ELECTRICAL SPECIFICATIONS

1.1 SUMMARY
A. Electrical systems required for this work includes labor, materials, equipment, and services necessary to complete installation of electrical work shown on Drawings, specified herein or required for a complete operable facility and not specifically described in other Sections of these Specifications. Among the items required are:
1. Service and distribution equipment shown on Drawings.
2. Feeders to switchboards, distribution panels, Heating–Ventilating and Air Conditioning.(HVAC) equipment, Owner provided equipment and other equipment as detailed.
3. Branch circuit wiring from the distribution panels for lighting, receptacles, motors, signal systems and other detailed circuit wiring.
4. Luminaires, control switches, receptacles, relays, supports and other accessory items.
5. Wiring and power connections for motors installed for heating, cooling and ventilation.
B. Fees:
1. Pay fees levied by serving electric utility to provide service to this project.
2. Obtain fees from serving electric utility prior to submitting a bid.
3. Obtain and pay for electrical permits, plan review, and inspections from local authorities having jurisdiction (AHJs).

1.2 DEFINITIONS
A. Provide: To furnish and install, complete and ready for the intended use.
B. Furnish: Supply and deliver to the project site, ready for unpacking, assembly and installation.
C. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at the project site as required to complete items of work furnished by others.

1.3 SUBMITTALS
A. Operation and Maintenance Documentation: Provide copies of certificates of code authority acceptance, test data, product data, guarantees, warranties, and the like.
B. Shop Drawings: Provide shop drawings which include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and the like.
C. Record Drawings: Show changes and deviations from the Drawings. Include written Addendum and change order items. Make changes to Drawings in a neat, clean, and legible manner.

1.4 QUALITY ASSURANCE
A. Conform to requirements of the National Electric Code (NEC), latest adopted version with amendments by local AHJs.
B. Conform to latest adopted version of the Uniform Building Code (UBC) with amendments by local AHJs.
C. Furnish products listed by Underwriters' Laboratories, Inc. (UL) or other testing firm acceptable to AHJs.
D. Conform to requirements of the serving electric, and telephone utilities.

1.5 SEQUENCING AND SCHEDULING
A. For the proper execution of the work cooperate with other crafts and contracts as needed.
B. To avoid installation conflicts, thoroughly examine the complete set of Contract Documents. Resolve conflicts prior to installation.
C. Prior to installation of feeders to equipment requiring electrical connections, examine the manufacturer's shop drawings, wiring diagrams, product data, and installation instructions. Verify that the electrical characteristics detailed in the Contract Documents are consistent with the electrical characteristics of the actual equipment being installed.

1.6 WARRANTY
A. Ballast Manufacturer's Warranty: Not less than 2 years for magnetic type ballasts and 5 years for electronic type ballasts, based on date of manufacturer embossed on ballast, current with installation date. Warranty includes normal cost of labor for replacement of ballast.
B. Lamp Warranty: 30 days for incandescent, 6 months for compact fluorescent, 12 for fluorescent and HID lamps.

PART 2 – PRODUCTS

2.1 MATERIALS
A. Provide new electrical materials of the type and quality detailed, listed by UL, bearing their label wherever standards have been established. Indicated brand names and catalog numbers are used to establish standards of performance and quality. The description of materials listed herein governs in the event that catalog numbers do not correspond to materials described herein.
B. Include special features, finishes, accessories, and other requirements as described in the Contract Documents regardless of the item's listed catalog number.
C. Provide incidentals not specifically mentioned herein or noted on Drawings, but needed to complete the system or systems, in a safe and satisfactory working condition.
D. Firestopping Foam Sealant: Foam sealant for use around conduit penetrations to prevent passage of smoke, fire, toxic gas or water. Maintain seal before, during and after fire. In and around conduit for thermal break at penetration of barrier between heated and unheated spaces. Chase Technology Corporation CTC PR–855, Fire Foam, Thomas & Betts.

