PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Basic requirements related to Division 16.

B. Related Sections:

1. Division 1 - General Requirements.
2. Notice to Bidders - Substitutions.
3. Division 3 - Concrete.
4. Division 4 - Elevators.
5. Division 15 - Mechanical.
6. Division 9 - Finishes

1.02 REFERENCE CODES AND STANDARDS

A. The electrical design and installations shall meet as a minimum of the most recent versions of the following:

1. Federal and State regulations.
2. OSHA
3. NFPA
4. NEMA
5. IEEE
6. ANSI
7. NESG
8. University Standards.

1.03 ELECTRICAL ROOMS

A. All systems foreign to the electrical system shall be kept from entering or passing through electrical rooms or over the equipment. Mechanical, control and fire suppression systems shall serve the room only.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Verify that Medeco lock cylinders are specified in Division 8 for locking devices requirement on equipment room doors for equipment specified in Division 16.

B. Product Data:
1. Require shop drawings submittals on the following products to verify that material standards are being satisfied.

   a. Circuit and motor disconnects including fuses.
   b. Medium voltage distribution equipment.
   c. Low voltage distribution equipment.
   d. Contactors.
   e. Wiring devices.
   f. Luminaires.
   g. Generator equipment.
   h. Battery power systems.
   i. Special systems equipment.
   j. Cabinets and enclosures.
   k. Modular wiring systems.
   l. Door-in-door panelboard covers.
   m. Supporting devices.
   n. UPS systems.

C. Permanent Power: Permanent power will not be turned on until all breaker settings are received and set, the correct CT’s and PT’s are installed, metering is installed correctly and wired correctly, grounding system is correctly installed, ground fault levels are properly set and all the above is verified by an independent testing agency, the design engineer and the University.

D. A new breaker coordination study of a buildings distribution system shall be done for all buildings where a new large load is added. The EOR shall give, in writing, all settings to the Contractor. The settings shall be verified at the time of the final inspection.

2.02 CONSULTANT SUBMITTAL REQUIREMENTS

The contract drawing information required from the Consulting Engineer shall be composed of:

A. SDs shall contain
   1. Narrative that outlines design
   2. Electrical rooms showing equipment (typical)
   3. One line drawing

B. The 15-35% (design development) shall at a minimum contain:
   1. Lighting and device layouts for “typical rooms”.
   2. One line diagrams.
   3. Luminaire schedule (partial for major luminare types).
   4. Typical panelboard schedules.
   5. Outline specification with all sections required.
   6. Narrative of electrical design.

C. The 50% - 70% design development drawing submittal shall at a minimum contain:
1. All lighting and devices laid out but not circuited, or the circuitry beginning to be developed.
2. Low voltage one-line and preliminary fire alarm riser.
3. Luminaire schedule, typical panelboard schedules.
4. Specifications. (Full specifications with edit markings).
5. Fault study.
6. Medium voltage system one-line.

D. The ±95% drawing shall be complete and used as a review set for comments by the University:
   1. All lighting and devices laid out and completely circuited.
   2. Completed power one-line and fire alarm risers.
   3. Completed medium voltage three line diagram.
   4. Completed luminaire and panelboard schedules.
   5. Completed specifications.
   6. Completed fault study, load study, relay calibration study and breaker setting study for a fully rated, selectively coordinated system.
   7. ¼” Scaled drawing showing electrical room layout.

E. The 100% drawings will be used only as a back check of all previous review comments. The drawings shall be composed of:
   1. Lighting.
   2. Power/Communications/Fire Alarm.
   4. One-lines.
   5. Risers.

F. Review comments shall be in writing to the design consultant. Consultants shall respond to all comments in writing. Possible meeting to ensure comments are picked up.

2.03 LOAD SHED CAPABILITIES

Load shed capabilities shall be provided on all new buildings and all large projects encompassing the majority of any floor. The load shed signal shall be a remote signal. Means shall be provided to shed ±50% of the lights in all spaces, non-essential loads and other such items. Load shed shall be by remotely controlled mechanically held lighting contactor, relay, etc.

2.04 Electrical Rooms

No Piping (plumbing, mechanical, etc.) may be in electrical rooms that do not serve the electrical room. No piping may pass through the electrical rooms.

PART 3 EXECUTION

3.01 SPECIAL ELECTRICAL PROVISIONS
A. Bidding Requirements

1. The bidder shall give evidence of being able to be bonded to \(1\frac{1}{2}\) times project value. A letter shall be provided by the bonding agency assuring capability of bonding this level and associated rates.

2. The successful firm shall be capable of starting work immediately upon receipt of contract award and have the resources to complete the total project in 30 days or less. (Allowance will be made for material delays caused by problems outside of contractor’s control, with proper documentation.)

B. Qualification Requirements

1. Contractors bidding this project must complete AIA Document A305-1986 “Contractor’s Qualification Statement” and submit it with their proposal for information purposes.

2. In addition to the information requested in Paragraph 1., the Contractor must provide a statement indicating they meet the following minimum requirements:

   a. Macintosh HD:Data:Electrical Standards:Converted:E16010 (Word6) List a minimum of two projects completed in the last five years which were similar in size (or larger), complexity and type. For each project list:

      Name and location of project.
      Name, address and phone number of client/owner and owner’s representative.
      Contract type (prime or subcontract) and contract value (or subcontract value). Year in which work was performed.

   b. If required list two projects on which the Contractor acted as the prime contractor (may be the same projects listed in Paragraph (a), if applicable).

   c. The firm or its operating officers (above the level of Project Manager) shall have been involved in Electrical Contracting for at least five years.

   d. List project values (or subcontract values, if applicable) which total at least five times the value of electrical work in the last five years completed by the firm or its operating officers.

