



Architecture Interior Design **Project Management** 

**622 Rood Avenue Grand Junction, CO 81501** 970-242-1058 office

BLYTHE GROUP + co.

LDN4

**New Construction Downlight** 

Example: LDN4 35/15 LO4AR LSS MVOLT EZ1

LSS Semi-specular

LD Matte diffuse

Specular

nLight™ Lumen Compensation

High ambient option (40°C)

fixtures on emergency circuit US point of manufacture

Chicago Plenum

nLight® Air enabled

nLight® dimming pack controls 0-10V eldoLED drivers

RELOC®-ready luminaire connectors enable a simple and

brands. Refer to KRL for complete nomenclature. Ava

only in RRLA, RRLB, RRLAE, and RRLC12S.

consistent factory installed option across all ABL luminaire

mended for metal ceiling installations

12 Must specify voltage for 3000lm. Not

available with emergency battery

packages with HAO.

pack option.

Fixture height is 5-11/16" for all lumen

MVOLT Multi-volt

Bighorn Consulting

Engineers, Inc. Mechanical & Electrical Engineers 386 Indian Road Grand Junction, CO 81501 phone: 970-241-8709,

**CDOT OFFICE RENOVATION** 

222 SOUTH 6TH STREET **GRAND JUNCTION, CO 81503** 

**LIGHTING - FLOOR PLAN** 

FOR CONSTRUCTION

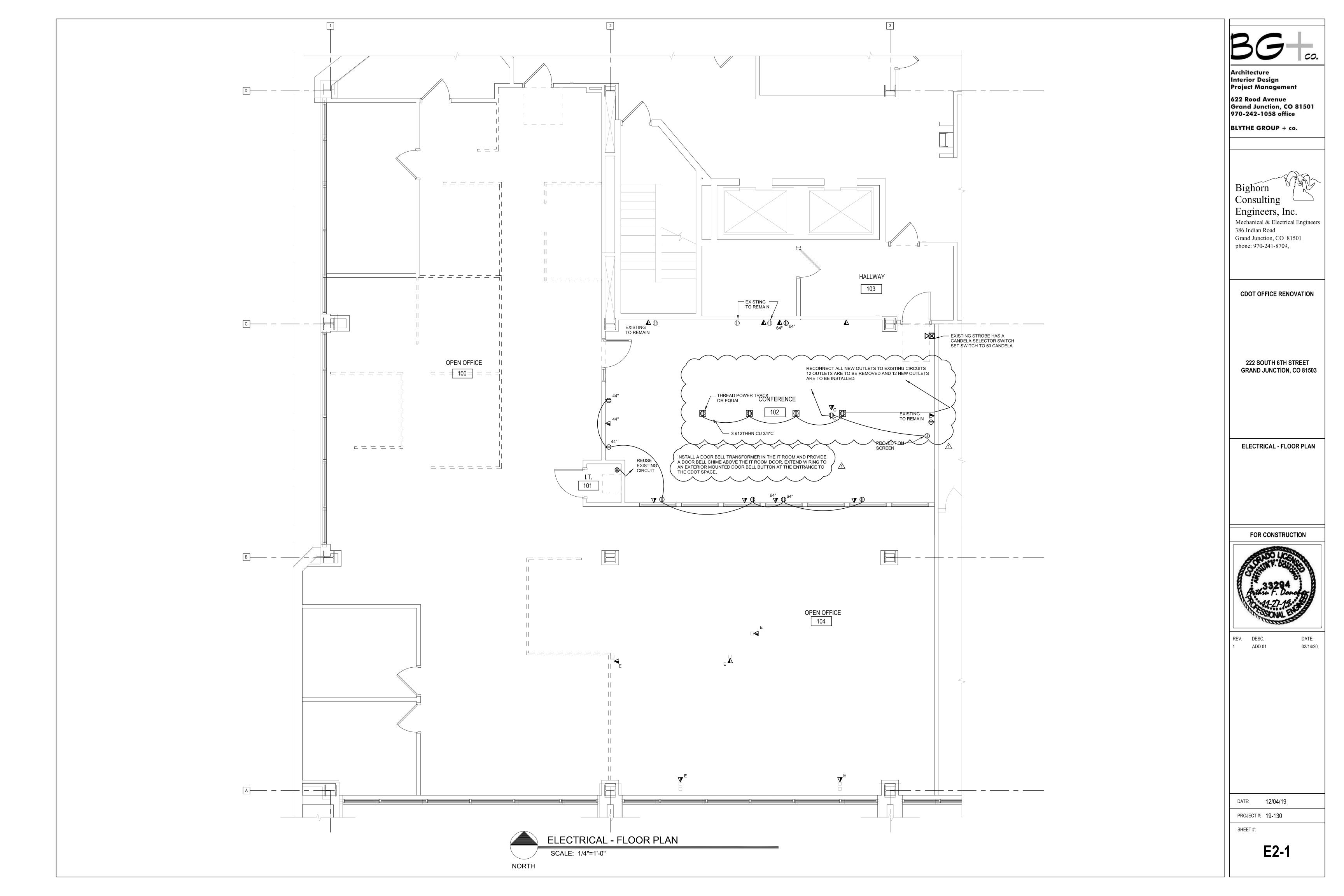


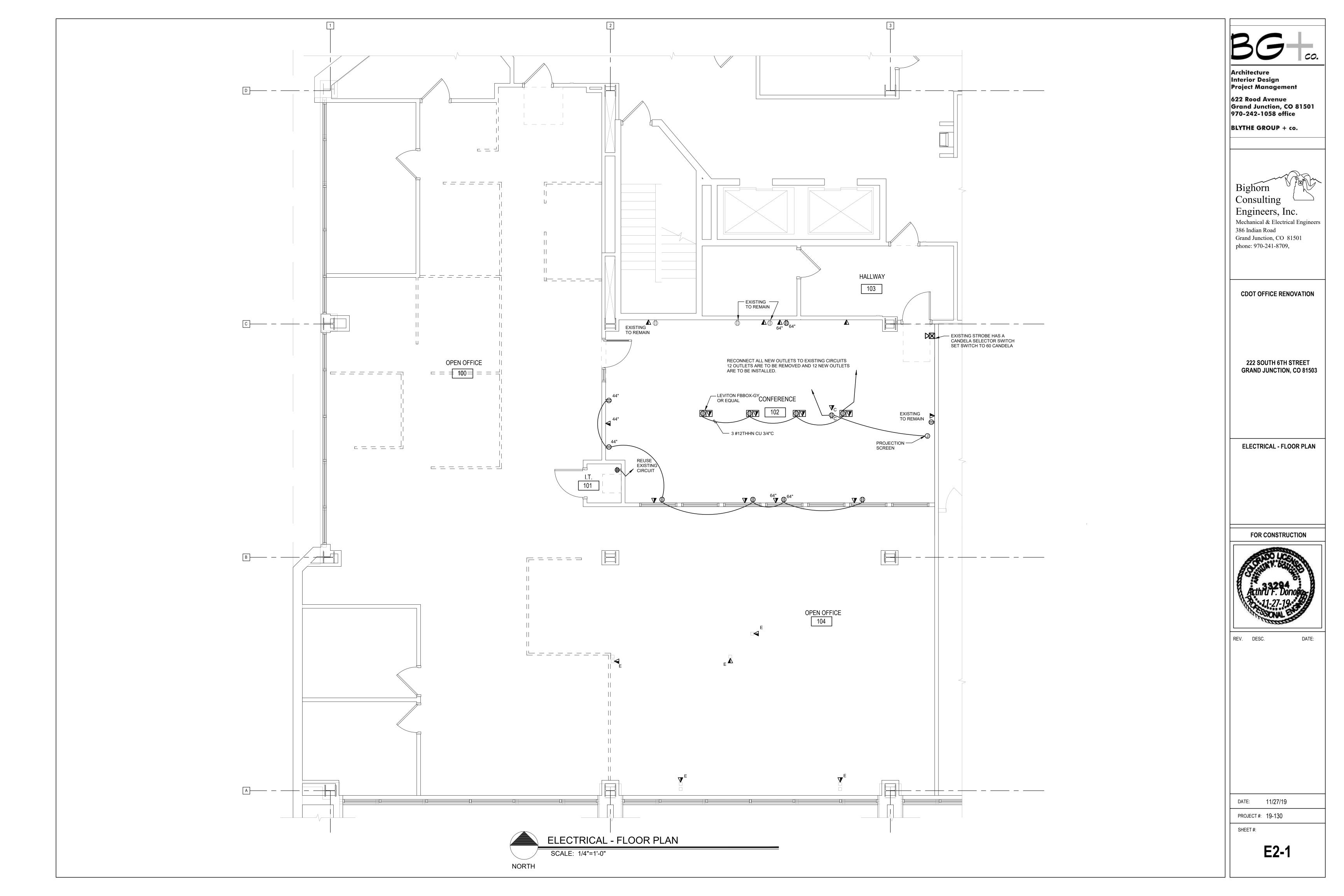
REV. DESC.

