

December 18, 2019

Doherty High School

Worcester, MA

RE: Electrical Recommendations – Code Upgrade

Under the code upgrade option, only the life safety systems will be upgraded, all other existing systems will remain and will continue to be used until they fail. Most of the existing systems are either past their useful working life or inadequate and need replacement.

Base Repair

- a. Electrical Service:
 - i. Existing electrical service and distribution equipment is to remain.
 - ii. Provide new padmount transformer and distribution equipment to the modular classrooms.
- b. Emergency Power:
 - iii. Provide new emergency/standby generator and distribution equipment.
- c. Lighting:
 - i. Evaluate existing emergency egress and exist lighting.
 - ii. Provide new egress and exit lighting to comply with current codes.
- d. Fire Alarm:
 - i. Provide new voice evacuation fire alarm system to comply with current codes.
- e. Data Communications:
 - ii. The existing telecommunications infrastructure is to remain.
- f. Audio-Video Systems:
 - i. Provide new public address and clock systems.
 - ii. Provide assistive listening system at Auditorium, Cafeteria, Media Center, and Gymnasium.
- g. Security Systems:
 - i. The existing security system is to remain.

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RE: Electrical Recommendations – Addition Renovation Narrative

Net Zero Energy

The City of Worcester has established efficient energy, sustainable design and net zero energy as a goal for the project. A net zero energy building is one that is optimally efficient and generates energy onsite using clean renewable resources in a quantity equal to or greater than the total amount of energy consumed onsite.

The building mechanical and electrical systems are the chief consumers of energy within the building. A combination of the following strategies contributes to the success in reducing energy demand from these systems.

- a. Reduce Energy Demand – size mechanical equipment adequately, reduce plug and lighting loads, and improve the building shell.
- b. Harvest Site Energy - Orient the building to maximize passive solar, and daylighting opportunities.
- c. Maximize Efficiency - use efficient equipment to maximize benefit.
- d. Efficient Operations and Maintenance – building commissioning, training of staff, and ongoing preventative maintenance, combined with monitoring of ongoing performance, can ensure energy efficiency gains are realized.
- e. Renewable Energy - Generate enough energy on-site using renewable technologies to meet all energy demands for the facility.

As the project progresses, meetings and design charrettes with the Owner will be planned and existing building performances will be evaluated to advance the efficient energy, sustainable design and net zero energy goals.

Enabling Early Site Package

- a. Provide electrical infrastructure for temporary power.
- b. Provide temporary site lighting and power.

Phase 1

Construct a 3-story Cafeteria, Science, Engineering Technology Academy (“ETA”, a Chapter 74 program), and mechanical spaces, as well as a 4 story Auditorium, Gymnasium, Administration and media center building. Maintain existing electrical, fire alarm, telecommunications and security systems in existing areas. Provide temporary electrical, fire alarm, telecommunications and security system connections to areas affected by demolition.

- a. Electrical Service:
 - ii. Provide electrical primary duct bank to a utility company padmount transformer located on the exterior of the building.
 - iii. Provide secondary electrical service conductors and main switchboard and distribution equipment to the main electrical room.
 - iv. Provide telecommunications underground duct system to the entrance facility room.

- b. Electrical Distribution
 - i. Provide electrical distribution equipment and feeder.
 - ii. Provide wiring devices and branch circuits.
 - iii. Provide lightning protection system.
 - iv. Provide roof mounted solar photovoltaic system.

- c. Emergency Power:
 - i. Provide emergency/standby generator, transfer and power equipment. Emergency equipment must be separated from normal and standby power equipment per the Massachusetts Electrical Code.
 - ii. All emergency equipment and feeders must be installed in 2-hour rated rooms or must be 2-hour rated.
 - iii. Provide power to emergency egress and exit lighting, life safety and standby equipment.

