

SECTION 2A-7

ELECTRICAL DESIGN CRITERIA

A. NORMAL POWER DISTRIBUTION SYSTEM

1. For existing facilities, the consultant shall visit the site, determine the present load conditions (max. demand) and provide detailed information on the existing service including voltage/phases, switchgear, number of conductors, conduit size, etc.
2. The consultant shall coordinate with FPL regarding the existing load plus the load that had been added to determine if the existing FPL transformers and/or vault need to be replaced. In existing facilities, when the FPL service is upgraded the consultant shall determine if the existing switchgear AIC rating is appropriate.
3. For new facilities, the consultant shall coordinate with FPL to determine the characteristics of the new service based on his preliminary load analysis. It is the standard of the School Board of Broward County (SBBC) to provide an FPL vault in all new facilities. Pad mounted FPL transformers will be considered at owners discretion on a case by case basis. For new FPL vaults the consultant shall contact FPL for their requirements. Overhead site distribution of power is not permitted in our sites.
4. For existing and new facilities, provide the following information on the working drawings.
 - a. Power Distribution System: Indicate the following characteristics:
Voltage _____ Phases _____ Wires _____ Ampacity _____
Electrical Service for new facilities shall be 277/480 Volts, 3 phase, 4 wire whenever available.
 - b. Service Point: Vault _____ Coordinate with the Design Criteria Professional to obtain the standard vault specs and details as developed by the SBBC Design Services Section and FPL.
 - c. Main Distribution:
 - (1) Free standing switchboard/fusible/breakers.
 - (2) Distribution panel/fusible/breakers.
 - (3) Surge Protection-Manufacturer and characteristics.
 - (4) Short circuit bracing for new switchboards
 - d. Fault Current: Provide fault current analysis in symmetrical RMS amps at specified voltage.
 - e. Grounding System:
 - (1) Connect to Building Steel
 - (2) Water system
 - (3) Driven ground system (minimum of 1- 3/4 inch x 10 feet)
 - (4) Connect the telephone equipment room ground to the service ground system.
 - (5) Note: Chemical ground rods "XIT" can be considered for those installations where soil conditions make it difficult to obtain low resistance values when standard ground rods are used.
 - f. Provide a dedicated room for the main switchboard. Ensure that this room opens to the exterior.
 - g. Provide dedicated electrical rooms throughout the facility. No storage shall be allowed in electrical rooms. Electrical rooms shall not open into instructional spaces.
 - h. Provide voltage drop computations for all large feeders. Feeder conductors shall be sized for a maximum voltage drop of 2%. Branch circuit conductors shall be sized for a maximum voltage drop of 3% at design load.
 - i. For existing facilities, the consultant shall test the existing grounding system and provide a field LOG report for evaluation by the SBBC Design Services Section.

- j. In existing and new facilities only one electrical service (as defined by NEC Article 230) is permitted per site. If the consultant determines that after analyzing all the options this is not feasible, then additional services may be considered at owner's discretion. Contact the Design Services Section for direction.
- k. When utilizing "As Built" drawings which depict existing underground utilities and duct banks which the consultant wants to use in the new project, the consultant must hire a company to verify that the underground utilities are located as shown on the drawings.
- l. The Engineer shall obtain at least the following information from the local utility company, available fault current, existing buildings maximum demand for the past 12 months, service entrance requirements including voltage load, and the location of power company transformer and primary power lines. If new load is being added a letter from FPL indicating that the vault has adequate capacity shall be submitted for review at Phase III-50%.

B. EMERGENCY POWER SYSTEM

1. Emergency power for facilities shall be such that in the event of failure of the normal supply to, or within the building or group of buildings concerned, emergency lighting, emergency power of both will be available within the time required for the application but not to exceed 10 seconds. The supply system for emergency purposes shall be permitted to comprise one or more of the types of systems described below.
 - a. Systems required as per Article 700 of the National Electric Code (NFPA-70).
 - b. Storage batteries.
 - c. Generator set.
 - d. Uninterruptible power supplies.
 - e. Separate service.
 - f. Connection ahead of service disconnecting means.
2. Emergency Generator on Site:
 - a. Specify: KW Rating _____ Voltage _____ Phases _____ Wires _____
 - b. Connect the following systems to the emergency generator:
 - (1) Andover System Panel (EM/S)
 - (2) Cooler/Freezer/Ice Maker/Reach-in Refrigerators/Milk Cooler/(1) Warming Oven.
 - (3) Dedicated outlets.
 - (4) Emergency Lighting.
 - (5) Fire Alarm System.
 - (6) Intercom System.
 - (7) Main Telephone Board.
 - (8) Security System. Card access system when provided.
 - (9) BECON ITV headend equipment.
 - (10) Entire Equipment Room ER (Equipment Room) outlets and equipments.
 - (11) Combination fire/smoke, fire, smoke dampers and smoke evacuation fans.
 - (12) Dedicated DX unit in Equipment Room (ER) and Telecommunications rooms (TR).
 - (13) Two quad receptacles in every TR room or distribution panel behind the rack.
 - (14) Provide 1 Nema L5-30R receptacle behind every equipment rack and 2 NEMA L5-30R behind every server cabinet in the ER and TRs.
 - (15) Fire Pump.
 - (16) Emergency Radio System.
 - (17) School District owned and operated lift station.
 - (18) One (1) 125 volts, 20 amps receptacle in the Clinic for the refrigerator.
 - (19) One (1) 125 volts, 20 amps receptacle in each School Police Office(s).
 - (20) One (1) 125 volts, 20 amps receptacle in the Media Center.
 - (21) One (1) 125 volts, 20 amps receptacle in the Principals Office.
 - (22) One (1) 125 volts, 20 amps receptacle in the in the Dining Room.
 - (23) One (1) 125 volts, 20 amps receptacle in the Gymnasium.
 - (24) DX units for designated EHPA areas in schools.

- (25) EHPA domestic water tank.
 - (26) Elevator
 - (27) All mechanical equipment required for EHPA.
 - (28) Flammable storage alarms and exhaust fans.
- c. The consultant shall obtain from the SBBC information as to whether the school is an EHPA shelter or a Special Needs EHPA shelter. Special needs EHPA shelters have greater requirements and thus the generator needs to be sized accordingly.
 - d. Locate the emergency generator in a dedicated room with doors opening directly to the outside.
 - (1) Provide generator room with emergency lighting connected to the generator and a wall pack battery light connected to room emergency circuit ahead of room lighting switch.
3. No Emergency Generator on Site:
- a. Provide connection ahead of the main for fire alarm system.
 - b. Battery lights connected to local lighting circuit ahead of any switching.
 - c. Inverter packs for fluorescent lamps connected to local lighting circuit ahead of any switching.
 - d. Self-powered exit signs connected to local lighting circuit ahead of any switching.
 - e. Provide battery back-up for the fire alarm system.
 - f. Separate electrical service with automatic switch over by the utility.
 - g. Connect the intercom system and main telephone board to the UPS System.

C. SITE DISTRIBUTION

1. Systems: Routing of all listed systems is required.
 - a. Normal lighting and power.
 - b. Emergency lighting and power.
 - c. Fire Alarm.
 - d. Intercom.
 - e. Television.
 - f. Telephone.
 - g. Security.
 - h. Energy Management.
 - i. Electrical Service.
 - j. Telephone Service.
 - k. Computer Networking.
 - l. Closed Circuit Television.
2. Installation:
 - a. Underground:
 - (1) Individual raceways.
 - (2) Ductbank.
 - (3) Manholes/Hand holes sized by NEC 370-28. Provide separate manholes for normal power, emergency power and communications.
 - (4) Grounding
3. One Line Diagram (Power): Indicate the existing installation and new system(s).
4. Site distribution of power and systems in new facilities shall be done underground.
5. Site distribution, outside the building footprint shall be 36 inch minimum burial depth for power and systems. For temporary and portable installations 24 inch minimum burial depth for power and systems will be allowed.

