Division 01: General Requirements

The following are special provisions to acquaint the A/E and General Contractors with requirements specific to working at Old Dominion University. The A/E is responsible for incorporating these requirements noted herein into the contract documents as applicable.

01.1. Definitions
   a. General Contractor refers to both the Construction Manager at Risk and the prime general contractor for bid projects.

01.2. Summary of the Work
   a. The A/E shall provide a written “Summary of the Work” section within the specifications. In FM projects, where specifications may be included on the drawings a written “Summary of Work” shall also be provided. The Summary of Work shall indicate the following:
      i. General description of all work including exterior work required for each trade. Provide a brief, but complete description to indicate the full scope of work for each contract. The proposed use for the building should be explained. Concurrent occupancy of adjacent buildings, or parts of a renovated building should be noted. Specific details and requirements for the project should be noted here. Individual specifications’ work scope must be coordinated with this overall summary.
      ii. Provide a list of separate contracts, if any, which are involved in the project.
      iii. Identify any additional work outside the scope of the General Contract that will be performed concurrently with the project, by other contractors or the University, advise the contractors that coordination and cooperation with this work will be required.
      iv. Identify University furnished items and any related work required of the general contractor.
      v. Identify items to be salvaged or removed from existing structures by the University, and items to be salvaged by the Contractor then turned over to the University. Identify these items on the drawings as appropriate. Indicate where salvaged materials are to be delivered to.
      vi. Project conditions such as occupation of buildings, limited scheduling for utility connections, and special events of the University must be defined.
      vii. When directed by the ODU Project Manager, the summary of work shall include specific language identifying the project schedule including the substantial and final completions dates.

01.3. Work by the University
   a. Work by University may include, but not necessarily be limited to, the following:
      i. Data and Communications infrastructure and cabling. See APPENDIX S – TELECOMMUNICATIONS PATHWAYS AND SPACES
      ii. Install, terminate (at user and in telecom closet) and test all Category Cabling throughout the building. (twisted Pair Cat6)
      iii. Install access control cable.
      iv. Install Copper Backbone to adjacent building.
      v. Install Copper Riser to join multiple closets.
      vi. Terminate and test all Copper Riser and Backbone Cabling.
      vii. Install and ground lightning protection for Copper Backbone
      viii. Provide and install dial tone for Elevator phones. (final connection to elevator equipment is performed by the general contractor)
      ix. Install Fiber Optic Backbone (Single Mode and Multi-mode) – diverse paths out of the building.
x. Install Fiber Optic Riser cabling to join multiple closets.
xii. Terminate and test all Fiber Riser and Backbone.
xiiii. Install Telecommunications Racks
xivi. Install all rack hardware, to include patch panels and Fiber housing systems.
xv. Install cable tray inside Telecommunications Room.
xvi. Ground communications cable tray and racks inside Telecom Room.
xvii. Provide Telecom room layout and power specs.
xviii. Install cable TV system.
xx. Install VOIP gateway system.
xxi. Install security cameras
xxii. Install Wireless access points.
xviii. Provide drops cables for PC connections.
b. Work by Owner shall be confirmed, on a project by project basis, with the ODU Project Manager.

01.4. Standard Work Hours

a. Standard work hours are as follows:
   Monday – Friday: 7:00 AM to 5:00 PM
   Weekends and Holidays: 8:00 AM to 5:00 PM

b. Contractors, on a case-by-case basis, may schedule work either earlier or later than the listed times to accommodate material delivery or to avoid disruption to normal university operations. Such times must be approved by the ODU Project Manager/Project Inspector and shall be communicated no less than 48 hours in advance.

c. Special Work hours should be considered during estimating, as some projects may require construction at times other than the standard hours noted above.

d. Official ODU observed holidays can be found on the ODU website.

01.5. No-Work Days

a. There are times during the academic year that noisy, disruptive construction work should cease because of the potential negative impact to students and/or faculty. The following days shall be incorporated into the construction schedule and reviewed with the ODU Project Manager on a project by project basis.
   • Residence Hall Move-in Days
   • Reading Days
   • Exams Days
   • Commencement
   • Athletic Events
   • ODU Closure for Weather Related Events

b. The academic calendar is available on the ODU website. Coordinate design and construction schedules, up front, with the academic calendar.

c. Work done in existing buildings shall require careful coordination of work hours so as not to disrupt ongoing classes, research or office operations. Work adjacent to residence halls may require an adjustment to the standard work hours. Coordinate any changes to the construction work hours with the ODU Project Manager.
d. The ODU Project Manager is responsible for communicating and coordinating any disruptive activities on campus with the Assistant Directors (3) in Facilities Management.

01.6. Coordination work that impacts University Operations

a. Traffic flow shall be maintained at all times. If traffic flow must be interrupted, the contractor will notify the ODU Project Manager and the university fourteen (14) days prior to the disruption. This includes, but is not limited to, pavement repair and/or deliveries. The contractor will be required to provide a traffic control and pedestrian safety plan. The plan shall be coordinated with the City of Norfolk when blocking access to a public street or city right of way. The contractor is responsible for obtaining the necessary permits from the City of Norfolk. Deliveries to the construction site should be avoided during home football games, residence hall move in and move out days or university graduations.

b. The ODU Project Manager shall ensure that disruptive activities are posted in the University Announcements at least 48 hours in advance.

c. The ODU Project Manager shall keep the Director of Transportation and Parking up to date on the timing of lot / street or other closures and/or disruptions that may impact the student faculty and staff including impacts to the shuttle bus. Street debris including mud and spillage caused by the work shall be removed immediately. Failure to clean public and University streets and/or rights of way may result in the University performing the work and back charging the contractor.

d. Repair of damaged streets, roads, or other facilities shall be the responsibility of the General Contractor, at no expense to the University. Work shall be performed to the satisfaction of the University and the City of Norfolk, as applicable.

e. Washout of concrete equipment or contamination by any construction products anywhere on University property is strictly prohibited.

i. The same requirement is expected during design phases where the A/E intends to do any site or existing building investigative work.

01.7. Emergency Contact Information

a. The Contractor and the ODU PM shall compile a comprehensive list of management personnel assigned to the project from the Contractor and the A/E. The list shall also include contact information for ODU Public Safety, Fire, Facilities Management and any other key personnel. The appropriate 24-hour emergency point of contact shall be provided for each entity.

01.8. Safety & Security

a. Jobsite Safety & Security is the contractor’s responsibility. The Contractor shall provide written project specific safety & security protocols to the project to the ODU Project Manager for review and approval. The approved safety and security plan shall be presented at the construction kick off meeting.

b. Entrances and exits for the public must be maintained during periods of joint occupancy.

c. Keys or key cards may be provided to the General Contractor by the University for renovation projects. The General Contractor shall be responsible for coordination of access by all trades, and shall return the keys upon completion. See Appendix AD – Contractor Key Request for additional information.

d. The general contractor is responsible for confirming his and his subcontractor’s personnel are wearing the appropriate safety gear including, but not limited to, hard hats, safety glasses, appropriate footwear, safety vests, etc.

01.9. Worker Behavior and Decorum

a. Contractor’s personnel shall refrain from contact with students, faculty and staff other than as necessary for the execution of their contract responsibilities. Specifically banned is contact in the form of
harassment, whistles, cat-calls, comments gestures or any form of uninvited communication. Any breach of this policy will result in immediate and permanent removal of the offender from the project site.

b. Contractor is responsible for ensuring all workers, whether a subcontractor, vendor, or contractors staff, are dresses appropriately. Offensive slogans or words on any portion of a workers attire, at the university’s sole discretion, will not be allowed and will result in immediate and permanent removal of the offender from the project site.

c. The Contractor is responsible for communicating to workers that the appropriate safety gear is worn while on the job site, including, but not limited to hard hats, safety glasses and safety vests. Individual workers are responsible for their own personal safety gear. The contractor shall document each instance of failure to wear appropriate gear while on the job site and shall establish, at the project’s inception, the number of offenses allowed prior to the immediate and permanent removal of the offender from the project site.

01.10. Contractor Parking

a. Refer to the ODU PARKING AND TRANSPORTATION website for Vendor and Contractor parking permit requirements. The A/E and the Contractor are responsible for providing parking for their personnel. Any costs associated with parking off site shall be anticipated and included in cost estimates as well as final bid numbers. Parking is not allowed on grassed/planted areas or on sidewalks. Vehicles shall not block any means of access or egress. Vehicles shall not block fire truck access to any buildings on campus.

01.11. The ODU Project Manager shall coordinate with the Director of Transportation and Parking, the date when onsite parking spaces become the university’s to control and subject to ticketing.

01.12. Staging Plan

a. Staging Plans are required for all projects, whether large Capital projects or small Non-Capital renovation projects. For smaller non-capital projects key factors are contractor parking and identifying construction entrances, and a construction delivery plan.

b. Contractor shall submit to the ODU Project Manager a written and graphic plan for staging of demolition work, staging of work, layout and location of material staging areas, and the location of dust prevention partitions within seven (7) calendar days from the Notice to Proceed date. The Plan shall be reviewed, revised as required and approved by the ODU Project Manager prior to initiation of work at site. The ODU Project Manager will share the staging plan with the Director of Facilities Management.

d. The staging plan shall include indications of what parking, if any, will be within the project’s construction fencing. Vehicles parked within the construction fence do not require a campus parking permit.

e. The staging plan shall indicate the location of construction dumpsters, construction trailers, lay down space, materials storage and any other pertinent activities. Staging and lay-down areas are very limited on campus and if additional space is required beyond the construction limits, then the impact of this should be considered in the schedule and cost estimating.

f. Indicate the location of temporary sanitary facilities on the staging plan.

g. Show the limit of the temporary construction fence and gates and construction truck entrances as appropriate.

h. The staging plan and ongoing construction activities must take into consideration pedestrian flow and vehicular traffic around the site.
vi. Identify all fire lanes for the subject property and/or building and fire lanes for adjacent buildings.
vii. Crane Plan
c. The contractor shall present the staging plan at the construction kick off meeting so that all stakeholders are made aware of the conditions.

01.13. Serve Weather Plan
a. The contractor shall provide a plan for securing the site to ODU Project Manager prior to the onset of a storm event, such as a tropical storm, hurricane, blizzard or nor’easter. The plan will be reviewed with Design & Construction at least 24 hours in advance of oncoming weather. Discuss timing and alternate plans if weather escalates or dissipates.

01.14. General Contractor’s Representative
a. The General Contractor's representative shall be present in the field office or on the building site at all times during the work.

01.15. Construction Dumpsters
a. All dumpsters used on site during construction shall have a securable cover or lid provided by the contractor. The cover/lid shall be secured (from wind and rain) at the end of each day and verified by the ODU Project Inspector.
b. Construction debris and waste shall not be dumped into ODU’s trash site.

01.16. Rain Gauge
a. The General Contractor shall provide a rain gauge secured to the construction trailer. The ODU Project Inspector shall record the rain accumulation each day on the daily report.

01.17. Field office
a. All new building construction projects shall require a job site office trailer with sufficient conference space for Owner Architect Contractor (OAC) meetings to be held at a minimum. Each contractor may provide its own field office trailer if site area permits. The General Contractor shall show the location of all trailers on the staging plan.
b. Job offices within the building may be established if the project size warrants, provided that this use does not adversely affect progress. ODU must approve use of the building for temporary office use by the contractors.
c. Refer to CPSM 7.5.17.2.2 INSPECTOR’S USE OF FACILITIES
d. Provide space for state inspectors, with desk and chair on site.
e. The use of existing bathroom facilities within renovation projects, by the contractor, shall be approved by the ODU Project Manager prior to the start of construction. The contractor shall be responsible for cleaning existing bathrooms when used by his personnel. At the conclusion of the project, the general contractor shall be responsible for returning the existing bathrooms to the condition they were found, prior to use. If the building is occupied, use of existing restroom facilities is not allowed and the contractor shall provide temporary facilities on site and shown on the staging plan.

01.18. Project Identification Sign
a. The ODU Project Manager will determine, along with the general contractor, the requirement of a project identification sign(s) at the project.
b. On renovation projects, the general contractor will post “pardon our dust” signs, refer to APPENDIX AL – CONSTRUCTION PROGRESS SIGNS.
c. A construction sign will be posted at a location to be determined by the University and shown on the site plan. The cost of mounting and disposing of the sign shall be included in the contractors general
conditions cost. Refer to APPENDIX O – CONSTRUCTION PROJECT SIGN for requirements. The Construction sign shall not be fabricated and installed without ODU Project Manager approval. No other project signage or advertising will be allowed without prior University approval.

d. The sign panels are to be fabricated from ¾” High Density Overlay Plywood. Sign graphics to be prepared on a white non-reflective vinyl film with positionable adhesive backing. Apply graphic panel to prepared HDO plywood panel following manufacturers’ instructions. Sign uprights to be structural grade 4” x 4” treated Douglas Fir or Southern Yellow Pine, No.1 or better. Attach sign panel to uprights using a minimum of six (6) .375” T-nuts. Position uprights and sign panels to allow a minimum of 4 feet clear between the grade and the bottom of the sign. Provide additional 2” x 4” struts on inside face of uprights to reinforce installation as necessary.

01.19. Materials and equipment

a. The University will not sign for, pay for, or otherwise accept materials for any contractors. All shipments are to be addressed and delivered to the project site.

b. Transportation and handling is the responsibility of the General Contractor. The General Contractor shall control deliveries to the site to avoid congestion of storage and work areas with materials which cannot be installed in a reasonable time.

c. The specifications shall identify the proper method of storage and protection of building materials and equipment and will include weather tight sheds of sufficient size to store all materials which might be damaged by the weather. All outdoor storage (when permitted by the specification) must be limited to the area within the construction fence. Small sheds shall be painted with one coat of gray paint, consistent for all sheds. Small identification signs are permitted.

d. Storage of materials within the building shall not obstruct any of the work, or entrances and exits of the building. Material storage within the building must be agreeable to the University.

e. Storage of University equipment or furnishings may be required shortly before substantial completion. The contractors shall discuss with the university and shall make available large rooms at or near grade level for this use.

f. Protection of University equipment stored on site is required of all contractors, similar to the protection afforded other contractor’s materials and equipment. This includes materials and equipment associated with data and communications installed by the University.

01.20. Temporary Construction Fence

a. The contractor shall provide a temporary fence surrounding the project site when shown on the construction documents. The fence shall include a lockable construction entrance which shall be identified with appropriate signage and shall be a minimum of 12 feet in width to allow access for emergency vehicles. 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. Two keys for any fence locks shall be provided to the Department of Design and Construction.

b. The temporary fence shall be at least 6’ feet high and shall have a privacy screen on all sides. The screen will have a minimum of 85% privacy, made of knotted HDPE UV Polyethylene fabric in blue with a minimum of a 2 year life span. The fencing shall be of galvanized 11-1/2 ga. chain-link construction with a minimum of 1-5/8” O.D. tubular steel posts and top rails.

c. Advertising signage of any kind, is prohibited on the temporary construction fence. Safety related OSHA signage and site entry rules shall be installed by the contractor as deemed appropriate.
d. The contractor shall maintain the construction site for the duration of the project including keeping plant growth around the base limited and trimmed. Construction fencing shall only be removed when directed by ODU.

e. Movable, surface mounted fence panels may be used with the approval of the University. These panels shall be adequately braced to resist wind forces and shall be secured to prevent public access.

f. Plywood barriers may be needed for closed sidewalks adjacent to construction sites.

01.21. Interior Temporary Partitions and Barriers

a. Interior temporary partitions are to be specified as part of the design documents and shall comply with the building code requirements for the construction type and occupancy of the existing building. The contractor shall provide spare keys for any temporary locks to the ODU Project Manager in case emergency access is required.

b. No work shall take place which obstructs the buildings means of egress without first coordinating with Office of Fire Safety. All attempts must be made to add additional temporary partitions and doors that will redirect exit access travel from a blocked exit to avoid creating dead-end conditions. Refer to the CPSM for additional requirements and approval process.

01.22. Temporary Scaffolding and Platforms

a. All scaffolding must have protection to prevent unauthorized access, such as a lockable plywood surround.

01.23. Permits and Shutdowns

a. The General Contractor shall identify to the ODU Project Manager all shutdowns anticipated for the project within 7 days of the Notice to Proceed.

b. Seventy-two (72) hours, excluding weekends, prior to any utility, communication device(s) or HVAC system cut-off, to all or any portion of the project site(s), adjacent university sites, or private properties required by the progress of the Work, the Contractor shall notify the ODU Project Manager in writing of such cut-off or interruption. The notification shall include, but not be limited to, service(s) to be cut-off, the date and time of the cut-off and the anticipated duration of the cut-off.

01.24. Hot Work Permit

a. Hot work permits are required for operations involving open flames or producing heat and/or sparks. This includes, but is not limited to: brazing, cutting, grinding, soldering, thawing pipe, torch-applied roofing, and cadwelding. A hot work permit is valid for only one day. A permit, submitted at least 24 hours prior to the start of the work, must be completed and posted for the duration of all hot work. For safety questions regarding Hot Work Permits, contact the office of Fire Safety at 757-683-5166.

https://www.odu.edu/content/dam/odu/offices/emmgmt/docs/fire/hot-work-permit.pdf

https://www.odu.edu/content/dam/odu/offices/emmgmt/docs/fire/hot-work-safety-guide.pdf

01.25. Fire Protection System Shut Downs

a. Any shut down or disruption of a fire suppression, fire alarm, and other fire protection system shall be coordinated with ODU’s Office of Fire Safety and the ODU Project Manager and/or the ODU Project Inspector. A minimum of 7 days advance notification of shut down or disruption is required, along with provision of a fire watch provided by the contractor requesting the outage.

01.26. Electrical Shutdowns

a. Notify and coordinate all electrical system shut downs with the ODU Project Manager and Assistant Director of Facility Operations And Maintenance. A minimum of 72 hours advance notice is required.
for any shut down and critical systems may require provision of alternate or temporary power.
Sensitive areas, such as research, may require additional time to prepare for a shutdown, coordinate
with the ODU Project Manager. It is the A/E’s responsibility to identify critical systems during early
design phases to determine what shut down requirements are necessary and to include these
requirements in the construction documents.

01.27. Temporary Use of Installed HVAC Equipment
a. The contractor shall obtain prior approval from ODU, the CxA and the A/E to use newly installed or
existing HVAC equipment during any drywall, demolition or other similar operations. The contractor
shall compile a detailed Temporary Operating and Conditioning Plan provided by all subcontractors
involved. The plan shall consider how the ducts and equipment will be maintained, cleaned, filters
changed and placed in service (warranty commencement) for review and approval. In general ODU
discourages the use of HVAC equipment for dust control during construction.

01.28. Commissioning
a. Capital Projects shall all receive fundamental commissioning at a minimum.
b. Non-Capital projects shall receive commissioning as determined by Assistant Director of Engineering.
The A/E on Non-Capital HVAC replacement projects should discuss the level of commissioning required
with the ODU Project manager and specify same in the construction documents.
c. Fundamental commissioning is a requirement of LEED and CPSM 6.1.3 High Performance Buildings
Act. ODU shall procure the services of an independent commissioning agent on all projects receiving
commissioning, whether fundamental or enhanced as defined by LEED. ODU will procure the
independent commissioning agent contract through the utilization of the state wide open end contract
for commissioning services administered by the Department of General Services, Division of
Engineering and Buildings. ODU will determine which projects are to receive enhanced
commissioning, based on the technical nature of the HVAC systems.
d. The Contract Documents shall require the General Contractor and all subcontractors to cooperate,
provide labor, materials, supplies and information where required to facilitate 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.
e. The A/E and ODU Project Manager shall coordinate participation by Facilities Management in the
commissioning process and review in detail the TABS and commissioning reports.

01.29. Tree Protection
a. Refer to DIVISION 31 – EARTHWORK for Tree Protection requirements.

01.30. Protecting Installed Construction
a. Roof Protection – Before working on 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. See
DIVISION 7 – THERMAL AND MOISTURE PROTECTION

7.03 reparation for low Slope Re-Roofing for additional requirements.

b. The contractor shall protect all utilities and structures installed in this contract whether by them or other contracts from construction operations at all times during the work. Protection of stormwater pipes and structures must comply with the Annual Standards and Specifications for Erosion and Sediment Control, found in the appendix. Means and methods of protection shall be submitted to the A/E for review and approval prior to work being performed.

c. The University will have the right to access the work for post installation testing of roofs, utilities and structures or any other installed systems for construction damage, forwarding the findings to the A/E for development of strategies for correction by the contractor.

01.31. Additives Bid Items (Alternates)

a. Refer to the CPSM 5.10 ADDITIVE BID ITEMS. The use of additive bid items shall be carefully considered before inclusion in the bid documents. All additive bid items must be approved by ODU leadership.

01.32. Unit Prices

a. Refer to CPSM 6.0.7 UNIT PRICES. Unit prices used as part of the bid documents shall include, but are not limited to:
   i. Removal of unsatisfactory soil and replacement with compacted satisfactory borrow soil material.
   ii. Removal of unsatisfactory soil and replacement with compacted imported structural fill material.

b. Schedule of Unit Prices must be approved by the ODU Project Manager.

c. Bid documents shall indicate quantities for the basis of bids.

01.33. Allowances

a. If allowances are carried in the estimates at schematic design and/or preliminary design, they cannot exceed $50,000 in total per the CPSM.

01.34. Submittals

a. Refer to APPENDIX S – OWNER CONSTRUCTION SUBMITTAL REVIEW for a list of submittals/shop drawings the University expects to review prior to submittal approval. The general contractor shall develop the procurement schedule to include University review of the designated submittals as noted in the appendix. The University shall be allocated 2 weeks for review of submittals concurrent with review by the A/E. The university will provide their review comments to the A/E for inclusion in the official review comments by the A/E. On board review of submittals such as hardware is an acceptable method to advance the review process, but attendance by the appropriate parties is a contingency of that review and approval.

01.35. Project Inspectors (PI)

a. The role of the PI is defined in the CPSM. Additionally the PI’s will verify underground utilities are being shown on the contractor’s as built each month prior to acceptance of the monthly pay application. Documenting the specific location and type of all underground activity is vital information to the University for future projects and work. It is the Contractor’s responsibility to carefully document, with measurements, the actual location of the utilities, during their installation. Photographs showing the utilities with files named to indicate the location would be invaluable information. The Civil engineer, who will produce record drawings from the contractor’s as built, should make themselves aware of the progress of the marked up as built; waiting until the end of the project to review will leave some information can be lost or forgotten.
b. If the General Contractor or a subcontractor needs a specific inspection performed by the PI, at least 24 hours advance notice to the Project Inspector shall be made. It is preferable that the request be made 48 hours in advance. Requests for inspections should use APPENDIX AN – PROJECT INSPECTION REQUEST FORM.

01.36. Exterior Mock Ups

a. Initial brick panel mock ups, used specifically for final selection of brick and mortar can be used, prior to construction of the full integrated mock up.

b. The final selected and proposed bricks, mortar, masonry/steel stud backup, mortar net, wall ties, insulation and limestone/precast stone trim, flashing including termination bars and drip edges, etc., applicable to the project shall be constructed in a fully integrated mock up. This mock up is separate from the sample panel/s and is to be used to set standards for quality, along with final confirmation of exterior materials selection.

i. The extent, materials and details of the project mock up panels shall be shown in the Preliminary Design Submittal by the A/E.

ii. Cost for the construction of the mock up shall be included as a line item in the schematic design estimate and updated through all subsequent estimates.

iii. The Architect of Record and the University shall review and approve the mock up wall panel for workmanship and conformance to the construction documents, prior to the materials order by the contractor. The Architect of Record shall advise the University prior to approving or not approving a mockup and prior to notifying the Contractor. Final approval shall be by the University.

iv. The intent of the integrated mock ups are to obtain University Leadership, University Architect and A/E’s approval of appearance and construction methodology prior to material ordering and production. To be acceptable, work must match approved mock ups. Confirm construction sequence, details, compatibility, means, methods, and techniques.

v. Test mock ups as specified for water infiltration.

c. Architectural cast-in-place concrete shall be included as part of the exterior mock-up for inspection and approval by the University. The mock-up will include a minimum of a 4’ x 8’ area. The mock-up shall establish an acceptable standard of workmanship and quality concerning concrete finishing, texture of formed material, etc. The concrete used in the mock-up shall be furnished by the project concrete supplier, and shall represent the approved mix for strength and texture. The sample panel shall be protected from construction operations, but shall be exposed to the elements.

d. Roofing systems shall be included in the construction Mock-Up for each project. The Mock-up shall be built before proceeding with final purchase of materials and fabrication of roofing components. Provide mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and color. Incorporate materials and methods of fabrication and installation identical with project requirements. Retain accepted mock-up as quality standard for acceptance of completed roofing.

e. Mock Ups should be constructed of actual materials to be used in the Project including actual finishes and colors. The exterior mock up is intended both to provide final material approval, but also as a “peel away” mock up to examine building envelop system construction.

f. The location of the mock ups shall be preapproved by the University and A/E and shall consider the solar orientation.
g. The General Contractor shall hold a Pre Mock Up meeting with the ODU project Manager, the A/E and all installers to review contract requirements, expectations, and acceptance criteria prior to construction of each mock up.

h. Installers shall be the same workers to be employed for the actual construction and production work during the remaining Contract.

i. Mock Ups can be rejected for appearance and/or construction. Remove and replace rejected mock ups at no additional cost to the Owner until an acceptable mock up is constructed.

j. The A/E shall provide drawings defining and detailing the mock up as part of the working drawings. The intent and scope of the mock up shall be discussed early in the project and associated costs included in the construction estimates.

k. Exterior Skin Mock Up shall include the following, as a minimum:
   i. Each exterior skin material.
   ii. Windows/storefront/glazed curtain walls including frames and each glass type.
   iii. Flashings including drips and weep holes.
   iv. Joint sealants.
   v. Water, air, vapor and thermal barrier systems, including insulation.
   vi. Roof construction
   vii. Roof edges, fascias, soffits, cornices.
   viii. Sun shades, sun screens.

01.37. Interior Mock Ups

a. The A/E shall discuss with the planning committee any requirements for mock ups specific to the project such as typical lab casework, athletic team lockers, theater style seating, etc. A list shall be compiled for review and approval by the planning committee for inclusion in the specifications.

01.38. Interior Paint Mock Ups

a. ALL interior paint colors shall be mocked up on the relevant wall or frame surface for final approval by the University Architect. Wall paint mock ups shall be a minimum of 8 feet high x 4 feet wide and shall begin at the floor level. Lighting and floor finishes shall either be temporarily or permanently installed as associated with specific paint colors. At least one of the paint mock ups shall show all preparation steps including primer and base coats in “peel away” demonstration.

b. If the A/E or the CMaR chooses to proceed with final painting without providing paint mock ups, as described above, for university approval, the cost to repaint shall be borne by the entity providing said direction.

c. The A/E shall include the requirement for interior paint mock ups in the project specifications.

01.39. In Place Shaft Wall Mock Ups

a. The university recommends that the construction of shaft walls be first built as an in place mock up for review by the ODU Project Inspector and the General Contractor. The goal is to identify and resolve problems, if any, early and to minimize remedial work; specifically to identify any issues with the application of UL designs in the field and to improve the acceptance of shaft wall construction by BCOM, State Fire Marshall.

b. The contractor shall engage the Project Inspector and the A/E to review shaft wall in-place mock ups.

01.40. Engineering By Contractor (Delegated Design)
a. The A/E shall clearly identify when engineering by the Contractor is required and what the specific requirements are, for each application specification section. The specifications shall require the following:
   i. The engineer be a Virginia Registered Professional Engineer employed by the Contractor.
   ii. The engineer shall be registered in the discipline for which the engineering is required.
   iii. The engineer shall carry Professional Liability, Errors and Omissions Insurance for Design Professionals Employed by the Contractor.
   iv. The Professional Engineer employed by the Contractor shall be responsible for the following:
      1. Be sole professionally responsible for the work.
      2. Calculate, design, engineer, and document the work.
      3. Prepare, professionally seal, sign, and submit calculations, shop fabrication drawings, erection and installation drawings, and other documents needed.
      4. Meet requirements of authorities having jurisdiction including applicable Codes.
      5. Meet requirements specified in the Contract Documents including visual requirements.
      6. Meet industry standards, unless higher performance is specified in the Contract Documents.

01.41. Temporary Utilities

a. **Connections to University utilities** shall be arranged by the general contractor through ODU.

b. **The University** may permit the general contractor to connect to existing utilities when they are available and shall not charge for electricity, water or natural gas. When utilities are not available, the general contractor shall arrange with the local utility company for installation of temporary utility service and shall pay all costs involved, which shall be included in the general conditions of the contract.

c. The A/E shall obtain drawings for existing utilities and include information concerning temporary connections in the contract documents.

d. **Utility company installations** of temporary services shall be reviewed with ODU and the A/E.

e. The General Contractor shall provide heating required by the work or trade as needed - until weather tight enclosure of the building. The general contractor is responsible for providing temporary heating, ventilation, and dehumidification after weather tight enclosure of the building.

f. **Temporary Storm Drainage:** shall be compliant with the ODU ANNUAL STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT in the Appendix as well as the project specific SWPPP.

g. **Internet service:** Where available, the university will provide guest access to internet services via the university wireless system for contractors’ use during construction. Where not available, contractors are required to provide for their own service via outside providers or by cellular/broadband services at their expense. The A/E shall coordinate availability with ODU and indicate the status in the contract documents.

h. **Hoisting facilities** for the project shall be provided by the General Contractor.
   i. **New elevators** may not be utilized for transportation of workers and materials
   ii. **Existing elevators** may not be used for construction unless approved by ODU.

01.42. No Smoking

a. All areas within the project site are designated as NO SMOKING areas. The Contractor shall not allow any workers to smoke within the project building(s). Additionally, smoking is not allowed within 25 feet of any campus building entrance/exit.

01.43. University Declared Emergency
October 12, 2018

a. If the University is officially closed due to an emergency condition, the Contractor will not be allowed to work.

01.44. Unmanned Aerial Systems (UAS or Drones) – As stated on the ODU website:
   a. “First and foremost, ODU’s main campus and that of the Peninsula and Virginia Beach Higher Education Centers are located within a 5 mile radius of a military airport installation. All Unmanned Aerial Systems (UAS) operated for business or recreational purposes within a five mile radius of a military airport cannot be operated without the military providing explicit permission. Likewise, operations within five miles of a civilian airport requires similar approvals. The ODU Office of Risk Management is responsible for requesting flight permission for UAS operations. To address the use of drones on campus, ODU has established **POLICY #3015: UNMANNED AIRCRAFT SYSTEM AKA DRONES, AERIALS AND OTHER POWERED MODEL AIRCRAFT.** Students, Faculty, Staff, Vendors and Guests who plan to operate a drone on or over property owned or controlled by ODU are required to abide by this policy.”

01.45. Evacuation Plans
   a. Evacuation Plans shall be provided by the A/E for installation in the building at approved locations. Evacuation Plans shall indicate where exterior gathering spaces are located as directed by the University Fire Safety Engineer.

01.46. Valve Plans
   a. The Contractor shall provide floor plans showing the location of all shut off valves in the building.
   b. Floor plans shall be laminated and installed on a visible, accessible wall in the main mechanical room.
   c. The contractor shall provide a PDF copy of the shut off valve location plans to the University with the close out documents.

01.47. Roof Inspection Reports
   a. Copies of the independent roof inspection reports, roof acceptance reports and the roof warranty documentation, shall be provided to the Facilities Management Assistant Director(s) and filed in the Digital Library.

01.48. Approved UL Wall Assemblies
   a. The State Fire Marshall requires a three ring binder be kept at the construction site of all approved wall assemblies and that this binder subsequently be stored within the building, in an easily identifiable location for post occupancy inspections.

01.49. O&M Training
   a. The General Contractor shall develop an O&M training plan for review by the ODU Project Manager and Facilities Management. The General Contractor shall provide at least a 1 week notice prior to the commencement of training. Training shall be provided by the manufacturer reps, not the contractor.

01.50. Warranty Requirements
   a. A list of all Warranties and the date of receipt of individual warranty documentation by Facilities Management shall be maintained by the ODU Project Manager and included in the close out documentation.

01.51. Close Out
   a. A representative of Facilities Management shall accompany the ODU Project Manager on a close out walk through to confirm the following:
      i. Ensure all piping is properly labeled
      ii. Ensure all electrical panels are properly labeled
b. At least week prior to occupancy of the building by the University, Facilities Management will make any inspections in preparation of acceptance. Facilities Management shall be notified by the ODU PM and acknowledge the date of the building is being accepted for University Occupancy.

c. Mechanical equipment warranties shall commence at the acceptance of the final building commissioning report.

d. Operation and maintenance (O & M) manuals

i. O&M manuals shall be submitted by the General Contractor as bookmarked PDF(s) with sections clearly identified and a linked table of contents, to the A/E for review and approval, prior to delivery to the University.

ii. The general contractor shall provide one hard paper copy format in loose-leaf binders with label pockets on the front and the binding shall be provided and stored in the building in the mechanical room or other secure location designated by Facilities Management. This copy shall only contain the O&M information, warranties and certificates associated with the mechanical electrical and plumbing equipment for the building.

iii. The general contractor can provide a combined file of as built, O&M Manual, Warranty and equipment PDF as desired. This would be in addition to the separate PDF files and shall not require any special training, software or equipment to open and read/use beyond Adobe Reader.

iv. The electronic O&M Manual shall be stored in ODU’s digital Library.

v. Refer to APPENDIX J – CLOSE OUT DOCUMENT CHECK LIST for further information.

01.52. Final Cleaning

a. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer’s written instructions.

b. Complete the following cleaning operations before requesting inspection for certification of Final Completion for entire Project or for a portion of Project:

i. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscaped areas, of rubbish, waste material, litter, and other foreign substances.

ii. Broom clean paved areas. Remove petrochemical spills, stains, and other foreign deposits.

iii. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

iv. Remove tools, construction equipment, machinery, and surplus material from Project site.

v. If applicable, remove snow and ice to provide safe access to building.

vi. Clean exposed exterior and interior hard-surfaced finishes to condition free of dirt, stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

vii. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

viii. Sweep concrete floors broom clean in unoccupied spaces.

ix. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

x. Clean transparent materials, including mirrors and glass in doors and windows.

xi. Remove glazing compounds and other noticeable, vision-obscurring materials.

xii. Replace chipped or broken glass and other damaged transparent materials. Remove labels that are not permanent.
xiii. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

xiv. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

xv. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
   1. Replace parts subject to unusual operating conditions.

xvi. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

xvii. Replace temporary air filters with permanent air filters per the construction documents. The A/E shall provide specifications for the type and use of temporary air filters in the specifications. Coordinate filter replacement with other requirements of the specifications including LEED.

xviii. Clean exposed surfaces of diffusers, registers, and grilles.
   1. Clean ducts, blowers, and coils if units were operated without filters during construction.
   2. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
   3. Clean turning vanes and any other accessories added to ductwork.

xix. Replace burned-out bulbs, and those noticeably dimmed by hours of use. Replace any defective LED boards or drivers.

xx. Leave Project clean and ready for occupancy.

xxi. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and report to rid Project of rodents, insects, and other pests.

xxii. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on University's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.
02.1. Refer to **CPSM 5.6.2.4.2 VERIFICATION OF EXISTING CONDITIONS.**

02.2. All existing hardscape and landscape to include, but not limited to, buildings, curb & gutter, stairs, sidewalks, site walls, roadways, parking lots, trees and shrubbery not noted for demolition or improvements shall be protected during construction to prevent damage. The General Contractor shall photographically document the existing conditions of the site prior to mobilization, and submit the documentation to the Project Inspector. The contractor shall return these areas to their pre-construction state, at the completion of the project. Any damage incurred to existing conditions, indicated to remain, shall be repaired or replaced back to its preconstruction condition by the General Contractor at his/her own expense.

02.3. Trees, shrubs and planting beds within the Contract Limit Lines are to be protected with fencing (rigid wood or chain link is preferred) to prevent damage from external construction activities. Selection of trees to be protected shall be coordinated through the Facilities Management Grounds Manager. The parking of vehicles and storage of any construction materials shall not occur under the drip lines of trees to be protected, no matter how short the duration. All tree removal requires prior approval by the Grounds Manager. Refer to **DIVISION 31 – EARTHWORK** for specific tree protection requirements.

02.4. Where applicable, the General Contractor shall, at the start of the work, identify and check the condition and operation of all existing valves, circuit breakers and disconnects serving the new work that are to be reused, for proper shut-off and isolation of the service. Any problems found shall be brought to ODU Project Manager’s attention for remedy.

02.5. Existing building demolition, generally, will be performed as a separate project and under separate contract, ahead of general building construction, although recent changes in stormwater requirements, have made early removal of existing impervious pavement and structures detrimental to stormwater calculations, so demolition will likely occur closer to the start of construction.

02.6. ODU reserves the right to remove and salvage items in buildings and/or areas to be demolished. ODU may remove items with their own forces or may include removal in the contractor’s scope of work, turning designated items over to the University. Coordinate requirements on a project-specific basis with the ODU Project Manager.

02.7. Historical items, relics and similar items including, but not limited to, cornerstones, commemorative plaques, antiques and other items of interest or value to the University which may be encountered during demolition remain the property of the University. The contractor shall notify the ODU Project Manager when encountering such items to determine whether they shall be salvaged. The contractor shall carefully remove and salvage each identified item or object in a manner to prevent damage and deliver promptly to the University.

02.8. The General Contractor shall inventory all existing fire extinguishers in buildings to be renovated or demolished. The ODU Project Manager shall provide a copy of the inventory to the ODU Fire Safety Manager to determine if any of the extinguishers can be reused in the new facility or elsewhere on campus. If they are to be reused, the General Contractor is responsible for storing the extinguishers and will be held responsible for replacing any that are lost or damaged.

02.9. The contract documents shall include language and specific instructions to itemize all existing structures and utilities within the project limits. The documents will indicate specific protection measures required to be implemented by the contractor to protect existing structures and utilities to remain including where utilities may be vulnerable to construction traffic.
02.10. When a building is slated to be demolished, the demolition shall include the entire building, including existing slabs. Discussions with the ODU Project Manager should commence during the initial project scoping phase to identify the removal extent of foundation removals.
   a. Remove existing spread footings in their entirety.
   b. The general contractor shall cut off existing pile foundations to 5' below grade minimum.
   c. Where pile foundations occur, remove existing piles and pile caps to a minimum depth of 5 feet below finished grade. If portions of existing pile foundations remain they must be surveyed and shown on the “as built” drawings immediately and provided to the A/E for design coordination.
   d. The general contractor shall anticipate this activity as part of the construction schedule as it may necessitate increased post demolition coordination of the design.

02.11. Refer to **DIVISION 31 EARTHWORK** for backfill requirements

02.12. A/E shall endeavor to recycle and reuse materials and equipment where possible instead of demolition and landfilling and shall clearly identify materials to be salvaged and reused on-site and / or off site as part of the construction documents.

02.13. The General Contractor and the ODU Project Manager shall coordinate the removal of all temporary power lines.

02.14. Underground utilities scheduled to be demolished shall be abandoned in place and filled with flowable fill. All abandoned utilities shall be clearly be located on the “As Built” survey.

02.15. Refer to **DIVISION 31 EARTHWORK** for additional information regarding erosion control and storm water management requirements for any land disturbing activities.

02.16. Refer to **CPSM 4.12 SPECIAL PROCEDURES FOR ASBESTOS ABATEMENT** and **4.13 SPECIAL PROCEDURES FOR LEAD-CONTAINING BUILDING MATERIALS**.

02.17. When partial or full renovation is being considered within an existing building on campus, the Environmental Health and Safety Office (EH&SO) shall be notified and a copy of any existing asbestos survey report obtained by the ODU PM. EH&SO maintains a list of which buildings on campus have asbestos materials. EH&SO is licensed to provide asbestos surveys of existing buildings and has previously inspected most buildings on campus. A follow up survey will be completed by the EH&SO for all renovation projects, no matter their size. The ODU Project Manager will communicate the intended project’s schedule to the EH&SO so they can plan for the follow up survey and abatement. All abatement is done by the universities asbestos/lead term contractor. There is not a list of buildings on campus that contain lead paint, so If the presence of lead paint is anticipated within a building, then the EH&SO will contact their term contractor to provide a lead paint survey of the building.

02.18. Floor finish demolition shall consider potential telegraphing of existing floor finishes through to new floor finishes when the existing are to remain.

02.19. The ODU project manager will carry the hazardous material (asbestos and lead) survey and report costs as well as the abatement costs separate from the construction budget in the total project budget.

02.20. Removal and Replacement of Sprayed-on Fireproofing
   a. The A/E in consultation with the University shall complete an initial assessment of the extent of sprayed on fireproofing within the building based on existing as built drawings. The A/E shall identify those areas of fireproofing to be removed and replaced/patched during the schematic design phase and shall review this with the University Fire Safety Manager.
b. During Preliminary Design, the A/E shall submit plans and specifications to the University Fire Safety Manager, through the ODU PM, defining the approach, extent and details for maintaining the integrity of the sprayed on fire-proofing. The A/E shall also include the life safety drawings, project data and code analysis information with this submittal.

c. Refer to CPSM 4.12.6 REMOVAL AND REPLACEMENT OF SPRAYED-ON FIREPROOFING for additional information.

02.21. The General Contractor shall coordinate the proper disposal of hazardous waste with the EH&SO prior to the start of construction. Disposal of all hazardous waste (PCB, lead-based paint (LBP), chemical waste, PCB containing ballasts, or any other RCRA regulated material), universal waste (mercury-containing light tubes, mercury containing thermostats, etc.) or any special wastes such as asbestos resulting from demolition, renovation, and/or construction must be coordinated through the Environmental Health and Safety Office. The ODU Project Manager shall inquire of the existing faculty and Dean to help identify any potentially contaminated research equipment such as biological safety cabinets (BSC), chemical fume hoods and/or equipment that may pose a health or environmental risk. The General contractor shall document the proper disposal of all hazardous waste materials and equipment indicating the item and disposal location. Documentation shall be provided to the ODU PM.

02.22. The ODU Project Manager shall carry an estimated cost for the disassembly, packaging, transportation and disposal of potentially hazardous scientific equipment in the total project budget.
Division 03: Concrete

Refer to CPSM 6.3 CONCRETE DESIGN STANDARDS for requirements which must be incorporated into all projects. In the case of a conflict between these Design Standards and the CPSM, the CPSM shall take precedence.

03.1. General
   a. All construction documents proposing new structural concrete placement shall include the Statement of Special Inspections in accordance CPSM 5.15 STRUCTURAL AND SPECIAL INSPECTIONS.
   b. A comprehensive concrete placement specification should be used on all projects. “Comprehensive” project specific specifications include but are not limited to coordinating work, submittal requirements, mix designs, reinforcing criteria, placement tolerances, finish requirements, curing, testing and inspection criteria.
   c. It is critical that the project specifications require a pre-installation conference attended by the A/E, ODU Project Manager, ODU Project Inspector, Testing Firm, Contractor and relevant Subcontractors to review project requirements and establish acceptable quality levels for all concrete surfaces prior to the placement of any concrete on the project. This does not apply to sidewalk placement or other small projects as determined by the ODU Project Manager.
   d. The inspector and/or testing agency should establish a Standard Quality Control Check List to monitor the placement and finishing of all concrete surfaces.
   e. The inspector and/or agency shall spot check batch times & delivery tickets for proper psi, etc. for large pours. The general contractor shall notify the ODU Project Manager of the need for an inspection at least 24 hours in advance and shall use APPENDIX U – PROJECT INSPECTION REQUEST form.
   f. The University shall engage the services of the concrete testing laboratory, per the CPSM, to perform the sampling, cylinder preparation and delivery, testing and reporting. The Contractor shall be responsible for adequate advance notice to the testing laboratory for the Contractor’s concrete pours/placement.
   g. The Contractor is responsible for assuring that all exposed concrete surfaces are not vandalized prior to the concrete initial setting. If refinishing or replacement is required due to vandalism during the initial setting the Contractor shall replace the concrete at no cost to the Owner.
   h. Refer to DIVISION 1 – GENERAL REQUIREMENTS additional information.
   i. Penetrations and openings shall be located on structural drawings.

