GETTELMAN BUILDING RELOCATION

MILWAUKEE, WISCONSIN

Division 26 - Electrical Work

1. **26 00 01 - GENERAL**
   A. This project includes electrical Design/Build construction for the relocation of a historic building on the MillerCoors property in Milwaukee, Wisconsin. Some of this work includes the following:
      1. Preparation of the building's new location near the Miller Tour Center on State Street. See Civil drawings for proposed new location. Disconnection of the building's existing electrical systems at the building's existing site will be done by another contractor and is not included here.
      2. Providing and installing a new 200 amp, 120/208 Volt service to the building. Provision of a new WE Energies service including Service Application submission, meter accommodations, and utility coordination.
      3. Installing a 200 amp, 120/208 Volt panelboard in the existing stair hall on the first floor. The panel shall have circuit breakers for all currently planned electrical loads plus at least 12 spare 20/1 breakers.
      4. Installation of six (6) outlet boxes for future CCTV cameras. From each outlet box, run one ¾" conduit to a location near the panelboard. Verify locations of outlet boxes with Owner. Provide cast, outdoor rated boxes for exterior locations. **THIS WORK TO BE QUOTED AS AN ALTERNATE BID. SEE BID FORM.**
      5. Painting and concealing all work on the outside of the building. Note that any exterior service equipment (Meter, CT, etc.) must be mounted on the South exterior wall. Placement of a WE Energies transformer shall be coordinated with the Architect.
      6. Installation of three 20 amp GFCI convenience receptacles: One on the first floor, one on the second floor, and one weatherproof outlet outside on South exterior wall. Verify all outlet locations with Architect prior to rough-in.
      7. Installing one(1) LED strip fixture at the panelboard, circuiting and a nearby switch. Cree LS40L 35K or equal.
      8. Installing six (6) ground mount flood lights including circuiting, time clock off. Fixtures to be mounted on 36" concrete bases with 6" of base above ground. Placement and aiming to be coordinated with Architect. Fixtures shall be dimmable with a dimmer installed in the basement. 3000K, LED, Wide rectangular flood Lithonia D-Series size one. **THIS WORK TO BE QUOTED AS AN ALTERNATIVE BID. SEE BID FORM.**
      9. Installing a photocell/Time clock controlled circuit to the monument sign. See Civil drawings for sign location.
      10. Full design services based on these scope specifications.

B. This section outlines electrical design and construction requirements for various spaces and systems within and around the facility. It is not exhaustive and shall not be used without direction from other members of the design/build team, including the Owner's representative. It is this design/build contractor's responsibility to provide complete code compliant electrical systems that meet the Owner's needs and requirements.

C. Electrical construction work shall conform to the International Building Code (IBC) as adopted by the State of Wisconsin, current industry practices, applicable electrical National, State and local electrical codes.

D. All materials shall be new and the best of their respective kinds suitable for the conditions and duties imposed upon same in service.

E. Electrical work shall include everything essential for a complete balanced electrical system in satisfactory operating order.

F. A competent foreman shall be on the job at any time work is being performed. He shall schedule and coordinate the electrical work to eliminate interferences with the work of other trades.

G. Design, Drawings, and Equipment Data

1. Furnish complete, easily readable, electrical installation drawings including, but not limited to, raceways, wiring, and devices. These drawings shall indicate the voltage, phase, horsepower, kilowatt rating, etc. of all equipment, electrical service to all equipment, including that furnished by others, and a complete circuit-by-circuit schedule of power and lighting panels.
2. The electrical drawings and all design calculations shall be stamped by an Electrical Engineer, registered in the State of Wisconsin.
3. The drawings shall be prepared with reference to the architectural and mechanical subcontractor drawings for a fully coordinated design.
4. The Contractor shall consult the complete drawings and specifications to determine and provide for electrical requirements of work provided by others including, but not limited to the Plumbing, System Subcontractor and General Contractor. Where connections are made to equipment furnished by others, obtain exact locations of connections and electrical requirements from the parties furnishing the equipment.
5. If clarifications to the specifications are required, document and interface with the listed Subcontractors, or the General Contractor, and obtain such clarification prior to entering into a subcontract.
6. Later claims for labor, materials, equipment and work required for any difficulty encountered shall not be recognized and all such difficulties shall be resolved by this Subcontractor at his sole expense.