DATE: 11/27/19

PROJECT #: 19-130 SHEET #:

E1-1





### SECTION 16000 GENERAL PROVISIONS

## **SECTION 16010**

A. THE ARCHITECTURAL GENERAL AND SPECIAL CONDITIONS FOR THE CONSTRUCTION OF THIS PROJECT SHALL BE A PART OF THE ELECTRICAL SPECIFICATIONS. THE ELECTRICAL CONTRACTOR SHALL EXAMINE THE GENERAL AND SPECIAL CONDITIONS BEFORE SUBMITTING HIS OR HER PROPOSAL B. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK INCLUDED IN THIS SECTION AND THE DELEGATION OF WORK TO THE ELECTRICAL CONTRACTOR, SHALL NOT RELIEVE HIM OF THIS RESPONSIBILITY. THE ELECTRICAL CONTRACTOR AND HIS SUBCONTRACTORS WHO PERFORM WORK UNDER THIS SECTION SHALL BE RESPONSIBLE TO THE GENERAL CONTRACTOR C. WHERE ITEMS OF THE GENERAL CONDITIONS OR OF THE SPECIAL CONDITIONS ARE REPEATED IN THIS SECTION OF THE SPECIFICATIONS. IT IS INTENDED TO CALL PARTICULAR ATTENTION TO OR QUALIFY

CONDITIONS SHALL BE ASSUMED TO BE OMITTED IF NOT REPEATED HEREIN. D. THE NAMING OF A CERTAIN BRAND OR MAKE OR MANUFACTURER IN THE SPECIFICATIONS IS TO ESTABLISH A QUALITY STANDARD FOR THE ARTICLE DESIRED. THE CONTRACTOR IS NOT RESTRICTED TO THE USE OF THE SPECIFIC BRAND OF THE MANUFACTURER NAMED UNLESS SO INDICATED IN THE

THEM: IT IS NOT INTENDED THAT ANY OTHER PARTS OF THE GENERAL CONDITIONS OR SPECIAL

E. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND PRESENT FIVE (5) COPIES OF SHOP DRAWINGS OR BROCHURES FOR ALL FIXTURES, EQUIPMENT, AND ACCESSORIES TO THE ENGINEER FOR THE ENGINEER'S APPROVAL. CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE SHOWN IS SUBJECT TO THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR: DIMENSIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE; FABRICATION PROCESSES AND TECHNIQUES CONSTRUCTION; COORDINATION OF HIS WORK WITH THAT OF ALL OTHER TRADES AND THE SATISFACTORY

PERFORMANCE OF HIS WORK. F. THE ELECTRICAL CONTRACTOR SHALL EXAMINE DRAWINGS RELATING TO WORK OF ALL TRADES AND BECOME FULLY INFORMED AS TO EXTENT AND CHARACTER OF WORK REQUIRED AND ITS RELATION TO

G.BEFORE SUBMITTING BID, CONTRACTOR SHALL VISIT THE SITE AND EXAMINE ALL ADJOINING EXISTING BUILDINGS, EQUIPMENT AND SPACE CONDITIONS ON WHICH HIS WORK IS IN ANY WAY DEPENDENT FOR THE BEST WORKMANSHIP AND OPERATION ACCORDING TO THE INTENT OF SPECIFICATIONS AND DRAWINGS. HE SHALL REPORT TO THE ARCHITECT ANY CONDITION WHICH MIGHT PREVENT HIM FROM INSTALLING HIS EQUIPMENT IN THE MANNER INTENDED.

H.NO CONSIDERATION OR ALLOWANCE WILL BE GRANTED FOR FAILURE TO VISIT SITE, OR FOR ANY ALLEGED MISUNDERSTANDING OF MATERIALS TO BE FURNISHED OR WORK TO BE DONE. I. EXISTING CONDUITS, PIPES, EQUIPMENT, ETC.: REFER TO DIVISION I FOR ADDITIONAL REQUIREMENTS. EXISTING CONDUITS, PIPES, UTILITY LINES, TANKS, EQUIPMENT, OR OTHER OBSTRUCTIONS WHETHER UNDERGROUND, CONCEALED, OR EXPOSED ARE NOT IN GENERAL INDICATED ON DRAWINGS. PRIOR TO START OF WORK, HAVE EXISTING UTILITY OBSTRUCTIONS CLEARLY MARKED BY UTILITIES LOCATOR SERVICE. PLAN WORK SO AS TO ROUTE AND LOCATE ALL NEW WORK TO AVOID THESE OBSTRUCTIONS. REPAIR OR REPLACE, AT NO COST TO OWNER, EXISTING INSTALLATIONS WHERE DAMAGED, OCCURRING DURING THE COURSE OF CONSTRUCTION.

## **SECTION 16015**

## ELECTRICAL DRAWINGS AND REFERENCE SYMBOLS

END OF SECTION 16010

A. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERALLY THE LOCATIONS OF MATERIAL AND EQUIPMENT. THESE DRAWINGS SHALL BE FOLLOWED AS CLOSELY AS POSSIBLE. THE ELECTRICAL CONTRACTOR SHALL COORDINATE THE WORK UNDER THIS SECTION WITH THE ARCHITECTURAL, STRUCTURAL, PLUMBING, HEATING AND AIR CONDITIONING, AND THE DRAWINGS OF OTHER TRADES FOR EXACT DIMENSIONS, CLEARANCES AND ROUGHING-IN LOCATIONS: THIS CONTRACTOR SHALL COOPERATE WITH ALL OTHER TRADES IN ORDER TO MAKE MINOR FIELD ADJUSTMENTS TO

ACCOMMODATE THE WORK OF OTHERS. DO NOT RELY ON THE SCALE OF THE DRAWINGS FOR ROUGH-IN MEASUREMENTS, NOR USE THEM AS SHOP DRAWINGS. B. THE DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY, EACH TO THE OTHER, AND THE WORK REQUIRED BY EITHER SHALL BE INCLUDED IN THE CONTRACT AS IF CALLED FOR BY BOTH.

C.IF DIRECTED BY THE ARCHITECT, THE CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE REASONABLE MODIFICATIONS IN THE LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES OR FOR PROPER EXECUTION OF THE WORK. D.ELECTRICAL SYMBOLS USED ON THIS PROJECT ARE SHOWN IN A SYMBOL LIST ON THE ACCOMPANYING WORKING DRAWINGS. THIS LIST SHOWS STANDARD SYMBOLS AND ALL MAY NOT APPEAR ON THE

PROJECT DRAWINGS; HOWEVER, WHEREVER THE SYMBOL ON PROJECT DRAWINGS OCCURS, THE ITEM SHALL BE PROVIDED AND INSTALLED. END OF SECTION 16015

## WORK INCLUDED

A. THE SCOPE OF THE WORK CONSISTS OF ELECTRICAL INSTALLATION AND MODIFICATION. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO: INSTALLATION OF MAIN DISTRIBUTION PANEL: AND OTHER ITEMS AS CALLED OUT ON THE DRAWINGS FOR THE AREAS OF REMODEL.THIS WORK WILL ALSO INCLUDE: ELECTRICAL DISTRIBUTION INSTALLATION; POWERING OF MECHANICAL EQUIPMENT; AND OTHER ITEMS AS CALLED OUT ON THE DRAWINGS FOR THE REMODEL CONSTRUCTION. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL SUPERVISION, LABOR, MATERIALS, EQUIPMENT, MACHINERY, AND ANY AND ALL OTHER ITEMS NECESSARY TO COMPLETE THE SYSTEMS. THE ELECTRICAL CONTRACTOR SHALL NOTE THAT ALL ITEMS OF EQUIPMENT ARE SPECIFIED IN THE SINGULAR: HOWEVER, THE CONTRACTOR SHALL PROVIDE AND INSTALL THE NUMBER OF ITEMS OF EQUIPMENT AS INDICATED ON THE DRAWINGS AND AS REQUIRED FOR COMPLETE SYSTEMS.

