MONTGOMERY COLLEGE

COLLEGE DESIGN STANDARDS

Version 1.3

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Note: Additions and modifications are in BOLD text

OFFICE OF FACILITIES
& PUBLIC SAFETY
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5.10. GENERAL HVAC SYSTEMS STANDARDS

A. **General:** all HVAC systems are to be integrated with the existing campus systems and be constructed to accommodate anticipated upgrades to the campus systems. The current Montgomery College Utilities Master Plan and IT Master Plan documents include extensive detail regarding existing and proposed systems in the area of the proposed building site and are to be consulted as reference documents for the planning and design of the project.

B. **Codes and Standards:** design shall comply with applicable jurisdictional codes and jurisdictional adopted standards including ASHRAE and SMACNA and engineering best practices. The A/E is to coordinate with the College to identify the degree of environmental control needed at each space, any special heating, air conditioning and ventilation needs, and the capacity of any existing systems that are to be extended or connected to the new building.

C. **Resource Conservation**: See the ***Resource Conservation and Integrated Systems Approach*** in the ***Part 3: Owner's Planning and Programming Standards*** for a discussion of the mandated integrated systems approach to building design, of which HVAC design is a critical element.

D. **Reliability**: the work shall be designed for maximum reliability. This includes the avoidance of systems which have an inadequate history of satisfactory performance. The work shall be designed for maximum maintainability. Provide adequate service clearance for all equipment.

E. **Specifications*:*** All equipment manufacturers specified shall be approved by the College. A/E shall list approved equivalent model numbers from approved alternate manufacturers in the Specifications *after assuring that the alternates are able to fit into the physical location.*

F. **O & M Manuals:** The College employs a maintenance and operations staff capable of troubleshooting and repairing most mechanical, plumbing, electrical, and telecommunication systems equipment. Therefore, it is required that five copies of suitable manuals are furnished with the equipment and systems. The following items and information are minimum requirements:

1. Manufacturer's catalog descriptions of specifics items of equipment.
2. Manufacturer's operating and maintenance instructions.
3. Wiring diagrams for inter- and intra- connections of components.
4. Schematics and location drawings of components and systems with "troubleshooting" guidance.
5. Component breakout lists for ordering replacement parts, etc.
6. *Operations and Maintenance Manuals shall be provided to the Montgomery College Office of Facilities two weeks in advance of any testing or commissioning of any equipment.*

G. HVAC System Design Criteria:

1. **Outdoor Design Conditions: All new and renovated HVAC systems shall be designed according to the Colleges outdoor design conditions listed below. The A/E shall review with the College where different design conditions may be required. At a minimum climatic design information provided by ASHRAE shall be used. For summer conditions the 0.4% dry bulb (DB) and mean coincident web bulb (MCWB) temperature shall be used. For winter conditions the 99.6% heating DB temperature shall be used.**

Outdoor Design Conditions Montgomery College	
Summer	95 °F / 78 °F
Winter	0 °F

2. **Indoor Design conditions: All new and renovated HVAC systems shall be designed to maintain adequate space temperature humidity and noise levels for occupants. Indoor design conditions for common occupant types are listed below. The A/E shall review with the College where different design conditions may be required.**

Occupancy Type	Summer Design Setpoint (+/-2°F / +/- 5%RH)	Winter Design Setpoint (+/- 2°F / +/-5 %RH)	Target Room Noise Criteria (NC)
Classrooms	75 °F / 50% RH	72 °F / No minimum Requirement	30
Teaching Labs	75 °F / 50% RH	72 °F / 40% RH	30
Libraries / Media Centers	75 °F / 50% RH	72 °F / 40% RH	25
Offices	75 °F / 50% RH	72 °F / No minimum Requirement	25
Conference Rooms	75 °F / 50% RH	72 °F / No minimum Requirement	25

H. HVAC System Criteria: Each Montgomery College Campus has a dedicated chilled water and heating water plant to serve the campus's cooling and heating demands. All new and renovated HVAC systems shall be designed to match the current College Standards to the fullest extent possible. Where proposed HVAC system may deviate from the College Standards the A/E shall review with the College. The following HVAC Systems standards shall be used to provide direction and design intent to the design team.

1. **Campus Chilled Water System**

   a. **Each campus has a central chilled water plant. Refer to the current campus master plans for information regarding current capacity and connected load.**

   b. **The central chilled water plants at each campus operate on an individual temperature differential. Each proposed cooling system tied to the central plant shall be designed around an entering and leaving water temperature concurrent with that campus's system. See the campus chilled water design criteria below.**

Campus Chilled Water Design Criteria	EWT / LWT (°F)
Germantown Campus	40 / 56
Rockville Campus	44 / 58
Takoma Park / Silver Spring Campus	44 / 58

   c. **Each campus's central chilled water plant utilizes a primary-secondary pumping arrangement. New or renovated buildings to be connected to the central chilled water system shall be equipped with secondary pumps and a chilled water bridge. Refer to 'Part 7: Design Standard Details' for chilled water bridge requirements.**

2. **Campus Heating Water Systems**

   a. **Each campus has a central heating water plant. Refer to the current campus master plans for information regarding current capacity and connected load.**

   b. **Each campus central heating water plant operates on an individual temperature differential. Each proposed heating system tied to the central plant shall be designed around an entering and leaving water temperature concurrent with that campus system. See the campus heating water criteria below.**

Campus Heating Water Design Criteria	EWT / LWT (°F)
Germantown Campus	180 / 160
Rockville Campus	195 / 160
Takoma Park / Silver Spring Campus	195 / 160

   c. **Each campus's central heating water plant utilizes a primary-secondary pumping arrangement. New or renovated buildings to be connected to the central heating water system shall be equipped with secondary pumps and a heating water bridge. Refer to 'Part 7: Design Standard Details' for heating water bridge requirements.**

3. **230519 – Meters and Gauges of HVAC**

   a. **BTU Meters**: all BTU Meters are to be the System-10-BAC BTU Meter, BACnet/IP Compatible, by Onicon, Incorporated. Coordinate with College for approval of final model selection.

b. **Flow Meters**: all Flow Meters are to be the F-3500 Series Electromagnetic Flow Meters by Onicon, Incorporated. Coordinate with College for approval of final model selection.

4. **230900 – Building Automation Controls**

a. **General:** the building's Energy Management and Control System (EMCS) shall be a stand alone Direct Digital Control (DDC) and ***ASHRAE Standard 135***, native BACNet system that will be integrated to the campus-wide system only after the entire building system has been tested and is working properly. The system shall consist of DDC terminal devices networked to a Graphical User Interface (GUI) terminal through a network of intermediate control units. The GUI shall provide a real time display of all HVAC and mechanical systems, contain all of the standard DDC control programming, and provide secure local and remote operator access.

b. **Acceptable Vendors: The EMCS for each campus utilizes Reliable Controls by Pritchett Controls Inc. Each new or renovated project shall provide Reliable Controls by Pritchett for campus continuity.**

Energy Metering?

c. **Dedicated GUI Room:** a dedicated and secure space shall be provided in the building to locate the GUI and provide sufficient work area and storage for the building's drawings and other records. Communications through modem phone lines and a telephone shall be provided.

d. **Real-time Networked System:** College standard control sequences and demand management capabilities will be integrated with real time utility pricing signals and "Smart Grid" technologies. BACnet Ethernet messages will be transmitted over the College's Facilities Network (FNet), have virtual local area network capabilities (VLAN), and use the College's standard object and network numbering scheme.

e. **Further Criteria:** see ***Part 6: Technical Standards*** section ***250000 Integrated Automation*** for additional information, including the typical building controls network arrangement and the object name, device instance and network number conventions.

f. **Commissioning**: commissioning of all integrated automation systems shall be included in the project commissioning scope.