H. Submittals
1. Review and approve all submittals prior to submitting them to Engineer.
2. Provide the following submittals for approval within fourteen (14) calendar days after contract award.
3. List of proposed subcontractors and material manufacturers.
4. Brochures and data on all proposed equipment, fixtures, etc.

I. Record Drawings and Owner's Manuals and Instruction:
1. Record Drawings - As work progresses, the foreman on the job site shall record all changes from the installation originally indicated on the installation drawings and record final grade elevations of underground lines by depth from finished grade and by distance to surface improvements.
2. Upon completion of the project and prior to receipt of final payment, add these revision/recordings to the original drawings and these drawings should be labeled as "record set", approved by the Electrical Engineer originally stamping the drawings, and submitted to the General Contractor. The record set drawings must be produced electronically (AutoCad 2012) and be submitted on engineering bond paper for permanent record purposes.
3. At the completion of the work, the Contractor shall furnish two complete manuals in three ring binders describing the construction, guarantees, operation, control and maintenance of each system and major piece of equipment installed under this contract. Mark equipment data sheets to indicate model numbers, operations, etc. which are applicable to this installation. Nonapplicable data shall be marked out.
4. Further, a list giving names and addresses of the nearest supply houses carrying spare parts of all equipment shall be furnished. Provide a schedule of recommended preventive maintenance and a written description of the system operation and controls.
5. These manuals shall be submitted to the General Contractor for review and forwarded to Owner, prior to providing oral instructions to the Owner.

J. Codes and Permits:
1. Obtain and pay for all permits, licenses, fees, etc. required by governing agencies prior to commencement of work. Upon completion of work, obtain all necessary inspections, approval and written acceptance from the proper governing agencies having jurisdiction.

K. Coordination:
1. Coordinate the electrical design and installation with the work of all other trades.
2. In case of conflict, General Contractor shall decide the proper location or layout and costs of revisions shall be at the expense of Subcontractor responsible for the work.

2. **26 00 02 – ELECTRICAL POWER AND SYSTEMS APPLICATIONS**

A. Power Distribution System:

1. The electrical service will be 200 amps at 120/208 volts, 3 phase, 4 wire.
2. Coordinate space needs with all design/build team members, including the Architect. Provide code minimum equipment clearances and increase clear space as needed to accommodate safe spaces for maintaining and testing of electrical equipment.
3. Provide a solid ground path including water piping/service, structural steel, ground rods and a concrete embedded (Ufer) electrode.
4. Provide at least twelve twenty amp, spare single pole breakers.
5. Provide a time clock and photocell for automatic control of exterior lighting and signage. Controls shall have the capability to control by photocell on/off, time on/off, or any variation of both.

B. Other Low Voltage and Miscellaneous Requirements:

1. Provide rough-in and pull strings needed for CCTV.

3. **26 10 01 - RACEWAY**

Furnish and install a complete conduit raceway system for all feeders, branch circuits, control, instrumentation and communication circuits, unless otherwise indicated in the specifications or on the plans.

A. Finished Areas: Raceway system shall be metallic, galvanized heavy wall metallic conduit, IMC, and/or electrical metallic tubing in trade sizes concealed wherever possible. M.C. cable may be used (where not exposed) if accepted by the Authority Having Jurisdiction. M.C. cable shall not originate from panelboards, only from a local junction box serving receptacle and lighting outlets in the area being served. AC, ENT and BX shall not be utilized.

B. Unfinished Areas: Raceway system shall be metallic, galvanized heavy wall, IMC and/or electrical metallic tubing in trade sizes run exposed on ceilings. Raceway system on walls shall be as follows: Vertical runs shall be concealed if possible, and horizontal runs shall be run concealed where practical and possible. Specific approval must be obtained from Architect before exposed raceway may be employed. In damp and exterior locations use rigid metal conduit.

C. Electric metallic tubing (thin wall conduit) bearing the U.L. label may be used for branch circuit wiring, feeders, and for auxiliary systems except it shall not be used for runs specified to be installed in rigid conduit.