B.IT IS THE INTENTION OF THE SPECIFICATIONS AND DRAWINGS TO CALL FOR FINISHED WORK, TESTED,

C. ANY APPARATUS, APPLIANCE, MATERIAL OR WORK NOT SHOWN ON DRAWINGS BUT MENTIONED IN THE SPECIFICATIONS, OR VICE VERSA, OR ANY INCIDENTAL ACCESSORIES NECESSARY TO MAKE THE WORK COMPLETE AND PERFECT IN ALL RESPECTS AND READY FOR OPERATION, EVEN IF NOT PARTICULARLY SPECIFIED, SHALL BE FURNISHED, DELIVERED AND INSTALLED BY THE CONTRACTOR WITHOUT ADDITIONAL EXPENSE TO THE OWNER. WITH SUBMISSION OF BID, THE ELECTRICAL CONTRACTOR SHA GIVE WRITTEN NOTICE TO THE ARCHITECT OF ANY MATERIALS OR APPARATUS BELIEVED INADEQUATE OR UNSUITABLE, IN VIOLATION OF LAWS, ORDINANCES, RULES; ANY NECESSARY ITEMS OR WORK OMITTED. IN THE ABSENCE OF SUCH WRITTEN NOTICE, IT IS MUTUALLY AGREED THE CONTRACTOR HAS INCLUDED THE COST OF ALL REQUIRED ITEMS IN HIS PROPOSAL, AND THAT HE WILL BE RESPONSIBLE FOR THE APPROVED SATISFACTORY FUNCTIONING OF THE ENTIRE SYSTEM WITHOUT EXTRA COMPENSATION

# END OF SECTION 16020

### SECTION 16030 CODES AND FEES

A. ALL MATERIALS AND WORKMANSHIP SHALL COMPLY WITH ALL APPLICABLE CODES, SPECIFICATIONS, LOCAL ORDINANCES, INDUSTRY STANDARDS. UTILITY COMPANY AND FIRE INSURANCE CARRIER'S REQUIREMENTS. CONTACT PROPER AUTHORITIES, OBTAIN AND PAY FOR REQUIRED PERMITS, NSPECTIONS AND UTILITY SERVICE CONNECTIONS. DO NOT INCLUDE ANY UTILITY COMPANY CHARGES THAT CAN BE BILLED DIRECTLY TO THE OWNER.

B. IN CASE OF DIFFERENCE BETWEEN THE BUILDING CODES, SPECIFICATIONS, STATE LAWS, LOCAL ORDINANCES. INDUSTRY STANDARDS. UTILITY COMPANY REGULATIONS. FIRE INSURANCE CARRIER'S REQUIREMENTS, AND THE CONTRACT DOCUMENTS, THE MOST STRINGENT SHALL GOVERN. THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ARCHITECT IN WRITING OF ANY SUCH DIFFERENCE. C.NONCOMPLIANCE: SHOULD THE CONTRACTOR PERFORM ANY WORK THAT DOES NOT COMPLY WITH THE REQUIREMENTS OF THE APPLICABLE BUILDING CODES, STATE LAWS, LOCAL ORDINANCES, INDUSTRY STANDARDS. FIRE INSURANCE CARRIER'S REQUIREMENTS, AND UTILITY COMPANY REGULATIONS, HE SHALL BEAR THE COST ARISING IN CORRECTING ANY SUCH DEFICIENCY. END OF SECTION 16030

# BASIC METHODS AND MATERIALS

# SECTION 16101

A.PROTECTION: ALL WORK, MATERIALS AND EQUIPMENT SHALL BE COMPLETELY AND ADEQUATELY PROTECTED AT ALL TIMES. PAY FOR ALL DAMAGE, INJURY OR LOSS, EXCEPT SUCH AS MAY BE DIRECTLY DUE TO ERRORS IN THE CONTRACT DOCUMENTS OR BE CAUSED BY AGENTS OR EMPLOYEES OF THE OWNER. POST EFFECTIVE DANGER SIGNS WARNING AGAINST HAZARDS CREATED BY THE WORK. B. TRENCHING AND BACKFILLING: PERFORM ALL TRENCHING AND BACKFILL REQUIRED BY WORK UNDER THIS DIVISION OF THE SPECIFICATIONS. TRENCHING AND BACKFILLING SHALL BE DONE IN ACCORDANCE WITH THE "SITE WORK" DIVISION OF THE SPECIFICATIONS AND AS HEREIN SPECIFIED. THIS PORTION OF

THE WORK SHALL BE EXECUTED UNDER THE DIRECT SUPERVISION OF THE GENERAL CONTRACTOR. TRENCHES SHALL BE EXCAVATED TO THE DEPTH REQUIRED FOR THE UTILITIES INVOLVED. THE TRENCH BOTTOM SHALL BE GRADED TRUE AND FREE FROM DEBRIS, STONES AND SOFT SPOTS. WHERE DIRECT BURIAL CABLES ARE USED FOUR INCHES OF FINE SAND SHALL BE PLACED IN THE BOTTOM OF THE TRENCH PRIOR TO CABLE PLACEMENT C.EQUIPMENT, MATERIALS, INSTALLATION:

1. ALL EQUIPMENT, ACCESSORIES AND SPECIALTIES CONNECTED TO EQUIPMENT AND ALL ITEMS OF MATERIAL SHALL BE INSTALLED AS RECOMMENDED BY THEIR MANUFACTURERS UNLESS SPECIFICALLY 2. STATED OTHERWISE. PROVIDE PROPER SUPPORTS, MOUNTS, ETC., AS REQUIRED. 3. COORDINATE WITH THE GENERAL CONTRACTOR. 4. OBTAIN INSTRUCTIONS FROM THE ARCHITECT FOR INSTALLATION OF ITEMS NOT COMPLETELY

COVERED BY CONTRACT DOCUMENTS OR PUBLISHED MANUFACTURER'S RECOMMENDATIONS. D.EQUIPMENT FINISH: ALL ELECTRICAL EQUIPMENT SHALL BE FURNISHED FACTORY PAINTED OR FINISHED WITH TWO COATS OF HIGH GRADE ENAMEL AND IN THE MANUFACTURER'S STANDARD COLORS UNLESS

1. UNPAINTED EQUIPMENT AND MATERIALS, EXCEPT CONDUIT IN CONCEALED SPACES, SHALL BE CLEANED AND PRIMED TO BE PAINTED BY THE PAINTING CONTRACTOR IN ACCORDANCE WITH THE PAINTING SECTION OF THESE SPECIFICATIONS

2. THE COLORS OF ALL EXPOSED ELECTRICAL MATERIAL AND APPARATUS SHALL BE AS SELECTED BY THE OWNER. E. CHASES, SLEEVES, CUTTING, PATCHING

1. PROVIDE FOR NECESSARY CHASES, HOLES, SLEEVES, BOXES, INSERTS AND HANGERS BY ARRANGEMENT WITH CONTRACTORS OF THE OTHER APPROPRIATE TRADES. PROVIDE "FLAMESEAL" OR OF THE APPROVED FIRESTOPPING MATERIAL AT ALL PENETRATIONS THROUGH RATED WALLS, FLOORS AND CEILINGS. 2. PROVIDE FOR ALL CUTTING AND PATCHING OF HOLES, OPENINGS, AND NOTCHES. OBTAIN WRITTEN

APPROVAL OF THE ARCHITECT BEFORE NOTCHING, BORING, CHIPPING, BURNING, DRILLING, WELDING TO STRUCTURAL MEMBERS. F. INSPECTION

1. ALL WORK AND MATERIALS COVERED BY DRAWINGS AND SPECIFICATIONS SHALL BE SUBJECT TO INSPECTION AT ANY AND ALL TIMES BY REPRESENTATIVES OF THE ARCHITECT AND OWNER. IF ANY MATERIAL OR INSTALLATION DOES NOT CONFORM TO THE DRAWINGS AND SPECIFICATIONS, WITHIN THREE DAYS AFTER BEING NOTIFIED BY THE ARCHITECT, REMOVE THE MATERIALS FROM THE PREMISES AND CORRECT THE INSTALLATION TO THE SATISFACTION OF THE ARCHITECT. ASSUME THE ENTIRE COST OF REMOVING AND REPLACING THE MATERIAL AND CORRECTING THE INSTALLATION, INCLUDING CUTTING AND PATCHING THAT MAY BE NECESSARY.

