PART 1: GENERAL

1.01 CODES AND STANDARDS

A. All electrical equipment and installation shall conform to all applicable federal, state and municipal laws and regulations as well as the latest adopted edition of the following codes:

1. National Electrical Code (NEC)
2. Occupational Safety and Health Administration (OSHA)
3. Building Code of New York State (BCNYS)
4. National Fire Protection Association (NFPA)
5. American with Disabilities Act (ADA)
6. Illuminating Engineering Society of North America Standards (IESNA)
7. Institute of Electrical and Electronics Engineers Standards (IEEE)

B. Electrical equipment, components, and accessories shall be UL certified for the purpose for which the equipment, components, and accessories are used.

C. Electrical installations shall also comply with Cornell Standard 018120 – Energy Guidelines for reducing energy consumption on campus.

1.02 RELATED SECTIONS

A. Section 018120 - Energy Guidelines
B. Section 262413 - Service and Main Secondary Distribution
C. Section 262416 - Panelboards and Building Distribution
D. Section 260923 - Lighting Controls
E. Section 262923 - Variable Frequency Drives
F. Section 263213 - Emergency Power Systems
G. Section 283100 - Fire Alarm and Detection Systems
H. Section 337800 - Pole Mounted Exterior Lighting

1.03 SUBMITTALS

A. Submittals, shop drawings, schematics, product data and samples shall be submitted in accordance with the contract documents, Division 1 (General Requirements).
B. Submit names, addresses, telephone numbers, sales and technical contacts, and other details for each of the proposed manufacturers and the proposed manufacturers’ local representatives. Provide the manufacturer’s web site address (URL) as well.

C. Submit delivery lead times for proposed equipment, components and accessories with the manufacturer’s shop drawings. The Electrical Contractor shall supply detailed delivery schedules of long lead items to the Project Manager within five (5) business days after shop drawing review is found in compliance with the specifications by the Engineer of Record.

1.04 ELECTRICAL DESIGN REQUIREMENTS

A. For all projects, the Engineer of Record shall perform the following basic electrical system design calculations and information prior to the completion of design. This information shall be submitted as a part of the overall project design documentation for review. Basic electrical system information required for the preparation of these studies shall be provided by the Project Manager.

1. Fault current rating, short circuit analysis, to determine the fault current rating at each major equipment location. This study is required for proper selection and verification of powered mechanical equipment and electrical distribution equipment fault current ratings and protective device sizing.

2. Load calculations and building power requirements for sizing of electrical distribution equipment, transformers and feeders. For modifications to existing building systems, verify existing system loads and perform analysis to evaluate the impact of new loads on existing building(s) and/or campus distribution system (refer to CU Standard 262413 for additional information).


4. Voltage drop on low-voltage circuit runs.

5. Lighting calculations including foot-candle levels and watts per square foot (lighting power density).

6. Emergency power requirements and equipment sizing as required by code. For adding additional loads to the emergency system, coordinate with Cornell’s Project Manager and/or Facilities Engineering Electrical Section to determine existing system loading and spare capacity.

7. Contact Cornell Facilities Engineering for requirements and considerations when designing a solar PV system for interconnection at an existing or new building.
B. ARC FLASH AND OVERCURRENT DEVICE COORDINATION STUDY

1. Arc Flash, short circuit and overcurrent device coordination studies shall be performed as required in Standards 262413 and 262416 for retrofit and new construction. Studies shall include:

   a. Short circuit and overcurrent device coordination study in accordance with IEEE Standard 242 for service and distribution equipment. Overcurrent device coordination study shall include time-current plots for phase and ground overcurrent coordination. Provide settings for all circuit breakers, relays and voltage sensors, as well as automatic transfer switches, standby power systems, variable frequency drives, starters, chillers and large powered mechanical equipment.

   b. Arc-flash hazard analysis conforming to IEEE Standard 1584 in order to meet equipment installation incident energy exposure levels as specified by NFPA 70E. (Refer to CU Standard 262413, Part 1.01D and 2.07D3).

   ♦ Arc-flash labels shall be provided for each piece of major electrical equipment installed which may require adjustment or maintenance while energized, including but not limited to medium and low voltage switches, switchgear, switchboards, MCC’s, and panelboards.

2. Studies shall include all electrical systems from the primary (medium voltage) service to the service transformer(s) and distribution system down to the branch circuit level. Include feeders and connections for major mechanical and other powered equipment.