- d. Lighting:
 - i. Provide light fixtures with LED lamps.
 - ii. Provide network lighting control system including vacancy sensors and daylight harvesting.
 - iii. Provide emergency egress and exit lighting fed from the emergency life safety branch of the emergency/standby system.
 - iv. Integrate lighting controls with HVAC system to optimize energy performance of the building.
 - v. Provide roadway and parking lot lighting. The exterior lighting will have the appropriate cut-offs to reduce light pollution and be considerate to the residential neighbors.

- e. Fire Alarm:
 - i. Provide voice evacuation fire alarm system.
 - ii. Provide public safety radio distributed antenna system.
 - iii. Provide area of refuge communications system.

- f. Data Communications:
 - i. Provide telecommunications cabling infrastructure per the BICSI standards. Utilize Category 6A cabling for voice and data drops. Install telecommunications equipment in dedicated rooms.

- ii. Provide data network switches based on HP Procurve (Aruba Enterprise Company).
 - iii. Provide wireless access points based on Cisco Meraki.
 - iv. Provide VoIP telephone system and handsets based on Mitel.
- g. Audio-Video Systems:
- i. Provide sound system in the gym/auditorium.
 - ii. Provide in-building classroom audio system.
 - iii. Provide in-building cellular amplification system.
 - iv. Provide handheld radio amplification system.
 - v. Provide public address system.
 - vi. Provide digital signage and clock system.
- h. Security Systems:
- i. Provide video surveillance system based on Genetec VMS and Axis cameras.
 - ii. Provide access control system based on HID.
 - iii. Provide intrusion detection system based on Bosch.

Phase 2

Sequence 2A will involve occupancy of phase 1 spaces. Sequence 2B involves demolition of the buildings containing the Gym/Physical Education support spaces and ETA as well as the west ends of both building containing the Cafeteria, Art Rooms, Classrooms and some Special Education rooms. Sequence 2C involves gut renovation of Auditorium, Science Classrooms and Classrooms below science rooms.

- a. Electrical Distribution:
- i. Provide electrical distribution and feeder.
 - ii. Provide wiring devices and branch circuits.
 - iii. Provide lightning protection system.
 - iv. Provide roof mounted solar photovoltaic system.
- b. Emergency Power:
- i. Provide emergency distribution and feeders.
 - ii. Provide power to emergency egress and exit lighting, life safety and standby equipment.
- c. Lighting:
- i. Provide light fixtures with LED lamps.
 - ii. Provide network lighting control system including vacancy sensors and daylight harvesting.
 - iii. Provide emergency egress and exit lighting fed from the emergency life safety branch of the emergency/standby system.
 - iv. Integrate lighting controls with HVAC system to optimize energy performance of the building.

- v. Provide roadway and parking lot lighting. The exterior lighting will have the appropriate cut-offs to reduce light pollution and be considerate to the residential neighbors.
- d. Fire Alarm:
 - i. Provide fire alarm devices.
 - ii. Provide public safety radio distributed antennas.
 - iii. Provide area of refuge communications system.
- e. Data Communications:
 - i. Provide telecommunications cabling infrastructure per the BICSI standards. Utilize Category 6A cabling for voice and data drops. Install telecommunications equipment in dedicated rooms.
 - ii. Provide data network switches.
 - iii. Provide wireless access points.
 - iv. Provide VoIP handsets.
- f. Audio-Video Systems:
 - i. Provide sound system in the cafetorium.
 - ii. Provide in-building classroom audio system.
 - iii. Provide in-building cellular amplification system.
 - iv. Provide handheld radio amplification system.
 - v. Provide public address system.
 - vi. Provide digital signage and clock system.
- g. Security Systems:
 - i. Provide video surveillance cameras.
 - ii. Provide access control card readers.
 - iii. Provide intrusion detection devices.

Phase 3

Sequence 3A involves occupying newly renovated and newly built spaces including new Administration/Guidance/Medical Suite, Art Classrooms, General Classrooms in renovated areas as well as new General Classrooms in newly constructed academic wings. Sequence 3B involves the gut/renovation of remaining spaces, the former Administration Suite with library above and the remaining classrooms within that area as well as the group of classrooms adjacent to the former gym.

