

ELECTRICAL DESIGN CRITERIA

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ELECTRICAL DESIGN CRITERIA

I GENERAL

- A. The Design Professional shall use this document in conjunction with the Educational Specifications, and District Master Specifications (DMS) to develop the design and contract documents
- B. Goals:
 - 1. Design the project to meet a nationally recognized high-performance green building rating system as approved by the Department of Management services. Such approved systems include the:
 - a. United States Green Building Council, Leadership in Energy and Environmental Design (LEED).
 - b. Green Building Initiative's Green Globes rating system.
 - c. Florida Green Building Coalition Standards.
 - d. International Green Construction Code.
 - 2. Provide safe and secure life safety system for the structures.
 - 3. Provide safe useable electrical system for end users.
- C. This division contains requirements for the following elements:
 - 1. Power Distribution Systems
 - 2. Lighting
 - 3. Switching
 - 4. Electrical receptacles
 - 5. Electrical Systems
 - 6. General requirements
- D. In this document, the term Engineer represents the professionally qualified Design Engineer of Record or Engineering Consultant, duly licensed in the State of Florida, that signs and seals project construction documents.
- E. The Engineer is the person responsible for the design and development of all project documents.
- F. Design shall incorporate the latest design or code requirements.
 - 1. National Electric Code, NEC
 - 2. Illuminating Engineering Society of North America, IES
 - 3. Florida Building Code, FBC
 - 4. Educational Specification
 - 5. National Fire Prevention Code, NFPA
 - 6. National Electric Safety Code
- G. Submittal requirements as listed in procedure BD-001 – Submission for Project Documents
- H. The Criteria shall not limit or restrain the performance and liability of the Professional or Professionals responsible for the integrity and performance of the structure.
- I. The Criteria is applicable to new construction and to the remodeling and renovation of existing facilities.
- J. The use of the Criteria in this document does not exempt the Design Professionals from any federal or state code or standards controlling the design and construction of any Facility.
- K. Do not put electrical systems on the same drawings with electrical power system.
 - 1. Provide separate electrical systems drawings.

II CRITERIA

A. POWER DISTRIBUTION SYSTEMS

1. Normal Power:

- a. Electrical service for new facilities shall be 277/480 volts, 3-phase, and 4-wire.
- b. Main service entrance panel / switchboard (MDP, MSB, switchgear) shall have a minimum 10% spare capacity (this means 10% spare ampacity and 10% spare circuit breakers).

- c. Distribution and Branch Circuit panels shall have a minimum of 20% spare capacity (this means 20% spare ampacity and 20% spare circuit breakers).
- d. Each school facility shall have only one electrical service as defined by NEC Article 230.
- e. Provide only one electric meter for each school facility.
 - 1) Exception: Sports lighting installed and maintained by local municipalities (county or cities) on School District owned facilities shall have a separate electrical service and meter.
- f. Size feeder conductors to meet the maximum voltage drop of 2%.
- g. Remodeling, renovation or addition to the existing facilities: the Engineer shall determine the adequacy of the existing service, and if necessary replace with a larger service.
- h. 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.
- i. Main switchboard (Main Distribution Panel) shall be in a dedicated room with two (2) entry/exit doors (one door at each end of the room). One set of door(s), double if needed, must be opening to the exterior, and second door may be opening to the interior or exterior of the building.
 - 1) Doors shall open in direction of exit and shall be equipped with panic hardware.
- j. Locate all electrical distribution panels in dedicated electrical rooms. Panels cannot be located in the storage rooms or student occupied spaces.
- k. Receptacles for computers and data equipment shall be connected to separate and dedicated panels.
- l. Step down transformers shall not be located above ceiling spaces. Place transformers larger than 45 KVA on housekeeping pads at floor level; mounting on the ceiling or hanging from the ceiling is not acceptable.
- m. All new main distribution panels, branch circuit panels, disconnect switches, and motor starters shall be provided with Arc Flash equipment labeling to include all the information required by NEC Article 70E-130.5(C).

2. Emergency Power

- a. The initial source of life safety branch of emergency power shall be a separate service lateral.
 - 1) Connect the emergency service feeders directly from power company transformer to an emergency power panel-board or disconnect switch.
- b. Provide new facilities with an emergency generator.
- c. Total load on new generator shall not exceed 80% of the generator rated capacity.
- d. In existing schools, with major remodeling, renovations, or additions back-up emergency power source shall be from an emergency generator.
 - 1) When adding a new generator to an existing facility, make provisions to allow for future connection of entire campus to the generator system, this means sizing the new emergency generator, transfer switches, feeders, and panel-boards to supply the entire facility.
 - 2) The load on the existing generator shall not exceed 90% of the generator rated capacity.
- e. Emergency Generators for Non-EHPA facilities:
 - 1) Emergency generator shall be LP gas or natural gas.
 - a) DESIEL GENERTORS ARE NOT ALLOWED.
 - b) When natural gas is available on the site, emergency generator shall be natural gas type.
 - c) When natural gas is not available on the site, emergency generator shall be LP gas with a separate and dedicated on-site storage LP gas tank for minimum of 4-hours full demand operation.
 - 2) Emergency Generators for EHPA facilities:

- a) When natural gas is available on the site, emergency generator shall be dual type natural gas / LP gas type.
 - (1) Natural gas shall be primary and LP gas shall be back-up.
- b) When natural gas is not available on the site, emergency generator shall be LP gas type but must have capabilities for future connection to natural gas.
- c) All generators for EHPA facilities shall have separate and dedicated on-site storage LP gas tanks for minimum of 24-hours full demand operation.
- 3) Provide the emergency generator system with two separate branches of power:
 - a) Life Safety and Optional Standby Loads.
 - b) Provide separate automatic transfer switches and disconnect switches for each branch.
- 4) The following are systems that shall be connected to emergency generator:
 - a) Through Life Safety Transfer Switch
 - (1) Emergency Lighting
 - (2) Exit Signs
 - (3) Elevator car Lights
 - (4) Fire Alarm
 - (5) Intercom System
 - (6) Fire Pump
 - b) Through Optional Standby Loads Transfer Switch
 - (1) Security System
 - (2) Main Telephone Board
 - (3) Card Access System
 - (4) Video Surveillance System
 - (5) Data equipment (MDF and IDF rooms)
 - (6) Air conditioning systems in MDF and IDF rooms (data equipment rooms)
 - (7) Receptacles for the EHPA
 - (8) EMS' Control Panels
 - (9) All Mechanical equipment required for EHPA
 - (10) Cooler/Freezer
 - (11) Elevator equipment motors and controls
 - (12) School District owned and operated lift station
 - (13) One (1) 125 volts, 20 amps receptacle in the Clinic for the refrigerator
 - (14) One (1) 125 volts, 20 amps receptacle in each School Police Office(s)
 - (15) One (1) 125 volts, 20 amps receptacle in the Media Center
 - (16) One (1) 125 volts, 20 amps receptacle in Principal's Office
 - (17) One (1) 125 volts, 20 amps receptacle in the Dining room
 - (18) One (1) 125 volts, 20 amps receptacle in the Gymnasium
 - (19) One (1) 125 volts, 20 amps receptacle in the Main Electrical Room
- 5) Transfer life safety loads to generator within 10-seconds of normal power loss, transfer optional standby loads to emergency generator within 30 to 60 seconds of normal power loss.
- 6) Locate the emergency generator and automatic transfer switches in a dedicated, two hour fire rated room with doors opening directly to the outside and located at a corner of the building.
 - a) 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.
- 7) Generators for the facilities designated as an EHPA shall have two remote annunciator panels; one in the EHPA managers' office and second in the main administrative office area.
- 8) Emergency system overcurrent devices shall be selectively coordinated with 0.1 second response time.

- a) Project Electrical Engineer (Engineer of Record) must submit a signed and sealed letter to the Building Department certifying that installed emergency power system is a selectively coordinated system and meets the requirements of NEC Article 700 and District Design Criteria.
 - 9) Spaces with unit equipment emergency lights shall utilize wall pack battery lights connected to local lighting circuit ahead of any switching.
 - 10) Connect self-powered exit signs to local lighting circuit ahead of any switching.
 - a) Provide self-powered exit signs in facilities without a generator.
 - 11) Provide battery back-up for the fire alarm panel.
 - f. All new automatic transfer switches and panels shall be provided with Arc Flash equipment labeling to include all the information required by NEC Article 70E-130.5(C).
3. Provide Surge Suppression Devices for Power Distribution Equipment as noted below:
- a. Normal and Emergency main service entrances equipment (panels).
 - b. All distribution and branch circuit panels for computer and lighting loads.

B. LIGHTING

1. General

- a. All luminaries shall be LED type with color temperature of 4000°K.
- b. Provide illumination computations for all non-standard layouts
- c. DO NOT use Coffered type light fixtures in any SDPBC school or ancillary facilities.
- d. Avoid placing light fixtures directly above projection screens; if necessary provide switching of the fixture allowing teacher control of fixture.

2. Average Maintained Light levels

- a. Classroom Lighting 45-50 FC
- b. Laboratories & Shops 50-55 FC
- c. Computer Laboratories 45-50 FC
- d. Media Center 50-55 FC
- e. Cafeteria 45-50 FC
- f. Kitchen 60-65 FC
- g. Administrative Offices 45-50 FC
- h. Teacher Planning Spaces 45-50 FC
- i. Corridors and Stairs 20-25 FC
- j. Gymnasiums 50 -60 FC
- k. All Other Interior Areas (refer to IES recommendations)

3. Exterior Lighting

- a. Minimum of one (1) foot-candle for walkway covers and canopies.
- b. Provide an average of one (1) foot-candle for building perimeter lighting.
 - 1) Provide wall packs around the perimeter of the buildings and adjacent to all entrances to the building.
 - 2) Place building mounted fixtures no more than 10 feet above grade.
- c. Provide an average of five (5) foot-candles at building entrances.
- d. Provide a minimum of one (1) foot-candle for the courtyards.
- e. All luminaries shall be LED type with color temperature of 5000°K.
- f. Locate lighting fixtures for the aluminum (metal) canopies and walkway covers on the columns with branch circuit conduits extended underground to the base of each column.
- g. Minimum of five (5) foot-candles lighting in open chiller plants controlled by four hour timer switch.
- h. Parking Lot and Bus Loop areas
 - 1) Minimum maintained of one (1) foot-candle with maximum to minimum ratio of 10 to 1.

- 2) Coordinate location of light poles with the architectural and landscape site plans to avoid conflict with trees.
- 3) All luminaries shall be LED type with color temperature of 5000°K.
- 4) Maximum mounting height for light poles shall be 25 feet.
- i. Lighting spillage and glare into residential properties at a minimum shall meet the Palm Beach County Lighting Ordinance.
- j. All light fixtures installed on exterior buildings walls and walkway covers shall be of type with shields or constructed to provide full cutoff light distribution.

4. Sport fields

- a. Discuss the design criteria with SDPBC Electrical Engineer prior to designing.
 - 1) Provide lighting for all high school sports fields unless waved by School District.
 - 2) Sports fields lighting shall meet recommendations of IES and School District requirements.
 - 3) Lighting to cover all bleacher areas of the High School stadium, both above and below seating area.
 - 4) Provide stadium bleachers with minimum of 10-foot-candle lighting.
 - 5) Provide below the stadium bleachers and exit pathways from bleachers with minimum of 2-foot-candle lighting.
- b. Install sports lighting on the same electric meter main buildings, unless another municipality (county or city) is maintaining and paying for the lighting.
- c. Provide two (2) LED light fixtures on each pole that are supplied by building emergency power.
- d. Sports fields lighting fixtures shall be LED type with color temperature of 5000°K.
- e. Provide provisions (conduits and wiring for power and controls) for sports-fields scoreboards.
- f. Provide provisions for football field pole mounted speaker systems, verify requirements with School District.
- g. Provide non-lighted sports fields (baseball, softball, and multi-purpose fields) with spare conduits for future lighting.
 - 1) Each field shall have 1-4" conduit extended from main electrical room to an underground pull box near the fields.
- h. Provide normal and emergency illuminations at all means of egress from stadium bleachers.
- i. Use remote ballast light fixtures for pole mounted sports lighting.

