ELECTRICAL SYSTEMS

The following is the Electrical System Narrative, which defines the scope of work and capacities of the Power And Lighting System as well as the Basis of Design. The electrical systems shall be designed and constructed in accordance with LEED for Schools.

1. CODES

All work installed under Division 26 shall comply with the Massachusetts State Building Code, IBC 2009 Appendix 115AA - Stretch Energy Code and all local, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

The work of Division 26 is as described in this narrative. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the electrical work and all items incidental thereto, including commissioning and testing.

3. SEQUENCE OF OPERATIONS AND INTERACTIONS

A. Classroom and corridor lighting will be controlled via “smart panels”, which is achieved through programming self-contained solenoid operated circuit breakers. The control of the circuit breakers shall be by automatic means such as an occupancy sensor in each classroom. The system will be interfaced with the DDC control system for scheduled functions. The controllability shall be in conformance with LEED for Schools IEQ Credit 6.1. The occupancy sensor shall have auxiliary contacts for DDC input functions.

B. Exterior lighting will be controlled by photocell “on” and “smart panel” for “off” operation. The parking area lighting will be controlled by “zones” and will have dual-level control.

C. Emergency and exit lighting will be run through life safety panels to be on during normal power conditions as well as power outage conditions. The emergency lighting system will have time control so that lights are “on” only when building is occupied.

4. DESCRIPTION OF THE SYSTEMS

A. Electrical Distribution System:

1. New construction service ratings are designed for a demand load of 10 watts/s.f. The service capacity will be sized for 2500 amperes with 100 percent rating at 277/480 volt, 3 phase, 4 wire. New lighting and power panels will be provided to accommodate respective loads. The equipment will be located in dedicated rooms or closets.

2. New temporary electrical service is to be provided for on-site modular classrooms. Connections to modular classroom systems are to be provided by this contractor.
B. Interior Lighting System:

1. Classroom lighting fixtures consist of pendant-mounted direct/indirect fluorescent luminaries with T5HO lamps and electronic dimming ballasts. The fixtures will be pre-wired for dimming control where natural daylight is available and also for multi-level switching. Two daylight zones will be provided in each classroom.

2. Office lighting fixtures will consist of pendant-mounted direct/indirect fluorescent luminaries with T5HO lamps and electronic ballasts. Offices on the perimeter with windows shall have daylight dimming controls similar to classrooms. The classroom power density will be targeted for less than 0.6 watts/sq. ft.

In general lighting power density will be 30-40 percent less than IECC 2009. The power density reduction relates to LEED for Schools Credit EAC1.

3. Lighting levels will be approximately 30 foot candles in classrooms and offices. The daylight dimming foot candle level will be in compliance with LEED for Schools IEQ 6.1.

4. Gymnasium lighting will be comprised of direct fluorescent fixtures with slots for an up-light component with T5HO lamps and electronic ballasts. The fixtures will be provided with protective wire guards. The light level will be designed for approximately 50 foot candles.

Daylight dimming will be provided within 15 feet of skylights or glazing. Daylight dimming controls will be similar in operation to classrooms.

5. Corridor lighting will be comprised of linear indirect lighting using LED light source. The corridor light level will be designed for approximately 15 foot candles. Corridor lighting will be on time clock control and only “on” during occupied hours. The corridor lighting will have two level controlled by schedule on DDC system.

6. Cafeteria lighting will be recessed indirect fluorescent fixtures with electronic ballasts. The light levels will be designed for approximately 20 foot candles. Daylighting controls will be provided on perimeter light fixtures with 15 ft. of glazing

7. Auditorium theatrical lights with a dimming system will be provided for performances. House lighting in the auditorium will be dimmable LED and controlled by a theatrical house dimming system. Theatrical border lights shall be LED with “RGB” control.

8. Kitchen and servery lighting will consist of recessed 2 ft. x 4 ft. acrylic lensed gasketed troffers with aluminum frame doors with three T5 lamps and electronic ballasts. Light levels will be approximately 50 foot candles.

9. Each area will be locally switched and designed for multi-level controls. Each classroom, office space, and toilet room will have an occupancy sensor to turn lights off when unoccupied. Daylight sensors will be installed in each room where natural light is available for dimming of light fixtures. The control system shall be in accordance with LEED for Schools Credit IEQ 6.1.
10. The entire school will be controlled with an automatic lighting control system using the DDC control system for programming lights on and off.

C. Emergency Generator System:

1. An exterior 200 kw natural gas emergency generator with sound attenuated enclosure will be provided. Light fixtures and LED exit signs will be installed to serve all egress areas such as corridors, intervening spaces, toilets, stairs, and exit discharge exterior doors. The administration area lighting and selected receptacles will be connected to the emergency generator.

2. The generator will be sized to include life safety systems, boilers and circulating pumps, refrigeration equipment, communications systems, gym and cafeteria, ventilation and heating, kitchen, etc.