5. **HVAC Pumps**

   a. **General: New or renovated projects shall provide secondary building pumps to connect to the existing campus chilled water and heating water system. Frame-mounted end suction or vertical-mounted double-suction centrifugal pumps are the preferred pump configurations. Pumps shall be installed per the College Standard Details see 'Part 7: Design Standard Details' for typical pumping arrangements.**

   b. **Inline circulator pumps shall be provided on all heating water coils that are introduced with outside air.**

   c. **Pumps shall be provided with vibration isolation to avoid transfer of vibration to the building structure.**

   d. **Acceptable Manufacturers: Basis of design for end suction and vertical-mounted double-suction centrifugal pumps shall be Bell and Gossett.**

6. **Water Treatment**

   a. Water treatment for HVAC systems is to be integrated with existing Central Plant treatment. The College retains an independent contractor to maintain the HVAC water treatment for the College HVAC systems. Coordinate with the College to confirm the requirements for water treatment, the project scope regarding water treatment and the connection of new systems to existing campus or building systems. Indicate clearly in the specifications that the existing campus HVAC system (or building system from prior development phase) will supply treatment to the building's new systems. Upon completion of construction of the new system, the Contractor is to flush the new system, clean system with approved cleaning agent/chemical, filter system to remove particulate and then flush again to remove all traces of cleaning agents. The Contractor's chemical treatment representative is to provide certification that the systems are properly cleaned, filled with city water and ready for startup. After that certification is provided the building systems can be opened to the campus system loop, allowing treatment from the campus plant to circulate in the new systems. All treatment products introduced to the systems after the Contractor's required flushing of the new systems are to be provided by the College's water treatment vendor.

   b. **Glycol Systems?**

7. **Air Distribution – Low-Pressure and High-Pressure Ductwork**

   a. **General:** Ductwork shall be of appropriate class and thickness, sound lined and insulated to minimize fan horsepower and minimize sound transmission. Ductwork shall meet the leakage requirements for the class of duct and minimize moisture and heat transfer. The ductwork shall be provided with access doors for inspection and

duct cleaning. All ductwork from air-handling units to the terminal devices shall be of insulated, double-wall galvanized steel construction, *round or flat oval*. Insulated flexible ductwork may be used on the low side of the terminal devices to the diffusers, provided the runs are limited to providing flexibility in diffuser to ceiling grid alignment. Return air shall generally flow through ceiling plenums and into return air ducts. The return air ducts shall be extended into the plenums in order to provide balanced flows throughout the building.

b. **New and renovated projects shall specify a maximum of 1% duct leakage for new high and low pressure ductwork installations.**

8. **Fans**

a. **New and renovated projects shall provide variable frequency drives (VFD) to control fan speed and modulate the airflow on motors 1HP and larger. Refer to '5.13: General Electrical Systems Standards' of this documents for College VFD standards.**

b. **Air handling equipment shall be provided with a fan section with adequate space for maintenance. Custom air handling units shall utilize fan arrays to provide system redundancy. The fan array configuration shall be determined with fan efficiency in mind.**

c. Where designs incorporate return fans the preference is that they be installed in the exhaust position.

d. Ventilation fan systems shall be designed to provide quiet and appropriate exhaust flows. All ventilation systems shall have dampers with motor operators that are interlocked to the motor starter circuits. The dampers shall be low leakage, tightly fitting with stainless steel perimeter and lip seals. All exhaust fans shall be connected to the Energy Management Control System and interlocked with their respective air handling system.

9. **Air Terminals**

a. **General: All VAV systems shall be provide single duct terminal units with hot water reheat coils and pressure independent controls. All terminal units shall have DDC control and the design shall ensure adequate control access above concealed spaces.**

b. **Sound Attenuation?**

c. **Acceptable Manufacturers: The basis of design for Air terminal units shall be Titus or Nailor.**

10. **Air Cleaning**

    a. **General: Air handing equipment shall be equipped with a filter section that include MERV-8 prefilters and MERV 13 filters in accordance with current code and/or LEED requirements for indoor air quality.**

    b. **Filters shall be provided on separate filter racks and should have adequate clearance for maintenance. Each filter rack shall be provided with a magnehelic pressure gages to read pressure across each filter rack independently.**

11. **Air Handling**

    a. **General: Where the building design allows the A/E team shall propose roof mounted variable air volume (VAV) air handling equipment. This is the College's preferred system and should be considered for campus continuity between systems. Where new and renovated projects require HVAC systems other than the College's preferred equipment the A/E shall review and get approval from the College.**

    b. **Roof Mounted VAV Air Handling Units: Custom air handling units shall be provided and** shall be of highest quality designed for rooftop exposure. They shall be of the penthouse type with double wall construction, durable finishes, airtight doors, and internal access walkways. An actual penthouse to protect the rooftop equipment is preferred to provide better protection for high performance equipment, and should be explored as an option provided net-to-gross square footage ratios can be met.

    c. **All air handling units shall be equipped with fan section chilled water coil section heating coil section filter section and mixing box. Access sections shall be provided between each air handling unit component to provide adequate maintenance. Units shall be installed and configured with equipment access and clearances in mind.**

    d. Dampers shall be motor-operated with tight fitting stainless steel perimeter and lip seals.

    e. Air handlers are to be appropriately sound and vibration isolated with dampening and sound lining so that noise is not transmitted to the building structure or to the ductwork.

    f. **The College's preference is that an air side economizer be provided for all central air handling equipment for energy savings. Air side economizers shall be provided for all central air handling equipment where space allows and where code requires the use of economizer.**

    g. **All central air handling equipment shall use supply air temperature reset controls for energy savings.**

h. **All central air handling unit equipment shall be provided with an enthalpy energy recovery wheel where required by code.**

i. **Acceptable Manufacturer: The basis of design for custom air handling units shall verified with the College for each project.**

12. **Hydronic Coils**

a. **General: Air handling unit equipment shall be provided chilled water coils and heating water coils to take advantage of the campus chilled water and heating water central plant. Coils shall be provided for cooling dehumidification outdoor air preheat and terminal unit reheat where required. Refer to the campus chilled water and heating water system criteria for coil entering and leaving chilled water temperatures.**

b. **Coil face velocities shall be designed for a maximum of 500 feet per min (fpm). Where space allows coil velocities should be reduced to maximize fan energy reduction and coil performance.**

c. Chilled water coils shall be sized to provide a low temperature supply air (approximately 40°F). **The design shall ensure adequate space cooling and dehumidification and shall reduce leaving air temperature when possible to reduce fan energy.**

d. **Copper vs. aluminum fins?**

e. **Hydronic coil sizes shall be limited to a maximum of 8'x4' for ease of coil maintenance. Designs shall include adequate space for coil pulls.**

13. **HVAC Commissioning**

14. **Specialty Design Standards**

a. **Laboratory Systems?**
- **General:**
- **ACH**
- **Fume Hood Control**

I. **Elevator Equipment & IT Rooms**: the scope is to include supplemental split systems for elevator equipment and IT rooms. Primary cooling shall be through building HVAC system, with supplemental systems to serve as backup.

