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I. INTRODUCTION

Eastern Florida State College (EFSC) is intensely interested in the function, design, construction, renovation and operation of the EFSC's facilities located at its Cocoa, Melbourne, Palm Bay and Titusville campuses. This interest has included not only the buildings and structures, but also the campus landscaping and utilities infrastructure.

These standards have been developed to ensure the continued quality of the built environment, to provide continuity in product selection and to enhance maintainability. Design consultants and contractors are required to familiarize themselves with this document and to incorporate its provisions into their contract documents or work. In instances where these requirements conflict with design parameters or code requirements, discussions with the associate vice president of facilities should take place to insure all conflicts are resolved. The associate vice president of facilities will make any final decisions concerning conflicts arising between the design consultant and the EFSC Construction Standards.

In general these standards represent solutions to past problems which have been successfully identified and resolved. It is not the intention of EFSC to restrict the creativity of the designers. Questions or recommendations for additions or changes to this document should be referred to the associate vice president for facilities at EFSC.

II. GENERAL PRINCIPLES

Above all, the buildings and landscaping at EFSC should reflect its essence: the exploration and distribution of knowledge essential to enhancing the quality of life for the residents of central Florida. Our physical space should promote lively intellectual exchange, such that all areas of the four campuses are considered learning environments.

The goal of EFSC is to enhance and unify each of the four campuses providing each its own unique design. The designer must consider the impact of new construction on each of the existing campuses infrastructure. This includes careful consideration of the project's utility, pedestrian walkways, parking, vehicular access, open space requirements and storm water run-off.

We regard our campus landscape as one of our most valuable assets. It is an essential component of the design process to create a landscape environment focused on utilizing native plants to establish a natural beauty and signature appearance for each of the campuses. We require a landscape environment that our community will use and enjoy. The basic design tenet of this standard is to use the landscape environment to create outdoor rooms where we can hold classes, study, meet colleagues for conversation, eat lunch, lose ourselves in thought, and relax. This standard necessitates a landscape environment that brings harmony to buildings, that is appropriate to our climate, and that reflects the essence of EFSC.

III. SPACE STANDARDS

EFSC is committed to providing a safe environment on all of its campuses. The design of campus facilities should optimize opportunities for the further implementation of design strategies needed for a safe environment. Designers should avoid complex building perimeters which create niches where individuals can conceal themselves and places which are difficult to monitor. The design must be particularly sensitive to plant selection and placement to minimize the creation of dark or hard to see areas. EFSC will be a pedestrian campus with motor vehicle traffic routed around the campus periphery; therefore, special emphasis is needed to insure that pedestrian walkway and vehicular conflict are minimized.

Planning for pedestrian safety shall be part of all EFSC construction projects. The Departments of Campus Security and Facilities will review, comment, and approve all pedestrian plans during all phases of a project.

The designer must be attentive to the methods and requirements for the maintenance of the facility. Designers are expected to consider long-term durability and maintainability when selecting equipment, materials and finishes for either new facilities or renovations. First cost is not the only consideration. Life cycle costs and low maintenance are essential components that will be considered in evaluating the overall cost of the project. The designer is expected to work closely with EFSC staff during the design and selection of the facility. Major maintainability issues that must be addressed during design are:

a. Size of equipment rooms to permit maintenance, repair and easy removal of equipment.

b. Do not combine custodial rooms, data/telecommunication rooms or equipment room.

c. Provide permanent ladders and platforms as required.

d. Comply with OSHA regulations for employee access to equipment via industrial stair, working platforms, ladders, etc.

e. Locate mechanical and electrical equipment rooms with access to the exterior.

f. Provide convenient service vehicle access.

g. Provide direct access to each individual service closet and equipment room.

h. Equipment is prohibited from being located on roofs.

i. It shall not be necessary to remove a wall/partition or other architectural component to remove or disassemble a piece of equipment.

j. It shall not be necessary to disassemble or remove other adjacent machinery, equipment, piping, electrical conduit, etc. in order to perform normal service and maintenance.

k. No conduit, electrical fittings, etc. shall be installed beneath any piece of equipment or machinery that is mounted “overhead/above ceiling”.

l. It shall not be necessary to disconnect and remove any system components below a piece of equipment in order to remove and lower it to the floor.

m. Overhead equipment will be located to prohibit the need to "climb out on" or "lay on" piping, conduit, ductwork, etc. in order to access or perform service. This includes HVAC equipment panels, disconnects, or fuses.

n. Leaning out over conduit, piping, ductwork, etc. to service/access a piece of equipment while standing on a ladder is prohibited.

o. Service personnel should be able to access equipment and perform routine maintenance without disruption to campus activities.

New parking lots or other forms of parking facilities shall be located on the campus periphery. This designer is expected to insure the appropriate parking spaces and facility access are available for persons who have mobility impairments. Alternate approaches to providing parking will be considered that are both effective and efficient for users and the campus. EFSC will continue to identify parking areas, which are specifically assigned to faculty/staff, students, and visitors.

Size of Space (square feet) per Occupant Function for Administrative Areas:

Facility Space Name Occupants	GSF
President's Office	300
Vice President's Office	225
Provost's Office	175
Bursar's Office	175
Registrar's Office	175
Director's Office	150
Other Administrator	135
Faculty Office – One person	120
Faculty Office – Multiple Varies 115 NSF for first person, plus 55 NSF for each additional person	
Staff Office – One person	120
Staff Office – Multiple Varies 115 NSF for first person, plus 55 NSF for each additional person	
Secretary/Clerk's Office – One person	110

Facility Space Name Occupants GSF

Secretary/Clerk's Office – Multiple Varies 105 NSF for first person, plus 50 NSF for each additional person Workroom Varies 100 NSF for first person, plus 35 NSF for each additional person	
Counseling Area Varies 100 NSF for first person, plus 20 NSF for each additional person	

Testing Area Varies 100 NSF for first person, plus
15 NSF for each additional person

Reception per Number Seated	20
Conference per Occupant	20
Faculty/Staff Lounge Per Occupant	11
Files Room	135
Supply Room	125
Storage Room	150
Flammable Storage	300

Utility Service Areas:

Requirements for Central Building Custodial Room Located on the First Floor

Equipment Stored or Used in Room	Qty.	Dimensions	Space Required(square inches)
Janitor's Cart	1	24 " X 54 "	1296
Locker	1	24 " X 20 "	480
Wet & Dry Vacuum	1	27 " X 31 "	837
Blower	1	24 " X 24 "	576
Desk	1	24 " X 30 "	720
Utility Sink	1	20 " X 24 "	480
Mop Bucket	1	22 " X 22 "	484
Buffer	1	26 " X 22 "	572
Shampoo Extractor	1	36 " X 36 "	1296
Floor Burnisher	1	36 " X 27 "	972
Vacuum Cleaner	1	24 " X 20 "	480
Trash Barrel	1	36 " X 36 "	1296
Boxes of Paper Towels	1	16 " X 29 "	464
Boxes of Toilet Paper	1	16 " X 29 "	464
Trash Toter	1	39 " X 36 "	1404

Trash Toter	1	39	"	X	36	"	1404
Circulation Area	1	60	"	X	60	"	3600
Total Square Inches of Floor Space Required							16825
Total GSF of Floor Space Required							**117**

Requirements for Custodial Room on Each Building Level Except for the First Floor

Equipment Description	Qty.	Dimensions					Space Required (square inches)
Janitor's Cart	1	24	"	X	54	"	1296
Locker	1	24	"	X	20	"	480
Utility Sink	1	20	"	X	24	"	480
Mop Bucket	1	22	"	X	22	"	484
Buffer	1	26	"	X	22	"	572
Vacuum Cleaner	1	24	"	X	20	"	480
Trash Barrel	1	36	"	X	36	"	1296
Boxes of Paper Towels	1	16	"	X	29	"	464
Boxes of Toilet Paper	1	16	"	X	29	"	464
Trash Toter	1	39	"	X	36	"	1404
Trash Toter	1	39	"	X	36	"	1404
Circulation Area	1	60	"	X	60	"	3600
Total Square Inches of Floor Space Required							12424
Total GSF of Floor Space Required							**86**

IV. CLASSROOM REQUIREMENTS

- Design for a typical classroom is based on 25-30 student stations
- Sound soak materials must be applied into the wall cavity to prohibit the transmission of sound into adjacent rooms.
- Interior walls must go to the deck.
- Provide a minimum of 32 linear feet of whiteboard space at a minimum width of 4 feet.
- Provide a bulletin board of no less than 4 feet by 4 feet.
- An 18 inch by 24 inch bulletin board to be installed on wall outside classroom at entry door
- Location, size and infrastructure for projection screens and multi-media equipment will be coordinated with IT during design
- Location, size and infrastructure for data connectivity will be coordinated with IT during design

V. OFFICE REQUIREMENTS

- Square footage of office must comply with SREF standard as designated by position assigned to the office
- Offices will be carpet
- Walls will be painted
- Sound soak materials must be applied into the wall cavity to prohibit the transmission of sound into adjacent rooms
- A 12 inch by 18 inch bulletin board to be installed on wall outside of office at entry door
- Location, size and infrastructure for data connectivity will be coordinated with IT during design

VI. ENERGY AND SUSTAINABILITY DESIGN

As a leader in higher education, EFSC has made a commitment to being excellent stewards of environmental resources. EFSC's construction of new facilities and renovation of existing facilities will demonstrate high standards of environmental stewardship. The requirements outlined below represent the minimum acceptable standards for any EFSC facility in order to achieve desired levels of environmental stewardship sought by EFSC.

It is the responsibility of the architect/engineer (A/E) to insure the requirements established within EFSC's Standard for Energy and Sustainability Design is achieved. EFSC expects the A/E to be both knowledgeable of, and in full compliance with, the requirements of this standard. The A/E should contact the Facilities Planner to review these requirements and address any questions.

The A/E should identify and make recommendations to incorporate construction design, techniques, products or other design or construction related methods and principles, which will further enhance operational sustainability and reduce energy consumption of the construction project. The A/E will forward any recommendations to the Facilities Planner who will then coordinate a review with the appropriate users of the facility, Associate Vice President of Facilities and Director of Plant Maintenance and Operations to determine which recommendations, if any, will be incorporated within the design.

At the completion of schematic design, conceptual design, 50% construction document and 90% construction document phases, the A/E will provide EFSC with a comprehensive report detailing the accomplishment incorporating the requirements of this standard within each phase of the design process.

In preparing the report, the A/E will follow the format provided by the Facilities Planner. The A/E will forward the report to the Facilities Planner who will coordinate a review of the report with the appropriate users of the facility, Associate Vice President of Facilities and Director of Plant Maintenance and Operations. Where the report is incomplete or the requirements are not fully incorporated within the design phase, the A/E will (at their cost) complete the report and make revisions, to the design phase being reviewed, incorporating any missing items in the standard.

OCCUPIED HOURS

- When cooling, normal building temperature set points will be 74F, and upon request can be lowered, but not below 70º F.

- When heating, normal building temperature set points will be 68F, and upon request can be raised, but not above 70º F.

- Thermostat set points for corridors and large common spaces will be set at 78F when cooling and 68F when heating.

- Outdoor air ventilation will be set by ASHRAE 62.1 guidelines or such other higher limits as prescribed by state law or regulations.

UNOCCUPIED HOURS

- When cooling, normal building temperature set points will be 82F (or HVAC OFF), and upon request can be lowered, but not below 78º F.

- When heating, normal building temperature set points will be 60F (or HVAC OFF), and upon request can be raised, but not above 68º F.

- Intermittent operation of the AC system during humid weather conditions on weekends and holiday periods will be permitted to maintain indoor relative humidity control.

- Thermostat set points for corridors and large common spaces will be set at the same levels as the occupied spaces.

- Outdoor air ventilation will be shut OFF. HVAC system start-up will begin 30 to 60 minutes prior to occupancy in order to flush accumulated air contaminants prior to occupancy.

- These rules may be relaxed as necessary if special operating conditions, such as scientifically critical areas so require.

- Data processing and server rooms are to be conditioned to within 10% of the maximum recommended space temperature as stated by the original equipment manufacturer. All new data centers located within the range of the central chilled water distribution loop shall have dedicated chilled water fan cool units to provide adequate space conditioning. If a new data center is not located within the chilled water loop, the space shall be conditioned utilizing a dedicated direct expansion unit without ventilation.

- All exterior windows and building doors will be designed to remain closed to insure adequate control and energy efficiency of the cooling and heating systems.

- All indoor lighting will be fluorescent or LED type, unless an exemption is specifically authorized for designated low usage fixtures. All indoor lighting levels will be surveyed

and recorded. The lighting levels will be adjusted to the appropriate Illumination Engineering Societies (IES) recommendation for the given task being performed in the space

- Occupancy sensors will be installed in all offices, classrooms, conference rooms and utility rooms to reduce and/or turn off lights in unoccupied areas. New energy saving fixtures, lamps, and ballasts will be used.

- Outdoor lighting will always be maintained at an appropriate level in order to ensure security. Outdoor illumination will be high pressure sodium, metal halide, LED, or fluorescent type with the efficacy of the lighting system being no less than 85 lumens per watt. Outdoor lighting shall be dark-sky compliant as indicated by manufacturer. Ballard lighting fixtures, low wattage landscape and step lighting will not be allowed. The average lighting level will be 2 foot candles (FC) for pedestrian walkways.

- Outdoor lighting will consist of more than one circuit from the lighting power panel located in the building. One of the circuits will be dedicated to security lighting and will be controlled by a photocell. The light level for the security lighting circuit will be a minimum of one foot candle. The other circuits for the outdoor lights will be controlled by a mechanical time clock.

V. STANDARD FINISH SCHEDULE BY ROOM TYPE

Room Type	Floor	Walls	Wall Finish	Ceiling	Ceiling Finish	Base
Classroom Storage	CPT	GWB	P	APT	2 X 2	CB
Classrooms	CPT	GWB	P	APT	2 X 2	CB
Conference Rooms	CPT	GWB	P	APT	2 X 2	CB
Corridor	VCT	GWB	P	APT	2 X 2	CB
Custodial Room	SCONE	GWB	P	APT	2 X 2	CB
Dry Laboratory	CPT	GWB	P	APT	2 X 2	CB
Dry Laboratory Storage	CPT	GWB	P	APT	2 X 2	CB
Electrical Room	SCONE	GWB	P	GWB	P	CB
General Storage	SCONE	GWB	P	GWB	P	CB
HVAC Room	SCONE	GWB	P	GWB	P	CB
Locker Rooms	CT	G/GWB	CT	GWB	P	CT
Main Lobby	CPT/CT	GWB	P	APT	2 X 2	CB/CT
Office	CPT	GWB	P	APT	2 X 2	CB
Office Reception	CPT	GWB	P	APT	2 X 2	CB
Office Storage	CPT	GWB	P	APT	2 X 2	CB
Restrooms	CT	GWB	CT	GWB	P	CT
Telecom/Computer Service Room	SCONE	GWB	P	GWB	P	CB
Wet Laboratory	VCT	GWB	P	GWB	P	CB
Wet Laboratory Storage	VCT	GWB	P	GWB	P	CB

Legend				
	GWB	Gypsum Wallboard	APC	Acoustical Panel Ceiling
	P	Painted	VCT	Vinyl Composition Tile
	CPT	Carpet	SCONE	Sealed Concrete
	CT	Ceramic Tile	G/GWB	Green Board
	CB	Cove Base		

VI. IRRIGATION

Primary water source for irrigation will be lakes, retention ponds or well. Potable water supply will be considered if no other water source is available.

Design characteristic will be based on Hunter products specified below. Working water pressures and volume will be determined by site conditions.

All piping will be PVC scheduled 40.

Acceptable products:

Rotors, General purpose	Hunter I-20 series
Rotors, Athletic fields	Hunter I-25SS
Sprays, General purpose	Hunter PRS 30
Valves	Hunter ICV-201G
Controller	Hunter ACC-99 series
Remote Controller Access	Hunter ICR
Water Conservation	Hunter Mini-Clik series

VII. DOORS, FRAMES AND HARDWARE

General:

- Install hardware according to manufacturer's installations and to manufacturer's template dimensions. Attach all items of finish hardware to doors, frames, walls, etc. with fasteners furnished and required by the manufacture of the item.
- Reinforced hollow metal doors and frames and reinforced aluminum door and frames require drilled and tapped machine screws.
- Solid wood doors and frames require full thread wood screws. Drill pilot holes before inserting screws.
- Continuous Gear Hinges require continuous mortar guards of foam or cardboard 1/2" thick x frame height, applied with construction adhesive.
- Install weather-strip gasket prior to parallel arm closer bracket, rim exit device or any stop mounted hardware. Gasket shall provide a continuous seal around perimeter of door opening. Allow for gasket when installing finish hardware. Door closers will require special templates. Exit devices will require adjustment in backset.
- Doors and Hardware will comply with standards listed below:
    - ✓ Door and Hardware Preparation ANSI 115.1.
    - ✓ Life Safety Codes NFPA-101 (Latest edition).
    - ✓ Fire Doors and Windows NFPA-80 (Latest edition).
    - ✓ Steel Door Institute ANSI/SDI-100 (Latest edition)
    - ✓ DHI Door and Hardware Institute

References

- Steel Doors and Frames:

American Society for Testing and Materials (ASTM)

a) A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
b) A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

American National Standards Institute (ANSI)

a) A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcing
b) A250.6 Hardware on Standard Steel Doors
c) A250.7 Nomenclature for Steel Doors and Steel Door Frames
d) A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames

- Wood Doors:

American National Standards Institute (ANSI)

a) E152- Methods of Fire Tests and Door Assemblies
b) A115.W Series, Wood Door Hardware Standards

National Fire Protection Association (NFPA)

a) NFPA 252-Standard Methods for Fire Assemblies
b) NFPA 80- Fire Doors and Windows

Underwriters Laboratory (UL)

a) UL10C-Fire Tests for Door Assemblies-Positive Pressure (or)
b) UL10B-Fire Tests for Door Assemblies-Neutral Pressure

Window and Door Manufacturers Association (WDMA)

a) Industry Standard I.S. 1-A-97

Architectural Woodwork Standards (AWI)

a) AWI Quality Standards 8th Edition, Version 1.0 2003

- Aluminum doors:

Aluminum Association (AA):

a) DAF-45 Designation System for Aluminum Finishes.

American Architectural Manufacturers Association (AAMA):

a) 501.2 Field Check of Metal Curtain Walls for Water Leakage.
b) 2605 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
c) 606.1 Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum.
d) 607.1 Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
e) 608.1 Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum.
f) 701.2 Specifications for Pile Weather stripping
g) Manual #10 Care and Handling of Architectural Aluminum from Shop to Site.
h) SFM-1 Aluminum Storefront and Entrance Manual.

American National Standards Institute (ANSI):

A117.1 Safety Standards for the Handicapped.