D. Conduits shall be of the size required to accommodate the number of conductors in accordance with the tables given in the current edition of the National Electrical Code.

E. All conduit shall be run concealed except that exposed surface conduit may be installed where concealment is found to be impractical or impossible and only with the approval of the Architect/Engineer.

F. Conduits shall be continuous from outlet to outlet, and from outlets to cabinets, junction or pull boxes, such that each system shall be electrically continuous from point of service to all outlets. Entire raceway system shall be made water tight where installed in wet places, underground or where buried in masonry or concrete.

G. Cap conduits upon installation. Remove caps, swab-out conduits, install junction boxes, panelboard tubs, etc. prior to installation of wire.

H. Flexible metal conduit in code approved lengths and sizes shall be used for final connections of all equipment subject to vibration or movement and for all motors auxiliary transformers and for connection to recessed lighting fixtures in suspended ceiling. Liquid tight flexible conduit shall be used in wet locations. A separate ground wire shall be provided through all flexible connections, except for lighting fixtures providing that U.L. approved grounding type connectors are used.

I. Conduit shall be securely fastened to structural parts of the building. It may be fastened to the metal deck of the building, but only with specific approval by the General Contractor. Supporting devices shall be specifically designed for the application. Perforated hanger iron is NOT acceptable. Conduit shall not be attached to ceiling grid suspension wires or the ceiling grid itself.

I. Conduit terminations at cabinets and boxes shall be rigidly secured with galvanized lock nuts and bushings as required by Code.

J. Exterior underground conduit shall be Schedule 40 PVC. Underground conduit runs which enter or exit the building envelope shall utilize PVC coated rigid metal conduit from the point of penetration of the building envelope and the next 5’ portion of the run in direct contact with the earth. Exterior underground conduit shall be buried at a depth of not less than 30 IN below grade. Provide conduits or ducts terminating below grade with means to prevent entry of dirt or moisture. Underground conduits shall slope 1/8” per foot for proper drainage. Conduits shall drain toward manholes and junction boxes, not the electrical equipment. Underground conduits under paved or driving areas shall be Schedule 80 PVC.

4. **26 10 02 - CONDUCTORS, WIRING DEVICES AND WIRING REQUIREMENTS**

A. Conductors:

1. All conductors shall be new, soft-drawn copper with 600 volt insulation, color coded per code.
2. In general: Code grade Type TW and THHN.
3. All conductors No. 8 or larger: Code grade Type THWN.
4. High Temperature Locations: Code grade Type RHH.
5. Conductors used for lighting, power, control and signal wiring shall be stranded.

B. Wiring Devices: Insofar as possible, all wiring devices shall be of one manufacturer. References to Hubbell devices have been used as a means of establishing grade and type for use on the project. Comparable devices of Hubbell, Leviton, or Pass & Seymour will be considered as equal. All devices shall be 20A, and specification grade. There shall there be no more than 6 duplex receptacles per circuit. Coordinate color of wire devices and faceplates with Architect.
   1. General use switches shall be rated at 20 amperes 120 Volt AC, Underwriter's listed, quiet toggle type Hubbell, HBL1221, HBL1223, and HBL1224.
   2. Switches controlling equipment, the operation of which is not evident from the switch position include Hubbell #1475 flush neon pilot light in conjunction with proper switch. Each switch shall be complete with engraved plate to identify equipment being controlled.
   3. All receptacles shall be of specification grade rated for the capacity and characteristics of the equipment served. All receptacles shall be properly and clearly identified with Panel designation and circuit breaker number feeding the receptacle.
   4. Device plates shall be Sierra specification grade, coordinated with room finishes in finished areas. Verify color with Architect.
   5. Protective devices shall have overcurrent ratings suitable for the equipment protected and maximum fault interrupting capability, greater than the fault current available at the location of the protective device.

C. Wiring Requirements:
   1. Conductor shall be furnished in the minimum AWG sizes:
      a. No. 12 for branch circuits of any kind.
      b. No. 10 for branch circuits serving a single item of equipment, direct burial conductor, and circuits exterior to building.
      c. Limit voltage drop to furthest outlet to 5 percent.
   2. Multi-wire branch circuits shall be provided with a means that will simultaneously disconnect all underground conductors at a point where the branch circuit originates. Contractor shall provide multi-pole breakers or approved breaker ties as required.