D. LIGHTING

1. Ensure all new construction complies with this section and the building codes referenced elsewhere in these rules.
 - a. Illumination of Means of Egress: Provide illumination of each means of egress under provisions with this rule for every educational plan. For the purposes of this rule, means of egress includes designated stairs, aisles, corridors, ramps, escalators, all covered walkways and other passageways leading to the public right of way.
 - (1) Ensure illumination of means of egress is continuous during the time that the building is occupied. Utilize lighting at such places for such time as required to maintain the illumination to the minimum required foot-candles.
 - (2) Illuminate means of egress at all points including angles, intersections of corridors, passageways, stairways, ramps, landings and exit door to a minimum of not less than one (1) foot-candle, measured at the floor. In auditoriums and other places of assembly, the illumination at the floors of exit access may be reduced as required during performances to a minimum of not less than one-fifth (1/5) foot-candle.
 - (3) Ensure illumination is from a source of reasonably assured reliability such as public utility electric service.
 - (4) Arrange illumination so that the failure of any single lighting component such as the failure of an electric bulb or the failure of one branch circuit will not leave any means of egress in darkness.
 - (5) Where electricity is used as a source of illumination of means of egress, make the installation under provisions of NFPA 70, National Electrical Code.
 - b. General Illumination: Ensure illumination levels in educational facilities conform to the IES lighting handbook latest edition. Design and circuit illumination so that the failure of any single lighting component such as an electric bulb or failure of one branch circuit will not leave any occupied area in darkness.
 - (1) Classroom Lighting:
 - (a) Base the average initial illuminance level on a light loss factor equal to the product of the ballast factor (BF) when multiplied by the voltage drop factor (VDF). Voltage drop is normally taken as 3 percent, therefore the voltage drop factor will be $LLF = BF \times VDF = BF \times 0.97$. All other factors shall be taken as one.
 - (b) Ensure the minimum foot-candle illuminance level is not less than forty (40) foot-candles.
 - (c) The maximum allowable rate of foot-candle levels at task height within any 4 foot distance from one another shall be at a ratio of two to one (2:1).
 - (d) Provide a computer illuminance analysis printout for every typical classroom layout and special use areas.
 - (e) Consider surface reflectance as close as possible to actual and properly documented.
 - (f) Base the lamp lumen output on lamp manufacturer's published data.
 - (g) In specific cases, a full visibility analysis might be required in which case visual comfort probability and equivalent sphere illumination must be considered.
 - (h) Classroom lighting fixtures shall be oriented perpendicular to the white board.
 - (2) Chalkboard Lighting: Provide supplementary lighting for the chalkboard so the ratio of task background existence to chalkboard exitance does not exceed three to one (3:1). Chalkboard lighting is to be provided as required by the Educational Specifications.
 - (3) Indirect Lighting Systems: Ensure the surface luminance (brightness) of any surface does not exceed 250 footlamberts. Ensure the uniformity ratio does not exceed five to one (5:1).
 - (4) Parking Lot Lighting: Design the illuminance of the parking lot to provide a minimum of one (1) foot-candle at ground level with a maximum to minimum not to exceed twelve to one (12:1). Entrances/exits to parking lots shall achieve an average maintained horizontal foot candle of 2 to comply with FBC. Pole fixture lighting shall have fuses in the base of the pole, not at the top or in the light fixture. When possible

use remote ballast light fixtures for pole mounted lighting fixtures. Maximum mounting height for light poles shall be 25 feet AFF. Deviation from this shall be brought to the attention of SBBC Design Services Department. Lighting spillage and glare into residential properties shall meet the Broward County and Municipalities Lighting Ordinances.

- (5) Chiller Area: Provide lighting in the chiller area for maintenance purposes. Provide a minimum of five (5) footcandle lighting in open chiller plants controlled by EMS.
- c. Emergency Lighting: Provide emergency lighting where required by NFPA 101. In addition, provide emergency lighting in group toilets, electrical rooms, student occupied areas, mechanical rooms, and the generator room.
- (1) When maintenance of illumination depends upon changing from one energy source to another, ensure that there is no appreciable interruption of illumination during the changeover. When emergency lighting is provided by a prime mover-operated electric generator, a delay of not more than ten (10) seconds shall be permitted.
 - (2) Provide relay interlocks and on/off switches for emergency lights installed.
 - (3) Suitably illuminate every exit sign by a reliable light source. Continuously illuminate externally or internally illuminated signs whether in the normal or emergency power mode.
 - (a) Externally Illuminated Signs: Illuminated by not less than five (5) foot-candles and employ a contrast ratio between letters and background of not less than one to two (1:2).
 - (b) In an internally illuminated sign with translucent letters and an opaque background ensure the average luminance of the letters are a minimum of two (2) foot-lamberts and a maximum of three (3) foot-lamberts. Illuminate the letters such that the brightest spot is not more than four (4) times as bright as the darkest spot.
 - (c) In an internally illuminated sign with translucent background and opaque letters, ensure the average luminance of the background is a minimum of three (3) foot-lamberts. Illuminate the background such that the brightest spot is not more than four (4) times as bright as the darkest spot. Ensure the contrast ratio between letters and background is at least one to two (1:2).
 - (d) In an internally illuminated sign with translucent background and translucent letters, ensure the average luminance of the brighter portion is a minimum of six (6) foot-lamberts due to internal sources only. Illuminate the background such that the brightest spot is not more than four (4) times as bright as the darkest spot. Ensure the entrust ratio between letters and background is at least one to two (1:2).
 - (e) **DO NOT** install self-luminous or phosphorescent exit signs in educational or ancillary facilities.
 - (f) Ensure illumination of exit signs are at the required level for the emergency lighting of a minimum of 90 minutes. Illumination may decline to 60 percent of the required illumination level after 90 minutes.
 - (g) Internally Illuminated Exit Signs: Illuminated by Light Emitting Diodes (LED) configured in such a way that failure of any one (1) single LED will not disrupt the continued illumination of the remaining LED. Single Face and Double Face Signs shall not consume more than 2 Watts. Ensure the rated average life of the sign is at least 30 years. The sign must be UL-924 listed. All exit signs shall be red in color.
- d. Conform to the following general illumination requirements:

Space

Classrooms

Chalkboard lighting

Average FC (Maintained)

60

Provide exitance computer analysis

Laboratories	60
Teaching Auditoriums (multiple systems) (*)	30/60
Media Center	60
Principal's and Assistant Principal's Office	60
Offices/ Clerical (*)	60
Physical Education (Gym) (*)	30/50 range
Kitchen	60
Cafeteria	50
Interior Corridors	30
Exterior Corridors	10
Computer Laboratories (*) (*)	60
Teacher Planning Spaces	60
Courtyards	1 (minimum)
Covered Walkways and Connector Walks	5 (Minimum of 1 with an average maintained horizontal of 5 FC)

All other Interior Areas (refer to IES recommendations)

LEGEND:

(*) Provide multiple level switching.

(**) Indirect systems can be considered when ceiling is at 10'-6" minimum.