- a. Electrical Distribution:
 - i. Provide electrical distribution and feeder.
 - ii. Provide wiring devices and branch circuits.
 - iii. Provide lightning protection system.
 - iv. Provide roof mounted solar photovoltaic system.

- b. Emergency Power:
 - i. Provide emergency distribution and feeders.
 - ii. Provide power to emergency egress and exit lighting, life safety and standby equipment.

- c. Lighting:
 - i. Provide light fixtures with LED lamps.
 - ii. Provide network lighting control system including vacancy sensors and daylight harvesting.
 - iii. Provide emergency egress and exit lighting fed from the emergency life safety branch of the emergency/standby system.
 - iv. Integrate lighting controls with HVAC system to optimize energy performance of the building.
 - v. Provide roadway and parking lot lighting. The exterior lighting will have the appropriate cut-offs to reduce light pollution and be considerate to the residential neighbors.

- d. Fire Alarm:
 - i. Provide fire alarm devices.
 - ii. Provide public safety radio distributed antennas.
 - iii. Provide area of refuge communications system.

- e. Data Communications:
 - i. Provide telecommunications cabling infrastructure per the BICSI standards. Utilize Category 6A cabling for voice and data drops. Install telecommunications equipment in dedicated rooms.
 - ii. Provide data network switches.
 - iii. Provide wireless access points.
 - iv. Provide VoIP handsets.

- f. Audio-Video Systems:
 - i. Provide sound system in the cafetorium.
 - ii. Provide in-building classroom audio system.
 - iii. Provide handheld radio amplification system.
 - iv. Provide public address system.
 - v. Provide digital signage and clock system.

- g. Security Systems:
 - i. Provide video surveillance cameras.
 - ii. Provide access control card readers.
 - iii. Provide intrusion detection devices.

Phase IV

Sequence 4A involves occupying newly renovated classrooms. Sequence 4B involves construction of the multipurpose field and finishing site and landscaping scope.

- a. Electrical Distribution:
 - i. Provide electrical distribution and feeder.
 - ii. Provide wiring devices and branch circuits.
 - iii. Provide lightning protection system.
 - iv. Provide parking canopy mounted solar photovoltaic system.
 - v. Provide electric vehicle charging stations.

- b. Emergency Power:
 - i. Provide emergency distribution and feeders.
 - ii. Provide power to emergency egress and exit lighting, life safety and standby equipment.

- c. Lighting:
 - i. Provide light fixtures with LED lamps.
 - ii. Provide network lighting control system including vacancy sensors and daylight harvesting.
 - iii. Provide emergency egress and exit lighting fed from the emergency life safety branch of the emergency/standby system.
 - iv. Integrate lighting controls with HVAC system to optimize energy performance of the building.
 - v. Provide roadway, parking lot and athletic field lighting. The exterior lighting will have the appropriate cut-offs to reduce light pollution and be considerate to the residential neighbors.

- d. Fire Alarm:
 - i. Provide fire alarm devices.
 - ii. Provide public safety radio distributed antennas.
 - iii. Provide area of refuge communications system.

- e. Data Communications:
 - i. Provide telecommunications cabling infrastructure per the BICSI standards. Utilize Category 6A cabling for voice and data drops. Install telecommunications equipment in dedicated rooms.
 - ii. Provide data network switches.
 - iii. Provide wireless access points.
 - iv. Provide VoIP handsets.

- f. Audio-Video Systems:
 - i. Provide sound system in the athletic field.
 - ii. Provide in-building classroom audio system.



- iii. Provide handheld radio amplification system.
 - iv. Provide public address system.
 - v. Provide digital signage and clock system.
- g. Security Systems:
- i. Provide video surveillance cameras.
 - ii. Provide access control card readers.
 - iii. Provide intrusion detection devices.