03.2. Concrete Mixes
   a. All concrete shall have a minimum 28-day concrete compressive strength of not less than 3,000 psi.

03.3. Cast-in-Place Concrete
   a. Exposed aggregate surfaces shall not be used in building elements without prior approval by the University Architect.
   b. Interior and/or exterior structural concrete surfaces shall not be scheduled to receive a sandblasted finish unless specifically approved by the University Architect.
   c. Fly ash and slag shall not be used in architecturally exposed concrete due to discoloration.
   d. Refer to DIVISION 1 – GENERAL REQUIREMENTS for exterior mock ups of architectural concrete.
   e. Chamfer exterior corners and edges of permanently exposed concrete.
f. Release agents shall meet all current EPA requirements. Only non-staining, water-based agents shall be used.

g. Finish Quality
   i. The A/E shall assure that flatness and levelness requirements are specified for concrete floors scheduled to receive finishes. The concrete specification must match the requirements of the finish material and subsequent construction.
   
   ii. Special consideration shall be paid to concrete floor slabs that will receive compact rolling shelving now or in the future. Coordinate concrete slab requirements with the compact rolling shelving manufacturer.

h. Curing
   i. Wet curing is preferred.
   
   ii. Use of a curing compound must be approved and is limited to instances where application of moisture is impractical; where application of such compounds will not jeopardize appearance of concrete or bond to additional concrete; and where concrete surface is to be finished with paint, tiles, waterproofing, roofing, chemical seal or other final finishes. Compatibility with proposed finishes must be confirmed. Curing compound shall be used and applied with uniform thickness and other recommendations by manufacturers including application requirements where surfaces are exposed to sunlight.
   
   iii. Concrete Mixing: Contractor to provide batch ticket for each Ready Mixed batch discharged and used in the Work, indicating project identification name and number, date, mix type, mix time, quantity and amount of water added. Record approximate location of final deposit in structure.

03.4. Steel Reinforcement:
   a. Comply with Concrete Reinforcing Steel Institute's recommendations for fabricating, placing and supporting reinforcement.
   
   b. Secondary Reinforcement
      i. Use of fibrillated polypropylene fiber for secondary reinforcement to control surface cracking in exposed concrete slabs on grade is encouraged. However, fibrillated polypropylene fiber is not a substitute for reinforcing for structural and expansion/contraction requirements.

03.5. Footings
   a. At the contractor’s option, clean cut earth forms are acceptable for non-exposed concrete footings where soil is stable enough to permit it. Where earth forms are used, footing width shall be increased a minimum of 3” each side (6” total).
   
   b. The horizontal ledge, or top of all footings, shall be parged away from the vertical surface of the foundation and incorporated into the below-grade damp or water-proofing foundation design.

03.6. Foundations
   a. Where finished floor is below adjacent exterior grade, provide exterior drain tile that drains to daylight or an approved stormwater system.
      
      i. Drain tile shall be located adjacent to the bottom of the footing.
      
      ii. Drain tile shall be protected against infiltration of stone or fine granular material by the use of a “sock” or other approved encasing material.
      
      iii. If pile foundations are required, consideration of vibration monitoring shall be discussed with the ODU Project Manager for any adjacent structures. Quantity and location of test piles will be
determined by an independent laboratory in cooperation with the A/E. The laboratory will locate the test piles such that if the test piles meet the project requirements, they may be used in the building foundation system.

03.7. Slab on Grade

a. Slab on grade floors in all academic, public use and service buildings; and public use, mechanical, laundry and storage rooms in buildings on campus shall be minimum five inches (5") thick with WWF 6x6- W2.9xW2.9 minimum reinforcing. Reinforcing top cover shall be one inch (1") minimum to two inches (2") maximum.

b. The A/E shall provide project specific concrete specification where terrazzo flooring shall be installed and shall include a control joint plan at terrazzo locations following manufacturer’s recommendations to avoid cracking.

c. Slabs shall have a minimum 6" porous fill below vapor barrier. Porous fill shall be sand with no more than 5% fines. Porous fill shall be deeper where recommended by geotechnical engineering report. Install, protect and repair vapor-barrier sheets (minimum of 15- mils, reinforced) according to manufacturer’s specifications. Place sheets in position with longest dimension parallel with direction of pour. Lap joints 6 inches and seal with manufacturer’s recommended tape. Under-slab vapor barrier shall be continuous, extending under and around all sides of the building footing and incorporated into the exterior foundation water-proofing system. Repair damage and reseal vapor barrier before placing concrete. Repairs to the vapor barrier shall be reviewed by the project inspector prior to being covered up.

d. Limit the number of vapor barrier penetrations. The A/E shall specify requirements for vapor barrier penetrations. General Contractor to review intent for repairs with PI when anticipating vapor barrier disruptions or damage due to work sequence or other circumstances.

e. Exposed interior concrete floors shall be sealed in accordance with the building design using a penetrating sealer. A hardener shall be required where the floor surface is subject to heavy, impact, and/or rolling loads. Acrylic sealants are not desirable.

f. All slabs on grade shall incorporate an approved expansion joint at all slab edges.

g. Strip Waterstops shall be used for cast-in-place concrete at a minimum and where they are shown on drawings and where new concrete pours meet existing concrete or masonry surfaces.

h. Slabs with Terrazzo Finish: Concrete slabs to receive a terrazzo finish shall be cured for at least 28 days. Slabs shall be flat (not exceeding ¼" in 10 foot span) and have a steel troweled finish. Slab control joints and construction joints shall be coordinated with the A/E.

03.8. Stair Treads and Landings

a. Ensure that the placement/screening method for stairwells and landings is uniform, flat and/or properly sloped. Stair treads are to slope down 1/8"per feet interior, ¼" per foot exterior, riser to nose. A screed template is to be used for stair treads to assure consistency.

b. A/E should monitor and coordinate with the ODU project manager to ensure that the requirements for floor finishes are acceptable on all concrete filled stairs.

i. All exterior concrete stairs shall have cast aluminum nosings provided with integral anchors. Bituminous paint to be applied to concealed surfaces of nosings.

ii. Provide temporary protection for nosings on interior concrete steps. Treads of exposed concrete steps shall be provided with non-slip surface.
c. All exterior stairs, exposed to weather, shall be cast concrete including all stairs in parking garages. Concrete filled, metal pan stairs are not allowed in these instances.

03.9. Architectural Precast Concrete

a. Fabrication Qualifications: Engage a firm experienced in producing architectural pre-cast concrete units and fabricator must participate in the Pre-Cast/Pre-Stressed Concrete Institute’s (PCI) Plant Certification Program and be designated a PCI certified plant for Group A1-Architectural Concrete at the time the project is bid.

b. The A/E and/or ODU Project Manager shall visit the precast concrete plant. The university reserves the right to engage a 3rd party to inspect the precast concrete plant.

03.10. Elevated Slabs: Refer to Chapter 4 - Division 5 Metals

03.11. Sidewalks and other site concrete – refer to Chapter 3 – Campus Design for requirements.
Division 4 – Masonry

04.1. Brick Selection

a. During the Preliminary Design phase, in context with the surrounding buildings, the A/E shall select brick, mortar and joint tooling, to be approved by the University Architect. The University has final approval of all brick types, shapes, colors and mortar type and color.

b. Refer to CHAPTER TWO – CAMPUS DESIGN for basis of brick used on campus.

c. Brick and mortar selection for renovations and/or additions to buildings shall match the closest freshly cleaned adjacent existing wall unless otherwise approved by the University. Additions and/or renovations to existing buildings shall match the existing mortar and brick in size, color, texture and compressive strength unless otherwise approved by the University. The A/E is to clearly delineate an existing 4-foot square or greater wall area containing a minimum of 100 existing bricks to be matched and include that information in the bid documents. The wall area location selected by the A/E shall be approved by the University prior to bidding. Allowances for masonry materials to match existing are not permitted.

d. Removal of existing brick for use on additions or renovations shall be carefully executed to prevent cracks, splits, spalls and damage to the surface integrity of the units.

e. Refer to DIVISION ONE – GENERAL CONDITIONS for information regarding brick mock ups. The specifications shall require the contractor to erect at least one, but no more than three, sample wall panels size 4'-0" x 4'-0" minimum, for brick and mortar selection by the University Architect and the A/E. Approval of sample panels is for color, texture and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship and other material and construction qualities. The A/E shall advise the University prior to approving or not approving a mockup and prior to notifying the Contractor.

f. If fewer than three brick manufacturers and/or mortars are selected, then performance specifications for size, type of brick, color, range, strength and permeability shall be used, citing as the basis of design one or more manufacturer’s brick products. Mortar shall be selected and specified, likewise.

g. Brick patterns/coursing must be approved during Preliminary Design.

h. All control joints must be shown on elevation drawings in the Working Drawing Design Submittal. Reliance on specified location criteria is not desired.

i. Any type of exterior masonry sealer, water repellant, or waterproofing coating is not allowed.

j. Limit/reduce the use of horizontal mortar joints (Caps, parapets, etc.) brick caps are not allowed except for the university standard site walls.

k. Flashing details (masonry flashings, weeps, parapets, wall caps, etc.), expansion joint and masonry opening detailing including end dams, shall be included in the Working Drawing Design Submittal for review by the University.

l. The use of masonry cleaners shall not be scheduled without prior approval by the ODU Project Manager.

04.2. Sills

a. All masonry veneer buildings shall use pre-cast, cast stone, brick, non-porous sills for all punched openings.

b. Sills shall be one-piece when the opening is <8’ in width. Where multiple piece sills are used, the vertical joints shall be located in line with window openings, flashing joints or other wall elements above.

c. Precast sills shall extend a minimum of 4” in each direction beyond the width of the opening.
04.3. Miscellaneous Metals
a. All steel lintels supporting exterior masonry shall be hot dipped galvanized. No field cutting is permitted.
b. Hot dip galvanized factory primed lintel, the A/E shall confirm that the final paint is compatible with the factory primer.
c. No exposed weld joints. If necessary, they must be ground smooth and hot galvanized.
d. Miscellaneous steel lintels, shelf angles, attachments, etc. embedded or incorporated into masonry construction shall be hot-dipped galvanized or stainless steel. Exposed to view, e.g., window lintels, items are to be finished to match adjacent construction.

04.4. Mortar
a. Masonry mortar shall not be mixed unless the outdoor air temperature is above 40 degrees F and rising without the specific approval of the A/E. Any cold-weather mortar mixing and applications shall comply with the most restrictive provisions of the current Masonry Standards Joint Committee (MSJC) code.
b. All masonry shall have full bed and head joints.
c. All joints shall be uniformly struck and the backsides shall not be parged. Exposed joints shall be struck in timely manner to produce an even coloration throughout the entire wall.
d. Projecting courses shall not be set until mortar, in the joints below, is set enough to prevent extrusion. All projecting courses shall be durably supported until mortar has cured.
e. Tooled joints shall be standard concave joints unless otherwise required to match adjacent existing joints.
f. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
g. Mortars with color pigments shall be factory premixed.
h. Mortar admixtures must have both A/E and University approval prior to specification and/or usage.
i. Mortar shall not be re-tempered or used after it has begun to set.

04.5. Flashing & Weeps
a. The use of a cavity drainage material or free-draining mesh, made from polymer strands that will not degrade within the wall cavity with insect barrier, is required. Cavity protection shall be provided throughout the entire installation to minimize backside mortar droppings. Every course of flashing and weeps shall be protected by a minimum of a 10” approved mortar net.
b. Flashing courses and weeps shall be inspected by the Project Inspector before covering.
c. Flashings shall be through-wall into the backing masonry joints and sealed with an elastomeric sealant.
d. Clearly show locations and detailing of flashing in the Working Drawings. Show extent and alignment of flashing locations with other building elements and openings on elevations. Indicate end dam locations.
e. Refer to Division 7 – Thermal and Moisture Protection for flashing materials.
f. Weep holes or screeds shall not be damaged by masonry installation and shall aesthetically complement the surrounding area.
g. Weeps shall be placed at a maximum 24” on center and shall extend into the cavity to at least the full cavity depth.
h. Weeps shall be designed to allow air circulation through the entire cavity.
i. Do not use open head joints.
j. Weep and vent holes for brick veneer shall be manufactured cellular plastic vents; One piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and
depth 1/8" (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard. Install at heads and sills of all openings and top and bottom of wall.

04.6. Grout
   a. All metal door frame jambs and heads in masonry walls shall be solid grouted.
   b. Grout mixtures shall be constantly monitored by an on-site 3rd party inspector.

04.7. Protect Stone and cast stone from masonry cleaners. Masonry cleaning shall be scheduled to be performed immediately following grout set.

04.8. Masonry Anchorage and Reinforcing
   a. Hot-dip galvanized, carbon-steel wire or steel sheet.
   b. Wire, steel sheets, steel plates, shapes and bars.
   c. Corrugated metal ties are prohibited.
   d. Stainless steel bars and anchors for stone trim or pre-cast concrete trim are required.
   e. Reinforcing Bar Positioners: Galvanized wire units designed to fit into mortar bed joints spanning masonry unit cells with eye hook loops for holding reinforcing bars in center of cells.

04.9. Masonry Accessories
   a. Concrete masonry control joints shall be built-in rubber type or grout keyed type, with face joint kept clear for installation of sealant.
   b. Dovetail slots and anchors shall be used for masonry veneer over concrete walls.
   c. Wire ties of pintle and eye-hook design shall be used for masonry veneer over concrete masonry or framed walls.
   d. While 304 stainless steel masonry ties and other structural elements are preferred for the Hampton Roads environment and for the extended life of a building, standard weight, hot-dip galvanized is acceptable.
   e. Specify molten zinc galvanizing repair if necessary for cut or abraded miscellaneous steel embedded in masonry. Paint-type repairs or non-galvanized miscellaneous steel items are not acceptable.

04.10. Masonry Restoration
   a. A/E shall review all restoration and cleaning specifications with the University.
   b. A/E shall specify cleaning to be performed from the bottom up.
   c. A/E shall specify pre-cleaning conference and test area.
   d. The General Contractor shall schedule and coordinate testing of cleaning agents to be used prior to bidding.
   e. Masonry Cleaning References
      i. Brick Industry Technical Notes on Brick Construction #20 - Cleaning Brickwork.
      ii. Cast Stone Institute Technical Bulletin #39 - Cleaning

04.11. Parapet Walls
   a. Parapet walls up to 42 inches in height shall be flashed from underside of coping to roofing.
   b. Roofing membrane to extend up and over parapet and to terminate to exterior face of wall.

04.12. Stone Masonry
   a. Limestone back and bonding faces shall be damp-proofed with a water barrier as approved by the Indiana Limestone Institute of America, Inc. Limestone shall not be installed lower than 4" above grade when adjacent to lawns or planted areas. Verify bonding capability.
   b. Non-staining sealant or acrylic-based compounds shall be used for sealing stonework.
   c. Silicon-based compounds are prohibited for limestone.
d. Handling, protection and installation shall comply with the recommendations of the Indiana Limestone Institute of America, Inc.

04.13. Cast Stone Masonry
   a. All cast stone shall be minimum 6,500 psi concrete. All exposed corners shall be eased.
   b. Embedded anchors and other inserts shall be fabricated from stainless steel.
   c. A/E shall specify cleaner that is compatible with cast stone.

04.14. Calcium Silicate Masonry
   a. Calcium Silicate masonry shall not be placed in contact with grade, shall be a minimum of 4” above grade.

04.15. Masonry Coatings
   a. Refer to the CAST STONE INSTITUTE TECHNICAL BULLETIN #35 – WATER REPELLENT COATINGS.
Division 5 – Metals

05.1. Design shall be complete for all required metal fabrications. Contractor engineered metal fabrications are prohibited except for interior egress stairs and associated handrails, manufactured ornamental stairs and handrails, ladders, fall protection and roof screens. If the A/E desires to add additional items to the engineering by contractor category, these shall be requested using APPENDIX B – DESIGN STANDARDS VARIANCE REQUEST FORM. The A/E shall also include in the specifications a separate section defining engineering by contractor requirements for the project.
   a. Engineering provided by the contractor shall include the Professional Engineers seal and calculations submitted as noted in Division 1.

05.2. The A/E shall detail and locate lintels in all walls as part of the contract drawings. The Contractor shall coordinate opening locations with all other trades.

05.3. All exterior or wet location structural ferrous metals, including but not limited to, all exterior lintels and gratings shall be hot-dip galvanized after fabrication. Repair all damage to galvanized coatings. Finished painting, if needed, shall be indicated on the contract documents by the A/E.

05.4. At exterior locations, fasteners shall be galvanized or stainless steel. Where welded connections are made after galvanizing, apply coating to resist rust.

05.5. Interior metal stairs for public access shall not be exposed concrete. At a minimum, cover all concrete treads and risers with rubber stair tread materials.

05.6. Exterior metal stairs are not allowed. Galvanized handrails are acceptable only at service locations and when approved by the University Architect. Fully weld all rails, handrails, attachments and supports and repair welds with galvanizing repair paint. Stair treads and landings shall be perforated or grating type material to allow drainage.

05.7. Alternating tread stairs are preferred over vertical ladders for roof access. If Vertical ladders are included in a project (outside of elevator shafts) locations shall be reviewed by facilities management prior to incorporating into the design.

05.8. A/E shall consider the how mechanical equipment shall be brought up to the roof or removed from the roof. The A/E shall consider including a including a hoist mechanism based on roof equipment maintenance.

05.9. If fixed ladders, when accepted by facilities management, are used to access roofs through a roof hatch, install safety post on the ladder. The post shall be designed with a telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless steel spring balancing mechanism.

05.10. All Exterior Gratings exposed to public pedestrian traffic shall be ADA compliant and safe for walking with shoes with narrow heels (1/4” maximum gap). Grating shall also be structurally rated for vehicular traffic when position at grade. Gratings in public locations shall be stainless steel. Back of house gratings shall be hot dipped galvanized. Provide galvanized hardware under all areaway gratings.

05.11. Exterior Handrails/Guardrails
   a. All campus handrails/Guardrails shall be anodized aluminum.
   b. All handrails/Guardrails shall be ground smooth and free of any burrs or other defects.

05.12. Steel Roof Deck and Moisture-Prone Floor Slabs
   a. Corrosion protection is critical to maintain the structural integrity of the roof deck from moisture leaks through the roofing membrane. NRCA Bulletin 15-91 provides guidance on protection.
b. The steel roof deck is required to be Factory Galvanized, G-60 or G-90 (ASTM A924-94) or Factory coating with aluminum zinc alloy (ASTM A792).

c. 'Primer paint' coated deck is not allowed.

d. Aluminum desking is allowed where appropriate.

e. Examples of moisture prone decks include full kitchens, bathrooms, and mechanical rooms.

f. The A/E shall indicate the location of all galvanized decking in the contract documents.

05.13. All ornamental stair or other railing systems shall be specified using standard, easy to replace, parts. Fabrications that can be easily replicated locally or by on-site trade personnel are preferred.
Division 6 – Wood, Plastics and Composites

06.1. Products shall be free of urea-formaldehyde binders, copper or arsenic. Avoid over harvesting, poor forestry practices and toxic treatment by specifying products from sustainable sources, such as FSC Certified Wood or regionally manufactured from abundant species. Specify that field-use adhesives shall not contain urea formaldehyde or excess VOCs as indicated for specific purpose. Specified materials should meet or exceed the latest version of the USGBC’s LEED rating system.

06.2. Rough Carpentry and Miscellaneous Rough Carpentry

a. In new non-combustible, construction, always provide and install fire-treated lumber unless otherwise directed by the Department of Design and Construction or BCOM. Confirm treatment manufacturer’s requirements regarding appropriate use, detailing, and environmental limitations.

b. Back up all wall and ceiling-mounted accessories with wood blocking (especially wall-mounted door stops, grab bars, shelving standards, window treatment hardware, and Laboratory, Kitchen & Bathroom wall cabinetry). Install only true, straight pieces.

c. All lumber in contact with masonry, concrete or roof termination details shall be ‘ground contact’ preservative treated (PT) to meet American Wood Protection Association (AWPA) standards. All fasteners, anchors, plates and hardware shall be or stainless steel to withstand the corrosiveness of preservative treatments. Preference is that where preservative-treated wood is used, provide a separation membrane between wood materials and metals, such as a .030 inch thick high-temperature “peel and stick” membrane or similar flashing type material. PT lumber shall not be used as a finished product.

d. At exterior construction fasteners shall be stainless steel.

e. Provide a minimum ¾” Plywood sheathing for all roof/sub-floor decks (no Oriented Strand Board (OSB) or composites).

06.3. Heavy Timber Construction

a. Solid Timber framing is not desired on campus and shall not be used without prior approval of the Department of Design and Construction.

b. Attachment / bolting of all heavy timber members shall meet the spacing requirement of Virginia Code and National Design Specification for Wood Construction.

06.4. Finish Carpentry

a. Fabricators and installers shall be Architectural Woodwork Institute (AWI) members and shall provide their licensed participant certificates. All casework and installation shall carry appropriate labels and certifications to comply with AWI’s certification program.

b. All casework to be AWI either Custom or Premium grade. It is important to be conscious of when to specify custom or premium grades. For millwork that will receive a lot of wear and tear over the years such as in public areas, premium grade is preferred. The A/E shall coordinate the casework grades with the Contractor early on to ensure cost estimates reflect the proper selections.

c. Countertops may include non-wood products such as recycled glass cast concrete, recycled content synthetic cast slabs, regionally quarried stone, bio based materials, and recycled plastic solid surfacing or plastic laminates. Plastic Laminate shall be used minimally and shall be avoided as countertop surfaces in wet environments and areas of heavy traffic. When used Plastic Laminate surfaces shall have a 3mm PVC edge band as a minimum. Counter tops may be fabricated off site, but back and end splashes should be shipped loose for field installation. Consider the location, use and susceptibility to wear when making material selections. Provide auxiliary support under counters to withstand the weight of people sitting on the counter.
d. Window sill to be solid/durable repairable material such as solid surface, 1/2” minimum thickness. Plastic laminate sills are not acceptable. Provide window sills at all gypsum wall board construction. Consider window sills at CMU partitions. The A/E shall account for expansion when detailing window sills.

e. A/E shall specify veneer species, cut (plain, rift or quarter sliced), and the amount of figure (none, light, moderate, heavy) to use in all wood veneer millwork.

f. Back prime all exterior trim prior to installation including priming ends.

g. Cabinet Construction shall be frameless box construction with flush overlay door and drawers.

h. Shelving shall be 3/4” 5-ply plywood - no particleboard. Hardwood plywood shelves with hardwood edge may be stained, or shelves may be completely covered (all six faces) with plastic laminate. Melamine surfaces and “T” edge molding is approved for spans 4’ and under. Support shelves on heavy-duty adjustable steel standards and brackets unless otherwise indicated.

i. The A/E shall specify “tamperproof” or “vandal resistant” fasteners in areas that are subject to vandalism by the general public.

j. Casework shall use standard modular units which can be disassembled and reassembled in another location. This is to facilitate relocation of departments over time.

k. Use frameless concealed Euro-style hinges on all cabinetry.

l. All cabinetry shall use Euro-spaced modular shelf pin systems. Shelf pins are to be plastic or steel and 10% spare shelf pins shall be provided upon job completion.

m. Use stainless steel pulls on all cabinet doors and drawers.

n. All wood millwork must be delivered on site to a conditioned space and allowed to acclimate before installation.

o. The use of use PVC trim materials (i.e. Fypon) shall be reviewed with the department of Design & Construction. PVC does not perform well when painted darker colors due to excessive thermal movement.

p. Design of acoustic wall panels shall consider the potential for damage, staining and vandalism. Panels should be located so as to not be easily accessible from adjacent walking or standing surfaces, and high enough when adjoining a seating area to not be damaged or stained by people resting their heads against the wall.

q. Synthetic solid surfacing material shall be solid acrylic or polyester and acrylic resin based. Material shall be through-patterned and homogeneous. No coated materials or non-homogeneous materials allowed. Materials shall be 100% repairable. Specify that panel products shall not be manufactured with binder resins or adhesives that contain urea formaldehyde.

r. For solid surface shower installations use the following:

   i. Shower pans:

      1. Shower pan shall be made from solid cast polyester/acrylic blend resin, with no voids or filler materials at underside of pan.

      2. Pan shall have adjustable drain locations, coved side walls, with a minimum 6” high, bi-level water dam at three sides and 4” high water dam at threshold side. Water dams shall be a minimum of 1/2” thick at highest point. Lower ledge at bi-level water dams shall be a minimum of 3/4” wide.

      3. Shower pans shall have a textured, nonskid floor pitched toward the drain at a minimum 0.6° slope (1/8” per foot). Shower pans shall have a non-slip coefficient of friction rating of 0.30 or greater as registered by the ASTM F462 slip resistance test method.
4. Shower Pans shall be a minimum of 9/16" thick at the thinnest point of the drain orifice and a minimum of 1-1/4" thick at the perimeter.
5. Pans shall carry a 15-year materials and workmanship warranty against cracks, breakage, and leaks.
6. The A/E shall specify that the General Contractor shall build an in-place mockup of the shower pan installation for review and approval by both the A/E and the ODU Project Inspector. Proper shower pan installation is critical for the long term durability of the shower pan to drain connection, the weak point in the installation. The A/E shall detail the shower pan installation as part of the working drawings.

ii. Shower walls:
1. Shower wall panels, trims and accessories shall be manufactured from solid cast polyester/acrylic blend resin.
2. Shower wall panels shall be 3/8" thick minimum with green board behind all panels.
3. Shower wall panels measuring 61" or less in width shall be supplied as single panels with no joints.
4. Shower wall panels shall be manufactured and supplied at largest practical sizes so as to minimize seaming at the jobsite.
5. Install shower wall panels with adhesive as recommended by manufacturer. Seal joints using manufacturer's recommended mildew resistant silicone sealant.
6. Shower wall panels shall be trimmed and scribed at time of installation to ensure proper fit.
7. In Residence Halls and locker room showers, provide 1/2" thick (min.) shower corner caddy(s), except at gang showers, where shower caddies are not required.
8. Provide 3/8" thick (min.) shower corner trim.

s. Refer to Division 09 Finishes for fully tiled showers are to be used in athletic facilities.
t. Wood Paneling shall be limited in its use as wood paneling is generally not within the scope of project budgets. Consider locations for long term durability. Avoid mounting any signage on wood paneling as the signage may change over time causing the replacement of the wood panels, which would no longer match.
u. No plastic laminate wall paneling is allowed.
v. Wood Base is not allowed in buildings because it gets marred and marked by cleaning equipment. Alternate materials such as tile and stone are desired in public spaces such as lobbies.
w. Wood stairs and handrails are not to be used.
x. Exterior wood shall be limited in scope and reviewed with Facilities Management for location and ease of maintenance. Exterior wood should be restricted to such species as ipe.
y. Composite wood is also acceptable in exterior locations and shall match the warranty and product specifications of a Trex or similar product.
07.1. While Division 7 – Thermal and Moisture Protection, shall include specific components of the building envelope, the A/E shall provide a Division 1 specification section on the Exterior Enclosure Air Barrier Systems defining how all the components work together, and the responsibilities of the general contractor to coordinate disciplines critical to envelope success.

07.2. The A/E and the Contractor shall refer to CPSM CHAPTER 4 FOR REROOFING REQUIREMENT and CPSM APPENDIX A - DEB ROOFING POLICY & TECHNICAL STANDARDS FOR STATE-OWNED BUILDINGS shall be followed.

07.3. An ODU Project Inspector, or third party roof inspector, shall be present during any roofing installation – both re-roofing and new roof conditions.

07.4. Preparation for low Slope Re-Roofing

a. The A/E shall ascertain that projected roof repairs, especially those involving new roof penetrations, do not void existing roof warranties. The ODU Project Manager shall provide the A/E copies of existing roof warranties and existing construction documents.

b. The A/E shall conduct a pre-design roof survey to photo document existing conditions, including the spaces directly below the roof including above ceiling investigations.

c. The A/E shall provide details of boots, sleeves, flashing, counter-flashing, curbs, etc. compatible with the roofing systems.

d. Construction of a curb around roof openings/penetrations is the preferred method for flat roofs, small (smaller than 12” square) penetrations do not require curbs.

e. The reuse of existing counter flashing materials shall be preapproved by ODU Project Manager.

f. The A/E shall specify the installation of new counter flashing in materials matching the appearance of the existing materials and compatible with them.

g. A/E shall confirm with the ODU Project Manager all rooftop equipment assumed to be abandoned and removed. The A/E shall also confirm where decking repairs are anticipated around equipment on re-roofing projects.

h. The A/E and Contractor shall assume all areas of an existing building will be occupied during roofing operations.

i. The contractor shall provide a qualified roofer, certified by the manufacturer of the roof system being installed, on site at all times when construction activity is present. Certification shall be submitted to the ODU project Manager prior to start of construction.

j. The contractor, accompanied by the ODU Project Inspector, FM representative and the ODU Project manager, shall conduct a second photographic survey of all spaces directly below the area of re-roofing prior to the start of construction to document existing conditions, equipment etc.

k. The Contractor is responsible for placing protective dust or water leakage covers over Owner’s equipment and/or furnishings. Contractor shall protect all roof drainage systems during all roof repairs and all roof work. If these roof drainage systems are not protected, maintained or remain open, the Contractor shall be held liable for all damages in the building and on the roof resulting from this failure to protect.

l. Conduct re-roofing so University operations will not be disrupted. Provide the ODU Project Manager at least 72 hours’ notice of activities that may affect University operations, as determined by the ODU Project Manager – see DIVISION 1 – GENERAL REQUIREMENTS of these standards for additional information.
m. Coordinate work activities daily with the ODU Project Inspector. Provide a written workplan for the next day's activities to the ODU Project Inspector. Notify the ODU Project Inspector, each day, the extent of roof tear-off proposed for the following day. Notify the ODU Project Inspector of any changes in the written work plan each day.

n. Protect building to be re-roofed, adjacent buildings, walkways, impervious pavers, BMP's, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations. Protection is especially important at impervious pavers and BMP's.

o. Maintain access to existing walkways, corridors, and other adjacent occupied facilities. Identify and maintain access to emergency egress routes from buildings to designated evacuation gathering areas.

p. Coordinate with the ODU Project Manager the shutdown of HVAC, fire-alarm and/or smoke-detection equipment if needed.

q. Application of a new roofing system over an existing system, roof-over or re-cover, is not acceptable. Complete removal of the existing roofing system to the surface of the roof deck is required by the Contractor. The Contractor shall take all necessary steps to insure that while removing the existing roof system, that the Contractor does not damage the existing roof deck. Once uncovered, if the roof deck is found to be structurally impaired, or any other unknown condition, immediately notify the ODU Project Manager to evacuate occupants from below the affected area. Also immediately notify A/E of conditions and do not proceed with installation until directed by the A/E. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired deck area.

r. Proceed with re-roofing preparation only when existing and forecasted weather conditions permit work to proceed without water entering existing roofing system or building.

s. Coordinate with the ODU Project Manager shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

t. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

u. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

v. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

w. Verify that rooftop utilities and service piping have been shut off before beginning roofing work.

x. When existing base flashings are removed around parapets, curbs, walls, and penetrations, clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

y. If project conditions warrant, identify to the ODU Project Manager components (e.g. mechanical equipment) that are required to be removed to facilitate roof repairs and upgrading.

z. A/E, as part of their basic services, to provide deck repair details covering deck damage as part of the working drawing package. Repair details shall cover conditions including rusted decks, deck holes, and deck cuts that occur during re-roofing operations. The intent is to limit the loss time when these
conditions invariably occur during re-roofing. The A/E shall indicate conditions by which repairs can be made and indicate the limits of said repairs. This does not preclude additional details becoming necessary for additional conditions uncovered during re-roofing operations.

aa. The general contractor shall coordinate the use of existing loading docks with the ODU Project Manager. Existing loading docks cannot be occupied for the duration, their use is limited to scheduled deliveries.

bb. Project Management and Coordination: Review methods and procedures related to roofing system including, but not limited to, the following:
   i. Review temporary protection requirements for existing roofing systems that is to remain, during and after installation.
   ii. Review roof drainage during each stage of re-roofing and review roof drain plugging and plug removal procedures.
   iii. Review structural loading limitations of deck during re-roofing.

07.5. Bituminous Damproofing (Not Used)

07.6. Waterproofing
   a. Provide heavy duty permanent water-resistant Modified Bituminous Sheet Waterproofing: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil thick, polyethylene film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
   b. The A/E shall include a ten-year installer experience clause in the specifications.
   c. For horizontal application under elevator pit slabs provide bonded HDPE or Polyethylene Blindside Sheet Waterproofing: Uniform, flexible, multilayered-composite sheet membrane consisting of an HDPE film coated with pressure-sensitive adhesive and protective release liner, total 46-mil thickness, or a cross-laminated film of low- and medium-density polyethylene, coated with a modified asphalt layer and a nonwoven geotextile-fabric final layer, total 95-mil thickness.
   d. Compatibility with water stop materials as may be required at joints shall be determined by the A/E and coordinated with the CPSM.


07.8. Water Repellents
   a. Water repellent coatings should be specified for all restored brick, concrete masonry and architectural pre-cast concrete. Products specified should be breathable silanes or siloxanes as appropriate for the surface to be coated. Film forming surface coatings such as silicones, acrylics, mineral gum resins and blends should not be used. Water Repellent shall be penetrating, colorless, non-staining, and mildew resistant.
   b. Products specified should be those which have an estimated life expectancy of no less than 10 years.
   c. Specify that adjacent and nearby surfaces be protected from spillage or overspray from repellents. Require that live plants, grass, windows and other areas be covered.
   d. The A/E shall coordinate and specify water repellents with graffiti-resistant coatings from the same manufacturer ensuring compatibility.

07.9. Thermal Insulation
a. Building insulation is one component of the exterior envelope system. Insulation provided only in the stud wall cavity is not allowed, but is allowed if in combination with the continuous insulation noted above. The A/E shall provide a dew point analysis for the exterior envelope design to the University Architect at Preliminary Design for review.

b. Fiberglass batt insulation shall be installed to minimize exposed fiberglass in areas needing to be accessed for inspections, maintenance, etc. Designs shall encapsulate fiberglass using foil or pre-applied backing, plastic or gypsum board covering.

c. Maximize insulation value to conserve energy; avoid insulation containing formaldehyde or ammonium sulfate or foams expanded with hydro chlorofluorocarbons (HCFC’s); consider insulation with recycled content.

d. Provide 2” rigid perimeter insulation, extend 24” under the slab horizontally and vertically to top of grade beam or other concrete foundation member. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer. Extend insulation to full footing depth. Protect below-grade insulation on vertical surfaces from damage during backfilling and site work by applying protection board.

07.10 Foamed-in-Place Insulation

a. Refer to CPSM 4.1.2.11 NFPA 285 ACCEPTANCE CRITERIA IN EXTERIOR WALLS AND BCOM NEWSLETTER #11 NOVEMBER 2015 for specific instructions related to assemblies utilizing combustible foam plastic insulation and required compliance with NFPA 285. Note: “BCOM will enforce IBC 2012 Section 2603.5.5 Vertical and Lateral Fire Propagation as written. NFPA 285 is a unique ‘Assembly Test’ where the replacement and/or modification of a specific component will void the Assembly Listing.” Provide design and detailing to completely separate foam plastic insulations from the interior of the building with appropriate thermal barriers. The A/E is responsible for coordinate with the Contractor that the individual submitted components of the assembly does not deviate from a tested assembly. The Contractor is responsible for constructing assemblies that do not deviate from the tested assembly.

07.11 EIFS

a. Exterior Insulation and Finish Systems (EIFS) shall not be used, unless a variance is submitted and approved by the University Architect and the Director of Design and Construction.

07.12 Vapor Retarders

a. The A/E shall require, as part of the specifications, the contractor provide complete details for the vapor barrier installation as part of their submittals.

b. Under Slab Vapor Retarders used on contact with soil or granular fill shall be Class A, with a maximum permeance of 0.01 perm and a minimum thickness of 15 mils, intentionally more restrictive than the ASTM E1745 Standard, appropriate for local conditions. Provide a complete system including mastic, adhesive, seam tape, and other materials recommended by vapor retarder manufacturer.


d. Coordinate installation of under slab insulation, installing vapor retarder over insulation. Provide continuous, air tight, vapor retarders, installed continuously in largest practical sheets to minimize seams. Orient seams so that concrete placement operations will be parallel to seams. Overlap seams at least a minimum of 6 inches and tape continuously. Cut and fit vapor retarder precisely to perimeter.
of area. Turn vapor barrier edge up against foundation wall 6 inches. Continuously tape the top of the vapor retarder to the foundation wall with vapor tape. Clean substrates to ensure tape sticks. Provide a loose 2 inch fold of vapor retarder at the horizontal and vertical transition to accommodate differential movements and slab settlement.

e. Cut and fit vapor retarders accurately to penetrations, making the minimum size holes to minimize patching and repairs. Effectively cover, patch, and repair all holes, tears, seams, and penetrations. Tape the vapor retarder continuously to the penetration. Form a "boot" around each penetration similar to roofing flashing boots. Ensure that air and water vapor cannot pass between the vapor retarder and the penetration. Provide a loose 2 inch fold of vapor retarder at the horizontal and vertical transition to accommodate differential movements. Ensure the seam seals, edge seals, and penetration seals are intact.

f. When the concrete slab is directly over the vapor retarder, provide additional measures to minimize slab curling, consider the following:
   i. Reducing construction joint spacing in concrete to 20 feet on center both directions.
   ii. Use a special concrete mix with low potential for shrinkage.
   iii. Cure with moisture retaining curing covers only, avoid use of curing compounds.

 Protect installed vapor retarder from physical damage and deterioration. Monitor all work above the installed vapor retarder to ensure the work does not damage the vapor retarder. The following activities are prohibited:
   i. Form stakes driven through installed vapor retarders
   ii. Intentional penetration or puncturing of vapor retarders to promote drainage
   iii. Intentional penetration or puncturing of vapor retarders to promote slab drying or curing
   iv. Removal of vapor retarder to foundation wall edge seals for grade lines or other reasons
   v. Careless placement of reinforcing steel and welded wire mesh of all types.
   vi. Careless raking of concrete which results in damage to the installed vapor retarder.
   vii. Careless lifting of reinforcing mesh which results in damage to the installed vapor retarder.

07.13. Air Barriers

a. Provide building air infiltration barrier where appropriate; Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane. Air barrier to be flashed to discharge. All incidental condensation or incidental water penetration shall discharge to the exterior. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage.

b. Air barrier system shall be from the same manufacturer as flexible flashing.

c. Provide a complete air barrier system from one manufacturer including, without limitation, primers, sealers, surface conditioners, edge sealants, fillers, adhesives, cants, mastics, and other materials and accessories required or recommended by system manufacturer.

d. Air Barrier Systems shall meet the following performance requirements:
   i. Air Permeance: Maximum 0.004 cubic feet per minute per square foot at 0.3 inch water gage [1.57 psf] pressure difference. Per ASTM E2178 Standard Test Method for Air Permeance of Building Materials

iii. Liquid Water Leakage: None at 5 gallons per square foot per hour at 6.24 psf pressure difference.

iv. Peel Adhesion: Minimum 3 pounds per linear inch of bond line; 180 degree peel, per ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.

v. Pull Adhesion: Minimum 12 pounds per square inch.


vii. Fasteners installed through cured air barrier shall be sealed so that no increase in air permeance or liquid water leakage around fasteners shall occur.

e. Apply a continuous air barrier system, with equipment and techniques recommend by manufacturer, over 100 percent of all wall surfaces free of defects including wrinkles, fish mouths, air pockets, bubbles, blisters, pin holes, slump, sag, runs and sponginess. Fully adhere air barrier system to substrates. Inspect installed air barrier and repair all damage before concealing using manufacturer’s recommended repair and patching procedures.

f. Additionally, for sheet applied air barrier systems provide minimum 3 inch overlaps at horizontal joints and seams and minimum 6 inch overlaps at vertical joints and seams per manufacturers’ recommendations. Continuously seal exposed sheet edges with air barrier system’s liquid sealant. Use mechanical fasteners to staple top edge of each air barrier membrane course and layer to sheathing, when recommended by air barrier manufacturer.

g. Additionally, for fluid applied air barrier systems seal substrate joints, cracks, and seams up to 0.125 inch wide with continuous fiberglass reinforcing tape and 12 inches wide first coat of air barrier material centered over the joint. Seal substrate joints, cracks, and seams 0.125 inch wide and wider with continuous minimum 6 inches wide crack membrane. Seal and flash penetrations, but not fasteners, with continuous crack membrane to form waterproof flashing “boots” around each penetration. Do not trap moisture between coats or layers.

h. The A/E shall provide standard details for air barrier installation as part of the contract documents. The A/E shall specify how contractor shall address how penetrations through the air barrier shall be sealed post system installation (i.e. signage electrical conduits).

07.14 Shingles

a. On the Williamsburg Lawn historic section of the campus, existing Spong and Rollins Halls have slate shingle roofs. Replacement of the Spong and Rollins Halls slate shingles will be considered on a project specific basis.

b. Asphalt shingles should not be considered for new construction on campus.

07.15 Metal Roof Panels

a. Refer to CPSM A.4 METAL ROOFING. Metal roofing shall comply with the latest edition of the SMACNA Architectural Sheet Metal Manual or the NCRA Metal Roofing Manual.

b. Roof Panels shall be:

i. Double lock seam or flat seam terne coated metal, copper, zinc, aluminum or stainless steel roofs are acceptable when they comply with the latest editions of SMACNA Architectural Sheet Metal Manual, or the NCRA Metal Roofing Manual.
ii. Lapped rib panels with exposed fasteners are acceptable only for utility structures such as sheds or pre-engineered buildings where the manufacturer is responsible for water tightness.

iii. Architectural systems installed over a solid deck are acceptable for roof slopes 4:12 or greater.

iv. Mechanically seamed cap strip with factory applied weather stripping.

v. Finish: Manufacturer’s standard color kynar 500 fluoropolymer.

c. Standing seam spacing shall be coordinated with the University Architect to insure proper aesthetic spacing for the building. Standing seams spaced 12” on center or 16” on center are typical spacing dimensions. 18” on center may be considered. 24” on center standing seam spacing is not acceptable. Panel Length shall ensure no panel end seams.

d. Provide lead coated copper or terne coated stainless steel for counter flashing, cleats, drip edges, exposed metal trim/ridge cap, cant strips, and, exposed metal valleys typical.

e. 60 mil, self-adhesive polymer-modified bituminous sheet sealable ice and water barrier shield shall extend continuously: from outer edges of eaves and gutters to 30” minimum upslope beyond the line of the exterior wall below, 30” from rake edges and roof penetrations, and 36” to both sides of valleys.

f. The Manufacturer shall provide a minimum 30 year system warranty. Special Warranty on Panel Finishes: Manufacturer’s standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

g. Refer to **DIVISION 1 – GENERAL REQUIREMENTS**, of these standards, regarding roofing mock ups.