Maximum of 250 foot lamberts with a uniformity ratio of 4:1.

e. Fluorescent Lamps and Ballast:

- (1) Lamps: T-8 (triphosphors) (4100K), cool white.
- (2) Ballasts: Fully electronic integrated circuit. Total harmonic distortion - less than 12 percent THD, crest factor 1.4 or less, Magnatek - Universal - Advance - Motorola - Toshiba.
- (3) All lamps to be TCLP approved whenever available.
- (4) Program start ballast shall be utilized for rooms containing lighting motion sensors.

f. Bottom of luminaires above finish floor, refer to SREF requirements.

g. The use of 2 x 2 luminaires is not allowed unless written permission is obtained from SBBC Design Services Department.

h. All Other Interior Areas: See IES Application Volume latest edition. Provide illuminance computer print out for all rooms/spaces under design.

i. Parking Lot Lighting:

- (1) Minimum of one (1) maintained foot-candle with a max/min of 12/1 and not to exceed 0.05 watts/sq. ft.
- (2) Indicate Light Loss Factor:
 - (a) Suggested MH Luminaires LLF = 0.75, HPS Luminaires LLF = 0.9
 - (b) SBBC reserves the right of actual performance verification.
 - (c) Computer Analysis: Based of a 10 foot grid.
- (3) Provide light trespass calculations at the site boundary based upon the site lighting zone classification as defined by IESNA RP-33.
 - (a) LZ1: Dark - Provide 0.01 maximum initial horizontal and vertical foot-candles at site boundary and beyond.
 - (b) LZ2: Low - Provide 0.10 maximum initial horizontal and vertical foot-candles at site boundary and 0.01 horizontal foot-candles 10 feet beyond.
 - (c) LZ3: Medium - Provide 0.20 maximum initial horizontal and vertical foot-candles at site boundary and 0.01 horizontal foot-candles 15 feet beyond.

- (d) LZ4: High - Provide 0.60 maximum initial horizontal and vertical foot-candles at site boundary and 0.01 horizontal foot-candles 15 feet beyond.
- (4) Document the Lighting Power Density for the site lighting complies with ASHRAE standard 90.1. Provide a table with the following data;
 - (a) Location and ID of each installed exterior luminaires.
 - (b) Site area to be illuminated by the luminaires.
 - (c) Installed lighting power density.
 - (d) ASHRAE-allowable LPD.
- (5) Confirm the site zone LZ classification for the project.
- (6) Document the Site initial lumens levels above 90 degrees from nadir. Provide a table with the following data;
 - (a) Luminaires type and ID.
 - (b) Quantity installed.
 - (c) Initial Lamp Lumens per luminaires.
 - (d) Initial Lamp Lumens above 90 degrees from nadir.
- j. Sport Fields: Discuss design criteria with SBBC Design Services Section prior to designing and shall comply with IES RP-6-01. At a minimum two 4"C stub-outs in a pull box shall be provided from the closest electrical room with the capacity for the sports field lighting to the proposed location of the sports field. Provide at least an empty conduit from the closest electrical room with a panel with the capacity for future scoreboard connection to the location of the proposed scoreboard(s). Provide provisions (conduits and wiring for power and controls) for sports-field scoreboards and pole mounted speaker system. Provide normal and emergency illumination at all means of egress from stadium bleachers.
 - (1) Provide light trespass calculations, with just the sports lighting turned on, at the site boundary based upon the site lighting zone classification as defined by IESNA RP-33.
 - (a) LZ1: Dark - Provide 0.10 maximum initial horizontal and vertical foot-candles at site boundary and 0.01 horizontal foot-candles within 10 feet of the boundary.
 - (b) LZ2: Low - Provide 0.30 maximum initial horizontal and vertical foot-candles at site boundary and 0.01 horizontal foot-candles within 10 feet of the boundary.
 - (c) LZ3: Medium - Provide 0.80 maximum initial horizontal and vertical foot-candles at site boundary and 0.01 horizontal foot-candles within 15 feet of the boundary.
 - (d) LZ4: High - Provide 1.50 maximum initial horizontal and vertical foot-candles at site boundary and 0.01 horizontal foot-candles within 15 feet of the boundary.
- k. Provide emergency lighting requirements in all classrooms, public spaces and administration areas.
- l. Provide two (2) luminaires connected to emergency power in each classroom. Automatic switching of emergency luminaires will be allowed when luminaires are back to "ON" in the event of power failure.
- m. For Indoor Applications: Do not compute "Initial LLF" as "one" (1), but as the product of the "ballast factor" (BF) multiplied by the voltage drop factor (VDF) (minimum 0.97).
- n. Comply with the Florida Energy Code Current Adopted Edition.
- o. Provide systems and power stub-outs terminated in a pull box to the proposed location of the future portables. The design shall take into consideration the power and system requirements of the portables and the electrical room where the power conduit originates shall have the capacity to serve the portables.
- p. All exterior luminaires shall be vandal proof with UV resistant lenses.
- q. Avoid using incandescent light fixtures unless is absolutely necessary in such areas as stage and theatrical lighting.
- r. At the beginning of a project involving lighting retrofit the contractor shall contact FPL to start the rebate process.

- s. Document total initial designed fixture lumens based upon the site lighting zone classification as defined by IESNA RP-33.
 - (1) LZ1: Dark - 0% are emitted at 90 degrees or higher from nadir.
 - (2) LZ2: Low - 2% are emitted at 90 degrees or higher from nadir.
 - (3) LZ3: Medium - 5% are emitted at 90 degrees or higher from nadir.
 - (4) LZ4: High - 10% are emitted at 90 degrees or higher from nadir.

E. LIGHTING CONTROL

1. Building Lighting Systems shall be studied to determine which system types; sources and lighting layouts are most appropriate for each project. Selected system shall conform to FBC and SBBC requirements.
2. Natural Lighting: The use of building design concepts, which introduce natural lighting into the building to offset the use of artificial lighting, shall be investigated. Special attention shall be paid to assure that natural lighting designs are compatible with intended areas of use.
 - (1) Provide lighting levels appropriate for tasks without providing excessive brightness.
 - (2) Control glare and have a high VCP.
 - (3) Reduce the amount of solar heat introduced into the building.
 - (4) Assure areas are supplemented with artificial lighting and related controls to provide acceptable lighting when natural lighting is available at reduced levels (light harvesting)
 - (5) All selections shall consider Florida Power and Light Company Rebates.
 - (6) In areas where natural lighting is being introduced into the building, photoelectric controls shall be provided.
 - (a) Closed loop photo sensors or Open loop photo sensors shall be provided so when adequate light enters the space, the photo sensor will send a signal to the lighting fixtures to gradually reduce the light output.
 - (b) Light fixtures shall be equipped with dimmable ballasts compatible with photoelectric controls.
 - (c) During a power loss emergency light fixtures shall override daylight harvesting controls and go to 100% brightness.
 - (d) Daylight harvesting controls shall be of the same manufacturer as the local motion sensors and shall be powered by the motion sensor power pack.
 - (e) Where pendant lighting fixtures are being used, photo sensors shall be installed at the same height as the bottom of the light fixture.
3. Artificial Lighting: Select the artificial Lighting System or Systems that are most appropriate for the school. Lighting Systems which should be investigated include, but are not limited to:
 - (1) Lamps shall not be exposed in areas primarily occupied by students.
 - (2) Suspended indirect fluorescent fixtures.
 - (3) All selections shall consider Florida Power and Light Company Rebates.
4. Accent/Specialty Lighting: Fixtures used for accent and specialty lighting shall be of an energy efficiency type. Chalkboard lightings shall be provided in accordance with FBC. Trophy and Art/Display lighting are two examples where this will apply.

