ELECTRICAL SPECIFICATIONS
SECTION 26000

PART 1 GENERAL

1.1 CODES AND REQUIREMENTS

A. All electrical work shall comply with the requirements of the applicable edition of the National Electrical Code, Local Building Code and as specified herein whichever is more strict.

B. The contractor shall comply with the requirements of the General Conditions, Supplemental General Conditions of the project specifications, all Contract Documents, and any base building specifications and building criteria included in this project.

C. Visit the premises before submitting bid as no extras will be allowed for lack of knowledge of existing conditions.

D. Drawings are diagrammatic in nature. Take all dimensions from Architectural drawings, certified equipment drawings, and from the structure itself before fabricating any work.

E. The drawings indicate the location, type and sizes of various utilities within the site where known. Any relocation or remodeling required must be approved by the Architect before proceeding. Investigate all utilities such as electric and telephone and make arrangements with the proper authority to pay for any charges associated with connecting those utilities. Pay for all permits, fees, inspections etc.

F. Good workmanship and appearance are considered equal to proper operation.

G. Provide all core drilling, channeling, cutting, patching, trenching and backfill as required for installation of electrical equipment. Seal holes, fireproofing where necessary, and refinish all repair work to original condition where damaged by electrical work.

H. Make provisions for safe delivery and secure storage of all materials.

I. Provide the Architect with a complete set of plans and specifications corrected to as-built conditions at the completion of the job.

1.2 WARRANTY

The electrical contractor shall provide for the owner a one-year (from the date of final acceptance) warranty of all electrical equipment and systems provided under this contract except for incandescent or fluorescent lamps. All defective equipment or materials which appear during the warranty period shall be replaced or repaired by the electrical contractor in a timely fashion.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. The contractor shall provide all equipment and accessories necessary whether specifically stated or not to make the required electrical systems complete and operational.

B. All equipment provided shall be new except as otherwise stated on the drawings. All equipment provided shall be U.L. listed when such standards exist for the type of equipment furnished and acceptable for installation by the Local Building Authority.

2.2 CONDUCTORS

A. Minimum size #12 AWG except for control circuits which may be #14 or signal circuits which shall be as indicated. All conductors shall be copper except where noted. Increase conductor size as necessary to limit branch circuit voltage drop to 3% and feeder voltage drop to 2%.

B. Splices for #8 and smaller conductors – wire or wing nuts.

C. Feeders and other wiring No. 4 AWG and larger, type THWN.

D. Other wiring No. 6 and smaller, type THWN.

E. Wiring in high temperature areas shall be rated 105° C and be a type accepted by local code.

F. Color Coding: Wiring for control systems to be installed in conjunction with mechanical and miscellaneous equipment shall be color coded in accordance with the wiring diagrams furnished with the equipment. Branch circuit wiring, including circuits to motors, and all feeders shall be coded by line or phase as follows:

Wire No. 2 AWG and smaller shall be factory color coded. Wire No. 1 AWG and larger may be color coded by field painting or color taping of six inch (6") length of exposed ends.

120/208 Volts	277/480 Volts
A = Black	A = Brown
B = Red	B = Orange
C = Blue	C = Yellow
Neutral = White	Neutral = Gray
Ground = Green	Ground = Green w/yellow stripes
Switch Travelers = Pink	Switch Travelers = Purple

2.3 OUTLETS

A. 4" square or octagonal, zinc coated sheet steel boxes.

B. Provide 3/8" no-bolt fixture studs.

C. Provide covers set to come flush with finish walls.

D. Utility or sectional switch boxes only where permitted.

2.4 DEVICES

A. All device colors shall be selected by architect.
1. Specification grade receptacles, equal to Hubbell 5262 series.
2. A.C. quiet operating type switches equal to Hubbell 122* series, rated 20A, 277V.

B. Device plates shall be nylon, color to match devices.

C. Mount devices in accordance with the following schedule except where otherwise noted on the drawings:
1. Convenience Receptacles – Long Axis Vertical 1'6" A.F.F.*
2. Light Switches – Latch Side of Door 4'0" A.F.F.
3. Telephone/Data Outlets 1'6" A.F.F.*
* Except in areas with counters, baseboard heaters or in areas of block or brick construction.