5. **26 20 01 - ELECTRIC SERVICE**

A. Temporary: Electrical Service for construction purpose as required. Arrangements to be established with Owner to utilize existing service and distribution equipment.

B. The Contractor shall apply for temporary and permanent Electrical Services with WE Energies.

6. **26 20 02 - ELECTRICAL DISTRIBUTION SYSTEM**

A. Branch Circuits:
   1. Copper wire branch circuits minimum 12AWG shall be extended from distribution panels to lighting equipment, receptacles and miscellaneous equipment via raceway system. Provide oversized neutrals wherever appropriate to compensate for harmonics.

C. Lighting and Receptacle Panelboards:

1. Furnish and install circuit breaker panelboards incorporating switching and protective devices of the number, rating required, including the required fault current. Panelboards shall be rated for the intended voltage and shall be in accordance with the Underwriters' Laboratories "Standard for Cabinets and Boxes" and "Standard for Panelboards" and shall be so labeled where procedures exist. Panelboards shall also comply with the NEMA Standard for Panelboards and the National Electric Code. A nameplate shall be provided listing panel type and rating.

   a. Circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip indicating and have a common trip on all multiple breakers. Connections to the bus shall be bolt on. Circuit breakers shall be UL listed and meet the requirement of Federal Specification WC-375a, Class 1.

   b. Provide new panelboards. All panelboards to have “door-in-door” front covers. Fronts shall have flush, brushed, stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door.

   c. Equipment shall be as manufactured by Square D NQOD style.

7. **26 40 02 - SPECIAL EQUIPMENT AND APPARATUS**

A. Special outlets and wiring in accordance with equipment served. Provide termination junction box, disconnect switch(es) or receptacle as required. Coordinate requirements with owner and other trades.

B. Contactors, Time Clocks: Provide as required.

8. **26 40 04 – ELECTRICAL IDENTIFICATION**

A. Provide nameplates on all panels, disconnect switches and starter, and other equipment with electrical connects. Other than Main Panelboard, nameplate shall include circuit number where power supply originates.

B. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring.

C. Directories for panels must be covered with clear plastic, have a metal frame and shall be typewritten. Room number on directories shall be Owner’s numbers, not Plan numbers unless Owner so specifies.

D. Wall switches, receptacles, device plates and box covers, photocells and time clocks shall be identified with circuit numbers and source. Identifications should be made inside of device covers, unless directed otherwise. Use machine-generated labels, or neatly hand-written permanent marker.

9. **26 40 05 - GROUNDING**

A. The electrical system and equipment is to be grounded as required by Code, local ordinances and to requirements herein.

B. All metallic conduits, supports, cabinets and other equipment shall be grounded so that ground will be electrically continuous from service to all outlet boxes. Provide grounding conductor in all conduit to complete equipment ground continuity.

C. All receptacles are to be of the grounding type with a positive ground connection to the outlet box.

D. All lighting fixtures shall be effectively grounded. Particular care shall be taken to provide a good and permanent ground to fluorescent fixture bodies. Fixtures mounted in continuous rows shall have metal-to-metal contact between fixtures.

E. Install separate Code rated grounding conductors to all special equipment and activity areas as required by Code to all building steel.

F. Provide a solid main grounding electrode system at the service entrance which will include at a minimum:
   1. A #4 solid copper “Ufer” conductor consisting of 50’ of conductor located within footings.
   2. Water pipe and building steel connections.
   3. At least three 20’ x 5/8” copper grounds rod spaced 20’ apart.

10. **26 51 13 – LIGHTING**

A. LUMINAIRES:
   1. Housings:
      a. Shall be free from burrs, sharp corners and edges.
      b. Shall be steel, unless noted otherwise, formed and supported to prevent warping and sagging.
   2. Mounting Accessories:
      a. Surface-mounted fixtures:
         1) Provide ceiling spacers as required for fixtures not labeled as suitable for direct mounting to a low density ceiling.
      c. Finishes:
         1) Painted finishes:
            - Shall be polyester powder painted enamel finish.
            - Shall be painted after fabrication, unless noted otherwise.
         2) Polished, brushed, other metal finishes:
            - Shall be finished with clear coat to inhibit finish deterioration and corrosion.