- (1) Down lighting shall be compact fluorescent type with high power factor electronic ballast.
 - (2) Exit Signs shall be LED or self-energized type shall consume no more than 2 watts.
 - (3) Incandescent and quartz sources shall only be used in special applications where exceptional color rendition is required.
 - (4) Apply for appropriate FPL Company rebates.
5. Ensure all new construction complies with this section and the building codes referenced elsewhere in these rules.
6. Install lighting fixtures in instructional spaces so that the light level may be effectively reduced to facilitate the use of projected visual aids, allow note taking while the lights are dimmed or to allow the reduction of artificial illumination when natural illumination is provided. Two levels of lighting shall be accomplished with the use of light switches. In schools with a generator, locate the emergency light switch by the entrance door and the normal light by the teacher's desk. Classroom lighting switching may be accomplished through different available methods, i.e.
 - a. Multiple Switching,
 - b. Electronic Dimmers
 - c. Occupancy Sensors
 - d. Light harvesting with the use of photo sensor controls.
7. In order to conserve energy and comply with the Florida Energy Code Current Adopted Edition, provide one (1) or as many as needed for appropriate coverage per manufacturer's recommendations) motion detector in each classroom, administrative office, conference room, custodial room, storage rooms and any other room as necessary to comply with the code. In science classrooms or other areas where gas is utilized, do not install motion detectors for light control. In larger spaces like auditorium, gymnasiums and dining areas the engineer shall consult Design Services for method of complying with the Florida Energy Code (i.e. astronomical time switches with key override). Motion sensors must be of the dual technology type, sensor and power pack must be from the same manufacturer. If the motion sensor fails it must fail with the lights in the on position. All new units shall be provided with a 5 year warranty. Unswitched lighting is not allowed.
8. Control light fixtures in the corridors and group restrooms by the school based Energy Management/Security (EM/S) System.
 - a. Provide each floor of every building with one separate control point (preferably in the custodial office). Switches shall be labeled and provided with pilot lights.
9. Control light fixtures in every large assembly area (dining room, stage and kitchen, media center, auditorium) by EM/S.
 - a. Provide each space with one separate control point.
10. Control light fixtures in the gymnasium, gymnasium lobby, locker rooms, shower areas, and its restrooms by (EM/S).
11. Provide a switch for each space controlled through EM/S to override the control of the lights during scheduled off hours/days.
 - a. Override switches shall provide maximum of four (4) hours lighting.
 - b. Override switches shall be capable of turning the lights on and off during scheduled off hours/days.
 - c. Locate the override switches next to the wall mounted light switches for each space. Exception: for the corridors locate an override switch at the corridor's entrances or exits, and label the switch.

12. Provide required lighting control relay panel for EM/S control.
13. Locate relay panel in the electrical rooms next to the lighting panels.
14. Interior lights supplied from Generator supplied power:
 - a. EM/S shall control emergency lights in the corridors and group restrooms.
 - (1) No manual wall mounted switches are required.
 - b. Occupancy sensors shall control emergency lights in the main lobbies (administration building, gymnasium building, media building, auditorium building, and similar spaces).
 - (1) No wall mounted switches are required.
 - (2) Locate occupancy sensors as needed for maximum reliability.
15. Provide override relays that bypass occupancy sensors and EM/S control upon loss of normal power.
 - a. Emergency lights must automatically turn "on" within ten (10) seconds of the loss of normal power in the area.
16. Control emergency lights in all other spaces by a wall switch located next to the entrance door via override relays to prevent 24 hours per day operation.
17. Chalkboards: In separate switch.
18. Outdoor: EM/S. Parking lot lighting and building lighting/covered walkway shall be on separate circuits.
19. Dressing Room Light Fixtures: Do not provide incandescent makeup lights; instead provide full-spectrum fluorescent lights.
20. Provide spaces and rooms with multiple entrances with 3 and 4 way light switches located at each entrance door.
21. Avoid using incandescent light fixtures unless it is absolutely necessary in such areas as stage and theatrical lighting. In stages provide down light fluorescent PL and general purpose fluorescent fixtures for non-performance hours.
22. Provide individual lighting controls for 90% of the administrative offices and other regularly occupied spaces occupants to enable adjustments to suit individual task needs and preferences. Document the following:
 - a. Total number of individual workstations and lighting controls used.
 - b. Listing of the project's group multi-occupant spaces and a description of the installed lighting controls.

F. ELECTRICAL OUTLETS

1. Provide four (4) or more duplex outlets in each instructional space. Consider the use of standard classroom equipment in locating these outlets throughout the space dedicated. Provide additional outlets where applicable for special equipment. Classroom receptacle outlet layout shall comply with "Instructional Spaces Typical Layout Detail".
2. Provide special purpose rooms with outlets suitable for the special equipment used. Place sufficient outlets and electrical circuits in strategic locations to serve the drop lights for localized task lighting.
3. Ground all outlets. GFI outlets cannot be downstream protected.

4. Provide all convenience outlets installed within 6 feet of water supplies, wet locations and toilet rooms with a ground fault circuit interrupt protection device (GFI). Where outdoor outlets are provided with direct grade level access they shall be weather proof outdoor GFI.
5. **DO NOT** install electrical receptacles within flammable, storage room and hazard storage rooms.
6. Mechanical Rooms: Minimum of one (1) receptacle. Connect all receptacles to GFI circuits.
7. Gymnasiums: Minimum of three (3) per wall.
8. Teacher's Lounge: Minimum of four (4) receptacles.
9. Offices: Minimum of one (1) receptacle per wall plus additional outlets to satisfy furniture layout. This does not include the computer receptacle.
10. Secretarial Areas: Minimum of two (2) receptacles in each wall plus additional outlets to satisfy furniture layout. This does not include the computer receptacle.
11. Electrical Rooms: Minimum of one (1) GFI.
12. In all elementary classrooms, electrical receptacles within reach of students shall have ground fault circuit interrupt protection devices (GFCI) except for the computer dedicated receptacles.
13. Branch circuits supplying data and printer's workstations shall be dedicated to this use only.
14. Each phase conductor for computer circuits must have its own neutral.
15. Main distribution panels, switchgear shall have a minimum 20% spare capacity and 20% spare circuit breakers.
16. Distribution and Branch circuit panels shall be provided with a minimum of 20 percent spare breakers and capacity, and a minimum of 20 percent spare capacity in all main panels and switchboards.
17. Do not provide electrical outlets in storage rooms.
18. Any receptacle in the boiler room shall be GFCI protected.
19. All building vestibule receptacles shall be GFCI protected.
20. All stairway landing receptacles shall be GFCI protected.
21. All receptacle outlets connected to emergency power shall be red in color.
22. All receptacle outlets for communication/data outlets shall be gray in color.
23. All receptacle outlets for laptop charging carts shall be royal blue in color.
24. Concession area outlets shall be GFI.
25. Provide service outlets at 125 volts, 20 amps within 25 feet of HVAC equipment on the roofs and grounds.
26. Chiller plants: four 125 volts, 20 amps outlets (one on each wall), on two separate branch circuits.

G. FIRE ALARM SYSTEMS

1. For existing facilities, the consultant shall discuss the re-use of the existing system or total replacement with the SBBC Design Services Section.