2.2 RACEWAYS
A. Galvanized Rigid Steel Conduit (GRC): Federal Specification WWC–581 and American National Standards Institute (ANSI) C80.1.
B. Intermediate Metal Conduit (IMC): Federal Specification WWC–581.
C. Electrical Metallic Tubing (EMT): Federal Specification WWC–563 and ANSI C80.3.
D. Flexible Conduit: Reduced wall flexible steel conduit. Federal Specification WWC–566.
E. Flexible Conduit, PVC Coated: PVC chemical resistant jacket.
F. PVC: Class 40 heavy wall rigid PVC, Federal Specification WC1094A and National Electrical Manufacturer's Association (NEMA) TC–2.
G. Conduit Fittings:
1. Bushings: Malleable iron with plastic insulator lining, 150C rated.
2. Ground Bushings: Malleable iron with plastic insulating liner and aluminum grounding lug rated for copper or aluminum conductor, 150C rated.
3. EMT Connectors and Couplings:
a. Set Screw Type: Zinc plated steel, insulated throat connectors.
b. Compression Type: Zinc plated steel, insulated throat connectors, raintight up to 2–inch.

2.3 WIRES AND CABLES
A. Copper, 600 volt rated throughout. Conductors 14AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded. Phase color to be consistent at feeder terminations; A–B–C, top to bottom, left to right, front to back. Conductors 3AWG and larger, minimum insulation rating of 75C. Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.
B. Service Entrance Cable: Copper conductor, 600 volt insulation, XHHW, Type SE.

2.4 BOXES
A. Luminaire Outlet: 4–inch octagonal box, 1–1/2–inches deep with 3/8–inch luminaire stud if required. Provide raised covers on bracket outlets and on ceiling outlets.
B. Device Outlet: Minimum 4–inch square, minimum 1–1/2–inches deep. Single or 2–gang flush device raised covers. Raco Series 681 and 686 or Bowers.
C. Multiple Devices: Three or more devices at common location. Install 1–piece gang boxes with 1–piece device cover, one device per gang.
D. Masonry Boxes: Outlets in concrete, Raco Series 690 or Bowers.
E. Weatherproof Outlet Boxes: Corrosion–resistant cast metal weatherproof outlet wiring boxes, of the type, waterproof cap suitably configured for each application, including face plate gasket, blank plugs shape and size, including depth of box, with threaded conduit ends, cast metal face plate with spring–hinged and corrosionproof fasteners and gray finish.
F. Junction and Pull Boxes: Galvanized sheet steel junction and pull boxes, with screw–on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.

2.5 WIRING DEVICES
A. Finish: As directed by Architect.
B. Wall Switches: Toggle type, quiet acting, 20 amp, 120/277 volt, UL listed for motor loads up to 80 percent of rated amperage. Arrow–Hart 1221, Leviton 1221, Pass & Seymour 20ACI, Bryant 4901, Hubbell 1221.
C. Pilot Light Switches: Lighted handle, toggle type, red, neon pilot lamp. Pilot lamp energized when load is energized. 20 amp/120 volt, Arrow–Hart 1991–PL, Leviton 1221–PL, Pass & Seymour 20ACI–PL, Bryant 4901–PL, Hubbell 1221–PL.
D. Receptacles: Straight parallel blade 15 amp, 125 volt, 2–pole – 3 wire grounding. Arrow–Hart 5352, Leviton 5352, Pass & Seymour 5352, Bryant 5352, Hubbell 5352.
E. Ground Fault Interrupter Receptacle: Feed through type, 20 amp, 125VAC. Hubbell IG–5362, Arrow–Hart IG–5362, Leviton, Pass & Seymour, Bryant.
F. Finish Plates: Smooth thermoplastic, same finish as device.