5. Emergency lighting

- a. Requirements refer to FBC and NFPA requirements.
- b. Provide two luminaries connected to emergency power in each area where emergency lighting is required by FBC or NFPA.
- c. Provide additional emergency lighting in all electrical rooms, elevator equipment room, elevator cab, mechanical rooms, central receiving, and teacher dining area/lounge.
- d. Provide switches for all emergency lights.
- e. Use relays for automatic switching of emergency lighting (where emergency lighting is required by FBC or NFPA). Relays shall be wired failsafe.
- f. Provide relay interlocks and on/off switches for emergency lights installed in classroom, corridors, group toilets, stairs and office areas to prevent 24 hours per day operation
- g. Each space including stairs where emergency lighting is required shall have minimum of two (2) light fixtures on emergency circuits.
- h. Provide one light fixture un-switched and connected to emergency branch circuit in each elevator lobby.

6. Incandescent light fixtures

- a. Avoid using incandescent light fixtures.

7. LED lighting fixtures

- a. Full use of LED lighting is required

- b. LED lights in all interior spaces shall have color temperature of 4000°K.
- c. LED fixtures shall have a lumen package as needed to produce the desired illuminance for the type of space being illuminated.

8. Stair Ways and Ramps

- a. Locate fixtures over landing, not stairs.
- b. Locate fixtures a maximum of 12' above the landing level.

C. SWITCHING

1. Circuits parallel to window walls shall enable those fixtures be dimmed or off in response to sufficient daylight.

2. Classrooms, instructional spaces, and conference rooms:

- a. Low voltage dimmers to control light fixtures on normal branch circuits and emergency branch circuits.
- b. Dimmers to allow multi-level of lighting in each space.
- c. Provide override relays to control light fixtures on emergency branch circuits to allow full level emergency lighting in the event of loss of normal power.
- d. Provide ceiling mounted occupancy sensors or vacancy sensors to automatically turn off lights within 30 minutes of all occupants leaving the space.
- e. Provide ceiling mounted occupancy sensors or vacancy sensors to allow manual lights on OR controlled to automatically turn the lighting on to not more than 50 percent of power.

3. Corridors and Group Restrooms:

- a. Controlled by EMS. See section for Automatic Control of Interior lights.

4. Gymnasium, Dining, Media Center and Similar Assembly Spaces:

- a. Locate gymnasium light switches (one set only) in a lockable cabinet near the main exit doors.
- b. Provide multiple sets of lights switches (3 and 4 way light switches) at each main entrance to the dining room, media center, and other assembly spaces.
- c. Control emergency lights by separate red switches via override emergency relays.
- d. Refer to "Automatic Control of Interior and Outdoor Lighting" for additional requirements.

5. Offices, teacher planning rooms, single restrooms, storages, and other non-instructional spaces:

- a. Provide wall switches and occupancy sensors to automatically turn off lights within 30 minutes of all occupants leaving the space and allow manually on.

6. Clinics

- a. See prototype clinic in Ed Specs.
- b. Provide separate switches for each of the cot areas.
- c. Each area shall have separate automatic lighting switch (switch with integral motion sensor.)

7. Automatic Control of Interior and Outdoor Lighting:

- a. Provide switching and dimming that responds to available daylight as required by the Florida Building Code.
- b. Interior lights supplied from normal and emergency power:
 - 1) Provide an occupancy sensor in every classroom, computer lab, home economic, skill lab, art lab, resource room, and press box, concession building rooms, large storage rooms, large office, weight room and all other similar spaces.
 - a) Occupancy sensors shall control the light fixtures in each space when the wall light switch is in "on" position.
- c. Occupancy sensors shall be ceiling mounted and located in the room for best results.
- d. Control light fixtures in the corridors, stairs and group restrooms by (EMS).
 - 1) Provide each floor of every building with one separate control point.
- e. Control light fixtures in the gymnasium, gymnasium lobby, locker rooms, shower areas, and its restrooms by (EMS).

- f. Control light fixtures in every large assembly area (dining room and associated stage and kitchen, media center, auditorium) by (EMS).
 - 1) Provide each space with one separate control point.
- g. Provide a switch for each space to override the EMS control of the lights during scheduled off hours/days.
 - 1) Override switches shall provide maximum of two (2) hours lighting.
 - 2) Override switches shall be capable of turning the lights on and off only during scheduled off hours/days.
 - 3) Locate the override switches next to the wall mounted light switches for each space.
Exception: for the corridors locate an override switch adjacent to each entry door.
- h. Provide required lighting contactors for EMS control.
 - 1) Locate contactors in the electrical rooms next to the lighting panels.

8. Additional requirements for the interior emergency lights:

- a. EMS shall control emergency lights in the corridors, and group restrooms.
 - 1) No manual wall mounted switches are required.
- b. EMS shall control emergency lights in the main lobbies (administration building, gymnasium building, media building, and similar spaces).
 - 1) No manual wall mounted switches are required.
 - 2) Locate occupancy sensors as needed for maximum reliability.
- c. EMS shall control emergency lights in the student locker rooms.
 - 3) No manual wall mounted switches are required.
 - 4) Locate occupancy sensors as needed for maximum reliability
- d. Provide override relays that bypass occupancy sensors and EMS control upon loss of normal power.
 - 1) Emergency lights must automatically turn “on” within ten (10) seconds of the loss of normal power in the area.
- e. Control emergency lights in all other spaces only by wall lights switches (red) via override relays.

9. Outdoor lights supplied from normal power:

- a. Methods of Control:
 - 1) Energy management system
 - 2) Astronomical time clocks with integral battery backup for schools without energy management system
- b. Divide outdoor lighting into three categories, and provide separate branch circuits and EMS controls points as stated below:
 - 1) Parking lot, service area, and bus loop area lighting.
 - a) Provide multiple branch-circuits and EMS controls points for sectional control of each area.
 - 2) Walkway and canopy lighting
 - a) Provide separate EMS control point for control of lights for each building.
 - 3) Security lighting including lights at building entrances and in the path of egress from enclosed court yards and corridors.
 - a) Connect to emergency branch circuits
 - b) Provide override relays to bypass EMS control upon loss of normal power.
 - c) Emergency lights must be automatically be turned “on” within ten second of the loss of normal power.
- c. Sports fields' lights shall have manual controls with time clocks to override manual controls.
 - 1) Locate controls near the sports fields.
- d. Lighting contactors shall be provided for EMS control, locate in the electrical room next to the lighting panels. Contactors shall have HOA switching capability.