J. **Commissioning**: commissioning of all HVAC systems shall be included in the project commissioning scope.

K. **Questions:** contact Montgomery College's Office of Facilities at (240) 567-5363 if there are any questions regarding HVAC systems or the standards for these systems..

5.11. GENERAL ELECTRICAL SYSTEMS STANDARDS

A. **General:** All electrical systems are to be integrated with the existing campus systems and be constructed to accommodate anticipated upgrades to the campus systems. The current Montgomery College Utilities Master Plan and IT Master Plan documents include extensive detail regarding existing and proposed systems in the area of the proposed building site, and are to be consulted as reference documents for the planning and design of the project. *Pepco provides only 3-Phase 460 volt power. No 480 volt power is available at any MC campus.*

B. **Codes and Standards:** The design shall comply with all applicable codes, standards, engineering best practices, and Montgomery College guidelines and standards. Specifically the design of the building electrical systems shall comply with ***ASHRAE 90.1***, and the ***National Electric Code***. The College has standardized selections for many materials, devices, fixtures, and equipment which shall be specified for use in the building. An Overcurrent Protective Device Coordination Study is required for building with large electrical demand, with large motors, pump, chillers or other large demand equipment.

C. **Energy Efficiency:** All spaces shall be controlled to conserve energy either by sensors or by other means. All equipment, transformers, and motors will be energy efficient types designed to minimize the production of harmonic distortion. Although energy efficiency is of major consequence, priority consideration in the design of the facility shall be given to environmental safety and operational, functional, and flexibility requirements.

D. **Electrical Power Systems:** The building shall be designed with provisions for life safety, lighting, equipment, receptacle, HVAC and emergency power. Building power shall be segregated to the separate load classes and sized in accordance with ***ASHRAE 90.1***, among other codes. All electrical power systems within buildings shall be encased in steel conduit and properly supported from the overhead structure. Intermediate Metal Conduit (IMC) conduit shall be used in mechanical rooms and anywhere that may be exposed to damage. Electrical Metallic Tubing (EMT) conduit is acceptable for use above ceilings and when concealed from harm. Compression type fittings are required for EMT. The minimum diameter allowed for any conduit is ¾." Metal Clad (MC) cable is acceptable as a pathway from a box located in the space served to the final device. Conduits shall not be buried in the slab of the building unless it is the primary underground feed from the building transformer to the main distribution panels. Underground electrical conduits shall be Schedule 40 PVC of 2" minimum diameter. The elbows at the transition points from below to above grade shall be Schedule 80. Motors shall be premium efficiency and meet IEEE standards for Variable Frequency Drive compatibility. All cable and conductors are to be copper. No aluminum is allowed for use as conductor. No splices in new cable, or splices of new cable with existing cable are allowed.

E. **Exterior Below-Grade Ducts□Raceways and Junction Boxes:** see the ***Exterior Below-Grade Ducts, Raceways and Junction Boxes*** subsection of the ***General Utilities Standards*** section of ***Part 4 Owner's Site Standards*** of this document.

F. **Electrical Distribution System:** The A/E shall coordinate the provision of power from the electrical utility with the College's Office of Facilities. Power will be provided by PEPCO at 13.2 kV. A load letter is required to establish service. The service transformers shall be vault type and the service lateral shall be underground. Coordinate the size and location of the metering cabinet with the PEPCO representative to the campus. The designer shall give particular attention to the location of the primary power taps for this service. Normally the

power will be stepped down by dry-type transformers to 120/208 volt, three phase service for receptacle power and other less consequential loads. In addition, the main electrical distribution systems usually consist of 480/277 volt, three phase main switchboards, distribution and branch circuit panelboards for lighting and some HVAC loads, and 120/208 volt, three phase branch circuit panelboards for receptacles, and associated appurtenances for a complete electrical distribution system. Each IT Independent Distribution Facility (IDF) room shall be provided with a dedicated 12-breaker subpanel to support the equipment that will be housed therein. The engineer of record shall determine the service entrance voltage and phasing, providing an energy and economic analysis of the factors that led to the voltage and phasing.

G. **Fire Separation at Power to Fire Pump:** the Montgomery County Department of Permitting Services has determined that due to uncertainties about the validity of the rating, fire rated cable may not provide adequate fire protection for power to fire pumps. Design documents for all College projects that include a fire pump or routing electrical power to a fire pump are to include a requirement for a 2-hour fire separation rated assembly around all power conduit to fire pumps, or a min. 2" concrete cover around the conduit. Confirm specific current requirements with the Montgomery County Department of Permitting Services and any other local authorities having jurisdiction.

H. **Emergency Power System:** Emergency power and protection equipment will be provided to support the life safety, emergency, and fire protection requirements. The emergency power system shall include a status monitoring system with annunciation at the building's management system. A new emergency generator shall be provided that is sized to handle emergency loads (i.e., fire pumps, emergency and egress lighting, fire alarm requirements, telephone, and security systems). A sub-base, diesel fuel tank, automatic transfer switch with provisions for manual bypass, weatherproof housing, and muffler shall be included in the generator package. The generator location shall be determined in coordination with the College. The generator may be required to support a building fire pump and domestic water booster pump and a possible sewage ejector pump, and potentially existing circuits at other nearby buildings. Note that stand-alone split system HVAC units will be used to cool elevator machine rooms, security system spaces, IDF, data, PoP and other telecommunication equipment spaces. Some or all of these DX type systems will also be backed up by the generator. All emergency power distribution systems are to be designed to comply with the "Emergency Power Distribution System Guidelines" indicated in drawing sheet E-1, titled "One Line Diagram," which is included in this standards document as Appendix H. Confirm current code requirements and coordinate all emergency power distribution design with the College team.

I. **Lighting:** Lighting systems shall be designed based on consideration of the normal tasks performed in the area or room, reflectance of surfaces, special lighting effects required, normal sight lines and zone control of larger surfaces. Fixture selection and layout of the lighting shall be in accordance with the latest engineering practices, IES recommendations, and ASHRAE 90.1 to meet the standards for quality and energy efficiency. Coordinate with the College for a current list of acceptable manufacturers and campus standard fixtures prior to specifying fixtures. Lighting in special design spaces, such as lobbies, may vary from the College's prescribed standards for light fixtures, with written approval from the College.

Daylighting and individual lighting controls shall be considered in support of energy efficiency and achieving the minimum LEED Silver status. The lighting layouts shall be coordinated with the architectural design so as to control interior and exterior brightness and glare.

Point-by-point lighting analysis is required for most spaces. The A/E shall optimize the use of natural daylight, analyze the applicability of day-light controls to turn lights off or dim them in response to natural light availability, and provide appropriate lighting controls, to include use of occupancy/vacancy sensors and interior photocells in conjunction with dimming or step switching ballasts. Lutron should be considered as the basis of design for ballasts and dimming controls.

Exterior and site lighting shall be LED sources. Step lights, ground level lights and bollard lights are to be avoided where feasible. Fixture selection is to be coordinated with LEED criteria for minimizing light pollution. Site lighting is described in the ***Site Lighting*** subsection of the ***General Site Development Standards*** section of ***Part 4 Owner's Site Standards*** of this document.