2.5 LIGHTING FIXTURES

A. Provide all new lighting fixtures complete with lamps, drivers, reflectors, plaster frames, louvers, stem hangers, etc., and as described on the drawings.

B. Exit lights shall conform with local code requirements.

C. Mount all fixtures at position and height to clear ducts, etc.

D. Mount all outlets at position and height to clear ducts, etc. minimum unpenetrated thickness shall be 0.035 inch.

2.6 BRANCH CIRCUIT PANELBOARDS AND SWITCHBOARDS

A. Provide dead-front, circuit breaker type panels, with the size and number of branches indicated. Breakers shall be thermal magnetic type employing quick-make and quick-break mechanisms for manual operation as well as automatic operation. Automatic tripping shall be indicated by the breaker handle assuming a distinctive position from the manual "on" and "off". Multiple breakers shall have a common trip. Tie handles will not be permitted.

B. Panelboards having branch circuit breaker sizes 15A to 100A shall be equal to:
1. ABB/General Electric "AL" or "AQ" for 120/240V or 208/120V systems.
2. ABB/General Electric "AE" for 480/277V systems.

C. Panelboards having more than two (2) branch circuit breakers rated in excess of 100A shall be equal to ABB/General Electric "AD" or Spectra Series.

D. All busses shall be copper.

E. All spaces shall be fully equipped.

F. Panelboards shall have a grounding lug for the equipment grounding system.

G. Circuit breakers shall have a minimum interrupting capacity as follows:

120/208 volts: 22,000 amperes.
In addition, upstream fuses shall be selected to provide a series rating of 100,000 amperes with downstream circuit breakers.

H. Panelboards shall be a minimum twenty inches (20") wide (box).

I. Panelboards used as service equipment shall be equipped with grounding bar, bonding jumper and UL service entrance label.

J. The above panelboard designations are ABB/General Electric; however equal products by Eaton/Cutler-Hammer, Siemens or Square D are acceptable.

K. Manufacturer will be responsible for all Arc Flash studies and Arc Flash labels.

2.7 SAFETY AND DISCONNECT SWITCHES

A. Provide enclosed, fusible or non-fusible safety switches where indicated and herein specified. Safety switches shall bear the UL label and each enclosure shall be the NEMA type suitable for the surrounding area and conditions (Ex. Nema 1 – Indoor, Nema 3R – Outdoor). Switches shall be minimum heavy duty, horsepower rated, and shall have quick-make and quick-break mechanisms. Switches used on motor circuits shall have adequate horsepower ratings for the motors served.

1. Safety switches employed as motor disconnect devices for two (2) or more loads shall be of the fusible type for rejection type fuses.

2. Heavy duty industrial type safety switches shall be used for 480 volt application and shall be horsepower rated with quick-make, quick-break mechanisms and interlocked covers.

3. Switches shall be as manufactured by ABB/General Electric, Eaton/Cutler-Hammer, Siemens or Square-D or as accepted, and all switches provided shall be by the same manufacturer.

2.8 FUSES

A. Fuses shall be as manufactured by Bussmann unless noted otherwise on the drawings.

B. Fuses for application at under 600 volts, and rated at 600 amps or less, shall be as follows:
1. For all fuses in the main service, equipment, except for motor circuits, provide current limiting, 200,000 rms amperes symmetrical interrupting capacity, rejection type, Bussmann Limitron or as accepted.

2. For all other fuses, provide rejection type with 200,000 rms amperes symmetrical interrupting capacity, Bussmann "Fusetron", or as accepted.

C. Control Fuses shall be Bussmann one-time nonrenewable fuses.

2.9 DRY TYPE TRANSFORMERS (IF APPLICABLE)

A. Transformers shall be as manufactured by ABB/General Electric, Eaton/Cutler-Hammer, Hevi Duty, Siemens, Square-D or equal.

