

2008

Capital Planning &
Construction

LONGWOOD
UNIVERSITY



Design Guidelines and Construction Standards

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DESIGN PHILOSOPHY AND PLANNING STANDARDS

Evoking respect, inspiration, admiration and excitement, the quality of exterior and interior architectural design, is part of Longwood University's tradition. Structures that speak clearly to this quality are located along High Street in the historical, northeast quadrant of campus and have solid ties to the original campus fabric. Respect for these structures should be maintained with each new building's design and siting, making reference to the scale, proportion, historical character, and quality of construction.

It is also Longwood University's intent for the campus to remain residential in nature, evolving more fully into a pedestrian campus that encourages and engages human interaction. With each new building project, opportunities to create common areas and gathering spaces should be explored. Also, to further enhance the pedestrian experience, vehicular access ways and core campus parking should be minimized and "greened" appropriately through the use of traffic islands, traffic circles and raised medians.

"Sustainability" is to also have a greater part in the Longwood University experience. At freshmen orientation, students are introduced to the important role sustainability plays in today's environment. To foster that learning experience and carry it forward, each new building, building renovation, and other program or process that impacts the campus environment will speak to that effort by implementing the most current standards.

General

It is Longwood University's intent to maximize the design potential of each campus building project in terms of accommodating the programs to be served, fostering collegiality on the campus, and contributing to the public realm that defines the Longwood University campus as a unique place.

Achievement of the programmatic goals for each project dictates that the design must cost-effectively overlay the specific, user-generated objectives for the project with Longwood University objectives of institutional identity, durability, longevity, flexibility, sustainability, and adaptability.

Each project must, in the interest of fostering collegiality, create environments that encourage interaction and discourse among students, faculty, and staff. This potential should be recognized in the development of both interior and exterior environments.

One major requirement of programmatic accommodation is development of a project's "insides." However, each project also has a responsibility to the greater whole of the

campus, both as an entity in itself, and part of the community in which it thrives. This responsibility to the public realm recognizes the importance of the architectural and planning traditions at Longwood University and strives to contribute to the further development of the campus as a highly imaginable, unique, and inspiring environment.

To achieve these goals, it is incumbent on the project design team to invest in an understanding not only of immediate program goals, but also of the planning and architecture history for the campus, as well as of the goals and objectives set forth in the current Campus Master Plan.

Accessible Design

Longwood University's policy is to create learning and working environments that will engender participation by all persons who visit, attend, and are employed by the University. New and renovated space designs allowing inclusion of all persons are top priority. In fact, universal design that incorporates access for all persons should be a primary planning criterion: accessibility standards should be included in the initial planning of all new facilities, not an afterthought during a code review of a design that is otherwise considered complete. For new construction, there is no need to segregate access for persons with disabilities from that for the general population.

Energy Efficiency

Longwood University is committed to the principles of energy conservation. All designs should maximize energy efficiency and comply with the Governor's Executive Order 48.

Sustainability

In order to incorporate sustainable design solutions in new construction and renovation projects, Longwood University has joined the USGBC (US Green Building Council) and follows the guidance of the LEED™ (Leadership in Energy and Environmental Design) Building Rating System during the design process. Furthermore, the University has developed the Sustainability Strategic Plan (2008). The pursuit of high performance energy efficient and environmentally sensitive "green" buildings will help to lower operating and energy costs, improve employee productivity, promote improved learning, and enhance the health and well-being of the students, faculty, and staff at Longwood University. All projects will focus on sustainability as it relates to site issues, water, and energy efficiency.

Design Character

1. The architecture at Longwood University generally expresses an ordered, traditional theme, drawing from a legacy of Palladian-Jeffersonian architecture in the historic northeast district of campus.

2. All new buildings should reflect the character of Longwood University as an institution with a rich past, vibrant present, and promising future.
3. Buildings should extend and enhance the underlying planning and architectural strengths of the campus.
4. New buildings should balance individual expression with contextual sensitivity.
5. Program, site, and budget parameters should all be addressed in an integrated fashion.

Planning

1. Buildings should be sited to reinforce and enhance the spatial structure of the campus and its circulation patterns.
2. Specifically, buildings should be sited to align with setbacks created by adjacent structures.
3. Building entries should be clear and coordinated with circulation patterns and landscaping elements.
4. Ground level uses should consider the harmony of interior and exterior activities.

Massing

1. Massing should be simple.
2. Buildings should be tall enough to define adjoining spaces. This will require a minimum 3-story or 45 feet high building.
3. Bays, porches, towers, and other minor adjustments to massing are encouraged.

Exterior Spaces

1. When considering placement of new buildings, relationships to adjacent structures should help in forming new green spaces and appropriately sized quadrants.
2. Efforts should be made to create exterior gathering and collaborative spaces that encourage interaction among students, faculty, and staff.

Roof Forms, Roof Lines and Silhouette

1. Well-developed and articulated rooflines are encouraged.
2. Sloped roofs and flat roofs are both acceptable
3. Sloped roofs should be of high quality, factory finished metal.

4. Flat roofs should have carefully selected aggregate or pavers if visible. Visible roofscapes must be as carefully designed as any other exterior surface of the building.
5. It will be necessary for designers to explain all aspects of their design selection including material, color, patterning, and other details.
6. Parapets should be well articulated and trimmed with cut stone. Profiles, scuppers, and other ornamental devices are acceptable and encouraged.
7. Dormers and pediments are also acceptable and encouraged, as are cupolas, chimneys, and other traditional roofing embellishments. Their intersection with the main roof must be well detailed and will receive careful scrutiny. These elements should not be viewed purely as ornamental elements without functional attributes.
8. Mechanical equipment on rooftops shall be screened to prevent its being seen from the ground.

Façades

1. Façades should be simple and well ordered.
2. General fenestration patterns should be regular. Some vertical hierarchy is appropriate. Window openings should be subdivided to create a vertical proportion where they form horizontal groupings.
3. The use of bays, giant order elements, or special accents to provide a large overall order is acceptable and encouraged.
4. Special detailing ornament and materials at significant locations are acceptable and encouraged.
5. Window frames and glass should be set back approximately 6". Sills and heads should be detailed to shed water and alleviate the possibility of unattractive weathering patterns.

Architectural Details

1. Quoins, coping, string courses, and other traditional architectural details are acceptable and encouraged.
2. The joining of dissimilar materials must be resolved carefully and will be rigorously reviewed.
3. Where possible, caulk joints should be placed in less visible locations such as inside corners or reveals.
4. Extreme care should be given to and experienced overseeing should occur concerning details designed to prevent water infiltration.

Masonry

1. Material selection should be made to reinforce existing campus patterns.
2. Masonry design must comprehensively consider unit size, texture, color, mortar, and striking. These design choices will be rigorously reviewed.
3. Pre-cast concrete, poured-in-place concrete, and cast stone may be proposed as alternatives to limestone trim.

Exterior Doors

1. Wood, metal, and glass doors are all acceptable.
2. Doors should have a quality and character appropriate to the overall façade.
3. Vision panels are appropriate and encouraged.

Color

1. Color choices for brick must be coordinated with the existing campus and reinforce the overall campus design.
2. Paint colors on campus are generally white for exterior trim and building components.

Transportation

1. Access and connectivity
2. Parking
3. Streetscapes
4. Pedestrian ways
5. Wayfinding

Exterior Scapes

1. General outdoor and landscape functionality and design.
2. Burial of overhead utility lines
3. Screening of utility and service areas
4. Design standards for fixtures, furniture, and features.

Water Conservation

1. Overall goals and approach
2. Potable water conservation methodology
3. Non-potable water conservation methodology
 - HVAC condensate lines
 - Two stage flush toilets
 - Shower and sink water reuse
4. Irrigation requirements, supply, and systems
 - Artificial turf water reuse

****END OF DESIGN PHILOSOPHY AND PLANNING
STANDARDS****

SPACE STANDARDS

1. Space planning for new University facilities shall generally follow the guidelines in Section 701.B of the Commonwealth of Virginia A/E Manual. In addition to those guidelines, the following space guidelines shall be used:

Administrative & Faculty Offices	Area Guideline
Vice Presidents; Deans	256 sf
Directors reporting to Vice Presidents, Deans, and the President	192 sf
Department Heads	168 sf
Associate and Assistant Department Head	144 sf
Faculty	120 sf

2. During the programming and schematic design phases the Architect/Engineer shall, for review and acceptance by the Building Subcommittee and the Capital Planning and Construction office, document specific space allocations based on these guidelines and the requirements of the project in design. These space allocations will become the basis for the development of the project design.

Other Space Requirements in New Construction

1. The following office spaces should be incorporated into the design of new buildings as required by the Longwood University Physical Plant employees to provide adequate custodial and preventive maintenance services for the building occupants:
 - Custodial Closet
 - Provide a minimum of one 7'x 8' closet or equivalent space on each building floor with a floor sink mounted in a corner: this sink will not be over 8" in height. Two closets are required on floors larger than 18,000 sf. (Additional space may be required depending on the building floor square footage.) A mop holder able to accommodate up to three mops will be mounted over the sink. One wall will have at least three shelves, spaced a minimum of 18" apart and at least 18" deep. The bottom shelf will be a minimum of 24" from the floor. The shelves will be the same length as the wall. The shelving can be either wood or steel. The shelves will not be mounted on the same walls that come in contact with the sink. There will be one light fixture suitable to properly illuminate the closet. The closet will be ventilated. The floor will be sloped to a center floor drain sized

for this space. The floor will be sealed concrete. The closet door should be hinged to open out and not into the closet. The walls shall be painted a shade of white to enhance the lighting. Do not include roof access and/or serviceable electrical and mechanical building equipment (i.e. electrical panels, motors, etc.) in this space.

- Custodial Supply Closet

- Provide one supply closet located on a floor level accessible from a service entrance or loading dock (not within the proximity of any custodial closet), containing a minimum area of 100 square feet. One wall will have adjustable shelving that is 24" deep (four total) with the bottom shelf being 24" from the floor. Shelving will be made of wood that has been treated with a wood sealer (not pressure treated) or painted steel. Shelving will not be mounted on the walls that come in contact with the sink. There will be one floor sink located in a corner furthest from the door. There will be one mop holder capable of holding three mops located over the sink. The floor will be sealed concrete sloped to a floor drain located in the center of the room and of the proper size to accommodate the size of the room. Lighting will be gauged to properly illuminate the room. The wall will be painted a shade of white. There will be at least one duplex receptacle, 120 VAC, located away from the sink, but not on the shelving wall. The room shall be ventilated. Do not include roof access and/or serviceable electrical and mechanical building equipment (i.e. electrical panels, motors, etc.) in this space.

- Preventive Maintenance Office

- Provide one 10' x 10' office or equivalent space in each building, located on the ground floor of the facility in close proximity to the loading dock.

2. The following recycling related office space and equipment requirements should be incorporated in the design of new buildings to facilitate waste stream separation and removal:

- Offices

- Provide desktop space for double-compartmented paper collector (10"W x 9-1/2"D x 11"H) or floor space for a desk side three compartment trash and paper collector (10-3/8"W x 19-3/8"D x 13-5/8"H).

- Copy Rooms
 - Provide floor space for one 30 gallon rectangular paper collector (21-3/4"W x 15-5/8"D x 27-5/8"H) for every two copiers (collector to be emptied once a week).
 - Note: For rooms with multiple high speed copiers, provide floor space for one 30 gallon rectangular paper collector (21-3/4"W x 15-5/8"D x 27-5/8"H) for each copier (collector to be emptied daily).
- Lounges/Mail Rooms
 - Provide floor space, or alcove, for 3 rectangular 30 gallon collectors for aluminum cans, newspapers, office paper (21-3/4"W x 15-5/8"D x 27-5/8"H).
- Corridors:
 - Provide floor space, or alcove, for two rectangular 30 gallon paper collectors (21-3/4"W x 15-5/8"D x 27-5/8"H) for every ten (10) office workers (collectors to be emptied once a week).
 - Provide floor space, or alcove, for one rectangular 30 gallon aluminum can collector (21-3/4"W x 15-5/8"D x 27-5/8"H) for each soda vending machine.
- PC Labs
 - Provide floor space or alcove for one 30 gallon paper collector 21-3/4"W x 15-5/8"D x 27-5/8"H) for each printer (collector to be emptied once a week during normal periods, 2-3 times per week during peak periods).
- Loading Docks:
 - Loading docks should be an "L" shaped design. Provide floor space along the long leg for multiple storage containers (37-1/2"W x 30-1/2"D x 43"H), one per recyclable.
 - Provide bumpers and dock leveler at each loading dock.
 - Exterior loading dock area should be enclosed with an overhead door, or at a minimum, sheltered from the elements by an overhanging roof.
 - Location of the loading dock should be near the mid-section of the building, rather than at either end.
 - Loading docks should be directly accessible by a service elevator having a 2500 lb. usable capacity.
 - Provide a 60" cardboard baler in close proximity to each loading dock area if the facility generates more than six cubic yards of cardboard per week and does not have an open hopper with a cardboard compartment.

3. Efforts should be made to create interior gathering and collaborative spaces that encourage interaction and discourse among students, faculty and staff.

****END OF SPACE STANDARDS****

ROOM NUMBERING STANDARDS

Goals (in priority order)

1. Identify rooms in a systematic way so they may be easily located by visitors to the building.
2. Identify rooms for building occupants.
3. Identify rooms for databases and administrative identification (IT, Physical Plant, etc.).

