required to have University telephone, pay telephone, data, or CATV outlets.
- 6.10 ATM Machines
Each location for ATM machines shall have one typical outlet.
- 6.11 Wireless Access Points
Provide two category 6 cables mounted at a height to be determined for wireless access points in common areas.

7. TESTING

All testing shall be performed after all terminations are completed at both ends of cables. Fiber optic cables shall be tested with an OTDR, appropriate power meter and each fiber tested at both operating frequency ranges for continuity, polarity, and level of attenuation. Copper riser cables (voice) shall be tested with a digital multi-meter and/or automated continuity tester and shall verify that no conductor is shorted to another conductor or raceway, and that the loop resistance does not exceed 30 ohms. The contractor shall perform validation testing on all Category 6 cables. An approved tester that can measure for Category 6 characteristics shall validate to the latest ANSI/TIA/EIA specifications for 100 ohm structured cable testing parameters. Each cable-run from each closet to every jack in every room shall be tested for Category 6 performance compliance. All cable certification reports shall bear the room number and cable identifier for each cable tested. Test results/reports by closet and building shall be delivered to the owner according to the project submittal procedures.

- 7.1 Test Equipment
Prior to any testing being performed, the Engineer shall be supplied with a list of

test equipment to be used, for review and approval. The submittal shall include documentation indicating that the proposed equipment is capable of performing all tests as required by this specification and has been factory calibrated within the past year.

8. MISCELLANEOUS

Updated: December 18, 2014

8.1 Fire Alarm Systems

Alarm systems requiring the use of a telephone shall be provided with two RJ31X jacks adjacent to the digital alarm communicator.

Two Category 6 cables (Yellow), shall be run from each jack to the closest telecommunications room (IDF / MDF). Cables shall be terminated in the communicator with RJ31X jacks and on a 66 block located on a red backboard in the IDF/MDF. **Also provide one Category 6 data cable adjacent to the fire alarm panel for a WEBS device.**

8.2 Lighting

The lighting fixtures shall be placed within the room to provide optimum and uniform illumination of the room after racks and hardware are installed. Consider perimeter placement of light fixtures. Provide a minimum equivalent of 500 lux (50 foot-candles) when measured 3'0" above the finished floor level.

8.3 Electrical

Provide two dedicated 208-volt 30 amp and three 120-volt 20 amp receptacles in the building MDF (one dedicated).

8.4 Elevators

Each elevator shall be provided with a telephone connection in the elevator equipment room. Cables shall be category 6 (Yellow) terminated in the elevator controller, run in conduit to the MDF, and terminated on 66 blocks located on a Red Back Board. Each elevator shall also be provided with an emergency phone in the cab. See the Facilities Design and Construction Project Manager for the current telephone used by the University. Ensure compliance with ADA guidelines and specifications.

8.5 Campus Emergency Telephones

Emergency telephones are located both in buildings and as freestanding towers located throughout campus. These telephones provide a voice connection to the University Police Department for immediate assistance to a user. Free standing towers are made of vandal resistant steel with a blue light that is always illuminated. An emergency phone is included in the tower, and when the

emergency phone button is pushed, a high-powered strobe automatically pulses. Contact the University Project Manager for direction in whether emergency telephones should be included in the scope of a project, as well as the current vendor of the telephones and installation specifications. Installation requires three 1" conduits, one for cabling, one for electrical 120 volt receptacle, and one for future. Ensure compliance with ADA guidelines & specifications.

8.5.1 Emergency Phone Cabling

For outdoor emergency telephones, **provide two** outdoor rated, shielded Cat5 gel filled cables. Terminate the cables on 2-pair lightning protectors on both ends. Ground the pedestal side of the cable to the electrical ground coming in and ground the telecom closet end to the grounding bus bar. Indoor emergency telephones shall have a Yellow Category 6 cable terminated on 66-style blocks mounted on a red backboard.

8.5.2 ADA Requirements

Compliance with The Americans with Disabilities Act (ADA) (36CFR Part 1191) shall be maintained at all times. This act specifies that text control telephones and volume control telephones be provided along with signage wherever banks of pay phones are installed. It also details mounting heights and clearances for telephones.

8.6 Control Systems

Provide a typical outlet beside the building's HVAC direct digital control system main controller.

8.7 Identification

The University and various subcontractors maintain and provide additions, moves, and changes for the overall campus telecommunications systems. Because of the dependence of the University upon its telecommunications systems, it is critical that labeling be clear and informative. Prior to labeling any portion of the system, the contractor shall coordinate with the University Project Manager for approval of proposed labeling systems. The University Project Manager shall approve all labeling schemes, and the labels used, prior to their installation.

The UNCG telecommunication infrastructure cabling administration and identification is based on ANSI/TIA/EIA-606B standard. Cables shall, in general, be identified at each termination point by telecommunication room number and a numerical suffix. The documentation and testing results shall be submitted in an acceptable electronic format as well as one hard copy approved by the University Project Manager. Refer to UNCG Wiring Guidelines Figure 1 for current UNCG labeling scheme.

8.8 Grounding

TIA / EIA 607 covers requirements for telecommunications grounding and bonding as a system. The major guidelines are as follows:

- A permanent infrastructure for telecommunications grounding and bonding is specified to be independent of telecommunications cabling.
- Telecommunications bonding connections are always implemented in accessible locations with approved components.
- Minimum #6 AWG insulated copper bonding conductors.
- Telecommunications Bonding Backbone (TBB) are installed through every major telecommunications pathway (backbone pathway) and directly bonded to a telecommunications grounding busbar (TGB) in each telecommunications equipment location.
- A Telecommunications Main Grounding Busbar (TMGB) is directly bonded to the electrical service ground. All TBBs end on this busbar.
- Generally, each TBB should be a continuous conductor from the TMGB to the farthest TGB. Intermediate TGBs should be bond connected to the TBB with a short bonding conductor.

9. WARRANTY

The engineer shall specify a minimum of a 25 year, Category 6 certified, cabling system warranty from the cable and equipment manufacture. Their warranty shall guarantee end-to-end system performance, shall cover both components and cabling, and shall cover materials and labor. This type of warranty, available from various system manufacturers, requires that installers be approved by, and registered with the system manufacturer. The engineer shall also include in the specifications that telecommunications submissions shall include proof of registration with a qualified manufacturer and the ability to provide a valid manufacturer's warranty. Failure to provide this proof during submittals will automatically disqualify the installer. The engineer shall provide, as a preferred alternate to the base bid, a specification for a 25 year cabling system warranty from AMP Net-Connect, using AMP Net-Connect products and installed by an AMP authorized Net-Connect Design & Installation contractor.

10. OTHER REQUIREMENTS

Updated: December 18, 2014

10.1 Heating, Ventilating, and Air Conditioning (HVAC) Operation

Provide an HVAC unit with independent local controls for the MDF and IDF's.

The HVAC system that serves the MDF and IDF's should be tuned to maintain a positive air pressure differential with respect to surrounding areas. If environmental conditions warrant, provide equipment to control humidity and air quality.

Consider that the following equipment may be located inside the MDF and IDF's

and could affect HVAC sizing requirements.

1. Environmental control equipment
2. Power distribution/conditioners
3. UPS systems with a rating of 5 kilovolt ampere (kVA) or higher

10.1.1 Environmental Control Requirements

The designer must consider the HVAC requirements of each piece of equipment that will be placed in the MDF and IDF's. The final design must accommodate any special or specific requirements. However, typical equipment requirements can be used as general guidelines until specific requirements are known.

10.2 Sprinkler Systems

Provide cages over sprinkler heads located in the MDF and IDFs.

10.3 Duct Bank Systems

Where duct banks are required, install a minimum of four 6 inch conduits between manholes/hand holes encased in concrete, and a minimum of four 4 inch conduits from the manhole/hand hole into the building encased in concrete. **One of the ducts in the ductbank shall be populated with Maxcell fabric inner duct. Discuss the exact quantity and size with UNCG.**

10.4 Physical Security

For Security purposes, to ensure that only authorized personnel have access to the Telecommunications Rooms (MDF & IDF'S), all doors shall be equipped with an auditable electronic lock system. Coordinate with the University Project Manager for details of locking requirements. **No** foreign equipment such as fire alarm panels, HVAC panels, **door lock equipment**, electrical panels and/or housekeeping supplies shall be installed or placed within these rooms.

16720. ALARM AND DETECTION EQUIPMENT

Fire alarm systems shall be designed and installed in accordance with the North Carolina Department of Insurance document *Requirements for Fire Detection and Alarm Systems*.

1. Fire alarm system design and construction will be coordinated through the University's Project Manager who will in turn coordinate with the UNCG Office of Safety, UNCG Telephone Services, and end users.
2. Voice systems shall be provided and shall include one-way Public Access emergency communications.
3. Contact ID communicators are used to transmit signals to the University Police Station. The communicator shall be connected through central office telephone lines and shall not

- be connected through key systems, voice over internet protocol, or other intermediary device.
4. The designer will perform a 100% test on all fire alarm devices during the prefinal inspection, and a representative from the UNCG Office of Safety will accompany the designer during this test. Additionally, other UNCG representatives may also be present at this test, including the Project Manager and a representative from UNCG Facilities Operations. A sensitivity report shall be submitted to the designer three days prior to the inspection, and no device shall be more than 2% dirty.
 5. After the designer approves submittals and shop drawings, three copies will be sent to UNCG. One set is for Facility Design and Construction records, one set is for Facilities Operations or Residence Life, and one set is for the Office of Safety.
 6. Project specifications shall include the following:
 - a. User defined control switches (or buttons) shall be located on the user interface of the FACP. Separate switches are not allowed. Separate switches shall be provided for HVAC bypass, A/V bypass, elevator bypass, fire door bypass, and city disconnects. These switches shall report a supervisory signal to the FACP upon activation.
 - b. SNAC panels shall have built in synchronization for strobes. No external devices shall be used.
 - c. Two sets of glass-framed floor plans indicating all fire alarm devices and device numbers shall be provided. One plan shall be mounted adjacent to the FACP and the other shall be mounted beside the remote annunciator. These plans shall be secured to the wall with screws.
 - d. Two separate days of training will be provided, divided over two days.
 - e. The site-specific program for the fire alarm system shall be stored on electronic media and archived by the fire alarm system manufacturer or authorized distributor. A CD copy shall be submitted to the engineer for transmission to the owner.
 - f. Provide a horn silence function with an adjustable delay of 2 to 15 minutes. Delay shall prevent the silence function from engaging. This silence function shall be manually activated and shall not prevent visual devices from flashing.
 7. Provide adjacent to the fire alarm control panel:
 - a. A telecommunications outlet consisting of 2 voice and 1 data port shall be installed adjacent to the fire alarm control panel. The 2 voice lines will be used

by the digital alarm communicator, and the 1 data line will be used for mass notification.

- b. A 12"x12"x4" deep box with a hinged cover, with a 120 volt receptacle inside. This box will be used by UNCG's Telephone Services group for the mass communication interface.
- c. Printer stand with paper storage.

16720A. MASS NOTIFICATION REQUIREMENTS FOR FIRE ALARM SYSTEMS

All fire alarm systems designed and installed at UNCG shall be designed with mass notification features, with systems capable of being integrated into an overall campus mass notification system in the future.

(Note: Because mass notification technology and systems are currently in development by manufacturers and standards-making bodies, there is currently no nationally recognized standard for the installation of these systems. Also, at this time, manufacturers of fire alarm systems also do not have a complete line of products available for purchase, nor do they have guidelines on how to design and install these systems.)

The National Fire Protection Association created Annex E in the 2007 edition of NFPA 72, the National Fire Alarm Code, as a way to begin the process of creating a consensus national standard, and when the 2010 edition of this standard is published it will incorporate mass notification requirements and a national consensus standard will be available for the first time.

Because the University will be installing fire alarm systems before standards-making bodies and manufacturers have completed their work, and because the preliminary standards that will be available are still being modified, each system's design will require close coordination with the campus to help insure the systems are compatible with future developments in this field. Designers are encouraged to keep current with the proposed standards and new hardware, and also to keep University personnel apprised of the most current ideas in this field. Designers should also use the Department of Defense's Unified Facilities Criteria document "Design and O&M: Mass Notification Systems" (UFC 4-021-01) and American's with Disabilities Act Accessibility Guidelines (ADAAG) when designing systems.

It is the University's intent to install a central control station at the UNCG Police Department and at other selected locations in the future that will be able to transmit information to building fire alarm systems. The central station will be able to call to buildings, then the building fire alarm systems will transmit both a public address (voice) message as well as a visual signal (using an amber strobe) to publically indicate an event.

Fire alarm systems should be designed and installed with the following:

1. Systems shall be designed in accordance with NFPA 72, Annex E, Mass Notification Systems.
2. All fire alarm systems shall be voice systems. Coordinate locations of the main fire alarm control panel and remote panels with University personnel so that local mass notification announcements are possible.
3. Fire alarm control panels shall have an external audio input, capable of accepting an external audio signal sent from a central control system.
4. Speakers shall be zoned according to the floor plan of the building and coordinated with the University.
5. A speaker shall be installed in stairwells, located on a landing that is centered vertically in the enclosure. (Note: Some of the taller campus buildings may require more than one speaker per stairwell. Discuss the number and locations with the University Project Manager during design.)
6. Exterior exit locations and appropriate congregation areas (i.e., balconies, patios, walkways) will have a fire alarm (white) strobe and a standard speaker.
7. A combination speaker/fire strobe (white)/mass notification strobe (amber) will be installed at all fire alarm strobe locations in egress corridors, in areas of common congregation, and in all rooms designated by the university to receive notification provisions for the hearing impaired.
8. Toilets, conference rooms, study rooms, and similar locations will have a combination speaker/fire alarm strobe (white)/mass notification strobe (amber).
9. Residence halls will have a speaker installed in each residence room, but not an amber strobe. This is in addition to the combination smoke detector/sounder base that will also be installed.
10. Mass notification strobe units will be initiated by a switch at the FACP, and used in conjunction with the voice communication system for mass notification purposes. It is not envisioned that both visual device systems will be used concurrently.
11. The UNCG Telephone Services group will furnish and install a Voice Over Internet Protocol interface between the campus network and the fire alarm control panel auxiliary audio input.

16722. ELECTRONIC DOOR ACCESS & MONITORING

Updated: 7/31/2013

1. GENERAL

- a. The University uses the Blackboard Transact Access Control System to provide and monitor access into buildings from the exterior and to certain interior spaces such as **IT Secure Areas**. The Designer should include a discussion of this scope of work in the meeting(s) with the University Locksmith and FDC Design Project Manager early in the Design Development phase of the project. This system should be included in the project as a Preferred Brand Alternate and as one of the three manufacturers in the base bid. These guidelines apply to all installations of the Blackboard Transact Access Control System on campus.
- b. As a general rule, all exterior doors will have one of three configurations:
 - Monitor only
 - Monitor and Unlock
 - Monitor, Unlock, and Card Access
- c. Interior doors that may require access control are:
 - Rooms where audit trails are required by law or regulation (**designated IT Secure Areas**, HIPPA, etc.)
 - Rooms that serve a large, broad group of the University community (computer labs, library)
 - Rooms with sensitive equipment and/or access, where unauthorized access may hamper educational goals or pose a significant liability risk (scientific labs)
- d. Refer to Hardware Guidelines (section 08000 **Doors/Windows** and section 16700 **Telecommunications Systems**) for additional requirements.

2. DESIGNER REQUIREMENTS

- a. The designer shall specify that the door access system must be a turn-key operation and complete installation.
- b. Include separate floor plans to show all access control openings. This should include all devices relevant to life safety and necessary to provide a comprehensive plan for access control. All openings should be clearly defined and labeled as they will exist at completion.
- c. A listing of symbols should be clear and reflect the hardware that will be installed at the opening.
- d. Each opening should have a diagram on the Riser page detailing conduit runs/paths/sizes and labeled clearly to correspond with floor plans.
- e. Label legends shall be listed on riser on page as well as front page of section to detail devices and notes as needed.
- f. Notes should be used to convey work scope and responsibility.
- g. Access control equipment should be placed in secure room with network connectivity and on **standby power**. **Requests to place wiring or equipment in IT Secure Areas must have written approval from the Vice Chancellor for Information Technology Services (UNCG Physical Access to Information Technology Resources Policy).**

- h. Equipment should be mounted on ¾" non-combustible plywood. If painted ensure appropriate paint and leave labels viewable.
- i. Door Hardware Schedule shall be prepared by opening and listed in a common schedule. ALL doors should be included with ALL hardware to be installed. NO EXCEPTIONS. A statement describing the Method of Operation for each door type should be included with each hardware set.
- j. Door hardware should be left such that it can only be operated with the electronic hardware. Keys and dogging features should be removed or dramatically restricted.
- k. Minimum of 2 network connections required in the Access Control controller area in close proximity to Access Control enclosures. If more than 16 doors involved add one network connection per 8 doors.
- l. The specifications should include a requirement for shop drawings for the security hardware installation and coordination with standard hardware prior to door frame approval. The needs of the security hardware equipment should be reflected and specifically noted on the door frame submittal.
- m. Require a pre-installation conference with all Contractors involved with this work including the Designer and FDC construction project manager.
- n. Some exterior doors and all interior doors will require a key override.

3. CONTRACTOR REQUIREMENTS

- a. Electrical Contractor
 - 1. Responsible for pathway from door/opening to Door Access Controller Area.
 - 2. ¾" Conduit to be used within walls.
 - 3. Permissible to use cable tray between doors and Door Access Controller Area. Residence Life requires cable in conduit from door to enclosure.
 - 4. Maintain all fire ratings.
 - 5. Responsible for pulling wire in path as detailed by owner.
 - 6. Minimum of 2 feet should be provided at each device location. Wire should be protected when pulled such that it doesn't get damaged during construction.
 - 7. Minimum of 20 feet should be provided in Access control controller area.
 - 8. Wire and cable shall be marked clearly on both ends by door/opening number and device. Example: door 1101 ext REX.
 - 9. Provide 1- 20 amp 110VAC circuit per 8 door controllers. Each controller to plug into receptacle.
 - 10. Wire to be 18 gauge, 12 conductor, shielded wire, minimum or a composite cable as required by FDC design project manager.
- b. Access Control Contractor
 - 1. Access Control Contractor must be Blackboard Transact certified. Preferred minimum 5 years' experience.
 - 2. Inspect wiring for labels and visual defects.
 - 3. Terminate wire at door/opening and add device.

4. Terminate and label wiring in Access Control Area.
 5. Label enclosures.
 6. Connect master controllers to data jacks.
 7. Test and commission.
 8. All network connections will be made by UNCG Information Technology Services.
- c. Hardware Contractor
1. Installs all door hardware and associated equipment such as power supplies.
 2. Coordinates location of all access control and hardware equipment.
4. MATERIALS REQUIRED
- a. Door hardware: Industry Grade 1 hardware 24 VDC <1 Amp.
 - b. Power Supply: Certified by door hardware provider to work appropriately with hardware usually needed for electric exit devices.
 - c. Request to Exit (REX) devices: 24 VDC with Normally Open Trigger
 - d. Door Position Switch: Contact is closed when door is closed.
 - e. Door readers should be "dual-use" swipe and contactless. Must be Blackboard Transact certified "dual-use" magnetic-stripe/NFC (13.56MHz, ISO 14443A) units.
 - f. Wire to be 18 gauge, 12 conductor, shielded wire, minimum.

16740. GPS WIRELESS CLOCK SYSTEM

A Primex satellite clock system is used on the UNCG campus. The system operates by receiving a time signal from the U.S. government's global positioning system, and then retransmitting a signal to wireless clocks located throughout the campus. The campus uses black 12 ½ inch clocks in most areas. Additional information concerning this system may be found at www.primexwireless.com.

When renovations or new building construction occurs, the designer shall show all clock locations on drawings, and shall indicate these as owner provided. UNCG's Facility Operations department furnishes and installs new clocks. Clocks shall be installed only in classrooms, seminar rooms, instructional labs, and similar teaching areas. They should be located on the wall opposite the instructor's normal teaching position so the instructor will typically be facing the clock. Offices and office suites, corridors, conference rooms, etc., shall not have clocks installed unless a project or department specifically requests clocks.

UNCG has receiver/transmitters strategically located throughout the main campus, and these existing units cover the campus with sufficient signal strength for all clocks being installed within the core campus. No additional receiver/transmitters will be required when installing or extending clocks on the main campus. For classrooms or other instructional areas not on the main campus, additional receiver/transmitters will likely be required, and provisions for 120 volt power, an antenna cable, and an antenna that can be pointed to a satellite should be designed into the project.

The receiver/transmitters, antenna cables, and antennas will be installed by the UNCG Facility Operations department.

The UNCG Design Project Manager shall coordinate with the Facility Operations department and capture a cost for the installation of clocks. This cost shall appear as a separate line item on the Design Project Manager's PreConstruction Expense form, so that the clocks may be paid for out of project funds.

16741. POLICE BI-DIRECTIONAL AMPLIFIER

In some larger buildings, the UNCG police department has experienced difficulties when communicating with officers using police radios. To help eliminate radio reception problems, where necessary, a radio bi-directional repeater/amplifier can be installed. These units receive and re-transmit radio signals eliminating communication "blind spots", or areas without police/emergency radio coverage in a building.

On renovation projects, the UNCG Project Manager shall contact the UNCG police to discuss radio reception in the building and determine if there is any need for this equipment. In buildings where radio reception has been acceptable in the past no new equipment will be required. For new construction, the Project Manager should contact the police and the GPD Group for assistance in determining the need for this equipment.

On those projects where the bi-directional amplifier will be installed, the Designer shall make provisions and leave space for the installation of this radio unit, coaxial cables, and antennas by others. The radio equipment will require an accessible space within a secure area to house the equipment; typically an electrical room at the top of the building. The radio equipment requires a wall space of approximately 2 feet by 2 feet, as shown in Figure 1, as well as a dedicated 120 volt duplex outlet is required beside the space for power.

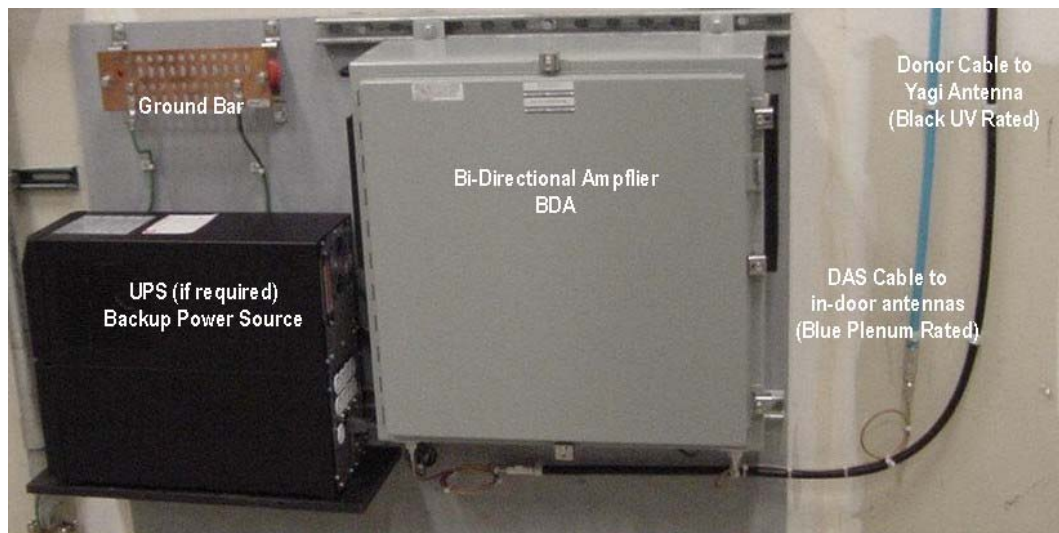


Figure 1

A ½ inch, UV rated foam core coaxial antenna cable, provided by the radio installer, will run from the bi-directional amplifier (Figure 1) to connect to a Yagi antenna that will be mounted on the roof by one of the methods shown in Figure 2 and/or as describe below.



Figure 2

Because this type of coaxial cable is difficult to bend, a straight run of 1” conduit with no junction boxes should be run to just below the roof. The penetration through the roof for the cable should be made with a minimum of a 2” rigid steel conduit extending 24” above the roof, with a gooseneck to prevent rain from entering the building. The open end of the gooseneck on the conduit above the roof will be sealed by the radio installer once the coaxial cable has been properly installed and secured.

The radio installer will run plenum-rated coaxial cable from the bi-directional amplifier output throughout specified areas within the building that require in-building antennas for effective communication. The radio installer will secure the plenum-rated coaxial cable above ceilings and terminate it into in-building antennas as shown in Figure 3. The installation of the plenum-rated cable needs to be coordinated with the radio technicians to make sure that sleeves through walls and floors are provided in order to run this interior antenna cable to locations chosen by the installer.



Figure 3

(For the UNCG Design Project Manager - UNCG's contact for additional information is Jim Riche with the GPD Group. He may be contacted at (770) 752-7197 or by emailing at jriche@gpdgroup.com.)

16920. MOTOR CONTROL CENTERS

1. Motor Control Centers shall be Class 1, Type C with terminal strip terminations.
2. Motor Control Centers shall not be located where ambient temperature could cause de-rating of overload devices.
3. Overload Heater Charts shall be mounted inside doors of cabinets or framed and mounted outside the equipment.
4. Motor starters and protective devices shall be of a type not affected by ambient temperature. The module shall be plug-in type to permit safe replacement without shutting down the Motor Control Center.

outside the equipment.

4. Motor starters and protective devices shall be of a type not affected by ambient temperature. The module shall be plug-in type to permit safe replacement without shutting down the Motor Control Center.

Utility Meter Setup Guide
The University of North Carolina at Greensboro
Facilities Operations
November 16, 2012
Version 1.1

The purpose of this document is to communicate fundamental information for setting up utility meters for The University of North Carolina at Greensboro. This document covers the units to be displayed for each different utility meter, parameters for setting up electricity meters on the University's campus-wide Ethernet utility network, and communications with the University's building automation/utility monitoring system.

A. Electricity Meters

1. Electricity meters are typically installed when a building is fed from UNCG's 12,470 Volt underground electrical distribution system or when fed directly from Duke Energy and submetering is required.
2. The University's preferred electricity meters are both manufactured by Electro Industries/GaugeTech: Nexus 1262 main meter and the Shark 200 submeter.
3. All electricity meters are to "reside" on the University's campus-wide Ethernet utility network, which means that each meter must have an Ethernet port (data drop) to plug into.
4. Each electricity meter must be "registered" with the UNCG Information Technology Services Department before it can be connected to the University's network. In order to be registered, the installer of the electricity meter(s) must provide a list [preferred format is an Excel spreadsheet] of each electricity meter, the manufacturer, the model name and model number, the designated installation location including the room number and load served, and the MAC address (Ethernet address) unique to each meter which is assigned by the manufacturer and never changes. UNCG ITS will assign an IP address for each meter which allows other devices connected to the utility network to locate each specific meter and know what load that meter is measuring. UNCG Facilities Operations will assign a Meter ID for internal use. The Excel spreadsheet can be forwarded via e-mail to the next recipient and will facilitate capturing all of the key information in one document, including UNCG ITS adding the IP addresses.
 - a. Note: The Calibration Reports for both the Nexus 1262 and Shark 200 meters are shipped with the meter and are to be provided to the University. The "Device Profile Report" shipped with the Nexus 1262 meter includes key data and the MAC Address for that meter and is to be provided to the University.
5. EACH ELECTRICITY METER MUST BE INSTALLED IN THE SAME LOCATION AS DESIGNATED AT THE TIME OF REGISTRATION. Otherwise, the pre-installation assignment of meters to loads gets scrambled.
6. Nexus 1262 Main Electricity Meter
 - a. IP address: Provided by UNCG ITS and is STATICALLY programmed into the meter.
10.0.35.XXX
 - b. Subnet Mask: 255.255.252.0
 - c. Default Gateway: 10.0.32.1
 - d. Units: kWh (kiloWatt-hours, whole number, maximum number of digits)
kW (kiloWatt demand)

e. Scrolling Meter Display: To be set up to automatically and continuously scroll through the following screens for about seven (7) seconds per screen:

1. Building Name (Meter Name)
2. kWh Received (kiloWatt-hours, whole number, maximum number of digits)
3. Peak kW Demand Received (whole number, no digits to the right of a decimal)
4. Date/Time kW Demand was Last Reset
5. Blank Screen/Screen Test

7. Shark 200 Electricity Submeter

- a. IP address: Provided by UNCG ITS and is NOT to be statically programmed into the meter. Shark 200 submeters are to be set to perform DHCP (Dynamic Host Configuration Protocol). Failure to set the submeter to DHCP will cause network errors and will result in a notification from UNCG ITS to fix the problem.
- b. Units: kWh (kiloWatt-hours, whole number, maximum number of digits with NO DIGITS to the right of a decimal point).
kW (kiloWatt demand)
- c. Other readings to display include voltage, current, power factor, etc. and the submeter is to be set up to automatically and continuously scroll through all available data screens that are selectable on the meter's face.

B. Natural Gas Meter

1. These are rare, but the reading (point) to be integrated into the University's Building Automation System, Tridium, is cumulative cubic feet (cu. ft.).

C. Domestic Water Meter

1. The reading to be integrated into the University's Tridium server is cumulative cubic feet (cu.ft.). If the meter display includes a fixed zero or two fixed zeros, be sure to multiply the reading by 10 or 100 as needed to display the correct reading in Tridium.

D. Chilled Water Meter

1. The following readings are typically integrated into the University's Tridium server and Vykon Energy Suite (VES):
 - a. Chilled Water Supply Temperature (degrees F).
 - b. Chilled Water Return Temperature (degrees F).
 - c. Delta T (degrees F).
 - d. Chilled Water Flow in gallons per minute (gal/min.).
 - e. Current or Instantaneous tons.
 - f. Cumulative ton-hours (NOT ton-hours X 1K).

E. Steam Meter

1. The two readings to be integrated into the University's Tridium server and Vykon Energy Suite (VES) are Steam Flow in pounds per hour (lb./hr) and Cumulative Steam Usage in pounds (lb.).

F. Steam Condensate Meter

1. The two readings to be integrated into the University's Tridium server and Vykon Energy Suite (VES) are Condensate Flow in gallons per minute (gal/min) and Cumulative Condensate Usage in gallons (gal).

- G. Integration of Utility Meter Readings into UNCG's Building Automation System (Tridium server) and Vykon Energy Suite (VES).
 - 1. It is the meter supplier/integrator's responsibility to ensure that each meter's readings shown in Tridium match the readings displayed on the meter. Also, the readings displayed on the meter are to be verified as correct.
- H. The Physical Location of each utility meter in the building must be such that a meter reader can read the meter's display while standing on the floor.
- I. Once the utility meters are set up they generally should NOT be reset. The University reads the utility meters monthly and uses many of the readings for on-campus billing purposes. If any meters have to be "pulled" to be repaired or replaced, the last readings on the meter being removed are to be written down and provided to the University along with the date that the meter was "pulled".

Referenced in Design Guidelines Section:

15170. METERING

16440. METERING