



FACILITIES DEPARTMENT

DESIGN AND CONSTRUCTION STANDARDS

**Revision 6: September 14, 2018
(Sections 23-HVAC and 26 - Electrical)**



The purpose of this manual is to provide the design professional and Construction Manager with a general listing of design criteria from a technical, facilities perspective specifically to Broward College. The manual is divided into chapters (00-33), which reflect the Construction Specification Institute (CSI) 2014 Master Format. Chapters not applicable to construction design at the College have been omitted. It is not the intent of this manual to direct design or insist upon any proprietary products, but merely to serve as a basis of quality and standardization needs for the College. The design professional and Construction Manager are responsible for ensuring the items listed herein are incorporated into the project. Variances from the items listed herein should be coordinated with the BC Facilities Construction Project Manager and confirmed in writing.

The Conformance Statement shall be signed by the Architect / Engineer of record and provided with the construction document submittal to the Broward College Facilities Construction Project Manager. Any comments, suggestions for improvements in the content of this manual are encouraged and always appreciated. We hope this guide will be of assistance to you and your staff and look forward to a successful project to improve the quality of education at Broward College.

The Broward College Facilities Construction Project Manager (BCPM) is the designated single point of contact for administering a project and is considered the Owner's Representative. All contact and direction to the Architect/Engineer Firm should be through this representative.

Design contracts awarded after July 2015 shall comply with this document.

PROJECT NAME: _____

BC PROJECT NUMBER: _____

I do hereby certify that I am the Architect / Engineer of record for the above indicated project and I have reviewed the Broward College design and construction guidelines and have incorporated the requirements of those guidelines into the construction documents unless indicated otherwise below.

Architectural / Engineering Firm: _____

Architect / Engineer of Record: _____

Design Deliverable Description _____ **Submittal Date** _____

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		Yes	No	Exception
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00 00 00 Procurement and Contracting Requirements

00 10 00 Solicitation

1. Broward College holds Architects/Engineers and Construction Managers continuing services agreements for construction projects from \$0 - \$ 2,000,000. These contracts are usually for a period of 3 years. Project specific solicitations will be issued for Architects/Engineers and Construction Managers for projects over \$2,000,000.
2. Architects/Engineers are engaged in the projects once the projects are approved by the college and an initial program is prepared by Broward College Facilities Budget and Planning Department.
3. A preconstruction agreement may be issued to the CM @ Risk to participate during the plan review process and assist with estimating efforts.
4. Once plans have been reviewed and approved by the Building Official, the CM @ Risk will be able to solicit bids. Refer to [Appendix 00 01 for purchasing bid limits](#).
5. The advertisement shall be submitted to the BCPM. The BCPM will submit the draft to the College Procurement Department for review and approval.
6. Any project with an estimated construction cost of \$300,000 or more must be advertised for at least three weeks. Projects with an estimated construction cost of less than \$300,000 can be advertised for one week.
7. The CM @ Risk is responsible to prepare bid packages, advertise, receive the bid package, evaluate the bids and submit a GMP based on the lowest most qualified and responsive bids. In the event the lowest bid is not the most qualified, the CM @ Risk must submit a justification.
8. The typical **GMP submittal** package shall include the following documents:
 - a. Cover Page
 - b. Proposal Letter
 - c. Table of Contents
 - d. Schedule of Values
 - e. Scope of Work, assumptions and clarifications as required
 - f. Bid tabulation, scope sheet comparisons along with copies of bids
 - g. Evidence of competitive bidding for Self-performed work (copies of bids or letter of refusal)
 - h. Advertisement for Bid (newspaper ad, electronic solicitation ad, etc.)
 - i. Index of contract documents
 - j. Project Schedule
 - k. Construction Manager Insurance. Refer to Appendix 00 02 for insurance requirements.
 - l. Subcontractors SDBE log

- m. Performance and Payment Bond letter of intent
- 9. The agreed upon list of subcontractors listed on the GMP shall not be changed without BCPM approval. List shall include contractor name, address, phone number and state license number.
- 10. Insurance requirements if vendor will be putting work in place on college property:
 - a. Broward College must be named as an additional insured and Certificate Holder.
 - b. The college address to be use in the certificate of insurance is:
Broward College
6400 NW 6 Way, 2nd Floor
Fort Lauderdale, Florida 33309
 - c. Coverage must be at least \$1,000,000/\$2,000,000 in regards to General Commercial Liability and \$1,000,000 of Automobile Liability, including Workers Compensation pursuant to FL Statutory Limits.
- 11. No retainage is held on Preconstruction Purchase Order payments. A separate GMP Purchase Order will be issued to the CM @ Risk. No work shall begin without an executed agreement and Notice to Proceed letter. Refer to [Appendix 00 02 for a Notice to Proceed sample letter](#).
- 12. BCPM must be invited to attend Bid Openings.

01 00 00 General Requirements for Design

1. Typical General Requirements may vary with the size and complexity of any given project. Coordinate items of inclusion with the BCPM.
2. All design and construction drawings shall be 24" x 36". The architect shall produce a reduced set of construction drawings for use in the field scaled to half size. All details shall be clearly shown and accurately referenced on the construction drawings.
3. At the completion of the construction document phase, the design professional shall provide CAD drawing (.DWG format and .PDF) files to the Owner. All deliverable document sets are to be transmitted via .pdf files. Utilize .pdf software plug-into export from CAD software, such as Bluebeam Revu or similar to create searchable files. The file naming protocol is as follow:
 - a. Broward College Project Number first (ie. 0000-C15-00.0)
 - b. Project Description (Room number if applicable)
 - c. Type of Asbuilt (Discipline and progress phase)
 - d. Date
 - e. Example: 1032-C15-0.2 Rm 234 Mechanical Asbuilt - Final 04-10-2015
4. A list of all codes referenced on the project shall be included on the drawings. Contact Authority Having Jurisdiction (AHJ) to confirm appropriate version is used for permitting.
5. Any projects over \$300,000 will be submitted to FDOE for review and approval. The A/E, with assistance from the BCPM, will prepare the following forms: OEF 111B, 208A, 209, and 564. Refer to Appendix 01 08 for plan submittal requirements from the Florida Department of Education.
6. Each project shall include a site plan or at least partial site plan showing relative locations of existing buildings.
7. Field verify all topographic features, elevations, landscaping at project perimeter to ensure seamless tie-ins.
8. When designing a new building, the following shall be considered:
 - a. Main building entrances shall be readily identifiable.
 - b. Whenever possible, building orientation shall conserve energy and allow for natural light and ventilation.
 - c. Provide identification and preservation of natural site feature.
 - d. Vegetation buffers and areas to remain unclear shall be clearly noted on the drawing. The Contractor is required to protect these areas during construction.
 - e. Provide an exterior building perimeter 2' wide, 4" thick, sloped concrete landscape skirting around the building.
9. Broward College endorses and supports the Integrated Project Delivery (IPD) method and expects all design team members and construction team members to actively participate and work towards maintaining a positive relationship among all team members throughout the project duration.

10. Coordinate with the BCPM when developing design for the following systems: Security & Access Control (refer to Appendix 01 01), Audio Visual systems (refer to Appendix 01 02 and 01 09), Doors and Hardware (refer to Division 8).
11. The structural plans shall clearly show all floor drain locations and the extent/limits that the concrete slab requires pitching towards the drain (i.e. emergency showers, mechanical rooms, etc.). Coordinate drains locations to avoid conflict with doors or other possible tripping hazards.
12. All exterior walls shall be continuous to the underside of the roof deck assembly. Do not design soffits venting into an attic space above interior spaces. Above ceiling spaces shall be designed air tight to prevent outside air from entering ceiling space. Roof insulation shall be designed in the roof deck assembly and not placed on ceiling assemblies.
13. Parapet walls shall have roofing membrane installed as a complete system including coping. The coping shall be stainless steel or as required by roofing system.
14. All buildings shall have a roof building identification number and a Building number. Refer to Appendix 01 03 and 01 11.
15. Metal roof systems or roofs that drain over the perimeter face of the building shall be designed with gutters and discharge into underground storm collection system, where applicable. Discuss and decide on a direction pertaining to this item with the BCPM.
16. EFIS wall systems shall not be specified for any building or structure.
17. The architect shall state in the contract documents all permits (i.e., Florida Building Code Permit, Water Management District, Site, utility, Right of Way Access, etc.) that are applicable to the project. All demolition projects require a demolition permit. All low voltage projects will also require a separate low voltage permit. Architect shall create and maintain a permit matrix for the project.
18. Post all permits in conspicuous location. The contractor shall coordinate all inspections required during construction. CM to send invite to BCPM for inspections. Invite to be sent via MS Outlook or similar digital calendar tool.
19. A/E to specify equipment based on the following:
 - a. "Owner Furnished/CM Installed" - the Owner will provide the equipment. The CM will be responsible for relocating/receiving, installation, startup, testing and inspecting.
 - b. "Owner Furnished/ Owner Installed" - the Owner will provide and be responsible for relocating/receiving, installation, startup, testing and inspecting. CM shall coordinate any additional requirements needed to accommodate the equipment.
20. A building dedication plaque is required on new construction and major redevelopment projects. The top of sign shall be at 60" AFF. Refer to Appendix 01 04 for details.

21. All room numbering will be done by BC Planning and Capital Budget Department. If a project requires existing rooms to be re-numbered, the changes will need to be reflected on the electrical panels, fire alarm panel, intercom, energy management, security, local law enforcement, fire department, F.I.S.H., etc. and coordinated through the BC EMS group.
22. Designer to check and review the most recent Comprehensive Safety Inspection Report, Environmental Reports, Asbestos Reports, and ADA Survey for inclusion in project design.
23. New construction and renovation designs shall include a storage room for attic stock storage. Room shall be 120 NSF.
24. Provide Key Management System to include lockable key cabinet or cabinets on new facility construction and on major renovation projects. Provide space for every door and key tags. Coordinate with BCPM.
25. Identify all appliances required and include as part of the contract documents. Coordinate manufacturers/model numbers with BCPM.
26. Assure door openings and passageways are sufficient for replacement or moving of appliances and/or equipment.
27. Submittals - Provide at least three (3) product options for each item or approved equal. Products identified in this manual shall take precedence. Refer to Appendix 01 10 for digital submittal process guidelines.
28. Verify that all products that require Florida Product Approval are so approved before specifying and the NOA is listed.
29. An Equipment Information Form is to be completed on all equipment in the project. The form shall specify any equipment installed that will require scheduled service and maintenance. Refer to Appendix 01 05.

01 50 00 General Requirements for Construction

1. The contractor is expected to work in a safe manner. The utmost consideration to safety should be given while working around students and staff.
2. Barricades should be maintained where required while construction is occurring and checked regularly. Contractor is required to submit a safety barrier plan and/or maintenance of traffic plan when affecting pedestrians and/or traffic, to the BCPM and to the BC Building Department if required. A chain link fence 6 feet in height with windscreen will be required around all work sites.
3. Access to and from the construction area needs to be planned and agreed upon by all involved.
4. Subcontractors shall be required to attend a pre-construction meeting with the project management team before beginning their work. Refer to Appendix 01 06 for proposed agenda.
5. It is the CM's responsibility to locate all private and public utilities prior to beginning of construction. Existing utilities damaged during construction will be the CM's sole responsibility to repair.
6. Clean construction site and construction debris daily.
7. Interaction with students and staff without BCPM presence is prohibited.
8. The CM shall submit a comprehensive company safety plan with provisions specific to the project. The contractor, subcontractors and workers shall abide by the Broward College security procedures while on site.
9. The Architect shall require the CM to submit Material Safety Data Sheets (MSDS) for all hazardous products and make them available at the job site.
10. Hot Work Permits shall be managed and issued by the CM. All welding, torch and brazing activities require this permit. (Rev. 2 dated 6-28-16)
11. For all construction projects the CM at Risk will contract directly with the assigned Broward College continuing services surveyor (according to the campus where the project is located). The surveyor will be responsible to update the asbuilts and at the end of the project, update the College Master Plan. For any maintenance projects, the BC Facilities Manager will contract the surveyor directly. Refer to Appendix 01 12 for the Specifications for Land Surveys.

01 70 00 Close Out Requirements

1. CM Asbuilt site drawings to be submitted to the Owner shall be certified by a professional land surveyor and clearly show all as-built conditions, elevations and utilities. The final survey must be incorporated into the BC Master Plan. CM to coordinate with BCPM for surveyor vendor selection.
2. Architect to provide to CM updated record CAD drawings inclusive of all revisions to each sheet for the CM to prepare asbuilts. The contractor shall be required to submit a complete set of as-built drawings in Auto CAD (.DWG and .PDF format) in addition to the hard copy.
3. Broward College (BC) requires surveys to be performed from time to time to support the design of improvements at the colleges various campuses.
4. The surveyor must meet with BC Staff to determine the site limits, scope of work, and insight into the purpose of the survey. Field work, in most cases, will take place during normal operational hours, so consideration must be made to not disturb the students or faculty. The surveyor should consult with staff to coordinate access and gain any security clearances that may be needed, before scheduling field work.
5. All survey work shall meet the Florida Rules 5J-17.050 - Minimum Technical Standards for Surveying and Mapping, as well as the specifications set forth herein. Refer to Appendix 01 07 for survey requirements.

02 00 00 Existing Conditions

1. Architect / Engineer shall conduct an existing conditions survey/observation including above ceiling and applicable mechanical and electrical rooms. The survey shall be coordinated through the BCPM.
2. Architect & CM shall reference Owner's environmental reports prior to beginning of design/demolition activities. If hazardous materials are encountered during demolition, notify the BCPM immediately.
3. Where remediation procedures are required, contractor shall provide landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
4. The Design Professional shall invite BCPM to inspect existing inventory of equipment and components within area of work, and prepare a list of items to be removed, discarded, sold, relocated or stored. Broward College maintains right of first refusal.
5. Existing utilities indicated to remain in service shall be maintained and protected against damage during demolition or selective demolition operations. Allow for a timeframe (72 hours minimum) for notification prior to shut-downs or excavations that may affect existing infrastructure or operations.
6. Any areas damaged during demolition or selective demolition shall be repaired immediately using approved methods and materials. Restore to match prior existing conditions.
7. Contractor shall comply with governing EPA notification regulations before beginning demolition and with hauling and disposal regulations of authorities having jurisdiction.

02 40 00 Demolition

1. A pre-demolition conference shall be scheduled by the contractor 2 weeks prior to demolition activities.
2. Contractor shall provide to the BCPM a building demolition schedule for approval prior to the start of demolition.
3. Contractor shall submit pre-demolition photographs and/or video documenting all existing conditions before the work begins including roadway routes trucks will be utilizing.
4. When required by the College, contractor shall submit a logistics plan indicating areas to be protected during demolition.
5. Building demolition shall be conducted so that operations of adjacent occupied spaces will not be disrupted.
6. Confirm that LEED requirements for Building Reuse for the project have been met.

03 00 00 Concrete

1. A pre installation conference shall be conducted.
2. Mix Designs shall be submitted for each class of concrete or precast concrete by primary supplier. It is highly recommended to have secondary supplier's mix designs approved in the event the primary supplier can't accommodate the schedule.
3. The Design Professional shall identify materials and/or assemblies that need to be tested and indicate which testing agency is responsible for the testing. General Contractor shall retain services of independent third-party testing agency. Broward College reserves the right to retain services of testing agency for the project.
4. Testing Agency shall be an independent agency qualified in accordance to ASTM C 1077 and ASTM E 329 for testing indicated and other applicable agencies.
5. Shoring shop drawings and calculations shall be signed and sealed, and prepared by or under the supervision of a professional engineer registered in the state of Florida.
6. Where required, contractor shall provide documentation indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement indicating cost for each product having recycled content for projects pursuing LEED certification.

03 30 00 Cast-in-Place Concrete

1. Steel reinforcing shop drawings shall include placing drawings.
2. Reinforcement fabrication shall be in compliance with CRSI's Manual of Standard Practice.
3. Formwork shop drawings shall be prepared by or under the supervision of a professional engineer registered in the state of Florida.
4. Informational submittals shall include current welding certificates, material certificates and material test reports.
5. The Design Professional shall provide a floor flatness and levelness schedule based on structure type and finish material.
6. Where required, Contractor shall provide Product Data for liquid floor treatments and curing and sealing compounds documentation including printed statement of VOC content for projects pursuing LEED certification.

7. Where required, Contractor shall provide Product Data for each concrete mixture containing fly ash and/or slag as replacement for Portland cement or other Portland cement replacements, and for equivalent concrete mixtures that do not contain Portland cement replacements for projects pursuing LEED certification.
8. Design Professional shall indicate control joint pattern for all slabs-on-grade. For exposed concrete applications, joints need to be cleaned and filled with approved joint filler compound for specific application. Location of all expansion/control joints shall be shown on plans.
9. Waterstops shall be provided as follows:
 - a. Flexible Rubber Waterstops: CE CRD-C 513.
 - b. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstop.
 - c. Flexible PVC Waterstops: CE CRD-C 572.
10. Provide polyolefin system sheet vapor retarders in compliance with ASTM D 4397, not less than 15 mils with taped joints. Provide complete system from single source. Documents to include all penetration details.
11. Coordinate curing compound with concrete finish requirements for compatibility.
12. Expansion and Isolation Joint Filler Strips shall comply with ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork. Confirm compatibility of sealant with expansion joint filler material. Joint shall be covered with an approved flexible sealant.

03 41 00 Precast Concrete

1. The project specifications and drawings shall include information regarding structural performance of precast structural concrete, including loading criteria and fire resistance rating. It shall also include finish type, profile and reveals.
2. Structural precast shop drawings shall include member locations, plans, elevations, dimensions, sections, openings, support conditions, reinforcement and fabrication and installation of precast structural concrete units, signed and sealed by the professional engineer registered in the state of Florida responsible for their preparation.
3. Delegated structural design calculations for precast structural concrete shall comply with performance requirements and design criteria, including analysis data, signed and sealed by the professional engineer registered in the state of Florida responsible for their preparation.

4. Informational submittals shall include qualification data for installer, fabricator and testing agency, welding certificates, material certificates, material test reports, source quality control reports and field quality control reports.
5. Fabricator qualifications shall require a firm experienced in the type of precast structural concrete in the project. In addition, fabricator's participation in PCI's Plant Certification and Erectors Certification programs will be required.
6. Welding qualifications shall include qualification of procedures and personnel in accordance to AWS D1.1, "Structural Welding Code - Steel" and AWS D1.4, "Structural Welding Code - Reinforcing Steel". The Design Professional shall specify criteria for visually inspected and/or tested welding connections, frequency and type of tests.
7. Comply with the latest and/or adopted edition of ACI and PCI publications.
8. Concrete, admixtures, grout and steel reinforcement shall comply with ASTM standards.
9. Architect/Engineer to specify mock up sample to demonstrate reveals, surface finishes, texture, color and standard workmanship.

03 47 13 Tilt-Up Concrete

1. Tilt-up concrete shop drawings shall include panel locations, plans, elevations, dimensions, shapes, reveals, cross sections, reinforcing, details of steel embedment, MEP embedded items, additional steel reinforcement to resist hoisting and erection stresses, location and details of hoisting points and lifting devices, and fabrication and installation of tilt-up concrete units. It shall also include finish type, profile and reveals.
2. Shop drawings and/or calculations for the lifting, erection and temporary bracing of the panels, signed and sealed by the Professional Engineer registered in the State of Florida responsible for their preparation shall be required.
3. Informational submittals shall include qualification data for installer, manufacturer and testing agency, welding certificates, material certificates, material test reports and field quality control reports.
4. Manufacturer qualifications shall require a firm experienced in the type of tilt-up concrete in the project is required. In addition, confirm that certification according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" is also required.
5. Installer qualifications shall include providing a qualified installer who employs a supervisor on Project who is an ACI-certified Tilt-up Supervisor.
6. Mockups are required and shall include casting and erecting tilt-up concrete panel to demonstrate typical reveals, surface finishes, texture, color and standard workmanship.

03 52 16 Lightweight Insulating Concrete

1. The Design Professional shall indicate Design Mixtures required for each lightweight insulating concrete mix and testing schedule.
2. Provide an average insulation value of R-20 minimum and/ or more as required to meet the project's energy performance goals.
3. Material thickness shall be coordinated with roof drains, curbs and parapets.
4. Material thickness shall be accounted for in the structural design.

04 00 00 Masonry

04 20 00 Unit Masonry

1. Contractor shall submit samples for verification for each type and color of exposed masonry units and colored mortars.
2. Informational submittals shall include material certificates for each type and size of product.
3. Contractor shall provide submittal of design mixes for each type of mortar and for grout.
4. Contractor shall provide building sample panel mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects.
5. Broward College requires blocks to be saw-cut only. Architect/Engineer to indicate in the project's specifications.
6. Do not use defective units (chips, cracks, etc.).
7. Exterior face of CMU cavity wall shall be fully coated with appropriate barrier to prevent moisture and water intrusion. Architect to provide complete specification.
8. Bituminous damp-proofing shall be specified as a troweled, rolled or sprayed-on application. If a sprayed-on application is considered acceptable, it shall be specified to be applied in no less than three separate coats per approved manufacturer's recommendations and verified to the Owner's satisfaction. Specify mill thickness in addition to number of coats (tolerances).
9. All exterior brick support angles where the underside of the angle is exposed (i.e., lintels, windows, etc.) shall be specified to be hot dipped galvanized or stainless steel.
10. All control/expansion joints shall be shown on the plans. Architect to show brick joints and engineer to show CMU joints. Engineer to provide all locations for control joints and expansion joints on approved documents.
11. Through-wall flashing systems shall be detailed on the drawings.
12. Split-face block shall be used as veneer only, not solid unit load bearing walls.

04 21 13 Brick Masonry: Face Brick

1. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.
 - a. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished. On Drawings, show details of special conditions and special shapes required.
 - b. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - c. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
 - d. For consistency, use face of brick. Saw cut is needed. Avoid turning and using end of brick to eliminate color variations (zipper effect).
2. Provide Facing brick complying with ASTM C 216, Grade SW, Type FBX or HBX Subject to the College's Approval.
 - a. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.
 - b. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 - c. Surface Coating: Brick with colors or textures produced by application of coatings will not be allowed.
 - d. Color and Texture: Size and color of Brick shall be coordinated with adjacent buildings and Campus standards. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
 - e. A stand-alone 5' x 5' minimum Mock up shall be provided from a mixed sample of bricks.
3. Plastic/vinyl weep with cotton wick and stainless steel insect screen shall be used.
4. Only brick manufacturer's approved cleaning chemical shall be used. Specify final cleaning to be performed at completion of construction.

05 00 00 Metals

05 00 50 General Metals

1. Pre installation conference shall be conducted for all structural steel and joist framing installations.
2. Contractor shall submit documentation indicating percentages by weight of postconsumer and pre-consumer recycled content for products having recycled content, Include statement indicating cost for each product having recycled content for projects pursuing LEED certification.

05 12 00 Structural Steel Framing

1. Steel members exposed to the exterior and weather shall be specified as receiving hot-dipped galvanized G-90 min. coatings.
2. Contractor shall be responsible for scheduling all weld testing per plans/specs and manufacturer's recommendations.

05 21 00 Steel Joist Framing

1. Where primer is required, it shall be shop applied. Joists that are permanently exposed to view shall be specified to be painted.

05 40 00 Cold-Formed Metal Framing

1. Cold-formed metal framing shop drawings shall include layout, spacings, sizes, thicknesses and type of cold-formed steel framing; fabrication; fastening and anchorage details, including mechanical fasteners; reinforcing channels; opening framing; strapping, bracing, bridging, splices, accessories, connection details and attachment to adjoining work.
2. Cold-formed metal framing calculations for all exterior applications that are subject to dead, live and/or wind loads, shall be signed and sealed by the Florida registered Professional Engineer responsible for their preparation and following the design criteria indicated in the structural drawings.
3. Contractor shall submit product data for each type of cold-formed steel framing product and accessory required for installation.
4. Informational submittals shall include welding certificates, product test reports, and research reports.

5. Miscellaneous materials shall be in compliance with the following:
 - a. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
 - b. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404.
 - c. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing silica sands, Portland cement, shrinkage- compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
 - d. Shims: Load bearing, high-density multimer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
 - e. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom of exterior track or rim track members.

6. Provide two beads of acoustical sealant under bottom tracks of interior sound partition walls.

06 00 00 Wood, Plastics, Composites

06 00 50 General Material and Finish Standards

1. Low Emitting Materials: As general practice, composite wood and agrifiber products used on the interior of the building (defined as inside of the weatherproofing system) shall contain no added urea-formaldehyde resins and that laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins. Composite wood and agrifiber products include: plywood, panel substrates and door cores.
2. Wood sourcing shall conform to Florida Statute 255.20; Specification of State-produced lumber.

06 10 53 Miscellaneous Rough Carpentry

1. Provide only pressure treated material for all lumber in contact with concrete, masonry, the ground, or water. Verify that the types of treatment that are acceptable for each type of exposure and the retention level of preservative been specified.
2. The Design Professional shall indicate the type and treatment of fasteners in contact with pressure treated lumber.
3. Plywood backing panels shall be installed on all walls in the telephone/communications/ data rooms and closets.
4. Backing for accessories shall be solid lumber when applicable.

06 40 23 Interior Architectural Woodwork

1. All interior architectural woodwork to be "Custom" grade in accordance with latest edition of the AWI "Quality Standards", unless higher grade is specifically required by the College. All joints shall be glued under pressure and nailed. Use of staples is not acceptable.
2. Body core members, countertops, backs, drawers and pigeonhole partitions to be exterior grade plywood, minimum 7-ply, conforming to PS 1-83, bearing APA grade mark of A-B or better. The use of MDF is not permitted.
3. Provide Grade 1 hardwood, kiln-dried to minimum of 12% moisture content at fabrication.
4. Drawer's joints to be locked shoulder (dovetail), glued under pressure and nailed.

5. Plastic laminate shall be in compliance with NEMA Standard LD3-1980, in thicknesses as follows:
 - a. Exposed exterior vertical: 0.030 inch
 - b. Exposed interior surfaces (including backs of doors): 0.020 inch
 - c. Toe space base (black): 0.030 inch
 - d. Countertop horizontal surfaces and edges: 0.050 inch
 - e. Backsplash vertical surfaces and edges: 0.050 inch
 - f. Drawer fronts: 0.050 inch
6. Hinges for 3/4-inch thick doors shall be brushed chrome-plated steel, five knuckle 0.088 gage, wraparound type allowing 270 degree swing at end of casework unit mounted with a minimum four (4) plated #8 self-tapping screws per hinge leaf.
7. Surface-mounted type pulls shall be in US26D (satin chrome) finish, by Stanley, EPCO, or equivalent.
8. Door catches to be provided as follows:
 - a. For doors up to and including 38-inches, provide one heavy-duty magnetic type catch, slotted for adjustment.
 - b. For doors over 38-inches, provide two (2) heavy-duty magnetic type catches.
9. Shelf supports to be provided as follows:
 - a. End supported standards, KV #255 Steel, Knape & Vogt or equivalent, secured with No.5 flat-head screws. Where chemicals will be stored, provide aluminum standards.
 - b. End support clips, zinc-plated, KV #256ZC, Knape & Vogt or equivalent.
10. Fabrication requirements: Conform to AWI (full overlay design) unless specifically directed otherwise by the College.
11. Base Cabinets: Backs, 1/4-inch thick plywood, plastic laminate finish. Sides, finished exposed end panels to cabinet assemblies in field consisting of an applied 3/4-inch thick end panel with high pressure plastic laminating, finish as follows:
 - a. Interior Behind Doors: Plastic laminate
 - b. Exposed Exterior End, Front Faces and Interiors: Plastic Laminate
 - c. Unexposed Exterior End: Phenolic overlay applied with 200 psi at 200 degrees F or plastic laminate with backing.
12. Omit dust covers.

13. Bases: Provide each base cabinet with its own unit base, factory applied.
14. Countertops, Backsplashes, and End Splashes: Plywood, minimum 3/4-inch thick construction, finished with solid surface material; Corian or equal. Provide 4" min. backsplash and end splashes.
15. Restroom sink countertops: provide sloped removable plastic laminate panels under countertops typical.
16. Open Wall Cabinets: Construction similar to base cabinets, all exposed surfaces finished with plastic laminate. Recessed tops and bottoms are not acceptable.
17. Provide 3/4-inch thick plywood with plastic laminate finish on both faces, swing hinged, full overlap type for both base cabinets and wall cabinets.
18. Installation requirements: Coordinate, locate and install wall structure reinforcement, wood grounds and back bracings in wall construction prior to installation of casework items. Attach countertops securely to base units. Spline and glue joints in countertops. Provide concealed mechanical clamping of joints.
19. Rough-in requirements: Provide holes in casework for plumbing and electrical work using templates furnished by suppliers of plumbing fixtures and electrical devices. Unnecessary oversize cut opening or sloppy opening will not be acceptable. Escutcheon plates shall be used when penetration is exposed to view.