2.6 SAFETY DISCONNECTS
A. Toggle Type Disconnect Switches: 120 volt, 1–pole, 20 amp, 1 HP maximum. NEMA 1 enclosure for indoors, NEMA 3R enclosure for outdoors.
B. Manual Motor Starters: Quick–make, quick–break. Thermal overload protection. Device labeled with maximum voltage, current and horsepower. Square–D Class 2510, Siemens, General Electric, or Cutler–Hammer/Westinghouse. Provide NEMA 1 enclosure for indoors, NEMA 3R enclosure for outdoors.
C. Safety Switches: Heavy duty, fused type, dual rated, quick–make, quick–break with fuse rejection feature for use with Class R fuses only. Provide NEMA 1 enclosure for indoors, NEMA 3R enclosure for outdoors.
Manufacturers: Cutler–Hammer/Westinghouse, Square–D, or Siemens.

2.7 SUPPORTING DEVICES
A. Hangers: Kindorf B–905–2A channel, H–119–D washer, C105 strap, 3/8–inch rod with ceiling flange.
B. Pipe Straps: Two–hole galvanized or malleable iron.

2.8 ELECTRICAL IDENTIFICATION
A. Engraved Labels: Melamine plastic laminate, white with black core, 1/16–inch thick, manufactured by Lamicoid. Engravers standard letter style, minimum 3/16–inch high letters. Drill or punch labels for mechanical fastening except where adhesive mounting is necessary because of substrate. Use self tapping stainless steel screws.
B. Conductor Numbers: Manufacturers standard vinyl–cloth self–adhesive cable and conductor markers of the wraparound type.
C. Branch Circuit Schedules: Provide branch circuit identification schedules, typewritten, clearly filled out, to identify load connected to each circuit and location of load.

2.9 GROUNDING MATERIALS
A. Ground Rods: Copperclad steel, 3/4–inch diameter, 10–feet long, tapered point, chamfered top.
B. Grounding Connectors: Hydraulic compression tool applied connectors or exothermic welding process connectors or powder actuated compression tool applied connectors. Mechanical type of connectors are not acceptable. Manufacturers: Burndy Hyground Compression System, Erico/Cadweld, Amp Ampact Grounding System or approved.
C. Pipe Grounding Clamp: Mechanical ground connector with cable parallel or perpendicular to pipe.
D. Telecommunications Grounding Bar: 1/4–inch thick by 4–inch high by 20–inch long copper ground bar with insulators.

2.10 METERING EQUIPMENT
A. Meter Base: Surface mounted meter socket enclosure. Provide meter base(s) for energy/demand and reactive energy/demand bases as required by serving electric utility.
B. C.T. Enclosure: Meet serving utility company's requirements. Construct as an integral part of the main distribution switchboard.

2.11 SWITCHBOARD AND DISTRIBUTION PANELBOARD CONSTRUCTION
A. Manufacturers: Siemens, Square–D, Cutler–Hammer, General Electric, or approved.
B. Standards: Comply with requirements of UL 891, NEMA PB2 and NEC 384 in construction of switchboards. Provide short circuit current rating (Integrated Equipment Rating, IER) for panelboards.
C. Lugs: Compression type.
D. Switchboard:
1. Enclosure: Free standing, dead front with front accessibility. Framework constructed of formed, code gauge steel, rigidly welded and bolted together (support cover plates, bussing and component devices during shipment and installation bolt steel base channels to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.
2. Bussing: Extruded aluminum plated by ALTAN 70 or 80 process. Bus supports, connections and joints bolted together with hex–head bolts and Belleville washers. Full length of switchboard ground bus, 50 percent of phase bus capacity.
3. Provide fully rated integrated equipment rating greater than the available fault current. Series rated switchboards are not acceptable. See Drawings for available fault current, if Drawings do not have the available fault currents then coordinate with serving electric utility.
E. Distribution Panelboards:
1. Enclosure: Flush panelboards rated 600 amp or less provide maximum enclosure depth of 5–3/4–inches. Provide galvanized metal finish.
2. Bussing: Aluminum bar with suitable electroplating (tin) for corrosion control at connection. Provide ground bar to accommodate specified terminal lugs.
3. Provide series rated integrated equipment rating greater than the available fault current. See Drawings for available fault current, if Drawings do not have the available fault currents then coordinate with serving electric utility.
4. Breakers: Bolt–on type.
5. Cover: Hinged door, flush lift latch and lock, two keys per panel. Key branch circuit panelboards alike. Medium light grey finish suitable for field painting to match wall finish.