**07.16. Metal Wall Panels**

a. The university allows aluminum composite metal panels on campus buildings. Panels shall be a minimum of 4 mm thick with an aluminum smooth, non-embossed panel skin gage of a minimum 0.020 inch. All panels shall be oriented so the directional grain is in one direction. Panels shall have a fire retardant core.

b. Steel panels are allowed, with approval by the ODU Project Manager in concurrence with the University Architect.

c. When panels are applied to a curved condition, provide true curved panels, do not provide flat faceted approximations of curves.

d. Shop Drawings for metal wall panels shall include details of concealed stiffener locations, corner reinforcing and fasteners.

e. Make each panel individually removable for repair and maintenance

**07.17. Metal Soffit Panels - Concealed-fastener, lap-seam panels, with and without perforations.** (Reserved)

**07.18. Fiber Cement Wall Panels** (Reserved)

**07.19. Fiber Cement Lap Siding** shall not be used on campus, without prior approval by the University Architect is

**07.20. Roofing**

a. It is critical that the A/E, along with the ODU project Manager, set up a roofing design meeting during Preliminary Design with the appropriate roofing personnel from Facilities Management to review proposed roof systems.

b. Roof covering choice shall consider the views from higher elevated structures.

c. All low-slope roofs shall obtain primary and secondary roofing and insulation materials from the roof system manufacturer to ensure a single-source responsibility for entire roofing system.
d. Vapor retarders shall have a perm rating of 0.5 or below in accordance with ASTM E96. Typically, a two ply organic membranes recommended under hot applied system; a polyethylene sheet under single plies

e. Maximize insulation value to conserve energy.

f. The following, 60 mil minimum, systems are used on University Buildings, in order of preference, when appropriate:
   i. THERMOPLASTIC POLYOLEFIN (TPO) ROOFING fully adhered systems.
   ii. POLYVINYL-CHLORIDE (PVC) ROOFING, with KEE, fully adhered systems
   iii. ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING fully adhered system

g. Roof Insulation
   i. Polyisocyanurate board insulation shall have a nominal average compressible strength of 25 psi. Material provided shall be labeled to show compliance with this requirement.
   ii. Board insulation shall be installed with a minimum of two layers with staggered joints in both directions, installed per manufacturer’s installation instructions. Maximum single board thickness for flat insulation shall be 2-inches.
   iii. Board insulation shall be installed with a minimum of two layers. Fit boards together with no gaps to achieve a complete thermal envelope.
   iv. Daily installation of roof insulation materials shall be limited to that amount which can be covered with the roofing membrane prior to the end of the day or prior to the onset of inclement weather.
   v. Anchor roof insulation in accordance with manufacturer's recommendations for fastener type, size, placement and density. Installation shall comply with Factory Mutual 1-90 rating against uplift.

h. All roofs shall have electrical outlets located no more than 200’ apart.

i. Whenever possible provide a frost-protected hose bib on each roof.

j. All roof drain strainers shall be metal.

k. Preference is for a combined roof drain and overflow drain in a single bowl.

l. Rooftop piping, conduits and equipment shall be mounted on supports specifically manufactured for roofing. Wood blocking is not an acceptable means of support.

m. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof drain plugs specifically designed for this purpose. Remove roof drain plugs at end of each work day, when no work is taking place or when rain is forecast.
   i. If roof drains will be temporarily blocked or unserviceable due to roofing systems removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

n. Warranty
   i. Review warranty requirements during preliminary design. Review sample warranty included with required submittals before contractor starts work.
   ii. Manufacturer's Warranty: After final inspection and approval by roofing manufacturer's representative, provide written warranty signed by manufacturer of primary roofing materials and his authorized Installer, agreeing to replace/repair defective materials and workmanship as
required to maintain roofing system in watertight condition. Warranty period is a minimum of 20 years from date of substantial completion, with no dollar limit.

iii. Contractor’s Warranty: Submit two executed copies of the Contractor’s Roofing Warranty, signed by the Installer (Roofer), agreeing to warrant the roof system. Warranty period is 2 years from date of substantial completion.

iv. Insulation shall be supplied by the membrane manufacturer and included in the required 20-year system warranty.

v. The contractor shall schedule a roof warranty inspection at the time of substantial completion, to include the ODU Project Manager, ODU Project Inspector, third party roof inspector.

o. All components shall be provided by a single manufacturer and installed by a single installer.

p. Manufacturer approved installer with not less than 10 years of successful experience with roofing membrane specified.

q. Pipe seals shall be pre-manufactured neoprene boots.

r. Wood members used in conjunction with roof system shall be pressure treated with water-borne preservatives for above ground use in compliance with AWPB LP-2.

s. Interior roof drain connections’ installation must be coordinated between all trades (roofing, plumbing and general trades) and clearly detailed on the drawings by the A/E.

t. Provide tapered installation with positive slope to drain per manufacturer’s recommendations.

u. Refer to the CPSM for requirements associated with water evaporation time limits.

07.21. Sheet Metal Flashing and Trim

a. For all warranties, specify wind speed.

i. Warranty for “Gravel Stop” Roof Edge: 20 years

ii. Warranty for Coping: 25 years

iii. Warranty for Through Wall Scupper: 20 Years

b. Stone precast concrete or metal coping systems require a complete thru wall flashing system. Flash the roof side of parapet walls the full height.

c. Roofing system flashing and miscellaneous sheet metal work, shall be installed in accordance with the manufacturer’s published instructions and furnish a 50 year warranty.

d. Metal for exposed flashing and drip edge shall be copper, not less than sixteen ounces (16oz.), concealed flashing shall not be less than twelve ounces (12 oz.). When flashing occurs extensively in connection with aluminum items, stainless steel (grade 304) or aluminum flashing not less than 0.032” thick shall be used. All flashing joints shall overlap 4” minimum and shall be sealed with a manufacturer approved elastomeric sealant.

e. All flashing and sheet metal work shall be as recommended by the sheet roofing membrane manufacturer and shall be included in the roof guarantee.

f. All metal shall be compatible with abutting systems.

g. Fascias and gravel stops shall be extruded aluminum, copper, stainless steel or color coated metal.

h. The top of flashing (bottom of counter-flashing) shall be a minimum of 8” above the plane of the roof.

i. Items penetrating roof should be flashed with pre-formed accessories, secured to the roof and penetrating items, do not use pitch pans.
j. Relief vents shall not be installed unless roof no longer is under warranty and vents are recommended by the manufacturer of the sheet roofing membrane. For roofs being constructed or under warranty, all wet insulation shall be replaced.

k. Where dissimilar metals will contact each other or corrosive substrates, protect galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

l. Solder all non-expansion joints in copper or zinc metal work.

m. All thru-wall flashing shall be stainless steel backplate with 40 mil rubberized asphalt peel and stick over the top for a seamless system.

n. Thru-Wall Flashing: Contractor shall inspect and certify proper installation of all thru-wall flashing. Prior to installation of first piece of thru-wall flashing related to the wall system and prior to the first piece of thru-wall flashing related to the roof system, the Contractor shall coordinate an on-site meeting so that the ODU Project Inspector and the A/E can be on site and witness the installation prior to it being covered up. It is the responsibility of the Contractor to allow time in the schedule for each of these initial inspections. The Contractor shall create and maintain a Thru-Wall Flashing Log listing the date, time, and area inspected and provide copies of the log at each job site meeting. The Contractor shall photo document inspections and each photo shall have a date and time stamp. The Contractor shall provide digital copies of the photos within 24 hours upon the Project Manager’s request. The log and photos shall be part of the close-out documentation.

o. Metal flashing, counter flashing, cleats, clips, drip edges, exposed metal trim/ridge cap, cant strips, scuppers, eyebrow roof vents, and exposed metal valleys shall be terne-coated stainless steel.

p. Continuous cleats are required.

q. Built-in through wall flashing shall be used for all new wall-flashing terminations. Surface applied reglets shall only be used on existing buildings where installation of built-in reglets is not possible.

07.22. Roof Specialties


b. On sloped roofs, provide adequately sized and securely installed gutters of aluminum, stainless steel or PVDF-coated steel. A minimum slope of 1/16-inch per foot for gutters is required. Counter flash top back edge of gutter under roof edge/fascia. Do not allow roof water to run down wall behind gutter. Space gutter hangers maximum 30 inches on center. Anchor gutter into structure, framing, or blocking. Cap gutter ends with shop fabricated terminations. Space gutter expansion joints a maximum of 30 feet on center and coordinate with downspout locations.

c. Downspouts shall be a minimum of 16-gauge, shall be adequately sized and securely fastened to the vertical plane, and shall empty into a cast iron boot at grade connected to a storm water system or BMP. A minimum of two downspouts for each drain area shall be provided. Coordinate downspout locations with gutter expansion joints. For existing facilities where this is not possible, water will be directed away from the building and new splash blocks will be provided. Attach to wall with hangers and spacers. Provide at least two hangers per downspout a maximum of 8 feet on center. Install all hangers at same heights. Provide fittings and offsets to make downspout follow wall profile. Provide 12 to 24 inches high, replaceable bottom outfall coordinated with drain method.
d. Gutter Debris Guards shall be included on all gutters for sloped roofs that are located under a canopy of
trees or will be susceptible to leaf collection. Debris guard material shall be compatible with gutter
material to avoid galvanic corrosion. Coordinate with ODU Project Manager.
e. If conductor drains are utilized, they shall have guards to prevent pigeons from nesting.
f. Lap joints are not allowed for built in gutters.
g. Built-in gutters are only permitted with approval of Design & Construction and Facilities Management.
Where approved, built-in metal gutter liner shall be terne-coated stainless steel.
h. Remove spilled sealant, finger prints, soiling, stains, and contamination from gutters and downspouts.
Clean with potable water and soft bristle brushes, being careful to not scratch or damage surfaces. Do
not use chemical cleaners or detergents without approval as they may damage the building.

07.23. Manufactured Roof Expansion Joints (Reserved)
Factory-fabricated, bellows-type, and aluminum roof expansion-joint assemblies.

07.24. Roof Accessories

a. Rooftop equipment must be screened from view of other buildings, streets and walkways. A/E shall
provide 3D views of the building design from various locations to demonstrate the full extent of the
equipment screening during preliminary design. Consider views from adjacent building windows and
consider future adjacent buildings who might have visual access to the roof.
b. Roof Access:
   i. Roof access shall be provided from inside the building to accommodate inspections, repairs, and
drain cleaning, Man door access is preferred. Permanent ladders or stairs shall be provided as
necessary to access each roof level. A/E shall demonstrate how ALL roof areas can be accessed
for maintenance as part of the preliminary design review.
   ii. Roof Access Preferences:
      a. Buildings 3 stories or less: Provide a 48 inch roof hatch with a ships ladder.
      b. Buildings 4 or more stories: Provide a stair to the roof, with an oversize door (42 inches) to
         the roof.
      c. Buildings greater than 6 stories: Provide an elevator that opens level with the roof surface
   iii. Buildings with significant mechanical equipment located on the roof shall endeavor to provide
      elevator access.
   iv. Roof hatches shall be insulated and feature thermally broken construction and have frangible
      (break away) type padlocks.

c. Elevated equipment must have permanently installed ladders and platforms to all equipment access
panels and items requiring ongoing maintenance.
d. Where parapets are below 42” in height, the A/E shall specify and detail roof tie-offs.
e. Roof Curbs: Roof-mounted equipment such as fume hoods fans, motor starters, etc. shall be installed
on fully flashed curbs. When set on stands, allow 24 inches minimum clearance, under equipment, to
facilitate repairs to equipment and allow for roof repair and reroofing. Equipment is not allowed to be
mounted on pressure-treated wood, plastic pads or panels set directly on roof surface. Curb caps shall
not be penetrated by attachment of motors or equipment. Install raised brackets that attach thru the side
of curbs and allow equipment attachment without penetrating curb cap.
f. Fasteners: Same metal as metals being fastened or non-magnetic stainless steel or other non-corrosive metal as recommended by the manufacturer. Match finish of exposed fasteners with finish of material being fastened.

g. Provide tie-off connections for life safety lines.

h. Keep any rooftop equipment and drains a minimum of 10 feet from any building edge to avoid the addition of roof guardrails.

i. Where new rooftop equipment or repair/replacement of existing rooftop equipment is approved, the project must incorporate the following:
   i. Provide adequate space and appropriate lighting for access and maintenance of the equipment.
   ii. Provide durable walk pads from roof access point to and around all rooftop equipment. Walk pads must be at least 2’ wide and extend 6’ from the equipment on the sides requiring service accessibility. Walk pads to be installed per manufacturer’s instructions. A/E to specify that walk pad installed to be certified in walk pad installation by the manufacturer. Construction drawings shall clearly show these traffic pad locations and dimensions. Enlarge roof pad area at roof access points for equipment staging.
   iii. Provide 12” clearance under rooftop equipment and horizontal supporting members to finished roof (24” clearance if the equipment is > 24” wide). Supports shall be mounted and fastened to structural deck or framing, not insulation.
   iv. Use of wood sleepers for rooftop equipment is prohibited.
   v. Equipment curbs shall not be placed in drainage valleys. Crickets shall be installed on upslope sides of equipment curbs.

j. Install roof anchors on all new buildings that require windows and skylights to be washed via suspension system (such as boatswain’s chair, rope descent, or temporary scaffolding) and for other equipment maintenance activities that would be considered a fall hazard.

k. OSHA approved fall protection including safety tie-back anchors shall be installed on all new roofing and reroofing projects. Tie-backs as required shall be securely anchored to the building structure.

07.25. Snow Guards

a. Review snow and ice guards on all steep slope roofs during Preliminary Design, paying special attention to all entrances and exits. Snow guards are required for all roofs with a slope of 4 in 12 or greater and over all entrances regardless of slope.

b. A minimum of three staggered rows is required. Snow guards shall be copper, stainless steel or bronze, butterfly type. Adhered plastic snow guards and wire snow guards are not acceptable.

c. Confirm design and layout of snow guard system as appropriate for size and slope of roof. Larger roofs may require intermediate rows of snow guards.

07.26. Fireproofing

a. Coordinate shop applied coatings with fireproofing manufacturer. Do not apply fireproofing to painted substrates if the fireproofing manufacturer prohibits or does not recommend application over painted substrates.

b. Intumescent Fireproofing. When structural steel is specified to receive intumescent fireproofing, coordinate the steel shop primer, or recommend steel to receive intumescent fire proofing be erected without primer. Steel shop primer, if any, must be approved by thin film fireproofing manufacturer. Commercial Blast surface prep is required under primer and intumescent fireproofing.
c. Refer to CPSM SECTIONS 4.12.6 REMOVAL AND REPLACEMENT OF SPRAYED-ON FIREPROOFING AND 5.8.6.9.10 APPLIED FIRE RESISTANT MATERIALS.

d. Sprayed-on fireproofing shall be 100 percent asbestos free and a cementitious type. Specify higher density products if needed based on project requirements.

e. Specify field quality control testing of sprayed-on fireproofing by an independent testing agency to verify that installed fireproofing complies with specified thickness, density and bond strength prior to ductwork installation.

f. Coordinate the extent of fireproofing between structural and architectural documents.

g. Coordinate specifications and manufacturer’s requirements for structural steel that is to receive fireproofing shall not be prime painted. Such steel shall be properly stored and protected to prevent surface rust. Require that applicators prepare steel in accordance with fireproofing manufacturer’s recommendations to ensure proper bond.

h. Repair of Existing Fireproofing

i. Where renovation work disturbs existing fireproofing, repairs shall be made by the contractor. Match the original fire resistance performance and original fireproofing density and thickness or provide compatible materials. Provide primers, bonding agents, mold inhibitor, and surface sealers recommended by fireproofing manufacturer. Patch and restore fireproofing to match original installation. Control curing of new fireproofing. Apply surface sealer if original fireproofing was surface sealed. Clean up and remove over spray. Contractor shall have the fireproofing installation reviewed and approved by the AHJ immediately before concealing.

07.27. Firestopping

a. Refer to BCOM NEWSLETTER #35 NOVEMBER 2017 for information regarding firestopping.

b. Contractor shall be required to provide verification of purchase to ODU of product provided for fire stopping penetrations through rated partitions.

c. ODU reserves the right to verify that the correct thickness of material has been provided at fire-stopped penetrations by cutting out sections at random at no extra cost to ODU.

d. Fire stop installer shall post labels at all fire stopped penetrations to identify “hour rating”, UL System, etc. Submit samples with shop drawing submittals.

e. The installing contractor shall be trained and authorized by the manufacturer of the fire stop product used to do the work; authorization shall be included in product submittals.

f. The manufacturer’s local representative shall be required to periodically visit the site to review the work done and make recommendations to ODU on the work performed. A site visit report shall be submitted to the Project Manager.

g. Floor penetrations in all mechanical spaces shall be sealed and water-proofed. On new construction sleeves shall be cast-in-place schedule 40 pipe and shall project 3" above the floor in all rooms housing mechanical equipment.

h. Engineering Judgment: For each fire stop condition for which there are no UL, or equal, system number, provide a Project specific custom designed fire stop system and a dimensioned drawing prepared, professionally sealed, and signed by a registered professional engineer.

i. Show all conditions, assemblies, penetrations, annular spaces, if any, and other conditions.

ii. Identify all fire stop materials proposed for use including installation locations and thicknesses.

iii. Attach product data sheets for each fire stop material proposed.
iv. Include engineer’s opinion and judgment of custom designed fire stop system.

v. Obtain approval of AHJ prior to constructing the fire stop system.

i. Fire stopping between slab edge and glazed curtainwall assemblies, provide UL “Perimeter Fire Containment Systems XHDG, CW-D” series or equivalent as appropriate for specific project conditions. For mineral fiber board which compresses and rebounds greater in one direction than the other direction, install mineral fiber board with greatest compression/rebound direction oriented horizontal between slab edge and back of curtain wall.

07.28. Preformed Joint Seals (Reserved)

Expandable foam joint seals, and precured, extruded silicone joint seals.

07.29. Joint Sealants

a. Sealants shall be specified for all exterior applications and those interior applications where caulking compounds are not suitable. Including the following locations:

   i. At all joints, seams, and intersections between dissimilar materials. Consider different types of masonry as dissimilar materials.
   ii. At all gaps and voids within or between similar materials.
   iii. At interior control joints.
   iv. At perimeters of door frames, other frames, and trims.
   v. At top of wall base along irregular walls.
   vi. At joint between acoustical ceiling edge trim and irregular walls.
   vii. At counter tops and splashes to make counter tops watertight.
   viii. Completely around all plumbing fixtures, fittings, and trim at counter tops, walls, and floors.
   ix. At perimeters of all exterior penetrations.
   x. At exterior control joints including at pavement and site walls.

b. Manufacturers’ Warranty Period for Exterior Sealants: 30 years, where possible, 20 year minimum.

   i. Sealants are to remain flexible to prevent cracking and water infiltration within the warranty period.
   ii. A written warranty for all joint sealants shall be provided by the Contractor and the sealant sub-contractor agreeing to replace all materials which fail within five years from the date of substantial completion, at no cost to the University.

c. A/E shall provide a joint sealant schedule as part of the specifications and coordinated with the drawings.

   i. Interior, Dry, No Traffic: White, paintable, siliconized acrylic
   ii. Interior, Wet, No Traffic: Low odor, mildew resistant, fungus resistant, sanitary silicone.

d. Specify preconstruction and field adhesion testing where appropriate.

e. The sealant specifications shall include all accessories such as seals, water stops, backer rod, bond break tape and primer.

f. For horizontal construction joints in concrete pavements or walks, use pourable urethane base sealant.

g. Five years’ experience of applicator shall be certified to the A/E prior to the installation of any sealants.

h. Joint Sealant Installation:
i. Installation of sealant materials shall be as late in the project as possible, but between cleaning operations and paint application. Do not install sealants when the temperature is below 40 degrees F. unless approved by the manufacturer and the A/E.

ii. Acceptance of conditions for application of sealant materials shall be solely the responsibility of the sealant sub-contractor.


iv. Remove loose and friable materials down to sound materials.

v. Etch and roughen surfaces to which sealant is adhered to improve bond.

vi. Clean joint surfaces immediately before installation, removing laitance, soil, grease, oil, and all contamination. Mask adjacent surfaces to control spillage and prevent damage to other surfaces. Prime all substrates prior to installation of sealants and apply sealant within same work period as primer application.

vii. Install backer rods wherever possible, without twisting or distortion. Do not puncture or damage closed cell back rods to prevent outgassing and sealant bubbles. Control depth of backer rod to control sealant shape and sealant thickness. Control depth of backer rod so compressed sealant does not protrude from joint.

viii. Comply with sealant manufacturer’s recommendations for sealant width and depth. Sealant cross section shall be “hour glass” shape with broad adhesion and thin center. Where backer rod is not possible, provide bond breaker tape at back of joint.

ix. Do not obstruct weep holes.

x. Force sealant into joints, do not drag sealant into joints. Fill joints with sealant to form dense, continuous sealant beads without air gaps and voids. Dry tool sealants to provide smooth, uniform, continuous visible sealant surfaces, do not wet tool. Tool visible sealant surface slightly concaved, except make flush in very hot weather.

xi. Avoid intersections between incompatible sealants. Where intersection between incompatible sealants is unavoidable, provide a 0.032 inch thick aluminum septum between the incompatible sealants and adhere both sealants to the septum.

i. Color and appearance of joint seals shall be approved by the University Architect as part of the exterior building Mock-Up, see CHAPTER ONE - PROJECT GENERAL REQUIREMENTS

07.30. Acoustical Joint Sealants

a. Interior Acoustical Sealant helps ensure that partition sound performance matches the promise of sound tests by sealing off spaces at partition perimeters and around cutouts. Sound transmission between spaces is an important consideration by ODU. The A/E shall indicate the location of acoustical sealants on all partition types and shall include acoustical joint sealants in the specifications.

b. Follow ASTM C919 Standard Practice for Use of Sealants in Acoustical Applications. Provide uniform, continuous sealant without air gaps and voids. Remove spilled and excess sealant. At all partition application provide acoustical sealant:

i. Horizontally between gypsum board edge and the subfloor or dissimilar material.

ii. Vertically between gypsum board edge and all dissimilar materials.
c. At the top of interior partitions fill the space between the top of the partition and the structural deck with acoustical insulation. Continuously seal both faces of the partition with acoustical joint sealant. Conceal the acoustical insulation. If intended to be exposed to view, provide neatly installed and tooled paintable sealant. Install visible face of sealant flush with adjacent surfaces or slightly recessed. Provide and remove temporary masking tape as needed. Do not smear sealant onto adjacent surfaces. Provide straight line sealant bead edges and terminations.

d. Acoustical Joint Sealants at Interior Partitions – STC less than 45: Provide one row of continuous liquid sealant on one side of the partition.

e. Acoustical Joint Sealants at Interior Partitions – STC less than 45 to 49: Provide two rows of continuous liquid sealant, one on each side of the partition.

f. Acoustical Joint Sealants at Interior Partitions – STC 50 and higher: Provide four rows of continuous liquid sealant, two on each side of the partition.

g. Acoustical Joint Sealant at interior frames – doors, sidelights, borrow lights, and windows: Provide four rows of concealed continuous liquid sealant, one on each side of partition between partition framing [stud and header] and frame and one on each side of partition between gypsum board edge and frame.

h. Acoustical Joint sealant at interior control joints: Provide continuous liquid sealant on each side of the partition directly behind the control joint. Fill the entire cavity behind the control joint and acoustical sealant with acoustical insulation.


j. Acoustical Putty Pads at Electrical Boxes: Comply with manufacturer’s instructions and recommendations. Cover entire back and all accessible sides of electrical box with putty pad. Seal putty pad to framing supporting electrical box.

07.31. Expansion Joint Covers

a. Location and details of expansion joints and covers shall be reviewed at Preliminary Design, including roofs, ceilings, walls (interior and exterior), and floors. Expansion Joint covers shall be coordinated with building systems and finishes.
Division 8 – Openings

08.1. General
   a. Doors and hardware are to be coordinated with the requirements of the Security section in Chapter Three of these standards and Appendix T-Electronic Access Control & Conduit Diagrams.
   b. The A/E shall specify all hardware in a separate hardware section. Storefront door hardware shall be included in this hardware section and not in the storefront specification.

08.2. Exterior Building Entry Doors
   a. The A/E shall consider wind direction, microclimate conditions and wind pressures when designing building entrances. Entry doors in the north and east facades of buildings are subject to high winds. Consider ways to provide windscreens for all exterior doors, but especially the north and east.
   b. All exterior building entries shall be arranged using a vestibule or “airlock” to avoid excessive exchange of conditioned indoor and unconditioned outdoor air.

08.3. Interior Doors
   a. Clear glazed vision panels shall be used in all classroom and stair doors.
   b. When double doors are necessary at card access locations, provide a removable mullion.

08.4. Hollow Metal Doors and Frames
   a. All non-entrance exterior doors shall be steel or fiberglass.
   b. Mechanical Room doors must be 42” wide single leaf or 60” pair.
   c. All hollow metal exterior doors shall not be less than 16 gauge galvanized steel (prior to the addition of coatings) fully insulated doors with the top channel turned ‘web up’ to eliminate dirt pockets. Doors shall carry a lifetime manufacturer’s guarantee.
   d. Other interior hollow metal doors shall be minimum 0.42 in, 1. mm, 18 ga. face sheets, prior to the addition of coatings. Solid grout head and jambs in high traffic or abuse locations. All steel frames shall be reinforced for scheduled hardware.
   e. Hollow metal door frames shall be one piece fully welded assemblies of not less than 16 gauge metal. Hollow metal knock down frames are allowed for interior renovations only - if approved by the university. Frames in interior walls of up to 8” thick shall be the full thickness of wall.
   f. Exterior metal frames shall be fully grouted. Specify shop-applied asphaltic frame undercoating for surfaces of frames that will be in contact with grout
   g. A preference of an A-60 (ZF 180) metallic coated steel sheet with factory primed finish after fabrication for standard exterior door frames and A-40 (ZF 120) for standard interior door frames. Typical primed frames do not offer enough corrosion resistance for the intended life span of a building and an A-60 coating is better capable of withstanding the local environment.
   h. All exterior doors shall be provided with automatically engaging door bottom weather-strip devices.
   i. Spliced frames are not acceptable.

08.5. Flush Wood Doors
   a. In all facilities discuss with the users any potential oversized equipment and or furniture that may need to be maneuvered within the building such as mass spectrometers or athletic equipment. Coordinate door width and heights to accommodate these, whether installed at the opening of a building or planned for the future.
   b. Wood doors shall be five plies, solid core with a minimum thickness of one and three-fourths inch (1¾”), and a lifetime warranty.
c. Wood doors shall be solid core and shall be reinforced for all hardware including closers; prime or seal all hardware cut outs and top and bottom of door. All doors shall be pre-finished with face veneers book-matched. Coordinate door veneers with adjacent existing doors, if any. Verify door veneer selection with the university.

d. Bi-fold or bi-passing doors are prohibited.

e. Exterior wood doors are prohibited.

f. Guarantee shall be a lifetime guarantee.

g. Interior paint grade, painted wood doors are prohibited, unless approved due to an existing condition, such as a renovation project.

08.6. Thermally Fused Laminate Doors

a. Thermally fused doors are an acceptable alternative to interior wood doors.

08.7. Access Doors and Frames

a. All access panels shall be fiberglass or metal. Provide access doors to attics, roofs, crawl spaces, valves, switches, concealed devices, tunnels and/or other similar areas where university personnel require access for maintenance or repair activities. Access panels shall be shown on reflected ceiling plans for layout and coordination. If there appears to be too many access panels in a hard ceiling, an accessible ceiling is desired. Provide key locks on all access openings that are exposed to the public. In Residence Halls, provided key locks or tamper proof screws at all access panels located in student rooms in addition to those located in public spaces.

08.8. Overhead Coiling Doors | Sectional Doors


b. Exterior insulated heavy duty rolling service doors: 24 gauge galvanized steel front and back, interlocking flat profile slats with endlocks. Hood is 24 gauge galvanized steel. Provide chain hoist operation or electric. Weather-stripping on the exterior and interior side of the guides, on the bottom bar and the hood lintel. Provide a zinc enriched powder coat finish.

c. Multiple control locations may be required for operators. Include wall penetrations, pathways, stubs, pavement penetrations and exterior conduit for exterior controls. Controls shall be up/down/stop.

d. Outside key switch or card swipe shall be coordinated with security requirements.

08.9. Aluminum-Framed Entrances and Storefronts

a. Aluminum doors shall be medium stile, thermal break construction with 10" bottom rail to accommodate wheelchairs.

b. Standard finish colors are clear anodized, powder coated silver, white or steel gray (College of Education). Custom Colors are to be approved by the university.

c. When designing exit vestibules, consider where pull stations are mounted to meet code.

08.10. Glazed Aluminum Curtain Walls

a. Where curtain walls are used, they shall be NFRC rated to provide a minimum total thermal resistance of at least R-6, including the frame and the glass.

b. When specifying curtain wall system consider thermal properties for heat gain and cold conditions, insulating properties and subsequent mechanical load impact.

08.11. Aluminum Windows
a. In general window frames shall be thermally broken 2” x 4-1/2” heavy commercial aluminum windows, flush dry glazed from the interior.
b. In residence halls, if fiberglass windows are being considered as a design option, discuss with the Department of Design and Construction during schematic design.
c. Prior to acceptance by the University, proposed manufacturers must provide to the ODU Project Manager copies of test reports by an independent laboratory which certify the proposed window unit’s performance standard baseline. The test reports will identify the standards used and provide documentation of those standards.
d. Written guarantee shall state that all components will meet specified performance requirements for a period of 2 years following acceptance and that defects will be repaired during the term of the guarantee at no cost to the University.
e. Weather stripping shall be guaranteed for a period of 5 years.
f. Standard finish colors are clear anodized, powder coated silver, white or steel gray (College of Education). Custom Colors are to be approved by the university.
g. All pre-finished windows shall have protective coverings during construction, until units are installed.
h. Window selection shall consider the window styles of surrounding buildings and visually adjacent windows.
i. In residence halls, all operable windows on the first floor shall have security screens.

08.12. Sun Shades
a. The design shall incorporate sun shade devices as appropriate for the sun angles on each specific elevation. Sun shade devices should not be added to windows on elevations where the impact is minimal. Consider vertical shading devices on east and west facades. Provide a sun study of the building exterior during schematic design demonstrating the impact of the shading devices on the glass, estimate the percentage area of glass shaded by these devices for June and December at 8 a.m., noon and 5 p.m.

08.13. Metal Framed Skylights
a. Skylights shall not be used in any occupiable spaces, including corridors.
b. Solar tubes are acceptable.

08.14. Door Hardware
a. Pre-wire / pre-drill all potential card access doors.
b. All doors and frames shall be prepped by the manufacturer for all hardware to be provided by the University.
c. Provide at least one key override on an exterior door in each building. Provide rim cylinder only with night latch trim, pull handles.
d. During the working drawing phase, the A/E shall meet with the ODU Project Manager, the FM lock shop supervisor and ITS access control to review the program needs for locks and hardware in the proposed project, using the security and access plan developed during schematic design as the discussion guide.
e. A first pass of the door hardware schedule and hardware specifications is required at 60% Working Drawings Progress review. The ODU Project Manager will set up a separate hardware meeting with the Lock Shop Supervisor, representatives of the building users along with ITS and Public Safety/Campus Security to review the hardware design. As stated previously in these standards, but reinforced here,
building room numbers are to have been finalized and approved by the University Space Manager, prior to this meeting.

f. The A/E shall specify all required hardware for each opening. One manufacturer shall be scheduled with two other acceptable manufacturers listed. All hardware shall be approved by the University. A complete hardware schedule and full set of specifications is required at the owner review working drawing submission, which is prior to BCOM Working Drawing submission.

g. Prior to shop drawing submission, a hardware coordination meeting is to be scheduled by the general contractor to include the ODU project manager, the A/E, user groups, ITS and the Facilities lock shop to discuss project specific issues related to lock functions, coordination and delivery. The Contractor shall prepare the final keying schedule based on this meeting that clearly indicates how the University’s final instructions on keying of locks has been fulfilled and submit it as part of the hardware submittal process.

h. The General Contractor shall procure all cylinders and cores and install same. Construction cores may be installed by the contractor during construction, but shall be removed prior to beneficial occupancy.

i. Furnish three (3) keys per lockset or as directed by the ODU Project Manager.

j. Single Source Responsibility: Obtain each type of hardware latch and locksets, hinges, closers, etc. from a single manufacturer.

i. Hardware Finishes:
   1. The designations used to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
      b. Door Closers: 689 Powder Coat Aluminum
      c. Door Stops: 626 (US26D) Satin Chrome Plated Brass/Bronze
      d. Exit Devices: 626 (US26D) Satin Chrome Plated
      e. Flush Bolts: 626 (US26D) Satin Chrome Plated Brass/Bronze
      f. Hinges (Exterior): 630 (US32D) Satin Stainless Steel
      g. Hinges (Interior): 626 (US26D) Satin Chrome Plated Steel
      h. Locks: 630 (US32D) Satin Stainless Steel
      i. Overhead Holders: 630 Satin Stainless Steel
      j. Protective Plates: 630 (US32D) Satin Stainless Steel
      k. Pull Plates: 630 (US32D) Satin Stainless Steel

ii. Heavy Weight and Standard Weight Hinges:
iii. Concealed Bearing 5 Knuckle Full Mortise Hinges.
iv. Lifespan Bearing System
v. Painted Hinges are not acceptable.
vi. Non-removable pins (NRP) – All locations
vii. Concealed Electric Hinges
   1. Heavy Weight
   2. Concealed Bearing 5 Knuckle Full Mortise Hinge
   3. Concealed wires
   4. Concealed switches
   5. Shop weld junction box before frame is set
viii. Painted Hinges are not acceptable.

ix. Aluminum Continuous Geared Hinges
   1. Provide heavy duty continuous hinges at all exterior entrance doors, including interior vestibule doors.
   2. Provide heavy duty continuous hinges at all rated wood doors (due to weight).
   3. Prep for electrical power transfer unit.
   4. Quick connect wire harness.
   5. Concealed Electric

x. Heavy Duty Mortise Locks
   1. BHMA Grade 1 Operation and Strength, Grade 2 Security
   2. Lever to match Best 40H Series Lever 14
   3. Rose to match Best 40H Series Rose H

xi. Mortise Cylinder
   1. 3 Year manufacturer Warranty
   2. BEST 1E series
   3. BEST 1CP (premium) Core
   4. 7 Pin Core
   5. Finish: 626 satin chromium plated (brass base material)

xii. Rim Exit Devices
   1. Acceptable manufacturers
      a. Von Duprin
      b. 
      c. 
   2. Provide QEL (Quiet Latch Retraction).
   3. Provide quick connect plugs at rim exit devices, mullions and electrified hinges.
   4. Motorized Latch Retraction w/ power supply, Precision is preferred.
   5. Electrical Power Transfer – preinstalled 12 wire harness w/ quick connect plug-in connectors
   6. Hex key dogging or less dogging, cylinder dogging is acceptable.
   7. Door Position Monitoring Switch provided by the hardware manufacturer.
   8. Trim – Rectangular trim with “wire” pull. (APEX 1700C “C” Grip)
   9. Vandal Resistant Trim (Apex 4900D “D” Grip)
   10. Single doors secure better than double doors. Use of single doors is preferred unless double doors are needed for moving equipment in and out of the building.
   11. When double doors are required, the A/E should consider the design and use of doors on a hold open. Instead of a series of single doors, provide a keyed removable mullion.

xiii. Surface or Concealed Vertical Rod Exit Devices
   1. BHMA ANSI 156.3 Grade 1
   2. Avoid concealed or surface mounted vertical rod exit device
   3. Avoid cross bar exit device

xiv. Swinging Door Hardware
   1. Deadbolt - ANSI/BHMA Type E8211 (Grade 1)
      i. Steel case with corrosion-resistant plating
ii. 5/8” x 1-3/8” x 2-7/8” bolt with a 1-3/8” throw made of eight ply laminated stainless steel. Center ply to be an alumina-ceramic core to defeat hacksaw attack.

xv. Door Closer

1. Acceptable Manufacturers
   a. Closers at light weight doors, offices and Residence Hall student room doors.
      i. Yale
      ii. Falcon
      iii. LCN
   b. Exterior, heavy doors, classrooms, project rooms, residence hall community rooms.
      i. LCN
      ii. Falcon
      iii. Stanley

2. R-14 die cast Aluminum Alloy Cylinder Body – institutional grade
3. Fully Hydraulic Checking
4. All season fluid
5. Back-checking start at 45 degrees
6. Heavy duty forged arms
7. Separate adjustments for backcheck, general and latch speeds
8. All door closers shall be heavy-duty cast iron or die cast aluminum alloy with a minimum 10-year warranty.
9. Closers shall be thru-bolted to doors at a minimum height of 80” A.F.F.
10. **All interior door closers shall be provided with automatic hold-open devices.**
11. Where cross corridors doors are desired to remain in the open position, provide magnetic hold open devices.

xvi. Concealed Mount, Heavy Duty Overhead Closers

1. Non-handed
2. 85 to 110 degrees of opening in 5 degree increments
3. Shock absorbing spring with 3 to 5 degrees of cushion before dead-stop

xvii. Flush Bolts, Strikes

1. Avoid flush bolts whenever possible. Use keyed mullions and rim exit devices instead.
2. Provide dust proof floor strikes
3. Adjustable height for carpeted areas

xviii. Electric Strikes

1. Acceptable manufacturers
   a. HES
   b. Von Duprin
   c. ?

xix. Automatic Operators

1. Acceptable manufacturers
   a. Beasm
   b. Stanley
   c. LCN
2. If there are a series of doors, both doors in the series must have automatic openers. Each door shall open independently.
3. Automatic Door Operators and switch shall be hard-wired into the emergency circuit and be provided with battery backup.
4. Field adjustable
5. Adjustable Spring Force
6. Non Handed
7. Full or low energy
8. Acts as a mechanical closer for manual operation in the event power is off.
9. Controller configuration via Bluetooth Technology
10. Header height = 6"
11. Automatic Reset
12. Provide wave actuators instead of push pads to operate doors.
xx. Overhead Door Holder and Stop
1. Heavy-Duty
2. Stop function to be Warnock Hersey Listed
3. Non-handed/reversible
4. Single point hold-open in increments of 5" from 85" to 110"
5. Hold open know can be disengaged to act as stop only
6. 5" to 7" shock compression following hold-open point
xxi. Push Pull Plates
1. Push Plates: 4" x 16" square corners
2. Pull Plates: 4" x 16" with Wire Pull Grip or Wire Pull Offset Grip
xxii. Kick Plates
1. Provide stainless steel 6" high kick plates on all janitorial/custodial rooms – both sides of door.
2. Doors subject to abuse by the frequent moving of equipment or based on function shall have kick plates.
xxiii. Door Stops
1. Door Stops that would allow a door to be propped open shall not be specified or used in any space on campus. Door stops that are found in buildings, post occupancy will be removed and disposed of, due to potential fire safety concerns.
2. Door or Floor mounted stops shall not be used.
3. Use Heavy Duty Stops in most areas except for private offices
4. Use Wall Stops with convex bumper, concealed mounting with back plate. Provide solid blocking at all locations.
xxiv. Silencers
1. Provide BHMA LO3011 silencers in all metal frames
xxv. Weather Seals
1. Provide neoprene door sweeps on all active exterior doors and service doors
2. Provide Silicone Bulb seals on all exterior doors
3. Heavy Duty Mortise Automatic Door Bottoms at exterior entry doors.
xxvi. Gaskets
   1. All classroom doors shall receive screw on sound gaskets (no self-adhesive)

xxvii. Automatic Door Bottoms
   1. Are acceptable

xxviii. Rain Drip guards
   1. Provide 1 ½" high x 2 ½" deep (min) rain drip guard in clear anodized at all exterior doors that are installed in a flush application (i.e. without any building overhang).

xxix. Electromagnetic Door Holders
   1. Recessed wall mount or surface wall mount depending on application.
   2. Reinforce Door at hold open.

xxx. Long Door Pulls
   1. Provide a contrasting finish in the grip zone.
   2. 1" Diameter
   3. Offset Pulls with round ends

xxxi. Networked Hardwired electronic Locks
   1. Refer to APPENDIX Q – ELECTRONIC ACCESS CONTROL

xxxii. Door Viewers
   1. Provide door viewers at standard height at each student entry door in residence halls.
   2. Provide ADA height viewer, in addition to standard height viewer in all accessible student rooms and staff apartment entry doors in residence halls.

xxxiii. Key Cabinets
   1. One key cabinet shall be provided in all buildings. FM shall provide location.
   2. In Residence Halls provide a key box at the lobby front desk.

xxxiv. Privacy Locks
   1. In Residence Halls, provide occupancy indicator locks on BOTH sides of bathroom doors when accessed from two bedrooms.

08.15. Glazing
   a. Plastics shall not be used in lieu of glass.
   b. All required safety glazing shall be laminated glass.
   c. Interior single glazed windows shall be a minimum of ¼" thick glass.
   d. Glazing tint color shall coordinate with existing campus aesthetic.
   e. Interior glazing film is acceptable. Design shall be approved by the University Architect.

08.16. Louvers and Vents
   a. Architectural and Mechanical louvers and vents shall be clearly identified on Mechanical drawings and shown on the architectural exterior elevations and specified by the architect. Louver finish shall be powder coated with final color selections approved by the University Architect. All exterior louvers shall include ¼" x ½" bird screen on the interior face.
09.1. General

a. As a public university, extravagant, costly and higher maintenance interior finishes are discouraged. Interior flooring and ceilings shall be selected from manufacturer’s standard material and color selection; custom material selections shall not be used without prior approval by the University as this impacts future renovations and design-not-to-exceed budgets. Avoid finishes or detailing that have unrealistic construction or installation tolerances. Limiting finishes in this way does not limit creativity and the University expects the A/E to carefully pay attention to the design of public interior spaces.

b. The University promotes sustainable design practices and expects that where possible and in the confines of the not-to-exceed budget, materials are specified to meet or exceed the latest version of the USGBC’s LEED rating system, or other acceptable equivalent rating system. Interior finish selections shall be high quality, durable materials that are encouraged to be manufactured regionally within 500 miles of the project site, with a strong preference for Virginia based manufacturers. Avoid the use of imported materials.

c. Opportunities to use materials that would provide sustainable educational moments to students are encouraged. Consider methods of communicating such opportunities to the students. Any environmental attributes of all interior finishes should be specified when product is proposed, including percentage recycled content, low/zero volatile organic compound (VOC), wood certification, etc.

d. Refer to the University’s web site for University Colors, Logo usage and complimentary colors.

e. Finish Presentations

i. Materials can have a dramatic impact on project budgets, so it is the responsibility of the A/E to monitor the selection of finish materials and to review the design phase estimates at each phase.

ii. When presenting finishes, the university’s preference is to have a “loose” initial finishes discussion looking at material type options and locations during schematic design. The A/E shall provide technical data for the proposed finishes to the ODU Project Manager for Departmental review.

iii. During the Preliminary Design phase the A/E shall present finish samples of adequate size to visualize colors and patterns.

iv. Final material selections will be presented to the University for approval using finish boards with actual samples during no later than the Working Drawing Owner Submission.

v. Once all finishes are approved the A/E will provide 2 finish boards mounted on black gator board to the Project Manager for reference and distribution. The finish boards will have an associated key for each material providing the manufacturer, product name color and any associated product numbers and shall tie into the room finish schedule.

g. All specified materials must have a demonstrated history in a similar institutional setting (heavy usage), with similar regularity of cleaning and maintenance, for at least five years. Products should be easy to maintain. At the time of initial finishes discussions, provide cleaning and maintenance requirements when presenting materials to the university for review and approval.

g. Contractor shall include product cleaning requirements for all surfaces in the close out documents.