D. ELECTRICAL RECEPTACLES

1. Floor boxes

- a. Do not use Floor Boxes, unless you have written permission from the District.

2. Location for general 20A-120 volt duplex receptacles

- a. In Pre-K through 1st grade classrooms, provide child safety receptacles (tamper-proof) within the students reach.
- b. Provide GFI receptacles in all elementary special needs classrooms.
- c. Classrooms: Instructional wall to have minimum of three, all other walls one plus specific requirements such as receptacles for computers, media cabinet, teacher desk station, and other equipment.
 - 1) One receptacle shall be located in the center of instructional wall.
 - 2) Location and number of receptacle outlets shall meet the requirements of the Educational Specifications' prototype classroom layouts.
 - 3) Refer to prototype classroom, music suites, and science rooms in Ed Specs for additional receptacles locations.
- d. Corridors: Every 100 feet and maximum 25' to end of corridors
- e. Storage and other closets: Minimum of one in each space, except as indicated on prototype classroom in Ed Specs, no receptacle in the storage room.
- f. Multi-Purpose Spaces such as media center, cafeteria, etc.:
 - 1) Every 20 feet, maximum 15 feet to end of each wall plus requirements per Educational Specifications
 - 2) Provide outlets on one side of columns located in the media center and cafeteria
 - 3) Refer to prototype media center in Ed Specs for additional receptacles locations
- g. Other instructional areas: Same as classrooms plus requirements per Educational Specifications
- h. Mechanical Rooms: Minimum of one GFI.
- i. Gymnasiums: Minimum of three per wall.
- j. Teachers' Lounge: Minimum of eight, on four dedicated branch circuits with three for counter, one for non-counter walls.
- k. Offices and teacher planning rooms: Minimum of one per wall.
 - 1) Additionally, teacher planning rooms shall have two 20 amps, 125 volts receptacles on dedicated branch circuits for future vending machines.
- l. Secretarial Areas: Minimum of two in each wall plus requirements per Educational Specifications.
- m. Electrical Rooms: Minimum of one GFI.
- n. Provide a single receptacle outlet located directly under EWC cabinet unless the EWC's manufacturer requires otherwise.
- o. Custodial Closets: Minimum of one GFI each closet.
- p. Custodial/Central Receiving: Provide two receptacles each wall at 4' AFF, plus receptacles for washer/dryer, refrigerator, and vending machines.
- q. Exterior: Every 250', maximum 50' to end of building, weather proof GFI.
- r. Provide service outlets at 125 volts, 20 amps within 25' of HVAC equipment on the roofs and grounds.
- s. Chiller plants: two 125 volts, 20 amps, outlets (one on each opposite wall), on one branch circuit.

3. Specific location special requirements for electrical outlets

- a. Cart Storage/Charging room provide charging capacities for the following campus types, each charger outlet shall be on a dedicated 20 amp, 120 volt circuit:
 - 1) Elementary: 2 golf carts
 - 2) Middle: 3-4 golf carts

- 3) High: 5-6 golf carts
- b. Special safety provisions refer to FBC.
- c. Provide special outlets for equipment required by Educational Specifications.
- d. Kiln Rooms: Two 50-amp, 208-volt kiln outlets and one GFI 20-amp, 125-volt general receptacle.
 - 1) Provide a high temperature heat detector in the kiln room, interlocked with power to the kiln.
- e. Skills and Computer Labs: Provide branch circuits required for the modular furniture (furnished by School District) for minimum of 30 computers in each lab.
 - 1) Coordinate with Interior Design Coordinator for exact modular furniture power requirements.
 - 2) Provide setup for typical classroom in addition to above.

4. Color or receptacles

- a. All receptacle outlets connected to generator backed-up panels shall be red in color.
- b. All receptacle outlets for communication/data outlets shall be gray in color.
- c. All receptacles controlled by occupancy sensors shall be in green color and be provided with required controlled outlet symbol.

5. General requirements

- a. Refer to educational specification and NEC for specific requirements and outlets for all equipment.
- b. Maximum of six duplex convenience receptacles on any branch circuit.
- c. Provide a dedicated receptacle at each appliance rated for 120 volts, 750 watts and more (EWC, refrigerator, microwave, toaster, coffeemaker, washer, etc) supplied from a dedicated branch circuit.
- d. Drawings shall be coordinated so those receptacle outlets are not located behind cubbies, shelving, and cabinets.

E. ELECTRICAL SYSTEMS

1. General

- a. Do not put electrical systems on the same drawings with electrical power system, provide separate electrical systems drawings.

2. Energy Management System (EMS)

- a. New facilities shall have an energy management system in accordance with DMS.
- b. The EMS shall control the irrigation pump.
- c. Connect the power metering device(s) at main switchboard(s) to EMS.
- d. In a hurricane shelter facility, connect all EMS panels controlling shelter equipment to the optional branch of the generator.
- e. Provide riser diagram for energy management system.
 - 1) Rooms housing main equipment and building boundaries and levels shall be identified on the riser diagram.
- f. For stadium elevators and elevators that open to the exterior of a building, provide a float switch in the elevator pit connected to the Energy Management Control System (EMCS) to send an alarm signal to the EMCS monitoring station when the water level in the pit reaches above the steel grate of the dry sump.
 - 1) General contractor shall coordinate the installation of the raceway system for the float switch.
 - 2) General contractor shall coordinate with the elevator inspector.
- g. Underground EMCS conduits shall be minimum 2 inches.

3. Lightning Protection System

- a. Evaluate new facilities using the Risk Assessment Guide in NFPA 780, and provide protection accordingly.

- b. DO NOT install copper lightning protection materials on aluminum surfaces.
- c. DO NOT install aluminum lightning protection materials on copper surfaces.
- d. Provide lightning protection for buildings, covered walkways, press boxes, scoreboards, and all other structures required and/or recommended by NFPA 780, UL 96A, and DMS.
- e. Provide surge protection devices (SPD) Level I or II on the main switchboard for UL 96A compliance.