2.12 OVERCURRENT PROTECTIVE DEVICES
A. Fuses: Dual element, time delay, current limiting, nonrenewable type, rejection feature. UL Class RK1, 1/10 to 600 amp, UL Class L, above 600 amps. Provide fuse pullers for complete range of fuses. Manufacturers: Bussmann, Gould–Shawmut, Littelfuse, or approved.
B. Molded Case Circuit Breakers: One, two or three–pole bolt on, single handle common trip, rated 15 to 800 amp, as indicated on Drawings. Overcenter toggle–type mechanism, quick–make, quick–break action. Trip indication is by handle position. Calibrate for operation in 40C ambient temperature.

2.13 CONTROL DEVICES
A. Lighting Contactors:
1. Continuously rated 20 amp per pole for all types of ballast and tungsten lighting and resistance loads, do not derate for use on high–inrush loads.
2. Contacts: Double break, silver–cadmium–oxide. Auxiliary arcing contacts not acceptable. Convertible Contacts, N.O. or N.C. Contact status, N.O. or N.C., clearly visible.
3. Approved per UL 508. Design in accordance with NEMA ICS2–211B, rated for application to 600 volt.
4. Mechanically Held Contactor Coil: Continuously rated and encapsulated.
5. Contactor Enclosures: Provide NEMA enclosure suitable for location and use, flush or surface mount as indicated on Drawings.
B. Electronic Time Switches: Double pole, single throw; one N.O. contact, one N.C. contact. 24–hour digital. Battery power source to provide minimum of 3 years of memory back–up. Eight event setpoints. Provide enclosure with separate hinged door, recessed or surface as indicated on Drawings. Intermatic, Paragon, Tork, Sangamo, or approved.
C. Photoelectric Switches: Hermetically sealed light sensitive element installed in diecast weatherproof enclosure. Adjustable external light level slide. Swivel adjustable enclosure. 20VAC, 1800VA, connected for pilot duty unless otherwise indicated. Paragon, Tork, Precision, or approved.

2.14 LUMINAIRES
A. Luminaires: Refer to description and manufacturers in Luminaire Schedule.
B. Where recessed luminaires are installed in cavities intended to be insulated, provide IC rated luminaires or other code approved installation.
C. Recessed Luminaires: Frame compatible with the ceiling material installed at the particular luminaire location.
D. Light Transmitting Components: Prismatic acrylic, extruded, flat diffusers, 0.125–inch overall thickness, unless otherwise noted.

2.15 BALLASTS
A. Ballasts, General:
1. Provide ballasts rated for specified lamps, i.e., T–8 rated ballasts where T–8 lamps specified.
2. Thermal Protection: Internal UL Class P with automatic reset.
3. Power Factors: Not less than 90 percent unless otherwise indicated.
4. Sound Ratings: Rating A, except where not available as standard products from manufacturer. Provide the quietest ratings available.
5. Input Voltage: Match branch circuit supply voltage; refer to Drawings.
B. Fluorescent Electronic Ballasts:
1. Provide ballasts which meet the requirements of UL 935 and bear the appropriate UL label.
2. Electrical Characteristics:
a. Provide electronic ballasts which withstand input power line transients as defined in ANSI C62.41, Category–A and Institute of Electrical and Electronic Engineers (IEEE) 587.
b. Lamp Crest Factor: 1.7 or less for rapid start ballasts and 1.85 or less for instant start ballasts.
c. Total Harmonic Distortion: Not to exceed to 10 percent of the input current.
3. Manufacturer: Advance RCN/VCN Series, Motorola, or approved.
C. HID Ballasts: Provide minus 20F minimum starting temperature. Constant wattage multi–tap autotransformer (CWA) types equal to Advance 73B Series except, high leakage–reactance high power factor (HX–HPF) equal to Advance 72C Series acceptable for up to 100 watt high pressure sodium lamp.