D. Site Lighting System LEED for Schools Credit SSc8

1. Fixtures for area lighting will be pole-mounted cut-off ‘LED’ luminaries in the parking area and roadways. Pole heights will be 20 ft. The exterior lighting will be connected to the automatic lighting control system for photocell on and timed off operation. The site lighting fixtures will be dark sky compliant. The illumination level is 0.5 foot candles minimum for parking areas in accordance with Illuminating Engineering Society.

2. Building perimeter fixtures will be ‘LED’ wall-mounted cut-off over exterior doors for exit discharge.

E. Wiring Devices:

1. Each classroom will have a minimum of two duplex receptacles per teaching wall and two double duplex receptacles on dedicated circuits at classroom computer workstations. The teacher’s workstation will have a double duplex receptacle also on a dedicated circuit.

2. Office areas will generally have one duplex outlet per wall. At each workstation a double duplex receptacle will be provided.

3. Corridors will have a cleaning receptacle at approximately 25 ft. intervals.

4. Exterior weatherproof receptacles with lockable enclosures will be installed at exterior doors.

5. A system of computer-grade panelboards with double neutrals and transient voltage surge suppressors will be provided for receptacle circuits.

6. Certain plug loads such as copiers, printers, and electric water coolers will be controlled by the DDC system for shutdown on a schedule basis.
F. Fire Alarm System:

1. A fire alarm and detection system will be provided with battery back-up. The system will be of the addressable type where each device will be identified at the control panel and remote annunciator by device type and location to facilitate search for origin of alarms.

2. Smoke detectors will be provided in open areas, corridors, stairwells and other egress ways.

3. The sprinkler system will be supervised for water flow and tampering with valves.

4. Speaker/strobes will be provided in egress ways, classrooms, assembly spaces, open areas and other large spaces. Strobe only units will be provided in single toilets and conference rooms.

5. Manual pull stations will be provided at exit discharge doors and at each egress stairwell not located at grade level.

6. The system will be remotely connected to automatically report alarms to the fire department via a method approved by the fire department.

G. Uninterruptible Power Supply (UPS):

1. One 24kw, three phase centralized UPS systems will be provided with battery back-up.

2. The system will provide conditioned power to sensitive electronic loads, telecommunication systems, bridge over power interruptions of short duration and allow an orderly shutdown of servers, communication systems, etc. during a prolonged power outage.

3. The UPS systems will also be connected to the standby generator.

5. TESTING REQUIREMENTS

The Electrical Contractor shall provide testing of the following systems with the Owner and Owner’s representative present:

- Lighting and power panels for correct phase balance.
- Emergency generator.
- Lighting control system (interior and exterior).
- Fire alarm system.
- Security system.

Testing reports shall be submitted to the engineer for review and approval before providing to the Owner.

6. OPERATION MANUALS AND MAINTENANCE MANUALS:

When the project is completed, the Electrical Contractor shall provide operation and maintenance manuals to the Owner.
7. RECORD DRAWINGS AND CONTROL DOCUMENTS:

When the project is completed, an as-built set of drawings, showing all lighting and power requirements from contract and addendum items, will be provided to the Owner.

8. COMMISSIONING

The project will be commissioned per Section 018100 of the specifications.

9. CCTV

A Closed Circuit TV system will consist of computer servers with image software, computer monitors and IP based closed circuit TV cameras. The head end server will be located in the head end MDF room and will be rack mounted. The system can be accessed from any PC within the facility or externally via an IP address. Each camera can be viewed independently. The storage SAN will store images for all cameras and keep this information for 45 days at 30 images per second (virtual real time).

The location of the cameras is generally in corridors and exterior building perimeter. The exterior cameras are pan-tilt-zoom type.

The system will fully integrate with the access control system to allow viewing of events from a single alarm viewer. Camera images and recorded video will be linked to the access system to allow retrieval of video that is associated with an event.

10. INTRUSION SYSTEM

An intrusion system will consist of security panel, keypads, motion detectors and door contacts. The system is addressable which means that each device will be identified when an alarm occurs. The system is designed so that each perimeter classroom with grade access will have dual tech sensors along the exterior wall and corridors, door contacts at each exterior door.

The system can be partitioned into several zones. Therefore, it is possible to use the Gym area while the remainder of the school remains alarmed.

The system will include a digital transmitter to summons the local police department in the event of an alarm condition.

The intrusion system will be connected to the automated lighting control system to automatically turn on lighting upon an alarm.

11. CARD ACCESS

A card access system includes a card access controller, door controllers and proximity readers/keypads. Proximity readers will be located at various locations. Each proximity reader will have a distinctive code to identify the user and a log will be kept in memory. The log within the panel can be accessed through a computer.

The alarm condition will also initiate real time recording on the integrated CCTV System. The system may be programmed with graphic maps allowing the end user to quickly identify alarm conditions and lock/unlock doors.
The system is modular and may be easily expanded to accommodate any additional devices.

12. PHASING

The work will only include “make safe” for demolition by General Contractor.