C. General Requirements

1. The successful firm shall provide a project supervisor of proven experience, and be willing to leave him (or her) on the project for the duration of the project, unless acceptable alternative arrangements are made with the owner.

2. The successful firm must have a business office which is staffed during normal working hours (8:00 - 5:00 Monday through Friday).

3. The project manager of the successful firm shall have paging capability during working hours.

D. Craftsman Regulations
1. Contractors shall include no more than one indentured apprentice per journeymen electrician. Apprentices shall be under the direct supervision of a licensed electrician at all times.

2. Helpers may be assigned to the project as required to do laboring type tasks, but may not do any installation type electrical work.

3. High voltage cable splicers must be certified by the Director of Facilities Management or his (her) Designated Representative, before either cable splicing or terminating begins. Certification requirement must be satisfied by illustrating knowledge by a test demonstration of capabilities. The University of Colorado at Boulder (UCB) will provide cable for test splice, contractor should provide test splice kits per UCB Standard and perform splice for CU High Voltage Department. Upon completion of requirements, a certification card will be issued by the Department of Facilities Management.

E. Shop Drawing Submittals

1. Shop drawings shall be provided showing the following \( \frac{1}{4} \) scaled drawings of electrical rooms, fault calculations and coordination. Equipment wiring diagrams indicating circuit arrangements, bussing, size, electrical ratings, equipment dimensions, weights, equipment arrangements, housing and proposed finishes, and NEMA rating. Equipment requiring this information:

   a. Medium voltage distribution equipment, cable and devices.
   b. Switchboards
   c. Panelboards including Door-in-Door Enclosure
   d. Standby Power Generation and ATS Systems
   e. Television Systems
   f. Electrical Systems Control
   g. Fire Detection/Alarm Systems and other special systems
   h. Circuit and Motor Disconnects
   i. Contactors
   j. Wiring Devices
   k. Luminaires
   l. Battery Powered Equipment including UPS Equipment
   m. Cabinets, Enclosures and Supporting Systems

F. Construction Requirements

1. It shall be a requirement that the Contractor have available at the job site, current information, on the following at all times:

   a. Construction Plans and Specifications
   b. Addenda
   c. Change Orders
   d. Submittals
   e. Inspection Reports
   f. Test Results
   g. Outage Information and requests
h. Electrical outages must be held to a minimum. The contractor shall submit a request for the outage to the owner detailing the reasons for the outage, areas affected, sequence of procedures to accomplish work, estimated maximum length of time, the date and time of day outage will occur. The Contractor shall obtain written authorization from the owner fourteen calendar days prior to all outages. Due to the critical implications of power outages, the owner may direct the contractor as to the time of day or night and date an outage may take place. The Contractor will be responsible for any temporary power required.

i. As-built Drawings (showing all changes)

3.02 MAINTENANCE

A. Maintenance Service:

1. As part of the service and instruction manuals for the project, the Contractor shall be required to submit schematic diagrams and point-to-point wiring diagrams for the following systems. Submittal shall be in the form of blacklines, furnish reproducible copy (mylar sepia), and AutoCAD latest version.

   a. Fire Detection/Alarm Systems
   b. Communication System
   c. Lighting/Dimming Control System
   d. Motor Control Systems
   e. Electrical Systems Control
   f. Medium voltage equipment

3.03 PROJECT CLOSEOUT

A. Operating and Acceptance Tests

1. The Contractor shall hire an independent testing agent to conduct operating and acceptance tests on new electrical system components and all existing devices which are impacted by the project.

2. The Testing agent shall prepare written reports of values of all test readings and procedures. Reports shall include all breaker settings and modifications to one line and three line drawings.

3. The Testing agent shall furnish all equipment, instruments and personnel required to conduct tests.

4. Test will be defined in the individual section describing the equipment or system.

B. Punch Lists

1. Final payment will not be authorized until all items on the final punch list have been completed, and routine maintenance procedure and spare parts have been received.

C. Cleaning and Conduit Painting
1. Clean all electrical equipment, such as switches, panelboards, luminaires, etc., of construction dirt, dust, paint smears, etc., and touch-up or repaint all scars, blemishes, rust spots, etc., to original or approved other state of finish.

D. Operation and Maintenance Manuals

1. Compile a complete list of product data and shop drawings, acceptance tests, warranties, certificates, sub-contractor and supplier information (i.e. name, address, and phone no.).

E. Guarantees and Warranties

1. Furnish to the Owner a formal warranty covering the electrical system installed under this contract, to be free from defective materials and workmanship for a period of one year after date of acceptance of installation by Owner. During this period provide all labor and new materials required to repair or replace all defects to the satisfaction of the Owner at no cost to Owner.

F. As-built Drawings

1. The Contractor shall provide to the Architect/Engineer a contract set of electrical drawings and CAD files, both hard copy and electronic copy with all CAD and clouded changes and deviations from the original drawings.

G. Emergency Lighting

1. All emergency lighting installed shall be commissioned. Commissioning shall be performed by UCB electrical engineer and contractor by walking. Areas of emergency egress lighting during non daylight hours and taking footcandle measurements where areas do not meet code, emergency lighting shall be added at NO COST to the university.

END OF SECTION