B. Dry Type Transformers: ANSI/NEMA ST 20; factory-assembled, air cooled dry type transformers; ratings as shown on the Drawings.

C. Insulation system and average winding temperature rise for rated KVA as follows:

Rating	Class	Rise (degree C)
1 – 15	185	115
16 – 500	220	115

D. Case temperature shall not exceed 35 degrees C rise above ambient at its warmest point.

E. Winding Taps, Transformers Less than 15 KVA: Two 5% below rated voltage, full capacity taps on primary winding.

F. Winding Taps, Transformers 15 KVA and Larger: ANSI/NEMA ST 20.

G. Sound Level: ANSI/NEMA ST 20.

H. Basic Impulse Level: 10 KV for transformers less than 300 KVA, 30 KV for transformers 300 KVA and larger.

I. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

J. Mounting: Transformers 75 KVA and less shall be suitable for wall, floor or trapeze mounting; transformers larger than 75 KVA shall be suitable for floor or trapeze mounting.

K. Coil Conductors: Continuous winding with terminations brazed or welded.

L. Enclosure: ANSI/NEMA ST 20; Type 1 for indoor application, Type 3R for outdoor or wet location application. Provide lifting eyes or brackets.

M. Isolate core and coil from enclosure using vibration-absorbing mounts.

N. Nameplates: Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 EXECUTION

3.1 CONDUIT/RACEWAYS

A. All conductors shall be enclosed by conduit sized in accordance with Chapter 9 of the National Electrical Code. Minimum 1/2" except for factory furnished lighting fixture flexible conduit may be 3/8". Follow the following schedule unless otherwise specified in the drawings. Exception: armored cable assemblies such as MC type cable may be used where allowed by NEC.
1. Rigid metal conduit (RMC) and intermediate metal conduit (IMC) shall be utilized for above and below grade applications in accordance with articles 344 AND 342 of the National Electrical Code. All couplings shall be threaded.

2. Rigid nonmetallic conduit (PVC) Schedule 40 shall be permitted for below grade or concrete cast in place applications above grade. All elbow transitions to above grade or stub-out of floor slab shall be asphalt coated rigid conduit. Provide equipment grounding conductor for all runs of rigid nonmetallic conduit.

3. Electrical metallic tubing (EMT) shall be utilized for all dry, above grade or above floor applications in accordance with article 358 of the National Electrical Code. Couplings shall be steel, set screw type or compression type, with screws set to maximum depth or nut made up wrench-tight respectively.

4. Flexible metal conduit shall be utilized for all connections to vibrating equipment such as motors (minimum of 2'-0" – maximum of 6'-0"), connection to lay-in type light fixtures or in remodel areas specifically noted for "fishing" in existing walls or non-accessible ceilings.

5. Surface metallic raceways shall be used only in areas specifically noted and of size and type specified on the drawings.

B. All exposed conduit (including conduit installed in ceiling plenums) shall be routed parallel or perpendicular with the building walls. Support conduit and cables as required by the National Electrical Code.

C. Provide expansion type fittings for all conduits which cross expansion joints.

3.2 GROUNDING

Service equipment, conduit systems, supports, cabinets, equipment, transformers, fixtures, the grounded circuit conductor, etc. shall be properly grounded in accordance with the latest issue of the National Electrical Code. Provide all bonding jumpers, wire, grounding bushings, clamps, etc as required for complete grounding. Route ground conductors to provide the shortest and most direct path to the ground electrode system. Ground connections shall have clean contact surfaces, tinned and sweated while bolting. Install all ground conductors in conduit. Make readily accessible connections to a continuous, metallic, underground cold water piping system at the point where it enters the building. If this is not practicable, connect to a cold water pipe and provide a meter jumper. Make connections to the water pipe that grounds the conduit enclosing the conductor as well as the conductor. Bond the service equipment to a separate grounding electrode per Code requirements. Provide intersystem bonding termination where required.

3.3 PANELBOARDS AND SWITCHBOARDS

A. Install enclosure such that the highest breaker operating handle is no more than six-foot, seven-inches (6'-7") from the finished floor or grade.