09.2. Acoustical Ceilings

a. All ceiling systems should be readily accessible. Access to all utilities above the ceiling shall be provided regardless of ceiling type used. Access panels shall be shown on the contract documents.

b. Acoustical ceiling tile shall be 24”x 24” from manufacturer’s standard palette, commercially available and
locally stocked. Basis of Design is Armstrong Cortega 770. Limit the use of different styles to areas of high visual impact.

c. Acoustical suspended grid system shall be white and of the highest quality available. Concealed spline support systems are prohibited. A standard Heavy Duty (HD) or Intermediate Duty (ID) 15/16-inch wide grid is preferred, 9/16" narrow grid is also acceptable with review by the ODU Project manager. Limit the number of different grids used. If other grid types are used, coordinate selection of lighting, HVAC supply and return diffusers with specific grid selected. Specify fire rated grid if required.

d. Renovations and/or additions shall be consistent with existing finishes and match existing tiles when possible and appropriate. When existing tile is no longer available to match, consider replacing entire rooms of tiles and salvaging existing tile as attic stock for remaining renovated spaces.

e. In support of landfill reduction on larger renovation projects, the A/E shall investigate and specify removed ceiling tiles to be recycled in a manufactured program recycling old ceilings into high recycle content ceiling products.

f. Bulkheads and soffits should be built of gypsum wall board supported on appropriate framing. Bulkheads and soffits made from ceiling grid and acoustic ceiling panel materials are not acceptable.

g. Auxiliary support systems for acoustic ceilings should be specified within the section for acoustic ceilings. The A/E shall provide clear requirements in the construction document for the support of ceiling systems and lights from structure. Ceilings shall not be supported from ductwork, conduit, HVAC lines or associated supports.

h. Metal ceiling systems and specialty concealed systems should be limited to areas which will require minimal access and approved the University.

i. Fire rated ceiling finish materials should be gypsum board or lay in ceiling systems which do not require clips to achieve fire ratings.

j. Provide hold-down clips near exterior entrances and operable windows to prevent panel displacement by wind.

k. Ceilings and mechanical/electrical equipment coordination:
   
i. Provide a minimum 24” x 24” access panel with clear path to the equipment above non accessible ceilings. Clear path shall be to service side of equipment.
   
ii. Coordination with mechanical, electrical, and plumbing equipment is required when laying out ceiling grids and supports; no mechanical, electrical, or plumbing access should be blocked.

iii. Design shall allow 6-inches from the suspended ceiling to the bottom of equipment for ceiling tile removal. Removal of ceiling tiles may not be blocked by equipment locations.

iv. Access to all utilities above the ceiling shall be provided regardless of ceiling type used. Access panels shall be shown on the contract documents.

09.3. Walls

a. Standard gypsum wall board product thickness is 5/8” for typical wall assemblies, 1/2” gypsum board is prohibited. Abuse resistant gypsum board and/or impact resistant gypsum board shall be considered for public areas, corridors and in Residence Halls, for the first 4 feet above the finished floor. The A/E shall coordinate extent of abuse resistant gypsum wall board with ODU Project Manager.

b. Joint treatment and wall finish shall carefully be considered and defined in the specifications following the Gypsum Association Application and Finishing of Gypsum Panel Products GA-216 publication.

c. Install gypsum board only after building is enclosed and weather tight.
d. In wet areas use cement backer board for tile. Paper-faced moisture resistant gypsum board panels (“green board”) is not allowed behind tile.

e. All corner bead to be metal unless identified for specific details.

f. Provide blocking and supplemental concealed supporting materials as required to adequately support suspended and supported items such as light fixtures, AV equipment, rails, grab bars, cabinets, and casework, etc.

g. Contractor shall hold a pre-installation meeting to review level of finish requirements to insure subcontractor understands contract requirements and expectations.

h. If plaster or gypsum board repairs that cause air borne dust are made as part of the punchlist corrections prior to Final Completion, the Contractor is responsible for full cleaning of areas that are affected by the plaster or gypsum board dust at no additional cost to the Owner. This includes cleaning of all affected surfaces like windows, furniture, carpets, etc. If final air filters were installed prior to any plaster or gypsum board punchlist corrections, Contractor is responsible for replacing air filters that serve affected areas, at no additional cost to the Owner.

i. Wall surfaces in classroom building hallways and waiting areas should consider materials other than gypsum wall board that do not scuff or become damaged due to furniture. At a minimum consider a chair rail or a chair rail/wainscot combination.

j. In Residence Hall stairwells, provide high impact gypsum wall board, or double 5/8” wall board.

09.4. Wall Protection

a. A/E to consider corner protection in major public corridors and outside corners interior to classrooms. Discuss options and cost with ODU project Manager.

09.5. Acoustic Wall Panels

a. Design and location of acoustical wall panels shall consider passing traffic, potential standing or leaning against wall surfaces and when located adjacent to seating. Specific locations shall be reviewed and approved by the ODU Project Manager.

b. Consider acoustical wall treatments other than wrapped fiberglass wall panels. Consider other durable materials of interest and design features in spaces requiring sound control. Three dimensional surfaces shall consider how these will be kept clean and maintained over the life of the building.

09.6. Sound Attenuation

a. Verify noise isolation and acoustical privacy requirements and show specific requirements on plans. Show intended STC rating of each partition in the wall/partition types in the construction documents.


c. The A/E shall specify wall and ceiling systems to insure acoustical privacy as follows:

i. Executive Offices – STC 52 minimum

ii. Offices, conference rooms, counseling rooms, meeting rooms, janitor closets and electrical closets containing transformers – STC 45 minimum.

iii. Classrooms – STC 42-47 minimum, or as required by ANSI/ASA S12.60.

iv. Toilet Rooms – STC 45 minimum.

v. Sleeping Rooms – STC 54-58 minimum; Exterior walls as dictated by code or meet nationally recognized sound isolation criteria.
vi. Floors – IIC 55 minimum.

vii. Any other areas requiring confidentiality shall meet nationally recognized sound isolation criteria.

viii. Sound isolation shall be specified and detailed as continuous sealant wherever possible.

d. Ceilings do not require additional sound attenuation if insulated walls are continuous to the roof deck. If walls are not continuous to roof deck, install a 4’ wide sound attenuation batt over top of insulated walls to form a continuous sound barrier.

e. Project requirements may dictate having an acoustic consultant on the A/E’s design team. Review acoustic issues with the ODU Project Manager.

09.7. Flooring

a. Designs should consider hard surface flooring at primary entrances.

b. Lobby flooring shall be terrazzo with the University seal, unless approved otherwise by the University. The University seal design shall be carefully coordinated with Appendix AF – Terrazzo University Seal.

c. The use of polished concrete floors are generally not desired. The A/E should discuss use of polished concrete applications with the University before proposing them as part of the design.

d. The use of plastic laminate wood flooring, brick flooring, porous ceramic tile and painted flooring, are not acceptable.

e. The A/E shall specify standard testing methods for determining Relative Humidity, Moisture Vapor Emission Rate and pH levels of concrete slabs prior to flooring installation. It is inherent that, at Old Dominion University, slab on grade, whether existing or new, will have moisture issues. The general contractor should anticipate delays or plan on moisture mitigation, depending on the construction schedule.

f. Allow adequate time for sufficient curing/drying/settling of floor installations per the manufacturer’s recommendations, prior to furniture and equipment installation.

g. All exposed concrete floors shall be sealed.

h. A/E shall detail all transitions between different flooring materials in the working drawings.

09.8. Walk off Carpet Tile

a. Vestibules shall use walk off carpet tile installed edge to edge without borders. Do not specify recessed slat-type walk off mats at vestibules.

09.9. Ceramic, Quarry and Porcelain Tile


b. Refer to Chapter 3 – Space Requirements | Restrooms for additional finish information.

c. The use of tiles with high recycled post-consumer and/or post-industrial content is encouraged. Products used in interior spaces shall be top quality with characteristics of smooth texture, minimum porosity, low absorption, cleanability and slip resistance.

d. Tile is preferred in areas of food preparation, food serving and other common areas of similar use.

e. As floor tile is a permanent finish that will last the life of a building, it is desirable to select tiles that are neutral in color. Because the ODU school colors are considered neutral they can be used for accent tiles, but avoid the use of other accent tile colors that would date the design or are a current fad or trend.

f. Install floor tile flush using stainless steel or extruded aluminum transition strips. Resilient transition strips at tile installations are not allowed.

g. Where tile is installed on walls above counters, tile both the backsplash and side (end) splash, full height
to overhead cabinet or 12” minimum when no overhead cabinet present.

h. Due to the growing limited availability and cost of formed cove tile base, straight tile base is acceptable with the use of a coved trim similar to a Schluter DILEX cove or equal when a coved base is desired for sanitary and cleaning conditions.

i. Concrete Control joints shall carry through to the tile pattern joints to avoid reflective cracks in the tile from movement of the concrete. The A/E can consider the use of an anti-fracture product to allow tile to span concrete control joints. Concrete curing, post installation, shall be considered when making this determination. The use of an anti-fracture product shall be discussed with the ODU PM prior to specifying.

j. Floor tile and grout color selections shall minimize the showing of dust and/or footprints. Epoxy grout is recommended for all areas, especially areas subject to staining such as at self-serve soda fountains and similar food service areas. When presenting tile materials for review and approval, provide proposed grout colors and materials as the same time as the tile.

k. Select appropriate grout joint products so that installation of larger tiles shall have narrow grout joints (1/8” preferred, 1/4” maximum) to minimize problems associated with cleaning and maintenance.

l. Careful specification of mortars, mastics, grouts and sealers is necessary to assure the low to zero VOC levels during installation. Require Technical Data Sheets (TDS) and Material Safety Data Sheets (MSDS) to assure compliance.

m. The Contractor shall coordinate a flooring pre-installation meeting with the A/E, ODU Project Manager, and tile subcontractor. Attention shall be given to the placement of tile control joints in larger expanses of tile. The A/E shall plan the location of tile control joints and indicate same on the floor plans. Specify appropriate installation materials for application and joint spacing and placement in accordance with current Tile Council of North America (TCNA) installation methods and associated ANSI standards.

09.10. Wall finishes Behind Drinking Fountains

a. Consider accent materials, behind drinking fountains that provide a higher level of durability and cleanability such as:
   i. Ceramic Tile
   ii. Solid Surface
   iii. Decorative RFP
   iv. Phenolic

09.11. Composite Textile Flooring

a. As an alternate flooring material for ceramic tile, resilient flooring or carpet, consider Composite Textile Flooring, such as J&J’s Kinetix product or Tandus Centiva’s Powerbond where appropriate.

09.12. Resilient Flooring

a. It is the university’s preference to use Luxury Vinyl Tile (LVT) in lieu of Vinyl Composition Tile (VCT) where budget allows due to LVT’s reduced maintenance requirements over VCT and BioBased Tile. In Residence Halls, LVT should be used in student rooms. Preferred LVT should include an option for an acoustical sound absorption layer or underlayment in student rooms and/or classrooms if budget allows.

b. Luxury Vinyl Tile shall have a minimum wear layer of 20 mil.

c. Luxury Vinyl tile shall have a minimum total thickness of 3mm, to avoid undesirable telegraphing of subfloor conditions, but ODU desires to use a 4.5 mm thickness for transition free flooring, such as Interface “Level Set”. Elimination of flooring transitions is proactive for accessibility.
d. Resilient flooring selections for laboratories shall meet project criteria for chemical resistance and maintainability. Cleaning and waxing of all resilient flooring materials (per manufacturer’s recommendations) is required by General Contractor prior to acceptance.

e. Provide 1/8" Rubber Flooring (integral treads and risers) in all stairwells and stair landings using a raised round dot pattern. A/E shall specify that landings are to be tiled with field tile as well as preformed treads on the treads. In Residence Halls provide a photo luminous strip on edge of tread in egress stairs. Other design options for stairs shall be considered and reviewed with the ODU project manager.

f. Public entry stairs or grand stairs shall have finish materials that are appropriate to and consistent with the spaces they are in as well as reasonable to maintain.

g. Homogenous linoleum sheet flooring or homogenous linoleum tile made of natural materials is acceptable when rated for extra heavy commercial traffic.

09.13. Terrazzo

a. In building renovations, effort shall be made to preserve and restore existing terrazzo whenever possible.

b. In new construction main lobbies, except in residence halls, shall have the university seal designed into the terrazzo floor. The ODU Project Manager will provide a vector file for use in developing the submittals for the use of any university seal. Refer to APPENDIX AA - OLD DOMINION UNIVERSITY TERRAZZO LOBBY SEAL for further information.

c. Terrazzo shall be 3/8” minimum thickness epoxy resin poured in place thin set terrazzo flooring systems 2 part 100% solid matrix.

d. Provide a 100% solid, flexible epoxy membrane designed to suppress reflective cracking in terrazzo floors, at all terrazzo locations.

e. Provide a one coat penetrating terrazzo sealer, slip and stain resistant, that is chemically neutral with pH factor between 7 and 12, does not affect color or physical properties of terrazzo type indicated, is recommended by sealer manufacturer for this use, and complies with NTMA Guide Specification for terrazzo type indicated.

f. Where terrazzo flooring is used, provide a 3/8” thick straight terrazzo base with an eased edge, polished all exposed edges.

09.14. Hardwood Flooring

a. Hardwood flooring, excluding athletic flooring, requires University approval. When approved for use over a concrete slab, a moisture barrier is required.

b. Use underfloor sound control where hardwood flooring is used.

09.15. Base

a. Where resilient base is used, provide 0.125” thick, minimum four inch high, heavy-duty rubber cove base from full 100 foot rolls. Resilient base color shall be integral throughout. Six inch high base can be used as appropriate.

i. Internal and external corners shall be field formed with joints 18” minimum from the corners. Ends shall be beveled and rounded.

b. Carpet base can be used only on approval of the University. When used, bind the edge, do not use a metal edge. Wood base is not preferred in public areas. Wood base can be used on a limited basis in private areas as approved by the university.

c. Stone bases are acceptable, excluding marble. For Terrazzo base see above.

d. Where ceramic tile is used, provide wall base either matching floor or wall tile.
09.16 Carpet

a. The Carpet and Rug Institute (CRI) developed a model specification process that classifies areas of intended use and minimum carpeting texture appearance retention ratings (TARR). Follow the TARR rating recommended by the CRI for specific uses with minimum rating set to heavy duty.

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>TARR</th>
<th>Traffic Level Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE</td>
<td>≥ 2.5  TARR</td>
<td></td>
</tr>
<tr>
<td>HEAVY</td>
<td>≥ 3.0  TARR</td>
<td></td>
</tr>
<tr>
<td>SEVERE</td>
<td>≥ 3.5  TARR</td>
<td></td>
</tr>
<tr>
<td>SPECIAL: See last section of Table</td>
<td>&gt; 3.5 TARR</td>
<td></td>
</tr>
</tbody>
</table>

b. Fiber Content: Must have a minimum of 85% solution dyed nylon.

c. Fiber Type: Either Type 6 or 6,6 Premium branded nylon (no mill extruded nylon permitted)

d. Minimum Density: 6000 (closeness of fibers tufted into the backing)

e. Minimum Modification Ratio: 2.2 or less

f. Antimicrobial Treatment (preferred method is a non topical treatment)

g. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

h. The A/E is encouraged to consider carpet, or carpet backing, manufactured from bio-based materials or with a min recycled post-consumer and/or post-industrial content of 40%. Low or Zero VOC adhesives and leveling compounds should be specified.

i. In renovation situations, the A/E shall specify that all removed carpet shall be recycled diverting waste from landfills. This can be through a manufacturer’s program such as Mannington, Interface among others or through other third party resources such as those found through Carpet America Recovery Effort (CARE). Contractor shall provide certification, with quantities, that the carpet has been recycled/reclaimed.

j. The university prefers to use carpet tile which allows damaged or stained tiles to be replaced individually, without having to replace carpet in its entirety. The use of broadloom carpet shall be approved by the ODU Project Manager.

k. Consider how proposed carpet will show dust and/or footprints. Merge-able dye products and/or patterned carpet tiles are preferred and very light or very dark colors should be avoided. Merge-able dye lot products and/or no dye lot products are preferred in highly trafficked areas. Loop or cut and loop textures are desired for increased durability over cut pile.

l. A/E shall specify a manufacturer’s standard warranty form in which the manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship against edge ravel, delaminating, zipperaging, and backing failure for period of 15 years from date of Substantial Completion.

m. The A/E shall review the details of the carpet warranty with ODU at the time of carpet selection, especially "Limited Lifetime" warranties and the conditions applicable to that warranty.

n. If broadloom carpet is approved in lieu of carpet tile, provide product with an upgraded attached backing system, such as a high performance backing for superior tuft bind, an attached carpet cushion or a water...
resistant/water proof backing as appropriate. Do not install a separate carpet pad.

- Carpeting is prohibited in telecommunications MDF / IDF rooms.

09.17. Access Flooring

- In active learning classrooms, access flooring shall be provided. Careful selection of a system appropriate to ease of reconfiguration with limited training and resources is desired. A/E shall confirm all accessible floor locations with the Assistant Director of Classroom & Learning Space Technologies and shall discuss the type of system being specified. In renovation projects, a shallow access flooring and appropriate ramps and or transitions shall be provided in active learning classrooms.

09.18. Paints and Coatings

- Products used in interior spaces shall be top quality coatings with characteristics of scrubbability, hiding power and washability. Preferred brands are Sherwin Williams, Benjamin Moore or PPG.

- Avoid the use of deeply saturated colors for walls; accent walls should be from the mid-tone ranges. The use of lighter colors enhances reflectivity and reduces the need for electrical lighting. Provide adequate ventilation during the application and curing of paint. Complete all painting prior to the installation of furniture or other soft surfaces. Specifications shall call for shop drawing submittals to include Technical Data Sheets (TDS) and Material Safety Data Sheets (MSDS) for compliance review for each paint product to be used. Specification shall also call for card stock brush-outs, AND the contractor to provide 6’x6’ in place samples for each paint color, with final light fixtures and lamps in place. Sample painting should extend across a typical gypsum board wall joint to verify acceptability of substrate finish.

- Paint Sheens
  - Painted walls shall have eggshell paint sheen.
  - Painted wood trim shall have semi-gloss sheen.
  - Flat paint sheen is prohibited on walls and trim, but is acceptable for flat ceilings.
  - Provide semi-gloss paints to bedrooms, bathrooms, mechanical rooms, housekeeping closets, telecommunication rooms and maintenance storage rooms.
  - Final coat on door frames to be semi-gloss enamel.

- All surfaces shall be pre-primed based on substrate. Use red oxide on galvanized surfaces.

- New construction doors frames shall be factory powder-coated or if field painted, door frames shall be factory primed. A/E shall coordinate factory primer with final paint system to ensure compatibility.

- Paint shall be used at full thickness and shall only be thinned for required spraying applications. Spraying shall be pre-approved by ODU Project Manager and shall always be back-rolled.

- Door Frames to be darker tone to hide abuse. Existing frames to be evaluated for excessive paint buildup which may require stripping.

- Exterior Paint
  - Metal surfaces to be black, are as follows. Submit sample for approval.
    - Railings and handrail, unless called out to be stainless steel or galvanized pipe.
    - Bollards
    - Light Poles
    - Fences
    - Gates

- The A/E shall prepare a schedule for all surfaces to be painted and the number of coats with dry film
thickness for each.

k. Exposed piping to be painted shall be clearly identified by the A/E on the drawings and specifications. The A/E shall also identify proper preparation technique for the pipe to receive paint.

l. Hollow metal frames shall be caulked where they meet adjacent surfaces. This work to be performed by the painting contractor.

m. All markings on substrate from ink pens, markers, etc. shall be removed prior to finish.

09.19. Wallcoverings

a. Vinyl coated fabric wall coverings, flexible vinyl wall coverings, rigid sheet vinyl wall coverings, and wallpaper are, in general, not allowed. The use of wallcoverings shall be limited and only where approved by the Department of Design and Construction through the variance process. Wallcoverings may be considered, with approval, in private conference rooms, Dean Suites or similar spaces.

b. All markings on substrate from ink pens, markers, etc. shall be removed prior to finish.

c. All substrates shall be primed, sealed and prepared for wallcovering removal with a mildew resistant primer. Textile wall coverings are not allowed unless they are part of an acoustical wall treatment system approved by the Project Manager.
Division 10 - Specialties

10.1. Visual Display Surfaces

a. Visual Display Surfaces are those that are used to convey information visually, including surfaces of markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

b. Visual Display Board Assembly is a visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes markerboards and tackboards.

c. In all classrooms, the A/E shall coordinate the design, location and quantity of visual display surfaces to maximize the amount of usable board to the degree possible, balanced against the budget. Consider the interface of markerboards with projection screens in the open position and/or wall mounted flat panel monitors. Access to the markerboards, based on classroom configuration, should also be considered. Careful coordination of all wall mounted devices in classrooms is critical when planning markerboard locations, as well as other teaching tools. It is expected that the A/E will provide elevations of classroom walls showing dimensioned locations of all wall mounted items and the extent of markerboards for review and approval by the Assistant Director of Classroom & Learning Space Technologies. V

d. In residence halls, provide markerboards in study rooms.

e. Provide tackboards in the lobby of all residence halls. Consider additional tackboards associated with individual community space on upper floors in residence halls. Tackboards should be sized and designed as part of the interior concept and not left as an afterthought. In residence halls, provide an individual tackboard adjacent to each Resident Advisor’s (RA) door.

f. The A/E shall discuss the desire for tackboards in lobby spaces of all buildings on campus. These need to be strategically located and designed to be a part of the interior design. Student Organization notices and other announcements need a place to exist that is visible and aesthetically pleasing. The goal is to avoid having random notices tacked on walls because there is no designated place to hang such notices.

g. Markerboards shall be porcelain enameled steel as follows: 2 coats of porcelain enamel; 28 gauge enameling steel; 1/2” industrial fiberboard core; 0.005” thick aluminum backing sheet. Magnetic is required.

h. Glassboards shall be produced with low iron ¼” tempered glass with polished edges, back painted white. Magnetic is required.

i. Tackboards shall be plastic impregnated, color through, self-healing ¼” thick cork over ¼” hardboard backing or fabric laminated over ½” fiberboard (such as Homasote).

j. Frames and trays shall be aluminum with concealed mechanical fastening devices. Mount boards to wall with necessary blocking in stud cavity.

k. Guarantee shall be submitted to the University, signed by an officer of the manufacturer, stating that all chalkboards and markerboards which do not retain the original writing quality, erasing quality, and visual acuity for 20 years after acceptance, shall be replaced including installation, at no cost to the University.

l. Chalkboards are prohibited in dust critical areas such as computer labs.
m. Refer to **APPENDIX AB – OFOI CFCI MASTER LIST** to clarify which elements are furnished and installed by the University. These items shall appear on the construction documents, by the A/E, for coordination and noted appropriately as to whom is responsible for providing.

n.  
**10.2. Display Cases**
   a. In **Residence Halls**, discuss what types of framed enclosed display cases are desired, if any, in each lobby.
   b. During the design process, the A/E shall discuss with the building users the desire for display cases in lobbies and other areas of the building.

**10.3. Directories**
   a. Wall mounted directories are required for new buildings, additions and renovated structures, other than Residence Halls. Directories shall have a graphic floor plan and be located near the elevator on each floor. Refer to **APPENDIX V – BUILDING DIRECTORIES** for additional information.

**10.4. Dedication Plaque**
   a. Each new named (person) building on campus shall have a dedication plaque included as part of the project and located in the lobby of the building. Location to be shown on the drawings and confirmed by University Leadership prior to permanent installation of the plaque. Plaque image and text to be provided by the university. Refer to **APPENDIX D – DEDICATION PLAQUE** for additional information.

**10.5. Dimensional Letter Signage**
   a. Refer to **CHAPTER TWO – CAMPUS DESIGN** for exterior building signage and plaques.

**10.6. Evacuation Plans**
   a. The A/E shall coordinate and produce an evacuation plan for review by the ODU Fire Safety Engineer and the Fire Marshall and for use in the facility as required by code.

**10.7. Toilet Partitions**
   a. See **CHAPTER 3 – SPACE REQUIREMENTS: Restrooms** for information

**10.8. Wire Mesh Partitions (Reserved)**

**10.9. Demountable Partitions (Reserved)**

**10.10. Folding Panel Partitions**
   a. Folding Panel partitions shall be overhead supported with no bottom track.
   b. Typically, operation shall not be motorized except for special installations.
   c. Sound rating shall be a minimum S.T.C. value of 50, sound rating above 50 is preferred, when appropriate and if budget allows.
   d. The A/E shall detail, and include in the working drawings, the acoustical wall closure above the folding panel wall to coincide with the STC rating of the specified panel.
   e. Accessories shall include automatic bottom seal and jamb seals and doors on storage pockets.
   f. Passage doors, if requested by users, through operable partitions cannot be considered for primary circulation and cannot be used as required exists.
   g. Discuss use of tack surface or markerboard surfaces with end users.
   h. Accordion Partitions are not to be used.

**10.11. Automatic Vertically Retractable Acoustical Wall(s)**
   a. Acoustical operable walls that, when in the down position (closed) are hard, rigid, flat, plumb walls, made of a grid of rectangular acoustical panels, and when are lifted (opened), fold upward (vertically)
without the use of any manual labor, in a manner similar to an accordion, into a pocket in the ceiling, between roof joists, or up between built in bulkheads. In the down (closed) position, the wall shall be comprised of two vertical planes of acoustical panels, separated by an acoustical air space.

b. The operable wall shall open and close in a manner similar to an accordion, in that all wall panels fold and unfold at the exact same time, at the exact same rate.

c. Sound rating shall be a minimum S.T.C. value of 50, sound rating above 50 is preferred, when appropriate and if budget allows.

10.12. Wall Protection

a. Wall and corner guards are required in corridors and other areas where service carts and moveable equipment will be used, such as food service areas. Discuss with the ODU Project Manager and the end users the need for wall protection within a building in schematic design so that the scope can be covered in the cost estimate.

b. In Food Service areas, provide stainless steel guards all outside corners.

c. Consideration should be made for recessed corner guards when aesthetics are a consideration such as in public lobbies.

10.13. Toilet Accessories

a. See CHAPTER 3 – SPACE REQUIREMENTS: RESTROOMS FOR INFORMATION

10.14. Other Accessories

a. Provide a double coat hook on the inside of all office doors.

10.15. Fire Protection Cabinets + Fire Extinguishers

a. Refer to CHAPTER 4 – DIVISION 21 – FIRE PROTECTION for information associated with fire extinguishers and Knox boxes.

10.16. General Use Lockers

a. Lockers shall be enameled steel unless project requirements dictate otherwise. **Size and quantity** will be shown on the drawings and determined by the user program.

b. Lockers shall have a sloped top, locker doors shall be vented with silencers, latch, and integral recessed hasp. Base shall be solid base with toe space and sanitary cove. Accessories shall include shelves, robe hooks and/or rods as defined by user. Base can be integral with the locker or built base as appropriate for the installation.

10.17. Special Use Lockers

a. Special use Lockers are those associated with any athletic facility. The type, style, material, configuration etc. shall be carefully discussed with the athletic department and appropriate users early in the project so that their relative cost can be defined. The A/E shall specify that a mockup of each type of locker associated with a team or coach is required. The mock up will be reviewed and approved by the appropriate athletic personnel, prior to the A/E’s approval of construction submittals and shop drawings.

10.18. Postal Specialties

a. In Residence Halls provide 1 mailbox per room or 1 mailbox per bedroom. This is intentionally less than one mailbox per student. Discuss options to provide package pick up boxes with Residence Life.

b. The mailboxes for student residents shall be heavy duty, key-operated boxes and shall accept a BEST small format 7 Pin interchangeable core (BEST 8L series mailbox lock). Minimum size box shall be 3-
1/2” x 12” with viewer window and engraved number on each door. Boxes shall be rear loading type, mounted no lower than 18” AFF.

10.19. Metal Storage Shelving (Reserved)

10.20. Flagpoles (Reserved)

10.21. Banners
   a. Refer to the ODU website for logo use guidelines.
   b. Refer to the ODU Brand Book for additional information with regards to logo usage and branding as may impact other aspects of the design:
   c. The incorporation of banners into the building design must be approved by University Leadership. Banner graphics shall be coordinated with the University Office of Strategic Communication and Marketing.
Division 11 – Equipment

11.1. General

a. The user program will identify which equipment is to be specified as part of the general contract and which equipment is to be provided by the University. Refer to APPENDIX AB – OFI CFCI MASTER LIST as a reference for this discussion and to confirm what is to be provided by the General Contractor.
b. The A/E shall coordinate with the ODU Project Manager to obtain a list of all University provided moveable equipment. The A/E shall be responsible for specifying all electrical and mechanical connections for University provided equipment to make such equipment functional upon occupancy. Moveable equipment will be specified by the University unless specifically included in the A/E’s scope of work.
c. The A/E shall specify all fixed equipment as required to respond to the program. Where applicable, the ODU Project Manager will advise the A/E of experience with specific types and manufacturers.
d. Submittals on all A/E specified equipment shall include rough-in drawings.
e. The A/E shall consider all aspects of equipment installation including receiving, unloading, and installation when designing the building to ensure that equipment can be transported to, and installed in, the appropriate final location.
f. All equipment specified by the A/E with “or equals” must have the same MEP and space requirements. If an “or equal” is listed the A/E must provide model numbers to assure the manufacture has equal equipment. DO NOT provide approved manufacturers only.

11.2. Parking Control Equipment (Reserved)

11.3. Loading Dock Equipment

a. Dock Lifts shall be built-in, scissors-type, single-leg, hydraulic dock lift of project specific capacity, size, and construction; complete with controls, safety devices, and accessories required.
b. Laminated-Tread Dock Bumpers fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Thickness: 4-1/2 inches (114 mm), Horizontal Style: 10 inches (250 mm) high by 24 inches (610 mm) long.

11.4. Residential Appliances

a. Residential Appliances located in Residence Halls shall be included in the design documents and shall be purchased and installed by the general contractor. All appliances are required to meet the American with Disabilities Act, 2010 Design Guidelines.
b. All appliances shall be Energy Star.

11.5. Breakroom Appliances

a. The A/E shall plan for a 20.8 Cubic standard refrigerator with a freeze on top with the option for an internal ice maker. The A/E shall confirm with the building user group if an icemaker is desired.

11.6. Foodservice Equipment

a. Foodservice equipment, if required, will be specified by the A/E’s food service consultant in coordination with the universities food service provider. The potential for existing food service equipment to be relocated from an alternate location for use in the project exists and should be coordinated early in the design with the ODU Project Manager.
11.7. Library Stack Systems
   a. Library equipment, if required, will be specified by the A/E's consultant and included as part of the construction contract.

11.8. Projection Screens
   a. Projection screen specification (size, proportions, motorized, finish, mounting, enclosure, etc.) shall be provided by Assistant Director of Classroom & Learning Space Technologies for all classrooms. The A/E shall show the location size and infrastructure of all screens in the construction documents. The A/E shall coordinate all connections required to make the screens functional at occupancy.
   b. Manually operated ceiling or wall mounted screens are provided by the University. Concealed blocking or reinforcing for mounting must be specified by the A/E.
   c. Electrically operated screens for large lecture halls, auditoriums, etc. are to be specified with fully automatic operation. Two control stations (front and rear of room) are required. The specifications for electrically operated screens shall be coordinated with the Assistant Director of Classroom & Learning Space Technologies. Electrically operated screens shall be included in the construction documents by the A/E and shall be fully detailed.

11.9. Laboratory Fume Hoods (Reserved)
11.10. Folding and Portable Stages (Reserved)
11.11. Stage Curtains (Reserved)
11.12. Rigging – Theater (Reserved)
11.13. Gymnasium Equipment (Reserved)
11.15. Playground Equipment and Structures (Reserved)
11.16. Facility Waste Compactors
   a. The A/E shall coordinate with the ODU Project Manager on whether a waste compactor shall be part of a project and the type of compactor to be used.
Division 12 – Furnishings

12.1. Window Treatments - General
   a. Window treatments shall be designed to reduce cooling demand for the building. Quantification of all window treatments shall be included at the preliminary design phase and included as part of the construction cost estimates. Final window treatment selections shall be determined prior to the completion of working drawings and shall consider the exterior façade of the building and coordinate window treatments to provide a uniform look.
   b. Window Treatments shall be included in the working drawings and shall include all concealed blocking or reinforcing as required for secure installation of the window treatments and shall. Provide adequate details for mounting of all window treatments in the contract documents.
   c. Restrict the use of motorized window treatments wherever possible and only used with prior approval by the university. When motorized shades are used, specify electrical connections and controls clearly on the electrical contract documents.
   d. Coordinate the use of room darkening window treatments and blackout window treatments with the Assistant Director of Classroom & Learning Space Technology and building users.
   e. Interior Windows shall not receive window treatments. Window film can be used to provide visual privacy, when needed.
   f. Where partial renovations are done within a building, new window treatments shall match exiting window treatments throughout the building for a consistent exterior appearance. Discuss with the OSU Project Manager if there is a desire and budget to replace all window treatments within a building as part of a partial renovation.

12.2. Horizontal Louver Blinds
   a. Limit the use of horizontal louver blinds to renovations with existing blinds in place.

12.3. Vertical Louver Blinds
   a. Are prohibited

12.4. Roller Window Shades:
   a. For all non-residence hall buildings and public spaces within residence halls, provide a PVC-free shade cloth and chain driven manual roller shade with a minimum of a 25-year lifetime limited warranty with 100% replacement and no depreciation over the life of the warranty. MechoShade is an example of an acceptable system. Coordinate the shading density with the university. For residence halls, provide a roller shade at all student room windows.

12.5. Laboratory Casework (Reserved)

12.6. Countertops
   a. Use low or zero, when available, volatile organic compound (VOC) materials within the interior of the facility. All wet location countertops shall be solid-surface with backsplashes. Synthetic solid surfacing material shall be solid acrylic or polyester and acrylic resin based solid, structural surfacing material. Material shall be through-patterned and homogeneous. No coated materials or non-homogeneous materials allowed. Materials shall be 100% repairable. In residence halls and when used elsewhere, provide integral lavatories with solid surface countertops.
b. The use of plastic laminate countertops shall be limited and only as authorized by the ODU project manager.
c. Cultured Marble countertops are prohibited.

12.7. Entrance Floor Mats and Frames
a. Recessed entry mats and frames are not desired by the university. Refer to division 9 or additional information.

12.8. Fixed Audience Seating
a. In classrooms, all seats shall have articulating tablet arms. Provide at least 10 percent left hand tablet arms. Minimum size of tablet arm shall be sufficient to completely support a laptop computer. Provide integrated cup holders. Provide multiple locations and writing surfaces for wheelchairs within the fixed seating area as required by code.
   i. Due to issues with a number of recent installations (2016) of tablet arms auditorium seating, ODU does not desire to use Irwin Seating for future projects.
b. Provide a mockup of the seats being installed prior to purchasing to confirm size and configuration is appropriate for students being served, especially true of athletic installations. Final approval of seat manufacturer and configuration is by the appropriate department Associate Director or dean or Associate Athletic Director for Operations.

12.9. Site Furnishings
a. Contracted painting:
   ASCO – American Stripping Company
   865 West 39th Street
   P.O. Box 6088
   Norfolk, Virginia 23508
b. Decals:
   FASTSIGNS® of Norfolk
   384@fastsigns.com
   2000 Colonial Ave. Ste 11, Norfolk, Virginia 23517
   Phone: 757-274-3344 | Fax: 757-274-3347
**Trash Receptacle**
Color Sapphire Blue (West of Hampton Boulevard)
Color Black (East of Hampton Boulevard)
Basis of Design: Victor Stanley, Inc. #SD-42, Ironsites 32 gal. capacity,
Tapered spun steel lid color RAL # 5003.
The side-door hinges have stainless-steel hinge pins and oil-impregnated bronze bushings.
All fabricated metal components are steel shotblasted, etched, phosphatized, preheated and electrostatically powder-coated with TGIC polyester powder coatings.
Provide a formed lid attached to the frame, a high-density plastic liner, and rubber-tipped leveling feet on the base.

Provide custom white decals with crown and Old Dominion University.

**Ash Urn**
Color Sapphire Blue (West of Hampton Boulevard)
Color Black (East of Hampton Boulevard)
Ash Urns shall be located at least 25' from any building entrance.

**Bench**
West of Hampton Boulevard
Basis of Design: Keystone Ridge, RE26 - Reading 6’ bench with back,
Color: Sapphire. Laser cut logo piece fit into RE26, client logo "Old Dominion University."
½” Thick black nylon pads with/bolt-hole to attach all benches with 1 ½” wide feet. 4 Pads per set.
See **APPENDIX X - MEMORIAL BENCH AND TREE POLICY**, for information related to memorial plaques on benches.

East of Hampton Boulevard
Basis of Design: Timberform Columbia Cascade, Renaissance MANOR
Arched Back Beach with Armrest, standard color (black) CASPAX – 7 powder coated steel # 2824 - 6
**Bike Racks**

Basis of Design, Hoop Rack by Dero Bike Rack Co.

In-ground mount embedded into concrete base Refer to **APPENDIX AH – BIKE RACK DETAILS.**

Provide a 1.5" schedule 40 (1.90" OD) bike hoop with high quality TGIC powder-coated finish, color Black. Prepare rack for painting with hard sandblasting. An epoxy primer is electrostatically applied. A final TGIC, UV resistant polyester powder coat is applied. Final coating mil thickness shall be no less than 6 mils.

Bike racks shall be considered and planned as part of the initial site planning efforts. Location of the racks should be placed in close proximity to offsite bike circulation paths and on the path leading to building entrances, balancing between aesthetic appearance and convenience. The goal is to avoid bicycles being locked to light poles, fencing, etc. because the racks are inconvenient. The placement of bike racks will be reviewed with the ODU Grounds Manager.

Mount racks with clearances as recommended by the manufacturer. Provide dimensioned layouts at all locations showing position of rack and bicycles in relation to all adjacent walkways.

**Exterior Tables and Chairs**

(Reserved)
12.10. Interior Furnishings

a. ODU, as a state institution must purchase furniture from Virginia Correctional Enterprises (VCE) and may only purchase from VASCUPP or other state contract vendors with an appropriate VCE waiver. Different Procurement rules may apply for Real Estate Foundation Projects. https://www.govce.net/

b. The A/E shall layout furniture and equipment as part of basic services design to demonstrate functional use of spaces and as a placeholder for the final furnishings selections. The A/E shall use furniture templates that are realistic and do not make the space appear larger than they are by using furniture templates that are too small to be functional. These plans will be used as the basis for locating receptacles, switches, data outlets, lighting, etc. during the remainder of the design process. In residence halls, the A/E shall obtain the actual furniture types and sizes from the Office of Residence Life and shall use these in defining room layouts.

c. Early in the programming and planning phase of a major renovation or new construction project, the method to be used for delivery of interior design services should be established. The A/E should come to an agreement with the ODU Project Manager and Director of Design and Construction to determine responsibility for FFE: whether design is to be done under the A/E's contract, whether a separate Interior Design Professional will be contracted directly with the Owner, or whether The Department of Design and Construction will assume responsibility for the design and purchasing of furnishings under another arrangement.

d. When developing the scope for FFE, consideration shall be made of existing furnishings and equipment that can be reused. The Interior Designer shall discuss with the ODU Project Manager the need for an inventory of existing FF&E with an evaluation recommending re-use or replacement. The inventory would include identifying any infrastructure needs for connecting and re-installing existing loose equipment (non-bench top).

e. When A/E furniture plans are provided, they shall be labeled and keyed sufficiently to cross reference to specifications and procurement documents for easy reference. Plans should indicate who is responsible for purchasing and installing the furnishings and when to coordinate with the contractor. If the A/E provides the furnishings specifications and procurement documents, they shall be keyed to the furnishings plans.
14.1. Refer to CPSM 6.14 VERTICAL TRANSPORTATION DESIGN STANDARDS for requirements which must be incorporated into all projects. In the case of a conflict between these Design Standards and the CPSM, the CPSM shall take precedence.

14.2. Planning & Design

a. A planning conference shall be scheduled by the A/E with the ODU Project Manager, building users and Facilities Management to determine project specific elevator requirements. For “service” or “freight” type elevators, the A/E shall verify type of freight and method of moving (i.e. pallet jack) so that the appropriate elevator size and floor load design criteria can be established. Included in that discussion should be the potential for future equipment that may be added to the building and may require special size requirements including door height, (i.e. a mass spectrometer). Based on this discussion, the A/E shall propose the elevator type(s) for approval no later than the Owner Preliminary Design Submittal.

b. When renovation of an existing building includes the area near an elevator, during the schematic design phase, the A/E shall prepare a written evaluation of the elevator and what steps and costs are required to bring the elevator up to the current code. The Department of Design and Construction and Facilities Management shall then make a determination as to what level of renovation can be included within the project scope.

c. Elevators shall access all floors of a building.

d. The University prefers tractionless, gearless elevators. It is the University’s intent to utilize a hole-less hydraulic elevator if necessary with eco-friendly oil. If a hydraulic elevator is used, the jack cylinder shall be installed inside a PVC pipe jacket to limit corrosion and help contain hydraulic oil leakage underground.

e. All elevator shafts with glass shall be designed so that the glass can be cleaned safely and inexpensively.

f. It is the preference of the Department of Design and Construction to have elevator shafts constructed of CMU block instead of shaft wall. This will provide the rated conditions necessary for BCOM approval.

14.3. Signals and Fixtures

a. All signals, fixtures and fasteners shall be vandal-resistant.

b. For buildings with color coded floors such as parking decks, the elevator call buttons shall be colored to match the color of the floor.

14.4. Elevator Equipment (Machine) Rooms

a. Elevator machine rooms shall be located in areas not susceptible to flood water damage.

b. 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. Electric fuse disconnect switches or circuit breakers for elevator and cab lights shall be adjacent to the door jamb of the main door to the machine room.

c. All machinery and equipment including that associated with machine room less type elevator machinery and controls, shall be accessible by maintenance personnel in a manner similar to the access afforded for maintenance in a typical elevator machine room.

d. Elevator machine and/or equipment rooms shall be acoustically treated.

e. Non-elevator related equipment such as piping and conduit shall not be located in or run through the elevator machine room.

f. Provide a sweep on the machine room door to provide for dust protection

g. Ensure the Unit disconnect switch is visible and clearly labeled.

h. Label elevator oil minder sump disconnect.

14.5. Elevator Pits
a. Elevator pits for hydraulic elevators shall have sump pits for use of a portable sump pump provided by University Facilities Management personnel. Drainage from the elevator pit shall not be connected to any building drainage or sewer system. Sump pits shall be equipped with a float sensor connected to Facilities Management Systems Control. Underground hydraulic piping for elevators shall be Schedule 80.

b. A duplex GFCI electrical receptacle is to be installed three feet above the finished pit floor for use by elevator mechanics.

14.6 Security

a. Elevator phones should be (Talk-A-Thon) and be tied into campus system for automatic monitoring [Point of contact is Assistant Director ITS Converged Technologies, 747-683-3017]. An emergency telephone will be furnished by the Owner for field installation by the contractor.

b. If an elevator cab has a stop that enters only into a mechanical space, the elevator shall require electronic card swipe access for that level.

c. In some instances, an elevator in a Residence Hall will require an access control card swipe to allow entrance to resident only floors. Coordinate requirement, locations and connection to owner supplied equipment with the Department of Design and Construction and Residence Life.

d. All keyed electronic switches must be able to accommodate BEST 7 pin cores (i.e. light, fans, stop/start override, etc.).

e. Any cooling required for elevator equipment rooms shall not be connected to district chilled water/building chillers and must be serviced by an independent DX unit.

14.7 Elevator Cab

a. University campus elevators tend to be very heavily used, therefore, both public and freight elevators should be designed with durable, vandal resistant, low maintenance finishes. Parts and components should be easy to replace in the event of damage.

b. Cab finishes shall be specified on the room finish schedule. Floor finish shall be resilient or porcelain tile; carpet is discouraged. Doors and jambs shall be brushed finish stainless steel; painted finishes are prohibited. Wall panels shall be plastic laminate with stainless steel rails on three walls. In Residence Halls, the wall panels shall be stainless steel. The ceiling system and lighting shall be vandal resistant with no exposed lamps within reach inside the cab. An inspection certificate frame shall be mounted in the cab with tamper resistant screws. Provide protective moving blankets and associated hooks as part of the base bid.

c. Preference in Residence Halls elevator cab floors shall be rubber floor tile with “lo-disc” raised circular design for a non-slip surface.

d. Elevator Cab shall be assigned a room number on the first floor plan. See APPENDIX H - ROOM NUMBERING PROCEDURES.

14.8 Acceptable Manufacturer's

a. Project specifications shall include 3 manufacturers that can provide elevator systems/hoistways and cars to fit within the specified requirements/shaft size.

b. Subject to compliance with project specific requirements, the following manufacturers are acceptable to the university:
   i. Fujitec America, Inc.
   ii. KONE Inc.
   iii. Otis Elevator Co.
   iv. ThyssenKrupp Elevator.
14.9. Shop Drawings
   a. Shop Drawings are to be submitted to the ODU Project Manager, through the A/E after review, who will forward the submission for review by the appropriate parties in Facilities Management.