2. The consultant shall visit the site and gather all proper information on the existing system. List this information on the design documents in the event of re-use.
3. See the SBBC Design Services Section Specifications for Fire Alarm Systems, Section 13845.
4. Provide buildings within 60 feet of each other with a common fire alarm.
5. The SBBC goal is to have all existing hard wired systems replaced by new addressable systems.
6. A dedicated zone module for future portable classrooms shall be provided.
7. Upon activation of the fire alarm system, shut off gas solenoid valves to the science classrooms in middle and high schools. The kitchen gas supply shall be shut off by the kitchen hood fire suppression system. When the hood fire suppression system is activated it shall shut off the main kitchen gas solenoid valve. During fire alarm drills or false alarms do not shut off the hood exhaust fan or the kitchen gas supply.
8. In fully fire sprinkled buildings, provide a smoke detector in custodial, storage rooms with electrical receptacles, telecommunication rooms, and electrical rooms. Provide an explosion proof smoke detector in the flammable storage.
9. Provide a Fire Alarm horn/strobe in each classroom.
10. Provide vandal proof smoke detectors in all group toilets.
11. Provide a Fire Alarm strobe in every single toilet.
12. Ionization type smoke or heat detectors are not allowed.
13. Provide fire alarm components complying with requirements for an EHPA in accordance with the most current State Requirements for Education Facilities (SREF) with EHPA shelters.
14. On new construction when the building is provided with a sprinkler system, electrical rooms shall be 2-hour fire rated and provided with a smoke detector in accordance with the exception under NFPA 13 Section 5-13-11. The communication ER and TR shall be provided with sprinkler heads.
15. For projects involving renovations, remodeling or additions, the consultant shall contact the SBBC Physical Plan Operations (PPO) Division Fire Alarm Supervisor at (754) 321-4600 regarding interface of the new fire alarm appliances with the existing fire alarm system.
16. Provide smoke detectors in dressing rooms.
17. Provide smoke detectors in classrooms with stoves. Devices shall not be located directly above the stove.
18. Use the program bells for recall purposes.
19. In schools without a fire sprinkler system, provide smoke detectors in rooms or spaces for storage, custodial closets, spaces under stages with wood structures and other unoccupied or unsupervised spaces. Mechanical Rooms shall be provided with heat detectors. Smoke and heat detector devices shall be installed in accordance with NFPA 72.
20. In schools with EHPA shelters, the main fire alarm panel shall be located in the EHPA manager's office and the remote annunciator shall be located in the school's main administration office. In schools without EHPA shelters, the main fire alarm panel shall be located in the school's main administration office. Due to the electronic components of the main fire alarm panels and remote

annunciators, they shall always be housed in air conditioned spaces. Location of both the main fire alarm panel and the remote annunciator shall follow NFPA and Florida Building Code requirements.

21. Fire Alarm Panels shall be located in rooms complying with manufacturer recommendations.
22. Provide a smoke detector above every Fire Alarm Control Unit (Main Fire Alarm or NAC panel) to comply with NFPA (1999) 72-1-5.6.
23. Fire alarm batteries shall not be located above 6.5 feet or mounted above the ceiling space.
24. Synchronize all strobe lights in the same room or adjacent spaces visually open to each other.
25. Provide an emergency voice evacuation system in auditorium, gym, and cafeteria per NFPA 101-2006:12.3.4.3.4.
26. Show all fire alarm devices in the fire alarm riser diagram.

H. MASTER CLOCK AND INTERCOMMUNICATION SYSTEM

1. For existing facilities, the consultant shall discuss the re-use of the existing system or if the system will be totally replaced with the SBBC Design Services Section.
2. The consultant shall visit the site and gather all proper information on the existing systems. List this information on the design documents in the event of re-use.
3. For new facilities, the consultant shall adhere to the master clock and intercommunication system specifications issued by the SBBC.
4. Please refer to standard wiring diagrams issued by the SBBC.
5. In the shops, provide handsets for the intercom systems.
6. In new facilities, provide ceiling speakers in the hallways connected to the intercom for all call purposes.
7. In existing facilities where the intercom is being replaced or new buildings are being added provide ceiling speakers in the interior hallways connected to the intercom system for all call purposes.
8. In new facilities, additions and renovations provide program bells connected to the intercom system. Refer to specification section 16724. Provide program bells for class changes in large cafeterias where background noise would be an issue.
9. In school where a separate communication's system is provided for the multipurpose, cafetorium, and music room, etc, an emergency intercom override shall be provided for all call purposes.
10. If intercom speakers mounted on the buildings do not provide adequate coverage of bus loop area, provide additional speakers at bus loop area.
11. Install combination call buttons and volume controls in all administrative office, teacher planning areas, conference rooms, clinic, and CCTV control room.

I. INSTRUCTIONAL TELEVISION SYSTEM

1. Consultant: For existing facilities, the consultant shall discuss whether to re-use the existing antenna mast and head end or total replacement with the SBBC Design Services Section.
2. If in an existing facility, the decision is made to replace the existing antenna tower and head-end, refer to the SBBC Standard Details and specifications.
3. For new facilities, refer to the SBBC Standard Details provided by the SBBC.
4. BECON ITV shall perform signal test probing to determine the size and location of the pole. The BECON test report shall be generated prior to the completion of the Phase III 50% construction documents and the consultant shall use this information to prepare the drawings. This report shall clarify dish size/configuration and any other equipment that would normally be variable based on proposed pole location.
5. The Contractor shall supply shop drawings for approval by BECON of the complete system showing all duct banks and electrical room tie points and device locations as well as devices used, and cable sweep test certification. Without this approval by BECON, the installation of the system shall not progress to the next phase of construction.
6. BECON reserves the right to perform periodic inspections during installation of the MATV system. Final inspection shall be approved and signed off by BECON.
7. The consultant shall adhere to the SBBC specifications for ITV as provided by the SBBC.
8. When a new addition is built, access to service the ITV tower shall be kept at all times. A minimum clearance of 25 feet between buildings shall be kept to let a truck pass through for service.
9. Consultant shall obtain SBBC Standard ITV drawing from Facilities and Construction Management Design Services Department to be incorporated in his set of construction documents when designing a new ITV tower.
10. Coordinate location of ITV outlets in classrooms with "Instructional Spaces Typical Layout Detail".

J. TELEPHONE DISTRIBUTION SYSTEM

1. Telephone Distribution System: The consultant shall coordinate with the SBBC Design Services Section and Local Exchange Carrier for the expandability of the existing system.
2. For new facilities, it is the consultant's responsibility to coordinate the telephone service with the Local Exchange Carrier.
3. Provide a system in accordance with the SBBC Specification Section 17000 - Voice, Data, and Video Structured Cabling Systems and SBBC Voice, Data, and Video Structured Cabling Design Criteria.

K. SECURITY SYSTEM

1. The consultant shall discuss the criteria with the SBBC Design Services Section prior to commencing work.
2. Provide a system in accordance with SBBC Specification Section 13825.

3. Provide a security keypad j-box to arm/disarm the alarm adjacent to an exterior entrance to the custodial receiving area. Provide a ¾" homerun and wiring to the nearest electrical room containing a security terminal cabinet.
4. Final acceptance of the Phase III-50% construction documents shall include review and approval of the security system layout.