Guidelines

1. The same room numbering sequence should be used on all floors of the same building with lower room numbers at one end of the building and higher room numbers at the other end of the building. Also, even room numbers should be on one side of the primary hallway and odd room numbers on the other side in so far as possible.
2. Rooms in similar locations on different floors should have similar room numbers so that room numbers are coordinated on a vertical as well as horizontal basis in the entire building. For example, rooms 115, 215, and 315 should all be located directly above or below each other or as close as possible.
3. Reasonably allow for renovation changes. Rooms should be numbered in such a manner that, should renovations occur in the future, intervening numbers will be available for room assignments (especially where larger rooms are built that may be subdivided into smaller rooms at some time in the future).
4. All accessible spaces must be assigned a room number. If an area of a room has a different use function or is not clearly delineated by walls and doors (ex. an area off of a corridor is used for a work area), dashed lines should be added to the floor plan to clearly identify the space and it should be identified by a room number.
5. All assignable rooms (including offices, labs, classrooms, and conference rooms) should have their room number begin with a numeric character where the first digit specifies the floor number.
6. All non-assignable rooms (including bathrooms, corridors, stairs, elevators, janitor closets, mechanical, and electrical rooms) should have their room number begin with an alphabetic character followed by a numeric room number; the first character specifies the floor number with "A" being the first floor, "B" being the second floor, etc.
7. A 3-digit room number should be used unless there are more rooms on a floor than this scheme will accommodate.

8. All interior rooms accessed from a primary room have an alphabetic character (ex. "A", "B", etc.) following the primary room number. A secondary interior room should have a single digit (ex. "1", "2", etc.) following the alphabetic character of the first level interior room (ex. Room "101A1" is accessed from room "101A" that is accessed from room "101").

Delivery Requirements

1. A separate AutoCAD (version 2000 or earlier) drawing file (.dwg) must be provided for each floor of the building and must be self-contained (i.e., no overlays, Xrefs, etc.) and use standard AutoCAD fonts (typically the simplex font). The name of the drawing file should indicate which floor it represents.
2. Each drawing should have only the following layers:
 - FLOOR
 - The FLOOR layer (white) should contain all walls, elevators, and stair entities
 - DOOR
 - The DOOR layer (red) should contain only door entities
 - WINDOW
 - The WINDOW layer (blue) should contain only window entities (both interior and exterior panes)
 - TEXT
 - The TEXT layer (magenta) should contain, for each identified space, two or more lines of text centered above/below each other. The top text line(s) should give the room name or use (ex. "OFFICE", "JAN.", "WOMEN", "STORAGE", "FRUIT RESEARCH LAB", etc.). The bottom line of text should contain the room number. All text should be set at 1'3" in height and be oriented so that it fits within the room or space without being obstructed in so far as possible. Also included on this layer are the stair and ramp directional arrows.
 - ROOM
 - The ROOM layer (green) should contain a polyline outlining each space in the building. The polyline should follow the inside wall surface of each room or space. It is used to calculate room areas and is required for our facilities management system.
3. Bathroom fixtures, cabinetry, furniture, etc., are not to be included on any drawings.

4. No overlaid drawing entities should exist. That is, a line or other entity on the drawing should not be stacked with multiple entities. Also, any single line on the drawing should consist of one line and not multiple line segments.
5. The drawings should be kept as simple and clean as possible as they are used and modified by many people in many functions across the University.
6. A sample drawing of a building floor may be obtained for reference.

****End of Room Numbering Standards****

SIGNAGE STANDARDS

All proposed signs (for both on-campus and off-campus applications) must be reviewed and approved by the University Signage Committee. For capital building projects, the cost of the interior and exterior signage is a part of the overall project cost, but separate from the “design to” construction budget.

Longwood University uses standardized signage and standard applications. This information is provided for reference only. Standard signage incorporates:

1. Non-Illuminated Interior Signage
 - Secondary Directional Signs
 - Area Identification Signs
 - Room Identification Signs
 - Regulatory and Control Signs
 - Mechanical, Instrumentation Sign
 - Main Building Directories
 - Department Directories
2. Illuminated Exterior Signage
 - Primary Identification Signs (Buildings)
3. Non-Illuminated Exterior Signage
 - Secondary Identification Signs
 - Vehicular Directional Signs
4. Dedicatory Plaques
5. Street Signage
 - Street Names
 - Regulatory and Control
6. Construction Signage

Site planning concepts should include suggested exterior signage locations. Typically, no signage is attached directly to the exterior of a building, in conformance with the Campus Master Plan. A construction sign cannot be a requirement of the contract documents. Should the contractor choose to have a construction sign, the sign must conform to the requirements set forth by the University.

The A/E must submit an electronic version of the floor plans to Capital Planning and Construction 6 months prior to substantial completion of construction in order to begin interior signage planning. Planning for dedicatory plaques, exterior regulatory, and interior control signage requires consultation with the University Signage Committee.

****END OF SIGNAGE STANDARDS****

MEMORIAL STANDARDS

General

1. The University has developed policies and standards for the placement of memorials on campus.
2. This information can be located at:
http://www.longwood.edu/hr/FINAL_POLICY_BASE_tables/TC7000.htm
The policy number for Memorials and commemorations is 7212.

****End of Memorial Standards****

ENERGY CONSERVATION STANDARDS

General

1. Buildings must be energy efficient and should strive to achieve a maximum energy consumption rate of 100,000 BTUs per square foot per year.
2. Lighting wattage should not exceed 1 Watt per square foot total.
3. Landscape design should strive to incorporate fast growing deciduous trees on the south facing side of the building to improve shading in the summer.
4. Primary entry doors shall include a vestibule to minimize infiltration.

****END OF ENERGY CONSERVATION STANDARDS****

DRAWING (CAD) STANDARDS

General

The Longwood University CAD Standards are maintained in a separate document in a link that is to be announced.

****END OF DRAWING (CAD) STANDARDS****

BIDDING REQUIREMENTS

The Bidding Requirements of all specifications for Longwood University projects shall be arranged in the following manner, using the samples enclosed herein and the referenced Capital Outlay Forms. Electronic copies of all forms can be downloaded from the Department of General Services (DGS) website – <http://forms.dgs.virginia.gov> Projects with federal funding may have additions or revisions to this list. Specific questions concerning any of the items should be directed to the Project Manager.

1. Sample Advertisement
 - Notice of Invitation to Bid in the specifications. Contact the Project Manager to determine the dates to be inserted.
2. Instructions to Bidders (CO-7a)
 - [DGS-30-055](#)
3. Sample Bid Form
 - The sample bid form shown herein shall be used as a basis to construct a bid form for the project. As each project is unique, contact the Project Manager concerning any special requirements.
4. General Conditions of the Construction Contract (CO-7)
 - [DGS-30-05 -CO-7](#), General Conditions of the Construction Contract.
5. Supplemental General Conditions
 - Insert current copy of form [DGS-30-377](#) - Supplemental General Conditions. If liquidated damages are to be specified insert current copy of [DGS-30-376](#), contact the Project Manager concerning the dates and amounts to be used.
6. 96 VUSBC Special Inspections – State Owned Buildings (CO-6b)
 - Insert current copy of form [DGS-30-052](#).
7. Contract between Owner and Contractor (CO-9)
 - Insert current copy of form [DGS-30-064](#). Contract will be prepared by the Owner and sent to the contractor for signature.
8. Commonwealth of Virginia Standard Worker's Compensation (CO-9a)
 - Insert current copy of form [DGS-30-076](#).
9. Commonwealth of Virginia Standard Performance Bond (CO-10)
 - Insert current copy of form [DGS-30-084](#). Contractor will prepare and distribute directly to the owner.
10. Commonwealth of Virginia Standard Labor and Material Payment Bond (CO-10.1)
 - Insert current copy of form [DGS-30-088](#). Contractor will prepare and distribute directly to the owner.
11. Schedule of Values and Certificate for Payment (CO-12)
 - Insert current copy of form [DGS-30-104](#).
12. Contract Change Order (CO-11)

- Insert current copy of form [DGS-30-092](#).
- 13. General Contractor Estimate for Change Order (GC-1)
 - Insert current copy of form [DGS-30-200](#).
- 14. Subcontractor Estimate for Change Order (SC-1)
 - Insert current copy of form [DGS-30-204](#).
- 15. Sub-Subcontractor Estimate for Change Order (SS-1)
 - Insert current copy of form [DGS-30-208](#).
- 16. Commonwealth of Virginia Affidavit of Payment of Claims (CO-13)
 - Insert current copy of form [DGS-30-108](#).
- 17. Certificate of Completion by A/E or Project Manager (CO-13.1)
 - Insert current copy of form [DGS-30-112](#)
- 18. Certificate of Substantial Completion by A/E (CO-13.1a)
 - Insert current copy of form [DGS-30-116](#)
- 19. Final Report of Structural & Special Inspections (CO-13.1b)
 - Insert current copy of form [DGS-30-120](#)
- 20. Certificate of Partial or Substantial Completion by Contractor (CO-13.2a)
 - Insert current copy of form [DGS-30-140](#).
- 21. Certificate of Completion by Contractor (CO-13.2)
 - Insert current copy of form [DGS-30-136](#).
- 22. Checklist for Occupancy (CO-13.3b)
 - Insert current copy of form [DGS-30-152](#).

****End of Bidding Requirements****

DIVISION 1 – GENERAL REQUIREMENTS

Summary of Work

1. Work by the University may include, but not necessarily be limited to, the following:
 - Asbestos abatement surveys
 - Water flow reports

Payment Procedures

1. Sections 19 and 36 of the General Conditions of the Construction Contract (CO-7) apply to this section.
2. Three days prior to the Monthly Pay Meeting, the Contractor shall submit a “draft copy” of the Schedule of Values and Certificate for Payment (Form CO-12) and Monthly Project Report (Section 19d) to the A/E, the University’s Project Manager and the University’s Field Engineer.
3. The A/E, Project Manager and Field Engineer will endeavor to review the submittals and return comments/changes to Contractor the following day.
4. The Contractor shall bring five copies of the “revised” and signed CO-12 and approved Monthly Project Report to the Monthly Pay Meeting.
5. At the conclusion of the Monthly Pay Meeting, the A/E and Field Engineer shall sign and certify the CO-12 for payment.

Project Management and Coordination

1. Sections 17 and 50 of the General Conditions of the Construction Contract (CO-7) apply to this section.
2. Staffing Plan
 - It is a requirement of the construction contract that the project be adequately and appropriately managed by the Contractor to ensure both timeliness and quality of all construction activities. The Contractor shall provide a Staffing Plan to University’s Project Manager and the A/E that lists all assigned personnel, their anticipated responsibilities, and their work history and experience for their review and approval prior to the preconstruction meeting. Once approved, any proposed changes to the Staffing Plan must be submitted in writing to University’s Project Manager and A/E for approval. The Staffing Plan should include, but not necessarily be limited to, the Project Manager(s), Project Engineer, General Superintendent and Assistant Superintendent(s).

3. Preconstruction Meeting
 - A preconstruction meeting will be held in accordance with Section 50 of the General Conditions of the Construction Contract (CO-7). The meeting is to be scheduled and conducted by the A/E. An agenda based on appropriate sections of the General Conditions of the Construction Contract and Division 1 of the Project Manual shall be prepared by the A/E and approved by Capital Planning & Construction in advance of the meeting.
4. Construction Progress and Pay Meetings
 - Monthly Progress and Pay Meetings will be held in accordance with Section 50 of the General Conditions of the Construction Contract (CO-7). The meetings are to be scheduled and conducted by the A/E. The agenda for the meetings shall be in accordance with Paragraph M. of the A/E Contract – Memorandum of Understanding and shall be indicated in this section of the Project Manual.
5. Pre-installation Meetings
 - The contract shall require pre-installation meetings to ensure both the quality and timeliness of various construction activities. The Contractor and appropriate Subcontractors shall schedule and conduct the pre-installation meetings in accordance with the requirements of the Project Manual. Given their knowledge of the project design documents, the A/E shall identify in this section, as a minimum, specific construction activities requiring a pre-installation meeting.

Construction Progress Documentation

1. Sections 19 and 36 of the General Conditions of the Construction Contract (CO-7) apply to this section.
2. Upon issuance of the Notice of Award and prior to submitting the preliminary schedule, the Contractor shall arrange to meet with Capital Planning & Construction and A/E to discuss the Contractor's plan to construct the project.
3. Contractor to provide printed copies of the schedule submittal(s) to Capital Planning & Construction and A/E for review. Once approved, record copies of the fully complete Project schedule and any approved revisions shall be submitted to Capital Planning & Construction and A/E electronically.
4. The Monthly Project Reports to be submitted with each pay request (Section 19d) shall consist of the approved construction schedule (or latest approved revision) that has been updated to indicate actual progress at the time of the submittal. The "as of" date (data date) for the update shall be no earlier than one week before the pay request meeting. If there are construction activities whose

actual progress is less than what is indicated on the approved schedule, a narrative report must also be submitted which lists the delayed activities and, where necessary, indicates how these activities will be expedited to avoid delaying the overall project completion date. A printed copy of the updated schedule and, if required, the narrative report must be submitted with each pay request. Review and approval of the Monthly Project Report is a prerequisite to the review and approval of the monthly pay request (Section 36a). Once approved, electronic record copies of Monthly Project Report shall be provided to the University's Project Manager.

Schedule Activity Content

1. All CPM schedule activities shall be coded to allow for sorting by Phase, Trade, and Building Location. The construction schedule shall include, but not necessarily be limited to, the following Schedule Activities as applicable to this project:
 - Construction tasks (maximum duration for any activity is 20 days)
 - Submittal and approval of required shop drawings
 - Submittal and approval of required coordination drawings
 - Ordering, fabrication and delivery of major materials and equipment
 - Check-out, start up and test/balance of major equipment
 - Submittal and approval of O & M Manuals
 - Clean up and punch list
 - Interim (i.e. pre-ceiling installation), Substantial Completion and Final Completion inspections
 - Owner occupancy

Vehicular Access and Parking Areas

1. Sections 25 and 31 of the [General Conditions of the Construction Contract \(CO-7\)](#) apply to this section.
2. Parking on the University campus is regulated for all vehicles. Longwood University's Police Department strictly enforces parking regulations (regulations at: www.longwood.edu/police/). Violations of parking regulations could result in parking tickets, wheel booting, or vehicle towing. Contractor parking on campus is managed with the following requirements:
 - Parking within the construction fencing of a capital project is allowed without restriction. Company and private vehicles may be parked inside the fence without a permit. All efforts should be made to keep contractor parking within the fenced area. Parking on site after the project is deemed

substantially complete and the construction fence is removed requires written approval by Capital Planning & Construction and/or an appropriate parking (turf) permit.