14.10. Pre-Installation Conference
   a. A pre-installation conference shall be scheduled with the Contractor, Elevator Subcontractor, Fire Protection contractor, HVAC contractor and Electrical contractor (and Fire Alarm subcontractor) to coordinate layout and requirements of all related systems.

14.11. Elevator Turnover & Closeout
   a. Prior to University 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. ODU shall employ the services of an independent elevator inspector. Any deficiencies shall be corrected by the contractor at no cost to ODU. Notify the ODU Project Manager at least three weeks in advance of testing in order to schedule the inspector.
   b. The A/E shall specify that the General Contractor and the Elevator Contractor must turn over the elevator for use by the Owner immediately following successful inspection and prior to final payment. The Elevator will not be used during construction for transport of material or workman unless approved by the ODU Project Manager and only if adequate protective measures are taken.
   c. Final payment for the elevator will not be made until maintenance and instruction manuals are submitted and approved by the A/E. Specifically note that "project specific" wiring diagrams are required before release of final payment will be approved. Generic wiring diagrams are unacceptable.
   d. Any manufacturer’s proprietary equipment, diagnostic tools and/or software shall be provided to Owner prior to final payment.

14.12. Warranty Service Requirements
   a. Immediately following elevator acceptance by the University, the elevator will be added to the University’s existing service contract. Identification of warranty work will be made by the service contractor to Facilities Management who will in turn inform the ODU Project Manager who will inform the contractor. The contractor will be responsible for correcting any defects not due to ordinary wear which may develop within twelve months from the date of Substantial Completion.
   b. 30 days prior to the end of the warranty period, the elevator contractor shall readjust the elevator as required to meet all performance parameters specified. A written report shall be submitted by the elevator contractor to the Director of Facilities Management.

14.13. Wheelchair Lifts
   a. Wheelchair Lift use is discouraged. If a wheelchair lift is deemed as the only solution, the A/E should request a variance for approval by the Department of Design and Construction. Wheelchair lifts shall not require keys for operation.
Division 21 – Fire Suppression

21.1. General
   a. Refer to CPSM 4.5 FIRE PROTECTION INFORMATION PLAN AND FIRE SAFETY SYSTEMS, 4.6 FIRE SAFETY REVIEW OF SHOP DRAWINGS and throughout CHAPTER 5 – PROJECT SUBMITTAL STANDARDS for detailed requirements which must be incorporated into all projects. In the case of a conflict between these Design Standards and the CPSM, the CPSM shall take precedence.
   b. Fire department building and riser connections shall be coordinated through ODU’s Risk Management office and the University’s Fire Prevention Manager. Ultimate approval of connections and design will be by BCOM for capital projects and the State Fire Marshall for all others.

21.2. Miscellaneous
   a. Provide a fire alarm input module to monitor the AC power of the sprinkler air compressor.
   b. Bolt down all incoming sprinkler lines from thrust block to flange with approved fasteners.
   c. Install placards at sprinkler riser with engraved hydraulic data, not permanent marker.
   d. Copper compression fittings shall not be used on sprinkler air compressor feeds.
   e. All dry valves to be manually resettable without removing face bolts.
   f. Provide floor drain and associated pit, in all sprinkler valve rooms, capable of handling the discharge at full flow or discharging the full flow to the exterior of the building. If discharged to the exterior, coordinate the landscape to accommodate the force of the discharge, without destroying planting, turf, etc. Consider heavy river rock or other material that can withstand the force of the discharge. Discharging to the exterior is preferred.
   g. Provide single action fire alarm pull stations.

21.3. Knox Box
   a. Locate the Knox Box adjacent to main entrance and coordinate location with ODU Project Manager, the ODU Fire Prevention Manager and the Fire Marshall. Location of the Knox Box shall be shown on the exterior elevations in the Preliminary Design Submittal for review and maintained as part of the working drawings.
   b. Knox-Boxes shall be 3200 series and recessed into masonry construction.

21.4. Fire Hose Cabinets
   a. Renovations of spaces that have fire hose cabinets shall remove hoses.
   b. In new construction, where fire hose cabinets are required, cabinets shall be installed without fire hoses.

21.5. Fire Extinguishers and Cabinets
   a. Locate Fire Extinguisher Cabinets on normal egress routes, in close proximity to doorways. Specific rooms, such as labs or kitchens shall locate cabinets in highly visible locations not prone to being blocked.
   b. Fire extinguishers and cabinets shall be specified by the A/E. Cabinets shall be stainless steel or brushed aluminum, semi recessed with vertical identification lettering on both sides of the frame visible on edge of cabinet, contractor furnished and installed. Fire Extinguishers shall be purchased by ODU and installed by the contractor. Refer to APPENDIX M – SIGNAGE for Fire Extinguisher Cabinet Signage.
   c. If quick response sprinkler heads are used on a project, the University still desires fire extinguisher cabinets.

21.6. Backflow Preventer
   a. A separate backflow preventer for fire protection shall be provided.
b. Provide floor drain, capable of handling the discharge at full flow or to the exterior of the building.

21.7. Water Service
   a. All buildings, no matter the size shall have a separate water service for fire protection and shall not be
      through the domestic metered water system.

21.8. Fire Pumps
   a. Connect fire pump controller to building generator.
   b. All drain lines shall be copper with sweat fittings.
   c. All associated plumbing hardware shall be properly supported.
   d. All pump discharge lines shall be monitored for flow at their respective locations.

21.9. Sprinkler Heads
   a. The University does not desire quick response heads in Residence Halls.
   b. If quick response heads are intended to be specified on a project, the A/E shall notify the ODU Project
      Manager for approval.
   c. Coordinate with NFPA 1383.
   d. Side wall sprinkler heads in Residence Halls, shall endeavor to be located over doorways or wall openings so as to discourage the use of the heads as coat hangers. When side wall sprinkler heads are installed in student rooms above solid walls, warning signage shall be provided as part of the contract documents.

21.10. Control Valves
   a. All control valves, including post indicator (PIV) and wall indicator valves, shall be electrically supervised
      by the fire alarm panel. Locate the post indicator valve (PIV) on the exterior of the building split from
      domestic water and must accept Best padlock, provided by owner.
   b. FDC should be located on the street side of a building with easy access for Fire Department and at a
      distance away from the building, outside of the building collapse zone where possible. Fire Department
      Connections (FDC) are preferred to be placed at same location as Post Indicator Valve (PIV). A wall
      mounted FDC can be considered if reviewed and approved by the ODU Fire Safety Manager.
   c. 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 six foot stepladder. Provide 24” x 24” access door for valves located above inaccessible
      ceilings. 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 on the access door indicating the location of the control
      valve. Refer to APPENDIX J – SIGNAGE for signage standard.
   d. All control valves that are located in spaces accessible by the occupants of the building shall be provided
      with lockable tamper prevention devices and/or locks as specified by the University.
   e. Control valves shall not be installed, above or below ceilings in classrooms, offices, conference rooms or
      any Residence Hall living quarters.
   f. Each control valve shall be supplied with a sign indicating the area of the building that is served by the valve.

21.11. Inspector Test Valves (ITV)
   a. 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 ITV’s shall be accessible
      with the use of no more than a six foot step ladder.
b. At all locations that ITV’s 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.

c. Inspector test valves shall not be installed, above or below ceilings, in classrooms, offices, conference rooms or in Residence Hall living quarters or in any area requiring entry through a classroom, office, conference room or any dormitory living quarters.

d. 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 six foot stepladder.

e. Drain valves shall not be installed, above or below ceilings, in classrooms, offices, conference rooms or in dormitory living quarters, or in any area requiring entry through a classroom, office, conference room or any dormitory living.

f. ITV main drain discharge shall be piped to the exterior of the building. Auxiliary drain valves discharge shall be piped to a drain capable of handling the discharge at full flow or to the exterior of the building.

21.12. Fire Sprinkler Piping

a. Each floor shall have a supervised isolation valve.

b. Sprinkler head braided flex connections are desired. Contractor shall install braided flex connections in the appropriate length and with minimum bends in the appropriate radius.

c. Schedule 40 steel pipe is allowed.

d. Piping material types shall not be intermixed i.e. do not mix black and galvanized piping.


a. Galvanized piping in dry systems is not allowed,

b. Black steel pipe shall be used in dry fire sprinkler systems with a monitored Nitrogen generating system that maintains a 98% nitrogen level.


a. All penetrations to accommodate standpipes shall have a drill doughnut/cutout permanently attached at location – per the NFPA code

21.15. Commercial Kitchen Hoods

a. Each group/gang hood system shall have its own pull station and suppression system. Each independent hood shall have its own pull station and suppression system.

b. When multiple hoods are used, clearly label which hood is associated with which pull station.

21.16. Residence Hall Kitchen Hoods

a. All residence hall apartments that have cooking facilities shall have heat only detection in the immediate area.

b. Self-contained suppression hoods required in all common cooking areas.

21.17. Signage

a. Refer to **APPENDIX M – BUILDING SIGNAGE** for signage requirements associated with Fire Department Connections (FDC), Post Indicator Valves (PIV) and Sprinkler Rooms. Location of all required signage shall be shown on the exterior elevations in the Preliminary Design Submittal for review and maintained as part of the working drawings.

a. In renovation and or addition projects, where the building is to remain occupied during construction, the following measures shall be included in the Contract Documents:

1. All existing fire protection systems shall remain operational during construction. If temporary shutdown is necessary, the system shall be returned to operational condition as soon as possible and no later than the end of each working day prior to the Contractor leaving the job site.

2. The Contractor is to notify the University Fire Prevention Manager, 48 hours in advance of any necessary shutdowns. Any necessary shutdowns shall not affect other areas not involved with the construction project.

3. All operational standpipes are to be maintained at all times.

4. Sprinkler systems in areas being renovated shall be operational when the Contractor leaves the site each day.

5. A contractor provided fire watch shall be provided at all times that a sprinkler system and/or fire alarm system is inactive.

b. Specifications shall indicate that following the completed installation, ODU’s Fire Prevention Manager and their independent consultant will inspect the installation prior to final inspection and acceptance by the State Fire Marshal and report any deficiencies.
Division 22 – Plumbing

22.1. General
   a. All piping systems shall be hydrostatically tested after installation. The test pressure shall be 200 PSI or 1 1/2 times the working pressure, whichever is greater. Components not suitable for a 200 PSIG test may be tested at a lower pressure and then valved off for the 200 PSIG test. Test duration on pipe with soldered joints shall be at least two (2) hours; the test duration on pipe with mechanical joints shall be 24 hours.
   b. The A/E shall note in specifications that water lines shall be disinfected and tested for bacteria at the completion of project.
   c. The A/E shall show underground / under-slab utilities on a separate drawing at the foundation level.

22.2. Common Motor Requirements for Plumbing Equipment
   a. Integral horse power electric motors shall be Totally Enclosed Fan Cooled (TEFC) premium efficiency. Open Drip Proof (ODP) motors are not acceptable.

22.3. Sleeves and Sleeve Seals for Plumbing Piping (floor and wall penetrations)
   a. Pipe sleeves at floors should extend two (2") inches above adjoining finished floor surface to serve as a dam in any area where flooding is possible due to nearby plumbing fixtures or mechanical equipment.
   b. If the slab is core drilled for pipes, provide sleeve as noted above.

22.4. Meters for Plumbing Piping
   a. Domestic water meters shall be installed at each building and shall be capable of showing cumulative gallons and of measuring the actual flow rates.
   b. Irrigation systems, hot water loop, chilled water loop and cooling tower make-up shall be metered separately.
   c. Fire protection service shall not be through the domestic metered water system.
   d. All meters shall be back-net capable of tying into the HVAC system.

22.5. Valves for Plumbing Piping
   a. The installation of isolation valves in university buildings requires the engineer assess the building from a maintenance view. Buildings should be valved to allow for shutdown based on the type of occupancy. For example a residence hall, which has a number of private bathrooms, should be valved to allow Facilities Management staff to repair student bathrooms without turning off the water to the entire building, an entire floor or even an entire wing. This is also true of a science building where shutting down an entire building or floor could pose a risk to research and instruction.
   b. Stop valves are not considered isolation valves.
   c. The A/E shall review with the Facilities Management staff an isolation valve scenario for each building during the preliminary design submittal review. Valves shall be shown on the drawings.
   d. Provide the following valves, as a minimum:
      i. All buildings shall be supplied with a main water cutoff valve within 10’ of an exterior wall of the building. Cut off valves shall be within 5’ of every fire hydrant.
      ii. Water service (Interior) shut-off valves are shall be located on each floor
      iii. On take offs from all vertical risers and branch lines.
iv. At each floor in branch line serving that floor (provide 2 valves if system is looped).

v. Hot and cold water at entry to each bathroom.

vi. Each service (water, gas, comp air, etc.) at entry to each laboratory and at each lab bench, fume hood, and at terminations for equipment. Valves shall be readily accessible and grouped together.

vii. Drain valves shall be installed in accessible locations at all low points in the piping system to permit drainage and servicing.

viii. The A/E shall determine need for any application specific additional valves that may be required.

e. The A/E shall require, as part of the specifications an as-built valve directory. All valves shall be individually numbered and tagged to correspond with valve directory. Tags shall be stamped brass tags or discs secured with non-ferrous beaded chain. Valve numbers shall be engraved or stamped as large as possible on tags (1 inch by 2 inches) or discs (1.25 inch diameter) attached to the valves by 10-gauge brass "S" hooks.

f. All valve boxes shall be raised to ground level.

g. When metallic piping is located outside mechanical rooms or closets, provide lockable access doors for all isolation valves, hammer arrestors and trap seal primer valves serving the domestic water systems.

h. Provide threaded ball valves on all lines up to 3\'' (no sweat valves). Flanged ball valves on all lines up to and including 6\''. Submit a variance request (APPENDIX B - DESIGN STANDARDS VARIANCE REQUEST FORM) for any butterfly valves specified.

i. Pressure reducing valves (PRV) shall be provided in all buildings at the domestic water entrance just downstream of the meter. Provide a full size bypass loop around the PRV and meter and a strainer with blow down valve upstream of the meter bypass loop. PRVs shall be suitable for the application and the A/E shall verify the prevailing mains water pressure and consult the manufacturer’s engineering department to verify the correct selection of the PRV. Provide inlet and outlet shutoff valves and by-pass valve. Provide pressure gauge on valve outlet.

j. Valves shall be compatible with piping materials. Non-ferrous full port ball valves up to four inches (4") can be used on domestic water. Non-ferrous or ductile iron butterfly valves can be used on two and one-half inches (2 ½") and above. Gate valves shall not be used except where provided with backflow prevention devices.

k. No dielectric unions / fittings - use threaded bronze body valve, bronze nipple in place

l. Six-inch (6") long brass nipples shall be used when connecting piping of dissimilar metals.

22.6. Identification for Plumbing Piping and Equipment

a. All piping and equipment in mechanical equipment rooms and central plants shall be completely painted according to the “SCHEME FOR THE IDENTIFICATION OF PIPING SYSTEMS,” ANSI A13.1 and the “SAFETY CODE COLOR FOR MARKING PHYSICAL HAZARDS,” ANSI Z53.1, latest revisions, for letter size, length of color field, colors, and viewing angles of identification devices for piping.

22.7. Plumbing Piping Insulation
a. All domestic hot, cold and tempered water piping shall be insulated and shall be continuous through floors, walls and studs. Condensation is an issue on campus and shall be carefully considered by the A/E when developing the specifications.

b. Insulation shall be performed fiberglass pipe insulation with vapor barrier and an all service jacket.

22.8. Water distribution Piping

a. In renovations where plumbing fixtures are removed but not replaced, domestic water pipes shall be removed to within five (5) pipe diameters of the main to prevent leaving a long dead leg, and terminated with a capped ball valve. Where plumbing fixtures are removed but the water pipes will be reused the pipes shall be capped to prevent debris from entering pipes.

b. Domestic water pipe shall not be installed in or under concrete slabs on grade, except where necessitated by building entrances or under sidewalks.

c. Closed water piping systems shall have air vents to purge any trapped air.

d. New construction shall not allow dead leg runs.

e. The use of domestic water for process (i.e. water cooled ice machines) cooling is prohibited.

22.9. Sanitary Waste Piping Specialties

a. Floor Drains: Drains shall be provided in all sprinkler valve rooms, restrooms, cooling towers, mechanical rooms and any other area subject to either continuous or intermittent wetting.

b. Cleanouts: Floor cleanouts are preferred over wall cleanouts where possible. Location of clean outs shall consider aesthetic and functional conditions to avoid pour placement, such as in a doorway or high traffic areas such as lobbies. Cleanout locations shall be reviewed by the A/E and the University Architect during Preliminary design. Cleanouts shall be adjustable and equipped with an internal brass plug with counter sunk brass screws holding rim to body cover. Wall cleanouts shall be stainless steel round access covers. Consider the floor or wall materials where the clean out would be installed and find alternate solutions where higher end materials such as terrazzo floors or wood paneled walls are present. The A/E shall clearly show all clean outs and access on drawings and review prior to bidding.

c. All cleanouts at or above the ceiling shall be brought to the floor level of the fixture being served.

d. Provide cleanouts on exterior sanitary and storm lines within 5 feet (5’) of the building.

22.10. Storm Water Systems

a. All storm lines shall be continuous from the inlet to the storm system outside the building.

22.11. Sanitary Waste Systems

a. Pumped discharge lines from sewage and storm ejectors shall not be combined with gravity drains inside buildings. Pumped and gravity drains shall run separately to the nearest manhole.

b. All underground sanitary piping shall be GPS located and those coordinates shall be reflected on as-built drawings.

22.12. Water Heaters

a. Gas fired domestic water heaters are proffered.

b. Water heaters, 50 gallons or less, can be electric.

c. Administrative and other buildings may utilize electric domestic water heaters.

d. Instantaneous or semi-instantaneous heaters shall be used for all domestic hot water loads. Provide temperature control devices for domestic water heaters. Domestic hot water storage tanks, where approved, should be set to 140 degrees Fahrenheit (140° F).
e. To conserve energy, domestic hot water storage systems and domestic hot water recirculation pumps shall have an input from the BAS (Building Automation System) so they can be turned back or off during scheduled unoccupied times.

f. Use chemical sterilization and/or booster heater systems for dishwashing needs instead of higher temperature supply hot water.

22.13. Plumbing Fixtures

a. Provide cut sheets on all plumbing fixtures during preliminary design for review by the University.

b. Residence Halls: Refer to BCOM TECHNICAL BULLETIN T-006 for the required toilet fixture waiver associated with R-1 / R-2 Use Application.
   
i. The A/E shall submit the required waiver with the Preliminary Submittal to BCOM. The A/E can choose to submit the waiver with the schematic submittal.
   
   ii. The request must identify and compare the type and duration of the transient housing occupancy to the number, distribution and accessibility of plumbing fixtures.

c. All bathroom fixtures shall be caulked with 100% silicone sealant matching fixture color, typically white.

d. All exposed piping in toilet rooms (unless concealed by an apron) shall be chrome plated brass.

e. All plumbing penetrations in non-fire rated walls shall be caulked air tight with acoustical caulk.

f. Acceptable Manufacturers for flushometers and hands free lavatory faucets:
   
i. Moen
   
ii. Sloan
   
iii. Toto

g. Acceptable Manufacturers for shower valves and shower heads:
   
i. Moen
   
ii. Symmons
   
iii. Kohler Commercial

h. Acceptable Manufacturers for Kitchen Sinks
   
i. Moen
   
ii. Kohler Commercial
   
iii. Elkay

i. Standard and ADA Water Closets: WaterSense-Certified White Vitreous China, Floor-mounted, Elongated Bowl,

j. Water Closet Flushometer: WaterSense-Certified 1.28 GPF exposed, sensor-activated, piston-type, chrome-plated with mechanical override.


l. Counter Lavatory: Solid surface integral bowl sink.
m. **Wall-Mount Lavatory (including hand wash sinks):** ADA Compliant, White Vitreous China

n. **Public Rest Room Lavatory Faucets:** hands free sensor, chrome plated, cast brass construction, single mount, vandal resistant aerator, 0.5 gpm (1.9 L/min) vandal-resistant multi-stream laminar flow, solenoid operations shall be battery operated with an 8 year minimum battery life, or automatically recharged during operation.

o. **All other Lavatory Faucets:** Provide wrist paddles.

p. **Service Sink:** Floor mounted, precast concrete or stone construction; 8” or 12” maximum height from floor to rim, 24” x 24” (minimum size). Faucet – Back-mount, chrome, vacuum breaker, integral stops, spout with pail hook and hose end, checks to eliminate cross-flow.

q. **Floor Drains:** Installed in all restrooms, centrally located with floor slightly sloped toward drain, 6” inlet with 2” outlet, chrome plated brass or nickel bronze.

r. **Exterior wall hydrants:** shall be spaced at a maximum of 100 feet (100’) around the entire building, but **not less than one hydrant per major exterior wall.** Freeze-proof concealed wall hydrants with extended stems can be supplied from interior partitions perpendicular to exterior walls. Wall hydrants shall be automatic draining with a key lock.

s. **Interior Hose Bibs:** Provide a hot & cold water key-operated hose bib in all multi fixture public restrooms, locate under lavatories. All mechanical equipment rooms, glycol tanks and cooling towers shall be equipped with a hose bib. Provide a hose bib in roof penthouses.

t. **Shower valve:** Brass construction, 1/2” PEX connections with integral stops, pressure balancing, four port, cycle valve, adjustable temperature limit stop to control maximum hot water temperature, pressure balancing mechanism maintain selected discharge temperature to ± 3.6°F, brass cartridge, Metallic/nonferrous and stainless steel materials.

i. No PEX shall be used larger than ⅜”.

u. **Shower heads:** WaterSense Certified, heavy duty, solid brass and chrome-plated with no removable parts. Shower valves and shower heads shall be installed on a sidewall in the shower unit so that the spray from the shower head does not spray toward the threshold or shower curtain.

v. **Shower Basins:** Off-site fabricated shower basins shall be of solid polymer construction. Shower stall walls shall be finished with ¼” solid surface polymer panels. Panels shall extend overlap at least 2” below top of shower basin on all walls in shower stall. Panel and base material shall be from the same manufacturer. Installation of shower basin connections to drains through slab shall be properly aligned and water tight.

i. Refer to **Division 1 – General Requirements** for shower mock ups.

22.14. Residential Housing Student Bathrooms Plumbing Fixtures

a. **Water Sense fixtures are required, when available.**

b. **Note:** Public restrooms within residence halls which shall follow the fixture standards above

c. **ADA Roll in Shower and ADA Transfer Shower:** provide a zero threshold shower with a floor drain adjacent to and outside the shower.
d. **Standard and ADA Water Closet**: Floor mounted, tank type, two piece vitreous china toilet with bottom outlet, elongated bowl, universal height, SanaGloss finish, chrome trip lever, 1.28 gallons per flush (GPF). Commercial plastic elongated seat with closed front and cover. Seat and cover shall include soft close hinge system

e. **Standard and ADA Vanity Sink**: Sink basin shall be integral counter mounted type. Provide ADA compliant offset tailpiece and insulation kit on piping below fixture when required.

f. **Vanity Sink Faucet**: ADA compliant, water sense, chrome plated brass, 4” center set single handle faucet with metal pop-up waste assembly, adjustable temperature limit stop and vandal resistant aerator

g. **Wall Hung Lavatory**: ADA compliant, water sense, 21”x18” wall hung, vitreous china lavatory, 4” faucet centers, front overflow

h. **Standard and ADA Shower Basin & Enclosure**: Single Fiberglass unit without ceiling enclosure, OR solid surface basin and wall panels. Provide 2” shower drain with stainless steel strainer and securing nut in each shower compartment.

i. **Standard Shower Valve and trim**: water sense, manual pressure balancing mixing valve with adjustable temperature limit stop, lever handle and low flow showerhead. Provide with chrome plated arm and flange.

j. **ADA Shower Valve and trim**: water sense, manual pressure balancing mixing valve with check stops, level handle and low flow showerhead (1.5 GPM). Provide head from same manufacturer as valve assembly. Provide with chrome plated arm and flange; Provide with ADA hand held showerhead (1.5 GPM) on slide bar. Diverter to control showers heads shall be provided; Provide diverter between shower arm and head at each fixed showerhead.

k. **Staff Apartment, Student Kitchen Sink, and Lounge Sink**: Two compartment, 18 gauge, under mount, type 304 stainless steel sink with drain opening in center rear of each compartment. Provide basket strainers with tailpiece. Sink faucets shall be 8” (min.) center set with 8” spout with single handle faucet, ceramic disc cartridge with 1.5 GPM aerators. Provide 17-gauge chrome plated offset tailpiece and 17-gauge chrome plated cast brass p-trap with cleanout. Provide supplies to wall with wheel handle angle stops. No sprayers. Provide wrist blades at faucets.

l. **Staff Apartment Bath Tub**: Tub fixture to be minimum 60”x30”x14” high fiberglass with slip resistant surface, integral apron; Provide Shower head and valve as noted for student showers above.

22.15. Emergency Plumbing Fixtures

a. Where research and teaching labs are required to have Emergency Eye/Face Wash and Emergency Showers, provide a recessed barrier-free swing-down eye/face wash with drain pan and shower safety station with ceiling mounted exposed shower head combination unit.

b. Where surface mounted Emergency Eyewash / Faucet combination units are required to supplement recessed swing-down emergency wash units, provide Faucet Eyewash Combo unit with the following features:
   - Combined gooseneck faucet with independently operated eye-wash.
   - Twin aerated eyewash sprays, with flip-top dust covers.
   - Eyewash activation by clearly delineated handle.
• Faucet handles shall be minimum 4-inch wrist blade handles for hot and cold water supplies operating quarter-turn ceramic cartridges (25 year cartridge warranty).
• Eyewash faucet location shall be further identified by appropriate wall mounted or ceiling suspended signage.

c. Valves should be spring loaded to prevent continuous flow.

22.16. Drinking Fountains

a. Acceptable Manufacturers
   i. Halsey Taylor
   ii. Elkay
   iii. Murdock

b. Combination Drinking Fountain / Bottle filling Station: Provide wall mounted stainless steel electric drinking fountain with bi-level dual fountain cooler and bottle filling station, ADA compliant, no touch sensor activation on bottle filler, cooler shall have push bar activation, non-filtered, non-refrigerated.

c. Exterior drinking fountains shall be frost proof type.

22.17. Laboratory Compressed Air Systems

a. Air-cooled rotary screw compressors are preferred for system needs greater than 50cfm

b. Ascertain that proper ventilation is available for compressor location.

c. Provide liquid-cooled compressors when ventilation is inadequate.

d. Control air pressure shall be monitored and alarmed through the DCC when the pressures are outside the range of acceptable pressures as determined by the owner.

e. Control air compressors shall have the following features:
   • External, disposable, cartridge-type oil filter
   • Positive pressure lubrication system
   • Loadless starting
   • Automatic condensate purge piped to drain

f. Compressed air systems shall have refrigerated driers.

g. Unless otherwise indicated compressed air system shall be of “instrument” quality, as further modified by other requirements stated herein. Uses requiring “Process” quality air require further development of project-specific criteria.

h. Compressed air system shall have redundant P3 filtration followed by redundant coalescing air filtration

i. Compressed air dew point shall be reduced to 40 degrees Fahrenheit

j. Provide a certificate issued by an appointed examiner or recognized inspection body in respect of the air receiver certifying the inspection during construction of the air receiver, and its auxiliary equipment.

22.18. Laboratory Gases
a. Piped gas systems shall be thoroughly identified and coded and all fuel gas pipe downstream of the meter shall be above grade.

b. Natural gas outlets shall not be installed in bio-safety cabinets or other contained rooms or areas that are not fully exhausted.

c. Natural gas shut-off valves shall be provided at the entrance to the room in which the gas is being used.

d. All medical gas outlets shall be D.I.S.S. type. All piping, tubing and fittings shall be pre-cleaned. Copper shall be type K.

e. Vacuum pumps shall be CLAW, oil lubricated or dry rotary vane type; liquid ring vacuum pumps shall not be used.

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


a. Comply with requirements of the City of Norfolk or other water supply authority requirements.

b. Backflow Preventers (BFP’s) shall be mounted approximately 3'-4' above the floor and be readily accessible for maintenance and located inside a heated building.

c. BFP’s shall be of the reduced pressure zone (RPZ) type. The assembly shall include shut off valves on inlet and outlet, and strainer on inlet “Y” strainer. Backflow preventers shall include test cocks and pressure-differential relief valve located between two (2) positive seating check valves.

d. Seats and seat discs shall be replaceable in both check modules and the relief valve.

e. Valve body and check modules shall be brass.

f. There shall be no threads or screws in the waterway exposed to line fluids.

g. Service of all internal components shall be through a single access cover secured with stainless steel bolts.

h. The assembly shall also include two resilient seated isolation valves, four resilient seated test cocks and an air gap drain fitting.

i. Provide access for backflow preventers that are installed in obscure places to allow removal of the entire unit for service/replacement.

j. Floor drain pipe size to be determined/evaluated before installation of backflow preventer to ensure that floor drain is capable of handling backflow to prevent flooding.

k. Consideration of where the back flow preventer water will flow during testing is key. Concerns are for the water pressure to disturb landscape materials, rocks, paver systems sand and gravel infill, etc. due to the force of the stream. Consider including splash blocks or other design features to avoid the destruction of the site where the water daylights.

22.20. Refer to CHAPTER ONE – PROJECT GENERAL REQUIREMENTS for close out procedures.

22.21. Plumbing Piping and Fittings

a. See Chart next page
<table>
<thead>
<tr>
<th>System</th>
<th>Piping Material</th>
<th>Fitting Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Condensate</td>
<td>Type L Copper or PVC Sch. 40</td>
<td>Copper or Solvent weld PVC</td>
</tr>
<tr>
<td>Domestic Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under-building-slab NPS 3 and smaller</td>
<td>Hard copper tube, Type L, ASTM B 88</td>
<td>Wrought-copper, solder-joint fittings; and brazed joints.</td>
</tr>
<tr>
<td>Domestic Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under-building-slab NPS 4 to NPS 8 and larger</td>
<td>Ductile-iron pipe; standard-pattern</td>
<td>Mechanical-joint fittings; and mechanical joints.</td>
</tr>
<tr>
<td>Domestic Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underground 2” and Smaller:</td>
<td>Soft copper tube, Type K, ASTM B 88</td>
<td>Copper pressure fittings; and soldered joints with no joints permitted below concrete slabs, PEX-a (Engle-Method Crosslinked Polyethylene) Piping and engineered polymer (EP) or lead-free brass F1960 cold expansion fittings with no joints permitted below concrete slabs.</td>
</tr>
<tr>
<td>Domestic Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underground 2-1/2” and above</td>
<td>Soft copper tube, Type K, ASTM B 88</td>
<td>Copper pressure fittings; and soldered joints.</td>
</tr>
<tr>
<td>Domestic Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground NPS 2 and smaller</td>
<td>Hard copper tube, Type L, ASTM B 88</td>
<td>Wrought-copper, solder-joint fittings; and soldered joints. OR Type L copper pressure fittings; and soldered joints.</td>
</tr>
<tr>
<td>Domestic Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground NPS 2</td>
<td>Hard copper tube, Type L, ASTM B 88 OR Hard copper tube, Type L with grooved ends</td>
<td>Copper pressure fittings; and soldered joints or hard copper tube, Type L with grooved ends; copper grooved-end fittings; copper-tubing, keyed couplings; and grooved joints.</td>
</tr>
<tr>
<td>Domestic Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground NPS 2-1/2 to NPS 4</td>
<td>Hard copper tube, Type L, ASTM B 88 OR Hard copper tube, Type L with grooved ends</td>
<td>Copper wrought-copper, solder-joint fittings; and soldered joints. OR Copper grooved-end fittings; copper-tubing, keyed couplings; and grooved joints.</td>
</tr>
<tr>
<td>Sanitary Soil &amp; Waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground NPS 4 and smaller</td>
<td>Hubless, cast-iron soil pipe and fittings OR Solid-wall PVC pipe, ASTM D 2665</td>
<td>CISPI hubless-piping couplings; and coupled joints. ASTM C 1277 and CISPI 310 OR PVC socket fittings, and solvent-cemented joints.</td>
</tr>
<tr>
<td>Sanitary Soil &amp; Waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground NPS 5 and larger</td>
<td>Hubless, cast-iron soil pipe and fittings</td>
<td>CISPI hubless-piping couplings; and coupled joints. ASTM C 1277 and CISPI 310</td>
</tr>
<tr>
<td>Sanitary Waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground Indirect sanitary piping</td>
<td>Copper DWV tube</td>
<td>Copper drainage fittings, and solder joints.</td>
</tr>
<tr>
<td>Sanitary Soil, Waste &amp; Vent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground located inside plenum</td>
<td>Hub-less cast-iron soil piping</td>
<td>Heavy duty couplings</td>
</tr>
<tr>
<td>Sanitary Soil, Waste &amp; Vent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underground NPS 4 and smaller</td>
<td>Solid wall PVC pipe, ASTM D 2665</td>
<td>PVC socket fittings, and solvent-cemented joints.</td>
</tr>
<tr>
<td>System</td>
<td>Piping Material</td>
<td>Fitting Material</td>
</tr>
<tr>
<td>--------------------------------</td>
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</tr>
<tr>
<td>Sanitary Soil &amp; Waste</td>
<td>Solid-wall PVC pipe, ASTM D 2665</td>
<td>PVC socket fittings; and solvent-cemented joints.</td>
</tr>
<tr>
<td>Underground NPS 5 and larger</td>
<td></td>
<td>ASTM D 2665, made to ASTM D 3311 and to fit Schedule 40 pipe.</td>
</tr>
<tr>
<td>Sanitary Soil &amp; Waste</td>
<td>Extra Heavy Hub and Spigot cast-iron soil piping</td>
<td>Cast Iron fittings</td>
</tr>
<tr>
<td>Underground Kitchen Waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanitary Soil &amp; Waste</td>
<td>Service Weight Hub and Spigot cast iron soil pipe</td>
<td>Cast Iron fittings</td>
</tr>
<tr>
<td>Underground Other than kitchen waste:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm Drainage Aboveground NPS 6 and smaller</td>
<td>Hubless, cast-iron soil pipe and fittings OR Copper DWV tube</td>
<td>Heavy-duty CISPI hubless-piping couplings; and coupled joints OR Copper drainage fittings, and soldered joints.</td>
</tr>
<tr>
<td>Storm Drainage Aboveground NPS 8 and larger</td>
<td>Hubless, cast-iron soil pipe and fittings</td>
<td>Heavy-duty CISPI hubless-piping couplings; and coupled joints.</td>
</tr>
<tr>
<td>Storm Drainage Underground NPS 6 and smaller</td>
<td>Hubless, cast-iron soil pipe and fittings OR Solid-wall PVC pipe,</td>
<td>CISPI hubless-piping couplings; and coupled joints. OR PVC socket fittings, and solvent-cemented joints.</td>
</tr>
<tr>
<td>Storm Drainage Underground NPS 8 and larger</td>
<td>Hubless, cast-iron soil pipe and fittings OR Solid-wall PVC pipe,</td>
<td>Heavy-duty CISPI hubless-piping couplings; and coupled joints. OR PVC socket fittings, and solvent-cemented joints.</td>
</tr>
<tr>
<td>General Service Compressed Air Piping Low-Pressure Compressed-Air Distribution Piping NPS 2 and Smaller</td>
<td>Schedule 40, black steel pipe</td>
<td>Threaded, malleable-iron fittings; and threaded joints.</td>
</tr>
<tr>
<td>General Service Compressed Air Piping Drain Piping NPS 2 and Smaller</td>
<td>Hard copper tube, Type L</td>
<td>Wrought-copper fittings; and brazed or soldered joints.</td>
</tr>
<tr>
<td>Hydronic Piping Aboveground Hot-water heating piping NPS 2 and smaller</td>
<td>Type L, drawn-temper copper tubing</td>
<td>Wrought-copper fittings, and soldered or brazed joints.</td>
</tr>
<tr>
<td>Hydronic Piping Aboveground Hot-water heating piping NPS 2-1/2 and larger</td>
<td>Schedule 40 steel pipe</td>
<td>Wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.</td>
</tr>
<tr>
<td>Hydronic Piping Aboveground Chilled-water piping NPS 2 and smaller</td>
<td>Type L, drawn-temper copper tubing</td>
<td>Wrought-copper fittings, and soldered or brazed joints.</td>
</tr>
<tr>
<td>Hydronic Piping Aboveground Chilled-water piping NPS 2-1/2 and larger</td>
<td>Schedule 40 steel pipe</td>
<td>Wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.</td>
</tr>
<tr>
<td>Hydronic Piping Aboveground Condenser-water piping NPS 2 and smaller</td>
<td>Type L, drawn-temper copper tubing</td>
<td>Wrought-copper fittings, and soldered or brazed joints.</td>
</tr>
<tr>
<td>System</td>
<td>Piping Material</td>
<td>Fitting Material</td>
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<tr>
<td>--------------------------------------------</td>
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</tr>
<tr>
<td><strong>Hydronic Piping</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground Condenser-water piping</td>
<td>Schedule 40 steel pipe</td>
<td>Wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.</td>
</tr>
<tr>
<td>NPS 2-1/2 and larger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Makeup-water piping</td>
<td>Type L, drawn-temper copper tubing</td>
<td>Wrought-copper fittings, and soldered or brazed joints.</td>
</tr>
<tr>
<td><strong>Condensate-Drain Piping</strong></td>
<td>Type DWV drawn-temper copper tubing</td>
<td>Wrought-copper fittings, and soldered joints.</td>
</tr>
<tr>
<td><strong>Blowdown-Drain Piping</strong></td>
<td>Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.</td>
<td></td>
</tr>
<tr>
<td><strong>Air-Vent Piping</strong></td>
<td>Inlet: Same as service where installed Outlet: Type K, annealed-temper copper tubing</td>
<td>Inlet: metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions. Outlet: soldered or flared joints</td>
</tr>
<tr>
<td><strong>Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping</strong></td>
<td>Same materials and joining methods as for piping specified for the service in which safety valve is installed</td>
<td>Metal-to plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.</td>
</tr>
<tr>
<td><strong>Refrigerant Piping</strong></td>
<td>Copper Tube ASTM B 280, Type ACR</td>
<td>Wrought-copper fittings ASME B16.22</td>
</tr>
<tr>
<td><strong>Facility-Natural Gas Piping</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground Exposed Fuel Gas Piping</td>
<td>Schedule 40 Steel pipe Type E or S, ASTM A3 /A53M</td>
<td>malleable-iron threaded fittings, and threaded joints</td>
</tr>
<tr>
<td>AND Concealed Fuel Gas Piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Pressure less than 0.5 psig branch piping NPS 1 ½ and smaller</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Aboveground Exposed Fuel Gas Piping</strong></td>
<td>Schedule 40 Steel pipe Type E or S, ASTM A3 /A53M</td>
<td>Malleable-iron threaded fittings, and threaded joints, OR Steel pipe, steel welding fittings, and welded joints.</td>
</tr>
<tr>
<td>AND Concealed Fuel Gas Piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPS 2 to NPS 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Aboveground Exposed Fuel Gas Piping</strong></td>
<td>Schedule 40 Steel pipe Type E or S, ASTM A3 /A53M</td>
<td>Steel welding fittings, and welded joints</td>
</tr>
<tr>
<td>AND Concealed Fuel Gas Piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Larger Than NPS 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Pressure less than 0.5 psig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AND System Pressures more than 0.5 psig</td>
<td>Pre-Sleeved Corrugated, Stainless-Steel Tubing Systems.</td>
<td>Steel pipe, steel welding fittings, and welded joints with welded steel vented conduit.</td>
</tr>
<tr>
<td>and less than 5 psig</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<td>Storm Drainage</td>
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<tr>
<td>Aboveground</td>
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<td></td>
</tr>
<tr>
<td>Service class 2&quot; and Larger</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cast-iron soil piping</td>
<td></td>
<td>Gaskets; and gasketed joints.</td>
</tr>
<tr>
<td>Storm Drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboveground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubless 2&quot; and larger</td>
<td>Cast-iron soil piping</td>
<td></td>
</tr>
<tr>
<td>Couplings:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Heavy-duty, Type 304, stainless steel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Heavy-duty, cast iron.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm Drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underground 2&quot; to 4&quot;: Service class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cast-iron soil piping</td>
<td></td>
<td>Gaskets; and gasketed joints.</td>
</tr>
<tr>
<td>Storm Drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underground 2&quot;</td>
<td>Schedule 40 PVC pipe</td>
<td>PVC socket fittings, and solvent-cemented joints</td>
</tr>
<tr>
<td>Storm Drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underground NPS 2 and larger Hubless</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cast-iron soil piping</td>
<td></td>
<td>Couplings</td>
</tr>
<tr>
<td>a. Heavy-duty, Type 304, stainless steel.</td>
<td></td>
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<tr>
<td>b. Heavy-duty, cast iron.</td>
<td></td>
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</tr>
<tr>
<td>Storm Drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underground NPS 8 and Larger Service class</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cast-iron soil piping</td>
<td></td>
<td>Gaskets; and gasketed joints.</td>
</tr>
<tr>
<td>Acid Resistant Waste &amp; Vent Aboveground</td>
<td>flame-retardant schedule 40 polypropylene</td>
<td>Socket fusion fittings. Mechanical joints allowed only under lab benches inside accessible cabinets and not in cabinet pipe chase.</td>
</tr>
<tr>
<td>Acid Resistant Waste &amp; Vent Belowground</td>
<td>Schedule 80 polypropylene</td>
<td>Socket fusion fittings</td>
</tr>
</tbody>
</table>
Division 23 – Heating Ventilating and Air Conditioning

23.1. Introduction:
   a. The intent of the Old Dominion University Mechanical Design Standards is to provide guidance to A/E firms early in the design process. The mechanical standards are based on previous experiences in the field, and contain Facilities Management (FM) preferences in various areas of mechanical design. This is a living standard, if revisions or variances from this standard are necessary, follow the procedures as outlined in the General Project Requirements of these standards.
   b. These standards apply to all campus buildings except for residence halls.

23.2. General Mechanical Design
   a. Unless otherwise noted, indoor design conditions for cooled & heated spaces shall be 75°F dry bulb & 50% relative humidity for summer and 72°F dry bulb for winter.
   b. Outdoor design conditions shall be based on latest version of ASHRAE's climate design information for climate zone 4A. Unless otherwise noted, summer outdoor design temperature shall be 93 °F dry bulb and 77°F wet bulb. Winter outdoor design temperature shall be 22 °F. Design altitude shall be sea level for all design calculations.
   c. Equipment schedules should reflect the actual designer’s heating/cooling calculations in addition to equipment specified. Designers are discouraged from putting manufacture cooling and heating performance data, in the event that the contractor does not choose the basis of design. Additionally, the building's life cycle cost analysis (LCA) to include psychometric charts, ductwork pressurization (assume a 20 year term for LCA) in the calculations.
   d. Show the area required for maintenance coil pull on all floor plans and enlarged plans. Additionally, show all door swings and sections for air handling units on floor plans and enlarged plans.
   e. Fan pressure drop calculations must include allowances for dirty filters, backdraft dampers, louvers, grilles, balance dampers.
   f. Pump head loss calculations must include allowances for coils, control valves, manual valves, balancing valves, circuit setters, heat exchangers, etc.
   g. Fouling factors shall be provided for all water-to-air and water-to-water heat exchangers (i.e. coils, converters, chillers, etc). Indicate fouling factors in the appropriate equipment schedule.
   h. Constant-volume supply, return, and exhaust ductwork must be sized using the equal friction method. Variable volume systems should be sized using static regain method.
   i. For hydronic systems, design velocity around 5-8 fps and max friction loss at 6’ per 100’.
   j. Design quantities of outside air for ventilation of occupied spaces shall be as per current ASHRAE standard 62.1 requirements.
   k. Particular attention should be given to humidity control by air conditioning equipment. For VAV systems, design shall include a constant 55 deg F supply temperature. Design VAV reheat coils to a maximum temperature of 95 deg F to avoid stratification.
   l. Use the latest revision of ASHRAE 62 for guidance on air quality.