American Society for Testing and Materials (ASTM):

a) A36 Structural Steel.
b) A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
c) B209 Aluminum and Aluminum - Alloy Sheet and Plate.
d) B221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
e) B308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.
f) E283 Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
g) E330 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
h) E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

Federal Specifications (FS):

a) TT-P-641G (1) Primer Coating, Zinc Dust-Zinc Oxide (For Galvanized Surfaces).
b) TT-P-645A Primer, Paint, Zinc Chromate, Alkyd Type.

Steel Structures Painting Council (SSPC):

a) Paint 12 Cold-Applied Asphalt Mastic (Extra Thick Film).

Door and Hardware Institute (DHI):

a) 115.1G Installation Guide

Submittal:

General

Finish hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items. Each floor of the building is to be detailed separately. The steel door and frame supplier will furnish to the architect (4) complete copies of the proposed steel door and frames schedule and/or shop drawings. Use the same reference number for details and openings as those on the contract drawings. After receipt of the approved door schedule the steel door and frame supplier will make any corrections submit to the architect (4) sets of corrected schedules, for file and field use.

- All door openings including wood, aluminum, overhead etc. must be listed on the steel door schedule. Include details on the following list of items:

    - ✓ Frame elevations
    - ✓ Door design elevations
    - ✓ Frame sections
    - ✓ Details of construction
    - ✓ Anchorage
    - ✓ Opening conditions
    - ✓ Joints and connections
    - ✓ Hardware locations

- If any opening is not by the steel door manufacturer only the door opening number should be shown along with the type of material (aluminum, wood etc.).

- No substitutions will be permitted unless approved by EFSC Facilities.

    - ✓ Shop drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts, special beveling, blocking for hardware, identify cutouts.
    - ✓ Indicate compliance with fire door testing procedure.
    - ✓ Product Data: Indicate door core materials, thickness, construction, veneer species, Veneer match, and Veneer Assembly on face.
    - ✓ Construction samples. Submit one or more of manufacturer's standard samples demonstrating door construction.
    - ✓ Finish samples: A set of 3 illustrating the range of color and grain of the specified door face materials.

Quality Assurance

Steel Door

- Provide Steel Doors and Frames complying with the Steel Door Institute recommended specifications for Standard Steel Doors and Frames ANSI/SDI 100

- Underwriters' Laboratories labeled doors and frames shall be manufactured under the UL factory inspection program and in strict compliance to UL procedures, and shall provide the degree of fire protection and, where required, panic loading capability indicated by the opening class.

- Provide doors, frames and hardware that meet the hurricane and wind load test requirements in accordance with the Florida Building code and are in compliance with the local authority having jurisdiction. All openings required to meet either the impact test or wind load test as indicated by the architect shall be tested as systems with the finish hardware, hollow metal doors and frames and installed in accordance with the applicable tests. These requirements take precedence over other requirements. Provide only material that has been tested and listed by local authority for the types and sizes of doors required, and complies with the requirements of the door and door frame

Wood Door

- Meet or exceed WDMA I.S.1-A 97 Premium Grade

- Labeled Doors shall conform to the requirements of Intertek Testing Services-Warnock Hersey (ITS-WH)

Delivery, Storage and Handling

- All doors and frames must be properly marked with door opening mark number to correspond with the schedule.

- Deliver all the steel doors in cartons and palletized to provide protection during transit and job storage.

- Store steel doors and frames under cover at the building site. Place units on wood sills or on the floor in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If the wrapper on the door becomes wet, remove the carton immediately. Provide a 1/4 inch space between stacked doors to promote air circulation.

- Inspect doors and frames upon delivery for damage. Minor damage is to be repaired, provided they are equal in all respects to new work and acceptable to the architect.

- Deliver, store, protect, and handle wood doors under provisions of WDMA, AWI, and manufacturer's care and handling instructions. Certain wood species are light sensitive. Protect doors from exposure to natural and artificial light after delivery. Do not store in damp or wet areas.

- Only accept doors on site in manufacturer's standard packaging. Inspect for damage. HVAC systems should be operating and balanced prior to arrival of wood doors. Acceptable humidity shall be no less than 25% and no greater than 55%.

- Wrap, protect finishing hardware items for shipment. Deliver to manufacturing contractors hardware items required by them for their application; deliver balance of hardware to job; store in designated location. Each item shall be clearly marked with its intended location.

- All permanent core cylinders and permanent keys are to be delivered by registered mail to: Eastern Florida State College
  Facilities Department
  1519 Clearlake Road
  Cocoa, Florida 32922

Acceptable Manufacturers:

- Steel Doors
  1) Steelcraft Manufacturing Company
  2) Curries Products
- Wood Doors
  1) Algoma
  2) Eggers
  3) Marshifield
- Aluminum and Storefront Doors
  1) YKK AP America Inc.
  2) Vistawall Architectural Products
  3) Arch Aluminum and Glass Co.
- Hinges, Continuous Hinges:
  1) Ives FBB179
  2) Ives HD224 Aluminum Geared Continuous Hinge shall be supplied for all storefront door systems.
- Flush Bolts:
  - ✓ Automatic - metal doors:
    1) Ives FB30 Series
    2) Equal product of any B.H.M.A. member.
  - ✓ Automatic - wood doors
    1) Ives FB40 Series
    2) Equal product of any B.H.M.A. member.
  - ✓ Constant Latching: metal doors:
    1) Ives FB50 Series
    2) Equal product of any B.H.M.A. member.
  - ✓ Constant Latching: wood doors:
    1) Ives FB60 Series
    2) Equal product of any B.H.M.A. member.
  - ✓ Manual - metal doors:
    1) Ives FB458
    2) Equal product of any B.H.M.A. member.

- ✓ Manual – wood doors:
  1) Ives FB358 Series
  2) Equal product of any B.H.M.A. member.
- ✓ Dust proof strikes - furnish with all flush bolts, except at openings having thresholds:
  1) Ives DP2
  2) Equal product of any B.H.M.A. member.

- Locksets:

1. Schlage ND Series with Rhodes style lever which accepts Schlage LFIC cylinders Balance of lock functions as specified in hardware sets. Classroom locks shall be ND75 Classroom Security lock by Schlage.
2. Schlage CO200 series Rhodes design in such case that a standalone electronic lock is to be utilized.
3. No Substitutions.

- Exit Devices:

1. Dor-O-Matic 1690, Von Duprin 98 Series in types and functions specified. All devices must be listed under "Panic Hardware" in accident equipment list of Underwriters Laboratories. All labeled doors with "Fire Exit Hardware" must have labels attached and be in strict accordance with Underwriters Laboratories.
2. Where there is interruption in the means of egress, panic devices will have Photoluminescence push pad to direct path of egress. Stairwells, cross corridor doors exterior exit doors.
3. All exit devices on exterior stairwell openings shall have the NL (nightlatch) function. Key is needed to retract Latchbolt and the lever cannot be unlocked with the key.
4. No Substitutions.

- Door Closers:

1. LCN 4041XP EDA series at aluminum doors and 4010/4111 at balance.
2. No Substitutions.

- Trim and Plates:

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

- Door Stops:

1. Ives WS407 Wall Bumpers
2. Ives FS436 or FS438 Floor Stops
3. Glynn Johnson 450 Series overhead stops where wall or floor stops are not applicable
4. No Substitutions.

- Removable Mullion:

1. Von Duprin 5764 for exterior aluminum door systems.
2. Von Duprin KR4954 for interior/exterior hollow metal or wood door systems.
3. Von Duprin KR9954 for interior door systems where needed.
4. All removable mullions shall only be removable by use of building keys.
5. No Substitutions.

- Door Holding Magnets:

1. LCN SEM 7800 series
2. No Substitutions

- Thresholds and Weather-stripping:

1. Zero
2. National Guard
3. No Substitutions

- Astragal:

1. Stainless steel, type 304, finish 2B. 12 gauge 1-5/8 inch wide. #10 x 3/4"st sheet metal screws.
2. National Guard 139SS
3. Reese 183SS
4. No Substitutions

- Astragal, Sound:

1. 1-5/8 aluminum housing with neoprene #6 sheet metal screws.
2. National Guard 109N
3. Reese DS79
4. No Substitutions

- Smoke Fire and Draft Seals:

1. Pemko
2. Reese
3. National Guard
4. No Substitutions

Finishes:

- Generally, Dull Chrome, US26D / BHMA 626.
- Exit device touchbars, push/pull bars, pull, push plates, kick plates, overhead holders and stops and wrought bumpers, Dull Stainless Steel, US32D / BHMA 630.
- Continuous gear hinges, satin aluminum, clear anodized, US28 / BHMA 628.
- Closers: Powder coated finish, color Aluminum BHMA 689.
- Thresholds: Mill finish Aluminum x "SIA" finish.

Hardware Locations and General Reinforcements:

- Locate hardware on doors and frames in accordance with the manufactures standard location.
- The door suppliers are responsible for coordinating hardware location on all doors and door frames.
- Hardware reinforcements are to be in accordance with the minimum standard gages as listed in SDI-100.
- Doors shall be mortised, reinforced and function holes provided at the factory in accordance with the hardware schedule and templates provided by the hardware supplier. Through bolt holes, attachment holes, drilling and tapping for surface hardware, shall be done by others.

Keying

- All locks and cylinders shall be to Eastern Florida State College's Existing, Interchangeable core, 11 Pin Schlage Primus-XP Level 9 key system, all bittings shall be issued by Schlage Lock, unless otherwise specified by direction of Eastern Florida State College's locksmith.

- Provide Two (2) each change keys per lock and Six (6) each grand master and master keys. Eight (8) construction keys, Two (2) construction control keys. All keys to be Patent Restricted. Fifty (50) additional uncut key blanks.

- Contact David Albright – Master Locksmith at Eastern Florida State College to set up the keying meeting with Dave Albright, Hardware Supplier contractor and lock manufacturer.

- All Mechanical/Electrical rooms to be keyed alike to the same change, at all campuses, and Eastern Florida State College's Great Grand Master only. Data Communication rooms to be keyed alike to the same change, at all campuses, and Eastern Florida State College's Great Grand Master only. All Janitorial rooms to be keyed alike to the same change, at all campuses and Eastern Florida State College's Great Grand Master only. Campuses include: Cocoa, Melbourne, Palm Bay, and Titusville.

- Hardware supplier to provide temporary cylinders or cores during the construction phase. Eastern Florida State College is to install all permanent cores. All temporary cores to be returned to the hardware supplier.

- Hand deliver One (1) hardcopy of the bitting schedule, produced by Schlage lock Company, to the Eastern Florida State College Locksmith. Bitting list to include 50 additional bittings under the building master.

- Submit detailed schedule indicating clearly how the Owner's final keying instructions have been followed.

- Submit as an integral part of finish hardware schedule or as a separate keying schedule.

Inspection:

- It is the responsibility of the General Contractor to make sure that all dimensions for existing opening or existing frames (strike height, hinge spacing, hinge back set, etc.) given to the steel manufacturer are accurate.

- It is the responsibility of the General Contractor to see that any scratches or disfigurements caused in shipping or handling are properly cleaned and touched up with a rust inhibiting primer.

Installation:

- Frames
  - ✓ SDI-105, "Recommended Erection Instructions for Steel Frames" and SDI-110 "Standard Steel Doors and Frames for Modular Masonry Construction" shall indicate the proper installation procedures.
- Doors
  - ✓ "Installation Guide for Doors and Hardware" published by DHI.
- Hardware must be applied in accordance with hardware manufacturer's templates and instructions.

Adjust and Clean:

- Check and re-adjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper condition.
- Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up or compatible air-drying primer.

Schedules:

- After installation, copies of the door schedules will be turned over to the owner when the building is accepted.

Hardware Supplier:

- Shall be an established firm dealing in contract builder's hardware. They must have an adequate inventory, qualified personnel on staff and be located within 100 miles of the project. Only domestic manufacturers are acceptable. The distributor must be a factory-authorized dealer for all materials required. Supplier shall be or have in employment an Architectural Hardware Consultant. (AHC)

Pre-construction Meeting:

- Prior to development of the Hardware Schedule, a Finish Hardware Meeting will be held with EFSC Facilities, the architect, the contractor, construction manager, and the hardware supplier. The contractor/construction manager and the hardware supplier's personnel directly responsible for preparing the hardware schedule shall meet with the architect and the architect's hardware consultant. Purpose of the meeting is to review the contract Documents' hardware schedule requirements and will include, but not be limited to the following:

  - ✓ Review specification requirements for hardware schedule, formats, hardware locations, opening descriptions, and other information specified.
  - ✓ Review products specified versus products proposed.
  - ✓ Hardware Supplier shall distribute, at the meeting, samples of schedules from other projects of similar nature prepared by the same person as will prepare schedule for this project.

Pre-installation Meeting:

- Before hardware installation, general contractor/construction manager shall request a hardware installation review to be conducted on the installation of hardware; specifically of locksets, closers, exit devices, overhead stops and coordinators. Manufacturer's representatives of the above products in conjunction with the hardware supplier for the project shall present. Review to be held at job site and attended by installers of hardware for aluminum, hollow metal and wood doors. Review to address proper coordination and installation of hardware, per finish hardware schedule for the specific project by using installation manuals, hardware schedule, templates, physical product samples and installation video's.
- When any electrical or pneumatic hardware is specified this review shall also include the following trades/installers: electrical, security, alarm systems and architect. The review needs to occur one week prior to start of work.

Final Adjustment:

- Provide the services of a representative to inspect material furnished and its installation and adjustment, to make final hardware adjustment, and to instruct the Owner's personnel in adjustment, care and maintenance of hardware.

- Locksets, closers and exit devices shall be inspected by the factory representative and adjusted after installation and after the HVAC system is in operation, to insure correct installation and proper adjustment in operation. The manufacturer's representative shall prepare a written report stating compliance, and also recording locations and kinds of noncompliance. The original report shall be forwarded to the Architect with copies to the Contractor, hardware distributor, hardware installer and building owner.

Technical and Warranty Information:

Provide manufacturer's warranty to the following terms:

- Interior Solid Core Doors: "Full life of Original Installation" including rehanging and refinishing if door(s) do not comply with warranty tolerance standards.

- Include coverage for delamination, warping, bow, cup and telegraphing of core construction beyond warranty tolerances.

Substitutions allowed only if approved by EFSC Facilities in writing 10 days prior to bid date.

At the completion of the project, the technical and warranty information coalesced and kept on file by the General Contractor/Construction Manager shall be given to the Owner or Owner's Agent. In addition to both the technical and warranty information, all factory order acknowledgement numbers supplied to the General Contractor/Construction Manager during the construction period shall be given to the Owner or Owner's Agent. The warranty information and factory order acknowledgement numbers shall serve to both expedite and properly execute any warranty work that may be required on the various hardware items supplied on the project.

VII. PAINTING STANDARDS

General:

- This section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces, including touch-up painting on pre-finished items. Surface preparation, priming, and finish coats specified in this section are in addition to shop-priming and surface treatment specified under other sections.

- Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory finish applied.

- The term "paint" as used herein includes emulsions, primers, enamels, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat. Standard coating terms defined in ASTM D 16 apply to this section.

References:

- American Society of Testing and Materials (ASTM), D 16 Standard Terminology for Paint, Related Coatings, Materials, and Applications.

- National Fire Protection Association (NFPA), 13 Standard for the Installation of Sprinkler Systems.

- Code of Federal Regulations (CFR)
    - ✓ Title 29 Part 1910 Labor - Occupational Safety and Health Standards
    - ✓ Title 29 Part 1926 Safety and Health Regulations for Construction
    - ✓ Green Seal (GS), GS-11 Paints

Surfaces to Be Painted:

- Paint all exposed surfaces whether or not colors are designated, except where surface or material is specifically indicated not to be painted or to remain natural.

- Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces.

- If color or finish is not designated, the Facilities Department will select from standard colors or finishes available.

- Existing work shall be painted where specified.

- Electrical items to be painted include conduit, fittings, cabinets, panels, enclosures, junction and pull boxes, hangers and other associated electrical items which are in "Public Spaces" and are therefore visible to the building occupants. Painting shall not obscure manufacturer's labels or additional nameplates, or conduit color banding, or other identification.

- Mechanical items to be painted include, but are not limited to:
  - ✓ Exposed piping, vessels and equipment rooms shall be color-coated.
  - ✓ Exposed piping, ductwork and hangers and supports in occupied areas shall be painted to match adjacent surfaces.
  - ✓ Exterior piping, un-insulated ductwork, and equipment shall be painted to conform to the architectural design of the building exterior.
  - ✓ It is preferred that exterior equipment be factory finished with a color that blends with the building colors. Provide available color samples with equipment submittals.

Surfaces Not Requiring Painting

- Pre-finished items including the following factory-finished components:
  - ✓ Metal toilet enclosures, unless otherwise specified
  - ✓ Acoustic materials
  - ✓ Architectural woodwork and casework
  - ✓ Finished mechanical and electrical equipment
  - ✓ Switchgear
  - ✓ Distribution cabinets
  - ✓ Metal roofing
  - ✓ Galvanized components of prefabricated metal buildings
  - ✓ Factory painted mechanical equipment with approved finishes.

- Concealed surfaces including wall or ceiling surfaces in unfinished spaces.
  - ✓ Foundation spaces
  - ✓ Duct shafts
  - ✓ Elevator shafts
  - ✓ Factory finished surfaces such as:
    - Anodized aluminum
    - Stainless steel
    - Chromium plate
    - Glass
    - Bronze and brass

- Operating parts including moving parts of operating equipment such as the following:
  - ✓ Valve and damper operators
  - ✓ Linkages
  - ✓ Sensing devices
  - ✓ Motor and fan shafts
  - ✓ Regulators, controls, instruments.
- Electrical conduit, boxes, panels and other associated electrical equipment located in Mechanical or Electrical equipment rooms, above ceilings, in chases, in basements or in other locations where they are not normally visible to the building occupants, unless otherwise specified.

Surfaces for Which Painting Is Prohibited:

- Sprinkler heads.
- Heat and smoke detectors.
- Pre-painted electrical equipment in equipment rooms which include lighting, inverters, VFCs, MCCs, switchboards, fire alarm and facility control system (FCS) panels. (Exception – to touch up existing paint damaged during installation or other construction).
- Conduit color banding or other identification.
- Conduit and equipment in equipment rooms, unless otherwise specified.
- Equipment in hazardous (classified) locations.
- Labels: Do not paint over Underwriters Laboratories, Factory Mutual, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- Concealed auto-releasing sprinkler head covers (i.e.; escutcheon plates).
- Glass, brass, or chrome plated portions of fire protection system control valves (i.e., PIVs, gate valves) hydrants and fire department connections. (Reference NFPA 13 and Section 15310, "Automatic Sprinkler and Water Based Fire Protection Systems.)