Interior lighting shall be LED sources. Fixtures in public spaces, including instructional spaces, shall be 2-tube fixtures with 3500°K lamps. Wall-washing fixtures for illuminating marker boards in instructional spaces shall be the "Style 210" adjustable recessed linear fixture by Elliptipar, with one 3500°K lamp. All "recessed can" fixtures are to have a minimum 6" diameter trim aperture, *and are to illuminate the ceiling around the fixture, in addition to the space below.* Fixtures in corridor areas shall be 2-lamp fixtures with 3500°K lamps, on ten to fourteen foot centers. No incandescent lamps are allowed. Occupancy sensors are required for lighting control in most areas and shall include auxiliary dry contacts for connection to the spare auxiliary dry terminals on the DDC terminal equipment controllers. The actual building lighting loads shall be used to size the electrical system and HVAC system.

Lighting fixtures shall be located with regard to actual and potential locations of desks, chalkboards, marker boards or other visual display units. The location and proximity of windows and the photometric characteristics of the luminaires shall be considered when locating fixtures. Learning resource areas shall be accommodated in a similar manner in accordance with IES recommended design practice. The lighting systems in these areas shall also be designed so that lighting levels can be adjusted for audio/visual presentations using control banks of lights that are controlled by on/off switches. Rooms with high ceiling spaces shall be provided with suspended direct/indirect luminaries. Lighting power densities for the various areas of the building shall comply with applicable guidelines. A building-wide target value of 0.5 to 0.75 watts / square foot should be pursued.

The basis of design for occupancy sensors shall be ceiling mounted "Omni-DT" series by Hubbell Building Automation, Inc. Wall mounted sensors shall be used only where specifically approved by the College, and shall match model "LHMTD2" by Hubbell Building Automation, Inc.
Emergency (twenty-four hour) lighting and exit signs are to be served by emergency circuits. Battery back up units are not allowed.

Light fixtures shall be located such that the light source and fixtures can be readily replaced without requiring building staff to work in unsafe conditions or to take expensive or extreme measures to provide safe conditions for the work. Replacement solutions for fixtures and lamps in high ceiling spaces and other locations where replacement will be challenging must be reviewed and approved by the College during Design Development Phase.

J. Lightning Protection System: A lightning protection analysis shall be performed to evaluate the requirement for a lightning protection system. If it is required, the lightning protection system shall be comprised of solid copper, nickel plated air terminals (depending on parapet flashing material) located around the perimeter of the roof, flat copper conductor cables, copper down leads and ground loop and copper coated steel ground rods. The down lead system is not to be connected to the building structural steel system. This system should be installed by a certified lightning installer in full compliance with *ANSI/UL 96* and *ANSI/NFPA 768* or latest editions, and have a UL Master Label when completed. Coordinate with College for selection of air terminal type and fastening method.

K. Commissioning: Commissioning of all electrical systems shall be included in the project commissioning scope. For further information see the *Instructions to the Consultant* section of the *Part 2 Facility Construction Program* which is incorporated in the *Request for Proposal* for the specific project.

L. Questions: Contact Montgomery College's Office of Facilities at (240) 567-5363 if there are any questions regarding electrical systems or the standards for these systems.

5.12. GENERAL COMMUNICATIONS SYSTEMS STANDARDS

A. General: All communication systems are to be integrated with the existing campus systems and be constructed to accommodate anticipated upgrades to the campus systems. The current Montgomery College Utilities Master Plan and IT Master Plan documents include extensive detail regarding existing and proposed systems in the area of the proposed project, and are to be consulted as reference documents for the planning and design of the project.

B. IT Standards: All cabling materials, products and work, and all work at MDF and IDF Communications Rooms is to comply with the current ***Voice/Data/Video Cabling MDF/IDF Communications Room Standard*** document, issued by the Montgomery College Office of Information Technology . The Office of Facilities will provide the current version of this standards document to the design team, upon request. *Layouts for equipment racks in IDF and MDF rooms are to be provided by the College. No racks are to be installed until a College approved layout has been provided, and confirmed in the field.*

C. AV Standards: All Audio Visual materials, products and work is to comply with the current version of the ***Montgomery College Audio Visual Standards***, issued by the Montgomery College Office of Information Technology. The Office of Facilities will provide the current version of this standards document to the design team, upon request.

Smart Instructor Work Station (SIWS): The Smart Instructor Work Station that is used at Classrooms, Computer Classrooms and other instructional spaces is to be designed per the current version of the "MC Smart Instructor Work Station Standards." The Office of Facilities will provide the current version of this standards document to the design team. *Coordinate with the College for requirements for special construction needed at locations for ceiling mounted projectors, to carry and stabilize the equipment and mount.*

MCTV Connectivity: Connection panels and cabling for operation of MCTV cameras, and simultaneous viewing of MCTV broadcast may be required in this project. The Office of Facilities will provide the current version of this standards document to the design team, upon request.

D. **Emergency Responder Radio Coverage**: The Montgomery County Department of Permitting Services (DPS) publishes the current requirements for emergency responder radio coverage within certain public buildings. These regulations apply to all buildings on Montgomery College campuses, and generally in-building amplification systems are needed, to achieve the required radio coverage. Refer to the current version of the DPS document "Emergency Responder Radio Coverage, In-Building Radio Signal Amplification System Standard" for the applicable requirements for systems and performance.

E. **Commissioning:** Commissioning of all communication systems shall be included in the project commissioning scope.

F. **Questions:** Contact Montgomery College's Office of Facilities at (240) 567-5363 if there are any questions regarding communication systems or the standards for these systems.

5.13. GENERAL ELECTRONIC SAFETY AND SECURITY SYSTEMS STANDARDS

A. **General:** All communication systems are to be integrated with the existing campus systems and be constructed to accommodate anticipated upgrades to the campus systems. The current Montgomery College Utilities Master Plan and IT Master Plan documents include extensive detail regarding existing and proposed systems in the area of the proposed project, and are to be consulted as reference documents for the planning and design of the project.

B. **Emergency Notification System:** *New technical standards for MC's emergency/mass notification system are in development. Coordinate with the College for the up to date standards for the emergency management system and the fire alarm system.*

C. **Security System:** A conduit, back box, and cable system shall be installed per the College's standard system and manufacturer's requirements for any security system equipment and devices. At a minimum, the following system elements should be considered by the A/E and evaluated for their applicability: closed circuit television surveillance, electrically operated locks at ground level stairwell exit doors, electrical security device at each desktop computer in computer labs, intrusion alarm systems at areas subject to break-in, and proximity/card access systems to control access to various parts of the building and ground floor entrances (with door contact/door position switch at all doors on the systems). Monitoring of alarms shall be within the Office of Safety and Security. Any inter-connection between a building security system and an external monitor shall be designed in coordination with the College. The basis of design for security software should be Infographics. See Technical Sections ***281300 Access Control*** and ***282300 Video Surveillance*** for further information.