- Prior coordination with the Longwood University Campus Police Department (434/395-2091) is required should the need arise for additional contractor parking. The University will designate a parking lot on campus for use by contractors. The designated contractor lot will be the only lot on campus in which contractor parking is allowed. The University, at its discretion, reserves the right to change the designated contractor lot to any other lot on campus during the term of the contract. Parking will only be allowed in the designated contractor lot on campus during the term of the contract. Parking in the designated contractor lot requires the purchase of a vendor/business/contractor permit from the Campus Police Department for both company and privately owned vehicles. These rates may change on an annual basis at the discretion of the Campus Police Department.
 - The hours of use of the designated contractor lot are generally reserved for normal daytime hours of work (7 am to 5 pm, Monday-Friday). The potential need for occasional night work is recognized and accepted, providing the lot is not used for overnight storage of vehicles. At no time will the lot be used to store equipment or industrial vehicles. Also, there will be occasions, typically on weekends, when the lot must be completely vacated for special activities such as graduation. The Campus Police Department will inform the Capital Planning and Construction department in advance of the special events dates and notices will be posted at the entrance to the lot. Vehicles left in the lot on these occasions are subject to being towed at the owners' expense.
 - **Golf cart parking is controlled and restricted. See link to cart rules, enforcement and penalties in Section _____.**
3. Contractors will abide by all traffic regulations at Longwood University. Construction sites must make consideration for the flow of pedestrian traffic around the site. Coordination for vehicle and pedestrian traffic must be made with the Police Department prior to occupation of the site. Large deliveries that cannot be accommodated within the staging area may be briefly off-loaded in the roadway ONLY with prior coordination with the Police Department (434/395-2091) at least five working days in advance. No significant activities should be planned at the construction site during University graduation ceremonies.

Temporary Barriers and Enclosures

Construction Site Fence

1. Prior to initiating any on-site construction activities, the General Contractor shall erect a temporary construction fence as indicated in the contract documents. The Contractor will meet with the University's Project Manager and A/E prior to the start of the installation to discuss timing, work conditions and pedestrian routing.
2. The Contractor shall call Miss Utility before driving any posts for the fencing.
3. Signs shall not be posted on the fence system except as follows: "No Trespassing" signs may be installed at 50' intervals; safety related signs required by OSHA; and visitor site entry rules as required by the Contractor. Advertising signage is strictly prohibited.
4. The Contractor shall keep plant growth from around the base of the fence by either trimming or chemical treatment.
5. The fence shall be maintained for the duration of the project, and shall not be removed without University's Project Manager's permission.

Fence Design and Materials

1. The minimum height for all temporary fencing shall be 6'.
2. The fencing shall be of galvanized 11-1/2 gauge chain-link construction with a minimum of 1-5/8" O.D. tubular steel posts and top rails.
3. Surface mounted fence panels may be used with the approval of University's Project Manager and are to be adequately braced to resist wind and ice loading and shall be continuously connected to prevent access by the public.
4. Privacy netting to screen construction activities shall be used on all projects, or as specified in the contract documents.
5. Privacy screen material shall be green, equal to the weave of US Netting's Windscreen, polyethylene netting.
6. Barbed wire shall not be used.

Gates

1. Limit entrance/exit to no more than two locations, unless otherwise approved by University's Project Manager.
2. Gates shall be a minimum of 12' in width to allow access for emergency vehicles.

3. Where other transportation authorities need to review gate locations and operation, communication with those authorities will be coordinated through the University's Project Manager.
4. Gates shall be closed and locked at all times the site is not occupied, unless otherwise directed by the University where emergency vehicle passage through the site is needed to access existing occupied buildings.

Protecting Installed Construction

1. Roof Protection
 - Before working over or moving equipment, materials, or personnel over a new or existing roof, the General Contractor and any of their agents and/or Subcontractors must thoroughly and completely protect the roof system from damage and excessive wear during and following the roofing work. Construction activities over or the movement of equipment, materials, or personnel over a new or existing roof without approved roof protection shall be cause for the University and/or A/E to stop work until the protection is provided and any damage to the roof system is corrected.

Close Out Submittals

General

1. Close out submittals, including as-built drawings, Operations & Maintenance manuals, and required product manuals must be submitted to and approved by the A/E prior to achieving Substantial Completion.

Operations & Maintenance O&M Manuals:

1. Prior to the demonstration of equipment, the Contractor shall submit operations and maintenance manuals to the A/E for approval.
2. Two complete sets of O&M manuals shall be provided in individually bound volumes as indicated below:

Division 1-13	Architectural
Division 14	Vertical Transportation
Division 15	Heating, Ventilating, Cooling

Division 15	Plumbing
Division 15	Building Automation System
Division 16	Electrical

3. Manual binders shall accommodate 8 ½" x 11" pages, be heavy-duty three-ring type with the project name lettered on the spine.
4. All pages shall be 8 ½" x 11". Larger pages, if used, shall be neatly folded to 8 ½" x 11" and be used as pullouts or foldouts.
5. As appropriate, each manual shall include:
 - Names, addresses and trades of all Subcontractors, manufacturers, and suppliers who participated in the construction or who furnished materials and equipment.
 - Complete maintenance instructions from the manufacturer's local representative for each item of operable equipment as well as the name, address, and telephone number of the installing Subcontractor.
 - Catalog data on all items submitted and other pertinent data such as mortar colors, bricks selected, and color selected for all finished materials and fabrics.
 - Catalog data on all plumbing fixtures, valves, water heaters, heating equipment, temperature controls, fans, electrical panels, service entrance equipment, light fixtures, similar equipment and systems. Manufacturer's advertising or promotional literature will not be acceptable.
 - Manufacturer's name, model number, service manual, spare parts lists, and descriptive literature for all components.
 - Preventive maintenance instructions and schedules for all major equipment.
 - List of most frequently encountered breakdowns and repairs.
 - Instructions for starting and operating the actual system as installed.
 - Detailed one-line, color-coded wiring diagrams.

Warranties & Guarantees

1. Two copies of all warranties and guarantees shall be drawn in the name of The Board of Visitors of Longwood University and be bound into a single, heavy duty, three-ring binder to accommodate 8 ½" x 11" pages. Include a table of contents and separate each warranty section with a marked tab in the order of the specifications.

Spare Parts & Materials

1. Spare parts and maintenance materials, where specified, shall be turned over to the University's Field Engineer prior to Substantial Completion.

General Commissioning Requirements

1. Definition of Commissioning
 - Commissioning as used in these Design Guidelines, is the systematic process of review, documentation, inspection and performance testing implemented starting with design and extending through construction and occupancy of the facility, utilized to assure that the facility and systems meet the University's requirements. The "Commissioning Authority" shall ideally be an independent, third-party consultant hired by the University, responsible for the conduct of the commissioning scope of work. In some cases, the Contractor will be required to hire the Commissioning Authority and conduct the commissioning scope of work.
2. Objectives of Commissioning
 - The objective of commissioning of Longwood University facilities is to ensure proper, reliable and safe operation of HVAC, plumbing, piping, electrical power and communications systems upon occupancy of each facility. Commissioning may also be utilized to assure the proper selection, installation and operation of other building systems, such as architectural systems, at the discretion of the University.
3. General Requirements
 - For most projects, Longwood University will hire an independent, third-party Commissioning Authority to provide the scope of commissioning services defined herein. These sections are intended to illustrate the scope of commissioning for which the Contractor will be responsible to cooperate and facilitate within the Project Documents. On some smaller projects, Longwood University will determine that commissioning services shall be included within the Contractor's scope of work. In these cases, the project specifications shall require the Contractor to appoint or hire the Commissioning Authority and include such in their bid. On all projects, unless otherwise approved, the contract documents shall include specifications which require the Contractor to cooperate; provide labor, assistance, materials, supplies and information; and otherwise facilitate the work of a third-party, independent "Commissioning Authority" (or to provide for and coordinate with the commissioning authority for commissioning services, where "contractor commissioning" is specified.) Where third-party commissioning is used, the independent Commissioning

Authority will normally develop the “Commissioning Specifications” sections for inclusion in the Project Documents by the A/E of record. Where “contractor commissioning” is utilized, the A/E will be responsible for developing the appropriate commissioning specifications sections. The University shall be consulted on each project to determine the applicability and appropriateness of third-party commissioning (vs. contractor commissioning) to the project scope, and to identify the specific systems to be commissioned for the particular project.

4. Systems to be Commissioned – On most typical projects the following systems are to be commissioned, as applicable:

- Air Handling Units
- Terminal Boxes
- Airflow Control Valves
- Exhaust and Supply Fans
- Sound Attenuation and Control Systems
- Fume Exhaust Fans
- Heating Units
- Steam and Hydronic Systems
- Hot Water Heaters and Converters
- Pumps
- Variable Frequency Drives
- Space Airflow and Temperature Control
- Chillers, Cooling Towers and Condenser Water
- Heat Recovery Systems
- Fume Hoods and Controls
- Laboratory Pressurization Controls
- Building Automation and Controls
- Emergency Generators and Transfer Switches
- UPS and Backup Electrical Power Systems
- Other Special Systems, as required

5. Commissioning Team Members

- On most projects the Commissioning Team shall consist of the following members:
 - University’s Representative (Capital Planning and Construction)
 - Third Party Commissioning Authority or Agent
 - Architect and Engineer of Record
 - Mechanical Contractor
 - Electrical Contractor
 - General Contractor
 - Contractor’s Commissioning Authority (where applicable)

- Test and Balance Subcontractor
 - Controls Contractor
 - Other Installers or Suppliers, as needed
6. Responsibilities of Team Members
- Each team member shall have specific responsibilities in support of the commissioning process clearly defined in the project specifications, and made a part of the Contract Documents and Requirements.
7. Commissioning Scope of Work
- Most projects shall include the following minimum scope of commissioning work in the Specifications, which obligates the Contractor and the Contractor's Subcontractors to participate and cooperate with the Commissioning Authority.
 - Provide Submittals and other documents for review
 - Completion of Installation Verification Checklists
 - Cooperate with Pre-Functional Testing of Systems
 - Participate in Scheduled Commissioning Meetings
 - Respond to Commissioning Issues and Field Reports
 - Provide other commissioning-related information, as requested
 - Assist in conduction of Functional Systems Performance Testing
 - Submit O&M Manual Documentation for review
 - Assist in development and conduction of Owner training
 - Provide all other reasonable and requested assistance to the Commissioning Authority
8. Contractor Responsibility
- The Contract Documents shall require the General Contractor and Subcontractors to cooperate, provide labor, materials, supplies and information where required to facilitate (or conduct, in the case of "contractor commissioning") the specified scope of commissioning work. The Contractor shall provide all specified assistance in a timely manner, at no extra cost to the University, and shall incorporate all commissioning activities and milestones into the overall Project Construction Schedule. Satisfactory completion and acceptance of all commissioning tests and reports shall be a condition for granting Final Completion of the project. Ideally, all functional performance testing shall be completed in order to grant Substantial Completion of the project.
9. Project Closeout
- Project closeout requirements shall include the review and recommendation of approval by the Commissioning Authority of O&M Manuals and Warranty Information. Project closeout requirements shall

include the completion of all testing and submission of all commissioning-related reports, certifications and manuals.

10. Owner Training

- Contract documents shall require the Contractor to provide assistance, materials and services required to conduct training of the University's personnel in the operation and maintenance of all major equipment and controls, and to cooperate with the Commissioning Authority in developing the training agenda and methods.

11. Related Commissioning Specifications Sections:

Division 15	Mechanical Systems Commissioning
Division 16	Electrical Equipment/Systems Commissioning
Division 17	Building Automation Systems Commissioning

****END OF DIVISION 1******DIVISION 2 – SITEWORK****Demolition**

1. The Contractor shall be responsible for satisfying any and all erosion control and storm water management requirements for any land disturbing activities, including but not limited to on-site or off-site borrow, on-site or off-site stockpiling or disposal of waste materials.
2. The Contractor shall be responsible for obtaining rights of way to any waste disposal areas for all material not to be salvaged. The Contractor shall be responsible for all tipping fees when materials are disposed of in a location not provided by Longwood University.

Site Preparation

1. Remove all tree stumps, trees, limbs, and rubbish from construction area. Controlled burning shall not be permitted. Stockpile topsoil in an approved area for later use during final grading and restoration.
2. All felled timber from which saw logs, pulpwood, posts, poles, ties, mine props, or cordwood can be produced shall be considered salable timber, and shall be trimmed of limbs and tops, sawed into salable lengths and delivered to the University.
3. The Contractor shall remove topsoil from the existing site prior to construction activities to reduce the potential for soil compaction and contamination. Topsoil shall be stockpiled in areas approved by the University.

Subsoil Preparation

1. Subsoil must be mechanically loosened to a minimum depth of 12" prior to topsoil spreading.
2. Remove all extraneous debris from subsoil prior to topsoil spreading.

Pavement Marking

1. Provide paint specifically formulated for use as pavement marking in automobile traffic areas. Parking spaces shall be painted using Longwood University's standard colors for each parking group. Crosswalks and handicap spaces shall be painted white.
2. Pavement markings in parking areas shall be 4" in width. Pavement markings on streets shall be 6" in width, or as otherwise specified on the plans. Lines shall stop 6" short of curb and sidewalk edge.