4. Fire Alarm System

- a. New facilities shall have a fire alarm system in accordance with DMS, NFPA 72, NFPA 101, and the Florida Building Code.
- b. Where codes allow smoke detector or heat detector, provide heat detector to minimize false alarms.
- c. In non-sprinklered facilities, provide ceiling mounted smoke detectors in media center reading room/stacks, student records room, and stage.
- d. In non-sprinklered facilities/buildings, provide heat detector in group restrooms.
- e. Provide weatherproof speakers/strobes near every main exit door (exit from the building, not exit from a single space) on the exterior of the buildings.
- f. Provide strobe lights in corridors, classrooms, all restrooms, instructional spaces, media center, cafeteria, kitchen, locker room, conference room, lobby, and any other common use area.
- g. A fire alarm strobe light is not required in an employee only work area space such as an office.
- h. Provide speakers in accordance with NFPA 72.
- i. Synchronize all strobe lights in the same room or adjacent spaces visually open to each other.
- j. Fire alarm control panel shall not have a drill switch.
- k. Electrical systems drawings shall show fire alarm shut down relays adjacent to (within three feet of) the equipment they control.
- l. In EHPA facilities locate the fire alarm control panel in EHPA manager's office.
 - 1) Remote fire alarm annunciator panel shall be located in the main office.
- m. Provide a wire guard for fire alarm speaker/strobes in gym.
- n. Fire alarm circuits and devices shall be wired as Class B System with the with the following conditions:
 - 1) No more devices shall be allowed on any circuit than 80% of the manufacturer's design capacity.
 - 2) The end of line resistors shall be located in the fire alarm terminal cabinets.
 - 3) Additions/renovations to the existing facilities with Class A System shall continue utilizing the same wiring method unless existing conduits capacity and sizes allow changes to Class B System.
- o. Speaker/Strobes
 - 1) Provide speaker/strobe devices in all student occupied spaces.
 - 2) Provide speaker/strobe devices in all mechanical and electrical rooms.
 - 3) Provide speaker/strobes and strobes only devices in all spaces as required by NFPA 101, NFPA 1, NFPA 72, and Florida Accessibility Code.
- p. Initiation of elevator lobby (lobbies), top of shaft, or machine room smoke detectors shall recall the elevator to the designated or alternate level.
- q. Heat and smoke detectors shall not be located in a direct air-flow or closer than 3' from a supply air or return air diffuser.
- r. The activation of the facility's fire alarm system shall not activate the NFPA 96 exhaust hood fire suppression system; however the activation of the hood's system shall activate the facility's fire alarm system.
- s. Provide surge protection devices on all wires that enter and leave the fire alarm control panels and booster panels.
 - 1) Provide surge protection devices on all wires that enter and leave the buildings.

- 2) Provide surge protection devices on all 120-volt power circuits serving the fire alarm control panels and booster panels.
- t. Show all fire alarm devices on the fire alarm riser diagram.
- u. Fire alarm system shall comply with the State Fire Marshal Rule 69A-58.
- v. In all School District Owned Buildings with a fire alarm system, provide heat detectors in all unoccupied or unsupervised spaces, if the buildings are not sprinklered.
 - 1) Heat detectors are not required, in spaces protected by automatic sprinkler head.
- w. There shall be fire alarm relay(s) in each mechanical room to shut down the required fans.
 - 1) EMCS shut down of the fans for fire alarm shut down is not acceptable.
- x. Fire alarm control panel shall monitor fire pump fail, fire pump run, and fire pump phase reversal.
 - 1) A fire pump on alternate power provided by an on-site generator shall be monitored as required above, when on alternate power in addition to normal power.
- y. Provide high temperature heat detector in press box.
- z. If there are two strobe lights in one room, they are required to be on opposite walls.
- aa. All fire alarm devices in open-air areas exposed to exterior elements shall be weatherproof, including the heat detector at the exterior landing near the grandstand press box.
- bb. Provide fire alarm pull station at the doors to stairs on upper levels.
- cc. Provide riser diagram for fire alarm system indicating any rooms housing main equipment, and show all building boundaries and levels on the riser diagram.
- dd. Provide battery back-up for the fire alarm system.
- ee. Fire alarm control panel or a fully functional remote annunciator panel shall be located in Administration Reception Area.
- ff. In a high school facility or middle school facility with many buildings, the fire alarm system shall be configured in a network / node configuration utilizing fiber optic backbone wiring between building's control panels and the campus control panel.
- gg. Duct smoke detector is not required in the return air duct of the air conditioning unit, if the return air volume is less than 15000 cfm.
- hh. In order to avoid the nuisance pulls of the fire alarm pull stations in fully sprinklered campus, the designers should take advantage of the exceptions provided in the NFPA 101-2005: 14-3.4.2.3.2 and in the FBC 2007: 907.3.1 to reduce the quantity of the pull stations.
- ii. Provide high temperature heat detector in the kiln room, interlocked with power to the kiln.

5. Security System

- a. New facilities shall have a security system in accordance with DMS.
- b. The designer of the security systems shall meet with and coordinate the design with the School Police Department at the beginning of the project and throughout the design phase.
- c. Locate the security system main terminal cabinet within 95' of the security system antenna.
- d. Provide conduit from the nearest security cabinet to the fire alarm main terminal cabinet.
- e. Provide conduit from the main security cabinet to the main telephone room.
- f. Provide 120V receptacle fed from normal power and 120V receptacle fed from optional branch of the generator at main security terminal cabinet.
- g. Obtain installation details from the School Police Department.
- h. Contractor shall provide a complete security system per DMS Section 28 16 00 (16722), except the owner pulls security wiring and installs security devices.
 - 1) Contractor shall provide pull lines in conduits, cabletrays and J-hooks.
- i. Provide riser diagram for security system indicating any rooms housing main equipment and show all building boundaries and levels on the riser diagram.

6. Video Surveillance System

- a. New facilities shall have a video surveillance system in accordance with DMS.

