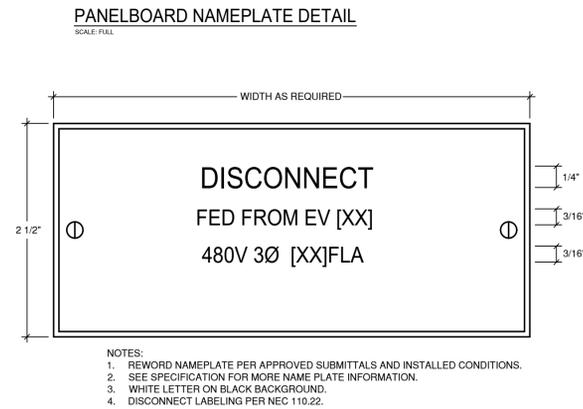
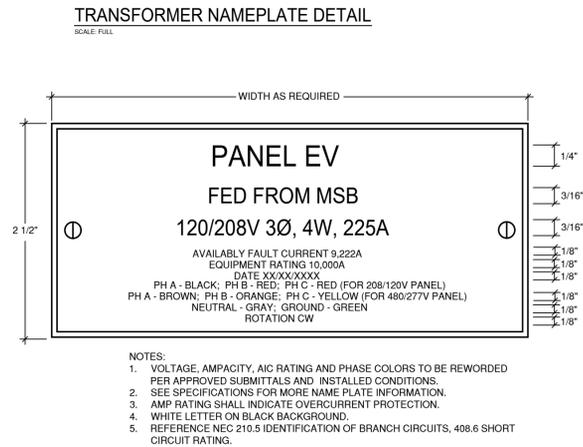
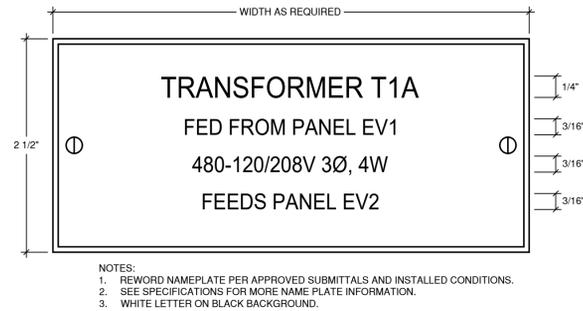


EQUIPMENT	
	DISCONNECT SWITCH
	FUSED DISCONNECT SWITCH
	ELECTRICAL PANEL
	METER
	GROUND
	FUSE & SWITCH CIRCUIT
	BREAKER
	TRANSFORMER
	ELECTRICAL PANEL

RACEWAY LEGEND	
	UG CONDUIT RUNS UNDERFLOOR OR BELOW GRADE
	OH CONDUIT RUN CONCEALED IN WALLS OR CEILING, OR EXPOSED WHEN CEILINGS ARE NOT PRESENT



## ELECTRICAL OUTLINE SPECIFICATION

### 1. GENERAL REQUIREMENTS

- A. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION.
- B. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR VERIFICATION OF EXISTING JOB CONDITIONS PRIOR TO START OF CONSTRUCTION.
- C. THE CONTRACTOR SHALL VISIT AND INSPECT THE SITE AND SHALL ASCERTAIN CONDITIONS UNDER WHICH THE WORK MUST BE PERFORMED INCLUDING THE HANDLING OF MATERIALS, SECURITY AND LIMITING FIELD DIMENSIONS.
- D. ALL WORK SHALL BE DONE IN COMPLIANCE WITH ALL NATIONAL CODES, INCLUDING THE NEC, NFPA, IBC, IECC AND ALL APPLICABLE LOCAL CODES AND ORDINANCES, AND OTHER AUTHORITIES HAVING JURISDICTION OVER ELECTRICAL CONSTRUCTION WORK AND THE PROJECT, FILE PLANS WITH AND OBTAIN APPROVALS FROM MUNICIPAL AGENCIES. ALL REQUIRED PERMITS AND CERTIFICATIONS OF INSPECTION SHALL BE OBTAINED AND PAID FOR BY THE CONTRACTOR AND PERTINENT CERTIFICATES SHALL BE DELIVERED TO THE OWNER'S REPRESENTATIVE BEFORE FINAL BILLING.