Quality Assurance:

- Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer of the finish coats.
- Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total coating systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- Notify the EFSC of problems anticipated using the materials specified.
- Material Quality: Provide the manufacturer's best quality of paint for the coating types specified. Paint material containers not displaying manufacturer's product identification are not acceptable.
- Proprietary names used to designate colors or materials are not intended to imply that products named are required, or to exclude equal products of other manufacturers.

Delivery, Storage and Handling:

- Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name, label, and the following information:

    - ✓ Product name or title of material
    - ✓ Product description (generic classification or binder type)
    - ✓ Manufacturer's stock number and date of manufacture
    - ✓ Contents by volume, for pigment and vehicle constituents
    - ✓ Thinning instructions
    - ✓ Application instructions
    - ✓ Color name and number
    - ✓ VOC content

- Store materials in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45°F. Store all flammable materials not in use in Underwriters Laboratories, Inc., NFPA or other approved flammable storage cabinet. When storing combustible or flammable liquids exceeding 25 gallons, compliance with OSHA 29 CFR 1926 is required. Maintain containers and cabinets used for storage in a clean condition, free of foreign materials and residue.

- Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing and application.

Project Conditions:

- Apply water-based paints only when the temperatures of surfaces to be painted when surrounding air temperatures are between 50°F and 90°F.

- Apply solvent-thinned paints only when the temperatures of surfaces to be painted when surrounding air temperatures are between 45°F and 95°F.

- Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5°F above the dew point, or to damp or wet surfaces.

- Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature and humidity limits specified by the manufacturer during application and drying periods.

Products:

The following compounds shall not be used in paints or primers on any EFSC projects:
Prohibited organic compounds

a. Methylene chloride
b. 1, 1, 1-Trichloroethane
c. Benzene
d. Toluene (methylbenzene)
e. Ethylbenzene
f. Vinyl chloride
g. Naphthalene
h. 1, 2 - Dichlorobenzene
i. Di (2-ethylhexyl) phthalate
j. Butyl benzyl phthalate
k. Di-n-butyl phthalate
l. Di-noctyl phthalate
m. Diethyl phthalate
n. Dimethyl phthalate
o. Isophorone
p. Formaldehyde
q. Methyl ethyl ketone
r. Methyl isobutyl ketone
s. Acrolein
t. Acrylonitrile

Prohibited metals (including their oxides)

a. Antimony
b. Cadmium
c. Hexavalent chromium
d. Lead
e. Mercury

Manufacturers:

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

- Sherwin-Williams Company (S-W)
- Richards Paint Co.

Masonry Block Filler:

- High-Performance Latex Block Filler: Heavy-duty latex block fillers used for filling open, textured interior and exterior concrete masonry block before application of top coats.
- Block filler used under high-performance polyamide epoxy coatings.

Primers and Sealers:

- Interior Latex Enamel: To be used as under-coat for smooth cementitious surfaces and bare wood. VOC content shall comply with GS-11, or not exceed 150 grams per liter (g/L)
- Interior Latex-Based White Primer: Latex-based primer coating to be used on interior gypsum drywall under a flat latex paint or semi-gloss latex enamel.
- Exterior Primer Coating: Exterior alkyd wood primer used for priming wood under alkyd enamels.

- Rust-inhibiting primer will be quick-drying. The rust-inhibiting primer will be used for priming ferrous metal on the exterior under high-gloss enamel and on the interior under enamel.

- Galvanized Metal Primer: Primer used to prime interior and exterior zinc-coated (galvanized) metal surfaces.

- Pigmented Sealer: Pigmented sealers over concrete used under high performance polyamide epoxy coatings.

Exterior Finish Paint:

- Exterior Acrylic: Quick-drying, flat, acrylic paint used on the exterior over concrete, stucco, and masonry (including concrete masonry block). VOC content shall comply with GS-11, or not exceed 100 g/L.

- Alkyd Enamel: Weather-resistant, air-drying, semi-gloss enamel used on the exterior over prime-coated wood, and over primed ferrous metal surfaces. VOC content shall comply with GS-11, or not exceed 200 g/L.

Miscellaneous Wood Finishing Materials:

- Solvent Thinned Interior Wood Stain: Slow-penetrating solvent thinned wood stain for general use on interior wood surfaces under clear finishes.

- Sanding Sealer: Manufacturer's recommended sanding sealer, compatible with catalyzed polyurethane finish coat. Sand Paper: 220 grit.

Execution:

- Examination:
  - ✓ Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

Preparation

- General Procedures:
  - ✓ Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in places that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces.
  - ✓ Clean surfaces before applying paint or surface treatments.
  - ✓ Remove oil and grease prior to cleaning.
  - ✓ Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly-painted surfaces.
  - ✓ Following completion of painting operations in each space or area, items shall be reinstalled in the same manner that they were removed.

- Surface Preparation:
  - ✓ Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.
  - ✓ Provide barrier coats over incompatible primers or remove and re-prime.
  - ✓ Notify SDR in writing when problems are anticipated in using the specified finish coat material with substrates primed by others.

- Cementitious Materials:
  - ✓ Prepare concrete, concrete masonry block, and stucco to be painted.
  - ✓ Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents.
  - ✓ Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
  - ✓ Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
  - ✓ Determine alkalinity and moisture content of surfaces by performing appropriate tests. Pay special attention to concrete masonry unit mortar joints and patched concrete surfaces. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint

surfaces where moisture content of surface to be painted exceeds that permitted in manufacturer's printed directions.

- ✓ Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, and rinse; allow drying and vacuuming before painting.

- Wood Materials:
  - ✓ Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper.
  - ✓ Sand smooth surfaces exposed to view and dust off.
  - ✓ Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of primer.
  - ✓ Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
    - ✓ After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler.
    - ✓ Sand smooth when dried.
    - ✓ When transparent finish is required, back prime with spar varnish.
    - ✓ Back prime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
    - ✓ Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery to jobsite.

- Ferrous Metals:
  - ✓ Clean non-galvanized ferrous-metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.
  - ✓ Treat bare and sand-blasted or pickled clean metal with a metal treatment wash coat before priming.
  - ✓ Touch up bare areas and shop-applied prime coats that have been damaged.
  - ✓ Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

- Galvanized Surfaces:
  - ✓ Clean galvanized surfaces with non-petroleum based solvents so that the surface is free of oil and surface contaminants.
  - ✓ Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

- Gypsum Board:
  - ✓ Surfaces shall be dry and shall have all loose dirt and dust removed by brushing with a soft brush, rubbing with a dry cloth, or vacuum cleaning prior to application of first-coat material.
  - ✓ Repair blemishes, irregularities and damaged surfaces.

- Material Preparation: Carefully mix and prepare paint materials in accordance with the manufacturer's directions.
    - ✓ Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
    - ✓ Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
    - ✓ Use only thinners approved by the paint manufacturer, and only within recommended limits. Use odorless thinner with alkyd enamel.

Interior Finish Paint Schedule:

- Interior Wall Paint recommended standard for typical application where neutral colors are selected. Other colors may be introduced where appropriate and approved by the owner. These selections must maintain the same painting quality.

- Gypsum Walls-Classrooms and Offices

  First Coat-Preprite 200 Latex Primer B28W200
  Second Coat-Pro Mar 200 Latex Egg-Shell B20W251
  Third Coat-Pro Mar 200 Latex Egg-Shell B20W (required for new construction only)

- Gypsum Walls-Common Area
  First Coat-Preprite 200 Latex Primer B28W200
  Second Coat-Pro Mar 200 Latex Semi-Gloss B31W200 series
  Third Coat- Pro Mar 200 Latex Semi-Gloss B31W200 series (required for new construction only)

- Gypsum-Toilet Rooms and Cafeteria Walls
  First Coat-Preprite 200 Latex Primer B28W200
  Second Coat-SW Water-based Catalyzed Epoxy B70 series
  Third Coat- SW Water-based Catalyzed Epoxy B70 series (required for new construction only)

- Concrete Masonry Unit Walls-Common Areas
  First Coat-Preprite Int/Ext Blockfiller B25W25
  Second Coat-SW Water-based Catalyzed Epoxy B70 series

- Metal door frames, etc. shall be painted the same color as the wall elevation in which they occur (each side).
  First Coat-Kem Kromik Universal Metal Primer B50 series
  Second Coat-Pro Mar 200 Alkyd Semi-Gloss B34W200 series
  Third Coat-Pro Mar 200 Alkyd Semi-Gloss B34W200 series (as needed)

- Wood Doors
  First Coat-Wood Classics Oil Stain
  Second Coat-Wood Classics Polyurethane Satin or Gloss
  Third Coat-Wood Classics Polyurethane Satin or Gloss

- Galvanized Miscellaneous Metals (Includes aluminum substrates)
  First Coat-DTM Primer Finish B66W1
  Second Coat-DTM Acrylic Simi Gloss B66 series

- All Miscellaneous Ferrous Metals
  First Coat-Kem Kromik Universal Metal Primer B50WZ series
  Second Coat-Industrial Enamel Alkyd Gloss B54 s

- Exterior Stucco and EIFIS Wall (Prepainted)
  First Coat-Loxon Guide Coat White A24W100
  Second Coat-Loxon Acrylic Top Coat A24W351

- Exterior Metal Handrails
  First Coat-Kem Kromik Universal Metal Primer B50WZ series
  Second Coat-Industrial Enamel Alkyd Gloss B54 series

Texture

A light knock down texture will be used on all sheetrock surfaces.

Exterior Paint Schedule:

- No primer or block filler is required on previously painted surfaces, unless specified in the contract documents or where alkaline, moisture or freeze-thaw cycles have caused blistering or peeling.

- Concrete, Stucco, and Masonry (other than concrete masonry units):
  - ✓ Lusterless (Flat) Acrylic Finish: Two (2) coats with total dry film thickness per manufacturer's recommendations.
  - ✓ First Coat: Exterior Acrylic
  - ✓ Second Coat: Exterior Acrylic

- Concrete Masonry Units
  - ✓ Lusterless (Flat) Acrylic Finish: Two (2) coats over block filler with total dry film thickness (filler excluded) per manufacturer's recommendations.
  - ✓ Block Filler: Latex Block Filler
  - ✓ First Coat: Exterior Acrylic
  - ✓ Second Coat: Exterior Acrylic

- Wood
  - ✓ Alkyd Finish: Two (2) finish coats over primer with total dry film thickness per manufacturer's recommendations.
  - ✓ Primer: Exterior Primer Coating
  - ✓ First Coat: Alkyd Enamel
  - ✓ Second Coat: Alkyd Enamel

- Ferrous Metal: Primer is not required on shop-primed items.
  - ✓ Alkyd Enamel: Two (2) finish coats over primer.

- ✓ Primer: Rust-Inhibiting Primer
- ✓ First Coat: Alkyd Enamel
- ✓ Second Coat: Alkyd Enamel

- Galvanized Metal
  - ✓ Alkyd Enamel: Two (2) finish coats over primer.
  - ✓ Primer: Galvanized Metal Primer
  - ✓ First Coat: Alkyd Enamel
  - ✓ Second Coat: Alkyd Enamel

Fire Protection Painting:

- Contractor shall paint those portions of fire protection as required by EFSC as follows, except as required in Section 1.01, E.1-5:
- Color Coding of Outdoor Water-Based Fire Protection System
  - ✓ Hydrants: All fire hydrants shall be painted "Traffic Yellow." The top portion (bonnet) shall be reflective (glass beaded) paint.
  - ✓ Post Indicator Valves: Sprinkler controlled post indicator valves shall be painted "Fire Protection Red." Water distribution system division post indicator valves shall be painted "Traffic Yellow."
  - ✓ Sprinkler Piping: Sprinkler piping which is exposed to exterior surface corrosion shall be painted "Fire Protection Red." Reference OSHA 29 CFR 1910 159(C).6 for color specification

VII. GUIDELINES FOR FIRE SAFETY

The college is sensitive to the needs to alert its faculty, staff and students of emergency situations. EFSC is equally concerned with the access needs of emergency responders and will make appropriate efforts to insure safe access to EFSC buildings for them. The standards below represent the EFSC's minimum standard for providing alerting and communicating emergency information to its patrons and for the safe access to buildings for emergency responders.

a. The Siemens' Fire Finder HLS voice activated fire alarm panel is the standard fire alarm panel to be used for new construction, remodeling, or renovation. The panel must be capable of being control and monitored from a remote location.

b. Fire alarm panels should not be put in closets that have other uses.

c. The purchase and installation of fire extinguishers shall be included as part of the cost of each project.

d. If the building has a sprinkler system or standpipe, a PIV must be provided.

e. Dead-end fire lanes in excess of 150 feet shall be provided with an approved area for turning around fire apparatus.

f. The required turning radius for a fire truck is 55 feet.

g. Markings and signs shall be provided for fire lanes.

h. Fire lanes must be able to support the weight of the largest fire truck (86,000 pounds).

i. Fire Lanes shall not be less than twenty feet wide.

j. Fire lanes vertical clearance shall not be less than thirteen feet and six inches.

The design must be particularly sensitive to plant selection and placement to minimize the creation of dark or hard to see areas. The EFSC will be a pedestrian campus with motor vehicle traffic routed around the campus periphery; therefore, special emphasis is needed to insure that pedestrian walkway and vehicles conflict are minimized.

VIII. ROOFING STANDARDS

Roofing System Components:

The roof system includes the following basic components: roof deck or substrate, insulation, waterproofing membrane, protective surfacing, flashing, counter flashing, roof cants, caps and copings, perimeter fascia and gravel stops, sealants, roof expansion and control joints, roof walkway systems, roof hatches, roof drains, emergency overflow protection, roof drain flashing, scuppers, gutters, and downspouts. Skylights, patios and decks constructed on the roof is prohibited.

Approved Roofing Materials:

The selection of roofing materials shall be limited to those manufacturers with a 15-year history of satisfactory manufactured and installation of at least 500,000 squares of their roof system and who can provide a minimum 20-year unlimited warranty for labor and materials, including metal finishes. The EFSC preferred roofing systems are Fibertite and Suprema.

Registered Architect or Engineer Required:

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

Steep Slope Roofing:

Steep slope roofing includes slate, tile, shingle and metal roof systems. Steep slope roofing shall not be utilized on EFSC facilities on a slope less than four (4) inches per foot.

Energy Management:

Roof system design will be consistent with energy management requirements of the Florida State College system, SREF, Florida Statutes and applicable Codes. Insulating values of the finished roof system shall be designed on the basis of economic life cycle return on investment when evaluated against fuel costs.

Roof Membrane Penetrations:

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

Expansion Joints:

Structural expansion joints occurring in new construction shall be located at high points in the structure of roof insulations to the maximum extent practicable to allow water to flow away from

them on the roof surface. Under no circumstances are the expansion joints to be placed such that roof water must flow across them to reach drains.

Utility Supply Lines:

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

Through-Wall Flashing:

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

Emergency Overflow Protection:

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

Drainage:

Roof drains will interconnect into the stormwater system.

Internal Gutters:

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

Roof Access:

All roof areas will be permanently equipped with a reasonable means of access for purposes of maintenance of the roof system and any roof mounted equipment. The preferred method of access is by an internal roof scuttle. External means of access is discouraged.

Roof Mounted Equipment:

Roof mounted equipment is not acceptable if other locations for placement can be found. Where equipment must be mounted on the roof, roof surface walkways are required to minimize damage to the roof. Roof mounted antenna, lightning protection anchorage, lab equipment or scientific devices will be located on areas specifically designed for that purpose. Roof loads, walking surfaces, anchoring devices, mounting pads, curbs or utility needs will be designed and provided using appropriate details, adapted as required, from the NRCA Roofing and Waterproofing Manual.

Pitch Pockets:

Pitch pockets are not permitted.

Roof Scans:

Whether installed on a new or existing facility, all new roofing will require acceptable roof scans to ensure satisfactory compliance with the specifications.

Insulating Light-Weight Concrete:

Insulating light-weight concrete over vented (perforated) metal roof decking is permitted. Insulating light-weight concrete over structural concrete slabs as a part of the roof system or over existing roof assemblies is acceptable provided:

- Insulating light-weight fill thickness, over substrate or insulation board, is a minimum of one (1) inch, not to exceed one and one half (1-1/2) inch.
- Insulating light-weight concrete is aggregate based and has a minimum compressive strength of 300 psi. Roof vents through the membrane will be acceptable provided they are insulated, spun aluminum roof vents having a one-way valve design. Roof vents constructed of PVC are not acceptable.
- All lightweight insulating concrete systems must meet the following standards:
  - ✓ Tested by Underwriter Laboratories in accordance with the procedures of ASTME 119 and listed in the most recent Underwriters Laboratories Fire Resistance Directory.
  - ✓ Tested by Factory Mutual Research and listed in the most recent Factory Mutual Approval Guide as non-combustible or Class 1.
  - ✓ Tested by Factory Mutual Research for windstorm classification 1-120 and listed in the most recent Factory Mutual Guide.

Re-saturates:

Re-saturates are not acceptable for rejuvenation of an existing built-up roof.

Galvanized Metal Flashing:

The use of galvanized metal flashing or any other use on the roof is not acceptable.

Asbestos:

The use of roofing materials containing asbestos is prohibited in the installation of new roofing, roof replacement or repair of existing roofing.

Protection Plan:

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

Codes and Standards:

All architects, engineers, specifiers, consultants and installers with utilize the following resources:

- Latest edition of all applicable building codes
- The Factory Mutual Systems Approval Guide
- The Underwriters Laboratory (UL) Building Materials Directory
- The UL Fire Resistance Directory
- The American Society for Testing and Materials Board of Standards Volume for Roofing, Waterproofing and Bituminous Materials
- The Architectural Sheet Metal Manual by the Sheet Metal and Air Conditioning Contractors' National Association
- Recommended standards and technical details of the Metal Roofing Systems Association
- The NRCA Roofing and Waterproofing Manual

IX. GUIDELINES FOR ROOFTOP FALL PROTECTION

The Department of Labor's Occupational Safety & Health Administration (OSHA) sets the standards for fall protection on roofs in the Construction Standards 29 CFR 1926.501-503 (Fall Protection) and in the General Industry Standards 29 CFR 1910.66 (Powered Platforms for Building Maintenance) and 29 CFR 1910 Subpart D – Walking – Working Surfaces.

Permanent roof top fall protection must be designed and installed as a part of each construction project for new buildings and every re-roofing project. The design of anchorage points for fall arrest systems must be performed by a professional engineer. All roof top fall construction must be inspected and certified by a professional engineer. The certified fall arrest anchorage points must be marked on the as-built drawings with the PE (professional engineer) stamp.

Each anchorage points must be permanently tagged with the following information.

- Load rating
- Name and credential of the professional engineer performing the inspection and certification
- Date of inspection

X. MECHANICAL

Design Criteria:

- HVAC system design, equipment selection and energy conservation abilities shall meet the requirements of the latest mandated edition of the Florida Department of Education's State Requirements for Educational Facilities (SREF); Florida Energy Efficiency Code for Building Construction (FEEC); NEC; NFPA, Standard Plumbing Code as well as the Standard Mechanical Code of the SBCCI.