07 00 00 Thermal and Moisture Protection

07 00 50 General Standards

1. The following conditions shall be specified to prevent issues due to mold growth in renovation and new construction projects:
 - a. New construction and/or renovation: Prevent water intrusion into the building (including dew point/condensation conditions) during construction.
 - b. Should water intrusion occur, the contractor shall take steps to immediately remove water, including dehumidification of the atmosphere as required to dry out the building, prevent entrapment of moisture with construction materials, and all other components of construction.
 - c. Dehumidification through the use of building HVAC systems require the use of adequate filters to prevent distribution of construction dust, etc., in air handling and duct systems.
 - d. If water intrusion occurs, all efforts shall be done to dry out affected material and material shall be removed immediately. Inspections shall be made on a continual basis to ensure no mold growth or conditions for mold growth exists, including, drywall, wall cavities or concealed areas affected by moisture. If mold is observed, the contractor shall be responsible to utilize consultant services to address the process and procedure for removing mold by treatment and/or material removal.
 - e. Sequence of construction installations shall be coordinated in such a way that the building is weather tight and acclimated per manufacturer's requirements for finish products installation.
2. All new, repair, and replacement roofing projects shall have plans and specifications developed by a registered architect. Plans and specifications are subject to BC Facilities Construction Project Manager and Roofing Consultant approval.
3. General: Rooftop MEP Systems are to be minimized to the greatest extent practicable. Where unavoidable, provide code required clearances from surface of roofing system for proper maintenance and drainage of roof. Accommodate MEP systems with prefabricated curbs, carriers, and penetration seals.
 - a. Roof Penetrations: Provide factory fabricated roof penetration seals and equipment supports to all roof penetrations.
 - b. Pitch pans will not be permitted.
 - c. Pre-manufactured boots and sleeves shall be used.
 - d. When the placement of MEP equipment on the roof is unavoidable, support with pre-engineered equipment supports or round pipe supports fabricated of aluminum, stainless or hot-dipped galvanized steel (G-90).

4. Product Test Reports shall be required for roof materials, indicating that roof materials comply with Solar Reflectance Index requirement for projects pursuing LEED certification.
5. The following roof drainage requirements shall be met: Provide roof system with a minimum positive slope to drain of 1/4-inch per linear foot. Roof drains are to be positioned at low points in the roofing system (not over columns). For new construction, drains are to be connected to storm drainage leaders located adjacent to perimeter building walls. Drains are to be a minimum 24" away from vertical walls and are to be sumped into roof.
6. Crickets and saddles shall be provided between drains and on the up-slope side of equipment penetrations as per NRCA and FBC.
7. Maintenance access requirements: Provide roof walks at logical access ways to protect roofing system from maintenance traffic. Provide OSHA compliant roof access for maintenance personnel. Whenever possible, a stairwell shall be extended to the roof level and an access door 3' x 7' shall be provided. Provide exterior rain guard, overhang and upturned curb threshold support for door weather protection. Provide OSHA compliant signage for fall protection on door.
8. All buildings shall have a roof building identification number. Refer to Appendix 01 03.
9. Provide roofing manufacturers standard heavy duty walking pads to all mechanical equipment.
10. Unless required by Structural Engineer, all supports and penetrations shall be round pipe. Square pipe, angles or unistrut through roofing system is not permitted.
11. Specification of OSHA roof tie downs shall only be used if no other options are available. The College prefers not to install tie downs since they require annual certifications and testing.

07 11 00 Waterproofing

1. Vapor barrier system under all building slab on grade. Minimum 15 mill. Poly membrane with 3" overlap and all taped sealed seams as specified by the manufacturer.
2. Waterproofing shall be required on the soil side at below grade conditions. Where hydrostatic pressure is likely, sheet membrane waterproofing or "Bentonite" or equal shall be employed. Required at all elevator pits.
3. Provide a seamless continuous positively bonded elastomeric waterproof membrane at "between slab" on plaza decks, parking decks, or at planters primarily on concrete and masonry surfaces.
4. Wet walls shall utilize a waterproofing membrane compatible with the finish product to be installed over it. Showers shall utilize a waterproofing membrane on floors and full height of walls. Provide complete system with valves, sleeves and accessories.

5. All waterproofing membrane systems shall include a minimum 10 year warranty.

07 18 00 Traffic Coatings

1. Material compatibility shall be required so that primers; base-, intermediate-, and topcoat; and accessory materials are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience. Indicate sourcing limitations for traffic coatings and pavement markings from single source from single manufacturer respectively or be compatible.
2. Preferred Roofing Systems:
 - a. Single Ply Membrane Flexible Sheet Roofing
 - 1) Twenty (20) year labor / material warranty
 - 2) Basis of design shall be Fibertite or equal.
 - b. Modified Bitumen (SBS) Roofing
 - 1) Twenty (20) year total roof system NDL warranty inclusive of roofing materials from roof deck to finish membrane shall be provided and will begin after project substantial completion. Provide non-deductible roofing warranty inclusive of all material and labor.
 - c. Metal Roofing
 - 1) Metal roof system shall be installed with no less than 2 and 12 slope, with continuous panel run from ridge to edge installed over a solid deck design with a peel and stick membrane, i.e., Ice and Water Shield or equal.
 - 2) Twenty (20) year leak free system warranty.
 - 3) Metal roof panels shall not be roll formed on the job site unless approved by the BCPM. Metal roof panels shall be roll formed in the manufacturer's permanent factory and transported to the job site.
 - 4) All roof curbs shall be provided and installed by the roof system manufacturer and be designed for that specific roof system.
 - 5) All lighting arrestor system parts shall be secured to the metal roofing standing seams with anchor clips acceptable to or provided by the roofing manufacturer. Do not "glue" anchors to the metal roof. Penetrations shall be kept to a minimum.
3. Flashing and Sheet Metal
 - a. Aluminum: ASTM b 209-90, Alloy 3003, Tempe H14 AA-C22A41 baked on enamel finish 0.040" thick, at edge detail and 0.050" at coping.
 - b. Stainless Steel: ASTM A 167-91 Type 304, soft temper 24 gauge thick, smooth 2B finish if not painted.
 - c. Manufacturer's laminated metal 24-gauge stainless steel for all flashing areas on single ply roofs.
 - d. All metal flashing shall meet current SMACKNA guidelines.
 - e. Metal decking scheduled to receive light weight concrete shall be designed G90.
4. Coping shall be aluminum, copper or stainless steel and mechanically fastened to the structure.

5. Maintenance/walkway pads shall be specified around all sides of HVAC equipment on single ply and modified bitumen capped asphalt built-up roofs. (Contrasting color suggested).
6. Sprayed on waterproofing for masonry restoration shall be water based only unless prior written approval by BCPM.
7. Provide roof access hatches and ladders to high roof areas, example: auditorium roofs, gymnasium roofs, cafeteria roofs and multistory classroom roofs.
8. The General Contractor shall:
 - a. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.
 - b. Verify that substrates are visibly dry and free of moisture.
 - c. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
9. Substrates shall be cleaned and prepared according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application, before applying traffic coatings. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.
10. Traffic coating shall be applied according to ASTM C 1127 and manufacturer's written instructions.
11. Vehicular pavement-marking paint is to be applied with mechanical equipment to produce markings of dimensions indicated with uniform straight edges.

07 25 00 Weather Barriers

1. Ensure a continuous seal is formed by a vapor and air barrier for each building enclosure.
2. Where masonry veneers are used, a water proofing barrier over substrate is required.
4. Roof Hatches:
 - a. Fabricate with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counter flashing.
 - b. Weld or mechanically fasten and seal corner joints.
 - c. Provide continuous weather tight perimeter gasketing and equip with corrosion-resistant.
 - d. Provide integral telescoping ladders when a fixed wall mounted ladder can't be provided. Where a wall mounted fixed ladder is installed, provide a vertical safety post (Bilco ladder up or equal).
 - e. Provide aluminum roof hatch units minimum size 36"x36" as manufactured by Bilco Company, "Model S20", or equivalent.
 - f. Hatch shall be located over unconditioned space and installed minimum of 15' away from away from roof edge to avoid code required guard rails. Hatch shall be provided with access control tie in.

07 92 00 Joint Sealants

1. Acceptable manufacturers include Sonobourne, Dow, Tremco or equal.
2. Sealant color, where applicable, shall match color of adjacent surface(s), typical.
3. Urethane sealants with minimum 10 year warranty will be accepted. Silicon sealants with minimum 20 year warranty will be accepted.
4. Field pull test shall be mandatory on all sealants by certified agent.

07 95 00 Expansion Control

1. All exterior sealants shall be adequate for UV exposure.
2. Contract documents to indicate joint type, location, dimensions and sealant to be used. All interior and exterior joints shall receive sealant, including sidewalks.
3. All floor to floor systems shall be recess mounted, mechanically anchored, Class II, clear anodized aluminum metal, heavy duty traffic and/or pedestrian rated as required with dual durometer gaskets with a flat profile, free of ridges/reveals that collect dirt.
4. Coordinate recess block outs for expansion joints and adjacent finishes for a continuous floor surface.

08 00 00 Openings

08 00 50 General Standards

1. All exterior openings shall be provided and installed as a system or assembly and are required to meet or exceed requirements of the Florida Building Code (latest edition), including the high-velocity hurricane zone requirements, for wind and impact resistance of components and cladding. Exterior products shall be designed and tested to be impact-resistant as a system in accordance with the Florida Building Code and provide Product Approval.
2. All exterior entry doors shall be insulated and recessed the width of the door or provided with an exterior overhang for weather protection.
3. Doors to group toilets shall be equipped with ADA operators. Avoid doors in series at restrooms and configure floor plan to avoid sight lines into restrooms.
4. A minimum door leaf size of 3'-0" x 7'-0" shall be specified for both interior and exterior doors. Standard door height is 7'-0" (6'-8" door height is not permitted in new construction projects).
5. Where large furniture, fixtures and equipment are included in the project, or may be required in the future, doors (both exterior and interior) shall be sized to allow for moving the items in and out.
6. At least one main entry door shall have an operator including the proper signage. All doors must comply with ADA/Florida Building Code requirements for size, opening/closing force, time delay on closer-equipped doors, etc.
7. All mechanical, IT, Communications and elevator machine rooms shall have insulated hollow metal doors.
8. All janitor closet doors shall swing out and shall be protected with a non-metallic impact protection panel at bottom 42" of door (interior side).
9. Wall louvers shall be provided in lieu of exterior louvered HM doors whenever possible.
10. Door closings shall have parallel arms. Perpendicular arms shall not be used.

11. Provide door vision panel lites at the following locations and any other regularly occupied space unless indicated otherwise by Broward College:
 - a. classrooms
 - b. labs
 - c. offices
 - d. corridors
 - e. interior stair access

08 11 13 Hollow Metal Doors and Frames

1. Door openings shall have a drip guard accessory and doors shall have a sealed top cap to prevent water from accumulating in door. Specify full gasketing and threshold install in full bed of sealant. SDI Standard steel doors level 3 – Model 1 (Heavy duty – full flush).
2. Fabrication of hardware reinforcement plates shall be from same material as door face sheets to comply with the following minimum sizes:
 - a. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - b. Closers, and Concealed Holders: Minimum 0.067 inch thick.
 - c. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick
3. Provide Standard Steel Frames in compliance with ANSI A250.11, and in accordance with Door and Hardware Institute (DHI) publication “Installation Guide for Doors and Hardware”.
 - a. Exterior HM to be at least 14 gauge hot-dipped galvanized, G60 typical. All exterior HM frames shall be grouted.
 - b. Interior HM frames to be at least 16 gauge galvanized.
4. All hollow metal doors and frames shall comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish standard steel door and frames after assembly.
5. Field-painted doors and frames shall be shop primed. Shop Primer: Manufacturer's standard, one coat of baked-on rust inhibiting prime paint in accordance with ANSI A 224.1; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.
6. Knockdown frames not allowed. Welded frames typical.
7. Wrap around frames are required at service area (Maintenance, cafeterias, etc.).
8. Provide continuous sound insulation at the inside of all interior steel doors and frames or foam.

08 14 16 Flush Wood Doors

1. Contractor shall submit chain-of-custody certificates indicating that flush wood doors comply with F.S.C. requirements and further indicate cost for each certified wood product as applicable for projects pursuing LEED certification. Stain color to be confirmed with owner.
2. Contractor shall submit product data for adhesives and composite wood products documentation indicating that product contains no urea formaldehyde for projects pursuing LEED certification.
3. Provide factory finished birch quartered slice, slip matched, Grade A veneered- faced doors with lumber core assemblies with lifetime warranty (for interior use only). Stain color to be confirmed with owner. Particleboard cores are not permitted. Doors to be insulated or meet specified STC values of the room.
4. Fire-Rated Door Frame Assemblies shall comply with NFPA 80 and shall be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
5. Doors and Windows
 - a. For aluminum windows, all extrusions shall be 0.125" minimum thickness with stainless steel hardware fasteners. Screens shall be included and specified as aluminum.
 - b. Architect shall specify Aluminum storefronts for main entries.
 - c. Acceptable Hardware Manufacturers:

PRODUCT	ACCEPTABLE MANUFACTURER	ACCEPTABLE SUBSTITUTE
Butt Hinges	Stanley	Hager
Locksets, Latch sets	Schlage Lock Co.	None
Privacy sets, Deadlocks, Cylinders, Keys, Keying Exit Devices	Von Duprin	None
Door Closers	LCN	None
Overhead Stops & Holders, Magnetic Holders	Rixon-Firemark	Glynn-Johnson
Push Plates, Pull Plates, Kick plates, Wall Bumpers, Floor Stop & Holders	Rockwood Mfg. Ives	Quality, Brookline
Threshold, Weather Strip, Transom Astragal, Sound Seal, Light Seal, Automatic Door Bottoms	Pemko Mfg.	Zero, Reese, Guard

- d. Locksets for interior and exterior doors shall be D-series with Primus interchangeable core. Locksets to be coordinated with building access control.
- e. Double doors with panic hardware use 99 or 98 series with removable mullion (keyed).
- f. All panic hardware use 99 or 98 series
- g. Steel doors shall comply with the Steel Door Institute (SDI).
- h. Steel door frames shall be 18-gauge interior and 16 gauge galvanized exterior with mitered continuous weld at corners. All door and window frames set in masonry shall have the interior field coated before installation with a brushed applied bituminous coating and grouted solid during installation. Frames set in CMU masonry construction shall have 4" heads. (New work: tie frames to block-work rather than bolting.)
- i. Interior door shall be specified as wood veneer, solid staved core conforming to NWMA with a minimum stile width of 2". Closure hardware shall be fastened with through bolts and finish washers. The top and bottom of wood doors shall be coated at the jobsite after hanging with clear varnish to seal the exposed wood. This shall be required even if doors are "Factory Sealed".
- j. Exposed vertical riser bars on doors with panic devices shall be specified as stainless steel with stainless steel vertical rod guards. Aluminum shall not be specified or accepted.
- k. Backing for hinges on metal doors should be at least 3/16" steel (continuous hinges acceptable).
- l. Door butts shall be stainless steel with non-removable pins, provide ball bearing butts at all doors with closers.
- m. Provide stainless steel kick plates on doors minimum 10" x full width of door.

08 31 13 Access Doors and Frames

1. Provide Flush, Insulated, Fire-Rated (when applicable) Access Doors and Frames with Flush Trim: Fabricated from steel sheet with spring type automatic closer and self-latching bolt operated by key with interior release.
2. Provide Flush Access Doors and Trimless Frames: Fabricated from steel metallic-coated steel sheet at Gypsum board wall and ceiling surfaces with spring-loaded concealed pin type hinges and screw driver or pinned-hex access operated cam latch. Size as appropriate to meet accessibility requirements of device.
3. Provide stainless steel access doors at bathrooms, custodial closets and finish tiled surfaces.

08 33 23 Overhead Coiling Doors

1. Exterior aluminum Kynar finished overhead coiling doors to withstand design wind load with current NOA without evidencing permanent deformation or disengagement of door components. Large manufacturer sticker not allowed.
2. Provide Fire Rated Stainless-Steel Door Curtain Slats at food service locations: ASTM A 666, Type 304; sheet thickness of 0.025 inch (0.64 mm).
3. Provide Endlocks and Windlocks for Service Doors to have safety switch along bottom of door and gasketing to prevent water intrusion.

08 33 26 Overhead Coiling Grilles

1. Provide Open-Curtain Grilles for open areas that require security. Manual or motorized door operation as confirmed by Broward College.
 - a. Aluminum Grille Curtain: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
2. Provide bottom bar finished to match grille with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
3. Provide concealed installation of overhead coiling grilles at all interior/occupied spaces.
 - a. Where a concealed condition is not possible, provide aluminum hood 0.040-inch- (1.02-mm-) thick aluminum sheet complying with ASTM B 209 (ASTM B 209M).

08 41 13 Aluminum Framed Entrances and Storefronts

1. Provide heavy-duty commercial systems for interior and exterior applications as follows:
 - a. Doors/ Entrances: Provide manufacturer's standard designs. Custom designs permitted only approved by Broward College.
 - b. Finish: Provide manufacturer's standard anodized finish colors for Broward College approval.
2. Sill flashing shall be provided as part of storefront system.
3. Contractor shall submit Product Data for adhesives and sealants used inside of the weatherproofing system, including printed statement of VOC content for projects pursuing LEED certification.
4. Contractor shall submit documentation indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content, Include statement indicating costs for each product having recycled content for projects pursuing LEED certification.
5. Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.
6. Provide Special Finish Warranty: shall be Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering. Warranty Period: 10 years from date of Substantial Completion.

08 44 23 Glazed Aluminum Curtain Walls

1. The structural framing system shall be coordinated with Product Approval (NOA) allowable clear spans to accommodate curtain wall system.
2. All miscellaneous steel connections for curtain wall system shall be coordinated with the building's structural system.
3. Curtain-wall systems shall maintain an average U-factor of not more than 0.66 Btu/sq. ft. x h x deg F when tested according to AAMA 1503, or as required to meet energy efficiency project requirements.

4. Provide manufacturer's standard colors of anodized finish system for Broward College approval.

5. Installer Qualifications: shall be capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer. Engineering Responsibility: Preparation of data for structural-sealant-glazed curtain-wall systems including the following:
 - a. Shop Drawings, Project-specific preconstruction-testing program development, and comprehensive engineering analysis by a qualified professional engineer.
 - b. Quality-control program development and reporting complying with ASTM C 1401 recommendations including, but not limited to, system material qualification procedures, preconstruction sealant-testing program, and procedures and intervals for system fabrication and installation reviews and checks.

6. Qualifying procedures and personnel shall be according to AWS D1.2, "Structural Welding Code-Aluminum."

7. Structural-Sealant Glazing shall be provided in compliance with recommendations in ASTM C 1401, "Guide for Structural Sealant Glazing."

08 62 00 Skylights

1. Skylights are not permitted without prior Owner's approval. The use of clerestories is preferred.

08 71 00 Finish Hardware

1. Coordinate Finish Hardware requirements for each room with BC PM and BC Locksmith
2. Provide each kind of hardware from one hardware supplier (DHI Certified Architectural Hardware Consultant) to the greatest extent possible.
3. All card reader access door locations shall be coordinated with Broward College Access Control Manager and all applicable frames shall be identified for preparation.
4. Provide hardware that conforms to published templates generally prepared for machine screw installation.
5. Contractor shall provide a covered and dry secure lock-up for all hardware items delivered to the project for storage until installation has been completed. Protect installed hardware through Substantial Completion and issuance of Certificate of Occupancy.

6. Supplementary marking on door: Provide UL label indicating Fire Door to be equipped with fire exit hardware and provide UL label on exit device indicating "Fire Exit Hardware" where panic exit devices are required on fire-rated doors.
7. Overhead door closers shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a period of ten (10) years commencing on the Date of Final Completion and Acceptance, and in the event of failure, the manufacture is to promptly repair or replace the defective with no additional cost to the Owner.
8. Acceptable Manufacturers:

PRODUCT	SPECIFIED MANUFACTURER	ACCEPTABLE SUBSTITUTE
1) Hinges	Ives	Hager, Stanley, Bommer
2) Locks & Latches	Schlage	None or equal with BC Locksmith approval
3) Cylinders, Keys, Keying	Schlage Primus	None or equal with BC Locksmith approval
4) Exit Devices	Von Duprin	None or equal with BC Locksmith approval
5) Door Closers	LCN – installed parallel to door	None or equal with BC Locksmith approval
6) OH Stops/ Holders	Glynn Johnson	Rixson
7) Magnetic Hold Opens	LCN	Dor-O-Matic
8) Wall Stops/Floor Stops, Flush bolts	Ives	Glynn Johnson, Trimco
9) Kick Plates	Ives	Trimco, Quality
10) Threshold/Weather-strip	National Guard	Reese, Zero
11) Silencers	Ives	Glynn Johnson, Trimco
12) Key Cabinet	Lund	Key Control

9. Hardware finishes:

Exterior Hinges and rooms that may contain moisture or chemicals (A/C, custodial, bathrooms, kitchens, science labs, storage, etc.) to be Stainless Steel (32D), Interior Hinges to be Satin Chrome (26D). Door Closers shall be aluminum. Locks shall be Satin Chrome (26D), Exit Devices shall be Satin Chrome (26D). Overhead Holders shall be Satin Chrome (26D), Flat Goods shall be Satin Chrome (26D) or Stainless Steel (32D) and the Thresholds shall be Mill Finish Aluminum.

10. Hinges and pivots:

- a. Exterior hinges on all out swinging doors shall be ball bearing type furnished with non-removable pins (NRP).
- b. Interior butts shall be as listed.
- c. Doors 5' or less in height shall have two (2) butts. Furnish one (1) additional butt for each 2'6" in height or fraction thereof.
- d. Dutch Doors: Provide two (2) hinges per leaf.

11. Keying requirements:

- a. All locks and cylinders shall be 11 Pin Schlage Primus key system (level 9) Everest 29 Primus-keyway, all bittings shall be issued by Schlage Lock through the College's locksmith.
- b. Lock cylinders for all projects shall be keyed into the Campus' existing grandmaster key system. Contact the college locksmith for additional information.
- c. Provide Two (2) each change keys per lock and Six (6) each grand master and master keys. All keys to be patent restricted.
- d. For each new construction or renovation project provide 200 Everest 29 Primus key blanks.
- e. All keys to be Primus originals.

12. All exterior (non-entry doors) shall be provided with a drip guard. Provide Pempko or equal.

13. Locksets requirements:

- a. Locksets shall be Heavy Duty ANSI Grade 1 – “D” Series (4000) Commercial Grade 1 Cylindrical type with large format interchangeable cores, unless specified otherwise, in “ND” series, Vandgard, Rhodes design or “L” series 06A design as manufactured by Schlage at exterior doors.
- b. Where required by the College provide programmable units; “AD” series, as manufactured by Schlage or “MiFare Readers”. Units shall have the capability of being networked with other electronic locks or operate in a stand-alone mode of operation to be reviewed by the College Access Control Personnel.

14. Exit devices requirements:

- a. All devices shall be Von Duprin 98 Series ANSI Grade 1 in types and functions specified. All devices must be listed under “Panic Hardware” in accident equipment list of Underwriters Laboratories. All labeled doors with “Fire Exit Hardware” must have labels attached and be in strict accordance with Underwriters Laboratories.
- b. All exit devices shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 1,000,000 cycles must be provided.
- c. All surface strikes shall be roller type and come complete with a plate underneath to prevent movement and shall be provided with a dead-latching feature to prevent latch bolt tampering.
- d. Provide exit devices with large format interchangeable core cylinders.

15. Door Closer requirements:

- a. All closers shall be LCN 4011/4111 series ANSI Grade 1 having non-ferrous covers, forged steel arms separate valves for adjusting back check, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power. Closers shall be furnished with parallel arm mounted on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Furnish with non-hold open arms unless otherwise indicated.
- b. Door closer cylinders shall be of high strength cast iron construction to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
- c. Door closers shall utilize temperature stable fluid capable of withstanding temperature ranges of 120 degrees Fahrenheit to -30 degrees Fahrenheit, without requiring seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with the standards UBC 7-2 (1997) and UL 10C.
- d. Door closers shall incorporate tamper resistant non-critical screw valves of V-slot design to reduce possible clogging from particles within the closer. Closers shall have separate and independent screw valve adjustments for latch speed, general speed, and hydraulic back check. Back check shall be properly located so as to effectively slow the swing of the door at a minimum of 10 degrees in advance of the dead stop location to protect the door frame and hardware from damage. Pressure relief valves (PRV) are not acceptable.

16. Trim and Plates requirements:

- a. Kick plates, mop plates, and armor plates, shall be .050 gage with 32D finish. Kick plates to be 10" high, mop plates to be 4" high. All plates shall be two (2) inches less full width of door.
- b. Push plates, pull plates, door pulls, and miscellaneous door trim shall be shown in the hardware schedule.

17. Door Stops requirements:

- a. Doorstops shall be furnished for all doors to prevent damage to doors or hardware from striking adjacent walls or fixtures. Wall bumpers to be Ives WS407 series are preferred, but where not practical furnish floor stops Ives FS436/438 series. Where conditions prohibit the use of either wall or floor type stops, furnish surface mounted overhead stops equal to Glynn Johnson, 450 Series.

18. Door Silencer requirements:

- a. Furnish rubber door silencers equal to Ives SR64 for all new interior hollow metal frames, (2) per pair and (3) per single door frame.

19. Fasteners requirements are indicated:
 - a. Hardware as furnished shall conform to published templates generally prepared for machine screw installation.
 - b. Furnish each item complete with all screws required for installation. Typically, all exposed screws installation.
 - c. Insofar as practical, furnished concealed type fasteners for hardware units that have exposed screws shall be furnished with Phillips flat head screws, finished to match adjacent hardware.
 - d. Door closers and exit devices to be installed with closed head through bolts.
20. All doors at interior stairs shall be on hold open connected to Fire Alarm System unless indicated otherwise by Broward College.

08 80 00 Glazing

1. The Design Professional shall evaluate Low-E glass options for exterior applications with regards to visible light transmittance and solar heat gain as best suited for the project and the targeted energy saving goals, for projects pursuing LEED certification.
2. The Design Professional shall evaluate and include glazing strategies that increase day lighting properties throughout the space and reduce the requirement for electric lighting through the implementation of day lighting sensors, for projects pursuing LEED certification.
3. Contractor shall submit product data for glazing sealants used inside of the weatherproofing system, including printed statement of VOC content, for projects pursuing LEED certification.
4. Exterior products shall be designed and tested to be impact resistant as a system with frame in accordance with the latest edition of the Florida Building Code. Provide Product Approval/NOA Number written verification that the exterior window products provided and installed as a system or assembly meet or exceed requirements of the latest edition of the Florida Building Code and Supplements, for wind resistance of components and cladding with any local code amendment requirements.
5. The Design Professional shall provide Glass type schedule including thicknesses for each size opening and location.
6. Provide interior clear glass units typical unless the College requires tinted units.
 - a. Doors, classrooms and offices: provide with clear tempered glass vision kits.
7. Where tinting of exterior glazing units shall be required, tinting of units is part of an integral laminated process and not applied.

8. Contractor shall provide qualification Data for installers, manufacturers of insulating-glass units with low-e coatings and sealant testing agency.
9. Safety glazing shall be permanently marked with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
10. Provide sound insulating glass units as required by sound control assembly manufacturer to comply with sound control STC requirements.
11. Factory install glazed lights according to requirements of tested assembly to achieve STC rating indicated.
12. Sound insulating glass locations shall be coordinated with the project acoustic requirements.

08 90 00 Louvers and Vents

1. Provide Horizontal Storm-Resistant Fixed with Product Approval/NOA, Extruded-Aluminum Louvers. Basis-of-Design Product: Ruskin ELF 6375 DXD Drainable Stationary Louver or equal with interior rain hood option and Kynar finish.
2. Provide Louvers with wind-driven rain performance of not less than 95 percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a core-area intake velocity of 400 fpm and bearing the AMCA Certified Ratings Seal.
3. Provide Stainless Steel Louver Screens (Insect Screening) at the interior face of each exterior louver, secured to Louver Frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c. and with Louver Screen Frames fabricated with mitered corners to louver sizes indicated.
4. Provide Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.
Where required.
 - a. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.
 - b. Panel Finish: Same type of finish applied to louvers, but black color.
 - c. Attach blank-off panels with sheet metal screws, continuously seal all edges to create a waterproof seal.