### E. OWNER REGULATIONS

- (1) ALL WORK SHALL BE IN COMPLIANCE WITH ALL OWNER'S REGULATIONS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN FROM THE OWNER A COPY OF ALL RULES AND REGULATIONS.
- (2) ALL WORK SHALL BE DONE IN COMPLIANCE WITH THE SPECIFICATIONS, DRAWINGS AND LATEST REVISIONS ON CONTRACT DOCUMENTS FOR ELECTRICAL WORK.
- (3) THE CONTRACTOR SHALL NOT DRILL HOLES INTO EXISTING SLABS OR STRUCTURAL MEMBERS FOR THE PURPOSE OF SUPPORTING ANY LOADS, OR ROUTING ANY FEEDERS, UNLESS WRITTEN APPROVAL IS OBTAINED FROM ENGINEER.
- (4) THE CONTRACTOR SHALL REPAIR OR REPLACE EXISTING CONSTRUCTION DAMAGED DURING THE PERFORMANCE OF THIS CONTRACT.

- F. LEAVE WORK READILY ACCESSIBLE FOR OPERATION, MAINTENANCE AND REPAIR. PROVIDE ACCESS HATCHES AS REQUIRED.

- G. MAINTAIN A FIELD REPRESENTATIVE ON THE PREMISES AT ALL TIMES DURING THE COURSE OF THE CONSTRUCTION WORK.

- H. THE CONTRACTOR SHALL SUPPLY ALL EQUIPMENT, LABOR SERVICES AND MATERIALS REQUIRED FOR THE COMPLETE INSTALLATION OF SYSTEMS SHOWN IN THE DRAWINGS AND HEREIN SPECIFIED. ALL MATERIALS SHALL BE NEW AND OF THE HIGHEST QUALITY AVAILABLE AND SHALL BEAR THE UNDERWRITERS LABORATORY OR APPROVE LISTING AGENCY LABEL.

- I. ALL WIRING, INCLUDING LOW VOLTAGE SIGNAL, SHALL BE INSTALLED IN CONDUIT.

- J. THE CONTRACTOR, BEFORE FINAL ACCEPTANCE WILL BE GRANTED, SHALL CLEAN ALL EQUIPMENT AND OTHER ITEMS FURNISHED UNDER THIS CONTRACT. CONTRACTOR SHALL ENSURE THAT ALL DIRECTORIES ARE IN PLACE WITH COMPLETED SCHEDULES. PANELBOARDS ARE VACUUMED AND ALL IDENTIFICATIONS AND MARKINGS OF EQUIPMENT, CABLES, AND OTHER ITEMS ARE COMPLETED.

- K. CONTRACTOR SHALL GUARANTEE ALL WORK AND MATERIALS FOR A PERIOD OF ONE YEAR AFTER DATE OF ACCEPTANCE OF THE PROJECT. IT IS UNDERSTOOD BY THEIR ACCEPTANCE OF THE CONTRACT THAT THEY WILL MAKE GOOD ON ALL WORK AND MATERIALS FOR THE DURATION OF THE PERIOD OF THE STIPULATED GUARANTEE PERIOD.

### 2. SCOPE OF WORK

- A. THE WORK UNDER THIS SECTION CONSISTS OF FURNISHING ALL LABOR, MATERIALS, EQUIPMENT AND APPLICATIONS INDICATED OR NECESSARY FOR ALL ELECTRICAL WORK AS INDICATED ON THE DRAWINGS OR DESCRIBED OR REFERRED TO IN THE SPECIFICATIONS.

- B. THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC IN CHARACTER. LOCATIONS SHOWN FOR ELECTRICAL EQUIPMENT, ETC. ARE APPROXIMATE. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING EXACT LOCATIONS ON SITE WITH OWNER.

- C. VERIFY IN FIELD AND ENSURE ALL ELECTRICAL CLEARANCES FOR ELECTRICAL EQUIPMENT ARE MAINTAINED PER NEC AND APPLICABLE LOCAL CODES REQUIREMENTS. DO NOT SCALE OFF OF ELECTRICAL PLANS.

- D. WHEN DIMENSIONS ARE SHOWN ON ELECTRICAL PLANS OR DETAILS, THESE DIMENSIONS ARE TO BE FIELD VERIFIED BY THE ELECTRICAL CONTRACTOR AGAINST FIELD CONDITIONS. INSTALLATION REQUIREMENTS OF OTHER TRADES, AND THE MANUFACTURER'S SUBMITTALS FOR EQUIPMENT TO BE INSTALLED, SHOULD ANY CONFLICTS ARISE, WHICH CANNOT BE EASILY RESOLVED IN THE FIELD WITHOUT CHANGING THE DESIGN INTENT, THE ELECTRICAL CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY.