2. WORK SHALL NOT BE CLOSED IN NOR COVERED BEFORE INSPECTION AND APPROVAL BY THE ARCHITECT. PROVIDE FOR UNCOVERING AND MAKING REPAIRS, AT NO EXTRA COST, WHEN UNINSPECTED WORK HAS BEEN CLOSED IN. NOTIFY THE ARCHITECT WHEN WORK IS READY FOR

3. NOTIFY PROPER AUTHORITIES WHEN WORK IS READY FOR ANY INSPECTIONS REQUIRED BY APPLICABLE CODES, RULES AND REGULATIONS, ALLOWING SUFFICIENT TIME FOR INSPECTIONS TO BE MADE WITHOUT HINDERING PROGRESS OF THE WORK, AND FURNISH THE OWNER, WITHOUT ADDITIONAL COSTS, PROPER CERTIFICATES OF ACCEPTANCE FROM SUCH AUTHORITIES. 4. UPON COMPLETION OF ALL WORK AND ADJUSTMENT OF ALL EQUIPMENT, FINAL INSPECTION SHALL BE MADE UNDER DIRECTION OF THE ARCHITECT. TEST AND OPERATE ALL DEVICES, EQUIPMENT AND SYSTEMS TO DEMONSTRATE THAT THE ELECTRICAL SYSTEM IS COMPLETE AND FUNCTIONAL IN THE MANNER REQUIRED

G.CLEAN UP 1. DURING THE COURSE OF THE WORK REMOVE ANY MATERIALS NOT INSTALLED IN THE WORK WHICH CONFLICT WITH THE WORK OF OTHERS IF SO DIRECTED BY THE ARCHITECT 2. AT COMPLETION OF WORK CLEAN UP AND REMOVE FROM THE PREMISES ALL DEBRIS AND MATERIALS

NOT INSTALLED IN THE WORK SO THE PREMISES WILL BE LEFT CLEAN. WASH AND WIPE CLEAN ALL LIGHTING FIXTURES AND LAMPS WHICH MAY HAVE BECOME SOILED DURING INSTALLATION. H.RECORD DRAWINGS: AT COMPLETION OF THE WORK FURNISH TO THE ARCHITECT TWO COMPLETE SETS OF ELECTRICAL PRINTS MARKED TO SHOWTHE WORK "AS-BUILT". I. MAINTENANCE AND OPERATING PROCEDURES: UPON COMPLETION OF ALLWORK AND ADJUSTMENT OF

ALL EQUIPMENT INSTRUCT THE OWNER ON THE CORRECT OPERATION AND MAINTENANCE PROCEDURE FOR THE ELECTRICAL SYSTEM IN TOTAL. FURNISH 3 SETS OF TYPED MAINTENANCE MANUALS CONTAINING CUT SHEETS ON ALL EQUIPMENT, TABLES OF FUSES AND FOR WHAT EQUIPMENT. TABLE OF LAMPS AND BALLASTS AND FOR WHAT FIXTURES. INCLUDE A LIST OF CONTACTS WITH PHONE NUMBERS FOR ALL SYSTEMS FOR OWNERS' USE, IN THE EVENT THE ELECTRICAL SYSTEM REQUIRES SERVICE

WORK WITHIN THE WARRANTY PERIOD. J. GUARANTEE: GUARANTEE THAT ALL WORK GOVERNED BY THIS DIVISION SHALL BE NEW AND FREE OF DEFECTIVE WORK, MATERIALS, AND COMPONENTS FOR A PERIOD OF ONE YEAR AFTER WRITTEN ACCEPTANCE. REPAIR, REVISE AND REPLACE DEFECTS AS DIRECTED, WITH NO ADDITIONAL COST TO THE OWNER. (INCANDESCENT LAMPS, FUSES AND ANY EXISTING EQUIPMENT ARE EXEMPT).

# A.PVC CONDUIT SHALL BE USED FOR ALL UNDERGROUND FEEDERS AND BRANCH CIRCUITS UNLESS

END OF SECTION 16101

END OF SECTION 16111

OTHERWISE DIRECTED ON PLANS OR AS APPROVED BY NEC. ALL CONDUIT SHALL BE UL APPROVED B. CONDUIT SIZES SHALL BE AS INDICATED ON THE DRAWINGS, OR MINIMUM IN ACCORDANCE WITH THE NEC, INCLUDING PROVISION FOR GREEN EQUIPMENT GROUNDING CONDUCTOR USING 3/4 INCH MINIMUM CONDUIT. THE USE OF 1/2 INCH CONDUIT ELSEWHERE MAY BE APPROVED IF CONDITIONS WARRANT. C.SPECIAL CONDUIT FITTINGS SHALL BE APPROPRIATE FOR EACH APPLICATION AND SHALL BE

MANUFACTURED BY T & B OR APPROVED EQUAL. D. CONDUIT SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF THE NEC AND

SHALL BE INSTALLED IN A NEAT, WORKMANLIKE MANNER. E. THE ENTIRE CONDUIT SYSTEM SHALL BE INSTALLED TO PROVIDE A CONTINUOUS BOND THROUGHOUT

F. ELECTRICAL METALLIC TUBING (EMT) MAY BE USED FOR BRANCH CIRCUITS AND RACEWAYS OTHER THAN FOR SERVICE ENTRANCE AND MAIN FEEDERS UNLESS PROHIBITED BY THE NEC OR LOCAL ORDINANCES. FMT SHALL BE ULAPPROVED GALVANIZED INSIDE AND OUTSIDE COMPLYING WITH ASA C-80.3 FOR ZINC COATED EMT WITH FITTINGS OF THE SAME TYPE MATERIAL AND FINISH, OF THE PRESSURE CONNECTED TYPE FOR EXTERIOR INSTALLATION AND OF THE SET SCREW TYPE FOR INTERIOR INSTALLATION.

G.ALL CONDUIT JOINTS SHALL BE CUT SQUARE, REAMED SMOOTH, AND DRAWN UP TIGHT. BENDS OR OFFSETS SHALL BE MADE WITH AN APPROVED BENDER OR HICKEY, OR HUB-TYPE CONDUIT FITTINGS. NUMBER OF BENDS PER RUN SHALL CONFORM TO THE NEC LIMITATIONS. H. CONCEALED CONDUITS SHALL BE RUN IN A DIRECT LINE WITH LONG SWEEP BENDS AND OFFSETS.

EXPOSED CONDUITS SHALL BE PARALLEL TO AND AT RIGHT ANGLES TO BUILDING LINES, USING CONDUIT FITTINGS FOR ALL TURNS AND OFFSETS. I. TRANSITIONS BETWEEN NONMETALLIC CONDUITS AND CONDUITS OF OTHER MATERIALS SHALL BE MADE WITH THE MANUFACTURER'S STANDARD ADAPTERS DESIGNED FOR SUCH PURPOSE. J. EXPOSED CONDUITS SHALL BE SECURELY FASTENED IN PLACE ON MAXIMUM 10 FOOT INTERVALS; AND HANGERS, SUPPORTS OR FASTENERS SHALL BE PROVIDED AT EACH ELBOW AND AT THE END OF EACH STRAIGHT RUN TERMINATING AT A BOX OR CABINET.

WIRES AND CABLES A. WIRE AND CABLE SHALL MEET ALL STANDARDS AND SPECIFICATIONS APPLICABLE, AND SHALL BE IN CONFORMANCE WITH THE LATEST EDITION OF THE NEC. INSULATED WIRE AND CABLE SHALL HAVE SIZE TYPE OF INSULATION, VOLTAGE AND MANUFACTURER'S NAME PERMANENTLY MARKED ON OUTER COVERING AT REGULAR INTERVALS NOT EXCEEDING FOUR FEET. WIRE AND CABLE SHALL BE DELIVERED IN COMPLETE COILS OR REELS WITH IDENTIFYING TAGS, STATING SIZE, TYPE OF INSULATION, ETC B. WIRE AND CABLE SHALL BE SUITABLY PROTECTED FROM WEATHER AND OTHER DAMAGE DURING

STORAGE AND HANDLING, AND SHALL BE IN FIRST CLASS CONDITION AFTER INSTALLATION. C. WIRE AND CABLE SHALL BE FACTORY COLOR CODED WITH A SEPARATE COLOR FOR EACH PHASE AND NEUTRAL USED CONSISTENTLY THROUGHOUT THE SYSTEM. COLOR CODING SHALL BE AS REQUIRED BY

D. ALL CONDUCTORS SHALL BE RATED 600 VOLTS, UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS, OR FOR ELECTRONIC OR COMMUNICATION USE E. WIRE AND CABLE FOR VARIOUS APPLICATIONS SHALL BE AS FOLLOWS UNLESS OTHERWISE DESIGNATED:

1. WIRE #10 AND SMALLER SHALL BE SOLID; WIRE #8 AND LARGER SHALL BE STRANDED. 2. #12 THRU #6 DRY LOCATIONS: TYPE THHN, 90 DEGREES C 3. #12 THRU #6 IN SLABS, UNDERGROUND, OR WET LOCATIONS: TYPE THWN OR TYPE XHHW, 75 DEGREES

4. #4 AND LARGER: TYPE XHHW OR TYPE THWN 75 DEGREES C. F. WIRE AND CABLE SHALL BE AS MANUFACTURED BY GENERAL ELECTRIC, ANACONDA WIRE & CABLE, ROME CABLE, TRIANGLE CONDUIT & CABLE, OR APPROVED EQUAL. SUBSTITUTION OF WIRE AND CABLE MANUFACTURER SHALL BE ONLY WITH THE APPROVAL OF THE ARCHITECT/ENGINEER G.FOR ANY SPECIFIC USE NOT COVERED HERE ABOVE, COMPLY WITH THE NEC IN CONDUCTOR USE.