09 00 00 Finishes

09 00 50 General Material and Finish Standards

1. In general, all materials shall be assessed for long range, life-cycle cost analysis for projects pursuing LEED Certification.
2. The Design Professional shall coordinate all color and material color selections with the BCPM and BC Facilities Planner.
3. A material and finish schedule and sample board showing color code/name, reference # as illustrated in plans, shall be provided for interior finishes, such as paint, vinyl, base, carpet, tile, bathroom partitions, etc., as well as exterior finishes, such as paint, glazing, etc.
4. Samples of all finishes and finishing material shall be submitted to Broward College for approval. For any nonstandard finishes a field mock-up (minimum 4' x 4' with each texture finish) is required. Location to be coordinated with BCPM.

09 22 16 Non-Load Bearing Steel Framing

1. The Design Professional shall indicate interior framing systems (supports for partition walls, framed soffits, furring, etc.) and interior suspension systems (supports for ceilings, suspended soffits, etc.).
2. Fire test-response characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
3. For STC-Rated Assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
4. A/E to provide single or composite walls, floor-ceiling and roof-ceiling assemblies that provide specific sound transmission class (STC) ratings when separating a core learning space from an adjacent space:
 - a. **STC-45** between Classrooms, labs and offices, if the adjacent space is a corridor, staircase, or office
 - b. **STC-50** between Classrooms if the adjacent space is another instructional core learning space (classroom), speech clinic, Lab, or outdoors,
 - c. **STC-53** between Classrooms, Labs, Conference rooms or Offices, if the adjacent space is a restroom,
 - d. **STC-60** if the adjacent space is a music room, mechanical equipment room, cafeteria, gymnasium or indoor swimming pool.

- e. Do not locate mechanical equipment rooms, restrooms, music rooms, gymnasiums, or any other noisy space adjacent to a class room or core learning space.
 - f. Classroom doors should be rated as **STC-30** or more, and music room doors as **STC-40** or more. Entry doors across a corridor should be staggered to minimize noise transmission.
5. Impact Insulation Class (IIC) is a rating for the ability of a floor-ceiling assembly to block impact/structure borne noise from transmitting to the space below. IIC ratings for floor-ceiling assemblies above core learning spaces should be between **IIC-45** to **IIC-50** (measured without carpeting on the floor).
 6. In new construction, gymnasium, dance studios or other high floor impact activities shall not be located above core learning spaces.
 7. In existing facilities **IIC-65-70** (depending on the volume of the space below) is recommended if gymnasia, dance studios or other high floor impact activities are located above core learning spaces.
 8. Steel framing for framed assemblies: 20 gauge, 16" O.C. or less otherwise required by design loads and depth as required.
 - a. Steel Studs and Runners: ASTM C 645 minimum.
 - b. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges. Clip Angle: Not less than 1-1/2 inches, 0.068-inch-thick, galvanized steel.
 - c. Hat-Shaped, Rigid Furring Channels: ASTM C 645 minimum base metal thickness: 0.0179 inch and depth as required.
 9. Resilient Furring Channels: 1/2 -inch- deep, steel sheet members designed to reduce sound transmission. Configuration: Asymmetrical or hat shaped.
 10. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
 11. Provide auxiliary materials that comply with referenced installation standards. Fasteners for Metal Framing: of type, material, size, corrosion resistance, holding power, and other properties to fasten steel members to substrates.

09 24 00 Portland Cement Plaster (Stucco)

1. Architect / Engineer to specify a design that minimizes the use of plastic accessories. Metal accessories will not be allowed unless otherwise approved by the BCPM.
2. Technical Services Information Bureau (TSIB Org.) to be used as the reference standard for stucco finishes.
3. Product Data for each product specified is required to be submitted.

4. Material Certificates shall be signed by the manufacturer for each kind of plaster aggregate certifying that the materials comply with specifications.
5. All cementitious materials are required to be delivered to the Project site in their original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number and are further required to be stored inside, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.
6. The contractor shall comply with requirements of the referenced plaster application standards and the recommendations of the plaster manufacturer for environmental conditions before, during, and after plaster application including requiring that plaster not be applied when the ambient temperature is below 40 degrees F.
7. Metal ceiling supports for suspended and furred ceilings and soffits shall be sized to comply with ASTM C 1063. Contractor to provide specialty engineering signed and sealed drawings for any exterior metal framing work.
8. Trim pieces inclusive of corner beads, casing beads, control joints and expansion joints shall be indicated to be fabricated from high-impact PVC installed in bed of sealant with sealed joints.
9. Job-Mixed Finish-Coat Cements shall be Portland cement, ASTM C 150, Type I, cement color gray.
10. Lime shall be specified as special non air-entraining hydrated lime for finishing purposes, ASTM C 206, Type S; or special non air-entraining hydrated lime for masonry purposes, ASTM C 207, Type S.
11. Sand Aggregate for Base Coats shall meet ASTM C 897.
12. Aggregate for Finish Coats is to comply with ASTM C 897 system and to be manufactured of natural sand.
13. Fiber for the Base and Scratch Coat only shall be specified as alkaline-resistant glass or polypropylene fine fibers 10 mil maximum width, 1/2 inch maximum long, free of contaminants, manufactured for use in Portland cement plaster.
14. The water for mixing shall be potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
15. A non-re-emulsifiable acrylic emulsion-type bonding admixture shall be used for the base coat in two-coat. Approved products include Thoroseal Acryl 60, manufactured by Harris Specialties Chemicals, Inc.; Xycrylic, manufactured by Xypex Chemical Corp.; and Sika Latex manufactured by Sika Chemical Corp.
16. Bonding agents applied to surface and left beyond manufacturer's time recommendation shall be removed and reapplied.

17. The mix shall be compliance with ASTM C 926 for base-and finish-coat mixes as applicable to plaster bases, materials, and other requirements indicated, except that plastic cement and masonry cement are not permitted.
18. Base Coat Mixes and Compositions shall be as listed below for proportion of materials for respective coats in parts by volume for cementitious materials and in parts by volume of aggregate per sum of cementitious materials to comply with the following for each method of application and plaster base indicated. (Mix proportions may be adjusted within limits specified to attain workability.)
19. Fiber Content shall be as follows: Add fiber to brown coat of 3-coat mixes after ingredients have mixed for at least 2 minutes. Comply with fiber manufacturer's written instructions, but do not exceed 1 lb/cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.
20. Three Coat Work Over Metal Lath (limited to protected horizontal applications) shall be as follows: Base-coat proportions as indicated below (comply with ASTM C-926):
 - a. Scratch Coat: 1 part Portland Cement, 0 to 3/4 parts lime, and 2-1/2 to 4 parts sand.
 - b. Brown Coat: 1 part Portland Cement, 0 to 3/4 parts lime, and 3 to 5 parts sand.
 - c. Finish Coat: 1 part Portland Cement, 3/4 to 1 1/2 parts lime, and 3 parts sand.
 - d. For fire rated walls refer to FBC.
21. Two-Coat Work over Concrete Unit Masonry shall be as follows: Base coat proportions 1 part Portland cement, 3/4 to 1-1/2 parts lime, and 3 to 4 parts sand. Water to be mixed with bonding admixture in proportion as recommended by admixture manufacturer. For fire rated walls refer to FBC.
22. Job-Mixed Finish Coats shall be as follows: Proportion materials for finish coats in parts by volume for cementitious materials and parts by volume of aggregates per sum of cementitious materials: 1 part Portland Cement, 3/4 to 1-1/2 parts lime, 3 parts sand.
23. Mechanically mix cementitious and aggregate materials for plasters shall comply with applicable referenced application standard and with recommendations of plaster manufacturer.
24. The following standards for the Installation of Lath and Furring shall be specified only at surfaces with sheathing: Comply with ML/SF A 920, "Guide Specifications for Metal Lathing and Furring," and with the requirements of ASTM C 1063.
25. The installation of supplementary framing, blocking, and bracing at terminations in work and for support of fixtures, equipment services, heavy trim and similar work is to comply with details indicated or, if not otherwise indicated, to comply with applicable written instructions of lath and furring manufacturer.

26. Where lathing and metal support system abuts building structure horizontally and where a partition or wall abuts an overhead structure, the design shall be sufficiently isolated from structural movement to prevent transfer of loading from building structure. Further slip-or cushion-type joints to absorb deflections but maintain lateral support shall be indicated.
27. Both sides of control joints shall be framed independently so the detail does not bridge joints with furring and lathing or accessories.
28. Contractor shall clean plaster bases and substrates for direct application of plaster, removing loose material and substances that may impair the Work.
29. Contractor shall immediately before plastering, dampen the concrete and concrete unit masonry surfaces indicated for direct plaster application. The contractor must determine and apply the amount of moisture and degree of saturation that will result in optimum suction for plastering. **Metal lath over concrete or concrete unit masonry is not permitted.**
30. Control joints shall comply with the following criteria unless otherwise indicated by the A/E:
 - a. Provide sealed pre-manufactured connector strips or interceptors at all junctions of screeds. Butt joints acceptable.
 - b. Where an expansion or contraction joint occurs in surface of construction directly behind plaster membrane.
 - c. Distance between Control Joints: Not to exceed 18 feet in either direction or a length- to-width ratio 2-1/2 to 1.
 - d. Horizontal Surfaces such as suspended ceilings (soffits), not more than 100 sq. ft. in area.
 - e. Where plaster panel sizes or dimensions change, it should be specified to extend joints full width or height of plaster membrane.
 - f. Install prefabricated expansion joints of 2-piece design where shown as "Expansion Joint" (1/4 inch joint width for interior work, 3/8 inch for exterior).
 - g. Install channel screeds (reveals) where indicated. Where ends of channel sections meet, set in bead of sealant; set all splice plates in mastic.
31. Contractor shall apply plaster materials (including requirements to moist-cure plaster base and finish coats), composition, and mixes to comply with ASTM C 926 Plaster Application Standard, including written instructions for time between coats and curing in "Annex A2 Design Considerations".
32. It is prohibited to use materials that are caked, lumpy, dirty, or contaminated by foreign materials. No re-tempering acceptable.

33. Flat Surface Tolerances shall not deviate more than plus or minus 1/8 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed at any location on surface.
34. Contractor shall sequence plaster application with installation and protection of other work so that neither will be damaged by installation of other.
35. The following number of coats and thicknesses are required for 3-coat work on metal lath bases at horizontal surfaces:
 - a. 1st (scratch) coat 1/4 inch
 - b. 2nd (brown) coat 1/4 inch
 - c. 3rd (finish) coat 1/8 inch
 - d. Total (minimum) 5/8 inch

09 29 00 Gypsum Board

1. All gypsum board shall be a minimum of 5/8 inches thick (type X). Provide multiple 1/4" layers for curved walls.
2. Full height approved high moisture resistance panels shall be used in the following rooms: janitor closets, wet laboratory areas, drinking fountains, mechanical room, restrooms, kitchens, showers, bathrooms and dishwashing areas.
3. Gypsum board shall contain recycled content, including post-consumer waste. Contractor shall submit Product Data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content, for projects pursuing LEED certification.
4. Joint compound shall be low VOC content and contractor shall submit Product Data for joint compounds, documentation including printed statement of VOC content, for projects pursuing LEED certification.

09 30 00 Tiling

1. The following areas are to receive tile at wall surfaces only:
 - a. Drinking fountains: back wall up to 60" A.F.F.
 - b. Wet walls at restrooms: full height.
 - c. Showers: entire wall perimeter at full height.
 - d. Janitor's closet – all walls
2. The Design Professional shall determine preferences for tile finishes from conferences with BCPM and BC Facilities Planner.
3. Glazed Ceramic Wall Tile: minimum 6" x 6" x 5/16" thick, plain face, cushion edge. Finish schedule shall indicate type and size at each condition.

4. Trim Units and Special Shapes shall be provided to match characteristics of adjoining flat tile and to comply with the following:
 - a. External Corners: Bullnose shapes with round out base and top trim special shapes or stainless steel accessories.
 - b. Internal Corners: Field-buttet square with square in-corner base and top trim special
 - c. No visible cut tile edges shall be permitted
 - d. Provide bullnose shape at top of non-full height wall applications.
5. Grout materials: provide Polymer-Modified Tile Grout: ANSI A118, color as selected. Water cleanable epoxy.

09 51 23 Acoustical Tile Ceilings

1. Acoustical Tile Ceilings Tolerances shall be as follow:
 - a. Free of irregularities and level to within 1/8-inch in 12 feet
 - b. Maximum Deflection: 1/360 of span
2. **Acoustical Tile Ceilings Suspension System** shall be in compliance with ASTM C635, intermediate duty, exposed Tee system for 24" x 24" lay-in acoustical ceiling tiles, with white factory applied baked enamel finished grid, stabilizer bars, clips, splices and matching edge moldings. [Refer to Appendix 09 01.](#)
 - a. Acceptable Manufacturers: Armstrong World Industries, USG Corp., or Chicago Metallic Corp.
3. Provide **Acoustical Ceiling Tile** as follows at all locations except high moisture areas:
 - a. Armstrong-Dune or approved equal
 - b. Edge detail: Tegular
 - c. Thickness: 5/8-inch
 - d. Size: 24" x 24"
 - e. [Refer to Appendix 09 01.](#)
4. Provide non sag / humidity resistant, washable, acoustical ceiling tile at food service areas restrooms, janitor's closet or other high moisture areas as applicable.
 - a. Armstrong - Optima Health Zone or approved equal
 - b. Edge detail: Tegular
 - c. Thickness: 1 inch
 - d. Size: 24" x 24
 - e. Texture: smooth

09 65 00 Resilient Flooring (applies to all vinyl composition tile (VCT), Resilient vinyl wall base and Resilient stair treads)

1. The following areas shall receive resilient flooring:
 - a. Storage rooms
 - b. Corridors

- c. Science Labs
 - d. Break rooms/lounge areas
 - e. Health science areas (full sheet roll goods)
 - f. Restrooms (Rev. 2 dated 6-28-16) [See appendix 09 02 for details](#)
2. IT, data and electric rooms; provide floor coverings with static-control properties in compliance with ASTM F 150 with 100-V applied voltage.
 3. Vinyl Composition Tile shall be in compliance with ASTM F 1066, Class 2 - Through pattern tile; 12" x 12" size, 3/32-inch thick; marbled design. Acceptable Manufacturers: Armstrong, Kentile Floors, Inc., and Azrock or approved equal.
 4. Accessories to include rubber transition strips for transition conditions between VCT and carpet.
 5. Preparation and installation requirements for Vinyl Composition Tile:
 - a. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
 - b. Concrete substrates: prepare according to ASTM F 710. Alkalinity and adhesion testing: perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing. Moisture testing: perform tests recommended by manufacturer. Proceed with installation only after
 - 1) Substrates pass testing.
 6. Preparation: Remove sub-floor ridges and bumps. Fill low spots, cracks joints, holes, and other defects with subfloor filler. Apply tile manufacturer's recommended primer.
 - a. Tightly cement resilient flooring to sub-floor without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll at perimeter of each covered area to assure adhesion.
 - b. Prohibit Traffic on floor finish for 48 hours after installation.
 - c. Clean, Seal and Wax floor surfaces in accordance with manufacturer's instructions.
 7. Provide extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
 - b. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.
 8. Provide Wall Base in compliance with ASTM F 1861. Acceptable Manufacturers: Armstrong World Industries, Inc., Azrock Commercial Flooring, Burke Mercer Flooring Products, Johnsonite.
 9. Provide Cove base (with top-set toe) at areas receiving VCT and Straight (toeless) at areas to receive carpet with minimum thickness of 0.125 inch, 4 inches in height, smooth surface and pre-molded outside and inside corners.

10. Provide Resilient Stair Treads in compliance with ASTM F-2169. Acceptable Manufacturers: Burke Mercer Flooring Products, Johnsonite, Roppe Corporation.
 - a. Tread material: Rubber, Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees with Lengths and depths to fit each stair tread in one piece.

09 66 23 Resinous Matrix Terrazzo Flooring (for Special applications as approved by Broward College)

1. Provide Resinous flooring including a penetrating two-component epoxy primer, aggregate, a three component free flowing epoxy undercoat including resin, hardener and filler, selected broadcast marking, and two two-component, high performance, clear epoxy sealers.
2. Contractor shall submit Product Data for adhesives and sealants, including printed statement of VOC content for projects pursuing LEED certification.
3. Contractor shall obtain primary resinous flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Contractor shall have completed at least five projects of similar size and complexity. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.
4. Performance requirements:
 - a. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.
 - b. FloorScore Compliance: Terrazzo floors shall comply with requirements of FloorScore Standard.
5. Project Conditions:
 - a. Concrete substrate shall be properly cured for a minimum of 30 days.
 - b. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.
 - c. A vapor barrier must be present for concrete sub-floors on or below grade.
 - d. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions. Moisture Testing: Test for moisture content by method recommended in writing by terrazzo manufacturer. Proceed with installation only after substrates pass testing.
 - e. Include crack suppression at per mfg. recommendations.
 - f. Protect finished floor per manufacturer recommendations. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

6. The Design Professional shall indicate and detail control joints and expansion joints as applicable for the system installation.
7. The Design Professional shall coordinate all Manufacturer's product requirements, surface preparation and installation procedures for the desired application.

09 67 23 Resinous Flooring

1. All resinous flooring at all janitor closets, public restrooms (Rev. 2 dated 6-28-16) [See appendix 09 02 for details](#), toilet and shower rooms, and in other locations as may be required by the College.
2. Contractor shall obtain primary resinous flooring materials, including primers, resins, hardening agents, and sealing or finish coats through one source from a single manufacturer.
3. Contractor shall obtain secondary resinous flooring materials including patching and fill materials, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
4. Contractor shall submit Product Data for adhesives and sealants, including printed statement of VOC content for projects pursuing LEED certification.
5. Moisture testing: Test for moisture content by method recommended in writing by resinous flooring manufacturer.
6. Flooring System Components: Resinous floor surfacing system consisting of primer, body coat(s) including resin, hardener, aggregates, and colorants (if any), and sealing or finish coat(s).
 - a. Waterproofing Membrane: Resinous product of, or approved by, resinous flooring manufacturer and recommended by manufacturer for application indicated.
 - 1) Liner: provide waterproofing membrane liner at shower floors and full height of shower walls.
 - b. Reinforcing Membrane: Manufacturer's flexible resin recommended for crack isolation to help prevent substrate cracks from reflecting through resinous flooring. Provide fiberglass scrim embedded in reinforcing membrane.
7. Project Conditions for Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminates incompatible with resinous flooring.
 - a. Comply with ASTM C811 requirements unless manufacturer's published instructions are more stringent.

- b. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and re-circulates the shot by vacuum pickup.
 - c. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's published recommendations.
8. The application of components of resinous flooring system shall be according to manufacturer's published instructions to produce a uniform monolithic wearing surface of thickness indicated.
 - a. Slope to Drain: Provide resinous flooring with minimum 1/8-inch per slope minimum slope to floor drains.
9. Provide Integral 6" high Cove Base with rounded internal and external corners Install cove base according to manufacturer's published instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.
10. Seal and Finish Coat(s) shall be applied including grout coat (if any) of type recommended by resinous flooring manufacturer to produce desired finish. Apply in number of coats and at spreading rates recommended in writing by the manufacturer.
11. Resinous flooring shall be cleaned not more than four (4) days before dates scheduled for inspections intended to establish date of Substantial Completion. Use cleaning materials and procedures recommended in writing by resinous flooring manufacturer.

09 68 13 Tile Carpeting

1. Provide modular, tufted textured loop carpet tile for office areas, computer labs, and other spaces as required by Broward College.
2. Delivery, storage and handling shall be in compliance with CRI 104.
3. Field conditions shall be in compliance with CRI 104 for temperature, humidity, and ventilation limitations. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
4. Standards for Carpet Tile:
 - a. Standard Backing System: GlassBac Tile
 - b. Color and pattern: As selected by Architect and approved by Broward College
 - c. Fiber Type: Post-Consumer content type 6 nylon
 - d. Pile Characteristic: Tufted Textured Loop pile
 - e. Pile Thickness: .093 for finished carpet tile according to ASTM D 6859
 - f. Primary Backing/Back coating: Manufacturer's Standard GlasBac® Tile
 - g. Size: Standard Size: 19.69 inches x 19.69 inches
 - h. Applied Soil-Resistance Treatment: Manufacturer's standard material: Protekt²®.
 - i. Antimicrobial Treatment: Manufacturer's standard material
5. Provide adhesives having VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

6. Concrete slabs shall comply with ASTM F 710 and the following:
 - a. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer. Proceed with installation only after unsatisfactory conditions have been corrected.
7. Provide the following sealer where unsatisfactory moisture readings of up to 90% or where PH levels of up to 11.0 are encountered.
 - a. Following Architect's approval; provide Driseal (manufactured by XL Brands) or equal concrete moisture sealer penetrating system.
 - b. Sealer shall be compatible with carpet tile adhesive and acceptable to concrete slabs installer.
8. Floor preparation requirements:
 - a. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
 - b. Use trowel able leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
 - c. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
 - d. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
 - e. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.
9. Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
10. Music rooms shall receive anti-microbial carpet at instrument performing locations.
11. Dance room and gymnasium floors shall be floating cushioned wood.
12. Vinyl wall coverings shall not be specified for any location without written approval from BCPM.

09 69 00 Access Flooring (at mainframe server rooms only)

1. Access floor system, where indicated on the design documents, shall consist of modular and removable fully encased cementitious filled welded steel panels supported on all four edges by structural steel members which are designed to bolt onto adjustable height pedestal assemblies forming a modular grid pattern.
 - a. Panel shall be easily removed by one person with a suction cup lifting device and shall be interchangeable except where cut for special conditions.
2. Access floor system Basis of Design shall consist of ConCore® 1250 access floor panel supported by a bolted stringer understructure system. Alternative products shall meet or exceed all requirements and must receive prior written approval by Broward College.
3. Pedestal assemblies shall be corrosive resistant, all steel welded construction with an adjustment range of +/- 1" for finished floor heights 6" or greater. Zinc electroplating shall be prohibited on all pedestal components, including head plate, threaded rod, adjustment nut, pedestal tube, base plate and all fasteners.
4. Stringers shall support each edge of panel. Steel stringer shall have conductive galvanized coating. Zinc electroplating shall be prohibited on stringers and stringer fasteners.
5. Floor panels shall consist of a top steel sheet welded to a formed steel bottom pan filled internally with a lightweight cementitious material. Mechanical or adhesive methods for attachment of the steel top and bottom sheets are unacceptable.
 - a. Floor panels shall be protected from corrosion by electro-deposited epoxy paint. The use of zinc electroplating shall be prohibited.
 - b. Cementitious fill material shall be totally encased within the steel welded shell except where cut for special conditions. Note: this greatly reduces the potential for dust in the environment from exposed cement materials.
 - c. Where required by the project, include directional perforated airflow panels: perforated steel airflow panels designed for static loads of 1000 lbs. shall be interchangeable with standard field panels and shall have 25% open surface area with the following air distribution capability
 - 1) Panel without damper: 746 cfm at 0.1-inch of H₂O (static pressure).
 - 2) Panel with damper at 100% open position: 515 cfm at 0.1-inch of H₂O (Static pressure).
 - d. Where required by the project, include Grate airflow panels: die case aluminum grate panels designed for static and rolling loads shall be interchangeable with standard field panels. Coordinate load bearing capacities with project requirements.
6. Surface of floor panels shall be finished with static control resilient floor covering material.
 - a. Tile coverings that require trim edge shall be applied to the panel's top surface and shall not wrap around the panel's edge.

7. Installation requirements:
 - a. Pedestal locations shall be established from approved shop drawings so that mechanical and electrical work can be installed without interfering with the pedestal installation.
 - b. Installation of access floor shall be coordinated with other trades to maintain the integrity of the installed system. All traffic on access floor shall be controlled by access floor installer. No traffic but that of access floor installers shall be permitted on any floor area for 24 hours to allow the pedestal adhesive to set. Access floor panels shall not be removed by other trades for 72 hours after their installation.
 - c. Floor system and accessories shall be installed under the supervision of the manufacturer's authorized representative and according to manufacturer's recommendations.
 - d. No dust or debris producing operations by other trades shall be allowed in areas where access floor is being installed to ensure proper bonding of pedestals to subfloor.
 - e. Access floor installer shall keep the subfloor broom clean as installation progresses.
 - f. Partially complete floors shall be braced against shifting to maintain the integrity of the installed system where required.
 - g. Additional pedestals as needed shall support panels where floor is disrupted by columns, walls, and cutouts.
 - h. Understructure shall be aligned such that all uncut panels are interchangeable and fit snugly but do not bind when placed in alternate positions.
 - i. Finished floor shall be level, not varying more than 0.062" in 10 feet or 0.125" overall.

09 91 00 Painting

1. Interior paints and coatings products shall be in compliance with VOC limits indicated by the latest edition of the applicable LEED Reference Guide for projects pursuing LEED certification.
2. Contractor shall submit product data for paints and coatings, including printed statement of VOC content for all projects.
3. The Design Professional shall list each product by name and indicate total thickness of paint, per coat, by "dry mil" or "wet mil" thickness (according to which is recommended by the paint manufacturer) for each application. **(MPI system reference will not be accepted.)**
4. Project conditions: Do not paint in rain, fog, mist, or when relative humidity exceeds 85 percent, or to damp or wet surfaces.
5. Paint materials not displaying manufacturer's identification as a standard, best grade product will not be accepted.

6. Provide pure, non-fading, applicable color pigment types to suit substrates and service life specified.
7. Surface preparation requirements: Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly painted surfaces.
 - a. Ferrous Metals: Clean ferrous surfaces that are not galvanized or shop-coated of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning
 - b. Galvanized Surfaces: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner then prime as required.
 - c. Aluminum Surfaces: Remove all oil, grease, dirt, oxide and other foreign material by cleaning Per SSPC-SP1 Using detergent and water or a degreasing cleaner then prime as required.
8. Application requirements: Provide additional coats when undercoats, stains or other conditions show through the final coat or paint, until paint film is of uniform finish, color and appearance.
 - a. Access Panels and Removable or Hinged Covers: Paint backsides of these items to match exposed finished surfaces.
 - b. Prime Coats: Apply prime coat to surfaces required to be painted (or finished) that have not received a factory-prime coat.
 - i. Re-Coat primed or sealed surfaces where there is evidence of "suction spots" or unsealed areas in prime coat to insure no "bleed-through" of the finish coat, or other defects due to insufficient priming or sealing.
9. Requirements for pigmented (opaque) finishes: Completely cover to provide opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be accepted
10. The completed work shall match approved samples for color, texture and coverage.
11. Provide Basis of Design products from preferred manufacturer: Sherwin Williams. Subject to compliance with requirements other acceptable manufacturers include the following:
 - a. Devoe Paint
 - b. Glidden Co. (Glidden)
 - c. Benjamin Moore and Co.
 - d. PPG Industries
 - e. Pratt and Lambert (P&L)
12. Interior Paint Schedule by substrate:
 - a. Concrete - (Interior Walls & Ceilings, Poured Concrete, Precast Concrete, Cement board, Tilt-Up, Cast-In-Place) including PLASTER - (Walls, Ceilings)
 - i. Latex Systems: Low Odor – Zero VOC Finish
 - ii. Semi-Gloss Finish for walls
 - iii. Flat Finish for ceilings

- b. Epoxy Systems (Pre-catalyzed Water Based): For high traffic or high abuse areas - Semi -Gloss Finish for walls
- c. Concrete - (Ceilings): Dryfall Waterborne Systems – For large interior concrete ceiling areas such as parking garages - Flat Finish
- d. Masonry - (Interior CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted)
 - i. Latex Systems: Low Odor – Zero VOC Finish
 - ii. Semi-Gloss Finish
- e. Metal - (Aluminum, Galvanized)
 - i. Latex Systems: HI-Performance – Zero VOC Finish – For metal doors and frames. (Interior or Exterior)
 - ii. Semi-Gloss Finish
- f. Urethane System (Water Based): For use on existing field painted handrails and high abuse areas. (Interior or Exterior) - Gloss Finish
- g. Metal - (Galvanized; Ceilings, Duct work)
 - i. Dryfall Waterborne Topcoats (for use at 10'-0" A.F.F. min)
 - ii. Flat Finish
 - iii. Primers in this case are optional if the Ceilings - Structural Steel, Joists, Trusses, and Beams are already primed. Contractor shall check for adhesion and compatibility prior to painting. Spot prime any bare areas with S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series or equal. Verify elevation per mfg. requirements.
- h. Metal (doors and frames)
 - i. Shop Primer: Manufacturer's standard, one coat of baked-on rust inhibiting prime paint in accordance with ANSI A 224.1; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.
 - ii. Apply a smooth coat of even consistency to provide a uniform dry film thickness.
- i. Metal - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous & Ornamental Iron, Structural Iron, Ferrous Metal)
 - i. Latex Systems: HI-Performance – Zero VOC Finish
 - ii. Flat Finish
- j. Dryfall Waterborne Topcoats (For use at 10'-0" A.F.F. min.) - Flat Finish
- k. Wood - (Trim): For special applications as approved by Broward College.
 - i. Latex Systems
 - ii. Semi - Gloss Finish (equipment rooms and janitor closets only)

- iii. Stain and Varnish System: For Wood Doors
 - iv. Satin Finish
- I. Drywall - (Walls & Ceilings): For Classroom, Offices, storage areas and similar.
- i. Latex Systems: Low Odor - Zero VOC Systems
 - ii. Semi-Gloss Finish (equipment rooms and janitor closets only)
 - iii. Egg-Shell Finish
 - iv. Flat Finish for ceilings only
 - v. Epoxy System (Water Base): For Hallways, high traffic and high abuse areas.
 - vi. Semi -Gloss Finish
 - vii. Egg-Shell Finish:
- m. Concrete - (Floors): Mechanical, exterior electrical rooms and similar applications. Add sand/paint for all utility rooms, exterior accessible mechanical/electrical rooms.
- i. Latex Systems
 - ii. Low Luster Finish
13. Exterior Paint Schedule by Substrate:
- a. Concrete - (Stucco, Tilt-up, Precast, and Cast-in-place)
 - i. Previously painted concrete surfaces: 1st Coat: Sherwin Williams Loxon Conditioner, A24-100 Series, or equivalent product. (Coverage: 200-300 sq ft/gal)
 - ii. New/ bare concrete surfaces: 1st & 2nd Coats: Sherwin Williams Loxon XP Waterproofing System, A24 Series, or equivalent product. (14.0 to 18.0 wet mils; 6.4 to 8.3 DFT mils per coat)
 - iii. Textured Coating System for Tilt-up surfaces: Textured Finish
 - b. Masonry (Concrete Masonry Units [CMU]- Cinder or Concrete Block)
 - i. Latex Systems
 - ii. Flat Finish
 - c. Metal - (Aluminum, Galvanized)
 - i. Latex Systems for Galvanized Metals: Painted or unpainted roof-related fabrications
 - ii. Gloss finish
 - d. Latex Systems for Aluminum roof-related fabrications - Flat Finish
 - e. Metal - (Misc. Iron, Ornamental Iron, Structural Iron & Steel, Ferrous Metal)
 - i. Latex Systems: Roof-related fabrications painted or unpainted
 - ii. Gloss finish

10 00 00 Specialties

10 11 00 Visual Display Surfaces

1. The following items to be furnished and installed by the general contractor: Marker boards and Tack boards.
2. Provide Porcelain-Enamel Marker-board Assembly: balanced, high-pressure, factory-laminated Marker board assembly of 3-ply construction consisting of backing sheet, core material, and porcelain-enamel coated steel face sheet with low-gloss finish.
3. Plastic-Impregnated-Cork Tack Assembly: 1/4-inch- thick, plastic-impregnated cork sheet factory laminated to 1/4-inch- thick particleboard backing.
4. Where the size of visual display boards or other conditions require support in addition to normal trim, provide structural supports to suit project conditions.