2.16 LAMPS
A. HID Lamps: Specified in Luminaire Schedule, General Electric, Osram/Sylvania, Philips, Venture.
B. Fluorescent Lamps: 3500K minimum CRI 80, length and wattage as noted in Luminaire Schedule. General Electric, Osram/Sylvania, Philips.
C. Incandescent: 130 volt rated. General Electric, Osram/Sylvania, Philips.

PART 3 – EXECUTION 3.1 EXAMINATION
A. Drawings are diagrammatic with symbols representing electrical equipment, outlets, luminaires, and wiring. Examine the entire set of Drawings to avoid conflicts with other systems. Determine exact route and installation of electrical wiring and equipment with conditions of construction.
B. Clarification:
1. The Drawings govern in matters of quantity, the Specification in matters of quality. In event of conflict on Drawings or in the Specifications, the greater quantity and the higher quality apply.
2. Should the Electrical Documents indicate a condition conflicting with the governing codes and regulations, refrain from installing that portion of the work until clarified by Architect.

3.2 MOTORS/APPLIANCE/UTILIZATION BRANCH CIRCUIT WIRING
A. Electrical Connections: Connect equipment, whether furnished by Owner or other Divisions of the Contract, electrically complete.
B. Connect motor branch circuits complete from panel to motor as required by code and manner herein described.
C. Appliance/Utilization Equipment: Provide appropriate cable and cord cap for final connection unless equipment is provided with same. Verify special purpose outlet NEMA configuration and ampere rating with equipment supplier prior to ordering devices and coverplates.

