

DESIGN and CONSTRUCTION GUIDELINES

For State Facilities in Florida



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1. INTRODUCTION

Based upon extensive building development experience, the Department of Management Services (DMS) is focused on obtaining high-performance building outcomes from our design consultants and contractors. In turn, we expect our consultants to thoroughly understand our mission during the design-through-occupancy process.

We want, and need, buildings that work for us in every way. They are to be energy-efficient, sustainable, and easily maintained and should include long life materials and equipment and be productive tools for the public users' program needs. At the same time, our buildings are to be aesthetically pleasing and cost-effective. We understand that rendering this balance is a challenge and that the designers can be successful only when they conscientiously adopt our high-performance design philosophy.

Our design criteria range from general to specific but always supports our high-performance expectation for buildings and related site development. We are hopeful that our criteria will only reinforce the quality decisions to be made by a designer who fully understands why public owners build buildings, which is to create a pleasant, secure, cost-effective, and easy-to-maintain built environment for staff to deliver essential services to our constituents.

2. GENERAL PLANNING AND DESIGN DATA

2.1 Design Policy – LEED

Florida Statute 255.255 establishes that “it is the policy of the state that buildings constructed and financed by the state be designed and constructed to comply with a sustainable building rating or a national model green building code. It is further the policy of the state, if economically feasible, to retrofit existing state-owned buildings in a manner that minimizes the consumption of energy used in the operation and maintenance of such buildings.” Therefore, it is DMS’ policy to provide design direction, material selections, and a construction approach that attain sustainable design and construction standards.

The department is directed to strive for USGBC LEED Gold Level certification for any new building constructed for and by the State of Florida. Selection of the specific green model code and its method of employment will be made on a case-by-case basis through consultation between the DMS project management team and the selected design and construction team.

Landscaping for all projects must comply with Florida Statute 255.259.

2.2 Design Philosophy

High-performance building projects. Depending upon the size and scope of the project, LEED (or other green building) certification may not be feasible, but we fully intend to incorporate the use of sustainable/green materials while striving to obtain high-performance outcomes on all new construction and remodeling projects. Construction materials that might deter the agency from obtaining future certification will not be allowed.

2.3 Applicable Site Planning and Zoning Codes

Our design standards are generally not repetitious of the mandatory codes except where we have encountered continual code oversights. Since design professionals are registered “to protect the life safety and welfare of the general public,” we expect them to have full knowledge of the applicable life safety codes and implement them into their design solutions.

2.4 General Construction Knowledge

Our design standards partially overlap “best practice” constructability and material detailing as they relate to commonly observed design “oversights.” Otherwise, we expect time-tested construction details at all material intersections that comply with industry best practices. Also, we expect full documentation that illustrates every condition that will ensure our buildings are leak-free for the expected life of the material assembly.

2.5 Design Oversights

We realize that your firm and/or your multitude of consultants will produce documents that include occasional “design oversights.” We prefer that when these issues are discovered, you expedite the necessary documentation to correct the issue and readily volunteer to compensate for your portion of the contractor scope change, which we consider is the cost above the “owner’s beneficial use” if the documentation had been properly embedded into

the bid documents.

2.6 Construction Administration

It is essential that your specifications contain the necessary construction period field testing to confirm that the project is constructed in accordance with the contract documents and the building systems operate properly and truly yield the high-performance outcomes. We will review Building Commissioning (CxA), especially for more complex projects such as laboratories and LEED-certified buildings. Also, the type and size of facility may determine if construction “Substantial Completion” can be granted without final testing, adjusting, and balancing (TAB) or commissioning (Cx) to verify that building systems are working per the design for both life safety and energy efficiencies.

2.7 Florida Product Approval

Florida Product Approval must be verified for all building materials that shall comprise the building envelope or as required by the Florida Building Code. Notice of Acceptance (NOA) documents must be provided to verify compliance.

2.8 Security Engineering

All new construction, additions, and renovations should be assessed relative to the potential for risk of intentional attack and damage from explosion, both intentional and unintentional. This approach should also include the entire site, considering vehicle and pedestrian access. The Department of Defense’s United Facility Criteria provide up-to-date guidance in these areas. Other references may apply.

2.9 Historic Preservation

In accordance with Florida Statute 267.061, DMS shall work with other agencies to ensure properties designated as historic shall be afforded requisite design and construction procedures, mandated by state and federal regulations.

2.10 CAD Standards

The product of the design effort, drawings and specifications, must be submitted to DMS in electronic and physical formats. When submitted electronically, AutoCAD drawings should be submitted as DWG files. Non-AutoCAD formats should be submitted as DXF files.

When BIM files are submitted, they must be provided in an IFC file format. All drawings and specifications must also be submitted as PDFs. Please see detailed CAD requirements in the DMS Operations Guide.

3 GENERAL DESIGN REQUIREMENTS

3.1 Referenced Codes and Standards

List on the plans the applicable building codes that apply. At a minimum, the building(s) shall comply with the Florida Building Code and the Florida Fire Prevention Code. Consult with the “Authority Having Jurisdiction” for the adopted versions of these codes as well as any other applicable codes. Also, consult with specific client agencies to identify all specialized requirements

3.2 Civil – Site Work

3.2.1 Lighting:

All building identification signs shall be lighted. Direct burial or well lights are prohibited.

3.2.2 Entry Signs:

See Specialties Guideline.

3.2.3 Solid Waste:

Solid waste is collected in dumpsters located in the building service area. The dumpsters are sized to hold three pounds of solid waste per employee per day. Space shall be provided for additional dumpsters for recycling purposes. Confirm requirements with the agency project director. All dumpsters shall be located on reinforced concrete slabs designed for the specific dumpster size, with a thickness of no less than 6 inches. All dumpsters should be located for ease of accessibility by waste management vehicles. All dumpsters should be concealed inside an enclosure of a height and design consistent with the architecture of the adjacent building.

3.2.4 Benches:

Bench design should be compatible with the building design. Special consideration should be given to minimize future maintenance costs. Benches should be freestanding and anchored to be immovable by the public.

3.2.5 Light Bollards:

Bollards with lights are allowed along entry walkways and plazas at the main entrance. Bollards shall incorporate full cut-off optics. Bollards without lights may be used elsewhere to separate pedestrian areas from vehicular areas or to protect against vehicle encroachment that may cause damage. Light bollards should be either cast or extruded aluminum with a dark bronze or black finish. The maximum bollard height should not exceed 42 inches, and the minimum diameter should be no less than 8 inches.

3.2.6 Walls and Screen Fences:

Walls or screen fences are placed around all service areas and all large above-grade utility equipment such as central boilers or sewer package treatment facilities. Screen fences/walls should be a material compatible with the building.

3.2.7 Bus Shelters:

Bus shelters (for campus plans) are located along local roads at a few central

locations throughout the campus. The shelter locations and design are coordinated with the local transit authority and compatible with the overall building design concept. The shelter shall be anchored to a concrete pad that is built next to the sidewalk so that the sidewalk passes directly in front of the shelter.

3.2.8 Building Entry Walks/Plazas:

Surfaces shall be slip resistant under wet and dry conditions and slope to drain away from building. Sidewalks shall be concrete and a minimum of 5 feet wide. Sidewalks/curb cuts that slope to a vehicular right-of-way shall have detectable warnings the full width of the sidewalk or curb cut and be 36 inches wide. Walks and paths shall be arranged to traverse steep areas at an angle to the contours and with turns back and forth so that runoff does not become concentrated in any one direction for long distances.

Plazas should have a minimum slope of 2 percent and a uniform surface that prevents ponding. Special attention shall be given to avoid ponding in the plaza area.

3.3 Landscape – Irrigation

3.2.1 Local Utilities:

If water from a local utility is used for the irrigation system, separate irrigation water meters must be installed to avoid sewer charges for water used.

3.2.2 Backflow Preventers:

Provide backflow preventers that comply with local regulations. Backflow valves shall be screened from public view. Verify that the use of backflow preventers in conjunction with pop-up sprinkler heads conforms to local ordinances.

3.2.3 Pressure Reducing Valve:

Provide pressure reducing valves and pressure gauges that can be isolated for maintenance. Specify the system operating pressure.

3.2.4 Zoning:

Irrigation systems shall be designed so that plants with similar water requirements are zoned together. Lawn areas shall be zoned separately from shrub or groundcover areas.

3.2.5 Controllers:

Automatic irrigation controllers are required for all irrigation systems.

3.2.6 Piping:

All underground irrigation piping shall be PVC. Main lines and lateral lines shall be schedule 40 PVC piping with solvent welds. Use only 1/2-inch and 1-inch piping as standard.

3.2.7 Testing:

Require pressure testing and reporting of all irrigation piping prior to backfilling.

- 3.2.8 **Quality Control:**
All irrigation systems shall be designed by experienced irrigation designers or landscape architects.
- 3.2.9 **Tracer Wire:**
Provide a tracer wire system that is electrically continuous, insulated, and suitable for underground use.
- 3.2.10 **Water Reuse:**
Water reuse—also known as grey water systems—may be considered. The system must be designed in accordance with the Florida Building Code and meet the requirements of established sustainability guidelines

3.4 Structural

- 3.4.1 **Live Loads:**
Minimum acceptable floor live load is 100 psf. Variations in this requirement may be allowed based on building type and code requirements.
- 3.4.2 **AISC Design Guide 11:**
If the structure is steel, provide design response for vibrations caused by human activity. Applicable section will be determined by the building function.
- 3.4.3 **ASCE 7-10:**
Provide design response for wind resistance. The design wind velocity zone should be determined using the Florida Building Code and coordinated with requirements outlined in ASCE 7-10. This standard also applies to seismic design.
- 3.4.4 **ASCE 41:**
Provide a design response to local seismic requirements as delineated by the Florida Building Code for retrofitting of existing buildings.
- 3.4.5 **ASCE 24 – Flood Resistant Design:**
Facilities should be elevated above the 100-year flood plain +2 feet at a minimum. Designation above a 500-year plain may be dependent on building function. Provide a design response concurrent with the requirements of ASCE 41.
- 3.4.6 **Use of Innovative Materials and Techniques:**
New or recently developed materials and techniques may be considered for use in construction of new buildings on a case-by-case basis. Systems such as tensile or pneumatically supported structures may be considered in special circumstances. Post-tensioned and pre-tensioned systems, as well as precast systems, should be avoided, except in parking structures.
- 3.4.7 **UFC 4-023-03 Progressive Collapse:**
If function and location dictate, the building, renovation, or addition must be designed to survive intentional and unintentional explosions to a degree that occupants may safely evacuate.

- 3.4.8 UFC 3-301-01 Risk Assessment and Category:
All new buildings, additions, and renovations must be evaluated relative to risk of attack, resulting in damage or caused by unintentional action. Design for progressive collapse may be found in UFC 4-023-03.
- 3.4.9 Elevators:
Isolate elevator equipment room floors and walls for sound attenuation.
- 3.4.10 Exterior Slabs:
Exterior slabs on grade and paving outside the building enclosure shall be sloped away from the building structure to prevent water build-up at the building perimeter. Specify that all such areas shall be hose-tested prior to acceptance of work to identify slope and drainage problems that may exist.

3.5 Architectural

- 3.5.1 Fenestration Water Penetration:
New windows shall be subjected to field mock-up testing with performance complying with AAMA 101-2008.
- 3.5.2 Roof Access:
Please provide internal roof access for all new construction.
- 3.5.3 Toilet Rooms:
Floor surface shall be sloped to floor drains, so no ponding occurs. Floor drains shall be located under partitions and coordinated with the partition feet. Ensure that the location and slopes do not conflict with accessibility requirements.
- 3.5.4 Janitor Closets:
Slope floor to floor drain. Provide a stainless-steel mop rack and shelf. Size janitor closet to provide supplies storage space.
- 3.5.5 Electrical and Communications Rooms:
See Electrical Systems guidelines in Division 26.
- 3.5.6 Mechanical Rooms:
See Mechanical Systems guidelines in Division 23.
- 3.5.7 Stairs:
To encourage use of stairs in lieu of elevator, provide at least one stair in multi-story buildings which is conveniently located with main pedestrian traffic flows, i.e. adjacent to lobby. Provide sufficient width, 5 feet minimum, so two adults can pass each other comfortably while traveling in opposite directions.
- 3.5.8 Main Lobby:
Building entry doors for the public and staff shall be equipped for automatic operation. Use vestibules or revolving doors to control wind flushing. Limit normal access into building to the lobby and the loading area. Building emergency exits shall be used as

exits only and shall not to be used for normal access. No mail chute shall be provided in the building, unless specifically requested by the user.

3.5.9 Recycling Storage:

Provide an easily accessible area that serves the entire building and is dedicated to the collection and storage of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics, and metals. Coordinate the size and functionality of the recycling areas with the anticipated collection services for glass, plastic, office paper, newspaper, cardboard, and organic wastes to maximize the effectiveness of the dedicated areas.

3.6 Interiors

See Division 09 in chapter 4.

3.7 Fire Protection

See Division 21 in chapter 4.

3.8 Plumbing

See Division 22 in chapter 4.

3.9 Mechanical

See Division 23 in chapter 4.

3.10 Electrical

See Division 26 in chapter 4.

3.11 Telecommunications

3.11.1 Codes and Standards:

The overall configuration of telecommunications and data rooms (as defined in the TIA standard: entrance facilities, distribution room, provider, and equipment rooms) shall comply with the current standard ANSI / TIA-569-D, and all other applicable TIA standards.

3.11.2 Tenant Spaces:

Tenant telecommunication and data rooms must meet the same standards relative to architecture and finish. However, HVAC systems, HVAC controls, security, and telecommunications and data equipment will be the responsibility of the tenant. Tenant requirements must be coordinated with the architecture of the room.

3.11.3 Telecommunication and Data Room Area:

All rooms should be no less than 100 square feet (10 feet x 10 feet) unless indicated in the standard. See the current TIA standard for overall size and number of rooms based on floor plate area.

- 3.11.4 Telecommunication and Data Room Vertical Dimensions:
The minimum ceiling height shall be 10 feet-0 inches AFF. Soffits and other protrusions into the space may be no more than 8 feet-0 inches.
- 3.11.5 Telecommunications and Data Room Doors:
Must be no less than 3foot-0 inches wide. Double doors may be required for some rooms. They must be equipped with hardware to enable operation without a center post. All doors should open out.
- 3.11.6 Telecommunications and Data Room Door Arrangement:
Where two rooms share a wall, an adjoining door is not permitted. Each room must be provided with a dedicated entrance.
- 3.11.7 Telecommunications and Data Room HVAC:
All rooms will be provided with a dedicated HVAC system to maintain required humidity and temperature. This system will operate separately from the building HVAC system providing 24/7 operability. The system will be connected to emergency power. See current ANSI / TIA-569-C for specific requirements. Tenant HVAC, controls and emergency power will be separate in DMS owned buildings.
- 3.11.8 Security:
Telecommunications and data rooms must have access control and intrusion detection systems integrated with the building system. Security in tenant space will be integrated with the specific tenant system.
- 3.11.9 Telecommunication and Data Room Finishes:
See 4.9.1.9 for finish requirements.
- 3.11.10 Telecommunication and Data Room Electrical:
See current TIA standards for requirements.
- 3.11.11 Life Safety:
The entire enclosure of the telecommunications and data room shall be fire rated, in accordance with required ratings for the building.
- 3.11.12 Insulation:
All telecommunications and data room walls will be provided with acoustic batt insulation.

3.12 Fire Alarm

See Division 28 in chapter 4.

3.13 Building Commissioning

3.13.1 Qualifications

1. The commissioning authority (CxA) shall have documented commissioning authority experience in at least two building projects.

2. The CxA shall be independent to the work of design and construction.
3. The CxA shall not be employed by the design firm or an employee of, or contracted through, the general contractor.
4. The CxA shall be a licensed professional engineer.
5. The CxA shall be an employed consultant of the agency.
6. The CxA shall report all results and findings directly to the agency.

3.13.2 Objectives

Building commissioning shall be implemented by the CxA to achieve all of the following objectives:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to minimum industry-accepted standards and that such equipment and systems receive adequate operational checkout by the installing contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that O and M documentation is left on-site and is complete.
4. Verify that the owner's operating personnel are adequately trained.

3.13.3 The Commissioning Plan

1. The CxA shall submit a plan that provides the structure, planning, and coordination of the commissioning process.
2. The project specifications shall take precedence over the commissioning plan.
3. The plan shall provide the framework for the delivery and review of submittals, systems manuals, and other documents and reports deemed necessary by the CxA and agency. The plan shall also identify the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning process.
4. The plan shall identify the following:
 - a. All systems to be commissioned;
 - b. All testing procedures;
 - c. All schedules and sequences for testing procedures;
 - d. Expected performance goals for all commissioned systems;
 - e. The commissioning team members;
 - f. The schedule for commissioning team meetings;
 - g. The responsibilities of the owner, related professionals, contractors, subcontractors, equipment suppliers, and the CxA;
 - h. Issue logging and resolution procedures;
 - i. Deficiency correction procedures;
 - j. O and M manual requirements;
 - k. Owner training requirements; and
 - l. The final commissioning report contents.
5. The commissioning plan shall be developed and implemented to achieve the agency's commissioning objectives.

3.13.4 The Commissioning Team

1. The CxA shall lead the commissioning team in the execution of all commissioning processes.
2. The commissioning team shall consist of members separately appointed by the general contractor and the owner.
3. Members appointed by the general contractor shall have the authority to act on behalf of the

entity he or she represents.

4. All commissioning team members will be expected to follow the commissioning plan. This will include, but not be limited to, the regular attendance of commissioning team meetings and adherence to the issue resolution procedures identified in the commissioning plan.