10 14 00 Signage

1. Refer to Appendix 10 01 for interior signage.
2. The construction documents shall indicate room identification signage for each interior room that includes the building number and room number and any applicable suffix (i.e., "A", "B", etc.). Coordinate requirements with BC Project Manager and BC Facilities Planner.
3. Requirements for room signage:
 - a. All rooms, unless noted otherwise, shall receive 7"x7" Room Identification, Acrylic Interior Sign consisting of frame with slider insert (Refer to Appendix 10 02) for changeable message and acrylic lens.
 - b. All classrooms, conference rooms and offices shall receive 8 ¾"x11 ¼" Acrylic Interior Sign consisting of frame with slider insert for changeable message and acrylic lens in compliance with Signage Graphics provided in the Appendix in addition to the 7"x7" Room Identification Sign indicated.
 - c. All mechanical rooms, electrical rooms, restrooms, shower areas, locker rooms, janitorial rooms and data rooms shall receive 7"x7" Room Identification, Solid Acrylic Interior Sign consisting of black background with white letters in compliance with Signage Graphics provided in Appendix 10 01.

4. Emergency Evacuation signage:
 - a. Emergency Evacuation Map and Map Holder: Provide 17-1/2"Wx15"H clear acrylic, non-glare, scratch resistant frame for 17"Wx11"H insert. Provide (Basis of Design) Seton Emergency Evacuation Map Holder model 94291 or equal. Confirm quantity and locations with BC Project Manager and BC Fire Marshall. Refer to Appendix 10 04 for details.
5. Building identification signage for each Building exterior shall be cast aluminum letters with mill finish that identify the building name and building number.
6. Signage shall be in compliance with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
 - a. Illuminated Exit Signs.
 - b. Fire Doors.
 - c. Room Capacity.
 - d. Elevator Signs.
 - e. Stairway Identification.
 - f. Signs for Accessible Spaces.

10 21 13 Toilet Compartments

1. Provide solid plastic toilet compartments and urinal partition Basis of Design products by Scranton Products, or equal as approved by Broward College. See appendix 09 02 for details (Rev. 2 dated 6-28-16)
2. Provide doors, panels and pilasters as follows:
 - a. High density polyethylene (HDPE), single thickness panel. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
 - b. 1 inch thick with edges rounded to 1/4 inch radius.
 - c. Recycled content: Minimum 25 percent or as required by project.
 - d. Color: as selected by architect and approved by Broward College Facilities Planner.
3. Provide hardware as follows:
 - a. Hinges: 8 inches long, fabricated from heavy-duty extruded aluminum with bright dip anodized finish, wrap-around flanges, adjustable on 30-degree increments, through bolted to doors and pilasters with stainless steel, Torx head sex bolts. Hinges operate on field-adjustable nylon cams, field adjustable in 30 degree increments.
 - b. Door Strike and Keeper: 6 inches long, fabricate from heavy-duty extruded aluminum with bright dip anodized finish, with wrap-around flanges secured to

- pilasters with stainless steel tamper resistant Torx head sex bolts. Bumper: Extruded black vinyl.
- c. Latch and Housing: Heavy-duty extruded aluminum surface mounted unit designed for emergency access.
 - d. Coat Hook/Bumper required at all stalls. Combination type, chrome plated Zamak, sized to prevent door from hitting mounted accessories.
 - e. Door Pulls: Chrome plated Zamak or manufacturer's standard unit for outswinging doors.
4. Required components:
- a. Doors and Dividing Panels: 55 inches high, mounted 14 inches above finished floor.
 - b. Pilasters: 82 inches high, fastened to pilaster sleeves with stainless steel tamper resistant Torx head sex bolt.
 - c. Pilaster Sleeves: 3 inches high, one-piece molded HDPE, secured to pilaster with stainless steel tamper resistant Torx head sex bolt.
 - d. Wall Brackets: 54 inches long, heavy-duty aluminum, bright dip anodized finish, fastened to pilasters and panels with stainless steel tamper resistant Torx head sex bolts. Provide continuous metal brackets at all panel joints for privacy.
 - e. Headrail: Heavy-duty extruded aluminum, anti-grip design, clear anodized finish, fastened to headrail bracket with stainless steel tamper resistant Torx head sex bolt and at top of pilaster with stainless steel tamper resistant Torx head screws.
 - f. Headrail Brackets: 20 gage stainless steel, satin finish, secured to wall with stainless steel tamper resistant Torx head screws.
5. Provide, unless otherwise directed, 24-inch wide in-swinging doors for ordinary toilet stalls and 32-inch wide (clear opening) out-swinging doors at stalls equipped for use by the handicapped.

10 26 00 Wall and Door Protection

1. Provide bumper rail and corner wall protection in all spaces with exception of offices. Refer to Appendix 10 06 for details.
2. Bumper rail assembly: continuous Snap-On plastic cover installed over continuous retainer; designed to spring back when hit.

10 28 00 Toilet, Bath and Janitorial Accessories

1. All toilet accessory items (including those to be provided by the College and contractor installed) contractor shall confirm full-functionality and dimensional fit. See appendix 09 02 for details (Rev. 2 dated 6-28-16)

2. Clearances shall comply with the requirements of the Florida Accessibility Code and as follows:
 - a. Provide 36-inch minimum clearance width in all toilet compartments
 - b. Provide 1'-6" minimum from centerline of lavatory to nearest adjacent wall
3. Bobrick shall be listed as the preferred manufacturer, or approved equivalent.
4. Provide fixed, non-tilted, stainless steel mirror units at handicap accessible lavatories.
5. Contractor shall furnish and install the following accessories at all public use washrooms:
 - a. Grab bars: configuration and length to be noted in drawings
6. Owner-Provided/Contractor installed Equipment:
 - a. Liquid soap dispensers
 - b. Paper Towel Dispenser: Roll paper dispenser type
 - c. Toilet Paper Dispenser: Jumbo roll dispenser
 - d. Waste receptacles (owner will install unless units need to be installed on wall).
7. Contractor shall furnish and install custodial accessories at all janitor closets:
 - a. mop and broom holder with shelf.
8. Contractor shall furnish and install accessories at all public use shower rooms:
 - a. Extra heavy-duty shower curtain rod
 - b. Shower curtain
 - c. Folding shower seat (at all accessible shower stalls)
 - d. Vandal resistant soap dish
 - e. Robe hook
9. Sanitary napkin and tampon vendor unit **shall not** be specified or installed.
10. For typical toilet, bath and janitorial accessories finish, layout and installation details refer to Appendix 10 07.

10 44 00 Fire Protection Specialties

1. Locate hose and valve cabinets so the centerline of the hose valve is in accordance with NFPA Pamphlet 14. Locate fire extinguishers and fire extinguisher cabinets in accordance with the Florida Fire Prevention Code.
2. Maintain the full fire rating and acoustical rating of walls wherever hose and valve cabinets and fire extinguisher cabinets are installed

3. Fire hose cabinet units shall be steel with baked enamel finish, flanged, semi- recessed mounted types (similar to fire extinguisher cabinets) large enough to accommodate a fire extinguisher beside the fire hose. Provide each cabinet with a lockable, full glazed, clear acrylic type door.
4. Whenever possible, all valves and fittings for fire department connections shall be rotated approximately 22-1/2 degrees down from vertical to facilitate easy hose connection.
5. Provide semi-recessed type fire extinguisher/valve cabinets with 2 1/2-inch rolled edge trim projection and full clear acrylic glazed door with lock. Basis of Design Larsen's Lock with clear anodized aluminum finish from the Architectural Series.
6. Provide manufacturer's standard fire extinguisher brackets appropriate for the type of fire extinguisher to be supported.
7. Identify fire extinguishers with wall mount 3 way view projecting sign above with graphic symbols. Provide Basis of Design Seton Model 84502 aluminum product or equal. Maintain all code required clearances.

10 51 13 Plastic Lockers & Benches

1. Provide solid plastic HDPE lockers formulated from a homogenous color- throughout compound carrying a 25 year warranty. Basis of Design product Scranton Products; Tufftec Lockers or approved as equal.
 - a. Door Style: Solid panel with horizontal vents, top and bottom.
 - b. Hinges: Self-closing and completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
 - c. ADA compliant recessed door handle and latch and lock.
 - d. Combination Padlocks to be provided by the College.
 - e. Equipment: Equip each locker with identification plate and the following, unless otherwise required: Double tier units: One double-prong ceiling hook and two single-prong wall
 - f. Finish: Color as selected by the BC planner.
 - g. Tiers: as required.
 - h. Sloped tops or soffits to extend to top of lockers.
2. Provide locker benches to be fabricated by same manufacturer as solid plastic lockers.
3. Installation requirements:
 - a. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates, channels, or blocking as required, using concealed fasteners.
 - b. Anchor single rows of lockers to walls near top and bottom of lockers.

11 00 00 Equipment

11 66 50 Gymnasium Equipment

1. All proposed equipment shall meet standards set forth by the National Collegiate Athletic Association (NCAA) and the USA Volleyball.
2. Product Data shall be provided for each type of product indicated on the drawings:
 - a. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
 - b. Motors: Show name plate data, ratings, characteristics, and mounting arrangements.
3. Shop drawings for gymnasium shall equipment include: plans, elevations, sections, details, attachments to other work, and the following:
 - a. Method of field assembly for removable equipment, connections, installation details, mountings, floor inserts, attachments to other work, and operational clearances.
 - b. Transport and storage accessories for removable equipment.
4. Samples for Verification shall be provided by Installer for the following products:
 - a. Basketball or Volleyball Net: a full sized net.
 - b. Volleyball Floor Insert: a full sized unit.
 - c. Volleyball Post Standard: a full sized unit with net tensioner.
 - d. Pad Fabric: a sample not less than 3 Inches Square, with specified treatments applied. Mark face of material.
5. Design Professional shall provide Coordination Drawings and documents including:
 - a. Court layout plans, drawn to scale, and coordinating floor inserts, game lines, and markers applied to finished flooring.
 - b. Qualification Data: For Installer and Professional Engineer.
 - c. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation including loads, point reactions, and locations for attachment of gymnasium equipment to structure.
 - d. Product Certificates: For each type of gymnasium equipment, signed by product manufacturer.
 - e. Warranty: Special warranty as specified in this Section.
6. All close out submittals shall include instructions for the Operation and Maintenance for all gymnasium equipment including emergency manuals, operation manuals, and maintenance manuals.
7. Construction documents shall call for minimum qualifications to be met for both fabricator of products and installers. Installers shall be trained and approved by product manufacturer.

8. Source Limitations: Obtain each type of gymnasium equipment through one source from a single manufacturer.
9. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
10. Project conditions shall be identified on the construction documents and coordination of equipment locations shall occur prior to final installation.
 - a. Environmental Limitations: Install gymnasium equipment after all spaces are enclosed and weatherproofed, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - i. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.
 - b. Coordinate floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction including light fixtures, HVAC equipment, fire suppression system components, and partition assemblies.

11 66 60 Gymnasium Equipment Materials

1. Aluminum alloy and temper recommended by manufacturer for type of use and finish indicated shall be met.
 - a. Extruded Bars, Profiles, and Tubes: ASTM B 221.
 - b. Cast Aluminum: ASTM B 179.
 - c. Flat Sheet: ASTM B 209.
2. Steel shall comply with the following:
 - a. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - b. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
 - c. Steel Sheet: ASTM A 1011/A 1011M.
3. Equipment support cable sizes shall meet the Manufacturer's standard, galvanized steel aircraft cable with a minimum breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written instructions for size, number, and method of installation alloy steel chain rated for overhead lifting per ASTM A 391/A 391M, with commercial-quality, steel connectors and hangars.
4. Castings and hangers are malleable iron, comply with ASTM A 47/A 47M, and meet the grade specified for structural loading.
5. Equipment wall-mounting board's finish, size, and quantity shall meet the drawing requirements and specifications prior to mounting gymnasium equipment according to manufacturer's written instructions.

6. Specified anchors, fasteners, fittings and hardware shall meet the manufacturer's standard specifications.
7. Specified grout shall be nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

11 66 70 Basketball Equipment

1. Equipment Manufacturer and provided products shall be in compliance with NCAA's Basketball Rule Book Standard requirements. Ensure that the chosen manufacturer offering the products is incorporated into the scope of work and substitutions are not permitted without authorization from both Broward College and the Design Professional.
2. Protruding fasteners or exposed bolt heads on front face of backboards are prohibited.
3. Backboards shall be overhead supported or wall braced depending on design requirements. Backboards may include the following types:
 - a. Stationary Type per the manufacturer's standard assembly.
 - b. Folding Type per the manufacturer's standard assembly for backboard, ensure that the specified hardware and fittings permit the backboard folding according to the project specifications in one of the following ways:
 - c. Forward-folding, front-braced
 - d. Forward-folding, rear-braced
 - e. Backward-folding
 - f. Side-folding
4. Wall-Mounted Backboards specifications shall contain complete assembly instructions, extending from wall, including support framing to building structure, bracing, cables, chains, pulleys, fittings, hardware, pipe anchors, equipment pads, and fasteners, tubing, and shapes. Design of framing shall minimize vibration during play. Types of framing may include the following:
5. Backboard framing specifications shall call for the frame to be made of steel pipe,
 - a. Center-Mast Frame: welded, welded and bolted or clamped, with side sway bracing.
 - b. Dual-Mast Frame: welded, welded and bolted or clamped, with cross bracing.
6. Goal Height Adjuster: Goal Height shall be adjustable from 8 to 10 feet with gear- drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing. Operation of mechanism may be one of the following:
 - a. Manual with detachable crank handle.
 - b. Electric with integral gear-drive motor, with limit switches preset to goal heights.
7. Backboard Safety Device shall be designed to limit free fall if support cable, support chain, pulleys, fittings, winch, or related components fail.

8. Retractor Device shall retract both support and safety cables, chains, and straps away from play of the basketball when backboard is in playing position.
9. Winch hoist: provide heavy-duty, fully enclosed worm-gear, brake, cable drum, cable, and fittings, for mounting; and in addition, shall be designed to move and hold backboard in any raised or lowered position with one of the following methods:
 - a. A Manual winch with detachable hand crank.
 - b. A Portable Winch Operator: with a portable electric motor-drive device, including an adaptor to fit crank mechanism.
10. Backboard Electric Operator: provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
11. Basketball Backboard shall comply with the following:
 - a. Shape and Size shall be: Rectangular or Fan shaped and meet the dimensions set forth in the NCAA's Basketball Handbook.
 - b. Material shall be predrilled with holes or preset inserts for mounting goals, and consists of one of the materials as follows:
 - c. Fiberglass: Not less than 1-1/2-inch-thick composite backboard consisting of not less than two 3/16-inch-thick, molded fiberglass panels laminated together over faces and edges.
 - d. Glass: Not less than 1/2-inch-thick, transparent tempered glass. Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded frame, with steel subframe, reinforcement, and bracing and with mounting slots for mounting backboard frame to backboard support framing with a method as follows:
 - e. Standard Mount: Provide steel corner reinforcement with mounting slots for mounting backboard frame to backboard support framing at standard mounting centers.
 - f. Direct Mount: Designed for mounting backboard frame to center mast of backboard framing to maximize relief of stresses on backboard frame and glass.
12. Rim-Restraining Device: Complying with NCAA rules and designed to ensure that basket remains attached if glass backboard breaks.
 - a. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to NCAA Basketball Handbook rules.
 - b. Target Area and Border Markings: Marked in pattern, stripe width, and color according to NCAA Basketball Handbook rules.
 - c. Finish: Where applicable, finish per manufacturer's standard factory-applied finish, with a white background.
13. Goal Mounting Assembly specifications shall be compatible with the goal, backboard, and support framing; with hole pattern for goal attachment, and shall meet the following material requirements:

- a. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit loads from goal to backboard frame and to minimize stresses on glass backboard.
 - b. Direct Mount: Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard and rigidity and the stability of goal are maximized.
14. Basketball Goal: provide flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
15. Basketball Net: provide 12-loop-mesh net, between 15 and 18 inches long, is sized to fit rim diameter, and as is composed of one of the material as follows:
- a. Cord shall be made from white cotton, nylon, or plastic.
 - b. Competition Cord shall be antiwhip, made from white nylon cord not less than 120- or more than 144-gm thread.
 - c. Chains (outdoor) shall be nontangle and nonstretch type, designed so that it will not scratch or impede the ball. The chain shall be made from zinc-coated steel chain.
16. Backboard Safety Pads: backboard thickness shall be indicated and shall extend continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by the NCAA Basketball Handbook.
17. Attachments may include: Peel-and-stick tape, adhesive, bolt-on, or per Manufacturer's recommendation.
18. Color shall be approved by Broward College and selected by Design Professional.

11 66 80 Volleyball Equipment

1. Equipment Manufacturer specified shall be qualified to provide products that are in compliance with USA Volleyball Rule Book's standard requirements. Ensure that the chosen manufacturer offering the products is incorporated into the scope of work and substitutions are not permitted without authorization from both Broward College and the Design Professional.
2. Floor Insert shall consist of solid-brass, chrome-finished steel, or aluminum floor plates; and a steel pipe sleeves, concealed by the floor plate, with capped bottom end, sized with ID to fit post standards set forth in the USA Volleyball Rule Book. Inserts shall securely anchor pipe sleeve in structural floor, or below the finished floor in a concrete footing; with anchors designed for securing floor insert to floor substrate as indicated by Design Professional or Manufacturer's Recommendations. When not in use, floor plates shall cover inserts in one of the following methods:
 - a. Flush with adjacent flooring: floor plate may be self-locking, lockable, or with a hinge access cover.

- b. Recessed with an insert to match finished flooring, and be flush with adjacent floor: floor plate may be self-locking, or lockable, with a hinged access cover.
 - c. Designed for use with a floating wood floor and be flush with adjacent flooring: floor plate may be a lockable swivel access cover.
 - d. Manufacturer provide a minimum of three tools for unlocking access covers.
 - e. Post Standard provide removable, paired volleyball post standards (with center post standard for multicourt play) as indicated in the USA Volleyball Handbook.
 - f. Posts may be:
 - Fixed, adjustable, or telescoping height;
 - Designed for easy removal from permanently placed floor insert supports;
 - Fabricated from steel, extruded-aluminum, or combined steel and extruded-aluminum pipe or tubing;
 - Equipped with non-marking plastic or rubber end cap or floor bumper to protect permanent flooring;
 - Finished with manufacturer's standard factory-applied, baked powder-coating finish.
3. Nominal Pipe or Tubing Diameter may be 3-inch, 3-1/2-inch, or 4-inch OD (outside diameter) at the base.
 4. Net Height Adjuster equipment shall allow for height adjustments, complete with fittings; designed for positioning net at heights, as required, and hold net at selected height during play.
 5. Height Markers shall be clearly marked at regulation play heights as indicated in the USA Volleyball Handbook.
 6. Net: Provide 32 foot long net and contain the following elements:
 - a. Width and Mesh shall meet a 36 inches width with a minimum 4-1/2-inch-square mesh made of black polyester string (4-inch-square mesh for competition).
 - 1) Hem Band Edges to finish all sides of net as required.
 - b. Dowels shall be no less than 1/2-inch-diameter fiberglass or 1-inch-diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
 - c. Net Antennas shall be 3/8-inch- diameter, high-tensile-strength, extruded fiberglass or plastic rods, 72 inches long, extending above top hem band of net, with alternating white and red bands according to competition rules. Provide two antennas per net.
 - d. Clamps shall be designed to secure antenna to top and bottom of net.
 - e. Boundary Markers shall clearly delineate the court play area.
 7. Net Tensioning System shall be designed to adjust and hold tension of net. The system shall be fully enclosed, nonslip winch with cable length and fittings for connecting to net lines, positive-release mechanism, and handle. Provide end post with post top pulley, and opposing post with welded steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.

8. Bottom Net Lock Tightener specifications shall be provided by manufacturer, offer a standard quick-release-type tension strap, spring-loaded self-locking tensioner, turnbuckle, pulley, or other device and linkage fittings designed to quickly and easily tighten bottom line or net.
9. Judges' Stands shall meet USA Volleyball Handbook Standards.
10. Safety Pads shall comply with NCAA requirements. Provide pads consisting of material no less than 1-inch-thick, with multiple-impact-resistant foam filler covered by puncture- and tear-resistant PVC-coated polyester. Provide pads with a hook-and-loop closure or attachments for the following components:
 - a. Post Standards: Wraparound style, designed to totally enclose each standard to a height of not less than 72 inches; 1 per post.
 - b. Net Lines: Four per net.
 - c. Judges' Stands: Designed to totally enclose each unit.
 - d. Fabric Cover Flame-Resistance Ratings: Passes NFPA 701
 - e. Fabric Color: as selected by Broward College.
 - f. Graphics: Optional as selected by Broward College.
11. Wall Storage Rack: provide a standard unit designed for mounting on walls and for storing post standards in vertical position with retaining arms, fittings for padlock, and mounting hardware; number of units as required to provide storage for specified equipment
12. Storage Cart: provide standard wheeled unit designed for transporting and storing volleyball equipment and passing through 36-inch-wide or wider door openings. Fabricate units of welded steel tubing with heavy-duty casters, including not less than two swivel casters. Fabricate wheels from materials that will not damage or mark floors; number of units as required to provide transport and storage for specified equipment.

11 66 90 Safety Pads

1. Safety Pad surface-burning characteristics shall meet ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Standard include:
 - a. Flame-Spread Index: 25 or less
 - b. Smoke-Developed Index: 450 or less.
2. Pad Covering: provide a safety pad fabric covering fabricated from puncture-and-tear-resistant, not less than 14-oz./sq. yd PVC-coated polyester or nylon-reinforced PVC fabric treated with fungicide for mildew resistance; with surface- burning characteristics indicated, and lined with fire-retardant liner.
3. Wall Safety pad shall consist of padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with

visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.

4. Wall Corner pad shall consist of no less than 1-1/4-inch-thick, multiple-impact-resistant, closed-cell polyethylene-foam filler, covered on both sides and all edges by fabric covering with backer board and manufacturer's standard anchorage to wall.
5. Column safety pads shall cover the exposed flange of columns to the height indicated on Design Professional's drawings. Pads shall consist of no less than 1-1/4-inch-thick, multiple-impact-resistant, closed-cell polyethylene-foam filler, covered on both sides and all edges by fabric covering with backer board and manufacturer's standard anchorage to column.
6. Wraparound safety pads for round columns shall fully cover the exposed round column to height indicated on the drawings. Pads shall consist of no less than 2-inch-thick, multiple-impact-resistant, bonded polyurethane-foam filler, 6.0-lb/cu. FT density, covered on both sides and all edges by fabric covering with hook- and-loop, or cord lace and grommet attachment to column.

12 00 00 Furnishings

12 00 50 General

1. Non Powered Roller Shades

- a. Acceptable Manufacturer for Roller Shade Systems and Controls (Base of design) MechoShade Systems, Inc. or equal.
- b. To be installed at all exterior office and classroom windows.
- c. Refer to Appendix 12 01.

2. Powered Shades

- a. Shade Motors:
 - i. Quiet [44 – 46 db] Intelligent Encoded Motor and Control System: Tubular, asynchronous (non-synchronous) motors, with built-in reversible capacitor operating at 110v AC (60hz), (230v/50 hz (AC) single phase, temperature Class A, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each motor.
 - ii. Conceal motors inside shade roller tube.
 - iii. Maximum current draw for each shade motor of 2.3 amps @ 110 V (.9 amps @230 V AC).
 - iv. Use motors rated at the same nominal speed for all shades in the same room.
- b. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade motor and tube assembly. Spring assisted lift systems shall not be accepted.
- c. Quiet intelligent Encoded Motor System (software, two-way communication): Specifications and design are based on the Intelligent Motor Control System / Whisper Shade-IQ™ Motor System) as manufactured by MechoShade Systems, Inc. Other systems may be acceptable providing all of the following performance capabilities are provided. Motor control systems not in all of the following performance capabilities are provided. Motor control systems not in completed compliance with these performance criteria shall not be accepted as equal systems.
- d. Quiet operation of up to 46dBa within 3' feet, open air.
- e. Upper and lower stopping points (Operating limits) of shade bands shall be programmed into motors via a hand held removable program module / configurator.
- f. Intermediate stopping positions for shades shall allow for up to three (3) repeatable and precise aligned positions.
- g. Up to 103 available alignment points including 3-user programmable predefined intermediate positions, for a total of 5-defined and aligned positions. All shades on the same switch circuit with the same opening height shall align at each intermediate stopping position.
- h. Provide wall switches.

3. Shade Cloth
 - a. Visually Transparent Single-Fabric Shadecloth: MechoShade Systems, Inc., ThermoVeil group, single thickness, opaque non-raveling 0.030-inch (0.762mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, in colors selected from manufacturer's available range.
 - b. Dense Basket Weave: "1300 series", 5 percent open, 2 by 2 dense basket-weave pattern.
 - c. Color: Gray
 - d. Warranty: 10-year Limited
4. Furniture systems and non-attached FF&E items are provided by the College unless determined otherwise.
5. Hardscape drawings shall clearly identify locations and quantities of specified site furnishings. Drawings shall indicate requirements through drawing layouts, details, and material schedules.
6. Contractor to provide samples for each exposed product and for each color, texture and finish specified prior to ordering the selected furnishings.
7. A product schedule for site furnishings shall be provided by the Design Professional. The schedule shall use the same catalog designations provided by the manufacturer, specify all ordering components, finishes and colors.
8. All site furnishing drawing details are to show proper anchoring methods to hardscape elements in order to deter theft or movement. Acceptable methods include:
 - a. Direct burial
 - b. Surface Mount
9. Site furnishing maintenance manuals shall be provided after installation work is complete.