3.3 INSTALLATION
A. Install electrical equipment complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough–in of the electrical equipment, examine the instructions thoroughly.
B. Earthwork: Perform excavation and backfill for the installation of electrical work.
C. Noise Control: Do not place outlet boxes at opposite side of partitions or walls back to back. Do not place contactors, transformers, starters or similar noise producing devices on walls which are common to occupied spaces unless specifically called for on Drawings. Where such devices must be mounted on walls common to occupied spaces, mount or isolate in such a manner as to effectively prevent the transmission of their inherent noise to the occupied space.
D. Firestopping: Coordinate with the Drawings the location of fire rated walls, ceilings, floors and the like. When these assemblies are penetrated by electrical equipment, seal around the equipment with approved firestopping material. Install firestopping material complete as directed by the manufacturer's installation instructions.
E. Conduit:
1. Conceal conduits. Exposed conduits are permitted only in the following areas: Mechanical rooms, electrical rooms or spaces where walls, ceilings and floors will not be covered with finished materials. Existing walls that are concrete or block construction and where specifically noted on the Drawings.
2. Do not install conduits on surface of building exterior, across roof, on top of parapet walls, or across floors.
3. Below Grade Conduit and Cables: Place a minimum 3–inch cover of sand or clean earth fill around the cable or conduit on a leveled trench bottom. Lay conduit on a smooth level trench bottom, so that contact is made for its entire length. Remove water from trench before electrical conduit is installed.
4. Conduit Terminations: Provide conduits shown on Drawings which terminate without box, panel, cabinet or conduit fitting with conduit connector or bushing.
5. Conduit Size: Minimum trade size 1/2–inch.
6. Provide pull cord in empty conduits.
7. Conduit Use Locations:
a. Underground: PVC.
b. Cast–in–Place Concrete, Masonry, Damp Locations and Subject to Mechanical Damage: GRC or IMC.
c. Dry, Protected: GRC, IMC, EMT.
d. Sharp Bends and Elbows: GRC, EMT use factory elbows.
e. Motors, recessed luminaires and equipment connections subject to movement or vibration, use flexible metallic conduit.
f. Motors and equipment connections subject to movement or vibration and subjected to the following conditions; exterior location, moist or humid atmosphere, water spray, oil or grease use PVC coated liquid tight flexible metallic conduit.
8. Branch Circuits: Do not change the intent of the branch circuits or controls without approval. Homeruns for 20 amp branch circuits may be combined to a maximum of six conductors in a homerun. Apply derating factors as required by NEC 310. Increase conductor size as needed.
F. Wires and Cables:
1. Conductor Installation: Install conductors with care to avoid damage to insulation. Do not apply greater tension on conductors than recommended by manufacturer during installation.
2. Conductor Size and Quantity: Install no conductors smaller than 12AWG unless otherwise shown. Provide required conductors for a fully operable system.
G. Boxes:
1. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.
2. Provide weatherproof outlets for locations exposed to weather or moisture.
3. Code Compliance: Comply with NEC as applicable to construction and installation of electrical boxes and fittings and size boxes according to NEC 370, except as noted otherwise.
4. Mount Center of Outlet Boxes as Required by Americans With Disabilities Act (ADA), or Noted on Drawings, the Following Distance above the Floor:
a. Control Switches: 48–inches.
b. Receptacles: 18–inches.
c. Telecom Outlets: 18–inches.
d. Other Outlets: As indicated in other Sections of Specifications or as detailed on Drawings.
H. Provide NEC–required disconnect switches whether specifically shown on Drawings or not. Provide disconnect switch at each motor location within 5–feet unless otherwise noted. Coordinate fuse ampere rating with installed equipment. Fuse ampere rating variance between original design information and installed equipment, size in accordance with Bussmann Fusetron 40C recommendations.
I. Supporting Devices:
1. Safety factor of 4 required for every fastening device or support for electrical equipment installed. Support to withstand four times weight of equipment it supports. Bracing to comply with the Seismic Zone requirements.
2. Provide vertical support members for equipment and luminaires, straight and parallel to building walls. Provide independent supports to structural member for electrical luminaires, materials, or equipment installed in or on ceiling, walls or in void spaces or over furred or suspended ceilings.
J. Electrical Identification:
1. Conductor Identification: Apply markers on each conductor for power, control, signaling and communications circuits.
2. Provide an engraved label on each major unit of electrical equipment, including but not limited to the following items: Disconnect switches, relays, contactors, time switches, override switches, service disconnects, distribution switches, branch circuit panelboards, and central or master unit of each electrical system including communication/signal systems.
K. Service and Distribution: Verify utility requirements prior to bidding and provide associated work required by local utility including but not limited to: Service underground primary including conduit, pull cord, excavation and backfill. Underground pull vaults. Pole risers. Transformer pads, vaults, and the like. Secondary service lateral including conduit, and conductors. Grounding of transformers. Service metering equipment.
L. Grounding:
1. Performance Requirements: Supplement the grounded neutral of the secondary distribution system with an equipment grounding system to properly safeguard the equipment and personnel. Install equipment grounding such that metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits operate continuously at ground potential and provide a low impedance path for possible ground fault currents.
2. Concrete Encased Ground Electrode: From the service equipment ground bus install grounding electrode conductor to footing foundation rebar. Bond the grounding electrode conductor to two independent steel rebars. Each rebars minimum length is 20–feet. Protect grounding electrode conductor extension from footing/foundation to service equipment with rigid PVC conduit.
3. Ground Rod Electrode:
a. Coordinate placement of ground rods and interconnecting conductor in base of building footing prior to placement of concrete.
b. Install 60–feet of No. 3/0 stranded bare copper conductor in base of perimeter footing.
c. Layout conductor to provide maximum exposure to earth in the perimeter footing. Do not fold conductor.
d. Bond to driven ground rods at 20–feet o.c.
e. Tap at center ground rod and extend ground electrode conductor to service ground bus. Install ground electrode conductor extension in rigid PVC conduit for physical protection.
4. Water Service Grounding: Bond building ground electrode and water service pipe to service ground bus. Connect to water pipe on utility side of isolating fittings or meters.
5. Raceway Grounding: Ground metallic raceway systems. Bond to ground terminal with code size jumper except where code size or larger grounding conductor is included with circuit, use grounding bushing with lay–in lug. Install ground bushings on metallic raceway terminations in pull boxes, panelboards and the like for circuits with overcurrent protection set at 60 amp and greater.
6. Install equipment grounding conductor, code size minimum in nonmetallic and metallic raceway systems.
7. Telecommunications Backboard: Provide telecommunications grounding bar at each telecommunications backboard. Bond the grounding bar to service grounding bar in the main service equipment with a 6AWG copper equipment grounding conductor.
8. Motors, Equipment and Appliances: Install code size equipment grounding conductor from outlet box to (motor) equipment frame or manufacturer's designated ground terminal.
9. Receptacles: Connect ground terminal of receptacle to equipment ground system by No. 14 conductor bolted to outlet box. Self grounding nature of receptacle devices does not eliminate conductor bolted to outlet box.
M. Switchboards:
1. Install equipment complete as directed by manufacturer's installation instructions.
2. Install equipment in conformance with work space requirements of NEC 110–26. Locate equipment in rooms or spaces dedicated to such equipment, NEC 408–2. Coordinate with other Divisions of work.
3. Flush Panels; Verify available recessing depth and coordinate wall framing with other Divisions. Provide one spare conduits from panel to accessible space above and below the panel. Maintain fire rating of wall.
N. Fuses: For each class and ampere rating of fuse installed, provide 3 spare fuses.
O. Control Devices:
1. Install time switches and other automatic control devices in accessible locations near the source of power or grouped at a common location in mechanical rooms or similar spaces.
2. Install photoelectric control devices at such locations as necessary to be most effective. Avoid locating photoelectric devices in or at locations where they can be influenced by other than natural light or under eaves. Verify location of equipment with Architect.
P. Lighting:
1. Install luminaire of types indicated where shown and at indicated heights; in accordance with manufacturer's written instructions and with recognized industry practices.
2. Avoid interference with and provide clearance for equipment. Where the indicated locations for the luminaires conflict with the locations for equipment, change the locations for the luminaire as directed by Architect.
3. Suspended Luminaires: Mounting heights indicate the clearances between the bottom of the luminaire and the finished floors.
4. Support Luminaires: Anchor supports to the structural slab or to structural members within a partition, or above a suspended ceiling.
5. Provide recessed fluorescent luminaires with two support wires as required by UBC.
6. Provide lighting indicated on Drawings with a luminaire of the type designated and appropriate for the location. Where outlet symbols appear on Drawings without a type designation provide a luminaire the same as those used in similar or like locations.