- E. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR LOCATING, VERIFYING, AND AVOIDING ANY NEW AND EXISTING UNDERGROUND SERVICES/UTILITIES.

- F. THE ELECTRICAL CONTRACTOR OR COMPANIES SUBCONTRACTED UNDER THEIR SCOPE OF WORK SHALL ARRANGE FOR ALL INSPECTIONS WHEN THEY BECOME DUE. ALL WORK PERFORMED UNDER THIS CONTRACT SHALL REMAIN EXPOSED TO VIEW UNTIL APPROVED BY THE INSPECTION AUTHORITY.

- G. ELECTRICAL CONTRACTOR SHALL PROVIDE JUNCTION BOXES, NEW CONDUIT AND WIRING AS REQUIRED TO REPAIR, REROUTE AND RECONNECT CONDUCTORS THAT ARE DAMAGED, DISTURBED OR OTHERWISE ADVERSELY AFFECTED BY THE WORK.

- H. PROVIDE ALL CUTTING AND PATCHING OF THE STRUCTURE REQUIRED FOR INSTALLATION OF ELECTRICAL WORK. ALL STRUCTURAL CORES SHALL BE COORDINATED WITH STRUCTURAL ENGINEER PRIOR TO CUTTING.

- I. PRIOR TO CORE DRILLING THROUGH FLOORS, VERIFY CLEARANCE OF BEAMS, DUCTWORK, ETC. IN CEILING SPACE BELOW AND USE X-RAY/GPR SCANS FOR CONDUIT AND/OR REBAR IN SLAB. COORDINATE WITH OWNER TO OF SCHEDULING FOR CORE DRILLING AND TO ADVISE CONCERNING PROTECTION OF ANY SENSITIVE EQUIPMENT PRIOR TO COMMENCEMENT OF WORK.

### 3. ELECTRICAL SERVICE

- A. CONTRACTOR SHALL OBTAIN THE LATEST UTILITY STANDARDS FOR MATERIALS AND INSTALLATION REQUIREMENTS AND COMPLY FULLY.
- B. PROVIDE SERVICE ENTRANCE EQUIPMENT WHERE CALLED OUT ON DRAWINGS.

- C. PROVIDE KW AND KWH METER BASES, METER RACEWAY AND METERING CONDUCTORS PER UTILITY REQUIREMENTS, FROM CURRENT TRANSFORMERS (CTS) TO METER LOCATIONS).

### D. WORK BY UTILITY

- (1) PRIMARY CONDUCTORS AND TERMINATIONS.
- (2) UTILITY SERVICE TRANSFORMER(S).

- (3) TERMINATION OF SERVICE ENTRANCE SECONDARY CONDUCTORS AT UTILITY CONNECTION POINT.

- (4) CURRENT TRANSFORMERS AND UTILITY REVENUE METERS.

### E. WORK BY ELECTRICAL CONTRACTOR

- (1) SERVICE ENTRANCE RACEWAYS AND CONDUCTORS PER UTILITY STANDARDS.

- (2) GROUNDING RODS AND GROUNDING CONDUCTOR AT TRANSFORMER VAULTS.

- (3) METER BASES PER UTILITY REQUIREMENTS.

- (4) ALL METERING RACEWAYS AND CONDUCTORS PER UTILITY REQUIREMENTS.

- (5) CURRENT TRANSFORMER ENCLOSURES PER UTILITY REQUIREMENTS.

- (6) CONDUCTOR PHASING IDENTIFICATION ON ALL CONDUCTORS, AT ALL TERMINATIONS POINTS AND ALL MANHOLES, HANDHOLDS AND PULL BOXES.

- (7) SERVICE ENTRANCE EQUIPMENT.

- (8) SERVICE ENTRANCE GROUNDING PER CODE.

- (9) ALL REQUIRED COORDINATION WITH UTILITY.