12 48 13 Entrance Floor Mats and Frames

1. College to provide walk off mats. Permanent recessed mats not allowed.

12 93 50 Site Furnishings

12 93 90.13 Bicycle Racks

1. Design Professional shall reference basis of design product by Barco Product (www.barcoproducts.com) galvanized metal tubes, 7 capacity rack, surface mount to concrete slab, or approved equal.

12 93 90.23 Trash and Litter Receptors

1. College to provide trash and litter receptors.

12 93 90.33 Site Seating and Tables

1. Site seating and table styles shall meet the following design standards:
 - a. Benches: Provide recycled plastic A-frame type, length as required.
 - b. Seat and Table combinations: Provide recycled plastic hexagon tables with integral seating for 6 including a handicap accessible space.
 - c. Tables shall be installed on hard surfaces (concrete, pavers, asphalt) not on grass.
2. The Design Professional shall provide Broward College with product cut sheets specifying material, design and overall layout of selected site furnishings for approval. Product cut sheets shall match catalog information provided on layout drawings as designated by Design Professional. Provide products by one of the following acceptable manufacturers:
 - a. Barco Products (www.barcoproducts.com),
 - b. Prestwick Group, Inc. (www.prestwicklimited.com), or
 - c. Upbeat Site Furnishings (www.upbeat.com)

12 93 90.43 Bollards and Wheel Stops

1. The Design Professional shall provide Broward College with product cut sheets specifying material, design and overall layout of bollard furnishings and parking lot wheel stops for approval.
 - a. Wheel Stops: Provide Basis of Design Product Premium Rubber Car Stop, Item # 06FY1770 by Barco Products with # HRDWR-3WS or equal. Concrete alternate shall be considered.
 - b. Bollards: Provide round dome top, concrete filled, or galvanized steel with plastic sleeve (white or yellow) as required. Bollards shall be FDOT compliant when used in traffic applications.

12 93 90.63 Planters

1. Free standing planter styles shall meet the following design standards:
 - a. Provide concrete planters with integral drainage and irrigation spaced appropriately to allow access for maintenance of adjacent structures.
 - b. Planters when fully loaded should be easily disconnected from irrigation source and easily moved with a forklift.

13 00 00 Not Used

14 00 00 Conveying Equipment

14 20 00 Elevators

14 24 00 Hydraulic Elevators

1. Preferred manufacturers offering elevators that may be incorporated into the Work include, but are not limited to, the following:
 - a. Otis Elevator Co.
 - b. Schindler Elevator Corp.
 - c. ThyssenKrupp Elevator
2. Provide manufacturer's standard enameled-steel car enclosures with removable wall panels, suspended ceiling, trim, accessories, access doors, doors, power door operators, sills (thresholds), lighting, and ventilation.
3. Minimum requirements:
 - a. Hole-less Type: for buildings 3 stories or under, or machine-room-less traction type for buildings 4 stories and over.
 - b. Rated Load: 3500 lb. min. or as required to suit project. Provide min. 5,000 lb. rated loads at all laboratory/science buildings typical.
 - c. Wire way to include cabling that will support IP cameras and access control.
 - d. Controls: Automatic recall.
 - e. Car Enclosures: As follows unless otherwise required:
 - i. Inside Width: 80 inches.
 - ii. Inside Depth: 65 inches.
 - iii. Inside Height: 95 inches.
 - iv. Front Walls Graffiti and Scratch resistant: Satin stainless steel with integral car door frames or as approved by the College.
 - v. Car Fixtures: Satin stainless steel.
 - vi. Sides and Rear Wall Panels: Satin Stainless Steel.
 - vii. Reveals: Enameled Steel.
 - viii. Door Faces (Interior): Satin stainless steel.
 - ix. Door Sills: Aluminum.
 - x. Ceiling: Luminous ceiling with LED fixtures.
 - xi. Handrails: Cylindrical ADA, Satin stainless steel, at side and rear walls.
 - xii. Floor prepared to receive resilient floor tile
4. Additional requirements for elevators:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with satin Stainless-steel frame.
 - b. Provide protective blanket hooks in all four sides of each car and one complete set of full-height blankets.
5. The Design Professional shall coordinate specific building equipment clearances with elevator openings and capacity in the case of Laboratory Buildings or similar. Note that items such as fume hoods and other lab specific equipment may require specific clearances.

15 00 00 through 21 00 00 Not Used

21 00 00 Fire Suppression General Requirements (rev 2 dated 6-28-16)

1. Life Safety: Shall specify location of all life safety equipment and provide detail specifications.
2. Fire Alarm: Illustrate FACP location, remote annunciator location, all devices, circuits, strobes, horns, tamper switches, etc. Include strobes on exterior elevations (all sides or as required for visibility from all exterior locations). Provide a reflected ceiling plan (RCP) for fire alarm devices (if applicable).
3. Fire Protection: Provide RCP plans identifying sprinkler head locations (centered on ceiling tile typical). RCP shall include all ceiling mounted devices or potential conflicts, including low voltage WAP devices, lighting, HVAC, A/V, access control and cameras. Plans to include piping sizes, types, fittings, penetration details through walls and slabs, riser elevations, service entrance details from exterior of building, drain locations, hanger and support details, DDCV (Ames Silver Bullet), and signage.
4. Final Inspections: All Fire Protection inspections are performed by the BC Fire Marshall. Buildings leased by the college require local AHJ/Fire Marshal inspections in addition to BC Fire Marshall inspections.
5. Fire Alarm: For new construction and renovation projects a licensed fire alarm contractor is required. The college existing fire alarm panels are *Notifier*, except in the downtown facilities where the panel is Simplex. Vendors certified on *Notifier* panels are preferred.
6. Submittals/ Shop Drawings: Provide minimum 1/2" scaled plan and elevation shop drawing prior to beginning construction. Provide signed and sealed hydraulic calculations.
7. Steel piping is preferred. CPVC is optional and is approved on a case by case basis. All metallic fire protection piping shall be painted red.

21 22 00 Clean-Agent Fire Extinguishing Systems

1. Documents call for extinguishing-agent containers: Steel tanks, with manifold for multiple storage containers [and with reserve-supply storage containers].
 - a. Extinguishing Agent: [HFC 227ea] [FK-5-1-12] [IG-541].
 - b. Discharge Nozzles: One-piece brass or aluminum alloy.
 - c. Control Panels
 - d. Voltage: Coordinate with available electrical circuit
 - e. Mounting: Recessed flush with surface/Surface
 - f. Separate supervised circuits for each independent hazard area
 - g. Automatic switchover to standby batteries
 - h. Storage container, low-pressure indicator
 - i. Detection Devices
 - j. Ionization detectors

- k. Photoelectric detectors
 - l. Remote air-sampling detectors
 - m. Manual Stations
2. Surface/Semi recessed mounted with clear plastic hinged guard including the following:
- a. Manual release.
 - b. Abort switch.
 - c. EPO switch.
3. Switches shall be provided for the following:
- a. Low-agent pressure switches.
 - b. Power transfer switches.
 - c. Door closers.
4. Alarm Devices shall be included for the following:
- a. Bells
 - b. Horns
 - c. Strobe lights.
5. Exterior Installations: All exterior mounted devices or devices exposed to non-conditioned air shall be weatherproof.

21 30 00 Fire Pump Controller

- 1. Fire Pump Controller shall have integral power transfer switch.
- 2. Motor starting methods shall be closed transition Y delta.
- 3. Fire pump and jockey pumps that are base mounted shall be placed on a pre-poured chamfered housekeeping pad (refer to concrete specification for details and finish). Secondary pour of pad after pump is installed is not acceptable.

22 00 00 Plumbing

22 05 13 Common Motor Requirements for Plumbing Equipment

1. Poly phase motors: Design B, medium induction motors.
 - a. Efficiency: Energy efficient.
 - b. Service Factor: 1.15.
 - c. Multispeed Motors: Variable torque
 - d. Rotor: Random-wound, squirrel cage.
 - e. Enclosure Material: Cast iron for motor frame sizes [324T] and larger; rolled steel for motor frame sizes smaller than [324T]

22 05 33 Heat Tracing for Plumbing Systems

1. Plastic-insulated, series-resistance heating cables:
 - a. Heating Element: Single- or dual-stranded resistor wire. Terminate with waterproof, factory-assembled non-heating leads with connectors at both ends.
 - b. Electrical Insulating Jacket: Minimum 4.0-mil (0.10-mm) Kapton with silicone jacket or Tefzel.

22 05 53 Identification for Plumbing Piping and Equipment

1. Provide identification for all piping, valves, and equipment including labels, tags, and color coding. Where required, identify all existing piping systems by color-coding, and arrows indicating the direction of flow. Conform to ANSI A13 1-75 Scheme for Identification of Piping Systems. Piping Systems include:
 - a. Domestic Cold Water - Dark Green
 - b. Domestic Hot Water - Light Green
 - c. Acid Piping – Yellow
 - d. Sanitary Waste and Vent
 - e. Storm
 - f. Propane Gas - Gloss Rust
 - g. Gas Utility Piping – Yellow

22 11 19 Domestic Water Piping Specialties

1. Loose key stops for sinks, lavatories, hose bibs, and wall hydrants.
2. Hose bibs and wall hydrants - Basis of design: Zurn Z1330
3. Valves: All valves 2-1/2-inch and smaller shall be full-port ball valves. Valves over 2-1/2 inches shall be butterfly valves. Basis of design manufacturer shall be NIBCO. Do not use gate valves).

22 13 16 Sanitary Waste and Vent Piping

1. Sanitary sewer piping shall be cast iron bell and spigot for use below grade, and NO-HUB for above grade installations. Schedule 40 PVC may be used with College approval on single story buildings. Copper drainage tube (DWV) may be used for waste arms and traps above grade

22 13 19 Sanitary Waste Piping Specialties

1. Provide floor drains with automatic trap primers in all toilet rooms, janitorial closets and mechanical equipment rooms.
2. Floor Drains, Roof Drains, and Cleanouts: Zurn

22 13 23 Sanitary Waste Interceptors

1. Grease Interceptors: Precast concrete.
2. Oil Interceptors: Factory-fabricated cast iron or steel.
3. Sand Interceptors: Factory-fabricated cast iron or steel.
4. Precast-concrete manhole risers.

22 13 29 Sanitary Sewerage Pumps

1. Submersible, quick-disconnect, double-seal effluent pumps:
 - a. Number of Pumps: One
 - b. Pump Casing: Cast iron, with open inlet.
 - c. Impeller: abrasion-resistant cast iron, closed or semiopen design.
 - d. Pump and Motor Shaft: Stainless steel
2. Submersible, quick-disconnect, progressing-cavity, grinder sewage pumps:
 - a. Number of Pumps: Dual
 - b. Pump Body: Cast iron
 - c. Pump Bearings: Radial and thrust types.
 - d. Pump Shaft: Steel.
 - e. Rotor: Stainless steel.
 - f. Seal: Packing gland and mechanical types.
 - g. Motor: Hermetically sealed, capacitor-start type.

22 14 13 Facility Storm Drainage Piping

1. Provide Schedule 40 PVC above grade and PVC below grade.

22 14 14 Equipment Drain and Condensate

1. Provide copper DWV above grade and Schedule 40 PVC below grade.

22 15 19 Packaged Air Compressors and Receivers for HVAC

1. Provide reciprocating air compressors to operate pneumatic valve actuators for operation of chilled water systems:
 - a. Compressor(s): Use 2 stage for above 5 HP.
 - b. Mounting: Freestanding
 - c. Receiver: Steel tank.
 - d. Pressure lubricated
 - e. Automatic drains for air dryers and receivers

22 15 20 Packaged Air Compressors and Receivers for Classroom Labs

1. Reciprocating air compressors:
 - a. Compressor(s): Use 2 stage for above 5 HP.
 - b. Mounting: Freestanding
 - c. Receiver: Steel tank.
 - d. Oil free for labs or specialty use
 - e. Automatic drains for air dryers and receivers

22 15 21 Packaged Air Compressors and Receivers for Tools and Equipment Rooms

1. Reciprocating air compressors:
 - a. Compressor(s): Use 2 stage for above 5 HP.
 - b. Mounting: Freestanding
 - c. Receiver: Steel tank.
 - d. Pressure lubricated
 - e. Automatic drains for air dryers and receivers

22 30 00 Plumbing Equipment

1. Water heaters: Use point of use units whenever possible. Generally use electric units up to 85 gallons and gas heaters for larger tanks if gas service is available. All water heaters shall be ASHRAE 90 rated and glass lined. Show on the plumbing fixture schedule.

22 40 00 Plumbing Fixtures

22 42 00 Commercial Plumbing Fixtures

1. Plumbing fixtures: Provide complete list and catalog cut sheets to the College prior to the completion of Construction Documents. Assign "P" numbers to each fixture required and show on the Drawings (including risers and detail sheets). Acceptable manufacturers include the following:
 - a. American Standard (basis for design)
 - b. Kohler
 - c. Eljer
2. Drinking Water Fountains:
 - a. Include one water / bottle filler combination drinking fountain per floor.

22 62 19 Vacuum Equipment for Laboratory Facilities

1. Documents call for packaged, oil-free, rotary, sliding-vane vacuum pumps:
 - a. Vacuum Pump(s): One
 - b. Mounting: Freestanding
 - c. Receiver: Vertical, steel tank.
 - d. Automatic control switches to alternate lead-lag vacuum pumps for duplex vacuum pumps.

23 00 00 Heating, Ventilating, and Air Conditioning

23 00 01 General HVAC Requirements

1. **Mandatory Prefabrication / Installation Meeting:** The general contractor shall include all associated trades in a mandatory pre-fabrication and pre-installation meeting on site. The sheet metal contractor shall be responsible for providing coordinated shop drawings for final coordination with all other trades.
2. **Standards:** All equipment and devices shall bear U.L. label, the label of an industry recognized approved testing agency or A.G.A. certification for said item of equipment or device. All electrical devices must be U.L. approved.
3. **Drawings:** Architectural and structural drawings take precedence over mechanical drawings with reference to the building construction. Mechanical drawings are diagrammatic and indicate the general arrangement and extent of work. Architectural drawings indicate more exactly the desired relationship between diffusers, registers, lighting fixtures, equipment, electric panels and devices, plumbing fixtures, and other items which remain exposed in the completed building. Exact locations and arrangement of materials and equipment shall be determined, with the acceptance of the Architect/Engineer, as work progresses to conform in the best possible manner with the surroundings and with the adjoining work of other trades. Where locations of equipment, devices or fixtures are controlled by architectural features, establish such locations by referring to dimensions on Architectural drawings and not by scaling drawings.
4. All electrical and data rooms shall be air conditioned by the primary building air conditioning system during chiller plant normal hours of operation. Data rooms shall be air conditioned by a secondary standard split system during off hours. Provide BMS controls for all applications.
5. Specify a minimum of 25 CFM differential for positive and negative rooms. Provide positive 0.06 inches-WG referenced to outdoor pressure.
6. Commissioning should be performed by third party.
7. Roof mounted air handlers are not allowed.
8. Specified HVAC systems will be selected with the following design conditions:
 - a. Summer
 - i. Outside Air Temperature: 90°F dry bulb and 78°F wet bulb
 - ii. Inside Conditions: 75°F and maximum 60% relative humidity
 - b. Winter
 - i. Outside Air Temperature: 46°F
 - ii. Inside Conditions: 68°F and maximum 60% relative humidity
 - c. Systems
 - i. Chillers shall be selected for 41°F leaving water temperature (LWT) and 56°F entering water temperature (EWT).
 - ii. AHU coils shall be selected for 41°F EWT and 56°F LWT.

9. Documents shall incorporate life-cycle considerations and a holistic approach with respect to energy conservation, and avoid over-designing of systems.
 - a. Energy Conservation: Refer to State Requirements for Educational Facilities (SREF) concerning heat recovery and thermal storage. The College wishes to maximize of all feasible energy conservation measures. Consult with local electric utility and provide current program information to the BCPM for consideration for each project.
 - b. Provide energy calculations including cooling, heating, and ventilating loads.

10. Documents shall call for plans, elevations, sections, and detail drawings to fully show the extent, nature and requirements of mechanical work. Plan notations shall identify the following:
 - a. rooms and their usage
 - b. locations for ducts, VAV's and accessories
 - c. piping and accessories
 - d. equipment and accessories

11. Descriptive notations must be used with symbols.
 - a. Floor Plans and Site Plans: Show all ducts, piping, and equipment properly located and drawn to scale.
 - b. Renovation Work: Determine where structural limitations will permit component installation and indicate those locations on the Drawings with accurate dimensions.
 - c. Coordination: All trades must coordinate installation to avoid conflicts and/or code violations.
 - d. Maintenance Access: Show coil pull, filter pull and motor access areas for all air handling units.
 - e. Service Piping: Show all chilled water piping with insulation to scale. Include plans and elevations to ensure access and serviceability.

12. Architect/Engineer shall confirm that clear space requirements for the installation of mechanical equipment have been met. Contract documents shall leave no question that clear space requirements can be met. Shop drawing equipment layout plan submittal required for mechanical room.

13. Electrical Provisions for HVAC design: Scope of Divisions 22 and 23 shall include the electrical requirements which are indicated to be integral with mechanical work and which can be summarized to include (but not necessarily be limited to) the following:
 - a. Motors.
 - b. Motor starters & VFD's
 - c. Wiring from mechanical equipment to electrical work termination (junction box or disconnect switch).
 - d. Control switch, pilot lights, interlocks and similar devices.
 - e. Electrical heating coils and similar elements in mechanical equipment.

- f. Electrical work specified in Division-23 for the HVAC control system.
 - g. Drip pans to protect electrical work.
14. Motors, Starters, Switches: Provide with all motorized mechanical equipment unless otherwise indicated.
15. Piping: Coordinate all pipe routes with adjacent equipment. Do not run piping directly above electrical (or electronic) equipment. Layout drawings for mechanical rooms shall show all equipment and mounting locations.
16. Access to mechanical rooms in new construction shall be located for access without disturbing occupied spaces.
17. HVAC subcontractor shall layout, and mark, all wall penetrations with dimensions and elevations during framing layout for coordination of all trades. These shall also be shown on shop drawings.
18. Provide UL listed penetration details including sleeves as needed to allow passage of items installed under any section of Division 23.
19. Interruption of existing services: Any interruption of existing services shall be coordinated 2 weeks in advance with the B C P M . Shutdown time and duration of critical services shall be approved by the Owner.
20. Cleaning and protection
- a. Ductwork and Components: Keep the interior of the duct system free from dirt and rubbish and other foreign matter by use of temporary protection film on each duct component. All fan motors, switches, and other items, shall also be protected from dirt, rubbish and other foreign matter during building construction. Thoroughly clean all components of the ductwork and remove all dirt, scale, oil and other foreign substances which may have accumulated during the installation process. Remove all pen/ permanent marker markings from duct & equipment.
 - b. Equipment: All mechanical equipment provided shall be thoroughly cleaned of all dirt, oil, concrete, etc. Any dents, scratches or other visible blemishes shall be corrected and the appearance of the equipment made "like new" and to the satisfaction of the BCPM. Keep the interior of the equipment free from dirt and rubbish and other foreign matter.
 - c. Upon completion, and before final acceptance of the work, all debris, rubbish, leftover materials, tools and equipment shall be removed from the site.
 - d. Temporary/Permanent Filters: Install temporary filters on supply and return grills during construction (MERV 7). Provide temporary filters in mechanical equipment (AHU's, FCU's, Split Units, etc.). Install permanent filters at TCO date. Provide one complete replacement set of filters and belts as attic stock.
 - e. CPU's required to monitor and operate equipment shall be rack mounted in data rooms. Do not locate this equipment in mechanical/electrical rooms.

21. Shop drawings

- a. Submit shop drawings for duct layouts, enlarged mechanical room layouts with sections and elevations, piping, duct and piping penetration locations and dimensions, dampers, fire alarm devices, RCP overlay, known obstructions, condensate drain routes, valves, temperature sensors, NEC clearances for electrical connections. The design team shall coordinate shop drawings between trades prior to submission to Owner.
- b. Shop drawings shall clearly show Technical and descriptive data in detail equal to or greater than the data given in the item specification. Indicate all characteristics, special modifications and features. Where performance and characteristic data is shown on the drawings or specified, submitted data shall be provided in a degree which is both quantitatively and qualitatively equal to that specified and shown so that comparison can be made. Present data in detail equal to or greater than that given in item specification and include all weights, deflections, speeds, velocities, pressure drops, operating temperatures, operating curves, temperature ranges, sound ratings, dimensions, sizes, manufacturers' names, model numbers, types of material used, operating pressures, full load amperages, starting amperages, fouling factors, capacities, set points, chemical compositions, certifications and endorsements, operating voltages, thicknesses, gauges and all other related information as applicable to particular item.
- c. Shop drawings technical information brochure
- d. Submit to B C P M , within fifteen days after Notice to Proceed, a hard-cover, 3-ring binder, 8-1/2" x 11" submittal package. Provide correct designation on outside cover and on spine of binder, i.e., mechanical. An electronic (AutoCAD/PDF format) copy shall also be submitted. All shop drawings shall be submitted at one time; partial submittals will not be accepted.
- e. The first page shall list all the Project related information (Broward College Project Number, Campus, Building Number, Architect/Engineer, Contractor, and all major subcontractors and suppliers name and contact information) for this Project. The second page in the submittal package shall be a photocopy of the Division 23 Index from the project specific specifications.
- f. Provide reinforced separation sheets tabbed with the appropriate specifications section reference number and typed index for each section.
- g. Shop drawing technical and descriptive data shall be inserted in the brochure in proper order on all items. Mark the appropriate specification section or drawing reference number in the right hand corner of each item. Provide complete information, including, but not limited to, wiring and control diagrams, scale drawings showing that proposed substitute equipment will fit into allotted space (indicate all service access, connections, etc.), test data, and other data required to determine if equipment complies fully with the specifications. All typewritten

pages shall be on contractor or equipment manufacturer printed letterhead.

- h. Shop drawings for piping systems and duct systems (*mandatory*). The HVAC systems in this project are of a higher than normal complexity and will require the mechanical/sheetmetal contractor to produce shop drawings for piping systems and duct systems. All shop drawings shall be done in minimum AutoCAD/PDF format and shall be of sufficient scale to verify clearances and equipment locations. AutoCAD base files of the building will be provided to the contractor. Shop drawings shall show actual approved mechanical equipment dimensions and all maintenance and operational clearances required. Shop drawings shall also include sections through congested areas such as the corridors of the first and second floors including lighting, multiple levels of ductwork, etc. All trades should be coordinated. Title drawings shall include identification of project and names of Architect, Engineer, Contractor, subcontractor and/or supplier, date, be numbered sequentially and shall indicate the following:
 - i. Architectural and structural (as required) backgrounds with room names and numbers, etc., including but not limited to plans, sections, elevations, details, etc.
 - 1. Fabrication and Erection dimensions.
 - 2. Arrangements and sectional views.
 - 3. Necessary details, including complete information for making connections with other work.
 - 4. Kinds of materials and finishes.
 - 5. Descriptive names of equipment.
 - 6. Modifications and options to standard equipment required by the contract.
 - 7. Leave blank area, size approximately 4 by 2-1/2 inches, near title block (for Engineer's shop drawing stamp imprint).
 - ii. In order to facilitate review of drawings, insofar as practicable, they shall be noted, indicating by cross reference the contract drawings, note, and/or specification paragraph numbers where item(s) occur in the contract documents.
 - iii. Also provide shop drawings, using architectural reflected ceiling plans, which indicate locations of the following (to be verified by Contractor): Air distribution devices, sprinkler heads, lights and access panels.
- i. Air handling unit and ductwork configuration shop drawings
 - i. Contractor shall submit a shop drawing for each air handling unit. Such shop drawings shall meet the following requirements:
 - 1. Be drawn at not less than a scale of 1/4" = 1'-0". Contractor may elect to use a larger scale if he desires (i.e., if drawing of unit is at 1/4" = 1'-0", 1/2" = 1'-0" may be used.).

2. Clearly show all proposed ductwork configuration changes (sizes, routing, and similar differences) which are different in any respect from the Drawings. Extent of shop drawings shall show all ductwork to and from each unit beginning with and terminating at those points where ductwork is intended to remain unchanged as shown on Drawings. Coordinate with other trades for potential conflicts.
 3. Where proposed changes affect any other work such as structure, housekeeping pads, piping, equipment, electrical work or any other work, shop drawings shall clearly show those proposed changes.
 4. Where Drawings show units in plan only, shop drawings shall show proposed units in plan and also in elevation in 1/2" scale. Elevation shall include all related components and controllers associated with the units.
 5. Shop drawings shall also show exact locations of related work (such as bar joists, columns, beams, sound attenuators, and like items) which affect the proposed ductwork routing and unit location and configuration.
 6. Each section of each air handling unit shall be clearly identified in plan and elevation views. Indicate access door orientation, filter pull, coil and miscellaneous clearances (i.e. blower motor, coil section, fan section, filter section, mixing box section, etc.).
 7. Include copy of all operating manuals.
 8. Failure to submit these shop drawings together at the same time with the air handling unit shop drawings will result in total disapproval of the proposed air handling units. Time delays or other reasons will not be considered.
22. Maintenance information: Submit for acceptance Maintenance Information consisting of manufacturer's printed instruction and parts lists for each major item of equipment. After acceptance, insert information in each Technical Information Brochure. Refer also to other sections which may describe maintenance.
23. Manufacturer's acceptance: Acceptance by Manufacturer's Representative (for major items of equipment): At completion of construction and after performance verification information as above-mentioned has been gathered, submitted and accepted, provide one copy of this information to the manufacturer's representative. Work required under this section shall include having the representative examine the performance verification information, check the equipment in the field while it is operating, and sign a startup certification and at final completion, an acceptance certification for record. Submit a copy of the certification on each major item of

equipment for each brochure. Certification shall be inserted on each brochure with the performance verification information and submittal data. Certifications shall be submitted before equipment is placed into operation and prior to request for final acceptance.

24. System warranty: The work required under Division 23 shall include a one year warranty. This warranty shall be by the Contractor to the Owner to replace for the Owner any defective workmanship, equipment, or material which has been furnished under this Contract at no cost to the Owner for a period of one year from the date of acceptance of the System. This warranty shall also include reasonable adjustments of the system required for proper operation during the warrantee period. Explain the provisions of warrantee to Owner at the "Instruction in Operation Conference".
25. Owner's demonstration and training: The Contractor shall give notice in writing to the BCPM that they are ready to give the Owner an "Instruction in Operation Conference". After the above mentioned request is received, the BCPM will notify the Contractor the time and date the conference can be held with the Owner. At the end of the conference, a copy of the memo certifying Instruction in Operation and Completed Demonstration shall be signed by the Contractor, Subcontractor, and Owner, and a copy inserted in each brochure.
26. Acceptable manufacturers: Materials and Equipment specified in these contract documents are accepted only in regards to general performance and quality. It shall be the Contractor's responsibility to insure that acceptable materials and equipment meet or exceed the efficiencies, capacities, electrical characteristics, performance and quality of the equipment herein specified. Acceptable equipment must also generally conform, without extensive modification of related systems to the accessories, weights, space and maintenance requirements, etc., of the specified equipment. Any modification to related systems of this or other trades shall be made at the Contractor's expense and the Contractor shall be responsible for coordination between trades. Any difference in capacity, efficiency, electrical characteristics, weights or quality of product, etc., between specified materials and equipment and acceptable alternates shall be submitted to the BCPM and Architect/Engineer for acceptance within 15 days of Notice to Proceed.
27. Operating and Maintenance Manuals:
 - a. Provide three Instructions and Maintenance Manuals.
 - b. Hardback three-ring loose-leaf binders.
 - c. Title sheet with job name, Contractor's, subcontractor's control subcontractor and related contractor's or material supplier's names, addresses and phone numbers.
 - d. Index of contents.
 - e. A signed copy of acknowledgment of instructions to the Owner or his authorized representative. Two additional copies of the signed acknowledgment shall be sent directly to the Architect as soon as possible after receipt.
 - f. Typewritten operating instructions for the Owner's personnel describing the following for each piece of equipment and systems:
 - i. How to start and stop each piece of equipment.
 - ii. How to set equipment and systems for normal operation.

- iii. Normal restarting procedures before contacting the service contractor.
- iv. Complete description of functions and operations of each piece of equipment including description of how equipment operates in conjunction with automatic control systems.
- v. Instructions for cleaning, oiling, greasing, fueling and similar tasks.
- vi. Approved shop drawings and submittal data and parts and maintenance booklet for each item of material and equipment furnished under this Division, including (but not limited to) the following: Spare parts list and source of supply for each equipment item; List of valves with location, service, size, model and operating position; Diagrams clearly indicating automatic control hook-up; any as-built wiring diagrams as called for in other sections of this division as needed to show how equipment controls interface with related systems.
- vii. Copies of certificates of inspection.
- viii. Guarantees/Warranties.