D. Emergency "Blue" Phone System: Exterior emergency phones are to be model #RR73 "one button phone model" by Ramtel, on a Ramtel PLC-8 stainless steel column, with a 906 backbox/enclosure, for a flush mount bezel. *Interior emergency phones are to be Ramtel model RR733 with a 906 Back Box. Specify model RR733-906 for correct phone and backbox/enclosure, for exterior and interior phones. Indicate, in construction documents, the concrete base that is required: 3'-6" tall, 1'-8" square, top at 4" above surrounding grade, or ¾" above adjacent paving (if paving on all sides), with ¾" bevel at top edges.*

E. **Commissioning:** Commissioning of all electronic safety and security systems shall be included in the project commissioning scope.

F. **Questions:** Contact Montgomery College's Office of Facilities at (240) 567-5363 if there are questions regarding electronic safety and security systems or the standards for these systems.

PART 6: TECHNICAL STANDARDS

6.1 Technical Notes (in CSI category sequence):

02 00 00 Existing Conditions (reserved)
03 00 00 Concrete (reserved)
04 00 00 Masonry (reserved)
05 00 00 Metals (reserved)
06 00 00 Wood, Plastics, and Composites (reserved)
07 00 00 Thermal and Moisture Protection (reserved)
08 00 00 Openings (reserved)
09 00 00 Finishes (reserved)
10 00 00 Specialties (reserved)
11 00 00 Equipment (reserved)
12 00 00 Furnishings (reserved)
13 00 00 Special Construction (reserved)

14 00 00 Conveying Equipment
14 06 00 Schedules for Conveying Equipment
14 06 20 Schedules for Elevators
14 06 20.13 Elevator Equipment Schedule
14 08 00 Commissioning of Conveying Equipment
14 08 20 Commissioning of Elevators
14 20 00 Elevators
14 21 00 Electric Traction Elevators
14 21 13 Electric Traction Freight Elevator
- No MRLs

14 24 00 Hydraulic Elevators
14 24 13 Hydraulic Freight Elevators
14 24 23 Hydraulic Passenger Elevators
14 27 00 Custom Elevator Cabs and Doors
14 27 13 Custom Elevator Cab Finishes
14 27 16 Custom Elevator Doors
14 28 00 Elevator Equipment and Controls
- Non-proprietary –College's elevator consultant must be part of contract

14 28 16 Elevator Controls
14 28 19 Elevator Equipment
14 28 19.13 Elevator Safety Equipment
14 28 19.16 Elevator Hoistway Equipment

21 00 00 Fire Suppression (reserved)
22 00 00 Plumbing (reserved)

23 00 00 Heating, Ventilating, and Air Conditioning (HVAC)

23 01 00 Operation and Maintenance of HVAC Systems

23 01 10 Operation and Maintenance of Facility Fuel Systems
- *Confirm need – only one MC building has such a system*

23 01 20 Operation and Maintenance of HVAC Piping and Pumps

23 01 30 Operation and Maintenance of HVAC Air Distribution

23 01 30.51 HVAC Air-Distribution System Cleaning
- *Never*

23 01 50 Operation and Maintenance of Central Heating Equipment

23 01 60 Operation and Maintenance of Central Cooling Equipment

23 01 60.71 Refrigerant Recovery/Recycling

23 01 70 Operation and Maintenance of Central HVAC Equipment

23 01 80 Operation and Maintenance of Decentralized HVAC Equipment

23 01 90 Diagnostic Systems for HVAC

23 05 00 Common Work Results for HVAC

23 05 05 Selective Demolition for Heating, Ventilating, and Air Conditioning (HVAC)

23 05 13 Common Motor Requirements for HVAC Equipment
- *Premium Efficiency, Inverter Duty*

23 05 16 Expansion Fittings and Loops for HVAC Piping

23 05 17 Sleeves and Sleeve Seals for HVAC Piping
- *Link Seal*

23 05 19 Meters and Gages for HVAC Piping
- *Pressure gauges, isolation valves, snubbers*
- *Temperature gauges, self powered solar digital, Weiss*

23 05 23 General-Duty Valves for HVAC Piping
- *¾"-2" – full port ball valve*
- *2.5 – larger – high performance, full lug body butterfly – Dezurik, Keystone*

23 05 29 Hangers and Supports for HVAC Piping and Equipment
- *Vibration isolation*

23 05 33 Heat Tracing for HVAC Piping

23 05 48 Vibration and Seismic Controls for HVAC
- *Analysis*

23 05 53 Identification for HVAC Piping and Equipment

23 05 93 Testing, Adjusting, and Balancing for HVAC

23 06 00 Schedules for HVAC

23 06 10 Schedules for Facility Fuel Service Systems

23 06 20 Schedules for HVAC Piping and Pumps

23 06 20.13 Hydronic Pump Schedule
- *Bell & Gossett*
- *See College Standard Base Mounted Pump Configuration*
- *Flex Connectors –* ***Metraflex Double Sphere Flex Pipe Connectors with neoprene body shall be the standard.***

23 06 30 Schedules for HVAC Air Distribution

23 06 30.13 HVAC Fan Schedule

- Fan Wall

23 06 30.16 Air Terminal Unit Schedule

- ***Single Duct terminal units, pressure independent,*** *Non-fan powered, hydronic re-heat,*
- ***Titus or Nailor***

23 06 30.19 Air Outlet and Inlet Schedule

- *Coanda effect diffusers*
- ***Titus or Nailor***

23 06 30.23 HVAC Air Cleaning Device Schedule

- *MERV 13 Camfil with local Magnahelic & BAS monitoring.*

23 06 50 Schedules for Central Heating Equipment

23 06 50.13 Heating Boiler Schedule

- ***Coordinate all boiler selections with Campus central plant.***

23 06 60 Schedules for Central Cooling Equipment

- *Carrier*
- *Frick*
- *Tecochill*

23 06 60.13 Refrigerant Condenser Schedule

23 06 60.16 Packaged Water Chiller Schedule

- *Carrier*
- *Frick*
- *Tecochill*

23 06 70 Schedules for Central HVAC Equipment

23 06 70.13 Indoor, Central-Station Air-Handling Unit Schedule

- ***Governair by Nortek***
- ***Air Enterprises***
- ***Buffalo Air Handling***

23 06 70.16 Packaged Outdoor HVAC Equipment Schedule

23 06 80 Schedules for Decentralized HVAC Equipment

23 06 80.13 Decentralized Unitary HVAC Equipment Schedule

- *RTUs – TMI, etc.*
- *Mitsubishi splits or VRF systems.*

23 06 80.16 Convection Heating and Cooling Unit Schedule

23 06 80.19 Radiant Heating Unit Schedule

- *Underfloor – Taco Xpump Block, Rehau*

23 07 00 HVAC Insulation

23 07 13 Duct Insulation

- *See duct spec.*

23 07 16 HVAC Equipment Insulation

23 07 19 HVAC Piping Insulation

- *Interior - Fiberglas, vapor barrier, formed PVC jacket*
- *Exterior - Fiberglas, vapor barrier, formed Aluminum jacket*
- ***All Pipe insulation and thickness shall meet current applicable energy code.***

23 08 00 Commissioning of HVAC

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

- *Reliable as represented by Pritchett Controls*

23 09 13.13 Actuators and Operators

- *Belimo*
- *Belimo Energy Valve*

23 09 13.23 Sensors and Transmitters

23 09 13.33 Control Valves

- *Belimo*
- *Belimo Energy Valve*

23 09 13.43 Control Dampers

- *Ruskin*
- *Stainless steel lip and edge seals*
- *Oil-lite Brass Bushings*
- *Opposing blade*

23 09 23 Direct-Digital Control System for HVAC

23 9 23.11 Control Valves

- *Belimo*
- *Belimo Energy Valves*
- ***All Hydronic Control Valves shall conform to ANSI B16.15 or B16.1.***
- ***All hydronic control valves all be Class 125 rated.***
- ***All valve steams shall be 316 stainless steel.***
- ***All valve***

23 09 23.13 Energy Meters

- *Onicon-BACNet*

23 09 23.14 Flow Instruments

- *Onicon*

23 09 93 Sequence of Operations for HVAC Controls

23 09 93.11 Sequence of Operation for HVAC DDC

23 10 00 Facility Fuel Systems

23 11 00 Facility Fuel Piping

23 12 00 Facility Fuel Pumps

23 13 00 Facility Fuel-Storage Tanks

23 21 00 Hydronic Piping and Pumps

23 21 13 Hydronic Piping

23 21 13.13 Underground Hydronic Piping

- *Permapipe*

23 21 13.23 Aboveground Hydronic Piping

- *Carbon Steel, Schedule 40, A53 Grade B, Welded no Victaulic for dynamic systems.*

23 21 16 Hydronic Piping Specialties

23 21 23 Hydronic Pumps

23 21 23.13 In-Line Centrifugal Hydronic Pumps

- *Bell & Gossett*

23 21 23.16 Base-Mounted, Centrifugal Hydronic Pumps

- *Bell & Gossett*

23 21 23.19 Vertical-Mounted, Double-Suction Centrifugal Hydronic Pumps

- *Bell & Gossett*

23 21 23.23 Vertical-Turbine Hydronic Pumps

23 21 29 Automatic Condensate Pump Units

- *Little Giant*

23 22 00 Steam and Condensate Piping and Pumps

23 23 00 Refrigerant Piping

23 24 00 Internal-Combustion Engine Piping

23 25 00 HVAC Water Treatment

23 25 13 Water Treatment for Closed-Loop Hydronic Systems

- *Campus Provider*
- *WSSC/COR sub-meter*
- *College sub-meter connected to DDC.*

23 25 33 HVAC Makeup-Water Filtration Equipment

23 30 00 HVAC Air Distribution

23 31 00 HVAC Ducts and Casings

23 31 13 Metal Ducts

23 31 13.13 Rectangular Metal Ducts

- *Duct-in-Duct Configuration, only allowed by approval*

23 31 13.16 Round and Flat-Oval Spiral Ducts

- *Duct-in-Duct Configuration – **This is the preferred duct***

23 31 13.19 Metal Duct Fittings

- *Factory installed, Flanged and bolted, NO slip connections.*
- ***Provide TDC/TDF joints with bolted flange on all factory fabricated ductwork***

23 31 16 Nonmetal Ducts

- *Limited to 6' or less on discharge of terminal devices.*
- *Interior liner and exterior insulation individually banded to hard duct.*

23 32 00 Air Plenums and Chases

23 33 00 Air Duct Accessories

23 33 13 Dampers

23 33 13.13 Volume-Control Dampers

- *Ruskin*

23 33 13.16 Fire Dampers

23 33 13.19 Smoke-Control Dampers

23 33 13.23 Backdraft Dampers

- *Actuated dampers only, no gravity.*

23 33 19 Duct Silencers

23 33 23 Turning Vanes

- *Airfoil vanes only*

23 33 33 Duct-Mounting Access Doors

- Ductmate/ductmate style – non hinge -

23 33 38 Duct Security Bars

23 33 46 Flexible Ducts

- *Limited to 6' or less on discharge of terminal devices.*
- *Interior liner and exterior insulation individually banded to hard duct.*

23 33 53 Duct Liners

- *No exposed duct liners*

23 34 00 HVAC Fans

23 35 00 Special Exhaust Systems

23 35 16 Engine Exhaust Systems

- *Low sound silencers*

23 36 00 Air Terminal Units

23 36 13 Constant-Air-Volume Units

23 36 16 Variable-Air-Volume Units

- *Titus, Nailor, non-fan powered, hydronic re-heat all boxes.*
- ***Provide pressure independent controls***

23 37 00 Air Outlets and Inlets

23 37 13 Diffusers, Registers, and Grilles

- *Titus - Coanda*

23 37 13.43 Security Registers and Grilles

23 37 23.13 HVAC Gravity Dome Ventilators

- *Actuated dampers only, no gravity.*

23 37 23.16 HVAC Gravity Louvered-Penthouse Ventilators

- *Actuated dampers only, no gravity.*

23 37 23.19 HVAC Gravity Upblast Ventilators

- *Actuated dampers only, no gravity.*

23 38 00 Ventilation Hoods

23 40 00 HVAC Air Cleaning Devices

23 43 00 Electronic Air Cleaners

23 50 00 Central Heating Equipment
23 51 00 Breechings, Chimneys, and Stacks

23 52 00 Heating Boilers
23 52 16 Condensing Boilers
23 52 16.13 Stainless-Steel Condensing Boilers
- *Fulton*

23 53 00 Heating Boiler Feedwater Equipment
23 54 00 Furnaces
23 55 00 Fuel-Fired Heaters
23 56 00 Solar Energy Heating Equipment

23 57 00 Heat Exchangers for HVAC
23 57 19.13 Plate-Type, Liquid-to-Liquid Heat Exchangers
23 57 19.16 Shell-Type, Liquid-to-Liquid Heat Exchangers

23 60 00 Central Cooling Equipment

23 61 00 Refrigerant Compressors
23 61 13 Centrifugal Refrigerant Compressors
23 61 13.13 Non-Condensable Gas Purge Equipment
23 61 16 Reciprocating Refrigerant Compressors
23 61 19 Scroll Refrigerant Compressors
23 61 23 Rotary-Screw Refrigerant Compressors

23 62 00 Packaged Compressor and Condenser Units
23 62 13 Packaged Air-Cooled Refrigerant Compressor and Condenser Units
23 62 23 Packaged Water-Cooled Refrigerant Compressor and Condenser Units
23 62 46 Packaged Variable-Refrigerant-Flow Air-Conditioning Systems

23 63 00 Refrigerant Condensers
23 63 13 Air-Cooled Refrigerant Condensers
23 63 23 Water-Cooled Refrigerant Condensers
23 63 33 Evaporative Refrigerant Condensers

23 64 00 Packaged Water Chillers
23 64 16 Centrifugal Water Chillers
- *See CT building –(high efficiency at lower loads)*

23 64 16.16 Water-Cooled Centrifugal Water Chillers
23 64 26 Rotary-Screw Water Chillers
23 64 26.16 Water-Cooled, Rotary-Screw Water Chillers

23 65 00 Cooling Towers
23 65 14 Induced-Draft Cooling Towers
- *BAC only*

23 65 14.14 Open-Circuit, Induced-Draft Crossflow Cooling Towers

23 70 00 Central HVAC Equipment

23 71 00 Thermal Storage

23 71 19 Ice Storage
- *BAC only*

23 71 19.16 External Ice-on-Coil Thermal Storage

23 72 00 Air-to-Air Energy Recovery Equipment

23 72 13 Heat-Wheel Air-to-Air Energy-Recovery Equipment
23 72 16 Heat-Pipe Air-to-Air Energy-Recovery Equipment