23.3. Mechanical Rooms and Equipment Locations:
   a. The A/E shall, in the earliest stages of design development, be responsible for establishing and/or verifying programmatic requirements for mechanical rooms in order to:
      i. Provide adequate safe access and manufacturer’s recommended working clearances for all equipment.
ii. Provide for replacement of the largest piece of equipment without removing permanent walls, large items of equipment or equipment essential to the principal on-going day to day building use.

iii. Provide accessibility for replacement of mechanical equipment at the end of useful life. During the preliminary design phase discuss with FM staff how boilers, chillers, etc. will be removed and new equipment installed without partial demo of Building. Additionally, verify adjacent building maintenance access is not prohibited.

iv. Provide direct access from the exterior for major mechanical rooms exceeding 100 net square feet. Provide double doors with a removable mullion for card access. Provide interior access for maintenance.

v. In phased projects mechanical rooms shall be sized to include equipment for all the phases.

vi. 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.

vii. Mechanical rooms shall be ventilated by a thermostatically controlled fan.

viii. Access to ducted fan coil units on occupied floors shall be from corridors, rather than through offices, classrooms, laboratory ceilings, or other occupied spaces.

ix. The installation of any air handling units with cooling coils above the ceiling level shall include an emergency drain pan with a float switch wired to the BAS, 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 shall terminate to a visible location.

tax. Consider proposed crane location after building completion for when replacing rooftop equipment in the event of a failure.

23.4. Mechanical (HVAC) General

a. Unless otherwise noted, fan powered Variable Air Volume (VAV) with zone hot water reheat is the HVAC system for academic and general purpose buildings on campus. In non-fan powered zone boxes, when specifying minimum air flow the designer shall consider diffuser dumping. If a zone has a large variance of load profile from neighboring zones a fan powered box should be considered to avoid dumping of diffusers. Hot water zone reheat shall be as specified in the scope.

b. Do not place interior and exterior spaces in the same zone. Exterior zones shall be on exterior walls facing the same direction. Provide separate zones for conference rooms. Zoning shall be maximum 4 offices per zone.

c. For water cooled chillers, system shall utilize cooling tower separately from chiller via plate and frame heat exchangers.

d. Provide energy recovery and equipment efficiencies per latest version of Virginia Energy Conservation Code.

e. Mechanical equipment should all be housed within a weather-tight mechanical room. Roof mounted equipment not in a mechanical room should be discussed on a case by case basis during the initial schematic design and estimating phase. This does not apply to packaged air handling equipment.

f. Exposed exterior roof top ductwork is not allowed.

g. Design should account for capability to shut down major equipment during the off season without detriment to building operation for major HVAC equipment servicing. Example: Single boiler serving domestic and building hot water would not qualify since taking the boiler down would affect two
systems. Additionally for lab equipment that is vital to research, place on separate process chiller that will not be affected by the building chilled water system.

h. Provide exterior connection to chiller / boiler loops should be provided in the event of equipment failure. Connection preferably to be located inconspicuously on exterior of building.

i. Hydronic chemical treatment system to be included in contractor’s bid. The A/E shall indicate same in the specifications. Non-chemical treated systems on campus are prohibited.

j. Third Party commissioning is required on all capital projects and encouraged on non-capital projects as determined by the director of Facilities and especially where complete system removal takes place. The Commissioning Agent is contracted directly by ODU and shall not be a member of the building engineering design team.

k. Dielectrics fittings are prohibited. Designer shall incorporate full port brass shut off isolation ball valves with brass unions whenever possible to account for dielectric connection. In the past, FM has encountered constant leaks through dielectric union fittings when hot water systems are temporarily shut down.

l. Refer to DIVISION 7 – THERMAL AND MOISTURE PROTECTION for roof access.

m. Avoid HVAC systems that modulate cooling supply air temperatures unless outside air is separately conditioned.

n. Unless used in residence halls, avoid use of chilled water fan coil unit (FCU) systems due the high maintenance associated with them. Coil condensate drain pans are especially problematic. If FCU’s are used, ensure adequacy of the drain system.

o. Air cooled chillers should be used for individual equipment smaller than 200 tons. Greater than 200 tons, use water cooled chillers. Where the load for the structure is 50 tons or less, air cooled DX units shall be provided

p. For refrigerant based systems, length of refrigerant piping are short enough to allow oil return.

q. Provide adequate thermal mass in chilled water systems to ensure proper control and longevity of chillers. For smaller systems, consider buffer tank if there is not sufficient volume recommended by the equipment manufacturer. A/E shall show sufficient volume in HVAC calculations.

r. HVAC equipment should not be installed in attics.

s. Air handling unit filter access doors should be specified as hinged with non-tool captive latching devices, ie captive thumb screws, quarter turn latches etc. Do not specify or approve access panels that are unhinged and/or retained by sheet metal screws.

t. Require contractors to provide a listing of the HVAC filters for each piece of equipment along with their MERV rating, dimensions (width, height and thickness) and types (permanent/washable, throwaway, etc)

u. Design and specify bladder type expansion tanks with automatic air relief valve on air separator.

v. Keep in mind fall hazards when locating equipment. Provide necessary guards/rails per Virginia Mechanical Code for maintenance access. Avoid placing equipment within 10 feet of roof edge.

w. Do not permit grooved couplings in HVAC piping system other than the chiller connection. Press type fittings are allowed.

x. Require 5 year warranty on compressor parts and labor. Additionally, require 5 year factory service agreement for all parts (if available).

y. Utilize extruded aluminum diffusers, registers, and grilles with factory finish.
z. Triple duty valves are not acceptable balancing devices; P.I.C. valves are preferred. Manufacturers
normally include disclaimers and Test and Balance technicians generally agree these devices seldom
accurately measure flow, even with manufacturer’s required upstream and downstream straight pipe
diameters.

aa. Provide pressure / temperature test ports across all pumps and equipment coils for testing purposes.

bb. ODU requires redundant pumping for both chilled water and hot water distribution systems. Ensure
A/E’s are providing pumping redundancy (N+1).

c. Variable Refrigerant Systems shall not be used at Old Dominion University, except for IT closets.

d. Dual temperature (2 pipe) systems are not allowed.

e. Condensate shall not drain into BMP ponds directly or indirectly. Discuss how the condensate will be
piped and drained with the ODU PM during preliminary design.

23.5. Ductwork

a. Interior ductwork insulating lining is not allowed except for transfer air ductwork to accomplish sound
attenuation. Provide double wall insulated duct for noise reduction.

b. Two-inch thick double wall insulated ductwork shall be used for exposed applications, exterior
applications when allowed and should always be utilized for painted applications.

c. Provide round or flat oval ductwork systems for primary air on all variable-air-volume supply systems.
Utilize round ducts for supply whenever space availability permits and rectangular for exhaust and
return ducts.

d. Provide no more than 6 feet of flexible ductwork for final connection to a supply diffuser.

e. Provide ducted return for all systems. Return plenum systems are prohibited.

f. All connections to shut off type VAV boxes shall be rigid duct. No flexible ductwork connections are
allowed. For fan powered VAV boxes, canvas duct connection is allowed for vibration isolation.

23.6. Duct Testing and Seal

a. A/E shall include requirements of duct testing and seal class on the contract drawings. A/E needs to
specify which portion of ductwork need to be tested, system test pressure, etc. Pressure classifications
specific to the duct system shall be clearly indicated on the construction documents in accordance with
the International Mechanical Code.

i. Low Pressure Ductwork – 0-2 inches water gauge (w.g.)

ii. Medium Pressure Ductwork – greater than 2 inches but less than or equal to 3 inches w.g.

iii. High Pressure Ductwork – greater than 3 inches w.g.

23.7. Ductwork Leak testing criteria

a. All High Pressure ductwork shall be leak tested in accordance with SMACNA HVAC Leakage Test
Manual. In addition, for variable air volume systems (VAV), supply ductwork from the air handling unit
to the inlet of the VAV box shall be leak tested regardless of pressure classification.

i. Air leakage formula \[ F = CL \times P^{0.65} \]

1. \( F \) = Max leakage (CFM/100ft^2)
2. \( P \) = static pressure of test. (in w.g.)
3. \( CL \) = Duct Leakage class

   a. For duct static pressure of less than 2 inches W.C., specify Class 12 for round duct
and Class 24 for rectangular duct.

   b. For duct static pressure of 2 inches to 3 inches W.C., specify Class 6 for round duct
and Class 12 for rectangular duct.
c. For duct static pressure of higher than 3 inches W.C., specify Class 3 for round duct and Class 6 for rectangular duct.

b. Documentation shall be furnished by the A/E of record demonstrating that representative sections totaling at least 25% of the duct area have been tested and meet the leakage criteria.

23.8. Ductwork Seal Class criteria
a. All installed ductwork shall be seal class A which includes all joints, seams, and all wall penetrations.

23.9. Insulation
a. Piping:
   i. Do not specify mineral fiber or flexible unicellular insulation on chilled water pipes. Use rigid insulation on all pipes subject to being stepped on or damaged. Cellular glass up to 1.5 inch thick is preferred on chilled water pipes and other pipes below ambient temperature. Metal jacket should be utilized for exterior or high abuse areas such as janitorial closets or mechanical rooms.
   ii. If mineral fiber is accepted through a variance on chilled water pipes, it shall be a vapor wick or equivalent type of insulation.
   iii. Provide split case, metal insulated boxes around pumps. Likewise, provide pre-manufactured removable insulation boxes for all balancing valves, and strainers.
   iv. Provide details for insulation support sleeves at hanger locations.
   v. Continue insulation through walls and floor slabs. Note that insulation over penetrations protected with fire dampers, smoke dampers, or combination fire/smoke dampers is prohibited by building codes.

23.10. Variable-Air-Volume Air Handlers
a. Ensure sequences work with system requirements and return/relief fan arrangements, include all set points. Make sure airflow measuring stations have the manufacturers required upstream and downstream straight ductwork lengths. Consider locating a static pressure sensor in the mixing box to assure the design intended outside airflow rate is achieved.

b. Locate duct static pressure sensors downstream of AHU. Include multiple sensors if main supply ductwork branches off in different directions and take worst case. Provide location on ductwork drawings for static pressure sensors; avoid requiring contractors to select locations.

c. Miscellaneous: Provide proper coil pull access. Show door swings and clearances around equipment on drawings. Evaluate air handler ductwork discharge configurations. Make sure they include smooth transitions from outlet up to horizontal run to avoid system effect. Bullhead tees are prohibited. Provide unit vibration isolation if fan vibration isolation is not provided.

d. Ensure static pressure design calculations include dirty filter pressure drop so the unit will be able to provide design airflow when the filters become loaded on a design day.

23.11. Roof Top Units
a. For access opening, use quarter turn handles. Screws for access panels are prohibited.

b. Outside air airflow measuring stations are usually inaccurate because of wind influences; consider mixed air plenum control for these applications.

c. Provide manufacturers insulated roof curb; avoid equipment stands due to potential future roof leak issues. Provide rooftop units curbs with piping chases to avoid exposed piping.

d. Since ODU is located near water, design shall include sufficient factory applied coatings on all exterior mounted coils. Capacity of equipment shall account for any coil coating. Field coatings are prohibited. Coating shall be good for a minimum 3000 hr. salt spray.
23.12. Energy Recovery Units (ERU’s)
   a. Specify filters in the outside air and exhaust air sides upstream of energy recovery wheels.
   b. Provide motorized, low leakage outdoor air automatic isolation dampers.
   c. Ensure fan / motor assemblies are provided with vibration isolation.
   d. Ensure preheat, cooling, and reheat coil loads can be met should the energy recovery wheel fail.
      Include this added capacity in the overall systems.
   e. Plate frame heat exchangers can be used in lieu of heat wheels, but require DEB approval.
   f. Provide compressors with multiple unloading stages. Four unloading stages are preferred.
   g. When scroll compressors are utilized, ensure at least one compressor is capable of maintaining unloading capability to help reduce the likelihood of compressor short cycling.
   h. Specify ERU corrosion protection package for all coils.

23.13. Variable-Air-Volume Terminal Boxes
   a. Provide details to identify six to eight ductwork diameters of straight hard ductwork upstream of inlet which is the same size as the variable-air-volume inlet. Transitions and flexible ductwork are disallowed at inlets due to turbulence yielding inaccurate flow readings.
   b. Make sure boxes are provided with adequate access to control panel, valves and filters.
   c. Bottom of VAV boxes shall be located maximum 12 inches above suspended ceilings.
   d. In the control sequence, always have the variable-air-volume terminal box enabled prior to starting the AHU fan to prevent series terminal box fans from spinning backwards and burning up the motors at start up.
   e. Provide fan speed controllers for box airflow balancing. If boxes are oversized for the airflow required by the zone, the discharge damper can be used to increase static pressure so the speed control is not set on minimum which may result in motor failure at start up.
   f. For area with carbon dioxide controls, make sure the reheat capacity is sized to handle the maximum terminal box primary airflow to avoid zone overcooling.
   g. Provide discharge air temperature (DAT) sensor and control valve position.
   h. VAV terminal boxes and parallel terminal boxes are both prone to cold air dumping issues as they approach the minimum airflow setting. Ensure diffusers are sized with sufficient velocity to keep the air attached to the ceiling at low airflow conditions to prevent dumping. Also ensure selected diffusers feature acceptable sound power levels at maximum airflow.

23.14. Exhaust Fans
   a. Provide roof curbs accommodating roof slopes on applicable drawing details.
   b. Provide disconnect at fan.
   c. Show fasteners securing fan to curb.
   d. Provide speed controller for single phase motors and include appropriate control algorithm in control sequences.

23.15. Louvers
   a. Provide weatherproof louvers with water eliminators and insect/ bird screens.
   b. Select louver free areas large enough to prevent moisture entrainment. Moisture entrainment normally occurs at free area air velocities greater than 600 feet per minute.

23.16. Piping
   a. Provide automatic air vents at all coils and piping system high points.
b. Provide required pre-set pressure on diaphragm expansion tanks. Consider building heights as the increased pressure is required for taller facilities when expansion tanks are located on the lower floors. Install expansion tanks in mechanical rooms.

c. Provide expansion loops, pipe guides and pipe anchors in heating hot water and steam piping systems. Show on drawings.

d. Make sure flushing is in the specification or noted on the contract drawings. Provide requirements for coil isolation from main piping systems while performing initial flushing to prevent coil fouling.

e. For chilled and hot water piping less than or equal than 2”, use Type K (buried) or Type L copper with wrought copper and bronze solder fittings. For piping greater than or equal to 3”, use carbon steel with welded joints.

f. Aquatherm piping is an acceptable system.

23.17 Valves

a. 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. Preference is threaded or flanged full port ball valves.

i. Install valves on all lines that penetrate the floor from below. Include appropriate access panels.

ii. Install valves on all lines at locations such that each floor can be isolated independent of main building.

iii. Install valves on all branch lines off of main lines.

b. Install control valves where they can be reached from the floor where possible.

c. Butterfly Valves: Only high performance type shall be used.

i. 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”.

ii. Blow-out proof stem and in accordance with API 609. Full lug end pattern. Valve shall have lugs on both sides to allow removal from either side.

iii. Valves 2 ½ “ and smaller provided with lock handles. Valves 3” and larger with manual hand wheel worm gear. Provide extended necks to accommodate insulation thickness.

d. Full port threaded or flanged Ball valves are preferred for isolation.

23.18 Controls

a. ODU has Siemens Direct Digital Controls. FM can provide contact for Siemens project manager for coordination. The A/E shall schedule a controls meeting with FM during the preliminary design phase.

b. Always include a dead band for chiller staging; avoid using identical set points to stage down and stage up chillers.

c. Primary loop variable flow (Variable Primary Pumping):

i. Always maintain chiller minimum flow requirements through bypass to avoid starving chillers when utilizing chiller primary loop variable flow pumping

d. Interface all water and energy meters back to DDC front end server for the energy management office. Energy meters are required to be provided by contractors.

i. Discuss sub metering scheme with Facilities Management during the schematic design phase.

e. Variable-air-volume air handling unit control:
i. Make sure controls, or controls provided by A/E's, match the design intent and specified equipment.

ii. Make sure the outside airflow remains constant when the variable-air-volume units are modulating or relief air dampers/relief air fan speeds are modulating.

iii. Avoid oversized variable volume relief or return fans. Fan motor speed turndown is typically limited to 20 hertz. Provide relief air dampers to reduce the relief airflow once the relief fan has reached its minimum allowed safe motor speed.

iv. For simple variable-air-volume units that without relief air control dampers, utilize inlet bell airflow measuring stations to track return air fans or return air dampers at an airflow rate that equals the supply airflow minus outside airflow requirement.

f. CO2 control:
   i. Consider project location ambient air CO2 levels being introduced into air handling units when setting alarm setpoints and opening outside air dampers to reduce facility CO2 levels.
   ii. Poll multiple points unless there is a zone with large occupancy driving the need for increased outside air.

g. Humidity control:
   i. Make sure coils have been located in the reheat position (downstream of cooling coil) with the capacity to maintain zone temperature at setpoint at full airflow.
   ii. Locate humidity sensors in return air ductwork or poll worst-case zones.

h. Building pressurization control:
   i. A reliable rule of thumb is to provide additional outside air equivalent to 10 percent of supply airflow for facility pressurization.
   ii. Avoid relieving air from facilities until the set point of positive 0.05 (ADJ) inches water gauge is exceeded.
   iii. Utilize mixed air plenum static pressure control of the return air damper when using relief air fans that are controlled by a facility pressure sensor. As previously discussed, a relief air control damper should be utilized to reduce airflow after the relief air fan has been commanded to its minimum safe motor speed.

23.19. Thermostats
   a. All Thermostats in public spaces shall have a secure cover to prevent tampering.
   b. Thermostats in private offices shall be adjustable, with a limit of 5 degrees up or down from the program.

23.20. Minimum Control and Monitoring Points for Typical HVAC Equipment,
   a. Air-Handling Units,
      i. Start/stop,
      ii. Heating control
      iii. Cooling control
      iv. Humidification control
      v. Static pressure reset
      vi. Building and zone
      vii. Pressurization control
      viii. Damper position (economizer)
      ix. Supply air discharge temperature
x. Return air temperature
xi. Mixed air temperature
xii. Supply airflow rate
xiii. Filter differential pressure
xiv. Airflow measuring station
xv. VFD Fan Frequency

b. Hot Water Boilers
   i. Start/stop,
   ii. Leaving water temperature reset
   iii. Reset
   iv. Isolation valve position
   v. Leaving water temperature
   vi. Flow
   vii. BTU energy monitoring
   viii. Entering water temperature
   ix. Cooling Towers
   x. Start/stop,
   xi. Leaving water temperature reset
   xii. Flow,
   xiii. Isolation valve position,
   xiv. Entering water temperature,
   xv. Leaving water temperature monitoring
   xvi. VFD Fan Frequency

c. Terminal Boxes
   i. Start/stop,
   ii. Discharge temperature reset,
   iii. Heating control,
   iv. Zone temperature reset,
   v. Zone pressurization control
   vi. Pumps
   vii. Start/Stop,
   viii. Differential pressure,
   ix. Flow,

23.21. Utilities - Submetering
   a. Electricity consumption and demand with tie into front end Siemens server.
   b. Domestic Water consumption with tie into front end Siemens server (Make up, deduct meters, and total building consumption)
   c. Gas consumption shall tie into front end Siemens server.

23.22. Chillers
   a. For smaller chillers utilizing scroll compressors, make sure there are at least four compressors to provide a minimum of four stages of unloading, preferably with one that has limited unloading capability out of the four.
b. Multiple chillers serving a common chilled water system are required to be provided with automatic isolation for each chiller.

23.23. Cooling Towers
   a. Make sure the bottom of the sump is above the centerline of the pump inlet serving it. Verify pump NPSH.
   b. Cooling tower piping shall by-pass to the cooling tower sump. This will help minimize potential condenser water pump cavitation.
   c. All cooling towers shall be of the induced draft (draw-through) type, stainless steel construction.
   d. Provide maintenance platforms with motor davits.
   e. Include chemical treatment for all cooling towers.

23.24. Pumps
   a. Provide a dedicated chilled water primary pump and condenser water pump for each chiller. Provide piping and valve configuration that allows each chiller to operate with any primary pump and with any condenser water pump. Provide back-up or standby pumps so that the total system capacity is available with any one pump out of service. Ensure these requirements are being met on every project.
   b. Provide hot water back-up or standby pumps so that the total system capacity is available with any one pump out of service. Ensure these requirements are being met on every project. Automatic isolation valves are also required for systems with multiple boilers.

23.25. Energy Management and Conservation,
   a. The BAS must have the capability to allow building staff to monitor system performance and determine energy consumption. Building electrical values, such as kW, PF, kWh, and frequency must be measured.
   b. Energy management measurements must be totalized and trended in both instantaneous and time-based numbers. Energy monitoring data must be automatically converted to standard database and spreadsheet format and transmitted to a designated workstation. The measured energy data must be capable of being analyzed.
   c. All HVAC systems installed in excess of 10 hp shall have a variable speed drive on the fan motor.
   d. Provide deduct water meters for buildings for make-up and total building consumption.
   e. For chilled and hot water systems, provide flow measurement devices to calculated total energy flow for future use. FM uses this information for billing purposes, and to track energy performance.
   f. For buildings with multiple tenants / departments, sub-meters shall be included in design.
## 23.26. HVAC Equipment List

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*No magnetic bearing chillers*
Division 26 – Electrical

26.1. General
   a. Refer to CPSM SECTION 6.16 ELECTRICAL DESIGN STANDARDS which include, but are not limited to, the following topics:
      i. Lightening Protection
      ii. Busway Installation
      iii. Photovoltaic installations
      iv. Emergency Systems
      v. Standby Systems
      vi. MC Cable
      vii. Clearance Markings
      viii. 4 Wire Delta systems
      ix. No incandescent lights without approval
      x. Aluminum Conductors
   b. Refer to DESIGN GUIDELINES DIVISION 33 – UTILITIES for underground electrical requirements.
   c. The campus’ primary electrical system is 23 K.V. and owned by Dominion Energy. Secondary services to buildings and facilities shall be 480/277V or 208/120V. Both systems shall be 3-phase, 4-wire WYE connected.
   d. Dominion Energy is responsible for the following, as coordinated through the ODU PM:
      i. Provide and install transformers
      ii. Make primary and secondary connections
      iii. Specifications and inspections for the transformer pad.
      iv. Relocation of overhead power lines to underground.
   e. Transformer and switch pads to be provided by the general contractor to Dominion Energy specifications.
   f. All damages incurred to new or existing electrical installations shall be immediately reported to the ODU PM and repaired by the general contractor at no additional cost to ODU.
   g. The main electrical room shall be separate from any mechanical room. Electrical rooms may be accessed through the main mechanical room if allowed by code.
   h. No ceiling shall be provided in any electrical room.
   i. All separate variable speed drives and combination starters shall be furnished by mechanical contractor and installed by the electrical contractor. The A/E shall include this in the specifications.
   j. General Contractor job-site construction as built drawings shall show actual conduit runs. They shall be marked and maintained on a daily basis throughout the entire project.

26.2. Cables
   a. Wiring
      i. Minimum conductor size for power wiring to be #12 AWG.
      ii. All wire shall be insulated for 600V with stranded or solid copper conductors with THWN or THHN insulation as applicable.
      iii. Spring-type connectors are not allowed.
      iv. Use solderless connectors and splices in #8 AWG and above.
      v. Grounding shall use exothermic welds where appropriate.
vi. Conductor color-coding for 208/120V:
   1. A-Black
   2. B-Red
   3. C-Blue
   4. N-White

vii. Conductor color coding for 480/277V
   1. A-Brown
   2. B-Orange
   3. C-Yellow
   4. N-Grey

viii. All splices in primary cable shall be performed by a Certified Cable Splicer. Splicers shall conform to the recommendations of the ICEA (Insulated Cable Engineers Association) and the cable manufacturer. Cable splicers shall be certified by the Contractor submitting, in writing, the cable splicer’s name and qualifications to the Engineer for approval prior to the beginning of any work.

ix. Phases shall be identified as Phase A, B, C at all splices with tags and attached with wire.

x. Identify phase arrangement at switches so that when facing the front of the switch, Phase “A” shall be on the left, Phase “B” at the center, and Phase “C” on the right. Where phases are aligned front to rear, Phase “A” shall be front, Phase “B” center, Phase “C” at rear.

xi. Cable shall be wrapped with flame resistant tape where spliced in manholes and junction boxes. Contractor shall not block a manhole to such an extent as to prevent the full use of all available duct space.

xii. Testing:
   1. All new medium voltage insulated distribution conductors and equipment shall be meggar tested after all final connections, splices, etc., are made, but before the system is energized.

26.3. Grounding and Bonding
   a. Provide bonding conductors in all Telecommunications rooms from the TGB (telecommunications ground bar) to the overhead cable trays. Bond bushings that go through walls to cable tray.

26.4. Hangers and Supports (Cable Trays)
   a. All cables serving fire alarm and data systems shall be in an approved cable tray or “J” hook system.
   b. No power wiring shall be placed in cable trays.

26.5. Raceways and boxes
   a. Conduit
      i. Refer to APPENDIX Q – ELECTRONIC ACCESS CONTROL, APPENDIX Q2-EAC CONDUIT DIAGRAMS, and APPENDIX R - TELECOMMUNICATIONS STANDARDS FOR BUILDING PATHWAYS AND SPACES for additional information.
      ii. All underground wiring shall be installed in schedule 40 PVC conduit, minimum 1.25” diameter.
      iii. All above-grade conduit size shall be at least ¾”
      iv. Pre-wired flexible conduit, other than fixture whips, shall not be used. Fixture whips shall not exceed 10’ in length.
v. Compression-type connectors or couplings shall not be used for interior applications. “Die Cast” connectors of any type are prohibited.

vi. Home run conduits from distribution panels shall be installed directly to the first device. No more than three (3) 90 degree bends between junction boxes shall be acceptable. Lighting home runs can go to a junction box within the room being served.

vii. Install pull string in all empty conduits.

viii. Tubular conduit shall be used for all home runs until the last junction box on the circuit. MC cable will be permitted to extend from junction box to end device.

b. All panels shall have conductors and MCB (main circuit breaker) sized to full panelboard capacity. Sizing of conductors and MCB’s shall not be based on load calculation only.

26.6. Underground Ducts and Raceways

26.7. Sleeves and Sleeve Seals for electrical raceways and cabling shall be provided and shown by the A/E on above ground and underground wall/barrier penetrations.

26.8. Identification. The following conduit colors shall be used:

   a. Red – Fire Alarm
   b. Yellow – High Voltage
   c. Blue – Data
   d. Orange – Fiber
   e. Purple – Security
   f. Green – Healthcare

26.9. Overcurrent Protective Device shall be provided per code.

26.10. Electrical Power monitoring and Control

   a. Enterprise Wide Power Management and Control System (EPMS)

26.11. Digital – Network Lighting Controls

   a. Provide occupancy sensors in all occupied spaces except the following where standard toggle switches shall be provided, unless otherwise directed by code:

      i. Electrical
      ii. Mechanical
      iii. Telecom/data/AV
      iv. Research Laboratories
      v. Residence Hall Sleeping Rooms

   b. All other occupied spaces shall have occupancy sensors, unless requested by and justified by the end user and not required by code. The A/E shall review spaces to receive occupancy sensors, locations and type, with end users.

   c. When dimming is desired provide modular LED dimmer switches compatible with dimmer drivers.

   d. The lighting control system shall be capable of providing all of the following functions for all lighting, although they may not be required for every project or fixture:

      i. Continuous dimming and automatic on/off controls.
      ii. Occupancy control.
      iii. Vacancy control.
      iv. Daylight harvesting.
v. Load management.

e. The lighting control system includes the following components:
   i. Sensors each contain a passive infrared sensor, digital photocell, digital temperature sensor (optional),
      microprocessor and/or a wireless radio.
   ii. For systems using controllers, each one shall contain a utility grade power meter chip and a latching relay
       which powers the sensors and sends the control signal to the light's ballasts or drivers.
   iii. For systems without separate controllers, the functionality of the controller shall be integrated into an LED
       driver or have independent functionality when using 2-wire sensors.
   iv. Hard-wired (preferred) or battery powered (with ODU approval), wireless room controllers with dimming, on/off
       and scene selection features for manual override.
   v. The central control system must be able to communicate with the sensors, aggregate the data collected by the
      sensors and transmit it to a central node that can reside on the premises or in the cloud.
   vi. This central node can store data collected by the sensors and host the software for a web-based graphical user
       interface for light management and energy savings display software.
   vii. Reports shall include graphical visualization tools for playback of occupancy and heat over time, usage by
        space types (conference rooms, open office areas, etc.), space utilization, and power usage.
   viii. The project shall use dimmable LED drivers where requested.

f. Warranty
   i. Provide manufacturer’s Enhanced 5 Year Limited Warranty:
      1. 5-year limited warranty for the replacement of defective system components from the date of system
         startup completion.
      2. Contractor shall provide limited workmanship warranty for one year from customer acceptance.
      3. A driver module warranty is [5] years. When purchased with a lighting control system this warranty shall
         also be [5] years by the lighting fixture manufacturer.

g. Acceptable System Manufacturers:
   i. nLight/ Aquity
   ii. LumaWatt
   iii. Lutron

h. Provide ten-year lighting controls operational life while operating continually at any temperature in an ambient
   temperature range of 0 degrees C (32 degrees F) to 50 degrees C (122 degrees F) and 90 percent non-condensing
   relative humidity. Equipment designed for outdoors must have an operating temperature range of -35 degrees C (-31
   degrees F) to 85 degrees C (185 degrees F).

i. Sensors and Control Units can be either ceiling mounted or fixture mounted built environment sensors.
   i. Built Environment Sensor.
      2. Digital Ambient Light Sensor.
      3. Processing Mechanisms:
         a. Microcontroller in each sensor.
         b. Communication Mechanism
         c. Low power 2.4 GHz Transceiver based on IEEE 802.15.4 with an option for Bluetooth enabling.
ii. Operations:

1. Sensors shall monitor changes in occupancy, changes in ambient light levels and communicate digital control commands to light fixtures according to a control strategy stored locally in the sensor.
2. Sensor shall either wired or wirelessly transmit occupancy, light level, power information to a gateway device which allows the data to be stored in a central location on premises or in the cloud.
3. Sensors shall be fully adaptive with the ability to have the sensitivity and timing to be remotely adjusted to ensure optimal lighting control for any use of the space.
4. Sensors have remotely adjustable settings for dimming levels, active motion windows for occupancy/vacancy sensing, and sensitivity to changes in motion and changes in ambient light levels.
5. If power is interrupted and subsequently returned, lights automatically return to their setting prior to power interruption and settings and learned parameters saved in protected memory shall not be lost.
6. Programming is stored in each sensor in addition to the central node. Sensors operate independently from central node, so there cannot be single point failure. Systems must operate so there is no single point of failure.
7. Responds to digital (load shed command) Demand Response signal.

iii. Electrical/Connections:

1. Sensor shall connect to a controller via a low voltage cable for interior applications or Ruggedized Sensors for exterior applications. Battery free, wireless devices will be acceptable.
2. System shall have user initiated manual demand response.
3. System shall be ADR 2.0a compliant. Systems that simulate ADR shall not be acceptable.

iv. Control Unit.

1. Components:
   a. Utility Grade Power Meter capable of 1% power measurement accuracy.
   b. Controller to include latching relay, to decrease power requirements of the power pack.
   c. Operate Bounce Time: 3 ms. Max.
   d. Controller shall measure the actual wattage of the fixture(s) that it controls.
   h. Controller shall meter real-time energy use at each fixture.
   i. Controller shall communicate real-time energy use to sensor unit.

j. Lighting Control Device Details

i. Spaces shall be equipped with an automatic control device to shut off lighting in those areas. This automatic control device shall function on either: 1) a scheduled basis, using time of day, with an independent program schedule that controls the interior lighting, or 2) an occupant sensor that shall turn lighting off within 20 minutes of an occupant leaving a space, or 3) a signal from another control or alarm system that indicates the area is occupied.

ii. Offers an interface that allows the system to communicate with the Building Automation System (BAS). A BAS enables occupant data to be further utilized to allow for more efficient usage of a building and space. A BAS can utilize data from the lighting system for providing increased savings by optimizing the operations of a building's HVAC system.
iii. Uses industry standard HTTPS security with AES-128 encryption safeguards the integrity of the entire system. Automatic backups prevent data loss and restore fixtures to operational modes. The system will provide reports that include fixture outages, lamp failure notifications, temperature and occupancy data. It constantly monitors areas to ensure that spaces are managed according to the assigned user preferences and tasks being performed.

k. Operator’s Software

i. User programming and editing may be conducted online in web-based software. Data shall be entered through a simple menu-driven user interface. The operators’ software provides all the information to the user regarding the consumption and saving of the energy utilized in the building environment. The basic operating software shall provide the following:

1. Site wiring documentation for all connected fixtures and system components shall be in O&M manual and project submittals. Reflected ceiling plan shall also be present in the software to show the location of components.
2. English descriptions of each circuit switch and calculated load.
3. Monitor/Control all fixtures.
4. Software shall show actual fixture states, with an optional menu showing how and when the fixture change occurred.

l. Central Programming, Monitoring and Control Work Station

i. The control work station shall provide monitoring, programming and control of the system. The system shall include at a minimum:

1. Scheduling Profile and Groups
   a. Profile: "A lighting profile", which is typically shortened to just profile, is a named set of configuration values that determine the setting of the light level of the luminaire (lighting fixture). The configuration values are used by the intelligence in the fixture along with the current operational mode, past and present sensor values, time of day, day of the week, and passage of time to control the light level. How the light is turned on and off and the light level set, is called the behavior of the light.
   b. Groups: The use for groups is for all fixtures in a room (e.g. conference room) to change to the occupied state (typically resulting in a fixture turning on their lights) when any fixture senses occupancy, and for all fixtures in a room to stay in the occupied state as long as any fixture senses occupancy.

2. Daylighting Controls
   a. The sensor shall have the ability to sense daylight in the surrounding areas. This feature shall allow the automatic reduction of ambient lighting levels when sufficient daylight is present to maintain the programmed foot-candle levels. The daylight sensing feature shall be included in one sensor that also has the ability to sense motion, temperature control and individual energy monitoring.

3. Motion Controls
   a. The sensor shall have the ability to sense motion through passive infrared detection in the surrounding areas. This feature shall allow the automatic activation of lighting to preset levels when motion is detected and provide the automatic reduction of lighting to preset levels when no motion is sensed.
after the programmed time-out period. The motion sensing feature shall be included in one sensor that also has the ability to sense daylight, temperature control and individual energy monitoring.

4. Energy Dashboard
   i. Shall have the ability to provide real-time graphic information concerning the energy usage of the individual lighting fixtures. This information can include but not be limited to:
      a. Displaying the building floor plan with the “ON” or “OFF” status of each light and the ability to zoom into to any fixture and get expanded operating information.
      b. Providing real-time information for any lights that are not functioning and the date when they stopped working.

5. Demand Response Control (Future use)
   ii. For buildings 10,000 square feet or greater and upon notification by the local utility, the system can automatically reduce lighting loads by 15% for the building when directed by the Building Management System (BMS).

26.12. Transformers
   a. Dry-type transformers rated 600 V and less, with capacities up to 500 kVA.
   b. Efficiency ratings will meet NEMA TP-1 standards at a minimum with NEMA Premium CSL-3 standards preferred.
   c. Acceptable Manufacturers:
      i. Square D: by Schneider Electric
      ii. Eaton Electrical Sector; Eaton Corporation.
      iii. Siemens Power Transmission & Distribution, Inc.

26.13. Switchgear
   a. All switchgears shall have bakelite, or equivalent, nameplates identifying each assembly as well as on all breakers, disconnects or switches contained therein.
   b. Provide written documentation of all parameters for digital electrical meters provided in the switchgear.
   c. The A/E shall call out DEB required signage as part of the drawings and specs.

   a. Service and distribution switchboards rated 600 V and less, subject to compliance with project specifications, provide products by one of the following:
      i. Square D; by Schneider Electric.
      ii. Eaton Electrical Sector; Eaton Corporation.
      iii. Siemens Power Transmission & Distribution, Inc.
   b. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete.
   c. All switchboards shall have bakelite, or equivalent, nameplates identifying each assembly
   d. All means of disconnect within assembly needs to be labeled with specific connected loads.
   e. Buses and Connections: Three phase, four wire unless otherwise indicated.
      i. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
ii. Phase- and Neutral-Bus Material shall be hard-drawn copper of 98 percent conductivity.

iii. Copper feeder circuit-breaker line connections.

iv. Tin-plated aluminum feeder circuit-breaker line connections.

v. Load Terminals shall be insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.

vi. Ground Bus shall be the minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with connectors for feeder and branch-circuit ground conductors.

vii. Main-Phase Buses and Equipment-Ground Buses shall have uniform capacity for entire length of switchboard’s main and distribution sections. Provide for future extensions from both ends.

viii. Neutral Buses shall have 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

f. Surge Protection Devices (SPDs)

i. Acceptable Manufacturers: Subject to compliance with project specifications, provide products by one of the following:
   1. Advanced Protection Technologies Inc. (APT).
   2. Eaton Electrical Sector; Eaton Corporation.
   4. Square D; by Schneider Electric.

SPDs with the following features and accessories:

i. Integral disconnect switch.

ii. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

iii. Indicator light display for protection status.

iv. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

v. Surge counter & Display

h. Disconnection and Overcurrent Protective Devices

i. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.


i. Instrumentation

i. Main switchboards shall contain a 10-function electronic digital monitoring system. This monitor shall have capabilities to reset approximate values, KWH in particular.

ii. Multifunction Digital-Metering Monitor shall be a microprocessor-based unit suitable for three- or four wire systems and with the following features:
   1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
a. Accuracy tolerances for values of accumulated energy, megawatt hours shall be plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.

b. Megawatt demand values shall be plus or minus 1 percent; demand interval programmable from five to 60 minutes.

c. Contact devices to operate remote impulse-totalizing demand meter.

26.15. Panelboards

a. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete.

b. All panelboards, switchboards, circuit breakers, dry type transformers and disconnect switches shall be of the same manufacturer.

c. Entire front trim shall be hinged to box using piano type hinge with standard door within hinged trim cover.

d. Provide directory card located on the inside panelboard door, mounted in transparent card holder.

e. Create machine-printed panelboard schedules to replace the handwritten schedules. Loads shall be specific room, piece of equipment, etc. verse using a generic "receptacles" label.

f. All breakers shall be a minimum of 20A rated.

g. Every electrical panelboard shall be rated at 225-amp minimum. The MCB and all conductors shall be sized to full panel board capacity. Sizing of conductors and MCB's shall not be based on load calculation only. Each panel board shall have its own 225A circuit from the Main Switchgear or MDP. Main lug or "Pass-Through" lug panels are not allowed.

h. Electrical panels shall have 15% spare capacity. Supply a minimum of four (4) ¾” empty conduits from recessed panels to an accessible location for future use.

i. No panelboards shall be located in housekeeping closets. Provide electrical closets on each floor dedicated to electrical panels only.

j. Commercial kitchens shall have dedicated electric panelboard(s) serving only kitchen-related outlets. Feeding kitchen-related circuits from other electrical panelboards is not acceptable. Commercial kitchen related panelboards shall have a minimum of (4) spare ¾” conduits stubbed into acceptable ceiling space for future kitchen-related circuits.

k. All interior transformers greater than 45 kva shall be floor mounted.

l. Integrated transformer/panelboards shall not be used.

m. Switchboards, panelboards and components shall have copper buss bars.

n. When panelboards are used as main service equipment, the same meter shall be installed adjacent to it and provisions for current transformers and other connections shall be made.

o. Fusible switches shall be spring-loaded types, with interlock and padlock capabilities.

p. Provide 5% spare fuses for fusible switches. Fuses shall be stored in the main electrical room.

q. Panelboards for light and power shall be of the dead-front, automatic C/B type. Circuit breakers shall be bolt-on or I-line type. Panelboards shall have copper grounding bars.

r. When an electrical panel is surface mounted, all under slab conduit that turns up into the electrical panel, shall transition from sch40 PVC to a rigid 90o elbow before extending through the floor. IMC conduit shall extend from the 90o elbow into the bottom of the panel.

s. Provided “fed-from…” phenolic bakelite, or equivalent, labels for panel boards and the lighting inverter.
t. If an existing building is renumbered, the corresponding electrical panels shall be renumbered and new labels produced and shall be documented by the A/E.

u. Distribution Panelboards acceptable manufacturers:
   i. Eaton Electrical Sector; Eaton Corporation.
   ii. Siemens Industry, Inc.
   iii. Square D.

v. Lighting and Appliance branch-Circuit Panelboards acceptable manufacturers:
   i. Eaton Electrical Sector; Eaton Corporation.
   ii. Siemens Industry, Inc.
   iii. Square D.

26.16. Motor-Control Centers (reserved)
26.17. Enclosed Bus Assemblies (reserved)
26.18. Power Distribution Units (reserved)
26.19. Electricity Metering
   a. All new construction and major renovations to be metered. It is the intent of the university to meter all buildings over time. The A/E shall discuss the metering scheme with Facilities Management at the earliest possible opportunity.
   b. Equipment for electricity metering by utility company shall be furnished and installed by Dominion Energy. The general contractor shall provide the meter base. Install raceways and equipment according to utility company’s written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
   c. Meter shall be located outside facility or accessible by local utility without the need of an ODU provided escort.
   d. Equipment for Electricity metering shall be provided by one of the following manufacturers:
      i. E-Mon.
      ii. National Meter Industries.
      iii. Square D.
   
   e. The meter shall have the potential to interface with the DDC system for HVAC. The meter can be integrated into the switchboard or motor control center.

26.20. Wiring Devices
   a. Typical Building Cover Plates: Stainless Steel
   b. **Residence Hall** Cover Plates: White Plastic
   c. **Controlled Receptacle** Cover Plates: To meet the requirements for identifying receptacles that will be automatically de-energized as part of an overall plug load control program, the 2017 NEC requires all 15A & 20A, 125V receptacles that are automatically controlled (as required by code) to be marked with the controlled receptacle marking symbol and the word “CONTROLLED” on the receptacle face. Provide green colored devices that meet this requirement with stainless steel cover plates (White in Residence Halls)
   d. Emergency Power Cover Plates: red receptacle with stainless steel cover plate with “EMERGENCY” engraved on cover plate with red lettering.
   e. All receptacle covers shall be labeled with the circuit and panel designation with an adhesive type label.
f. Single device boxes shall be a (4”x4”x2.125”) minimum size with appropriate plaster ring or adapter. Junction and pull boxes shall be a minimum of (4”x4”x2.125”) with appropriate cover.
g. Provide at least two (2) separate electrical 20A, 120V receptacle circuits in every Residence Hall room.
h. Provide (1 or 2) GFCI receptacles outside of each building entrance. Each receptacle shall share a dedicated 20A, 120 volt circuit.
i. Wiring devices shall be hard-use, specification-grade, 125V AC, 20A, back or side wired. Devices to have screw/clamp type terminals. Switches to be rated 277 VAC regardless of system voltage.
j. Receptacles shall be provided inside at each entrance vestibule and at least every fifty feet 50’ in all corridors. These receptacles shall be on a dedicated circuit.
k. Provide at least one dedicated 20A, 120V receptacle circuit per public bathroom.
l. Provide at least one 20A, 120 VAC GFCI receptacle in each electrical, elevator, mechanical, maintenance storage and trash room, and at each cooling tower and AHU. Each circuit shall be dedicated to its respective room.
m. Receptacles serving vending machines shall have their own 20A dedicated circuit to each receptacle. There shall be one (1) communications outlet for each bank of machines.
n. All conductors in boxes serving receptacles shall be pigtailed so that the device can be removed without interrupting the circuit.