L. SURVEILLANCE CAMERAS

1. The consultant shall discuss the criteria with the SBBC Design Services Section prior to commencing work.
2. The system shall be designed in accordance with SBBC Specification Section Video Surveillance System. Provide a dedicated power receptacle connected to the emergency system in each electrical room containing a security surveillance camera terminal cabinet. Locate the receptacle next to the security surveillance camera terminal cabinet.
3. All security conduits (min. ¾") shall be homerun to the nearest electrical room containing a security camera terminal cabinet. From this cabinet provide a minimum 2" conduit homerun to the Security Camera Monitoring Room in middle and high schools and to the main reception area in elementary schools.
4. Final acceptance of the Phase III-50% construction documents shall include review and approval of the security surveillance camera system layout.
5. In the Security Camera Monitoring Room provide a minimum of 3 data quads in high schools, 2 data quads in middle schools and elementary schools.

M. ENERGY MANAGEMENT/SECURITY SYSTEM

1. Provide a system in accordance with SBBC Specification Section 15900.
2. Final acceptance of the Phase III-50% construction documents shall include review and approval of the Energy Management/Security System layout.

N. SPECIAL SYSTEMS

1. Provide the following special systems: Coordinate with the SBBC Design Services Section for the standard specifications for all systems listed below.
 - a. Gymnasium Sound System.
 - b. Gymnasium Score Board.
 - c. Auditorium Stage Lighting System/Sound System.
 - d. Music Rooms Intercom.
 - e. Stage (Platform) Intercom System.
 - f. Stage (Platform) Sound System.

O. SPECIAL CONSIDERATIONS

1. Dry Type Transformers:
 - a. Ensure transformers are energy efficient per SREF and Specification Section 16460 requirements.
 - b. Provide vibration pads for all transformers.
 - c. Provide a disconnecting means on the primary side of the transformer when the source of power is not within sight.

- d. Step down transformers shall not be concealed above ceiling spaces.
 - e. Minimum wire size and over current protection shall be sized per NEC Table 450.3B at 100% of the transformer's KVA rating.
2. Electrical Motors:
- a. Ensure motors are energy efficient.
 - b. Provide motors with a minimum power factor of 0.85 at 100 percent load.
 - c. Motor Efficiency: Comply with IEEE Test Procedure 112, Method B.
 - d. Provide motors with a Motor Saver Catalog No. 455 as manufactured by Sym Com, Inc.
3. Emergency Generators:
- a. Emergency generators sized 125 KW or less shall be LPG engine driven. Emergency generators sized over 125 KW shall be diesel engine driven.
 - b. Provide a cost comparison analysis for the use of LPG vs. diesel fuel. Address and comply with EPA and DPEP environmental requirements.
 - c. When adding a new generator to an existing facility, make provisions to allow for future connection of items listed under Section B.2b (Electrical Design Criteria) to the generator system.
4. Emergency Power: Types of emergency backup power shall not be mixed on any one campus. Backup emergency power shall be provided by any one of the following:
- a. Rechargeable central storage battery system.
 - b. Generator-Supplied automatic transfer switch.
 - c. Non-Interruptible power supply with integral automatic transfer mechanism.
 - d. Exception: "Unit equipment" type emergency lighting devices in accordance with NEC Article 700-12 will satisfy the requirement for initial and backup emergency power to emergency lighting equipment and exit signs only when connected to the very same branch lighting circuit that serves the general illumination in that room in which the "unit equipment" fixture is mounted. Cord and plugs are not allowed.
5. Provide two remote generators shut off switches, one inside the generator room by door and the second by the generator remote annunciator in administration office.
6. Provide a disconnect or breaker for each range (stove) located in classrooms. Mount disconnect near range (stove) between 60" – 72" AFF.
7. Each area being used as the EHPA shelter shall be provided with a duplex receptacle connected to the generator with a red cover plate to allow for the connection of a portable TV.
8. The EHPA Manager's Office shall be provided with a dedicated telephone line. In the case of a Special Needs EHPA shelter, two dedicated telephone lines shall be provided in the manager's office, each telephone line shall be provided with an adjacent duplex outlet. The duplex outlet shall be connected to the emergency generator. The EHPA Manager's Office shall be provide with four duplex outlets connected to the generator.
9. All receptacles connected to the emergency generator shall be provided with a red cover plate and the device shall be red in color.
10. Luminaires:
- a. Provide all luminaires above 20 Watts with a minimum of 0.85 power factor.
 - b. Base all classrooms lighting layout on an illuminance computerized analysis for evaluation.
11. Control Panels for HVAC Equipment:
- a. Ensure all panels are "UL" labeled or listed. This requirement includes all air conditioning control panels and energy management control panels as well.

12. Electric Panels:
 - a. No half (1/2) size or tandem breakers allowed.
 - b. When main breaker is required, ensure it is not of the feedback type.
 - c. Electrical Panels: **DO NOT** install panels in classrooms, corridors or in storage rooms. Provide electrical rooms for the installation of the electrical panels.
 - d. Provide surge protection in all panels.
 - e. Electrical panels shall be properly labeled and circuits shall be identified as to use by typewritten directories installed inside the panel door.
 - f. Voltage drops for NEC 215-2 shall be calculated using Note 2 of Table 9 of the NEC and shall not exceed three percent of the nominal line voltage.
13. Wiring:
 - a. Provide a grounding conductor in each wiring raceway (conduit, EMT, PVC, etc.).
 - b. Ensure all conductors are stranded copper.
14. Raceways: Minimum conduit size shall be 3/4 inch. In existing facilities where the existing provisions do not allow for extension of 3/4" conduit from an existing j-box, then 1/2" conduit may be used to feed new devices with the approval of the SBBC Electrical Engineer and compliance with the NEC.
15. Site Visitation:
 - a. The consultant shall coordinate with the SBBC Design Services Section in order to conduct the field inspection. He shall be assisted by an electrician from the SBBC PPO Office for the opening and field data gathering of the electrical panels, devices, etc.
16. Facilities provided with elevator and an emergency generator shall have the elevator connected to the generator. The elevator shall be provided with a dedicated telephone circuit which rings to a 24 hour emergency service.
17. In EHPA shelters, the main fire alarm panel shall be located in the shelter manager's office and a fire alarm remote annunciator panel, with the characteristics as listed in the SBBC Specification Section 13848 – Fire Alarm, shall be located in the school's main administration office.
18. Systems (fire alarm, intercom, clock, security) panels shall be located in the electrical rooms. ER and TRs are dedicated to communication equipment only.
19. PVC conduit is allowed to be used when embedded in the concrete of the tilt up wall construction with a minimum cover of 2 inches concrete and in the cells of a block wall when filled solid with concrete only when the facility is fully fire sprinkled.
20. Emergency Operation of the Lighting System (when switched): If case of a loss of utility power, the emergency generator (when available in the school) will operate within 10 seconds and provide limited power to emergency power light fixtures. The normal power light fixtures will not operate. The emergency power light fixtures are override controlled through a relay and will operate "on", no matter what position its wall toggle switch is in.
21. Electrical connection to other appliances or equipment in the kitchen shall not be made through the use of the Kitchen hood fire suppression system Automan control box.
22. In all new facilities provide a 1-1" power conduit from the closest electrical room with available spare 277V power and 1-2" data conduit to accommodate gel filled copper and possible fiber optic cable from the closest communication's room to feed the marquee sign located on the site. Any marquee sign that will be connected to the phone line needs to be surge protected. Please contact the Telecommunication's Coordinator to authorize final connection to the telephone line. Existing facilities shall be inspected to determine available power source.