- The HVAC system design, equipment selection and energy conservation features shall follow the latest editions of the design and application guidelines as outlined in the Industrial Ventilation Manual, the ASHRAE Handbooks, SMACNA and other accepted authorities (to include the manufacturer's recommendations for installation/service clearances). The volume of ventilation air for a space shall be in accordance with latest edition of ASHRAE Standard 62-2001.

- A copy of the engineering heat gain calculations and a copy of the Life Cycle Cost Analysis (LCCA) shall be provided to the EFSC Facilities Department for review (exception being a project whose heat gain load is less than 30 Tons as in accordance with SREF 99). Data shall be submitted in an 8-1/2"x11" binder titled "HVAC Calculations" and shall include the project name, project number and date of submission. Calculations shall include the full load and partial load psychometric analysis as well as charts for the cooling coil sections. The HVAC engineering heat gain calculations shall be determined using the design parameters listed below.

- Summer Parameters:
  Indoor = 74° Fdb (and 55% RH)
  Outdoor = 96° Fdb (80° FWB)

- Winter Parameters:
  Indoor = 68° Fdb
  Outdoor = 38° Fdb

- Daily range = 20° Fdb

- Atmosphere clearness factor = 0.90

- Lighting heat gain = 1.5 W/SF

- Occupant heat gain = 250 BTUH sensible & 200 BTUH latent

- Occupied hours:
  Monday to Thursday 5:00 AM to 10:00 PM
  Friday, Saturday & Sunday hours adjustable based on schedule

- Building pressure analysis shall be performed in all spaces served by the various mechanical HVAC equipment installed (to ensure positive air and vapor pressure) in all spaces (except special use spaces as later defined in this document). The architect/engineer shall be charged with ensuring no wall, partition, barricade or other obstructing item shall be allowed to interfere with air mixing within the spaces and shall specify correct registers/diffusers to accomplish complete air mixing in areas served by the HVAC system while meeting noise level criteria set forth herein. The architect/engineer shall provide a proposed air-mixing diagram of the spaces served. Air mixing shall be confirmed using accepted smoke testing methods. The Contractor shall be responsible to retain a "test and balance" (T&B) firm to balance the HVAC system (to +10% to -5% of design values) prior to substantial completion.

- Substantial completion shall not occur until 30 days after approval of certification by an independent T&B Consultant, under contract with EFSC, who shall verify the results of the Contractor's T & B firm.

- Installation of rooftop equipment shall not be permitted (inclusive of rooftop air conditioning package units, ducts, piping, conduit, etc). Exceptions will be considered (such as rooftop exhaust fans, air intake hoods and split system condenser units) when installation on grade is not possible. Rooftop equipment shall be anchored to sustain hurricane force winds as outlined in ASCE Standard 7-98 and details of the method of anchoring shall be provided on the mechanical drawings and detailed on the structural drawings.

- The rooftop exhaust fans (and air intake hoods) serving the Enhanced

- Hurricane Protection Areas (EHPA) shall be provided with rectangular enclosures fabricated of heavy duty, expanded metal (with standard/flattened diamond shape galvanized steel grating) for hurricane missile impact protection. The frame shall be constructed of structural tube sections welded to 3" galvanized steel pipe columns at each corner, with the frame anchored to the roof. One side panel (as well as the top panel) of the five sides shall be hinged to allow access to the rooftop equipment for servicing, repair and/or replacement. Other design concepts may be entertained and require approval by the designated officials within the EFSC Facilities department.

- Do not install any HVAC or plumbing piping inside the block cores of exterior walls. Install all piping in furred walls or in pipe chases.

- Ensure positive pressure in all areas (except in kitchens, toilets, custodian rooms, chemistry classrooms containing fume hoods, etc.) by allowing a 10%-20 % positive pressure of the AHU supply air within the space served. Show CFM values on all supply and return air openings so that the system can be properly balanced.

- Noise levels due to air conditioning unit fans (non-inclusive of ventilating equipment, ducts, grilles, diffusers and air system pressure reducing devices) shall conform to the "RC Noise Rating Procedure" as outlined in the latest mandated edition of the "ASHRAE HVAC Applications Handbook". Classrooms and all spaces (other than those listed below) shall be designed for a noise criteria range of RC-25(N) to RC-30(N). The exceptions shall be:

1.	Corridor, Lobbies	RC-40(N)
2.	Chiller Rooms	RC 60(N)
3.	Storage, Toilets, Custodial	RC-45(N)
4.	Mechanical Rooms	RC-45(N)
5.	Gymnasium	RC-45(N)
6.	Kitchens	RC-40(N)

  Note: *Internally lined double wall insulated ducts shall be provided on all supply and return air ducts for a distance of 20 feet to and from the air handling unit discharge.*

- Should the air conditioning equipment noise levels exceed those listed above, other methods of reducing noise levels shall be implemented and approved by the appropriate designated officials within the EFSC Facilities department. Exterior installed air-cooled chillers, emergency generators, pumps, cooling towers and various accessories shall be designed so that the noise levels do not exceed 55 dBA within the interior of the building or immediately outside the exterior of the building (or the levels be transmitted to an adjacent classroom).

- Special attention and consideration shall be provided when air-cooled chillers are to be located adjacent to residential areas. Noise levels generated by this and other equipment shall not exceed 55 dB at the property line.

- Architect will specify adhesives, paints, sealants, carpets, etc. that are certified as "green" by the US Green Building Counsel. Architect shall adhere to ASHRAE standard 62-2001 in selection of materials with VOC's.

- Architect/Engineer shall employ ASHRAE 90.1-2001 standard for energy conservation in selection of mechanical equipment and lighting

- An energy model is required for all substantial renovations and any new construction. The building analysis is mandatory and shall be inclusive of the entire building whether new construction or renovations.

- In existing facilities requiring remodeling renovation and/or additions, the following requirements shall be adhered to, in conjunction with all other requirements for new construction and listed herein, by the Project Consultant with assurances that final construction documents are correct and up-to-date.

- Mandatory field verification shall be performed by the Project Consultant. The Project Consultant shall verify all existing conditions to ensure the feasibility of construction commencement as well as lend aid in the prevention of unforeseen delays during construction.

- A complete set of demolition plans for areas within the scope-of-work shall be provided as part of the contract documents. Demolition plans shall include ALL mechanical equipment whether the equipment or systems are to remain, be removed or be reused. Notations on demolition plans or various related documents such as "EXISTING TO REMAIN" are insufficient and will not be approved.

- All work requires special attention to cleanliness, safety, protection (of both materials and equipment) and site maintenance. The project consultant must ensure the following requirements are met as well as those determined by designated officials):

    1. Ensure that all walkways and entrances are useable to pedestrian traffic at all times.
    2. Do not encumber the site with excess materials or equipment to be stored or used in an unreasonable timeframe.
    3. Assume full responsibility for protection and safe keeping of products stored on premises.
    4. Conduct daily inspections and more often if necessary to verify that requirements of safety and cleanliness are being met.
    5. Provide all required personnel, equipment and materials needed to maintain cleanliness.
    6. Retain all stored items in an ordinary arrangement allowing maximum access, not impeding drainage or traffic and providing the required protection of materials.
    7. Do not allow the accumulation of scrap, debris, waste material.

- The contractor is solely responsible for maintaining cleanliness of all air distribution equipment and systems which will remain (or be placed in operation) during any phase of the construction/renovation and shall appropriate steps to ensure that no transmission of construction dust, debris, vapors and/or odors occurs between the construction site and any occupied area of the building being renovated.

- A complete updated set of remodeled or renovated plans for areas within the scope-of-work shall be provided and must include all new mechanical equipment (such as HVAC AHU's, ductwork, ductwork sizes including CFM values, exhaust fans, natural or propane gas system, sanitary system, storm drain system, domestic water system, plumbing fixtures, etc). Plans must also include the new plumbing fixture count (fixture units) being added to the existing sanitary system. Should the existing HVAC system be extended to serve new areas the AHU and all terminal devices serving areas (other than those in the scope-of-work, but on the same HVAC system), shall also be properly rebalanced. The entire system along with the new CFM values shall be shown on the plans.

- All existing HVAC equipment to be reused in existing facilities requiring renovation work shall be shown on schedules in the plans by the Design Professional. The existing HVAC controls shall be upgraded to satisfy existing life safety code and energy conservation requirements. Building temperature and energy controls shall adhere to the controls specifications within this document and shall connect into the existing controls backbone. The design of the BAS shall allow the co-existence of new DDC controller with existing controllers in the same network without the use of gateways or protocol converters.

- All existing equipment (to include electrical data and capacities) shall be listed so that proper testing and balancing can be performed. The Contractor shall provide a maintenance schedule describing all cleaning and repair work to be performed. The information required in this paragraph shall be documented on the Contractor's letterhead stationary in a service report format and demonstrated to the designated officials for final approval.

- When selecting either HVAC, plumbing or other mechanical equipment, the engineer/architect shall specify per EFSC standards.

- In existing facilities requiring renovations and/or additions, all new HVAC equipment shall be tagged and identified in a sequential numerical format in coordination with the existing HVAC equipment so as not to repeat AHU numbers, exhaust fan numbers, etc. In new facilities, all new HVAC equipment shall be tagged and identified in a sequential numerical format. Included in the tagging identification shall be the area served by the HVAC equipment (such as AHU-1/ Media Center, AHU- 2/Multipurpose Room, etc.). Equipment tags shall be engraved plastic white letters on black background or other high contrast format cleared with the designated officials of the EFSC facilities department prior to specification and shall be riveted, screwed or mechanically fastened (as NO adhesive attachment will be accepted) to appropriate equipment.

- Tag font shall be 1.25" tall. All hand and motor operated valves shall be sequentially numbered with the same intent as equipment numbering excluding the requirement of area served, with circular 3" diameter brass tags and chains. Alpha-numeric will be either stamped or engraved into tags and shall be legible from a minimum distance of 25'. Valve tags will be designated as to the system the corresponding valves control i.e. oil, chill water, hot water, condenser water, etc.

- All piping shall be identified as to the type of fluid within and the system served per ASA standards and to MIL-STD-101except that slip on labels or tapes with pressure sensitive adhesive conforming to FED. SPEC. A-A-1689 may be used in lieu of stenciling.

- Exposed piping shall be painted with an approved weather and UV resistant elastomeric paint and conforming to the ASA Standard color code. Exposed is defined as equipment and piping visible without removing ceilings or opening access panels. All mechanical room piping and equipment shall be considered as exposed.

HVAC System:

- The systems shall be designed so that each zone air-handling unit (AHU) shall not exceed a total of 20 HP connected fan motor load. Pre-conditioning of the outside air is required for all air handling systems exceeding 10% of the total outside air volume. Pre-conditioning of the outside air will be required and shall be facilitated via outside air monitoring stations for VAV air handling systems.

- All units introducing outside air shall have controls allowing for the sequence of operation to open, to a minimum of ten percent, the heating and cooling valves to allow for freeze protection.

- The freeze protection sequence shall not adversely affect the system ability to maintain temperature set points within the space supplied. This sequence shall be automatically implemented whenever outside ambient temperatures are at or below 38° F.

- Chillers provided with a primary/secondary loop shall be installed in parallel. The primary loop pumps shall be designed for constant volume flow while the secondary loop pumps shall be designed for variable volume flow. Plants shall be designed with pumping redundancy and cross connects capability to increase plant run time and dependability.

- A constant air volume (CAV) system shall be selected for such areas as Kitchens, Dining/Multipurpose Rooms, Auditoriums and the Gymnasium/Locker Rooms. The Gymnasium/Locker Rooms shall be served with a single zone AHU equipped with a pre-conditioning unit. All VAV air handling systems shall use variable frequency drives for fan control. Variable inlet vanes are prohibited. Approved variable speed drive manufacturer shall be ABB.

- Due to the intermittent occupancy of 3 hours or more in these areas, the HVAC system design calculations for the Auditorium, Dining/Multipurpose Room and the Gymnasium shall be based on a ventilation rate of 7.5 CFM/person, as stipulated in ASHRAE Standard 62-2001.

- Air handling units shall be double walled with 1" thick/3 PCF density or 2" thick/1-1/2 PCF density uncompressed insulation having a minimum R-value of 4.2 sandwiched between the two panels, constructed of galvanize steel and contain a 2" angular filter section with access modules for coil maintenance. Filters shall be 2" metal frame replaceable media type and media shall meet current ASHRAE 62 filtration requirements of MERV 6.

- The cooling coil shall be designed to contain a minimum of 6 rows and a maximum of 8-11 fins/inch (FPI). Design entering chill water temperature shall be 45° F. AHU's shall contain a sloped stainless steel IAQ drain pan with a bottom drain in lieu of a flat galvanized steel drain pan.

- Air-cooled condenser and DX condensers shall be provided with a factory applied spray-processed coating for corrosion protection. The coating material and process (as applied to fin tube coils) shall provide an effective corrosion protection in range of 1.0-14.0 pH. The coils shall be prepared through the manufacturer's procedural cleaning steps allowing for drying prior to the coating process. A 1.0 dry mil thickness of acrylic polymer resin primer shall be applied by spray coating (and be fully cured) prior to applying the protective finish coat. The coil corrosion protection coating shall be applied by spray application and built up to a dry mil thickness of 2.0-3.0. The corrosion protection coating shall be built up on the fin edges with a final four-step spray coating process applied to both sides of the coil.

- Protection shall be provided for the coil tubes from fluid infiltration during the coating process by maintaining a 50 PSI blanket of nitrogen on the fluid side. Coating materials shall have passed a MINIMUM of 1000 hours of salt spray exposure in testing performed by an independent laboratory in accordance with ASTM B117.85 standards. The coating shall be field-repairable and touchup product shall be available for this purpose. The company providing the coating process shall also provide a five-year coil warranty. The entire coating process shall be similar to the Husky Coil Coat patented process as manufactured by Bronz-Glow Technologies, Inc. (Jacksonville, FL), Heresite (Manotowac, WI) or equal, approved by Facilities.

    - ✓ For electrical rooms requiring air conditioning based on the consultant's heat gain calculations (especially those rooms containing a large quantity of electrical equipment such as transformers) conditioned air shall be provided from adjacent classrooms or other similar rooms required to be exhausted in accordance with ASHRAE Standard 62 for air makeup requirements. Prior to exhaustion to the exterior, this conditioned air shall be passed through the electrical room to act as air makeup. When it is impractical to use an exhaust fan in the electrical room, the space air can be returned back to the AHU via a return air grille for retreating and redistribution.

    - ✓ All air conditioning equipment installed on grade (such as cooling towers, DX condenser units, etc.) shall provide a 6 foot, black vinyl coated chain link fence with privacy slats to enclose mechanical areas to prevent unauthorized access.

    - ✓ The use of return air plenums (whether in ceilings or mechanical rooms) is prohibited in new construction. In remodeling or renovation projects, the use of return air plenums will be considered only when there is no ducted means available.
    - ✓ The walls and doors of the mechanical room shall be sealed with moisture retardants and insulation to prevent air infiltration and heat intrusion.

    - ✓ The use of louvered doors for chiller or mechanical rooms is prohibited. Exterior doors shall be solid and weather stripped to minimize air infiltration in order to prevent condensation from forming on the AHU casing and ductwork. An outside air makeup opening over the door shall be provided with a door-width storm proof louver equipped with a modulating, motor-operated damper and a manual volume damper ducted to the air handling units.

- ✓ All outside air louvers shall be storm proof. The Architect/Engineer shall take every precaution to assure storm water cannot splash, fall, be driven or drawn into outside air ducting. Outside air ducting shall be installed with a ½" per foot of duct run slope downward from the MAU/OAU towards the duct/building junction. A 1" wide by ¾" deep trough shall be fabricated into the outside air duct at the point of building entrance. A ⅜"drain line shall be attached at the lowest point of this trough and routed to the condensate line floor drain to facilitate water run-off in the event there is water intrusion into the outside air duct.

- ✓ Mechanical rooms shall be sufficiently sized to provide the HVAC equipment manufacturer's recommended clearances for maintenance and servicing. A minimum of 3' clearance shall be provided on both sides and the front of the AHU and 2' clearance in the back.

- ✓ In order to minimize the introduction of moisture laden outside air into the building interior during unoccupied periods, provide a motor-operated, modulating, low leakage outside air damper at each of the mechanical room outside air makeup openings. The motorized outside air dampers and building exhausters shall be interlocked to the AHU(s) serving the areas exhausted by said exhauster(s), and shall de-energize the exhausters and close the outside air dampers during un-occupied times.

- ✓ Exhausters shall be provided with low leakage back-draft dampers that will close when exhauster is de-energized. The low leakage motorized outside air dampers shall be designed to remain closed during unoccupied evenings, weekends and holidays.

- ✓ The sequence of operation of the AHU, exhauster and motorized dampers shall be accomplished through the "building automation system" (BAS). Provisions shall also be made for a manual volume damper on the duct downstream of the motorized outside air damper to properly balance the required quantity of outside air.

- ✓ Coordinate with the structural engineer and install the AHU's on 6" concrete pads in the mechanical rooms. For AHU's provided with internal spring isolation on the fan assembly, the units will be installed on a ⅜" cross-ribbed, oil-resistant, resilient neoprene mounting pad between the unit and the concrete pad. When the AHU's are <u>not</u> provided with internal spring isolation on the fan assembly, install the units on spring-type vibration isolators atop the concrete pad. Ascertain that each unit sits sufficiently high on the concrete pad to enable adequate space for removal/replacement of the condensate trap.

- ✓ In mechanical rooms, provide a 3" floor drain at the rear or to the side of each AHU and route each AHU condensate pipe to discharge into a safe waste (via a 2"minimum air gap) that is connected to the floor drain and routed into the sanitary system as stipulated in the SBCCI Standard Mechanical Code, Section 603.

- ✓ Floor drains shall be located with sufficient clear space for service and installation in front of the AHU where they can become a tripping hazard are prohibited.

- ✓ Provide a hose bib adjacent to the door inside each mechanical room for coil wash-down. The hose bib shall only be approved for mechanical rooms. All other areas requiring a need for domestic water shall be provided with wall hydrants.

- ✓ When designing the Automatic Temperature Control (ATC) System, EFSC Facilities Section required sequences of operation shall be used when applicable. All sequences of operation shall be reviewed with EFSC Facilities, architect/engineer and controls contractor and will require written approval from EFSC prior to bidding. The automatic temperature control (ATC) system shall be a Distributed Digital Control (DDC) type.

- ✓ Thermostat sensors shall be located based on the air-mixing diagram to assure accurate set point room control. Thermostat sensors shall not be adjustable at the thermostat and shall not have a temperature indicator at the sensor.

- ✓ All AHU motors (with the exception of fractional HP motors) shall be NEMA standard design, sound rated and be of the grease lubricated ball bearing type. Motors shall be high efficiency types wound for specified voltage, have a minimum power factor of 85-100% load and a minimum efficiency of 91.7 % at 100% load per IEEE Test Procedure 112, Method B.