Piping and Fittings

1. Upon completion of the work, the Contractor shall provide two sets of record drawings to the University clearly illustrating the as-built elevations of all grades, structures, and pipes installed as part of the construction. The record drawings shall be prepared by and sealed by a land surveyor or professional engineer licensed in the State of Virginia.
2. PVC water mains 4" and larger shall be SDR-18, Class 150.
3. Water laterals 3" or smaller shall be ductile iron.
4. PVC sewer pipe shall be PVC SDR 35 or PVC Schedule 40.
5. Plastic marking tape shall include integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3' deep.
6. Tapping sleeves shall be Mueller Mechanical Joint Tapping Sleeves, catalog number H-615, provided by the University and installed by the Contractor.

Valves and Cocks

1. Shop drawings shall include manufactures' names, class of materials, pressure rating, catalog, and engineering data showing compliance with the specified requirements.
2. Submit Corrective and preventive maintenance instructions, including recommended spare parts.
3. Gate valves shall have right-hand threads.

Water Systems

1. Domestic water shall be metered with valve assembly to bypass to meter. Meter shall be furnished by the University and installed by the Contractor.
2. Backflow Preventers shall be installed at all building service meters and all outside hydrants/sprinkler outlets.
3. Post indicator valve shall be installed on all buildings that are fully sprinkled.

4. #12 Covered Insulated Tracing Wire w/URD, shall be installed/taped to all PVC pipe (domestic and chilled water lines), for the length of the pipe, from top of valve box to the building.
5. Anchorage for water lines shall be protected against joint pulling or thrust damage by suitable mechanical joint restraint devices at all joints, fittings and other critical points.
6. Hose bibs shall be installed on all sides of buildings and located so as to facilitate watering of planting areas and areas requiring routine cleaning such as building entries.

Topsoil Spreading and Seeding

1. Spread topsoil to 6" minimum depth after subsoil preparation.
2. Compact topsoil to 80% Standard Proctor.
3. Contact the Longwood University Landscape Architect for additional topsoil preparation and seeding specifications or to review acceptability of a consultant's topsoil and seeding specifications.

Landscape Design

1. The project architect shall retain a Landscape Architect to provide the University with a complete landscape plan, details, and specifications to be included in the project bid documents, as well as a cost estimate. The Landscape Architect must consult with the Capital Planning & Construction office and the Grounds Department throughout the landscape planning process and as follows:
 - Coordinate plant selection with Longwood University Landscaping & Grounds Management department.
 - Coordinate landscape planning with the Capital Planning & Construction office and the Longwood University Landscaping & Grounds Management if required.
 - Review landscape specifications with the Capital Planning & Construction office and the Longwood University Landscaping & Grounds Management.
 - Trees are to be planted at 50% maturity.
 - New trees are to be planted to cover 50% of the green space available at each building site.
 - Existing trees are to be protected during construction. Longwood University Landscaping & Grounds Management to do necessary remediation to roots and tree structure 12 to 18 months before construction is started.

2. The Landscape Architect should consult the Campus Master Plan 2008 Update Part Two: Design Guidelines, for discussion of Landscape Guidelines prior to meeting with the Campus Landscape Architect.
3. Landscape Architect must conduct a preconstruction meeting with the landscape subcontractor. Also provided, at a minimum, will be one or more inspections during landscape installation and a final landscape installation inspection/ punch list to the contractor and Campus Landscape Architect. Final landscape installation acceptance shall be by the Landscape Architect.
4. The “design to” construction budget will be reduced in accordance with the estimate for landscaping.

Exterior Site Furnishings

1. **Trash receptacles- place one receptacle at all major building entrances. Receptacles shall be equal to model MF 3203 (31 gal) manufactured by Wausau Tile, Wausau, Wisconsin, and placed at each building entrance and at 150' intervals along pedestrian routes. Color will be black.**
2. Ash urns- place one urn at all major building entrances. Urns shall be equal to model S-20 manufactured by Victor Stanley, Inc. of Dunkirk Maryland (800) 368-2583. Color will be dark bronze.
3. **Benches- place one 4' x 8' concrete slab along walks or on plaza areas. Benches at buildings shall be equal to model MF2200 manufactured by Wausau Tile, Wausau, Wisconsin, and be black in color. Benches and table groupings in common areas and gathering areas are to be teak as manufactured by _____.**
4. Bike Loops- place loop groupings in close proximity to off-site bike circulation paths and building entrances. Bike loops shall be equal to model BL-36 Bike Loop manufactured by Wabash Valley Inc. of Silver Lake Indiana. (800) 253-8619. Color will be dark bronze. For slab sizing and installation details, see Site Development Specifications and Details available from Site and Infrastructure Development @ 434/395-_____.

****END OF DIVISION 2******DIVISION 3 – CONCRETE****Concrete (Cast in Place)**

1. Interior and/or exterior structural concrete surfaces should not be scheduled to receive a sandblasted finish unless specifically approved by the University.
2. Building interior structural concrete painted surfaces should not be scheduled to receive a rubbed finish. If a smooth plaster-like finish is desired, specify a thin coat of veneer plaster over the concrete substrate.
3. Building exterior expressed concrete structural frame should be detailed (incorporating insulation and finish systems) to prevent thermal loss or gain.
4. Exposed interior concrete floors should be sealed. A hardener is required where the floor surface is subject to heavy impact and/or rolling loads.
5. A sample panel of exterior exposed “Architectural” concrete should be provided to establish an acceptable standard of workmanship/quality concerning finishing, texture of formed material, etc. The concrete used in the sample panel should be furnished by the project concrete supplier and should represent the approved mix for strength and texture.
6. Exterior concrete flatwork should be 6” nominal thickness, 3000 PSI air-entrained concrete, reinforced with welded wire fabric located two inches below the top surface. The flatwork should be placed over a six inch aggregate stone base, and where intermittent vehicular traffic is anticipated, be a minimum of nine feet wide. The top surface should be broom finished with sawn or tooled joints at a maximum of 6’ on-center.
7. All defects, form irregularities or honeycomb shall be repaired immediately upon form removal.

****END OF DIVISION 3******DIVISION 4 – MASONRY****Brick****Concrete Masonry Units****Delivery****Quality Assurance**

Information on Drawings and in Specifications establishes requirements for both aesthetic effects and performance of the stonework. Aesthetic effects relative to formal characteristics are indicated by dimensions, arrangement, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's written approval and only to the extent exclusively needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
2. Retain mock-up during construction as the standard for judging completed stonework. When directed, demolish mock-up and remove from site.
3. Provide separate specifications for stone and concrete block installations
4. Provide specifications for supplemental testing and inspection of materials and mixed mortars.
5. Provide outline of masonry pre-installation meeting. Obtain from the Project Manager.

Installation

1. No stone shall be less than 5" thick and all beds and builds shall be full to at least 6" from face.
2. No horizontal joint shall be greater than 6'0" and no vertical course greater than three (3) stones.

3. Rectangular stones are to be laid with the long dimension horizontal.
4. Delivered stone will require additional cutting and shaping by the Contractor prior to being suitable for installation.
5. Mortar shall be ASTM C270 type N mixed to the proportion specifications using portland cement and hydrated lime. Masonry cement mortars will not be permitted
6. Mortar shall be mixed to and used in a masonry mortar type consistency. "Dry pack" type mortar will not be permitted.
7. All head and bed joints shall be completely and neatly filled with mortar
8. Brick joint width should be as narrow as possible, $\frac{3}{4}$ " plus $\frac{1}{2}$ " minus $\frac{1}{4}$ ". Joint is to be finished with a $\frac{1}{2}$ " flat struck joint
9. Flashings are to be stainless steel or lead coated copper terminating evenly on shelf angles or precast members day-lighting to at least $\frac{1}{2}$ " drip. Consider using two piece flashings. Install Mortar Net™ or equivalent in two continuous courses directly above flashing.
10. Clean finished brick surface of mortar droppings and projections by bucket and brush method within seven to ten days of completion of the panel. Pre-clean brick of dust and residue prior to setting.
11. Provide silicone sealed joints, prepped, primed for all details between dissimilar materials such as brick to precast, metal to brick or precast, and block to precast. Specify sealant testing to be performed and submitted by the Contractor prior to construction. The submittal should include a list of sealants used, results of adhesion and staining tests, and required primer usage if any.

**** END OF DIVISION 4 ******DIVISION 6 – WOOD AND PLASTIC****Rough Carpentry**

1. This section includes, but is not limited to, dimensional lumber, engineered wood products, plywood, medium density fiberboard, particleboard, and rot and insect resistant wood.
2. Sustainable Considerations: Avoid overharvesting, poor forestry practices, and toxic treatment when specifying products from sustainable sources, such as FSC Certified Wood or regionally manufactured from abundant species. Products shall be free of urea-formaldehyde binders, copper, and arsenic.

Finish Carpentry / Cabinets / Countertops

1. This section includes, but is not limited to, interior millwork, paneling, caseworks, and countertops.
2. Sustainable Considerations: Avoid depletion of natural resources by specifying wood species from sustainable sources, such as FSC Certified Wood or regionally manufactured from abundant species. Avoid use of exported or exotic species such as mahogany that are limited in supply or not sustainably harvested. Products shall be free of urea-formaldehyde binders, copper, and arsenic.
3. Countertops may include non-wood products such as recycled glass cast concrete, recycled content synthetic cast slabs, regionally quarried stone, recycled plastic solid surfacing, or plastic laminates.

****END OF DIVISION 6****

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

Building Insulation

1. Fiberglass batt insulation shall be installed to minimize exposed fiberglass in areas needing to be accessed for inspections, maintenance, etc. Designs should encapsulate fiberglass using foil or pre-applied backing, plastic or gypsum board covering.
2. Roof insulation shall achieve a minimum of an R-30 rating, for both flat and sloped roofs.
3. Sustainable considerations: Maximize insulation value to conserve energy; avoid insulation containing formaldehyde or ammonium sulfate or foams expanded with hydrochlorofluorocarbons (HCFC's); consider insulation with recycled content.

Roofing

1. Flat roofs shall be white in color and have a minimum solar reflectance of 50%.
2. Single-ply roofing systems (60 Mil) should be specified for low slope (less than 4 in 12 pitch) applications. Fully adhered systems are preferred. Ballasted systems must be approved in advance by the University. Mechanically fastened systems are not acceptable.
3. Ballast (if approved) should be clean, river washed gravel meeting ASTM-C-136.
4. Specify service walkways (minimum 2'0" wide) appropriately located to service all roof top equipment from the roof access.
5. Specify thin wall 16 gauge copper flashing between parapet walls and capstone.
6. Gutters and downspouts shall be (minimum) 16 gauge copper.
7. Downspouts shall tie directly to underground storm drainage system.
8. Slate shingles, where appropriate, shall be a minimum of ¼" thick, weighing not less than 900 pounds per square.
9. Provide snow guards over entrances on all roofs with a slope of 6 in 12 or greater.

10. Specify roof hatches that are insulated and lockable.
11. Rating of complete roof assemblies shall be a minimum Class I-60 designed in accordance with FM P7825 (and I-90 rating is preferable). When approved, loose laid ballasted applications shall be designed to withstand wind uplift in accordance with requirements of FM Tech Advisory Bulletin I-29.

**** END OF DIVISION 7 ****

DIVISION 8 - DOORS AND WINDOWS

Exterior Doors

1. Primary entry doors should be power operated. Operators should be Electro-Mechanical equal to Stanley Magic Access with power assist option. Both doors in a vestibule configuration should be power operated. Power operated egress doors shall have electronic strike or latch to allow power operation during times when building is locked.
2. Power operators shall have auxiliary contacts to allow for card reader and proximity reader activation of the openers.

Interior Doors

1. Standard, 3'0" x 7'0" x 1-3/4" birch, stain grade, solid core.
2. All doors in new construction shall have lever handles that comply with ADAAG requirements. When renovation work requires changing door hardware or which hardware change is requested for functional change, all replacement hardware shall include ADAAG compliant lever handles.

Locksets

1. Cylindrical Locksets should be Series 4000, Grade 1 (ANSI A156.2), 93K Lever handle with through bolted trim, Round rose - varying in size between 2-9/16" to 3-3/8" or the largest available size. Lockset should be complete with a combined core and must accept a Best 7-pin interchangeable core. NO SUBSTITUTES.
2. The University Keyshop personnel shall accomplish the final keying and installation of cores. Construction cores may be installed by the Contractor during construction, but must be removed prior to beneficial occupancy.

3. Closers should be equal to Von Duprin EL-RX-LX.
4. Panic Exit Devices should be Equal to Sargent 9800 Rim type or Sargent 9898 Non-handed. Trim pack determines function. For lever handle application, Sargent 8800 series with ET outside trim should be used.

Glazing

1. All exterior glass sheeting (tempered or otherwise) shall be “Low E” or “Comfort E.”

Restrooms

1. Mirror Glass/Standard: 18" x 24", vandal proof, with stainless steel frame.
2. Mirror Glass/Handicapped: 18" x 36", vandal proof, with stainless steel frame.

**** END OF DIVISION 8 ****

DIVISION 9 – FINISHES

General

1. Extravagant, costly and/or high maintenance finishes should be avoided.
2. The University must approve the color selections of all finishes.
3. Finishes that have minimal tolerances and place unrealistic expectations on the installing contractor(s) should be avoided.

Ceramics and Quarry Tile

1. Floor Tile: 2" x 2" porcelain ceramic tile equal to Dal-Keystone Porcelain Ceramic Mosaics by Dal-Tile Corporation. Standard Grade quality conforming to ANSI 137.1-1980.
2. Wall Tile: 4-1/2" x 4-1/2" glazed ceramic tile equal to Dal-Tile Glazed Interior Wall Tile by Dal-Tile Corporation. Standard Grade quality conforming to ANSI 137.1-1980.
3. Ceiling Tile: Ceramic panels, 2' x 2' x 5/8" high density, resistant to moisture, steam and chemicals, equal to Ceramaguard 601A by Armstrong.
4. Quarry Tile Care: in instances where quarry tile is specified as the building floor covering, the Contractor will clean the quarry tile floor with Hillyard Seal - 341 or approved equal. Colors selected shall minimize the showing of dust and/or footprints.

Suspended Acoustical Ceilings

1. Acoustical Tile should be 2' x 2'5/8", non-directional, mineral board lay-in panels, equal to Armstrong #770 or Clotex #157 Safetone, fissure tone. Suspended Grid. Intermediate duty, double web, exposed grid system, equal to DX system by Donn Corporation shall be used, with main tee equal to DX-24, cross tee equal to DX-422.

Resilient Flooring

1. Floor Tile: Vinyl composition, 1/8" x 12" x 12", as manufactured by Kentile, Armstrong or equal, meeting or exceeding Federal Specification #SF-T-321 B, Type 4. Colors selected shall minimize the showing of dust and/or footprints.
2. Base: Rubber cove base, 4" or 6", as manufactured by Roppee Rubber, Johnsonite Rubber Company, Flexco, or equal, meeting or exceeding Federal Specification #SF-W-40A, Type 1.

Carpet

1. Unless otherwise directed by the University, carpet shall be procured and installed by the General Contractor. The A/E shall obtain a guide specification for carpet from the University Project Manager.

**** END OF DIVISION 9 ****

DIVISION 10 – SPECIALTIES

Toilet Compartments

1. Paper Towel Dispenser:
 - Type 300 stainless steel, design for single fold paper towels (quantity 400), key lock, surface mounted, equal to Bobrick #B-263.
2. Soap Dispenser:
 - Stainless steel or chrome, designed for liquid soap dispensing, dispenser valve front mounted with push action for operation, 40 ounce capacity reservoir, no refill container (must hold bulk soap), top fill, lockable door, equal to Continental #V444SS.
3. Toilet Paper Dispenser:
 - Stainless steel or plastic, with viewing slot to determine quantity of paper left. Dispenser must accommodate a 13" x 4" with a 3" core single ply roll of toilet paper. There must be tear strips located on two sides of the dispensing slot for the paper to be easily torn from the roll. The dispenser cover must be lockable and include one key.
4. Sanitary Napkin Disposal:
 - Stainless steel type 304, 22 gauge, satin finish, surface mounted, covers to have full length piano hinge and bottom unlocks with key, equal to Bobrick B-270.
5. Stall Partitions:
 - Stainless steel, type 302, #4 satin finish and vertically grained, 1" thick and formed of sheet steel that is fabricated into a sandwich construction and laminated to a double-faced honeycomb core under pressure. All edges are then interlocked with a roll-formed edge molding. All corners are welded and ground smooth. Corner clips are unacceptable.
6. Stall Pilasters:
 - Stainless steel, type 302, #4 satin finish and vertically grained, 1-1/4" thick and formed of sheet steel that is fabricated into a sandwich construction and laminated to a double-faced honeycomb core under pressure. Face plates are welded together at intervals of 18" on center around the edge perimeter to ensure a rigid one piece unit. All edges are then interlocked with a roll-formed edge molding. All corners are welded and ground smooth. Corner clips are unacceptable.
7. Stall Pilaster Shoes:
 - 3" high polished 2C gauge stainless steel shoe of one piece construction. Tamper-proof shoe assembly with concealed hold down anchor clips. Exposed shoe is unacceptable.

8. Stall Doors:

- Stainless steel, type 302, #4 satin finish and vertically grained, 1" thick and formed of sheet steel that is fabricated into a sandwich construction and laminated to a double-faced honey comb core under pressure. Face plates are welded together at intervals of 18" on center around edge perimeter to insure a rigid one piece unit. All edges are then interlocked with a roll-formed edge molding. All corners are welded and ground smooth. Corner clips are unacceptable.

9. Stall Hardware and Fittings:

- All doors, panels and pilasters are to be prepared with suitable internal reinforcement and pre-drilled to accommodate all hardware and fittings. Each compartment is to be complete with all hardware, door hinges, door latches, stops and keepers, coat hooks, and necessary fittings and fastenings for a complete installation.

10. Stall Pilaster and Wall Fittings:

- Wall and pilaster brackets shall be heavy Zamac #3 chrome plated die casting. The dividing partitions and pilasters shall be attached to the wall with two brackets of double EAR or one EAR type depending on wall conditions. Dividing partitions shall be attached to the pilasters with two "U" brackets. All hinge brackets, strike, and keeper will be through bolted with sex bolts having one-way theft-proof heads. All other hardware and fittings are to have appropriate screws. All fastenings are to have a highly polished chrome finish.

11. Partition Locks:

- Slide bolt latch is to be equal to SURFACO, 3-1/2" Bet screw #9G0136.

12. Handicapped Grab Bars:

- Stainless steel sizes are to fit the layout of room.

13. Feminine Napkin Vendor Machine:

- Stainless steel, type 304, satin finish, welded construction, field replaceable door, 18 gauge minimum, full length piano hinge, coin mechanism set for \$.25 operation, equal to Bobrick #B-352.

Fire Extinguishers and Cabinets

1. Fire extinguisher cabinets shall be incorporated into all projects as required by code and sized for the required extinguisher.
2. Fire extinguisher cabinet doors shall not be equipped with any type of lock that limits public access to emergency use only. Only roller latches, or something providing an equivalent level of function, shall be used. Access without a key is required for extinguisher inspections.

3. Contract specifications shall identify the extinguisher type and size and note that the extinguishers shall be provided and installed by the University.

Classrooms

1. General – Classroom specialties vary significantly depending upon the ultimate use of the space. The A/E should work closely with university personnel to identify the needs of each room.

If Requested

1. Chalkboard
 - Vitrasite, standard black with trim, chalk rails and track for map hooks. Sliding boards to allow for greater flexibility are preferred. Board space to be as large as practical within the space. Dry marker boards should be specified only when specifically requested by the university.
2. Tack Boards
 - Above or adjacent to chalk boards
3. Electronic tension projection screen
4. Seating
 - Fixed seating, if requested, shall be included in the contract documents and be included in the A/E “design to” budget.

**** END OF DIVISION 10 ****

DIVISION 11 – EQUIPMENT

Custodial Closets

1. Key Cabinet: 20 gauge steel minimum, baked enamel finish, grey color, concealed hinge, key type lock, 12" x 12" x 2" minimum size, one per building.

**** END OF DIVISION 11 ****

DIVISION 12 – FURNISHINGS

General

1. Building furnishings including, but not limited to desks, chairs, tables, lockers, window treatments, lecterns, etc. shall be identified by the A/E but not included in the building contract.
2. Where appropriate, furnishings shall be shown on the contract drawings with a note indicating “NIC”.
3. The A/E shall provide to the University minimal specifications and a budget cost estimate for furnishings specified to be owner-furnished.

**** END OF DIVISION 12***

DIVISION 14 - CONVEYING SYSTEMS

Elevators

1. Perform work in accordance with the following:
 - ANSI A117.1 – Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
 - ANSI/ASME A17.1 – Safety code for Elevators and Escalators.
 - ANSI/UL 108 – Fire Tests of Door Assemblies
2. Submittals shall include shop drawings, schematic wiring diagram, product data and maintenance manuals. Maintenance manuals are required and shall minimally include operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, and emergency instructions. Provide three sets of maintenance manuals for the University's use after approval of all shop drawings.
3. Hydraulic Elevators' jack cylinders shall be installed inside a PVC pipe. (The PVC jacket is helpful in preventing corrosion to the jack cylinder which shall be provided with dielectric protection. If the jack leaks underground, the PVC jacket helps to contain the hydraulic oil).
4. Prior to the University's acceptance of the installation, an inspection must be performed and acceptance tests must be witnessed by an independent elevator inspector to verify conformance of elevators and chair lifts with code requirements. The University shall employ the services of an independent elevator inspector. Any deficiencies shall be corrected by the Contractor at no cost to the University. The University requires three weeks notification prior to testing to schedule inspector.
5. Elevators shall be provided with a 12 month warranty which begins on the date of Substantial Completion.
6. For Hydraulic Elevators install piping above ground where possible. If necessary to route underground, cover piping with permanent protective wrapping before backfilling. Provide shut-off valve in machine room for maintenance purposes. Underground hydraulic piping for elevators shall be schedule 80.
7. Full maintenance shall be provided by skilled, competent employees of the elevator installer for a period of 12 months following Date of Substantial Completion at no additional cost to the University. Full maintenance services to be included under this contract and at no additional cost to the University shall minimally include (1) monthly preventive maintenance performed during normal working hours, (2) repair or replacement of worn or defective parts or components, (3) lubricating, cleaning, and adjusting as required for proper elevator operation in conformance with specified requirements and (4) 24-hours-per-day, 7-days-per-week emergency callback service. Exclude only repair or

replacement due to misuse, abuse, accidents, or neglect caused by persons other than the installer's personnel.

8. Submittals: Contract documents shall require a letter from the elevator manufacturer (on manufacturer's letterhead) verifying that the manufacturer acknowledges and will comply with all requirements of the specifications relative to repair and maintenance tools. Specifically, the letter shall include language that acknowledges the acceptance of the following:
 - Any and all maintenance diagnostic tools, electrical schematic wiring diagrams and any access codes and passwords required to perform any maintenance function over the life of the equipment such as diagnostics, adjustments or parameter reprogramming shall be provided to the University on the Date of Substantial Completion. Tools may be handheld or built into the control system and shall function for the life of the equipment without the requirement to return them to the Manufacturer. Provide complete operations and maintenance manuals and maintenance training manuals including diagnostics instructions for troubleshooting the microprocessor system. The University shall not be required to sign licensing agreements related to the use of maintenance or repair tools.
 - It is the intention of the University to obtain competitive bids for all maintenance and repair services and material for the elevator provided. Accordingly, the use of proprietary equipment or equipment requiring the use of any proprietary items throughout the life of the equipment is unacceptable. In addition, any special tools, prints, technical data, layouts, hardware, software, etc. required throughout the life of the equipment and which cannot be obtained from multiple suppliers, must be provided by the manufacturer to the University at Date of Substantial Completion of the project.
9. Chair lifts shall not require keys for operation.
10. Elevator equipment rooms shall not be used for access to roofs or other parts of the building unless elevator equipment is fenced or walled in.
11. Traction-type elevators shall have machinery located overhead.
12. Elevator pits shall have sump pumps and adequate drains to prevent the accumulation of water. Drains shall not be connected to building sewers.
13. An emergency telephone will be furnished by the University for field installation by the Contractor. A 6" x 8" recessed cabinet with door, between 19" and 48" above the cab floor, shall be indicated on the shop drawings.
14. Elevator cab floors shall be rubber floor tile with "lo-disc" raised circular design for a non-slip surface. Acceptable manufacturers include Roppe Rubber Co., Johnsonite and Musson Rubber Co.
15. Provide a sweep on the machine room door to provide for dust protection.

16. Provide all signage as required by applicable codes.
17. Elevators shall be provided with a full ray electronic door detection device.
Device shall project detection beams across the full car entrance from the floor to a 72" minimum height. When interrupted at any point, the device shall cause closing doors to stop and reopen and enact an alarm buzzer. The doors shall again attempt to close unless the detection beam is activated, in which case the doors will reopen. The process shall repeat continuously until the obstruction is removed from the entrance. Provide a keyed switch in the car operating panel or a toggle switch in the service cabinet that will disconnect the electronic detection device.
18. Residence Hall elevators shall have stainless steel cab interiors and vandal resistant hall call stations, light fixtures, car stations, position indicators, etc.
19. Provide conduit for analog telephone wiring from the telephone backboard to the elevator controller. Power for the elevator telephone must be on an emergency circuit.
20. All electric motors on elevator or conveying equipment shall be "Premium Efficiency" installed.
21. Hydraulic elevators shall be provided with emergency battery back-up elevator lowering devices such that, in a power outage, the elevator will lower to the main landing and doors will open so that entrapped passengers can safely exit.
22. All elevators shall be provided with emergency lighting.

**** END OF DIVISION 14 ****

DIVISION 15 – MECHANICAL

General Provisions

1. Provide access doors for all maintenance items above inaccessible ceilings and into inaccessible walls. If necessary, fire rated access doors shall be used to preserve wall fire rating.
2. All buildings shall contain storage space for a minimum of one complete change of air filters for all HVAC equipment. The storage space shall be dry and (preferably) accessible from the loading dock or service entrance.
3. Accessible doors to crawl spaces shall be located as close as possible to mechanical equipment under floor.
4. Locate filter boxes and other maintainable equipment outside of critical areas served, such as operating rooms, so that items can be serviced without disrupting operations in the room or releasing contaminants into space.
5. Locate humidifiers, fan coil units, terminal boxes, and other equipment containing water over hallways rather than occupied or critical spaces wherever possible. Where it is necessary to locate such equipment over such spaces, provide secondary drain pans.
6. Provide adequate roof access (stairs or elevator) wherever serviceable equipment is roof mounted. Ladders to roof hatches are not acceptable.
7. **Provide control air compressor/filter-dryer and after cooler for each building. Utilize plant control air where available as a redundant backup.**
8. In atriums or other multi-story open to roof areas, maintenance and accessibility should be a consideration when mounting fans, lights and other equipment above the floor.
9. Condensate receiver and pumps and backflow preventers shall be furnished by the University and installed by the Contractor.
10. Primary manufacturer/model number is to be specified for various types of mechanical equipment is specified herein. Provide a minimum of two additional and equivalent valve manufacturers and model numbers for each primary manufacturer and model number listed.
11. Provide bound, indexed operation and maintenance (O&M) manuals. Manuals shall be organized by systems and fully indexed by equipment type. Must contain original manufacture's bulletins and manuals, copies are not acceptable.
12. Mechanical System Designer shall list building design loads and the installed equipment capacities for heating, ventilation, cooling and domestic hot water on the first mechanical drawing.
13. Process cooling requirements shall be addressed by a dedicated process cooling system. Process cooling shall not be achieved using the building chilled water system, the campus chilled water system or the building domestic water system.

14. Any new HVAC systems (especially involving 100% outside makeup air) shall include a heat pipe or heat wheel for heat recovery.
15. All HVAC systems installed in excess of 1HP shall have a variable speed drive on the fan motor.

Pipes and Pipe Fittings

1. ABS piping is unacceptable.
2. Do not install heating, hot water, or other similar service piping susceptible to freezing in overhanging soffit areas.
3. No sweat connection valves shall be used on both domestic water and mechanical systems. Use only flanged or threaded valves.
4. Extra heavy cast iron hub piping shall be used on all sanitary and storm sewer drains that are located under concrete floor slabs or under other inaccessible floor construction. No PVC piping shall be used under floor slabs.
5. All piping on high pressure steam systems (above 15 psi) shall be at a minimum Schedule 80.
6. All joints on copper pipe 2-½" diameter and larger shall be brazed instead of soldered.
7. Steam, chilled water, and hot water piping shall be insulated to minimum standards.
8. No mechanically formed tee connections or couplings shall be used on domestic water piping systems.

Valves

1. Include sufficient zone isolation/shut-off valves in cold/hot water, heating hot water, chilled water, steam, and other service piping to allow maintenance and replacement of terminal equipment without shutting down entire building.
2. Install valves on all lines that penetrate the floor from below.
3. Install valves on all branch lines off of main lines.
4. Install valves on all lines at locations such that each floor can be isolated independent of main building.
5. Any equipment such as showers, darkrooms, etc., requiring mixing of hot and cold water shall utilize a pressure compensated mixing valve rather than a temperature compensated mixing valve.
6. Install control valves where they can be reached from the floor where possible.
7. All valves and steam devices used on steam lines shall be rated for minimum 500° F and 1 ½ times the working pressure.
8. Butterfly Valves:

- Only high performance type shall be used. Acceptable manufacturers are Bray Series 41, and Xomox. Others only on approval of the University.
 - High Performance Butterfly Valves shall be double offset design in accordance with ANSI Class 150, 300 or 600, as required and MSS-SP68 "face to face".
 - Blow-out proof stem and in accordance with API 609.
 - Full lug end pattern.
 - Double Dead-End bi-directional zero leakage must exceed ANSI Class IV leakage standard.
 - Valves 2 ½" and smaller provided with lock handles
 - Valves 3" and larger with manual hand wheel worm gear.
9. **Ball valves shall be Xomox Class 150 full port threaded or flanged. No sweat valves are to be used. All ball valves to be brass.**
10. Any point that the piping of supply and return water is connected on chilled water or heating water there shall be hand valves to isolate each. Control valves shall not be used for isolation.

Piping Specialties

1. Provide sufficient air vents in chilled and hot water piping systems to easily bleed entrapped air.
2. Pipe chases should be provided in sufficient size to accommodate maintenance personnel (at least three feet wide). Do not locate pipe chases in custodial closets.

Meters

1. Provide differential pressure indicators (manometers) for all serviceable filters and locate the indicator where it can be readily observed. Mark on the indicator the "clean" and "replace filter" points.

Pumps

1. Provide parallel stand-by pumps for all primary pumped building systems, such as chilled water, heating, domestic hot water, etc.
2. Pumps shall be Bell & Gossett or equal.
3. Any pump motor installed over 1HP shall have a variable speed drive.

Mechanical Identification

1. Mark the location of air handlers, fan coil units, mixing boxes, etc., above ceilings with identifying "buttons" to facilitate maintenance through ceiling.
2. Tag roof top exhaust fans and associated fume hoods in order to facilitate maintenance and identification.
3. Utilize standard tags or placards to mark all major equipment. Tag all valves and provide valve charts for each floor.
4. Utilize standard Commonwealth of Virginia color coding for various building service piping and ductwork. Mark each with the name of the service, direction of flow, and associated units served where appropriate.
5. All systems handling hazardous materials must have appropriate marking and visual or audible alarms to protect building occupants and maintenance personnel. Mark exhaust fans on roofs that handle hazardous fumes with the appropriate color code.
6. Mark air handling units with large letters and numbers.
7. All fire dampers shall be numbered and identified on s chart in mechanical room.

Mechanical Rooms and Equipment Locations

1. The Architect/Engineer shall, in the earliest stages of design development, be responsible for establishing and/or verifying programmatic requirements for mechanical rooms in order to:
 - Provide adequate safe access and manufacturer's recommended working clearances for all equipment.
 - Provide for replacement of the largest piece of equipment without removing permanent walls, large items of equipment, or equipment essential to the principal ongoing day to day building use.
 - Provide direct access from the exterior for major mechanical rooms exceeding 100 net square feet.
2. In phased projects mechanical rooms shall be sized to include equipment for all the phases.
3. Air handling units, zone control devices such as VAV boxes, mixing boxes, reheat coils, etc., shall also be located to provide unobstructed access to filters, manual valves, zone control devices and automatic control equipment.
4. Mechanical rooms shall be ventilated by a thermostatically controlled fan.
5. Mechanical rooms shall have a floor drain.
6. Access to ducted fan coil units on occupied floors shall be from corridors rather than through offices, classrooms, laboratory ceilings, or other occupied spaces.

7. The installation of any air handling units with cooling coils above the ceiling level shall include an emergency drain pan installed beneath the unit. This emergency drain pan shall be piped so the occupant can detect any condensate that collects in the emergency drain pan. Such a flow tube should terminate ½” below finish ceiling and match the finish of the ceiling.
8. Equipment mounting stands shall be constructed of steel. Wood stands are not acceptable.

Ventilation

1. Outside air intakes shall not draw in exhaust air from adjacent systems, loading docks, parking lots, emergency generators, chemical storage, sewer manholes, etc.

Air Conditioning

1. Chilled water shall be used as the cooling medium for all new buildings unless specific approval is obtained from the University for an alternate method.
2. For projects in an existing building, chilled water shall be used as the cooling medium for any new or renovated spaces as long as sufficient capacity is available in an existing chilled water system.
3. Direct Exchange (DX) systems shall not be used except after specific approval by the University. On DX systems, total refrigerant charge shall be listed on the unit.
4. Glycols and other heat transfer fluids shall only be used in limited systems such as heat recovery loops or thermal storage systems that serve only a single central station AHU. Use only after specific approval by the University.
5. Water-cooled condensing units using domestic, potable water on a single-pass cycle are prohibited.

Refrigeration Systems

1. Installations shall be complete with dryers, sight glasses, thermostatic expansion valves and thermostatically controlled solenoid valves for pump-down operation (except for capillary tube units). Refrigerant liquid and suction piping shall be type “K” hard-drawn copper. Suction lines shall be insulated. The need for defrosting is not limited to electrical units. In larger installations, hot gas defrost is required. Installation shall be provided with necessary protective devices, including, but not limited to, electrical overload devices, low suction-pressure

cutouts, oil traps, crankcase heaters, anti-cycling timers and head pressure control.

2. Main piping fittings for dryers, sight glasses, expansion valves and controls shall be flared. A nitrogen purge shall be maintained while soldering all joints. Copper-to-copper joints shall be evacuated to 29.5" (water) gauge vacuum and held for at least 24 hours under this vacuum prior to charging the system with refrigerant. Refrigerant shall be approved by Physical Plant.

Cooling Coil Condensate

1. Cooling coil condensate shall be piped to sanitary drains.
2. Pumped condensate systems shall not be used.
3. Cooling coil condensate lines shall have cleanouts which allow access of all branches of the condensate drain system.
4. Cooling coil condensate lines shall be minimum 1 ¼" ID.
5. Lines less than 1 ½" shall be copper instead of PVC.

Chemical Treatment

1. The Architect/Engineer shall coordinate with the Project Manager and the University's Chemical Treatment Consultant as to the required specifications for chemical cleaning and equipment to be furnished by the Contractor. The chemicals to be used by the Contractor for the specified initial treatment shall be furnished by the University. All chemical treatments shall be performed by the University after systems have been cleaned, flushed, and filled.
2. After cleaning and chemically treating the HVAC system, the Contractor shall furnish the University in writing, the following information:
 - Date of initial treatment
 - Type of chemical(s) used for treatment
 - Estimated date that further treatment or testing will be required.

Fire Protection Systems

1. In buildings with sprinklers, fire pumps and/or standpipes, separate water service for fire protection shall be provided, and shall not be through the domestic metered water service.
2. Specifications shall indicate that, following the completed installation, the University's independent consultant will inspect the installation prior to final inspection and acceptance by the State Fire Marshal and report any deficiencies.

3. In all buildings with fire alarm systems, all control valves, including post indicator and wall indicator valves, shall be electronically supervised by the fire alarm panel. At all locations that control valves are concealed above ceilings or behind access doors, a sign shall be provided on the ceiling below the valve or the access door indicating the location of the control valve.
4. In residential buildings, all control valves located in spaces accessible by the occupants of the building shall be provided with lockable tamper prevention devices and locks that shall be specified by the University.
5. Control valves shall only be installed in corridors, stairwells, mechanical rooms, fire pump rooms and sprinkler valve rooms and shall be easily accessible. The control valves shall be accessible with the use of no more than a 6' stepladder. Provide 24" x 24" access doors for valves located above inaccessible ceiling types.
6. Control valves shall not be installed above or below ceilings in classrooms, offices, conference rooms, or any dormitory living quarters.
7. Each control valve shall be supplied with a sign indicating the area of the building that is served by the valve.
8. At all locations that inspector test valves (ITV) are concealed above ceilings or behind access doors, a sign shall be provided on the ceiling below the valve or on the access door indicating the location of the ITV.
9. Inspector test valves shall only be installed in mechanical rooms, corridors, stairwells, fire pump rooms, sprinkler valve rooms, and custodial closets and shall be easily accessible. The ITVs shall be accessible with the use of no more than a 6' stepladder.
10. Inspector test valves shall not be installed above or below ceilings, in classrooms, offices, conference rooms, dormitory living quarters, or in any area requiring entry through a classroom, office, conference room, or any dormitory living quarters.
11. Inspector test valve discharge shall be piped to a drain capable of handling the discharge at full flow or to the exterior of the building.
12. Drain valves shall only be installed in corridors, stairwells, mechanical rooms, fire pump rooms and sprinkler valve rooms and shall be easily accessible. The drain valves shall be accessible with the use of no more than a 6' stepladder.
13. Drain valves shall not be installed above or below ceilings, in classrooms, offices, conference rooms, dormitory living quarters, or in any area requiring entry through a classroom, office, conference room, or any dormitory living area.
14. Main drains discharge shall be piped to the exterior of the building
15. Auxiliary drain valve discharge shall be piped to a drain capable of handling the discharge at full flow or to the exterior of the building.

16. In addition to building code requirements, in buildings more than two stories tall all stairways that have an exterior exit shall be provided with standpipes and fire department hose valves on each level.
17. In residential buildings, each fire department hose valve shall be provided with a lockable tamper prevention device and a lock that shall be specified by the University.
18. No sprinkler heads from any manufacturer which incorporate a rubber O-ring shall be permitted to be installed in University buildings. If a unique situation exists where a head with a rubber O-ring is the only type that will work, specific permission to use the head must be obtained from the University on a case-by-case basis.
19. A digital set of as-built sprinkler system plans shall be provided and for every individual sprinkler head location shall include information that identifies the manufacturer, model, temperature rating, and date of manufacture for the head that was actually installed. In addition, a digital summary shall also be provided which lists all the individual types of heads installed for the whole building, and the total number installed of each type. It is the responsibility of the sprinkler contractor to verify in the field that the inventory accurately represents the heads that were actually installed. Reliance solely on the approved shop drawings is not acceptable.

Plumbing

Restrooms

1. Floor Drains
 - To be installed in all restrooms, centrally located with floor slightly sloped toward drain, 6" inlet with 2" outlet, chrome plated brass or nickel bronze.
2. Water Closet
 - Shall be Watersaver vitreous china, wall hung, siphon jet, elongated closet bowl with 1-1/2" top spud with 5-1/4" floor to center outlet equal to Kohler_____.
3. In all restrooms in new construction and major renovation projects, touchless faucets on lavatories and touchless flush valves on commodes and urinals shall be used. Hard-wired type shall be installed where practical. Battery pack type shall be used in areas where hard-wired is not feasible.
4. Touchless devices should be as manufactured by Zurn or an approved equal.

Hallways

1. Drinking Fountains shall be recessed, wall mounted, and surface mounted.

Housekeeping Closets

1. Service Sink shall be floor mounted, of concrete or stone construction, 8" maximum height from floor to rim, and 24" x 24" at a minimum. Faucet-vacuum breaker, integral stops, spout with pail hook and nose end, top single brace, renewable units and valve seats equal to Eljer 749-1200 or 749-1400 shall also be included.

Laboratories

1. Drain and waste lines shall be selected for chemical resistance and heat resistance where steam is used as a laboratory medium.

Domestic Water

1. Shut off valves are required on each floor, on take-offs from all vertical risers, and at the connection to each piece of equipment.
2. Dielectric fittings shall be used with connecting piping of dissimilar metals.
3. Drain valves shall be installed in accessible locations at all low points in the piping system to permit drainage and servicing.
4. No iron pipe or fittings (including galvanized) shall be used in any potable water system.

Heating, Ventilation, and Air Conditioning

1. Indoor design conditions for cooled and heated spaces shall be 74°F dry bulb with 50% relative humidity for summer and 68°F dry bulb for winter. Summer outdoor design temperature shall be 91°F dry bulb and 74°F wet bulb. Winter outdoor design temperature shall be -10°F. Design altitude shall be 2150' for all design calculations.
2. Design quantities of outside air for ventilation of occupied spaces shall be as per current ASHRAE requirements.
3. Ventilation rates (number of air changes) for spaces such as restrooms, mechanical rooms, etc. shall be as per current ASHRAE requirements.
4. Use only steam (not hot water) pre-heat coils on air handlers with high outside air percentage.