28. Verbal and Video Maintenance Operating Instructions:

- a. Contractor to provide verbal, hands-on, operating and maintenance instruction to Owner's authorized personnel for each equipment item and system. Instruction shall be given by competent personnel and videotaped. Video to be submitted with O&M manuals submittal.
- b. Duration: Total instruction period for all systems of this Divisions 22 and 23 shall be issued not less than fifteen (15) working days from the Certificate of Occupancy.

29. Verbal instruction at the site for the following equipment items and systems shall be given jointly by the contractor and the authorized manufacturer's service representative:

- a. Air Handling Units (4 hours)
- b. Chillers, Cooling Towers (5 hours each)
- c. Exhaust Fans (2 hours)
- d. Pumps (2 hours)
- e. Fan Coil Units) 2 hours)
- f. Terminal Units. (2 hours)
- g. Energy Recovery Ventilators.(2 hours)
- h. DDC Controls (24 hours)

23 05 13 Common Motor Requirements for HVAC Requirements

1. Acceptable Motor Manufacturers:
 - a. General Electric.
 - b. Westinghouse.
 - c. Baldor Electric Co.
 - d. Emerson.
 - e. Lincoln.
 - f. Reliance Electric
 - g. Gould Electric
2. Motors shall be totally enclosed fan cooled (TEFC) for all applications, unless application requires otherwise; . i.e., explosion proof where flammable vapors may be present, or any other special type as required by the equipment motor manufacturer's recommendations. All motors shall be rated as HE high efficiency type.
3. Motors designated to operate with a variable frequency drive shall be approved by the manufacturer of the variable frequency drive equipment and the manufacturer of the motor to insure quiet and stable continuous operation over the entire speed range and shall be provided with shaft grounding devices to protect motor bearings.
4. Select motor horsepower to exceed load brake horsepower by 20% to allow for balancing and unforeseen construction conditions.

23 05 16 Expansion Fittings and Loops for HVAC Piping

1. Where required, expansion fittings and loops for HVAC piping shall be twin reinforced rubber spheres or flexible-hose type.

23 05 20 HVAC Piping:

1. Chilled and heating system piping shall be schedule 40 black steel with welded or malleable iron fittings or polypropylene-random (PPR) piping with heat-fusion joints for sizes 2" and larger. Copper, type L, hard drawn pipe shall be used for 1½" and smaller; fittings shall be wrought copper, solder joint, pressure type. Mechanical fittings may be used for iron pipe in accessible above ground locations; mechanical fittings shall be of a single U.S.-based manufacturer. Press-fit fittings may be used for copper piping in accessible above ground locations. Push-on fitting shall not be used. Provide dielectric fittings between dissimilar metals.
2. Chiller condenser water piping shall be schedule 80 PVC with schedule 80, solvent cement welded fittings.
3. Condensate piping shall be Type M or Type L hard drawn copper with wrought copper, solder joint fittings.
4. Where required, fuel oil piping shall be schedule 40 black iron with malleable iron fittings.

23 05 23 General-Duty Valves for HVAC Piping

1. Valves 2 inches and smaller shall be full port ball valves. Valve larger than 2" shall be gate valves. Basis of design manufacturer shall be Nibco.

23 05 29 Hangers and Supports for HVAC Piping and Equipment

1. ***All horizontal piping and ductwork shall be supported from the structure.***
2. Preferred manufacturer for hangers and support fittings is Grinnell Mechanical Products. Acceptable alternates are :
 - a. F&S Manufacturing Corp.
 - b. Fee and Mason Manufacturing Co.
3. Hangers In Contact With Copper Piping shall be copper plated or Teflon coated; tape or other isolating material is not acceptable.

Hangers other than in Contact with Copper Piping shall have manufacturer's standard finish.

4. Provide insulation shields for all insulated pipe.
5. POWDER (GUNPOWDER) ACTUATED FASTENERS are not allowed.

23 05 48 – Vibration Isolation Equipment

1. Provide vibration isolation supports for all equipment and ductwork, as required, to prevent transmission of vibration and noise to building structure, including air handling units, fans, ductwork, pumps, and similar items.
2. Acceptable manufacturers:
Consolidated Kinetics; Mason Industries; Amber-Booth; Keflex; Flexonics; Vibration Eliminator Company.
3. Select all vibration isolation equipment based on recommendations by the manufacturer for each particular application.
4. Unless otherwise noted, spring type vibration isolators shall be used for all motor driven equipment. Provide isolation pads or mounts for equipment having internal vibration isolation for motor driven components, such as air-handling units or chillers.
5. Protect all isolators exposed to weather from corrosion by suitable coatings or finishes
6. Flexible Pipe Connectors shall have the same internal diameter as the pipe in which the connector is installed (not necessarily internal diameters of inlets or outlets of equipment) and be able to absorb the combination of vibratory and/or expansion or contraction motions (lateral and/or axial and/or angular) encountered at each installation.
7. Provide acoustic seals at all wall, ceiling and floor openings

through which pipe runs from equipment rooms into adjoining spaces.

23 05 53 Identification for HVAC Piping and Equipment

1. Provide complete identification of the mechanical systems including piping, valves and Equipment (i.e.: pumps, AHUs, VAV boxes).
2. This section directly relates to piping and the interconnected equipment and component items for the following systems:
 - a. Refrigerant Piping.
 - b. A/C Condensate.
 - c. Heating Hot Water.
 - d. Chilled Water
 - e. Interconnecting piping, components, and equipment
3. Provide schedules of all items bearing identification; valve schedules shall be posted in all mechanical and custodial rooms in each building.

23 07 13 Insulation, HVAC

Provide insulation on all HVAC system component surfaces operating at temperatures that may create condensation, be hazardous, or where heat gain or loss inhibits proper system operation. These include, but are not limited to, heating water and chilled water supply and return piping, pumps, supply air and outside air ductwork, exhaust air ductwork less than 10 feet from the exterior discharge point. Return air ductwork within the building insulated envelope, equipment that is factory pre-insulated may need no additional insulation unless additional non-factory-installed insulation is required for service and conditions.

1. The total insulation system including insulation, sealant, finishes, etc. shall comply with or exceed all code requirements. All materials and adhesives used shall conform to the requirements of NFPA 90A as to flame spread and smoke developed ratings.
2. Provide the following insulating materials:
 - a. Heating, Chilled water, and Condensate piping:
 1. Pre-formed rigid fiberglass with factory-applied kraft reinforced foil vapor barrier jacket not less than 1½ inches thick
 2. Preformed cellular glass with field applied jacket not less than 2 inches thick
 - b. Refrigerant piping
 1. Pre-formed rigid fiberglass with factory-applied kraft reinforced foil vapor barrier jacket not less than 1 inch thick
 - c. Pipe insulation jackets: In exterior locations, provide full aluminum jacketing in addition to the insulation and jacket listed above.
 - d. Duct insulation:
 1. Fiberglass flexible blanket wrap factory laminated to a reinforced foil kraft (FRK) vapor barrier not less than 1½ inches thick

2. Fiberglass semi-rigid board with a foil scrim-kraft (FSK) reinforced laminate of aluminum foil and kraft bonded to provide a metallic surface finish vapor barrier not less than 1½ inches thick
3. Provide hanger or pipe support shields of 16 gage (minimum) galvanized steel over or embedded in the insulation to prevent deformation of insulation. fastened with pipe straps at each end.
4. Insulate Valves, Cocks and Specialties as for the related piping system in which they are located.
 - a. Ambient conditions for the purpose of insulation thicknesses shall be:
 1. Interior: 80oF and 80% RH.
 2. Exterior: 90oF and 80% RH.
5. Duct systems
 - a. Locations and extent of both internal and external insulation for duct systems are described in section entitled "Ductwork" and/or by the "Duct Type and Location Schedule" on the Drawings.
 - b. Internal Insulation: Ductwork which is required to be insulated internally (acoustically/thermally lined) shall be insulated as work of the section entitled "Ductwork".
 - c. External Insulation: Ductwork which is required to be insulated externally shall be insulated as work of this section.
 - d. Factory Insulation: Ductwork which is factory manufactured with internal or external insulation is not to be additionally insulated as work of this section unless specifically stated. Such factory insulated ductwork generally consists of flexible externally insulated ductwork and double walled acoustically thermally lined ductwork.
 - e. Interior, Concealed (e.g., ceiling plenums): Where external insulation is required, insulate externally with 2.2 inch thick fiberglass blanket wrap (Type DI-1). Adhere duct insulation using adhesive (Type A-F1) applied in accordance with the manufacturer's recommendations. Where duct width exceeds twenty-four inches (24"), the insulation shall be additionally secured to the bottom of the duct using mechanical fasteners spaced one foot (1') on center. Insulation shall be applied with edges tightly butted, and all joints and breaks in the vapor barrier sealed using glass fabric and mastic applied in conformance with manufacturer's recommendations.
 - f. Interior, Exposed, (e.g., air handling unit rooms, areas without ceilings, etc.): Where external insulation is required, insulate with 1-1/2"-inch thick semi-rigid fiberglass board (Type DI-2). Adhere to ductwork with adhesive (Type A-F1). Finish joints and seams with finish fabric (Type FF-GP1).

- g. Provide double-wall insulated galvanized steel duct for all supply and return air ducts within 20 feet of mechanical equipment discharge and return connections. This applies regardless of duct pressure rating.
6. Duct systems equipment
- a. General: Insulate as follows unless detailed to a greater extent on the Drawings.
 - b. Fire Damper External Surfaces:
 - i. Externally Insulated Duct Locations: Extend duct insulation up face of fire damper to damper sleeve. Seal insulation edges with 4-inch minimum width duct tape.
 - ii. Internally Insulated Duct Locations: Provide additional external insulation from a point on the duct 12 inches from the fire damper to the fire damper and on the face of the fire damper to the fire damper sleeve. Seal insulation edges with 4-inch minimum width duct tape.
 - iii. Air Distribution Devices: Insulate the backs of all ceiling diffusers and other air outlet devices installed in other than return air plenums as specified for interior concealed ducts.
7. Cold equipment and related components
- a. Condensate Drain Piping From Cooling Equipment:
8. Interior, and Exterior, Protected: Insulate with fiberglass pipe insulation. Thickness 3/4-inch. Provide 25/50 flame/smoke rating.

23 09 00 Instrumentation and Control for HVAC

- 1. Electrical/mechanical work: All controllers shall be manufactured or shipped as integral with Division 23 equipment:
 - a. All electric motors and other electrical power consuming equipment (such as electric air heating coils, electric boilers, electric hot water heaters, etc.).
 - b. All control circuits (including conduit and boxes) from the Division 26 panels to point of use including the necessary circuit breakers.
 - c. All other control circuits, including conduit and boxes.
 - d. All control connections to equipment.
 - e. All control connections to controllers, switches, motors and other mechanical systems electrical power consuming equipment (such as electric air heating coils, electric boilers, electric hot water heaters, etc.).
 - f. Auxiliary control devices.
 - g. All control devices (thermostats, pressure switches, flow switches, humidistats, etc.) and make control circuit connections thereto.
 - h. Any and all electronic and electric control devices and electric connections thereto.
- 2. Furnish: All controllers which are generally manufactured and/or shipped as separate

but companion items to Division 23 equipment (such as centrifugal chiller starters which are matched with the chillers but are not physically an integral part of the chiller assembly.)

3. Auxiliaries and accessories: Include all auxiliaries and accessories for complete and properly operating systems.
4. All temperature gauges shall be mounted in wells.
5. Provide electronic controllers with pneumatic actuators for chilled water control valves

23 09 23 Direct-Digital Control System for HVAC

1. Furnish all labor, materials, equipment, and service necessary for modifications, and additions, to the existing DDC temperature control system in the building or for new systems in Broward College buildings, as defined by ANSI/ASHRAE Standard 135B2001, Direct Digital Controls, electronic interfaces and actuation devices, as shown on the drawings and as described herein. The existing Broward College DDC infrastructure is Andover. All controls for renovation and new projects shall be provided by Andover, Inc. and shall be accordance with the Broward College DDC standards and requirements.
2. The control system shall use an open architecture that matches the existing campus control system. No substitutions shall be accepted.
3. Use Native BACnet. as the common communication protocol between all controllers and integral ANSI / ASHRAE™ Standard 135B2001.
4. The System shall provide local and remote Web-Based Graphical User interface where the owner may make all adjustments, settings, and changes through the same software during any single session without having to launch an additional piece of software. Remote communications, using Windows Professional compatible software, shall allow operator to view and change all information, associated with system on color graphic displays. Operator shall be able to change all parameters in this section from off-site location including all programming of global controllers and programmable terminal unit controllers. The system shall be capable of supporting an unlimited number of web browser clients. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. User log-on identification and password shall be required.
5. Use Broward College's standard sensor and process signals.
6. System shall periodically gather energy extended log data stored in the field equipment and archive the information.
7. System software shall be capable of graphing the Energy log data.
8. Provide basic operator training for a minimum of 3 persons, as required, up to 16 hours. Demonstrate complete operating system to Owner's Representative.

23 09 25 Variable Frequency Drives

All VFD's shall comply with latest IEEE 519 – "Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems", and the latest applicable standards of ANSI, NEMA and the NEC.

1. All VFD's shall be manufactured by Yaskawa. Other manufacturers are not acceptable and will not be considered.
 - a. VFD's shall be of the 6 pulse for motor HP <100 and 12 pulse or greater for motor HP > 100, Pulse Width Modulated (PWM) design using a two-step operation. VFD's utilizing a third power section are not acceptable.
 - b. The VFD's shall be able to start into a spinning motor.
 - c. Power Factor Correction capacitors shall not be utilized to meet motor performance criteria.
 - d. All VFD's programmable parameters shall be adjustable from a digital operator keypad located on the front door of the VFD,
 - e. The front door of the unit shall have a "hand/off/auto" switch.
 - f. VFD assembly shall contain a separate, across-the-line magnetic starter, sized to match motor and arranged for manually-activated emergency use in event of VFD system failure, controlled by same input data as VFD system.
2. The service package shall include a comprehensive (replacement parts and labor) two-year warranty from date of Owner Acceptance or Substantial Completion (whichever is later) for all VFDs provided.
3. Provide a minimum of 16 hours of training for all VFDs for the Owner and Owner's maintenance personnel.

23 23 13 Refrigerant Piping, Valves and Specialties

1. Refrigerant system piping shall be ASTM B280, Type L (refrigerant grade), dehydrated and sealed, seamless, hard drawn temper.
2. Fittings shall be refrigerant grade, wrought copper, long radius, solder joint type conforming to ASME B16.22. Joints shall be made with silver brazing alloy using a non-corrosive flux, specifically designed for silver brazing.
3. Provide refrigerant specialties, including refrigerant valves, filter-driers, moisture indicating sight glass, expansion valves, charging connections, isolation or shut-off valves, and similar items in each system.
4. Install any refrigerant piping which is below slab or grade in Schedule 40 PVC piping.

23 25 00 HVAC Water Treatment

1. Provide water treatment for all HVAC water piping systems including chilled water, heating water, glycol, and open-loop recirculating systems. Treatment shall include:
 - A. Cleaning and flushing, including metal passivation. Flush and clean dirt legs and strainers.
 - B. Leak testing; perform at three (3) times operating pressure, with nitrogen, for not less than 24 hours.
 - C. Chemical treatment suitable for open or closed loop, fluid composition, piping and system material, and temperatures, as required.
2. Provide a Chemical and Service Program for one year following date of Substantial Completion. Contract with Owner's water treatment specialist/vendor to provide this service.

23 31 00 Metal Ductwork

1. Provide complete duct systems; plenum return systems are not acceptable. Submission of SHOP DRAWINGS is **MANDATORY** and shall include complete data on all prefabricated duct and fittings; duct sealing materials; duct joining and seaming methods; and all other items. Shop drawings shall also include partial plans for mechanical equipment rooms, and congested areas; at a minimum 1/4" per foot scale. All duct dimensions shall be nominal internal dimensions; account for insulation and other items affecting clearances.
2. All ductwork, fittings, and accessories, including materials, shall conform to the latest edition of SMACNA "HVAC Duct Construction Standards, Metal and Flexible" for the pressure and velocity classification required. Provide duct of galvanized steel unless required by system or application.
3. ***All horizontal ductwork on this project shall be supported from the structure. Where a horizontal fire-rated ceiling assembly is between the ductwork and structure, that is connected to the structure all duct hangers and supports shall be carefully coordinated with the fire-rated assembly to maintain the existing rating at the completion of the hanger installations.***
4. Interior of ductwork/sheet metal plenums visible through registers, grilles, or diffusers **shall be painted flat black.**
5. Do not route ductwork through transformer vaults and electrical equipment spaces and enclosures, and data equipment rooms.
6. Provide all curved elbows with radius ratios of not less than 1.5 unless otherwise shown. Provide all mitered elbows with turning vanes.

- A. Connect flexible ductwork to collars on rigid ductwork and diffuser collars and terminal devices with stainless steel worm gear driven type locking clamps. Stainless steel ductwork shall be secured with stainless steel bands and clamps only. **Plastic Cable or "ZIP" Ties are not permitted to connect ductwork.**
 - B. Flexible duct between rigid duct and diffusers shall be a **MAXIMUM of 6 feet** in length and shall be fully extended with a maximum equivalent of (2) 90 degree bends (no bend shall be made with centerline radius of less than one duct diameter).
 - C. Flexible duct shall be supported at ends and at each 90 degree bend. Maximum permissible sag is 1/2 inch per foot of spacing between supports.
7. Hangers and supports shall comply with latest applicable SMACNA construction standard.
 8. **Tape is not allowed to achieve seal class on ducts.** Use mastic or a combination of mastic and embedded fabric: Use mastic/mesh/mastic as a sealant where pressure/velocity classification is equal to and exceeds P/VC-3, and where any spaces between metal surfaces at transverse joints or longitudinal seams or duct wall penetrations exceeds 1/16-inch.
 9. LEAKAGE TESTING:
 - a. Leak test the following duct systems:
 - i. All rigid ducts which are directly connected to air moving device (air handling unit, exhaust fan, supply fan or similar air moving equipment).
 - ii. All rigid ducts which are part of a supply, return, outside and/or exhaust air system.
 - b. Duct systems shall be constructed so that leakage does not exceed 5.00% of the air quantity handled by the respective fan, measured a test pressure which is equal to the pressure/velocity classification of the duct system .
 10. Duct types shall be as follows:
 - a. Supply/Discharge Ductwork from VAV AHU's to the inlet of each VAV terminal unit - High/Medium pressure ductwork/Seal Class A.
 - b. Supply Ductwork downstream/discharge side of the VAV terminal units – Low pressure ductwork/Seal Class C.
 - c. Toilet and Ventilation Exhaust Ductwork – Low pressure ductwork/Seal Class C.
 - d. Return and Relief Air Ductwork – Low pressure ductwork/Seal Class C.
 - e. O/A Ductwork – Low pressure ductwork/Seal Class C.

23 33 00 Air Duct Accessories

1. Provide all necessary duct system accessories to assure proper balance, quiet and draft-free distribution and conveyance, and minimization of turbulence, noise and pressure drop for all supply return, exhaust and ventilation air quantities indicated.
2. Coordinate all items affecting the duct systems including but not limited to the following items: air handling units, exhaust fans, supply fans, sound attenuators, duct mounted coils, access panels air distribution devices, fire dampers, outside air louvers, hoods, filters, roof curbs, structural framing, roof construction, and roofing.
3. SHOP DRAWINGS - Include complete data on: flexible connectors; manual volume dampers including operating hardware; extractors; turning vanes; automatic shutters and all other items.
4. Flexible duct connections shall be at least 4 inches long. "
5. Splitters shall be constructed of at least the same gauge galvanized steel as the duct wherein they are used, but not less than twenty-two (22) US gauge. Use in low pressure duct systems only..
6. Metal turning vanes - Provide permanently fixed type in all elbows, bends and tees of low velocity ducts, conveying air at greater than 700 fpm average velocity, and in high pressure ducts of adequate rigidity and strength to be completely flutter proof. Provide air foil type in all mitered elbows, mitered bends, and tees. Barber-Colman "Airturns", Tuttle and Bailey "Ducturns", or Dura-Dyne "VR" with 24 gauge rails and hollow vanes, or equivalent by Titus, Anemostat, or Metalaire .
7. Provide extractors at rectangular branch duct take-offs in low pressure duct systems only. Extractors shall be multi-vane, adjustable, not cause objectionable noise or pressure drop, and allow adjustment of the deflectors from outside the completed ductwork without necessity for puncturing or otherwise penetrating ductwork and/or its vapor barrier. Titus Model AG-45 or AG-225 Volume Extractor, Tuttle & Bailey Type VCL or VLK Vectrol, Waterloo Type DTM or DT2M Extractor, Anemostat "DTB" or "DTA" or Young Regulator "890" or 890A", or equivalent.
8. Provide manual volume dampers in the low pressure air distribution system(s) (including ductwork, return air plenums, etc.) to allow complete balancing of the air supply, return, ventilation and exhaust system(s). These are in addition to dampers integral with grilles, registers, diffusers, or other air inlet or outlet.
 - A. Dampers shall be flutter proof with 8" maximum blade width; multi-blade dampers shall be opposed blade type. Damper shall be fully adjustable, with locking device, from outside the completed ductwork without necessity for puncturing or otherwise penetrating the ductwork and/or its vapor barrier.
 - B. Provide at a point in the ductwork which is a sufficient distance upstream from an outlet (or downstream from an inlet) to attenuate objectionable noise due to damper throttling and to preclude adverse effects on the distribution device.

- i. Dampers in ducts which are exposed or located above "lay-in" or "accessible ceilings": Young Regulator Company Model 817 or equivalent.
 - ii. Dampers in ducts concealed above plaster ceilings or behind dry wall construction: Young Regulator Company Model 817A or equivalent.
 - D. Provide low pressure duct access doors for each manual and motorized damper, fire damper; smoke damper, electric duct heater, air-flow measuring station, other equipment requiring periodic inspection or maintenance, and where access is otherwise necessary.
 - E. Factory prefabricated double wall insulated type of same gauge as duct in which it is installed or 24 US gauge, whichever is greater, galvanized steel with adjustable tension catches and shall be completely gasketed around their perimeters.
 - F. Minimum size shall be as large as is compatible with duct size but not less than the following (provide larger sizes if necessary to permit proper access operation):
(Max. Duct Dimensions: Access Door Size)
 1. 11" and less: 12" x 12"
 2. 12" through 16": 12" x 16"
 3. 17" and over: 16" x 24"
 - G. Doors shall be Ventlok "Access Doors". Install in accordance with manufacturers recommendations using Ventlok #360 sealant or equivalent.
 - H. Test openings - Provide gasketed capped test openings for test equipment (pitot tubes, etc.) on the entering and leaving sides of air handling units and other air handling equipment and heating coils. Ventlok #699-2 or equivalent. Pre-fabricated duct connections - At Contractor's option, prefabricated duct connections as manufactured by Ductmate (or approved equal system) may be used in locations and applications for which the duct connection system is recommended. Use of these connections must meet or exceed specified duct construction quality as related to structural rigidity, pressure, accessibility and other such requirements.
9. All accessories shall conform to the latest editions of applicable SMACNA construction standards.
 10. All accessories installed in double-walled ductwork shall match the material and insulation requirements for double-walled ductwork.

23 33 13 Fire Dampers

1. Fire dampers shall comply with Underwriters Laboratories (UL) Standard 555 and bear the UL test label.
2. Provide a mock-up of each type of fire damper installation in a one-hour fire wall. The mock-ups shall contain all required framing, retaining angles, sleeves, caulking, drywall and other appurtenances as shown on the details and/or the manufacturer's installation instructions. After fabrication the mock-ups shall be approved by the Architect/Engineer. The mock-ups shall remain on the project premises to be used for reference and training purposes.
3. Provide multi-blade type fire dampers in ducts at grilles and registers where required. Provide curtain type fire dampers where required at all other locations.
4. Curtain-type fire dampers
 - a. Fire dampers shall be constructed with casings of 11 gauge galvanized steel with bonded red acrylic enamel finish interlocking type damper blade assembly, and fusible link rated at 160- 165oF unless noted otherwise on the drawings. Provide factory furnished duct installation sleeve. Sleeve shall be minimum 16 gauge for dampers up to 36" wide x 24" high and 14 gauge for sizes exceeding 36" x 24". Dampers shall be Style "B", 100% full duct opening.
 - b. Acceptable manufacturers are: Prefco, American Warming & Ventilating, Inc., Ruskin Mfg. Co., Nailor Hart, Louvers and Dampers and Air Balance, Inc., Safe Air, Greenheck or equivalent.
5. Multi-blade type fire dampers
 - a. Provide multi-blade type spring-driven fire dampers with casing constructed of 10 gauge galvanized steel with bonded red acrylic enamel finish, fusible link 160-165oF (71-74oC), and matching factory furnished installation sleeve.
 - b. Acceptable manufacturers are: Nailor Hart, Ruskin, Louvers and Dampers, American Warming & Ventilating, Prefco and Air Balancing, Inc., Safe Air, Greenheck or equivalent.
6. Provide access doors to facilitate re-linking of fire and fire/smoke dampers.
7. Adhere strictly to damper manufacturer's instructions.

23 33 19 Sound Attenuators

1. Provide factory fabricated sound attenuators where required. Specify required actual minimum attenuation (in decibels) for the indicated octave bands at the design conditions.
2. Shop drawings shall include complete data on: dimensions, airside pressure losses, dynamic insertion losses, regenerated sound level (i.e. self-noise or airflow generated noise), performance certification, performance test method, and materials of construction.
3. Acceptable Manufacturers:
 - a. Rink Division of Krueger/Phillips Industries.
 - b. Commercial Acoustics.
 - c. Transonics.
 - d. Industrial Noise Control, Inc.
 - e. Titus.
 - f. United McGill Corporation.
 - g. Ruskin Sound Control.
 - h. Industrial Acoustics Company. (*Basis of Design*)
4. Construction shall include:
 - a. The outer casings of the attenuators shall be constructed of not less than 22 gauge galvanized steel with seams lock formed and mastic filled, or shall be continuously welded.
 - b. The interior partitions of the attenuators shall be constructed of not less than 24 gauge galvanized perforated steel.
 - c. The silencer filler material shall be inorganic mineral glass fiber of a density sufficient to obtain the specified acoustic performance and shall be packed at not less than five percent (5%) compression to prevent the formation of voids due to vibration or settling. The material shall be inert, vermin and moisture proof, and shall comply with the flame spread and smoke developed ratings of NFPA 90A.
5. Performance - Acoustic and aerodynamic performance shall be tested and certified in accordance with ASTM E477-84 Standard Method of Testing Duct Liner Material and Prefabricated Silencers for Acoustical and Airflow Performance. Airflow pressure drops shall be tested in accordance with AMCA Standards.
6. Where multiple sound attenuators are assembled, by either the manufacturer or the installer, into attenuator banks, the individual attenuators shall be securely fastened together as recommended by the manufacturer. All joints between the assembled attenuators shall be sealed to prevent air leakage as recommended by the manufacturer.

23 34 00 HVAC Fans

1. Provide time-of-day schedule for all exhaust fans associated with AHU's. Exhaust fans shall not operate during AHU pre-conditioning sequences or unoccupied periods.
2. SHOP DRAWINGS shall include complete data on: fan external static pressure, fan rpm, motor rpm, fan tip speed, fan size, fan performance tables or curves showing all possible operating selection points for each fan size (including rating certification), fan brake horsepower, motor horsepower and electrical characteristics, sound level, curb adapter, fan accessories, Fan design mounting meeting the Miami-Dade requirement for 140 MPH wind resistance without the need for cabling tie downs, etc.. The data shall take the form of engineering data sheets, clearly depicting specification compliance, and a complete schedule worked up by fan number.
3. All fans shall be AMCA certified for both sound and performance ratings.
 - a. Greenheck Fan and Ventilator Corporation is preferred as basis-of-design manufacturer; Loren Cook Company and Penn Ventilator Company are acceptable alternate manufacturers. Provide backward inclined fans where possible.
4. Where required, connect inlet ducts to roof curb inlet flanges..
5. Provide unit mounted disconnect switches wherever possible to avoid additional roof-mounted racks or structures.

23 36 16 Terminal Units: VAV, Single-inlet, Electric Heating Coil

1. Provide single inlet, variable air volume (VAV) terminal units.
2. Shop drawings: Refer to Section entitled "General Mechanical Provisions". Include: complete performance data at the scheduled operating conditions; dimensions; performance data; pressure losses; descriptions; discharge and radiated sound power levels at the stated conditions.
3. Acceptable Manufacturers:
 - a. Trane. (*shall be **Basis of Design***)
 - b. Enviro-Tech
 - c. Titus.
 - d. Krueger.
 - e. Metalaire.
4. Terminology: The word "box" or "terminal unit" used throughout this section without any modifying adjective shall mean the entire terminal unit assembly including all other accessories integral therewith, unless otherwise indicated. Terminal units may be referred to as "TU".

