

ELECTRICAL SPECIFICATIONS

- PART 1 - GENERAL
1. DESCRIPTION
a. DEFINITIONS
1. THE FOLLOWING DEFINITIONS APPLY TO THIS PROJECT:
1. FURNISH - TO SUPPLY THE MATERIAL NECESSARY TO PERFORM THE TASK.
2. INSTALL - TO SUPPLY THE LABOR NECESSARY TO COMPLETE THE TASK.
3. PROVIDE - TO FURNISH AND INSTALL MATERIAL AND LABOR TO COMPLETE THE TASK.
b. INDUSTRY STANDARDS
1. THE FOLLOWING IS A LIST OF ABBREVIATIONS USED IN THE ELECTRICAL SPECIFICATION:
1. NEC - NATIONAL ELECTRIC CODE
2. NEMA - NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
3. UL - UNDERWRITERS LABORATORIES, INC.
4. HVAC - HEATING, VENTILATION, AIR CONDITIONING
5. IEEE - INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
6. IFC - INTERNATIONAL FIRE CODE
7. AIC - AMPERES INTERRUPTING CAPACITY
c. THE ELECTRICAL SPECIFICATIONS COVERS ALL ELECTRICAL WORK FOR THE PROJECT. WORK SHALL INCLUDE LABOR, MATERIAL, AND ACCESSORIES NECESSARY TO ACCOMPLISH THE WORK AS SPECIFIED AND SHOWN ON THE DRAWINGS, INCLUDING CONNECTION AND CHECKOUTS OF EQUIPMENT FURNISHED BY OTHERS (OTHER TRADES, THE OWNER, AND OTHER CONTRACTORS), AND TO ALL KITCHEN EQUIPMENT AND AS INDICATED ON DRAWINGS OR AS REQUIRED.
d. THIS WORK INCLUDES BUT IS NOT LIMITED TO: ELECTRICAL SERVICE AND DISTRIBUTION SYSTEMS, DISCONNECT SWITCHES, LIGHTING FIXTURES, AND CONTROL WIRING WITH FINAL CONNECTIONS TO ALL EQUIPMENT REQUIRED FOR A COMPLETE SYSTEM.
e. EC TO VERIFY TYPE OF POWER SERVICE AVAILABLE (UNDERGROUND OR OVERHEAD) PRIOR TO SUBMITTING A PROPOSAL.
f. EC TO VERIFY METERING, IN ACCORDANCE WITH LOCAL ELECTRIC UTILITY COMPANY REQUIREMENTS FOR GENERAL SERVICE SCHEDULE.
g. EC SHALL PROVIDE 1-PHASE 120/240V SERVICE. IF FOR ANY REASON THIS IS NOT AVAILABLE, THE EC SHALL NOTIFY THE OWNER IN WRITING PRIOR TO SUBMITTING A PROPOSAL.
h. EC SHALL PROVIDE LABELS 3/16" INCH HIGH FOR DESCRIPTION OF MAIN SWITCHBOARD, PANELBOARD, AND ALL BRANCH CIRCUITS.
2. CODES, PERMITS, AND INSPECTIONS
a. INSTALLATION SHALL COMPLY WITH ALL LAWS APPLYING TO ELECTRICAL WORK IN EFFECT, INCLUDING THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE, THE NATIONAL ELECTRICAL SAFETY CODE, ALL LOCAL GOVERNING CODES AND ORDINANCES, WITH THE REGULATIONS OF THE SERVING ELECTRICAL UTILITY COMPANY, ALL APPLICABLE PERMITS AND INCLUDE THE COST OF SAME IN THE COST OF THE PROJECT. OBTAIN AND PAY FOR (WITHOUT ADDITIONAL EXPENSE OF THE OWNER) ALL REQUIRED INSPECTIONS AND REVIEWS.
b. THE EC SHALL UPGRADE THESE SPECIFICATIONS AS REQUIRED TO MEET COMPLIANCE WITH ALL APPLICABLE CODES IN EFFECT; HOWEVER, WHERE THESE SPECIFICATIONS MAKE STIPULATIONS OVER AND ABOVE THE MINIMUM REQUIREMENTS OF APPLICABLE CODES, THE CONTRACTOR SHALL NOT DOWN-GRADE THESE SPECIFICATIONS TO MINIMUM CODE REQUIREMENTS WITHOUT PRIOR WRITTEN APPROVAL FROM THE OWNER.
3. QUALITY ASSURANCE
a. THE FOLLOWING INDUSTRY STANDARDS AS APPLICABLE TO THE ELECTRICAL WORK SHALL APPLY TO THE WORK OF THIS DIVISION EXCEPT WHERE THE REQUIREMENTS OF THESE SPECIFICATIONS ARE MORE THAN THE LISTED STANDARDS, THEN SPECIFICATIONS WILL TAKE PRECEDENCE:
1. UL - UNDERWRITERS LABORATORIES
2. NEMA - NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
3. NECA - NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION
4. ANSI - AMERICAN NATIONAL STANDARDS INSTITUTE
5. ASTM - AMERICAN SOCIETY OF TESTING MATERIALS
b. ALL MATERIALS SHALL BE NEW, UL LISTED AND LABELED WHERE LABELED MATERIALS ARE AVAILABLE, UNDAMAGED AND FREE OF DEFECTS AT TIME OF INSTALLATION. MATERIALS OR EQUIPMENT DAMAGED IN SHIPMENT OR OTHERWISE DAMAGED PRIOR TO OR DURING INSTALLATION SHALL NOT BE REPAIRED AT THE JOB SITE, BUT SHALL BE REPLACED WITH NEW MATERIALS. WHEN THE MANUFACTURER'S NAME APPEARS IN THESE SPECIFICATIONS AND DRAWINGS, IT SHALL BE CONSTRUED THAT THE MANUFACTURER HAS TO MEET THE FULL REQUIREMENTS OF THE SPECIFICATIONS AND DRAWINGS AND THAT HIS STANDARD CATALOGED ITEM MAY BE UNACCEPTABLE WITHOUT MODIFICATION.
4. WORKING CLEARANCE
a. THE SIZE OF ELECTRICAL EQUIPMENT SHOWN ON THE DRAWINGS IS BASED ON DIMENSION OF A PARTICULAR MANUFACTURER (GENERALLY THE FIRST NAMED), WHILE OTHER MANUFACTURERS MAY BE ACCEPTABLE, IT IS THE RESPONSIBILITY OF THE TRADE TO DETERMINE IF THE EQUIPMENT PROPOSED WILL FIT IN THE ALLOCATED SPACE.
b. INSTALL ALL EQUIPMENT IN A MANNER TO PERMIT ACCESS TO ALL SURFACES. MAINTAIN PROPER CLEARANCE TO MEET ALL SAFETY AND OPERATING CODES, PARTICULARLY NEC. INCLUDE ALL REQUIREMENTS DICTATED BY OPERATION, CONTROL, ADJUSTMENT, MAINTENANCE, AND POSSIBLE REPLACEMENT OF EQUIPMENT IN DETERMINING CLEARANCE.
c. SHOULD THERE BE APPARENT VIOLATIONS OF NEC CODE CLEARANCE, NOTIFY THE ENGINEER BEFORE PROCEEDING WITH CONNECTION OR PLACEMENT OF EQUIPMENT.
5. COORDINATION
a. INSTALLATION STUDIES ARE REQUIRED TO COORDINATE THE ELECTRICAL WORK WITH THE WORK OF OTHER TRADES. PREPARE COORDINATION DRAWINGS AT ACCURATE SCALES WHERE SEVERAL ELEMENTS OF ELECTRICAL STRUCTURE AND ELECTRICAL WORK MUST BE SEQUENCED AND POSITIONED WITH PRECISION IN ORDER TO FIT INTO THE AVAILABLE SPACE.
b. SHOW THE ACTUAL PHYSICAL DIMENSIONS WHERE REQUIRED FOR PROPER INTEGRATION OF EQUIPMENT WITH BUILDING SYSTEMS.
c. PROVIDE APPROVED SHOP DRAWINGS TO ALL REQUIRED DISCIPLINES AND VERIFY FINAL ELECTRICAL CHARACTERISTICS BEFORE ROUGHING POWER FEEDS TO ANY EQUIPMENT. WHEN ELECTRICAL DATA ON APPROVED SHOP DRAWINGS DIFFERS FROM COMPLETED DESIGN, MAKE NECESSARY ADJUSTMENTS TO THE WIRING, DISCONNECTS, AND BRANCH CIRCUIT PROTECTION FOR THE EQUIPMENT ACTUALLY INSTALLED AT NO ADDITIONAL COST TO THE OWNER.
d. DAMAGE FROM INTERFERENCE CAUSED BY INADEQUATE COORDINATION SHALL BE RECTIFIED AT NO ADDITIONAL COST TO THE OWNER.
6. WORKMANSHIP
a. ALL WORK SHALL BE EXECUTED IN A WORKMANLIKE MANNER AND SHALL PRESENT A NEAT MECHANICAL APPEARANCE.
b. ANY MATERIAL ITEMS OR WORK NOT SHOWN ON THE DRAWINGS, BUT MENTIONED IN THESE SPECIFICATIONS OR VICE-VERSA, OR ANY ACCESSORIES NECESSARY TO MAKE THE WORK COMPLETE IN ALL RESPECTS AND READY FOR OPERATION SHALL BE PROVIDED WITHOUT ADDITIONAL COST TO THE OWNER.
7. TESTS
a. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY ON ALL ELECTRICAL WORK INSTALLED UNDER THIS CONTRACT TO PERFORM TESTS NECESSARY TO DEMONSTRATE TO THE SATISFACTION OF THE ENGINEER THAT ALL PARTS OF THIS CONTRACT HAVE BEEN COMPLETED AND ARE IN WORKING ORDER.
b. ALL SECONDARY POWER WIRING SHALL BE ENTIRELY FREE OF GROUNDS AND SHORT CIRCUITS.
c. IT IS INTENDED THAT THE PHASES ON THE PANELS BE BALANCED TO WITHIN 10% PHASE TO PHASE.