3.13.5 The Commissioning Process

1. Commissioning during construction shall begin with a scope meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.
2. Commissioning team meetings will be required throughout construction, scheduled by the CxA with necessary parties attending to plan, scope, coordinate, and schedule future activities and resolve problems/issues.
3. Equipment documentation shall be submitted to the CxA during normal submittals, including detailed start-up procedures.
4. Subcontractors shall develop start-up plans and documentation formats, including any manufacturer recommended checklists. The CxA shall provide pre-functional checklists to be completed as part of the start-up process.
5. The subcontractors shall execute and document the pre-functional checklists and perform start-up and initial checkout procedures. The CxA shall document that the checklists and start-up procedures were completed according to the approved plans.
6. The CxA shall develop specific equipment and system functional performance test procedures. The subcontractors shall review these procedures.
7. The functional performance test procedures shall be executed by the subcontractors and documented by the CxA.
8. Items of non-compliance in material, installation, setup, or operation shall be corrected at the subcontractor's expense and the system retested.
9. The CxA shall review the O and M documentation for completeness for turn-over at project completion.
10. The CxA shall review, approve, and coordinate the training provided by the subcontractors and verify that it was completed.
11. All deferred testing shall be performed prior to substantial completion.
12. All commissioning work shall be completed prior to substantial completion.

3.13.6 Required Documentation

The CxA shall, at a minimum, provide the following documentation to the agency at the predetermined times:

1. The commissioning plan;
2. Pre-functional checklists;
3. Functional test reports;
4. Issue logs (ongoing and final);
5. Issue resolution documentation (ongoing and final); and
6. Final commissioning report.

4 TECHNICAL SPECIFICATIONS

4.1 Division 01 – General Conditions

4.1.1 General Conditions:

Will be set forth in Division 01 of the technical specifications. They will be subject to review and approval by the DMS project management team.

4.1.2 Background Check:

All contractor and subcontractor personnel must pass a background check. Consult with the DMS project management team to determine the level of the check and specific requirements.

4.2 Division 02 – Existing Conditions

4.2.1 Demolition:

A detailed demolition plan must be provided as part of the construction documents. It will include debris encapsulation and removal methods, the removal path, on-site storage, protection of existing finishes, dust mitigation, and transport to disposal site. The latter must comply with any green building model chosen.

4.2.2 Phasing Plan:

A detailed phasing plan must be provided for all projects in which work may not occur concurrently or in which there may be a need to displace workers. It is preferred that the phasing plan be represented graphically in the construction drawings.

4.2.3 Cutting and Patching:

All areas disturbed by new work, must be returned to original condition or a condition compatible with new work.

4.3 Division 03 – Concrete

For Future Expansion

4.4 Division 04 – Masonry

For Future Expansion

4.5 Division 05 – Metals

For Future Expansion

4.6 Division 06 – Wood and Plastics

For Future Expansion

4.7 Division 07 – Thermal and Moisture Protection

4.7.1 Building Envelope

The building shall be designed to ensure weather tightness, minimize maintenance,

maximize building longevity, and be architecturally compatible with the environment.

4.7.1.1 Exterior Wall System:

The exterior walls shall include a secondary drainage plan composed of an assembly system comprised of materials from the same manufacturer. The wall system shall be continuous with foundation and roof systems.

4.7.1.2 Air Barriers:

Air barriers are made of durable, non-porous materials and are sealed to adjoining wall, ceiling or floor surfaces with suitable long-life mastic. Taped and sealed drywall may constitute an air barrier but dropped acoustical tile ceilings (T-bar ceilings) may not. Batt insulation facings and asphalt-impregnated fiberboard and felt paper are not considered air barriers.

Where vented dropped ceiling cavities occur over conditioned spaces, the ceiling shall be both the upper thermal envelope and pressure envelope of the building and shall contain a continuous air barrier between the conditioned space and the vented unconditioned space that is also sealed to the air barrier of the walls.

Where unvented dropped ceiling cavities occur over conditioned spaces that do not have an air barrier between the conditioned and unconditioned space (such as T-bar ceilings), they shall be completely sealed from the exterior environment (at the roof plane) and adjacent spaces by a continuous air barrier that is also sealed to the air barrier of the walls. In that case, the roof assembly shall constitute both the upper thermal envelope and pressure envelope of the building.

4.7.1.3 Exterior Joints in the Envelope:

All exterior joints cracks and holes in the building envelope shall be caulked, gasketed, weather-stripped, or otherwise sealed. Such joints shall include, but not be limited to, the following: Around windows or door frames, between walls and foundations, between walls and roof/ceilings, through wall panels and top and bottom plates in exterior walls, at penetrations of utility services or other service entry through walls, floors, and roofs, between wall and floor where the floor penetrates the wall, between wall panels, particularly at corners and changes in orientation, around penetrations of flue vents, or attic hatches, walls bounding building cavities between floor/ceilings and ceilings/roof decks.

4.7.2 Insulation and Acoustical Treatment:

Ceiling/Roof shall have an R value compatible with the Florida Building Code.

Walls shall have an R value compatible with the Florida Building Code. Option: thermal performance may be determined via an energy model per the Florida Building Code.

4.7.2.1 Acoustical Treatment:

Mechanical rooms shall be acoustically separated from adjacent computer room. Insulation extending to the underside of the deck above and with acoustical sealant at the top and bottom of the wall. Acoustical treatments shall be a fiberglass batt type specifically intended for this purpose.

Elevator equipment room and hoistway walls shall be acoustically insulated when

adjacent to usable (tenant) space.

4.7.3 Roofing

4.7.3.1 Quality Assurance:

All roofing and plaza deck system types shall be from a single source manufacturer. Non-Prorated weather tight single sourced 20-year warranty for material and workmanship shall be provided as a baseline. The warranty must also cover perforation or structural failure of metal roofing panels and accessories. Warranties of shorter duration may be considered depending upon cost and application. Warranties of greater duration may be requested for special applications.

Metal Roof panel manufacturer must warranty for minimum period of five years that the finish color will not change more than five NBS units in accordance with ASTM D 2244 and will not crack, peel or lose adhesion with the substrate for a period of 20 years.

Third Party, RCI/IRWC certified inspections shall be available.

4.7.3.1.1 Plaza Deck System Warranties:

Must include insulation, pavers, paver support system, leak detection system, and planters. The warranty must allow for removal of these items – the overburden – to allow for repair of the membrane.

4.7.3.2 Mechanical/Plumbing/Maintenance Integration:

Roof Access:

- a. Provide internal access to the roof via a ladder or stair and a lockable weather tight door or hatch.
- b. Provide walk pads around maintenance items along the route from roof access points to the maintenance items.

Roof Penetrations:

- a. Mechanical ventilation and plumbing penetrations through the roof should be limited wherever possible.
- b. Detailing of penetrations should comply with SMACNA or NRCA guidance.
- c. Detail references from SMACNA or NRCA should be provided in the contract documents.
- d. Through-the-roof penetrations shall be round pipe or round sleeve.
- e. Avoid shapes with corners where possible.
- f. All roof penetrations shall be flashed by the roofing contractor.
- g. Maintain a minimum spacing of 4'6" between penetrating pipes and equipment to allow for the convenient and proper detailing work of the roofing application.

Roof Top Equipment:

HVAC units or equipment are not typically permitted on the roof top, except for necessary exhaust fans, vents, and outside air intakes. If it is necessary to install major mechanical equipment on a roof top, screening structures must be provided. Screening structures must be compatible with the architectural style of the building and be designed for the appropriate design wind speed. It is preferred that all major roof top equipment

be mounted on roof curbs.

4.7.3.3 Drainage Considerations:

- a. Emergency overflow drains are preferred over through-wall scuppers. Provide a minimum 4-inch-high leaf guards on drains.
- b. Gutter to rain leader connections shall be welded (for aluminum gutters) in lieu of a flange secured to the gutter with fasteners and sealant. Provide a detail of this construction on the plans.
- c. Expansion joints shall be elevated upon a solid tapered base; drainage shall be positive and away from the joint at every side.
- d. Vertical rain leaders shall be external to the building/envelope.
- e. Drainage pieces should be kept a sufficient distance from parapets and up-stands to allow the installer to work from all sides.

4.7.3.4 Detailing:

The following conditions must be properly detailed and referenced on the contract documents.

- a. Pitch Pockets - Avoid the use of uncapped pitch pockets.
- b. Limit the use of pitch pockets.
- c. Detail roof flashing at all types of roof penetrations.
- d. Detail every flashing condition required for the type of building designed. Show flashing intersections in isometric views.
- e. Show all penetrations through the roof on Roof Plan.
- f. Show all roof ventilators, and any other types of approved equipment to scale on Roof Plan.
- g. Specify and locate roof walk protection pads on Roof Plan.
- h. Show roof drains and overflow drains or scuppers on Roof Plan.
- i. Provide details of all applicable primary drain installations, including rain leader tailpiece connection to gutter.
- j. Show metal coping cap on parapet tops. Terminate roof membrane under this cap.

4.7.4 Flashing

Use the latest edition of the “Architectural Sheet Metal Manual” published by the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) as a design guide.

Aluminum flashing is preferred. However, galvanized metal is acceptable if properly finished. Factory finished flashing is preferred, regardless the material, unless specific design conditions warrant a field finish. Composite flashing is not permitted, unless it is a component of a roof system.

Verify substrate materials and joint compounds are compatible with flashing and will not cause corrosion of flashing material and staining of face veneers.

Design metal flashing and coping caps to eliminate or minimize the use of sealants. Do not rely on sealants as the primary barrier to water penetration.

Where sealant joints are required, utilize sealants that are designed to accommodate movement characteristics and are compatible with the flashing material selected.

Protect dissimilar metals against galvanic action.

Base flashing should have an 8" minimum upstand from roof and be a minimum of 4 inches above a 4-inch cant. Metal counter-flashing should lap base flashing at least 4 inches.

Plan for Renewal: Counter-flashing to be removable and replaceable or renewable. Wall system must have a permanent sill or seating.

4.7.4.1 Flashing Details:

Provide the following flashing details or incorporate the requested information into details for related work:

- a. Roofing flashing;
- b. Against parapets;
- c. At all penetrations through roof;
- d. At gravel stops;
- e. Expansion joints;
- f. Corner conditions;
- g. Non-typical design feature;
- h. Wall Flashing;
- i. Flashing under copings;
- j. Thru-wall flashing;
- k. At windows and doors;
- l. Expansion joints;
- m. Corner conditions; and
- n. Non-typical design features.

4.7.5 Gutters and Down Spouts

Connecting sections (seams) of gutters shall not occur directly over building entries or walkways. The A/E should detail the connection between the rain leader and the gutter and require shop drawings for this feature. The metal gutter outlet (neck) connection at the continuous aluminum rain gutter should be welded using the TIG or MIG welding process. Mechanically fastened the rain leader to the metal fitting at the bottom, if connecting directly to the storm sewer.

To avoid problems with water infiltration within the building, the rain leader (downspout) should be outside of the secondary weather barrier and secured to the building exterior wells.

SMACNA gutter and down spout design calculations must be provided with the contract documents.

Splash blocks must be provided, must be sized appropriately, and must be shown on the drawings.

4.7.6 Sealant and Caulk

All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the requirements of the following reference standards:

South Coast Air Quality Management District (SCAQMD) Rule #1168.

Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36.

4.8 Division 08 – Openings

4.8.1 Steel Doors and Frames

Recess exit doors coming from outboard stairs.

Mechanical equipment rooms shall be located on exterior walls with exterior doors.

Exterior doors shall be painted hollow metal.

All exterior frames shall be welded

4.8.2 Wood Doors

Janitor closet doors shall be solid core wood, painted or stained, 3 feet x 7 feet minimum. Frames shall be painted hollow metal sized for equipment width and height. Frames shall be hollow painted metal and have welded frames.

Mechanical Rooms interior doors shall be solid core wood, painted or stained, 3 feet x 7 feet or larger as may be dictated by service requirements of equipment. Frames must be welded.

Stair entry doors shall be fire rated as required, painted hollow metal, 3 feet x 7 feet minimum. Frames shall be hollow metal, painted and fire rated as required by code. Welded frames are required.

Main lobby stair doors at each floor level shall have magnetic hold opens. Provide vision panels in all other stair doors. Steel frames must be welded.

Tenant space doors shall be solid core wood, painted or stained, 3 feet x 7 feet minimum. Frames are painted hollow metal. Knock down frames are permitted.

Openings with a height of 6 feet 8 inches are permissible, if necessary to match existing doors.

4.8.3 Entrances and Storefronts

4.8.3.1 General:

All exterior glazing shall be insulated. The typical glazed opening shall be a center glazed storefront system. The following are the major glazing system components: Glazing unit = 1" thick unit; Outer pane = 1/4" tinted, tempered glass, with low-E coating on surface two; 1/2" air space; Inner pane = 1/4" clear, fully tempered.

4.8.3.2 Storefront Basis of Design:

4 inches nominal width, center glazed, equivalent to Kawneer Tri-Fab 451, as a basis of design.

4.8.3.3 Entrance Doors:

4 1/2-inch stile heavy duty aluminum doors, fully glazed with FT single glazing, pivot hinges and concealed overhead closer that are adjustable to 8.5 pounds closing force. Other door dimensions may be used, if engineered for the specific application. Provide hydraulic power door operators with hard wired switches at main employee and visitor entrances.

Automatic Doors (Sliding) - The following applies to sliding automatic doors:

1. The doors must be provided with a break-away feature;
2. In the break-away configuration, the clear opening must also be 32 inches minimum;
3. The doors must break-away in the direction of egress;
4. A dedicated circuit, to power the door operator, is required; and
5. In the event a clear opening of 32 inches cannot be achieved in the break-away configuration, the doors must be connected to emergency power. If emergency power is not available, an integral battery pack is required. If a battery pack is used, the door operator must be programmed to "fail open." Sliding doors should not be utilized in secure environments.

Automatic Doors (Swinging): The following applies to swinging automatic doors:

1. The doors must allow for manual operation with loss of power;
2. Door opening force must comply with The Florida Building Code – Accessibility;
3. A clear opening of 32 inches is required, however, 36" is preferred;
4. A dedicated circuit to power the door operator is required.

4.8.3.4 Storefront Glazing:

Edge blocks are required for all storefront and curtain wall installations, even if not mandated by the manufacturer. Provide elastomeric, neoprene, EPDM, or silicone blocks of size and hardness required to limit lateral movement (side walking) of glass and which are compatible with glazing sealant.

4.8.4 Metal Windows – Exterior:

Detail windows (sealing on the exterior) to prevent air or water infiltration. Compliance with the criteria of air leakage shall be determined by testing to AAMA/WDMA 101/I.s.2-97 or ASTM E283-04, as appropriate. Air leakage shall not exceed 0.3 cfm.

Provide windows with thermal break construction. Provide units which have been tested for thermal performance in accordance with current AAMA requirements.

Design window sections to accommodate expected wind pressure and turbulence. The contractor is to submit signed and sealed calculations.

Windows shall be fabricated with non-corrosive fasteners.

Window frames should be designed with baffled weep holes. Do not allow weep holes to be blocked by sealant. Air pressure equalizer holes should be provided wherever some portion of a window frame or curtain wall assembly will have a lower pressure than the outside atmosphere.

Compatibility testing should be specified for all setting materials that come in contact with each other, such as sealants or setting blocks, gaskets, and edge shim material. Specify

that setting block locations will be verified in the field so as not to seal off weep holes.

Sills must slope down from the window to allow positive drainage.

4.8.5 Door Hardware

4.8.5.1 General:

Use passage sets as a default configuration for all doors. Provide grade two hardware with lever handles that do not have rough edges or casting imperfections.

All hardware in fire rated doors must be U.L. Listed.

Use a standard unit -type (non-mortise) lock cutout.

Hardware configuration at exit stairs allows re-entry with card reader during business hours. However, no re-entry may be required at some locations.

All doors opening to outside (e.g., exit doors) shall have non-removable hinge pins. Provide latch guards at exterior doors to deter unauthorized entry protection.

All hardware specifications, finishes, and schedules shall be submitted to the agency prior to bidding.

Interior hardware shall be Satin Chromium Plated [626(26D)]; exterior hardware shall be Satin Stainless Steel [630(32D)]. Other finishes may be considered, relative to design and budget.

4.8.5.2 Locks:

Provide locking hardware configuration at suite entrances, storage areas, building support spaces (such as telephone closets, electrical closets, and mechanical rooms), and where specifically required in building program.

Locks shall have heavy wrought steel cases and armored fronts adjustable to suit door bevel.

Latch bolts shall be “true” anti-friction hinged type with minimum throw of $\frac{3}{4}$ ". Deadbolts shall have a minimum throw of one inch. Equip with hardened steel roller inserts.

Locksets/latchsets levers on doors leading into hazardous areas shall have a tactile warning finish.

4.8.5.3 Keying:

A key cabinet should be provided, if one does not exist.

Cylinders shall be keyed to the agency key system, and are subject to the Great Grand Master, Grand Master, Master and Change Keys. Locksets are to accommodate the agency's standard cylinder.

Cylinders shall be “Construction Master keyed.”

Permanent cylinders shall be factory keyed as directed by the agency.
Keys shall be stamped "State of Florida" - "Do Not Duplicate."

The following keys and equipment shall be furnished:

1. Three each GMK;
2. Six each MK system as required;
3. Three per lock change keys; and
4. One each lockable key cabinet to suit job requirements with 100% expansion space.

4.8.6 Glazing

4.8.6.1 General:

Glazing systems should be carefully evaluated to accommodate applicable building movement. Verify that glass selected can accommodate expected thermal expansion and contractions. Glass must meet Florida Building Code Energy Conservation requirements as a part of the exterior building envelope.

Provide non-operable windows with spectrally selective double pane glazing or tinted double pane glazing.

Windows should have a Solar Heat Gain Coefficient (SHGC) less than 0.40. This may vary depending on other building envelop components.