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RE: Electrical Recommendations – A.1 New Construction on Existing Site-Pods on Park Narrative
– A.2 New Construction on Existing Site-Olmsted Homage Narrative
– A.3 New Construction on Existing Site-Highland Proud Narrative

Net Zero Energy

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- a. Reduce Energy Demand – size mechanical equipment adequately, reduce plug and lighting loads, and improve the building shell.
- b. Harvest Site Energy - Orient the building to maximize passive solar, and daylighting opportunities.
- c. Maximize Efficiency - use efficient equipment to maximize benefit.
- d. Efficient Operations and Maintenance – building commissioning, training of staff, and ongoing preventative maintenance, combined with monitoring of ongoing performance, can ensure energy efficiency gains are realized.
- e. Renewable Energy - Generate enough energy on-site using renewable technologies to meet all energy demands for the facility.

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Existing Building

- a. The existing building utilities shall remain in service and uninterrupted during the school hours for the full duration of the new construction.
- b. Provide temporary lighting for the enabling site phase.

New Construction

- a. Temporary Construction Services
 - i. Provide temporary lighting, power and fire alarm during construction.

- b. Electrical Service:
 - i. Provide electrical primary duct bank to a utility company padmount transformer located on the exterior of the building.
 - ii. Provide new secondary electrical service conductors and new main switchboard and distribution equipment to a new main electrical room.
 - iii. Provide new telecommunications underground duct system to a new server room.
 - iv. Provide new electrical distribution and branch circuits.
 - v. Coordinate with utility company to disconnect power to the existing building at the end of construction to facilitate demolition by the General Contractor.

- c. Electrical Distribution
 - i. Provide electrical distribution equipment and feeder.
 - ii. Provide wiring devices and branch circuits.
 - iii. Provide lightning protection system.
 - iv. Provide roof and parking canopy mounted solar photovoltaic system.

- d. Emergency Power:
 - i. Provide new emergency/standby generator, transfer and power equipment. Emergency equipment must be separated from normal and standby power equipment per the Massachusetts Electrical Code.
 - ii. All emergency equipment and feeders must be installed in 2-hour rated rooms or must be 2-hour rated.
 - iii. Provide power to emergency egress and exit lighting, life safety and standby equipment.

- e. Lighting:
 - i. Provide new emergency egress and exit lighting fed from the emergency life safety branch of the emergency/standby system.
 - ii. Provide new light fixtures with LED lamps.
 - iii. Provide new network lighting control system including occupancy sensors and daylight harvesting.
 - iv. Integrate lighting controls with HVAC system to optimize energy performance of the building.
 - v. Provide roadway, parking lot and athletic field lighting. The exterior lighting will have the appropriate cut-offs to reduce light pollution and be considerate to the residential neighbors.

- f. Fire Alarm:
 - i. Provide new voice evacuation fire alarm system.
 - ii. Provide new public safety radio distributed antenna system.
 - iii. Provide area of refuge communications system.

- g. Data Communications:
 - i. Provide new telecommunications cabling infrastructure per the BICSI standards. Utilize Category 6 cabling for voice and data drops and Category 6A shielded cabling for wireless access points. Install telecommunications equipment in dedicated rooms.
 - ii. Provide data network switches based on HP Procurve (Aruba Enterprise Company).
 - iii. Provide wireless access points based on Cisco Meraki.
 - iv. Provide VoIP telephone system and handsets based on Mitel.

- h. Audio-Video Systems:
 - i. Provide new sound system in the gym/cafetorium/auditorium/athletic field.
 - ii. Provide in-building classroom audio system.
 - iii. Provide in-building cellular amplification system.
 - iv. Provide handheld radio amplification system.
 - v. Provide public address system.
 - vi. Provide digital signage and clock system.

- i. Security Systems:
 - i. Provide new video surveillance system based on Genetec.
 - ii. Provide new access control system based on HID.
 - iii. Provide intrusion detection system based on DMP.

A.1 and A.2 New Construction

- a. Provide lighting, power, fire alarm, data communications and security systems for parking under the building.

A.3 New Construction

- a. Provide lighting, power, fire alarm, data communications and security systems for parking under the fields.