26.21. Utility Service Entrance

a. The Owner will pay all charges levied by the Power Company for the underground service. The general contractor shall assist the Owner with the application for electrical service.
b. All work shall be in accordance with the Dominion Energy’s standards for means and methods.
c. The general contractor shall coordinate work with the power company within 30 days of notice to proceed contract date. Notification shall be in writing. The contractor shall schedule a preconstruction meeting with the appropriate subcontractors present and shall be held at Dominion Energy’s district offices.
d. The contractor shall notify Dominion Energy at least seven days in advance the start of duct bank construction.
e. Dominion Energy Provided Work and Materials
   i. Pad mounted transformer.
   ii. Primary conductors and terminations to the transformer.
   iii. Cable terminations at secondary bushings of transformer.
   iv. Conduit seal on the transformer end of Contractor-provided conduits to company transformer.
      i. Metering circuitry from CT Cabinet to meter.
      ii. Transformer pad.
      iii. Grounding at service entrance and transformer pad.
f. Contractor Provided Work and Materials
   iv. Excavation and backfill for primary and secondary service ductbanks.
v. Conduit ductbank for Dominion Energy primary conductors to transformer.
v. Service switchboard with Utility-Approved CT section.
vii. Ductbank from utility pad mounted transformer to service switchboard CT section, with conductors terminated in switchboard.
viii. Conduit seals in accordance with Dominion Energy requirements.
ix. 1-1/4" concealed empty conduit from CT section to utility meter base.

g. Furnish two (2) PDF copies of as-built drawings showing the actual location and installation of the main feeders, main duct bank and complete system.

26.22. Fuses (reserved)

26.23. Enclosed Switches and Circuit Breakers
   a. All exterior disconnects shall be NEMA 4X Stainless Steel

26.24. Controllers: Variable frequency drives shall be specified by the A/E as provided by the mechanical contractor.

26.25. Photovoltaic Collectors
   a. ODU has existing photovoltaic installations on campus and is open to discussions for additional installations associated with projects when appropriate.

26.26. Generators
   a. All new construction shall have emergency power shall be supplied by generator set and transfer switch.
   b. Automatic transfer switches and related components shall be provided by the selected generator-set manufacturer.
   c. Acceptable generator manufacturers:
      i. Generac (preferred)
      ii. Caterpillar; Engine Div.
   d. The Automatic Transfer Switch (ATS) control pad shall provide the following display features:
      i. Utility voltage by phase
      ii. Emergency voltage by phase
      iii. Frequency by phase
   e. The generator set shall be located outside of the building in a discreet location. Consideration will be paid to flood plain height in relation to the emergency generator; no generator shall be placed in locations prone to flooding. Same consideration shall be applied to main distribution panels as it relates to areas prone to flooding. Considerations shall include the anticipated shift in the floor plane height over the life of the building, to the degree possible.
      i. The bottom of the generator shall be located at the building’s first floor elevation or higher.
   f. The A/E shall locate an exterior portable emergency generator hook up when the permanent generator cannot support additional load as identified by the building users for an extended power outage, such as museum climate control or research facilities. The project team will discuss what is considered an extended power outage for the specific building usage.
      i. A permanent means of connecting temporary generators shall be installed in a location approved by ODU staff. Shall include a manual transfer switch and the connections will be a cam-lock type. All parts shall be rated equivalent to 100% of main disconnect switch(s).
   g. The A/E shall require generators to operate in high salt content in the air due to sea-spray evaporation.
   h. Permanent generators shall be natural gas fueled.
i. The generator muffler/silencer shall have a sound attenuation of 25 dB at 500 Hz under no load. After installation is complete sound level measured at a distance of 25 feet from exhaust discharge shall be 78 dBA or less.

j. Generators <100kw shall provide a means of connecting a portable load bank. The method of connecting the portable load bank shall be easily accessible.

k. Generator shall be able to communicate to the BAS. Locate generator annunciator panel adjacent to the building fire alarm control panel.

l. Provide at least one empty ¾" conduit and pull string between the generator enclosure and the ATS switch.

m. Generator shall be provided with at least one (1) double-duplex convenience outlet. This outlet shall be mounted in an accessible location within the generator enclosure. This outlet shall be fed from a minimum 20 amp capacity breaker that is clearly marked and is also on emergency power.

n. Outdoor Generator enclosure shall be Vandal-resistant, sound-attenuating, weatherproof aluminum or salt resistant housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

o. All main and distribution IT switches, and HVAC DDC panels shall be connected to emergency circuits. Refrigerators and freezers shall be evaluated on a case by case basis for connection to emergency power.

p. Provide a service light in the vicinity of the generator to illuminate on and around the unit for servicing.

26.27. Lightning Protection

a. Install lightning protection components and systems according to UL 96A and NFPA 780.

b. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends and narrow loops.

c. Conceal the following conductors:
   i. System conductors.
   ii. Down conductors.
   iii. Interior conductors.
   iv. Conductors within normal view from exterior locations at grade within 200 feet of building.

26.28. Cathodic Protection (reserved)

26.29. Surge Protection for Low-Voltage Electrical Power Circuits (reserved)

26.30. Lighting General

a. Design consultant shall submit cut sheets of all proposed light fixtures to the ODU PM for approval prior to the completion of Preliminary Drawings. The cut sheets will be clearly labeled and tied to the lighting plans.

b. The university attracts a varying array of age levels from toddlers to the elderly for the multitude of activities and learning offered. It is our responsibility to design a safe environment for all individuals without sacrificing the natural environment.

c. The designer shall consider appropriate fixtures that will provide a minimum value to achieve and be able to demonstrate good to excellent facial recognition at a distance of 30 feet.

d. Lighting uniformity on campus is a priority. When designing a project, light level plans shall include neighboring fixtures and their impact on the current project.

26.31. Exit Signs

a. Provide LED internally lighted signs with 50,000 hours minimum rated lamp life.
26.32. Interior Lighting

a. New construction shall utilize LED fixtures.

b. Renovations shall convert to LED fixtures when appropriate, otherwise re-use and or match existing fluorescent fixtures.

c. All LED lighting shall carry at least a 5 year full product replacement warranty.

d. Color temperature shall be no less than 3500K.

e. Color temperature shall not vary more than 200oK within a connected space.

f. Recessed “can” type fixture shall only be used in locations with hard ceilings that allow repair access through lamp opening only. The use of these fixtures shall be kept to a minimum regardless of location.

g. Lights shall be installed over landings verses stair treads wherever possible and meet the minimum egress lighting required by code. If lights are required to be installed above treads they shall be no higher than 10’ above finished floor and shall be accessible from a 6’ ladder.

h. Lighting in all multimedia classrooms shall be reviewed and approved by the Assistant Director Classroom and Learning Space Technology.

i. Use wire guards on all lighting in gymnasiums or similar types of athletic spaces, including emergency lights, fire alarms, and clocks. Lenses shall be Plexiglas/ Lexan type material for better resistance to shattering.

26.33. Emergency and Exit Lighting

a. All emergency lights shall be connected to 277V circuits. Emergency lights shall be connected to emergency power when available. Battery backed-up ballasts connected to house circuits are not acceptable.

b. Refer to the BCOM NEWSLETTER #12 DECEMBER 2015, excerpted below

i. Occupancy sensors shall:
   1. Be installed throughout the building to provide full coverage of all areas.
   2. Incorporate both infra-red and ultrasonic technologies within each sensor device.
   3. Be equipped with a time-delay (off) function and shall be set for minimum 15-minute duration.

ii. The means of egress must be illuminated for the entire floor whenever an occupant is sensed anywhere on that floor.

iii. Elements of the means of egress that serve all floors shall be illuminated whenever an occupant is sensed anywhere within the building. This shall include, but not be limited to, stairways and common lobbies such as main building lobbies and elevator lobbies.

   iv. Means of egress illumination located outside of the building or on the exterior of the building shall not be controlled by occupancy sensors. Typically, this lighting is controlled by photocell(s) and this practice continues to be acceptable. (ODU Comment: The preference is to use HVAC DDC system to control exterior lighting using one master photocell installed to input to the DDC system which will trigger outside lighting to activate.)

v. In buildings where a fire alarm system is provided, the means of egress lighting shall be illuminated upon activation of the fire alarm system.

vi. The design and sequence of operation of the occupancy sensing system shall be included in the electrical plans submitted for permit and sealed by the electrical design engineer. The means of egress shall be clearly defined on the architectural plans.
vii. Emergency means of egress illumination required by VCC Section 1006.3 shall not be controlled by occupancy sensors. Note: if the same luminaires are utilized for both normal means of egress illumination (VCC 1006.1) and emergency means of egress illumination (VCC 1006.3), then occupancy sensor control of these luminaires must be by-passed in the event of normal power supply failure by use of an emergency device listed for the purpose.

26.34. Theatrical Lighting (reserved)

26.35. Exterior Lighting

a. Refer to Appendix AI – Standard Campus Light Pole and Appendix AJ - Standard Campus Parking Lot Pole.

b. Photometrics
   i. Photometrics shall be provided for exterior lighting as required by the CPSM.
   ii. All exterior steps, roadways and main pathways shall be designed to meet Illumination Engineering Society of North America (IESNA) standards for cut-off optics, unless otherwise directed.
   iii. Point-by-point foot-candle calculations of the site lighting and voltage drop calculations for site lighting circuits shall be provided with the preliminary document submission; foot-candle calculations shall include the IESNA design level/classification used.
   iv. Because we are a college campus and there are not site specific boundaries, it is vital that the surrounding existing fixtures be accounted for in the photometric calculations.
   v. A final photometric drawing indicating the measured light levels at completion shall be submitted with the record drawings, along with the approved photometric drawings originally submitted to DEB. The calculations shall include exterior building mounted fixtures and exterior light spill from interior fixtures.

c. Foot candle consistency – exterior lighting design shall provide the required fc levels on walkways and stairs with no greater than a 50% change in fc readings between fixtures. Example: if the light reading the pathway of a light fixture is 2 fc, then the light shall drop to no less than 1 fc or increase no greater than 2fcfs along that same path. The intent is to avoid shifts in light levels going from dark to light too quickly which the eyes cannot adjust to.

d. All exterior lighting fixtures shall use LED lamps only. Lens shall be impact-resistant tempered glass, lexan or other approved material.

e. The A/E shall indicate in the construction documents that the exterior campus light pole heads shall be owner furnished, contractor installed. The poles and bases shall be provided by the general contractor and shown on the A/E documents. The A/E shall provide ODU with a list of the heads required, the lamping etc. so that ODU can provide the right fixtures for the project.

f. The A/E shall detail the light pole base, including a hand hole, as part of the construction documents.

26.36. Athletic Exterior Lighting (reserved)
Division 27 - Communications

27.1. General

a. Industry Standards. The document is based on ANSI/TIA/EIA-569-B, State and other Industry standards including but not limited to:
   i. ODU has standardized on the Belden IBDN Structured Wiring System.
   ii. Building Industry Consulting Service International Telecommunications Distribution Methods Manual (BICSI TDMM) for any topics not covered in these standards.
   iii. BICSI RCDD Registered Communications Distribution Designer for complete infrastructure design.

b. The primary focus of this standard is to provide design elements and guidance for the structured cabling systems and communication infrastructure required by Old Dominion University’s Information Technology Services. The components will be used to deliver required voice, video and data services throughout a building. This document focuses on building elements by which that system will be deployed. The six prominent components of the building infrastructure are:
   i. Entrance Facility (EF)
      o Provides the point at which outdoor cabling enters the building and interfaces with the intra-building backbone cabling.
      o Historically it has been known as a Master or Main Distribution Frame (MDF).
      o ODU typically utilizes a first floor Telecommunications Room (TR) as the EF/MDF.
   ii. Equipment Room (ER)
      o Any or all functions of a telecommunications room may be provided by an ER, however, ERs usually house equipment of higher complexity.
      o ODU does not typically utilize ERs.
   iii. Backbone Pathway (BP)
      o Extend between the Inter-building Infrastructure (Outdoor Conduit) System and the EFs and TRs.
      o Inter-building Pathways (IBP) – are the ODU outdoor communications conduit system.
      o Horizontal Backbone Pathways (HBP) – are between rooms on the same floor.
      o Riser backbone Pathways – are between rooms on different floors.
   iv. Telecommunications Room (TR)
      o The TRs are the junctions between backbone and horizontal pathways. They contains active voice, video and data telecommunications equipment, network UPSs, termination, cross-connect wiring and other access and security infrastructure.
      o Historically known as telecommunications closet (TC) or Intermediate Distribution Frame (IDF).
   v. Horizontal Pathway (HP)
      o Facilities, such as conduit and cable tray, used in the management of horizontal cabling from the work area outlet (Telecommunications Outlet (TO)) to the TR.
      o These pathways must be designed to handle all types of cables including: unshielded twisted-pair, and optical fiber.
      o This pathway is for low voltage communications cabling only.
   vi. Work Area (WA)
      o The work areas (WA) is where the telecommunications outlets (TO) and work station equipment are located.
Diagram 1) Scope of ODU Building Standard for Telecommunication Pathways and Spaces

27.2. **Pathways for Communications Systems** *(Conduits, wireways, surface pathways, boxes and enclosures, and handholes and boxes)*

a. **Entrance Facility (EF).** Provides the point at which outdoor cabling enters the building and interfaces with the intra-building backbone cabling.
   i. ODU typically uses the first Telecommunications Room (designated as T1) on the first floor as the entrance facility/MDF.
   ii. Inter-building Pathways (Conduit) enter the building at this location.

b. **Equipment Room (ER).** ODU typically does not use equipment rooms.

c. **Backbone Pathway (BP).** Inter-building Pathways (IBP) – Outside conduit system between campus buildings.
   i. External pathway conduit must end in the EF/T1/MDF
   ii. External pathways are to be schedule 40 PVC Pipe
   iii. External hand holes and lids shall be Tier 22, labeled “ITS” and manufactured by Quazite and be made of Precast Polymer Concrete.
   iv. External hand holes shall be installed using gravel and other proper techniques to prevent settling of the box and allow for proper drainage.
v. Grading of external underground pathway should permit proper drainage.

vi. Number of conduits to enter the building are determined by the size and prominence of the building and shall be schedule 40 PVC Pipe:
   1. Up to 96 telecom outlets not less than 2 – 4” conduits
   2. Above 96 telecom outlets not less than 4 – 4” conduits, 2 each to two different diverse hand holes.

d. Horizontal Backbone Pathways (HBP) - Are between telecom rooms on the same floor
   i. Must be connected by at least 2 – 4” conduits or cable tray.
   ii. Used to place backbone cable between TRs on the same floor.

e. Riser backbone Pathways (RP) - Are between telecom rooms on different floors.
   i. Must be connected by at least 2 – 4” conduits or cable tray.
   ii. Used to place riser cables between TRs.
   iii. Pathways can be conduit, sleeves or cable trays as appropriate to the space being traversed.

f. Telecommunications Rooms (TR)\Closets. The TRs are the junctions between backbone and horizontal pathways. They contains active voice, video and data telecommunications equipment, network UPSs, termination, cross-connect wiring and other access and security infrastructure.
   i. There should be at least one TR per floor
   ii. TRs should be stacked if at all possible and connected by at least 2 – 4” conduits/sleeves.
   iii. All telecommunications outlets must be within 290ft, as the pathway flows, of a TR.
   iv. TRs are not to be used for other services\trades during construction, such as, temporary power and pathway between areas.
   v. Ceilings need to be open.
   vi. Walls and floors need to be complete before the pulling of wiring begins. Plywood and floor sealed at a minimum.
   vii. Communications wiring needs to start with sufficient time to be completed before the ceilings are closed in and grid goes up.
   viii. Only equipment directly related to the telecommunications systems, control systems and its environmental support systems are to be housed in TRs.
   ix. TRs are not to be used as a storage space.
   x. All walls are to be covered with 8 ft. high, 3/4 in. Fire Rated plywood to attach equipment.
   xi. Walls, floor and ceiling finishes should be light in color to enhance room lighting. Provide 30 FC minimum.
   xii. Access to TRs shall be through a 36 in. wide by door from a public corridor and must be controlled by the University’s Electronic Access Control System. Entrance to the TF’s from within another space or the exterior is not acceptable.
   xiii. ODU requires an independent AC unit to continuously maintain an operating temperature of less than 75°F.
   xiv. Lighting and sprinkler heads should not be placed directly over racks. No other water lines shall run through the TRs.
   xv. Provide a grounding bar appropriately bonded to the building ground and sized to meet the building needs.
   xvi. ODU to build out cable tray within telecom rooms.
   xvii. Contractor to provide 3 – 4” sleeves to tie hallway cable tray to the TR.
xii. Power

1. Rack Power
   a) 6 dedicated 20 amp 110V circuit with a duplex (5-20R) receptacle.
   b) 1 dedicated 20 amp 208V circuit with L6-20R receptacle.
   c) 2 dedicated 30 amp 208V circuit with L6-30P receptacle.
   d) 18” AFF next to the end of the equipment rack row.
   e) If a 3 rack system an additional 2 dedicated 30 amp 208V circuit with L6-30P receptacle need to be installed.

2. Door Access
   a) 1 dedicated 20 amp 110V circuit with a quad (5-20R) receptacle, 18” AFF below the Door Access Controller.

3. General Purpose
   a) One (1) dedicated circuit with 3 duplex outlets 1 each on 3 walls. (not wall with rack power)

xiii. Emergency Power

   i. Security cameras are powered by the network equipment therefore all network equipment is to be on emergency power.

xiv. See TR Diagrams below for typical layout of Telecom Rooms.
TR Diagram 1) Typical 1 Rack TR Layout

Cable Tray Above Ceiling Provided by Contractor (Tied to Hallway System with 3 - 4" sleeves)

AC

Electrical Panel (Telecom Only)

110 18" AFF

15" AFF
Dedicated 110V for Door Access

110 18" AFF

Telephone/CATV

Outside Plant Conduit

6 - 110V 5-20R
1 - 208V L6-20R
2 - 208V L6-30R
TR Diagram 2) Typical 2 Rack TR Layout

Cable Tray Above Ceiling Provided by Contractor (Tied to Hallway System with 3 - 4" sleeves)

18" AFF
Dedicated 110V for Door Access

110
18" AFF

6 - 110V 5-20R
1 - 208V L6-20R
2 - 208V L6-30R

Outside Plant Conduit

Ground Bus

Telephone

AC

Electrical Panel (Telecom Only)

Door Access

CATV
TR Diagram 3) Typical 3 Rack TR Layout
Table 1: Typical Minimum Telecommunications Room (TR) Size Requirements

<table>
<thead>
<tr>
<th>Telecommunication Outlets per Floor</th>
<th># of Racks</th>
<th>Minimum Room Size - ft</th>
<th>Rack Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 96</td>
<td>1</td>
<td>7 x 9</td>
<td>6-110V 5-20R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1-208V L6-20R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2-208V L6-30R</td>
</tr>
<tr>
<td>97 to 240</td>
<td>2</td>
<td>9 x 9</td>
<td>6-110V 5-20R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1-208V L6-20R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2-208V L6-30R</td>
</tr>
<tr>
<td>241 to 432</td>
<td>3</td>
<td>11 x 9</td>
<td>6-110V 5-20R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1-208V L6-20R</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4-208V L6-30R</td>
</tr>
<tr>
<td>433 and Above 2nd TR Required</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

- **g. Horizontal Pathway (HP).** Facilities, such as conduit and cable tray, used in the management and installation of horizontal cabling from the work area outlet (Telecommunications Outlet (TO)) to the TR.
  - i. All conduit and cable tray must be of sufficient size to accommodate the number and size of cables being installed.
  - ii. Cable tray must be installed in all hallways.
  - iii. J-hooks or other approved methods will be used to support cable between the hallway cable tray and the telecommunications outlets and will be installed by the University's contractor.
  - iv. Wall penetrations with sleeves/conduit are required for access from the hallway cable tray into individual rooms.
  - v. All telecom outlets must have conduit with pull strings stubbed out into accessible ceiling with access to the nearest cable tray.
  - vi. All telecom conduit shall have an insulating plastic bushing installed on open ends, to include sleeves, pass through, etc.
  - vii. Any inaccessible ceilings (lock-in ceiling tiles, drywall, plaster, hard ceiling, etc.) within the cable tray path must be spanned by conduit, minimum 2-4", between the cable tray sections.
  - viii. Telecom wiring in open ceiling shall be in conduit or cable tray.
  - ix. Telecom outlet conduit which extends outside of the room shall have pull string installed.
  - x. Internal Pathways are to be either EMT or Rigid Pipe & Fire Rated
  - xi. Bends are not recommended; if required there should be no more than 180° of total bends.
  - xii. Intermediate pull boxes must be installed when there is more than 180° of total bends.

- **h. Work Area (WA).** The WA is where the telecommunications outlets and work station equipment are located
  - i. Private Office Space
    1. One single gang box will be located on the same wall as the desk telecom services and a second one on the opposite wall.
  - ii. Cubicles and Open Work Space
    1. One single gang box per desk.
  - iii. Lab Space
    1. One single gang box per 6 computers, if located on a continuous table.
iv. 1" EMT should be connected to the telecom outlet boxes and stubbed out to the nearest accessible ceiling.

27.3. Grounding and Bonding for Communications Systems *(Grounding for communications systems and equipment; for reliable signal reference)*
   a. See Division 26 – Electrical for building grounding requirements.

27.4. Cable Trays for Communications Systems *(Ladder, trough wire basket, and single-rail type; steel, aluminum, stainless steel, and fiberglass)*

27.5. Sleeves and Sleeve Seals for Communications Pathways and Cabling *(Sleeves and seals for penetrations through floors and walls)*

27.6. Communications Equipment Room Fittings *(Telecommunications mounting equipment, and grounding)*

27.7. Communications Backbone Cabling *(Pathways, cables, connecting hardware, and cable identification systems)*

27.8. Communications Horizontal Cabling *(Cables, MUTOAs, connecting hardware, and identification and administration systems)*

27.9. Master Antenna Television System *(MATV with options for off-air antennas, CATV, or broadcast satellite service)*

27.10. Public Address Systems *(Amplifiers, speakers, and microphones)*

27.11. Sound Masking Systems *(Electronic noise generators, amplifiers, speakers, and controls)*

27.12. Intercommunications and Program Systems *(Manually-switched and microprocessor-switched systems) – NOT USED*

27.13. Educational Intercommunications and Program Systems *(Manually and microprocessor-switched systems) – NOT USED*

27.14. Clock Systems *(Master and secondary clocks and signal devices; interface with intercom and public address systems) – NOT USED*

27.15. Elevator Emergency 2-Way Emergency Communication System. *(RESERVED)*
Division 28 – Electronic Safety and Security

C28.1 General: These guidelines have been established to promote the safety of faculty, staff, students and guests; to support the security of campus buildings and facilities; and to provide protection from unauthorized access.
   a. To limit, control and monitor access to restricted and/or controlled areas of the University by unauthorized personnel.
   b. To identify persons accessing restricted and/or controlled areas.
   c. To manage control and access during normal working hours to campus facilities.
   d. To support the institutions Department of Emergency Management Shelters in Place and Secure in Place approach.  https://www.odu.edu/content/dam/odu/offices/police/docs/shelter-and-secure-in-place.pdf

C28.2 Definitions
   a. EAC – Electronic Access Control – the overall system
   b. CAC – Card Access Control – doors equipped with card readers for after-hours access
   c. DPS – Door Position Switch, also sometimes referred to as a prop sensor.
   d. REX – Request to exit, also sometimes referred to as a PIR

C28.3 Design Process
   a. Refer to CHAPTER TWO – CAMPUS DESIGN for additional information regarding general building and site design approach for safety and security.
   b. Through user discussions during the programming phase, room specific security concerns should be documented as part of the Room Data Sheets. Because these questions are raised during the earliest phase of a project, the inclusion of an ITS and Public Safety representative and/or the Threat Assessment Coordinator, in these meetings is essential and will provide personnel with a clear picture of the security concerns for any particular building user group.
   c. As part of the schematic design submittal, provide a security and access plan identifying the following:
      i. Primary Entrance Doors. Identify all EAC locations.
      ii. Secondary Entrance Doors.
      iii. Egress only exit doors.
      iv. Identify the accessible path of travel from adjacent buildings, streets and sidewalks, transportation stops, accessible parking and accessible loading zones to the building entrance. At those entrances provide auto operators.
      v. Any intended locations, along the path of travel, for operable door actuators, both exterior and interior. Indicate whether they are to be mounted on pedestals or building components.
      vi. The Project Manager and A/E should discuss with the users how they will enter the building. For example in a residence hall should all students only be allowed to enter at the main lobby where the 24 hour desk is located and that exterior doors to stairs will not be used for building entry.
      vii. Identify which doors will be equipped with card access control for after-hours access for authorized individuals. Designate two doors at each building as after-hours card access control. Confirm with the users the designated doors are acceptable to avoid costly additions or changes when the building opens.
      viii. Locate all security cameras.
ix. Show in plan any areas that have been identified by the building user as high value areas and places where students sit and hang out.

x. Identify other campus buildings that are paired or associated with the facility under design by the nature of their function. Map out pedestrian traffic between such buildings to understand if and when students and faculty will be going between buildings and how this might impact after hour’s card access and accessible paths.

xi. Identify access points that are key management issues versus a means of intrusion detection.

xii. Discuss with the building users any issues associated with privacy and faculty student interactions that might prompt additional EAC or security measures.

d. During the preliminary design phase the A/E will hold a follow up meeting with representatives from Public Safety, ITS and building users to review in detail the security measures in place for the building.

C28.4 Access Control (Computer controlled, with interface to other facility management systems)

a. All exterior entrances shall be programmed to unlock and will have an electric latch, DPS, and a REX.

b. All Primary entrance doors shall have CAC. CAC shall consist of, at minimum, door positioning switches, electric latch control, request to exit device and a card reader. If more than one door is installed at a single entrance, only one door will require card access control. The remaining door(s) shall be required to have electric latch, request to exit device and door positioning switches.

c. CAC will be provided at the exterior door when doors in sequence exist such as vestibules, except at Residence Halls where the interior door at vestibules will be the CAC door.

d. All accessible entry doors shall receive auto operators and will also be equipped with card access control. Actuators shall not be set to operate both doors in parallel. Provide a second actuator device inside the vestibule to actuate the second door in the series. The auto operator system shall be tied in with the EAC to prevent the auto operator from engaging when the door is locked. Consider how a wheelchair bound individual will access the devices and be clear of the door swings. Vestibule depths should be at a minimum of 8’ between doors to accommodate the larger motorized wheelchairs.

e. Provide at least two (2) after-hours access locations. Review and confirm with the building users the designated after-hours access locations at the conclusion of schematic design. Provide CAC, electric latch, DPS, REX and card reader at these locations.

f. All exterior emergency egress “exit only” doors will remain locked at all times and be equipped with DPS and horn. Exterior exit only doors will not have any hardware on the exterior except a cylinder. The intent is to discourage use of these doors for entry into the building. In Residence Halls, provide CAC at exterior egress only doors, access will be restricted to faculty and staff only.

g. All other exterior “exit only” doors will remain locked at all times and be equipped with DPS, Horn and REX. These doors will not have any hardware on the exterior except a cylinder.

h. When possible mechanical and electrical rooms shall not be accessed directly from the exterior.

i. Data/Communications/IT rooms shall not have any other access doors or roof hatches leading to or from the room.

j. Fire pump rooms and Fire System Control Rooms shall be accessed directly from the exterior without EAC.

k. All Communication rooms shall be equipped with CAC with Function 70 capabilities.

l. No offline locks.

m. No push button combination locksets or similar types on exterior doors.
n. No magnetic locks.
o. All electronic locks shall fail secure.
p. All doors with electronic access shall have free egress at ALL times.
q. No dogging options on exterior doors.
r. For research facilities security measures should receive special consideration. Chemical, biological and radiological areas will be designed to federal research facility requirements.
s. In Residence Halls, CAC will be installed at each entrance. CAC is required between public area of the building and residential areas. Elevators that provide access from the public lobby to residential floors shall have CAC as will doors leading from public lobbies to residential spaces on the same floor. The use of CAC at student room entry doors should be evaluated early in the project for budget feasibility.
t. Classroom, Lecture Halls and other teaching spaces shall be equipped with CAC. In teaching spaces under 50 occupants provide a locking device that meets ANSI F110 Intruder/Classroom locking function (Both sides lock or unlock outside lever with key; inside lever always unlocked).

C28.5 Distributed Antenna System (DAS)
a. Building design will include calculations for DAS.
b. Configuration will incorporated RF bi-directional transmissions for campus public safety and City of Norfolk Police Department frequencies.
c. Configuration will incorporate cellular signal boost across all carriers for public safety as a first means of notification in threat situations.

C28.6 Video Surveillance (Cameras, data transmission wiring, monitors, and control equipment)
a. The CCTV system consists of IP cameras. Only fixed cameras will be used unless otherwise stated.
b. Interior cameras for exterior doors will be placed at a height of 6-10 feet AFF to the camera center, either in the drop ceiling or on the wall and no further away than 15 feet from the entrance to record individuals entering the building. Another camera will be placed above the door at the same mounting requirements to record individuals leaving the building. Interior cameras will be placed throughout building corridors at a maximum distance of 60 feet in a cross pattern with a two camera design. The distance between the camera’s shall be 4 feet. (See diagram below).
c. Exterior cameras will be placed at a mounting height between 12-20 feet AFG ensuring complete coverage of the exterior building areas, unless otherwise indicated
d. Security cameras will also be required at high value areas and places where students sit and hang out.
e. **C28.7 Planning for the Future**
   
   a. Buildings are designed to exist for 40 plus years. As such it is important to anticipate changes and provide the cost effective infrastructure where possible for the future.
   
   i. All doors located within metal stud walls should be prepped for future electronic locks. The doors shall be core drilled for future EAC, no conduit infrastructure is required.
   
   ii. All doors located within CMU or other “solid” walls shall have conduit infrastructure installed for the conversion of the door to an EAC door in the future.

**C28.8** Refer to **APPENDIX Q – SECURITY HARDWARE** for detailed information regarding specific door hardware configurations and equipment requirements.

**C28.9 Fire Alarm System.**

a. Printers are not required.

b. Provide a standard 1 year warranty.

**C28.10** Conductors and Cables for Electronic Safety and Security UTP, *(fiber-optic, coaxial, RS-232, and RS-485 cables, connecting hardware, and identification systems.)* Reserved

**C28.11** Grounding and Bonding for Electronic Safety and Security *(Grounding for electronic systems and equipment; for reliable signal reference for electronic systems.)* Reserved

**C28.12** Pathways for Electronic Safety and Security *(Conduits, wireways, surface pathways, boxes and enclosures, and handholes and boxes.)* Reserved

**C28.13** Sleeves and Sleeve Seals for Electronic Safety and Security Pathways and Cabling *(Sleeves and seals for penetrations through floors and walls.)* Reserved

**C28.14** Intrusion Detection *(Detection devices, controls, and alarms.)* Reserved

**C28.15** Perimeter Security Systems *(Detection devices, controls, and alarms on the site perimeter)* Reserved

**C28.16** Refrigerant Detection and Alarm *(Monitors, alarms, breathing apparatus, and ventilation equipment interlocks.)* Reserved

**C28.17** Local-Area Mass Notification Systems *(Mass notification systems for single buildings, multiple buildings on a small campus, arenas, athletic or entertainment fields, or other local-area facilities.)* Reserved
Division 31 - Earthwork

31.1. General
   a. Materials shall comply with the following Virginia Department of Transportation (VDOT) Road and Bridge Specifications (Latest Edition).
   b. Clearing and grubbing shall comply with VDOT Road and Bridge Specification Section 301 – “Clearing and Grubbing.”
   c. Erosion control measures shall be in place prior to the commencement of clearing and grubbing – without exception.

31.2. Unclassified Materials
   a. Unclassified excavation includes the satisfactory removal and disposal of all materials (except contaminated materials) encountered regardless of the nature of the materials and shall be understood to include, but not be limited to, blast rock, bedrock, earth, hardpan, fill, foundations, pavements, curbs, piping, railroad track and ties, cobblestones, footings, bricks, concrete, abandoned drainage and utility structures, and debris.
   b. Drilling, blasting, excavation, and disposal of rock shall be considered unclassified excavation and shall be included as a part of the Contract Price.
   c. The Contractor shall immediately halt soil movement activities and notify the Owner if visual, olfactory, or other evidence suggests that soils may be contaminated with oil or hazardous materials. Contractor shall provide reasonable assistance to Old Dominion University for access to potential contamination areas for proper assessment of hazardous conditions. The ODU Project Manager shall contact an environmental professional, test and evaluate any earth materials suspected of containing hazardous waste per the Department of Environmental Quality (DEQ) Virginia Hazardous Waste Management Regulations. If mitigation and/or removal of contaminated materials is required, the ODU PM, the A/E and the Contractor shall negotiate time and expenses and coordinate available soil management, disposal, and recycling options prior to the commencement of any work. ODU reserves the right to negotiate and contract with other entities for remedial work, which the Contractor shall make reasonable accommodations for others to perform this work.

31.3. Site Clearing
   a. Strip all objectionable growth. Remove from the site all debris resulting from the stripping operations at frequent intervals to prevent accumulation of material. On campus disposal of material will not be permitted.
   b. Strip topsoil to its full depth from entire area to be graded.
   c. Grading operations shall avoid soils and debris spillover. Large areas to be graded shall limit clearing the ground too far in advance, to limit erosion. Dust control shall be provided during all grading operations.
   d. Protect new grade areas from the elements. Repair all settlement and erosion and reestablish grades to the required elevations prior to acceptance.
   e. Unclassified excavation materials may include rock, soil and any unforeseen obstructions. No changes in the contract sum or the contract time shall be authorized for rock excavation or removal of obstructions without prior consent from the University. Unit prices shall be carried for removal of unsuitable soils, rock, debris or other unforeseen obstructions. The A/E to include estimated quantities
of unsuitable soils in the bid documents as per the CPSM. Remove unsuitable material encountered at subgrade elevations, backfill with material and compact as required.

f. Rock is not anticipated on ODU sites at the Norfolk or Virginia Beach campuses, but if rock is encountered during excavation, the general contractor shall notify the A/E to establish the quantity of rock to be removed. Rock excavation shall be performed to eliminate water pockets in the excavated rock subgrade.

g. Coordinate stockpile location with the ODU Project Manager; the location should not interfere with construction activities. Topsoil to be reused shall be free from roots, brush and debris. Coordinate the location of excess topsoil on University property with the ODU Project Manager and ODU Grounds Manager.

31.4 Earth Moving

a. No excavation work shall begin until all temporary E&S controls and plant protection measures are in place. This includes any on-site or off-site borrow, on site or off-site stockpiling or disposal of waste materials.

b. The general contractor is responsible for all tipping fees when materials are disposed of in a non-university owned location. Intent to remove excavated materials from the site shall be reviewed with the University no later than the preliminary design phase. All logs, stumps, brush, wood and refuse shall be disposed of away from University Grounds in an approved landfill. On-site burning is prohibited.

c. Refer to APPENDIX W – ANNUAL STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT for stockpiling requirements.

d. All open excavations shall be protected by temporary fencing or other approved means to ensure public safety. After inspection of a completed trench, the general contractor shall backfill trench immediately. All wires, pipes, etc. shall be removed from the excavated fill material prior to replacement in the trench.

e. Contractor shall furnish, erect and maintain all shoring, sheeting, bracing and pumping equipment required to support and protect all excavations. Contractor shall provide all barriers, signs, and lights required to protect workmen and the public in and around excavated areas.

f. All pipe ends shall be closed while unattended.

g. Control the grading so that ground is pitched to prevent water from running to excavated areas, damaging other structures, or adjacent properties.

h. Where soil has been softened or eroded by flooding, equipment, traffic, or placement during unfavorable weather, or such other conditions, it shall be removed and replaced by the Contractor with suitable material, and at no cost to the University.

i. Exercise care to preserve the material below and beyond the lines of excavation. Where excavation is carried out below indicated grade or beyond the lines of excavation, Contractor shall backfill and compact the over excavation with structural fill to the indicated grade, at no additional cost to the Owner and at the direction of the Engineer.

j. Limits of excavation are such that all unsuitable material shall be removed to firm natural ground in the manner specified below. In building areas, unsuitable materials shall be removed to a distance of five feet (5') beyond the building lines. Limits of unsuitable material excavation also apply to areas below exterior column footings. All abandoned pipes within building areas shall be removed and the excavations shall be properly backfilled.
k. Unsuitable materials which are classified as organics such as peat, trash, fill, stumps, debris, material determined to be hazardous, and topsoil and subsoil when determined by Engineer to be unacceptable for incorporation into the work.

l. Under pavement areas, existing fill shall be densified in place and shall not be excavated. Topsoil need not be excavated from pavement areas if located more than three feet (3') below finish pavement grades.

m. Abandoned pipes, that are buried more than four feet (4') from finish grade to the top of the pipe and that do not interfere with utilities to remain or to be installed, shall be capped and/or grouted at both ends and left in place. Abandoned pipes less than four feet (4') from finish grade shall be removed and the trench shall be appropriately backfilled with structural fill.

n. All suitable material, as determined by the Engineer, may be reused on the site provided it meets the gradation requirements for the given materials in the information of fill sections, embankments, subgrades, backfills, etc.

o. Do not over excavate below proposed design grades for the purpose of obtaining borrow for use off-site.

p. The general contractor shall excavate for all drainage pipes, utilities, and related structures and accessories and for any other trenching necessary to complete the work. Machine excavation of trenches is permitted with the exception of preparation of pipe beds which will be hand work. Excavate by hand or machine methods to at least six inches (6") below the bottom of pipe. Excavation to final grade shall maintain the undisturbed bearing character of the soils exposed at the excavation level. Utilities or piping shall not be laid directly on rocks, cobbles, or other hard material. If this type of material is found, the material shall be removed to a minimum of six inches (6") below the bottom of pipe and backfilled or compacted.

31.5. Dewatering

   a. The Contractor shall be responsible for keeping groundwater levels to a minimum of 2 feet below the bottom of excavations and to have a substantially dry and stable subgrade for proposed work.

   Or

   Perform dewatering operations to lower the groundwater level in excavations as required to provide a stable, dry subgrade for the prosecution of the proposed work.

   OR

   Do not allow water to accumulate in excavations. Contractor shall provide and maintain ample means and devices to remove promptly, and to dispose of properly, all water entering excavations and to keep them dry until the proposed work is completed.

b. Maintain excavations and trenches free of water 24 hours a day. Dewatering shall be considered part of the construction contract and shall be included in the bid price.

c. Provide and maintain ditches of adequate size to collect and prevent surface and subsurface water seepage from entering the excavations. Intercept and divert surface water runoff away from excavations through the use of dikes, curbing, walls, ditches, pipes, sumps or other approved means.

d. Water from excavations shall be pretreated and then disposed of in such manner as will not cause injury to public health, public and private property, existing work, work to be completed or in progress, roads, walks, and streets, or cause any interference with use of same by public. If a drainage system or
water course is silted or becomes blocked due to dewatering operation, it shall be cleaned by the Contractor at no additional cost to the Owner.

e. Any enforcement actions or fines resulting from improper dewatering and/or discharge of turbid water and sediment to protected areas shall be the sole responsibility of the Contractor.
f. The contractor shall prevent damage to adjacent properties, buildings, structures, utilities and other facilities, modifying dewatering equipment and procedures when operations threaten to cause damage to adjacent areas not within the Limits of Work.
g. No pipe shall be laid in water. No masonry shall be laid in water, and no water shall be allowed to inundate new concrete and new brick masonry within 48 hours after installation. Contractor shall constantly guard against the possibility of flotation of pipe or structures after installation. Backfill or other means shall be placed promptly to prevent this occurrence.
h. If the dewatering methods have not been adequate and the bearing soils are disturbed, remove disturbed soil and replace with compacted Structural Fill or no additional cost to the Owner.

31.6 Termite Control

a. The A/E shall specify termite control on all new construction. Soil treatment termiticide must have a minimum effectiveness of not less than five years, from the date of substantial completion, against infestation of subterranean termites.
b. Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.
c. Prior to soil treatment, remove foreign matter such as extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations. Remove impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
d. Treat soil as follows, before construction or as recommended in treatment manufacturer's installation instructions.
   i. Slabs-on-Grade: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
   ii. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footings, piers, and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
   iii. Masonry: Treat voids.
   iv. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
   v. Treat soil in crawlspaces, areas around entrance platforms, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
e. Post warning signs in areas of application.
f. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

31.7. Vermin Protection
   a. All demolition/construction sites shall be pretreated by a pest control contractor to include placing bait stations/mechanical devices near demolition site and/or the perimeter of nearby occupied buildings to curtail rodent activity from moving to nearby occupied buildings.

31.8. Tree | Vegetation Protection
   a. The A/E is responsible for defining protection of trees, shrubs, and irrigation systems to remain in the contract documents for all projects, no matter what size and shall indicate on the drawings boxes, fences or other protection required based on proximity of construction activities. Protection shall cover tree tops, trunks and roots. Trees to be saved shall be labeled on all site plans including, but not limited to, demolition and grading plans.
   b. Grassed and planting areas generally have irrigation systems below grade; verify location of these systems and all other underground utilities in Work or staging areas prior to the start of construction.
   c. The General Contractor shall not permit heavy equipment or material stockpiles within tree drip line. Any pruning required shall be with the approval and direction of the University Grounds Manager/Arborist. The General Contractor shall be responsible for the survival of protected trees for seven years after the date of substantial completion. The ODU Project Inspector shall document tree, shrub and irrigation system protection during construction. The contractor shall be responsible for any tree that is considered to be in declining health (by a certified arborist) due to improper protection. If trees with a trunk diameter 8” or less, measured 4 feet above the finished grade, is determined to be in declining health or has not survived seven years after construction, then the tree shall be replaced at the General Contractor’s expense with the same size caliber and species tree. If a tree with a diameter greater than 8”, measured 4 feet above finished grade, is determined to be in declining health or has not survived seven years after construction, then the general contractor shall pay the appraised value of the tree to the university using the Guide for Plant Appraisal, current edition, authored by the Council of Tree and Landscape Appraisers (CTLA).
   d. All associated costs for the removal of the declining tree(s) and any required professional assessments shall be the responsibility of the Contractor.
   e. Replace any trees, shrubs, lawns or plantings damaged by the Contractor or its agents during the Work of this project within two (2) weeks of occurrence.
   f. Repair and pay all costs associated with damaged utilities and site features.

31.9. Tree Protection Fencing
   a. Tree protection fencing must be installed around all existing trees noted to remain on plans within the fenced staging area. Fencing shall extend a distance from the trunk of 1.25 feet per each inch of trunk diameter or 6', whichever is greater. For example, a tree with a 12” trunk diameter shall be fenced 15’ from the trunk (30’ diameter)
   b. Fencing shall be galvanized chain link, 4’ minimum height. Plastic fencing and wood stakes, or snow fencing are NOT acceptable.
   c. Fence shall be maintained for the duration of the project, and shall not be removed without the owner’s permission.
   d. No material storage, vehicles or any other activity shall occur at any time within tree protection fencing.
e. Contractor may be required to pay tree replacement and/or soil compaction remediation costs if there is any incursion into tree protection zones.

31.10. Backfill

a. Backfill only with acceptable materials that can be compacted, without containment. A/E to specify densities and compaction requirements.
b. Backfill on inside of buildings, under slabs on grade, paving, pads, stairs and similar items.
c. Trench and utility backfill under paving and within 10 feet of paved areas.
d. Backfill around manholes, drainage structures and underground structures.
e. 98% of the Max Dry Density under ASTM D698 (standard proctor) of top 12" of sub-grade under roadways, drives, parking areas (95%), foundations, backfill, footings, pads, paved pedestrian walks and courts, loading docks and paving primarily for vehicle traffic.
f. Imported fill shall be tested to be free and clean of all hazardous materials. Test results shall be provided by a certified testing lab.
g. Place backfill and fill soil materials in layers not more than 8" in loose depth for materials compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
h. Provide clean #57 backfill within 5' of all exterior walls adjacent to building.
i. All fill shall be of proper type and proper compaction. All final grading shall be smooth and blended with existing contours. All exposed stones and other debris shall be removed prior to application of topsoil or any other fill.

31.11. Topsoil

a. Minimum depth for topsoil shall be 6" for grass and depth as recommended by the ODU Grounds Manager for other planting materials.