Noise criteria:

- a. *The maximum allowable NC level in any occupied space shall not exceed NC20 as a result of radiated or discharge noise from any terminal unit.*
5. Select terminal units for maximum air discharge within the mid-range of the unit rating so that field adjustment of maximum indicated discharge air quantity may be made plus and minus 15%.
 6. Terminal units intended for full shut-off operation shall not have air leakage of more than 2% of nominal box capacity when inlet pressure is 6.0 inches W.G.
 7. Maximum allowable static pressure drop across the control box portion of any terminal unit (i.e., excluding any applicable companion sound attenuator or heating coil) shall not exceed 0.20 inches W.G. Maximum allowable minimum operating pressure of the entire unit shall not exceed 0.50 inches W.G.
 8. Terminal units shall be double-wall, galvanized steel or aluminum casing; insulated between the outer and inner wall with 1-inch thick high density fiberglass insulation to prevent condensation (comply with NFPA 90A); acoustically treated to reduce noise level; air quantity indicator; access panel(s) for complete access to all parts of the assembly which may require service, maintenance and repair. The solid inner liner shall be constructed of 26-gage galvanized steel.
 9. DDC controllers shall be **Andover, Inc.** and shall be factory-mounted in each VAV terminal including damper motors and similar items.. Terminal manufacturer shall coordinate with **Andover, Inc.**
 10. Provide each terminal unit with an integral, factory-mounted electric heating coil and control panel with integral disconnect on the door of the heating coil control panel.
 11. Select controls for pressure independent operation: units shall be able to maintain constant discharge flow for any given set-point with any variation in inlet static pressure between 0.2 inches W.G. and 6.0- inches W.G. and shall be factory set for design air flow and for minimum air flow.
 12. Locate terminals so that access for repair, maintenance and adjustment is easily facilitated without removal of other permanently located items which are in the immediate vicinity of boxes (this excludes removable ceiling panels, removable air distribution devices attached to flexible ductwork and other similar items).
 13. No terminal unit outlet (including companion sound attenuator, if needed) shall be nearer than 60-inches from the first flexible duct connection take-off to the first downstream air distribution device.

23 37 13 Air Distribution Devices

1. Insulate air distribution devices to prevent condensation formation.
2. Acoustical: Noise produced at each diffuser, register, grille or other air distribution device shall not exceed a noise criteria level of NC 20 based on sound pressure levels in db re 0.002 microbars unless otherwise indicated. Coordinate air distribution devices, sound attenuation measures and equipment actually provided to insure that this design constraint is not exceeded by the system installed.
 - a. Exceptions: Any particular rooms or areas which are normally occupied by other than maintenance staff or service staff and which may be noted on the drawings as requiring lower NC criteria.
 - b. Pressure Drop: Pressure drop across any air distribution device shall not exceed 0.15 in W.G. static pressure unless otherwise indicated.
3. All air distribution devices shall be submitted in a detailed air device schedule indicating the specific performance requirements for each air device. **No exceptions.** The schedule shall include the dimensions, airflow, static pressure, NC levels, air outlet velocity, and room location.
4. Acceptable Manufacturers:
 1. Titus.
 2. Metalaire.
 3. Price.
 4. Krueger.
5. Other requirements:
 - a. Each air distribution device which has a portion thereof (frame, core, etc.) exposed to view in the finished area shall have a factory applied finish which matches and is compatible with the color of the surrounding surface on which the device is installed. Colors must be approved by Architect prior to device fabrication. Duct interiors, air distribution device interiors, and blank offs shall be painted with flat black enamel to eliminate light reflectance from the inside of the duct system. Visible fasteners shall be furnished with the air distribution equipment and be finished at the factory to match the finish on the grille, diffuser, or register in which they are to be used.
 - b. All louvers, dampers and/or shutters shall be rated by their manufacturer in accord with AMCA Standard 500-74.
 - c. All dampers, blank-off baffles and other companion devices which form an integral part of air distribution device shall be factory made items produced by the manufacturer of air distribution device.
 - d. Louvers may be specified in another division but for reference may also be indicated on mechanical drawings.

- e. Door grilles may be specified in another division but for reference may also be indicated on mechanical drawings.
 - f. All devices shall comply with the applicable portions of the Air Diffusion Council (ADC) Equipment Test Code 1062R4 "Certification, Rating and Test Manual", the Air Movement and Control Association, Inc. (AMCA) Standard 500 "Test Method for Louvers, Dampers and Shutters" and the "National Fire Protection Association" (NFPA) Standard 90A "Installation of Air Conditioning and Ventilating Systems".
 - g. Provide ceiling and/or linear diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support.
 - h. Diffusers, grilles and registers installed in fire rated assemblies shall be constructed of steel.
6. Lay-in diffusers shall be supported by the inverted T-bar suspension system, but all connected ducts shall be supported independently of the ceiling from the building structure. Hard surface ceiling, sidewall, and duct mounted grilles, registers shall be mounted securely to the surface and duct system flanges using finish screws.
7. Furnish to Owner 3 operating keys for each type of outlet and inlet that require them.

23 41 00 Air Filters and Assemblies

- 1. Provide air filtration for all equipment supplying air to occupied spaces. Provide MERV 8 pre-filters and MERV 14 final filters for each air handling unit. When equipment is not furnished with an air filter section, provide a separate air filter housing assembly. Air filters shall be a standard size, 24" x 24" x 2" or 12" x 24" x 2", unless approved by Broward College.
- 2. Select air filtration assemblies to pass applicable air quantities at velocities and pressure drops which are within manufacturer's recommended operating ranges.
 - a. Acceptable Filter Manufacturers: Camfil Farr; Continental; American Air Filter; Cambridge; Flanders; Purafil.
 - b. Filter Housing Manufacturers shall be the same manufacturer as the applicable filters or same manufacturer as the air handling unit in which installed, whichever manufacturer is applicable.
 - c. Standard or pre-filters shall be extended surface, pleated panel disposable type, MERV 8 per ASHRAE 52.2 test method. Basis of design shall be Camfil Farr AeroPleat IV; MERV-8 High Capacity Pleated Panel Filter.
 - d. Final filters shall be high performance, extended area, deep-pleated, 12-inch thick, disposable type, MERV 13 per ASHRAE 52.2 test method, listed by Underwriters' Laboratory as UL 900-Class 2. Filter shall consist of a filter element, media retainer

holding frame and sealer frame. Basis of design shall be Camfil Farr OptiPac; MERV-14, High-Efficiency.

- e. Provide washable aluminum-mesh filters in outside air intakes prior to air-flow measuring stations, and for bulk OA systems such as kitchen hood make-up air or EHPA supply air.
 - f. Access: Filter sections shall be designed for side service access unless otherwise indicated.
- 3. Provide for easy access to and removal and replacement of filters. Provide access doors and/or panels as necessary.
 - 4. Provide an original filter set and two (2) spare filter sets for each unit having an air handling equipment filter assembly specified above.

23 44 00 Air Purification Systems

- 1. Provide bi-polar ionization air purification systems in each air-handling unit that is not a dedicated outdoor air supply unit. Ion emitters shall be Type 316 stainless steel needle-point style emitting positive and negative ions; mesh tubes and recessed emitters are not acceptable. Emitters shall be mounted inside the AHUs.
- 2. Provide ion detectors for each system with interface to Building Automation System to independently indicate operation of system.
- 3. Provide controls to operate system during operation of AHU.

23 70 00 Central HVAC Equipment

- 1. Air handling unit shall be single path and selected for custom dimensioning to meet the clearances in each mechanical room.
- 2. Supply fan performance shall be certified as complying with ARI Standard 430-89. Coil capacities, pressure drops and selection procedure shall be certified in accordance with ARI Standard 410-91.
- 3. Each air handling unit shall carry a full five-year parts & labor warranty.
- 4. All air handling units shall be of the same manufacturer. All components in factory-furnished air handling units shall be factory-assembled and factory-tested prior to shipping. Basis of design shall be Trane Performance Climate Changer. Carrier 39M and McQuay Vision air handling units are acceptable alternatives. Air-handling units shall have the following features:
 - A. Sectional, insulated, double wall casing with hinged, insulated access doors for each section; separate fan and coil sections, galvanized 18 gauge outer and 20 gauge inner skins with R13 foam insulation.

- B. Insulated, 20 gauge stainless steel, double wall pitched drain pan extending a minimum of six inches downstream of the coil face; insulation 1 inch thick.
- C. Up to two, aluminum blade Class II single width, single inlet direct drive, plenum-type fans.
- D. Copper tube, aluminum fin Coils leak tested to 200 psig and designed for 300 psig working pressure; continuous seamless copper tube with aluminum plate fins not exceeding 12 fins per inch; minimum 16 gauge, Type 304 stainless steel casing with copper headers brazed to tubes with threaded connections. FACTORY-APPLIED Electro-fin coating.
- E. Filter sections with gasketed rails for 2" thick pleated media MERV 8 pre-filter and a 12" thick pleated media MERV-13 final filter. Provide initial start-up set of filters, one complete set of MERV 8 filters for test and balancing and complete set of pre-filters (MERV-8) for all AHU's to provide one complete pre-filter change-out.
- F. Piping, isolation valves, and flanges or unions shall be arranged for unobstructed removal of the coil .
- G. Fans shall be internally isolated free of vibration and excessive noise.
- H. Flange or collar duct connections for flexible duct connection to the supply and return duct connections to prevent transmission of vibration into the duct system.
- I. Six (6)-inch galvanized steel, full perimeter frame channels/rails.

26 00 00 ELECTRICAL

26 00 00 Electrical Design and General

1. Design Approach: Incorporate life-cycle considerations and a holistic approach with respect to energy conservation, properly proportioned demand load considerations, emergency power requirements, and power quality needs. Avoid over-designing of systems.
2. Related Work: All Electrical work to be performed shall be reflected in Division-26 specifications and/or on the Electrical Drawings. Any required electrical work related to other Divisions of the specifications shall be shown on the Electrical Drawings and specified in Division-26.
3. Existing Drawings: Drawings of existing facilities and underground utilities or systems may not be accurate and shall be considered as informational only. Architect/Engineer/CM shall verify field conditions (above ceiling, behind existing furniture, etc.).
4. Communications and Data Systems: The Architect/Engineer shall identify access points and outlets for these systems. Coordinate communications and data systems design and communication duct bank design with the College Project Manager.
5. Ceiling Space: The Architect/Engineer shall coordinate component dimensions above ceilings and verify adequate space is available for all trades.
6. Branch Circuit Design: Where anticipated loads are comprised of a high proportion of equipment utilizing switched-mode power supplies, design in conformance to NEC.
7. Separate Neutrals: Specify separate neutrals on all circuits. Shared neutrals will not be acceptable.
8. Products: Equipment and materials of the same type of classification and use for the same purpose shall be products of the same manufacturer. ie. Motor controllers, disconnects, switch gear and panel boards shall be same manufacturer. Match equipment manufacturer for existing conditions.
9. Classrooms, Conference Rooms and Instructional Spaces: Provide communications/data infrastructure consisting of lighting with motion detection sensors, emergency power, audiovisual, voice, data and electrical distribution.
 - a. Audio-visual screens shall be electrically powered and controlled from AV console.
 - b. Multi-media: Provide connectivity for a classroom multi-media podium.
 - c. Voice Evacuation System: Provide for public assembly areas such as lecture halls, auditoriums and libraries or as required by applicable code.

- d. Laboratories: Provide electrical power to all lab tables from slab or floor below. Ceiling drops for electrical power shall not be used under any circumstances without the BCPM written authorization.
 - e. Equipment list must be provided prior to design and provided on the drawings. Coordinate all proposed equipment requirements.
10. Coordinate Short Circuit Current Calculations: The Architect/Engineer shall determine the proper sizing of circuit breakers in accordance with NEC. Submit calculations to the College for review prior to final construction document submittal. Include calculations on the Electrical Drawings.
 11. Provide arc flash assessment and labeling of all existing and new electrical components.
 12. Voltage Drop Calculations: To meet NEC recommended minimum of 3 percent voltage drop, the Architect/Engineer shall specify the following:
 - a. #12 Wire: 120V 20A circuit 0 to 50 feet to the farthest outlet; 277V 20A circuit 0 to 100 feet to the farthest outlet.
 - b. #10 Wire: 120V 20A circuit 51 to 90 feet to the farthest outlet; 277V 20A circuit 101 to 200 feet to the farthest outlet.
 - c. #8 Wire: 120V 20A circuit 91 to 140 feet to the farthest outlet; 277V 20A circuit 201 to 300 feet to the farthest outlet.
 - d. Wire size required to be increased due to distance shall be the length of the entire circuit.
 13. Aluminum products and materials including, but not limited to, raceways, wires, boxes, and fittings are not permitted for electrical work.
 14. Quality Work: Contractor shall maintain the highest level of quality in the performance of the work. The execution of the work in the installation of electrical equipment shall be performed in a neat and workmanlike manner as required by the current edition of NFPA 70, National Electrical Code. The College and the Code authorities having jurisdiction will strictly enforce this requirement "Area practice" does not relieve the Contractor of the responsibility for conforming to the stated and shown Contract Document requirements.
 15. Coordination: Contractor shall coordinate work specified in other Divisions of the specifications that require electrical installation with the requirements of Division 26 and the contract drawings to ensure all subcontractors involved work together to provide a complete, operational systems at no additional cost to the College.
 16. Exterior Equipment: All exterior electrical equipment and related supports and fasteners shall be stainless steel. Grade of stainless steel shall be a minimum of grade 316.

26 00 50 Electrical and Communication Room Requirements

1. Space: Maximum allowable space shall be allotted to electrical and communications/data equipment rooms to provide ample clear space for the equipment provided and for future needs. Rooms shall be located to be serviced from an interior corridor.
 - a. Rooms shall be a minimum of 10-feet by 12-feet; minimum size for closets shall be 8-feet by 10-feet. Provide a minimum of 50 percent additional wall space for future expansion. Non electrical utilities (ie. Water, HVAC, etc) are allowed to be in this space. HVAC required for the space shall be ducted outside the space.
 - b. Communications/data equipment rooms are not to be calculated as part of the 6 percent space allocation for electrical and mechanical space under State Requirements for Educational Facilities.
 - c. Communications/data equipment rooms are to be include in the net square foot area of the facility that is used to calculate the 6 percent space allocation for electrical and mechanical space.
2. Drawings:
 - a. A/E Construction drawings shall contain enlarged floor plans at 1/2-inch scale of all electrical and communications/data equipment rooms and closets showing the location of all equipment in these spaces. Plan view and elevations of each wall shall be provided. Including, but not limited to, all equipment, pull boxes, junction boxes, grounding systems and exposed conduits.
 - b. The Electrical Contractor shall provide, prior to construction, shop drawings for approval by the Electrical Engineer and BCPM, containing enlarged floor plans at 1/2-inch scale of all electrical and communications/data equipment rooms and closets showing the location of all approved equipment in these spaces. Plan view and elevations of each wall shall be provided. Including, but not limited to, all equipment, pull boxes, junction boxes, grounding systems and exposed conduits.
3. Air-conditioning and Ventilation: Provide all telephone equipment and communications/data equipment rooms and closets with 24-hour air-conditioning. Provide all electrical rooms and closets with air-conditioning unless provided with positive outside air ventilation. Primary HVAC from central station and backup and after hours with a dedicated space AC system. AC system or ductwork shall not be located within the space. AC system shall be controlled through the Building EMS.
4. Ceilings: Provide exposed ceilings in the electrical room. Provide acoustical ceiling in communication/data rooms.
5. Lighting: Provide battery power emergency lighting.
6. Doors: All electrical and communications/data equipment room doors shall swing out.

7. Raceways: Terminate immediately adjacent to the cable trays or backboards. All conduit type raceways, including through the floor stubs, shall terminate in an insulated throat, lay-in lug bonding bushing (RAC01213, or equivalent).
8. Data/Communication Outlets: Provide one in each electrical distribution room.
9. Housekeeping Pads: Provide for all floor-mounted electrical equipment; minimum 4-inches high, 3000 psi concrete with no greater than a 2-inch lip chamfered edge around the equipment.

26 05 19 Manufactured Wiring Assemblies

1. Sequencing: All surface-mounted wiring devices shall be installed only after finish painting is completed.
2. Transient Voltage Surge Protection (TVSS): Provide for all outdoor lighting poles, incoming mains, sub-panels, computer circuits, fire alarm systems, and other sensitive equipment or systems. Refer to Section 16285 for specific TVSS requirements
3. Boxes: No aluminum metal boxes, extensions or mud rings will be acceptable.
4. Outlet box extension rings will not be permitted
5. "Handy" Boxes, 180 boxes, or gangable/non-gangable 2-inch wide ("cut-in") switch boxes will not be permitted
6. Box Height: Minimum receptacle box mounting height shall be 18 inches and switch height 46 inches on center. All finish device height shall be uniform within wall run. No operable switch to be installed above 48 inches.
7. Receptacles: General-duty Simplex or Duplex receptacles shall be 2-pole, 3-wire rated at 125 volts and 20 amps, equipped with green hexagonal equipment grounding screw, ground terminals and poles internally connected to the mounting yoke, with plated ears, back wiring, NEMA configuration 5-20R.
8. GFI: Ground fault interrupter, general-duty duplex receptacles shall be of the GFCI (ground fault circuit interrupter) grounding type, UL rated Class A, Group 1, 20 amp rating, 120 volts, 60 Hz, with solid state ground fault sensing and signaling with 5-milliampere ground fault trip level, NEMA 5-20.
9. Back-wired, feed-thru type, capable of protecting connected downstream receptacles on single circuit are only acceptable where used as a single unit not protecting any other downstream receptacles.
10. Snap Switches: Provide single pole or multi-pole heavy-duty, flush toggle, 20 amp, 120/277 volts AC, commercial grade.

11. Occupancy Sensing Switches: Provide 120/277V, 20 amp units that provide single pole or 3-way switching.
12. Interior Finish Plates: Provide smooth, white plastic wall plates.
13. Installation of Boxes: Where used to enclose flush devices, provide with the proper mud ring to ensure that the front-edge to finish, and side edge to plaster complies with NEC. The use of "goof rings" is not acceptable. One eighth (1/8)-inch maximum setback allowed in non-combustible material walls and flush in combustible material walls per NEC 370-20 & 21. Boxes to be fully mudded in.
 - a. Boxes of any type shall not be supported from ceiling support wires
 - b. Do not install back-to-back; install at least 12-inches apart
14. Installation of Receptacles: Vertical installation shall be with the ground pin down. Horizontal installation shall be with the neutral pin up.

26 05 26 Grounding

1. Grounding Buss: Copper, minimum ¼ x 4 x 12 with 25 percent spare capacity. Provide in the Electrical Main Distribution Room and in all other Electrical Distribution rooms and separate Communication/Data rooms.
2. Equipment Grounding Conductors:
 - a. Architect and Engineer to provide a complete design of all equipment grounding. Providing a grounding symbol and NEC reference only is not acceptable.
 - b. Equipment grounding conductors shall in no case, be run on the exterior of a raceway, on the building surface, or concealed in the building structure. All grounding conductors to be in conduit.
 - c. Termination: Terminate equipment grounding conductors in terminal bars, screws, or lugs expressly designed for the purpose.
3. Grounding Buss Installation: Mount 18-inches above the finish floor of the Electrical Main Distribution Room. Connect to the footer steel, building steel, to two (2) 3/4" diameter by 10 Basic foot long copper-clad driven ground rods, or to the cold water pipe with the proper size copper grounding electrode conductor.
 - a. Interconnect grounding buss to each Electrical Distribution room grounding buss with a tie conductor of the same size as the main grounding electrode conductor.
 - b. Connections: Connect the ground buss in each communications room with a minimum #3/0 copper conductor in 1-inch conduit.
4. Grounding Electrode Conductor. Run enclosed in rigid metallic conduit continuous from the service entrance grounding buss to the grounding electrode.

5. Connections and Terminations to the grounding electrode and grounding electrode conductor shall be made by exothermic welding.

26 05 29 Hangers and Supports for Electrical Systems

1. Performance Requirements: Design supporting devices capable of supporting combined weight of supported systems and components. Do not use cantilever supports.
2. Submittals: Provide shop drawings to the BCPM for approval prior to fabrication and erection of electrical supporting devices for exterior equipment.
3. General Material: Provide cold-formed steel with corrosion-resistant coating acceptable to authorities having jurisdiction. Use 316 stainless steel for outdoor and damp locations, U-channel system components.
4. Raceway and Cable Supports: Manufactured Clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
5. Pipe Sleeves: Stainless Steel or ASTM A53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
6. General Installation: Securely fasten electrical items and their supports to the building structure unless otherwise indicated.
7. Support Clamps for PVC Raceways: Use click-type clamp system.
8. Horizontal Raceways: Support individual raceways with separate pipe hangers or clamps. Arrange for grouping of parallel horizontal conduit runs to be supported together at the proper intervals on trapeze type hangers. No tie wire support acceptable.
9. Threaded Steel Hanger Rods: Use minimum 1/4-inch diameter for support of a single conduit up to a 2" conduit. Single conduits 2" and larger, minimum 5/16" diameter support rod.
10. Arrangement: Arrange supports in vertical runs so the weight of raceways and enclosed conductors are carried entirely by raceway supports, with no weight load on raceway terminals
11. Metal Channel Racks: Install for mounting cabinets, panel boards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
12. Sleeves: Sleeves must be listed. Install for cable and raceway penetrations of concrete slabs and wall unless core drilled holes are used.
 - a. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies.

- b. Install sleeves during erection of concrete and masonry walls.
13. Wall-Mounted Electrical Equipment: Install surface and wall-mounted equipment on Unistrut equivalent supports, installed approved wall backing or 3/4-inch exterior A-C grade or better plywood.

26 05 33 Raceways and Boxes for Electrical Systems

1. Locations, Types, and Sizes:
 - a. All raceways above grade/slab in the building interior shall be metallic unless subject to damage. All systems for lighting, heat, power, or controls shall be installed in 3/4-inch trade size raceways with minimum 3/4-inch trade size.
 - b. All branch circuit home runs shall be 3/4-inch minimum trade size containing not more than one four-wire multi-wire branch circuit plus an equipment grounding conductor (if required) and shall be clearly indicated as such on the Drawings.
 - c. All raceways below grade or under slabs shall be a minimum of 3/4-inch trade size.
2. Aluminum: No aluminum raceways will be permitted.
3. Rigid Galvanized Steel Conduit (RGS): Use where conduit is exposed and subjected to the weather or potential physical damage (ie. mechanical areas, electrical areas, service areas, parking garages, etc).
4. Conduit: Provide rigid steel conduit, in, below, or through concrete floor slabs, vapor barriers, and in masonry or concrete walls. Protect conduit utilizing one of the following methods:
 - a. Field-coated with two coats of bitumastic compound
 - b. Additional outside factory coating of polyvinyl chloride, phenolic-resin-epoxy material, or other equally flexible and chemical resistant material
5. EMT (Electrical Metallic Tubing): May be used for all indoor work exposed or concealed above slab except where subject to physical damage or wet locations.
6. All fittings shall be steel or malleable iron without exception, conforming to ANSI C80.4. Where concealed, fittings may be set-screw type with insulated throat connectors having two (2) set screws in line at each tubing connection for sizes 1-1/4 to 2-inches, and two (2) set screws 45 degrees apart at each tubing connection for sizes 2-1/2 to 4inches.
7. Provide steel or malleable iron compression type, UL listed fittings for rain-tight applications, with insulated throat and casehardened locknuts.

8. The connection of power or communications outlets within permanently installed cabinets and casework shall be concealed and run in EMT.
9. Exposed Connections: Provide Liquid-tight Flexible Metal Conduit, 24-inch maximum length in mechanical rooms, damp and wet locations, or where flexible connections are required.
10. Flexible Metal Raceways: Shall not be used to extend a raceway system, or for the connection of outlets within permanently installed cabinets or casework. Flexible metal raceways shall be steel (no aluminum will be permitted).
 - a. May be used only where they will be concealed but dry and accessible
 - b. May be used for the connection of recessed lighting fixtures where a maximum run of 6-feet will be permitted
 - c. Connections to items requiring frequent maintenance
11. Fittings: Steel or malleable iron, UL listed when used for grounding. No die-cast or pot metal fittings will be permitted.
12. Cable Tray: Use of cable tray is not acceptable unless approved by the College. In those instances where the College has approved the use of cable tray, provide in continuous runs without gaps, field-fabricated fittings, or bends. Only manufactured fittings will be acceptable. Installed cable tray shall be easily accessible with a minimum of 2-feet clear on each side.
13. Surface-Mounted Raceways: Provide a fabricated trough or enclosure with a screw cover to house or enclose data cables, communications cables, and power raceways.
14. Locate to provide easy access for servicing or future expansion or modification of the enclosed systems
15. Provide grommets for power, data and communications cables at proper locations. Size shall be 1-3/4 inches or 2 inches as required.
16. Installation, General: There shall be no single bend exceeding 90 degrees in any conduit run.
17. Stub-Outs: Provide four (4) spare 3/4 inch conduit stub-outs from each panel board and telephone board into the nearest accessible ceiling space. All spare conduits to terminate in a box. Spare to panel to be identified on the box.
18. Pull Wire: Provide a pull wire in all empty raceways. Pull wire shall be #14 TW, Thomas Industries Jet Line #232 polyline 200 lb. Test, or equivalent.
19. Raceways penetrating walls or floors through sleeves shall be sealed and fire-stopped. Refer to Section 07 8413, Fire and Smoke Protection, for additional requirements.

20. Conductors or circuits of differing voltages (i.e., 120/208VAC or 277/480VAC, or Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power Limited circuits, or circuits originating in different panel boards) shall not be installed or contained in the same conduit run.
21. Architectural Millwork and Furniture: Provide a trough or enclosure with a screw cover to house or enclose data cables, communications cables and power raceways.
22. Location: Provide easy access for servicing or future expansion or modification
23. Grommets: Provide 1-3/4 inch or 2 inch diameter units at proper locations for power, data and communications cables.

26 05 53 Identification of Electrical Systems

1. General: Tag all conductors and identify unused conduits in or at outlets, raceways, panels, pull boxes, switch boards, motor controllers, cabinets and similar items. Conductor tags shall be non-conductive or Brady-type markers.
2. Junction Boxes: All lighting and power junction boxes shall be identified by circuit and panel board number and color-coded (refer to section E below) in a permanent manner.
3. Other Devices: All disconnect switches, panel boards, motor starters, system controllers, fire alarm zones, transformers, power outlets (other than ordinary receptacles) shall be identified by installing a permanent plastic laminated engraved nameplate with appropriate designation.
4. Panel Board Directories: Typewritten indicating complete as-built circuit information, and protected by a plastic covering.
5. Load description including location or room number and use indicated for each circuit (as-built documentation shall show corrected information)
6. Panel power source including room number.
7. Provide a master power riser in the main electrical room.
8. Re type directory after additional work is performed in the panel.
9. Panel Schedules: All panel schedules shown on the Drawings and shall include the following:
 - a. Load description including location or room number and use indicated for each circuit (as-built documentation shall show corrected information).
 - b. Panel power source including room number.
 - c. Panel type and capacity, individual load calculations, short circuit, conduit, wire size, grounding, neutrals and overcurrent protection.
10. Color-Coding: Identify all systems by painting the designated color-code on all junction boxes and covers using the following system:

- a. Normal Power - Black
- b. Telephone - Gray
- c. Normal Lighting - Blue
- d. Sound System - Light Blue
- e. Emergency Light/Power - Orange
- f. Energy Management - Pink
- g. Fire Alarm - Red
- h. ATC/AC Control System - Purple
- i. Clock System - Green
- j. Computer/Conditioned Power - Yellow
- k. Data Systems - White
- l. Security - Burgundy
- m. MATV Systems - Brown

26 05 72 Overcurrent Protective Device

1. Application: A listed TVSS device shall be provided for each building service entrance, distribution panel, sub-panel, and individual equipment including motor control center.
2. Purpose: The Transient Voltage Surge Suppression System (TVSS) shall be designed to protect all AC electrical circuits and connected equipment from the destructive, damaging and disruptive effects of lightning induced transients, normal utility load switching activities, and internally generated transients caused by the normal operation of connected equipment, as well as capacitive and inductive load switching that typically accounts for 80 percent of the transient activity at a given facility. Design in accordance with these requirements and those of the TVSS manufacturer.
3. Manufacturer: Basis of design for TVSS manufactured by ERICO and distributed by Omega Power Systems.
4. Standards Compliance: All TVSS components shall be designed, tested, manufactured, listed and installed in accordance with the applicable publications, resources, and standards.