H. ALL CIRCUITS SHALL BE 2#12+G UNLESS OTHERWISE NOTED ON DRAWINGS OR IN SCHEDULE: I. ALL 15 AND 20 AMP CIRCUITS WITH LENGTHS OVER 150 FT. SHALL HAVE THEIR CONDUCTOR SIZE INCREASED TO #10 FOR VOLTAGE DROP.

END OF SECTION 16120

**END OF SECTION 16121** 

# **SECTION 16121**

WIRE CONNECTIONS A JOINTS ON BRANCH CIRCUITS SHALL OCCUR ONLY WHERE SUCH CIRCUIT DIVIDE AS INDICATED ON PLANS AND SHALL CONSIST OF ONE THROUGH CIRCUIT TO WHICH SHALL BE SPLICED THE BRANCH FROM THE CIRCUIT. IN NO CASE SHALL JOINTS IN BRANCH CIRCUITS BE LEFT FOR THE FIXTURE HANGER TO MAKE. NO SPLICES SHALL BE MADE IN CONDUCTOR EXCEPT AT OUTLET BOXES, JUNCTION BOXES, OR SPLICE

B. ALL JOINTS OR SPLICES FOR #10 AWG OR SMALLER SHALL BE MADE WITH UL APPROVED WIRE NUTS OR COMPRESSION TYPE CONNECTORS. C.ALL JOINTS OR SPLICES FOR #8 AWG OR LARGER SHALL BE MADE WITH A MECHANICAL COMPRESSION CONNECTOR. AFTER THE CONDUCTORS HAVE BEEN MADE MECHANICALLY AND ELECTRICALLY SECURE, THE ENTIRE JOINT OR SPLICE SHALL BE COVERED WITH SCOTCH #33 TAPE OR APPROVED EQUAL TO MAKE THE INSULATION OF THE JOINT OR SPLICE EQUAL TO THE INSULATION OF THE CONDUCTORS. THE CONNECTOR SHALL BE UL APPROVED.

A.INSTALL CONDUCTORS IN ALL RACEWAYS AS REQUIRED, UNLESS OTHERWISE NOTED, IN A NEAT AND WORKMANLIKE MANNER. ALL EMPTY CONDUITS SHALL HAVE A #14 GALVANIZED PULL WIRE OR NYLON PULLCORD LEFT IN PLACE FOR FUTURE USE.

B. CONDUCTORS SHALL BE COLOR CODED IN ACCORDANCE WITH THE NEC. MAINS, FEEDERS, SUBFEEDERS SHALL BE TAGGED IN ALL PULL, JUNCTION, AND OUTLET BOXES AND IN THE GUTTER OF PANELS WITH APPROVED CODE TYPE WIRE MARKERS. C.NO LUBRICANT OTHER THAN POWDERED SOAPSTONE OR APPROVED PULLING COMPOUND MAY BE USED TO PULL CONDUCTORS

D. AT LEAST EIGHT (8) INCHES OF SLACK WIRE SHALL BE LEFT IN EVERY OUTLET BOX WHETHER IT BE IN USE OR LEFT FOR FUTURE USE. E. ALL CONDUCTORS AND CONNECTIONS SHALL TEST FREE OF GROUNDS SHORTS AND OPENS BEFORE

TURNING THE JOB OVER TO THE OWNER. F. PULL BOXES SHALL BE REQUIRED IN RUNS OVER 100 FEET OR WHEN THREE 90-DEGREE BENDS ARE USED, OR AS INDICATED ON THE DRAWINGS. G.FEEDERS ARE TO BE RUN ABOVE GROUND TO ALL POWER PANELS AND LIGHTING PANELS, UNLESS

INDICATED OTHERWISE ON DRAWINGS. H. WHERE MOTORS HAVE CONDUIT TERMINAL BOXES, FEEDERS SHALL BE CONNECTED TO SAME BY

I. ALL MOTORS WITH SLIDING BASE MOUNTINGS SHALL HAVE NOT LESS THAN 18 INCHES NOR MORE THAN 6 FEET OF CONDUIT CONNECTING RIGID CONDUIT FEED TO MOTOR TERMINAL BOX. J. CONDUCTOR SPLICES SHALL BE MADE ONLY IN JUNCTION BOXES, TERMINAL BOXES, OR PULL BOXES. END OF SECTION 16125

### SECTION 16133 OUTLET BOXES

ALL OUTLET BOXES FOR CONCEALED WIRING SHALL BE SHEET METAL, A GALVANIZED OR CADMIUM PLATED, AT LEAST 1 « INCHES DEEP, SINGLE OR GANGED, OF SIZE TO ACCOMMODATE DEVICES AND NUMBER OF CONDUCTORS NOTED. BOXES SHALL BE EQUIPPED WITH PLASTER RING OR COVER AS NECESSARY. ALL OUTLET BOXES SHALL BE MANUFACTURED BY STEEL

CITY OR APPROVED EQUAL. B. BOXES FOR EXPOSED WIRING SHALL BE MALLEABLE IRON, CADMIUM FINISH, OR CAST ALUMINUM ALLOY, AS MANUFACTURED BY STEEL CITY, AND SHALL NOT BE LESS THAN 4 INCHES SQUARE BY 1 « INCHES DEEP UNLESS OTHERWISE NOTED

C.FIXTURE OUTLET BOXES SHALL BE MINIMUM 4 IN OCTAGONAL AND, WHERE REQUIRED AS OUTLET AND JUNCTION BOXES, THEY SHALL BE 4 11/16 INCHES BY 2 1/8 INCHES DEEP. END OF SECTION 16133

### SECTION 16190 SUPPORTING DEVICES

END OF SECTION 16190

A.THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL METALLIC SUPPORTS AS REQUIRED FOR THE PROPER INSTALLATION OF RACEWAY SYSTEMS AND ALL OTHER EQUIPMENT INSTALLED UNDER THIS DIVISION OF THE CONTRACT CONFORMING TO THE LATEST EDITION OF THE NEC. B. CONDUIT SHALL BE SUPPORTED ON APPROVED TYPES OF WALL BRACKETS, CEILING TRAPEZES, STRAP HANGERS OR PIPE SUPPORTS, SECURED BY MEANS OF TOGGLE BOLTS IN HOLLOW MASONRY WALLS OR UNITS. EXPANSION BOLTS WILL BE USED IN CONCRETE OR BLOCK MACHINE SCREWS ON METAL SURFACES AND WOOD SCREWS ON WOOD CONSTRUCTION.

C.CONDUIT SHALL BE SECURELY FASTENED TO ALL SHEET METAL OUTLETS, JUNCTION AND PULL BOXES WITH TWO GALVANIZED LOCKNUTS AND BUSHING, CARE BEING TAKEN TO SEE THAT THE FULL NUMBER OF THREADS PROJECT THROUGH TO PERMIT THE BUSHING TO BE DRAWN TIGHT AGAINST THE END OF THE CONDUIT, AFTER WHICH THE LOCKNUTS SHALL BE MADE TIGHT SUFFICIENTLY TO DRAW THEM INTO FIRM ELECTRICAL CONTACT WITH THE OUTLET BOX. INSTALL A PLASTIC BUSHING ON END OF PIPE THREADS PROTRUDING INTO JUNCTION BOXES AND OTHER ENCLOSURES TO PROTECT CABLING. D. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SUPPORTS REQUIRED FOR THE ELECTRICAL EQUIPMENT AND CONDUIT

## SECTION 16195

**ELECTRICAL IDENTIFICATION** A. THE ELECTRICAL CONTRACTOR SHALL MAINTAIN ACCURATE RECORDS OF ALL DEVIATIONS IN WORK AS ACTUALLY INSTALLED FROM WORK INDICATED ON THE DRAWINGS. ON COMPLETION OF THE PROJECT, TWO (2) COMPLETE SETS OF MARKED-UP PRINTS SHALL BE DELIVERED TO THE ARCHITECT.