3) All finish types and colors shall be verified with the Architect prior to ordering.

B. LED LIGHTING:

1. The manufacturer offering this item must have produced at least 1000 (one thousand) identical or similar models to that being tendered.
2. The manufacturer of the LED lighting fixture shall utilize high-brightness LEDs.
3. Light output of the luminaire shall be the absolute photometry following IESNA LM-79 requirements and guidelines.
4. Lumen maintenance of the LED's (sources, arrays, modules) shall be reported following IESNA LM-80 requirements and guidelines.
5. Luminaire Color Rendering Index (CRI) shall be a minimum of 70 for exterior fixtures, and a minimum of 80 for interior fixtures.
6. The LED fixture shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the fixture is to be installed.
7. The luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours at 25 degrees C for exterior locations and conditioned interior locations, and 40 degrees C for unconditioned interior locations.
8. The luminaire shall be mercury-free, lead-free and RoHS compliant.
9. The luminaire shall be certified by a Nationally Recognized Testing Laboratory (UL, ETL, IEC) as listed by OSHA.
10. LED driver shall have a minimum power factor of 0.90.
11. Electrical components of the LED lighting fixture [LED light engine/board array and driver(s)] shall be of modular construction so that each component is individually replaceable in the field for maintenance and repair purposes. Wiring connecting these components shall utilize quick disconnects.
12. The LED lighting fixture shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
13. LED driver shall operate at 525mA drive current maximum.
14. LED driver shall be compatible with dimming control where specified. Refer to fixture specification.
15. LED luminaire, driver, and controls shall be submitted for review at the same time to ensure compatibility.
16. All LED fixtures when submitted for review shall include the "Lighting Facts" sheet.

D. FIXTURE INSTALLATION:

1. Locate ceiling luminaires as described. Coordinate all discrepancies between the lighting and reflected ceiling plans with the architect.
2. Install surface mounted and exit signs plumb and level, adjust to align with building lines and with each other. Secure to prohibit movement. Where mounting surface is not flat for proper mounting of fixture, then modify surface or provide accessories provided by fixture manufacturer, to mount fixture

completely against surface as per manufacturer's or Engineer's direction.

3. The Contractor shall install fixture supports as required. Fixture installations with fixtures supported only by insecure boxes will be rejected. It shall be the Contractor's responsibility to support all lighting fixtures adequately, providing extra steel work for the support of fixtures if required. Any components necessary for mounting fixtures shall be provided by the Contractor. No plastic, composition or wood type anchors shall be used.
4. Install recessed luminaires to permit removal of all components that may require maintenance from below the ceiling. These components shall include, but not be limited to, ballasts, sockets, and low-voltage transformers.
7. The EC shall verify construction and type of surface on or in which lighting fixtures are installed, for ceiling construction proper, type of suspended ceiling and space above same and possible conflicts with equipment of other trades.
    a. Determine the specific ceiling construction including the ceiling materials and the ceiling suspension system in each area where a suspended ceiling is to be provided. Verify suspended ceiling type with ceiling contractor prior to releasing lighting fixtures for delivery.
    b. Furnish fixture of type scheduled complete with accessories necessary to make installation in accordance with the manufacturer's recommendations including plaster frames, couplings and connectors, suspension assemblies mounting brackets and other auxiliary equipment.
8. Install accessories furnished with each luminaire.
9. Connect luminaires to branch circuit outlets using flexible conduit.
10. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
11. Bond fixtures and metal accessories to branch circuit equipment grounding conductor.
12. Fixture Connections:
    a. Surface and wall-recessed fixtures shall be connected directly to a junction box or solid conduit.
    b. Ceiling recessed fixtures shall be connected to flexible metal conduit, originating at a solidly supported j-box. Flexible metal conduit shall be minimum 3/8″ diameter. Conduit length shall allow movement of fixture for maintenance purposes.

E. ADJUSTING AND CLEANING:
1. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.
2. Touch up luminaire finish at completion of work.

F. FIELD QUALITY CONTROL:
1. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

END OF SECTION