26 05 83 Wiring Connections

1. Neutrals: Separate neutrals are a requirement. Common neutrals shall not be used.
2. Wire Size: 120 volt/20 amp branch circuits supplying lighting, receptacles exceeding 100 feet from the overcurrent device to the connected device and all 277 volt/20 amp lighting circuits exceeding 150 feet from the overcurrent device to the first outlet shall be #10 AWG for the entire branch circuit. Circuits exceeding 200 feet to the first outlet shall be #8 AWG for the entire branch circuit. Verify voltage drop prior and after installation.
3. Grounding:

- a. Provide a copper equipment grounding conductor of the proper size in all power and lighting branch circuit and feeder raceways. This wire is in addition to conduits and other raceway ground paths.
 - b. Minimum size of the equipment grounding conductor shall be #12 stranded copper.
 - c. A10/32 green screw shall be used to ground all outlet boxes.
 - d. Wire and Cable shall be annealed, coated stranded copper per ASTM B33 or ASTM B189 with conductivity or not less than 98 percent.
4. Provide Stranded Class B wire and cable per ASTM B8
- a. Bus, lugs, and terminal blocks shall be copper
 - b. Aluminum wire and cable will not be permitted.
5. Conductor Insulation: UL Type THHN/THWN, or provide UL Type THW or XHHW as appropriate for locations where installed.
6. Color-Coding: Factory color insulation. Re identification with paint, tape or other means is not permitted.
- a. Ground leads Green
 - b. Neutral Conductors White (120/208V); Gray (277/480V)
 - c. Phase A, B, C 120/208V Black, Red, Blue
 - d. Phase A, B, C 277/480V Brown, Orange, and Yellow
7. Conductors: Run in approved conduit system regardless of voltage or insulation.
8. Lugs: Use approved types on all stranded or solid conductors.
9. Bundling: Conductors located in branch circuit panel boards, cabinets, and control equipment shall be bundled neatly and securely using plastic cable tie-wraps. Tape is not permitted as a tying method.
- a. Wires: Not more than seven (7) wires, including the equipment grounding conductor, shall be installed in a conduit run except by written authorization from the BCPM.
 - I. Splices: Provide sleeves using hydraulic Hy-Press or approved methods for splices made in conductors #4 AWG and larger.
 1. No splicing will be permitted on fire alarm, clock, speaker, intercom, or TV systems wiring. All splicing on these types of systems shall be made in junction boxes on the proper termination strips.
 - b. Compression terminals and splices shall be installed only with a controlled cycle crimping tool.

26 24 16 Panel Boards

1. Panel Board Schedules shall indicate details of size, capacity, number of poles, and number of circuits. Each branch circuit listed in the schedule shall have an indication of location of usage.
2. Location: Units shall not be located in corridors or public/staff areas except by special written authorization from the BCPM.
3. Selection: Where a major portion of the loads supplied by the panel board are non-linear, a non-linear type panel board shall be used. Use of Load Centers is not acceptable.
4. Fault Current Ratings shall be adequate to carry all available fault current.
5. Future Expansion: Reserve 20 percent of the dedicated circuit breakers provided as spares. Provide spares with complete bus connectors and supports for future breaker installation.
6. Buses: Panel board buses shall be copper or silver-plated copper only.
7. Fused Pullouts are not acceptable and shall not be used for any purpose.
8. Fused Disconnect Switches: Use only where specifically required by Code or equipment manufacturer.
9. Installation, General: Panel boards, circuit breaker enclosures, and cabinets shall be mounted not more than 6'-6" above the finish floor as measured to the top of the unit. Install so the center of the switch grip, or circuit breaker operating handle, will not be more than 6 feet above the finish floor when in its highest position.

26 24 19 Motors Controls

1. General: Provide combination across-the-line controller with the required motor circuit disconnect switch included, HOA switch, phase monitoring on all three phase starters for protection against phase loss or phase reversal, electronic overload protection, and no pilot light.

26 36 00 Transformers

1. K-Rated Transformers: Specify power conditioning equipment or devices, or other disturbance mitigation methods for systems supplying outlets for computer terminal or other sensitive equipment
2. Line-side Mitigation: Provide equipment such as Harmonic Traps for equipment utilizing 6 pulse and 12 pulse power supplies, all variable frequency drives, and appliances capable of generating harmonic frequency currents or voltages on their respective circuits of significant magnitude that would be harmful to the facility's electrical system.

3. Provide units with copper windings and electrostatic shielding.
4. Dry-Type Transformers: Provide "Energy Star", low impedance units with copper windings, amorphous iron or silicon steel core and type "HN insulation, 115 degrees C temperature rise above 40 degrees C ambient
5. Installation: All transformers shall be floor mounted with vibration isolation pads between the unit and the supporting structure secured to a 4-inch high concrete housekeeping pad.
6. Transformers rated at 30 KVA or less may be mounted on the wall.
7. Transformers shall not be hung from, or mounted to, overhead building structure.

26 40 00 Lighting Protection

1. General: The College's facilities are located in a geographical area that experiences the highest incidence of lightning strikes in the Nation. Therefore, all new facilities shall have a certified lightning protection system included in the design. College facilities to be renovated shall be provided with lightning protection if it is included in the Project scope of work.
2. Surge Suppression: Include a complete network of surge suppression from the service to sensitive equipment outlets.
3. Early Streamer Emission (ESE) Lightning Protection: Basis of design shall be Lightning Preventer System as distributed by Omega Power Systems, Inc.

26 51 00 Interior Lighting

1. General: Lighting illumination values shall be in accordance with Florida Department of Education, Office of Educational Facilities, State Requirements for Educational Facilities (latest edition) and IEEE Standards. Basis of design for all fixtures shall be LED.
2. Illumination Certification: Provide computer-generated calculations prepared by the lighting fixture manufacturer certifying that lighting levels in foot candles and equivalent spherical illumination values comply with specified standards.
 - a. Submit copies of the computer-generated calculations with the lighting fixture shop drawings.
 - b. Provide normal and emergency point-by-point foot candle specific area plots for all functional areas (including site lighting, exterior lighting, and lighting for non-instructional areas) as part of shop drawing submittal
3. Maintenance: Lighting fixtures shall be so designed that there shall be no special equipment, tools, or methods needed for a worker to reach the fixture for the purpose of maintaining it, or to replace lamps.
4. Architectural Lighting and indirect lighting fixtures shall not be used or specified without written authorization from the BCPM.

5. Instructional Spaces: Provide low voltage control system for all light switching for classrooms, laboratories, and rooms used for instructional purposes, that will result in optimum light levels for the application of digital projection teaching systems.
 - a. Lighting control stations shall be located at each exit and at the front of the room at the instructor's station.
 - b. Master occupancy sensor system shall over-ride all lighting to "off" when the room is unoccupied.
6. Down Lights: Provide LED type with convection venting.
7. Recessed Fixtures: May be connected with flexible raceways not exceeding 6-feet in length made to a junction box in accessible concealed spaces above ceilings. No fixture to fixture connections will be permitted except where the fixtures are mounted end-to-end and mechanically connected together.
8. Anchorage: All lay-in type recessed fixtures shall be fastened to acoustical ceiling grid main T bars by four (4) approved clips, or by other Code approved method, located one at each corner.
9. Independently Support each lay-in fixture from the building structure, diagonally from two comers with minimum #12 AWG steel wire.
10. Fixture Support Bars spanning structural T-bar ceiling channels shall be required for surface-mounted fixtures. Support bars and fittings shall allow vertical and horizontal positioning of the fixture.
11. "Y" Grid Ceilings: Proper ceiling grid hangers shall be used for mounting or suspending light fixtures. The grid hanger shall be secured to the main support channels of the ceil Lighting and have provisions for locking in place and acceptance of stem canopy fixtures or surface mounted fixtures.
12. Industrial Lighting: Provide 2' or 4' LED vapor tight fixtures in areas such as mechanic room, electrical rooms, and elevator machine room and elevator pit.

26 52 00 Emergency Lighting

1. Symbols: Provide exit sign symbols on the electrical power drawings as well as the electrical lighting drawings.
2. Exit Signs: Provide red LED having the following salient features:
 - a. Precision die-cast aluminum or white plastic construction throughout
 - b. Normal AC illumination shall be provide by digital design red LED lamp panels consuming 7 watts or less per face at 120 or 277 VAC

- c. Emergency illumination shall be achieved through a factory-installed, fully automatic, power pack providing 1-1/2 hours of emergency operation except where a separate building EM power system is used. Power pack components shall mount inside the fixture casing and include a solid-state battery charger, a maintenance-free nickel-cadmium battery, a charge indicator pilot light, and a test switch. The charger shall be capable of recharging the battery within acceptable UL specified time standards.
- d. Standard snap-out directional arrows
- e. Comply with all UL 924 requirements
- f. Provide cast aluminum or white plastic mounting canopies for end, ceiling, and wall mounted models
- g. Dimensions shall be approximately 7-3/4 inches high by 10-1/2 inches wide by 2-1/4 inches deep.
- h. Transformers shall be provided for universal 120/277 VAC Lighting

26 52 19 Emergency Power Systems

- 3. Purpose: Emergency generator power system shall be used for emergency and stand by loads exceeding 24 KVA or consider inverter alternate for less than 24 KVA. When generators are not provided, an external generator dock connection will be required.
- 4. Life Safety and Emergency Egress Lighting: Provide systems listed by Underwriters' Laboratories (UL) under UL 924. Specify additional battery pack lighting in electrical and generator rooms.
- 5. Salient Design Features: Provide for the following:
 - a. Prime mover power plant shall preferably be a water-cooled natural gas/diesel hybrid unit if gas available at location.
 - b. Voltage Output regulation shall be +/- 0.5% of nominal
- 6. Generator Windings: 2/3 pitch design to eliminate triplen harmonics on the voltage waveform and for the mitigation of excessive neutral currents when supplying non-linear loads
- 7. Emergency AC Inverter System: Storage battery type for emergency loads from 2500 VA to 24 kVA, consisting of a 3-stage battery charger, a DC to AC static inverter with transfer relay circuit, a battery bank properly sized for load requirement, a solid state custom IC-controlled electronics system, and a central display panel. Other salient features are as follows:
 - c. Electronics and Batteries: Provide fully enclosed in 16 gage, welded steel cabinetry of modular design that allows side-by-side or vertical stacking. When provided

stackable, cabinets must be capable of being stacked two high for each two unit stack and shall have a foot print no larger than 27-inches wide by 18-1/2 inches, and a maximum height of 92-inches when stacked.

8. Battery Charger 3-stage unit meeting UL 924 standards and having the following features:
 - d. IC-controlled for continuous monitoring and full charge maintenance
 - e. Temperature compensated, constant voltage type providing constant current, float, and equalization of charging modes
 - f. Operating efficiency not less than 85%, with each mode of operation indicated by a 2-color LED on the unit's central display panel
9. Output circuit fuse and thermal cutout on the charger transformer to insure fail-safe operation
10. AC Inverter System shall deliver single phase, sinusoidal emergency power free from high voltage surges or frequency drift and shall have the following features:
 - g. Inverter Start-up: Capable of transferring 100% of the system's rated capacity to the connected emergency load within one second of utility failure
 - h. Output: Sinusoidal AC wave form with voltage regulation held to +10%, -5% variance from nominal (standard input/output voltages shall be 120/120 or 277/277 VAC, 60 Hz, single phase)
 - i. Output Frequency Tolerance: 60 Hz+/-2%
 - j. Total Harmonic Distortion: Less than 10%
 - k. Inverter shall accommodate load power factors of 0.5 lead to 0.5 lag
 - l. Operating Efficiency: Not less than 85%
11. Emergency Power Source: Sealed, maintenance-free batteries with expected 10-year life and a 10-year pro-rata warranty.
12. Central Display Panel: Located on the front of the electronics cabinet having the following features:
 - m. Service Alert Alarm section shall provide audio/visual alarms for the following:
 - n. HI/LO Battery
 - o. OUTPUT CIRCUIT BREAKER OPEN
 - p. BATTERY CAPACITY/TRANSFER CIRCUIT
 - q. THERMAL OVERLOAD
 - r. ALARM SILENCE
13. Test Switch to initiate a 5-minute discharge/diagnostic cycle check of emergency operation
14. Systems Status Panel to provide the following:
 - s. STATUS INDICATOR (to indicate charger operation)
 - t. UNIT READY (indicates unit is ready for emergency operation)

- u. AC OUTPUT VOLTS; DC CHARGER CURRENT; DC INPUT VOLTS; AND OUTPUT FREQUENCY are to be indicated on a 3-figure LED digital display
15. Output Distribution Circuit Breakers: Provide an appropriate number in electronics cabinet
- v. 2-Year System Warranty
 - w. Factory Start-Up
 - x. Automatic Transfer Switch:
 - i. Must be UL-1008 listed through 480 VAC.
16. Automatic Transfer Switch Drive Mechanism: Shall not be dependent upon springs, gravity, latches or counterweights, and shall be operated by a positive, unidirectional stroke, fully electrically energized drive mechanism that will prevent an accidental neutral position and assure contact transfer in 6-cycles or less.
17. Emergency Lighting: Provide each emergency fixture with battery backup ballast.

27 00 00 Communications

27 05 00 Common Work Results for Communications

1. Provide a complete structured cabling system (racks, outlets, patch panels, patch cords, wire management, media/cabling, testing, administration, commissioning, etc.).

27 11 00 Communications Equipment Room Labeling

1. Labeling shall comply with TIA/EIA-606-A and UL 969.

27 13 00 Communications Backbone Cabling

1. Materials shall be:
 - a. Cable Supports: Support brackets, lacing bars, spools, J-hooks, and D-rings.
 - b. Conduit and boxes. Flexible metal conduit is allowed when wall is fished.
 - c. Optical Fiber Cabling: Multimode, 50/125 62.5/125-micrometer, 24-fiber, nonconductive, tight buffer.
2. Connectors: Simplex and duplex, Type SC connectors.

27 51 16 Public Address

1. Public Address (PA) systems functions shall selectively connect any zone to any available signal channel, selectively amplifying inputs, all call, telephone paging, program-signal tone generation, and produce high-quality, noise- and distortion-free sound.
2. PA system shall utilize modular with solid-state components, with preamplifier, power amplifier, and transfer to standby amplifier. Other components:
 - a. Microphones: Desk-stand, dynamic type with cardioid polar characteristics.
 - b. Volume limiter/compressor.
 - c. Control Console: Modular, with self-contained power and control unit.
 - d. Equipment cabinet.
 - e. Equipment rack with 20 percent spare capacity
 - f. Telephone paging adapter.
 - g. Tone generator for clock and program interface.
 - h. Monitor panel.

- i. Loudspeakers: Cone and horn type.
- j. Noise-operated gain controller.
- k. Volume Attenuator Stations: Autotransformer type with paging priority.
- l. Microphone outlets.
- m. Headphone outlets for the hearing impaired.
- n. Battery backup power unit.
- o. Conductors and Cables: Jacketed, twisted pair and twisted multi pair copper conductors.
- p. Use raceways. No loose wire permitted.

28 00 00 Electronic Safety and Security

28 10 00 Electronic Access Control and Intrusion Detection

1. Refer to [Appendix 28 01](#) for the [Access Control Communication Matrix](#).

28 30 00 Fire Alarm

1. System Description: Microprocessor controlled, intelligent reporting fire alarm system.
 - a. Manufacturer: Notifier Fire Systems.
2. System Performance: Fire alarm system shall be UL, FM and ISO9001 listed and provide the following:
 - a. Alarm, Trouble and Supervisory Signals: Provide from all intelligent reporting devices encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC)
 - b. Initiation Device Circuits (IDC): Provide as Class B wired circuits (NFPA Style B) as part of an addressable device connected to the SLC.
 - c. Notification Appliance Circuits (NAC): Provide as Class B wired circuits (NFPA Style Y) as part of an addressable device connected by the SLC or a panel circuit
 - d. Alarm Signals: Signals arriving at the main fire alarm control panel (FACP) shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded
3. System Functional Operation: When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
 - a. System alarm LED on the FACP will flash
 - b. Local piezo electric signal in the control panel will sound
 - c. Display on the FACP will indicate all information associated with the fire alarm condition, including the type of alarm point and its location
 - d. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm will be executed and the associated system outputs will be activated
4. System Capacity and General Operation:
 - a. Capable of expansion where required for future additions
 - b. Include Form-C alarm and trouble relays rated at a minimum of 3.0 amps at 30 VDC

- c. Fire alarm control panel shall include a full-featured operator interface and back-lit 80 character LCD
 - d. Fully field programmable
- 5. Specific System Operations:
 - a. Point Disable
 - b. Point Read
 - c. System Status Reports
 - d. Water Flow Operation
 - e. Supervisory Operation
 - f. Signal Silence Operation
- 6. Warranty: Provide warranty for a 3-year period from date of acceptance by the College. Warranty shall cover defects of any kind and shall include all labor and materials. Notifier distributor must meet NESCO requirements for the warranty.
- 7. Project Construction Cost shall include as a separate price the cost of maintenance labor and materials for the fire alarm system during the first year of operation.
- 8. Installation Contractor shall be a Notifier distributor, a member of NESCO (Notifier Engineered Systems Company), and shall have NICET Level II certification, and a State of Florida Fire License. Installing technicians shall have Alarm Agent Certification or higher.
- 9. Wiring: Color-coded and identified with Brady tags or other suitable means of identification to provide ease of tracing for maintenance, trouble identification and correction purposes.
 - a. Color-coding shall be reflected on the required Record (As-Built) Drawings. Refer to Section 01790, Project Record Documents, for additional requirements.
 - b. Loop - Twisted Pair - Red outer sheath
 - c. Notification Appliances - Orange & Yellow (out); Purple & Violet (in)
 - d. Door Holder - Pink & White
 - e. AHU Shut Down - Blue & Gray
 - f. 24 Volt DC - Red & Black; Note: All wire shall be stranded
 - g. If FPL cable is used, color code shall be uniform throughout the system
 - h. Conduit: Minimum 3/4-inch conduit

10. Fire Alarm Control Panel (FACP): Completely microprocessor-based, analog, and addressable. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program. Basic operator controls shall include the following:
 - a. Acknowledge Switch
 - b. Alarm Silence Switch
 - c. System Reset Switch
 - d. Lamp Test
11. Central Microprocessor High-speed, state-of-the-art, able to communicate with, monitor and control all external interfaces; include an EPROM for system program storage, nonvolatile memory for building-specific program storage, a "watch dog" timer circuit to detect and report microprocessor failure, and ability to perform the following functions:
 - a. Real-time Clock: To provide for time annotation of system displays, printer, and history file; time of day and date shall not be lost if system primary and secondary power fail.
 - b. Control-by-Event Programs: Capable of containing and executing programs for specific action to be taken is alarm condition is detected by the system
12. Display: 80-character (minimum) back-lit LCD capable of providing light-emitting-diodes (LED's) for standard fire alarm indications; provide with a type keypad and multiple password levels
13. Signaling Line Circuits (SLC): Provide a minimum of one SLC that can provide power to, and communicate with, intelligent detectors (ionization, photoelectric, or thermal) and intelligent modules (monitor or control)
14. Power Supply: Modular expandable with over-current protection on all power circuits, an integral battery charger for 24 hours of standby using dual-rate charging techniques, and all circuits power-limited UL 864 requirements including ground fault detection.
15. Addressable Devices: Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel signaling line circuits. Detectors shall be ceiling-mounted types with separate twist-lock base with tamper-proof feature. Functions include the following:
16. Smoke and Thermal Detectors to provide alarm and power/polling LED's
17. FACP to permit detector sensitivity adjustment through field programming
18. Testing whereby detectors will simulate an alarm condition and report that condition to the FACP

19. Batteries: Gel Cell type, 12 volt nominal (two required) with the capacity to power the fire alarm system for not less than 24 hours, plus 5-minutes of alarm upon a normal AC power failure.
20. Remote Annunciator Panel: Provide inside building at the main entrance.
21. Function: Upon activation of any alarm device, the annunciator will identify the exact location of the device.
22. Features: Provide one additional silence key switch as well as the following standard features:
 1. Built-in voltage regulator
 2. Reverse polarity protection
 3. Per point diode isolation
 4. Lamp test key switch
23. Wiring: Install wire in conduit or raceway.
24. Multiple Cables: Where three or more cables are contained within a single conduit, the filled cross-sectional area of the conduit shall not exceed 40 percent
25. Cable Separation: Cable shall be separated from any open conductors of power or Class 1 circuits, and shall not be placed in any conduit, junction box, or raceway containing these condition per NEC.
26. Fire Alarm Control Panel: Connect to a dedicated branch circuit, maximum 20 amps.
27. Signaling Line Circuits (SLC): Wire all SLC loops per NFPA 72, Style 4 (Class B)
28. System Testing: All testing shall be done in accordance with NFPA 72.

32 00 00 Exterior Improvements

1. Grates:
 - a. All storm water outfalls shall have protection grates and horizontal energy dissipation pads per FDOT specifications.
 - b. Provide Florida Accessibility Code for Building Construction compliant grates at all trench drains and inlets at areas of pedestrian traffic.
2. Vinyl Coated Chain Link Fence :
 - a. Chain link fence shall be minimum 9GA galvanized fabric thickness at all locations.
 - b. All posts shall be set in concrete bases.
 - c. Tension wire in lieu of bottom rail shall be specified for all locations.
 - d. Top and bottom selvage shall be knuckled/turned into the fabric.
 - e. Provide minimum one gate 60" wide all locations for lawn mower.
 - f. Galvanize fabric prior to weaving.
 - g. The fence shall be green in color.
3. Composite Fence: Fence made out of 50% reclaimed wood fiber and 50% polyethylene. Basis of design is Trex Seclusions. Refer to Appendix 32 01.
4. Bacteriological Testing:
 - a. In addition to bacteriological water testing that may be required by the Department of Health, a minimum of 2 bacteriological tests (at sink and at water fountain) for the interior of each floor and building.
5. Site Drainage Grading:
 - a. The construction drawings shall clearly show (and have appropriate spot elevations) of finish grades in the areas of structures/buildings and shall be designed to shed surface runoff away from the structures/buildings. The A/E shall ensure that the finish floor elevations shall be a minimum of 8" above adjacent finish site grades to ensure positive runoff away from the structures/buildings. No water shall be designed to sheet flow over sidewalks from landscape areas or roofs.
 - b. Renovation projects shall be designed to make modifications to spaces and adjacent grades such that the above criteria are met. Swales and runoff collection systems shall be designed and clearly shown on the construction documents to ensure drainage away from all buildings.

- c. Design for storm drainage away from buildings, parking areas and driveways. Consider flow of concentrated storm drainage, design to slow down velocity. Concentrated drainage across sidewalks shall not be allowed, nor will ponding be allowed. Discharge from roofs and canopies shall be directed away from buildings and walks or tied to an underground storm drainage system.
 - d. Take roof rain leaders to underground systems (when appropriate) utilizing a sleeve.
 - e. Install storm drainage collection devices with a positive outfall in all areas where water can be trapped, especially in closed basin such as between buildings, interior courtyards and other similar conditions.
 - f. All storm drainage pipe installed shall comply with the applicable water management agencies, material and construction specifications.
 - g. As built drawings, signed and sealed by a Florida registered surveyor, will be required upon completion of the retention basins and storm drainage system. Drawings shall include all invert and grate elevations of all storm pipe and structures.
6. Termite Protection:
- a. The general contractor will schedule a meeting, at the site, with the owner, architect and pest control operator to discuss procedures, chemicals and ratios of mix.
 - b. Termiticide treatments shall not be applied at existing facilities during occupied hours.
 - c. Termite protection chemicals shall be brought to the site in sealed containers and mixed on site with the Owner present.
 - d. All applications are to be witnessed by the Owner. 24-hour notice shall be given to the Owner of scheduled treatments. Prior to application, the contractor will be responsible for calculating the square footage, lineal footage and any other dimensions needed to determine the proper ratios of mix being applied.
7. Athletic Fields:
- a. Baseball/Softball fields shall have a sand/clay ratio of 20/80 to 30/70 with surface additive.
 - b. Provide a hose bib nearby for maintenance of clay.
 - c. Hose bib installed in both dugouts.
 - d. Dugouts shall consist of aluminum canopy, chain link fencing and aluminum bench on concrete pad.
 - e. Provide drinking water fountains at athletic fields.

- f. Athletic courts shall be asphalt.
 - g. Provide basketball goals on courts.
 - h. All exterior athletic courts shall have flexible base material specified.
 - i. Soil cement shall not be specified as a base material for any exterior athletic courts.
 - j. Courts fencing shall be vinyl, black or green-coated galvanized fabric.
 - k. Soccer fields and Tennis courts shall run north/south.
 - l. Tennis courts surfacing shall be Plexi-Pave or equal over asphalt.
8. Refer to [Appendix 32 02](#) for details on the approved valve box cover.

32 10 00 Paving

- 1. Type FDOT S-1 asphalt shall be specified in all vehicular traffic areas. Consider the use of recycled asphalt whenever possible.

32 80 00 Irrigation

- 1. All PVC utilities and main irrigation lines shall have #10 GA copper tracer wire located directly above the line and terminate on a metal device accessible from the surface without excavation. In addition, plastic marker tape indicating the type of line shall be located no less than 2' directly above the utility line. The tape and wire/terminations shall be inspected by the Owner prior to backfill. On main irrigation lines provide marking tape ½ ways between pipe and grade.
- 2. Irrigation systems shall be designed by the A/E and clearly detailed on the construction drawings. Irrigation systems designed by the installer shall not be allowed. Use Rainbird, Hunter or equivalent unless approved by the Owner.
- 3. Schedule 40 PVC pipe shall be specified for irrigation lines. All irrigation heads shall be pop-up type, regardless of application. Fixed head, stationary risers shall not be specified.
- 4. New Irrigation lines connected to re-use water lines shall be "purple" pipe PVC.
- 5. Existing irrigation lines connected to re-use water lines shall have purple sprinkler heads/caps.
- 6. All irrigation wells shall have as a basis of bid, 100 FT in depth.
- 7. Pump and controls design shall be selected for ease of maintenance.

8. Sprinkler systems shall be directed away from buildings and shall not spray on buildings to reduce the likelihood of moisture intrusion.
9. Architect / Engineer to submit a preliminary plan to be reviewed by the owner.
10. Existing systems should be evaluated and field inspected prior to new work being specified.
11. A pre-construction meeting should be scheduled including contractor, Architect/Engineer and owner.
12. At substantial an owner training session will be required.
13. An inspection of the system at the end of the warranty period should be performed.
14. Wipe clean all glue joints of excess adhesive.
15. The pipe edge should be tapered on PVC 2" and larger.
16. At substantial, demonstrate a control wire integrity test, assuring the minimum ohm requirements are satisfied.
17. When sodding next to pavement or sidewalk, always set/lay the top of the sod 1-inch maximum lower than the pavement finish grade. This will prevent sod from trapping water on the pavement or sidewalks. When tying into existing sodded areas, the top of sod elevation shall match existing sodded areas without wedge cut areas.
18. Sod the bottom and side slopes of a retention basin or swale to reduce erosion.

32 90 00 Landscape

1. Landscape Architect to provide plant schedule with mature height specifications with color photos for each type of planting at mature height. Spacing of planting material shall be based on matured / maintained height and spread.
2. All landscaping shall have root ball wraps cut back prior to planting.
3. A/E's are encouraged to consider sodding throughout entire site. Use proper sod to match soil conditions.
4. All spaces between newly placed sod shall be filled in with organic material, rolled and fertilized as deemed necessary.
5. The Designer shall indicate the protection of all existing planting to remain or to be relocated.
6. All species should be native to or acclimated to South Florida and require low maintenance. When available to meet landscaping goals, select native plants whose

mature sizes are appropriate to the locations planted. Warranty trees and shrubs through indicated maintenance period, and until final acceptance.

7. Warranty trees and shrubs for a period of one year after date of final acceptance against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Landscape Installer's control.
8. Sodded areas should be easily accessible for mowing.
4. Whenever possible incorporate the removal of existing exotic species listed as category I or II by the FLEPPC.
5. Where feasible, reduce lawn areas by increasing xeriscaping with native plants and native ground covers.
7. Utilize integrated pest management to minimize the use of pesticides including insecticides, herbicides, and fungicides.
8. Fertilize sparingly using organic compost or low phosphate/phosphate-free fertilizer.
10. Maintain a grass-free area around trees to avoid damage by weed eaters.
11. Specify Melaleuca mulch when available and avoid mulches containing arsenic or dyes.
13. When designing the landscape plan for the project, review each Master Plan to assure it is consistent with native plant landscaping.
15. Design landscaping to enhance security. Plants of appropriate maintained or mature size will be selected to assure visibility and prevent obstruction of lighting and signage.
16. Maintain plant material away from equipment to meet equipment access requirements.
17. Design for matured tree canopies away from the building roof overhangs.
18. Avoid specifying material that will require hedge pruning.