1. PROVIDE AND INSTALL LAMINATED BLACK AND WHITE LAMACOID NAMEPLATES FOR ALL SERVICE SWITCHES, DISTRIBUTION SWITCHES, DISTRIBUTION SWITCHBOARDS, BRANCH CIRCUIT PANELBOARDS, SAFETY SWITCHES, CABINETS, STARTERS, AND OTHER EQUIPMENT WITH THEIR CORRECT DESIGNATION. LABEL EQUIPMENT IN AREAS ACCESSIBLE TO THE PUBLIC ON INSIDE OF ENCLOSURE ONLY. NAMEPLATES SHALL BE FIRMLY SECURED TO FRONT COVER OR DOOR WITH TWO

2. MOUNT A TYPEWRITTEN DIRECTORY BEHIND PLASTIC ON THE INSIDE OF EACH BRANCH CIRCUIT PANEL DOOR, GIVING THE NUMBER, DESCRIPTION AND LOCATION OF THE CIRCUIT CONTROLLED BY EACH CIRCUIT BREAKER. REVISE EXISTING DIRECTORIES TO REFLECT CIRCUIT MODIFICATIONS UNDER THIS

3. ALL FUSED SAFETY SWITCHES AND FUSED SWITCH UNITS IN SWITCHBOARDS SHALL INDIVIDUALLY

BEAR A FUSE LABEL SHOWING PROPER SIZE AND TYPE OF FUSE TO BE USED. 4. INSTALL WIRING DIAGRAMS ON THE INSIDE COVER OF ALL STARTERS, SWITCHES AND OTHER SUCH EQUIPMENT. SUCH DIAGRAMS SHALL NOT BE HANDWRITTEN. 5. ALL JUNCTION BOXES WITH BLANK COVERS SHALL HAVE CIRCUITS CONTAINED THEREIN IDENTIFIED BY

MEANS OF PERMANENT BLACK "MAGIC MARKER" ON THE COVER. END OF SECTION 16195

## ELECTRONIC EQUIPMENT

A. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION AND CONNECTION OF A PROPER POWER SUPPLY TO ALL ELECTRONIC EQUIPMENT FURNISHED BY OTHERS. HE SHALL VERIFY ALL VOLTAGE, FREQUENCY, ETC., REQUIREMENTS PRIOR TO ENERGIZING THE CIRCUIT. THOSE INSTALLING THE EQUIPMENT WILL BE RESPONSIBLE FOR THE PROPER OPERATION OF THE EQUIPMENT PROVIDED THE PROPER POWER SUPPLY CIRCUIT IS INSTALLED BY THE ELECTRICAL CONTRACTOR. B. PROVIDE TELEPHONE LINES TO EQUIPMENT CONTROL PANELS WITH MODEM ACCESS. COORDINATE WITH MECHANICAL CONTRACTOR.

### SECTION 16400 SERVICE AND DISTRIBUTION

A. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL RELATED DISTRIBUTION EQUIPMENT AS INDICATED ON THE FLOOR PLAN, DIAGRAMS, SCHEDULES, AND NOTES. ALL EQUIPMENT SHALL BE NEW B. RELATED DOCUMENTS: DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING

GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 1 SPECIFICATIONS SECTION, APPLY TO

### WORK OF THIS SECTION. END OF SECTION 16401

SAFETY SWITCHES SHALL BE UL LISTED

END OF SECTION 16199

## **SECTION 16440**

**DISCONNECT SWITCHES** A. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL SAFETY SWITCHES AS INDICATED ON THE DRAWINGS OR AS REQUIRED. ALL

1. THE SWITCHES SHALL BE FUSED SAFETY SWITCHES (FSS) OR NON-FUSED SAFETY SWITCHES (NFSS) AS SHOWN ON THE DRAWINGS OR REQUIRED AND SHALL BE MANUFACTURED BY SIEMENS, SQUARE D, OR APPROVED EQUAL

2. SWITCHES SHALL HAVE A QUICK-MAKE AND QUICKBREAK OPERATING HANDLE AND MECHANISM WHICH SHALL BE AN INTEGRAL PART OF THE BOX. PADLOCKING PROVISIONS SHALL BE PROVIDED FOR PADLOCKING IN THE OFF POSITION WITH AT LEAST THREE PADLOCKS. SWITCHES SHALL BE HORSEPOWER RATED FOR 250 VOLTS AC OR DC OR 600 VOLTS AC AS REQUIRED. LUGS SHALL BE UL LISTED FOR COPPER AND ALUMINUM CABLE

3. SWITCHES SHALL BE FURNISHED IN NEMA I GENERAL PURPOSE ENCLOSURES WITH KNOCKOUTS UNLESS OTHERWISE NOTED OR REQUIRED. SWITCHES LOCATED ON THE EXTERIOR OF THE BUILDING OR IN "WET" LOCATIONS SHALL HAVE NEMA 3R ENCLOSURES (WP). 4. THE SAFETY SWITCHES SHALL BE SECURELY MOUNTED IN ACCORDANCE WITH THE NEC. THE

CONTRACTOR SHALL PROVIDE ALL MOUNTING MATERIALS AND INSTALL FUSES IN THE FSS. THE FUSES SHALL BE DUAL ELEMENT ON MOTOR CIRCUITS. END OF SECTION 16440

A. THE CONDUIT SYSTEMS AND NEUTRAL CONDUCTOR FOR THE WIRING SYSTEM, AND THE TELEPHONE SYSTEM SHALL BE SECURELY GROUNDED. THE GROUNDS SHALL BE NEC GROUNDS IN EACH CASE. B. A GROUND SHALL BE ESTABLISHED AND TESTS CARRIED OUT TO INDICATE THAT SATISFACTORY GROUND HAS BEEN ESTABLISHED IN ACCORDANCE WITH THE NEC.

C. WRITTEN RESULTS OF THIS TEST SHALL BE FORWARDED TO THE ENGINEER BEFORE CONNECTION TO

## END OF SECTION 16450

SECTION 16470 PANEL BOARDS A.FURNISH AND INSTALL DISTRIBUTION AND POWER PANELBOARDS AS INDICATED IN THE PANELBOARD SCHEDULE AND WHERE SHOWN ON THE DRAWINGS. PANELBOARDS SHALL BE DEAD-FRONT SAFETY TYPE, EQUIPPED WITH QUICK-MAKE, QUICK-BREAK FUSIBLE BRANCH SWITCHES AND APPROVED FOR SERVICE ENTRANCE. THE ACCEPTABLE MANUFACTURERS OF THE PANELBOARD ARE SIEMENS, SQUARE D, AND GE, PROVIDED THEY ARE FULLY EQUAL TO THE TYPE LISTED ON THE DRAWINGS. THE

PANELBOARD SHALL BE UL LISTED AND BEAR THE UL LABE B. ALL FUSIBLE BRANCH SWITCHES SHALL BE QUICK-MAKE, QUICK BREAK, WITH VISIBLE BLADES AND DUAL HORSEPOWER RATINGS SWITCH HANDLES SHALL PHYSICALLY INDICATE ON AND OFF POSITIONS. SUCH HANDLES SHALL ALSO BE ABLE TO ACCEPT THREE PADLOCKS HAVING HEAVY-DUTY INDUSTRIAL TYPE SHACKLES. COVERS SHALL BE INTERLOCKED WITH THE SWITCH HANDLES TO PREVENT OPENING IN THE ON POSITION A MEANS SHALL BE PROVIDED TO ALLOW AUTHORIZED PERSONNEL TO RELEASE THE INTERLOCK FOR INSPECTION PURPOSES WHEN A SWITCH IS ON. A CARDHOLDER, PROVIDING CIRCUIT IDENTIFICATION, SHALL BE MOUNTED ON EACH BRANCH SWITCH. SWITCHES SHALL BE PROVIDED WITH FUSES OR AS NOTED ON THE DRAWINGS.

C.PANELBOARD BUS STRUCTURE AND MAIN LUGS OR MAIN SWITCH SHALL HAVE CURRENT RATINGS AS SHOWN ON THE PANELBOARD SCHEDULE. THE BUS STRUCTURE SHALL ACCOMMODATE PLUG-ON OR BOLTED BRANCH SWITCHES AND MOTOR STARTERS AS INDICATED IN THE PANEL BOARD SCHEDULE WITHOUT MODIFICATION TO THE BUS ASSEMBLY PROVIDE SOLID NEUTRAL ASSEMBLY (S/N) D. SWITCHES AND PANELBOARD BUS STRUCTURE SHALL SAFELY AND WITHOUT FAILURE WITHSTAND SHORT CIRCUITS ON THE SYSTEMS CAPABLE OF DELIVERING UP TO 100,000 AMPERES RMS

SYMMETRICAL, UNLESS OTHERWISE NOTED. E PANELBOARD ASSEMBLY SHALL BE ENCLOSED IN A STEEL CABINET. THE RIGIDITY AND GAUGE OF STEEL TO BE AS SPECIFIED IN UL STANDARD FOR CABINETS. THE SIZE OF WIRING GUTTERS SHALL BE IN ACCORDANCE WITH UI STANDARD CABINETS SHALL BE FOUIPPED WITH A FRONT DOOR AND HAVE FULLY CONCEALED. SELF-ALIGNING TRIM CLAMPS. FRONTS SHALL BE FULL-FINISHED STEEL WITH RUST INHIBITING PRIMER AND BAKED ENAMEL FINISH.