- b. The designer of the video surveillance systems shall meet with and coordinate the design with the School Police Department at the beginning of the project and throughout the design phase.
- c. Provide conduit from main video surveillance cabinet to main security cabinet.
- d. Provide conduit from main video surveillance cabinet to main card access cabinet.
- e. Provide 120V receptacle fed from normal power and 120V receptacle fed from optional branch of the generator at main video surveillance cabinet.
- f. Video surveillance monitoring room shall have no windows, be provided with supplemental A/C unit, and the door lock keyed separately from the other doors.
- g. Obtain installation details from the School Police Department.
- h. Contractor shall provide a complete video surveillance system per DMS Section 27 33 00 (16723), except the owner pulls wiring and installs devices.
 - 1) Contractor shall provide pull lines in conduits, cabletrays, and J-hooks. School District Police Department determines the locations of the video cameras.
- i. Provide riser diagram for video surveillance system indicating any rooms housing main equipment and show all building boundaries and levels on the riser diagram.

7. Card Access System

- a. New facilities shall have a card access system in accordance with DMS.
- b. The designer of the card access systems shall meet with and coordinate the design with the School Police Department at the beginning of the project and throughout the design phase.
- c. Provide conduit from main card access cabinet to main telephone room.
- d. Provide conduit from main card access cabinet to elevator machine room.
- e. Provide conduit from main card access cabinet to gate.
- f. Provide 120V receptacle next to each card access terminal cabinet fed from optional branch of the generator.
- g. At each controlled door, provide 120V to electric hardware's power supply fed from optional branch of the generator.
- h. Obtain installation details from the School Police Department.
- i. Provide riser diagram for card access system indicating any rooms housing main equipment and showing all building boundaries and levels shall the riser diagram.
 - 1) Show power receptacles required for cabinets on the riser diagram.

8. Intercom Systems for Existing Schools: Intercom systems in existing schools if and when is necessary to be upgraded or replaced shall meet the requirements of DMS section for intercom for "Existing Schools" and as noted here:

- a. Provide two-way intercom for classrooms, instructional spaces, offices, teacher planning areas, kitchen, dining, stage, gym, media center, and custodial receiving area.
- b. Provide ceiling mounted intercom speakers in corridors and areas with ceiling tiles.
- c. Locate the speakers within 15' of the end of the corridor.
- d. If intercom speakers mounted on the buildings do not provide adequate coverage to bus loop area, provide additional speakers at bus loop area.
- e. Install combination call buttons and volume controls in all administrative offices, teacher planning areas, conference rooms, clinic, media center, CCTV studio, and CCTV control room.
 - 1) Expansion on existing systems:
 - a) If the intercom console lacks enough call button stations, the intercom call button in offices with telephones may be omitted; the telephone may be a substitute for the call button.
 - b) This substitution shall be authorized in writing by the school principal.
 - 2) Office shall have intercom speaker.
- f. Areas primarily used by the students shall have intercom call button.
 - 1) Volume control is not allowed in student occupied areas.

- g. Do not provide intercom call button in dining area.
- h. The intercom system shall permit 4 and 5-digit dialing.
- i. Provide four Administrative Display Telephones for elementary schools and seven for middle schools and high schools.
- j. Provide a protective wire cage around intercom speakers in gym.
- k. Do not locate the intercom console in the general reception area; locate it in a space such as production/workroom.
- l. Class change bell system shall be a tone generator through intercom system.
- m. Provide Administrative Display Telephone outlet in EHPA manager's office.
- n. In elementary schools, provide intercom administrative display telephones in principal's office, principal's secretary's office, one assistant principal's office, and admin reception area (total of four devices).
- o. In middle and high schools, provide intercom administrative display telephones in principal's office, principal's secretary's office, admin reception, student services reception, dean's reception, guidance reception, and grade level student services offices (total of seven devices).
 - 1) If the above-mentioned areas are more than seven, the principal will decide which seven spaces get intercom administrative telephones.
- p. Intercom call button in classrooms shall be located at the teacher station. Location of the call button shall comply with the ADA.
- q. Provide complete intercom rack with all card cages/power supply for full capacity of the system specified (xxx room's capacity).
 - 1) Provide required station and analog cards needed now plus 20% spares.
- r. Provide intercom speaker(s) in-group toilets.
- s. Provide weatherproof exterior intercom speaker near every main exit door and one every 100 feet.
- t. Provide riser diagram for intercom system indicating any rooms housing main equipment and indicating all building boundaries and levels on the riser diagram.
 - 1) Show power receptacles required for cabinets on the riser diagram.
- u. Do not provide administrative display telephone in media center reading room.
- v. Intercom equipment shall have a capacity of no less than 350 room stations for high school.
- w. Intercom equipment shall have a capacity of no less than 240 room stations for middle school and elementary school.
- x. Contractor shall provide separate intercom and video system (AIPHONE, not part of campus intercom system) from main office entrance door to the reception counter, principal's office, and principal's secretary's office.
- y. Intercom speakers shall produce sound level 10 decibels above the space noise at full occupancy.

9. Intercom System for New And Replacement/Modernized Schools: All new and replacement (modernized) school facilities shall have an intercom system equal to EPIC/SAFE System as manufactured by Audio Enhancement Inc.:

- a. Design the intercom systems for new and replacement (modernized) schools in accordance with DMS section intercom in "New and Modernized schools" and as noted here.
- b. Main intercom system monitor/panel and phone shall be located in the main office/reception area.
- c. Intercom system shall be designed to be capable of initiating a tone and/or voice alert to being used as school bell system for class changes.
Computers for principal, assistant principals, after care office, and adult school offices shall be programmed to allow full operation and access to main intercom system.