- PART 2 - PRODUCTS
1. GENERAL
a. ALL EQUIPMENT OF A PARTICULAR KIND, SUCH AS WIRING DEVICES, PANELBOARDS, AND LIGHTING FIXTURES OF THE SAME TYPE SHALL BE THE PRODUCT OF THE SAME MANUFACTURER.
b. PROVIDE ACCESS PANELS FOR ALL EQUIPMENT AND DEVICES REQUIRING SAME SIZE AS REQUIRED FOR PROPER ACCESS AND MAINTENANCE. MINIMUM ACCEPTABLE SIZE IS 12 INCHES BY 12 INCHES CLEAR OPENING WHERE HAND ACCESS ONLY IS REQUIRED.
c. PROVIDE LABELS FOR EACH MOTOR CONTROLLER, SAFETY SWITCH, RELAY, PANELBOARD, CONTACTOR, TIMER, CONTROL DEVICE, METER, AND CIRCUIT BREAKER. LABELS SHALL BE LAMINATED, PHENOLIC STRIPS 1/16" THICK AND ENGRAVED TO SHOW BLACK LETTERS ON A WHITE BACKGROUND NOT LESS THAN 1/4" HIGH. SIZE STRIPS TO PROPERLY FIT MANUFACTURER'S BRACKETS AND BE LEGIBLE. WHERE MANUFACTURER'S BRACKETS ARE NOT PROVIDED, MOUNT LABELS WITH PROPER SCREWS OR AN APPROVED ADHESIVE.
2. RACEWAYS
a. CONDUIT, RIGID STEEL, GALVANIZED OR SHERARDIZED AND MANUFACTURED IN ACCORDANCE WITH ANSI STANDARD C80.1. FITTINGS SHALL BE PIPE THREADED, MALLEABLE IRON. CONNECTORS SHALL BE INSULATED THROAT TYPE.
b. CONDUIT, PVC; POLYVINYLCHLORIDE SCHEDULE 80 PIPE SPECIFICALLY MANUFACTURED AND LABELED (UL STANDARD 651) FOR USE AS ELECTRICAL CONDUIT. FITTINGS SHALL BE EITHER SOCKET WELDED TYPE OR PIPE THREADED WITH INSULATED THROAT.
c. CONDUIT, FLEXIBLE METALLIC, GALVANIZED, INTERLOCKED SPIRALLY WOUND STEEL STRIP WITH GALVANIZED OR SHERARDIZED FITTINGS. LISTED PER UL-L. FITTINGS SHALL BE OF THE SQUEEZE TYPE WITH INSULATED THROATS.
d. CONDUIT, LIQUIDTIGHT METALLIC, GALVANIZED, INTERLOCKED SPIRALLY WOUND STEEL STRIP WITH OVERALL JACKET OF LIQUID TIGHT PVC. UL LISTED. FITTINGS SHALL BE STEEL OR MALLEABLE IRON INSULATED THROAT, WATERTIGHT.
e. ELECTRIC METALLIC TUBING, GALVANIZED OR SHERARDIZED AND MANUFACTURED IN ACCORDANCE WITH ANSI STANDARD C80.3. FITTINGS 1/2" THROUGH 2" TRADE SIZE SHALL BE COMPRESSION TYPE, MANUFACTURED FROM MALLEABLE IRON OR STEEL, AND RAIN AND/OR CONCRETE-TIGHT AS REQUIRED BY INSTALLATION. POT METAL OR DIE CAST TYPE FITTINGS ARE PROHIBITED. CONNECTS SHALL BE INSULATED THROAT TYPE.
f. RACEWAYS: ALL CONDUIT SHALL BE EITHER RIGID STEEL OR ELECTRICAL METALLIC TUBING. FOR IN SLAB AND UNDERGROUND INSTALLATIONS, SCHEDULE 80 PVC OR RIGID STEEL SHALL BE USED, INSTALLED PER NEC.
g. FITTINGS AND BUSHINGS: ALL REQUIRED BENDS, FITTINGS, JUNCTION BOXES, ETC., WHETHER OR NOT THEY ARE SHOWN ON THE DRAWINGS, SHALL BE INSTALLED TO SATISFY ALL CODES AND STANDARDS OF GOOD PRACTICE. ALL CONDUITS ENTERING/LEAVING A CONDUIT OR RACEWAY SHALL BE AFFORDED ABRASION PROTECTION BY AN ADEQUATE BUSHING OR OTHER APPROVED MEANS.