31.12. Piles

a. The A/E, ODU PM and the CMaR shall discuss potential risks and impacts to the university from pile operations, early in the design. The discussion shall include, at a minimum the following:
i. Coordination of pile installation and the academic calendar
ii. Potential impact to adjacent buildings including, but not limited to, classes, operations, and research from pile driving operations
iii. Cost impact for auger cast piles
b. The design of the piles shall not be delegated, it shall remain with the structural engineer of record. The design shall comply with the recommendations in Precast Concrete Institute (PCI) Committee Report: "Recommended Practice for Design, Manufacture and Installation of Prestressed Concrete Piling."
c. The quality-control standard for precast concrete piles shall be PCI MNL-116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."
d. The installation of static test piles shall be coordinated with the academic calendar and approved by the ODU PM, prior to scheduling.
e. Test piles should be 60 inches longer than production piles.
f. Dynamic pile analysis shall be used to provide supplemental information for evaluating pile hammer performance, driving stresses, and bearing capacities. Dynamic testing shall be conducted during the entire time piles are initially driven or redriven and during pile restrike testing. Equipment to obtain dynamic measurements, record, reduce and display its data shall be furnished and meet the
requirement of ASTM D 4945 and have been calibrated within 12 months thereafter throughout the contract duration.

g. The Geotechnical Engineer shall be experienced in the pile driving process, monitoring of test pile installation, and in the use of the Pile Driving Analyzer and its related equipment.

h. Dynamic pile analysis shall be performed per Geotechnical Engineer’s recommendations.

i. Test piles shall be identical to those required for Project, and be driven with appropriate pile-driving equipment operating at rated driving energy to be used in driving permanent piles.

31.13. Storage Tanks

a. Underground storage tanks (USTs) are not permitted.

b. If undocumented existing UST’s are discovered during excavation, stop work and notify the ODU PM immediately.

c. All UST’s found during site survey’s shall be removed as part of the scope of the project. Notify the ODU PM when such elements are discovered during existing conditions surveys.

31.14. Dimensional Mesh Soil Stabilization

a. The dimensional mesh soil stabilization elements shall be, “Netlon Advanced Turf System (GEOGRID REINFORCED SOIL) three-dimensional fiber or approved equal,” (tape type two-dimensional fibers are not acceptable as a soil reinforcing material, GrassPave 2 is not acceptable) a compacted layer of pre-blended rootzone material, being a mixture of sand, soil, organic material, and Netlon mesh elements at an inclusion rate of 5kg/m3 (8.4 pounds per cubic yard).

b. The rootzone/mesh thickness layer shall be 8 inches for Emergency Vehicle Access Lanes. The system shall also include a 4 foot wide reinforced transition zone which shall be the same pre-blended rootzone material having a mesh element inclusion rate of 2.5 kg/m3 (4.2 pounds per cubic yard) and a layer thickness of 4 inches.

i. Rootzone Thickness: As determined by Netlon Limited (8 inches). Note that the design sections of the reinforced mesh elements do not eliminate the requirement to provide a full depth rootzone cross-section at all locations.

ii. Rootzone Mix Properties: Rootzone blend shall be tested by GridTech for conformance to the project specifications.

iii. Netlon Mesh Elements: Rootzone mesh shall have the following properties:

1. Polymer: Polypropylene homopolymer

2. Rootzone Topping: Shall be the same specifications as “Rootzone Mix” but shall not include a mesh incorporation component.

c. The mesh elements shall be installed by the use of specialized installation equipment which is designed for such purpose. This equipment is a ‘Netavator’ by Blec Equipment, a specialized reverse-tine tillage machine. Due to equipment width of 6 feet, the 4 foot transition section shall include a 2 foot portion of the full depth stabilization section which must be reworked with the appropriate loading to develop a full depth 8 inch section.

d. Unless modified by documented site conditions and geotechnical recommendations, vehicular dimensional mesh stabilization shall be:

Bermuda Sod

1” Amended Sand
8” Amended Sand Base Zone with Netlon Stabilization Fibers (Max 4” Lifts)
4” Washed #57 Sone Drainage Layer
Uncompacted subgrade

e. Provide a flush concrete curb to define the limit of the vehicular dimensional mesh soil stabilization for the full length. This shall be delineated on the civil plans. Curb shall match VDOT detail CG-2.
Division 32 – Exterior Improvements

32.1. Asphalt Paving
   a. Asphalt paving shall conform to the latest version of the Virginia Department of Transportation Road and Bridge Specifications, Section 315 as well as all other sections reference therein.
   b. Construction of all roads, drives and parking areas, including sub-grade preparation and all related work, must be constructed by a contractor fully qualified and equipped to perform the work.
   c. The construction of all pavements within public rights-of-way shall be in accordance with the rules, regulations and requirements of the public agency having control and ownership of such rights-of-way.
   d. Bituminous paving for pedestrian walkways shall not be used.
   e. Protect the surface course from vehicular traffic and parking until the pavement has cured.
   f. Repair depressions by cutting out the surfacing with vertical cuts to a minimum depth of 1", filling and rolling. Feathered patches are prohibited.
   g. Minimum slope for all paved surfaces shall be designed to avoid ponding of water on the roads.
   h. Curbs shall comply with 6” standard CG-2 of Virginia Department of Transportation (VDOT). Curb and gutter complying with VDOT CG-6 Standard six-inch (6”) Curb and Gutter shall be used to match an existing condition or within City of Norfolk streets. Painted striped crosswalks shall be provided at all road intersections.
   i. Unless modified by documented site conditions and geotechnical recommendations, asphalt paving shall be:

<table>
<thead>
<tr>
<th>Course/VDOT Specification</th>
<th>Roads</th>
<th>Parking</th>
<th>Pedestrian walks (not allowed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface/9 -52A&quot;</td>
<td>2&quot;</td>
<td>1 ½ &quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>Binder/BM 25.0</td>
<td>3&quot;</td>
<td>2&quot;</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Sub-base/#21A</td>
<td>10&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>Geotextile Fabric</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sub-grade compaction</td>
<td>*100%</td>
<td>95%</td>
<td>95%</td>
</tr>
</tbody>
</table>

   *Maximum dry density (ASTM D698, Method D)

   j. Pavement thickness at utility trenches shall be a minimum of one-and-one-half times (1.5x) existing pavement thickness or, as noted above, whichever is higher. Backfill in utility trenches under pavements shall be VDOT #21A above top of bedding to underside of pavement.

32.2. Imprinted Asphalt
   a. Imprinted or stamped asphalt is not used on campus unless used for crosswalks in the City of Norfolk streets as directed by them.

32.3. Concrete Paving
   a. Refer to Chapter Two Campus Design for sidewalk widths. Sidewalks surface shall have a light broom finish.
   b. Use concrete for walkways, drives, dumpster pads, compactor pads, loading dock ramps, aprons and bus stop shelter pads.
   c. When repairing cracked or damaged panels, replace entire panel.
d. Walks adjacent to lawns are to be flush. Walks adjacent to planting beds shall have rolled curb.
e. Radiused intersections shall be poured monolithic and should extend to the outer limits of the curves. Segmented curves are not permitted.
f. Scoring type and locations for sidewalks shall be shown on the drawings. All scoring shall be tooled. Saw cut joints shall only be permitted if routed with round over bit.
g. Cross slope of all walks shall meet the ADA Standards for Accessible Design.
h. Walks abutting buildings shall bear on the foundation or be dowelled.
i. The full width of sidewalks adjacent to curbs shall be ¼" above the curb.
j. Dropped curbs for drive and handicapped access shall be formed for all new work.
k. Remove existing curb back to nearest existing joint when new curbs extend into existing curb lines.
l. Where sidewalks abut existing structures, expansion joints shall be provided.
m. Sidewalks shall be repaired in complete panels as originally scored. Cutting and replacement shall be at existing construction joints as agreed to with ODU Project Manager.
n. All sidewalks greater than 5’ wide will be constructed for vehicular traffic.
o. The A/E shall verify all scoring patterns with the Project Manager. Scoring pattern design shall take into consideration existing scoring patterns of adjacent walks.
p. Unless modified by documented site conditions and geotechnical recommendations, concrete paving shall be:

<table>
<thead>
<tr>
<th>Course/VDOT Specification</th>
<th>Vehicular</th>
<th>Pedestrian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface/ Class A3 (3000 psi)</td>
<td>6&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>Reinforcing</td>
<td>6x6 *w1.4)</td>
<td>none</td>
</tr>
<tr>
<td>Sub-base/#21A</td>
<td>6&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>Sub-grade compaction*</td>
<td>95%</td>
<td>95%</td>
</tr>
</tbody>
</table>

*Maximum dry density (ASTM D698, Method D)

32.4. Decorative Concrete Paving
a. Decorative concrete such as surface-imprinted, stamped, stencil-patterned, or stained finish concrete paving are not permitted on campus.

32.5. Unit Paving
a. Unit paving, if any, shall be limited due to the impact to stormwater requirements.

32.6. Permeable Unit Paving
a. Interlocking pavers Nansemond blend #239, herringbone pattern.
b. Pavers in pervious applications shall not be sealed.
c. Base for pervious pavers shall consist of:
   - Open-graded bedding course: 2” of #8 washed aggregate (was shown in COE, but not on BDC)
   - Open-graded base course: 4” #57 washed aggregate
   - Open-graded subbase on soil subgrade: 10” minimum #2 or 3 washed aggregate with 4” perforated underdrains at 10’ on center.
   - Non-woven geotextile fabric on non-compacted subgrade
Provide drawings detailing the permeable pavement installation as required for stormwater and MS4 permit.
d. Provide #9 washed aggregate for joint infill for permeable joints in paver system.

e. Paving system shall be design to allow university vehicles to plow the surface in the event of a snow emergency.

f. Provide a flexible, multi-height, durable mill finish aluminum edge restraint and component system with an L-shaped profile with a slotted wall to allow water runoff. Sections shall be a minimum of 8’ in length.

32.7. Parking Bumpers

a. Where required provide precast concrete parking bumpers, each end to be pinned with 5/8” minimum steel pins.

32.8. Surface-Applied Delectable Warning System.

a. Reinforced Thermoset Plastic

b. Thin surface profile with perimeter beveled edge.

c. Solid one Piece construction with integral color throughout

d. Adhesive scores on the back of each panel,

e. Powder coated mechanical concrete anchors

g. Color FED 20109 (sometimes referred to as Colonial Red or Brick Red)

h. Manufacturers

i. ADA Solutions

j. Alert Tile

32.9. Synthetic Grass Surfacing Synthetic grass surfacing, or artificial turf, intended for use in sports.

(RESERVED)

32.10. Playground Protective Surfacing Impact-attenuating, protective surfacing for use under public playground equipment. (RESERVED)

32.11. Chain-link Fences and Gates

a. Follow the guidelines of the CLFMI Manual (Chain Link Fence Manufacturer’s Manual) when developing specifications. Any chain link fence used on campus shall be commercial grade vinyl coated chain link fencing, with a 9 gauge core wire and a class 2b thermally fused and bonded black vinyl coating on galvanized pipe. All aspects of the fence system shall be vinyl coated. Provide gates as necessary.

b. All chain link fencing, including gates, shall have either privacy slats or fence fabric.

i. Privacy Slats: High Density Polyethylene (HDPE) slats with ultra-violate inhibitors, self-locking and provide a minimum of 75% coverage.

ii. Slat Color: Prior to bid, the A/E shall select three manufacturers of slats and provide samples of the manufacturer’s standard colors for selection by the University Architect. If the standard color is not acceptable, the University Architect may require a custom color. The intent is to find a dark blue similar to the ODU blue (PMS 540).

iii. Fence screen Fabric: Vinyl coated poly made from PVC Polyester, UV stabilized. Provide a black binding on all edges with grommets at no greater than 24” on center. Fabric shall span full height of fence. Color to match adjacent fence fabric if one exists, otherwise fabric to ODU Blue. Provide fabric that has 80% visual blockage.

32.12. Decorative Metal Fences and Gates

a. Refer to APPENDIX AH – ORNAMENTAL WALLS & FENCES for information associated with campus brick walls and/or brick and ornamental fence walls.

32.13. Segmental Retaining Walls
a. Dry-laid concrete masonry unit retaining walls are not permitted on campus.

32.14. Planting Irrigation

a. It is the intent of the University to restrict the use of permanent irrigations systems to managed lawns. These are limited in use on campus and shall only be included in designs with prior approval of the Ground Manager.

b. Temporary irrigation for plant establishment is desired and shall be included in each project as appropriate. Temporary irrigation will be abandoned after the establishment period which shall be defined in the specifications by the A/E.

c. Refer to APPENDIX N – IRRIGATION SPECIFICATIONS

32.15. Topsoil

a. Soils in areas to be planted that are compacted above 85% maximum density shall be mechanically loosened to a minimum uniform depth of twenty-four inches (24") below final grade. Inadequate soil conditions must be addressed prior to planting.

b. Finish Grading: Contractor shall grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

32.16. Turf and Grasses

a. Turf (sod) shall be certified turfgrass sod is grown from certified seed inspected and certified by the Virginia Crop Improvement Association (VCIA) and bear an official “Certified Turf” label on the bill of lading.

b. Turf shall be nursery-grown of dense growth, with a strong, fibrous root system, and shall be composed of hybrid Cynodon dactylon, Tifway419, or approved equal, and free of pernicious weeds. Standard sections of turf to be installed shall be of enough strength to support their own weight and to retain their size and shape when held within its upper ten (10) percent and suspended vertically.

c. Turf shall be machine cut at a uniform thickness of 3/4 inch (plus or minus 1/4 inch) at the time of cutting. This thickness shall exclude shoot growth and thatch. Turf pieces shall be cut the supplier’s standard width and length with a 5% deviation acceptable. Torn or uneven pads will not be accepted.

d. Turf shall be harvested, delivered and installed within a period of 36 hours. Do not lay turf in excessively wet or dry weather.

e. For turf to be laid on newly graded subgrades:

i. Apply fertilizer directly to subgrade prior to loosening the subgrade soil. Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner’s property.

ii. Contractor shall spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

f. For turf to be laid on unchanged (unaltered or undisturbed by excavating, grading, or surface-soil stripping operations) Subgrades:

i. Contractor shall remove existing grass, vegetation, and turf, without mixing same into surface soil.
ii. Contractor shall loosen surface soil to a depth of at least 6 inches, remove stones larger than 1 inch in any dimension, sticks, roots, trash and other extraneous matter. Apply soil amendments and fertilizers (applied directly to soil before loosening) according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till the soil to a homogeneous mixture of fine texture.

g. Contractor shall legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

h. Contractor shall saturate turf with fine water spray within two hours of planting.

i. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below turf.

32.17. Turf Maintenance

a. Contractor shall maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare, rutted, damaged, eroded or improperly graded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

b. Contractor shall mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings.

c. Satisfactory Turf installations shall meet the following criteria as determined by Design Professional:

i. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

32.18. Plants

a. The A/E shall provide detailed specifications covering the planting procedures for all projects no matter the size or limits of the plant materials.

b. The selection of plant material and the planting and maintenance of trees, shrubs and herbaceous plants must be consistent with the current American Standard for Nursery Stock (AAN).

c. Plants shall be typical of their species and variety, have normal growth habits, well developed branches, densely foliated and vigorous fibrous root systems.

d. Plants shall be free from defects, injuries, plant diseases and insect infestations.

e. All plants of each particular variety shall be reasonably uniform in size and configuration.

f. Plants shall be freshly dug and nursery grown; shall have been transplanted and root pruned at least once in the past two years; shall have been grown under similar climatic conditions to those of the project locality.

g. All trees shall be balled and burlapped while shrubs may be container grown or balled and burlapped. Burlap shall be unwrapped and laid back prior to backfilling the soil; wire cage shall be removed.

h. All new trees shall have straight trunks with full symmetrical crowns.

i. Staking and Guying

i. Staking or guying plants shall be dependent upon the plant's type, size, root system, and location. Stakes and guy wires shall be used only when necessary to protect, support, or anchor the transplant. Any device that would wound the trunk of the plant shall not be used. Staking and
guying shall be completed immediately after planting. Plants shall stand plumb after staking in accordance with the landscape plan.

ii. Tree ties shall be used to support and protect tree trunks or limbs which are guyed with wire. Tree ties should contact the trunk or limb with a broad, smooth surface and be elastic enough to minimize abrasion.

j. Form a watering basin of mulch around trunk holding at least 5 gallons of water for trees and 2½ gallons for shrubs.

k. Prune dead or broken branches with sharp instruments.

l. Root Damage during construction: If roots are bigger than your wrist, contact the ODU Grounds Manager to determine how to cut/proceed.

32.19. Warranty

a. New trees, shrubs, perennials and ground covers shall be guaranteed for one year from the date of issuance of Substantial Completion. The contractor’s responsibilities include the protection of plantings, pest control, pruning, watering and plant material during warranty period. All plant material soil conditions must be inspected by ODU Grounds Manager. Warranty shall cover death and improper planting, unsatisfactory growth, neglect or damage by others excluded. The Contractor shall replace unsatisfactory plant materials with healthy, vigorous materials, planted only during the next specified planting season. Borderline plants shall be replaced.

b. The one year warranty will restart for all replaced plant materials, beginning the day of replanting.

32.20. Inspection for Acceptance:

a. Inspection of planting to determine completion of Contract work shall be made to confirm that all landscaping conforms to quantities and sizes listed in the planting schedule.

b. The Contractor shall give at least 7 days notice requesting the inspection to the A/E and the ODU Project Manager who will coordinate inspection by the ODU Grounds Manager in conjunction with the A/E. The A/E will prepare a punch list and work found not in accordance with plans and specifications shall be subject to re-inspection.

32.21. Planting Procedures

a. The width of each planting hole should be three times (3x) the size of the root ball. The depth of the hole shall be two inches (2”) less than the distance from the bottom of the root ball to the root collar. The bottom and sides of the each hole should be scarified to encourage root development. Upon planting, all plants must be inspected to ensure that the root collar is exposed.

b. Specific plants that require seasonal planting will be indicated on the planting plan.

c. Actual plant installation shall occur only during periods when weather and soil conditions are favorable. As plants shall not be installed in unfavorable seasons, the Contractor shall indicate in the construction schedule when plant installation shall occur and this shall be approved by the ODU Grounds Manager when the initial schedule is published. Deviation from the approved planting schedule shall only occur if approved by the ODU Grounds Manager. If the building opening does not coincide with the appropriate planting season, this shall be brought to the attention of the ODU PM so that University Leadership can be made aware of the conditions for building opening and other arrangements made.

d. The A/E and ODU Grounds Manager shall be notified at least 48 hours before planting begins.

e. The Contractor shall stake the location of planting sites and the A/E will approve the location prior to beginning any planting.
f. Plant Placement - Each plant shall be placed in a straight, upright, and centered position in its planting hole or as specified. Balled and burlapped and container-grown plants shall be handled only by their roots, balls and containers. Plants may settle after transplanting and water will collect around the trunks. In all but very well-drained soils, plants will not establish and thrive if the tops of their root balls are below the level of the surrounding soil. Some plants should be planted slightly higher than they were originally growing to allow for this settling of the backfill or soil conditions. Consult with the A/E for recommendations. In no case, should the top portion of the root ball be exposed above surrounding soil line. Any special directions for planting in poorly drained soils or other specific plant needs will be indicated on the planting plan. Balled-and-Burlapped plants shall have all synthetic materials removed from the root ball, trunk or crown as they will not decompose and will cause damage to the plant. All synthetic straps, bands and twine shall be removed from one half (½) to one third (1/3) of the top of the root ball and all ropes or wires shall be removed from the plant's trunk or crown. Burlap shall be left intact around the edge of the root ball, but shall not be left on the upper portion of the ball or left exposed above the soil surface.

g. Plant Selection: The Contractor shall use only plants that are nursery grown, unless otherwise specified and approved by the ODU Grounds Manager. All plants shall be in accordance with American Standard for Nursery Stock, latest edition. All plants shall be typical of their species or cultivar and have a normal growth habit. They shall be healthy, vigorous, well-branched, and densely foliated when in leaf. Plants shall be free of disease, nematode, and insect pests, including insect eggs and larvae. They shall have a healthy, well-developed root system.

h. Regional Materials: Refer to APPENDIX W – PLANT PALLET for the list of acceptable materials. Plants should be sources within 100 miles of the Project site. If the Contractor believes that specified plant material cannot be sourced within 100 miles, the Contractor must inform the A/E and the ODU Project Manager in writing and wait for direction on how to proceed.

i. Plant Substitutions: All substitutions in genus, species, cultivar or size made by the Contractor must be approved by the A/E and ODU Grounds Manager. Plants larger than specified may be substituted on approval of the A/E, but such plants shall not increase the contract price. If the use of larger plants is approved, the spread of roots or ball of earth shall be increased in proportion to the size of the plant. If larger sizes are used, any future replacements shall match the size installed.

32.22. Mulching

a. Due to ODU’s location and ongoing Stormwater management, it is imperative that the civil engineer and landscape architect coordinate closely to ensure we do not place trees with planned mulch beds, planted within 10 feet of storm drains. Mulch that washes into the Stormwater system creates ongoing flooding issues that we recognize needs to be avoided. If this is unavoidable, then pine straw can be substituted, but only with approval by the Campus Grounds Manager. The university understand mulch contributes to the overall health of plants and trees, so it is a balance between that and Stormwater management.

b. All planting areas shall receive shredded hardwood bark mulch unless directed otherwise by the ODU Grounds Manager.

c. Shredded hardwood bark mulched areas:

i. All shredded hardwood bark mulch shall be 100% shredded hardwood bark mulch. Each delivery must contain only single-ground shredded hardwood bark that is clean, single-ground, uniform
particle size (no piece shall be any longer than 3” and not wider than ½”), free of foreign matter, and aged for a minimum of six months.

ii. The mulching material shall be 100% shredded hardwood bark mulch, applied 3’ to 5’ thick to achieve a minimum settling depth of 3”.

iii. Note: Only shredded hardwood bark mulch will be accepted; ground wood (not bark) will be rejected.

d. Pine Straw:
   i. All pine straw shall be clean, fresh, and free of branches and foreign matter.
   ii. The mulching material shall be pine straw, applied four inches (4”) to six inches (6”) thick to achieve a minimum settling depth of three inches (3”).

e. Contractor shall mulch all trees and shrubs immediately after planting, NOT at the end of the entire planting project.

f. The contractor shall mulch the planting holes and staked areas of individual trees shall be mulched, while the entire planting areas of shrub and ground cover beds shall be uniformly mulched. No soil, rocks, clods, or drip irrigation lines shall be visible through the mulch.

g. Trees and tree like shrubs planted in turf areas shall have a circular mulch ring with a four-foot radius from the trunk of the tree. All areas that are not turf or hardscape shall be mulched, unless otherwise specified. Do not place mulch within 3 inches of trunks or stems.

32.23. Underground Utility Offsets

a. New utilities should be located so that the construction will not damage or destroy the plants to remain. Utility trenching shall not be located closer than one foot (1'-0”) for each (1”) in diameter, with a minimum of five feet (5'-0”) and a maximum of twenty feet (20'-0”) for trees to remain. Damaged trees and plants shall be restored to the satisfaction of the ODU Grounds Manager.

b. To preserve trees and manage underground utilities, new trees shall not be planted:
   i. Within ten feet (10'-0”) of any existing underground utility lines with joints
   ii. Within five feet (5'-0”) of any existing underground utility lines without joints (joints may occur when they are at least ten feet from the tree center in both directions)
   iii. Where new storm and sanitary sewer piping alignment cannot be avoided within ten feet (10'-0”) of an existing or new tree, use HDPE butt-welded pressure piping.

32.24. Landscape Edging

a. Landscape edging shall not be used.

32.25. Initial maintenance of trees and shrubs

a. Trees and shrubs shall be maintained by the Contractor after final planting until final acceptance by the ODU Grounds Manager.

b. Refer to section 32.15 Planting Irrigation.

c. The Contractor shall remove weeds, replace mulch and restore eroded watering basins around trunks if needed.

d. The Contractor shall remove all plant identification tags and labels.

e. The Contractor shall apply insecticides, fungicides and herbicides if necessary to prevent or correct insect infestation or disease. Contractor shall apply pre-emergent herbicides for all plant beds.

f. The Contractor shall dig up and correct any trees that are not plumb

32.26. Pruning
a. If pruning of roots is required of existing plants or trees, Contractor must contact ODU Project Manager and arrange for ODU Grounds manager to review the conditions and advise.

b. B. If pruning of roots is required for new plants, Contractor must seek approval from A/E prior to proceeding.

c. Contractor shall remove only dead, dying, or broken branches as approved by ODU Grounds Manager. Do not prune for shape.

d. Contractor shall prune and thin trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by A/E, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

e. Pruning of plant material shall be limited to fine pruning. Fine pruning is the removal of dead, diseased, injured, broken, rubbing, or crowded branches or twigs. Minor branches and branches that connect to the trunk may be fine pruned. Fine pruning should not result in large voids in the general outline or structure of the plant.

f. Protruding branch stubs, left on the tree after pruning, is not acceptable. It will increase the possibility of decay and may result in the growth of undesirable shoots from the stub.

g. The normal shape of the plant shall be left intact unless otherwise directed by the A/E. Additional pruning may be required on trees of special use or character.

h. All pruning cuts on woody plants shall be made in accordance with standards set forth in the National Arborist Association's Pruning Standards for Shade Trees, Class I Fine Pruning. Improperly pruned shrubs and trees may result in rejection of plants by the Design Professional.

32.27. Transplanting

a. Mechanically transplanted trees:

b. Trees dug and transplanted with a mechanical tree spade (on site) shall be placed in a planting hole dug by a mechanical tree spade of the same size.

32.28. Vegetated Roof Assemblies

a. Refer to CPSM APPENDIX A - DEB ROOFING POLICY & TECHNICAL STANDARDS FOR STATE-OWNED BUILDINGS for additional requirements regarding vegetated roof systems.

b. General Requirements

i. During schematic design, the objectives for installation of a vegetated roof must be defined (stormwater benefit, aesthetics, amenity space, etc). The specific design of the landscaped roof must be preapproved by Facilities Management and the Department of Design and Construction.

ii. Vegetated roof installation must be minimum 1,000 sf.

iii. Design and details must be developed by an experienced vegetated roof consultant, who must be a member of the design team as soon as a green roof concept is identified.

iv. Design must provide reasonable, safe access for landscape maintenance personnel and must be approved by the University Grounds Manager.

v. Provide access to roof top equipment such as drains, skylights, etc., avoiding frequent foot traffic over planted areas.

vi. Design shall include a perimeter zone, free of any vegetative roof components to a depth of at least 12’ or as recommended by the vegetative roof consultant.

c. Acceptable Vegetated Roofing Systems
i. Modular Tray Extensive: 1’x2’ trays with interlocking capability and positive drainage cells, made with recycled content. Trays shall be set on a slip sheet/root barrier of 45-60 mil with bonded seams, of a material compatible with roofing membrane system. Trays shall be pre-grown for 1 growing season, exposed tray edges shall be protected with sturdy aluminum “L” shaped edging (4.5”x3”), and growth media shall cover tray edges by 1” depth.

d. Warranty
i. Provide single-source, full assembly vegetated roof system replacement in the event of membrane failure; to include membrane plus all overburden, including soil media and plant replacement, for minimum 20 years.
ii. Provide 50% vigorous plant coverage warranty in 1 year, 80% vigorous plant coverage in 2 years.

e. Engineered Growth Medium
i. Design must be specific to the depth of medium and type of plants specified, meet German FLL requirements for engineered growth medium and submit certified laboratory tests for approval.

f. Leak Detection
i. Provide electric field vector mapping leak detection systems reviewed and approved by Facilities Management. Components of the vegetated roof system, including the membrane, must be compatible with the leak detection system.

g. Irrigation
i. Provide a hose-bib for irrigation during establishment and dry periods.
ii. Tap non-potable irrigation sources such as condensate or storm water cisterns. Irrigation piping material to be stainless steel or PVC schedule 40. Galvanized and copper piping are not acceptable due to potential leachate damage to plants.

h. Installation
i. Installation shall be by qualified, certified, experienced vegetated roof contractor. Coordinate installation such that other trades have limited, managed access to the area receiving a vegetated roof to avoid damage to the waterproofing membrane.
ii. The vegetated roof design consultant shall inspect and approve installation of all layers of the system, and shall submit approval(s) to Facilities Management.
iii. Prior to installation of waterproofing membrane, the vegetated roof contractor and the University Project Inspector shall visually inspect the substrate surface to verify it is clean, dry, smooth and acceptable for the membrane installation.
iv. Waterproofing membrane to be water-tested, witnessed, confirmed in writing and approved by the University prior to installation of any over burden of vegetated roof system components.
v. UV or temperature sensitive roofing materials must be protected prior to and during vegetated roof installation.
vi. Planting shall be installed in an appropriate season. Sedum pots shall be planted March-April-May, or in fall if acceptable to the University Grounds Manager. Pre-grown trays and carpets may not be installed in freezing temperatures. Sedum carpets must be installed immediately upon arrival at project site.

32.29. Pavement Markings
a. Parking spaces shall be delineated with a single stripe line configuration between 90 degree and angled parking spaces. All parking space lines shall be 4” in width. Ninety degree parking spaces shall be 9 feet wide center to center of the line configuration and 18 feet deep.


c. Parking space pavement marking paint for asphalt or porous concrete shall be water based traffic paint (without glass beads) that meets federal specification TTP-1952-E (Traffic and Airport Marking) and the Department of Transportation (DOT) specification 971-3.

d. Only standard pre-tinted paint colors shall be used for white, yellow, blue, red, green, and black traffic paint markings.

<table>
<thead>
<tr>
<th>Pavement Marking Color</th>
<th>Location Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Parking space lines</td>
</tr>
<tr>
<td>Blue</td>
<td>Accessible parking spaces including: parking space lines, hashed areas, curbs, and symbols</td>
</tr>
<tr>
<td>Yellow</td>
<td>Fire lanes, no parking zones, and designated clear areas at the ends and/or corners of parking aisles</td>
</tr>
<tr>
<td>Green</td>
<td>Electric Vehicle charging areas – including parking space and curbs surrounding charging equipment</td>
</tr>
</tbody>
</table>

e. For asphalt surfaces, apply two coats, each wet application shall be a minimum 15 mils.

f. For concrete surfaces apply 1 coat, and the wet application shall be a minimum of 15

g. A/E shall coordinate with ODU Project Manager to include Transportation and Parking Services as well as the University Fire Safety officer in the review of parking layouts, fire lane and fire hydrant markings during the preliminary design phase.

32.30. Manufactured Metal Bollards

a. Refer to Chapter two – Campus Design regarding bollards locations.

b. Landscape Forms 6” black Annapolis Bollard (or equal). Surface mount or removable style with supplied embedded galvanized steel socket. Removable bollards to have a keyed lock to secure the bollard when in the socket. Provide a cover place flush with the surface and secured with a chain when the bollard is removed. The cover plate and chain store in the sleeve when the bollard is in the socket. Lighted bollards, when used shall be LED. Install per manufacturer’s directions in a 24” diameter (min.) concrete footing 30” deep with drainage pipe to engineered fill. When desired, based on location, the bollard can be filled with concrete for added security. If filled with concrete, extend the drain line to the top of the concrete, keeping it unobstructed.

c. When approved by the Department of Design and construction, on a limited basis, 6” concrete filled, steel bollards may be used. Factory pre-filled with concrete, factory finished painted yellow with welded dome cap. Schedule 40 or 80 pipe.

32.31. Skateboard Deterrents

a. Skateboard Deterrents shall be indicated in the working drawings by the A/E.

b. Material: 6061-T6 Aluminum in a clear anodized finish.
c. Dimensions: 2” Wide x 4 ¾” deep x 1” tall with a 1/8” to 3/8” radius edge.
d. Anchoring: minimum of two offset anchors set in two-part epoxy.
e. Spacing: set 18” from end of planters and walls and then 36” +/- on center.
f. Product: FR 0.12 By Skate Stoppers or equal.
Division 33 – Utilities

33.1. General

a. The contractor shall secure, at the contractor’s expense, all utilities hookups and access roads for all construction projects. The contractor shall be required to make all utility connections and is responsible for the removal of all connections and any repairs that may need to be made. Contractor shall be responsible for furnishing and installing water pipes, fittings, valves, hydrants and other necessary equipment in accordance with the requirements of the municipal water and fire departments. Prior to ordering materials, the Contractor to obtain the latest copy of the municipal water department’s standards and specifications and shall notify the A/E immediately if any discrepancies are found between those requirements and the Contract Documents.

b. The contractor shall first notify the ODU Project Manager no later than 72 hours in advance of a potential utility disruption.

c. A 48-hour notice shall be given to residents or businesses affected by the shut-down, and shall be done by the Contractor under the direction of the A/E. The municipal or private utility may require the work to be done at night.

d. Connections made to existing campus systems shall require prior approval as to the location, manner and time of the connections. Connections and reinstatements requiring any shutdown of an existing ODU system shall require the shutdown to be done only by Facilities Management personnel. A 14-day advance written notice shall be submitted to ODU Project Manager and shall be approved prior to any connections being made. As soon as temporary connections are no longer required, they shall be immediately removed by the contractor.

e. Existing services and equipment shall be specified to be removed from site and not be abandoned in place except with the written approval of Facilities Management.

f. The Contractor shall adjust all existing and new utility structures (manholes, valve boxes, etc.) to meet new grades as required to complete this project at part of the Cost of the Work.

g. The engineer shall provide underground profile drawings of all utilities to be installed on campus (steam, chilled water electrical duct bank, sewer, storm, etc.) clearly indicating depths of existing underground utilities and minimum clearance required.

h. Where utility excavation will be required, the engineer shall specify “maximum limits of excavation.”

i. Accessible isolation valves, identified as to function, shall be provided at new taps from existing utilities.

33.2. Warning and Tracer Tape

a. Provide metal-backed warning tape a minimum of 6” wide, at all non-ferrous underground utility lines. Provide non-metallic multiple-bonded plastic layer tape. The tape shall bear the wording ‘BURIED DRAIN LINE BELOW’ (with ‘DRAIN’ replaced by ‘WATER’, ‘SEWER’, ‘ELECTRICAL’, ‘GAS’, ‘TELEPHONE’, or ‘CHEMICAL’ as appropriate), continuously repeated every 30 inches to identify the pipe.

b. Tape colors shall be as follows as recommended by the American Public Works Association (APWA):

<table>
<thead>
<tr>
<th>Utility</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>Red</td>
</tr>
<tr>
<td>Gas and Oil</td>
<td>Yellow</td>
</tr>
<tr>
<td>Communications</td>
<td>Orange</td>
</tr>
<tr>
<td>Water</td>
<td>Blue</td>
</tr>
</tbody>
</table>
c. Tape shall be located the shallower of 3 feet or half the distance between the crown of the pipe or conduit and the finished grade.

d. Prior to Material Completion, the Contractor shall camera all new sanitary sewer pipe installed exterior to the building perimeter, and 10’ beyond the connection point with existing pipe. The Contractor shall provide the A/E and ODU Project Manager with an electronic copy of the video footage for review. Cost of videoing the system shall be included in the Cost of the Work.

33.3. Utility Separation

a. Whenever possible water mains shall be laid at a minimum at least 10 feet, horizontally, from any existing or proposed sewer. Should local conditions prevent a lateral separation of 10 feet, a sewer may be laid closer than 10 feet to a water main if:
   i. It is laid in a separate trench, or if;
   ii. It is laid in the same trench with the water mains located at one side on a bench of undisturbed earth, and if;
   iii. In either case, the elevations of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main.

b. Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or reconstructed with mechanical-joint pipe for a distance of 10 feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

c. When it is impossible to obtain horizontal and/or vertical separation as stipulated above, both the water main and sewer shall be constructed of mechanical-joint cement lined ductile iron pipe or other equivalent based on watertightness and structural soundness. Both pipes shall be pressure tested by an approved method to assure watertightness or both pipes shall be encased in concrete.

d. For all other utilities, a minimum of twelve inches (12”) vertically and five feet (5’–0”) horizontally, wall-to-wall, shall be provided between any two utilities and utilities structures.

33.4. Utility Trench cuts in Roadways

a. Utility trench cuts in roadways shall be limited to 200’ maximum and shall be covered with traffic-rated steel plates at the close of construction activities each day.

33.5. Building and Roof Drainage

a. Drainage piping shall be located as approved by the Director of Facilities Management and/or the city authorities when located in streets, right-of ways or easements and when not located on university property.

b. All building roof drainage, including external downspouts, areaway drains, and foundation drains shall be connected to a storm water best management practice, or the storm sewer system.

c. If connecting to the storm sewer system, connections shall preferably be made to a manhole or a drop inlet directly. Where the preferred connection is not feasible or economically justified, the connection
shall be to the storm sewer with a “Y” a maximum of 50 feet away from the building. Provide cleanout at roof drain and at a change in direction of any drainage piping.

33.6. Storm Inlets and Structures

a. The following requirements apply to storm inlets and structures:
   i. VDOT standard structures are to be used.
   ii. Curb inlets shall be used for all surface drainage for roadways and parking lots unless vegetated swales or bio retention filters are used
   iii. All grates for yard inlets shall meet handicapped accessibility standards.
   iv. Avoid grate or other type inlets in lawn areas designed for student activities.
   v. Grate inlets shall be used for all lawn areas.
   vi. Dome top inlets are preferred in landscaped areas.
   vii. Inlet grates shall be bicycle-safe and orientated with the long axis perpendicular to the direction of traffic.
   viii. The tops of all structures shall be flush with the pavement surface.
   ix. Inlet structure grating shall be heavy-duty traffic rated providing a minimum 24” clear opening for access.
   x. For pipe diameters up to eighteen inches (18”) or a depth of four feet (4’-0”), the minimum inside size for drop inlets shall be twenty-four inches (24”). For pipe diameters greater than eighteen inches (18”) or deeper than four feet (4’-0”), drop inlets shall be forty-eight inches (48”).
   xi. Area drains, clean outs and yard drains with minimum pipe size and cover shall use shallow cast iron fittings or heavy-duty HS 20 traffic fittings.

33.7. Site Storm and Sanitary Systems

a. Sanitary piping shall not be located within areas of flooding or drainage channels.

b. Storm mains eighteen inches (18”) and above should be Class III reinforced concrete pipe. All pipe 18 inches and smaller shall be Class V.

c. HDPE double wall corrugated pressure pipe or solvent weld jointed schedule 40 PVC may be used for mains under 24”. Foundation and retaining wall drains shall be perforated solid wall schedule 40 PVC with solvent joints wrapped in geotextile fabric with a stone dust bed and cover. Under slab drains can be flexible PVC.

d. Sanitary piping shall be cast iron (CI), ductile iron (DI), HDPE pressure pipe or solvent weld jointed schedule 40 PVC.

e. Specify a minimum cover of twenty-four inches (24”) for storm pipe and thirty-six inches (36”) for sanitary.

f. The minimum slope shall result in a self-cleaning velocity (2 fps minimum) for the diameter used. Pipe on a twenty percent (20%) or greater slope shall be secured with concrete anchors.

33.8. Manholes and Cleanouts

a. Provide manholes on storm and sanitary systems adjacent to all buildings to which laterals from the building are directly connected. Laterals shall be a maximum of fifty feet (50’). Where sanitary laterals exceed twenty feet (20’), a clean out shall be provided just outside the building. The cleanouts shall be installed in a concrete pad flush with the surface and be HS 20 rated.
b. Manholes shall occur at changes in direction and in straight runs at a maximum of 400 feet in storm lines and 200 feet (200') in sanitary lines.

c. Sanitary manholes shall be precast concrete (4,000 psi minimum compression strength) units with a 4 foot minimum inside diameter precast concrete units with eccentric cone section tapering to 30-inch diameter, or flat top, and one pour monolithic base. All units to be designed for HS-20 loading.

d. Manhole frame and cover shall be heavy-duty traffic rated, providing a minimum twenty-four inch (24") clear opening for access.

e. Manhole covers shall be designed to VDOT load bearing requirements and shall include identification of the system involved (steam, sanitary sewer, storm drains, electric, telecom, etc.)

f. Joints in precast manholes (inside and outside) shall be filled with non-shrink grout and finished smooth.

g. Manholes shall be coated from inside with vapor/moisture penetration preventing epoxy coating and from the outside with 2 coats bitumastic waterproof coating.

h. Pipe connections to manholes shall be made with flexible rubber boots. At existing structures install sleeve prior to connection. For sanitary manholes use flexible, mechanical clamps, grout and water stop for a leak-proof connection.

33.9. Exterior Domestic and Chilled Water Piping

a. The municipal water department shall be notified prior to starting construction of any portion of the municipal water system.

b. The closing of valves necessary for making connections with existing municipal system(s) will be done by the local Water Department employees, assisted by the Contractor. Sufficient notice shall be given the Water Department of planned connection. No allowance will be made for any delay in closing of valves.

c. Underground sanitary sewer pipe shall be double asphalt coated, cement lined ductile iron. Class 52 or higher with flexible restrained joints, furnished in 18-foot and 20-foot nominal lengths. PVC C900 is acceptable for water distribution piping.

d. All fittings and hardware shall be epoxy coated. Branch lines two inch (2") and smaller can be type K copper. All mains shall be a minimum of six inch (6") diameter.

e. The entry point into buildings shall be made with factory flanged ductile iron pipe, class 53 or higher.

f. New chilled and domestic water branches shall preferably be connected to existing mains with full size tees; reducing tees or wet taps can only be used with prior approval of Facilities Management. Full size resilient seal gate valves shall be provided on both branches after tees (upstream of reducers).

g. Buried chilled water supply pipes shall be insulated. Field installed rigid foam glass with a 50 mil poly jacket is preferred however a pre-insulated double wall pipe system can be used with prior approval of Facilities Management.

h. Domestic water piping shall have a minimum three-foot (3') cover; chilled water lines shall have a minimum four-foot (4') cover. All buried domestic and chilled water lines shall have a stone dust or sand bed and cover.

i. All buried domestic and chilled water lines shall be pressure tested at 200psig for two (2) hours. Domestic water lines shall be bacteria tested.

j. Chilled Water Branches shall have a ductile iron valve box with lid marked “CHILLED WATER".
k. Chilled water design pressure to be 150 psig. Direct Bury DIP Systems shall test pressure 1 times design pressure witnessed by Project Inspector.

l. Long radius elbows are preferred

m. All piping systems shall be protected against corrosion in accordance with AWWA standards.

33.10. Natural Gas

a. The contractor is responsible for contacting Virginia Natural Gas (VNG) and notifying them prior to starting construction of any portion of the site gas lines (gas distribution system).

b. The closing of valves necessary for making connections with the existing VNG system shall be done by VNG employees, assisted by the Contractor. Notify VNG at least 72 Hours in advance of any planned connection. The Contractor shall give a 48-hour notice to residents or businesses affected by the shutdown. VNG may require the work to be done at night during the low use time period, which shall be included in the base contract cost.

c. In the event of contact with or damage to any VNG facilities, or interruption to gas service as a result of accidental breakage, the Contractor shall promptly notify VNG and shall cooperate fully with VNG in the restoration of service and repair of damage. Under no circumstances shall the excavator backfill or conceal any damaged area until the Private Gas Company reviews the damage and approves a procedure to affect repairs.

d. If there is an escape of gas due to Contractor’s work or negligent work, the Contractor shall immediately notify the appropriate VNG officials, the ODU Fire Safety Officer and the ODU Project Managers and shall make every effort to limit potential damage, including cordonning off the area and assisting in evacuation of adjacent people who may be harmed by the escaped gas.

e. Natural Gas pipe shall be schedule 40 black pipe. Below ground pipe shall have welded seamless joints. Above ground pipe shall have threaded joints.

33.11. The A/E and the general contractor shall work with Dominion Energy to determine who will install electrical manholes and manhole covers on ODU property when required. The A/E shall incorporate Dominion Energy’s standard specifications into the project specification for manholes and underground utilities when determined that the general contractor will be installing same.

33.12. Pond and Reservoir Liners

a. Typically specified on the drawings, but due to the need for clarity and a tight specification, ODU requires a written specification section for liners.