3. Coordination studies shall be provided in a computer-generated format using Easy Power or SKM electrical modeling software.

4. For minor renovation work involving the replacement or installation of new panelboard(s), a short circuit study, coordination, and arc flash analysis shall be conducted to the extent necessary to properly label the new panelboard(s) with the short circuit current and arc flash hazard level.

C. Electrical designs shall include detailed one-line diagrams (Riser Diagrams may be provided in addition to one-line diagrams) showing electric distribution system components, meters, controls and interfaces with other building and campus utility systems. Detailed riser diagrams shall be provided for fire alarm and security system designs.
D. Ladder logic diagrams and wire connection diagrams shall be included in the design documents for any electrical system related controls, including generator-ATS switch connections and related tie-in to FACP and remote annunciator panels, electrical distribution gear ZSI connections (if applicable), etc.

E. For renovation projects, existing building one-line diagrams shall show updates to clearly indicate locations of all new system tie-ins or components being removed.

F. The main service entrance room shall provide for adequate equipment and maintenance clearances, allowing for clear access within the room, and for possible extensions, modifications, or alterations to the system.

G. Electric rooms shall not share space with storage and/or custodial supplies, or telecommunications. Electric rooms should be located, where possible, away from elevator shafts, stairwells, HVAC duct chases and other major utility corridors so that branch circuits may be distributed in all directions.

H. Electric rooms should not be located where they may be susceptible to flooding due to broken pipes, stopped drains or surface drainage.

I. All new installations requiring switchboards, switchgear, panelboards, disconnect switches, and other power related components should be from the same manufacturer.

1.05 INSPECTIONS

A. Inspections shall be conducted by the local Authority Having Jurisdiction (AHJ) (e.g. City of Ithaca, Town of Ithaca). However, State campus buildings fall under the State of New York jurisdiction and shall be inspected by the Contract College Facilities’ Code Enforcement Officer. The electrical contractor shall furnish the original Certificate of Inspection to the Project Manager and/or Engineer of Record with the following items before submitting their final payment application:

1. Temporary inspection of electrical work for temporary power for the job site and contractor trailers requiring power.

2. Temporary inspection of building primary and secondary power systems, before energizing building permanent power.

3. Final inspection of the completed electrical system.
B. A project punch list/walk-through shall be conducted with the contractor, Engineer of Record, and Project Manager to review the work and ensure it has been constructed as specified in the contract documents, and that all labeling has been completed.

1.06 CERTIFICATION AND TESTING

A. The Engineer of Record shall determine the field and factory acceptance test requirements as required by code and local municipalities.

B. The Electrical Contractor shall test all systems for proper operation, code compliance, and standards compliance. (Note: Luminaires, devices, and panels shall be tested in a manner that does not affect the equipment components or accessories’ performance.)

C. Field acceptance testing for electrical distribution equipment and equipment feeders shall be completed in accordance with manufacturer’s product data and the National Electrical Testing Association, Inc. (NETA).

D. All adjustable-trip electrical protective devices, including relays, circuit breakers and automatic transfer switches shall be set and calibrated per the coordination study recommendations of the Engineer of Record.

E. Cornell’s Environmental Health & Safety (EH&S) and the Ithaca Fire Department shall conduct acceptance testing and certification of the building fire detection, alarm, and suppression system (refer to CU Standard 283100 for additional information). EH&S will submit a Letter of Acceptance to the Project Manager documenting the inspection results.

F. Acceptance testing shall be performed at a time convenient to Cornell University’s representatives. The Contractor shall be responsible for all costs associated with scheduling, performance, and completion of the testing.

1.07 PROJECT CLOSE OUT

A. The Contractor shall provide all warranties and bonds at the completion of the project, as specified in the contract documents (i.e. Division 1, General Requirements), to the Project Manager and/or Engineer of Record.

B. Operating and Maintenance Manuals shall be provided as specified in the contract documents (i.e. Division 1, General Requirements). Documentation shall include a detailed system sequence of operation, PM schedules & PM procedures, and performance measurements for use in troubleshooting and re-commissioning.
C. The Contractor shall provide the Project Manager with a complete set of “As-Built”
drawings reflecting as-built changes to the contract documents. The Project
Manager will provide these drawings to the Engineer of Record, who shall provide
the Project Manager with a complete set of Record Drawings in paper and
electronic CADD format, which are based on the contractor provided As-Built
drawings.