23 73 00 Indoor Central-Station Air-Handling Units

23 73 13 Modular Indoor Central-Station Air-Handling Units
23 73 23 Custom Indoor Central-Station Air-Handling Units
23 73 33 Indoor Indirect Fuel-Fired Heating and Ventilating Units
  23 73 33.13 Indoor Indirect Oil-Fired Heating and Ventilating Units
  23 73 33.16 Indoor Indirect Gas-Fired Heating and Ventilating Units
23 73 39 Indoor, Direct Gas-Fired Heating and Ventilating Units

23 74 00 Packaged Outdoor HVAC Equipment

23 74 13 Packaged, Outdoor, Central-Station Air-Handling Units
23 74 16 Packaged Rooftop Air-Conditioning Units
  23 74 16.11 Packaged, Small-Capacity, Rooftop Air-Conditioning Units
  23 74 16.12 Packaged, Intermediate-Capacity, Rooftop Air-Conditioning Units
  23 74 16.13 Packaged, Large-Capacity, Rooftop Air-Conditioning Units
23 74 23 Packaged, Outdoor, Heating-Only Makeup-Air Units
  23 74 23.13 Packaged, Direct-Fired, Outdoor, Heating-Only Makeup-Air Units
  23 74 23.16 Packaged, Indirect-Fired, Outdoor, Heating-Only Makeup-Air Units
23 74 33 Dedicated Outdoor-Air Units

23 75 00 Custom-Packaged Outdoor HVAC Equipment

23 75 13 Custom-Packaged, Outdoor, Central-Station Air-Handling Units
23 75 16 Custom-Packaged, Rooftop Air-Conditioning Units
23 75 23 Custom-Packaged, Outdoor, Heating and Ventilating Makeup-Air Units
23 75 33 Custom-Packaged, Outdoor, Heating and Cooling Makeup Air-Conditioners

23 76 00 Evaporative Air-Cooling Equipment

23 80 00 Decentralized HVAC Equipment

23 81 00 Decentralized Unitary HVAC Equipment

23 81 13 Packaged Terminal Air-Conditioners
  23 81 13.11 Packaged Terminal Air-Conditioners, Through-Wall Units
  23 81 13.12 Packaged Terminal Air-Conditioners, Freestanding Units
  23 81 13.13 Packaged Terminal Air-Conditioners, Outdoor, Wall-Mounted Units
23 81 16 Room Air-Conditioners
23 81 19 Self-Contained Air-Conditioners
  23 81 19.13 Small-Capacity Self-Contained Air-Conditioners

23 81 19.16 Large-Capacity Self-Contained Air-Conditioners
23 81 23 Computer-Room Air-Conditioners
23 81 23.11 Small-Capacity, Computer-Room Air-Conditioners, Floor Mounted Units
23 81 23.12 Large-Capacity, Computer-Room Air-Conditioners, Floor-Mounted Units
23 81 23.13 Computer-Room Air-Conditioners, Ceiling Mounted Units
23 81 23.14 Computer-Room Air-Conditioners, Console Units
23 81 23.16 Computer-Room Air-Conditioners, Rack Mounted, Space-Cooling Units
23 81 23.18 Computer-Room, Rack-Cooling Equipment
23 81 26 Split-System Air-Conditioners
23 81 26.13 Small-Capacity Split-System Air-Conditioners
23 81 26.16 Large-Capacity Split-System Air-Conditioners
23 81 29 Variable Refrigerant Flow HVAC Systems
23 81 43 Air-Source Unitary Heat Pumps
23 81 46 Water-Source Unitary Heat Pumps
23 81 49 Ground-Source Unitary Heat Pumps

23 82 00 Convection Heating and Cooling Units
23 82 19 Fan Coil Units
23 82 26 Induction Units
23 82 29 Radiators
23 82 33 Convectors
23 82 36 Finned-Tube Radiation Heaters
23 82 39 Unit Heaters
23 82 39.13 Cabinet Unit Heaters
23 82 39.16 Propeller Unit Heaters
23 82 39.19 Wall and Ceiling Unit Heaters
23 82 41 Water-to-Water Heat Pumps

23 83 00 Radiant Heating Units

23 84 00 Humidity Control Equipment
23 84 19 Desiccant Dehumidification Units

25 00 00 Integrated Automation (reserved)

26 00 00 Electrical Standards
26 01 00 Operation and Maintenance of Electrical Systems
26 01 20 Operation and Maintenance of Low-Voltage Electrical Distribution
26 01 26 Maintenance Testing of Electrical Systems
26 01 30 Operation & Maintenance of Facility Electrical Power Generating & Storing Equipment
26 01 40 Operation and Maintenance of Electrical Protection Systems
26 01 40.13 Operation and Maintenance of Lightning Protection Systems
26 01 50 Operation and Maintenance of Lighting
26 01 50.51 Luminaire Relamping
26 01 50.81 Luminaire Replacement

26 05 00 Common Work Results for Electrical

26 05 05 Selective Demolition for Electrical
26 05 19 Low-Voltage Electrical Power Conductors and Cables
- *Copper – no Aluminum*
- *No taps/splices – all homeruns*

26 05 19.13 Undercarpet Electrical Power Cables
26 05 19.23 Manufactured Wiring Assemblies
26 05 23 Control-Voltage Electrical Power Cables
26 05 26 Grounding and Bonding for Electrical Systems
- *Building steel is not a path to ground*
- *All buses, copper or other, (e,g, used for IT) etc. shall have grounds running from the bus bar or other grounding connection point to the building ground in the building's electrical room.*

26 05 29 Hangers and Supports for Electrical Systems
- *In general: trapeze for conduit*

26 05 33 Raceway and Boxes for Electrical Systems
- *All steel*
- *No wireways*
- *Busways and ?????OK with approval.*

26 05 33.13 Conduit for Electrical Systems
- *Service entrance to panels – threaded IMC*
- *Panels to classroom/office/room interiors (generally to center of space) EMT with compression fittings only*
- *No quick connect*
- *¾ inch minimum*

26 05 33.16 Boxes for Electrical Systems
- *Steel*

26 05 33.23 Surface raceways for Electrical Systems
- *Wiremold*

26 05 36 Cable Trays for Electrical Systems
26 05 39 Underfloor Raceways for Electrical Systems
26 05 43 Underground Ducts and Raceways for Electrical Systems
26 05 44 Sleeves and Sleeve Seals for Electrical Raceways and Cabling
26 05 46 Poles for Electrical Systems
26 05 48 Vibration and Seismic Controls for Electrical Systems
26 05 48.16 Seismic Controls for Electrical Systems
26 05 53 Identification for Electrical Systems
- *Phenolic style with engraved name with rivet of SS screw attachment. Adhesive only when rigid not physically capable of application or desired to use*

26 05 73 Power System Studies
26 05 73.13 Short-Circuit Studies
- *Required*

26 05 73.16 Coordination Studies
- Required

26 05 73.19 Arc-Flash Hazard Analysis
- *Required*

26 05 73.23 Load Flow Studies
26 05 73.26 Stability Studies
26 05 73.29 Harmonic-Analysis Studies
26 05 76 Photometric Studies