5. Provide adequate freeze proofing for all air handling equipment using a high percentage of outside air. Provide coils that can be drained.
6. Provide stand-by or redundant equipment, cycled or alternating lead-lag sequence for critical needs (e.g. standby compressors on refrigeration for food storage).
7. Use dual independent refrigeration circuits on HVAC equipment where available, particularly when serving critical areas.
8. Utilize semi-hermetic compressors rather than hermetic compressors for all HVAC/refrigerant equipment larger than 10 nominal tons where available.
9. Provide minimum 5 year parts and labor warranty on HVAC compressors.
10. Any new or renovated building containing more than one chiller shall have a primary/secondary chilled water pumping system.
11. Aluminum tubing in HVAC coils is unacceptable.
12. All air handlers and fan coil units shall be located with provisions for sufficient space to service units, (e.g.: change filters, sheaves, bearings, motors and coils; lubricate components; and replace belts).
13. Provide high-limit on steam humidifiers to prevent spraying liquid condensate into duct system.
14. Avoid water coils and piping in rooftop air handling units.
15. Steam traps shall be Illinois or equal.
16. All cooling towers shall be of the induced draft (draw-through) type.
17. Air handling unit fans should be specified to mid-range speed instead of near maximum. (Units are coming apart at high speed). Units should be sized so the motor will have less horsepower than the maximum allowed for fan size.
18. Specify variable frequency drives instead of vortex dampers for air flow volume control.
19. Piping and conduit shall be run parallel and perpendicular to building structure (walls, ceilings, floors).
20. **Drain pans in air handling units and fan coil units shall be double layer insulated, tilted in two directions so it will drain no matter how the unit is set. Pan is to have alarm or cut-off.**
21. All Hydronic Control Valves shall be selected with a minimum close-off pressure capacity of 45 - 50 psig.
22. Direct steam heating systems shall be designed for low pressure operation. Typically, coils and heating equipment shall be selected at 5 psi steam pressure to meet required heating capacity. The system shall be designed for operation at 10 psi with relief set at 15 psi. These design conditions apply whether the steam source is the campus low pressure (nominal 15 psi) or the high pressure (nominal 90 psi) distribution system.

23. Drain lines that carry condensate from two or more units shall be minimum 1-¼" diameter. Copper pipe shall be used on lines smaller than 1 ½".
24. No unpumped condensate return lines shall run on an upgrade for either steam or air conditioning condensate.
25. Cooling coils shall be selected at a face velocity that will permit all condensate to drain into the drain pan and will not allow blow over.
26. On air handling units, heating and cooling coils shall be adequately separated (minimum 15") to properly install the freeze-stat. When possible, factory-install the freeze-stat across the coil and route to a connection outside of the unit housing.
27. For steam humidifiers located in air handling units or in supply air ducts, the source of steam shall be the Longwood University Steam Plant high pressure line where practical. Factors including the humidifier location relative to the steam lines, first cost operation, and maintenance costs shall be considered in the selection of the humidifier.
28. Except in extraordinary circumstances as determined by the design engineer, air handling units which provide internal isolation for components (fans, etc.) shall not require external isolation.
29. Temperature sensors shall be installed on the discharge side of all coils.
30. Steam condensate return lines that have more than one steam trap connected to them shall be 1-1/2" or larger.
31. All equipment used on hydronic systems shall be capable of operating correctly with pressures and flows that the system develops. Valves shall open and close fully and not make noise.
32. Face and Bypass Dampers are required in air handling units that supply 100% outside air and have a steam pre-heat coil.

Variable Frequency Drives

1. Variable Frequency Drives: Three manufacturers to specify – ABB, Allen Bradley, and Square D.
2. All VFDs shall be provided with a manual or automatic type constant speed bypass circuit. The bypass circuit shall be provided in the drive enclosure. A harmonic analysis shall be performed by the drive manufacturer based on the system documentation. Provide this information as a part of the submittal. Provide isolation transformers in a separate enclosure. VFDs shall include input line reactor.
3. Electrical output for variable speed drives shall not exceed 10% THD.

Air Distribution

1. Size restroom grilles and diffusers according to State, Federal, and local codes for room size, air quality, etc. They shall be stainless steel type 304, or aluminum, satin or brushed finish shall be used.
2. Use care in locating outside air intake relative to exhausts, vents, or other discharges. Do not locate near loading docks, parking areas, or other vehicular traffic areas.
3. Transferred return air for ventilation (second hand ventilation air) is unacceptable.
4. Where fume hoods are present, provision must be made for makeup air, such as hoods being of the "add-air" or "auxiliary-air" design and including a motor operated shut off valve in the exhaust stack.
5. All fire dampers shall have access doors.
6. Ceiling return plenums shall not be used. All return air shall be ducted from conditioned building spaces back to air handling units.

7. No interior duct insulation (liner) shall be used.
 - Duct insulation shall be by use of any of the following:
 - Exterior duct wrap
 - Factory fabricated double wall metal duct with solid metal inner wall with insulation between walls
 - Factory fabricated double wall metal duct with perforated metal inner wall with insulation between walls and 2 mil thick Mylar between inner liner and insulation. (Use this method only where noise is of particular concern)
 - All interior air contact surfaces of ducts shall be coated with PorterSept anti-microbial paint, Avron 46 or be constructed with metal treated with AgION anti-microbial compound. (see #14 below)
 - Where perforated inner walls are used on double wall duct, the metal perforations are not to be bridged with paint prior to assembly of double wall ducts. Painting shall not be done after assembly to prevent bridging sheet metal perforations.
8. Double wall construction shall be specified for Air Handling Units, Fan Coil Units, Variable Air Volume Boxes or other Terminal Boxes. Insulation shall be between the inner and outer walls. The inner wall shall be solid metal (not perforated) so that no insulation is exposed to the air stream.

9. All interior surfaces of air handling units (excluding coils, fins, and fan wheels) shall be coated with anti-microbial paint or be constructed with metal treated with AgION anti-microbial compound.
10. Air filtration shall be minimum 80% efficiency for air handling systems serving general classroom and office spaces. This is typically achieved by using a 30% to 40% efficient 2" pleat or panel pre-filter and an 80% efficient final bag or rigid box (cartridge) filter.
11. Keep air handling equipment clean during construction:
 - If equipment is going to be operated during construction, change filters once per month or more often if needed, and install filter media over return grilles
 - Keep fan coil units clean by covering inlet and outlet during construction when not in use.
 - Building must be turned over to the University upon project completion with clean air handling equipment and duct systems, including a clean set of air filters installed in the air handling equipment and with a quantity of filters for one additional change left in the building.
12. All interior surfaces of outside air, supply and return air ducts including dampers, turning vanes and extractors shall be treated with an anti-microbial substance (See #14 below).
13. All interior surfaces of fan coil units, VAV boxes and other terminal boxes, excluding coils and fan wheels, shall be coated with an anti-microbial substance (See #14 below).
14. Acceptable anti-microbial treatments for interior surfaces of ductwork and equipment shall be as indicated below (proposed equals will be considered but must be specifically approved by the University):
 - Anti-Microbial Paint – PorterSept Product #3830 by Porter Paint Co.
 - AgION anti-microbial compound treatment for metal duct and equipment, blue coating. Process as provided by Lindab, Inc.
 - Avron 46 anti-microbial coating by Semco, Inc.
15. The application of anti-microbial paint to the interior surfaces of air handling units, fan coil units, VAV boxes, and other terminal boxes shall be done at the factory. Field coating of these surfaces is not acceptable. Interior coating of ductwork can either be field or factory applied.
16. Ductwork that is exposed to the weather shall be double wall, smooth inside and out, insulated, with flanged connections. Joints shall be insulated and the outside panel either painted with weather resistant paint or having a stainless steel exterior.

Laboratory Buildings

1. Commingling, or mixing of general laboratory exhaust and exhaust directly from fume hoods, is allowable as long as it is accomplished in compliance with any applicable building and life safety codes.
2. Where fume hoods and general room exhaust streams are combined, the duct shall be round stainless steel (Type 316) ductwork with welded seams and flanged or welded connections. The stainless steel ductwork shall be run from the point of collection (hood connection or room exhaust grille/inlet) to the main riser for that portion of the building. The main duct riser may be constructed of stainless steel or anti corrosion coated galvanized or other suitable materials. Where exhaust streams are NOT combined, only fume hood exhaust ductwork need be run in stainless steel, coated, or constructed with or of other suitable anti-corrosion materials.
3. No heat recovery wheels (or any technology that does not completely separate the exhaust and intake airstreams) will be considered for energy recovery building exhausts that handle fume hood exhaust, whether combined or not.
4. Variable air volume control dampers controlling the exhaust flow from fume hoods and general room exhaust shall “fail-open” or “power-open” upon loss of control power or control air.
5. Emergency generators shall be sized to provide adequate power for all exhaust fans serving combined fume hood and general room exhaust systems. Supply air handler outside air intake louvers shall “fail-open” or “power-open” to prevent excessive negative building pressurization upon loss of primary power. Supply air handlers need not be included in emergency generator capacity. Where fume hood exhaust is separate from general room exhaust, only fume hood exhaust fans need be included in calculating emergency generator capacity.
6. Commingled or combined fume hood and general room exhaust systems must be considered and designed as “hazardous exhaust systems” in accordance with the International Mechanical Code, and other applicable building and life safety codes.

Cooling Towers

1. Provide packaged induced draft cooling tower(s) for installation on steel structural support in accordance with manufacturer’s installation recommendations.

Design Criteria

1. The cooling tower(s) shall have the following design criteria:

Location	
No. Cells	x
Cooling Water Flow	XXXXGPM
Entering Water Temp	950 F
Leaving Water Temp	850 F
Ambient Wet Bulb	Summer design wet bulb plus 20 F.
Motor HP	xxxHP
Motor Voltage/Ph	xxx/3
Motor Speed RPM	xxxx/xxx

2. Guarding: Provide appropriate guards meeting all OSHA recommendations for all rotating and/or nip points.
3. Manufacturers: Acceptable manufacturers shall be Marley, Baltimore Air Coil, and Tower Tech, or engineer approved equal.

Submittal Information

1. Provide the following submittal data as part of the bid response:
 - Dimension drawings and installation information,
 - Structural requirements
 - Electrical service requirements
 - Performance data
 - A complete description of corrosion protection for steel components
 - The cooling tower(s) shall be induced draft, cross flow, vertical discharge, draw through type, factory assembled.
2. General
 - Structural components of the tower, including the cold water basin, framework, mechanical equipment supports, casing, hot water basins, fan deck, and fan cylinder shall be fabricated of heavy gauge steel (basin and floor shall be a minimum of 16 gauge and sides shall be a minimum of 11 gauge), and be protected against corrosion by G-210 galvanizing, or equivalent, that meets the requirements of salt fog testing in accordance with ASTM B 117. Factory welded components shall be hot-dip galvanized after completion of fabrication to a zinc thickness equivalent of G-210. Cold galvanizing will not be acceptable.
3. Basin Sections

- Minimum 16 USSG galvanized steel
 - Cold water basin with side outlet connections consisting of suction, overflow and drain piping. Heat tape shall be installed on manual sump drain piping.
 - Condenser water outlet connections with a clog resistant, lift out strainer with perforated openings sized smaller than spray nozzle orifices, mounted in assemble with an anti-cavitation device.
4. Fan Sections
- Provide single fan propeller type with corrosion resistant cast aluminum blades, adjustable pitch, individually attached to a cast aluminum or cast iron hub.
 - Provide hot dipped galvanized steel fan cylinder with close, but adequate tolerance for fan blade tips.
 - Provide heavy gauge hot dipped galvanized wire grill type fan guard over fan cylinder.
 - Provide fan with vibration switch to de-energize fan in the event of excessive vibration.
4. Fan Bearings
- Heavy duty roller type bearings integral with gear reducer.
5. Fan Drives
- Fan shall be driven through helical gear reducer. Gear reducer shall have synthetic rubber oil seals and shall be designed to require oil changes on five year intervals. Speed reducers employing pulleys and belts shall not be acceptable unless manufacturer warrants such speed reducing equipment to be maintenance free for a five (5) year period.
 - All cooling towers shall have variable speed driven fans.
6. Fan Motor
- Motor(s) shall be TEFC, 1.15 service factor, variable torque, and specially insulated for cooling tower duty. Motor shall operate in the shaft-horizontal position and nameplate horsepower shall not be exceeded at design operation
7. Casings
- Casings shall be heavy gauge steel protected against corrosion by G-210 galvanizing, or equivalent, with lapped joints sealed watertight.
 - Provide large galvanized steel access doors located in each end wall casing for entry into the cold water basin and fan plenum area. Access doors shall be operable form inside as well as outside the tower

- The tower and all its components shall be designed to withstand a wind load of 30 psf, as well as a Zone 4 seismic load, per UBC. Fan deck and hot water basin covers shall be designed for 50 psf live load or a 200 lb. concentrated load. Fork lift slots shall be provided to facilitate movement at grade level.
 - Provide galvanized steel guardrails, handrails and ladder. Guardrails shall be capable of withstanding a 200 pound concentrated load in any direction.
8. Tower fill and drift eliminators
- Fill shall be lightweight and manufactured of non-corrosive material.
 - Drift eliminators shall be two-pass manufactured of non-corrosive honeycomb type material supported in galvanized steel framing. Maximum allowable drift loss shall be less than 0.2% of the water circulated.
9. Water Distribution
- Open gravity type hot water distribution basin using replaceable polypropylene or PVC diffusing type metering orifices. Heavy duty flow regulator valves shall be provided at the discharge into each hot water distribution basin to equalize water flows. These valves shall be disc type with cast iron bodies and stainless steel stems. Valves shall be right-angle type precluding the need for inlet fittings.
 - Basin cover(s) shall be removable galvanized steel panel(s) supported by basin sides, top of cover flush with basin. These covers shall withstand loads described in paragraph G (3).
10. Basin Heaters
- Provide electric immersion heaters and controls to prevent freezing in the collection basin. One or more stainless steel immersion heaters shall be installed in threaded couplings provided in the side of the basin. A NEMA 4 enclosure shall house a magnetic contactor to energize heaters; a transformer to provide 24 volt control circuit power; and a solid state circuit board for temperature and low-water cut-off shall be provided. A control probe shall be located in the basin to monitor water level and temperature. The system shall be capable of maintaining 40°F water temperature at an ambient air temperature of –10°F.