Glazing should have a Visible Transmittance (VT) above 0.70 to maximize daylight and view. The total window should have a VT above 0.50.

Verify that glass meets U-value and shading coefficients required by mechanical equipment design. Select a window with a U-factor lower than 0.35.

Window sections conform to current American Architectural Manufacturers Association (AAMA) standards for commercial or heavy commercial windows.

Insulated glass must conform to Sealed Insulating Glass Manufacturers Association (SIGMA) guidelines for vertical and sloped glazing.

Provide the project director with a "washability" design statement applicable for all glass surfaces. External and internal which describes how glass is accessed for cleaning. Architect should consider maintenance and cleaning design criteria for evaluation by the agency prior to inclusion in the project specification.

Specify that the general contractor will provide certification that units installed meet the specified requirements.

Standard glass colors for project shall be either bronze or grey, with the final selection to be confirmed by the agency prior to submittal to the Schematic Design Phase. Reflective glass, if approved by the agency, shall not exceed 35 percent.

Require warranty on insulated units covering seal and build-up of condensation.

4.9 Division 09 – Finishes

4.9.1 Room Finishes

4.9.1.1 Corridors:

All walls shall be painted, including fire-rated gypsum board, with an eggshell or semi-gloss high traffic/washable latex type wall paint. Floors shall have carpet tile with a minimum 10-year warranty. The carpet shall be a tufted textured graphics loop with a minimum pile face weight of 16 ounces per square yard. Base shall be vinyl/rubber, coved, 4 inches high, minimum 1/8 inch thick. Ceiling shall be 2 feet x 2 feet suspended acoustical ceiling tile with tegular edge.

4.9.1.2 Toilet Rooms:

Toilet room walls shall be masonry or water-resistant gypsum board with acoustical insulation in walls, ceilings, and behind cabinets. Floors may be ceramic tile or sheet flooring.

4.9.1.3 Janitor Closets:

Where hazardous gases or chemicals may be present or used, exhaust each space sufficiently to create negative pressure with respect to adjacent spaces with the doors to the room closed. For such spaces, provide self-closing doors and deck to deck partitions or a hard lid ceiling. The exhaust rate shall not be less than 0.50 cfm/ft^2 with no air recirculation. The pressure differential with the surrounding spaces shall be adequate to contain the hazardous gases based on industry standards. See Ventilation and Exhaust Systems for further information. Floors shall be stained/sealed concrete or ceramic tile. Base shall be covered vinyl/rubber. Wall finish shall be epoxy paint on water-resistant gypsum board or CMU. Ceilings shall be water resistant gypsum board painted with semi-gloss enamel or exposed to structure above.

4.9.1.4 Electrical Rooms:

Walls shall be painted CMU or gypsum wall board. Ceilings shall be the exposed structure. Floors shall be sealed concrete.

4.9.1.5 Mechanical Rooms:

Floors shall be hardened and sealed concrete. Ceiling is exposed structure. Walls are painted concrete masonry or water-resistant gypsum board. Provide floor drains and slope floors for proper drainage. Waterproof walls to 6 inches AFF and wall/floor interface to prevent water/moisture migration.

4.9.1.6 Stairs:

Walls shall be fire rated as required by code and shall be CMU, shaft wall, or other compliant tested assembly, painted with high traffic/washable latex wall paint multi-color system with a maximum of two colors. Commercial rubber treads and risers shall be used with nose caulk for every tread. Landings shall be commercial vinyl tile (VCT) to coordinate with treads and risers. Exception: First floor leading to center stair to have tile to match lobby tile. The ceilings shall be 2 feet x 2 feet suspended acoustical ceiling tile with tegular edge.

4.9.1.7 Main Lobby:

Floor finish and base shall be slip resistant hard tile (ceramic, quarry, or stone), thinset. Dark grout is preferred with 1/8-inch grout joints. Expansion joints shall be located under side walls where possible or as shown on prototype plans. Coordinate location of construction joints in concrete floors with location of tile joints. An ADA compliant metal edge strip shall be placed at termination of tile where tile abuts carpet. Walls shall be gypsum board with appropriate fire rating. Finishes should be durable such as paint (same as corridor) or plaster. Ceiling finish shall be acoustic ceiling panel, painted gypsum board, or metal. Entry vestibule requirements are the same as the main lobby with the following exception: acoustic ceiling tile, if utilized, must have clips or bracing to prevent uplift. The entry vestibule must be provided with a walk-off matt – recessed with aluminum frame is preferred. All finishes in the entry vestibule must be of a type to withstand higher exposure to humidity than interior spaces.

4.9.1.8 Offices:

Walls shall be painted gypsum board and terminate 6 inches above the ceiling except that walls of offices for Division Directors, Assistant Division Directors, and larger rooms are to extend to the underside of the deck above. Conference rooms, training rooms, and those spaces requiring confidentiality should also extend to deck above. Walls are not to be acoustically insulated except as required by the program and approved by the agency. Ceilings shall be flat lay-in 2 feet x 2 feet acoustic panels with a tegular edge, typically 9 feet high. Floors shall be carpeted.

4.9.1.9 Telecommunications and Data Rooms:

Ceilings shall be painted gypsum board. Lay-in ceilings are not permitted. Walls shall be painted gypsum board. The ceiling and wall envelope must be contiguous. Wall and ceiling paint must be a light color. Plywood must be applied to at least one wall. See current TIA standards for installation of plywood. Flooring must be an electrostatic dissipative (ESD) product with a compatible base.

4.9.1.10 Copy/Break/Vending Rooms:

Floors shall be commercial vinyl tile or ceramic/porcelain tile. Cove bases shall match flooring material. Counters and backsplashes shall be plastic laminate. Sinks shall be stainless steel. Base and wall cabinets shall be plastic laminate with flush overlay. Protect splash area behind coffee sinks. Walls will be standard high traffic/washable latex type wall paint. Ceilings shall be suspended 2 feet x 2 feet acoustical tile with tegular edge.

4.9.1.11 Communications Rooms:

Communications rooms shall have all walls covered with 4 feet x 8 feet x 3/4 inches fire retardant interior grade plywood.

4.9.2 Exterior Soffit and Vents

4.9.2.1 Soffits and vents should be constructed in such a way that insects, particularly wasps, will not be able to travel through holes in the vent or any other voids or crevices inherent in the construction.

4.9.3 Stucco:

Comply with requirements of the Portland Cement Plaster (Stucco) Manual. Also comply with the requirements of the specific vendor.

4.9.4 Gypsum Board

4.9.4.1 Maximum spacing of partition studs and wall furring is 16 inches on center.

Gypsum wall board thickness shall be 5/8 inches minimum when used in single layer applications.

4.9.5 Tile

4.9.5.1 Floors shall be unglazed ceramic or non-slip porcelain floor tile in 8 inches x8 inches or larger sizes with a maximum of two tile colors.

Separate color schemes may be developed for the men's and women's toilet rooms or on a floor-by-floor basis. Tile wainscots are preferred. Base shall be coved tile. Wall behind the water closets/urinals and the back wall of the handicapped stall shall be 8 inches x 8 inches matte finish ceramic or porcelain tile with a maximum of three tile colors. Provide four rows of porcelain tiles on wall next to urinals. All other walls shall be a multi-colored paint system.

Coordinate all grout joints in the wall, base and floor tiles so that they are aligned. Dark grout is preferred with 1/8-inch joints.

4.9.5.2 Thresholds shall be marble, maximum height of ½ inch with a beveled edge-ADA compliant. Thresholds will be installed directly under the door.

4.9.5.3 Utilize the current addition of the TCNA manual for all installation guidance.

4.9.6 Suspended Acoustical Ceilings:

4.9.6.1 In general, ceiling shall be 2 feet x 2 feet lay-in flat, suspended acoustical ceiling tile with tegular edge, unless notified otherwise. Utilize sag resistant ceiling tiles treated with fungicide to inhibit or retard growth of mold or mildew on their painted surfaces. Use in conjunction with manufacturer's hot-dipped galvanized grid to obtain a 15-year warranty; warranty shall be in the owner's, not the contractor's or subcontractor's name. Special features such as washable surfaces, etc. are as required by the program subject to approval by the agency.

Coordinate grid with overall building module. Minimize grid conflicts with major architectural design features.

Style, pattern, and color of components are selected by the agency from alternatives offered by the developers. Select a tile that will be available as a manufacturer's standard material without requiring special ordering or fabrication.

Concealed-spline ceilings or fiberglass batt/scrim/vinyl faced ceiling tiles are not

permitted. This does not include lay in ceilings with specialized coatings that may be required in special use areas, such as kitchens, labs, or medical treatment rooms.

4.9.6 Resilient Flooring and Base

4.9.7.1 Sheet vinyl or vinyl tile floor finishes may be used for support spaces.

Resilient stair treads and nosings are not required in exit stairs. A brushed concrete finish is preferred.

Base shall be a minimum of 4 inches, coved at carpeted and resilient floors. In renovation work, match the existing base height and color. Exception: in lab, medical, food preparation, or other applicable work areas a higher cove base is permissible.

Flooring shall be non-slip and ADA compliant.

4.9.8 Carpeting

4.9.8.1 Provide transition strips for carpet to tile, or any dissimilar materials, unless there is no change in dimension between materials.

Use a textured graphic loop carpet tile for corridors, public spaces, and heavy traffic areas on buildings four stories or less where the agency desires to encourage the use of stairs instead of elevators. All carpet specified must be listed on the State of Florida Department of Management Services' Contract. Carpet must be installed using the manufacturer's recommended low VOC adhesive and recommended method of installation.

4.9.8.2 Warranty:

The manufacturer's written instructions for carpet care and maintenance shall be provided to the Building Manager upon completion of installation. All materials and labor shall be warranted for a minimum of 10 years from the completion of installation. The installer shall make all repairs or corrections necessary to maintain the completed work in first-class condition for a 10-year period at NO additional cost. This shall include, but shall not be limited to, replacing carpet, relaying, or re-stretching any carpet that does not provide professional appearance, and correcting any condition due to faulty installation, such as a loss of adhesion to sub-floor, dishing, cupping or separating carpet tiles, or frayed or raveled seams.

4.9.8.3 Warranty – Wear:

The carpet shall have a minimum non-prorated warranty of 15 years, warranted against excessive surface wear (not more than 10 percent), delamination of secondary backing, edge ravel, and zippering, by the manufacturer from the date of completion of installation, when installed by certified installers, approved by manufacturer and maintained as specified by manufacturer. The manufacturer shall not be liable for abnormal circumstances and abuse. The warranty shall cover materials, labor and transportation charges, if any. Warranties appearing separately or included in the preprinted material that are less than above, shall not be acceptable and provisions herein take precedence.

4.9.8.4 Carpet tile is preferred in most applications. However, broadloom may be considered in special circumstances.

4.9.9 Paint

4.9.9.1 Paint all interior GWB walls and ceilings with washable eggshell latex paint.

Janitor closets are to be painted with epoxy. Door frames and trim finishes are semi-gloss alkyd enamel. The interior of all exterior walls shall be painted with latex (permeable) paint only. The use of non-permeable finishes on these walls is prohibited.

Paints and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the following criteria:

1. Architectural paints, coatings and primers applied to interior walls and ceilings: Do not exceed the VOC content limits established in current Green Seal Standard GS-11.
2. Flats: 50 g/L.
3. Non-Flats: 100 g/L.
4. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: Do not exceed the VOC content limit of 250 g/L established in Green Seal Standard GS-11. Clear wood finishes, floor coatings, stains, and shellacs applied to interior elements: Do not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings.
5. Clear wood finishes: varnish 350 g/L; lacquer 550 g/L.
6. Floor coatings: 50 g/L.
7. Sealers: waterproofing sealers 100 g/L; sanding sealers 275 g/L; all other sealers 200 g/L.
8. Shellacs: Clear 730 g/L; pigmented 550 g/L.
9. Stains: 100 g/L.

4.9.9.2 All paints and coating must be MPI systems.

4.10 Division 10 – Specialties

4.10.1 Toilet Compartments

Toilet partitions are to be floor supported and overhead braced. Jamb sections not anchored to walls shall be a minimum width of 8 inches. The maximum clearance between the floor and partition is 12 inches. Attach toilet partitions to adequate structural support including backing in walls. Do not use solid color plastic laminate. Avoid matte dark colors.

Solid phenolic or HDPE partitions are preferred. Eclipse by Scranton Products, Inc. or Accurate Partitions by ASI Group, Inc. are basis of design options.

All partitions must be designed for enhanced privacy – having little or no gap between the door, wall or adjacent panels. Gaps between panels or panels and supports may not exceed ¼ inch.

4.10.2 Directories and Signage

4.10.2.1 Utilize the room numbering system as specified by the agency.

Door numbers are to match room numbers.

The exterior sign must be clearly legible from a distance of at least 100 feet. Minimum height of the letters shall be 6 inches.

4.10.2.2 Building Identification Signs:

A building identification sign should be located at or next to the main entrance walk of the building.

4.10.2.3 Traffic Signs:

Traffic signs are typically the standard signs used by the local government or the Florida DOT.

4.10.2.4 The sign material shall be one of the following design formats. (Note: Do not use surface silk-screened graphics and subsurface silk-screened graphics without UV protection due to their poor weathering characteristics). Subsurface silk-screened graphics are also discouraged because they cannot be easily refinished. Do not use fiberglass reinforced polyester panels. All design formats shall be reviewed by agency signage personnel as directed by the project director.

Steel or aluminum finished with two-part catalyzed urethane paint is the preferred material for outdoor signage. The catalyzed paint finish is preferred over anodizing for aluminum. Note: This finish contains lead products and cannot be used at playgrounds, daycare facilities, or where the presence of children is likely.

Outdoor dimensional letters shall be cast aluminum, bronze, or stainless steel. Aluminum should be painted rather than anodized.

If vinyl lettering is specified, use only cast vinyl equivalent to 3M Company Scotchcal™ or Scotchlite™ vinyl sheeting. Do not use calendared (die-cut) vinyl for permanent signage outdoors. Calendared letters contain internal stresses from the manufacturing process that cause the letters to shrink and peel off when heated by the sun. Cast letters, by contrast, tend to bake on under the same conditions.

4.10.3 Toilet and Bath Accessories:

Grab bars are required to have concealed mounting at accessible toilet stalls.

Dual roll toilet tissue dispensers are required at all toilet stalls.

C-fold paper towel dispenser with integral disposal, surface or semi-recessed mounting located in all toilet rooms, unless otherwise specified.

Surface mounted feminine napkin disposals are required in all women's toilet stalls.

Soap dispensers are required at all lavatories, unless otherwise specified (Coordinate location in design documents.)

Toilet accessory finishes are to be brushed stainless steel. Finishes shall be coordinated with each other, door hardware, and plumbing hardware.

Mirrors shall be full width of counter at floating counters or individual over wall mounted lavatories and placed above a minimum 6 inches high backsplash. Provide warranty against silver spoilage.

4.10.4 Fire Safety Equipment

4.10.4.1 Knox Box:

For all free-standing new construction provide a Knox Box in accordance with local fire safety ordinances. This may also apply to renovations when a new main entrance, or emergency ingress location has changed.

4.10.4.2 Fire Extinguisher:

Provide number and type as required for the specific application per NFPA codes.

4.11 Division 11 – Equipment

4.11.1 Common Use and Breakrooms:

These areas are “common-use” areas and must be accessible to persons with disabilities. Height of countertops shall be 34 inches AFF. Sink area shall be in accordance with the Florida Building Code – Accessibility with clear floor space for a front approach and proper knee clearance. Counters and backsplashes shall be plastic laminate. Sinks shall be stainless steel. Base and wall cabinets shall be plastic laminate with flush overlay. Protect splash area behind coffee sinks.

Requirements for appliances including coffee makers, refrigerators, and microwaves should be reviewed with the client and confirmed by the agency.

Requirements for seating areas should be reviewed with the client and confirmed by the agency.

4.12 Division 12 – Furnishings

For Future Expansion

4.13 Division 13 – Special Construction

For Future Expansion

4.14 Division 14 – Conveying Equipment

4.14.1 Elevators

Elevators may be hydraulic in buildings five stories or less. Traction systems specifically engineered for low-rise applications may be permitted. The following criteria are required:

1. A minimum capacity of 4500 pounds is required.
2. Must be pre-engineered.
3. 150 FPM hydraulic minimum required.
4. Ceiling height of 9 feet minimum (one elevator to have minimum 10 feet if no separate service elevator is provided).
5. Completely accessible emergency hatch required.
6. Doors and frames shall be 36 inches wide center opening with No. 4 satin stainless steel finish.
7. Wall finish shall be plastic laminate with stainless steel handrails on back and both side walls.
8. Wall finish is No. 4 satin stainless steel on front wall.
9. Walls shall have stainless steel hooks for protection pads.

4.14.2 Hydraulic Service Elevators

4.14.2.1 The following criteria are required:

1. A minimum capacity of 4000 pounds;
2. Must be pre-engineered;
3. 125 FPM hydraulic;
4. Cab height shall be 10 feet with a 2 inch x 2 inch silver anodized aluminum suspended ceiling grid with satin stainless-steel T-bars at 9 feet 6 inches;
5. Doors and frames shall be 48 inches wide center opening with No. 4 satin stainless-steel finish.;
6. Wall and floor finishes are to match passenger elevators (if in same proximity as passenger elevators);
7. Walls shall have stainless steel hooks for protection pads;
8. Completely accessible emergency hatch provided;
9. The service elevator serves all floors including mechanical or penthouse floors.;
10. The service elevator is to have a separate direct access to the service area on the ground floor that does not conflict with public traffic and elevator access patterns.

4.14.2.2 Elevator equipment room walls shall be acoustically insulated when adjacent to usable (tenant) space. Provide cooling and exhaust in elevator equipment rooms in accordance with the Florida Building Code and elevator code.

In buildings four stories and higher, at least one elevator must be connected to emergency power.

4.21 Division 21 – Fire Suppression

4.21.1 General Fire Suppression Systems

4.21.1.1 Fire water system connections and backflow preventers shall comply explicitly with the “Authority Having Jurisdiction.”

4.21.1.2 The contractor shall provide the complete installation of water-based fire- extinguishing systems and is required to be the installing contractor or site representative with the

required license. Subcontracting will not be the contractor must be NICET level II certified and must possess the appropriate class I or class II fire sprinkler license as required by the State of Florida.

4.21.1.3 Water-based fire systems shall be installed, inspected, tested and certified per appropriate NFPA 13, 14, 20, 24, 25, including NFPA 101. Any applicable codes shall apply to meet State of Florida and State Fire Marshal requirements, local and state jurisdiction.

4.21.1.4 The following criteria are required:

1. Black Steel pipe shall be required for all installations. Galvanized pipe is not acceptable except for trim piping on Dry Pipe and Preaction systems.
2. All Sprinkler Piping will be painted RED for outdoors or exterior installations.
3. Schedule 40 Back Steel pipe shall be used on Dry Pipe and Preaction Systems.
4. Steel pipe shall be used on Dry Pipe and Preaction Systems.
5. All Dry Pipe and Preaction Systems shall use nitrogen as the supervising gas.
6. The main system drains and inspector test drains shall be piped to an adequate drain outside the building. The drain water flow shall not pose a threat to persons on sidewalks, in parking garages, or on streets adjacent to the building.
7. Provide 4-inch gauges with a connection size not smaller than ¼ inch. Each gauge connection shall be equipped with a shutoff valve and provisions for draining.
8. All control, drain, and test connection valves shall be supplied with weatherproof identifications signs secured with corrosion-resistant chain.
9. All control valves shall be equipped with signage that indicates the exact area/zone of coverage.
10. All control valves shall be individually electronically supervised. Multiple control valves shall not be supervised by the same zone or addressable point.
11. Sprinkler heads shall be located to reduce water damage to electrical equipment when possible.
12. Sprinkler heads shall be centered in acoustical ceiling tiles.
13. Dry-pipe system valves shall be the type that is able to be reset without dismantling the valve.
14. Air compressors for dry-pipe and preaction systems shall be sized to refill the system within thirty minutes.
15. All air compressors shall be conventional oil-filled compressors, not oil-less.
16. All dry-pipe and preaction fire sprinkler systems shall be protected against microbiologically influenced corrosion (MIC).
17. All alarm/supervisory devices shall be installed by the fire sprinkler contractor.
18. All wiring of alarm and supervisory devices shall be performed by the fire alarm contractor.
19. Control valves shall be butterfly valves with built in tamper switches, not OS and Y valves, unless specifically required by Code.
20. Sprinkler risers and sectional/floor control valves shall be located in stairwells, provided they do not interfere with egress.

4.22 Division 22 – Plumbing

4.22.1 General Plumbing Requirements

4.22.1.1 The following criteria are required:

1. No water/sanitary piping shall pass over or through communication or electrical rooms.
2. According to the Department of Community Affairs, *potty parity* does not apply to office buildings. Design the plumbing systems in accordance with the latest edition of the Florida Building Code.
3. Domestic cold and hot water mains and risers, and horizontal roof drainage piping, shall be insulated with one-inch thick fiberglass preformed insulation with all-service jacket (ASJ) and PVC fitting covers.
4. Drinking fountains shall be recessed to avoid obstructing corridors and becoming a protruding object for visually impaired or blind.
5. All drinking fountains shall be bi-level.
6. Toilet rooms are expected to have an accessible plumbing chase with a minimum clearance of 30 inches between walls. The chase (wet) wall shall at least include toilets and urinals. Provide a shut-off valve for the supply water for each toilet room and a floor drain with trap primers located in the plumbing chase.
7. Lavatories shall have cold water only. All faucets are to be self-closing. In addition to the lavatory within the accessible stall, every restroom shall have at least one accessible (ADA) lavatory outside of the stall.
8. Every toilet room shall have one tamper-proof hose bib with a vacuum breaker located under a lavatory and installed at least 16 inches above the finished floor.
9. Provide a mop sink and a floor drain with the floor sloped to the drain in all janitor closets.
10. Mechanical rooms shall be provided with at least one hose bib.

4.22.2 Plumbing Piping and Specialties

The following criteria is required:

1. All pipe, valves, and fittings shall be manufactured in the United States.
2. All domestic water piping shall be copper in accordance with the applicable ASTM standards for below grade and above grade use.
3. Provide shut-off valves at each floor level for all utilities.
4. Toilets, urinals, sinks and water coolers shall have individual shut-off valves. Provide access panels with the appropriate fire ratings to facilitate maintenance and repair activities.
5. Roof drainage piping material shall be the same as sanitary waste and vent.

4.22.3 Building Soil, Waste, Sanitary, Vent, and Interior Storm Systems

4.22.3.1 The following criteria is required:

1. Specify cleanouts as required by code. Keep cleanouts away from entry walks, doorways, public, and tenant use areas, and above the flood level rim of fixtures served.
2. Specify on the plans the invert elevation of the junction between the building drain and

building sewer.

3. Specify on the plans the total connected fixture load.
4. Specify trap primers on floor drains per the Florida Building Code.
5. For buried pipe or pipe embedded in concrete use: Schedule 40 PVC conforming to ASTM D1785 and D2665 or Cast iron “bell and spigot” with rubber compression gaskets meeting ASTM A74 and C564.
6. For above ground piping use service weight hubless cast iron pipe with “clamp all” neoprene gaskets and stainless-steel bands and screw joining assemblies (80 ft-lbs. torque).
7. All pipe fittings shall be long radius fittings.
8. Laser leveling shall be required for all below grade piping.
9. Building sewers shall be connected to the utility provider’s systems in accordance with the utility provider’s regulations and the Florida Department of Environmental Protection’s rules.

4.22.4 Air-Handler Condensate

Where “Authority Having Jurisdiction” requires air-handler condensate disposal to the storm water system, provide both a floor drain to the sanitary sewer for coil cleaning and hub drain to the storm sewer for normal condensate disposal. Provide ball valves to select either the storm sewer system or the sanitary sewer system, not both.

Condensate from air-handling units, fan coils, etc. shall be piped with insulated copper pipe and DWV fittings. PVC condensate piping is unacceptable.

Air-handler condensate pipes shall be equipped with unions before and after the p-trap. Also, provide cleanout plugs at the base of each p-trap.

4.22.5 Plumbing Fixtures

4.22.5.1 All plumbing fixtures are to be classified as “low flow.” Specify like plumbing fixtures throughout the buildings at each campus unless otherwise directed or authorized in writing.

4.22.5.2 Lavatories shall be vitreous china or integral solid surface bowls in solid surface counters. A backsplash is required in toilet lavatories (4 inch minimum height). Lavatories will have cold water only in restrooms and hot and cold water in break room areas and janitor closets.

4.22.5.3 Water closets shall be wall hung white vitreous china with elongated bowls, lever handle flush valve, open front seats, and suitable carriers. Sensor flush valves will be considered upon consultation with the agency. Urinals shall be wall hung white-vitreous china with elongated bowls, suitable carriers, and a high-back design.

4.22.5.4 Provide cast brass adjustable p-traps.

4.22.5.5 Service sinks shall be floor mounted either molded stone or terrazzo.

4.22.5.6 Specify washer-less or long-life faucets.

4.22.5.7 Hose bibs shall be chrome plated with a ¾ inch hose connection, vacuum breaker, and key-handle operator. Specify exterior hose bibs with vacuum breakers located on each side of the building spaced no more than 150 feet apart. Provide frost-free units where applicable.

4.22.5.8 Break room sinks shall be stainless steel. Sinks shall comply with Section 4.24 of FACBC and be a maximum of 6 feet-1/2 inch deep. Provide a protective, removable cover for aesthetics and protection against exposed pipes and surfaces.

4.22.6 Backflow Preventers

4.22.6.1 Specify a backflow preventer that is a reduced-pressure type meeting the requirements of the local authorities having jurisdiction.

Conceal or screen the backflow preventer from view by the public. An indoor location is preferred. Provide an insulated enclosure when the unit is located outdoors and specify bolting the enclosure to the concrete pad.

4.22.7 Water Meters

4.22.7.1 Main building water meters shall be approved by the “Authority Having Jurisdiction.” Main building water meters are not necessarily expected to be the same diameter as the water main. The engineer should consider load diversity in sizing the water meter to minimize associated fees from the local utility provider when applicable. Water meters intended for connection to the building Energy Management and Control System (EMCS), like hydronic make-up water and cooling tower fill lines, shall be furnished by the EMCS contractor but installed by the plumbing contractor.

4.22.7.2 Provide isolation valves around all water meters.

4.23 Division 23 – Heating Ventilation and Air Conditioning

HVAC Design Criteria:

1. Florida Building Code – All Sections;
2. ASHRAE Standard 55 – Thermal Environmental Conditions for Human Occupancy;
3. ASHRAE Standard 62.1 – Ventilation for Acceptable Indoor Air Quality;
4. ASHRAE Standard 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings; and
5. Other industry standards as applicable.

4.23.1 HVAC Design Development and Presentation:

4.23.1.1 Building cooling and heating loads shall be based upon the owner-approved occupancy and internal loads as defined during the schematic phase of design. Miscellaneous loads shall be based upon actual numbers of heat-producing equipment such as, but not limited to, lighting, computers, servers, refrigerators, and copiers. Include all design load parameters on the plans.

4.23.1.2 Provide HVAC design parameters in schedule format on the plans at the design development stage. Outdoor design temperatures, indoor temperatures, design humidity level, ventilation flow rates, occupant density, and any other pertinent data or assumptions must be reflected on the plans.

4.23.1.3 Outdoor design temperatures shall be based on the latest ASHRAE design criteria for the climate zone of the project.

4.23.1.4 Ventilation systems shall be designed per current ASHRAE Standard 62.1.

4.23.1.5 The HVAC system shall be designed and controlled to maintain the building and/or each floor at a positive pressure of 5 to 10 percent. Building pressurization shall be calculated as follows:

$$[(outside\ air - exhaust\ air) \div supply\ air] \times 100 = 5\ to\ 10$$

4.23.1.6 Provide an air balance schedule on the plans to demonstrate building pressurization. The air balance schedule should include the room number, function, supply, exhaust, transfer, and return air flow rates. Also, include subtotals for each air handling unit and/or floor as well as calculations to demonstrate positive pressure.

4.23.1.7 A schedule is required for each building/floor and shall include the owner-approved room number, function, number of occupants, ventilation rate, ventilation methodology, subtotals and/or totals, and any related notes or assumptions. The ventilation design shall utilize the intermittent or variable occupancy rate or indoor air quality procedures where allowed in accordance with the standard. The design shall minimize or eliminate outside air during unoccupied periods and utilize CO₂ controls or demand-based ventilation control to minimize energy consumption and reduce operating costs.

4.23.1.8 A life-cycle cost analysis is required to be performed in accordance with the *Florida Life-Cycle Cost Analysis Program (FLCCA)* for all projects that include the installation or replacement of major energy-consuming equipment. The FLCCA program is available from DMS.

4.23.1.9 Proposed architectural features shall be the basis of design. Subsequent architectural changes that affect the thermal performance of the building such as, but not limited to, wall insulation, site orientation, and changes in area or fenestration must be reflected in an update to the HVAC load calculation and life-cycle cost analysis.

4.23.1.10 Corridors, lobbies, and other common areas where occupancy is coincidental shall be designed as separate HVAC zones so that temperature set-points can be maintained differently than temperature set-points in occupied zones.

4.23.1.11 Where ducts cross on the plans, indicate which duct is below with broken lines. Provide adequate elevation detail drawings for complex areas to ensure that insulated ductwork will fit in designated places.

4.23.1.12 All HVAC equipment and components shall be consistently identified on the plans and

in the field after installation to coincide with the existing identification system, when applicable. Only one identification scheme shall be used throughout the project.

4.23.1.13 Specify on the plans that the bottom side of all HVAC equipment such as fan terminal units shall be no more than 18" above the ceiling grid. Such HVAC equipment shall not be installed over tall areas like entrance lobbies and foyers to facilitate maintenance. Specify and design catwalks and platforms as required where equipment will be otherwise inaccessible.

4.23.1.14 Avoid installing HVAC equipment in, above, or close to critical noise areas such as conference rooms.

4.23.2 Mechanical Rooms

4.23.2.1 The following criteria are required:

1. Major air conditioning and/or refrigeration equipment such as chillers, pumps, expansion tanks, etc. shall be located in accessible mechanical rooms. Major air conditioning equipment shall not be located on the roof unless approved in writing by the owner.
2. Mechanical equipment rooms shall be located on exterior walls with exterior doors, where practical.
3. Design mechanical rooms to allow access to all equipment. Show all equipment service requirements on the plans using dashed lines or hatching. Provide a minimum clearance of 2 feet 6 inches from any wall adjacent to the mechanical equipment.
4. Mechanical equipment room floors shall be sloped to floor drain(s) where possible and shown sloped on the appropriate architectural and structural floor plans. All equipment shall be placed on 4-inch-high housekeeping pads.
5. Design mechanical rooms with ducted returns. Mechanical rooms that serve as return-air plenums are strictly prohibited.
6. Provide knock-out walls only as a last resort. In general, provide a double 3 feet wide door that swings outward and incorporate active/inactive leaves.
7. Specify painting exposed piping in mechanical rooms and providing signage for pipe identification and direction of flow.
8. Provide tags for all valves and a framed valve schedule.
9. Specify sealing mechanical room floors around all pipe penetrations. Coordinate with the architect as required.

4.23.3 Equipment Rooms

4.23.3.1 The following criteria are required:

1. Provide cooling and exhaust in elevator equipment rooms in accordance with the Florida Building Code and elevator code.
2. Equipment rooms with transformers totaling 30 KVA or more, communication closets, and main telephone switch rooms with expensive heat-sensitive switchgear shall be cooled with dedicated air conditioning units, preferably fan coil units where chilled water is available 24 hours a day.

3. Stand-alone HVAC equipment must be provided when 24-hour temperature control is required by the agency or equipment vendor and/or when chilled water is not available after normal work hours.
4. Equipment room HVAC units must be capable of maintaining room temperature and humidity conditions within the equipment manufacturer's requirements.
5. Air-conditioning units intended for equipment rooms shall be located outside of the equipment room to prevent expensive equipment damage caused by potential water leaks and condensate overflows.
6. In general, chilled water piping and condensate piping shall not be routed over equipment unless no other option is feasible.
7. Schedule the cooling capacity to accommodate limited future expansion unless directed otherwise by the agency. In general, include a safety sensible load factor of approximately 20 percent.
8. Equipment room HVAC systems shall be interfaced with the building Energy Management and Control System (EMCS).
9. Provide a hose bib in mechanical rooms.

4.23.4 Critical Rooms

4.23.4.1 The following criteria are required:

1. The owner will determine which rooms require 24-hour temperature control and/or redundant cooling.
2. Hydronic fan/coil units shall be utilized for primary cooling when chilled water is available.
3. When redundant cooling is necessary, the owner will determine whether hydronic or direct expansion systems are more appropriate.
4. Critical room HVAC systems shall not be installed above the ceiling in critical rooms to avoid water damage to expensive electronic equipment.
5. Critical room HVAC systems shall be interfaced with the Energy Management and Control System (EMCS).

4.23.5 Ventilation and Exhaust Systems

4.23.5.1 Ventilation systems shall be designed per current ASHRAE Standard 62.1 or the latest version accepted by code, whichever is more stringent.

4.23.5.2 Demand-control ventilation will be expected. Deviation from demand-control strategies will require justification in writing from the engineer of record and prior agency approval.

4.23.5.3 Large conference rooms shall be designed to compensate for the shift in loads regarding outside air needs during occupied and unoccupied periods. The building Energy Management and Control System (EMCS) or other means of occupancy determination is expected. Utilizing constant volume air systems for these areas will not be acceptable.

4.23.5.4 Temper outside air with heat as necessary to augment morning warm-up during cold spells.

4.23.5.5 Provide MERV 11 filtration in all outside air intakes. Such filters shall be installed prior to outside air supply fans when applicable.

4.23.5.6 Restrict access to outside air intakes for security purposes. All outside air intakes shall be a minimum of 15 feet above grade or roof mounted.

4.23.5.7 Slope outside air intake ducts upward (so that any water drains out the louver) a minimum of one inch per seven feet of run and solder all seams for the first six feet of duct.

4.23.5.8 Provide exhaust in all break rooms to vent odors from the building.

4.23.5.9 Where hazardous gases or chemicals may be present or used (including garages, housekeeping/laundry areas and copying/printing rooms), exhaust each space sufficiently to create negative pressure with respect to adjacent spaces with the doors to the room closed. For each of these spaces, provide self-closing doors and deck to deck partitions or a hard lid ceiling. The exhaust rate shall be at least 0.50 cfm/ft^2 with no air recirculation. The pressure differential with the surrounding spaces shall be at least 5 Pa (0.02 inches of water gauge) on average and 1 Pa (0.004 inches of water) at a minimum when the doors to the rooms are closed.

4.23.6 General Pipe and Fitting Requirements

4.23.6.1 Compliance with ASME Standard B31 for pressure piping is required.

4.23.6.2 Specify a protective coating such as Bitumastic on all underground metallic piping other than pre-insulated types.

All direct-buried chilled water, steam, and heating hot water piping shall be pre-insulated with polyurethane foam with a protective outer casing made of high-density polyethylene.

All piping utilized for underground service is required to have the ends sealed prior to storage or installation. The ends of all such pipes shall remain sealed until they are ready to be installed and welded. Under no circumstances shall piping be left unsealed in trenches for any length of time.

4.23.6.3 Provide flush-out procedures approved by DMS prior to use of pipe.

4.23.7 Vibration Isolation

4.23.7.1 Pumps, fans, and other equipment subject to vibration shall be checked and tested at the full set of speed ranges available from the controls. The maximum acceptable vibration levels shall be specified by the engineer. Specify spring-isolated inertia bases for pumps located in off-grade mechanical rooms and direct mount pump bases on housekeeping pads for pumps located at grade level.

Specify long-life flexible pipe connections with union connections at all water coils, chillers, and other equipment with rotating parts to isolate vibration.

4.23.8 Mechanical Insulation

- 4.23.8.1 All chilled water and hot water piping through walls shall be in sleeves, continuously insulated, and fire-rated as required.

Provide a corrugated aluminum jacket with vapor barrier for all exposed and exterior piping.

All chilled water and below-ambient piping shall be insulated with cellular glass unless direct buried underground.

- 4.23.8.2 Specify exterior insulated ductwork except when acoustical treatment is deemed necessary by the owner. Specify semi-rigid board-type insulation with exterior vapor barrier (i.e., duct board) in exposed areas, such as in mechanical rooms, up to an elevation of 10 feet. Specify mechanical fasteners on the bottom of ducts 12 inches and wider, and a fastener maximum distance of 3 feet from the corners of the duct. Insulation seams, joints, and penetrations shall be sealed with glass fabric and mastic.
- 4.23.8.3 If condensation occurs on the outside of insulated air ducts, air-handling equipment, air terminal boxes, piping, etc. during the construction period, the contractor shall take immediate action to determine the cause and provide corrective action. The contractor will be expected to consult the design engineer as needed and rework the insulation system until the problem is resolved.

4.23.9 Hydronic Piping and Specialties

- 4.23.9.1 All hydronic piping shall be schedule 40 black steel. Welded connections are expected for pipe diameters 2-1/2 inches and larger. Otherwise, use threaded or flanged connections.
PVC and CPVC piping for hydronic systems are prohibited. Specify pre-insulated piping with high density polyethylene (HDPE) outer casing for all underground hydronic piping.

Require the pipe welder certification to be current (within last twelve months) and that it pertains to the type and position of welds required in the project. The certifications must be submitted to the mechanical engineer for review and approval prior to the commencement of work.

- 4.23.9.2 Provide piping connections for temporary connectivity of a cooling tower, chiller, or boiler unless directed otherwise.
- 4.23.9.3 Specify isolation valves at all branch connections. Ball valves are preferred.

Isolation valves are expected to be installed at all hydronic equipment to facilitate proper maintenance.

- 4.23.9.4 All hydronic systems shall have an adequate number of air eliminators installed. All air eliminators shall be connected with isolation valves.

4.23.9.5 Specify comprehensive water treatment for all hydronic systems such as chilled water, steam, condensate, etc. and that all related activities be provided by a qualified water treatment technician. Require a detailed water treatment submittal tailored specifically to the project and that approval by the A/E is required before commencing work.

4.23.9.6 All piping utilized for underground service is required to have the ends sealed prior to storage or installation. The ends of all such pipes shall remain sealed until they are ready to be installed and welded. Under no circumstances shall piping be left unsealed in trenches for any length of time.

4.23.9.7 Specify installation of temporary bypasses and valves at equipment connections to facilitate flushing the pipe during construction. The engineer shall specify, and the agency shall review, the flush-out procedures and parameters. All flushing must occur before connecting to equipment such as AHUs, chillers, coils, etc. All new or affected piping must be flushed, cleaned with solution, flushed, and final treatment added.

4.23.10 Valves

4.23.10.1 The following criteria are required:

1. All valves shall contain all pertinent ASME/ANSI ratings pertaining to pressure, temperature, and fluid type.
2. Flange connections are expected for valve diameters of 2-1/2 inches and larger. Otherwise, use threaded connections.
3. Wafer type butterfly valves are prohibited. Lug-type butterfly valves will be considered acceptable.
4. Provide and/or specify gear operators for all valves 8 inches in diameter and larger.
5. Only full-bore type ball valves are acceptable. All ball valve handles shall be stainless steel, bronze, or other approved corrosion proof coating. Electro-deposited zinc (i.e. electro-galvanizing) is unacceptable.
6. All HVAC control valves shall be furnished by the EMCS contractor and installed by the mechanical contractor.

4.23.11 Pumps

4.23.11.1 The following criteria are required:

1. Pumps and other items of equipment intended as backup shall be served by a separate and distinct set of controls; e.g. one VFD per pump/motor or one motor starter per pump/motor, etc. so that full backup is provided.
2. Pumps with variable frequency drives (VFD) shall be reviewed to assure that proper cooling and lubrication takes place at all speeds. The lowest pump rpm should be clearly shown on the drawings.
3. Pumps and other equipment subject to vibration shall be checked and tested at the full set of speed ranges available from the controls.
4. Maximum acceptable vibration levels shall be specified in the plans and specifications.
5. Specify the alignment of pumps after installation and require a report of alignment

procedures and results.

6. Specify isolation valves, suction diffusers, strainers, and discharge check valves on all hydronic pumps. Multi-purpose valves are acceptable.
7. Provide a single pressure gauge (minimum 4 inch dial) with tubing and isolation valves arranged in a manifold to read pressure before and after all critical components such as the strainer, pump, and discharge check valve.

4.23.12 Chillers

- 4.23.12.1 Chiller selections shall be made based on a life-cycle cost analysis. Use the HVAC load calculation data, building occupant loads, operating schedule data, inflation, actual utility rate data, and chiller performance/efficiency data (including part-load data), and projected maintenance costs in the analysis over the life of the chiller to determine the least overall-cost machine. The analysis shall also include the effects of parasitic losses such as evaporator and condenser barrel pressure losses. Life-cycle cost analyses shall be performed in accordance with the *Florida Life-Cycle Cost Analysis Program (FLCCA)* available from DMS. Chiller selections shall be reviewed and approved by the agency.
- 4.23.12.2 Warranty: All chillers shall be provided with a 10-year parts and labor warranty, a refrigerant warranty and 10-year service and inspection warranty (quarterly and annual service and inspection with condenser cleaning).
- 4.23.12.3 Air-cooled chillers, when used, shall be specified with condenser fin coating or copper fins regardless of location within the state.
- 4.23.12.4 For chillers 200 tons and larger, specify a factory low-load test to demonstrate the turndown capability of the new chiller during low load and/or cold weather operation. The engineer of record shall specify all test parameters and conditions. The test results shall require the review and approval of the agency and the engineer. Additional tests shall be performed at the contractor's expense.
- 4.23.12.5 Specify all chillers with single point power connection and a unit mounted starter device. The height of the disconnect switch shall comply with NEC.
- 4.23.12.6 Water-cooled centrifugal chillers shall be provided from the manufacturer with all the hardware required to communicate the control points listed in the separately-provided *DMS Centrifugal Chiller Point List* with the EMCS.
- 4.23.12.7 Air-cooled chillers and other water-cooled chillers (*approximately 200 tons and smaller*) shall be provided from the manufacturer with all the hardware required to communicate the following control points with the EMCS:
 - a. Chiller start/stop. Chiller status (on/off).
 - b. Chilled water temperature set-point. Entering chilled water temperature. Leaving chilled water temperature.
 - c. Entering condenser water temperature (if applicable). Leaving condenser water temperature (if applicable). Evaporator refrigerant pressure (each circuit).

- d. Evaporator refrigerant temperature (each circuit). Condenser refrigerant pressure (each circuit).
- e. Condenser refrigerant temperature (each circuit). All available fault codes and/or alarm codes.

4.23.12.8 If required, the chiller manufacturer will be expected to map and coordinate their control points into the new or existing EMCS interface.

4.23.12.9 In general, replacement chillers shall communicate via BACnet MS/TP protocol. Exceptions will require prior agency approval.

4.23.12.10 Chillers shall be specified and provided from the manufacturer with all the hardware necessary to communicate with the new or existing EMCS.

4.23.12.11 Provide a detail of the chiller installation on the plans and include items such as, but not limited to, flexible pipe connections, pressure taps, temperature gauges, pressure gauges, and flow switches. The chiller detail shall reflect all appurtenances necessary to perform all industry standard and agency-required test, adjust, and balance (TAB) procedures.

4.23.12.12 Factory start-up, testing (ARI and low-load), and reporting must be performed on all chillers. Consult the agency and/or DMS regarding the need for the owner to witness the factory-performed performance testing.

4.23.13 Cooling Towers

The following criteria are required:

1. All tower basins and wet parts shall be constructed of type 304 stainless steel. Cooling towers specified with pressurized inlet headers are preferred for chiller systems that utilize variable condenser water flow.
2. Cooling towers shall be provided with high and low water level alarms capable of connecting to the new or existing EMCS.
3. PVC for condenser water piping or tower connections such as equalizers will not be acceptable.
4. Specify a variable frequency drive (VFD) for all cooling tower fans. All cooling tower fans shall operate at variable speeds.
5. Specify vibration switches for towers and specify connecting these devices to the Safety Shutdown Circuit on the starter or VFD.
6. Specify a mechanical float type make-up valve unless otherwise directed.
7. Specify sump heaters for all cooling towers north of Tampa.
8. Design/specify three-way diverting valves for all towers. The piping bypass on the 3-way valve goes to the sump.
9. Provide pressure reducing valves and gauges for all make-up water lines.
10. Provide manual isolation valves for ancillary tower equipment like make-up water valves and pressure reducing valves.
11. For multi-cell towers, provide motorized isolation valves at supply and return connections to isolate cells when not in use.

4.23.14 Air Handling Units and Outside Air Systems

The following criteria are required:

1. Provide no less than MERV 13 air filtration in all air handling units that serve office areas. For all other areas, refer to the latest edition of the ASHRAE Applications Handbook for guidance. All filter efficiencies shall comply with the latest edition of ASHRAE Standard 52.
2. Provide 4 inch angled filter assemblies/sections whenever possible.
3. All central station air handling units shall be equipped with variable frequency drives (VFD) in lieu of inlet guide vanes (IGV).
4. Review published turndown data for all air-handling units to ensure that acceptable vibration and noise levels are maintained throughout the required operating range. Specify the maximum acceptable noise and vibration levels on the plans in accordance with ASHRAE guidelines.
5. All central station air-handling units shall incorporate double-wall construction with a solid inner liner. Insulation density shall be three pounds per cubic foot. No insulation shall be exposed in the air stream.
6. Provide stainless steel drain pans in all air-handling units. All drain pans are to be insulated and double-sloped.
7. Provide stainless steel coil casings on all central station air-handlers.
8. Design all chilled water coils with a minimum 15 degrees Fahrenheit water temperature rise and a water velocity between two and four feet per second.
9. AHU coils are to be provided with air vents and drains from the factory.
10. Specify a ball valve and a pipe plug on coil maintenance drains.
11. Provide housekeeping pads and/or AHU base rails of sufficient elevation to allow condensate line p-traps of sufficient height to be installed.
12. All central station air-handling units shall have fans mounted on internal vibration isolators that provide a minimum static deflection of 2”.
13. Condensate lines from air-handling units, fan coils, etc. shall be piped with insulated copper pipe with DWV fittings.
14. Air-handler condensate pipes shall be equipped with unions before and after the p-trap. Also, provide cleanout plugs at the base of each p-trap.
15. Air-handlers shall be provided with adequate clearance between coils to allow the installation of EMCS air temperature sensors.
16. Air-handlers shall be provided with adequate clearance between coils to allow proper coil cleaning.
17. Self-tensioning motor base: provide a self-tensioning motor base versus fixed base. Basis of design is Browning Tenso – Set.

4.23.15 Fans

The following criteria are required:

1. Fans shall be sized and specified to provide low noise and vibration levels.
2. Specify the maximum-acceptable noise and vibration levels on the plans for fans more than five motor horsepower.
3. All fans more than five motor horsepower shall be installed with vibration isolators that provide a minimum static deflection of 2 inches.
4. Provide backdraft dampers, preferably motorized, at the outlet of all fans.

4.23.16 Motors

The following criteria are following:

1. Motors in general shall be premium efficiency based upon IEEE-112 Method B per NEMA Standard MG1.
2. Motors controlled by variable frequency drives (VFDs) shall be specified to comply with NEMA Standard MG1. Motors shall have Class F insulation (105 C rise over 40 C ambient) and be suitable for continuous VFD use for variable-torque loads. Motor nameplates shall be marked "For VFD Control."
3. Motors shall include top and bottom "zerk-type" lubrication fittings and extensions/tubing for access without removing insulation.

4.23.17 Variable Frequency Drives (VFD)

The following criteria are required:

1. Specify a three-year parts and labor warranty on all VFDs.
2. Acceptable VFD manufacturers must have an authorized service provider within a two-hour drive from the project location. The service provider must be able to respond to a warranty-related problem within two hours.
3. All VFDs must be provided with an electronic bypass or 3-contactor bypass.
4. Dual VFDs will be considered for equipment deemed critical by the agency. Consult with the agency as needed.
5. All VFDs must be provided from the factory with the ability to communicate directly with the building EMCS.
6. All motors intended for VFD use shall be labeled "inverter duty" or similar.
7. Locate VFDs in conditioned space whenever possible.

4.23.18 Ductwork

The following criteria are required:

1. Limit flexible duct length to 8feet.
2. Ducts shall be designed for the water column pressure available from the fan motor(s) with the speed controls and or dampers and other pressure controlling devices in the peak load condition.
3. Branch takeoffs and manual volume dampers shall have insulation standoffs with locking quadrants. Adjustments to the damper shall be made without damaging the vapor barrier. Air scoops are not acceptable.
4. Branch take-offs shall have a 1inch gasketed flange collar. Spin-in collars are not acceptable.
5. Ducts shall generally be constructed of G-90 galvanized steel sheet and conform to all current and applicable SMACNA requirements regarding pressure and leak class required by system type.
6. Snap-lock duct pipe is prohibited. Specify spiral round duct pipe when round ductwork is utilized.
7. Specify sealing all ductwork transverse and longitudinal seams, joints, penetrations, etc. regardless of pressure class or SMACNA requirements. Forego any duct pressure testing when 100 percent sealing is evident, otherwise require duct leakage test at the contractor's expense.

4.23.19 Air Dampers

Smoke and fire dampers shall be furnished by the sheet metal contractor.

General air control dampers shall be furnished by the sheet metal contractor.

Damper actuators shall be furnished by the EMCS contractor unless they are integral to the damper assembly.

4.23.20 Air Diffusers and Grilles

4.23.20.1 All diffusers and grilles shall be constructed of aluminum.

All air diffusers and grilles shall be selected based on performance such as throw characteristics and noise condition (NC) in addition to aesthetics.

Throw characteristics and noise condition (NC) are expected to comply with current industry standards. Noisy diffusers and grilles will not be acceptable.

4.23.20.2 Integral air dampers, when provided, shall be operable through the face of the diffuser/grille. Rattles and other such noises will not be acceptable.

4.23.20.3 Removable ceiling air diffusers shall not be intended or accepted for use as access to equipment located above ceilings.

4.23.21 Air Terminals

4.23.21.1 Basis of design shall be Environmental Technologies, Titus, Trane, or Carrier.

4.23.21.2 Bottom access terminal units are prohibited. Service access to all air terminals shall be clearly indicated on the plans.

Specify a double-wall cabinet or FSK internal liner.

All air terminals are to be supplied from the factory with a cross type primary air flow sensor for connection to the EMCS. Refer to the EMCS Guidelines for control point details.

4.23.21.3 Parallel (fan-powered) VAV boxes may utilize electronic motor speed control with an analog input for fan speed modulation in response to the EMCS controller signal.

4.23.22 General Requirements – Test and Balance

4.23.22.1 The testing, adjusting, and balancing (TAB) contractor shall be certified by AABC (Associated Air Balance Council) or NEBB (National Environmental Balancing Bureau). The TAB contractor shall be an independent and unbiased third party with respect to any other contractor associated with the project.

The TAB contractor shall be employed directly by the agency, commissioning

agent, or the general contractor as directed by the agency.

The following systems and all components of these systems shall be completely tested, adjusted, and balanced in accordance with the engineer's specifications, agency requirements, and industry standards should they be included in the scope of any construction or renovation project:

- a. Air moving equipment (AHUs, fans, etc.)
- b. Air distribution systems (VAV terminals, diffusers, grilles, etc.) HVAC pumps (chilled water, hot water, condenser water, etc.) Hydronic cooling and heating systems (coils, heat exchangers, etc.)
- c. Steam systems
- d. HVAC control systems (EMCS)

4.23.22.2 TAB procedures shall not commence until construction is complete enough to permit the closing of doors and windows and include the presence of other building components such as walls and ceilings that are required to simulate normal HVAC operating conditions.

4.23.22.3 The HVAC design engineer shall specify the responsibilities of the associated trade contractors to provide fully operational HVAC-related systems so that TAB procedures can be performed efficiently and in accordance with all industry standards.

4.23.22.4 The TAB contractor shall conduct a thorough pre-balance site review and submit a written report for the HVAC design engineer's approval regarding the suitability of site conditions for commencing TAB procedures.

4.23.22.5 Other trade contractors shall be required to provide the following information and capabilities as required by the TAB contractor for completion of work:

1. Equipment submittals;
2. Equipment start-up reports;
3. EMCS control point lists;
4. Access to the EMCS network; and
5. Project drawings (for reference and mark-up purposes).

4.23.22.6 The TAB contractor shall submit the following items to the HVAC design engineer, general contractor, commissioning agent, and agency:

1. A detailed overview of all TAB procedures;
2. A detailed description of each testing procedure;
3. Regular field reports regarding progress, observed deficiencies, etc.; and
4. Preliminary and final test results in bound reports.

4.23.23 Air Systems – Test and Balance

The following criteria are required:

1. Equipment air flow: Adjust and record supply, return, exhaust, and outside air

- flow at each fan and coil. Include temperature measurements as applicable.
2. Static pressure profile: Static pressure profiles shall be measured and recorded across each supply fan, cooling coil, heating coil, return air fan, air handling unit filter, and exhaust fan, and at the furthest air device or terminal unit from the air handler supplying that device. Static pressure profiles shall also be provided for systems which do not perform as designed.
 3. Fan speed: Measure and record RPM at each fan speed.
 4. Voltage and amperage: Measure and record the final operating amperages and voltage for each motor.
 5. Filters: Check air filters and filter media and balance only systems with essentially clean filters and filter media.
 6. Zone Air Flow: Record and adjust each AHU zone, HVAC terminal unit, and air handling unit (AHU) to design air flow.
 7. Outlet air flow: Record and adjust each exhaust air inlet and supply air outlets to design air flow in accordance with an industry standard tolerance.
 8. Maximum and minimum air flow: Record and adjust air flow on all HVAC terminal units to comply with design maximum and minimum air flows.
 9. Pitot tube traverses: All exhaust, main supply, outside air, and return air ducts shall have air velocity and volume measured and recorded in accordance with an industry standard Pitot tube traverse method. Locations of all duct traverses shall be present on the report.
 10. Coil temperatures: With controls set to full cooling and/or full heating, read and record entering and leaving dry bulb temperatures at each cooling coil, heating coil, and HVAC terminal unit. Provide wet bulb temperatures for all cooling coils as well. While measuring air temperatures, also record water flow, entering water temperature, and leaving water temperature for each coil.

4.23.24 Hydronic Systems – Test and Balance

The following criteria are required:

1. Adjusted system tests: Adjust the balancing valves at each coil and heat exchanger for design flow. Adjust the balancing valves at all pumps to obtain design water flow. Record the pressure rise across all pumps and water flow from the pump curve. Permanently mark the balanced position for each valve. Note: If discharge valves on the pumps are used for balancing, record the head being restricted by the valves.
2. Temperature readings: Read and record entering and leaving water temperature at each water coil, converter, and heat exchanger at design flow. Adjust as necessary to secure design operating conditions. Provide final readings at all thermometer well locations.
3. Pressure readings: Water pressure shall be recorded at all gauge connections. Pressure readings at coils and pumps shall be related to coil and pump curves in terms of flow and through flow-measuring stations, if provided and installed, at each air handler. The flow of water through all water coils shall be adjusted by balancing valves until the rated pressure drops across each coil is obtained and total water flow is verified by flow measuring station. For coils equipped with three-way valves, the rated pressure drop shall first be adjusted through the coils. The bypass valve shall then be adjusted on each coil until an equal pressure drop between supply and return connections

is the same as with the flow through the coil.

4. Voltage and amperage readings: Read and record the final operating amperages and voltage for each pump motor.

4.23.25 Temperature Control Systems – Test and Balance

The following criteria are required:

1. The TAB agency shall work with the EMCS contractor to ensure the most effective total system operation is within the design limitations, and to obtain mutual understanding of the intended control system performance.
2. Verify that all control devices are properly connected and operated by the intended controller.
3. Observe that all valves are properly installed in the piping system in relation to direction of flow and location.
4. Observe the calibration of all controllers.
5. Verify the proper operation and application of all normally-open and normally-closed valves.
6. Observe the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media.
7. Verify that the sequence of operation for any control mode is in accordance with approved shop drawings and the engineer's specifications.
8. Verify the operation of all interlock systems.
9. Perform variable volume system verification to assure the system and its components track with changes from full flow to minimum flow.

4.23.26 Sound and Vibration – Test and Balance

4.23.26.1 Sound: Read and record sound levels at up to 15 locations in the building designated by the engineer. All measurements shall be made using an octave band analyzer. All tests shall be conducted when the building is quiet and in the presence of the engineer, if required by the engineer.

4.23.26.2 Vibration: Record vibration readings on all equipment where motor horsepower is equal to or greater than 10 HP (7.46 kW).

4.23.27 Stairwell Pressurization Systems – Test and Balance

Stairwell pressurization systems shall be tested after the stairway shaft has been checked for leaks, cracks, door seal function, etc. and after all system fans have been balanced.

With all doors closed, measure and record the pressure differential across each door to verify the pressure differentials at each floor.

4.23.28 Special Systems – Test and Balance

TAB requirements for specialized systems shall be developed by the engineer.

4.23.29 Final Report Requirements - Test and Balance

The TAB activities described shall culminate in a report neatly typed, arranged, and bound. Include with the data the date tested, personnel present, records of test

instruments used, and a list of all measurements taken. The intent of the final report is to provide a reference of actual operating conditions for the agency's operations personnel.

All measurements and recorded readings (of air, water, electricity, etc.) that appear in the reports shall be certified by the TAB contractor.

Submit reports on forms approved by the HVAC design engineer. Three hard copies and one electronic copy of the final report shall be submitted to the HVAC design engineer to including a summary of actual operating data and any abnormal operating conditions.

4.24 Division 24

For Future Expansion

4.25 Division 25 – Integrated Automation

4.25.1 General EMCS Requirements

- 4.25.1.1 Unless otherwise directed, specify and design a Direct Digital Control (DDC) Energy Management and Control System (EMCS) for the HVAC system, security, lighting, and fire alarm systems.
- 4.25.1.2 The controls drawings and specifications are the responsibility of the engineer of record. Point lists, control diagrams, and control sequences shall be developed by the engineer of record in accordance with these guidelines and shall be included in the mechanical drawings specific to each project.
- 4.25.1.3 New EMCS systems shall can utilize standard BACnet protocol based on ASHRAE Standard SPC-135A and be able to integrate third-party systems via existing vendor protocols.
- 4.25.1.4 Communication between building controllers and operator workstations shall be via a high-speed Ethernet network that uses TCP/IP, IEEE 802.3 protocol.
- 4.25.1.5 New EMCS systems in DMS-managed buildings shall be connected to the existing Siemens Apogee BACnet interface at the DMS Building "F" (OPCON) facility in Tallahassee.
- 4.25.1.6 Primary-level network devices shall communicate via BACnet IP. Secondary-level network devices shall communicate via BACnet MS/TP.
- 4.25.1.7 Building controllers shall be programmable. Controllers shall be able to execute custom, job-specific processes defined by the user to automatically perform calculations and special control routines.
- 4.25.1.8 New EMCS systems shall can support wireless field devices and/or sensor communications through a mesh topology and IEEE 802.15.4 network.

- 4.25.1.9 The control system specification shall be performance-based. If the design intent cannot be met, the engineer of record shall notify the agency in writing, explaining the discrepancies and request deviation(s). Only agency-approved deviations shall be accepted at the final inspection. The A/E, contractor, or both, shall be responsible for correcting work found non-compliant at no cost to the agency.
- 4.25.1.10 The engineer of record shall coordinate the specification of the system with the agency to ensure compatibility and/or functionality with existing systems.
- 4.25.1.11 The EMCS contractor will be expected to coordinate with the manufacturer of the existing system to develop dynamic graphics, data sharing, alarms, operating schedules, and trending capabilities from the existing operator workstation. Providing a new operator workstation and/or graphics software package will not be an acceptable substitute.
- 4.25.1.12 Provide a schedule of DDC points, control system diagram, and a comprehensive sequence of operations for each type, piece, and configuration of HVAC equipment (e.g. fans, air handling units, fan terminal units, chillers, boilers, etc.) Specify only those points necessary to operate the system in accordance with the design intent.
- 4.25.1.13 The sequences of operation should address occupied, unoccupied, winter, summer, and Test and Balance operating modes. Specify sequences of operation to shut off outside air, exhaust air, and main air-handling systems during unoccupied periods.
- 4.25.1.14 Unless directed otherwise by the agency, the EMCS shall be fully integrated and include a personal computer to act as an operator interface. The EMCS shall incorporate stand-alone-module system architecture and not be dependent on the central processing unit (CPU) for routine operations.
- 4.25.1.15 The CPU, laptop, printer, and other related peripheral equipment shall be equal to the industry standard available at the time the controls contract is executed and be adequate to operate the system in accordance with the design intent. The system printer shall be a color laser jet printer.
- 4.25.1.16 The EMCS contractor shall include an adequate allowance of time to meet with the commissioning agent and/or the HVAC engineer to commission the system.
- 4.25.1.17 The EMCS contractor shall provide four hours of on-site operator training at the DMS Building "F" (OPCON) facility in Tallahassee or the agency's monitoring facility, whichever is pertinent.
- 4.25.2 Minimum EMCS Control Point Requirements:
Air Handling Units and Outside Air Units (AHU)
Provide the control points and features listed below:
- a. Air-handler status (on/off);
 - b. Supply air temperature;

- c. Return air temperature;
- d. Mixed air temperature;
- e. Air temperature between cooling and heating coils (when applicable);
- f. Return air relative humidity;
- g. Supply air static pressure at AHU;
- h. Supply air static pressure 2/3 the distance down the major supply duct;
- i. Return air CO₂ sensor;
- j. Outside air temperature on any one AHU in the building;
- k. Outside air relative humidity on any one AHU in the building;
- l. Modulating return air damper;
- m. Modulating outside air damper;
- n. Outside air flow measurement station (preferably Ebtron);
- o. Modulating electronic chilled water control valve;
- p. Modulating electronic hot water/steam control valve (when applicable);
- q. SCR control for electric heaters (when applicable);
- r. Differential air pressure across filter sections; and
- s. Fan motor VFD control (include all control/diagnostic points provided within the VFD).

4.25.3 Hydronic Fan/Coil Units (FCU):

Fan/coil units, when utilized, are expected to be integrated into the EMCS. At minimum, provide the control features listed here. Depending on the application, more control points and features may be warranted:

- a. Unit start/stop;
- b. Fan/coil unit status (heat/cool/off);
- c. Space temperature;
- d. Supply air temperature;
- e. Return air temperature;
- f. Mixed air temperature (when applicable);
- g. Air temperature between cooling and heating coils (when applicable);
- h. Modulating electronic chilled water control valve;
- i. Modulating electronic hot water control valve (when required);
- j. Electric heater control (when required). Provide staged heater control when deemed appropriate. SCR heater control is also acceptable; and
- k. Fan status via a current sensing device. Note: current transformers are expected for belt-driven units.

4.25.4 Air Terminal Units (VAV Terminals):

Provide the control features listed below as applicable to the various types of terminal units (without reheat; with reheat; and fan-powered VAV).

- a. Space temperature;
- b. Modulating electronic primary air damper actuator;
- c. Primary air flow via a cross-type averaging flow sensor (all types);
- d. Supply air temperature downstream of reheat coils (when reheat is utilized);
- e. Modulating electronic hot water control valve (when hydronic reheat is utilized);
- f. Electric heater control (when required). Provide staged heater control when deemed appropriate. SCR heater control is also acceptable; and
- g. Fans status via a current sensing device for fan-powered air terminals.

4.25.5 Split DX Systems:

Split DX systems are expected to be integrated into the EMCS with the control features listed below. Deviation from the control scheme for split DX systems will require agency approval.

- a. System status (heat/cool/fan/off);
- b. Space temperature;
- c. Supply air temperature;
- d. Return air temperature;
- e. Mixed air temperature (when applicable);
- f. Air temperature between cooling and heating coils (when applicable);
- g. Electric heater control (when required). Provide staged heater control when deemed appropriate. SCR heater control is also acceptable;
- h. Fan status via a current sensing device. Note: current transformers are expected for belt-driven units; and
- i. Compressor amps via a current transformer (optional).

4.25.6 General Exhaust Fans:

Exhaust fans that are not intended to be interlocked with a restroom light switch shall be interfaced with the EMCS. Fan status shall be provided with a current sensing device, preferably a current transformer. Start/stop control may be provided through the VFD or through relay control depending on the motor size and/or application.

4.25.7 Laboratory Exhaust Fans:

Consult the agency for current requirements.

4.25.8 Fume Hoods:

Consult the agency for current requirements.

4.25.9 Outside Air Fans:

Outside air fans shall be interlocked with their corresponding air-handling units. Fan status shall be provided with a current sensing device, preferably a current transformer. Start/stop control may be provided through a VFD or through relay control depending on the motor size and/or application.

4.25.10 Water-Cooled Centrifugal Chillers:

The EMCS contractor shall be prepared to receive all of the chiller control points listed below from the chiller manufacturer. The chiller manufacturer is expected to map and coordinate their points for input into the EMCS interface, if required. The chiller manufacturer is expected to provide these control points in the appropriate communication protocol. Refer to the mechanical guidelines for details regarding specific chiller requirements:

- a. Chiller system status (on/off);
- b. Chiller system start/stop;
- c. Chilled water entering temperature;
- d. Chilled water flow (flow switch interlock);
- e. Chilled water leaving temperature;
- f. Condenser water entering temperature;
- g. Condenser water flow (flow switch interlock);
- h. Condenser water leaving temperature;
- i. Chiller amps;
- j. Chiller percent RLA;
- k. Chiller voltage;
- l. Manual reset alarm;
- m. Auto reset alarm;
- n. Chilled water pump start/stop;
- o. Communication status;
- p. Demand-limit set-point.;
- q. Chilled water set-point;
- r. Oil tank temperature;
- s. Oil tank pressure;
- t. Oil differential pressure;
- u. Discharge oil pressure;
- v. Inlet guide vane degrees;
- w. Inlet guide vane percent;
- x. Compressor phase-A current;
- y. Compressor phase-B current;
- z. Compressor phase-C current;
- aa. Compressor winding #1 temperature;
- bb. Compressor winding #2 temperature;
- cc. Compressor winding #3 temperature;
- dd. Compressor discharge refrigerant temperature;
- ee. Evaporator refrigerant temperature;
- ff. Evaporator refrigerant pressure;
- gg. Condenser refrigerant temperature;
- hh. Condenser refrigerant pressure;
- ii. Saturated condenser temperature;
- jj. Saturated evaporator temperature;
- kk. Purge status;
- ll. Purge suction temperature;
- mm. Purge water set-point source;
- nn. Purge liquid temperature;
- oo. Purge operation (code);
- pp. Purge total pump-out time (minutes);
- qq. Purge total run time (hours);
- rr. Purge 24-hour pump-out (hours);
- ss. Purge maximum pump-out (hours);
- tt. 30-day purge pump-out average (minutes);
- uu. Chiller average run time (days);
- vv. Bearing #1 temperature;
- ww. Bearing #2 temperature;

- xx. Compressor starts (number of starts); and
- yy. Compressor run time (hours).

- * *Control features to be provided solely by the EMCS contractor:*
 - a. -Chilled water flow (GPM); and
 - b. -Condenser water flow (GPM).

4.25.11 Air-Cooled and Other Water-Cooled Chillers:

The EMCS contractor shall be prepared to receive the chiller points listed below from the chiller manufacturer. The chiller manufacturer is expected to map and coordinate their points for input into the EMCS interface, if required. The chiller manufacturer is expected to provide these control points in the appropriate communication protocol. Refer to the Mechanical guidelines for details regarding specific chiller requirements:

- a. Chiller start/stop;
- b. Chiller status (on/off);
- c. Chilled water temperature set-point;
- d. Entering chilled water temperature;
- e. Leaving chilled water temperature;
- f. Entering condenser water temperature (if applicable);
- g. Leaving condenser water temperature (if applicable);
- h. Chilled water flow (flow switch interlock);
- i. Condenser water flow (flow switch interlock);
- j. Evaporator refrigerant pressure (each circuit);
- k. Evaporator refrigerant temperature (each circuit);
- l. Condenser refrigerant pressure (each circuit);
- m. Condenser refrigerant temperature (each circuit); and
- n. All available fault codes and/or alarm codes.

- * *Control features to be provided solely by the EMCS contractor:*
 - a. Chiller voltage;
 - b. Chiller phase-A current;
 - c. Chiller phase-B current;
 - d. Chiller phase-C current;
 - e. Compressor amps;
 - f. Chilled water flow (GPM); and
 - g. Condenser water flow (GPM).

4.25.12 Cooling Towers:

All cooling towers are expected to be interfaced with the EMCS. Provide the control points listed below:

- a. Fan motor start/stop;
- b. Fan motor status (on/off);
- c. Modulating electronic actuator for the 3-way diverting valve;
- d. Low water level alarm;

- e. High water level alarm;
- f. Fan motor VFD control (include all control/diagnostic/alarm points with the VFD);
- g. Provide an EMCS-connected water meter on the tower water make-up; and
- h. Vibration sensor.

4.25.13 Boilers:

All boilers are expected to be interfaced with the EMCS. The control features listed here represent the minimum level of control expected. Other control features may be required by the engineer of record or the agency. All external alarm outputs provided by the boiler manufacturer are expected to be interfaced with the EMCS:

- a. Boiler start/stop;
- b. Boiler status (on/off);
- c. Entering water temperature;
- d. Leaving water temperature;
- e. General alarms (as equipped);
- f. Discrete alarms (as equipped); and
- g. Hot water flow (high-temperature flow meter).

4.25.14 HVAC Pumps:

All HVAC pumps are expected to be interfaced with the EMCS. The control features listed below represent minimum level of control expected:

- a. Pump start/stop;
- b. Pump status via a differential pressure switch (on/off); and
- c. Pump motor amps (through VFD or current transformer as required).

4.25.15 Variable Frequency Drives:

All variable frequency drives (VFDs) are shall be integrated with the EMCS. At a minimum, the EMCS contractor shall be prepared to receive the control points listed below:

- a. VFD start/stop;
- b. VFD status (on/off/drive/bypass);
- c. Percent speed;
- d. Percent current; and
- e. All alarms and trouble codes available in the VFD.

4.25.16 HVAC Chilled Water (Building Interface):

The following control features are the minimum requirement for the building chilled water interface. Depending on the type and complexity of the system, the project requirements may be modified:

- a. Provide chilled water supply and return temperatures on both the primary and secondary chilled water loops when applicable;
- b. Provide a BTU meter in the chilled water system that includes a flow meter and two matched temperature sensors;

- c. In general, provide a differential pressure transducer located at the farthest and highest location on the building chilled water loop. This transducer is required to control the VFD-controlled chilled water pump speed. Note: transducers shall not be placed at the air-handler chilled water supply and return lines in order to prevent erroneous readings;
- d. Provide chilled water differential pressure (inches) across the system strainer;
- e. Provide an EMCS-connected water meter on the chilled water make-up; and
- f. All chilled water control valves shall have modulating electronic actuators.

4.25.17 HVAC Hot Water (Heat Exchangers):

The following control features are the minimum requirement for the building heating hot water system. Depending on the type and complexity of the system, the project requirements may be modified:

- a. Provide hot water temperature sensors on the inlet and outlet side of all building heat exchangers;
- b. Provide a high-temperature flow meter on the inlet side of the heat exchanger;
- c. Provide an EMCS-connected meter on the domestic water make-up line; and
- d. Heat exchanger control valves shall have modulating electronic actuators.

4.25.18 Steam Systems (Building Interface):

The following control features are the minimum requirement for the building steam system interface:

- a. Provide a steam flow meter on the high-pressure side of the pressure reducing station. The flow meter shall be flanged with a visual local readout or remote readout mounted at eye level. Consult the agency for preferred manufacturers.
- b. Provide steam pressure transmitters on the high and low side of the steam pressure regulator(s).
- c. All pressure reducing stations shall be electronically-actuated. The actuator shall be a spring-return type that is normally closed. The speed of the actuator for full stroke shall be less than 60 seconds. The valve shall be able to close off at a differential pressure of 150 PSID.
- d. Provide positive feedback for each steam pressure reducing station.

4.25.19 Domestic Water:

Total building domestic water usage shall be measured using an EMCS-connected meter designed for domestic water consumption. Provide manual isolation valves before and after the flow meter.

4.25.20 Domestic Hot Water:

Provide an EMCS-connected hot water temperature sensor on the outlet side of the water heater. All building domestic water heaters are to have self-contained operating controls from the manufacturer.

4.25.21 Elevator Rooms:

Elevator rooms shall be monitored for room temperature. In general, temperature

control shall be provided through terminal unit equipment.

4.25.22 High-Occupancy Rooms:

High-occupancy rooms such as auditoriums and conference rooms shall employ motion sensors to confirm occupancy. These rooms are also expected to employ CO₂ sensors for proper ventilation verification if not already employed in the AHU control scheme. Note: motion sensors shall be properly located to avoid erroneous readings.

4.25.23 Lighting Control:

All lighting controls, when installed, shall incorporate normally closed contacts for fail-safe operation. All lighting control panels are expected to be installed by the electrical contractor.

4.25.24 Building Electrical Usage:

For DMS-managed buildings, total building electrical consumption (kWh) and demand (kW) shall be monitored by the EMCS through the Square D Power Logic Meter and any requisite communication accessories. In certain circumstances, DMS may allow the use of a Siemens Series 2000 Digital Energy Monitor (DEM) or its equivalent, but prior approval will be required. Sub-metering, when required by DMS, shall be provided through a Siemens Series 2000 DEM or its equivalent. The EMCS shall incorporate peak demand limiting capabilities.

4.25.25 Emergency Generator and Automatic Transfer Switch:

The emergency generator and automatic transfer switch (ATS) shall be monitored through BACnet MS/TP protocol and include the control points listed below:

- a. Generator status (on/off);
- b. Battery voltage (analog value);
- c. Output amperage (analog value);
- d. Output voltage (analog value);
- e. Radiator water temperature;
- f. Generator oil pressure;
- g. Generator fuel level; and
- h. ATS status (normal/emergency).

** Additional requirement: All EMCS field panels shall be connected to emergency power circuits whenever emergency power exists. The EMCS contractor is expected to coordinate these requirements with the electrical engineer and electrical contractor as necessary.*

4.26 Division 26 – Electrical

4.26.1 General Requirements

4.26.1.1 Provide complete, safe, efficient, cost effective operational systems for lighting, power, security, fire safety, and communications.

4.26.1.2 Provide redundant (two) services/feeds for critical facilities with each feed from a separate substation if possible. An on-site generator will may be considered in lieu of separate services/feeds. Coordinate the electrical service with the agency during design development.

4.26.1.3 All cable/wire systems that need to be installed in agency-owned manholes and duct bank systems shall be installed per agency-required engineering requirements as well as NESC requirements for separation. “Inner duct” type products will not be allowed in this system. All ducts/conduits shall be sealed at both ends per agency approval. Provide above-grade junction boxes for accessibility to these circuits. Verify these requirements with the agency.

4.26.1.4 Electrical service monitoring is required. Specify a Square D Power Logic meter and coordinate EMCS communication requirements with the EMCS contractor as required. Verify these requirements with the agency.

4.26.1.5 Plans and specifications shall be adapted to local conditions, including salt air near oceans or acidic soils.

4.26.1.6 Coordinate with the project manager to obtain the latest list of electrical components available for purchase on State Contracts, including light fixtures, lamps, switches, panelboards, etc. Use these items in building design.

4.26.1.7 Main lobby entrances and other principal entry doors shall be equipped with card readers or key pads. Building entry doors for public and staff shall be pre-wired for future automatic assist doors.

4.26.1.8 Requirements for appliances including coffee makers, refrigerators, and microwaves should be reviewed and approved by the agency.

4.26.1.9 Consult with the Information Technology Program project manager for design criteria for the communications room and the overall system. Also see applicable sections in this guide.

4.26.1.10 Clean power systems for computers are only provided in raised floor, main frame computer rooms. Convenience outlets for offices, which may be used for desktop computers, are limited to four receptacles per circuit.

4.26.1.11 Outdoor/landscape lighting and irrigation controllers shall be delineated on the electrical plans.

4.26.1.12 Provide inspection covers for all ground rod locations.

4.26.2 Quality Control Items

- 4.26.2.1 All bolted or screwed electrical connections shall be tightened to manufacturer's specified torque. This requirement shall apply to all factory and field connections. Provide a test report for the agency to review.
- 4.26.2.2 Every duplex receptacle shall be tested for polarity grounding and GFI protection with a plug-in tester.
- 4.26.2.3 Provide an electrical system testing specification describing tests to be performed, acceptance criteria, timely notice to the agency to witness tests, and furnishing test results to the agency.
- 4.26.2.4 Provide maintenance schedules that incorporate the manufacturer's recommendations. Maintenance schedules shall address status information on switchgear, especially replacement of indicator light bulbs, resetting of targets, and testing of relays and controls.
- 4.26.2.5 Provide a list of overcurrent relay settings, ground fault relay settings, and settings for adjustable circuit breakers. Relays shall be tested, and the settings verified. Responsibility for detailed operational parameters and protection rests with the Design Professional and shall have manufacturer's acceptance.
- 4.26.2.6 Provide default current calculations indicating that specified equipment can withstand the maximum calculated default current.
- 4.26.2.7 Circuit breakers shall have their time-current characteristic (TCC) selectively coordinated to open overcurrent protective devices closest to the fault.
- 4.26.2.8 Life-safety loads, critical loads, and non-critical optional stand-by loads shall be fed from separate panels, distribution equipment, or transfer switches to increase the reliability of the life-safety system.
- 4.26.2.9 Provide comprehensive on-site and factory training on electrical equipment operation and safety concerns for personnel who will operate the buildings.
- 4.26.2.10 Building commissioning services shall include back-up power systems.

4.26.3 Contractor Qualifications for Medium Voltage Work

- 4.26.3.1 The electrical contractor shall have previous experience in medium voltage conversion projects. This experience shall consist of previous experience in the completion of at least 10 projects within the past five years that included the following:
 - a. Transformer installations and replacements;
 - b. Medium voltage switch/cable installations and replacements duct bank installations; and

c. Cable splicing on cables equivalent to those in the current bid project.

4.26.3.2 The electrical contractor shall have a certified full-time cable splicer on staff that has a minimum of 10 years' experience in cable splicing on medium voltage systems and cable types equivalent to those in the current bid project. This individual shall perform all cable splicing and terminations in the project.

4.26.3.3 All cable splices shall be coordinated to be witnessed by the engineer of record and agency. A resume shall be submitted that includes the cable splicer's qualifications, a list of projects where he/she performed such cable splices, the types of cable employed, and the system voltage. All documentation shall be submitted 10 days prior to bid.

4.26.3.4 The successful contractor shall be prepared to perform a splice or termination on each type of cable within 10 days after bid. Splices and terminations shall be witnessed by the agency's representative. The required evidence and electrical contractor experience must be submitted within seven days after the solicitation/pre-bid meeting.

4.26.3.5 All testing such as hi-pot, phase, and rotation testing shall be performed before the circuits are energized.

4.26.4 Electrical and Communications Rooms

4.26.4.1 Provide separate electrical and communication rooms. Size electrical rooms to allow adequate ventilation and servicing room around the equipment.

4.26.4.2 Communications rooms shall not be located next to elevator shafts, stairwells, pipe chases or other obstructions that would prevent conduits from entering the rooms from all sides.

Meet code clearance requirement, but in no case, provide less than:

- a. 4 feet minimum clearance around electrical cabinets;
- b. 4 feet minimum level clearance in front of main breaker cabinets; and
- c. At least 4 feet clearance in front of electrical distribution panels.

4.26.4.3 Communications rooms shall be equipped with receptacles, surge suppression, and grounding as required by the communications program.

Communications rooms shall not be used to house building controls, security equipment or other such uses unless expressly approved by the project manager.

4.26.5 Conduit and Raceway

The following criteria are required:

- a. Minimum conduit sizes shall be $\frac{3}{4}$ inches diameter for runs with up to seven No. 12 AWG conductors and $\frac{3}{8}$ inches diameter for flexible conduit used to connecting light fixtures.

- b. Metal conduit connections shall be tight to ensure electrical continuity. PVC conduit, when and where allowed, shall use solvent welded connections.
- c. Underground medium voltage circuits, more than 600 volts shall be installed in concrete encased PVC conduit, type DB, 4-inch diameter or greater. The top of the concrete envelope shall be more than 24 inches below grade. Consult the agency regarding the need for spare conduits.
- d. Use only RGS or IMC conduit for exterior applications.
- e. Conduits concealed in walls or ceilings shall be EMT. All others shall be IMC or RGS.
- f. PVC conduit, where installed underground or in concrete, may be used in lieu of rigid steel conduit.
- g. Rigid galvanized steel ells and turn-ups shall be provided when penetrating a concrete slab.
- h. Flexible conduit in dry locations and flexible liquid-tight conduit in wet locations may be used for connections to light fixtures, dry-type transformers, and equipment with noise, vibration, or motion problems.
- i. Wireways shall be galvanized steel with hinged covers.
- j. Cable trays and/or J-hooks shall be provided for telecommunications systems with two or more entries into communications rooms spaced to prevent crowding. Details on the plans are to clearly depict the method of installation and a coordinated path for the tray to follow. This is not to require fittings for the tray.

4.26.6 Wires and Cables

The following criteria are required:

- a. Conductors shall be stranded copper wire for No. 12 AWG and larger.
- b. The minimum power conductor size shall be No. 12 AWG.
- c. Aluminum wire is not allowed in buildings.
- d. 600-volt insulation for wires and cables shall be type THHW / THWN / THHN.
- e. Insulation for primary voltages more than 600 volts shall be ethylene propylene rubber (EPR).
- f. Neutrals or equipment grounding conductors # 4 AWG and larger may be black insulated wire identified by green tape in lieu of green insulation, per NEC. Phase conductors # 8 AWG and larger may be color coded with tape. Apply three bands of colored tape, 3/4" wide and one inch apart with four wraps of tape in each band, at each end of each wire.
- g. Color coding by voltage shall be as shown here:

<i>Conductor Type</i>	<i>480/277 Volts</i>	<i>208/120 Volts</i>
Phase conductors	brown, orange, or yellow	black, red, or blue
Neutral conductors	natural grey	white

4.26.7 Data and Telecommunication Cables

4.26.7.1 All fiber optic cables shall be installed in UL approved raceways or "inner-duct"

within air plenums. Fiber optic cable types OFNP and OFCP may be installed within wall spaces, ceiling spaces, or air plenums. All installations shall comply with NEC.

4.26.7.2 For renovations, all proposed cable routing shall be approved by the building facilities manager.

4.26.7.3 All discontinued and/or deleted cable systems and wires shall be removed within the scope of the project, not abandoned in place.

4.26.7.4 No data/telecom wiring, including EMCS and fire alarm wiring, shall be supported from or attached to electric raceways or fire sprinkler piping. In addition, no such wiring shall be laid directly on lay-in ceiling tile systems.

4.26.7.5 All wires and raceways shall be concealed in offices and public spaces.

4.26.8 Boxes and Fittings

4.26.8.1 Boxes for concealed work shall be 4 inches square and 1-½ inches deep.

Boxes for exposed or exterior work shall be aluminum with threaded hubs. Conduit fittings shall be compression type steel fittings where exposed to weather and steel EMT set-screw fittings for interior locations.

4.26.9 Wiring Devices

The following criteria are required:

1. Receptacles and switches shall be specification/commercial grade, 20 amp rated side wired, and grounding type.
2. All branch circuits shall be electrically continuous when any receptacle is removed.
3. Cover plates shall be standard size with a smooth finish. The color and material of construction shall be coordinated with the agency.
4. Color for switches, receptacles, and cover plates shall be selected by the agency.
5. Special purpose receptacles shall be provided to suit the specific equipment requirements.

4.26.10 Enclosures and Cabinets

4.26.10.1 In general, all floor-mounted equipment and enclosures shall be installed on typical 3-1/2-inch-thick concrete housekeeping pads.

Custom fabricated enclosures and cabinets for electrical equipment shall be welded and corrosion resistant (galvanized, stainless steel, or aluminum).

The electrical contractor shall provide and install all custom access panels required by the EMCS contractor.

4.26.11 Electric Motors

Specify premium-efficiency type electric motors. All motors intended for use with VFD shall be rated as such. See Mechanical Guidelines for further details regarding motor requirements.

4.26.12 Motor Controls

4.26.11.1 Specify horsepower-rated starters with an H-O-A switch, melting alloy thermal overloads for each pole, and auxiliary contacts as appropriate.

All motor starters in one project are to be products of one manufacturer. When adding to existing facilities, new motor starters shall match existing.

Floor-mounted equipment shall be installed on housekeeping pads.

4.26.12 Variable Frequency Drives (VFD)

4.26.12.1 Refer to Mechanical Guidelines for further details regarding VFDs.

Surge suppressors for control loops for adjustable speed drives shall be provided to prevent damage from lightning and transferred potentials if the loop extends to another building or is more than 100 feet long.

Floor-mounted equipment shall be installed on housekeeping pads.

4.26.13 Electrical Supporting Devices

4.26.13.1 Use UL approved pillows of fire stop material that can be removed and re-stacked to allow reuse of the fire stop materials when cables are added to or removed from penetrations of fire walls.

Conduits, cable trays, boxes, and fittings shall be hung from the building structure with metal supports. No electrical item shall be hung from pipes or ductwork.

4.26.14 Electrical Identification

4.26.14.1 Electric panel identifiers must include the room number they are located in.

Electrical panels shall have an engraved laminated plastic label attached with glue and screws with the panel identifier in one-inch letters and voltage rating in ½ inch letters.

Embossed plastic tape labels are not to be used.

Specify panels to have typewritten directories.

4.26.15 Emergency Power

- 4.26.15.1 Emergency power shall be limited to those devices essential to the operation of the building under conditions of emergency egress unless otherwise directed by the agency.

The design professional will be expected to coordinate with the agency as required to determine actual emergency power requirements.

4.26.16 Emergency Generators

- 4.26.16.1 Fuel tanks for emergency generators and/or above ground fuel storage tanks must comply with FAC 62-761. Tanks fills, vents, monitoring, related items are to be in strict compliance with these regulations, including the requirement for a construction permit.

Integral fuel storage must enable a generator to operate continuously for no less than 72 hours, with accommodation for additional portable fuel storage for an additional 24 hours. This is a minimum standard. If design constraints permit, 96 hours of integral fuel storage is preferred.

- 4.26.16.2 Emergency generators, when provided, shall be driven by a diesel or natural gas engine. The generator shall be a brushless design with solid state exciter.
- 4.26.16.3 If an emergency power system is provided, overcurrent coordination will prevent a short circuit on any branch circuit from disabling any other emergency branch circuit.

Generators and automatic transfer switches (ATS) are expected to be integrated with the Energy Management and Control System (EMCS). New generators shall be provided with all the hardware required to communicate the information below with the EMCS in BACnet protocol. Refer to the EMCS guidelines for further details:

- a. Generator status (on/off);
- b. Battery voltage (analog value);
- c. Output amperage (analog value);
- d. Output voltage (analog value);
- e. Radiator water temperature;
- f. Generator oil pressure;
- g. Generator fuel level; and
- h. ATS status (normal/emergency).

4.26.17 Medium Voltage Distribution Equipment

- 4.26.17.1 Medium-voltage equipment, more than 600 volts and less than 40,000 volts, if installed indoors, shall be in a separate, dedicated, locked medium-voltage equipment room.

Outdoor medium-voltage equipment shall be installed in a pad-mounted, weatherproof, locked metal cabinet which completely encloses all terminals and equipment and complies with the NESC.

Provide barrier walls or landscaping to shield out-of-doors, medium-voltage installations from view.

4.26.18 Transformers

4.26.18.1 Dry type transformers shall be UL labeled, manufactured with 220°C insulation and designed for a maximum of 150°C rise above a 40°C ambient.

Floor-mounted transformers shall be installed on typical housekeeping pads.

Provide sound isolation including a neoprene pad under transformer sized for the weight of transformer installed and flexible metal conduit for electrical connections.

Aluminum transformer windings are prohibited.

Autotransformers may be used where allowed by code or municipality.

Transformers 30 KVA and larger shall be floor mounted.

Bonding jumper to ground a transformer secondary of a separately derived system, required by NEC 250-26, shall be connected directly to the X0 terminal.

4.26.19 Power Factor Correction

Power factor correction is recommended for existing facilities where the power factor may be low. Power factor correction will be considered, but only on the advice of the engineer of record. When incorporated, power factor correction systems shall include capacitors with not more than 10 percent overvoltage during light load or off-peak periods.

Automatic switching may be provided to prevent overvoltage.

4.26.20 Grounding

4.26.20.1 Each building shall have a copper No. 2 AWG minimum ground ring per NEC 250.52(A)(4). The ground ring may be installed in footings or grade beams as a concrete encased electrode encircling the building. Splices and connection to the ground ring shall be Cadwelded and tested to assure resistance of 5 ohms or less. Ground rings and details shall be included in structural drawings of foundations if conductors penetrate concrete.

Provide a detailed grounding plan showing all ground electrodes, grounding electrode conductors, bonding to other grounded systems, grounding for separately derived systems, and ground connections for communications equipment.

4.26.20.2 An equipment grounding conductor shall be installed in every feeder and branch circuit conduit and raceway.

Provide grounding to metal raceways/conduits when connecting to non-metallic fixtures.

Equipment grounding conductors installed in metal conduits or raceways shall be bonded to that conduit or raceway at both ends of the run to minimize ground impedance.

4.26.20.3 A separate grounding bus, a “ground source,” shall be installed on the wall of a communications room but not in an electrical room. (An electrical room has the equipment grounding bus inside the panelboards to comply with National Electrical Code.)

4.26.20.4 Medium-voltage, outdoor, pad-mounted equipment shall be grounded to ground ring three feet from the pad and three feet below grade with 10 feet x 5/8 inches Copperweld ground rods at each corner of the ground ring with two ground electrode conductors going to opposite sides of the ring. The ground ring and grounding electrode conductor shall be the same size (No. 2 minimum). PVC conduits may be cast into the pad for the ground electrode conductor.

4.26.21 Service Entrance Equipment

4.26.21.1 Buses and/or service entrance conductors shall be copper.

4.26.21.2 Short circuit currents for the service entrance, including motor contributions, shall be listed on the electrical one-line diagram showing the service entrance.

A load calculation complying with NEC Article 220 shall be included on the one-line diagram showing the service entrance and shall be used to size the service entrance equipment. Service entrance equipment shall not exceed NEC by more than 50 percent.

4.26.21.3 The “six switch” rule for service disconnects may be used to avoid 480-volt breakers with GFI protection.

4.26.21.4 Spare fuses mounted in a wall cabinet shall be provided for fusible devices.

4.26.21.5 Analog voltmeters and ammeters shall not be installed in service equipment.

4.26.21.6 Instrumentation for EMCS may be installed on service entrances.

4.26.21.7 Service entrances for 600 volts or less shall have surge suppressors with shunt type protection and high-energy metal oxide varistors as the primary suppression element.

4.26.21.8 Electrical service monitoring is required. Specify a Square D Power Logic meter (as basis of design) and coordinate EMCS communication requirements with the

EMCS contractor as required. The meter shall include phase voltage, phase amperes, kW demand, and kWh totalizing among other capabilities and shall be connected to the existing SCADA system per agency requirements.

4.26.22 Disconnect Switches

The following criteria are required:

1. Safety switches shall be heavy duty, quick-make, quick-break, and horsepower rated.
2. All disconnect switches shall be provided in an appropriate NEMA enclosure.

4.26.23 Panelboards

The following criteria are required:

1. Panelboards shall be dead front with bolt-on thermal magnetic circuit breakers with copper buses.
2. A panelboard shall have a main breaker if it is fed from a panel in another room or if a main breaker is required by code.
3. All panelboards on one project shall be the product of one manufacturer.
4. When adding to an existing facility, new panels shall match the existing whenever possible.
5. Provide 25 percent spares in 120/208-volt panelboards and 25 percent spares in 277/480- volt panelboards.
6. Switchboards shall be service entrance labeled, dead-front, metal enclosed, front connected, free standing with ground fault protection for all devices rated 480 volts and 1,000 amperes or greater.
7. Main device shall be circuit breaker or fusible bolted pressure contact switch. Distribution devices shall be group mounted fusible switches or molded case circuit breakers.
8. Fusible devices shall have spare fuses mounted in a wall cabinet.
9. Floor-mounted panelboards (switchboards) shall be installed on typical housekeeping pads.

4.26.24 Interior Lighting

- 4.26.24.1 Provide individual lighting controls for 90 percent (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences. Also, provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences.

For corridors, indirect lighting may be used if accessibility is not restricted.

For stairs, light fixtures on landings shall be located a minimum of 7 feet above landings and not more than 10 feet for maintenance access.

Lighting loads shall not exceed a 1.0 watt per square foot average for the facility interior. Exceptions shall be made for rooms with ceiling heights above 12 feet, TV studios, sports arenas, theaters, and podiums.

4.26.24.2 Interior lighting levels shall be the lesser of the average maintained levels listed in the IESNA Handbook or the levels listed below:

<i>Room Type</i>	<i>Lighting Intensity</i>
General office space	40 foot candles
Conference rooms	30 foot candles
Stairways and corridors	5 foot candles
Toilet rooms	20 foot candles
Storage rooms	20 foot candles

4.26.24.6 General office space shall be lighted via standard 2 feet x 4 feet. (T-8 or T-5) fluorescent lighting fixtures with high power factor (0.95) electronic ballast or 2 feetx2 feet or 2 feet x 4 feet LED lighting fixtures. Basis of design shall be Lithonia.

4.26.24.7 Indirect lighting with 20 percent turndown may be used for VDT screens, training rooms, conference rooms, and offices for visual comfort.

4.26.24.8 Restrooms may be lighted with a combination of any or all of the following:

- a. Recessed 2 feet x 4 feet, 1-lamp or 2-lamp fluorescent or 2'x2' or 2'x4' LED troffer with 0.125" acrylic prismatic lens.
- b. Cove mounted 2-lamp fluorescent strips with para-louver shielding or equivalent LED fixture types.
- c. Extruded aluminum wall mounted 2-lamp fluorescent lighting fixture with up and down light components equivalent LED fixture types.

4.26.24.9 Ballasts for fluorescent fixtures shall be electronic, operate at a 20-kilohertz minimum, have less than 10 percent total harmonic distortion, and include a five-year replacement warranty. Ballasts shall be circuited to operate each lamp independently.

4.26.24.10 Semi-specular louvers and reflectors shall be finger print and dust resistant.

4.26.24.11 The use of 2 feet x 2 feet fluorescent fixtures must be approved by the project director.

4.26.24.12 Energy efficient lamps shall be used as they become economical.

4.26.24.13 Incandescent lamps, including tungsten halogen lamps, may only be used for theatrical areas, television production, and seldom-use areas. Exceptions will be made for explosion-proof fixtures.

4.26.25 Roadway and Parking Area Lighting

4.26.25.1 Selection of light poles shall be coordinated with the architect.

- 4.26.25.2 The architect shall review the building and site plans for security purposes. Areas, walkways, or safe islands designated by FDLE to require security lighting shall receive security level lighting levels.
- 4.26.25.3 A site illumination plan will be provided for the parking areas, major public walkways, and security areas adjacent to the building.
- 4.26.25.4 The maximum variation of exterior lighting from maximum to minimum is ten to one (10:1). The minimum exterior light levels are:

<i>Type</i>	<i>Lighting Intensity</i>
Building entrances	3 foot candles
Arterial roads	0.6 foot candles
Local roads	0.5foot candles
Parking areas	0.5 foot candles
Sidewalks	0.5 foot candles

- 4.26.25.5 All site lighting and signage shall be controlled by a photocell and timer located within the buildings, or by the EMCS. Consult with the agency.
- 4.26.25.6 Locate lights on alternating sides of the road from the intersection as required to meet the design criteria.
- 4.26.25.7 The site lighting design for roadways, parking, and sidewalks shall have the number of light poles of the height and the number of fixtures that yield the lowest life cycle cost.
- 4.26.25.8 The use of bollards with lights or other low-level lighting fixtures will require approval of the project manager.
- Light bollards, when permitted, shall incorporate full cut-off optics with no light distribution above a 90-degree radius.
- 4.26.25.9 Exterior lighting shall be specified and installed to provide ease of accessibility and maintenance.
- 4.26.25.10 Exterior and pole lighting shall include transient voltage surge suppression near the fixture preferably in an above-ground box.

4.26.26 Emergency Lighting

- 4.26.26.1 No battery pack lighting is acceptable unless pre-approved by the agency.

Emergency generators and distribution systems are the preferred method.

4.26.27 Hazardous Location Fixtures:

Explosion proof fluorescent light fixtures using 48-inch T8 or T12 lamps are not acceptable. Use incandescent, HID, or compact fluorescent as directed.

Vandal resistance light fixtures may be required.

4.26.27 Transient Voltage Surge Suppression System (TVSS)

4.26.27.1 TVSS: Transient voltage surge suppression system shall be provided at all branch circuit panelboards. The surge suppression system shall start at the main distribution panelboards and improve in quality and class at each point. The state will provide the suppression devices at the point of use.

TVSS mounting and wiring shall conform to the manufacturer's instructions. Provide a suitable circuit breaker. The wiring is to take the most direct route from the TVSS to the ground bus.

4.26.27.2 Class "C" surge protection on the primary panel and class "B" surge protection on breaker panel may be provided for both convenience power as well as lighting power circuits.

4.26.27.3 Secondary service entrance shall be provided with a surge suppressor with shunt type protection circuitry, and high energy metal oxide varistors as the primary suppression element.

4.26.28 Lightning Protection

4.26.28.1 Only UL listed lightning protection systems complying with NFPA 780, Lightning Protection Code may be installed.

Specify the system to achieve a Class B UL Master Label lightning protection system using copper or aluminum air terminals and conductors.

Structural steel roof framing and steel columns shall be used as roof conductor and down conductors per NFPA 780 3-19.1.

4.26.28.2 Down conductors shall be provided at all exterior corners of a building with additional down conductors to satisfy code requirements.

4.26.28.3 Flag poles shall be aluminum and grounded with No. 2 bare copper cable electrically continuous from the pole grounding lug to a ¾ inch x 20 foot. copper weld ground rod driven until the top is 24 inches below grade.

4.26.28.4 Underground circuits installed in PVC conduit or direct buried, may be protected from lightning by installing a bare copper counterpoise, solid No. 4 wire or larger, laid six inches above the PVC conduits or six inches above direct buried cable or on top of the concrete envelope, if used, with one counterpoise per duct bank. The counterpoise shall be bonded to a building ground electrode or a driven ground rod at each end.

4.26.28.5 Provide surge protection for any wiring which connects two buildings.

4.27 Division 27 – Communications

For Future Expansion

4.28 Division 28 – Electronic Safety and Security

4.28.1 General Fire Alarm Requirements

4.28.1.1 All new fire alarm systems shall comply with ADA Guidelines and NFPA Standards 70, 72, 72E, 72G, 72H, and 101.

4.28.1.2 All new fire alarm systems shall be U.L. listed and classified.

4.28.1.3 All new fire alarm systems shall be electrically supervised multiplexed style fire alarm systems with intelligent analog alarm initiation and shall be device addressable and annunciated. Connection to the Capitol Security Center may be required for DMS-managed facilities.

4.28.1.4 Acceptable fire alarm system manufacturers shall have a minimum 10 years of experience. Acceptable fire alarm system installation contractors shall have a minimum of five years of documented experience.

4.28.1.5 Acceptable fire alarm manufacturers are as follows:

- a. EST;
- b. Simplex;
- c. Siemens Cerberus; and
- d. Others per agency approval.

4.28.1.6 The entire fire alarm system shall be fed from the emergency generator, if one exists, and battery back-up, per NFPA 72.

4.28.1.7 All fire alarm system wire and cable shall be installed in concealed conduit unless otherwise directed by the agency.

4.28.1.8 Fire alarm systems shall include one of the following to allow testing of the system without audible and visual appliances being activated or relay and outputs being activated. 1.) Walk test 2.) Service Groups. 3.) Function Keys or buttons programmed to disable Audible/Visual appliances. Owner shall instruct contractor how the walk test, services groups, function keys or buttons should be programmed to operate. This shall be provided as part of the scope of work at no additional expense to the owner.

4.28.1.9 Fire alarm systems shall include a printer.

4.28.1.10 The owner or agency shall approve all nomenclature related to device descriptions,

messages, and locations.

- 4.28.1.11 Surface mounted control panels or power supplies shall be mounted on vertically mounted Uni-Struts to prevent any water leaks from running down walls into panels and power supplies.
- 4.28.1.12 Only factory knock outs shall be used on fire alarm equipment enclosures (cabinets). Drilling of holes in enclosures (cabinets) for conduit, wiring, or mounting is prohibited.
- 4.28.1.13 Fire alarm scope of work shall include a statement that the installing contractor is responsible for the expense to coordinate, utilize, and manage all other trades associated with providing a complete, code-compliant, fully functional fire alarm system with all required integrated fire safety functions operational. This shall include elevator, mechanical, electrical, and sprinkler contractors and any other divisions or trades necessary to install, test, or repair the fire alarm system.
- 4.28.1.14 Modules and detectors (sensors) shall be owner replaceable. If special equipment or executive software is required, including proprietary programmers, laptops, PCs or computers, they shall be provided as part of the scope of work at no additional expense to the owner
- 4.28.1.15 As Built (Record) drawings of the fire alarm system shall meet all the requirements of NFPA 72, National Fire Alarm Code. They shall be provided electronically in AutoCAD (.dwg) format. In addition to meeting all the requirements for NFPA 72, they shall include point to point wiring diagrams. They shall show the exact location of all panels, power supplies, annunciators, initiating devices, notification appliances, end-of-line resistors, fire alarm communicators, wiring and conduit runs including junction box locations. Initiating devices shown on the drawings shall include the device's address. Notification appliances shall include the audible and visual circuit numbers. Visual notification devices shall include the candela setting of the device. Speakers shall include the decibel (dB) setting of the device.

4.28.2 General Access Control

- 4.28.2.1 The entire Security/Access Control Systems system shall be fed from the emergency generator, if one exists, and battery back-up. Battery backup shall be capable of powering entire security and access control system including electronic locks for a minimum of twenty-four (24) hours. Connection to the emergency generator is dependent upon the emergency generator being capable of supporting the load.
- 4.28.2.2 Network equipment (switches, routers, media converters, etc.) shall be fed from the emergency generator, if one exists. Connection to the emergency generator is dependent upon the emergency generator being capable of supporting the load.
- 4.28.2.3 Security/access control systems shall be a network-based system using IP controllers.

- 4.28.2.4 Electronic locks shall use electric strikes, electrified locksets, or electrified exit hardware. Magnetic Locks shall not be used unless specifically directed by the agency.
- 4.28.2.5 All electric strikes, electrified locksets, or electrified exit hardware shall be fail secure.
- 4.28.2.6 All security/access control panels and power supplies for panels and locks shall be labeled with location of the electrical panel and the circuit number that provide power.
- 4.28.2.7 Only factory knock outs shall be used on security equipment enclosures (cabinets). Drilling of holes in enclosures (cabinets) for conduit, wiring, or mounting is prohibited.
- 4.28.2.8 Surface mounted control panels or power supplies shall be mounted on vertically mounted Uni-Struts to prevent any water leaks from running down walls into panels and power supplies.
- 4.28.2.9 As Built (Record) drawings of the security/access control shall be provided electronically in AutoCAD (.dwg) format. They shall show the exact location of all components of the security/access control system, including but not limited to panels, power supplies, card readers, locking hardware, door contact switches, glass break detectors, REXs, motion detectors, monitoring and badging stations, and network switches and routers. They shall include wiring and conduit runs including junction box locations.
- 4.28.2.10 Video surveillance systems shall use color CCTV network (IP) cameras meeting the following specifications. 1.) Minimum resolution of 1080p. 2.) Frame rate of 30 fps. 3.) Video compression H.264 and Motion JPEG. 4.) Minimum illumination Color .6 lux. 5.) Multiple, individually configured video streams.
- 4.28.2.11 CCTV cameras used outdoors shall be IP66 and NEMA 4x rated.
- 4.28.2.12 Agency shall specify requirements for and approve specialty cameras such PTZ, Day-Night, Mega-Pixel, or thermal.
- 4.28.2.13 DVR, NVR, or other video storage solutions are required to provide a minimum of 30 days for video storage capacity.
- 4.28.2.14 Network cable for security/access control systems and video surveillance systems shall be CAT6.
- 4.28.2.15 Agency's IT department shall specify and approve all network switches, routers, and media converters used for security/access control systems and video surveillance systems.
- 4.28.2.16 Video surveillance systems shall be fed from the emergency generator, if one

exists, and battery-backed up with a UPS. Connection to the emergency generator is dependent upon the emergency generator being capable of supporting the load.

4.28.2.17 As Built (Record) drawings of the video surveillance system shall be provided electronically in AutoCAD (.dwg) format. They shall show the exact location of all components of the Video Surveillance System, including but not limited to cameras, DVRs, NVRs, power supplies, media converters, switches, routers, point to point wiring diagrams, badging station, monitors, etc. They shall include wiring and conduit runs including junction box locations.

4.31 Division 31 – Earthwork

For Future Expansion

4.32 Division 32 – Exterior Improvements

For Future Expansion

4.33 Division 33 – Utilities

For Future Expansion