B. Field check all panelboard loading and reconnect circuits as required to provide balanced phase and line loads.

C. Fill out circuit directory card. Note spare circuits in pencil.

D. Install switchboards on concrete pads. Attach to pad with a minimum of four anchors.

3.4 MECHANICAL EQUIPMENT WIRING AND CONNECTIONS

A. Mechanical equipment motors and controls furnished with mechanical equipment.

B. Provide feeder circuits to mechanical equipment and make all connections.

C. Provide safety switches and/or thermal overload switches as required.

D. Provide all power (line voltage) wiring for mechanical equipment and make all connections except for temperature control equipment, which will be wired by mechanical contractor.

E. Furnish, set in place, and wire, except as indicated, all heating, ventilating, air conditioning, plumbing, fire protection, motors and controls in accordance with the following schedule. Carefully coordinate with work performed under the Mechanical Division of these specifications.

F. Heater units in all motor starters shall be sized for approximately one hundred fifteen percent (115%) of full load motor current. Check and coordinate all thermal protective devices with the equipment they protect.

1. Provide for each motor, one-half (1/2) horsepower and below, a horsepower rated disconnect switch and thermal overload protection unless integrally provided with the motor. Thermal overload switches for single phase motors shall be Allen-Bradley Bulletin 600 or acceptable. Size heater units for approximately one hundred fifteen percent (115%) of full load motor current.

2. Miscellaneous Equipment: Where outlets are indicated for miscellaneous equipment requiring electric power or control, provide wire, conduit, etc., and make all connections, unless otherwise indicated. Refer to the Mechanical Specifications and Plans covering sprinkler systems, motor interlocks, switching, etc. Provide wiring, conduit, outlets and provide final electrical connections to all equipment.

3.6 DRY TYPE TRANSFORMER INSTALLATION

A. Set transformer plumb and level, on 4 in. high concrete housekeeping pad for floor mounted units, on strut assemblies for wall or ceiling mounted units.

B. Use flexible conduit 2 ft minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

C. Mount transformers on vibration isolation pads suitable for isolating the transformer noise from the building structure.

D. Provide seismic restraints where installed in seismic zones.

3.7 TELEPHONE/DATA SYSTEM

A. Provide conduits and outlets as indicated. Provide #14 AWG pull wire for all empty conduit.

B. Outlets shall consist of 4" square box with plaster ring and cover plate with configurable knockouts for RJ11, RJ45, coax, etc. Plates shall match finish of other cover plates. Wiring and jacks shall be provided by others.

3.8 SPECIAL SYSTEMS

Provide all special systems as specified on the drawings including all required accessories to make the system complete and operational. All special systems shall be installed and connected in accordance with the manufacturer's specifications. Provide instructional demonstration for the owner prior to final acceptance.

3.10 GFCI OUTLETS IN OTHER THAN DWELLING UNITS

All single-phase receptacles rated 150V to ground or less, 50A or less and three-phase receptacles rated 150V to ground or less, 100A or less installed in areas listed in NEC Article 210.8(B) shall have GFCI protection for personnel.

3.11 ADJUSTABLE OVERCURRENT PROTECTIVE DEVICES

Where new circuit breakers with field adjustable settings are supplied or significant changes are made to existing distribution equipment equipped with adjustable settings, a coordination study shall be conducted to determine the proper trip and delay values. The Contractor, equipment supplier or licensed third party may conduct the study. All data required for the study shall be provided to the study preparer by the Contractor and/or equipment supplier.

END OF SECTION

CORNERSTONE DESIGN SERVICES
Mechanical | Electrical | Plumbing | HVAC | Fire Safety
3740 DAVINCI CT, SUITE 100 PEACHTREE CORNERS, GA 30092
o: 770.717.0040 w: www.cndesignservices.net

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WATSON STREET WAREHOUSE
6667 WATSON STREET
UNION CITY, GA

Kent Ahrenhold Architect
6851 ROSWELL RD. NE. NO K-22
ATLANTA, GEORGIA 30328
PHONE: 404-374-6985

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