23. All hand dryers located in group toilets shall be connected through a breaker capable of being locked in the open position to comply with NEC (FBC adopted edition) Chapter 422-31 (b).
24. Rooms housing transformers above 112.5 KVA shall be made of fire resistant construction with a minimum of 1 hour fire rating to comply with NEC 2005 450.21(B).
25. In Middle and High School Science Classrooms and the Science Material Storage/Preparation Areas provide a normally closed, lever-operated manual reset, 120Volt electric solenoid valve in the ceiling area. In addition the exterior above grade building natural gas or LP supply main entering the building and containing the gas meter (natural gas only) shall be provided with a weatherproof, normally closed, lever-operated manual reset, 24 VDC electric solenoid valve. Refer to the SBBC Mechanical Design Criteria for additional requirements.
26. In a fire sprinklered facility the requirements for the electrical rooms shall follow NFPA 13-5-13.11 Exception.
27. Lightning protection shall be provided for all facilities in high lightning risk areas and shall be evaluated using the Risk Assessment Guide in NFPA 780 and other standards which address lightning protection, and shall be protected accordingly.
28. Provide a data drop with a single gang box with 1" conduit and wiring homerun to the nearest TR (Telecommunications room) and a duplex receptacle for the Kronos Machine. Coordinate height of both outlets with manufacturer's recommendations.
29. Provide a data drop with a single gang box with 1" conduit and wiring homerun to the nearest TR (Telecommunications room); also provide a quad of power outlet for the STAR computer.
30. Point of Sale: All cash registers shall be provided with a single gang outlet box higher than 18" with 1" conduit and wiring back to the nearest TR (Telecommunications Room). The cash registers will be connected to the network. In the cafeteria managers office provide one data quad outlet in front of the office under the glass window and another in the back of the office for connection of two computers. The wiring for the computers and cash registers shall be installed in accordance with SBBC Specification Section 17000 and SBBC Voice, Data and Video Structured Cabling Design Criteria.
31. Kitchen Bell: Provide a single gang box with 1" conduit and wiring from the kitchen bell location to the nearest TR for connection to the telephone system.
32. Do not locate manholes or pull boxes in sport fields and play ground areas.
33. Each instructional space shall be provided with a Sound Field Classroom Sound Enhancement system. The system will require power connection and shall be located in the front of the classroom in the media cabinet. Refer to Instructional Spaces – Typical Layout Detail and Specification Section 16820 – Sound-Field Classroom Sound Enhancement.
34. Each instructional space shall be provided with laptop charging outlets located on the wall opposite to the teaching wall. There shall be two duplex outlets each on a separate circuit (royal blue in color) and one quad outlet (gray in color). The royal blue duplex outlets shall be for the connection of the charging carts (NIC) and the gray quad outlet is for the connection of a computer workstation (NIC). Refer to the "Instructional Spaces – Typical Layout Detail".
35. Each instructional space shall be provided with a projector (NIC) located as indicated in the "Instructional Spaces – Typical Layout Detail". The consultant shall coordinate the projector location with the luminaires. The row of luminaires where the projector is located shall be controlled by one of the light switches.

36. All conductors shall be pulled for rough-in inspection.
37. MC CABLE IS NOT ALLOWED.
38. The Main Demarcation Room shall be located next to the ER and shall have plywood backboard on all walls painted with fire retardant paint gray in color. This room shall house the terminal cabinets and be the main termination point for all systems (i.e. ITV/CCTV, intercom, clock, fire alarm, etc) entering the school. This room shall have a GFI duplex receptacle on each wall.
39. Floor mounted receptacles/pedestal receptacles in the kitchen area shall be provided with GFI/WP in use covers.
40. PVC Schedule 80, UV resistant conduit shall be used outdoors when exposed to the chemical agents in chiller system cooling tower yard and irrigation equipment installations in compliance with NEC 110-11.
41. Automotive labs shall comply with NEC 511.
42. Minimum circuit breaker size for 120V, single phase circuit shall be 20A, unless a smaller size is required by the manufacturer for equipment protection.
43. RADIO REPEATERS: Each new school shall be provided with a radio repeater. The repeater shall have a dedicated duplex receptacle on emergency power located in a centrally located TR room on the highest point of the school. The antenna shall be mounted using a bracket provided by the manufacturer. Provide a roof penetration for the UHF Conventional Radio Transmission System antenna to route a 1" conduit with a pull string from the antenna location to the repeater in the TR room. Bond roof mounted antenna to the lightning protection system. Roof mounted conduit shall comply with SBBC Specifications Section 07600. Provide 120V receptacle from the generator for each of the designated emergency broadcast receiver, radio communication repeater station, EHPA, and wireless propagation enhancement systems headend locations.
44. At a minimum provide charging capacities for 2 golf carts in elementary schools, 3 – 4 golf carts in middle schools and 5 – 6 golf carts in high schools. This requirement shall be coordinated with the Educational Specifications and school staff.
45. In stairwells do not locate light fixtures directly above the tread and risers. Light fixtures shall be on the walls mounted at each landing/level areas with bottoms at 10'-0" AFF or 12" below the ceiling whichever is less.
46. Renewable Energy: The feasibility of using a photovoltaic system, wind turbine generators, or geothermal energy shall be investigated.
 - a. Analyze electrical loads of the building to determine size of renewable energy system.
 - b. Consult SBBC if electronic displays featuring energy production information in public areas are required.
 - c. Document the On-Site Renewable Energy Sources used, the annual energy generated from each source, and the backup fuel for each source.
 - d. Document the source of annual energy cost information, and provide appropriate energy values and costs.

P. EXHAUST FANS

1. Ensure all general exhaust fans in toilets and in non-classroom areas such as gymnasiums, auditoriums, etc. are started and stopped by a single zone switch on the central H.O.A. Control Panel already dedicated to close the outside air damper of the air handler unit serving that zone. Continuously exhaust these areas during occupied periods and shut down during evenings, weekends and holidays when the building is unoccupied.
2. Design all exhaust fans, with the exception of the kitchen hood exhaust fan, to immediately shut down upon activation of the building fire alarm system. The kitchen hood supply exhaust fans shall shutdown upon activation of the kitchen hood fire suppression system.
3. All custodian room exhaust fans shall be electrically interlocked to the associated air handler unit serving that zone. Only as a last resort and approval by the SBBC Design Services Section shall the fan is equipped with a time-delay switch so that the fan continues to operate for a minimum of five minutes after the light has been turned off.
4. Provide the Science Material Storage/Preparation Area Organic and Inorganic Storage Rooms with continuous operating, explosion-proof exhaust fans coated with a chemical resistant coating. In the Middle and High School Science Material Storage/Preparation Area and in the Science Chemistry Classrooms containing fume hoods only, provide mechanical exhaust systems according to the Mechanical Design Criteria containing a 5 minute time delay relay located behind the Teacher's demo table and provided with an engraved sign per Mechanical Design Criteria. The same applies to the Flammable Storage Room with the exclusion of the chemical resistant coating. An audible alarm activated by a pressure differential switch in the exhaust ductwork shall be provided to indicate fan failure. All devices, including luminaries, inside both organic and inorganic storage rooms shall be explosion proof.
5. 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, Science Organic and Inorganic Storage Rooms and the Flammable Storage Room to indicate fan failure. The alarm shall be wired on a separate circuit.
6. The Flammable Storage Room and Outdoor Equipment Storage Room exhaust fans shall be electrically interlocked to the emergency generator so that they are energized at all times during non-hurricane and hurricane periods. This will provide continuous exhaust in these rooms so as to prevent any flammable vapor buildup.
7. The Dust Collector shall operate only when the starter is activated in the "ON" position. The dust collector shall be electrically connected to the zone AHU so that shutting down the AHU by the fire alarm system shall also shutdown the dust collector.
8. The kiln room exhaust fan shall operate when the local control starter is in the 'ON' position. A local firestat shall shutoff the fan in the event of a fire. Ensure that the fan is not interlocked with the air handling unit. Exhaust fan is to be interconnected with the kiln operation.
9. Ensure that the kitchen waterwash exhaust hood is independent of the kitchen air conditioning system.
10. The Spray Booth Compressor shall be interlocked with the exhaust fan.

Q. EMERGENCY CUTOFF SWITCH

1. Provide every laboratory space that has electrical receptacles at student workstations, with an emergency cutoff switch key reset within 15 feet of the teacher's demo table. Ensure that the emergency cutoff switch is operable by a single motion and interrupts power to all receptacles in

room. Emergency cut off switches shall use a contactor circuitry, do not use shunt trip breaker to accomplish this operation. Emergency cut off switches are not required in computer laboratories.

2. In the middle and high school science and chemistry lab classrooms, provide a Master Control Utility Panel with a lockable hinged cover installed recessed in the partition wall behind the teacher's demo table. The Master Control Utility Panel shall contain a printed circuit board along with three front panel mounted push buttons to activate/deactivate the gas, water and electrical services; a 60 minute time switch; and a front panel mounted red panic ON/OFF mushroom button. The system shall also include ceiling mounted solenoids containing a normally closed, lever-operated manual reset, 24 Volt electric solenoid valve along with a manual quarterturn butterfly valve for each of the gas, water and electrical services; and an electrical contactor box enclosure. The Master Control Utility Panel shall be similar to the Utility Controller manufactured by Isimet (Naples, TX). Take note that automatic reset type solenoid valves are **PROHIBITED**
3. In the middle and high school science material storage/preparation area, provide a Master Control Utility Panel with a lockable hinged cover installed recessed in the partition wall behind the teacher's prep table or other designated area. The Master Control Utility Panel shall contain a printed circuit board along with three front panel mounted push buttons to activate/deactivate the gas, water and electrical services; a 60 minute time switch; and a front panel mounted red panic ON/OFF mushroom button. The system shall also include ceiling mounted, solenoid box enclosure containing a normally closed, lever-operated manual reset, 24 Volt electric solenoid valve along with a manual quarterturn butterfly valve for each of the gas, water and electrical services; and an electrical contactor box enclosure. The Master Control Utility Panel shall be similar to the Utility Controller manufactured by Isimet (Naples, TX). Take note that automatic reset type solenoid valves are **PROHIBITED**
4. The Master Control Utility Panel 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 ON/OFF mushroom button shall not activate the building fire alarm system...but activation of the building fire alarm system shall de-energize the main building gas solenoid valve via a set of contacts.
5. Provide every shop space which has power operated machinery accessible to students with at least two emergency cutoff switches which shuts off power to student accessible machines and receptacles in the shop. Locate one emergency cutoff switch near the machinery and one in the instructor's office if there is a clear view of the entire shop area. Ensure the emergency disconnect switch is operable by a single motion. In addition, all equipment in the shop space shall be provided with electro magnetic starters controlled by a Start/Stop station. Do not provide shunt trip mechanism with the emergency cutoff switches. Emergency cutoff switches shall be via contactors. Refer to typical detail.

EXCEPTION: Non-hazardous machines not requiring emergency cutoff includes office machines, computers, sewing machines and potter's wheels.

6. Provide a "Panic" switch inside the sauna and steam room, two (2). Tie the panic switch into an alarm or other approved warning device in a supervised space inside the sauna and/or steam room. Label the operation of the switch to indicate the intended function.
7. Provide a disconnect or breaker for each range (stove) located in classrooms. Mount disconnect near range (stove) between 60" – 72" AFF.
8. Provide two remote generators shut off switches, one inside the generator room by door and the second by the generator remote annunciator in administration office.

R. ENERGY MANAGEMENT/SECURITY (EM/S) SYSTEM

1. The SBBC has integrated Energy Management/Security (EM/S) at every school site. The EM/S system consists of TAC-Andover Controls Corp. based equipment which starts and stops the HVAC equipment and optimizes the outside lighting. In addition, the system interfaces to the electronic security devices which report intrusion alarms to a central monitoring station.
2. The Central H.O.A. Control Panel shall be located in the Media Center ER. A 36 inch x 24 inch EM/S panel shall be mounted adjacent to Central H.O.A. Control Panel so an open wall space will be required. In existing schools requiring replacement of the existing automatic temperature control (ATC) system, the new ATC system shall be wired back to the existing Central H.O.A. Control Panel. A simplified sequence of operation geared to a non-technical individual explaining the ATC system operation shall be installed behind a Plexiglas or Lexan cover adjacent to the Central H.O.A. Control Panel. An electrical schematic drawing of the equipment shall also be provided in a similar manner for use by SBBC maintenance personnel during servicing of the equipment.
3. Ensure all AHU's, chilled water and condenser water pumps, general exhaust fans, toilet exhaust fans, etc. and all outside air dampers are started/stopped or open/closed by the Central H.O.A. Control Panel. Should the installed ATC be manufactured by Johnson Controls or Siemens Controls (approved for building additions only), the panel shall be provided with separate, face mounted Hand-Off-Auto (H.O.A.) switches, zone status pilot lights and permanent engraved labels for each zone. In most cases, the ATC shall be as manufactured by TAC-Andover Controls Corp. and the front panel shall be blank since the above functions shall be controlled by a desktop computer at the facility and at the SBBC/PPO Energy Conservation and Utility Management Office located offsite. Each zone should not exceed a total of 20 HP connected fan motor load. The mechanical room outdoor air dampers and toilet exhaust fans shall be on one zone and separate from the AHUs. The HVAC equipment is to be enabled and disabled by a single zone switch. All electrical wiring interfaces between the SBBC EM/S system and the HVAC system will be done at the auto side of the H.O.A. switch for Start/Stop control.
4. Electrical Requirements: Without having a specific building design, it's nearly impossible to specify conduit layouts. The basic design concept is to provide a 1-inch conduit from each electric room, home run to the Media Center Equipment Room (ER). Install a 120 VAC quad outlet for the security power supply in each electrical room. During the Phase plan review, contact the SBBC designated EM/S representative, Telephone #754-321-4757, for site specific conduit layout requirements and additional information concerning the EM/S interface and ATC requirements.
5. Design of Energy Management System shall comply with SBBC Specification Section 15900.

S. COMMUNICATIONS INFRASTRUCTURE

1. Refer to SBBC Technical Specifications Section 17000 (Voice, Data, and Video Structured Cabling System) and SBBC Voice, Data and Video Structured Cabling Design Criteria.
2. Refer to Standard Detail for Instructional Spaces Typical Layout Detail.

T. LIGHTNING PROTECTION SYSTEM

1. Evaluate new facilities using the Risk Assessment Guide in NFPA 780, and provide protection accordingly.
2. Installation of the lightning protection system shall be in accordance with the Specifications.
3. Do not install copper lightning protection materials on aluminum surfaces.

4. Do not install aluminum lightning protection materials on copper surfaces.
5. Provide lightning protection for buildings, covered walkways, press boxes, scoreboards, and all other structures required and/or recommended by NFPA 780.

U. DETAILS

1. Refer to the installation details as prepared by SBBC Design Services Section.

V. GENERAL COMMENTS

1. Standard SBBC electrical details to assist the consultant on the execution of his work are available from the SBBC Facilities and Construction Management Department, Design Services Section.

END OF SECTION