F. TERMINALS FOR FEEDER CONDUCTORS TO THE PANELBOARD MAINS AND NEUTRAL SHALL BE SUITABLE FOR THE TYPE OF CONDUCTOR SPECIFIED. TERMINALS FOR BRANCH CIRCUIT WIRING, BOTH BREAKER AND NEUTRAL. SHALL BE SUITABLE FOR THE TYPE OF CONDUCTOR SPECIFIED. G. BEFORE INSTALLING PANELBOARDS CHECK ALL OF THE ARCHITECTURAL DRAWINGS FOR POSSIBLE CONFLICT OF SPACE AND ADJUST THE LOCATION OF THE PANELBOARD TO PREVENT SUCH CONFLICT

WITH OTHER ITEMS H. THE PANELBOARDS SHALL BE MOUNTED IN ACCORDANCE WITH THE NEC. THE ELECTRICAL CONTRACTOR SHALL FURNISH ALL MATERIAL FOR MOUNTING THE PANELBOARDS. END OF SECTION 16470

# SECTION 16471

BRANCH CIRCUIT PANELBOARD A.POWER AND LIGHTING PANELS SHALL BE OF THE DEAD-FRONT, SAFETY TYPE, WITH THERMAL MAGNETIC, QUICKMAKE, QUICK-BREAK, TRIP FREE, BOLTED-TYPE MOLDED CASE CIRCUIT BREAKERS. VOLTAGE RATINGS NUMBER OF POLES, FRAME SIZE, TRIP RATINGS, MAIN BREAKER OR LUGS, NEUTRAL BUS, AND GROUND BUS ARE ALL AS SHOWN ON THE DRAWINGS. BUS BARS SHALL BE RECTANGULAR, SOLID COPPER, SECURELY MOUNTED AND BRACED. ALL CONNECTIONS TO BUS BARS SHALL BE SECURELY BOLTED. CABINET BOXES SHALL BE CONSTRUCTED OF CODE GRADE GALVANIZED STEEL, SIZED TO PROVIDE MINIMUM 4-INCH WIDE WIRING GUTTERS ON SIDES, TOP AND BOTTOM. FRONTS SHALL BE CONSTRUCTED OF CODE GRADE STEEL, ADJUSTABLE INDICATING TRIM CLAMPS AND WITH DOOR PROVIDED WITH CONCEALED HINGES AND CYLINDER TYPE LOCK AND CATCH. TWO KEYS PER PANEL

B. POWER PANELS SHALL BE SIEMENS. TYPE S1. S2. S3. SE. OR ENGINEER APPROVED EQUAL. WITH BRANCH BREAKERS, MAIN BREAKERS OR LUGS, NEUTRAL AND GROUND BUSES, ETC., ALL AS SHOWN ON THE C. POWER AND LIGHTING PANEL CONSTRUCTION DETAILS SHALL BE IN ACCORDANCE WITH UL STANDARDS

SHALL BE FURNISHED, AND ALL LOCKS KEYED ALIKE. FRONT SHALL BE FINISH PAINTED BLUE-GRAY.

AND SHALL CONFORM TO NEMA STANDARDS. THEY SHALL BEAR THE UL LABEL. PANELS SHALL MEET USASI SPECIFICATIONS W-P-115A, TYPE 1, CLASS I.

D. ALL PANEL DIRECTORIES SHALL BE TYPED AND TERMINOLOGY APPROVED BY THE OWNER. END OF SECTION 16471

OVERCURRENT PROTECTIVE DEVICES A. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL WHERE INDICATED ON THE DRAWINGS OR AS REQUIRED BY THE NEC MOLDED CASE CIRCUIT BREAKERS IN A NEMA TYPE 1 ENCLOSURE. BREAKERS SHALL BE MANUALLY OPERATED. TRIP-FREE AND DESIGNED SO THAT ALL POLES OPEN SIMULTANEOUSLY. TRIPPING MECHANISM SHALL BE (THERMALLY, MAGNETICALLY) OPERATED, SHALL OPEN INSTANTANEOUSLY ON SHORT CIRCUITS AND HAVE TIME DELAY ON OVERLOADS, AND HAVE EFFECTIVE SCALING AGAINST TAMPERING. BREAKERS SHALL BE AS CALLED FOR ON THE DRAWINGS OR

IN THE PANELBOARD SCHEDULE AND AS MANUFACTURED BY SIEMENS, SQUARE D, OR APPROVED EQUAL. B. FUSES, UNLESS INDICATED OTHERWISE, SHALL BE DUAL ELEMENT, TIME LAG, CARTRIDGE TYPE AS MANUFACTURED BY BUSSMAN. FUSES FOR MOTOR CIRCUITS SHALL BE SIZED IN ACCORDANCE WITH THE NEC. LABELS INDICATING THE SIZE AND TYPE OF REPLACEMENT FUSES SHALL BE GLUED TO INSIDE OF DOOR ON ALL FUSIBLE SWITCHES AND PANELBOARDS.

C. ALL FUSES SHALL BE OF THE CURRENT AND VOLTAGE RATING AS REQUIRED OR INDICATED. D.SPARES: SPARE FUSES AMOUNTING TO 10% (MINIMUM THREE) OF EACH TYPE AND RATING SHALL BE SUPPLIED BY THE ELECTRICAL CONTRACTOR. THESE SHALL BE TURNED OVER TO THE OWNER UPON PROJECT COMPLETION.

## SECTION 16900 CONTROLS AND INSTRUMENTATION

END OF SECTION 16475

# SECTION 16901

A. ALL EQUIPMENT AND MATERIALS USED IN RELATION TO CONTROL WORK FOR THE PROJECT SHALL BE NEW AND SHALL BEAR THE MANUFACTURER'S NAME AND TRADE NAME. THE EQUIPMENT AND MATERIAL SHALL BE ESSENTIALLY THE STANDARD PRODUCT OF A MANUFACTURER REGULARLY ENGAGED IN THE PRODUCTION OF THE REQUIRED TYPE OF EQUIPMENT AND SHALL BE THE MANUFACTURER'S LATEST

APPROVED DESIGN. B. THE ELECTRICAL CONTRACTOR SHALL RECEIVE AND PROPERLY STORE THE EQUIPMENT AND MATERIAL PERTAINING TO THE ELECTRICAL WORK. THE EQUIPMENT SHALL BE TIGHTLY COVERED AND PROTECTED AGAINST DIRT, WATER, CHEMICAL OR MECHANICAL INJURY AND THEFT. THE MANUFACTURER'S DIRECTIONS SHALL BE FOLLOWED COMPLETELY IN THE DELIVERY, STORAGE, PROTECTION AND

C. THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL ITEM NECESSARY FOR THE COMPLETE INSTALLATION OF THE EQUIPMENT AS RECOMMENDED OR AS REQUIRED BY THE MANUFACTURER OF THE EQUIPMENT OR REQUIRED BY CODE WITHOUT ADDITIONAL COST TO THE OWNER, REGARDLESS OF WHETHER THE ITEMS ARE SHOWN ON THE PLANS OR COVERED IN THE

D.IT SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO CLEAN THE ELECTRICAL EQUIPMENT, MAKE NECESSARY ADJUSTMENTS AND PLACE THE EQUIPMENT INTO OPERATION BEFORE TURNING EQUIPMENT OVER TO OWNER. ANY PAINT THAT WAS SCRATCHED DURING CONSTRUCTION. SHALL BE "TOUCHED-UP" WITH FACTORY COLOR PAINT TO THE SATISFACTION OF THE ARCHITECT. ANY ITEMS THAT WERE DAMAGED DURING CONSTRUCTION SHALL BE REPLACED.

1. UNLESS OTHERWISE INDICATED ALL HEATING, VENTILATING, AIR CONDITIONING, PLUMBING, AND OTHER MECHANICAL EQUIPMENT, MOTORS, AND CONTROLS SHALL BE FURNISHED, SET IN PLACE AND WIRED AS FOLLOWS:

SET POWER- CONTROL-

# RESPONSIBLE DIVISION

INSTALLATION OF ALL EQUIPMENT AND MATERIALS.