26 05 83 Wiring Connections

26 06 00 Schedules for Electrical
26 06 20 Schedules for Low-Voltage Electrical Distribution
- 26 06 20.13 Electrical Switchboard Schedule
- 26 06 20.16 Electrical Panelboard Schedule
- 26 06 20.19 Electrical Motor-Control Center Schedule
- 26 06 20.23 Electrical Circuit Schedule
- 26 06 20.26 Wiring Device Schedule

26 06 30 Schedules for Facility Electrical Power Generating and Storing Equipment
26 06 40 Schedules for Electrical Protection Systems
26 06 50 Schedules for Lighting
- 26 06 50.13 Lighting Panelboard Schedule
- 26 06 50.16 Lighting Fixture Schedule

26 08 00 Commissioning of Electrical Systems

26 09 00 Instrumentation and Control for Electrical Systems
26 09 13 Electrical Power Monitoring
- *At service entrance and additional as required*

26 09 15 Peak Load Controllers
26 09 16 Electrical Controls and Relays
26 09 19 Enclosed Contactors
26 09 23 Lighting Control Devices
26 09 26 Lighting Control Panelboards
- *Main breaker*
- *20A min circuit brkr*
- *Bolt on Circuit brkr*
- *Circuit brkr AIC match main (fully rated)*

26 09 33.13 Multichannel Remote-Controlled Dimmers
- *In general we avoid complex lighting control (digital)*

26 09 33.16 Remote-Controlled Dimming Stations
26 09 36 Modular Dimming Controls
- 26 09 36.13 Manual Modular Dimming Controls
- 26 09 43.13 Digital-Network Lighting Controls
  - *Existing BAS system*
- 26 09 43.16 Addressable Luminaire Lighting Controls
  - *Try to avoid*
- 26 09 43.19 Wireless Network Lighting Controls
  - *Try to avoid*
- 26 09 43.23 Relay-Based Lighting Controls

26 09 61 Theatrical Lighting Controls

26 20 00 Low-Voltage Electrical Distribution

26 21 00 Low-Voltage Electrical Service Entrance
26 21 16 Low-Voltage Underground Electrical Service Entrance
- *Spares are preferred*

26 22 00 Low-Voltage Transformers
26 22 13 Low-Voltage Distribution Transformers
- *K=All copper*
- *Meet DOE 2016 standard*
- *85° C temp rise*

26 23 00 Low-Voltage Switchgear
26 23 13 Paralleling Low-Voltage Switchgear

26 24 00 Switchboards and Panelboards
26 24 13 Switchboards
- *Eaton*
- *Square D*
- *Include metering*
- *Probably 2 -3 MDP blanks*

26 24 16 Panelboards
- *Same as Service Entrance*

26 24 16.16 Electronically Operated Circuit-Breaker Panelboards
26 24 19 Motor-Control Centers

26 25 00 Low-Voltage Enclosed Bus Assemblies
26 25 13 Low-Voltage Busways

26 27 00 Low-Voltage Distribution Equipment
26 27 13 Electricity Metering
- *BacNet*

26 27 16 Electrical Cabinets and Enclosures
26 27 19 Multi-Outlet Assemblies
26 27 23 Indoor Service Poles
26 27 26 Wiring Devices
26 27 33 Power Distribution Units
26 27 73 Door Chimes

26 28 00 Low-Voltage Circuit Protective Devices
26 28 13 Fuses
26 28 16 Enclosed Switches and Circuit Breakers
26 28 16.13 Enclosed Circuit Breakers
- *Match manufacturer*

26 28 16.16 Enclosed Switches

26 29 00 Low-Voltage Controllers
26 29 13 Enclosed Controllers
26 29 13.13 Across-the-Line Motor Controllers
- *See College's electronic motor starter list*

26 29 13.16 Reduced-Voltage Motor Controllers
26 29 23 Variable-Frequency Motor Controllers
- *ABB ACH 550*

26 29 33 Controllers for Fire Pump Drivers
26 29 33.13 Full-Service Controllers for Fire Pump Electric-Motor Drivers

26 29 33.16 Limited-Service Controllers for Fire Pump Electric-Motor Drivers
26 29 33.19 Controllers for Fire Pump Diesel Engine Drivers

26 30 00 Facility Electrical Power Generating and Storing Equipment

26 31 00 Photovoltaic Collectors

26 32 00 Packaged Generator Assemblies
26 32 13 Engine Generators
- *PEPCO provides 460V service – not 480V*

26 32 13.13 Diesel-Engine-Driven Generator Sets
- *MTU - Baltimore*

26 32 23.13 Horizontal-Axis Wind Turbines
26 32 23.16 Vertical-Axis Wind Turbines

26 33 00 Battery Equipment
26 33 23.13 Central Battery Equipment for Emergency Lighting
- *Myers Power Products- Pennsylvania*

26 36 00 Transfer Switches
26 36 23 Automatic Transfer Switches
- *Four wire*

26 40 00 Electrical Protection

26 41 00 Facility Lightning Protection
- *Master Label Certification*
- *Aluminum air terminal is OK if flashing is Aluminum. However, the roof loop should be copper with copper downleads concealed within the building*

26 41 13 Lightning Protection for Structures
26 41 13.13 Lightning Protection for Buildings

26 43 00 Surge Protective Devices
26 43 13 Surge Protective Devices for Low-Voltage Electrical Power Circuits

26 50 00 Lighting

26 51 00 Interior Lighting
26 51 19 LED Interior Lighting
- *Blackbody temp = 3500° K*
- *See Colleges list of approved/suggested fixtures*
- *Point by Point required for typical classrooms, offices and untypical spaces.*
- *Built-in dimming*
- *In general – no cans – if cans, then no smaller than eight inches in diameter*
- *Cans not used for general lighting in an area*
- *No direct view LEDs anywhere – interior/exterior*
- *Occupancy sensors – no vacancy sensor mode*
- *No building wide central lighting control/monitoring*
- *Dual technology OS – infra-red/ultrasonic*

- *Local office/classroom control – Wattstopper*

26 52 00 Safety Lighting

26 52 13 Emergency and Exit Lighting

26 52 13.13 Emergency Lighting

- *No battery – all on generator*

26 52 13.16 Exit Signs

- *See College's list of approved fixtures*

26 55 00 Special Purpose Lighting

26 55 53 Security Lighting

- *White security lighting in the hallway – stairway, etc., lighting always on – no OS control on these.*
- *Exit egress lighting on building's emergency photo cell*

26 56 00 Exterior Lighting

26 56 13 Lighting Poles and Standards

- *Powder coated*

26 56 19 LED Exterior Lighting

- *Manufacturers: KIM for parking lots –AAL for interior/campus lighting – see College standards-both are Hubbell companies. We have standard fixtures for these applications*
- *No direct view LEDs*
- *Blackbody temp = 4000° K*

27 00 00 Communications (reserved)
28 00 00 Electronic Safety and Security (reserved)
31 00 00 Earthwork (reserved)
32 00 00 Exterior Improvements (reserved)
33 00 00 Utilities (reserved)

6.2 Technical Standards

075200 – Low Slope Roofing
275100 – Distributed Audio-Visual Communication – Emergency Call Box
281300 – Access Control
282300 – Video Surveillance
283111 – Addressable Fire Detection & Alarm System