Mechanical Systems Commissioning

1. Scope of Work:
- The mechanical equipment and systems defined in Division 1 – General Commissioning Requirements will be commissioned. List the project-specific items of mechanical equipment and systems to be commissioned in this section.

2. Work Included:
 - As a minimum, the following commissioning tasks will require the cooperation, labor, materials, and assistance from the Contractor and Subcontractors:
 - Mechanical equipment installation verification
 - Mechanical system and equipment startup testing, adjusting and calibration
 - Mechanical Systems Functional Performance Testing
3. References and/or Standards:
 - List applicable standards and codes that apply to the commissioning of the equipment and systems commissioned in this section.
4. Related Sections:
 - List other sections of the specifications that relate to the commissioning work of this section, and require coordination and cooperation by Contractor and all Subcontractors.
5. Sample Forms/Reports:
 - Provide adequately detailed sample forms, checklists, and report formats for all commissioning inspections, tests, and reports requiring the cooperation and assistance of the Contractor and Subcontractors for completion.
6. Test Procedures:
 - Provide adequately detailed test procedures for all commissioning pre-functional and functional performance tests and inspections that require the cooperation and assistance of the Contractor and Subcontractors for completion.
7. Testing and Re-Testing:
 - Require that the Contractor and Subcontractors provide all required assistance, labor, materials, and supplies for specified commissioning tests. Specify that tests failed due to improper Contractor work or preparation shall be rescheduled, and all costs of retesting will be borne by the Contractor.
8. Project Closeout:
 - Specify that the Contractor is responsible for the satisfactory completion of all commissioning items of this section, and of Division 1 – General Commissioning Requirements, prior to approval of project closeout.

Demonstration of Mechanical Equipment

- Provide project walk-through, instruction, and start-up by Contractor and factory technical representative, where appropriate. Consider videotaping instructions for future reference.
- In individual buildings, only closed loop systems, such as secondary heating water, shall have chemical treatment (chemical treatment for fluids from central systems will be provided at the heating or chiller plant).

**** END OF DIVISION 15 ****

DIVISION 16 – ELECTRICAL

General Provisions

1. Electrical closets and distribution shall be centrally located throughout the building.
2. In atriums or other multi-story open to roof areas, accessibility and maintenance should be a consideration when mounting lights.
3. Access doors to crawl spaces should be located as close as possible to electrical equipment under floor.
4. Provide separate electrical and telecommunications closets. Custodial closets shall not be used to house electrical or telecommunications equipment.
5. Provide one duplex receptacle for each stair landing.
6. Corridor wall receptacles (primarily used for floor cleaning equipment) shall be circuited separately from interior office/classroom receptacles.
7. The Contractor shall submit warranties and guarantees in one commercial-quality, hardback binder sized to accommodate 8.5" by 11" pages, with a table of contents and two (2) copies of each warranty or guarantee. Marked tabs shall separate warranties and guarantees in sections following the order of the specifications.
8. Electrical wiring system shall be designed and installed with as much flexibility as practical and reasonable.
9. In demolition associated with renovations, all wire shall be removed back to the panel board and all accessible conduit shall be removed.
10. Neon and/or cold cathode lighting systems are not permitted for use in exterior lighting systems.
11. **Weather proof, 110-120 volt outlets shall be provided on all sides of each building.**
12. **"Blue" emergency light standards to be provided at front and rear of each building.**

Raceways

1. Minimum conduit size shall be $\frac{3}{4}$ ". Flexible metal conduit shall be used only for whips to lighting fixtures and equipment. All empty conduit shall have a 65 pound test polymer (or equivalent) pull string tied off at both ends.

Conductors

1. Use of MC cable is not permitted. BX cable is not permitted. (BX cable is an MC cable)
 - All conductors shall be copper. All power conductors shall be awg #12 or larger. Minimum control wire shall be awg #14 and minimum signal wire size no smaller than awg #18. All awg #10 and smaller wire shall be solid conductors and awg #8 and larger wire shall be stranded.
 - Neutrals shall not be undersized.

Wiring Devices

1. All wiring devices shall be industrial heavy duty specification grade, rated a minimum 20A, 125V.

Emergency Generators

1. Emergency generators rated 50KW or less shall be natural gas with propane backup. Fuel tanks shall not be located underground. Propane tanks shall be furnished by the University. Emergency generators rated above 50KW shall be diesel. Natural gas is not available.

Service and Distribution

1. One line diagram of electrical system shall be posted in the switchgear room or in the vicinity of main distribution panel.
2. Panelboards shall be flush mounted only in areas with grid type ceilings or open ceilings. Do not locate panelboards in custodial closets.
3. Distribution panelboard shall be provided complete with all mounting hardware for mounting any size breaker that the panel will accept and breakers shall be bolt-in type.
4. Provide a minimum of one 100 ampere, 30 pole panelboard per laboratory.
5. Provide 50% spare breaker space in each distribution panel in all new buildings. Provide 20% spare breaker space in each panelboard.
6. All panelboard indices shall identify all equipment served by each circuit, (i.e. Rcpt - Rooms 111, 112, 115).
7. Any panelboard spaces shall be fully bussed.

Interior Lighting Systems

1. Standard light fixtures are 2, 3, or 4-lamp, 2' x 4' fluorescent lay-in fixtures with electronic ballasts and T-8 lamps. T-8 lamps shall have low mercury content, a color rendering index of 75 or greater and a color temperature of 4100k in academic and general buildings. High mercury content lamps are unacceptable.
2. Light fixtures shall be selected to permit the use of lamps that are on State contract, readily available from multiple manufacturers and are in typical use at the University.
3. No lighting fixtures shall be specified for which the manufacturer will require a minimum order for the purchase of replacements. Non-catalog and custom lighting fixtures are to be economically justified and avoided whenever possible.
4. Electronic ballasts shall have a minimum power factor of 0.95 and a maximum THD of 10%
5. Ballasts shall be warranted for 60 months from date of manufacture and shall have harmonic distortion of less than 15%. Ballasts shall be of the parallel lamp connection design such that lamps remain fully lit if any of the companion lamps fail.
6. The University requires the use of light emitting diode (LED) lighted exit signs with diffused lenses. Only red lettered exit signs will be used. Exit lights shall be equal to Lithonia Modular xs/xl series.
7. Typical locations for occupancy sensors include small rooms such as individual restrooms, one person offices, and small storage rooms like closets, supply rooms or recycling rooms, areas of rescue assistance and conference/ classrooms when possible. Ceiling mounted occupancy sensors shall be provided in conference rooms and classrooms. Wall switches will also be provided in conference rooms and classrooms such that lights may be controlled by switches when space is occupied.
8. Locate light fixture schedule on drawings. Schedule shall contain a description of the fixture, not simply a model number.
9. Use of fluorescent dimming systems is discouraged, except where "daylight harvesting" requires it. Any daylight harvesting system shall be specified as such and shall be furnished by one manufacturer as opposed to components from various manufacturers to create daylight harvesting opportunities. All components shall be standard products in production in the USA a minimum of 5 years. Daylight harvesting systems specifications shall also require job specific installation instructions and wiring diagrams for use during installation. Record as-built drawings indicating any changes for these systems shall also be provided upon project completion. When approved, the ballasts shall have a dimming range of 100% to 1%. Ballasts shall have a 60 month (5 year) warranty.
10. Lighting systems installed shall not exceed 1 Watt per square foot total.

Fire Alarm Systems

1. Fire alarm systems shall comply with the _____ Fire Alarm Design Standards.
2. Systems to be manufactured by Siemens, Pyrotronics.

Motors and Controls

1. All motor variable frequency controls shall meet IEEE recommended practices and requirements for harmonic control in electrical power systems. See IEEE standard 519-1992.
2. Motors of ¾ HP and larger shall be 3-phase power of the highest available and appropriate voltage. All such motors shall be equipped with permanently lubricated bearings.
3. Motors of 1HP and larger shall be “Premium Efficiency.”

Communication Cabling

1. Conform to Longwood University Cabling Standard.

Exterior Lighting Systems

1. Neon lights and cold cathode lighting systems shall not be allowed for exterior lighting applications.
2. All exterior lighting to have metal halide lamping.

Electrical Systems Commissioning

1. Scope of Work:
 - The electrical equipment and systems defined in Division 1 – General Commissioning Requirements will be commissioned. List the project-specific items of Electrical equipment and systems to be commissioned in this Section.
2. Work Included:
 - As a minimum, the following commissioning tasks will require the cooperation, labor, materials and assistance from the Contractor and Subcontractors:
 - Electrical equipment installation verification
 - Electrical system and equipment startup testing, adjusting and calibration
 - Electrical Systems Functional Performance Testing

3. References and/or Standards:
 - List applicable standards and codes that apply to the commissioning of the equipment and systems commissioned in this section.
4. Related Sections:
 - List other sections of the specifications that relate to the commissioning work of this section, and require coordination and cooperation by Contractor and all Subcontractors.
5. Sample Forms/Reports:
 - Provide adequately detailed sample forms, checklists, and report formats for all commissioning inspections, tests, and reports that require the cooperation and assistance of the Contractor and Subcontractors for completion.
6. Test Procedures:
 - Provide adequately detailed test procedures for all commissioning pre-functional and functional performance tests and inspections that require the cooperation and assistance of the Contractor and Subcontractors for completion.
7. Testing and Re-Testing:
 - Require that the Contractor and Subcontractors provide all required assistance, labor, materials, and supplies for specified commissioning tests. Specify that tests that have failed due to improper Contractor work, equipment malfunction, or lack of adequate preparation shall be rescheduled at the convenience of the University and Commissioning Authority, and that all costs of re-testing will be borne by the Contractor.
8. Project Closeout:
 - Specify that the Contractor is responsible for the satisfactory completion of all commissioning items of this section, and of Division 1 – General Commissioning Requirements, prior to approval of project closeout.

**** END OF DIVISION 16 ****

DIVISION 17 – BUILDING AUTOMATION SYSTEMS

1. Design heating valves to “fail-open”. In areas where an over temperature condition may be as critical as freezing conditions, provide a high temperature limit to de-energize air handling equipment.
2. Local HVAC controls shall be compatible with existing Siemens Building Technologies, Inc. energy management system (EMS). Level of DDC control is to be determined.
3. Provide thermostatically actuated control valves on all radiation (heating) units. This is in addition to outside air reset or zone.
4. Locate thermometers, gauges, etc., where they can be readily observed from floor level. Provide instruments with the appropriate range.
5. BAS design must conform to following Longwood University Building Automation System Standards.
6. Unless specifically directed otherwise, Siemens Building Technologies is the sole supplier of building automation systems for all campus buildings.

Building Automation Commissioning

1. Scope of Work
 - The Building Automation equipment and systems defined in Division 1 – General Commissioning Requirements will be commissioned. List the project-specific items of Building Automation equipment and systems to be commissioned in this section.
2. Work Included: As a minimum, the following commissioning tasks will require the cooperation, labor, materials and assistance from the Contractor and Subcontractors:
 - Building Automation equipment installation verification
 - Building Automation system and equipment startup testing, adjusting and calibration
 - Building Automation Systems Functional Performance Testing
3. References and/or Standards
 - List applicable standards and codes that apply to the commissioning of the equipment and systems commissioned in this section.
4. Related Sections
 - List other sections of the specifications that relate to the commissioning work of this section, and require coordination and cooperation by Contractor and all Subcontractors.

5. Sample Forms/Reports
 - Provide adequately detailed sample forms, checklists and report formats for all commissioning inspections, tests and reports that require the cooperation and assistance of the Contractor and Subcontractors for completion.
6. Test Procedures
 - Provide adequately detailed test procedures for all commissioning pre-functional and functional performance tests and inspections that require the cooperation and assistance of the Contractor and Subcontractors for completion.
7. Testing and Re-Testing
 - Require that the Contractor and Subcontractors provide all required assistance, labor, materials, and supplies for specified commissioning tests. Specify that tests failed due to improper Contractor work or preparation shall be rescheduled and all costs of retesting will be borne by the Contractor.
8. Project Closeout
 - Specify that the Contractor is responsible for the satisfactory completion of all commissioning items of this section, and of Division 1 – General Commissioning Requirements, prior to approval of project closeout.

**** END OF DIVISION 17 ****

Referenced “linked” standards:

BIDDING REQUIREMENTS

1. (DGS) website – <http://forms.dgs.virginia.gov>.
2. Longwood CAD Standards: TBA
3. Sec 1, Vehicular Access and Parking Areas- parking regulations (regulations at: www.longwood.edu/police/).
4. Sec 2, Landscape Design, 2- Campus Master Plan 2008 Update
5. Sec 17, 5- Longwood University Building Automation System Standards.
6. Golf Cart Regulations: TBA
7. Memorial and Commemoration Standards:
http://www.longwood.edu/hr/FINAL_POLICY_BASE_tables/TC7000.htm
8. IT Cable Standards: TBA
9. Building Automation System Standards: TBA
10. Classroom Standards: TBA