- d. Main intercom system computers shall have their electrical power supplied from building generator power system and a back-up local UPS unit.
- e. Provide two-way intercom for classrooms, instructional spaces, offices, teacher planning areas, kitchen, dining, stage, gym, media center, and custodial receiving area.
- f. Each classroom shall be provided with four (4) ceiling mounted speakers to be used for school wide intercom and classroom audio enhancement.
- g. Media centers shall be provided with minimum of ten (10) ceiling mounted speakers to be used for school wide intercom and local audio enhancement
- h. Provide ceiling mounted intercom speakers in corridors and areas with ceiling tiles.
- i. Locate the speakers within 15' of the end of the corridor.
- j. Provide intercom dismissal paging horns/speakers at the bus loop and parent pick-up area.
- k. Install combination call buttons and volume controls in all administrative offices, teacher planning areas, conference rooms, clinic, media center, CCTV studio, and CCTV control room.
- l. Areas primarily used by the students shall have intercom call button.
 - 1) Volume control is not allowed in student occupied areas.
- m. Do not provide intercom call button in dining area.
- n. Provide a protective wire cage around intercom speakers in gym.
- o. Class change bell system shall be a tone generator through intercom system.
- p. Intercom call button in classrooms shall be located at the teacher station. Location of the call button shall comply with the ADA.
- q. Provide intercom speaker(s) in-group toilets.
- r. Provide weatherproof exterior intercom speaker near every main exit door and minimum one every 75 feet.
- s. Provide riser diagram for intercom system indicating any rooms housing main equipment and indicating all building boundaries and levels on the riser diagram.
 - 1) Show power receptacles required for cabinets on the riser diagram.
- t. Intercom equipment shall have a capacity of no less than 500 room stations for high school.
- u. Intercom equipment shall have a capacity of no less than 300 room stations for middle school and elementary school.
- v. Contractor shall provide separate intercom and video system (AIPHONE, not part of campus intercom system) from main office entrance door to the reception counter, principal's office, and principal's secretary's office.
- w. Intercom speakers shall produce sound level 10 decibels above the space noise at full occupancy.
- x. Speakers in cafeteria, and gymnasiums shall be high ceiling speaker type. Provide protective wire guards for speakers in the gymnasium.
- y. Provide weatherproof, high ceiling, exterior rated intercom speaker speakers in PE play area with protective wire guards.
- z. Provide weatherproof, exterior rated intercom speaker speakers for all play areas and fields.
- aa. Intercom system shall be connected to fire alarm system, activation of fire alarm system shall temporary mute the intercom speakers while fire alarm speakers/horns are audible.

10. Public Address System

- a. New facilities shall have a public address system in accordance with DMS.
- b. Provide public address system in media center, courtyard, cafeteria, gym, and stadium.
- c. Provide 1" conduit raceway (for future speakers) back to the local storage room (coordinate with District) for owner supplied system in the parent drop-off area.
- d. Provide microphone outlet at satellite PA control system(s).
- e. Provide surge protection devices on all wires that enter and leave the stadium public address consol. Provide surge protection device on 120-volt power circuit serving the stadium public address consol.

- f. Provide riser diagram for public address system indicating any rooms housing main equipment and show all building boundaries and levels on the riser diagram.
 - 1) Show power receptacles required for cabinets on the riser diagram.
- g. Public address speakers shall produce sound level 10 decibels above the space noise at full occupancy.
- h. Provide three microphone outlets at stage ceiling.

11. Instructional Television System (ITV)

- a. New facilities shall have an ITV system in accordance with DMS. ITV system will be IP based and run on the data network.
- b. Provide dedicated data outlet and duplex electrical outlet in locations where wall-mounted televisions may be placed. This commonly includes reception areas, staff dining room, media center, and cafeteria and as required by educational specifications.
- c. Provide two communications outlets in CCTV control room and CCTV studio to allow for connection of ITV equipment for signal origination.

12. Communication System (Voice and Data)

- a. New facilities shall have a communication system in accordance with DMS.
- b. Provide two communication outlets in the Clinic, one in Counter Area and one in Reception Area
- c. Provide three communication outlets in classrooms:
 - 1) One at teacher station / media cabinet
 - 2) One at rear of room for mobile cart system connectivity
 - 3) One in ceiling at center of room for Wi-Fi
- d. Provide three communication outlets in resource rooms.
 - 1) One at teacher station / media cabinet
 - 2) One at rear of room for mobile cart system connectivity
 - 3) One in ceiling at center of room for Wi-Fi
- e. Provide four communication outlets in ESE classrooms.
 - 1) One at teacher station / media cabinet
 - 2) One at rear of room for mobile cart system connectivity
 - 3) One in ceiling at center of room for Wi-Fi
 - 4) One at rear of room for hard wired computer stations
- f. Provide four communication outlets in all other instructional spaces, one of which is in ceiling at center of room for Wi-Fi.
- g. Provide two communication outlets in offices.
- h. Provide minimum three communication outlets in teacher planning areas, if more than two stations, one per station.
- i. Provide two communication outlets in stage.
- j. Provide two-communication outlet in kitchen manager's office.
- k. Media Center: See prototype layout for locations and exact amounts, at minimum:
 - 1) Provide eight communication outlets in media center reading area for elementary schools.
 - 2) Provide 12 communication outlets in media center reading area for middle schools.
 - 3) Provide 16 communication outlets in media center reading area for high schools.
- l. Communication outlets requirements for computer labs and skill labs shall be in accordance with educational specifications.
- m. Provide one communication outlet in main security cabinet, main card access cabinet, and main video surveillance cabinet.
- n. Provide two communication outlets in principal's conference room.
- o. Provide communication outlet in EHPA manager's office.
- p. Provide communication outlet in ceiling at each conference room, principal's office, reception area, mailroom, media center, cafeteria, gym or PE pavilion, and auditorium and teacher workrooms.

- q. Provide conduit from cash registers to kitchen manager's office.
 - 1) Locate junction box next to telephone outlet.
- r. In media center reading room, with columns within the space, provide communication outlet and electrical receptacle on all faces of the columns facing the student sitting areas, also see prototype media center in Ed Specs.
- s. Allow minimum of 5' wall space for each outlet.
 - 1) Provide quad receptacle outlet within 12" of the communication outlet.
- t. Communication Service Room shall be the entry point for communication cables coming to the facility.
 - 1) Room size shall be minimum 320 (16 x 20) SF for middle schools/high schools.
 - 2) Room size shall be minimum 168 (12 x 14) SF for elementary schools.
- u. Provide communication closets on each floor in each building.
 - 1) Communication closet shall be minimum 8' wide x 6' deep, with no other electrical systems in this closet.
 - 2) Communication closet shall be connected to generator power.
- v. Obtain installation details from the IT Infrastructure / Network Services Department.
- w. The designer of the communication system shall coordinate the design with the IT Infrastructure / Network Services Department.
- x. Communication equipment rooms shall have dedicated secondary source of air conditioning for evenings, weekends and holidays when the chiller is shutdown
- y. Provide riser diagram for communication system indicating any rooms housing main equipment and show all building boundaries and levels on the riser diagram.
 - 1) Show power receptacles required for cabinets and equipment on the riser diagram.
- z. Provide and install a mule tape 2500-pound test pull string in each of the service conduits for Telco Utility.
- aa. Floor outlets are not allowed.
- bb. Cable trays are allowed. Provide 12" minimum access space above tray.
- cc. Install vinyl flooring in the Communications Service Room.