- 3. CONDUCTORS AND CABLES
a. GENERAL: ALL CONDUCTORS SHALL BE NINETY-EIGHT PERCENT (98%) CONDUCTIVITY SOFTDRAWN COPPER, NEW, INSULATED IN ACCORDANCE WITH NEC CODE FOR THE TYPE OF SERVICE. UNLESS NOTED OTHERWISE, CONDUCTORS No. 8 AWG AND LARGER SHALL BE INSULATED WITH "TY-RAPS" INSULATION. INSULATION SHALL BE OF THE SAME MANUFACTURER. OTHER CONDUCTORS SHALL BE INSULATED WITH TYPE "THIN" INSULATION AND HAVE SOLID CONDUCTORS, EXCEPT THAT WIRE IN FIXTURE CHANNELS AND OTHER SPECIAL LOCATIONS SHALL BE SPECIFICALLY NOTED TO THE CONTRARY ON THE DRAWINGS OR IN THE NEC. INSULATION SHALL BE RATED FOR 600 VOLTS AC SERVICE MINIMUM AND COLOR-CODED IN ACCORDANCE WITH ACCEPTED STANDARDS.
b. CONDUCTORS FOR SPLICING CONDUCTORS #10 AWG AND SMALLER SHALL BE LIVE SPRING TYPE PRESSURE CONNECTORS MANUFACTURED BY 3M "SCOTCHLOK" OR APPROVED EQUIV.
c. CONNECTORS FOR #6 AWG AND LARGER SHALL BE TWO-WAY LONG BARREL COMPRESSION TYPE WITH INSULATING COVER, THOMAS & BETTS "COLOR-KEYED" OR APPROVED EQUAL. WHERE "GUTTER TRAPS" ARE REQUIRED, CONNECTORS ARE TO BE H-TYPE WITH INSULATING COVERS.
d. TERMINATIONS FOR MOTORS WITH #10 AWG AND SMALLER CONDUCTORS IN INTERIOR LOCATIONS MAY BE MADE WITH SPRING TYPE PRESSURE CONNECTORS. #6 AWG AND LARGER SHALL BE THOMAS & BETTS "MOTOR PISTAIL CONNECTORS" WITH SLIP-ON INSULATORS SECURED BY "TY-RAPS".
e. ELECTRICAL INSULATING TYPE SHALL BE "SCOTCH" No. 88 OR 99 OR APPROVED EQUAL.
4. BOXES
a. OUTLET BOXES: GALVANIZED PRESSED STEEL WITH GALVANIZED STEEL EXTENSION RINGS OR PLASTER RINGS OR TILE RINGS TO PROVIDE EXPOSED SURFACE FLUSH WITH WALL OR CEILING FINISH. PROVIDE ALL CEILING OUTLET BOXES WITH "NO-BOLT" OR THROUGH AND LOCK-NUT TYPE FIXTURE STUDS.
b. JUNCTION AND PULL BOXES: FABRICATE IN ACCORDANCE WITH NEMA AND NEC STANDARDS AND REQUIREMENTS INSOFAR AS MATERIAL, GAUGES, DIMENSIONS, AND FABRICATION METHODS. BOXES SHALL BEAR THE UL LABEL. WHERE BOXES ARE NOT SIZED ON THE DRAWINGS, THEY SHALL BE SIZED IN ACCORDANCE WITH NEC CODE REQUIREMENTS. FINISH IN STANDARD GREY ENAMEL, WITH SIDES AND BACK SPOT-WELDED IN POSITION AND THE REMOVABLE SCREW COVER MOUNTED WITH BRASS MACHINE SCREWS.
5. CABINETS AND ENCLOSURES
a. ALL INSTALLED FLUSH CABINETS AND ENCLOSURES AS SHOWN ON THE PLANS AND AS HEREIN SPECIFIED, UNIT SHALL BE PROVIDED WITH DEAD FRONT SUB PANEL, RECESSED AS REQUIRED, TO HOUSE CONTROLS. DOOR SHALL BE PROVIDED WITH CONCEALED HINGES AND FLUSH KEY OPERATED LOCK. DOOR AND TRIM SHALL BE PRIME PAINTED FOR FIELD PAINTING TO MATCH WALL FINISHES. PROVIDE KNOCK-OUTS, LOUVERS, AND IDENTIFICATION ENGRAVINGS AS REQUIRED TO MEET FIELD CONDITIONS. EXACT BACKBOX SIZE TO BE COORDINATED WITH EQUIPMENT.
6. CIRCUIT DISCONNECTS
a. SAFETY SWITCHES: SAFETY SWITCHES SHALL CONSIST OF A BOX, FRONT COVER, AND CIRCUIT PROTECTOR DEVICE ALL MANUFACTURED BY SQUARE D OR EQUAL, AND ASSEMBLED IN ACCORDANCE WITH NEMA STANDARDS WITH UL LISTING AND LABEL. THE CIRCUIT PROTECTOR DEVICE SHALL BE GENERAL DUTY, QUICK-MAKE, QUICK-BREAK FUSED OR UNFUSED SWITCH RATED FOR MOTOR CIRCUITS AND/OR SERVICE ENTRANCE DUTY. IF REQUIRED, SWITCHES WILL BE FUSIBLE, BUT NOT FUSIBLE AS DICTATED BY PLANS/LOCAL CODES AND WILL BE NEMA TYPE 1 FOR INDOOR (DRY) INSTALLATION OR A NEMA TYPE 3R ENCLOSURE FOR OUTDOOR INSTALLATION. FUSED UNITS SHALL BE FURNISHED COMPLETE WITH PROPER FUSES.
7. SERVICE/DISTRIBUTION EQUIPMENT
a. DISTRIBUTION PANELS AND PANELBOARDS SHALL BE SQUARE D OR EQUAL.
b. PANELBOARDS:
1. SQUARE D PANELBOARDS OR EQUAL USED IN SERIES WITH I-LINE CIRCUIT BREAKERS AND FITTED WITH SQUARE D OR EQUAL BRANCH CIRCUIT BREAKERS ARE LISTED FOR USE WITH UP TO 22,000 RMS SYMMETRICAL AMPS OF FAULT CURRENT. USE AN APPROPRIATE SQUARE D BREAKER OR EQUAL WITH EACH PANEL. PANELS SHALL BE RATED AT 22K AIC.
2. SHALL CONSIST OF BOX, INTERIOR, FRONT, AND CIRCUIT PROTECTION DEVICES. THE ASSEMBLY SHALL BE UL LABELED AND BE LISTED FOR SERVICE. THE ASSEMBLY SHALL BE DESIGNED AND MANUFACTURED IN ACCORDANCE WITH NEMA STANDARD PB-1.
3. THE BOX SHALL BE FABRICATED FROM CODE GAUGE GALVANIZED STEEL IN ACCORDANCE WITH THE LATEST UL STANDARD (UL-50) AND SHALL HAVE A TURNED EDGE AROUND THE FRONT FOR RIGIDITY AND FOR CLAMPING ON FRONT. PROVIDE STANDARD KNOCKOUTS ON REMOVABLE BOX ENDS. FABRICATE FROM SHEET STEEL AND FINISH WITH BAKED ON GREY ENAMEL OVER RUST INHIBITOR. EACH FRONT SHALL HAVE A DOOR MOUNTED ON SEMI-CONCEALED HINGES WITH A CYLINDER LOCK, INDEX CARD CIRCUIT DIRECTORY MOUNTED BEHIND CLEAR PLASTIC AND HELD IN A METAL FRAME AND CONCEALED TRIM CLAMPS FOR MOUNTING TO THE BOX. ALL LOCKS SHALL BE MASTER KEYS AND ALL PANEL DIRECTORIES SHALL BE TYPEWRITTEN.
4. ALL INTERIORS SHALL BE COMPLETELY FACTORY ASSEMBLED. THE DESIGN OF THE INTERIOR SHALL PERMIT REPLACEMENT OF INDIVIDUAL BRANCH BREAKERS WITHOUT DISTURBING THE ADJACENT UNITS AND WITHOUT MACHINE DRILLING OR TAPPING. BUS BARS FOR PANELS RATED 600 AMPERES OR MORE SHALL BE TIN PLATED 98% CONDUCTIVITY COPPER OR TIN FINISH ALUMINUM (57% CONDUCTIVITY) OF RECTANGULAR CROSS-SECTION. BUS BAR CONNECTIONS TO BRANCH CIRCUIT BREAKERS SHALL BE THE PHASE SEQUENCE TYPE AND ACCEPT BOLT-ON TYPE BREAKERS ONLY.
5. BREAKERS SHALL BE QUICK-MAKE, QUICK-BREAK, THERMAL-MAGNETIC MOLDED CASE CIRCUIT BREAKERS ONE, TWO, OR THREE POLE WITH INTEGRAL CROSSBAR FOR MULTI-POLE UNITS. EQUIPPED WITH AN OVER CENTER, TRIP-FREE, TOGGLE-TYPE OPERATING ACTION AND POSITIVE HANDLE INDICATION OF BREAKER STATUS. CIRCUIT BREAKERS SHALL BE UL LISTED IN ACCORDANCE WITH UL STANDARD 489.
6. EACH PANELBOARD, AS A COMPLETE UNIT, SHALL HAVE A SHORT CIRCUIT RATING EQUAL TO OR GREATER THAN THE INTEGRATED EQUIPMENT RATING SHOWN ON THE DRAWINGS. THE RATING SHALL BE ESTABLISHED BY TESTING WITH THE OVERCURRENT DEVICES MOUNTED IN THE PANELBOARD. THE SHORT CIRCUIT TESTS ON THE OVERCURRENT DEVICES ON THE STRUCTURE SHALL BE MADE SIMULTANEOUSLY BY CONNECTING THE FAULT TO EACH OVERCURRENT DEVICE WITH THE PANELBOARD CONNECTED TO ITS RATED SUPPLY VOLTAGE.
8. OVERCURRENT PROTECTIVE DEVICES
a. FUSES: FUSES OF THE PROPER SIZE, RATING, AND ELECTRICAL CHARACTERISTICS SHALL BE PROVIDED IN EACH FUSIBLE DEVICE. FUSES OF 600 VOLTS AND BELOW SHALL BE UL CLASS RK-1, CURRENT-LIMITING, TIME-DELAY, DUAL-ELEMENT, 200,000 AMPERE RMS SYMMETRICAL INTERRUPTING CAPACITY ON NON-MOTOR CIRCUITS AND UL CLASS RK-5, TIME-DELAY, DUAL-ELEMENT, 200,000 AMPERES RMS SYMMETRICAL INTERRUPTING CAPACITY ON MOTOR ELEMENTS. APPROVED MANUFACTURERS: BUSMANN OR FERRAZ SHAWMUT (ALL FUSES SHALL BE OF SAME MANUFACTURER AND FUSE TYPE TO INSURE SELECTIVE COORDINATION).
c. CIRCUIT BREAKERS: CIRCUIT BREAKERS OF THE PROPER SIZE, RATING, AND ELECTRICAL CHARACTERISTICS SHALL BE PROVIDED WHERE CALLED FOR ON DRAWINGS. BREAKERS SHALL BE THERMAL MAGNETIC MOLDED-CASE WITH QUICK-MAKE, QUICK-BREAK, OVER CENTER TOGGLE TYPE MECHANISM AND TRIP-FREE HANDLE MECHANISM. THE SAME BREAKER SHALL BE ENCLOSED IN A SUITABLE NEMA RATED ENCLOSURE. BREAKERS SHALL BE OF SAME MANUFACTURER AS THOSE IN THE PANELBOARD.
1. PANELBOARD BRANCH/FEDDER CIRCUIT BREAKERS: ALL DOWNSTREAM BREAKERS MUST BE SQUARE D OR EQUAL TO MAINTAIN SERIES LISTING. IF FUSIBLE DISCONNECTS ARE USED, SQUARE D OR EQUAL PANELBOARDS AND CIRCUIT BREAKERS SHALL BE USED.
2. GROUND FAULT CIRCUIT INTERRUPTER (GFCI) BREAKERS: GROUND FAULT CIRCUIT INTERRUPTER (GFCI) TYPE CIRCUIT BREAKERS SHALL BE SIMILAR TO THE PANELBOARD CIRCUIT BREAKERS BUT WITH GROUND FAULT PROTECTION. GFCI BREAKERS SHALL BE UL APPROVED AS CLASS A DEVICES IN ACCORDANCE WITH UL STANDARD 943.

- 9. LIGHTING
a. FIXTURES ARE SPECIFIED IN THE SCHEDULE BY MANUFACTURER'S NAME AND CATALOG NUMBER.
b. LAMPS: ALL LAMPS USED ON THIS PROJECT SHALL BE NEW, DELIVERED TO THE JOB SITE IN THE ORIGINAL PACKAGING CASES AND SLEEVES AND SHALL BE OF THE SAME MANUFACTURER.
c. PHOTOCELL (OUTDOOR): ELECTRONIC LIGHT SENSOR SHALL BE TORK EPC-1 OR EQUAL. ENCLOSED IN A LEXON HOUSING WITH A 1/2" CONDUIT MOUNTING AND 180 DEGREE SWIVEL. LIGHTING CONTROLLER AS A 2 TO 100 FOOT-CANDLE LIGHT ADJUSTMENTS. INSTALL IN A WEATHER TIGHT JUNCTION BOX ON THE ROOF PER MANUFACTURER'S RECOMMENDATIONS. SET SENSOR TO 100 FOOT-CANDLE LEVEL.
1. LIGHTING CONTROLLER (OUTDOOR LIGHTING CONTROL): THE LIGHTING CONTROLLER SHALL BE THE TORK LC-200 OR EQUAL IN A NEMA 1 ENCLOSURE. THE LC-200 USED IN CONJUNCTION WITH A TORK EPC-1 OR EQUAL PHOTOCELL.
d. CONTACTOR (OUTDOOR LIGHTING CONTROL):
1. THE LIGHTING CONTACTORS USED WITH THE OUTDOOR PHOTOCELLS SHALL BE SIMILAR AND EQUAL TO SQUARE D ELECTRICALLY HELD LIGHTING CONTACTOR CLASS 8903 TYPE LG-80 FORM F WITH 120V CONTROL COIL, NORMALLY OPEN CONTACTORS RATED AT 30 AMPS CONTINUOUS IN NEMA TYPE 1 ENCLOSURE WITH FUSED CONTROL CIRCUIT.
e. PHOTOCELL BYPASS SWITCH:
1. THE PHOTOCELL BYPASS SWITCH SHALL BY A "BRYANT" #4801-L SINGLE POLE LOCK TYPE 15A 120-277 VOLT SWITCH WITH KEY #8006 AND COVERPLATE (WHITE).

PART 3 - EXECUTION

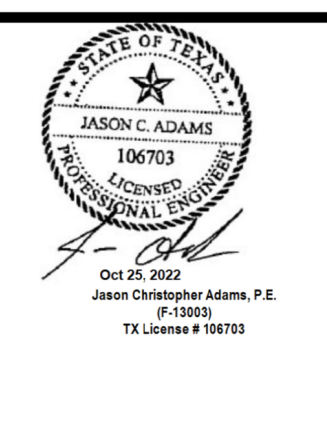
- 1. METHOD OF PROCEDURE
a. ERECT EQUIPMENT PARTS AT SUCH TIME AND IN SUCH A MANNER AS TO MINIMIZE INTERFERENCES AND DELAYS IN THE EXECUTION OF THE WORK CARE SHALL BE USED IN THE ERECTION AND INSTALLATION OF ALL EQUIPMENT AND MATERIALS TO AVOID MARRING SURFACES OF THE WORK. DAMAGES SHALL BE REPAIRED AT NO ADDITIONAL COST TO THE OWNER.
b. EQUIPMENT REQUIRING ELONG SERVICE SHALL NOT BE ENERGIZED OR PLACED IN SERVICE UNTIL ALL INTERESTED PARTIES HAVE BEEN DULY NOTIFIED AND ARE PRESENT OR HAVE WAIVED THEIR RIGHT TO REPRESENT. WHERE EQUIPMENT TO BE PLACED IN SERVICE INVOLVES SERVICE OR CONNECTION FROM ANOTHER CONTRACTOR OR THE OWNER, THE CONTRACTOR SHALL NOTIFY THE OWNER IN WRITING WHEN THE EQUIPMENT WILL BE READY. THE OWNER SHALL BE NOTIFIED AS FAR IN ADVANCE AS POSSIBLE, OF THE DATE VARIOUS ITEMS OF EQUIPMENT WILL BE COMPLETE.
c. THE WORK OF THIS TRADE INCLUDES ROUGH-IN FOR AND FINAL CONNECTION & REQUIRED TO ALL MISCELLANEOUS EQUIPMENT FURNISHED BY OTHERS, OR UNDER OTHER DIVISIONS OF THE WORK. THIS SHALL INCLUDE POWER AND CONTROL WIRING, WIRING DEVICES AND COVER PLATES FOR BUILT-IN EQUIPMENT AND INCLUDED IN THE WORK OF THIS DIVISION. SAFETY DISCONNECTS AND OTHER MISCELLANEOUS PROTECTIVE DEVICES REQUIRED BY NEC ARE INCLUDED IN THE WORK OF THIS DIVISION. DO ALL ROUGHING-IN AND FINAL CONNECTIONS FROM APPROVED SHOP DRAWINGS ONLY.
d. CONTRACTOR SHALL FURNISH AND INSTALL ALL REQUIRED ELECTRICAL CONDUIT AND WIRING FOR ALL MOTOR STARTERS AND ELECTRICAL CONTROLS. CONTRACTOR SHALL MAKE LINE VOLTAGE ELECTRICAL CONNECTIONS AS REQUIRED FOR HVAC SYSTEMS.
e. EC SHALL INSTALL THE CONNECTIONS TO ALL RECEPTACLES, SALES COUNTERS, GONDOLAS, AND FINAL CONNECTIONS TO ALL FIXTURES AFTER FIXTURES ARE IN PLACE.
f. EC SHALL VERIFY EXACT LOCATION OF ALL SIGNS WITH OWNERS REPRESENTATIVE. PROVIDE ALL CONDUITS AND WIRE WITH STRIPS AS DIRECTED BY THE OWNERS REPRESENTATIVE AND MAKE ALL FINAL CONNECTIONS AS REQUIRED BY HVAC.
g. WIRING:
1. ALL WORK SHALL BE COMPLETED IN A NEAT AND WORKMAN-LIKE MANNER. THE EC SHALL CONTACT THE OWNER'S REPRESENTATIVE SHOULD THIS PLAN REQUIRE MODIFICATION TO COMPLY WITH LOCAL CODES.
2. ALL CONDUCTORS SHALL BE RUN IN APPROVED METALLIC RACEWAY OR CONDUIT AND SHALL BE UNIFORMLY COLOR CODED THROUGHOUT THE ENTIRE SYSTEM. SPLICES, TAPS, AND TERMINALS SHALL BE MADE ONLY IN J-BOXES, OUTLET BOXES, AND PANELBOARDS.
3. ALL CONDUCTORS SHALL BE COPPER THHN, 90 DEGREES CELSIUS, WITH A MINIMUM WIRE SIZE OF #12 AWG (ALUMINUM CONDUCTORS SHALL NOT BE USED). THE EC SHALL ENSURE THE CONDUCTORS UTILIZED ARE IN KEEPING WITH GOOD PRACTICE FOR THE CIRCUIT/PROTECTIVE DEVICES EMPLOYED. THE NEUTRAL CONDUCTOR (WHERE USED) SHALL HAVE THE SAME AMPACITY AS THE ASSOCIATED PHASE.
4. THE EC SHALL ENSURE THAT CIRCUIT AMPACITY AND SHORT CIRCUIT/OVERLOAD PROTECTION IS APPROPRIATE FOR THE EQUIPMENT BEING INSTALLED. UL LISTED CONDITIONS SHALL BE OBSERVED.
5. TO COMPLY WITH NEC/UL LISTING CONDITIONS, ROOFTOP UNITS MAY BE SHOWN WITH FUSED DISCONNECT SWITCHES:
1. ALL FUSES SERVING MOTOR LOADS WILL BE OF THE DUAL ELEMENT TYPE.
2. DUE TO THE DIFFERENT INTERRUPTING CHARACTERISTICS, PANELBOARD CIRCUIT BREAKERS MAY BE RATED HIGHER THAN THE DUAL ELEMENT FUSES THEY SUPPLY TO ENSURE SUFFICIENT STARTING CIRCUIT.
6. WIRE SIZE LISTED ARE MINIMUM. CONDUCTORS SHALL BE SELECTED SUCH THAT THE MAXIMUM VOLTAGE DROP BETWEEN THE PANELBOARD AND LOAD (AT FULL LOAD AMPS) SHALL NOT EXCEED THE FOLLOWING GUIDELINES:
1. MOTOR LOADS (AIR CONDITIONING, REFRIGERATION, ETC.) - ~2% OF CIRCUIT VOLTAGE AT PANELBOARD.
2. ALL OTHER LOADS - 5% OF CIRCUIT VOLTAGE AT PANELBOARD.
7. THE EC SHALL PROVIDE DEDICATED CIRCUITS WITH ISOLATED GROUND FOR ALL CIRCUITS ORIGINATING FROM PANELS. THE PURITY OF THE ISOLATED GROUND SHALL BE MAINTAINED BY USING ONLY INSULATED GROUNDING CONDUCTORS AND ISOLATED GROUND. THE GROUNDING CONDUCTOR FOR THE ISOLATED GROUND SHALL NOT MAKE ELECTRICAL CONTACT WITH THE COMMON GROUND OR ANY ITEM CONNECTED TO THE COMMON GROUND (IE CONDUITS, J-BOXES, SWITCH BOXES, ETC.) AT ANY POINT OTHER THAN AT THE SERVICE GROUNDING TERMINAL. REFER TO NEC 250.96(B).
h. COMPLIANCE WITH THE DRAWING AND ANY NOTES THEREIN IS REQUIRED. PROVIDE OPENINGS AND SLEEVES FOR ELECTRICAL WORK.
2. RACEWAYS
a. GENERAL: ALL POWER AND LIGHTING CIRCUITS SHALL BE RUN IN METALLIC RACEWAYS EXCEPT WHERE SPECIFICALLY NOTED OTHERWISE. THESE RACEWAYS SHALL BE RUN CONCEALED IN ALL FINISHED AREAS, AND WHERE RUN EXPOSED SHALL BE SQUARE TO THE BUILDING AND HELD TIGHT TO THE BUILDING CONSTRUCTION. LOW VOLTAGE, TELEPHONE, INTERCOM, MUSIC, ALARM, AND SECURITY WIRING RUN ABOVE ACCESSIBLE CEILINGS SHALL BE RUN USING INSULATED CABLE. METALLIC CONDUIT FOR THESE SYSTEMS SHALL BE PROVIDED ONLY WHERE RUN INSIDE WALLS. THE DRAWINGS INDICATE THE REQUIRED SIZE OF ALL RACEWAYS (EXCEPT AS HEREIN AFTER SPECIFIED). THE POINTS OF TERMINATION AND THE SUGGESTED ROUTING, HOWEVER, THE INSTALLER IS RESPONSIBLE FOR PROPER COORDINATION WITH BUILDING STRUCTURE AND THE WORK OF OTHER TRADES. FURNISH ALL REQUIRED BENDS, ELBOWS, FITTINGS, JUNCTION AND PULL BOXES, WHETHER OR NOT SPECIFICALLY SHOWN ON DRAWINGS, THAT MAY BE REQUIRED TO SATISFY CODES AND THE STANDARDS OF GOOD PRACTICE. WHERE CONDUITS FOR BOTH BRANCH AND FEDER CIRCUITS ARE RUN CONCEALED, CONDUITS MAY BE RUN OUT OF SQUARE TO THE BUILDING PROVIDING THE SHORTEST POSSIBLE RUN IS UTILIZED. RACEWAY SIZES ARE BASED ON THE USE OF COPPER CONDUCTORS AND NEC FILL.
b. USAGE: CONDUIT, WHERE INDICATED, SHALL BE CONSTRUED AS ELECTRICAL RACEWAYS AND SHALL CONFORM TO THE FOLLOWING: CONCEALED IN HUNG CEILINGS AND INTERIOR PARTITIONS - EMT WITH SET SCREW TYPE FITTINGS. UNDERGROUND OR BELOW INTERIOR SLABS - GRS. (NOTE: PVC CONDUIT IS PERMITTED OUTSIDE FOR PARKING AREA LIGHTING, SIGNS, ETC. ELBOWS SHALL BE GRS).
c. CONDUIT BENDS SHALL BE MADE TO THE LARGEST POSSIBLE RADIUS FOR EASE IN PULLING CONDUCTORS AND TO PROVIDE A NEATLY INSTALLED APPEARANCE. EQUIPMENT AND CONDITIONS PERMITTING, POWER CONDUIT BENDS SHALL CONFORM TO THE FOLLOWING:
1-1/2 IN 18 IN RADIUS
2 IN 24 IN RADIUS
2-1/2 IN 24 IN RADIUS
3 IN 36 IN RADIUS
d. GRS CONDUIT SHALL BE CUT WITH POWER OR HACKSAW AND CLEANLY REAMED TO REMOVE ALL BURRS AND ALL FIELD CUT THREADS SHALL BE PAINTED WITH WHITE LEAD BEFORE COUPLINGS ARE APPLIED.
END OF SECTION

- 4. WIRING INSTALLATION
a. ALL CONDUCTORS SHALL BE COPPER THHN, 90 DEGREES CELSIUS. MINIMUM WIRER SIZE SHALL BE #12 AWG WIRE AND #6 AWG AND LARGER SHALL BE STRANDED. INSULATION SHALL BE TYPE THWN OR THWN-2 OR AS SHOWN ON THE PLANS AND SHALL CONFORM WITH NEC FOR THE PARTICULAR APPLICATION.
b. GENERAL: EXCEPT FOR SUCH ITEMS AS ARE NORMALLY WIRED AT THEIR POINT OF MANUFACTURE AND SO DELIVERED - AND UNLESS SPECIFICALLY NOTED TO THE CONTRARY HEREIN - THE ELECTRICAL TRADE SHALL DO ALL ELECTRICAL WIRING OF EVERY CHARACTER. IT IS THE INTENT OF THESE SPECIFICATIONS AND DRAWINGS THAT ALL SYSTEMS AND EQUIPMENT SHALL BE PROVIDED WITH ALL NECESSARY UTILITY CONNECTIONS. COMPLETED TO ALLOW SAFE AND PROPER OPERATION OF SAID SYSTEMS. WHEN IT IS NECESSARY FOR TRADES PERFORMING WORK COVERED BY THIS DIVISION TO MAKE FINAL CONNECTIONS TO ITEMS OF EQUIPMENT BEING FURNISHED BY OTHERS, OR BY OTHER TRADES UNDER OTHER DIVISIONS, ALL SUCH WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THIS DIVISION AND ALL MATERIALS USED SHALL BE AS SPECIFIED HEREIN.
c. WIRE SIZE: MINIMUM WIRE SIZE FOR BRANCH CIRCUITS SHALL BE #12 AWG, EXCEPT THAT HOME RUNS LONGER THAN 50 FOOT LENGTH FROM THE PANEL TO THE CIRCUITS ELECTRICAL LOAD CENTER SHALL BE #10 AWG MINIMUM, WHERE MORE THAN THREE CURRENT CARRYING CONDUCTORS ARE ENCLOSED IN THE SAME RACEWAY. CONDUCTORS ARE TO BE DERATED PER NEC AND WIRE SIZE INCREASED AS REQUIRED. WHERE THE INCREASED CONDUCTOR SIZE REQUIRES, INCREASE THE RACEWAY SIZE AS WELL. FOR CONTROL WIRING, USE #14 AWG MINIMUM FOR FIXTURE WIRING, AS PERMITTED BY NEC. USE #18 AWG MINIMUM FOR SIGNAL AND COMMUNICATIONS SYSTEMS USE WIRE SIZE AS SPECIFICALLY REQUIRED BY THE SYSTEM SUPPLIER.
d. MAKE CONNECTIONS TO TERMINALS USING PRESSURE TYPE CONNECTORS. SOLDERED JOINTS ARE PROHIBITED. ALL JOINTS IN CONDUITS SHALL BE MADE AT AN ACCESSIBLE LOCATION WITHIN A BOX BY TWISTING THE BARE CONDUCTORS ENDS TOGETHER AND APPLYING A WIRE CONNECTOR IN ALL SIZES UP TO THE MAXIMUM CAPACITY OF THE CONNECTOR. JOINTS SHALL BE TAPED WITH AN APPROVED ELECTRICAL TAPE. SPLICES FOR CONDUCTORS LARGER THAN #10 AWG SHALL BE MADE WITH AN APPROVED COMPRESSION (SQUEEZE) CONNECTOR INSULATED WITH NOT LESS THAN TWO LAYERS OF ELECTRICAL FILL TAPE TO 1.5 TIMES THE THICKNESS OF INSULATION, FOLLOWED BY TWO (MINIMUM) LAYERS OF HALF-LAPPED ELECTRICAL TAPE FOR MECHANICAL PROTECTION. LOCATE ALL SPLICES IN BOXES OR FITTINGS OF PROPER SIZE PER NEC.
e. IDENTIFY ALL WIRES AND CABLES WITH BRADY ADHESIVE WIRE MARKERS AT EACH BOX, PANEL, AND OUTLET. IDENTIFICATION SHALL, AS A MINIMUM, INDICATE THE PANEL AND CIRCUIT SUPPLYING THE OUTLET. AT THE PANEL END, THE LOAD SERVED AND ITS LOCATION SHALL BE INDICATED. PROVIDE A MINIMUM OF 8 IN. SLACK WIRE AT EACH OUTLET FOR MAKING CONNECTION TO THE DEVICE OR TO PROVIDE FOR A FUTURE DEVICE IN A BOX.
5. BOXES
a. EACH BOX SHALL BE OF PROPER SIZE TO ACCOMMODATE THE DEVICE AND FUNCTION FOR WHICH IT IS SHOWN. BOXES FOR WALL DEVICES SHALL BE FURNISHED COMPLETE WITH PLASTER RING OR TILE RING ACCORDING TO WALL CONSTRUCTION WHERE REQUIRED. BOXES FOR INSTALLATION IN MASONRY WALLS SHALL BE SPECIAL SQUARE CORNER MASONRY TYPE. BOXES FOR MOUNTING OF LIGHTING FIXTURES SHALL BE FOUR INCH OCTAGON, EQUIPPED WITH 3/8 IN. "NO BOLT" FIXTURE STUD. BOXES FOR FLOOR OUTLETS SHALL BE CONCRETE PROOF STEEL BOXES WITH ADJUSTABLE TOPS AND DEVICES AS HEREINAFTER NOTED OR SHOWN. ALL BOXES SHALL BE FURNISHED COMPLETE WITH PROPER COVER AND/OR DEVICE PLATE AND DEVICE.
6. SYSTEM GROUNDING
a. GENERAL: EQUIPMENT, RACEWAY SYSTEMS, WIRING SYSTEM NEUTRALS, RECEPTACLES AND POWER OUTLETS, MOTORS, AND MOTORIZED EQUIPMENT, SHALL BE GROUNDED IN ACCORDANCE WITH NEC ARTICLE 250.
b. GROUNDING MATERIAL:
1. GROUND RODS - 3/4" DIA., 10' LONG, COPPER WELD.
2. GROUND CONDUCTOR - SIZE AS PER NEC REQUIREMENTS, BARE STRANDED, SOFT DRAWN OR SOFT ANNEALED, COPPER WIRE.
3. JOINTS AND CONNECTIONS - MOLDED FUSION WELDING PROCESS USING PROPER MOLD AND THE NUMBER, SIZE, AND TYPE OF CARTRIDGE FOR THE JOINT OR CONNECTION. WATERPIPE CONNECTION, SILICON BRONZE APPROVED MECHANICAL CONNECTOR DESIGNED FOR THE PIPE AND CABLE TO BE BONDED.
7. PANELBOARD INSTALLATION
a. MOUNT PANELBOARDS WITH CENTERLINE AT 5 FT 6 IN ABOVE FINISHED FLOOR. EXCEPT THAT THE HIGHEST BREAKER HANDLE SHALL BE BELOW 6 FT 5 IN ABOVE FINISH FLOOR. ARRANGE BREAKERS SO THAT THE BREAKER RATING IS VISIBLE WITH THE FRONT PANEL IN PLACE.
b. PANEL DIRECTORIES, AS A MINIMUM, SHALL BE TYPEWRITTEN AND INDICATE BREAKER POSITION NUMBER, EQUIPMENT SERVED, ROOM NAME AND NUMBER, AND THE PANEL IDENTIFICATION. THE PANEL IDENTIFICATION SHALL BE LOCATED ON THE PANEL TRIM AND SHALL CONSIST OF A BLACK LAMINATED PHENOLIC LABEL, SCREW MOUNTED, WITH THE PANEL IDENTIFICATION MATCHING PANEL IDENTIFICATION ON DRAWINGS, ENGRAVED IN 1/4 IN WHITE LETTERS. LABEL ALL CONDUCTORS WITH ADHESIVE WRAP LABELS WITHIN 2 IN OF THE CONDUCTOR TERMINATION PRIOR TO INSTALLATION OF TRIM.
8. LIGHTING FIXTURE INSTALLATION
a. PROVIDE A LIGHTING FIXTURE FOR EACH AND EVERY OUTLET IN ACCORDANCE WITH TYPE DESIGNATION AND FIXTURE SCHEDULE ON THE DRAWINGS. VERIFY THE ARCHITECTURAL FINISHES AND CEILING CONSTRUCTION AND - REGARDLESS OF THE CATALOG NUMBER PREFIXES AND SUFFIXES SHOWN - PROVIDE FIXTURES WITH THE PROPER TRIM, FRAMES, SUPPORTS, AND HANGARS AND OTHER MISCELLANEOUS APPURTENANCES TO PROPERLY COORDINATE WITH SAID FINISHES. REINFORCE CEILING CONSTRUCTION AS REQUIRED TO PROPERLY SUPPORT THE WEIGHT OF FIXTURES INSTALLED THEREON.
b. IMMEDIATELY PRIOR TO FINAL INSPECTION, THOROUGHLY CLEAN ALL FIXTURES INSIDE AND OUT, INCLUDING PLASTICS AND GLASSWARE. ADJUST TRIM TO FIT ADJACENT SURFACES. REPLACE BROKEN OR DAMAGED PARTS. INSTALL NEW LAMPS. ELECTRICALLY AND MECHANICALLY TEST THE SYSTEM FOR PROPER OPERATION.
9. CLEANING
a. THOROUGHLY CLEAN ALL FIXTURES, SWITCHES, OTHER DEVICES, PANELBOARDS, AND EQUIPMENT PROVIDED OR CONNECTED IN THIS CONTRACT. ALL SURFACES SHALL BE PROPERLY POLISHED AND SHALL BE FREE OF PAINT AND ALL OTHER DIRT OR DEBRIS. TOUCH-UP OR COMPLETELY REFINISH ALL EQUIPMENT FURNISHED WITH FACTORY FINISHES THAT IS DAMAGED DURING DELIVERY OR CONSTRUCTION. PROPERLY PROTECT THE FRONTS OF ALL PANELBOARDS, SWITCHBOARDS, AND SIMILAR EQUIPMENT TO PREVENT MARRING AND OTHER DEFACING.
b. AT ALL TIMES, KEEP THE PREMISES FREE FROM ACCUMULATIONS OF WASTE MATERIALS OR RUBBISH CAUSED BY THE WORK OF THE TRADESMEN DOING ELECTRICAL WORK. AT COMPLETION OF THE WORK, REMOVE ALL RUBBISH, TOOLS, EQUIPMENT, AND SURPLUS MATERIALS. BROOM CLEAN ALL ASSIGNED SPACES PRIOR TO LEAVING THE PREMISES.
10. TESTING AND LOAD BALANCING
a. TEST ALL CIRCUITS TO ASSURE THEM TO BE FREE OF GROUNDS AND SHORTS. LIGHT AND TEST EACH LAMP. PROVIDE AND TEST THE AVAILABLE VOLTAGE ON THE LOAD SIZE OF EACH DISCONNECT. VERIFY PROPER OPERATION OF THE DISCONNECT.
b. THE EC SHALL TEST, PRIOR TO ENERGIZING FOR THE FIRST TIME, ALL PIECES OF ELECTRICAL EQUIPMENT TO ASSURE THEY HAVE THE PROPER PHASE TO PHASE TO GROUND INSULATION AND TO BE FREE OF SHORTS. AFTER ENERGIZING, EACH LUMINAIRE SHALL BE LIT AND TESTED.
c. THE VARIOUS CIRCUITS SERVED FROM THE PANELBOARDS VARY IN LOAD. THE EC SHALL CAREFULLY BALANCE THE LOAD ON EACH LEG OF THE SERVICE. WHEN ALL LOAD IS TURNED ON AND THE SYSTEM IS OPERATING AT 100%, THE INITIAL UNBALANCE SHALL NOT EXCEED 10%. NOTE: WITH PHASE 3 DELTA, PHASES A AND C SHALL BE BALANCED WITHIN 10%. PHASE B SHALL BE BALANCED AS CLOSELY AS POSSIBLE.
d. INSPECTION
1. EC SHALL FURNISH AT THE COMPLETION OF THE PROJECT OR EACH INSPECTION POINT AN INTERMEDIATE OR FINAL INSPECTION CERTIFICATE FROM THE LOCAL INSPECTING AUTHORITY.
e. PERFORMANCE REQUIRED:
1. ALL EQUIPMENT AND FIXTURES SHALL BE PROPERLY CONNECTED WITH ADEQUATE POWER AND CHECKED THOROUGHLY FOR PROPER OPERATION.
2. ALL EXPOSED EQUIPMENT SHALL BE INSTALLED AS PER DRAWINGS AND IS SUBJECT TO INSPECTION FOR WORKMAN-LIKE APPEARANCE.

Table with columns: NO., DATE, REVISION. Includes project name: TRINITY METRO RAIL STATION FORT WORTH, TX.

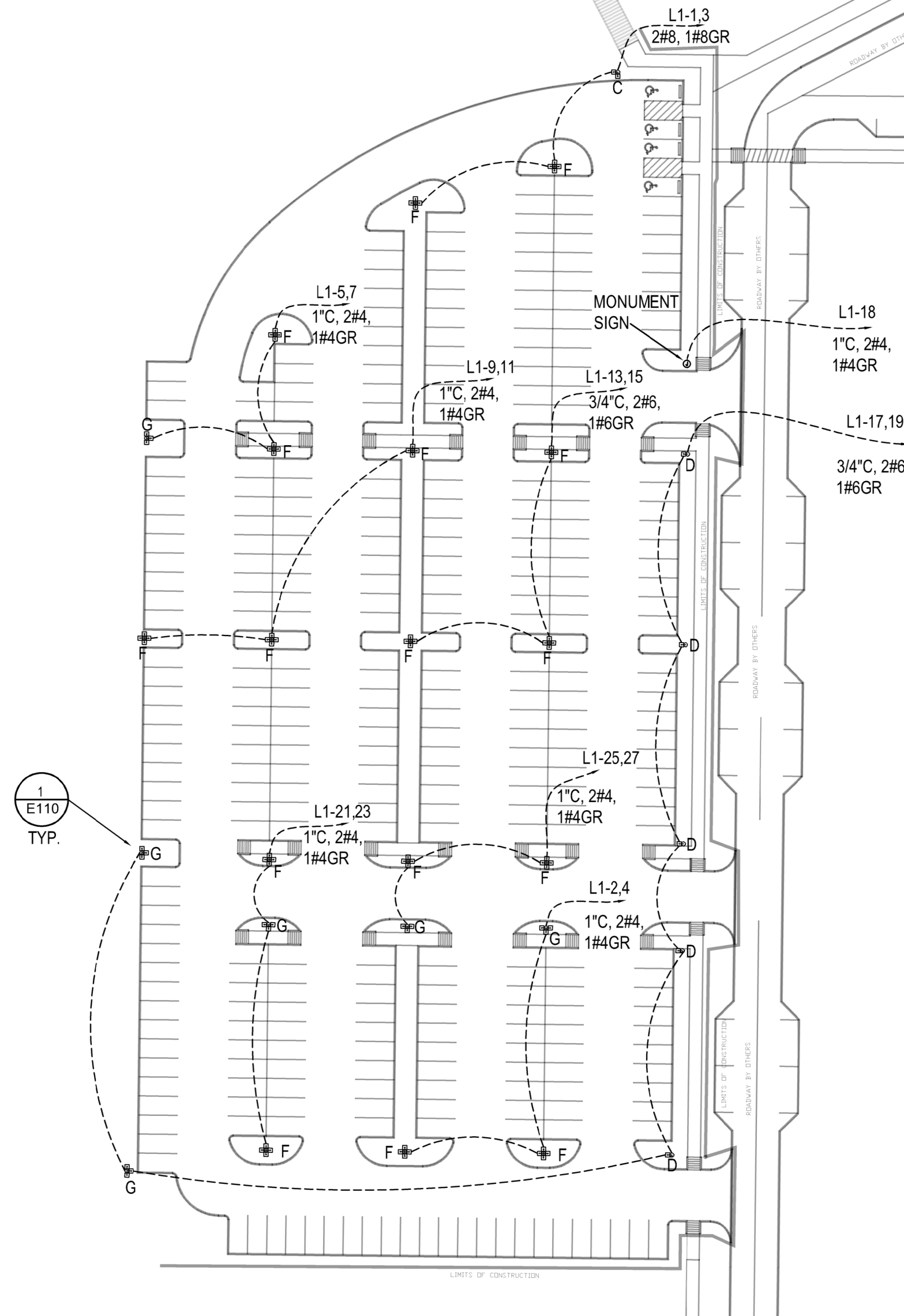
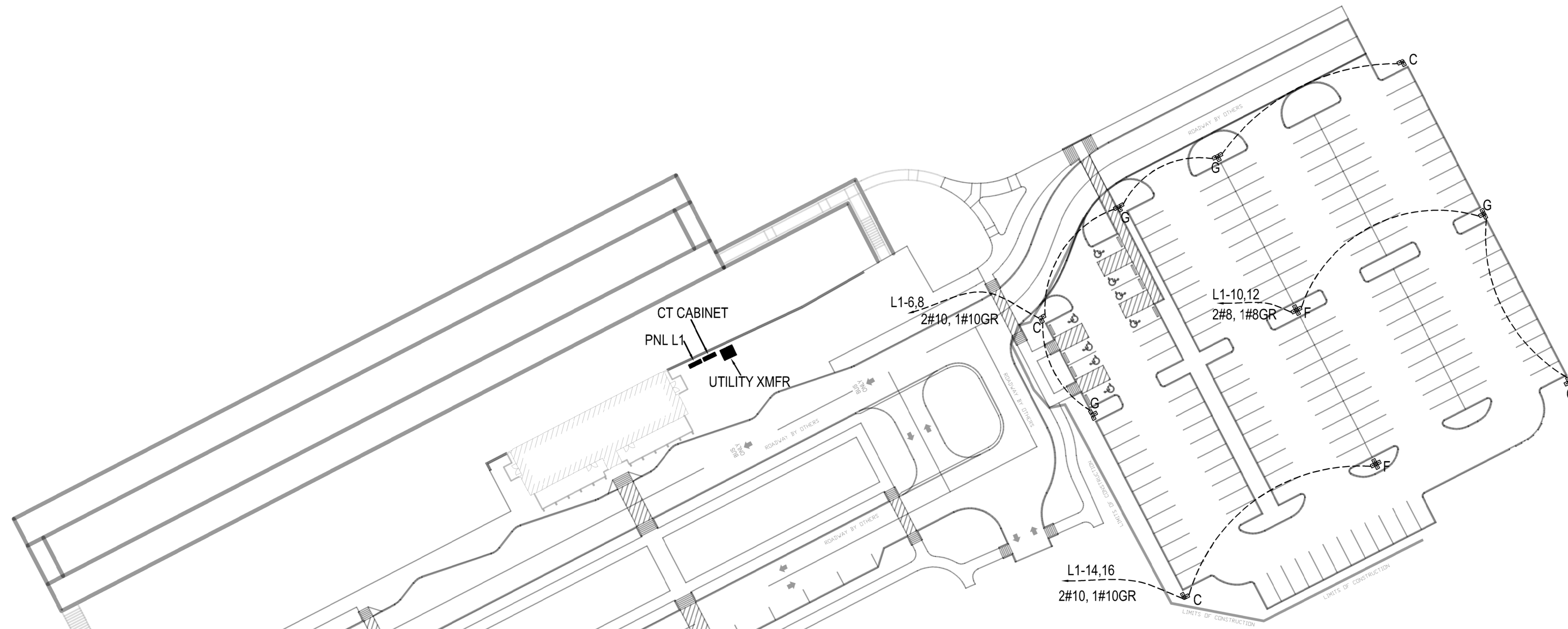
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SUIITE 608B, 67500 ST. JOE, 479-638-5004
ROCKERS, AR 2758. DESIGNED BY: TRM

TRINITY METRO RAIL STATION FORT WORTH, TX



Date: 10/25/2022
Scale: NTS
Drawn By: TRM
Reviewed By:
Project: 29510
E010

SYMBOLS LEGEND	
SYMBOL	DESCRIPTION
	UTILITY TRANSFORMER
	PANELBOARD
	JUNCTION BOX
	UNDERGROUND ELECTRIC CABLE



SYMBOL	TAG	DESCRIPTION	MANUFACTURER / MODEL	VOLTS/WATT	LAMP QTY/TYPE	MOUNTING
	D	SITE/ROADWAY LUMINAIRE	KIM LIGHTING 15A ALTP70-120L4K 240 A28 VSF-25B PS	240 V/2-275 VA	1 / LED	POLE MOUNTED 1800° KIM LIGHTING HERITAGE ARMS B/SB-HALL-PS COPPER POLE RSS 25'-6" POLE DM28 FBC VD, GALV WITH BASE COVER, J-HOOK AND J-BOX AT 12' DOWN FROM TOP
	C	SITE/ROADWAY LUMINAIRE	KIM LIGHTING 25B ALT 4P70-120L4K 240 A28 VSF-15A PS	240 V/2-551 VA	2 / LED	POLE MOUNTED 1800° KIM LIGHTING HERITAGE ARMS B/SB-HALL-PS COPPER POLE RSS 25'-6" POLE DM28 FBC VD, GALV WITH BASE COVER, J-HOOK AND J-BOX AT 12' DOWN FROM TOP
	G	SITE/ROADWAY LUMINAIRE	KIM LIGHTING 35T ALTP70-120L4K 240 A28 VSF-35T PS	240 V/2-826 VA	3 / LED	POLE MOUNTED 1800° KIM LIGHTING HERITAGE ARMS B/SB-HALL-PS COPPER POLE RSS 25'-6" POLE DM28 FBC VD, GALV WITH BASE COVER, J-HOOK AND J-BOX AT 12' DOWN FROM TOP
	F	SITE/ROADWAY LUMINAIRE	KIM LIGHTING 45C ALTP70-120L4K 240 A28 VSF-45C PS	240 V/2-1102 VA	4 / LED	POLE MOUNTED 1800° KIM LIGHTING HERITAGE ARMS B/SB-HALL-PS COPPER POLE RSS 25'-6" POLE DM28 FBC VD, GALV WITH BASE COVER, J-HOOK AND J-BOX AT 12' DOWN FROM TOP

* VERIFY MODEL NUMBER WITH MANUFACTURER

L1		PANELBOARD		NEW		120/240V, 1PH, 3W				
						225A M.C.B.				
						24K AIC				
						GROUND BAR				
LOCATION: ADJACENT TO UTILITY TRANSFORMER						SURFACE MOUNT				
SERVES: PARKING LOT LIGHTING										
SUPPLIED BY E.C.										
DESCRIPTION	WIRE	BRKR	PL	KVA		PL BRKR WIRE	DESCRIPTION			
				A	B					
1 LIGHTING 1	8	20	2	1.38	1.51	2	20	4	LIGHTING 8	2
3										4
5 LIGHTING 2	4	20	2	1.51	1.79	2	20	10	LIGHTING 9	6
7										8
9 LIGHTING 3	4	20	2	1.65	1.24	2	20	8	LIGHTING 10	10
11										12
13 LIGHTING 4	6	20	2	1.65	0.83	2	20	10	LIGHTING 11	14
15										16
17 LIGHTING 5	6	20	2	1.51	1.20	1	20	10	MONUMENT SIGN	18
19									SPACE	20
21 LIGHTING 6	4	20	2	1.51	0.00				SPACE	22
23									SPACE	24
25 LIGHTING 7	4	20	2	1.51	0.00				SPACE	26
27									SPACE	28
29 SPACE				0.00	0.00				SPACE	30
TOTAL CONNECTED				17.32	KVA	16.12	KVA			
TOTAL CONNECTED				144.31	AMPS	134.31	AMPS			
TOTAL LOAD				33.43	KVA	139.31	AMPS			
PER NEC ARTICLE 220 FEEDER LOAD				41.79	KVA	174.14	AMPS			

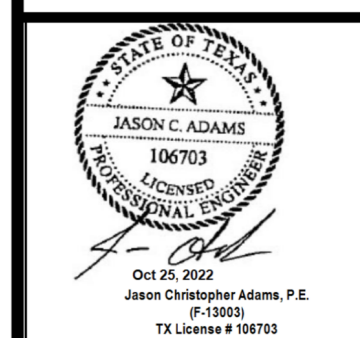
1 ELECTRICAL SITE PLAN

3/32" = 1'-0"

NO.	REVISION	BY	DATE

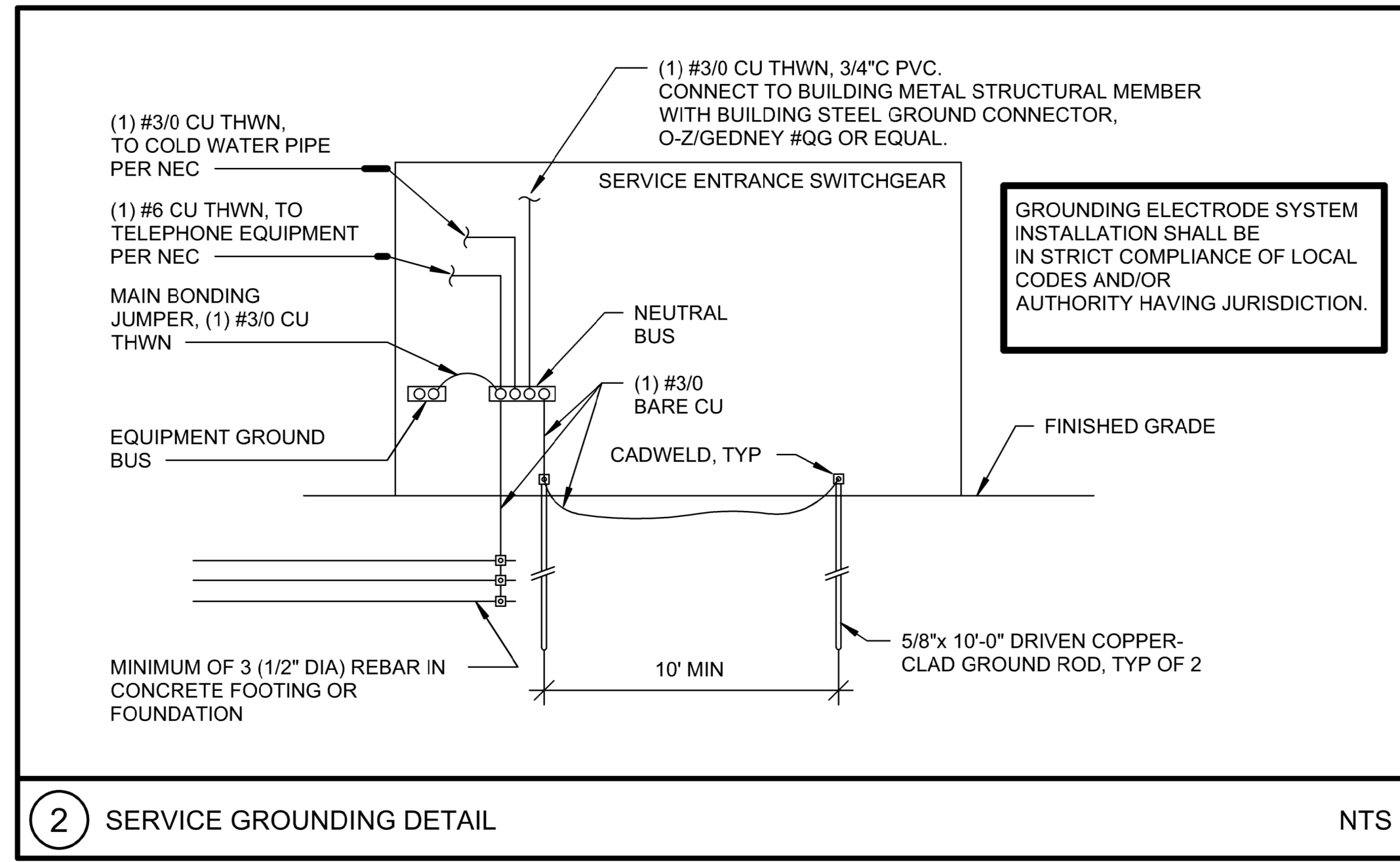
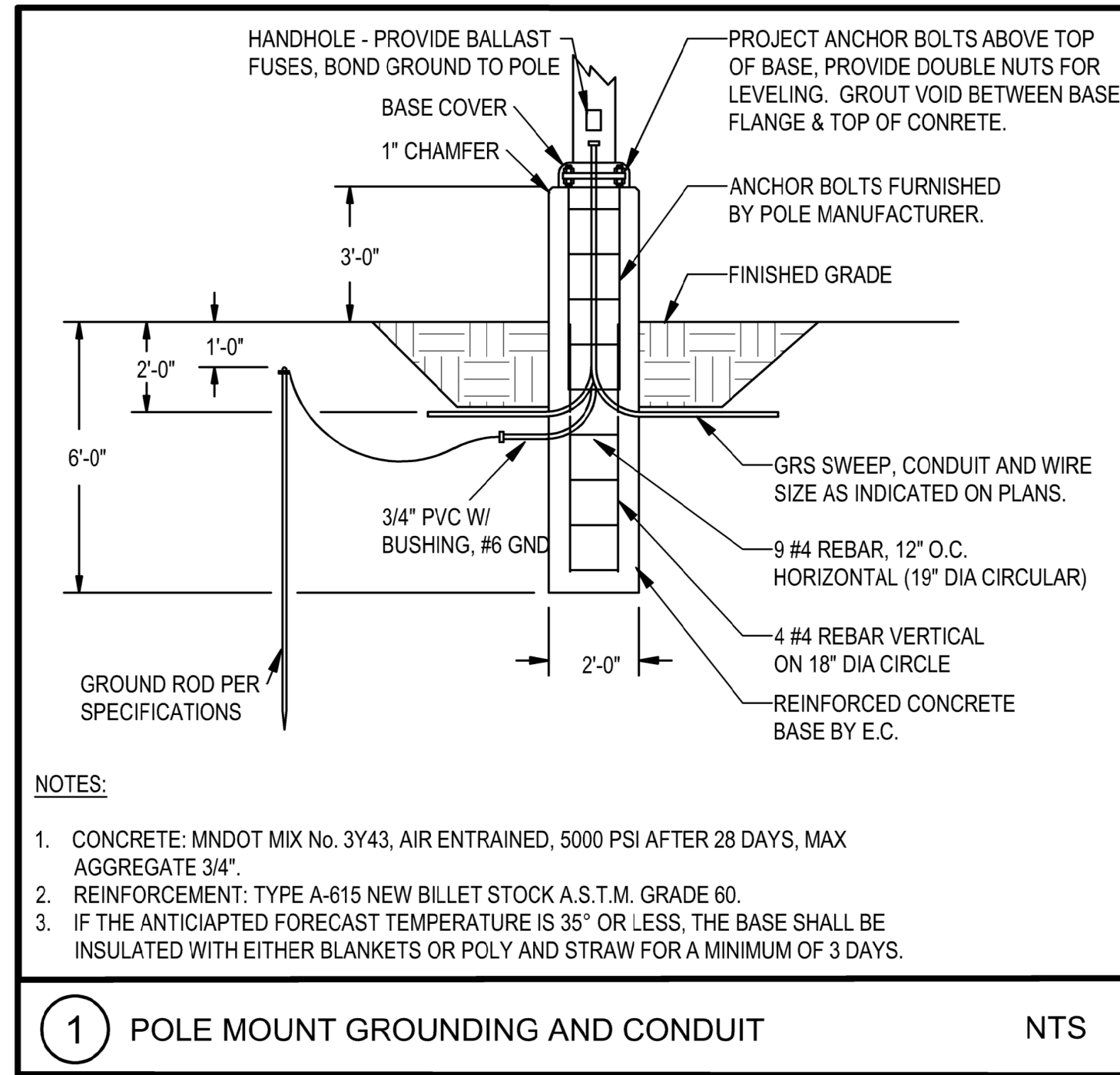
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TRINITY METRO
RAIL STATION
FORT WORTH, TX



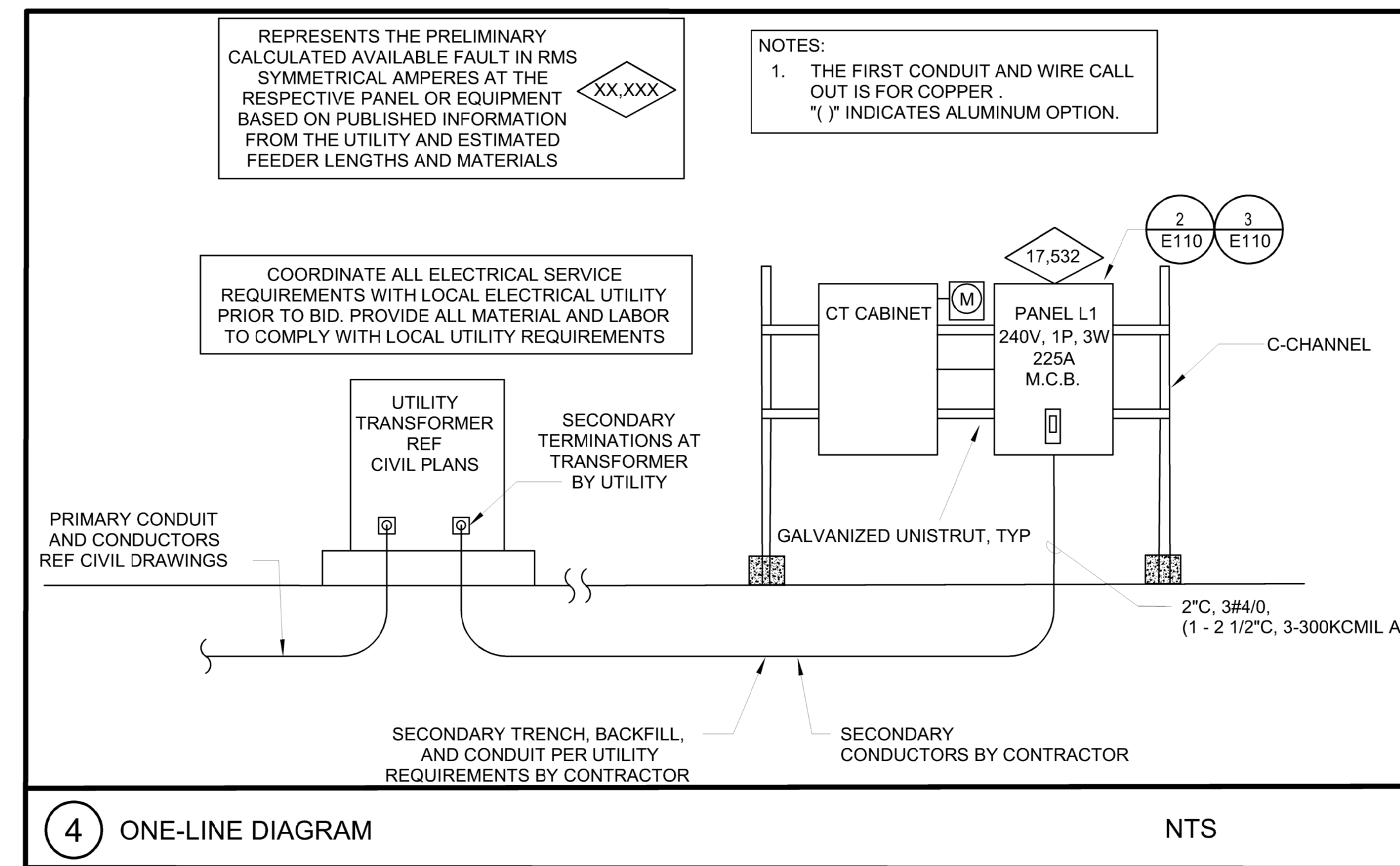
Date: 10/25/2022
Scale: NTS
Drawn By: TRM
Reviewed By:
Project: 29510

E100



ARC FLASH INFORMATION

CATEGORY	USE THIS INFORMATION IN ACCORDANCE WITH APPLICABLE OSHA STANDARDS, NFPA 70E, AND OTHER REQUIRED SAFE ELECTRICAL WORK PRACTICES
0	
18 INCHES	FLASH PROTECTION BOUNDARY
1.2 CAL/CM ²	MAX INCIDENT ENERGY AT 18" WORKING DISTANCE
CATEGORY 0	PPE CATEGORY (PER NFPA 70E-2009)
480 VAC	SHOCK HAZARD WHEN COVER IS OPEN
42 INCHES	LIMITED APPROACH
12 INCHES	RESTRICTED APPROACH
1 INCH	PROHIBITED APPROACH
	} PER NFPA 70E-2009
	Q2C: 12345678 DATE: 12/26/08
VALUES PRODUCED BY AN ENGINEERING ANALYSIS. ANY SYSTEM MODIFICATION, ADJUSTMENT OR PROTECTIVE DEVICE SETTINGS, OR FAILURE TO PROPERLY MAINTAIN EQUIPMENT WILL INVALIDATE THIS LABEL.	
NOTES:	
A. CONTRACTOR SHALL PERFORM ARC FLASH COORDINATION STUDY IN ACCORDANCE WITH NEC 110.16 AND NFPA 70E. CONTRACTOR SHALL PROVIDE A COPY OF THE STUDY TO OWNER'S REPRESENTATIVE UPON COMPLETION.	
B. INSTALL PERMANENT LABEL, SIMILAR TO THE ABOVE, TO ALL SWITCHBOARDS AND PANELBOARDS TO WARN OF POTENTIAL ARC FLASH HAZARDS.	
3	ARC FLASH DETAIL NTS



FORT WORTH
CITY OF FORT WORTH, TEXAS
STREET LUMINAIRE POLE
FOUNDATION DETAILS

REVISED: 03-22-2016
34 41 20-0622

CONTRACTOR TO VERIFY WITH LIGHTING MANUFACTURER THE ANCHOR BOLT PATTERN PRIOR TO POURING FOUNDATIONS.

NO.	REVISION	BY	DATE

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P.E.
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SUITE 500B, ST. JOE, AR 72156
ROCKERS, AR 72156
DESIGNED BY: TRM

TRINITY METRO
RAIL STATION
FORT WORTH, TX

STATE OF TEXAS
JASON C. ADAMS
106703
Professional Engineer
Exp. 09/25/2022
Jason Christopher Adams, P.E.
#106703
TX License # 106703

Date: 10/25/2022
Scale: NTS
Drawn By: TRM
Reviewed By:
Project: 29510

E110