		11101125	02.	WIRED	WIRED
EQUIPMENT COMBINATION MAGNETIC MOTOR STARTERS, MAGNET MOTOR STARTERS AND CONTACTOR	IC	15	15	16	
FUSED AND UNFUSED DISCONNECT SWITCHES, THERMAL OVERLOAD SWITC AND HEATERS, MANUAL MOT STARTERS		15	16	16	15
MANUAL-OPERATING AND MULTI-SPEED SWITCHES CONTROLS, RELAYS,		16(1)	16(1)	16	-
TRANSFORMERS		15	16	16	16
THERMOSTATS (LOW VOLTAGE) AND TIME SWITCHES	GE)	15	15	16	15
THERMOSTATS (LINE VOLTAGE)	GE)	15	15	16	15
TEMPERATURE CONTROL PANELS		15	15	16	16
MOTOR AND SOLENOID VALVES, DAMPER MOTORS, PE & EP SWITCHES		15	15	16	16
PUSH-BUTTON STATIONS AN PILOT LIGHTS	D	15	15(2)		15(2)
HEATING, COOLING, VENTILATION AND AIR CONDITIONING CONTROLS		15	15(20		15(2)
EXHAUST FAN SWITCHES		15	16	16	15(2)
SUBSCRIPT FOOTNOTES:					

1) UNDER DIVISION 15 IF FURNISHED FACTORY-WIRED AS PART OF EQUIPMENT OR IF FURNISHED WITH COMBINATION

STARTERS 2) IF ITEM IS FOR LINE VOLTAGE, SET IN PLACE AND CONNECT UNDER DIVISION 16. WHERE FACTORY MOUNTED ON EQUIPMENT OR ATTACHED TO PIPING OR DUCTS AND USING LINE VOLTAGE FURNISH AND SET UNDER DIVISION 15, CONNECT UNDER

2. VERIFY LOCATION AND NAMEPLATE DATA OF ALL MECHANICAL EQUIPMENT WITH THE MECHANICAL CONTRACTOR PRIOR TO INSTALLING ELECTRICAL FACILITIES. BE RESPONSIBLE FO COORDINATION OF REVISIONS AND MODIFICATIONS NECESSARY TO PROPERLY SUPPLY ELECTRICAL FACILITIES TO HEATING, VENTILATING, AIR CONDITIONING, PUMPS, MOTORS, CONTROLS, AND OTHER MECHANICAL EQUIPMENT INSTALLED IN PLACE OF EQUIPMENT SPECIFIED. REQUIRED ELECTRICAL FACILITIES CHANGES SHALL BE CONSIDERED TO BE A PART OF THE MECHANICAL CONTRACT.

PROVIDE EACH MOTOR WITH A HORSEPOWER RATED DISCONNECT SWITCH AND MOTOR RUNNING OVERCURRENT PROTECTION PER N.E.C. 430-37. TO FACILITATE EASE AND SAFETY OF OPERATION AND MAINTENANCE OF MECHANICAL EQUIPMENT, LOCATE THE DISCONNECT SWITCH IMMEDIATELY ADJACENT TO THE MOTOR, UNLESS OTHERWISE INDICATED. SIZE THERMAL OVERLOAD HEATER UNITS FOR APPROXIMATELY 115% OF FULL LOAD MOTOR CURRENT. SIZE FUSES IN ACCORDANCE WITH THE ACTUAL MOTOR NAMEPLATE RATING AND AS RECOMMENDED BY THE BUSSMAN MFG. CO. CHECK AND COORDINATE ALL STARTERS. FUSES. AND OTHER MOTOR-RUNNING PROTECTIVE DEVICES WITH THE EQUIPMENT THEY CONTROL, AND PROVIDE AND INSTALL THE CORRECT SIZE PROTECTIVE ELEMENTS

4. DO NOT CONNECT MOTORS WHICH ARE OF A VOLTAGE RATING DIFFERENT THAN SUPPLY VOLTAGE. REPORT SAME TO THE ARCHITECT IN WRITING AND OBTAIN WRITTEN INSTRUCTIONS FOR RESOLUTION. 5. USE FLEXIBLE CONDUIT FOR ALL CONNECTIONS TO DEVICES DIRECTLY ATTACHED TO DUCTS, PIPING AND MECHANICAL FOLIPMENT

# SECTION 16950

A. AS SOON AS ELECTRIC POWER IS AVAILABLE AND CONNECTED TO SERVE THE EQUIPMENT IN THE BUILDING, AND EVERYTHING IS READY FOR FINAL TESTING AND PLACING IN SERVICE, A COMPLETE OPERATIONAL TEST SHALL BE MADE. THE CONTRACTOR SHALL FURNISH ALL NECESSARY INSTRUMENTS AND EQUIPMENT AND MAKE ALL TESTS, ADJUSTMENTS, AND TRIAL OPERATIONS REQUIRED TO PLACE THE SYSTEM IN BALANCED AND SATISFACTORY OPERATING CONDITION; FURNISH ALL NECESSARY ASSISTANCE AND INSTRUCTIONS TO PROPERLY INSTRUCT THE OWNER'S AUTHORIZED PERSONNEL IN

THE OPERATION AND CARE OF THE SYSTEM. B. PRIOR TO TESTING THE SYSTEM, THE FEEDERS AND BRANCH CIRCUITS SHALL BE CONTINUOUS FROM MAIN FEEDERS TO MAIN PANELS. TO SUBPANELS. TO OUTLETS. WITH ALL BREAKERS AND FUSES IN PLACE. THE SYSTEM SHALL BE TESTED FREE FROM SHORTS AND GROUNDS. SUCH TESTS SHALL BE MADE IN THE PRESENCE OF THE ENGINEER'S REPRESENTATIVE.

C. NO CIRCUITS SHALL BE ENERGIZED WITHOUT THE OWNER'S APPROVAL D. THE RIGHT IS RESERVED TO INSPECT AND TEST ANY PORTION OF THE EQUIPMENT AND/OR MATERIALS DURING THE PROGRESS OF ITS ERECTION. THE CONTRACTOR SHALL FURTHER TEST ALL WIRING AND CONNECTIONS FOR CONTINUITY AND GROUNDS BEFORE CONNECTING ANY FIXTURES OREQUIPMENT E. THE CONTRACTOR SHALL TEST THE ENTIRE SYSTEM IN THE PRESENCE OF THE ARCHITECT OR HIS ENGINEER WHEN THE SYSTEM IS FINALLY COMPLETED TO ENSURE THAT ALL PORTIONS ARE FREE FROM SHORT CIRCUITS OR GROUND FAULTS.

SECTION 16980 DEMONSTRATION OF ELECTRICAL EQUIPMENT

END OF SECTION 16950

END OF SECTION 16901

A. THE ELECTRICAL CONTRACTOR SHALL PROVIDE THE ARCHITECT WITH CERTIFICATION OF THE INSPECTION AND APPROVAL OF AN ACTIVE MEMBER OF THE INTERNATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS OF ALL WORK COMPLETED AND INCLUDED IN THE SECTION, IF REQUIRED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE INSPECTOR WHEN WORK REACHES

INSPECTION STAGE. B. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE LOCAL AUTHORITY HAVING JURISDICTION IN ORDER THAT LOCAL INSPECTION MAY BE CARRIED OUT AT THE PROPER STAGE. C.THE ELECTRICAL CONTRACTOR SHALL PAY FOR ALL PERMITS, INSPECTION FEES, AND INSTALLATION

FEES AS REQUIRED TO COMPLETE THE WORK UNDER THIS SECTION OF THE CONTRACT. D.THIS CONTRACTOR SHALL GUARANTEE THE MATERIALS AND WORKMANSHIP FOR A PERIOD OF TWELVE (12) MONTHS FROM THE TIME THE INSTALLATION IS ACCEPTED BY THE OWNER. IF, DURING THIS TIME, ANY DEFECTS SHOULD SHOW UP DUE TO ANY DEFECTIVE MATERIALS. WORKMANSHIP, NEGLIGENCE OR WANT OF PROPER CARE ON THE PART OF THIS CONTRACTOR, HE SHALL FURNISH ANY NEW MATERIALS AS NECESSARY, REPAIR SAID DEFECTS, AND PUT THE SYSTEM IN ORDER AT HIS OWN EXPENSE ON RECEIPT OF NOTICE OF SUCH DEFECTS FROM THE ARCHITECT. THIS SPECIFICATION IS NOT INTENDED TO IMPLY THAT THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR NEGLIGENCE OF THE

> END OF SECTION 16980 END OF DIVISION

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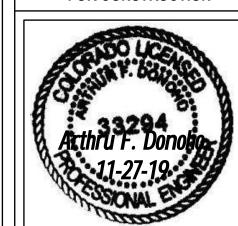
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**ELECTRICAL SPECIFICATIONS** 

FOR CONSTRUCTION



REV. DESC.

DATE: 11/27/19

PROJECT #: 19-130

SHEET #: