

CAMPUS DESIGN and CONSTRUCTION STANDARDS

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The mission of Florida Polytechnic University is to prepare 21st century learners in advanced fields of science, technology, engineering and mathematics (STEM) to become innovative problem-solvers and high-tech professionals through interdisciplinary teaching, leading-edge research and collaborative local, regional and global partnerships.

CAMPUS DESIGN and CONSTRUCTION STANDARDS
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Division 0 - Procurement and Contracting Requirements

Section 000200 - Contracting Requirements

The standard Florida Polytechnic University (Florida Poly) agreement for the Architect, Engineers, General Contractor or Construction Manager will be based upon an adaptation of the American Institute of Architects contract documents, specifically for the Florida Poly. Most agreements are based on a fixed fee and will be negotiated at the outset of the project. Alternate scope may be addressed in the initial documentation of the agreement.

Section 002100: Instruction to Bidders – General bid contracts for construction will be handled with a modified agreement based the premises of AIA A-101 for “General Contractor” (Fixed lump sum contract) or AIA A-102 for “Construction Manager” (Cost plus a fee for a Guaranteed Maximum Price).

Section 002200: Conditions of the Contract - The Florida Poly “General Conditions of the Contract for Construction” (AIA A-201) and the “Supplementary Conditions of the Contract” (AIA A-503) are provided in separate documents, so named.

Section 002600: Procurement – The Florida Polytechnic University is mandated to take advantage of tax savings wherever possible, and will expect to enter into owner direct purchase agreements for permanent additions to construction projects.

Section 002500: Pre-bid and pre-construction meetings will be held for all major activity sections of the contract agreement (greater than five percent of the agreement).

Division 1 General Requirements

Section 011000 Summary

- **SUMMARY**

This section contains general guidelines affecting the design of Florida Polytechnic University construction. The guidelines included in this section are State or Federal mandated requirements, SUS or University Policies, and/or University conventions or preference.

Many of the University's various facilities management and/or planning offices have or will develop their own sets of Division 0 and 1 specification sections generally referred to as "non-technical" or "front end" specifications) for use on construction projects they administer. These various sets of "non-technical" specifications are considered to be supplemental standards regardless of whether they are contained within a set of supplemental standards or issued separately.

- **ACCESS FOR PERSONS WITH DISABILITIES**

All new construction and renovation projects shall comply with the Florida Accessibility Code for building construction. Temporary entrances and exits must meet Florida Building Code requirements.

- **BUILDING AND SITE STANDARDS**

A new campus building must be designed with all sides having the appearance of being the "front" of the building, with each façade oriented and linked to surrounding campus buildings or features.

- **BUILDING SITING, ORIENTATION AND LINKAGES**

Overall, building siting, orientation and linkage should seek to preserve and maintain open spaces; provide access for emergency service and disabled persons vehicles and respect adjacencies to other facilities and the natural environment. Building sites should carefully consider the creation of quadrangles and the relationship to existing buildings and pedestrian pathways to create pleasant and functional open spaces.

Temporary buildings are defined as structures that provide temporary support to programs in need of or in the process of constructing new space. These structures may be anticipated for use during a period of 12 months, be outside the core of campus, and in no case shall their use extend beyond a period of 5 years.

- **ARRANGEMENT OF ANCILLARY USES ON SITE**

In order to minimize storm damages and also emphasize the design characteristics of buildings, open spaces & full tree canopies, electrical and telecommunication lines should be located underground. These utilities should be placed at grade within the building or in an exterior location screened from public view. Any above grade utility equipment such as electrical transformers that cannot be reasonably located underground, should be screened from view.

- **REGULATORY REQUIREMENTS**

Florida Polytechnic Building Code Administration Program

The purpose of this program is to implement Building Code Administration for Florida Polytechnic University Capital Improvement Program. Such regulated practice of building code compliance is necessary, in the interest of public health and safety, which shall be provided through compliance of all adopted codes, statues and standards. The program is administered by the Building Code Administrator (BCA), through documents reviews and construction inspections. Building Code Administration is required by Florida Statue section 240.209 (3) (p), regulated by Florida Statue chapter 553 part VII, and delegated by FAC rule 6c-14.020(2) and Chancellor’s memorandum CM-N-22.00-12/00. Categories of code administration personnel are established in Florida Statute Chapter 368 part XII.

Florida law and regulations require that all new buildings constructed and modifications to existing buildings be reviewed and inspected for compliance with adopted codes and standards. This policy requires that all University entities, conducting building construction, repair or modifications, submit construction documents (drawings and/or specifications) for review, obtain a building permit for construction which, after proper inspection and completion, is certified for occupancy or re-occupancy.

- **RESPONSIBILITIES**

A qualified building code administrator has been appointed to manage the Building Code Administration program. The Building Code Administrator is certified by the Council of American Building Officials and licensed by the Department of Professional and Business Regulation as a Building Official. The Building Code Administrator administers, code compliance, the documents review and construction inspection process. After reviewing the documents, comments, if any, are returned with appropriate references. A letter of “code compliance” is issued after final review and approval of 100% construction documents and upon resolution of all outstanding comments.

The University Project Manager (PM) or the General Contractor (GC) or the Construction Manager (CM) shall submit to the Building Code Administrator a request for a building permit. A building permit shall be issued upon satisfactory completion of the application process, receipt and review of all necessary documents and permit fees if required are paid in full.

- **PROCEDURES**

Design professionals prepare construction documents in accordance with all applicable codes.

Florida Polytechnic University project manager and Building Code Administrator reviews such documents for code compliance and return “comments” or a “letter of code compliance” as applicable.

The general contractor, construction manager or project manager applies for building permit with the proper fee.

The Building Code Administrator reviews the “building permit” application and issues a permit if all information submitted is acceptable and complete and fees, if required, are paid in full.

The general contractor or construction manager requests and Building Code Administrator performs inspections in accordance with all Florida Codes.

When construction is “substantially completed” and all required inspections performed, The Building Code Administrator issues the appropriate “certificate of occupancy or re-occupancy.”

Though the design professional may be asked to manage certain items, the university will generally provide record documentation of existing conditions, geotechnical testing and civil / survey of the property. All utilities and sizes will be provided in the record documentation.

Interior furniture, fixtures and equipment are provided by the University, but may be required to be coordinated by the designer for bid package or the construction team for install coordination.

Section 011100 Threshold Building – For those buildings required by F. S. Section 553.71 and the Florida Building Code to have special inspector, daily summary reports shall be filed with the University. Deviation reports will need to be filed and responded to immediately.

Section 012500 Substitution Procedures – The section is used to outline methodology for substitutions. The university operates under State guidelines for “direct owner purchase” of materials to achieve sales tax savings for anything installed in the facility. In specifying materials, it is up to the design team to set certain standards for specialty materials.

Normally three options are given, or a standard is set by naming one vendor’s product, with the expectation that the other vendors will provide assurances and demonstrate the “or equal” status, that such substitution exceeds or matches that specified as the standard. The substitution approvals take place after the award of the contracts, and it is up to the contractors to carry the higher price of the two products, so that occasionally a reduction in price will be awarded the University upon substitution.

Section 012550 Submittals – Submittal logs shall be created for all items requiring approval per the Specifications. The logs shall be updated weekly and submitted to the university. The Submittals will be reviewed by the university staff, as the design team approves each item, and the Campus Development & Facilities Department may make comment for changes.

Section 012600 Contract Modifications Procedures – Contract or agreement modifications are handled by first an outline of the work, a proposal for the work, demonstrating credits in both labor and materials for the modification as a deduct, or debits in both labor and materials for the modification as an add change.

Generally such procedures start with proposal to the university for additional services or with requests for information from the construction team to the architects for proposal of services reduction or addition.

Section 012900 Payment Procedures – Upon award of the contract, the university will be given a schedule of values for the project based upon natural breaks in the project by trades or subcontracts. Each month’s activities will be assigned to a portion of the project appropriate to

that schedule of values to determine percentage of completion, amounts for payment and retainage. Comparison to the schedule will also be cross-checked.

With the first pay request, a list of subcontractors and contact information, the payment and performance bonds, insurance showing the university as a co-insured, along with the time schedule, the list of staff assignments and principal consultants, will be provided, and subsequent pay requests will require a release of liens from each affected subcontractor, to assure payment from previous pay requests. A monthly progress report will be required.

Section 0131000 Project Management and Coordination

Submittals include:

- Subcontractors and suppliers contact information – name, company, address, phone numbers and e-mail.
- Number and title of related Specification Section for subcontractors and suppliers.
- Related drawing number, title and detail number for subcontractors and suppliers.
- Construction team key personnel - name, address, phone numbers and e-mail.

Coordination:

- Provide overall project schedule in a critical path format with milestones identified.
- Provide a schedule of values for work in the base agreement, as a part of the project Guaranteed Maximum Price (GMP).
- Provide for update meetings with the university and the design team, as appropriate to the progress of the work, minutes to be taken and provided by the construction team.
- Pre-installation conferences shall be organized by the construction team at all milestone activities.
- Review all submittals with the university Campus Development & Facilities staff and provide threshold inspection reports.
- Project close-out meeting shall be scheduled with the University and the design team.
- Provide for start-up and adjustment commissioning of all systems.

Division 2 Existing Conditions

Section 020000 Site Preparation – The section addresses the needs for site boundary drawings and surveying, existing topographic data, geotechnical investigations, and State and City regulatory legislation to meet agency requirements.

Section 022000 Site Logistics – Outline the need for logistics planning for extension of utilities, infrastructure (temporary and permanent), mobilization and site set up & scheduling.

Section 024000 Selective Demolition – For existing building renovations or overall demolition, the section identifies the need to follow regulatory agency guidelines for demolition and disposal of deleterious materials. It also describes the effort at protection of life and properties from activities of the demolition and continuous operations of the university activities.

Division 3 Concrete

Section 030000 General Provisions for Concrete

GENERAL PROVISIONS

No concrete product or concrete shall contain fly-ash.

The floor on the inside and outside of each doorway shall be level for a distance of not less than five (5) feet by five (5) feet in each direction. A 2% slope and cross slope is acceptable outside for drainage purposes and ADA compliance.

CODES AND STANDARDS

- A.** Concrete Reinforcing Steel Institute (CRSI) placing reinforcing bars-recommended practice.
- B.** ACI 117 - Standards specifications for tolerances for concrete construction and materials
- C.** ACI 301 – Specifications for structural buildings
- D.** ACI 305 – Hot weather concrete
- E.** ACI 308 – Standard practice for curing concrete
- F.** ACI 309 – Guide for consolidation of concrete
- G.** ACI 318 – Building code requirements for reinforced concrete
- H.** ACI 347 – Guide to formwork for concrete
- I.** CI 347.2R – Guide for shoring / reshoring of concrete multistory buildings

TESTS

A minimum of four (4) test cylinders prepared in accordance with ASTM C495 shall be taken during each day's placement and every 50 cubic yards thereafter. Tests shall be made by a testing laboratory employed and approved by the consultant or University project manager. Written reports of the test shall be sent directly to the consultant / project manager with a copy to the University Building Code Administrator. Laboratory shall make tests for wet density, dry density, and compressive strength of each specimen.

STRENGTHS

All concrete designs strength shall be determined by the project Architect / Engineer, however, in no case shall the compressive strength be less than 3,000 psi in 28 days, excepting flowable fill at utilities.

EXPOSED CONCRETE AT STAIRS

Protection for nosing on concrete steps shall be provided by imbedded rounded metal cast nosing with non – slip surface no greater than 1/4 inch thick by 3 inch width by stair dimension.

NON – SLIP SURFACING

Ramps, treads, and platform of stairs shall have non – slip surface when not covered with flooring finish materials

CURING COMPOUNDS

Specify only non – staining type. The structural engineer shall delineate methods for curing concrete.

INSULATING CONCRETE ROOF DECKS

Concrete shall have the following characteristics

Wet density 40 – 60 lbs. per cubic foot

Dry density 20 – 30 lbs. per cubic foot

Compressive strength 300 psi minimum

Section 031000 Formwork - Generally used for specifying the plasticized-liner formwork, kerf wood inserts, snap ties and standards for plywood, industrial grade form board, dimensional lumber or solid plastic, ACI 301.

Section 032000 Reinforcement – The section is used to specify steel reinforcement for concrete, generally meeting ACI 315 to ACI 318 and AWS D1.1, D1.4, D12.1 for welding re-bar, et al.

Section 033000 Cast-in-Place Concrete – Concrete at the I-4 Campus will generally be rated as 3,000 PSI concrete achieving slumps meeting ASTM C143 and breaks meeting AASTM C39 for samples. Grouts must meet ASTM C1107 without modifications. ACI 301 governs the specifications of structural concrete.

- Control joints in exterior work are normally at a maximum 100-250 SF per pour area based on slab thickness, with expansion joints as required by the structural engineer of record.
- Exterior slabs are a minimum six-inch thickness for trafficable areas, and four-inch thickness for pedestrian only areas.
- Sidewalks are normally ten-feet wide, with exceptions only for fire lanes (twenty-feet wide) or minor walkways (six-feet wide). Turn down and reinforce the edges.

Section 033300 Architectural Concrete – Upon direction of the architect, this could be deleted. The Section is primarily for specialty items requirement exceptional finishes, such as polished concrete floors or decorative items requiring smooth finish.

Section 033543 Integrally Colored Ground and Polished Concrete – Only used for specialty colored concrete floors or slabs. Not recommended for exterior use in Florida.

Section 035300 Concrete Topping – Fiber-reinforced concrete is normally not used, except in topping slabs.

Division 4 Masonry

Section 040000 General Requirements for Masonry

SPLIT COURSING

Only full coursing will be permitted at the head of any type of opening.

STANDARDS

- A. All new brick work, including but not limited to expansion joints, ties and fasteners, and accessories, shall comply with the guidelines established by the Brick Industry Association (BIA)
- B. ACI 530 Building code requirements for masonry structures
- C. ACI 530.1 Specifications for masonry structures

EXPANSION AND CONTROL JOINTS

Expansion and control joints shall be detailed and specified to accommodate potential movement that may cause cracking. But no more than 250 square feet based on concrete slab.

SEALANT JOINTS

Sealant joints shall have backer rod and sealant color shall match adjacent mortar joints to the extent possible. For exposed joints that do not receive a coating, silicone based joint materials are required. See thermal and moisture protection division

MORTAR

Mortar for laying masonry may be ready mixed or job mixed. Specify by types listed in ASTM C-270. Do not specify mortar which may corrode steel reinforcement or structure. Mortar shall be specific based on performance criteria. Mortar joints shall be tooled slightly concave. Struck or raked joints shall not be used in exterior walls unless required to match the existing joints.

MASONRY ACCESSORIES

Brick ties, plates, fasteners, lintel angles, relieving angles and other metal accessories shall be galvanized steel (minimum G-90) or be stainless steel. Flashing shall extend beyond openings and have end dams at vertical terminations. Through wall flashing for brick veneer shall extend a minimum 8 inches above weep location. Joint reinforcement shall not be wire mesh type. Weeps shall be installed at all through wall flashing locations in accordance with Brick Institute of America guidelines. Open head joints with honeycomb plastic weep inserts are required rather than cords, tubes or open head joints. Locate through wall flashing and weeps a minimum of 12 inches above adjacent roofs to allow reroofing without interfering with their operation. Plug anchorage by use of wood, lead or plastic is prohibited.

UNIT MASONRY

Color and blend of face brick shall generally be specified to match brickwork in a specific adjacent building. Consult the University regarding this requirement. Submit to the University a manufacturer's certification that the bricks show no efflorescence when tested in accordance with ASTM method C67. Face brick elevations shall include structural considerations for division of such elevations into panels to accomplish structural support of the brick face and expansion joints for control of thermal expansion damage.

SAMPLE PANEL

Include the following paragraph in the specifications. Before starting work, build one sample panel for inspection and approval. Build panel on a firm foundation, in location indicated by University project manager. Panel shall be F-shaped, with long side a minimum of five (5) feet four (4) inches long by three (3) feet four (4) inches high, with one corner return at least two (2) feet long and with one intersecting six (6) inch thick concrete block wall two (2) feet long. Construct long side and return of 8 inch concrete block and face brick. Panel shall show color range and texture of masonry units, bond, mortar joints and workmanship. Completed masonry work in the building shall be equal to that shown in the approved panel. Do not remove panel until masonry work is completed or until removal is authorized. Panel to include sample of openings.

CONCRETE BLOCK TYPES AND USES

The use of cinder blocks is prohibited

LOAD BEARING – Normal weight, standard size

NON LOAD BEARING – normal weight, standard size

CONTROL JOINTS – to control cracking, follow recommendations of the Concrete Masonry Handbook published by the Portland Cement Association.

TESTING: Depending on the facility, performance testing of installed systems shall be performed to verify that they are installed properly. The project specifications shall indicate the frequency and use of standard field test procedures developed by ASTM.

BUILDING COMMISSIONING

The University may include the Building Commissioning as part of the project requirements. For certain projects, the Building Commissioning will include the building envelope, which includes exterior masonry cladding systems. The project specifications should provide information to outline the Building Envelope Commissioning requirement.

Section 040100 Masonry Cleaning and Repair - The section is used to specify chemicals for cleaning of masonry and the repair and repointing of masonry (CMU, brick or stone). No harsh VOC emitting chemicals will be allowed in occupied areas or near where students & staff may be present.

Section 040200 Unit Masonry – Concrete masonry units are described as meeting local standards for sizes shapes and decorative properties meeting job requirements. CMU, concrete pavers, brick, structural clay facing tile and stone trim units are all described.

- Concrete masonry units are generally set in single-wythe construction.
- Veneer or facing units are tied to structural CMU by ladder-type wire ties.
- Control joints in exterior work are normally at a maximum 250 SF per area, with expansion joints as required by the structural engineer of record.
- Sidewalk pavers are normally set in a sand cement bed and require seeping of sand cement prior to acceptance and must resist 4000 psi loading when installed.

Section 047000 Cast Stone – Only used for specialty concrete cast stone.

Division 5 Metals

Section 050000 General Requirements for Metals

STRUCTURAL METAL FRAMING

STRUCTURAL STEEL: Include a complete section in the specifications for this part of the work. In addition to the Structural Engineer notes on the drawings. The Structural Engineer is responsible for complete coordination of statements in the specifications and the notes on the drawings. Structural steel shall comply with the American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."

AFFIDAVIT FROM ERECTOR: the general contractor shall be required to provide an affidavit, at the completion of the job, to the effect that the structural steel frame is plumb and level within normal tolerances specified in the code.

Section 051000 Structural Steel Framing - The section is used to specify structural steel framing meeting AISC 303 & 360 Standards for structural steel buildings, ASTM A325 or 490 Standards for bolts, and AWS D1.1-6 Standards for welding. All castings shall meet ASTM A27, Grade 65-35, medium-strength carbon steel. Signed and sealed shop drawings are required and are to be checked by the structural engineer of record.

METAL JOISTS

Manufacturer's certificate of compliance with the Steel Joist Institute Specifications required.

Prime coat and touch up painting, complying with SJI specifications, will be considered adequate for joists, except where subjected to moisture or where exposed to view.

Section 051200 Architecturally Exposed Structural Steel Framing – refers to framing members near to the human eye when a pedestrian in the building. Meet or exceed AISC 303 for tolerance requirements.

Section 053000 Steel Deck – steel meeting AISI standards for Cold-Rolled Structural Steel Members. Stainless steel - ASTM A1008 SS Grade 33 minimum at yield strength of 38 KSI. Galvanized steel - ASTM A653 structural quality Grade 33 minimum at yield strength 33 KSI. Floor decking shall be formed with integral locking lugs or embossments minimum .050" depth. Submittals shall include calculations and shop drawings, manufacturer's certification, installation instructions, welder certifications and research reports or evaluation reports. Do not bend or mar decking. Manufacturer's certificate of compliance with Steel Deck institute Specifications is required. Prime coat and touch up painting will be considered adequate for metal deck. Except where subjected to moisture or where exposed to view. Use galvanized metal deck for all roof applications.

Vented metal decking shall be used, when topping with insulating concrete roof decks.

Section 054000 Cold Formed Metal Framing – steel sheet for forming shall be ASTM A653/A or 653/M with G60 coating. C-shaped metal studs ASTM C 955 of 16 gauge for window sills, 18

gauge for exterior 6-inch studs, or 22 gauge minimum for interior metal stud framing at 16-inches on center. Comply with AWS D3.1 for welding or ICBO for zinc or cadmium coated screws. Provide four studs at each corner and three studs at each intersection. Provide fire-stopping, attachment blocking, and insulation as required to meet fire requirements and loading.

COLD FORMED and LIGHT GAUGE METAL FRAMING

Exterior walls: "C" SHAPED LOAD BEARING STEEL STUDS AND FURRING STRIPS SHALL BE SPACED 16 INCHES ON CENTER, MAXIMUM. Wind load calculations by a State of Florida registered structural engineer is required for exterior wall application. Wire tying of framing components is not permitted. Use qualified welders and comply with the American Welding society (AWS).

Interior walls: Metal framing shall be used for interior wall partitions
Steel studs shall be 22 gauge or heavier. The use of 25 gauge wall studs is prohibited.
All metal stud framing shall be spaced a maximum of 16 inches on center.

Section 055000 Metal Fabrications

WELDER CERTIFICATION

The General Contractor or Construction Manager is responsible for obtaining and retaining welder certifications for any person performing on-site welded steel fabrication or erection. The certifications must be current and validated by welding logs or certification test (s) conducted within the last two (2) years. All exterior ferrous metals shall be hot-dipped galvanized after fabrication.

METAL STAIRS

Stair treads for public-access stairways shall be concrete with cast metal nosing.
Stairs for disabled shall have railings on both sides and shall comply with the latest Florida Accessibility Code.

HANDRAILS AND RAILINGS

Shall meet the latest ADA requirements and the latest Florida Accessibility Code. Handrails to be aluminum or stainless steel construction. If stainless steel all fasteners shall be stainless steel.
Powder coat finishing is acceptable coordinate with University project manager.

GRATINGS

Ferrous gratings shall be hot-dipped galvanized. Galvanized hardware cloth shall be installed under all areaway gratings.

Division 6 Wood, Plastic and Composites

Section 061000 General Requirements for Wood, Plastic and Composites

HEAVY TIMBER CONSTRUCTION (use only if approved by Owner)

Timber Trusses: With the shop drawings, a complete design analysis of structural components shall be submitted. Data shall bear the seal and signature of a professional architect or engineer, registered in Florida, attesting that the design of trusses meets requirements of applicable codes and design loads.

PREFABRICATED STRUCTURAL WOOD (use only if approved by owner)

Section 061000 Rough Carpentry –

Interior walls: Metal framing shall be used for interior wall partitions, as wood framing is not acceptable. Exterior walls: Wood framing shall not be used in exterior walls. In all Type I construction (per NFPA 220) buildings, the use of wood framing is prohibited, with the exception of: Blocking for the installation of cabinets, shelving and wall hung equipment. Nailing strips for the installation of wood base, chair rails and crown molding. In all Type I construction (per NFPA 220) the use of wood above suspended ceilings is prohibited. All wood blocking, nailers and cant strips utilized in low slope roof membrane systems shall be pressure treated and certified (with the appropriate stamp) for use in roofing applications. All pressure treated wood shall be certified Arsenic free.

Section 064023 Interior Architectural Woodwork –

CUSTOM CASEWORK

Plastic laminate work shall be AWI (Architectural woodwork Institute) “CUSTOM” grade. Fine woodwork and special laminate work shall be AWI “PREMIUM” grade.

COUNTER TOPS

Plastic Laminate Counter Tops: Counter tops shall be a minimum of ¾ inch plywood with a 1/16 inch general purpose grade high pressure decorative laminate surfacing. In laboratories where chemicals are used, plastic laminate shall be acid resistant type. Plywood for use in sink cabinets and counter tops shall be minimum AC-EXT-DFPA grade. In all other areas, use minimum AD or AA-INT-DFPA grade. Particleboard is not acceptable for use in the construction of plastic laminate counter tops.

CABINET WORK

The design and construction of all cabinetwork shall be a minimum AWI “CUSTOM” grade, in accordance with the latest edition of the American Woodwork Institute “Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program” guide book. Drawer slides shall be side mounted type rated for intended use but in no case carrying less than a 100 lbs. load rating. File drawer slides shall carry a minimum 150 lbs. load rating.

Cabinet hinges shall be flush overlay, concealed self-closing, all metal, 165 degree opening.

Division 7 Thermal and Moisture Protection

Section 0711416 Membrane Waterproofing

- **MEMBRANE WATERPROOFING:**

The following are minimum requirements to assure adequately designed waterproofed floors for machine and equipment rooms and other areas subject to flooding from equipment failure or seepage from exterior sources. Drawings shall fully detail the installation of the membrane. Continuous membrane risers shall be provided above the finish floor surface at vertical walls, pads, curbs, pipes and ducts through the slab. Risers shall be at least as high as the lowest curb and shall be bonded to the vertical surface. Concrete foundation walls around elevator pits and around basement, from grade to footing, shall be treated with sixty (60) mil minimum membrane waterproofing. When elevator opens into areas subject to flooding, opening sills must be above membrane riser height to keep flood water out of elevator shaft. If water is present, construction of work slab (mud slab) is recommended, to receive water proofing membrane. Exterior surfaces of walls constructed below finish grade shall be waterproofed, not damp proof. Attention should be paid to termination of below grade waterproofing and its incorporation into the building envelope. Bentonite panel waterproofing and accessory products should be used for positive side below grade applications like elevator pits.

Modified bituminous sheet waterproofing shall be used for above grade applications. Specifications shall be provided for a heavy duty, permanent waterproofing type of membrane capable of adjusting to building movements without breaking the membrane seal. When rubber or plastic membranes are specified, a ten (10) year installer experience clause with written documentation shall be required by the specification. Specifications shall provide for the testing of waterproofed membrane floors by flooding. Floors shall be filled with water to within ¼ inch of top of lowest curb for a period of six (6) hours and closely inspected for leaks; test shall be witnessed by designated representatives of the University. The test shall not relieve the contractor of maintaining a leak free floor until the end of the warranty period.

The General Contractor, Manufacture and installing subcontractor shall furnish a written three (3) year guarantee on the complete membrane waterproofing installation. Submit the guarantee in triplicate. The guarantee shall begin at substantial completion and accepted for use by the Owner. The guarantee shall cover at no cost to the Owner, all labor, materials and equipment required for repair or replacement to correct leaks, faulty materials or workmanship, and reestablishing all conditions and finishes equal to condition prior to repair.

B. DAMP PROOFING

Bituminous Type: Surfaces of exterior walls and walls below grade, which will receive an applied finish, shall be primed and coated with bituminous damp proofing prior too installation of furring.

C. FLASHING

Flashing shall be fabricated and installed so that all water is collected and discharged to the exterior of the building. Membrane or sheet meal flashing systems shall be used. For cavity wall construction like brick masonry veneer, through wall flashing shall be specified and detailed at drainage plane interruptions including heads and sills of openings like doors, windows and louvers and below stone

coping. Provide end dams at vertical terminations of flashing. Unsealed penetrations through flashing materials are prohibited.

D. WALL JOINT SEALANT

Silicone based joint sealant shall be used for exterior joints that do not receive a coating, i.e. brick masonry, stone cladding, meal panel systems, curtain wall panel system, etc. Urethane based joint sealant shall be used for exterior applications that receive a coating material, i.e. Portland cement plaster with a painted surface. Sealant joints shall be constructed with properly sized foam backer rod. Substrate materials may need to be primed to achieve proper adhesion. Field adhesion tests may be required to verify joint construction and adhesion.

Section 072100 Thermal Insulation

- INSULATION

Insulation materials shall comply with the Florida Energy Code and ASHRAE standards. Additional insulation or improved thermal performance materials and systems may be required to achieve efficiency goals associated with LEED certification requirements. All energy calculations must be presented to the university staff for review. Ventilate attic spaces, crawl spaces and air cavities. Provide wall assembly details identifying size, type and placement of insulation; type and location of air barrier and vapor retarder. Roof deck insulation material shall be non-hygroscopic. Provide a vapor barrier under insulation whenever the possibility of condensation exists. Compatibility with roofing materials or separation is mandatory for wood, treated wood, fibrous materials, insulation, etc.

- AIR AND VAPOR BARRIERS

Air and vapor barriers shall be detailed, specified and installed so that condensation will not occur within the wall assembly. Air barrier system performance standards shall be consistent with those established by the Air Barrier Association of America (ABAA), www.airbarrier.org. Radon systems, if required, shall be designed and inspected by a certified Florida Radon Specialist.

- EXTERIOR INSULATION AND FINISH SYSTEMS

The use of exterior insulated and finish systems (EIFS) shall not be used as components of exterior walls. EIFS materials may only be used to repair existing EIFS systems.

- FIRESTOPPING

Fire proofing material shall be cementitious rather than fiber-based. Fire-stopping materials shall have Underwriters Laboratory (UL) ratings consistent with the rating of the wall or floor system. Comply with ASTM E814, "Standard Method of Fire Tests of Through Penetration Fire Stops". Penetration details shall be approved by UL or other agency and shown on drawings. Expandable polyurethane foam is not acceptable for sealing penetrations through rated assemblies.

- SHINGLES AND ROOFING TILES

Follow State University Standard Practice for roofing systems, included at the end of this section.

- METAL WALL PANEL SYSTEM

Meal panel systems shall be detailed and specified continuous vapor barrier systems, flashing and weeps so that water will not accumulate within the wall system. Details shall indicate fastening systems and joint details where the meal panel systems are adjacent to other wall cladding systems such as brick masonry, curtain wall or storefront systems

- TRAFFIC COATINGS

Pedestrian and vehicular traffic coatings for application to the specific type of deck indicated on the drawings. The pedestrian and vehicular deck coatings shall be a complete system of compatible materials including cold liquid applied elastomeric coatings supplied by an approved manufacturer to create a seamless waterproof membrane. The pedestrian and vehicular traffic coatings shall be Class "A" by Underwriters laboratories (ASTM E108/UL790), containers to bear Underwriters label. Material used in coatings system shall meet existing VOC regulations. Apply coatings over previously cleaned, etched surfaces. Treat crack and joints as directed by the manufacturer's written instructions.

- SHINGLES AND ROOFING TILES

Follow State University Standard practice for roofing systems. Specify asphalt roof shingles wind resistant type. Fire-resistant rating shall be UL Class A.

Section 072720 Membrane Roofing

A. MEMBRANE ROOFING

Follow State University Standard practice for roofing systems, included at the end of this section.

Roof decks: The roofing system includes the following basic components: roof deck or substrate, insulation, waterproofing membrane, protective surfacing, flashing, counter flashing, roof cants where applicable, caps and copings, perimeter fascia/gravel stops, sealants, roof expansion and control joints, roof walkway systems, roof hatches, skylights, roof drains, emergency overflow protection, roof drain flashings, scuppers, gutters, downspouts and ballast material where applicable. These components and all type of roofing material, including metal and tile are subject to the requirements of this section. Patios and decks constructed on roofs require special design consideration and shall not violate the roofing requirements of this section. Roof decks must be built with a slope of at least a ¼ inch per foot slope towards drains. Dead level roofs are prohibited. Scupper openings shall be provided through parapet walls. Insure that drains are truly at low points of roofed areas. Install "crickets or saddles" to divert water flow around curbs so as to avoid interference with the designed drainage system. Reroofing projects will require individual assessment for design to provide adequate slope.

The University shall be given two (2) weeks advance notice of intent to start installation of roofing materials. Designated University personnel must be permitted to perform a pre-installation inspection of roofing materials and equipment, to be present throughout roofing installation to observe installation techniques for compliance with specifications and to participate in final inspection. A pre-roofing conference should be included in specifications. The University reserves the right to cut test panels from the finished roof in order to determine that minimum requirements have been met. The roofer shall repair, at his own expense, the roof where test panels were taken.

The General Contractor, Roofing subcontractor and the manufacturer of materials use shall jointly furnish a written twenty (20) year guarantee on the complete roof installation. Submit the guarantee in triplicate. The guarantee shall begin when the project is completed and accepted by owner. The guarantee shall cover, at no cost to the owner, all labor and materials required to repair or replace roofing, flashings, sheet metal and copings as necessary to fully correct leaks, faulty workmanship, or defective materials.

All roofing materials shall be stored in a dry trailer or inside a dry building. Exterior storage on skids or tarpaulin coverage is unacceptable. Asphalt or coal tar pitch may be stored outside if kept under a tarpaulin or plastic film. Roofing felts or insulation which has become wet before or after installation must be removed and replaced. Wet materials shall not be dried or used. Wetted membrane materials must be thoroughly evaluated to determine the effect on adhesion, lap seals or blister potential. Remove any such material if there is any possibility of failure. Emphasize that debris not be allowed to accumulate on roof during construction. All debris to be totally removed from roof daily.

- DESIGN STANDARDS

Florida Building Code current edition: American Society of Civil Engineers minimum design loads for buildings and other structures (edition referenced by current edition of the Florida Building Code). Florida Polytechnic University design and construction standards.

- ROOF INDUSTRY GUIDELINES

The NRCA roofing and waterproofing manual, current edition, published by the National Roofing Contractors Association. Architectural Sheet Metal Manual published by SMACNA (Sheet Metal and Air-conditioning Contractors' National Association). FM Global RoofNav (factory mutual systems approval guide). Underwriters Laboratory (UL) building materials directory. UL Fire Resistance directory. American Society for Testing and Materials (ASTM) Annual book of standards for roofing, waterproofing and bituminous materials. Metal Roofing System Association (technical details). Concrete and Clay Roof Tile Installation Manual published by the Florida roofing, sheet metal and air conditioning contractors association Inc. (FRSA) and the tile roofing institute (TRI) formerly known as Roof Tile Institute. FEMA guidelines for buildings to be used as public shelters.

- ROOF SYSTEM DESIGN

All new, repair and replacement roofing projects shall have plans and specifications developed by a registered architect or engineer licensed by the State of Florida. The professional consultant shall have a minimum of ten (10) years direct experience in roofing design and analysis of roof systems. Design of low slope roofing systems shall consider wind uplift resistance, primary drainage, secondary emergency drainage and insulation to provide thermal resistance.

- WIND DESIGN

Design roof systems to resist extreme wind forces. Structural analysis are required to verify the integrity of all roof components. Wind uplift design shall comply with the most stringent requirements of applicable codes and the latest edition of American Society of Civil Engineers – Minimum design loads for buildings and other structures (ASCE 7, edition referenced by the current edition off the Florida Building Code. The designer shall specify roof systems and system components that have current Florida

Building code product approval or Miami-Dade Notice of Acceptance (NOA) indicating that the system has been satisfactorily tested to resist wind uplift design pressures determined by the project structural engineer. The wind uplift design pressures shall be indicated on the plans according to the Florida Building Code. Roof drainage design shall be to the Florida Plumbing Code current edition.

All requirements of this Standard and referenced standards shall be strictly adhered to. All penetrations and conditions shall be detailed (including fan bases, power supply, equipment corners, terminations, drains, scuppers, overflows, edges, flashings and slopes) according to the recommended procedures provided in the latest edition of the National Roofing Contractors Association (NRCA) roofing and waterproofing manual and installed per manufactures instructions. The details in the manual show standard conditions that shall be adapted to suit each individual project.

Low slope membrane systems over lightweight insulating concrete consist of a minimum of a three (3) ply modified bitumen membrane system (one mechanically fastened base sheet, one modified bituminous interplay sheet and one modified bituminous cap sheet). Cap sheet shall have a white granular or white reflective surfacing.

Modified bitumen three (3) ply over rigid insulation shall consist of a three (3) ply modified bitumen membrane system (one base sheet adhered to a cover board, one modified bituminous interplay sheet and one modified bituminous cap sheet). Cap sheet shall have a white granular or white reflective surfacing.

- ENERGY EFFICIENCY AND ROOF INSULATION

All University facilities will be designed and constructed in accord with Leadership in Energy and Environmental Design (LEED) criteria, or equivalent third party certification, including all newly constructed facilities and roofing replacement projects. Generally, the roof system designs for these facilities will require reflective surfacing materials which comply with Energy Star guidelines.

Roof system designs shall be consistent with energy management requirements of Florida Polytechnic University, Florida Statutes and applicable codes. Insulating values of the finished roof system shall be designed on the basis of economic life cycle return on investment when evaluated against fuel cost.

Insulation materials shall comply with the Florida Building Code and ASHRAE 90.1. Additional insulation or improved thermal performance materials and systems may be required to achieve energy efficiency goals associated with LEED certification requirements.

A minimum final slope of ¼ inch per foot shall be required on all new roof systems. The roof surface shall have positive slope with no ponding. Areas exhibiting ponding shall be re-worked, not merely have the number of plies increased.

Section 072900 SUS Standards for Roofing Assemblies

STATE UNIVERSITY SYSTEM STANDARD PRACTICE FOR ROOFING SYSTEMS FOR UNIVERSITY FACILITES
(CM-N-16.02-02/00)

- ROOF SYSTEM COMPONENTS:

The roof system includes the following basic components: roof deck or substrate, insulation, waterproofing membrane, protective surfacing, flashing, counter flashing, roof cants where applicable, caps and copings, perimeter fascia/gravel stops, sealants, roof expansion and control joints, roof walkway systems, roof hatches, skylights, roof drains, emergency overflow protection, roof drain flashing, scuppers, gutters, downspouts and ballast material where applicable. These components and all types of roofing material, including metal and tile, are subject to the requirements of this Chancellor's Memorandum (CM). Patios and decks constructed on roofs require special design consideration and shall not violate the roofing requirements.

- APPROVED ROOFING MATERIALS

The selection of roofing materials shall be limited to those manufactures with a fifteen (15) year history of satisfactory manufacture and installation of at least 250,000 squares of their roof system, and who provide a minimum twenty (20) year unlimited warranty/ guaranteed for labor and materials, including metal finishes.

- REGISTERED ARCHITECT OR ENGINEER REQUIRED

All new, repair and replacement roofing projects shall have plan specifications developed by a registered architect or engineer licensed by the State of Florida. The engineer shall be a professional engineer, with a minimum of ten (10) years direct experience in design and analysis of roof systems, and certified as a registered roof consultant by the Roof Consultants Institute.

- STEEP SLOPE ROOFING

Steep slope roofing includes slate, tile and metal roof systems. Steep slope roofing shall not be utilized on University facilities on slopes less than four (4) inches per foot unless a waterproof underlayment system is utilized beneath the steep roofing components. Under no circumstances shall slate or tile be installed at slopes less than two (2) inches per foot.

- ENERGY MANAGEMENT

Roof system design shall be consistent with the energy management requirements of the State University System, Florida Statutes and applicable codes. Insulating values of the finished roof system shall be designed on the basis of economic life cycle return on investment when evaluated against fuel cost.

- ROOFING CARRIED OUT BY UNIVERSITY PERSONNEL

Roofing projects carried out by University personnel shall be performed in a manner approved by the roof system manufacturer or one of its licensed roofing contractors. Repairs to low slope roofs shall be accomplished in accordance with the National Roofing Contractors Association Repair Manual for Low-Slope Membrane roof systems or manufacture's requirement's to maintain warranty.

- ROOF MEMBRANE PENETRATIONS

All penetrations of the roof membrane shall be detailed according to the recommended procedures provided in the latest National Roofing Contractors Association (NRCA) roofing and waterproofing manual and installed per manufactures instructions. The details in the manual show standard conditions which should be adapted to suit each individual project.

- EXPANSION JOINTS

Structural expansion joints occurring in new construction shall be located at high points in the structure or roof insulation to the maximum extent practicable to allow water to flow away from them on the roof surface. Under no circumstances are expansion joints to be placed such that roof water must flow across them to reach drains.

- UTILITY SUPPLY LINES

Utility supply lines (electrical, water, gas, etc.) to roof mounted equipment shall be installed within the supporting curb of that equipment.

- THROUGH WALL FLASHINGS

Architects/Engineers designing new facilities shall be cautioned to carefully locate through-wall flashings at sufficient elevation above anticipated finished roof level to ensure minimum base flashing height as defined herein can be met. Elevations and accessibility of other components shall be considered for their impact on roofing installation, including re-roofing of the facility. Such components as siding, window sills (above roof level), equipment supports, stucco facades, etc. can greatly hamper appropriate installation of roofing components and thus have a significant impact on the costs and feasibility of re-roofing.

- EMERGENCY OVERFLOW PROTECTION

All roof systems shall have a secondary means of evacuating water from the surface of the roof in the event the primary drainage system is blocked. The secondary system shall be totally independent of the primary system and may consist of overflow scuppers through walls, an independent internal overflow drainage system, or other suitable means. The structural components of a roof system shall be reviewed by a licensed professional structural engineer to ensure that any water, which accumulates on a roof system in the event of failure of the primary system will not overstress the structure. Water shall not be allowed to accumulate to a depth greater than four (4) inches.

- INTERNAL GUTTERS

Internal gutters are prohibited on new facilities. Internal gutters on existing facilities shall be eliminated during re-roofing projects to the extent practicable.

- ROOF ACCESS

All roof areas shall be permanently equipped with a reasonable means of access for purposes of maintenance of the roof system and any roof mounted equipment. Access can be in the form of internal roof scuttles. External wall mounted ladders may only be considered if no other means of access is available and only where safety and security can be maintained.

- ROOF-MOUNTED EQUIPMENT

Roof-mounted equipment is not acceptable if other locations for replacement can be found. All roof-mounted equipment shall be provided with roof surface walkway access to allow ease of maintenance and minimize roof surface damage. Roof mounted antenna, lightning protection anchorage, lab equipment, or scientific devices shall be located in areas specifically designed for that purpose. Roof

loads, walking surfaces, anchoring devices, mounting pads, cubs, or utility needs shall be designed and provided using appropriate details, adapted as required, from the NRCA roofing and waterproofing manual. Pitch pockets are prohibited. Pitch pockets are not permitted, including those filled with a urethane, butyl rubber or similar pourable caulking, and bituminous materials.

- ROOF COATINGS

Specific spray-applied polyurethane foam roof systems and specific roof coatings shall be considered for new and re-roofing projects where the Architect/Engineer and the University demonstrated that their use is appropriate and when specific and acceptable monitoring and control measures are carried out throughout the design and construction periods. When replacement of a roof is required, criteria for the replacement roof shall be in full compliance with this CM.

- MINIMUM SLOPE

A minimum slope of $\frac{1}{4}$ inch per foot shall be required on all areas of a new roof system before final acceptance of that roof system by the University. On existing roofs where it is impractical to attain the required $\frac{1}{4}$ inch slope, a minimum slope of $\frac{1}{8}$ inch may be permitted if other provisions are made to ensure that the integrity of the roof and drainage systems are maintained. Built-up roofs constructed with coal tar pitch as the interplay mopping and surfacing may be applied on "dead flat" areas where existing conditions prohibit installation of tapered materials and the roof system manufacturer will issue the required warranty with no exclusion for standing water. Overflow protection shall be provided.

- BASE FLASHING

All base flashing shall extend a minimum of ten (10) inches up the vertical surface of curbs, walls or roof penetrations. The dimension is from the top of the membrane (or ballast) to the top of the base flashing.

- CANTS

Four (4) inch pressure treated wood cant strips shall be required around all vertical interruptions of the roof system, such as curbs and walls. In certain circumstances, where their use is justified, fiber cants are permitted.

- ACCESS DOOR THRESHOLDS

Access door thresholds to the roof or roof hatches shall be twelve (12) inches above the adjacent roof surface. An acceptable walking surface shall be installed immediately outside the access door threshold on the roof system.

- ROOFING CONTRACTORS

All roofing contractors working on University facilities shall have a current State of Florida license and be certified/approved as a roofing contractor by the manufacture for the system being installed or repaired. Roofing contractor firms shall have a minimum of five (5) years of experience installing the type of system specified. Experience shall have been earned by the firm proposing the work, not the individual employees. In addition, the job site superintendent shall have a minimum of five (5) years of experience installing the type of system specified.

- ROOFING OVER EXISTING ROOFS

The application of new roof materials over existing roof will not be permitted until a nuclear or infrared scan (or other acceptable method of moisture detection) of that roof has been completed and all wet areas detected by that scan/method have been removed. After the new roof is installed, roof scans are to be made to record the condition of the new roof and compliance with specifications.

- ROOF SCAN

All new roofing shall require acceptable roof scans to ensure satisfactory compliance with specifications.

- INSULATING LIGHT-WEIGHT CONCRETE

Insulating light-weight concrete over vented (perforated) metal roof decking is permitted. Insulating light-weight concrete over structural concrete slabs as part of the roof system or over roof assemblies is acceptable provided: Insulating light-weight fill thickness (over substrate or insulation board) is a minimum one (1) inch, not to exceed one and a half (1-1/2) inches; and insulating light-weight concrete is aggregate based and has a minimum compressive strength of 300 psi. Roof vents through the membrane will be acceptable provided they are insulated, spun aluminum roof vents having a one-way valve design. Roof vents constructed of PVC are not acceptable. Tested by Underwriters Laboratories in accordance with the procedures of ASTM E 119 and listed in the most recent Underwriters Laboratories Fire Resistance Directory. Tested by Factory Mutual Research and listed in the most recent Factory Mutual Approval Guide as non-combustible or Class 1; and Tested by Factory Mutual Research for windstorm classification I-120 and listed in the most recent Factory Mutual Approval Guide.

- RESATURANTS

Resaturants are not acceptable for rejuvenation of an existing built-up roofing system.

- GALVANIZED METAL FLASHING

The use of galvanized metal flashing is not acceptable.

- ASBESTOS

The use of roofing materials containing asbestos is prohibited in the installation of new or the repair of existing roof systems. The removal of roofing containing asbestos shall be carried out by State certified roofing contractors. Asbestos roofing removal shall be conducted in accordance with all requirements of Environmental Protection Agency, Occupational Safety and Health Administration, and Florida Statutes: and all applicable rules of the department of Business and Professional Regulation, Department of Environmental Protection, Department of Labor and Employment Security or other state agencies having jurisdictional authority.

- CODES AND STANDARDS

The University shall ensure that all architects, engineers, specifiers, consultants, inspectors, installers and University maintenance personnel utilize the following resources: the latest edition of all applicable Building Codes, the Factory Mutual Systems Approval Guide, The Underwriters Laboratory (UL) Building Materials Directory, the UL Fire Resistance Directory, and the American Society for Testing and Materials Board of Standards Volume for Roofing. Waterproofing and Bituminous Materials, the Architectural

Sheet Metal Manual by the Sheet Metal and Air Conditioning Contractors' National Association, recommended standards and technical details of the Metal Roofing Systems Association, and, the NRCA Roofing and Waterproofing Manual. The University shall emphasize to the Architect/Engineer the need to design to resist extreme wind forces. Structural analyses shall be required to verify the integrity of all roof components. Wind uplift design shall comply with the most stringent requirements of applicable codes and the latest edition of American Society of Civil Engineers-Minimum Design Loads for Buildings and Other Structures (ASCE 7-98). The Architect/Engineer shall also be required to consider long-term serviceability in the design of all roof systems.

- PLAN REVIEW

The University offices of Campus Development & Facilities shall review plans and specifications for compliance with State University System roofing standards and ensure that the requirements of this CM are met.

- ALTERNATIVE ROOFING SYSTEMS

If the Architect/Engineer proposes a specific alternative roof system, i.e. a unique or non-traditional system, the University shall conduct a preliminary evaluation of the system and make the necessary recommendations to the State University System Office of Facilities Planning (SUSOP). A request to install an alternative roof system shall be in writing and include justification data. The SUSOP will advise the University whether or not the request is approved.

- PRE-CONSTRUCTION CONFERENCE

The University shall ensure that a roofing preconstruction conference is conducted for all new and re-roofing projects at which the University offices of Campus Development & Facilities, architect/engineer, general contractor, roofing contractor, roofing manufacturer's representative and other related trades' representatives are present.

- PROTECTION PLANS

The University shall require a specific protection plan for all new and re-roofing projects to describe the means of maintaining the building in a safe and watertight condition throughout the construction period. Existing and newly installed roof systems shall be considered in the protection plan to ensure roofing operations do not damage them. Areas where the roof deck/structure are (or may be) damaged or deteriorated shall only be re-roofed when the occupied spaces below are unoccupied. Other potential phases of re-roofing operations can be hazardous to the facility and its occupants and shall be carefully reviewed with the Architect/Engineer during design, with prospective contractors during bidding, and at appropriate phases during construction.

- INSPECTION OF INSTALLATION

The University shall provide full-time inspection whenever the roof system is being installed (roofing, flashing, gravel, etc.). The inspector shall be knowledgeable in roofing specifications and appropriate installation or repair procedures. The inspector shall be required to issue written reports on a daily basis which include, at a minimum: the name, address, and phone number of the roofing contractor, the name of the roofing foreman/superintendent, description of the day's weather, number of roofers/sheet metal mechanics on project, location of the day's work, description of work accomplished,

deficiencies observed in the work requiring correction, a description of materials incorporated into the day's work and those stored for later use, and a quantitative summary of unit price items incorporated into the day's work. Roof system installation inspection may be acquired as professional services from project funds. The University shall require the Architect/Engineer to include in the project specifications the requirement that the roof membrane manufacture make a minimum of three (3) visits during application and one (1) visit at the time of substantial completion inspection with a written report of each visit to the Architect/Engineer and the University. Manufacture inspections shall be accomplished by technical representatives with a minimum of five (5) years direct working experience with the technical department of that manufacture.

- WARRANTIES AND GUARANTEES

The University shall maintain copies of all roof warranties/guarantees and records of all roof maintenance work. The effective date of warranties is the date of substantial completion by the University.

- COMPREHENSIVE ROOF MANAGEMENT PROGRAM

The University shall establish a comprehensive roof management program for each facility to include: Historic records and roof asset information listing the Architect/Engineer, general contractor, roofing contractor, manufacture and supplier, type of roof system, including all individual components, warranty/guarantee dates and data, history of repairs, regular surveys and inspection data, preventative and planned maintenance procedures, projected replacement and budget needs. Periodic roofing inspections and checklist: At least one inspection per roof area per year by qualified independent roofing technicians, who are not affiliated with roofing contractors, roof system manufacturer's or suppliers including descriptions of roof related defects in the surfacing, membrane, membrane flashings, metal flashings, penetrations, equipment, walls, etc. Itemized descriptions of remedial work requirements with itemized cost estimates for each necessary to restore the integrity of the defective area to the service level of the overall roof system. A roof plan for each roof area or group of roof areas indicating the precise location of each remedial action necessary and the non-destructive testing results. A cumulative summary of all maintenance and repair costs, An overall/replacement budget in tabular form summarizing the derived repair costs per facility. As part of this summary, maintenance costs are to be projected five (5) years from date of each inspection to provide anticipated budget requirements well in advance. Costs for roof replacement versus roof repair shall be included with respective costs by year.

Division 8 Doors, Windows and Glazing

Section 081000 General Requirements for Doors, Windows and Glazing –

Comply with the requirements of access for persons with disabilities

In renovations of existing buildings, door finish and style shall be in keeping with existing doors that remain. Doors along hallways shall be uniform in appearance. New door hardware shall match the existing.

Section 081100 Doors

- INTERIOR: all typical interior doors shall be solid core, hardwood veneer. Hollow core or Formica-covered doors are not acceptable.
- EXTERIOR: Exterior doors shall be galvanized, solid core flush steel or anodized aluminum.
- FIRE RATED: Fire-rated doors and frames shall have appropriate UL labels.
- FRAMES: Frames shall be hollow metal, fully welded along entire depth. Knockdown frames are acceptable only in renovation projects, with prior approval by the University. Exterior hollow metal frames shall be galvanized steel (grout filled) or anodized aluminum.

Section 084113 Aluminum Framed Entrances and Storefronts

- All new, repair and replacement window glazing projects shall have plans and specifications prepared by a registered architect or engineer licensed by the State of Florida. The professional consultant shall have a minimum of ten (10) years direct experience in window design.
- All glass in entrances and storefronts and glass installed in hazardous locations shall be fully tempered safety type.
- Pairs of double doors shall have removable mullion with lock strike unless approval is given by the University to deviate from this requirement.
- The designer shall specify current Florida Building Code Product Approval or Miami-Dade Notice of Acceptance (NOA) indicating that the system has been satisfactorily tested for wind design pressures as determined by the project structural engineer. The wind design pressures shall be indicated on the plans according to the Florida Building Code. Window assemblies must have the impact resistance ratings required by Code for the intended application.
- All installations shall comply with the following industry standards and guidelines:
 - Florida Building Code, current edition
 - American Society of Civil Engineers-Minimum Design Loads for Buildings and other Structures (ASCE7-02, or edition referenced by the current edition of the Florida Building Code).
 - American Architectural Manufacturers Association (AAMA)
 - GANA Glazing Manual, Glass Association of America
 - ASTM International
 - ASTM C1036- standard specifications for flat glass
 - ASTM C1048-standard specifications for heat treated glass
 - ASTM E2112-standard practice for installation of exterior windows, doors and skylights

- Frames shall be factory finished. Depending on the application, framing systems may be thermally broken or thermally isolated to resist condensation.
- All glazing shall be insulated. Glazing options may need to be analyzed as a part of energy modeling requirements.
- Tinting of glazing, if any, must be presented to and approved by the University during design. Surface applied window film shall not be used.
- The installer shall be certified by the manufacturer and the manufacturer shall certify the installation on completion.

Section 087100 Hardware

- All doors and associated hardware shall comply with the Florida Building Code and the Florida Accessibility Code.
- Closers shall be surface mounted, non-handed, and full rack and pinion hydraulic action. Specify heavy duty type with broad range of adjustment of door. Open pressure of five (5) pounds maximum for interior doors, 8.5 pounds maximum for exterior doors. Covers shall be of clean design, high impact, with aluminum finish and shall be type which does not require removal to make adjustments.
- Use concealed or minimum profile paralleled arm closures.
- Interior door closures shall not be visible from corridors, lobbies, and other public spaces. Room side visibility is desired.
- Overhead closures shall be mounted so that they are not exposed to the weather and so that they do not hit walls or other surfaces when doors are opened to full swing (minimum full swing: 90 degrees). Closures shall be mounted to doors with through bolts.
- Door stops shall be provided on all interior and exterior doors.
- Kick plates will extend the full width of the door.
- Door closers shall be adjusted prior to Substantial Completion so that doors shall be operable by a maximum required pressure of eight (8) pounds.

STOPS

Overhead stops are preferred on exterior doors. They shall be coordinated to stop the door simultaneously with the door closer check mechanism, when provided. Hold-open or select hold open features on overhead stops of exterior doors are not permitted, except where the building function requires such, in which case the select hold open type is to be used.

INTERIOR DOORS

Wall mounted convex rubber bumpers, with concealed fasteners shall be used. Provide blocking in wall as required for bumper installation.

EXTERIOR DOORS

Specify extra heavy-duty door checks or some other means of protection from wind damage.

POWER DOOR OPERATORS

On new buildings and major renovations, at least one entrance door shall be electrically operated sliding door, to facilitate access by disabled persons. Door operators may be surface mounted or concealed in the door head. Electric operator switches may be wall mounted or post mounted. Installation and equipment shall be provided by a factory authorized and trained distributor. Maintenance manuals shall be included in the close-out documents showing templates, wiring diagrams and full maintenance instructions. Automatic reset is required. If the door is locked or if the door encounters an obstacle when the operator is activated, the operator system will do one of the following: Continue to push gently on the door until the time delay period expire, then close. Sense the resistance, shut off power and close.

Operator systems shall have:

- A. Adjustable time delay period (opening time plus hold open time) shall be approximately twenty (20) seconds, adjustable from at least forty (40) seconds to seven (7) seconds minimum.
- B. Adjustable opening speed (time from activation until door is fully open) shall be approximately seven (7) seconds, adjustable from at least eleven (11) seconds to five (5) seconds minimum.
- C. Slow closing speed approximately seven (7) seconds. Adjustability is desirable but not mandatory.
- D. Full compliance with ANSI 117, and Life Safety Code.
- E. Weatherproof controls and circuitry.
- F. Low voltage current from operators to controls.
- G. Heavy-duty "supermarket" quality.
- H. Easy manual door operation. In event of power failure or pedestrian impatience, pressure on strike side of door equal to that required to open a conventional thirty-six (36) inch wide door with closer shall be adequate to open the door manually.
- I. Easy access for maintenance. Access covers, if provided, must also have vandal resistant screw attachment.
- J. Operation must be smooth and quiet.
- K. Closer shall be spring type which functions with power on or off.

PANIC DEVICES

Panic devices shall be push-rail type, with "ETL" lever type function. Outside doors shall lock automatically when closed. Such doors shall have a TP-2 thumb-piece function. All emergency exits must be equipped with panic devices. Panic devices shall be through bolted where possible. Vertical rod devices shall be used at double doors. Emergency exit alarm locks may be key operated from the inside, the outside or both, as directed by the University.

MISCELLANEOUS

Thresholds shall be set in mastic and thoroughly anchored to concrete floors. Expansion shields of any kind are generally not acceptable, particularly at construction joints. Silencers or mutes shall be provided at all door frames, at a minimum of three per door. Closers and/or magnetic hold open devices shall be specified in accordance with all applicable codes. They shall be integral, the one with the other, when possible. Push/pull finishes shall match other hardware used. Where both a push and pull are used, they shall be through bolted to each other. Pulls on exterior doors shall be of a design that will not create a lever action at the point of attachment to the doors; i.e., mountings shall be made with two-point connections to the door.

HOLD OPEN DEVICES

Magnetic hold-open devices should be specified in areas where automatic closers are required, but traffic patterns force the doors to be normally open. The hold-open device shall automatically release the doors upon activation of the fire alarm system or power failure.

NOISE CONTROL

On machine room doors and other doors where excessive noise is anticipated, weather stripping at heads and jambs and surface applied automatic door buttons shall be specified.

Section 088000 Glazing

GLAZING

Use of tinted, mirrored, fritted, translucent glass, and/or spandrel panels is subject to approval of the University. All glazing shall be designed for Energy Conservation. Borrowed light windows (where used in partitions between corridors and rooms) shall be glazed with 1/4-inch wired glass set in hollow metal frame or as required by code. Size of wire glass panel as permitted by code. Laminated glass shall be 1/4-inch thick safety glass, or an approved equal.

- **INSULATING GLASS**

Insulating and reflective insulating glass, guarantee: Provide manufacturer's written guarantee that, for ten (10) years from date of building completion, a replacement will be provided for any unit which develops edge separation or other defects which materially obstruct vision through the glass or safety or affects the insulating qualities; except, that guarantee shall not cover breakage from physical abuse, earthquake, storm, or similar causes. Partial shading of insulating glass can cause stress breakage. Manufacturer's consider this to be a design error and will not replace broken glass broken by temperature differential stresses. Avoid partial shading of large panes.

- **MIRROR GLASS**

Framed mirrors for toilet and shower rooms should be included in Division 10. Large mirrors unframed, or in custom made frames, should be included in this division.

Division 9 Finishes

Section 091000 General Requirements for Finishes

- A. The iconic Innovation, Science and Technology Building will help set the standard for finishes on the Florida polytechnic University Campus for ceilings, walls, base and floor finishes.
- B. Finishes shall not be loaded or installed prior to conditioning of the building. Provide a full color and finish schedule.

MISCELLANEOUS REQUIREMENTS

Suspensions from ceiling runners must be secured to the structure above by toggle, molly bolts, self-drilling anchors, cast-in inserts, or bolts in expansion shields. The use of wood, lead, or plastic plugs is prohibited. Use of asbestos, in any form, is expressly prohibited. The use of acoustic tile or lay-in panels at less than eight (8) feet above floor is prohibited unless approved by the University. Provide fire-rated ceilings as required for floor/ceiling and roof/ceiling assemblies.

The use of resilient tile in front of urinals is prohibited. Use of ink marking pens on surfaces of any kind of materials is prohibited. Experience has shown that such marks bleed through paint and other finishes. Non-standard sizes of resilient tile is prohibited.

FIRE RATED CEILINGS

Because of the limitations applying to the use of lath and plaster for ceiling construction, finish materials for fire-rated ceilings will generally, but not necessarily, be limited to fire rated gypsum board.

CANOPY SUSPENSION CEILINGS

Stainless steel hanger wires must be specified for canopy suspension systems and for other systems in locations subject to moisture penetration or condensation.

SUPPORTS FOR CEILINGS

Ceiling grid systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines, and vice versa. Each utility system and the ceiling grid system shall be a separate installation and each shall be independently supported from the building structure. Where interference's occur, provide trapeze type hangers or other suitable supports for each system. Locate hangers and supports where they will not interfere with access to mixing boxes, fire dampers, valves, and other appurtenances requiring service.

The requirements for independent supports for ceiling grid systems shall be repeated in the applicable sections of the specifications. If patented ceiling suspension systems are required for plaster, gypsum board, and acoustic ceilings, a separate section may be written for the systems; or each separate system may be specified in the section for the particular ceiling material. However, it is preferred that suspension systems for acoustic ceilings be specified with the ceiling materials to avoid divided responsibilities.

Ceiling suspension systems shall be supported from the building structure and shall be supported at all four corners and two sides of fluorescent light fixtures. Installation require coordination with electrical layouts. Separate safety supports for light fixtures must be specified in Division 16.

ACOUSTICAL TREATMENT

Mineral fiber lay-in type acoustic ceilings shall be specified. Panels shall be a minimum of 5/8" thick and maximum panel size shall be 2 feet X 2 feet. Other size panels may be used subject to review and approval by the University. Edge treatment shall be tegular, unless otherwise specified. All ceiling panels shall be non-directional fissured. Ceiling panels may be laid only after ALL work, including telephone wiring, has been completed above ceiling and the building's HVAC system is operational.

LATH AND PLASTER

Exterior Portland cement plaster stucco shall use an integral color, or paint. Comply with Portland cement and plastering standards ANSI A42.2 and ANSI A42.3. Veneer plaster over standard gypsum board or metal lath, or skim-coated plaster over gypsum board backing may be used under special circumstances. Texture of plaster veneer shall be smooth or match existing. Include corner bead in all cases, whether plaster is used or not.

Section 092400 Cement Plastering

- A. INTERIOR WALL FINISH: Paint over high-impact gypsum wallboard to 48" AFF or higher is the standard interior wall finish for all corridors, classrooms, and other high-use areas. Veneer plaster over standard GWB or metal lath, or skim coat plaster over gypsum board backing may be used under special circumstances. Texture of plaster veneer shall be smooth or match existing. Include corner bead in all case, whether plaster is used or not.
- B. STUCCO: Exterior plaster should not be used for walls; however, if its use is unavoidable, it shall be coated with an elastomeric coating.

Section 092900 Gypsum Wall Board

- A. Standard for University finishes will be 5/8-inch Type X gypsum wall board.
- B. Water resistive "Green" board shall be used in all wet areas.
- C. High impact resistant board shall be used in all corridors.

Section 093000 Porcelain Tiling

- A. Floor tile to be Type CTF-1 factory mounted unglazed porcelain tile 4"x4".
- B. Wall tile to be Type CTW-1 porcelain wall tile 24"x12".
- C. Latex Portland cement mortar equal to ANSI A108.02 Laticrete.

Section 095113 Acoustical Panel Ceilings

- A. Standard is 24x24x3/4-inch tegular-fizzured mineral fiber tile.
- B. Armstrong, Chicago Metallic or equal with wide-faced capped steel tee grid.
- C. Provide #12 wire suspension at minimum 48 inch centers and six at each 48-inch light fixture.

Section 096513 Resilient Base and Accessories

- A. Rubber base is preferred for all applications.
- B. Mercer, Johnson or equal 1/8-inch by four inches.

FLOORING

Section 096723 Resinous Flooring

- A. Resinous flooring required for all laboratory installations.
- B. Match IST Building standards.

A. VINYL

Vinyl composition tile, 1/8 inch thick. Non-standard sizes are prohibited. In some instances the University may feel that the use of rubber tile, sheet vinyl, or materials other than vinyl composition tile may be advantageous. Approval by the University is required prior to specifying such materials.

Wall bases shall be 1/8" thick with coved toe, rounded top edge and four-inch minimum height; preformed internal and external corners shall be used when available. Terminal ends of base shall be beveled and toes rounded.

Furnish not less than one box for each fifty boxes or fraction thereof, of each class, wearing surface, color, pattern, and size of resilient floor installed. Non-standard resilient floor or base materials may be required to submit evidence of their resistance to flame propagation and smoke development as well as production of toxic gasses. Four copies of test results from a recognized laboratory and four copies of a notarized statement, signed by an officer of the manufacturing company, confirming that the flooring or base products proposed for use are those which have passed flammability, smoke, and toxic gas tests selected. If test reports and certification shall be required, the installer shall submit four copies attesting that materials actually installed are the same as those certified by the manufacturer as meeting specified requirements.

Section 096813 Tile Carpeting

- A. Tile carpeting required in all offices.
- B. May be used for walk-off mats.
- C. Interface Flooring, Super Floor or equal.

B. CARPET

Modular tile carpeting for use in designated educational facilities shall be a high-performance, branded 100% Type 6 or 6.6 nylon with a modification ratio of less than 2.5. Fibers with a post-consumer content will be considered. Mill extruded nylons will not be accepted. Carpet shall be tufted and have a manufacturer's standard vinyl or hard back backing system which provides a non-permanent installation application, using pressure sensitive, releasable adhesive or a pre-adhered adhesive system, meeting or exceeding requirements for certification according to the CRI Green Label Plus IAQ Test Program. Carpet tile shall be recyclable meeting USGBC LEED Rating System requirements and shall have third party certification. Carpet should be "Scotchguard" treated. When using carpet tiles, carpet tiles shall be either 18" X 18" to 40" X 40" or other modular size. The carpet fiber shall be a high quality nylon, no olefin fibers, multi color yarn, meet ADA requirements and be recycled, either by the manufacturer or by some other company specializing in such. The carpet backing shall be impervious to liquids. The carpet anti-static control shall be permanent. Anti-static topical coatings are not acceptable. The maximum acceptable static build-up when tested in compliance with test standards AATCC-134 shall be maximum 3.5 kilovolts at 70 degrees Fahrenheit and 20% relative humidity.

C. INSTALLATION ENVIRONMENTAL CONDITIONS

Tile carpeting shall not be delivered or installed until building is enclosed, wet work completed, and HVAC system is operating and maintaining temperature and humidity at occupancy level during remainder of construction period. Comply with CRI 104, section 6.1 site conditions: **Temperature and Humidity.** Ensure that the carpet tile is installed only when the concrete moisture content is below the carpet manufacturer's written recommendations.

D. EXTRA MATERIALS

Provide additional carpet tiles equal to 1% of each type, color, and pattern furnished for use as maintenance stock. This stock shall be designated for use by the University only, after completion of the project and shall not be used for repair or replacement during warranty period.

E. INSTALLATION PROCEDURES

Provide all items and accessories as required for a total and complete installation in every respect. Complete preparation and field verification procedures identified. Use trowelable leveling and patching compounds as recommended by carpet tile manufacturer for filling cracks, holes, and depressions in substrates. Remove coatings including curing compounds and other substances that are incompatible with adhesives. Install tile carpeting and walk off tile using releasable installation method. Provide adhesive free system that suits subfloor conditions indicated and complies with flammability requirements for installed carpet tile.

As an alternate, if prior approval is obtained for the University, provide water resistant, mildew resistant, non-staining, pressure sensitive adhesive to suit products and sub floor conditions indicated; that complies with flammability requirements for installed carpet tile and recommended by carpet manufacturer for releasable installations.

Where the carpet tile does not continue beyond a door to another room, extend carpet tile into door reveals so that carpet tile stops under door when door is in closed position. Remove any adhesives, paint, or other products on the carpet immediately during carpet installation.

F. PROTECTION

Protect tile carpeting against damage from construction operations and placement of equipment and fixtures during remainder of construction period as recommended by manufacture and as required by **CRI 104, Section 15, Protection of Indoor Installation.** Do not use plastic, adhesive sheet. Immediately prior to final inspection, carpeted areas shall be totally cleaned of all soil, including dirt, dust, spots, stains, adhesives, paint, etc.

If design conditions, or budget, dictate thin-set method of installation, marble chip or ceramic granule toppings may be installed with chemical matrix or with cement matrix chemically bonded to the substrate, only when such methods and materials are approved by the University.

G. CARPETING (Glue-Down Installation)

RESTRICTED AREAS:

Heavy traffic areas. Do not plan carpet for corridors which carry heavy traffic. Do not use carpet under vending machines and for a distance of at least six (6) feet in front of machines. Omit carpet in or near serving lines area of food service. No carpet on stairs, under water coolers, and in direct entry from

exterior. Previously uncarpeted areas particularly areas below grade and subject to moist conditions shall not be carpeted without review and approval for carpet by the University. Use glue down methods of installation utilizing a non-asbestos containing adhesive. Carpet adhesives shall be low odor/solvent content. Other installation methods may be acceptable with prior approval from the University.

SELECTION CRITERIA

A. INDUSTRY STANDARDS AND TESTS

- NFPA 253
- Floor Covering Installation Board (FCIB)
- Carpet and Rug Institute (CRI)
- Floor Covering Installation Contractors Association

B. APPLICABLE PUBLICATIONS

- MasterSpec section 09 68 13 TILE CARPETING
- CRI 104 standard for installation of commercial carpet

C. SUSTAINABLE COMPLIANCE

The University prefers those carpet tile manufactures with an operational carpet tile-recycling program for 100% of the carpet product (at the end of its useful life). Third party certification shall be required.

D. MANUFACTURES QUALIFICATIONS

Utilize only manufactures making the specified materials as a current and regular production item. Manufactures of specified carpet tiles shall have a minimum of fifteen (15) years of production experience with carpet tiles of similar types and whose published product literature clearly indicates compliance of their product with a particular carpet tile specified. Manufacture shall provide verification of registration to ISO 9001/9002 QUALITY MANAGEMENT SYSTEM and ISO 14001 ENVIROMENTAL MANAGEMENT SYSTEM. Manufactures to provide three (3) references of installations in similar facilities. Manufactures must provide Chain of Responsibility that states they will take back their product for recycling at the end of its useful life.

E. WARRANTY

Special Tile Carpeting Warranty: Written warranty, non-prorated, signed by carpet tile manufacturer agreeing to remove and replace tile carpeting installation that fails in materials and workmanship within the specified warranty period. Failures include, but are not limited to, more than ten (10) percent loss of face fiber/yarn loss by weight, normal use, edge raveling, runs, loss of tuft bind strength, dimensional stability, excess static discharge, delamination and stain resistance. Warranty shall not require the use of chair pads. Manufacture period: Fifteen (15) years from date of order. Manufacture shall warranty that dye lots are mergeable. Warranty shall identify the following: Pattern name, pattern color, square yards used. In case of multiple buildings where tile carpeting has been used, identify building name/number and pattern, pattern color, square yards used.

F. PRODUCT SYSTEM

CARPET TILE CHARACTERISTICS (minimum)

- A. Fiber content:** 100% nylon Type 6 or 6.6 with Modification Ratio of less than 2.5.
- B. Fiber type:** Branded type, Aquafil, Struttura, Invista, Solutia.

- C. Dye method:** Minimum of 65% solution dyed.
- D. Mergeability:** Tile carpeting that is of the same style/color, but from different dye lots and/or manufacturing dates, may be merged and used interchangeably, both at initial installation and at later selective replacement, to create a continuous carpeted surface with no tile appearing out of place.
- E. Color and pattern:** Selected by architect and approved by owner.
- F. Pile density:** 5400 minimum.
- G. Gauge:** 1/12" minimum.
- H. Surface pile weight:** 17 oz./sq. yd. minimum.
- I. Size:** Approximately 18 X 18" to 40"X40" square.
- J. Stiches per inch:** 8.00" minimum.
- K. Backing systems:** Manufacturer's standard vinyl or thermoplastic hard-backed backing system, 39% minimum total recycled content, maintaining a 100% true moisture barrier between secondary backing and the floor substrate below, passing the British Spill Test, Method E.
- L. Colorfastness to crocking:** Not less than 4, wet and dry, per AATCC-165.
- M. Colorfastness to light:** Not less than 4 after 60 AFU (AATCC fading units) per AATCC16.
- N. Stain resistance:** AATCC-175, must pass Acid Red 40 spot test with an 8 or better.
- O. Antimicrobial treatment:** Must have low water solubility and not be metallic or halogen based. Not less than 2-MM halo of inhibition for gram-positive bacteria: no less than 1 mm, AATCC 138 washed, AATCC 174 parts 2&3. (if requested, provide the University with independent test certification(s) that states use of antimicrobial treatment is in compliance with all government regulations, including the AATCC specifications stated in this paragraph, regarding its use within the complete carpet tile construction/assembly). Antimicrobial preservative should be incorporated into primary backing of the product during manufacturing and not topically applied to the fiber.
- P. Dimensional stability:** Aachen method DIN 54318, 0.2% or less per ISO 2551.
- Q. Smoke density:** <or = 450 flaming.
- R. Static generation:** AATCC 134 w/neolite <or= 3.5KV at 20% r.h.
- S. Flame-spread and flammability:** Carpet flammability shall meet federal flammability standards CPSC FF 1-70, when tested in accordance with ASTM D2959-70T (methenamine pill test).
- T. Trowelable leveling and patching compounds:** Latex-modified, hydraulic-cement based formulation provided by carpet tile manufacturer.
- U. Adhesives:** Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and recommended by carpet tile manufacturer for releasable installations.
- V. Indoor air quality control:** Carpet tile and adhesive shall be CRI Green Label Plus certified by published class (product type) and certification number.
- W. Climate neutral:** Product shall be climate neutral as certified by a Third Party Entity ensuring that all greenhouse gas emissions associated with the life cycle of the product have been offset.

Section 099600 Access Flooring

- A. Standard for University finishes will match adjacent flooring.
- B. Steel structure and grid for 24x24 bolted pattern is expected.

- C. CISCA tested assembly meeting 1250 lbf and 15- LB drop test.

Section 099000 Finish Painting

- A. Exterior paints shall be three-coat high-gloss enamel paints per specification and use.
- B. Paint over 5/8" Type X gypsum board is the standard interior wall finish for areas other than corridors, classrooms and high-use zones.
- C. Texture shall be smooth or match existing.
- D. The gypsum board shall be primed with minimum of one coat of a high quality latex primer or acceptable equal manufactured especially for the priming of gypsum board.
- E. Control joints shall be designed into the interior elevation as required by industry standard.
- F. High performance coatings will be required in certain wet areas and laboratories.

PAINTING

The consultant /Architect shall prepare a schedule listing all surfaces in generic terms, all coating or finish operations, the types of finish materials and the number of coats of each material. Preferred finishes for certain locations or surfaces are as follows:

A. INTERIOR WOODWORK: Natural finish-stain, two (2) coats sanding sealer, two (2) coats semi-gloss varnish. If polyurethane varnish is used, delete sanding sealer. Painted finish-primer and two (2) coats semi-gloss alkyd enamel.

B. METAL DOORS AND FRAMES: Shop coat, touch up and two (2) coats semi-gloss enamel.

C. NEW GYPSUM WALLBOARD OR INTERIOR PLASTER: Spackle as required, primer and two (2) coats semi-gloss alkyd enamel or two (2) coats semi-gloss latex.

D. EXISTING PREVIOUSLY PAINED GYPSUM WALLBOARD OR INTERIOR PLASTER: Primer and one (1) coat semi-gloss alkyd enamel or two (2) coats semi-gloss latex. If surface is poor, remove finish to substrate, repair and finish the same as new gypsum wallboard or plaster.

E. INTERIOR CONCRETE OR CONCRETE BLOCK (unpainted): one (1) coat self-sealing heavy filler-type primer and two (2) coats semi-gloss alkyd enamel or two (2) coats semi-gloss latex. For laboratories requiring chemical resistance, replace alkyd or latex paint with epoxy two-component finish.

F. EXTERIOR WOOD PLATFORMS OR BENCHES: Use Behr Plus 10 Solid Color Stain or approved equal in accordance with manufacturer's directions.

G. EXTERIOR PORTLAND CEMENT PLASTER (stucco): Use integral color, or paint.

H. TOP AND BOTTOM EDGES OF WOOD DOORS: Shall be sanded and sealed after fitting and finished with at least two (2) coats of varnish or paint.

I. TOP AND BOTTOM EDGES OF METAL DOORS: Shall be painted with the same materials and number of coats as used on the door faces.

J. DRY FILM THICKNESS: Shall be specified for all coats of paints on metals.

K. ACCENT COLORS: If it is anticipated 5% or more of the scheduled finishes will be in accent colors, attention should be called to this fact. Estimated percentage of accent colors should be given as an aid to bidders in preparation of bids. A statement should be made to the effect that the information given in no way restricts the consultant in his final selection of colors.

L. COLOR CODING FOR PIPING: Include finish painting of insulated and uninsulated piping in the general contract documents and include color banding of finished piping in the appropriate contract documents.

M. INTERIOR PAINTING: Finish coat to be semi-gloss in all corridors and stairwells. Use washable type of finish material on walls for ease of maintenance and cleaning.

N. WALLCOVERINGS: Materials must conform to ASTM E-84. Research code carefully to determine class of fire and smoke resistance required for the specific application.

O. VINYL WALLCOVERING: Must satisfactorily pass Class A physical requirements for Type II wall covering as listed in G.S.A. CCC-W-408A and CFFA Quality Standards for Vinyl coated fabric wall covering.

P. SPECIALTY COATINGS: Provide specialty coatings wherever wearing or caustic materials may be encountered (e.g. labs). Coatings may be TNEMEC, Thoro-Seal or equal.

Division 10 Specialties

Section 101100 Visual Display Surfaces – Visual Display units will generally be confined to marker board and tack board surfaces or elements applied directly to walls. Wall Talkers surface by RJF international, or equal by Egan Visual or Omnova Solutions, product line for marker boards is preferred. Tack board surfaces may be confined to trim framed areas of classroom walls by Claridge, Fabricmate, or equal.

Visual Display Boards

Electronically operated boards shall have access panels provided for servicing motors, drives and controls. Switches shall be key operated.

Section 101419 Dimensional Letter Signage – The Dimensional Letter Signage Section deals with dimensional metal fabricated character units internally lit. Stainless Steel sheet should meet ASTM A240 or 240M and ASTM A666 for flatness, and welded seams shall meet AWS standards for welding and brazing, with concealed studs and fasteners. Paints shall meet ASTM D1187 for cold-applied asphalt emulsion. Entire unit shall carry a five-year warranty for materials and installation.

Section 101423 Panel Signage – The room identification signage, with raised letters and Braille, and field applied vinyl character signage are governed by the Section. Materials used will include: metal (aluminum ASTM B209, carbon steel ASTM A606, stainless steel AISI 302/304), non-glare plastic (transparent, translucent or opaque), tempered glass (ASTM C1048), lacquer or acrylic paints (DuPont, Sherwin Williams, or Porter), stainless steel fasteners, and silicone sealants (Dow, GE or equal). All laminated glass panel signage to generally match that in the Innovation, Science and Technology Building, or as designed by the Architect.

Section 102113 Toilet Compartments – The solid-polymer toilet compartments and urinal screens shall comply with GSA's CID-A-A-6003 for "Partitions and Toilet Compartments", and comply with the Americans with Disabilities Act guidelines. Surface burning characteristics shall meet ASTM E84, flame spread index under 25 and smoke under 450. Aluminum castings for framing shall meet ASTM B26 or 26M, while extrusions meet ASTM B221 or 221M. Stainless steel castings ASTM A743 or 743M may be substituted. The units shall be Ampco Inc, Comtec Industries, General Partitions Mfg, or Santana solid polymer partitions. Toilet partitions and urinal screens shall be one (1) inch thick constructed from High Density Polyethylene (HDPE) resins. Painted metal, plastic laminate, or wood is not acceptable.

Hinges shall be integral, fabricated from the door and pilaster with no exposed metal parts. Door strike/keeper shall be made of heavy-duty extruded aluminum. Latch and housing shall be made of heavy-duty extruded aluminum. Pilaster shoes shall be three (3) inches high and made of one-piece molded HDPE plastic. Wall brackets shall be made of extruded PVC plastic. Brackets shall be fastened to the pilaster with stainless steel tamper resistant torx head screws and fastened to the panels with stainless steel tamper resistant torx head hex bolts. Head rail shall be made of

heavy-duty extruded aluminum with anti-grip design and integrated curtain rack. Partitions shall be wall and floor mounted. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 3/8". When it is necessary to provide out-swinging doors, specify slide latches and door pulls. All ADA compartment doors shall swing out.

Corner Guards

Corner guards shall be required in all public spaces. Corner guards shall be high-impact vinyl or stainless steel. Light gauge aluminum is not acceptable.

Section 102213 Wire Mesh Partitions – The Wire Crafters, LLC - Style 840 Tool Crib, or equal by Acorn Wire, R. J. Donaldson, Jesco Ind, or Miller Wireworks, shall be used as a standard for wire fabric partitions.

Section 102238 Operable Panel Partitions – Noise Isolation Class (40), Noise Reduction Coefficient (50), and Sound Transmission Class (50) shall be determined for the application. The basis of design shall be Dorma Group – Acousti-Seal 932, or equal by FolDoor – Holcomb and Hoke, Hufcor, Kwik-Wall Co., or Panelfold Inc. and must meet NFPA standards for flame spread index under 25 and smoke 450.

Section 102800 Toilet, Bath and Laundry Accessories - The stainless steel units shall meet a basis of design for Bobrick Washroom Equipment, or equal by A&J Washroom Accessories, American Specialties, or Bradley Corp. Grab bars, mirrors, liquid soap dispensers, combination towel and waste, dual toilet tissue dispenser, robe hook, mop and broom holder, and shelf unit will all be specified. Diaper-changing stations shall be Koala Kare Products KB110-SSRE, by Bobrick, or equal by American Specialties.

Section 104413 Fire Extinguisher Cabinets - The recessed and semi-recessed units shall meet standards of Larsen's Manufacturing Co, Architectural 2409-RT, or equal by Fire End & Croker, J. L. Industries, Kidde Commercial Division, or Potter Roemer LLC. Units will be white with vertical red letters "Fire Extinguisher".

Section 104416 Fire Extinguishers - The ten-pound ABC units shall meet NFPA 10 and UL 4-A:60-BC. Equipment shall be equal to Buckeye Fire Equipment, Fire End & Croker, J. L. Industries, Kidde Commercial Division, or Potter Roemer LLC with manufacturers' standard valves. All portable fire extinguishers and non-valved cabinets shall be furnished and installed by the General Contractor. All portable fire extinguishers and components shall conform to National Fire Protection Association (NFPA) pamphlet 10, latest edition. Each extinguisher shall be approved by Underwriter's Laboratory (UL) and bear their label. The selection and locations of the fire extinguishers are subject to the review and approval of the University and the State Fire Marshal. Extinguishers meeting the described requirements, including those manufactured by Amerex or Buckeye will be considered for acceptance. Refer to NFPA Pamphlet 10, Chapters 2, 3, and 4. Chapter 2 is used to determine the classification of potential fires, and the rating or relative fire extinguishing effectiveness of various types of extinguishers. Chapter 3 assists in the selection of

extinguishers which is dependent upon the character of anticipated fires, property construction and occupancy, the vehicle or hazard to be protected, ambient temperature conditions, and other factors. The quantity of extinguisher is determined by Chapter 4. Penetration of walls by cabinets or other penetrations, unless openings and voids are sealed with fireproof materials, is prohibited. Fire-rated walls must not have the rating reduced by penetrations or reduction of thickness.

Division 11 Equipment

Section 110000 General Requirements – All specialty equipment for laboratories and classrooms will be reviewed with the Campus Development & Facilities Department, for special requirements of the equipment to be purchased by the University faculty and staff.

Section 115313 Laboratory Hoods – Laboratory fume hoods and Bio-safety Cabinets will function as ventilated enclosed workspaces designed to capture confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure. The hood and exhaust system are designed to the chemical list for the particular area of use including steel unit, operable safety glass sash, chains, guides and fasteners, as well as flue piping for the exhaust system. Make up air systems are required for all fume hoods. Systems by Thermo Scientific, Kewanee, ALC Collegedale and Labconco may be used meeting design criteria.

Division 12 Furnishings

Section 120000 General Requirements – The University will direct purchase furniture for the proposed facility. Review of the design with Campus Development & Facilities will be required to determine if the design consultant or construction team will assist in the selection or installation. Interior furniture, fixtures and equipment are provided by the University, but may be required to be coordinated by the designer for bid package or the construction team for install coordination.

Section 122413 Roller Window Shades – Window shades may be manually operated or motor-operated roller shades with single rollers. Specifications shall outline chain and clutch operating mechanisms, rollers, mounting hardware, roller coupling assemblies, shade bands, with accessories including: recessed shade pocket, closure panel and wall clip. Motorized units shall also include: electrical components, motor, remote control, crank-operator override, limit switches, group operation and interface with building automation controls. Acceptable products by MechoShade Systems, Draper Inc, Hunter Douglas Contract and Lutron Electronics Co Inc shall be specified.

Section 123553 Metal Laboratory Casework – Casework shall include: steel casework, table frames, work surfaces, sinks and outlets, service fittings accessory equipment and solvent storage cabinets. Requirements are for flush overlay construction with radius edges, slimline styling, self-supporting units, with cleanable interiors, drawers, two door without vertical mullion, and alternates for frame glazed doors. Units shall comply with Scientific Equipment and Furniture Association standards: 2.3 for installation, 3 for work surfaces, 7 for laboratory fixtures and 8 for laboratory furniture. Work with the University for chemicals list for casework. Acceptable products by Thermo Fisher Scientific, Kewanee and ALC Collegedale shall be specified.

Division 14 Conveying Equipment

Section 142100 Electric Traction Elevators – Elevators shall be designed to meet A17.1/CSA B44 and function as both freight elevator and passenger elevator. Acceptable products by KONE Inc - Ecospace, Otis Elevator – Gen2 Product or Schindler Elevator Corp – 400A Product shall be specified. Elevator description shall indicate: elevator number, gearless traction machinery, rated load and speed, openings, operations, security features, dual car-control stations, car enclosure and hoistway descriptions, traction systems, hooks and protective pads. Every effort shall be made to eliminate “proprietary equipment”, to allow any reputable service company to respond to the University need for continuing services contract. Any special tools, programming software or hardware required to service the elevator shall be made available to the University (at no additional cost) to provide for the service of the units.

Division 21 Fire Protection

Section 210500 Common Work Area Results for Fire Suppression – The suppression system shall include: mechanical sleeve seal escutcheons, pipe and tube fittings joining materials, and non-shrink grout. Mechanical sleeves by Advance Products and Systems Inc, Calpico Inc, Metraflex Co, or Pipeline Seal and Insulator may be used. Steel pipe sleeve shall meet ASTM A53, Type E Grade B, Schedule 40, galvanized plain ends. Joining materials shall meet ASME B16.21 for non-metallic, flat gaskets full or narrow-face type; AWWA C110 rubber flat face ring; ASME B 18.2.1 Carbon steel flange bolts and nuts; plastic pipe ASTM D Schedule 40 per manufacturer for pipe-flange gasket, bolts and nuts; and grout ASTM C1107. Sprinkler heads will generally be concealed with temperature-sensitive “pop-off” cover.

Section 210501 Asperating Smoke Detection System – The very early smoke detection system, if needed, shall be equal to VESDA Laser Plus VLP-012 and VESDA Laser Focus VLF-500 meeting NFPA, NEC and Florida SFM Standards. Acceptable manufacturers include: Xtralis Inc, Ansul, Fike or Simplex/Grinnell.

Section 211313 Wet-Pipe Sprinkler Systems – Fire sprinkler systems shall include: pipes, fittings and specialties, fire-protection valves, fire-department connections, and sprinklers meeting NFPA 13 for “Installation of Sprinkler System” and NFPA 24 for “Installation of Private Fire Service Mains and Their Appurtenances”. Steel pipes and fittings shall be standard weight, black-steel pipe meeting ASTM A53/A 53 M or ASTM A135; valves will be UL listed or FM Global approved, UL 1091 (ball valve) or UL 312 (check valve), minimum pressure 175 psig, bronze body threaded for small LT 1.5” valves and bronze or ductile-iron threaded for larger valves. Acceptable fire department connection manufacturers include: Fire-End & Croker Corp, Potter Roemer, or Elkhart Brass, meeting UL 405 and NFPA 1963. Acceptable sprinkler manufacturers include: Reliable Automatic Sprinkler Co Inc, Tyco Fire & Building Products LP, or Viking Corporation, meeting UL “Fire Protection Equipment Directory” or FM Global “Approval Guide” listing. Provide penetration fire stopping at all rated walls.

Division 22 Plumbing

Section 220500 Common Requirements for Plumbing – The plumbing requirements shall include: general description of piping material and installation instructions, transition fittings, dielectric fittings, sleeves, escutcheons, grout, equipment installation requirements, painting and finishing, concrete bases, supports and anchorages. Joining materials shall meet ASME B16.21 for non-metallic, flat gaskets full or narrow-face type; AWWA C110 rubber flat face ring; ASME B 18.2.1 Carbon steel flange bolts and nuts; plastic pipe ASTM D Schedule 40 per manufacturer for pipe-flange gasket, bolts and nuts; and grout ASTM C1107. Transition fittings shall meet AWWA 219 for NPS 2 underground piping or ASTM C1173 for flexible transition coupling with elastomeric sleeve and corrosion resistant metal bands. Dielectric fittings suitable to pipe type and fluid, pressure & temperature application. Escutcheons will be brass with polished chrome finish one piece or split plate as appropriate.

Section 220157 Sleeves and Sleeve Seals for Plumbing Piping – The piping sleeves will be: cast or fabricated for cast iron pipe, zinc coated welded steel collar for galvanized steel wall pipes ASTM A 53/A 53M Schedule 40, zinc coat with plain ends for galvanized-steel-pipe sleeves ASTM A 53/A 53M Grade B Schedule 40. PVC-pipe sleeves ASTM D1785 Schedule 40, or galvanized-steel-sheet sleeves 0.0239 inch minimum thickness round tube with closed welded longitudinal joint. Sleeve-seal systems acceptable manufacturers include: Advance Products & Systems Inc, CALPICO Inc, Metraflex Company, Pipeline Seal and Insulator Inc, or Proco Products Inc. grout to meet ASTM C 1107/C Grade B post-hardening and volume-adjusting, hydraulic-cement grout.

Section 220519 Meters and Gages for Plumbing Piping – The meter and gages section includes: metal case liquid-in-glass thermometers ASME B40.200 by REOTEMP Instrument Corp, Trerice H. O. Co, Weiss Instruments Inc, Winters Instrument US, or WIKA Instrument Corp USA; thermowells meeting ASME B40.200 pressure type socket fitting made for insertion into piping tee fitting with copper tubing CNR or steel piping CRES; metal-case dial-type pressure gages ASME B40.100 by AMETEK Inc US Gauge, Ashcroft Inc, Marsh Bellofram, Trerice H. O. Co, Watts Regulator Co, Weiss Instruments Inc, or WIKA Instrument Corp USA; brass snubber ASME B40.100 or brass stainless-steel needle valves as gage attachments; minimum 500 psig – 200 deg F. test-plugs by Flow Design Inc, National Meter Inc, Peterson Equipment Co Inc, Trerice H. O. Co, Watts Regulator Co, or Weiss Instrument Inc; and test-plug kits by same manufacturer.

Section 220523 General-Duty Valves for Plumbing Piping – The valve section includes: bronze valves ASME B16.24 for NPS 2 and smaller with threaded ends or ferrous valves ASME B16.1 for NPS 2.5 and larger with flanged ends; copper-alloy ball valves MSS SP-110 by Conbraco Industries Inc, Crane Co Valve Group, Kitz Corp of America, or NIBCO Inc; flanged ferrous-alloy butterfly valves MSS SP-67 Type 1, 150-300 psig by Cooper Cameron Corp, Grinnell Corp, Mueller Steam Specialty, or Tyco International Ltd or grooved-end ductile-iron butterfly valves, 175-300 psig CWP Rating by Hammond Valve, Milwaukee Valve Co, Mueller Steam Specialty, NIBCO Inc, or

Victaulic Co of America; bronze, horizontal and vertical lift check valves MSS SP-80 Type 2 Class 150 by Cincinnati Valve Co, Crane Co Valve Group, Walworth Co, Milwaukee Valve Co, Kitz Corp of America, or Grinnell Corp; gray-iron swing check valves with metal seats MSS SP-71 Type 1 Class 250 by Crane Co Valve Group, Kitz Corp of America, Milwaukee Valve Co, Mueller Co, or NIBCO Inc; spring-loaded, lift-disc check valves FCI 74-1 Type 1 Class 250 by Mueller Steam Specialty; bronze gate valves MSS SP-80 Type 1 Class 200 with ferrous-alloy hand wheel by Crane Co Valve group, Hammond Valve, Kitz Corp of America, Milwaukee Valve Co, or NIBCO Inc; and cast-iron gate valves MSS SP-70 Type 1 Class 125 by Crane Co Valve Group, Hammond Valve, Kitz Corp of America, Milwaukee Valve Co, or NIBCO Inc. Valve applications will be generally: ball, butterfly or gate valves for shut-off service; spring-loaded, lift-disc check valves for pump discharge; ball valves for compressed-air piping; or balancing valves per domestic water piping specialties on construction documents.

Section 220553 Identification for Plumbing Piping and Equipment – The section refers to equipment labels, pipe labels, stencils and valve tags. Equipment labels shall be plastic minimum 2.5 x 0.75 inch with 1/4 inch high white lettering on black background attached with stainless steel rivets or contact permanent adhesive up to 24 inch viewing distance; ½ inch high for 72 inch viewing; and proportionately larger for greater viewing distances. Pre-printed color-coded pipe labels ASME (ANSI) Standard A13.1-2007 showing flow direction shall be semi-rigid plastic pre-coiled formed to partially circumference of pipe, connected without fasteners, with 1.5 inch high letters. Valve tags of stamped or engraved plastic with ¼ high letters and ½ high valve number with brass wire-link, beaded chain or S-hook.

Section 220700 Plumbing Insulation – The insulation materials for plumbing will include: flexible elastomeric closed-cell, sponge or expanded-rubber complying with ASTM C534 Type 1 for tubular materials and Type 2 for sheet materials by Aeroflex USA Inc - Aerocel, Armacell LLP – Armaflex, or RBX Corp – Insul-Sheet 1800 and Insul-Tube 180; mineral-fiber, pre-formed pipe insulation Type 1, 850 deg F. by Fibrex Insulations Inc – Coreplus 1200, Johns Manville – Micro-Lock, KNAFF Insulation 1000, Manson Insulation Inc – Alley-K, Owens Corning –Fiberglass Pipe Insulation; mineral-fiber insulating cements meeting ASTM C195 by Insulco – Triple I or P. K, Insulating Manufacturing Co – Super-Stik; flexible elastomeric adhesive MIL-A-24179A Type 2 Class 1 by Aeroflex Aeroseal, Armacell 520, or RBX Rubatex Contact Adhesive; mineral-fiber adhesive MIL-A-3316C Class 2 Grade A by Childers Products CP-82, Foster Products Corp 85-20, ITW TACC S-90/80, Marathon Industries Inc 225, or Mon-Eco Industries Inc 22-25; ASJ adhesive, and FSK and PVDC jacket adhesive MIL-A-3316C Class 2 Grade A for bonding insulation jacket lap seams and joints by Childers Products CP-82, Foster Products Corp 85-20, ITW TACC S-90/80, Marathon Industries 225, or Mon-Eco Industries 22-25; vapor-barrier mastic MIL-C-19565C Type 2 by Childers Products CP-35, Foster products Corp 30-90, ITW TACC CB-50, Marathon Industries Inc 590, Mon-Eco Industries Inc 55-40, or Vimasco Corp 749; compatible lagging adhesives MIL-A-3316C Class 1 Grade A by Childers Products CP-52, Foster Products Corp 81-42, Marathon Industries Inc 130, Mon-Eco Industries Inc 11-30, or Vimasco Corp 136; flexible elastomeric joint

sealants compatible with insulation materials or ASJ flashing sealants and vinyl, PVDC and PVC jacket flashing sealants equal to Childers Products CP-76 compatible with insulation materials; Factory applied jackets shall be white, kraft-paper, fiber-reinforced scrim with aluminum-foil backing ASTM C 1136 Type 1; vapor retarder ASJ tapes AASTM C 1136 matching factory-applied jacket by Avery Dennison Corp – Fasson 0835, Compac Corp 104 & 105, Ideal Tape Co Inc - 428 AWF ASJ, or Venture Tape – 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ; and PVC corner angles 30 mils, minimum 1 by 1 inch ASTM D 1784 Class 16354-C. All surfaces to be prepared clean and dry for insulation with corrosion coating added, and applied in compatible climate conditions. Protect insulation from hanger conditions, while insulating piping, fittings, valves, strainers, flanges and unions. Provide a schedule of all insulating materials and application for piping systems.

Section 220800 Commissioning of Plumbing – Entire systems of piping will require commissioning including tests, phase controls coordination, test-adjust-balance review and coordination, maintenance orientation, measuring instruments and logging devices, and including requested information by the commissioning agent. Each phase of the work will require notice for Building Code Administration participation. Non-conformance will be noted, and re-testing should be set to be at the cost of the subcontractor.

Section 221116 Domestic Water Piping – The domestic water piping will be: hard copper tube ASTM B 88 Type L water tube drawn temper with bronze flanges ASME B 16.24 Class 150, copper unions MSS SP-123, with wrought copper or cast bronze solder joint fittings and EPDM seal, by NIBCO Inc, or Viega Plumbing & Heating Systems; or soft copper tube ASTM B 88 Type K water tube annealed temper with copper solder-joint fittings ASME B16.22, wrought copper pressure fittings. Piping joining materials will be: pipe-flange gasket materials AWWA C110 rubber, flat face, 1/8 inch thick or ASME B16.21 non-metallic full face or ring type; or metal, pipe-flange bolts and nuts ASME B18.2.1 carbon steel. All materials and installation are required to be in accord with Florida Plumbing Code and ASME/ASTM Standards.

Section 221119 Domestic Water Piping Specialties – The specialties include: bronze pipe-applied, atmospheric-type vacuum breakers ASSE 1001 by Ames Co, Conbraco Industries, FEBCO SPX Valves and Controls, Watts Industries Inc, or Zurn Plumbing Products Group (Wilkins Div); hose-connection vacuum breakers ASSE 1011 by Conbraco Industries Inc, MIFAB Inc, Watts Industries, Woodford manufacturing Co, or Zurn Plumbing Products Group; reduced-pressure-principle backflow preventers ASSE 1013 by Ames Co, FEBCO SPX, Watts Industries Inc, or Zurn Plumbing Products Group; water pressure-reducing valves ASSE 1003 by Conbraco Industries Inc, Cla-Val, Watts industries Inc, or Zurn Plumbing Products Group; copper-alloy calibrated balancing valves (brass or bronze body) by Armstrong International Inc, ITT Industries (Bell & Gossett Div), NIBCO Inc, Taco Inc, or Watts Industries Inc; temperature-actuated (thermostatic) water mixing valves ASSE 1017 by Armstrong International Inc, Bradley Valve Co, Leonard Valve Co, Powers – Watts industries, or Symmons Industries Inc; Y-pattern strainers for domestic water piping of bronze

for LT NPS 2, or cast iron with AWWA C550 or FDA-approved epoxy coating NPS 2.5 and larger; ball-valve-type or hose-end drain valves MSS SP110 chrome plated brass with replaceable seats and seals; water hammer arresters ASSEE1010 or PSI-WH 201 by Josam Co, PPP Inc, or Sioux Chief Manufacturing Co Inc. Provide plastic laminate equipment name plates and signs for backflow preventers, water pressure-reducing valves, balancing valves, and water mixing valves. Require setting field adjustments for water pressure-producing valves, balancing valves, and temperature-actuated water mixing valves.

Section 221316 Sanitary Waste and Vent Piping – The sanitary waste and vent piping will comply with Cast Iron Soil Pipe Institute CISPI and NSF International or comply with NSF 14 Plastic Piping Systems Components and Related Materials, including NSF-dwv, NSF-drain, NSF tubular and NSF-sewer piping and be so labeled. The materials and systems include: hubless cast-iron soil pipe and fittings CISPI 301 or shielded couplings ASTM C 1540 with rubber sleeves ASTM C 564 by Clamp-All Corp, Missions Rubber Co, Husky, or Anaco; copper tube and fittings of copper DWV tube ASTM B 306 with fittings of cast copper ASME B16.23 or wrought copper solder-joint ASME B16.29, or hard copper tube ASTM B 88 Types L and M and fittings ASME B16.18 cast-copper-alloy or wrought copper solder-joint ASME B16.22 and flanges ASME B16.24 Class 150 cast copper with solder-joint end and copper unions MSS SP-123 copper-alloy balls and socket with solder-joint or threaded ends; or solid wall PVC pipe ASTM D 3311 drain, waste and vent patterns, and socket type fittings ASTM D 2665 with solvent cement PVC ASTM D 2564 and compatible adhesive primer. Provide pipe hanger and supports specifications MSS SP -69 suitable for cast-iron, steel, copper tubing or PVC piping. Protect exposed PVC piping from sunlight degradation with two coats latex paint.

Section 221319 Sanitary Waste Piping Specialties – The compatible parts of systems include: metal cleanouts by Josam Co, Smith Jay R Mfg Co, Tyler Pipe - Wade, Watts Drainage Products Inc, or Zurn Plumbing Products Group; cast-iron floor drains by Josam Co, MIFAB Inc, Smith Jay R Mfg Co, Tyler Pipe - Wade, Watts Drainage Products Inc, or Zurn Plumbing Products Group; trench drains by Josam Co, MIFAB Inc, Smith Jay R Mfg Co, Tyler Pipe - Wade, Watts Drainage Products Inc, Zurn Plumbing Products Group; floor drain fittings of cast iron with threaded inlet/outlet or spigot outlet and trap-seal primer valve connection; positive air-gap fittings meeting ASME A112.1.2; or solids interceptors by Josam Co, MIFAB Inc, Rockford Sanitary Systems Inc, Smith Jay R Mfg Co, Tyler Pipe – Wade, Watts Drainage Products Inc, or Zurn Plumbing Products Group with plastic laminate labels. Protect installation to avoid clogging with dirt and debris, and provide plugs in ends of uncompleted piping at the end of each day or when work stops.

Section 221413 Storm Drainage Piping – The sanitary waste and vent piping will comply with Cast Iron Soil Pipe Institute CISPI and NSF International or comply with NSF 14 Plastic Piping Systems Components and Related Materials, including NSF-drain and NSF-sewer piping and be so labeled. The materials and systems include: hubless cast-iron soil pipe and fittings CISPI 301 or shielded couplings ASTM C 1540 with rubber sleeves ASTM C 564 by Anaco, Clamp-All Corp, Missions

Rubber Co, or Husky; or solid-wall PVC pipe ASTM D 2665 drain, waste and vent with PVC solvent cement and compatible adhesive. Installation per ASTM D 2665 or underground per ASTM D 2321 inspected by the authority having jurisdiction.

Section 221423 Storm Drainage Piping Specialties – The compatible part of systems include: cast-iron general-purpose storm drains ASME A112.6.4 by Josam Co, MIFAB Inc, Smith Jay R Mfg Co, Zurn Plumbing Products Group, or Tyler Pipe – Wade; metal cleanouts by Josam Co, Smith Jay R Mfg Co, Tyler Pipe – Wade, Watts Drainage Products Inc, or Zurn Plumbing Products Group; trench drains by Josam Co, MIFAB Inc, Smith Jay R Mfg Co, Tyler Pipe – Wade, Watts Drainage Products Inc, or Zurn Plumbing Products Group; or horizontal breakwater valves by Josam Co, MIFAB Inc, Smith Jay R Mfg Co, Watts Water Technologies Inc, Zurn Plumbing Products Group, Spears, or Clean Check. Protect installation to avoid clogging with dirt and debris, and provide plugs in ends of uncompleted piping at the end of each day or when work stops.

Section 221429 Sump Pumps – The section includes: submersible, fixed position, double-sealed sump pumps by ITT Flygt Corp, PACO Pumps, Grundfos Pumps Corp, Little Giant Pump Co, Zoeller Co, or Hydromatic Co with balanced, abrasion-resistant cast iron impellers ASTM A 532/A 532M, stainless steel pump and motor shaft and factory-sealed grease fittings, and hermetically sealed, capacitor-start type motor, and controls for pedestal mounted float switch with float rods and rod buttons with automatic alternator, float guides and high water alarm, and controls for switch with mechanical-float, mercury-float or pressure type in NEMA 250 Type 6 enclosures with mounting rod and electric cables and with automatic alternator, float guides and high water alarm, and control-interface features including remote alarm contacts and building automation system interface; or packaged submersible drainage-pump units by Goulds Pumps ITT Corp, Little Giant Pump Co, Zoeller Co, or Hydromatic Co, factory-sealed and –tested, automatic-operation, basin-mounted, sump pump unit.

Section 220500 Common Work Results for Plumbing – The section includes: pipe, tubes and fittings per the Division 22 with threading meeting ASME B1.20.1; joining materials - pipe-flange gaskets ASME B16.21 for non-metallic materials of full-face type for flat face Class 125 cast-iron and cast-bronze flanges or narrow face type for raised face Class 250 cast-iron and steel flanges, or AWWA C110 for rubber, flat face and full-face or ring type, carbon steel flange bolts and nuts ASME B18.2.1, solder filler metals ASTM B32 lead free alloys and water-flushable flux ASTM B813, brazing filler metals AWS A5.8, BCuP Series copper –phosphorus alloys and AWS A5.8, Bag1 silver alloy for refrigerant piping, welding filler metals AWS D1012 for steel pipe, or solvent cements for joining plastic pipe – CPVC ASTM F 493 or PVC ASTM D 2564 with primer ASTM F 656; transition fittings AWWA C219 transition metal sleeve-type couplings or flexible transition couplings for underground non-pressure drainage piping ASTM C 1173 with elastomeric sleeve; dielectric fittings – combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain or weld-neck end connections which match the piping material systems with suitable insulating materials, factory-fabricated 250 psig dielectric unions, companion-flange

dielectric-flange kits, and dielectric galvanized-steel couplings; sleeves of galvanized-steel 0.0239-inch sheet with welded longitudinal joint, galvanized steel pipe ASTM A 53, Type E, Grade B plain ends, permanent molded PVC with nailing flange to wooden forms, Schedule 40 PVC pipe ASTM D 1785, or molded reusable PE tapered-cup shaped with nailing flange to wooden forms; manufactured wall and ceiling escutcheons and floor plates of one-piece deep-pattern deep-drawn brass box shaped chrome finished, one-piece cast-brass with set screw, one-piece stamped steel type with set screw, split-casting cast-brass with set screw or split-plate stamped-steel chrome finished with set screw; non-shrink, non-metallic, dry hydraulic-cement grout ASTM C 1107, Grade B pre-mixed and factory packaged.

Section 220157 Sleeves and Sleeve Seals for Plumbing Piping – The sleeves include: cast-iron wall pipes of cast or ductile iron pressure pipe with plain ends and integral waterstop; galvanized-steel wall pipes ASTM A53/A 53M Schedule 40 with plain ends and welded steel collar, zinc coated; galvanized-steel-pipe sleeves ASTM A 53/A 53M Type E Grade B Schedule 40 zinc coated with plain ends; PVC-pipe sleeves ASTM D 1785 schedule 40; or galvanized-steel-sheet sleeves 0.0239-inch minimum thickness – round tube with welded longitudinal joint.

Section 220519 Meters and Gages for Plumbing Piping – The meters and gages include: metal case, compact style or industrial style liquid-in-glass thermometers by Trerice, Weiss Instruments or Winters Instruments; thermowells ASME B40.200 for use with copper tubing CNR or steel tubing CRES with graphite and glycerin heat-transfer medium; direct mounted, metal case, dial type, Bourdon tube pressure gages ASME B40.100 with brass fittings by AMETEK Inc, Ashcroft Inc, Marsh Bellofram, Trerice, Watts Regulator, Weiss Instruments or WIKA Instrument Corp; gage attachments - ASME B40.100 brass snubbers with NPS 1/4 or NPS 1/2 ASME B1.20.1 pipe threads and piston type surge dampening device, brass or stainless steel needle valves with NPS 1/4 or NPS 1/2 ASME B1.20.1 pipe threads; brass or stainless steel test plugs with chlorosulfonated polyethylene synthetic self-sealing rubber core inserts by Flow Design Inc, National Meter Inc, Peterson Equipment Co, Trerice, Watts Regulator or Weiss Instruments; and test plug kits with thermometers, Bourdon tube insertion type pressure gage, adapters and metal or plastic carrying case.

Section 220523 General Duty Valves for Plumbing Piping – The general valves include: ASME B16.24 bronze angle valves for NPS 2 and smaller, or ASME B16.1 cast iron or ASME B16.5 steel angle valves for NPS 2-1/2 and larger, all with flanged or AWWA C606 soldered grooved ends, valve actuators, extended valve stems, MSS SP-45 valve bypass and drain connections; full port, copper-alloy ball valves MSS SP-110 by Conbraco Industries, Crane Co, Kitz Corp or NIBCO Inc; MSS SP-67 flanged ferrous-alloy butterfly valves by Cooper Cameron, Grinnell Corp, Mueller Steam Specialty or Tyco International; grooved-end ductile-iron butterfly valves by Hammond Valve, Milwaukee Valve, Mueller Steam Specialty, NIBCO Inc or Victaulic Co; MSS SP-80 bronze check valves Type 2 Class 150 horizontal and vertical lift bronze body nonmetallic disc and bronze seat; MSS SP-71 gray-iron swing check valves Type 1 Class 250 by Crane Co, Kitz Corp, Milwaukee

Valve, Mueller Co or NIBCO Inc; FCI 74-1 spring-loaded wafer lift-disc check valves Type 1 Class 250 by Mueller Steam Specialty; MSS SP-80 bronze gate valves Type 1 Class 200 by Crane Co, Hammond Valve, Kitz Corp, Milwaukee Valve or NIBCO Inc; and MSS SP-70 bronze-mounted cast-iron gate valves Type 1 Class 125 OS&Y by Crane Co, Hammond Valve, Kitz Corp, Milwaukee Valve, or NIBCO Inc.

Section 220553 Identification for Plumbing Piping and Equipment – The identification includes: equipment labels 1/8-inch thick multi-layer, multi-colored, engraved plastic labels of a minimum 2-1/2x3/4-inch black background with ¼-inch white letters, sized larger for viewing distances; pre-printed color-coded pipe labels with flow direction arrows 1-1/2-inch letters, pre-tensioned and pre-coiled for attachment without fasteners by pipe size; valve tags stamped or engraved of brass, 0.32” stainless steel, or 0.25” anodized aluminum – pre-drilled for fastening with brass wire, beaded chain or S-hook, 1/4-inch letters for pipe abbreviation and ½-inch numbers. Provide schedule of valve tags – number, abbreviation, location by room, normal-operating position and variations including emergency shut-off or special uses.

Section 220700 Plumbing Insulation – The insulation includes: closed-cell sponge or expanded-rubber flexible elastomeric insulation ASTM C534 Type 1 Tubular and Type 2 Sheet Material by Aeroflex USA, Armacell LLC or RBX Corp; ASTM C 547 pre-formed mineral-fiber insulation Type 1 grade A with factory applied ASJ-SSL by Fibrex - Coreplus 1200, Johns Manville – Micro-Lok, Knauf 1000, Manson – Alley-K or Owens Corning – fiberglass pipe insulation; ASTM C195 mineral-fiber insulating cement by Insulco – Triple I or P. K. Insulation – Super-Stik; MIL-A-24179A flexible elastomeric Type 2 Class 1 adhesive by Aeroflex - Aero seal, Armacell - 520 Adhesive or RBX – Rubatex; MIL-A-3316C mineral fiber adhesive Class 2 Grade A by Childers – CP-82, Foster 85-20, ITW TACC S-90/80, Marathon 225 or Mon-Eco 22-25 with MIL-A-3316C for ASJ, FSK and PVDC jacket adhesives Class 2 Grade A bonding jacket lap seams and joints by same manufacturers; MIL-C-19565C mastics Type 2 with water-vapor permeance ASTM E96 Procedure B 0.013 perm at 43-mil dry film thickness by Childers CP-35, Foster 30-90, ITW TACC CB-50, Marathon 590, Mon-Eco 55-40 or Vimasco 749; MIL-A-3316C lagging adhesives Class 1 Grade A by Childers CP-52, Foster 81-42, Marathon 130, Mon-Eco 11-30 or Vimasco 136; compatible elastomeric joint sealants for materials, jackets and substrates, or ASJ, vinyl, PVDC, and PVC jacket flashing sealants by Childers CP-76; ASTM C1136 factory-applied, Type 1, ASJ jackets; ASTM C 1136 ASJ tape by Avery Dennison - Fasson 0835, Compac 104 & 105, Ideal Tape 428 AWF ASJ, Venture Tape - 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ; ASTM D 1784, Class 16354-C, PVC corner angles to match adjacent surface.

Section 220800 Commissioning of Plumbing – The plumbing systems will all be commissioned by certified CxA agents in accord with Mechanical Engineers direction. Testing guidelines will be provided by the CxA agent.

Section 221116 Domestic Water Piping – The domestic water piping shall include above ground domestic water piping of ASTM B88 hard copper tube Type L water tube, drawn temper with bronze flanges ASME B16.24 Class 150 with solder end joints, or MSS SP-123 cast-copper-alloy unions with solder or threaded ends by NIBCO Inc or Viega, wrought copper or cast bronze fittings with EPDM rubber O-ring seals; under-building-slab of ASTM B 88 soft copper water tube Type K annealed temper with ASME B16.22 wrought copper pressure, solder-joint fittings; with joining AWWA C 110 rubber, flat-face, pipe-flange gasket material 1/8", or ASME B 16.21 non-metallic full-face or ring type gaskets, or ASME B18.2.1 carbon steel pipe-flange bolts and nuts. Provide appropriate hanger rods for suspended pipe installations.

Section 221116 Domestic Water Piping Specialties – The specialties shall include: pipe-applied atmospheric-type vacuum breakers ASSE 1001 by Ames Co, Conbraco Industries, FEBCO SPX, Watts Industries or Zurn Plumbing Products; hose-connection vacuum breakers ASSE 1101 by Conbraco, MIFAB Inc, Watts Industries, Woodford Manufacturing or Zurn Plumbing Products; reduced-pressure-principle backflow preventers ASSE 1013 by Ames Co, FEBCO SPX, Watts Industries or Zurn Plumbing Products; water pressure-reducing regulator valves ASSE 1003 by Conbraco Industries, Cla-Val, Watts Industries or Zurn Plumbing Products; copper-alloy calibrated balancing valves by Armstrong International, ITT Industries, NIBCO Inc, Taco Inc, or Watts Industries; temperature-actuated thermostatic water mixing valves ASSE 1016 Armstrong International, Bradley Valve, Leonard Valve, Powers – Watts or Symmons Industries; Y-pattern strainers for domestic water piping AWWA C550 with threaded hose valve drain ASME B1.20.7; ball-valve-type, hose-end drain valves MSS SP-110; and water hammer arresters ASSE 1010 (Size AA-A) or PDI-WH 201 (Size A-F) by Josam Co, PPP Inc or Sioux Chief Mfg Co.

Section 221316 Sanitary Waste and Vent Piping – The piping includes: above ground - CISPI 301 hubless cast-iron pipe and fittings with ASTM C 1540 stainless steel shielded couplings and bands with ASTM C564 rubber sleeve by Clamp-All Corp, Mission Rubber Co, Husky or ANACO; copper DWV tube ASTM B306 with cast copper fittings ASME B16.23 or ASME B16.29 wrought copper solder-joint fittings, hard copper tube ASTM B88 Types L and M with copper pressure fittings ASME B16.18 or wrought-copper solder-joint fittings ASME B16.22, copper flanges ASME B16.24 Class 150 and copper-alloy unions MSS SP-123 with solder-joint or threaded ends; or underground piping - ASTM D 2665 solid wall PVC pipe, PVC pocket fittings made to ASTM D3311 drain, waste and vent patterns using ASTM D2564 solvent cement VOC content LT 510 g/L and adhesive primer VOC content LT 550 g/L. Provide MSS Type 8 or 42 clamps for vertical piping and MSS Type 52 at base or MSS Type 1, 43 or 49 hangers for short LT 100 feet, medium and long run suspended piping.

Section 221319 Sanitary Waste Piping Specialties – The specialties include metal cleanouts by Josam Co, Smith Jay R Mfg Co, Tyler Pipe, Watts Drainage Products or Zurn Plumbing Products; cast-iron floor drains by Josam Co, MIFAB Inc, Smith Jay R Mfg Co, Tyler Pipe, Watts Drainage Products or Zurn Plumbing Products; trench drains by Josam Co, MIFAB Inc, Smith Jay R Mfg Co,

Tyler Pipe, Watts Drainage Products or Zurn Plumbing Products; miscellaneous drainage piping specialties – cast-iron floor-drain, trap-seal primer fittings NPS ½-inch or ASME A112.1.2 air-gap fittings; and solids interceptors by Josam Co, MIFAB Inc, Rockford Sanitary Systems, Smith Jay R Mfg Co, Tyler Pipe, Watts Drainage Products or Zurn Plumbing Products. All exterior piping is to be CCTV inspected and recording provided to the university project manager.

Section 221413 Storm Drainage Piping – The piping materials include: above ground - CISPI 301 hubless cast-iron pipe and fittings with ASTM C 1540 stainless steel shielded couplings and bands with ASTM C564 rubber sleeve by ANACO, Clamp-All Corp, Mission Rubber Co or Husky; or underground piping - ASTM D 2665 solid wall PVC pipe, PVC pocket fittings made to ASTM D3311 drain, waste and vent patterns using ASTM D2564 solvent cement VOC content LT 510 g/L and adhesive primer VOC content LT 550 g/L.

Section 221423 Storm Drainage Piping Specialties – The specialties include: cast-iron roof drains ASME A112.6.4 by Josam Co, MIFAB Inc, Smith Jay R Mfg Co, Tyler Pipe or Zurn Plumbing Products; metal cleanouts by Josam Co, Smith Jay R Mfg Co, Tyler Pipe, Watts Drainage Products or Zurn Plumbing Products; horizontal backwater valves by Josam Co, MIFAB Inc, Smith Jay R Mfg Co, Tyler Pipe, Watts Water Technologies, Zurn Plumbing Products, Spears or Clean Check; or trench drains by Josam Co, MIFAB Inc, Smith Jay R Mfg Co, Tyler Pipe, Watts Drainage Products or Zurn Plumbing Products. All exterior piping is to be CCTV inspected and recording provided to the university project manager.

Section 221429 Sump Pumps – The sump pumps include: submersible, fixed-position, double-seal sump pumps HI 1.2-1.2 and HI 1.3 by ITT Flygt Corp, PACO Pumps, Grundfos Pump Corp, Little Giant Pump Co, Zoeller Co or Hydromatic Co with NEMA 250 Type 1 indoor or Type 4X outdoor controls and remote alarm interface; or package submersible drainage-pump units by Goulds Pumps ITT, Little Giant Pump Co, Zoeller Co or Hydromatic Co.

Section 223400 Fuel-Fired Domestic Water Heaters – The section includes: commercial, power-vent, storage, gas water heaters ANSI Z21.10.3/CSA 4.3 by Bradford White Corp, Lochinvar Corp, Rheem Water Heater Div, Smith A.O. Water Products Co, or State Industries, Inc. with glass-lined, storage tanks NSF 61 with threaded or flanged ends, replaceable magnesium anode rod, dip tube, drain valve ASSE 1005, insulation ASHRAE/IESNA 90.1 around tank, steel enamel finish jacket, power-vent water heater burner, automatic electric gas-ignition ANSI Z21.20, adjustable thermostat temperature control, high-temperature and low water safety control shut-off devices, and combination temperature and pressure relief valve; special NSF 5 construction requirements; and power-vent system exhaust fan, interlocked with burner; steel pressure construction compression tanks by AMTROL Inc, Armstrong Pumps Inc, Smith A.O., Taco Inc, or Watts Regulator with factory-fabricated steel tappings, NSF 61 interior barrier material finish and factory installed air-charging valve; and water heater accessories – ANSI Z21.15/CGA 9.1 manual gas shut-off valve, ANSI Z21.18 gas pressure regulator, ANSI Z21.21 electrical gas automatic

valves, combinations temperature and pressure relief valves, minimum 18 inch water heater stand, 24 gage galvanized steel or 0.0625 high impact plastic drain-pan units, piping manifold kits, and ASHRAE/IESNA 90.1-2004 piping-type heat traps.

Section 224000 Plumbing Fixtures – The fixtures include: lavatory and sink faucets by American Standard Co, Chicago Faucets, Kohler Co, Speakman Co, T&S Brass and Bronze Works Inc, or Zurn Plumbing Products; shower faucets by American Standard, Kohler, Symmons Industries, Leonard Valve co, Powers, or Zurn Plumbing Products; flushometers by Coyne & Delany Co, Hydrotek International, Sloan Valve Co, TOTO USA Inc, Zurn Plumbing Products; toilet seats by American Standard, Bemis Manufacturing, Centoco Manufacturing, Church Seats, Eljer, Kohler Co, or Olsonite Corp; protective shielding pipe cover guards by McGuire Manufacturing, Plumberex Specialty Products, TCI Products, or TRUEBRO Inc; fixture supports by Josam Co, MIFAB Manufacturing, Smith J R Manufacturing, Tyler Pipe, or Zurn Plumbing Products; sediment trap interceptors by Josam Co, MIFAB Manufacturing, J R Smith Manufacturing, Tyler Pipe, or Zurn Plumbing Products; disposers by In-Sink-Erator, Kitchen Aid, or Maytag Co; water closets by Kohler Co, Eljer, Zurn, TOTO USA Inc, or American Standard Co; urinals by Kohler Co, Eljer, Zurn, TOTO USA Inc, or American Standard Co; lavatories by Kohler Co, Eljer, Zurn, TOTO USA Inc, or American Standard Co; commercial sinks by Advance Tabco, Elkay Manufacturing, Just Manufacturing, Metal masters Food Service Equipment Co, or AERO Co; showers by Eljer, Jacuzzi Inc, Kohler Co, American Standard Co, Aker Plastics Co, Best Bath Systems, Aqua Bath Co, or Aqua Glass Corp; kitchen sinks by Jacuzzi Inc, Kohler Co, American Standard Co, Eljer, DuPont Corian Products, Elkay Manufacturing, or Just Manufacturing; service sinks by American Standard Co, Commercial Enameling Co, Eljer, Kohler Co, Crane Plumbing, or Zurn Plumbing Products; mop sinks by Crane Plumbing, Florestone Products Co, Precast Terazzo Enterprises, Stern-Williams Co, or Zurn Plumbing Products; laundry trays by Eljer, Crane Plumbing, Florestone Products Co, Mustee E L & Sons Inc, Swan Corp, or Zurn Plumbing Products; water coolers by Elkay Manufacturing, Halsey Taylor, Haws Corp, Murdock Inc, Oasis Corp, Stern-Williams Co, or Sunroc Corp; and hose bibbs and hydrants by Zurn plumbing Products, Prier, WoodFord, or J R Smith.

Section 226113 Compressed-Air Piping for Laboratory Facilities – The section includes: compressed-air piping for non-medical laboratories of Type L copper medical gas tube with wrought-copper fittings, brazed press-type fittings , pressure-sealed joints; gas-powered-tool air (instrument air) piping of Type K copper medical gas tube with wrought-copper fittings, brazed joints; and drain piping of copper water tube with cast- or wrought-copper fittings, solder copper water tube with press-type fittings, pressure-sealed PVC pipe with PVC fittings and solvent-cemented joints. It will also include: three piece body brass or bronze ball valves; in-line pattern bronze check valves; zone valves - three-piece body full-port ball valves with gage; formed steel or aluminum zone valve boxes; bronze ASME construction safety valves; bronze spring-loaded, diaphragm operated relieving type pressure regulators; and stainless steel automatic drain valves.

Section 226119 Compressed-Air Equipment for Laboratory Facilities – The section includes packaged, enclosed scroll air compressors meeting ASME Boiler and Pressure Vessel Code independently tested by MGPHO or is an NRTL. It will also include: packaged, multiple oil-less scroll air compressors; combination inlet-air filter-silencers; refrigerant desiccant type compressed-air dryers; compressed-air purification systems with coalescing, particulate, and activated-charcoal filters, catalytic converter, gages, thermometers and controls; and restrained-spring vibration isolation.

Section 226213 Vacuum Piping for Laboratory Facilities – The section includes: non-healthcare laboratory low-vacuum piping of Type L copper medical gas tube with wrought-copper fittings and brazed joints; non-healthcare laboratory high-vacuum piping of Type L copper medical gas tube with wrought-copper fittings and brazed joints; and drain piping of copper water tube with cast-or wrought-copper fitting and soldered joints. It will also include: three piece body brass or bronze ball valves for copper tubing; three piece body brass or bronze ball valves for PVC piping; zone valves - three-piece body full-port ball valves with gage; formed steel zone valve boxes; bronze ASME construction safety valves; and stainless steel automatic drain valves.

Section 226219 Vacuum Equipment for Laboratory Facilities – The section includes vacuum equipment meeting NFPA 99 and UL 544, delegated design equipment mounting with seismic performance ratings, and receiver tank meeting ASME Boiler and Pressure Vessel Code independently tested by MGPHO or is an NRTL. It will also include: vacuum pumps 123; mounting of freestanding tank mounted; horizontal or vertical steel tank receiver; and automatic control switches to alternate lead-lag vacuum pumps and sequence lead-lag for multiplex vacuum pumps.

Section 226313 Gas Piping for Laboratory Facilities – The section includes: gas piping for carbon dioxide, helium, nitrogen, nitrous oxide, oxygen, or specialty TBD gas; wall mounted gas cylinder storage racks; and University supplied bulk gas storage tanks. Non-healthcare specialty gas piping shall be Type K copper medical gas tube with wrought-copper fittings and brazed joints; and protective conduit of PVC Schedule 40 pipe and fittings. It will also include: three piece body brass or bronze ball valves; in-line pattern bronze check valves; zone valves - three-piece body full-port ball valves with gage; formed steel or aluminum zone valve boxes; emergency oxygen connection; bronze ASME construction safety valves; bronze spring-loaded, diaphragm operated relieving type pressure regulators; nitrogen pressure control panels; and DISS quick coupler service connections and electrical service outlets with No. 4 stainless steel cover plates.

Section 226700 Processed Water Systems for Laboratory Facilities – The section includes factory assembled high purity water system, including reverse osmosis and deionization, water quality 2.0 megohm or better Type 2 ASTM Reagent Grade, by a manufacturer regularly engaged in the production of water treatment equipment equal to Marlo Inc. as approved by the Engineer. The system shall include: 304 stainless high pressure pump and motor; electrical control system; two

panel-mounted flow meters instrumentation and panel mounted pressure gages with cartridge filter outlet, RO feed and RO concentrate, all of 3316 stainless steel and liquid filled; pump throttle valves of brass or Noryl thermoplastic; polypropylene sediment pre-filter in the RO machine with built-in pressure relief valve; skid and frame assembly of powder coated aluminum; piping to be Schedule 80 PVC for less than 75 psig with RO product tubing of polypropylene, or Schedule 80 PVC with high-pressure control and pressure gauge tubing of high-pressure polypropylene for greater than 75 psig; RO product atmospheric storage tank with A0.2 micron tank filter with level controls.

Division 23 Heating, Ventilating and Air Conditioning

Section 230010 Common Requirements for HVAC – The systems, equipment, devices and accessories shall be installed, finished, tested and adjusted for continuous and proper operations.

- A. The University maintains central chilled water (CHW) equipment to service the campus. It is devised and piped to central loops on the east and west sides of the central ponds to provide service to campus buildings. Each project will make contribution to cost of the equipment and extension of the piping systems to connect to the buildings.
- B. Heating hot water (HHW), gas or electric heat will be the responsibility of the project and produced within the building.
- C. The project is to be made complete and operational in all respects, and all materials and equipment shall be furnished, delivered and installed without additional expense to the University. Include all materials, equipment, supervision, operation, methods and labor for the fabrication, installation, start-up, test and balance, and commissioning tests necessary for complete and properly functioning systems.
- D. Applicable Standards - Florida Building Code (FBC) (current editions) and National Fire Protection Association (NFPA) Standards (current editions):
 - 1. FBC – Mechanical Edition
 - 2. FBC – Plumbing Edition
 - 3. FBC - Fuel gas Edition
 - 4. FBC - Chapter 13 Florida Energy Efficiency for Building Construction
 - 5. NFPA-1, Uniform Fire Code
 - 6. NFPA-30, Flammable and Combustible liquids Code
 - 7. NFPA-51B, Standard for fire Prevention During Welding, Cutting, and other Hot Work
 - 8. NFPA-54, National Fuel Gas Code
 - 9. NFPA-70, Standard for Protection of Information Technology Equipment
 - 10. NFPA-90A, Standard for Installation of Air Conditioning and Ventilation Systems
 - 11. NFPA-90B, Standard for Installation of Warm Air Heating and Air Conditioning Systems
 - 12. NFPA 96, Standard for Ventilation Control and Fire Prevention of Commercial Cooking Operations
- E. Shop Drawings (Submittals) are required for all components of the systems:
 - 1. Each piping system
 - 2. Ductwork systems
 - 3. Coordination drawings
- F. Record Drawings are required for all systems installations;
 - 1. Maintain one set of black or blue line on white project record “as built” drawings at the site. At all times the set shall be accurate, clear, and complete, indicating the actual installation. Equipment Schedule, control diagrams, sequences of operation shall also be updated weekly.
 - 2. Prior to substantial completion, transfer onto an unmarked second set of drawings all changes, marked in colored pencil, and submit them to the Architect. Upon

completion of all punch lists, transfer all “as built” conditions to the AutoCAD record drawing files, package three print sets of full size drawings and two CDs of the AutoCAD drawing files with associated reference files and submit them for review and approval.

Section 230500 Common Work Results for HVAC – The work includes: piping materials and installation instruction common to most piping systems of ASTM A53 steel, cast or fabricated cast iron, ASTM D1785 PVC, or polyethylene; transition fittings of ASME B16.21 non-metallic flat pipe flange gaskets, AWWA C110 rubber flat faced, or full faced ring type gaskets, ASME flange bolts and nuts, plastic pipe-flange gasket bolts and nuts, ASTM B32 lead-free alloy solder fill materials, AWS 5.8 BCuP Series copper-phosphorus alloy brazing filler materials, AWS D10.12 welding filler metal materials, solvent cement for CPVC piping ASMT F 493 or for PVC ASTM D2564, or fiberglass pipe adhesive; mechanical sleeve seals by Advance Products and Systems, Calpico Inc, Metraflex Co, or Pipeline Seal and Insulator Inc; sleeves for steel galvanized ASTM A53 Type E Grade B Schedule 40, cast iron fabricated wall pipe with integral water stop and plain ends, stack sleeve fittings of cast iron with clamping flange clamp ring and set screws, molded PVC ASTM D1785 Schedule 40, or molded polyethylene taper-cup shaped with nailing flange; escutcheons; grout; equipment installation requirements common to equipment sections; painting and finishing; 3000 psi concrete bases with dowels at 18 inches at perimeter; and supports and anchorages with field welding meeting AWS D1.1.

Section 230513 Common Motor Requirements for HVAC Equipment – The work includes general requirements for single-phase NEMA MG1 Deign B, and poly-phase IEEE 841 general purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at the manufacturer’s factory or separately by the manufacturer for field installation. The equipment will need to be coordinated with features of the motor controller, torque speed and horsepower of the load, ratings and characteristics of the supply circuit and control sequence, and the ambient and environmental conditions of the installation.

Section 230519 Meters and Gages for HVAC Piping – The meters and gages includes: metal-case, liquid-in-glass thermometers by Palmer-Wahl, H O Trerice Co, Weiss Instrument, or Weksler or thermowells by the same manufacturer; direct mounting dial type pressure-gages by Palmer-Wahl, H O Trerice Co, Weiss Instrument, or Weksler; calibrated Venturi flow meters by ABB Instrumentation, Gerand Engineering Co, Hyspan Precisions Products, Preso Meters, S A Armstrong Ltd, or Vitaulic Co; corrosion-resistant brass or stainless steel test plugs by flow Design Inc, MG Piping Products, National Meter Inc, Peterson Equip Co, Sisco Manufacturing Co, H O Trerice Co, or Watts Industries; and ultrasonic thermal-energy meters by EMCO Flow Systems, Siemens Energy & Automation, or Onicon.

Section 230523 General Duty Valves for HVAC Piping – The valves include: two-piece full-port brass ball valves MSS SP-110 by Crane – Crane Valves or Jenkins Valves, Flow-Tek Inc, Milwaukee

Valve Co, NIBCO Inc, or Red-White Valve Corp; one-piece reduced-port bronze ball valves MSS SP-110 by American Valve Inc, Conbraco Industries Inc, or NIBCO Inc; : two-piece full-port bronze ball valves MSS SP-110 by Milwaukee Valve Co, NIBCO Inc, Red-White Valve Corp, or Watts Regulator Co; iron single-flange lug-type butterfly valves 150 CWP by Bray Controls, Crane – Crane Valves or Jenkins Valves, DeZurik Water Controls, Milwaukee Valve Co, NIBCO Inc, Tyco Valves and Controls, or Watts Regulator Co; iron swing check valves Class 125 by Crane – Crane Valves, Crane Stockham or Jenkins Valves, Milwaukee Valve Co, NIBCO Inc, or Watts Regulator Co for MSS SP-71 valves, MSS SP-71 valves or MSS SP-125 valves; and Class 125 bronze gate valves MSS SP-80 Type 1 by American Valve Inc, Crane – Crane Valves, Crane Stockham or Jenkins Valves, Milwaukee Valve Co, NIBCO Inc, or Watts Regulator Co.

Section 230529 Hangers and Supports for HVAC Piping and Equipment – The supports include: steel pipe hangers and supports MSS SP-58 Type 1 -58 by Globe Pipe Hanger Products, Grinnell Corp, or National Pipe Hanger Corp; MSS SP-69 Type 59 shop- or field-fabricated trapeze pipe hangers of structural steel with MSS SP-58 hanger rods, nuts, saddles and U-bolts; fiberglass pipe hangers; MFMA-3 shop- or field-fabricated steel channel framing systems by B-Line Systems, ERICO/Michigan Hanger, GS Metals Corp, Tyco Power-Strut, Thomas & Betts Corp, Tolco Inc, or Unistrut Corp; ASTM C 552 Type II thermal-hanger shield inserts by Carpenter & Paterson Inc, ERICO/Michigan Hanger, PHS Industries, Pipe shields Inc, Rilco Manufacturing, or Value Engineered Products Inc; mechanical-expansion anchor fastener systems by B-Line Systems, Empire Industries, Hilti Inc, ITW Ramset/Red Head, or MKT Fastening LLC; pipe stands of manufactured corrosion-resistant components to support roof-mounted piping; and equipment supports of welded, shop- or field-fabricated structural steel ASTM A36/A A36M; and ASTM C 1107 factory-mixed hydraulic-cement non-metallic grout.

Section 230548 Vibration Controls for HVAC Piping and Equipment – The vibration controls include: neoprene isolation pads by Ace Mountings Co, Amber/Booth Co, California Dynamics Corp, Isolation Technology Inc, Kinetics Noise Control, Mason Industries, Vibration Eliminator Co, Vibration Isolation, or Vibration Mountings & Controls; freestanding laterally stable open-spring isolators for 200% rated load and travel 50% deflection; freestanding steel restrained spring isolators for 200% rated load and travel 50% deflection; combination coil-spring steel and elastomeric-insert hangers for 200% rated load and travel 50% deflection; and factory-fabricated welded structural-steel bases and rails, or factory-fabricated welded, structural-steel inertia bases and rails for concrete insertion, and vibration isolation equipment bases.

Section 230553 Identification for HVAC Piping and Equipment – The identification includes: stamped or engraved metal – 0.032 brass, 0.032 aluminum equipment labels, minimum 2.5x3/4" with 1/4" letters; 1/8" multi-layer multicolor plastic equipment labels minimum 2.5x3/4" with 1/4" machined letters; similar warning signs and labels with schedule; pre-printed pre-coiled semi-rigid plastic pipe labels showing flow direction attached without fasteners or adhesive; 1/8" multi-layer multicolor plastic duct labels minimum 2.5x3/4" with 1/4" machined letters, or 1/2"

letters for 72" viewing distance, and 1-1/2" letters for duct label contents; 1-1/4" letter ASTM A13.1 aluminum stencils for piping or 3/4 " for access doors; stamped or engraved metal – 0.032 brass or 0.032 aluminum round valve tag labels, minimum 2.5x3/4" with ¼" letters and ½" numbers; and pre-printed accident-prevention warning tags of plasticized card stock with matt-finish suitable for writing 3"x5-1/4" minimum with large primary nomenclature such as "DANGER", "CAUTION" or "DO NOT OPERATE", yellow background with black lettering.

Section 230593 Testing, Adjusting and Balancing for HVAC – The TAB section includes balancing by certified AABC, NEBB or TABB supervisor and technician: constant-volume air system; variable-air-volume systems; variable-flow hydronic systems; and primary-secondary hydronic systems. TAB conference is required with the University Facilities Staff, Architect, Construction Manager and Commissioning Agent outlining: the document examination report, TAB Plan, coordination and cooperation of trades and subcontractors, and coordination of documentation and communication flow.

Section 230700 HVAC Insulation – The section includes: insulation materials – ASTM C552 cellular glass by Cell-U-Foam Ultra-CUF or Pittsburgh Corning Foamglas Super K; ASTM C534 flexible elastomeric by Aeroflex USA Aerocel, Armacell LLC AP Armaflex, or RBX Corp Insul-Sheet 1800 and Insul-Tube 180; ASTM C 553 Type 2 mineral-fiber blanket insulation with ASTM 1290 Type 3 jacket by CertainTeed Duct Wrap, Johns Manville Microlite, Knauf Insulation Duct Wrap, Manson Insulation Alley Wrap, or Owens Corning All-Service Duct Wrap; ASTM C612 Type 1A or 1B mineral-fiber board insulation with factory-applied ASJ by CertainTeed Commercial Board, Fibrex Insulations FBX, Johns Manville 800 Series Spin-Glas, Knauf Insulation Board, Manson Insulation AK Board, or Owens Corning Fiberglas 700 Series; flexible elastomeric and polyolefin adhesives MIL-A-24179A Type 2 Class 1, mineral fiber adhesives MIL-A-3316C Class 2 Grade A, ASJ adhesives MIL-A-3316C Class 2 Grade A, and PVC jacket adhesives with VOC 50g/L at 40 CFR 59 Subpart D, compatible with the insulation materials; vapor barrier mastics MIL-PRF-19565C with VOC 50g/L at 40 CFR 59 Subpart D; FSK and metal jacket flashing sealants and ASJ flashing sealants equal to Childers Brand CP-76; ASTM 1136 Type 1 – ASJ and ASJ-SSL factory-applied jackets or Type 2 - FSK and FSP factory-applied jackets; ASTM C921 Type 1 FSK, PVC, or aluminum metal field-applied jackets; ASTM C1136 – ASJ or FSK tapes; band securements or insulation pins and hangers with retaining washers; and ASTM D 1784 Class 16354-C PVC or ASTM B209 0.040" aluminum corner angles.

Section 230800 Commissioning of HVAC – The commissioning (CxA) process requirements for HVAC & Refrigeration Systems, assemblies and equipment is outlined in the section. Contractor's responsibilities include: perform commissioning tests at the direction of the CxA; attend construction phase controls coordination meeting; attend TAB review and coordination meeting; participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA; provide information requested by the CxA for final commissioning documentation; and provide measuring instruments and logging devices to

record test data, and provide data acquisition equipment for the required test data. Commissioning documentation shall include: plan for delivery and review of submittals, system manuals, and other documents and reports; identification of installed systems, assemblies, equipment, and components including design changes during construction; process and schedule for completing checklists and manufacturer's pre-start and startup checklists for HVAC&R systems, subsystems, equipment and components to be verified and tested; certificate of completion that installation, pre-start checks, and startup procedures have been completed; certificate of readiness certifying that HVAC&R systems, subsystems, equipment and associated controls are ready for testing; test and inspection reports and certificates; corrective action documents; and verification of testing, adjusting and balancing reports.

Section 230900 Instrumentation and Control for HVAC – The section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls and the sequence of operations. Submittals should include: DDC system hardware, control system software, and controlled systems product data, shop drawings, data communications protocol certificates, software and firmware operational documentation, software upgrade kit, and operation and maintenance data.

Section 231123 Facility Natural-Gas Piping – The gas piping includes: ASTM A 53A/A 53M black steel Schedule 40 pipes; ASTM D 2513 polyethylene pipe for exterior use; ASTM A234/A A234M wrought steel welded fittings; ASTM D 2683 socket-fusion or ASTM D3261 butt-fusion PE fittings; flexible appliance connector and corrugated stainless-steel tubing with polymer coating and other piping specialties; joint compound and tape, or welded filler materials AWS D10.12/D10.12M, for gas piping and tubing; ASME B16.33 metallic valves labelled "WOG"; MSS SP-110 one-piece bronze ball valves by BrassCraft, Conbraco, R W Lyall & Co, A Y McDonald Mfg, Perfection Corp, or NIBCO Inc; MSS SP-110 two-piece full-port bronze ball valves by BrassCraft, Conbraco, R W Lyall & Co, A Y McDonald Mfg, Perfection Corp, or NIBCO Inc; MSS SP-78 bronze plug valves by Lee Brass Co or A Y McDonald Mfg; MSS SP-78 cast-iron lubricated plug valves by Flowserve, homestead valve, A Y McDonald Mfg, Miliken Valve Co, Mueller Co Gas, or R&M Energy Systems; ASME B 16.40 PE ball valves by Kerotest Mfg, R W Lyall & Co, or Perfection Corp; cast-iron two-section valve boxes labelled "GAS"; ANSI Z21.21 automatic motorized gas valves by ASCO Power, Dungs Karl Inc, Eaton Corp, Eclipse Combustion, Honeywell International, or Johnson Controls; UL 429 electrically operated valves by ASCO Power, Dungs Karl Inc, Eclipse Combustion, Goyen Valve Corp, Magnatrol Valve Corp, Parker Hannifin Corp, or Watts Regulator Co; ANSI Z 21.80 service-pressure or line-pressure regulators by Actaris, American Meter Co, Fisher Control Valves & Regulators, Maxitrol, Invensys, or Richards Industries; ANSI Z21.18 appliance-pressure regulators by Eaton Corp, Harper Wyman Co, Maxitrol Co, SCP Inc; dielectric unions, fittings and flange kits by Capitol Manufacturing, Central Plastics, Watts Regulator or Wilkins Zurn; and mechanical sleeves ASTM A 53/A 53M Type E Grade B Schedule 40 galvanized steels plate; and seals by Advance Products & Systems, Calpico, Metra Flex Co, Pipeline Seal and Insulator.

Section 232113 Hydronic Piping – The hydronic piping includes: hot-water heating piping or chilled-water piping of ASTM Type L drawn-temper copper tubing, ASTM B88 Type K annealed-temper copper tubing, ASTM B306 Type DWV copper tubing, ASME B 16.22 wrought-copper fittings by Anvil International, S P Fittings or Vitaulic Co, ASTM A 53/A 53M steel pipe, ASME B 16.4 Class 125 and 250 cast-iron pipe with threaded fittings, ASME 16.3 Class 150 and 300 malleable-iron pipe with threaded fittings, ASMT B 16.39 Class150, 250 and 300 malleable-iron unions, ASME B 16.1 Class 25,125, and 250 Cast-iron pipe flanges and flanged fittings, ASTM A 234/A A234M wrought steel fittings, ASME B16.5 wrought cast- and forged-steel flanges and flanged fittings, and ASTM A 733 steel pipe nipples; condensate-drain piping; air-vent piping;; dilectric fittings by Capitol Manufacturing, Central Plastics, Hart Industries, watts Regulator, or Zurn; safety-valve-inlet and –outlet piping with valves by Armstrong Pumps, Bell & Gossett Domestic, Flow Design Inc, Gerand Engineering Co, Griswold Controls, or Taco; air control devices by Amtrol Inc, Armstrong Pumps, Bell & Gossett, or Taco; and hydronic piping specialties such as Y-pattern strainers, stainless steel bellow flexible connectors, and spherical rubber flexible connectors.

Section 232123 Hydronic Pumps – The hydronic pumps include separately coupled, vertically mounted, in-line centrifugal pumps by Armstrong Pumps, Aurora Pump, Flowserve Corp, ITT Corp B&G, Patterson Pump, or Taco; and angle pattern suction diffuser and angle or straight triple-duty valves.

Section 233113 Metal Ducts – The ductwork includes: single-wall rectangular ducts and fittings meeting SMACNA “HVAC Duct Construction Standards – Metal and Flexible”; single-wall round ducts and fittings by Lindab Inc, McGill Airflow, SEMCO Inc, EHG Duct, Sheet Metal Connectors and Spiral Manufacturing; sheet metal materials such as ASTM A 653/A 653M galvanized sheet steel, ASTM A 1008/A 1008M carbon-steel sheets, ASTM A 480/A 480M stainless steel sheets, ASTM A 36/A 36Msteel plates shapes and bars (black and galvanized), tie rods, and shop application of duct liner per SMACNA; water based join and seam sealants, flanged joint sealants, flanged gaskets and round duct O-ring seals; and cadmium plated, electro-galvanized or steel cable hangers and trapeze supports.

Section 233300 Air Duct Accessories – The accessories include: similar materials to Section 2331113; gravity balanced backdraft and pressure relief dampers by Air Balance Inc, American Warming and Ventilating, Duro Dyne, Greenheck Fan, Nailor Industries, NCA Manufacturing, Potorff PCI, Ruskin Co, SEMCO Inc, or Vent Products Co; standard steel manual volume dampers by Air Balance Inc, Flexmaster USA, McGill Airflow, METALAIRE, Nailor Industries, Ruskin Co, or Vent Products Co; AMCA low-leakage rating control dampers by Air Balance Inc, American Warming and Ventilating, Aero United Ind, Duro Dyne, Flexmaster USA, Greenheck Fan, McGill Airflow, METALAIRE, Nailor Industries, NCA Manufacturing, Ruskin Co, Vent Products Co, or Young Regulator Co; UL 555 labeled dynamic 1.5 hr. rated fire dampers by Greenheck Fan, Nailor

Industries, or Ruskin Co; UL 555 or UL 555 S labeled dynamic 1.5 hr. rated combination fire and smoke dampers by Greenheck Fan, Nailor Industries, or Ruskin Co; add-on or roll-formed flange connectors by Ductmate Industries, Nexus PDQ, or Ward Industries; turning vanes by Ductmate Industries, Duro Dyne, METALAIRE, SEMCO Inc, or Ward Industries; duct-mounted access doors by American Warming and Ventilating, Ductmate Industries, Flexmaster USA, Greenheck Fan, McGill Airflow, or Nailor Industries; UL 1978 rated duct access panel assemblies by Ductmate Industries, Flame Gard Inc, or 3M; flame-retardant noncombustible flexible connectors by Ductmate Industries, Duro Dyne, or Vent Fabrics Inc; flexible ducts by Flexmaster USA, or McGill Airflow; and duct accessory hardware such as instrument test holes and high strength, quick setting, neoprene based adhesives.

Section 233423 HVAC Power Ventilators – The ventilators include: spun aluminum, dome top and out baffle centrifugal ventilators by Greenheck Fan, Loren Cook Co, or PennBarry; and spun aluminum with alum straightening vanes, inlet and outlet flanges, in-line centrifugal fans by Greenheck Fan, Loren Cook Co, or PennBarry. Ventilator fan to have sound rating per AMCA 301 and performance rating per AMCA 210.

Section 233450 Laboratory Exhaust Fans – The lab fans include specialized fans meeting NFAP-45, UL 705, and AMCA 300 standards, designed for specific use by Strobic Air Corp, Greenheck Fan or Loren Cook, with minimum nozzle velocity of 3,000 FPM.

Section 233600 Air Terminal Units – The section includes: shutoff, single-duct air terminal units ASHRAE 62.1-2004 by Trane, Envirotech, E H Price or Titus, with volume-damper assembly inside casing, hydronic coils and direct digital controls; foil-faced casing w/ 1" insulation liners and adhesives; sealants and gaskets; detailed equipment system-air-powered bellows section regulator assembly schedules; control sequence wiring diagrams; and cadmium-plated steel rod hangers and galvanized steel cable ASTM A603 supports.

Section 233650 Laboratory Temperature & Airflow Control System – The lab system (LTACS) includes: control of the airflow (venture air valve) into and out of the laboratory rooms utilizing Space Comfort Controller, variable air volume (SCC-VAV Object type 8502) profile and communicating using Lontalk protocol and Lonmark devices; variable air exhaust flow rate for laboratory fume hoods connected to sash sensor and fume hood monitor; and constant average face velocity of air for LTACS interfaced with building management system.

Section 233713 Diffusers, Registers and Grilles – The section includes: 18 gauge steel, with aluminum frame and baffle, displacement diffusers by Price Industries, Trox, and Krantz; baked-enamel aluminum rectangular and 24"x24" square ceiling diffusers by Price Industries, Nailor Inc, or Titus; baked-enamel aluminum louver face diffusers by Price Industries, Nailor Inc, or Titus; baked-enamel aluminum round ceiling diffusers by Price Industries, Nailor Inc, or Titus; baked-enamel aluminum linear bar diffusers by METALAIRE Inc, Price Industries, or Titus; baked-enamel

aluminum linear slot diffusers by METALAIRE Inc, Price Industries, or Titus; adjustable bar register; and baked-enamel aluminum fixed face grille by METALAIRE Inc, Price Industries, or Titus.

Section 235216 Condensing Boilers – The boiler section includes packaged, factory-fabricated and –assembled, gas-fired, fin-tube condensing boilers, trim and accessories for generating hot water by Hydrotherm Inc, AERCO International, Laars Heating Systems, or Raypak Inc.

Section 237313 Modular Indoor Central-Station Air-Handling Units – The section includes constant-air-volume, single-zone air-handling units, and variable-air-volume, single-zone air-handling units by Trane/Ingersol Rand, York/Johnson Controls, or Carrier Corp/United Technologies, complying with NFPA 90A, ARI 430, ASHRAE62.1-2007, ASHRAE/IESNA 90.1-2007 and NFPA 70, with disposable panel filters.

Section 238219 Fan Coil Units – The section includes factory packaged and tested fan-coil units and accessories by Trane, York, or Carrier complying with ARI 440, ASHRAE 33 and 62.1, and UL 1995 and filters meeting ASHRAE 52.1 and MERV 5 by ASHRAE 52.2.

Division 26 Electrical

Section 260100 Basic Electrical Requirements

- A. The electrical systems are to be compatible with the TECO provider and shall be in satisfactory condition, ready for operation, including raceways, conduits, wires, cables and other materials needed for all complete electrical systems required by the documents.
- B. Systems shall meet the State of Florida, Polk County, City of Lakeland and the Florida Polytechnic University adopted standards, as well as: the latest edition of the Florida Building Code, ASME-A17.1 Elevator Code, and National Fire Protection Association (NFPA) Standards.
 - 1. NFPA-1, Uniform Fire Code
 - 2. NFPA-13, Standard for Installation of Sprinkler Systems
 - 3. NFPA-37, Standard for Installation and Use Of Stationary Combustion Engines and Gas Turbines
 - 4. NFPA-54, National Fuel Gas Code
 - 5. NFPA-70, National Electrical Code
 - 6. NFPA-72, National Fire Alarm Code
 - 7. NFPA-75, Standard for Protection of Information Technology Equipment
 - 8. NFPA-90A, Standard for Installation of Air Conditioning and Ventilating Systems
 - 9. NFPA-101A, Guide on Alternative Approaches to Life Safety
 - 10. NFPA-101B, Standards on Means of Egress for Buildings and Structures
 - 11. NFPA-110, Standard for Emergency and Standby Power Systems
 - 12. NFPA-780, Installation of Lightning Protection Systems
- C. The electrical work will include provisions for:
 - 1. Door hardware
 - 2. Roll-up doors
 - 3. Roll-up grilles
 - 4. Signage
 - 5. Fire shutters
 - 6. Elevators
 - 7. Escalators
 - 8. Sliding or automatic doors
 - 9. Mechanical Divisions of the Specifications
 - 10. Landscape Architect drawings
 - 11. Interior Design drawings
 - 12. Fountains
 - 13. Millwork design drawings and shop drawings
- D. Reference will be made to organization standards: ANSI, ASTM, ICEA IEEE, ISA, NEMA, NFPA, OSHA, UL and others as appropriate.
- E. Record drawings are required upon completion of all systems.

Section 260519 Low-Voltage Electrical Power Conductors and Cables – The systems will include: NEMA WC 70 copper building wires and cables rated 600V AC and less (Type THHN-THWN) by American Insulated Wire Corp, General Cable Corp, Senator Wire & Cable Co, or Southwire Co – feeders solid copper for #10 AWG and smaller, and stranded copper for #8 AWG and larger; connectors, splices, and termination (with six inch slack at outlets) rated 600V and less by Hubbell Power, O-Z/Gedney, or 3M terminated per UL 486A and 486B; and sleeves and seals for cables.

Section 260526 Grounding and Bonding for Electrical Systems – The systems include: underground distribution grounding per NEC, NEC 70-100 and UL 467; and common ground NEC 250 bonding per NEC 517-14; with lightning protection system.

Section 260529 Hangers and Supports for Electrical Systems – The section includes hangers and NECA 1 & NECA 101 supports for electrical equipment and systems: steel slotted support by Allied Tube & Conduit, Cooper B-line Inc, ERICO International, G S Metals Corp, Thomas & Betts Corp, Unistrut, or Wesanco; nonmetallic slotted glass fiber resin supports by Allied Tube & Conduit, Cooper B-Line, Fabco Plastics, or Seasafe Inc; mounting anchoring attachment components by Hilti Inc, ITW Ramset/Red Head, MKT Fastening, or Simpson Strong-Tie for power actuated fasteners, by Cooper B-Line, Empire Tool & Manufacturing, Hilti Inc, ITW Ramset/Red Head, or MKT Fastening for mechanical-expansion anchors, or welded or bolted structural-steel shapes field fabricated and for concrete with MSS Type 18 steel or malleable slotted support systems meeting MFMA-4 or MSS SP-58; and construction requirements for minimum 4-inch for 3,000 psi reinforced concrete bases with anchorages minimum 10 bolt diameters from edge.

Section 260533 Raceway and Boxes for Electrical Systems – The section includes: rigid steel /ANSI C80.1, IMC /ANSI C80.6, EMT /ANSI 80.3, FMC /zinc-coated steel, LFMC /flexible steel conduit with PVC jacket - metal conduit and tubing by Allied Tube & Conduit, Maverick Tube Corp, O-Z Gedney, or Wheatland tube Co; RNC /NEMA TC2 Type EPC-40-PVC nonmetallic conduit and tubing by Lamson & Sessions, Manhattan/CDT/Cole-Flex, RACO, or Thomas & Betts Corp; NEMA 250 Type 1 12 3R sheet metal sized wireways by Cooper B-Line, Hoffman, or Square D; galvanized steel surface metal raceways by Thomas & Betts Corp, Walker Systems Inc, Wiremold Co; rigid PVC surface nonmetallic raceways by Hubbell Inc, Lamson & Sessions, Panduit Corp, Walker Systems Inc, or Wiremold Co; fittings for each of the types EMT /steel, RNC /NEMA TC3, couplings, offsets, elbows, expansion joints, adapters, end caps and hold-down straps; steel /NEMA OS 1, aluminum cast metal /NEMA FB 1 Type FD, nonmetallic /NEMA OS 2 outlet, device and junction boxes, steel enamel enclosures /NEMA 250 Type 1, and galvanized steel cabinets /NEMA 250 Type 1 for electrical wiring, each by Cooper Crouse-Hinds, EGS/Appleton Electric, Hoffman, Hubbell Inc, RACO, Robroy Industries, Spring City Electrical, Thomas & Betts Corp.

Section 260543 Underground Ducts and Raceways for Electrical Systems – The section includes: rigid steel /ANSI C80.1 metal or RNC /NEMA TC2 Type EPC-40-PVC nonmetallic conduits,

nonmetallic ducts and duct accessories by Cantex Inc, CertainTeed Corp, Condux international, ElecSys Inc, or Electri-Flex Co, for direct-buried and concrete-encased duct banks, and in single duct runs; precast concrete handholes and boxes /ASTM C858 by Carder Concrete, Christy Concrete, Riverton Concrete, or Utility Vault Co; polymer or fiberglass handholes and boxes by Carson Industries, Armorcast, Christy Concrete, Synertech Moulded Products Inc; and precast manholes /ASTM C858 by Carder Concrete, Christy Concrete, Utility Concrete, or Utility Vault Co; utility structure accessories such as manhole frames, covers, chimney components, pulling eyes, bolting inserts, expansion anchors, steel cable rack assembly, and cover hooks, each by Bilco Co, East Jordan Iron Works, Neenah Foundry Co, NewBasis, or Underground Devices.

Section 260553 Identification for Electrical Systems – The identification section includes: power raceway identification /ANSI A13.1, black letters on orange field, “DANGER CONCEALED HIGH VOLTAGE WIRING”; power and control cable identification /ANSI 13.1 self-adhesive vinyl labels; color-coded conductor identification vinyl tape; color-coded underground-line warning tape /ANSI Z535.1 through Z535.5 red for “ELECTRICAL LINE” or “HIGH VOLTAGE”, and orange for “TELEPHONE CABLE”, “CATV CABLE”, “COMMUNICATIONS CABLE”, or “OPTICAL FIBER CABLE”; warning labels and signs /NFPA 70 and 29 CFR 1910.145 such as DANGER – ELECTRICAL SHOCK HAZARD – EQUIPMENT HAS MULTIPLE POWER SOURCES”, “WARNING – OSHA REGULATION – AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES”, or arc flash warning per NEC 110.16 and NFPA 70E and OSHA; engraved laminated acrylic or melamine plastic instruction signs, black letters on white face, or adhesive film instruction signs; engraved plastic laminate nameplate equipment identification labels; general purpose, UV-stabilized or plenum rated /ASTM D638 black cable ties; and miscellaneous identification products such as stainless-steel self-tapping screws for labels.

Section 260800 Commissioning of Electrical – The section includes commissioning process requirements for electrical systems, assemblies, and equipment: requiring the contractor to perform commissioning test at the direction of the CxA, attend construction phase controls coordination meetings, attend testing adjusting and balancing review and coordination meeting, participate in electrical systems, assemblies, equipment and component maintenance orientation and inspection as directed by the CxA, and provide information requested by the CxA for final commissioning documentation; contractor to provide to the CxA the plan for delivery and review of submittals, identification of installed systems, assemblies, equipment and components, process and schedule for completing construction checklists, certificate of completion certifying the systems, assemblies, equipment and components have been completed and are ready for testing, test and inspection reports and certificates, and corrective action documents.

Section 260913 Electrical Power Monitoring and Control – The section includes monitoring of the systems with: PC-based workstations and software; communication network and interface modules for RS-232 data transmission protocols. Action submittals including: product data such

as for switchboards and switchgear; shop drawings - outline drawings, block diagram, detail equipment assemblies, wiring diagrams, UPS sizing calculations, and surge suppressors; and closeout submittals including: operating and applications software documentation, software licenses, software service agreement, PC installation and operating documentation, and hard copies and PDF files on CD-ROM of manufacturer's specifications and design & user guides for software and hardware; software and firmware operational documentation such as self-study guide for settings and access, software operating and upgrade manuals, software back-up on CD, device address list and set points, and graphic file and print-out of screens and icons with legend.

Section 260923 Lighting Control Devices – The section includes: electronic solid-state UL 917 time switches by Intermatic Inc, Leviton Mfg Co, Lithonia Lighting, or TORK; solid-state UL 773 outdoor photoelectric switches by Intermatic Inc, Lithonia Lighting, Paragon Electric Co, or TORK; solid-state wall- or ceiling-mounted indoor dual-technology type occupancy sensors by Hubbell Lighting, Leviton Mfg Co, Lithonia Lighting, Sensor Switch Inc, or TORK; outdoors motion sensors by similar groups; electrically operated and mechanically-held lighting contactors by Allen-Bradley/Rockwell, ASCO Power Technologies, Eaton Electrical Inc, GE Industrial Systems, or Square D; and normally closed electrically-held emergency shunt relays by Lighting Control and Design Inc or equal.

Section 260943 Network Lighting Controls – The section includes addressable lighting control devices communicating with data-entry and –retrieval devices using DALI protocol, submittals including: product data such as for control modules power distribution components, DALI network materials, manual switches and plates; shop drawings - outline drawings, block diagram, wiring diagrams; coordination drawings – interconnecting signal and control wiring and interface devices proving compatibility, and networked controls of protocols, and statements from manufacturers that input and output devices meet interoperability requirements of the network protocol; software and firmware operational documentation such as software operating and upgrade manuals, program software back-up, devices address list, and printout of software application and graphics screens; field quality control test reports, software licenses and upgrades, operations and maintenance data, and special eight and ten year warranties for software and hardware.

Section 262413 Switchboards – The section includes: service and distribution front- and side-accessible switchboards rated 600V AC and less /NEMA 250 Type 1 indoor and Type 3R outdoor enclosures by Eaton Electrical, General Electric Co, Siemens Energy & Automation, or Square D; IEEE C62.42 compliant surge protection transient voltage suppression devices UL 1449 by Eaton Electrical, General Electric Co, Siemens Energy & Automation, or Square D; thermal-magnetic molded-case circuit-breakers UL 489 or 100 percent rated, sealed insulated-case circuit breaker, disconnecting and overcurrent protective devices; multi-function digital-metering monitor instrumentation; 120V ac circuits for control power supplied through secondary disconnecting devices from control power transformer and control wiring for hardware and other accessory

components and features; labeling identification similar to Section 260553; and continuously integrated mimic buses factory applied to front of switchboard.

Section 262416 Panelboards – The panelboards include: NEMA PB 1 power and feeder distribution type panelboards by Eaton Electrical Inc, General Electric Co, Siemens Energy & Automation, or Square D; NEMA PB1 lighting and appliance branch-circuit panelboards by Eaton Electrical Inc, General Electric Co, Siemens Energy & Automation, or Square D; and disconnecting and overcurrent protection devices and load centers with molded-case circuit breakers UL 489 or fused switch NEMA KS1 Type HD, all by Eaton Electrical Inc, General Electric Co, Siemens Energy & Automation, or Square D.

Section 262276 Wiring Devices – The wiring devices include: 125V 20A convenience straight blade receptacles /NEMA WD1 by Cooper 5351/5352 (single/duplex), Hubbell HBL5351/5352, Leviton 5891/5352, Pass & Seymour 5381/5382, and NEMA WD6 UL498 & 493 Class A 125V 20A duplex GFCI receptacles by Cooper GF20, or Pass & Seymour 2084, and associated device plates; NEMA WD1 NEMA WD6 configuration L5-20R single convenience 125V 20A twist-locking receptacles by Cooper L520R, Hubbell HBL2310, Leviton 2310, or Pass & Seymour; receptacles with integral surge suppression units; NEMA WD1 UL20 120/277V 20A snap switches by Cooper 2221-2224 (single-pole to four-way), Hubbell CS1221-CS1224, Leviton 1221-2 to 1224-2, or Pass & Seymour 20AC1-20AC4, similar pilot light and key operated switches, and modular full-wave solid-state wall-box dimmers with EMI/RFI suppression filters; solid-state fan speed controls; wall-switch and exterior occupancy sensors; matching locking-type plug and receptacle body pendant cord-connector devices NEMA WD6 configurations L5-20P and L5-20R heavy-duty grade; rubber-insulated strand-copper conductors Type SOW-A cord and plug sets ampacity plus 30%; modular flush-type floor service outlets and poke-through assemblies by Wiremold EFB8S SVI or equal, NFPA 70 service poles, and #12 AWG multi-outlet assemblies by Hubbell Inc/Wiring Device-Kellums, or Wiremold Co.

Section 262813 Fuses – The section includes cartridge fuses rated 600V AC and less for use in control circuits, enclosed switches and enclosed controllers with cartridge fuses NEMA FU1 by Cooper Bussman Inc, Edison Fuse Inc, Ferraz Shawmut Inc, or Littelfuse Inc.

Section 262816 Enclosed Switches and Circuit Breakers – The section includes: fusible switches by Eaton Electrical Inc, General Electric Co, Siemens Energy & Automation, or Square D; Type HD single throw 240 or 600V AC 1200 A and smaller nonfusible switches by Eaton Electrical Inc, General Electric Co, Siemens Energy & Automation, or Square D; shunt trip switches; NEMA AB1 & NEMA AB 3 UL489 thermal magnetic molded-case circuit breakers by Eaton Electrical Inc, General Electric Co, Siemens Energy & Automation, or Square D; and NEMA AB1, NEMA KS1, NEMA 250 and UL50 enclosures to comply with environmental conditions at installed location.

Section 263213 Engine Generators – The section describes materials, installation and testing of an engine generator set, with main breaker and auxiliary support system, to be used for in the event of a utility power failure. Generators shall be “standby power rated” units with diesel fuel tank by Caterpillar/Olympian, Onan/Cummins, Power Seave or Kohler.

Section 263353 Static Uninterruptible Power Supply – The section includes: UPS systems by Eaton Corp, Liebert corp, or Mitsubishi with surge suppression, input harmonics reduction, field adjustable rectifier-charger, pulse-width modulated inverter, solid-state static bypass uninterrupted transfer switch, valve-regulated recombinant lead-calcium battery and battery disconnect device by C&D Technologies, eaton Corp, or EnerSys; NEMA PB2 UL891 internal maintenance bypass/isolation switch; UL1561 output isolation transformer; remote UPS monitoring provisions, with basic battery and battery-cycle monitoring, and remote computer monitoring.

Section 263600 Transfer Switches – The section includes automatic transfer switches rated 600V AC and less by Caterpillar Engine Division, Emerson ASCO Power, GE Zenith Controls, Kohler Power Systems Generator Division, Onan/Cummins Power Generation, or Russelectric Inc.

Section 264116 Lightning Protection for Structures – The lightning protection systems UL or LPI Master Installer/Designer design is required for all University structures UL96 and NFPA 780 by Harger, Heary Brothers Lightning Protection Co, or Thompson Lightning Protection.

Section 264313 Surge Protection Devices – The section includes surge protection devices (SPD) for low voltage power, control and communication equipment by Advanced Protection Technologies, Atlantic Scientific, Cutler-Hammer Inc, EFI Electronics Corp, General electric Co, Leviton Mfg Co, Square D Surgelogs, or LEF International, and TVSS or SPD equipment required for the protection within specified and tested limits of AC electrical circuits and electronic equipment.

Section 265100 Interior Lighting – The interior lighting includes: interior lighting fixtures – recessed NEMA LE4, incandescent fixtures NEMA LE5A UL 1598, fluorescent fixtures NEMA LE5A UL 1598, HID fixtures UL 1598, with sheet metal components, doors, frames, lenses, plastic diffusers, covers, globes, lamps and ballasts; internally-lighted emergency units and LED exit signs UL 924; single-stem and twin-stem hanger lighting fixture supports; and retrofit kits for fluorescent lighting fixtures.

Section 265600 Exterior Lighting – The exterior lighting includes: UL 1598 and IESNA RP-8 exterior luminaires with painted metal components, light shields, doors, frames, lenses, UV resistant plastic parts, low-temperature rated ballasts and lamps; luminaire-mounted photoelectric relays; poles and accessories with concrete pole foundations; and luminaire lowering devices.

Division 27 Communications, Data and Fiber

I. Systems

A. Introduction

1. In order for the new home for Florida Polytechnic to fulfill its mission, it has to be as visionary in the use of advanced building technologies as it is in its architecture.
2. This document covers the campus facilities systems portion of the vertical standards. If element isn't mentioned here then it is covered by the master plan or the facilities program.
3. The University will approach the technical vision for the campus in an "Intelligent Building System/Intelligent Campus Environment" with central management and control.
4. Intelligent environments are holistic. It represents everything from the gathering of raw data to the interaction of user's right up to the display of content. The new campus will be designed to grow with the future of advances in technology so that it remains cutting edge even as technology progresses.
5. Florida Poly will be a leader in the development of new technologies for efficient building operations, environment enhancement, and increased user experience.
6. The LEED standards are outlined in other documents as a minimum design to standards and won't be addressed in this document.
7. We will focus on the user. The user experience is the center of all that is done and that experience is what defines success. The "user" and the targeted experience will change with each circumstance. It is critical that all who step onto this new campus have a positive experience.
8. We will focus on flexible designs that allow for modifications to energy supplies, cooling equipment, and communications. The systems will be flexible in that they will allow for alternatives in energy, chilled/hot water, and communications.
9. Students, faculty, staff, and visitors from around the world will be visually stimulated by the architecture and magnificence of this campus and mentally stimulated by the leveraging of advanced solutions incorporated into the campus culture.
10. A clean, safe, and functional campus environment engulfed in sustainable, converged, and advanced systems are a must for effective and efficient learning spaces.

No language in this document will supersede any items required by Florida Building Code, National Fire Code, National Electrical Code, Authority Having Jurisdiction (AHJ), or safety.

B. Background

1. The information used to produce this document was gathered from the following sources:
 - a. *Florida Polytechnic 2010 – 2020 Master Plan Update*, produced by Santiago Calatrava, October 2009
 - b. *Florida Polytechnic Facilities Program*, July 28, 2008
 - c. *Florida Polytechnic 2015 – 2025 Campus Master Plan Update*, produced by AMEC Foster Wheeler, adopted September 2016.
2. It is imperative that any person or group engaged with construction or any element that impacts the operation of the Florida Polytechnic University campus comply with this document.

3. It was determined that as the campus begins to come together with design and construction that a global design standard should be created that addressed the systems and operation for the campus.
4. The benefits of having a global design document are numerous. First of all it creates a uniformed understanding of how all systems are to function and creates a final outcome visual for the designers. With uniformed vertical standards to work by, all selected design firms will be on the same page even if they are working on different buildings. In addition it passes clear understanding of how the campus is to function and operate; enabling designers to understand the “why” and focus on the “how”. Lastly, it creates a baseline for construction, project management, and all brings and understanding for stakeholders to understand exactly what is the “desired outcomes” for all systems on campus.
5. It isn’t enough to provide solutions that deliver functions, features, and outcomes. It is equally important to deliver systems that make these deliveries using a standard set of rules. This document will focus on the “how” whereas *how* a system functions is as important as the services and solutions it provides.
6. The technical foundations for the specifications to be created and designed are several layers. First, the systems will utilize industry standards and an open architecture capable of both integrating and interfacing different systems, and networking hardware and software from different manufactures or in house developed systems. Second, they must incorporate scalability and flexibility for growth and advancements in technology. Lastly they must leverage protocols such as TCP/IP and open sourced software.
7. This guide is not intended to include code requirements, design requirements or performance requirements to construct any of the listed systems. It is a design guide intended to inform of campus standards and unique requirements for Florida Polytechnic system installations. Some of the provisions of this guide may exceed minimum code requirements. Should there be a variance between this guide and any codes, the more stringent requirements should apply. Should there be a conflict between this guide and any codes, the codes shall take precedence.
8. All standards on campus will focus on the following key elements:
 - a. **Maintenance.** It is critical that all systems are designed for maintainability and long term quality.
 - b. **Flexibility.** We are aware that the campus will be doing research for alternative energy and designs. The desire is to have the ability to isolate a building or area in order to insert alternate supplies of energy. It is also necessary to control the internal environment as well. Inside and outside air flow, lightings, communications, and other like systems have to be controlled and monitored at every opportunity.
 - c. **Open Systems.** Proprietary systems will not be allowed. Solutions that revolve around open protocols, open sourced software, common fixtures and attachments are the standard.
 - d. **Controllability.** All systems are to be controlled and monitored from a **central point**. Some may be controlled from more than one point; therefore, web accessibility will be a major requirement. All systems are to be controlled on and off campus. Florida Poly will leverage a Network Operations Center, located in the Campus Control Center (CCC) to control and manage systems on campus. The network operations center is where we will monitor and manage the technology systems on campus. The facility will have connectivity to all the technology systems for the systems’ administration, monitoring, troubleshooting and

management. The facility will consist of video displays, video switching matrixes, enunciators, consoles, and system workstations. (See Division 25)

- e. **Space and Element Sizing:** It is imperative that all space allocations for cooling, ventilation, monitoring, and overall environment for key specialized areas be coordinated with the office of jurisdiction. These items are Audio Visual, Telecommunications, Data Communications, and Security. The highly advanced systems require special environments to maintain operability and longevity.
- f. **Closeout Documents and Record Documents:** It is imperative that we establish up front the closeout documentation required for all systems. These requirements are uniform across the campus and should be in every contract for every contractor.

- 1) Complete drawings in Electronic PDF and AutoCAD of the as built system.
- 2) Complete BOM of all parts, serial numbers, and suppliers.
- 3) Hard copy and electronic copy of all Owners and Maintenance manuals.
- 4) Hard and electronic copy of commissioning tests and the results.
- 5) Password list for ALL systems installed with password access.
- 6) Video-taped training for all systems.
- 7) Electronic and soft copies of all warranties

g. *The overall site systems design is the most critical determining factor in pursuing our goals for a unified campus solution. Facilities will collapse onto the site systems and bring all the campus together.* (Refer to Division 25)

h. Systems affected by this document:

Chilled Water	Hot Water	Telecommunications
Potable Water	Sewage	Natural Gas
Electricity	Lighting	Digital Signage
Cabling	Power Management	Wireless Networks
Building Automation	Access Control	Campus Backbone
Audio Visual	CCTV	Emergency Response
Code Blue	CATV	

C. Outside Plant

- 1. All outside plant systems must incorporate these key elements:
 - a) Scalable. The campus will grow in population and square footage. The site plant systems including telecommunications, gas lines, sewage, and hot/chilled water system must be scalable and modular enough to accommodate that growth. Vaults and manholes must be sized to accommodate that growth, strategically located for accessibility, and have proper drainage for the Florida weather environment.
 - b) Flexible. The university will create alternatives to heating and cooling and will want to isolate buildings from the main water loop and insert other sources of cooling into the environment. By pass and hook up valves must be incorporated into the design and be accessible by university personnel.
 - c) Controllable. The university will control and adjust solutions for performance, user experience, information collection, and overall efficiencies. The chilled water system will be controlled and managed from a central location on and off campus.

- d) Maintenance. The system must be designed for ease of maintenance and longevity. Vaults and manholes must be accessible, by-passes automated; leak detection incorporated, and operates in manual/automatic modes effectively.
- e) Open protocols. The university will incorporate new designs for hardware and software as breakthrough in research development. The systems must be non-proprietary and have all points of control and monitoring accessible and adjustable. Future control software/hardware may be written and developed for deployment by the University. To have a solution that allows the sharing of information across a network and reuse common data points and have those points mapped and reused across the campus environment.
- f) Communications cabling and protection will incorporate twisted pair (300 Ft or less), single mode fiber optic (All connections over 1000 Ft.), and multi-mode (optional for under 1000 Ft) fiber optic leveraged in a ring and a mesh topology. Special consideration will be used to keep splicing to a minimum and reduce transition from outside plant to inside plant. Pull ropes and strings should be required for all conduits. Conduits can be crushed or damaged during the construction process. All conduits should be verified serviceable.
- g) Replicable solutions are a must. We must be able to repeat each solution into every building regardless of the building size or type or its function.
- h) Suppliers for all systems should have a long standing history in the solutions they provide. In addition, the solutions have to have a migratory history and shown the ability to keep up with changes in the industry with backwards and forward capability.
- i) Owners stock should be identified and accounted for.
- j) All utilities systems should be equipped with a smart meter (EEM) to allow tracking of all utilities by campus personnel.
- k) Lakes with water features must be powered and controllable remotely. Bypass for alternate power will be installed. Decorative programmable lighting will also be utilized.

D. Duct Bank and Utility Channel

1. The underground work will prove to be a key system in the initial design of the campus in that once it's done, it very difficult and expensive to make adjustments later. Items in the duct bank system and Utility channel would include telecommunications, gas, potable water, electrical, chilled water, CATV, and sewage.
2. Key Design Elements:
 - a) Clearly recognizable and accessible manholes, covers, and enclosures.
 - b) Proper sizing for growth.
 - c) Most cost effective route for growth:
 - d) proper sizing to use minimum sized pumping and circulation
 - e) positioned to reduce distance from supply point, access points, and create the smallest footprint.
 - f) manholes and vaults core bored for future additions.
 - g) designed for drainage and water relief (Florida climate)
 - h) proper coordination for all utilities/sharing where possible to reduce costs

E. Chilled water system

The general layout of the chilled water system is a ring topology.

1. Key Design Elements
2. All motors over 5 HP must be incorporate VFD Technology.
3. Minimum Design Elements:
 - a. Vaults designed for accessibility, maintenance, and scalability.
 - b. Piping incorporating algae resistance, leak detection, and longevity.
 - c. Bypass and tap (not drilled) in system for alternative sources.
 - d. Pump Packaged solution. (Seamless management by BAS)
 - e. Leverage VFDs for all motors.
 - f. Integrated water treatment (Remote monitored and controlled)
 - g. Graphical Interface
 - h. Open SCADA
 - i. Web accessible
 - j. Leveraged for Ice and alternate cooling sources
 - k. High Efficiency equipment (Frictionless)
 - l. Low noise emission
 - m. Redundancy
 - n. Variable Flow
 - o. Key monitoring points (Minimum):
 - 1) GPM (CWS/CDWS)
 - 2) LWT/Delta (CWS/CDWS)
 - 3) Run/Stop (Control process to manual start/stop, local/remote)
 - 4) AMP Draw
 - 5) Pump Package and Cooling Tower Controls (Minimum)
 - 6) VFD Parameters
 - 7) Run/Stop (Status and Control)
 - 8) Amp draw
 - 9) GPM
 - 10) Operational Percentage
 - 11) Vibration
 - 12) Suction and Discharge Pressure
 - p. Wet Bulb – Wet bulb should be a common temp reused throughout the system and incorporated into Building Automation and Control.
 - q. Alarm management and notification.
 - r. Interface with BAC and Computerized Maintenance Management System (CMMS)
 - s. NEMA Compliance across the board for all systems
 - t. Note: The university will do research into building environments will develop new alternatives to improving the efficiencies in the effectiveness of today's solutions. We will need to put the university in a position to incorporate those solutions into the environment, regardless of the manufacturer of the system. Leveraging open protocols, software, databases, and equipment will allow for these developments to be incorporated.

F. Inside/Outside Lighting

1. The system shall utilize an open architecture that will support equipment and systems from multiple vendors. Both the physical network for the systems, the cable plant, and the logical network for the systems, the networking protocols, will be open architectures, supporting multiple applications and equipment manufacturers.
2. Lighting will not only enhance the visual beauty of the campus but make a statement. Leveraging LED solutions for street lighting, pathways, and walkways in and around the campus can be powered by low voltage (12V) solutions or even Power over Ethernet for some systems. Solutions that offer the opportunity to change sequencing and even color should be explored.
3. Central web based management that includes scheduling and override is required.
4. Daylight capture and automatic adjustments are to be incorporated into the design.
5. Lighting should exceed minimum safety illumination standards. The programmable lighting control system shall be fully integrated, capable of dimming, switching, lighting automation and lighting energy management functions. The system shall also control blackout shutters on sports lighting fixtures and motorized window shades for complete blackout capabilities in select areas of the facility.
6. The system shall consist of intelligent lighting control cabinets with programmable inputs and integral astronomic time-clock.
7. The system shall be a networked operation making possible the sharing of schedules and overrides between lighting control system cabinets, as well as integration with other systems. All inputs shall be transferable over the network to create any switching or dimming pattern required.
8. Lighting control system shall permit lighting to be overridden ON for after-hours use and cleaning. Overrides shall be hard-wired switches, optional touch-tone telephone control, or through the building operator's PC with touch-screen controller. Any control pattern shall be available from any override in the system. Overrides may be programmed to time out after up to two hours during after-hours use.
9. System will interface campus access control in that users swipes for access, once granted, the lights will then turn on.
10. Motion sensor will be installed in all rooms.
11. Room lighting can be controlled and managed via the individual phone in the room, leveraging the Cisco system already in place.

G. Fire and Fireman's Command Console

A class B, Addressable system is planned for the new campus as a minimum standard; Class A is preferred.

1. The building fire alarm system shall be a totally solid state addressable, analog, microprocessor-based, intelligent, multiplex type, employing digital communication techniques over common bus data lines between a Fire Alarm Control Panel (FACP) and various field processing units (FPU).
2. The system shall provide individually identified fire alarm peripheral input, signal, and control devices. Each input and control device shall be given a unique address with operator assigned English language descriptor.
3. The system shall be alarm and trouble annunciated and electrically supervised against opens, shorts or grounds. In the event of any disarrangement of wiring in the system, a trouble signal and lamp shall be activated until system is restored to normal. The trouble signal may be silenced by means of a switch. Upon restoration for the system to normal, the trouble signal shall again sound until the switch is restored to normal position.
4. Multiplex communications techniques shall be utilized to receive and transmit data from remote

field processing units. The basic FPU shall be microprocessor based, and equipped with individual standby rechargeable batteries.

5. The system shall include a remote enunciator located in the lobby of the main entrance to the building.
6. The system shall incorporate a Voice Communication System.
 - a. The Voice Command Center (VCC) shall function as a fire voice alarm and general emergency communications system, for manual selection and annunciation of each building's firefighter's command center's (FCC) speaker circuits. The system shall be capable of manually dispatching emergency instructions via campus building selector switches.
 - b. The firefighter's campus command center (FCCC) shall communicate with the individual buildings via the "Structured Telecommunications Cabling System (refer to Section 16791). Provide all network gateways to accommodate this networked communication.
 - c. Special information can be displayed such as blind or deaf student in area.
7. The goal would be to use the same speakers for the fire alarm tone as the emergency message broadcast from the firefighter's speaker amplifier and microphone. We will need to be in position to allow campus wide emergency paging through this system.
8. The system must be of open standards and available via multiple contractors/vendors.

H. Telecommunications/Data/Wireless/Audio Visual Communications Infrastructure

1. The telecom and data outside plant infrastructure should consist of a combination of multimode fiber optic, single mode fiber optic, and twisted pair copper cabling. The topology for this network can leverage both ring and star layouts and/or a combination of both. All applicable ANSI/TIA/EIA standards apply. Keeping the cable entrance rooms as close to the outside can help reduce the amount of splicing.
2. Special consideration will be needed for the fire alarm backbone which is typically multimode fiber optic plus twisted pair. We will use this backbone for a campus "all-call"/"Voice Evacuation" solution.
3. Confined space training for all support personnel should be included.
4. The campus will leverage the single mode fiber for CATV distribution. Broadband COAX infrastructure will not be needed.
5. We will leverage an inter-building campus backbone data network solution, intra-building local area networks, and a campus VOIP telephone system (Currently in Place at Lakeland campus). All systems must be provided on platforms that accommodate future technologies and allows a smooth, cost effective migration path. The systems must be based on an open architecture, adhere to industry standards, ensure modular, cost-effective growth in the base system, and permit addition of application capacities and processing power as needed.
6. These systems will perform the following general services:
 - a. Connectivity to support critical high-bandwidth, low-latency applications across the campus and within each facility.
 - b. Telephone services for campus administration, faculty, staff, guest users and dormitory residents, including voice mail and unified messaging services.
 - c. A network operating center able to control, monitor and manage all technology systems on campus.
 - d. System management and reporting functions for all systems, including cost accounting, billing and system accountability for the telephone system providing management control of call abuse through reporting features and capabilities and security precautions.
7. The inter-building campus backbone network shall provide connectivity between campus facilities utilizing single mode fiber optic cable. The Network Operating Center and the main core of the

inter-building network as well as the communications center and overall campus demarcation point are located in the CCC. A redundant backup of the network and systems may be located in the main building (If the campus goes live before the plant constructed- this would have been a temp data center).

8. The campus back bone will be a 10 GB Ethernet in a ring/mesh topology. The intra Building network will consist of Ethernet POE switches having ports capable of 10/100/1000 Mbps operation and an uplink port capability to the campus backbone network of 1000/10000 Mbps.
9. There may be coordination of system relocations from the Lakeland campus to the new campus.
10. The campus will deploy a wireless network both inside and outside. These systems will be managed by a central control system. The communication standards will leverage:
 - a. IEEE 802.11b and IEEE 802.11g
 - b. IEEE 802.3af Power over Ethernet (PoE)
 - c. FCC Part 15, including 15.107, 15.109 and 15.247
 - d. UL 60950, UL1950 and UL 2043
 - e. AS/NZS 3548
 - f. FCC Bulletin OET-65C
 - g. RSS-102
11. The wireless access points must utilize the IEEE 802.11g standard, be certified for 802.11b and 802.11g, and 802.11i, use and dynamically select 11 channels, and have output power of at least 15dBm. Access points must be capable of communicating with other access points in a mesh network.
 - a. Security
 - 1) The wireless access point must comply with industry network standards for wireless data encryption and user authorization including but not limited to:
 - a) Wi-Fi Protected Access (WPA) for IEEE802.1 for mutual authentication.
 - b) Wireless security (WEP) configurable for 40-bit and 128-bit encryption
 - c) Wi-Fi Protected Access 2 (WPA2)
 - d) MAC address filtering
 - e) NAT firewall
 - f) RADIUS authentication
 - g) Protected EAP (PEAP)
 - h) Extensible Authentication Protocol (EAP)
 - i) Tunneled TLS (TTLS)
 - j) Transport Layer Security (TLS)
 - k) VPN pass-through support
 - l) Secure SSH Telnet
 - 2) Secure Socket Layer (SSL) remote management loginThe equipment must provide security settings for multiple groups
 - 3) The equipment must be able to dynamically rotate keys on a per-user, per-session.
 - 4) The equipment must be able to provide for rogue access point detection and notification

- 5) The equipment must provide for multiple security settings per access point with use of VLANs
 - 6) The equipment must have intra-cell blocking to prevent client-to-client snooping, and be able to block SSID broadcasts.
 - 7) We may use this system for GPS on campus as well for location of equipment and possibly people.
- b. Management Software
- 1) The wireless access points must be provided with software to configure the network and wireless access point for connectivity, including access point setup and network administration.
 - 2) The software must be capable to monitor the signal quality of each wireless access point and to administer groups of access points.
 - 3) Software must provide for remote and secure management via SNMPv3 and HTTPS (SSL). Software must support MIB I, MIB II, and 802.11 MIB using SNMP-based network management software.
 - 4) The system must be able to prioritize network access and administer network quality-of-service (QoS).
- c. Interfaces
- 1) The equipment must have a 10/100BASE-T Ethernet LAN port with RJ-45 connector.
 - 2) The equipment must have a standard RS-232C interface with DB-9 male connector
 - 3) The equipment must have external antenna connectors for connecting external directional or omni-directional antennas.
- d. Power - The equipment must operate via IEEE 802.3af Power-over-Ethernet
- e. The network will encompass single source solutions. We will avoid "mix and match" equipment.

I. Cable Plant Key Design Elements

1. All cable systems should be designed by a RCDD and done so to BICSI standards.
2. Racking and support should be provided in all the manholes.
3. Conduits should be concrete incased under roads for protection.
4. Proper spacers, support, and vibration used during installation
5. Outdoor splicing, especially in the manholes, are prohibited.
6. All cables, terminations, and conduits are to be labeled according the BICSI standards.
7. Quantities and sizing should allow for a growth factor of 3.
8. Spare conduits for growth factor of 3.
9. Multi Mode fiber should be 50/125 um, with tight buffer jacket.
10. Single Mode fiber should be 8.3/125 um.
11. Minimum strand requirement for Single Mode should be 48 and MM =24.
12. Copper should be 50 Pair minimum with solid state protection.
13. Terminations should be fusion pigtails. No mechanical splicing on campus.
14. Outside cable plant for CCTV, Code Blue Phones, Wireless and others outside technologies should not be direct buried but placed in a minimum ¾ inch conduit.

15. Each discipline should come from single manufacture and not mix and match products.

J. Digital Signage

1. Digital Signage will be a primary tool used by visitors, students, faculty and staff to find their way, get the latest news, and learn more about our institution. Signage can range from high definition video to simple scrolling marquee.
2. Designers must work with key personnel employees to coordinate signage locations, types, and overall expectations of this system.
3. We will coordinate with campus Audio Visual management for details of this system.
4. Key Design Elements:
 - a. Outdoor power for sign locations.
 - b. Conduit and communications cabling installed with high speed solid state protectors.
 - c. Adequate power.
 - d. The signage system will interface the campus television system and allow for messages and bulletins to be displayed on certain channels.

K. Laboratory Air Flow

1. We will install a laboratory airflow control system (LACS) to maintain laboratory airflow, pressurization, temperature and fume hood average face velocity. Room pressurization control shall utilize airflow tracking to vary the volume of supply air into the room and general exhaust air from the room to maintain both minimum ventilation and airflow balance. The room pressurization control system shall also maintain laboratory temperature. The exhaust air volume of laboratory fume hoods shall be controlled by a stand alone fume hood controller that is, seamlessly, incorporated into the room pressurization control system.
2. The Laboratory Air flow will be variable volume and auto sensing. The room air exchange can be altered automatically according to the state of the fume hood. Programming will account for these elements/states:
 - a. Fume hood sash Up.
 - b. Fume hood down.
 - c. Fume hood up with body in front.
 - d. Fume hood up but no body.
 - e. Fume hood down with experiment or without experiment.
 - f. Fume hood up but no lab condition.
3. Trending and reports must be made available.
4. System should interface seamlessly with the BAS. Trending, graphical communications and control, and total system management.

L. Building Automation

1. The Building Automation System (BAS) will serve as the core system for managing the campus environment. It is critical that special consideration be given to this system, the sequence of operation, and careful consideration to the vender and the components used. BAS systems must comply with Campus Division 25 Specifications for Integrated Systems.
2. We will design and install a fully integrated campus wide building automation system, incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems with open communications capabilities as herein specified. The system must interface and integrate with other technology systems on campus, including but not limited to fire alarm, video surveillance, access control and lighting control system.

3. The system shall utilize an open architecture that shall support equipment and systems from multiple vendors. Both the physical network for the systems, the cable plant, and the logical network for the systems, the networking protocols, shall be open architectures, supporting multiple applications and equipment manufacturers. The system shall use the Campus wide fiber optic Ethernet network for communication between buildings.
4. All communications will be IP based BacNet or Modbus protocols. (See Division 25).
5. We will not allow transceivers, gateways, or protocol converters to be inserted to make non compatible solutions function.
6. System Monitoring and Supervisory Control shall be provided through the installation of GUI software applications that support either a direct driver to the LNS database or a fast DDE interface. GUI workstations shall provide complete access to any point in the system at any time. Remote Operator interfaces and configuration tools shall be supported by the LNS database in a client-server fashion. This GUI will be customer customizable and web browser accessible. (See Division 25)
7. Sensors and controls will be in place to control air quality and costs.
 - a. CO2 Sensors in meeting spaces and classrooms to control variable air.
 - b. Temp sensors will be put in place at the room supply.
 - c. Mixed air control will be critical to controlling costs.
8. Individual rooms will be controlled via telephone leveraging the Cisco telephone system already in place. Individuals will be able to turn lights on/off, manage air temp, and other devices via the services on their telephones.

M. Computerized Maintenance Management System

1. The Florida Polytechnic University CMMS is a platform for tracking maintenance, assets, equipment, preventative maintenance scheduling, and other operational considerations.
2. System Features Required:
 - a. Work Order System
 - 1) A work order module shall be used to track and monitor all maintenance tasks across the campus.
 - 2) Tasks within a work order must be able to be assigned to different departments.
 - 3) Items must include but not be limited building, cost code, item, problem type, personnel assigned, priority codes, specialty codes, budgets for material and labor, and completion dates.
 - 4) The module shall provide adequate reporting to monitor the work order process by department, by task, by exception.
 - 5) The system must project labor demands for any future time period based upon the work orders.
 - 6) The work order module shall be capable of monitoring work-performance indicators other than cost or time.
 - 7) The work order module shall allow end-users to enter work orders.
 - 8) The work order module must be able to communicate with remote clients through TCP/IP.
 - b. Time Collection
 - 1) The system must record labor charges and labor hours against the work orders. aterial and Equipment Parts Inventory
 - 2) The system shall record material and equipment parts needed from inventory or from direct purchases for the work orders.
 - c. Preventive and Corrective Maintenance

- 1) The maintenance cost history for all equipment and assets must be maintained by the system.
 - 2) The system must provide a preventive maintenance module to maintain the condition of equipment and other assets based upon a pre-determined schedule.
 - 3) The system shall manage work orders for pre-defined jobs such as scheduled inspections, and routine maintenance tasks.
- d. Scheduling
- 1) The systems must have a scheduling system to present the results of the maintenance and work order systems relative to a time line.
 - b) Equipment Management - The system should have an equipment management module that will automatically create work orders for preventive maintenance of the equipment, and to track warranty work performed.
 - c) Asset Monitoring - The CMMS must be capable of storing maintenance related information for a variety of components.
 - d) CMMS Management Features Required but may be adjusted during the design process:
 - i. The system must allow for simultaneously access to the management capabilities of the system. Don't restrict access to one person at a time.
 - ii. The system must be able to be accessed through an Internet Web browser.
 - iii. A browser based interface must be provided for installation, provisioning, administration and maintenance tasks of the system management system.
 - iv. The system must provide for scheduling system management functions.
 - v. The system must allow for reports to be generated on demand and on an AMU defined schedule.
 - vi. The system must have diagnostic tools to detect troubles and component failures in the system.
 - vii. The system must report all alarms to the NOC and to any active management terminals.
 - viii. The system must automatically report alarms to the universities remote maintenance personnel.
 - e) CMMS Reporting Features Required
 - i. The system must have a full featured reporting tool and also provide for customized reports for planning and analysis, budgeting and programming and asset and equipment performance monitoring.
 - 1) Time Keeping Report
 - 2) Total Payroll Hours by Charge No. and Task within date
 - 3) Employee Pay Period Time Report
 - 4) Work Order Backlog Report
 - 5) Work Order Detail Report (Labor & Materials)
 - 6) Work Order Labor Report (Labor only)
 - 7) Fleet Report
 - 8) Employee Listing Report
 - 9) Individual And Departmental Cost Billing
 - f) System Security Features Required
 - i. The system must be login-password protected.