13. Display System

- a. New facilities shall have a display system including ceiling mounted projectors and wall mounted interactive flat panels in accordance with DMS.
- b. The designer of the display systems shall coordinate the design with the Educational Technology Department.
- c. Obtain detail of installation from the Educational Technology Department.
- d. Display system shall include complete system including junction boxes, outlets, cables, connectors, and receptacles.
- e. Provide wall mounted interactive flat panel system in classrooms, instructional spaces, resource rooms, laboratories, and in any other space required per the educational specifications.
- f. Provide ceiling mounted projector system in media center reading room and cafeteria.
 - 1) Refer to Section 11 52 13 of DMS for projection screen specifications.
- g. Group wall mounted interactive flat panel outlet together with power outlet. Refer to projector wiring detail.
- h. In rooms with multimedia cabinet, provide outlets on the wall behind the multimedia cabinet to serve the equipment housed inside the multimedia cabinet.
- i. Group wall mounted interactive flat panel outlets together with power outlets, and data outlet on the wall behind the multimedia cabinet. Refer to projector wiring detail.
- j. Coordinate conference room table with wall mounted interactive flat panel conduits such that they align with pedestal leg on end of table farthest from panel.

- k. At the start of each project, the electrical designer shall obtain the scope of technology wiring in classrooms for that project from the Educational Technology Department and design accordingly.
- l. Provide classroom technology wiring detail on the drawings.
- m. Provide specific detail for every space such as classroom, media center, and cafeteria, and conference room, one typical detail covering all the spaces is not acceptable.

14. Lightning Detection (Prediction) System

- a. New and modernized facilities shall have a complete system of lightning detection/prediction system for early warning of lightning strikes in accordance with DMS.
- b. Provide lightning detection protection for covered walkways, press box, playgrounds, and sports fields.
- c. Locate lightning detection system main control panel/data receiver in the main office (final location to be approved by Building Code Services).
- d. Provide 120 volts power for the lightning detection control panel from life safety branch of emergency generator power system.
- e. Drawings shall show location of each of the lightning detection system components.
- f. Drawings shall include a wiring detail showing interconnection of each system's components.

F. GENERAL REQUIREMENTS

- 1. Install wiring (cables) for power and fire alarm system in conduits.
- 2. Conductors for intercom, data, telephone, instructional technology, and energy management may be located in cable trays.
- 3. Open wiring for non-life-safety systems shall be allowed in new and existing buildings that are being renovated or remodeled, see DMS section 27 60 00 for open wiring for details.
- 4. Provide a pull wire in all empty conduits.
- 5. Minimum size conduit is 1/2" except as noted for specific systems, see DMS for detail requirements.
- 6. All wiring shall be copper.
- 7. Provide a grounding conductor in all conduits and raceways, size per NEC table 250-66 or 250-122, whether the grounding conductor is required by code or not except for service entrance conduits.
- 8. Provide installation details to facilitate a quality and well thought out installation.
- 9. Provide power and lighting equipment schedules and panel-board schedules on the plans and not in the specifications.
- 10. Generally all conduits shall be installed concealed to view, except, exposed conduits may be installed on existing block walls.
- 11. Give special consideration to the resulting aesthetics of electrical equipment and conduit installed exposed to view outside of equipment or storage rooms.
 - a. Give consideration to soffits and/or placement (such as in the wall/ceiling corner) so as to minimize the negative impact on the aesthetics of the facility.
 - b. Situations where an exposed conduit run must be used may require the addition of special notes and/or showing conduit on the plans all the way back to the panel it originates from in lieu of the traditional home run arrow.
 - c. Electrical equipment and conduit shall be painted to match the adjacent surface where exposed in finished spaces.
 - d. Exposed conduits within classrooms, offices, and corridors (existing block walls) shall be surface raceways.
- 12. All systems and equipment shall meet the requirements of DMS.
 - a. Provide all required systems and equipment design including special systems such as gymnasium sound system, auditorium stage lighting and sound system, CCTV, security system, telephone

system, instructional technology for data, voice and video, etc. for a complete project as per requirements.

13. Fully coordinates design with other consultants such as mechanical, structural, civil, kitchen equipment, architectural, landscaping, theater, etc.
14. All new main distribution panels, branch circuit panels, disconnect switches, and motor starters shall be provided with Arc Flash equipment labeling to include all the information required by NEC Article 70E-130.5(C). Related Arc Flash calculations shall be submitted to Building Code Services.
15. Provide empty conduits and pull-boxes for future portables in all new facilities. Provide two 4" conduits for power and eight-2" conduits for systems (two 2" conduits for intercom and two 2" conduits for fire alarm). Terminate these conduits into rack-mounted junction boxes in the vicinity of space reserved for future portable classrooms.
16. DO NOT use floor outlets in classrooms, labs, or at any other location use of floor outlets (power and data) are not permitted.
17. Locate dry type transformers in the electrical rooms.
18. Do not locate manholes or pull boxes in sport fields and playground areas.
19. Light fixtures in the stairwell shall be wall mounted at each landing/level areas with bottom at 10'-0" above finished floor or 12" below the ceiling whichever is less.
 - a. DO NOT locate light fixtures directly above the tread and risers.
20. Provide each facility with a lightning detection system.
21. Provide notes on plans indicating the following:
 - a. Prior to any trenching or excavation the Contractor shall locate all existing underground utilities.
 - b. Contractor is responsible for restoring any damage to underground utilities caused by trenching or excavating.

END OF SECTION