- ✓ All AHU three phase motors shall be protected against contact failure, loss of any phase (single phasing), low voltage, high voltage, voltage unbalance and phase reversal. The protection device shall be capable of providing automatic power system range sensing; adjustable trip delay, restart delay and voltage adjustment; unbalance trip indicator; LED status readout.

- ✓ All roof mounted HVAC equipment shall be designed to meet the hurricane wind load and missile impact criteria as stipulated in Chapter 7, Paragraph (24) of the 1999 SREF. In addition, the rooftop exhaust fans and air intake hoods serving the EHPA only shall be provided with rectangular enclosures fabricated of heavy duty, expanded metal with standard or flattened diamond shape galvanized steel grating for hurricane missile impact protection.

- ✓ For hurricane periods, provisions shall be made in the EHPA to shut down the respective AHU's and fully close the motorized outside air dampers.

- ✓ Provide Y-type strainers with blow down valves on the CHW and HHW supply line upstream of each AHU coil. (Also provide a drain valve and air vent directly on each of the coils.)

- ✓ During construction, all AHU's shall be fitted with 2" depth, UL Class 2, medium efficiency, disposable extended area, pleated filters with an atmospheric dust spot (ADS) efficiency of 60-65% and an average arrestance of 98% in accordance with ASHRAE Standard 62.1-92. The filter shall consist of water laid micro-fine fiberglass paper media; media support grid and an enclosing moisture resistant carrier board frame.

- ✓ All supply and return air ductwork openings shall be fitted with blanket type, disposable 1" thick synthetic media not intended for air flow in order to prevent construction debris from entering and accumulating inside the duct surfaces. At the discretion of the Owner's representative, the air filters may be removed and replaced as needed in order to maintain the cooling coil and system cleanliness. Prior to test and balance, the 2" construction air filters shall be removed and replaced with a new set of 2" metal frame filters, in any configuration of 16"x 20"; 20"x 20" or 25" x 20" with replaceable synthetic media meeting ASRAE standard 62.1- 2001 filtration guidelines

- ✓ The ductwork opening synthetic media shall be removed and discarded. Initial resistance of the 2" filters shall not exceed 0.40" WG at 500 FPM with a recommended final resistance of 0.60 to 0.80" WG. The Contractor shall provide a metal strap with the end turned up at the bottom and ends of each AHU filter frame to facilitate sliding the filters out for easy removal and replacement.

- ✓ A simplified "Sequence of Operation" ladder diagram explaining the HVAC system operation and corresponding to the actual devices used shall be installed behind a plexiglas or lexan cover adjacent to the equipment in each mechanical room. The transparent cover shall be permanently anchored to the wall at a height of 5 feet to the bottom of the cover. An electrical schematic drawing of the equipment shall also be provided in a similar manner for use by repairmen during servicing of the equipment.

Ductwork:

- The supply, return and outside air ductwork shall be fabricated of galvanized steel in compliance with SMACNA "HVAC Duct Construction Standards Metal and Flexible". The use of fiberglass duct board for duct construction or exposed fiberglass duct liner is prohibited.

- Provide double wall insulated duct for use as a sound attenuation liner for the first 20' of supply and return air ducts off the AHU. Double wall insulated duct liners shall be as manufactured by United McGill or approved equal.

- ✓ In order to attenuate noise and for flexibility, use UL 181 Class 1 commercial grade insulated flexible duct to connect the supply air diffusers and return air grilles to the supply and return air distribution duct. Flexible duct shall have a minimum R-value of 6.0 and be constructed of an aluminum foil laminate inner core liner encapsulating a steel wire helix, factory installed high density fiberglass blanket insulation and a metalized reinforced vapor barrier jacket as specified in the Omniair Series 1200, Thermaflex MKE or Flexmaster Type 5M.

- ✓ Flexible duct shall be one-piece, 2' MINIMUM to an 8' MAXIMUM in length and shall not be installed so that it lies on the ceiling or is kinked. Spliced duct is prohibited.

- ✓ Exhaust ductwork shall be fabricated of galvanized steel except for specialty exhaust systems such as the shower/ locker room exhaust (stainless steel or aluminum), kitchen hood exhaust (stainless steel or black steel), fume hood exhaust (stainless steel), dishwasher exhaust (stainless steel), etc.

- ✓ The supply and return air ducts shall be fully insulated as well as return air ducts located in unconditioned spaces or in mechanical rooms. The exhaust and outside air ducts shall be un-insulated.

- ✓ Supply and return air duct insulation in concealed areas shall be fiberglass blanket insulation. In exposed areas such as mechanical rooms, rigid fiberglass insulation board in lieu of fiberglass blanket insulation shall be used over the ductwork. 12 gauge galvanize steel impale type anchor pins adhered to the duct exterior with mastic shall be provided. The use of self-adhesive type anchor pins for the fiberglass blanket insulation is prohibited.

- ✓ Each duct branch take-off shall have a 90° locking quadrant balancing damper with a 2" stand off as manufactured by Ruskin or EFSC approved equal. Mechanical contractor shall ensure that extreme care is taken during the mastic sealing process to not allow the mastic to impede the normal full operation of the balancing dampers due to careless application of mastic.

- ✓ When the supply and return air duct branches or sub-branches are provided with volume dampers for balancing purposes, the terminal devices shall not contain dampers which would be redundant.

- ✓ Duct sealers such as mastic shall be water-base, fire resistive, non-toxic and compatible with mating materials. Under no circumstances will the use of petroleum-based products be permitted for duct or insulation sealant or adhesive purposes. Mastic sealant shall be applied to all duct transverse joints and longitudinal seams.

- ✓ HVAC or exhaust ducts shall not be supported from joist cross and lateral bracing or from galvanized steel decking.

- ✓ During duct system construction, provide temporary closure such as with 1" synthetic filter media or taped polyethylene sheet on all open ductwork to prevent construction dust from entering and accumulating inside ductwork.

- ✓ After installation and prior to test and balance, the duct system shall be cleaned by forcing high velocity air through it to remove the accumulated construction dust. To obtain sufficient air, half the system should be cleaned at a time dependent on the system size. Equipment that may be subject to damage from excessive dust or dirt shall be protected with construction filters or bypassed during cleaning.

- ✓ A pressure test shall be performed on all new duct systems prior to being insulated and on existing duct systems being reused or extended in order to determine the integrity of the duct. Maximum leakage rate shall not exceed 2%.

- ✓ During the duct pressure/leak testing procedure, the duct system shall not become distorted nor "oil can" at test pressure. Should the duct work become distorted or "oil can," the mechanical contractor will be required to add bracing to any duct section which "oil cans," and to replace ALL distorted sections and subsequently employ additional bracing.

- ✓ The Contractor shall be responsible for test and balancing of the system. Upon completion, EFSC shall certify the readings with the use of its own and test balancing firm.

- ✓ For grid type ceilings, the ceiling supply air diffusers shall be 2'x 2' lay-in aluminum louvered types with round necks. Ceiling return air grilles shall be aluminum hinged, louvered or egg-crate types provided without filters based on the design of Titus #350FF1 or Titus #50FF. The top panel of the S/A diffuser above the ceiling shall be fully insulated to prevent condensation with the outer edges of the insulation adhered to the ceiling grid with silver foil tape. The use of perforated type diffusers for supply air is prohibited. Side wall supply or return air grilles shall be based on the design of Titus #3FL, Titus #272FL or Price #620.

- ✓ For plastered ceilings, the ceiling supply air diffusers shall be surface mount aluminum louvered types based on the design Titus TDC-AA, Metalaire Series 5000 or Price AMD. Plastered ceiling return air grilles shall be aluminum hinged, louvered types provided without filters based on the design of Titus #350FF1 or Titus #50F. The top panel of both the supply air diffusers and the return air grilles above the ceiling shall be fully insulated to prevent condensation. The use of perforated type diffusers for supply air is prohibited. Side wall supply or return grilles shall be based on the design of Titus #3FL, Titus #272FL or Price #620.

Chillers:

- General
  - ✓ Chiller shall be a fully packaged unit including evaporator, condenser, marine water boxes, compressor, motor, starter, oil heater and cooler, economizer or intercooler, purge system, refrigerant piping, instrument and control piping, operating and safety controls mounted on the chiller, and other auxiliaries necessary for safe and proper operation of the unit.

  - ✓ All water-cooled chillers containing Group A1 refrigerants such as HCFC-22 and HFC-134A shall be provided with exhaust fans and oxygen deprivation sensors in the mechanical room to monitor any refrigerant leak and to warn of oxygen levels below 19.5% in accordance with ASHRAE Standard 15. Upon activation, the sensor shall activate an alarm, shut down all boilers and start the ventilation system

  - ✓ Chiller operation shall be fully automatic. Chiller should be able to unload to 20% of design tonnage with constant entering water temperature. The machine shall be modified to include hot gas bypass if the minimum load cannot be met.

- Applicable Standard - Chiller shall be rated and certified in accordance with ARI Standard 550 and shall have an efficiency of not more than 0.68 Kw/ton. FPL Chiller Retrofit rebate paperwork to be completed by installing vendor.

- Sound Data - Chiller sound pressure level (SPL), in decibels (dB), with a reference pressure of 20 micropascals shall not exceed 82dB (weighted) at 100% load as rated per ARI 575-94. Raising or lowering water temperatures is not allowed when determining the SP.

- Hermetic (or open): Chillers shall be open (or hermetically sealed), using one of the Refrigerants, HFC-134a or HCFC-22.

- Compressor (Centrifugal Type)

  - ✓ Single or multistage, having statically and dynamically balanced impeller, either direct or gear driven.
  - ✓ Impeller shaft shall be heat-treated carbon steel of sufficient rigidity to prevent whip or vibration at operating speed.

  - ✓ Shaft main bearings shall be of journal type with bronze or Babbitt line steel cartridge, aluminum alloy one-piece insert type, or rolling element type with an AFBMAL 10 life of a minimum of 200,000 hours.

  - ✓ Rolling element bearings shall be rated in accordance with AFBMA 9 or AFBMA 11 as applicable.

- ✓ Casting shall be cast iron or steel plate with split sections gasketed and bolted together.

- ✓ Lubrication system shall be forced-feed type and shall provide oil at proper temperature to all parts requiring lubrication.

- ✓ Make provisions to insure lubrication of bearings prior to starting and of shaft seal both on stopping and starting, or bearings and shaft seal shall be submerged in oil.

- ✓ On units providing for forced-feed lubrication prior to starting, a differential oil pressure cutout interlocked with compressor starting equipment shall allow compressor to operate only when required oil pressure is provided to bearings. The inlet guide vanes shall be electrically operated upon the actuation of temperature or pressure sensor.

- Condenser

  - ✓ Shell-and-tube type, two pass construction with marine water box, tested, and stamped in accordance with applicable portions of Section VIII D1 of the ASME Boiler and Pressure Vessel Code.

  - ✓ Condenser shall have seamless or welded steel shell, steel tube sheets, and cast-iron or steel water boxes.

  - ✓ Tubes shall be nonferrous metal, plain, smooth wall, individually replaceable, and shall be expanded full diameter into reamed and grooved holes or silver soldered.

  - ✓ Intermediate tube supports shall be provided as recommended by the manufacturer to minimize tube vibration, stress and wear.

  - ✓ Tubes shall fit tightly in the supports to prevent chafing due to vibration or pulsation.

  - ✓ Performance of condenser shall be based on a water velocity not less than 1 m/s (3fps) nor more than 4 m/s (12fps), and a fouling factor of 0.000044m C (0.00025 hr. sq. ft.) F/Btu.

  - ✓ The minimum tube wall thickness shall be .028".

- Evaporator

  - ✓ Two pass construction with marine water box and tested and stamped in accordance with Section VIII D1 of ASME Boiler and Pressure Vessel Code where applicable for working pressure produced by refrigerant used and water system installed, but no less than 1000 kPa (150 psig) waterside working pressure.

- ✓ Fabricate evaporator of seamless or seam-welded copper tubing, plain or with integral fins, individually replaceable and rolled or brazed into copper or steel tub sheets, with tube supports of copper or steel plate.

- ✓ Evaporator feed control shall be complete and designed to properly feed evaporator at all levels of capacity from 100 percent down to minimum required operating level.

- ✓ Performance shall be based on a water velocity not less than 1 m/s (3 fps) nor more than 4 m/s (12 fps), and fouling factor of 0.000044 m C (0.00025 hr. sq. ft.) F.Btu.

- ✓ Design chill water leaving shall be 43° F.

- Insulation - Evaporator, suction piping, compressor, and all other parts subject to condensation shall be insulated with 1 ½ inch minimum thickness, painted with manufacturer's standard paint and color, of flexible elastomeric thermal insulation, ASTM C534 and shall not sweat under normal summertime plant conditions at design entering and leaving chill water temperatures.

- Economizer

  - ✓ Provide if required by manufacturer. Flash gas shall be piped from economizer to inlet of intermediate stage impeller wheel.

  - ✓ Provide a refrigerant flow control system (float valve or multiple orifice system to automatically regulate flow of liquid refrigerant through economizer).

  - ✓ If external-type economizer is used; such economizer shall be constructed and tested in accordance with Section 8 of ASME Boiler and Pressure Vessel Code for working pressures produced by refrigerant used, unless exempt by Section U-1 of the mandated code.

- Motor Load Limiter

  - ✓ Provide a sensing and control system which will limit maximum load current of compressor motor to a manually selectable percentage of 20-100% of full load current.

  - ✓ System shall sense compressor motor current and limit same by modulating inlet guide vanes at the compressor, overriding other controls in their ability to increase loading, but not overriding their ability to reduce loading.

Purge System:

- For refrigerants with vapor pressure less than 100kPA (14.7 psi) when machine is operating; provide a purge system connected to main refrigeration system. When in operation, purge system shall function automatically to remove air, water vapor, and condensable gases from refrigeration system and to condense, separate, and return to system and refrigerant present therein.

- Purge system shall be manually or automatically started and stopped and shall be assembled as a compact unit. Purge system shall be complete with all necessary operating and safety devices and with oil separator is required by manufacturer. As an option, a fully automatic purge system that operates continuously while main unit is operating may be furnished. Such purge system shall provide a means to signal operator of occurrence of excessive purging indicating abnormal air leakage into unit.

- The purge system shall be of high efficiency purge equipment with low refrigerant to non-condensable gas discharge ration and with capability to operate when the chiller is off.

Isolation Pads: Manufacturers standard for noise and vibration control.

Refrigerant and Oil:

- Provide sufficient volume of dehydrated refrigerant and lubricating oil to permit maximum unit capacity operation before and during tests.

- Refrigerant charge lost during the warranty period due to equipment failure shall be replaced without cost to the EFSC.

- The chillers shall be furnished with refrigerants with an ozone depletion factor (ODF) of .05 or less, and not scheduled for phase-out within 20 years from date of start up and the chillers shall have been successfully tested and operated on this new refrigerant for a minimum of one year. The manufacturer shall certify that all components of the chillers that come in contact with these refrigerants (such as seals, o-rings, motor windings, etc.), are fully compatible with these refrigerants and that all pressure components are rated for the pressure developed by these refrigerants (chillers with CFC refrigerants are not acceptable).

- Chillers utilizing HCFC-123 shall be supplied with a pre-vac system to maintain the chiller at positive pressure during chiller "OFF" cycle.

- Chillers utilizing HCFC-123 shall be supplied with carbon rupture disc, all metal, non-fragmenting with reverse buckling design rupture disc.

Cooling Towers:

- Provide a fiberglass reinforced polyester (FRP) and stainless induced draft, cross-flow, vertical discharge, single speed cooling tower with a stationary water distribution manifold, stainless steel hardware, a maximum of 0.005% drift loss of design GPM flow rate and capable of cooling water from 95° Fdb to 85° Fdb at an entering wet bulb temperature of 80° Fwb. New cooling towers shall be CTI certified STD-201.

- Additionally, the cooling tower manufacturer shall guarantee the performance of the tower as installed according to plans. If, because of a suspected thermal performance deficiency, the owner chooses to conduct an on-site thermal performance test under the supervision of a qualified, disinterested third party, and witnessed by the manufacturer, in accordance with CTI or ASME standards during the first year of operation; and if the tower fails to perform within the limits of the tolerance test; then the manufacturer will pay for the cost of the test and will make such corrections as necessary and agreeable to the owner to compensate for the performance deficiency. This is a mandated requirement.

- Towers shall be designed for direct drive. When towers with capacities greater than 200 Tons are gear driven, the speed reducer gear shall be rated in accordance with the practices of the American Gear Manufacturer's Association using a service factor of 2.0 for cooling tower service in accordance with CTI Standard 111. The oil lubricated geared speed reducer shall require no maintenance for the first five years of operation.

- EFSC approved direct drive towers are the BAC Ultralite. Approved gear driven towers are the Marley Quadraflow and the BAC JE Premier Series.

- Multiple cell tower configurations in lieu of single tower configuration in order to prevent system downtime. On multiple towers having a common condenser water system, an equalizer line shall be provided between both tower sumps and contain a manual butterfly valve for servicing. An automated bypass valve and loop configuration shall be employed to assist in low ambient operating conditions. In addition, provision shall be made for a service gantry on each tower to be used to replace the tower fan motors and drive assemblies.

- Provision shall be made for a backflow preventer on the cooling tower water makeup line in order to prevent contamination of the domestic water line. In addition, provide a water meter on the cooling tower water makeup line to record water consumption. Acceptable backflow preventers are the Wilkens #975RPZ or Watts #909RP backflow preventer.

- Provision shall be made to drain the cooling tower overflow and basin into a 3 inch sanitary area drain located under the tower in the tower foundation pad via an air gap. Discharge into the ground is prohibited.

- The cold-water basin, structural columns, hot water distribution basins, basin covers, top deck, fan cylinder, and access door shall be formed of stainless steel. All hardware, with

exception of the supporting grillage, shall be fabricated of stainless steel. This shall include the mechanical support structure, fan guards, and all bolts, nuts and fasteners used in the tower construction.

- Fan(s) shall be propeller type and constructed incorporating heavy-duty blades of cast aluminum or high strength, inert composite material. Blades shall be individually adjustable and replaceable.

- Motors shall be TEFC, 1.15 service factor, and specially insulated for cooling tower duty. Speed and electrical characteristics shall be 1800 (1800/900) RPM, single winding, three phase, 60 Hz, 480V. Motor shall be located outside the humid interior of the tower and within an alcove.

- The stainless steel cold-water basin shall be sealed watertight and shall include a stainless steel debris screen. The top of the basin to the base of the fill shall be covered with heavy-duty stainless steel screens to keep out airborne debris.

- The manufacturer shall warrant the entire tower (including the motor) for a period of 5 years against failure due to defects in materials and workmanship from the date of startup.

- Stainless steel towers that require maintenance personnel to inspect or perform maintenance work on tower shall include OSHA approved stainless steel hardware, handrails, cat walks and ladders, flow control balancing valves and other components required to meet the design intent.

Chilled and Condenser Water Piping:

- The Contractor shall furnish the initial treatment of the chilled water system. Subsequent treatment of the chilled water system and all treatment of the condenser water system shall be maintained by the EFSC District/Plant Operations Department. New chilled water and condenser water chemical treatment systems for chillers shall be approved and signed off prior to bidding, on an individual facility by facility basis EFSC District/Plant Operations Department.

- Provisions shall be made by the Contractor for furnishing and installing the chemical pot feeder, injection pumps wells, taps, electrical service and the required piping connections. The electrical services shall include a 120 Volt dedicated service to the water treatment system and a 120 Volt hookup to the solenoid for bleed purposes.

- Only Schedule 40 domestic black steel seamless pipe 125 pound class conforming with ANSI B31.9 and with welded joints and dielectric fittings at points of connections to dissimilar metals shall be approved for the chilled water Chill Water (CHW), Heating Hot Water (HHW) and condenser water (CW) main piping. Above ground chilled water piping run outs to the individual AHU of sizes 2" and smaller may be Type "L" copper not to exceed 20' in length.

- Usage of PVC and Victaulic (groove-lock) pipe for the chilled, heating and condenser

water piping is prohibited with the sole exception of the above ground condenser water connection to the cooling tower which may be PVC. Black steel pipe installed underground shall be coated with a bitumastic material.

- All AHU chilled water coils shall be provided with two-way, modulating chilled water valves and two-way modulating heating hot water valves. All coils will be provided with a vent and drain located at the AHU. High point automatic air vents shall be provided at each AHU. Thermometer wells and threadles with ¼" x 3 ½" nipples and gauge-cocks and gauges will be provided at all water supply and return piping to AHUs.

- Upon installation and after pressure testing, the chilled water and condenser water piping shall be flushed with water in order to remove sand and other foreign contaminants. It has been mandated that the pipe ends be temporarily sealed with plastic sheeting and duct tape (and remain empty) of any water after pressure testing until the final pipe connections are completed.

- Underground chilled water and condenser water piping shall not be installed less than 24" below grade and shall be provided with expansion loops as necessary. A detail of the expansion loop with dimensions shall be shown on the plan.

- Upon completion of the chilled water, heating hot water and condenser water piping installation and prior to insulating the basket strainers, the Contractor shall flush the piping systems with water in order to remove sand and other foreign contaminants. The strainers shall be removed, cleaned and re-installed during this cleaning procedure. The chilled water, heating hot water and condenser water piping shall be chemically cleaned by the Contractor in order to remove mill slag, dirt, oil and/or other foreign contaminants. The strainers shall then be removed again, cleaned and reinstalled. Upon completion, the chilled water and condenser water piping shall be drained, flushed and a nitrite solution shall be applied to prevent pipe oxidation. The Contractor shall then contact the EFSC District/Plant Operations Department.

- Upon certification of a clean system by the contractor and acceptance by EFSC District/Plant Operations Department, shall maintain the water chemical treatment system.

- When field-insulating the black steel chilled water piping in both the building interior and exterior spaces, two-piece pre-formed foam glass insulation such as Foamglas as manufactured by Pittsburgh Corning with Pittwrap CW jacket for underground piping will be used. The insulation on heating hot water piping shall be factory-formed, fiberglass insulation factory-jacketed equal to Manville "Microlok 650." The use of factory pre-insulated polyurethane foam black steel pipe with extruded PVC or high density polyethylene jacket such as manufactured by Thermacor, Perma-Pipe, Thermal Pipe or Insul-Tec is approved for exterior underground piping only. Fiberglass insulation will not be approved.

- Details of the underground chilled water, heating hot water and condenser water pipe, anchors, sleeves and expansion loops or joints shall be shown on the plans.

- All pipes shall be code banded near each valve, branch take-off from the main and not less than every 15'-0" on long exposed runs. Code banding shall conform to ASA Standard A-13 "Identification of piping systems," with descriptive name of material in pipe superimposed on the color band. Directional arrows of the same color shall also be used to denote direction of flow. S.M. Brady Co. self-stocking, all temperature pipe markers.

- At no time shall any piping or tubing, main, branch or otherwise, be stored on the earth. Contractor shall make appropriations to store all piping and tubing above ground level and shall keep open ends covered and sealed so as to prevent debris from entering the piping or tubing.

- Temporary bypasses around all coils shall be installed during pipe cleaning to ensure that no intra pipe debris can lodge in the coils.

- ALL mechanical equipment being supplied with chill water, heating hot water or condenser water shall be provided with supply and return manual isolation butterfly valves. No motorized valve shall be considered as an isolation valve.

- The chiller water makeup line shall be provided with a pressure reducing backflow preventer similar to the Wilkens #975RPZ or Watts #909RP backflow preventer to prevent contamination of the domestic water line.

Gauges:

- Install thermometers and pressure gauges at chill water inlet and discharge piping.

- Install thermometers and pressure gauges at condenser water inlet and discharge piping.

- Thermometers and pressure gauges will be located to allow the technicians the ability to read them when standing on the floor.

Controls:

- Chiller shall be furnished complete with all standard components, (including diagnostic control panel).

- The diagnostic control panel shall provide control of chiller operation and monitoring of chiller sensors, actuators, relays and switches. The panel shall be a complete system for stand-alone chiller control and includes controls to safely and efficiently operate the chiller.

- The chiller control panel shall monitor such safeties as motor starting and running time between compressor/motor starts, low chilled water temperature, high condenser refrigerant pressure, low evaporator refrigerant temperatures, evaporator and condenser water flows, low oil pressure, high oil temperature, and proper operation of unit controls and sensors.

- The chiller control panel is to be provided with a start counter and running meter.

- The front of the chiller control panel shall be capable of displaying the following:

    1. Entering and leaving evaporator water temperature.
    2. Entering and leaving condenser water temperature.
    3. Chilled water set point.
    4. Electrical current limit set point.
    5. Chiller diagnostic codes.
    6. Chiller operating mode.
    7. Evaporator refrigerant pressure.
    8. Condenser refrigerant pressure.
    9. Low oil pump pressure.
    10. High oil supply pressure.

- The chiller control panel shall provide evaporator freeze protection and low limit control.

- The chiller control panel shall provide an alarm relay output that shall energize whenever a fault requiring manual reset is detected by the panel.

- The chiller control panel shall provide leaving chilled water temperature reset based upon a 4-20 MA or 0-10 VDC signal from a building automation system.

- Chillers shall be pre-wired to terminal strips for interlocked to other equipment.

- Provide contacts for remote start/stop, alarm for abnormal operation or shut down, and for the BAS, open protocol, interface.

- Starting equipment for water chilling unit and auxiliary hydronic system shall be electronically interlocked to provide time delay and sequence of starting indicated on control drawings.

- The chiller start/stop, status and alarm shall be tied in to the existing plant DDC/BAS system.

- Provide an interface/gateway to send chiller points to existing DDC system.

Motor Starter:

- Adjustable Frequency Drives (AFD) shall be factory mounted on the chiller. The centrifugal water chiller shall be furnished with a liquid cooled AFD. The AFD shall be factory mounted on the chiller and shipped completely factory assembled, wired and tested.

- The AFD will be specifically designed to interface with the chiller controls and allow for the operating ranges and specific characteristics of the chiller. The AFD logic shall optimize chiller efficiency by coordinating compressor motor speed with compressor inlet guide vane position to maintain the chilled water set point while avoiding surge. If a surge is detected, AFD logic will make adjustments to move away from and avoid surge at similar conditions in the future.

- The drive efficiency shall be 97% or better at full speed and full load. Fundamental power factor shall be a minimum 0.96 lagging at all speeds and loads.

- The AFD shall be solid state, with a pulse width modulated output waveform.

- Power semi-conductor and capacitor cooling shall be from a liquid cooled heat-sink. The AFD heat-sink shall be capable of transferring the heat load from the electronic components to the liquid in the cooling circuit. All required AFD tubing shall be copper.

- The AFD shall be furnished in a NEMA 1 metal enclosure with three wire input lugs plus a grounding lug for electrical connections, output motor connections via factory installed bus bars and all components properly separated and completely enclosed in a single metal cabinet. The enclosure shall have a door-mounted circuit breaker with a shunt trip assembly with a rating to comply with UL 508.

- The AFD shall include a 3% DC bus filter choke to comply with IEE 519-1992 for commercial building applications. Complex active switching filters are not allowed.

- Ratings of the VFD shall meet or exceed Electrical Code Table 430-150.

- Input shall be nominal 480 VAC, three phase, 60 Hertz, +/- 15% of nominal.

- The drive unit shall include the following:

    - ✓ All control circuit voltages are physically and electrically isolated from power circuit voltage.
    - ✓ 150% instantaneous torque available for improved surge control.
    - ✓ Minimum and maximum speed adjustments.
    - ✓ Soft start adjustable linear acceleration.
    - ✓ Adjustable current limiting and UL approved electronic motor overload protection.
    - ✓ Insensitivity to incoming power phase sequence.
    - ✓ AFD and motor protection from phase loss at AFD input, grounded phase between the AFD and the motor, phase to phase short AFD output, over-voltage, under-voltage and under-current.
    - ✓ Loss of power ride through for a minimum of 30 milliseconds.
    - ✓ Cabinet cooling shall be capable of allowing drives to operate in a continuous 104 F room ambient temperature.
    - ✓ Protection against DC bus over voltage.
    - ✓ No-load run capability.

- ✓ Shall be capable of starting into a rotating motor.
- ✓ Carrier frequency shall be fixed at 2 Khz for maximum efficiency.
- ✓ AFD shall include digital fault status, and drive signal indicating amps, input voltage and speed output signals to interface with the control system.
- ✓ Automatic operation at minimum speed if input reference signal is lost.
- ✓ Acceptable start stop commands shall include closure of a contact.
- ✓ AFD status indicators shall be available to facilitate start up and maintenance; running, remote, jog, auto, forward, reverse and program.

- At full power output with room ambient at 104° F, room ambient 0-95% RH, AC line voltage –10% to +10% and line frequency between 38 and 60 Hz, no external venting or heat exchangers shall be required.

- The AFD shall be warranted by the manufacturer for a period of one year after the date of start up and shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service.

- Manufacturer to provide for the services of a factory trained service engineer to supervise and approve the installation; start-up, test and adjust the unit for proper operation; and instruct the owner's representative in the operation and maintenance of the machine. This shall include furnishing a start-up and test log showing all initial settings and readings; signed by the manufacturer's service representative.

- Before acceptance by the Owner, the unit manufacturer shall approve, in writing, the complete installation, including piping and wiring connections, and proper functioning of all operational and safety controls.

- Successful bidder shall provide (for four technicians) 15 hours of owner training. The total should be comprised of 7 ½ hours of classroom instruction and 7 ½ hours of hands on field training.

- Contractor shall confirm measure and balance condenser and evaporator water flow rates.

- Unit manufacturer shall provide a 5-year compressor warranty for all compressors and 1-year warranty on all other parts and labor. Any manufacturer whose compressor may operate at or greater than 10,000 rpm shall include an oil sample analysis for five years from the date of start up in their warranty coverage at no additional cost to owner.

Maintenance Service:

- Contractor to furnish service and maintenance for a period of one year from date of startup. This maintenance shall include a minimum of five running inspections and a major annual inspection including refrigerant leak testing and condenser tube brushing. Tube brushing shall be performed no more than one month prior to warranty expiration.

- For HVAC/chiller equipment being removed/de-commissioned refrigerant recovery shall be the responsibility of the Contractor and such recovery shall comply with the Clean Air Act.

- Refrigerant discharge to the atmosphere is permitted solely for the water-cooled chiller pressure relief device or rupture seal. In compliance with Section 608 of the Clean Air Act, venting chiller refrigerant into the atmosphere via the same device during servicing or disposing of HVAC equipment is prohibited.

- The Contractor shall furnish the initial treatment of the chilled water system. Subsequent treatment of the chilled water system and all treatment of the condenser water system shall be maintained by the EFSC District Maintenance Department. The Contractor shall responsible for furnishing and installing the chemical pot feeder, wells, taps, electrical service and the required piping connections. The electrical services shall include a 120V dedicated service to the water treatment system and a 120V hookup to the solenoid for bleed purposes. The Contractor shall confer with the appropriate designated officials within the EFSC District/Plant Operations Department.

Ventilation and Exhaust:

- In building perimeter toilets and custodian rooms, use ceiling exhaust fans containing gravity dampers and terminating with a brick vent or extruded aluminum louver such as manufactured by Penn Ventilator Company "Zephyr". Should a sidewall exhaust not be possible, then terminate with a rooftop cap such as the Penn Ventilator Company "Airette". Minimize all roof penetrations at all times in order to prevent potential roof leaks.

- All general purpose exhaust fans in areas such as gymnasiums, auditoriums, etc. shall be started and stopped by the building automation system, and shall be interlocked to the associated AHU(s) supplying outside make up air to the spaces served by the exhauster, an HOA switch shall be provided locally at the motor starters for all general purpose exhausters. These areas shall be continuously exhausted during occupied periods. A low leakage back draft damper shall be provided at all exhausters to provide for a closed building envelope when systems are de-energized.

- All custodian room exhaust fans shall be electrically interlocked to the AHU serving that zone so that the exhaust fan operates when the AHU is energized. These areas shall be continuously exhausted during occupied periods. The low leakage outside air damper shall close and remain closed during evenings, weekends and holidays when the building is unoccupied.

- All electrical room exhaust fans shall be started and stopped by a wall mounted thermostat set at 85° F. These areas shall be continuously exhausted during occupied periods. Conditioned air in lieu of moisture laden outside air for air makeup requirements can be provided from adjacent rooms required to be exhausted to the exterior in accordance with ASHRAE Standard 62-2001.

- In the Flammable Storage Room, provide a mechanical ventilation system consisting of an explosion-proof-up blast exhaust fan sized for 20 air changes/hour. The exhaust duct main shall split into two vertical branches extending from floor to ceiling in order to exhaust fumes from both the floor and ceiling levels.

- Science Material Storage/Preparation Area Organic and Inorganic Storage Rooms shall each be provided with continuous operating explosion-proof up blast exhaust fan sized for 20 air changes/hour. The exhaust fan shall be manually started and stopped by a key switch. The exhaust duct shall extend from floor to ceiling in order to exhaust fumes from both the floor and ceiling levels.

- A chemical resistant coating such as Eisenheiss or approved equal shall be applied to the exhaust fan and exhaust duct. Air makeup shall be provided via an outside air makeup duct containing a fire damper and a grille which shall be chemical resistant coated.

- All exhaust fans, with the exception of the kitchen hood exhaust fan, shall be designed to immediately shutdown upon activation of the building fire alarm system.

- An audible alarm activated by a pressure differential switch in the exhaust ductwork shall be provided for exhaust fans in potentially hazardous areas as the Science Material Storage/Preparation Area, Organic and Inorganic Storage Rooms, Science Chemistry Classrooms, Flammable Storage Area to indicate fan failure. The alarm shall be wired on a separate circuit.

Energy Management System:

- ALC shall furnish and install a fully integrated building automation system, incorporating DDC for energy management, equipment monitoring and control, and subsystems with open communications capabilities as herein specified.

- System shall be capable of BACnet communication according to ASHRAE standard SPC-135A/95. System shall be capable of OPC server communications according to OPC Data Access 2.0 and Alarms and Events 1.0

- The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation or identification number and sequence of operation all bearing the name of the manufacturer. The installing manufacturer shall certify in writing that the above conditions have been met.

- All materials and equipment used shall standard components, regularly manufactured for this and/or other systems and not custom designed for these projects. ALL systems shall have been thoroughly tested and proven in actual use for at least 2 years.

- Mechanical contractor installs all wells, valves, taps, dampers, flow stations, etc. furnished by BAS manufacturer.

- Electrical contractor provides 120v power to all BAS and/or temperature control panels. Wiring of all power feeds through all disconnects starters to electric motor. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by BAS manufacturer.

- The BAS system shall be designed and installed, commissioned and serviced by manufacturer employed personnel. Manufacturer shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment. DISTRIBUTORS OR NON-LICENSED INSTALLING CONTRACTORS SHALL NOT BE ACCEPTED.

- The Manufacturer shall provide full time, on site, experienced project manager for all work, responsible for direct supervision of the design, installation, and start-up and commissioning of the B.M.S.

- The installer shall be regularly engaged in the manufacturing, installation and maintenance of BMS systems and shall have a minimum ten year demonstrated technical expertise and experience in the manufacture, installation, and maintenance of BMS systems similar in size and complexity to these projects.

- All BAS peer-to-peer network controllers and local displays shall be UL Listed under standard UL 916, category PAZX; Standard ULC C100, category UUKL7; and under standard UL 864, categories UUKL, UDTZ, and QVAX and be so listed at the time of bid. All floor level controllers shall comply, at a minimum, with UL Standard UL 916 category PAZX; Standard UL 864, categories UDTZ, and QVAX.

- The manufacturer of the BAS shall provide documentation supporting compliance with ISO-9002 and ISO-140001.

- This system shall have a documented history of compliance for a minimum of 15 years. Future compatibility shall be supported for not less than 10 years. Compatibility shall be defined as the ability to upgrade existing field panels to current levels of technology, extend new field panels on a previously installed network, and the ability for any existing field panel microprocessor to be connected and directly communicate with new field panels without bridges, routers or protocol converters.

- As part of the BAS commissioning process, the project engineer shall have the BAS manufacturer record all operating parameters of the system for not less than 1 week. The project engineer and EFSC Facilities Department will then review these reports and resubmit to the BAS manufacturer these reports with questions and observations. The BAS manufacturer will address these comments and resubmit the data logs for a final review by EFSC Facilities Department and the engineer. Stroking of components through their operating ranges does NOT constitute commissioning.

- In the event of normal loss of power, there shall be an orderly shutdown of all DDC controllers to prevent the loss of database or operating system software. Non-Volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a period of 60 days.

- Upon restoration of normal power, the DDC controller shall automatically resume full operation without manual intervention. Should DDC controller memory be lost for any reason, the user shall have the capability of reloading the DDC controller via a network

workstation/server PC.

- The design of the BAS shall network operator workstations and stand-alone DDC controllers. The network architecture shall consist of three levels, a campus-wide Ethernet network based on TCP/IP protocol, high performance peer-to-peer building level network(s) and DDC controller floor level local area networks with access being totally transparent to the user when accessing data or developing control programs.

- The design of BAS shall allow the co-existence of new DDC controllers with existing DDC controllers in the same network without the use of gateways or protocol converters.

- HOA modules shall be incorporated within building level controllers to allow on-site manipulation of controlled critical equipment without the need to connect to the network.

- The BAS shall be totally stand-alone and shall continue to run the sequence of operation, maintaining all set points and calculations of algorithms in the event that any or all network communication or peer-to-peer communication is interrupted.

- The Sequence of Operation shall conform to ASHRAE Standard 90.1-2001 standard for energy conservation. Energy models shall be built for any new construction or major renovation in which HVAC mechanical equipment is added, or extended.

- Upon project completion, submit operation and maintenance manuals, consisting of the following:

    - ✓ Index sheet, listing contents in alphabetical order.
    - ✓ Manufacturer's equipment parts list of all functional components of the system, Auto-CAD disk of system schematics, including wiring diagrams and physical location of devices.
    - ✓ Description of sequence of operations.
    - ✓ As-built interconnection wiring diagrams identifying physical locations.
    - ✓ Operator's Manual.
    - ✓ Trunk cable schematic showing remote electronic panel locations and all trunk data.
    - ✓ List of connected data points, including panels to which they are connected and input device.
    - ✓ Conduit routing diagrams.

- Owner training shall consist of 15 hours. Training should include 7 ½ hours of classroom training and 7 ½ hours of hands-on field training.

- BAS shall be an extension of the existing Siemens Building Technologies, System 600 Apogee that already exists on all campuses. No other manufacturer will be accepted.

- EFSC Facilities Department will provide standard sequences of operation to the Architect/Engineer and shall approve all non-standard sequences at the discretion of

EFSC Facilities Department.

Commissioning Process:

- The A/E shall provide to EFSC Facilities Department a Commissioning Plan. This plan must be updated throughout the construction process with all changes to Design Intent and equipment.

- The Commissioning Plan shall identify the commissioning team and the responsibilities of members of this team, the Design Intent, any and all assumptions made by the Engineer as to energy performance, space requirements, performance standards of the existing HVAC system, and other HVAC system requirements that affect building use and aesthetics.

- A Systems Manual conveying the required operation of the HVAC systems, in all modes of operation, and all other HVAC system requirements will be provided. The Systems Manual shall include but not be limited to the following information per ASHRAE Guideline 1:
    - ✓ The initial and final design intent document
    - ✓ Index of all commissioning documents.
    - ✓ Commissioning Report.
    - ✓ As-built documents.
    - ✓ Description of systems, including capabilities and limitations.
    - ✓ Operating procedures for all normal, abnormal and emergency modes of operation.
    - ✓ Sequence of operation as actually implemented, with control system data including all set points, calibration data, etc.
    - ✓ Location of all control sensors and test ports.
    - ✓ Seasonal start-up, shutdown procedures.
    - ✓ Control schematics and computer graphics.
    - ✓ Complete terminal interface procedures and capabilities of DDC system.
    - ✓ A list of operational recommended records including sample forms, trend logs or others and a rationale for each.

Maintenance Procedures:

- The Engineer shall provide to the Owner a signed checklist covering each completed functional performance test containing identifying information, data and readings required. The checklist shall be specific for each piece of equipment, subsystem or system. It shall include:
    - ✓ Name and identification code.
    - ✓ Time and date of the tests.
    - ✓ Individuals present for the test.
    - ✓ Calibration of sensors/sensors function.
    - ✓ Control sequence.
    - ✓ Strength of control signal for each set point at a defined condition.
    - ✓ Response to control signals at a defined condition.
    - ✓ Sequence(s) of response(s) to control signals at a defined condition.
    - ✓ Actual flow rates at defined conditions.
    - ✓ Inlet and outlet temperatures of all fluid streams at defined conditions.
    - ✓ Inlet and outlet pressures or pressure drops, of all fluid streams at defined conditions.
    - ✓ Responses to defined temporary upset of system operation.
    - ✓ Trend Logs.
    - ✓ Deficiencies.

- Any equipment or system which fails the performance test will require corrective actions be implemented and performance tests to be re-conducted.

- A Commissioning Report shall be provided to the Owner. This report will conform to section 12.5.5 a) through i) of ASHRAE Guideline 1-1996. The responsibility of the HVAC Design Professional to the Owner shall be as follows:

    - ✓ Provide documentation of basis of design and initial design concepts.
    - ✓ Provide HVAC system design parameters and revisions to the initial design intent document as necessary, obtaining approval of the owner.
    - ✓ Prepare contract documents, including the commissioning specification and description of the HVAC system.
    - ✓ Prepare contract documents that coordinate interfaces between life safety systems and HVAC systems, including commissioning specifications.
    - ✓ Specify and verify adequate maintenance accessibility for each piece of equipment in shop drawings and actual installation.
    - ✓ Periodic inspections of the HVAC systems are the responsibility of the design professional.
    - ✓ Develop an overview of system design and operation for the Systems Manual.
    - ✓ Review TAB procedures as submitted by TAB contractor.
    - ✓ Review verification and functional performance testing procedures.
    - ✓ Review TAB report and verification data sheets for system conformance to contract documents. Issue a report noting deficiencies that require correction. Review and accept the final TAB report.

- ✓ Upon acceptance of the completion of verification, the certificate of readiness will be issued which will allow the performance testing to be conducted.
- ✓ Review trend logs and functional report tests for system conformance to contract documents. Issue a report to the CM noting deficiencies. Insure that test results conform to the finalized design intent document.
- ✓ Be responsible for system evaluation, adequacy of the system to meet design intent, capacity of the system, quality control checks, or any other elements of the system design and recommend final acceptance of the HVAC system to the owner.

- Architects responsibility shall be to include a statement regarding commissioning in division 1 – General requirements, alerting all parties to the need to participate. The Architect shall select construction and finish materials that minimize adverse effects on Indoor Air Quality.

- Responsibilities of all other participants shall be as outlined in ASHRAE Guideline-1 ANNEX A2.

- All renovations encompassing changes or modifications to HVAC system(s) and changes to occupancy and/or layout will use previous building design intent, commissioning plan, and commissioning acceptance to establish new design intent and commissioning plans. At a minimum the following will be included:

    - ✓ Revision of as-built records, system manual, O & M manuals and shall follow the format and requirements of the original design intent and commissioning process. Testing, adjusting and balancing of affected system(s), sections and areas. Training where O & M procedures are affected.
    - ✓ In the event that the original design intent does not exist, the design professional shall comply with ASHRAE in the development of design intent and that document shall be entered into record as the design intent by which all others will comply.

- An audit of existing facilities within the building to be renovated shall include the following:

    - ✓ Review of existing documentation and as-built records.
    - ✓ Equipment testing.
    - ✓ Review of operating procedures.
    - ✓ Review of operating costs.
    - ✓ Determination of system performance.
    - ✓ Determination of ventilation effectiveness and air quality.

- The design professional shall include the following statement under the requirements for Owner training in the project specifications.

  "The training program shall provide a thorough understanding of all equipment, components, systems and their appropriate how-to skills including use of the systems manual with emphasis on design intent, systems description, capabilities and limitations, systems operational procedures for all modes of operation, acceptable tolerances for equipment adjustments at all operating modes, procedures for dealing with abnormal operating conditions and use of the O & M manuals."

- Recommended procedures for collecting and interpreting performance data.

- Specialized manufacturers' training.

Gas System:

- The gas system piping installed above grade shall be fabricated of ASTM A53 or A120, Schedule 40 black steel pipe or ASTM B88 hard drawn Type L copper pipe. Gas piping installed underground and outside the building shall be fabricated of ASTM D2513; SDR 11.5 polyethylene (PE) pipe installed 36" below grade. Transitional risers connecting the plastic piping to black steel shall be installed by the plastic pipe manufacturer's certified installer and in accordance with the requirements of the utility company.

- An electrically continuous corrosion resistant yellow tracer wire (minimum AWG 14 shall be installed 12" above all buried gas piping to facilitate locating of the gas pipe. One end shall terminate above grade at the building wall or riser. In addition, a color-coded detection tape shall be installed 24" above all buried gas piping for early detection during excavation.

- Avoid running gas piping under concrete slabs at all times. If approved, install the carrier pipe in a Schedule 40 PVC pipe sleeve sealed on the building interior end and vented to the outside at the building exterior end. The pipe sleeve should be at least two and one-half to three pipe sizes larger than carrier pipe, but not less than 2" for a ¾" gas pipe. ***Never embed*** piping in concrete.

- Gas supply pipe shall be routed to above-ceiling spaces immediately upon entering a building. The routing of gas piping underneath the building shall not be permitted. Gas piping SHALL NOT be installed in, above or across interior corridors or stairwells. As an example, gas supply piping running through or passing across an interior corridor SHALL NOT be approved. Gas supply branch piping shall be approved to run across interior corridors only as a last resort if it is installed in a Schedule 40 steel pipe sleeve encased in a one hour fire-rated gypsum board enclosure within the confines of the corridor.
- A gas supply branch connected upstream of the building gas supply main solenoid valve shall be installed to provide uninterrupted gas supply to any natural gas fueled emergency generator.

- The exterior above grade building natural gas supply main entering the building and containing the gas meter, pressure regulator, manual shutoff valve, etc. shall be provided with a weatherproof, normally closed, lever-operated manual reset solenoid valve. The entire assembly shall be enclosed inside a vandal proof, ventilated steel cage housing under lock and key. Should the building fire alarm system be activated, the building gas supply main solenoid valve shall close and cutoff any further supply of gas into the building.

- All gas solenoid valves whether used for the gas supply main at the point of delivery to the building or the science classroom demo tables shall be 120 Volt normally closed, lever-operated manual reset electric solenoid valves. Automatic reset type solenoid valves are prohibited.

- In Science Material Storage/Preparation Areas located on the first floor, the routing of the gas piping to the teacher's demo table shall be from the above-ceiling space down through the partition wall to underneath the floor and then up inside the demo table. The gas piping shall then be re-routed back underneath the floor to the partition wall where it will run up to above the ceiling space and then down through the partition walls to the science classroom student tables located along the perimeter walls. For the chemistry classrooms with the island student table, the gas piping shall run down through a vertical vandal resistant pipe sleeve or chase located on the far end of the student table.

- In Science Material Storage/Preparation Areas located on the second floor, the gas piping shall be routed above the first floor ceiling space and up to the teacher's demo table. The gas piping shall then be re-routed back down into the first floor ceiling space and then up into the science classroom student tables located along the perimeter walls. For the chemistry classrooms with the island student table, the gas piping shall run up into the student table.

- In Science Material Storage/Preparation Areas, provide a 120 Volt normally closed, lever-operated manual reset electric solenoid valve on the gas supply piping inside each demo table along with one lockable type quarter-turn butterfly valve. The lockable type quarter-turn butterfly valve shall be used by the teacher to shut off the gas supply to the demo table, student work tables and the fume hood at the end of each day. In addition, provide one manual quarter-turn butterfly valve on the pipe branch located inside the demo table that supplies gas to the student work tables. This valve shall be used to shut off the gas supply to the student work tables at the discretion of the teacher.

- In Science Material Storage/Preparation Areas, the demo table gas solenoid valve will be de-energized by activating a red ON/OFF mushroom button located behind the demo table which will simultaneously shut off the gas supply, water supply and electricity (except the classroom lights) to the student work tables and the fume hood at the discretion of teacher. It shall not be directly wired to the building fire alarm system, but shall be de-energized when the fire alarm system is activated. For example, activation of the red mushroom button shall not activate the building fire alarm system...but activation of the building fire alarm system shall de-energize the demo table gas solenoid valve via a set of contacts. In the Science Material Storage/Preparation Area, the red mushroom button shall be centrally located so that it serves the same purpose. All other electrical circuits shall be wired separately. In addition to the solenoid valve, the hot and cold water supplies under the demo table shall also be equipped with manual quarter-turn butterfly valves for shutoff purposes.

Fume Hood:

- Science Classrooms designated to be chemistry classrooms containing fume hoods and the Science Material Storage/Preparation Area fume hoods shall be provided with an integral exhaust air system.

- Fume hood exhausters shall be remotely located on roof curbs. NO in-line exhausters are allowed.

- Fume hoods shall exhaust a volume that will maintain a hood face velocity of 100'/minute (FPM) at full sash. Contractor shall demonstrate that the fume hoods contain when HVAC system is running per ASHRAE standard 110 smoke test procedures.

- In any hood exhaust design where multiple fume hoods are ducted together, use of a utility set exhauster shall be incorporated. Each fume hood shall have motorized low leakage dampers that will open and close automatically with the activation of any hood's main switch that shall be located on the hood frame. The exhauster speed shall be controlled by a variable speed/frequency drive to maintain exhaust duct static pressure sufficient to maintain at least 100 FPM face velocity but not more than 120 FPM velocity at EACH operating hood at full sash regardless of which hoods are on.

- Use of fume hoods as integral HVAC system exhaust points shall be prohibited. It shall not be required for any fume hoods to continuously run during occupied times to establish science lab negative pressure.

- Fume hoods shall comply with ASHRAE HVAC Applications Handbook noise ratings of RC-25(N) and RC-30(N) for classrooms.

Compressed Air System:

- In technology laboratories where compressed air piping is required, it shall be fabricated of ASTM A53 or A120, Schedule 40 black steel. Compressed air piping installed underground shall be PVC coated extruded pipe coated or coated with a bitumastic material or other EFSC approved material. All buried black steel pipe shall be thoroughly cleaned such as removing of surface rust, etc. prior to being coated with a corrosion resistant material such as wrapping.

- In the technology laboratories, the walls separating the air compressor from the lab areas shall be acoustically treated to reduce sound transmission into audio studio.

Kitchen:

- Design kitchen and serving area water-wash exhaust hoods to be island type four-sided, filter-less stainless steel hoods capable of extracting 95% of generated grease through a series of horizontal overlapping exhaust air baffles. Each hood shall be provided with a UL listed wet chemical fire suppression system such as Ansul R-102, exhaust and supply air fans, stainless steel or black steel ductwork, recessed florescent lighting, front horizontal air discharge and a 140° F minimum detergent water wash system.

- The kitchen hood shall be provided with a utility distribution system (UDS). The water wash control panel for the kitchen hood shall be mounted on the UDS while the serving area water wash control panel shall be a wall-recessed. Acceptable manufacturers are:

    1. Gaylord CG3-BDL-MAW
    2. Ventmaster H-IM-BMA
    3. Carroll Model W1-C-SP

    No substitutes shall be approved.

- The kitchen shall be provided with a commercial grade, quick recovery gas-fired electric water heater such as manufactured by Lochinvar, A.O. Smith or Webon-Jarco. When gas is not available, an electric water heater may be substituted. The water heater shall be located in a one-hour fire-rated room located on the building perimeter and equipped with an exterior door.

- Hood exhaust ductwork shall be fabricated of stainless steel or black steel.

- The entire kitchen including the Somat extractor/waste handling equipment room and the Somat pulper room shall be provided with 4”floor sinks with the exception of laundry rooms which shall be provided with a 3” floor drain and the dry storage room and paper storage room entry doors which shall be provided with trough drains.

- The kitchen Somat pulper discharge shall be directed into a below grade Schedule 40 PVC grease waste system. The Somat extractor discharge shall be directed into a below grade Schedule 40 PVC sanitary system by means of a floor sink containing a ¾ grate

which shall be located directly underneath the Somat extractor discharge outlet.

- The Somat extractor in the Somat extractor/waste handling equipment room shall be provided with a concrete curb around the equipment in order to avoid flooding the room.

- The can wash in the kitchen Somat extractor/waste handling equipment room shall be installed in a 4" recessed floor area containing a 4" floor sink equipped with a chrome plated, bronze spray nozzle and water supply assembly.

- A wall mounted service faucet containing a threaded spout with hot and cold water shall be installed above the can wash in the Somat extractor/waste handling equipment room and in the Somat pulper room.

- The kitchen steam kettle shall be installed in a 4" recessed floor area containing a 4" floor sink with a ½ grate. The floor sink shall be located directly underneath the steam kettle discharge faucet. In addition, a 4"floor sink with a ¾ grate shall also be provided at one end of the cooking island to receive the discharge of the water-wash hood water used to clean the hood.

- The kitchen grease tank shall be provided with a 4" minimum influent pipe and effluent pipe. The 4" effluent pipe shall be increased to 6" if applicable immediately after the two-way cleanout. All tank sizes shall be a maximum of 1200 gallon and contain a PVC or concrete baffle plate to separate the grease containment area from the liquid containment area.

- Sizing calculations shall be provided on the plans along with a tank detail. Multiple tanks shall be installed in series.

- Two wall mounted wash-down hose stations capable of providing hot and cold water shall be provided at opposite ends of the kitchen. Should the design include a food court serving area, an additional wash-down hose station shall be provided in this area.

- Each wash-down hose station is to consist of cast bronze valves, mixing chamber, stainless steel hose rack and a EFSC furnished fifty foot high pressure/high temperature hose suitable for 110 degrees F hot water and equipped with a front trigger control. The wash-down station shall be similar to Model #B-1451 Thermo-Kleen #2 as manufactured by T&S.

XI. PLUMBING

General

- All plumbing design shall be in compliance with the latest mandated versions of the American Disability Act (ADA) as well as the Florida Accessibility Code for Building Construction (Chapter 553, F.S.) implemented under the Florida Americans with Disability Accessibility Implementation Act, the U.S Architectural and Transportation Barriers Compliance Board and the Standard Plumbing Code.

- All plumbing piping shall be supported in accordance with the latest mandated version of the Standard Plumbing Code.

- Piping conveying fluid shall not be located in or through any electrical rooms or communication closets. Domestic water lines will not be used for electrical grounding.

- Each floor will have a set of isolation valves that allow the shutting off of water and gas on the floor for maintenance and repair needs.

- All black steel piping installed underground shall be PVC coated extruded black steel pipe or black steel pipe wrapped and coated with a bitumastic material or other EFSC approved material. Pipe shall be thoroughly cleaned of dirt and surface rust, etc. prior to being coated with the corrosion resistant material.

- Installation of any plumbing piping inside the block cores of exterior walls is prohibited. Coordinate with the architect and install piping in furred walls.

- Each building drain shall be provided with a two-way grade cleanout within 6' of the junction of the building drain and building sewer immediately after exiting the building. If the two-way cleanout is installed in a grassy area, it shall be embedded in an 18"x18"x4" thick concrete pad.

- Each horizontal sanitary and storm drainage pipe shall be provided with a clean out at the upstream end of the pipe and in changes in direction greater than 45 degrees. Offset cleanouts so that they are not located in classrooms or building entrances whenever possible.

- Cleanouts shall be provided at 50' intervals for horizontal sanitary and grease drain pipes of 3" or less and 80' intervals for pipes 4" and larger in accordance with the SPC.

- Cleanout plug will be encompasses in a concrete pad the measures a minimum of 18" square and 6" inches in depth.

- Joint connections for joining domestic water pipe shall be lead free. When used, 95/5 solder and flux shall not have a lead content exceeding 0.2%. Threaded connections shall be made with non-lead bearing compounds. Joint connections for gas copper pipe shall

be welded or brazed with lead-free solder.

- All shutoff valves installed on domestic water piping in building interiors for pipe sizes less than 3" shall be full flow ball valves for pipe. The use of gate valves is prohibited.

- The primary roof drain system shall be sized for a rainfall intensity of 8"/hour for 5 minute duration of a 100" year rainfall. Roof drains shall not be less than 4" in size.

- A secondary emergency roof drain system, sized for a rainfall intensity of 8.8"/hour, shall be provided totally independent of the primary roof drain in accordance with the 1994 Standard Plumbing Code, Chapter 11, and Section 1109.2. It may consist of parapet scuppers or scupper heads and exterior surface mounted leaders.

- All primary roof drain system storm drain runoff shall be terminated directly into the storm drain systems. The use of splash blocks or discharging onto grade is prohibited. All secondary emergency roof drain system storm drain runoff shall be terminated above grade.

- Where buildings are designed with an interior storm drain system, the vertical storm drain piping (conductors) shall be provided with base cleanouts and access doors. The use of No-Hub cast iron pipe for above grade interior use is approved.

- Sanitary, grease and storm drain system piping installed below grade within the building interior can be either cast iron or schedule 40 PVC. For the kitchen steam kettle only, the first ten feet of underground drain piping shall be fabricated of cast iron before transitioning over to schedule 40 PVC piping due to the high temperature of the steam kettle discharge water which can exceed 140° F.

- Water closets installed back-to-back such as in group toilets shall be provided with double tee-wye or double combination sanitary fittings. The use of double sanitary tees is prohibited.

- Electric water heaters are prohibited in all areas other than commercial or teaching kitchens, lab areas and custodial rooms.

- Commercial gas-fired water heaters shall be provided for commercial and teaching kitchens and shower rooms. Both the kitchen and shower room commercial water heaters shall be provided with inline recirculation pumps. Inline recirculation pumps for all other water heaters shall be considered if the length of pipe run is excessive.

- Shelf mounted water heaters shall be provided with a stainless steel safety pan containing a pan drain. Both the 1" pan drain and the ¾" P&T relief drain shall be made of copper and run separately into a mop sink or floor drain. The shelf mounted water heaters in the custodian rooms shall be mounted close to, but not directly over, the mop sink in order to allow installation and access to the mop rack over the mop sink. Discharge 6" above the exterior grade shall be approved only if no other method of discharge is available.

- All water heaters shall be interconnected to the energy management system.

- Three-quarter ¾ inch flush mounted anti-siphon wall hydrants shall be used for all building interior and exterior installations. Interior wall hydrants shall be installed 30" AFF including the exterior wall hydrant at the kitchen dumpster area.

- All other exterior wall hydrants shall be installed 18" AFF. ¾ inch hose bibs shall only be used in mechanical rooms.

- Plumbing fixtures flows are to be restricted to, 3 GPM for showers; 1.0 GPF for urinals; and 1.6 GPF for water closets.

- All lavatory and sink faucets shall be provided with laminar flow aerators.

- All handicap water closet flush valves, urinal flush valves and lavatory self-closing metering faucets shall be suitable for a maximum of 5 PSI activating pressure in accordance with ADA requirements.

- All handicap lavatories shall be provided with insulated P-traps installed parallel to the wall.

- In Science Material Storage/Preparation Area and the Photography Dark Room, chemical waste shall run through a silicate glass chemical waste system into a high density polyethylene neutralizing tank before being discharged into the sanitary sewage system. The neutralizing tank shall contain a bolt-down cover and be similar to the Series T Neutralization Tank as manufactured by Enfield.

- In Science Material Storage/Preparation Area, provide a combination emergency shower/eyewash equipped with a stay-open shower ball valve, six aerated brass spray heads with a stay-open ball valve and a 3" acid resistant floor sink for evacuating large volumes of shower water.

- Waste from the eyewash fixture shall be indirectly (safewaste) connected to the chemical waste system with all the waste piping installed inside interior walls. The combination emergency shower/eyewash is to be installed away from any door or cabinets. The fixture shall be anchored to the floor with a base plate and to the wall with a bracket at the top of the fixture riser which shall be screwed into a 2" x 4" length of metal stud or equivalent installed behind the plastered wall. The combination emergency shower/eyewash shall be Model #SE-603 as manufactured by Speakman.

- In Science Classrooms, provide hot and cold water to each professor's demo table and to each utility sink at the rear of the classrooms. The student table sinks shall be provided with cold water only.

- In the Science Material Storage/Preparation Area, distillation water still shall be provided over the utility sink to produce the highest purity water. The still shall be Mego-Pure Still/Fisher EMD Scientific #S50920ND as manufactured by Corning.

- The Science Material Storage/Preparation Area Organic and Inorganic Storage Rooms shall each be provided with acid resistant floor drains connected to the chemical waste system.

- Floor drains shall be 3" in diameter in all areas (except the kitchen). In the kitchen, 4" in diameter floor sinks and trough drains shall be provided (only exception being the kitchen laundry room where a 3" floor drain may be placed).

- All floor drains and floor sinks shall be equipped with trap primers in order to prevent evaporation of the trap seals.

- The emergency generator exhaust piping shall be fabricated of Schedule 40 black steel piping and shall be insulated.

- Every building shall have at least one main vent stack not less than 3"diameter. Air admittance valves (AAW) used to eliminate venting to the outdoors are prohibited. A vent terminal shall be a minimum of 10' from any door, window or fresh air intake.

- All lavatories shall have fixtures as manufactured by Delta or Sloan. Non-ADA fixtures shall be model # 86T104 or 86T110. ADA lavatory fixtures shall be Delta model #86T104L or #86T110L. Sloan Optima Plus EBF-85 can be used in ADA and Non-ADA applications. All water closets shall be 1.6 GPF and employ Sloan ECOS 8111-1.6/1.1 Electronic Dual Flush flushometers. All urinals shall be 1.0 GPF and shall employ Sloan Optima G2 Plus 8186 flushometers.

XII. ELECTRICAL

General

- All electrical design shall be in compliance with the latest mandated versions of the Florida Building Code, SREF, IES lighting standards and the Standard Electrical Code. All electrical equipment and devices shall be U.L. approved.

Acceptable Manufacturers:

Application:	**Products:**	**Manufacturers:**
Classrooms & Labs	Dimmable fluorescent, 4100K 28 watt lamps, A+ electronic ballast or quieter 2RT5 28T5 277 ADZT LPM835P 2RT5 28T5 277 ADZT LPM835P EL14 (emergency light)	Lithonia
Office	Stepped fluorescent, 4100K, 28 watt lamps, A+ electronic ballast or quieter 2RT5 28T5 MVOLT GEB95S LPM835P 2RT5 28T5 277 GEB95S LPM835P EL14 (emergency light)	Lithonia
Hallways	Fluorescent, 4100K, 28 watt lamps, A+ electronic ballast or quieter 2RT5 28T5 MVOLT GEB95 LPM835P 2RT5 28T5 277 GEB95 LPM835P EL14 (emergency light)	Lithonia
Classrooms & Labs	Dual technology ceiling sensor lighting control	Wattstopper DT-355
Office & Conference Rms.	Dual technology wall switches sensor	Wattstopper 200
Hallways	Dual technology ceiling sensor lighting control	Wattstopper DT-355
Receptacles	2-pole, 3-wire rated at 125 volts and 20 amperes and equipped with green hexagonal equipment grounding screw, stainless steel outlet plate	Hubbell,
Panel & Disconnects	bolt-in circuit breaker type, dead front, locking door, flush lock, master keyed	Square D, Siemens
Exit Light		

Light Fixture Guidelines

- Manufacturer shall warrant ballasts to be free from defects in material or workmanship for at least two (2) years from date of substantial completion of project.

- Recessed fixtures may be connected with flexible raceways not exceeding six feet in length made to a junction box in accessible concealed spaces above ceilings.

- No fixture connections will be permitted except where the fixtures are mounted end-to- end and mechanically connected together.

- Lighting levels must meet IES guidelines according to tasks being performed in illuminated area.

- The Engineer shall not locate fixtures without considering how they will be serviced.

- Incandescent lighting will not be allowed.

- Where down lights are used; compact fluorescent type with convective venting will be used.

- Wire bulb guards shall be provided on all open type or industrial type fluorescent fixtures.

Exterior Light Fixture Guidelines:

- Exterior lighting fixtures shall be LED

- Exterior lighting will not be affixed to any wall of a building or screen.

- Exterior lighting pole lighting for sidewalks will be no higher than 12 feet or closer than 24 inches from the edge of the sidewalk.

- Exterior lighting for parking lots will be not higher than 25 feet.

- All poles and light heads shall match existing.

- All in-line fuses shall be installed in the pole hand holes (not ground boxes).

- Provide surge protection for all exterior pole lighting. Each pole mounted fixtures shall be properly grounded.

- All pole mounted fixtures shall be placed with consideration given to mature size of landscaping materials surrounding poles. Hand holes for pole mounted fixtures shall be made of non-conductive material.

- Poles shall have hinged base for ease of maintenance.

- Bollard light fixtures are prohibited.

Conduit Guidelines:

- Minimum conduit size shall be ¾" for all system.
- No aluminum raceways will be acceptable.
- EMT (Electrical Metallic Tubing) will be used for all indoor work from the panel to the switch and receptacle.
- Where exposed, fittings shall be UL listed for rain tight applications and concrete tight, and connectors shall be the insulated throat type with case hardened locknuts.
- Set screw fittings are acceptable for interior application.
- Compression fittings are acceptable for exterior application.

Transformers

- All transformers shall be floor mounted. Transformers rated at 25kVA or less may be mounted on the wall. In no case shall transformers be hung from or mounted to the overhead structure unless otherwise approved.
- K-rated transformers with electrostatic shielding, Power Conditioning equipment or devices, or other disturbance mitigation methods shall be specified for systems supplying outlets for computer terminals or other sensitive equipment. Provide line side mitigation equipment such as Harmonic Traps for equipment utilizing 6 pulse and 12 pulse power supplies, all Variable Frequency motor drives, and or appliances capable of generating Harmonic frequency currents or voltages on their respective circuits of significant magnitude which may cause harmful disturbances on the facility electrical system. IEEE 1100-1992 shall be the required criterion for the design of the facility Division 16 systems.
- Dry type transformers shall be low impedance, type "H" insulation, 115 degrees C temperature rise above 40 degrees C ambient. All transformers shall be floor mounted with vibration isolation pads between the unit and the structure. Transformers rated at 25 kVA or less may be mounted on the wall. In no case shall transformers be hung from or mounted to the overhead structure unless otherwise approved

Switchboards, Panel boards & Control Centers

- Shall not be located in corridors or public areas.

Transmission and Distribution

Underground Work – General: Locate Service Must Survey Dig area.

- The Contractor shall be responsible for contacting No-Cuts (or other underground utility locator) and coordinating with the EFSC Facilities Department prior to any digging to verify underground utilities.

- The duration of all open trenching shall be minimized and substantial personnel/safety barricades, flashers and construction barriers to prevent unauthorized access to disturbed or new areas shall be a requisite and required.

Manholes and Hand-holes:

- All manholes shall have cover for communications and power up to 277/480 Volts and shall be provided with non-metallic cable racks to support all cables entering and leaving the manhole.

- Manhole and handhole covers shall be lockable, color-coded (with dot system), diamond plated aluminum with aluminum angle frame.

- Any manhole/handhole over 3"x3" shall be 3/8" thick.

- All raceways leaving the manhole shall be sealed using approved type sealant.

- No splices shall be made in manholes for main power feed or signal feeds.

- Communications duct manholes shall be spaced not more than 300' between and shall have a maximum 180 degrees of bends in the run.

- In each pole Hand-holes serving exterior lighting for security, walkway, parking lot, etc., provide one Bussman (or equal) Type HEB water tight in-line fuse holder and insulation boots, with an FNQ fuse in each phase conductor to the pole light fixture and all splices shall be water proof type.

- In Hand-holes serving as junction boxes, all splices shall be water-proof type.

- Manholes must have access point to measure and monitor gas content in the confined area.

Duct Banks:

- The Engineer shall provide 100% spare conduit in duct banks for future needs. Long radius elbows shall be used for all underground services and duct banks.

- Duct bank conduits shall terminate in end bells, spaced 9 inches center-to-center for four inch conduits and spaced proportionately for other sizes, and finish flush with the manhole interior surface, plumb vertical and horizontal.

- Underground Utilities Duct Banks shall be run in Underground PVC Plastic conduit schedule 40 conforming to NEMA TC 2 encased in concrete with a minimum envelope of 3 inches of concrete. A colored concrete cap may be installed over a duct bank when approved by the Building Official. Mark tape must be installed over the duct bank during backfill.

- All duct lines shall be laid to a minimum grade of 4 inches per 100 feet. Slope may be away from the building, from one manhole to the next or both ways from a high point between manholes, depending on the contour of the finished grade. Low points that may trap water are unacceptable. Duct lines shall be installed so that the top of concrete encased duct lines is not less than 30 inches below finished grade or finished paving at any point. Changes in direction of more than 10 degrees, either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be used at the ends of the run. Manufactured bends shall have a minimum radius of 36 inches. Duct shall be thoroughly cleaned before using or laying. During construction and after the duct line is completed, the ends of the ducts shall be plugged to prevent water washing mud or the wind from blowing sand in to the raceways or manholes. Particular care shall be taken to keep the conduits clean of concrete, dirt and any other substance during the course of construction.

- After construction of the duct line is completed, a standard flexible mandrel not less than 12 inches long, having a diameter approximately ¼ inch less than the inside diameter of the conduit, shall be pulled through each conduit to make certain that no particles of sand, or gravel have been left in the line. There shall be a suitable pull wire or string left in each empty conduit.

- Each individual conduit shall be completely encased in concrete to a minimum of one inch between conduits and three inches on the outside surfaces. Separators or spacing blocks shall be placed at five foot intervals and the conduits shall be securely tied down and anchored to prevent movement during the placement of concrete.

Tele-Power Poles: The use of Tele-power poles is prohibited

Central Clock Systems: Central clock systems are prohibited

Intercom Systems: Are not used except a required in the fire code for the fire alarm

XII. ELEVATOR REQUIREMENTS

- A building exceeding two stories must have two elevators.
- The use of non-proprietary subsystems and parts are required.
- Elevator equipment must be contained in a separate room with an exterior entry.
- All elevator machine rooms must be conditioned and satisfy the manufacturer's recommended environmental requirements.
- The HVAC equipment for conditioning elevator machine rooms must be part of, and connected to, the building's infrastructure system(s).
- The elevator HVAC system must be separate from the building HVAC system.
- Provide duplex receptacles of the grounded type in elevator room and pit.
- Rear wall and side walls shall be covered with HP Plastic Laminate.
- Car Doors / Hoist way Doors shall be Standard Brushed Stainless Steel.
- Certificates must be provided and mounted in a frame in the elevator cab before the building can be occupied.
- Fire alarm recall is required.
- A microprocessor programmable logic non-proprietary main controller shall be provided. The requirement for any external device or knowledge of any programming knowledge shall not be required.
- The pump unit shall consist of the pump, motor and valve and shall be incorporated as a single unit which will include the reservoir.

XI. TELECOMMUNICATIONS STANDARD

The will be the standard design and installation specification for all EFSC building cabling infrastructure. Telecommunications cabling, will comply with the standards as set forth by ANSI/TIA/EIA-569-A (CSA T530) Commercial Building Standards for Telecommunications Pathways and Spaces.

Telecommunication Equipment room:

- Minimum size of telecommunication room will be 150 gross square feet.
- The telecommunication room will be located close to center of building.
- Sleeves' and room penetrations will be a minimum of 4" in diameter and properly fire stopped. The number of sleeves will be determined by the amount of cabling required with a minimum of three (3) per entrance wall to room. Sleeves shall be EMT with bushings on both ends.
- At each station location mount a 4 x 4 electrical box with a minimum 3/4"' conduit extended above the ceiling line with a 90 degree bend.
- A duplex plaster ring will be provided at each station location.
- Each wall behind equipment racks shall be covered with ¾" A/C plywood securely fastened to the framing of the finished wall at a height of 8'-0" above finished floor and coated with approved fire retardant material.
- At least two (2) dedicated electrical circuits that will be mounted 7'-6" above finished floor.
- Additional electrical receptacles shall be placed on each wall of room and to accommodate easy access to equipment racks.
- HVAC requirements will be based on equipment load for each particular application and designed with sufficient air changes to dissipate heat in accordance with requirements specified by the equipment manufacturer.
- A bonding conductor will be interconnected with each telecommunication closet to the service equipment (power) ground of the building.
- The copper core conductor must be insulated and be at least No.6 AWG in size.

Cabling Requirements:

- Outside plant cabling or entrance cabling will be rodent proof design.

- Plenum-rated cables only will be used from communications closet's to end user stations and must meet ANSI/UL 910-1994 or NFPA262-1990 fire and smoke specifications.

- EFSC will use a certified structured cabling system e.g. Beldin, Systimax etc. in all applications.

- Category 6 cabling will be the standard interior cabling, high speed data applications with category 6 cabling shall be limited to a total distance of 90m (295 ft.)

- Multi–mode fiber 62.5/125um or single-mode optical fiber cable will be used as per application specified.

Bid Specifications:

- Must be an Avaya (Systemax) and Belden / NORDX CSV. Must furnish copies of certificates with bid response. Must be certified to do warranty work on Avaya (Lucent) systems.

- All technicians working on EFSC projects must have Belden / NORDX training certificates. Provide copies of certificates with bid response. No subcontractors, temporary or "day" labor permitted.

- Supervisors to hold Belden / NORDX training certificates. A work crew supervisor will be physically present at the jobsite for all work. Submit names and certifications of supervisors with bid response. Belden / NORDX representatives will inspect all major installations and selected minor installations.

- Response requirements: Two hour emergency response, 48 hour response on MAC projects.

- Project Management: All design and engineering assistance, site surveys and related consulting are to be included in the basic labor rate. Examples; walk-through, planning meetings (at any EFSC location), blue print evaluations, in-person or telephonic conversations are all to be included at no additional charge. The design and engineering function will require the creation of drawings, modifications to drawings or other documentation; this will also be included at no additional charge.

- Cabling contractor must specify materials lists for projects. Must also communicate with materials supplier to coordinate shipping/receiving of all materials. All ordering and inventory control will be performed by the cabling contractor. EFSC will pay supplier direct for required materials.

- Must be able to perform both inside and outside plant projects. This includes coring, sleeving, minor conduit installation for copper, fiber and coax installations. All wall sleeve penetrations must be fire stopped with Fire Resistant Caulking.

- Must test all installations to the applicable specifications including EIA/TIA. Must have approved testers rated for the test being performed. Must include cable Category 5 (A+B), Category 6, fiber (single + multimode) and coax. All work will be tested and test results submitted to EFSC electronically or in writing. Include a list of testers currently in use with this bid response. List Manufacturer names, models and which tests are performed with each unit.

- Must be insured and bonded. Provide proof with bid response.