3.4 FIELD QUALITY CONTROL
A. Tests: Conduct tests of equipment and systems to demonstrate compliance with requirements specified in Division 16. Refer to individual Specification Sections for required tests. Document tests and include in Closeout Documents.
B. Verify electrical characteristics of equipment prior to installation of conduits and wiring for equipment.
C. Coordinate HVAC voltage requirements with Drawings and equipment submittals prior to rough–in.
D. Wiring Device Tests: Test wiring devices to ensure electrical continuity of grounding connections and after energizing circuits, to demonstrate compliance with requirements. Test receptacles neutral, line to ground and neutral to ground faults. Correct defective wiring.
E. Verification of Conditions: Verify ceiling construction, recessing depth and other construction details prior to release of luminaire for shipment.

3.5 CLEANING
A. Remove dirt and debris caused by the execution of the electrical work. Leave the entire electrical system installed in clean, dust–free and proper working order.
B. Thoroughly clean the exterior and the interior of each switchboard and distribution panelboard in accordance with manufacturer's installation instructions.
C. Where finish of luminaires or enclosures is damaged, touch up finish with matching paint in accordance to manufacturer's specifications and installation instructions.
D. Clean paint splatters, dirt, dust, fingerprints, and debris from luminaires.

END OF SECTION

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PROFESSIONAL SEAL:

STATE OF OHIO
DAN R. RHODES
E-57289
REGISTERED
PROFESSIONAL ENGINEER

PROJECT TITLE:

Blue Heron and Wyandot Toll Plazas
Ohio Turnpike
Genoa OH 43430

No.	Revision Description	Date

SHEET TITLE:

ELECTRICAL SPECIFICATIONS

PROJECT NO.: AEG 16268
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ISSUE DATE: 10–28–16
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