- ii. The system must have the capability to automatically age passwords, the cycle length must be able to be administered, and the user must be given advance notice of the upcoming expiration.
 - iii. The system must support the setting of an attempts threshold for access to system management ports.
 - iv. The system must support Secure Shell Access (SSH), Secure Copy (SCP), and secure WEB access using the Secure Sockets Layer (SSL) with HTTPS.
 - v. The system must support FTP service.
 - vi. The system must be able to be automatically disconnected after a period of inactivity.
 - vii. The system must log all login sessions and user activity.
 - viii. The system must store backup copies of critical configuration information including authentication and account information on external storage systems.
 - ix. The system must provide notification of possible abuse attempts on either the System Management or Remote Access ports.
- g) This system must be completely supported by local resources with a history of success.

N. Video Distribution/CATV

1. The video distribution system shall provide for distribution of live and recorded video. We will leverage unshielded twisted pair and not coax/broadband for the infrastructure.
2. The System is an analog and digital video distribution system, distributed between buildings via AMU fiber optic cable, and within buildings from IDFs to outlets via AMU unshielded twisted pair (UTP) cable.
 - a. The analog system will utilize fiber optic transmitters and receivers between a head end located in the Library and each building on campus. Within each building the RF signal will be converted to and distributed via UTP using baluns (balanced/unbalanced signal converters). The analog video head end will provide for a minimum of 77 channels and two-way video utilizing sub-band. Inputs to the head end will include, but are not limited to, DVD, local CATV service, VHS, cameras, satellite, and character generators.
 - b. The digital video distribution will transmit and receive MPEG 2 and MPEG 4 video streams via TCP/IP and Ethernet protocols and standards, utilizing the AMU data network. The system must distribute and transmit digital video in a multicast or unicast mode. The system must have a media retrieval system, allowing authorized users to schedule and stream video programming on demand, and an extensive management and reporting system. Inputs to the digital video distribution system will be live or recorded video, encoded analog video from the analog video distribution system, as well as other sources.
 - c. High Definition Television must be incorporated into the system.
 - d. The CATV must communicate seamlessly with Digital Signage.
 - e. Opportunities for media to connect to broadcast, record, or supply content must be made available.
 - f. The plan is to create production environment for video and promotional materials. Opportunities for these locations will be explored. Equipment for these technologies will be housed and monitored for air temp, function, and security.

O. Access Control

1. Access Control/Identity Management System:
 - a. The access/identity management system (System) shall monitor and control access to areas on campus. The system must be capable of:
 - a) Producing access control cards for students, faculty, authorized vendors, and staff and enrolling them in the system
 - b) Providing security to student, administrative, visitors and residential university facilities
 - c) Assigning multiple levels of access privileges
 - d) Conducting the access control transaction
 - e) Authorizing access
 - f) Updating and revoking access privileges
 - g) Providing for temporary credentials including temporary badges
 - h) Tracking and auditing accesses
 - i) Generating custom access reports
 - j) Managing the card hot list;
 - k) Maintaining the access database
 - l) Managing visitor control with identity management and criminal search
 - b. The system will utilize multi-technology “smart” cards as its primary access device, but will support other card and other input (biometric and Hirsch keypad) technologies at each door. It will have to also support alarm inputs and control outputs for fire alarm and CCTV.
 - c. Open, non proprietary solutions only. System must communicate with Fire and CCTV.
 - d. The System must be able to grow from the capacities of the initial installation to a capacity of ten times the initial capacity by adding equipment, without any change out of initial hardware or software.
 - e. The microprocessor based controllers will be capable of controlling a minimum of 16 card reader inputs and 6 door outputs. It will also be able to monitor a minimum of 32 alarm points, storing a minimum of 1000 events before down loading to the central computer. It will be able to store a minimum of 25,000 cardholders.
 - f. System shall be capable of operating with or without host software station.
 - g. The access control system will have and support multiple integrated, computer generated photo-identification systems.
 - h. POE must be leveraged throughout the system.
 - i. It will monitor all emergency egress doors and interface the alarms from these doors with the CCTV system.
 - j. It shall be password controlled.
 - k. It shall have the ability to “dial” out to remote monitoring services.
 - l. It must be a web based, browser management.
 - m. The database must be able to be partitioned.
 - n. Multiple agency reporting capabilities.
2. The access control system will interface POS, Room Key, and other systems creating a “One Card” environment.
3. Dormitories will use a “hotel” type access system. This system will communicate wirelessly to central database and record all access events. This central management system will allow for remote management of the locks and who has access.

P. Video Surveillance Security System (CCTV)

1. The CCTV system must incorporate the latest in surveillance technology. Key Design Elements are:
 - a. ODBC Compliant.
 - b. Web browser interface.
 - c. Complete control via the browser.
 - d. Record each camera at variable fps up to 30 fps per every camera.
 - e. Use DVN technology storing all video in the data center, not distributed.
 - f. Use motion activation and video analytics.
 - g. Use formats: MPEG1, MPEG2, AVI, DV-AVI and WMV.
 - h. Must communicate with Fire alarm and Access control.
2. Software must be:
 - a. Capable of trimming, reformatting and recompressing of video files
 - b. Capable of providing a video directory
 - c. Capable of specifying which cameras to archive and how long to archive the cameras.
3. Cameras
 - a. We will use color IP cameras for video surveillance and with the following minimum capacities:
 - 1) CCD Image Sensor: 1/3 inch solid state high resolution color digital CCD
 - 2) Horizontal Resolution: 460 TVL
 - 3) Auto iris Control: Internal auto iris control for DC-drive auto iris lenses
 - 4) Sensitivity: 1.5 lux minimum
 - 5) Lens Mount: Accept both C and CS mount lenses
 - 6) White Balance: Automatic
 - 7) input Power: 24VAC, 60Hz
 - 8) Lens: 3.5-8mm auto-iris vari-focal lens.
 - 9) All exterior or outdoor cameras will be capable of both color and black and white.
 - 10) Indoor cameras will incorporate sound.
 - b. The Video Camera System will also be used for recording lectures and other events around campus.
4. High Definition Camera Systems will be incorporated.

II. Information Technology Infrastructure

A. DATA

1. There will be one phone and two data ports for each bed in each bedroom. Florida Poly IT Division will verify in each project.
2. In apartments there will be an additional phone and two data ports in the living room.
3. Community lounges, kitchens and lounge/kitchens will have one phone and two data ports.
4. Housekeeping offices and storage rooms will have one phone and two data ports; custodial closets will not.
5. Maintenance offices, shops, and storage rooms will have one phone and two data ports.
6. Maintenance and electrical rooms containing meters to be monitored by physical plant will have appropriate data lines and terminations to monitor water, electric and BTU meters.

7. Lobbies and 24 hour desk locations will have one phone and two data ports in an appropriate location for a possible night clerk monitoring station.
8. Offices and other such spaces will follow the Florida Poly IT specs for one phone and two data ports.
9. Conduit for data lines should be run during construction for all future main entry/exit door upgrades and camera installation.

B. TELEPHONES

1. There will be one phone and two data ports for each bed in each bedroom. Where design permits can use wireless connections instead of hardware.
2. In apartments there will be an additional phone and two data ports in the living room.
3. Community lounges, kitchens and lounge/kitchens will have one phone and two data ports.
4. Housekeeping offices and storage rooms (excluding janitorial closets) will have one phone and two data ports.
5. Maintenance offices, shops, and storage rooms will have one phone and two data ports.
6. Maintenance and electrical rooms containing meters to be monitored by physical plant will have appropriate data lines and terminations to monitor water, electric and BTU meters.
7. Lobbies will have one phone and two data ports in an appropriate location for any night clerk monitoring station.
8. Offices and other such spaces will follow the Florida Poly IT specs for one phone and two data ports.
9. Entry phones: each entry with card access shall have an entry phone. Entry phones to be used in accordance to FLORIDA POLY IT specs.

C. CABLE TELEVISION

Note: Florida Poly contracts and operates the CATV Service through Bright House Networks.

1. Each bedroom (residence hall, suite, and apartment) shall have one CATV port, with wiring in conduit to corridor wire tray. Each port will be “homerun” no “daisy chaining”. Sharing of lines/ports is not acceptable.
2. In apartments, each living room will have one “homerun” CATV port.
3. Offices, office lobbies, residence lobbies, lounges, kitchen/lounges, community laundry rooms,
4. Maintenance shop/offices and housekeeping offices will have CATV ports.
5. Both termination ends will be labeled with room numbers.
6. Design of system is to be reviewed and approved by Florida Poly contracted CATV provider.

D. HOUSING ACCESS CONTROL SYSTEM

1. Florida Poly has an access control system (**multi-CLASS RP40**).

2. Security cameras should be tied in to the access control system at every entry/exit location wherever possible.
3. Card access systems should have backup power supply or connectivity upon power drops on campus.

E. DOORS, WINDOWS AND GLAZING

Electric strikes are to be used on card access doors. The strike to be used is the **HES Genesis**, surface mount series **multi-CLASS RP40**.

F. DISTRIBUTED ANTENNA SYSTEM (DAS)

The Project buildings must be surveyed for potential issues with strength of cellular signal as design is completed for optimum placement of repeaters and antennas to provide the building with full cellular coverage. As with the wired and wireless networking, Florida Polytechnic University IT cabling specifications must be followed in order for the system to be supported.

G. EDUCATION MEDIA AND AUDIO/VISUAL SERVICES

Florida Poly will consult on educational and other AV needs in the Project to ensure standards are implemented where possible offering faculty and students a seamless teaching and learning classroom experience. Depending on the project, the specific requirements may be written as part of the request.

Division 31 Earthwork

Section 310000 General Requirements for Earthwork

- A. Earthwork shall include all permitting, excavation, backfilling, compaction and testing in alteration of the terrain of the site in a building project. It will include borrow and disposal of excavated materials.
- B. The University will require permitting for all digging and the Civil Engineer will need to make application to the SWFWMD for any drainage alterations or changes to permeability.
- C. It will be the responsibility of the constructor to call for utility locates Sunshine State One Call and notify the University Building Code Administrator (BCA) before beginning work. The responsibility for damage to any University facilities or private safety issues lies with the constructor.
- D. Relocation of utilities will be included in the constructor's project cost and proper backfilling in twelve-inch lifts. Tape marking of utilities and certified compaction to 95% of modified Procter density testing will be required.
- E. Comply with all OSHA regulations; notify the BCA and the office of Environmental Health and Safety (EH&S) for all safety issues. It is the constructor's responsibility to install and maintain adequate barricades to protect the public with a minimum of orange safety fence for unattended excavations.
- F. Provide a logistics plan for the work, and all submittals and cost data are to be reviewed with the University project manager prior to beginning the work.

Section 310280 Soil Treatment

- A. The constructor shall coordinate and provide for termite treatment by a licensed installer within the project cost, and notify the office of EH&S before beginning the work. Formulate and apply termiticides and devices according to the EPA-Registered Label for all products.
- B. Soil treatment application report, after completion or treatment, will be required including:
 - 1. Date and time of application.
 - 2. Moisture content of soil before the application.
 - 3. Termiticide brand name and manufacturer.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes used, and rates of application.
 - 6. Areas of application.
 - 7. Water source for application.
- C. Soil treatment will be required under all footings, slabs on grade, and sidewalks that adjoin new or existing buildings. Soil treatment shall not be applied until excavating, filling, compacting and grading operations are complete.
- D. Soil treatment is also required beneath all components of modular structures being conveyed to the University for occupancy for more than one year. All components of the structure that

come into contact with soil, such as piers, footings, grade beams, slabs, stairs, decks, ramps and skirting shall have the adjacent soil treated.

- E. The contractor shall exercise caution to prevent disturbance of the treated area. If any area is required to be re-treated, through no fault of the University or architect/engineer, it shall be done at the constructor's expense.
- F. The warranty period shall be five years from the date of substantial completion for material, labor and application means. Retreatment for the re-infested areas shall be at no cost to the University.

Division 32 Exterior Improvements

Section 310500 Paving and Surfacing

- A. The section includes requirements related to various pave or surfaced areas, such as sidewalks, streets, service drives, bicycle lanes and paths, and parking lots and garages. Included are the requirements for marking pavement and the repair of pavement disturbed by construction.
- B. Applicable design standards include:
 - 1. Roadway construction shall be designed in accordance with “Design Standards for the Design, Construction, Maintenance and Utility Operations of the State Highway System”, FDOT “Florida Greenbook”. All roadway paving will be Type II asphaltic concrete or reinforced 3000 psi concrete (minimum eight-inch thick). Fire lanes are a minimum twenty feet wide, for emergency vehicle passing.
 - 2. Bicycle lanes and paths shall be designed in accordance with the “Florida Bicycle Facilities Planning and Design Handbook” by FDOT and the “Guide for the Development of Bicycle Facilities” by AASHTO. Bicycle paving will be 3000 psi concrete (minimum six-inch thick), unless it is part of the roadway construction. Pedestrian pathways, crossings and other facilities shall be designed in accordance with the “Florida Pedestrian Facilities Planning and Design Handbook” by FDOT. Pedestrian paths and sidewalks will be 3000 psi concrete, ten feet in width (minimum six-inch thick).
 - 3. All traffic control devices, signs, signals, markings and other devices used to regulate, warn or guide traffic placed on, over or adjacent to a street, pedestrian facility, or bikeway shall be designed and installed in accordance with the “Manual on Uniform Traffic Control Devices”(MUTDC) by USDOT and the “Traffic Engineering Manual” by FDOT.
 - 4. Striping standards will be in accordance with the MUTDC standards, thermoplastic roadway and parking control markings per FDOT, or exterior grade latex paint at parking lot space striping only.
 - 5. Roadway design, including bicycle lanes (on-road) and paths (off-road) shall be by a Florida licensed professional engineer.

Section 312900 Landscaping and Irrigation

- A. The section includes requirements for lawns, trees, shrubs, and ground covers including protection of landscaping during construction.
- B. Any construction project which disturbs existing landscaping or exterior hardscape shall include appropriate new landscaping and buffering from adjacent uses, where appropriate.
- C. Any vegetation disturbed by construction activity will be restored with like kind within 72-hours of completion of the associated construction activity.
- D. Hardscape including sidewalks, benches, fountains, retaining walls, streetlights, and accent lights shall be relocated or restored in like kind.

- E. The landscape architect shall provide for a tree protection, to drip line, and vegetation protection plan, using standards of the “Tree Protection During Construction” by the Florida Department of Agriculture and Consumer Services.
- F. The constructor shall prepare the tree and vegetation protection plan, and barricading plan, for approval by the University.
- G. Certain specimen trees, as noted by the University project manager, will require special extra protection requiring a plan of the landscape architect and constructor.
- H. All protected and new landscape shall be warranted to be alive and in healthy condition one year from the date of substantial completion, including replacement at no cost to the University.
- I. Selection of all plant materials shall be approved by Campus Development and Facilities, University project manager.
- J. Lawns on the campus are generally un-irrigated Argentine Bahia sod. Hydro-seeding of certain undeveloped areas may be permitted, as approved by the University project manager.
- K. Florida native specimen grasses and plants shall be used for accent garden-beds.
- L. Florida native trees shall be used for any landscape or accent tree cover.
- M. All landscape area beds are to be fully irrigated, and connected to new sectors of, or work in concert with, the University irrigation systems.

Section 319000 Site Furnishings

- A. Site waste and recycling receptors shall be equal to Arete Industries “Classic Series” recycled HDPE model WE3C-28-D-RP.
- B. Site ash receptors shall be equal to U-line recycled plastic model H-1103GR.
- C. Bicycle racks are a mill finish aluminum, 1-1/2” dia, catenary arch loop for two bicycles each, minimum 36-inches on center, with ¼” plate feet and six tap-con fasteners.
- D. Regulatory signs are painted steel or aluminum, with galvanized steel round posts, in accordance with FDOT guidelines.
- E. Wayfinding and building signs shall be approved by Campus Development and Facilities, University project manager.

Division 33 Utilities

Section 330000 General Requirements for Utilities

- A. Utility piping and conduits of various materials including fittings and accessories.
- B. Systems are generally considered to be located outside of buildings, starting at a maximum distance of five feet outside the building.
- C. Identification of underground utilities and piping shall include:
 - 1. Non-detectable warning tape buried 18 to 30-inches above the utility at six-inches wide and color coded per APWA and conforming to OSHA 1926-956 (C) (1).
 - 2. Tracer wire on non-metallic underground piping (except pipe containing electric wires and traceable communications) attached to the pipe, allowed to free-float upon backfill.
 - 3. The tracer wire shall have a color coded jacket: electrical distribution – red; gas/ oil – yellow; communications – orange; potable water – blue; reclaimed water – purple; sanitary sewer/ storm sewer/ drain lines – green; chilled (or heating hot) water – black.
 - 4. Tracer wires shall be #12 AWG for piping less than 12-inch diameter, or #10 AWG for larger pipe or pipe more than six feet below grade, HS-CCS copper conductors rated for direct burial use at 30 volts.
- D. Cleanouts shall be provided at grade, made of brass, and surrounded by concrete pad minimum 18"x18"x6" with #10 gauge welded wire mesh.
- E. Manholes shall be designed by a Florida licensed engineer based on ASTM C487 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures with A-16 (AASHTO HS 20) wheel loads, with "Ram-Nek" sealant at joints. All manhole covers are to include "Florida Polytechnic University" and the year of installation.
- F. Sanitary sewer manholes shall have:
 - 1. Entrance neck 24-inch maximum length.
 - 2. Exterior waterproofing of bituminous material.
 - 3. Smooth concrete channel at manhole invert to convey sewage.
 - 4. No integral ladder.
 - 5. Maximum manhole spacing 350 feet.
 - 6. Specify "drop" manhole if invert is greater than two-feet above manhole invert at outside of the manhole.
- G. Provide 24-inch minimum diameter rings and lids marked "SANITARY" equal to US Foundry 170E lids and covers. All manhole covers are to include "Florida Polytechnic University" and the year of installation.
- H. Storm sewer manhole shall have:
 - 1. Entrance neck 24-inch maximum length.
 - 2. Smooth concrete channel at manhole invert to convey sewage.
 - 3. No integral ladder.
 - 4. Maximum manhole spacing 350 feet.

- I. Provide 24-inch minimum diameter rings and lids marked "STORM" equal to US Foundry 170E lids and covers. All manhole covers are to include "Florida Polytechnic University" and the year of installation.
- J. Chilled water manholes shall have:
 - 1. Minimum size manhole shall be 9'x9'x9' with at least 24-inch clearance between pipe/valves and parallel wall.
 - 2. Exterior waterproofing of bituminous material.
 - 3. Provide an integral galvanized ladder.
 - 4. Integral 12"x12"x12" sump located beside the ladder.
 - 5. Lid size should allow removal or replacement of all equipment. Provide 24-inch minimum diameter rings and lids marked "CHILLED WATER". All manhole covers are to include "Florida Polytechnic University" and the year of installation.
 - 6. Vents (1/2-inch), drains (1" min.) and pressure gauges shall be located on each side of the valves in manholes.
 - 7. Manholes shall be laid out such that valves can be operated without needing a ladder to access the valves. Valves 5-inches and up shall be gear driven. Valves 4-inches and smaller shall have a stainless lever shaft and operator.
- K. Heating hot water manholes, if required will meet similar guidelines, but be marked "STEAM".
- L. Electrical manholes, switch vaults and pull boxes shall have:
 - 1. Minimum size manhole shall be 10'x10' with standard eight feet ceiling height.
 - 2. Switch vault sizes shall be coordinated with the actual switchgear intended for proper clearance for cabling and operation of the switchgear.
 - 3. Minimum size pull boxes shall be 6'x6'x6'; larger sizes required for installed conductors.
 - 4. Exterior waterproofing of bituminous material on manholes.
 - 5. Integral 12"x12"x12" sump with grate located directly beneath concentric cover pumping ring or below one of the double doors.
 - 6. Rectangular hatches of checker plate, hinged, spring assisted with frames of aluminum or galvanized steel in accordance with ASTM A123. All hatches to be secured with penta-head, stainless steel bolts. Hatches shall be welded or brass marked "ELECTRIC" and have permanent marking of manhole or switch vault identification with ID number. All manhole covers are to include "Florida Polytechnic University" and the year of installation. Hatches to be designed by a Florida registered engineer in accord with ASTM C857 with A-15 (HS20) wheel loads and additional live load spacing one foot for A-12 (HS-15) impact wheel loads.
 - 7. Throat for new or modified manholes shall be no more than 18-inches tall under hardscape and no more than 24-inches tall under landscaping.
- M. Pipe and fittings include:
 - 1. Cast-iron pipe under buildings in corrosive area shall be wrapped in a plastic approved for underground application. Cast-iron pipe is not to be used outdoors.
 - 2. Ductile iron pipe installed in a corrosive area shall be wrapped in a plastic approved for underground application.

3. Corrugated metal pipe nor vitrified clay pipes are not to be used.
4. Valve boxes on potable, storm or sanitary sewerage, where applicable, shall be cast iron surrounded with 18"x18"x8" chamfered edge concrete pad, with 10" gauge WWF. Lids shall be marked "WATER", "SANITARY" or "REUSE" as appropriate, AASHTO H-16 rated. All manhole covers are to include "Florida Polytechnic University" and the year of installation.
5. Chilled water system butterfly valves installed on horizontal piping shall have their shafts oriented horizontally.
6. Hydrants by American Darling or Mueller shall be a dry-barrel, breakaway type with bronze 5-1/4-inch seats, bronze sub-seats, and main valve meeting AWWA C502 standards. Hydrants shall have two 2-1/2-inch nozzle connections and one 4-inch nozzle connection. The nozzle section of the hydrant shall be able to rotate 360 degrees during field installation. A gate valve shall be installed in the line feeding the hydrant as close as possible to the hydrant. Pumper nozzle installation height is 18 to 22-inches above grade. With six-inch inlet pipe connection. Head color to match standard pressure guidelines without a tamperproof cover. No constructors shall operate hydrants for using water during construction, and testing shall be only with the use of proper fire hydrant tools.

Section 332660 Water Distribution

- A. Potable water piping 4-inch and larger shall be C900 PVC or cement lined, bituminous sealed ductile iron. Pipe size under 4-inch shall be Schedule 80 PVC. Design shall include a reaction block schedule, if applicable. Flanges shall conform to American Standard B16.1, full-faced type rubber gaskets 1/16-inch thick. Backflow prevention as required by the engineer in concert with Division 22 Plumbing. Minimum burial depth is 30-inches to the top of pipe. All buried lines under roadways, paths and sidewalks shall have a pipe sleeve of ductile iron pipe, two pipe inches larger than the service line OD, extending five-feet beyond either side of the roadway and one-foot either side of path or walks. Pressure test to ASTM Standards, all lines at 150 psi for a minimum of two hours, and repeated after repairs should the test fail.
- B. Chilled water pipe shall be ASTM A53, Grade B, Standard Weight, Type E or S. Underground burial depth shall be 30-inches to the top of pipe insulation, with clean sand bedding a minimum six-inch under and on sides and 12-inches above pipe. See 330000 C above for ID marking of pipe. Hydrostatic pressure testing of pipe shall be 1.5 times design pressure with a gauge indicating 0-300 psi for a minimum four hours; no vessel, pump, valve or other component shall exceed the maximum test pressure of the component to be tested, per ASTM/AME Standards.
- C. Fire protection systems will be similar to potable water systems and be tested per NFPA 24 at 200 psi for two hours, following ASTM Standards. Backflow prevention will be required to isolate fire from potable water lines.

- D. Absent the use of mechanical connections, properly sized concrete thrust blocks will be required on fittings at changes of direction. Pipes shall be wrapped in 6-mil polyethylene film (Visqueen) prior to pouring the thrust block to facilitate ease of future removal.
- E. Water wells are regulated by SWFWMD, under a SWUCA consumptive use permit, capping at 100,000 gpd/yr average and capped at 1 MM gpd/day maximum, and six inch well. Contact the office of Campus Development and Facilities for information about proposed wells.
- F. All piping for water distribution systems shall be cleaned and tested in accord with appropriate AWWA Standards. Specify thorough flushing, and cleaning and flushing with a "Poly-pig" where necessary. Water samples shall be tested per FDEP Standards through Polk County Environmental Health Division, with samples taken under supervision of the BCA.

Section 332680 Fuel and Steam Distribution

- A. Campus natural gas piping is owned and operated by Central Florida Gas/ Florida Public Utilities, who should be contacted about any extensions to the system. For construction project emergency situations, contact the University project manager or Campus Police.
- B. Steam lines shall be minimum Schedule 40 seamless black steel pipe and condensate lines shall be minimum Schedule 80 seamless black steel pipe. The preferred piping configuration for steam and condensate includes mineral wool insulation and enclosed within epoxy coated steel or PVC conduit systems. Copper pipe may only be used for control tubing 3/8-inch and smaller for steam pressure reducing valve. Minimum burial depth is four feet to the top of pipe. Add 3/4-inch minimum drain valves at strategic locations on both sides of main valves in manholes. Refer to Division 22 Plumbing for metering and steam traps by Hoffman, Velan, Sarco and Yarway. All piping must be cleaned, tested for two hours per ASME B31.1, and witnessed by the BCA.

Section 332700 Sewerage and Drainage

- A. Storm systems are to be designed to have no standing water in the system pipes. Storm sewerage inlets shall conform to FDOT Standards with reticuline steel grates suitable for bicycle traffic and satisfy AASHTO HS-20 loading. Piping for storm sewerage shall be Schedule 40 PVC up to 10-inches and RCP for over 10-inch diameter meeting FDOT Standards. Black corrugated HDPE may be acceptable for minor areas of drainage systems, as designed by the engineer of record.
- B. Gravity sanitary systems piping of green PVC shall be in accordance with ASTM 3034D Standards and SDR ratio applicable to the depth of burial. Cement lined ductile iron pipe Class 50 is acceptable for special conditions. Sanitary force main piping shall be green DR-25 PVC with mechanical joint fittings.
- C. Lift stations shall be connected to the University alarm systems. Provide a factory-built fiberglass enclosure. Pumps shall be self-priming, horizontal, above ground by Gorman-Rupp or Clone. Provide a freestanding control panel driven by a PLC programmed with RS 500 Logix

computer language, and have a cabinet supplied with a generator receptacle (100Amp, 4 pole, corrosion resistant with Hubbell box #B1001W, plug #4100, and Hubbell cap #PC100) and an emergency power supply control that separates line power from emergency power. Float switches shall be equal to Mercoid. Red trouble light shall be used to indicate a high sump level, with a silence switch, by Allan Bradley or Clone. Provide manhole covers for wet-well access, minimum 30"x30" or 30 inch dia. Provide a four-inch emergency bypass pump-out connection.

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