4. PANELBOARDS
- A. NEW PANELBOARDS SHALL BE 3-PHASE, 4-WIRE OR SINGLE PHASE, 3-WIRE AS REQUIRED BY DRAWINGS WITH SOLID FULL SIZE NEUTRAL BUS AND GROUND BUS. UNO. ALL BUSES SHALL BE COPPER UNLESS OTHERWISE NOTED. REFER TO THE ELECTRICAL ONE-LINE DIAGRAM AND SCHEDULES FOR ADDITIONAL INFORMATION.

- B. CIRCUIT BREAKERS SHALL BE QUICK-MAKE, QUICK-BREAK, MOLDED CASE TYPE WITH THERMAL, MAGNETIC TRIPS, FRAME SIZE, NUMBER OF POLES, AND TRIP SETTING AS SHOWN ON PLANS, ONE-LINES, OR SCHEDULES.

- C. PANEL ENCLOSURES SHALL BE SURFACE MOUNTED, NEMA 3R TYPE, UNO.

- D. PANELBOARD SHALL BE SUPPORTED BY SUITABLE FLOOR TO CEILING ANGLE IRONS OR CHANNELS, ATTACHED TO STRUCTURAL FRAMEWORK OF THE BUILDING OR FREE-STANDING STANDS TO THE SATISFACTION AND APPROVAL OF THE OWNER. PANELBOARD FRONTS SHALL BE HINGED TO BOX CONSTRUCTION.

- E. PROVIDE APPROVED LARGE SIZE METAL DIRECTORY FRAMES INSIDE OF PANEL DOOR, COMPLETE WITH TRANSPARENT PLASTIC COVERS OVER TYPEWRITTEN CARDS WHICH SHALL INDICATE AND LIST ALL FEEDERS OR CIRCUITS SUPPLIED FROM PANEL.

- F. BACKBOX INTERIORS, INSIDE TRIM, DOOR, AND EXTERIOR SHALL BE PAINTED WITH A RUST INHIBITOR AFTER PICKLING AND FINISHED IN ANSI-61 GRAY ENAMEL.

- G. AT CONCLUSION OF THE PROJECT, PANELBOARD DIRECTORIES SHALL BE FULLY UPDATED, AND ALL SPARE CIRCUIT BREAKERS SHALL BE PLACED IN THE "OFF" POSITION. INSTALL FILLER PLATES IN UNUSED SPACES.

5. LOW VOLTAGE TRANSFORMERS
- A. SHALL BE GENERAL PURPOSE, DRY-TYPE DOE 2016 TRANSFORMER, NEMA 3R TYPE, UNO.

- B. COMPLY WITH NEMA STANDARD ST 20 " DRY-TYPE" TRANSFORMERS FOR GENERAL APPLICATIONS.

- C. THREE PHASE TRANSFORMERS SHALL BE 480 VOLT DELTA PRIMARY 208Y/120 VOLT, 3-PHASE, 4-WIRE SECONDARY, UNO. OTHER VOLTAGES SHALL BE AS SHOWN ON THE DRAWINGS OR OTHERWISE REQUIRED.

- D. FACTORY ASSEMBLED AND TESTED, AIR COOLED UNITS OF TYPES SPECIFIED, HAVING CHARACTERISTICS AND RATINGS AS INDICATED ON DRAWINGS, UNITS SHALL BE DESIGNED FOR RATINGS AS INDICATED IN DRAWINGS AND FOR 60 HZ SERVICE.

- E. CORE CONSTRUCTION SHALL BE OF GRAIN ORIENTED, NON-AGING SILICON STEEL WITH HIGH PERMEABILITY. LOW HYSTERESIS AND LOW Eddy CURRENT LOSSES AS NEED TO ACHIEVE REQUIRED EFFICIENCY LEVELS. CORE LAMINATIONS SHALL BE TIGHTLY ASSEMBLED AND MAGNETIC FLUX DENSITIES SHALL BE KEPT WELL BELOW THE SATURATION POINT.

- F. COILS SHALL HAVE CONTINUOUS WINDINGS WITHOUT SPLICES EXCEPT FOR TAPS.

- G. INTERNAL COIL CONNECTIONS SHALL BE BRAZED OR PRESSURE TYPE.

- H. ALL TRANSFORMER WINDINGS SHALL BE COPPER UNLESS OTHERWISE NOTED.

- I. WIRING COMPARTMENT AND TERMINATION SHALL BE ACCESSIBLE BY REMOVING ENCLOSURE FRONT PANELS. THREE PHASE TRANSFORMERS SHALL USE ONE COIL PER PHASE IN PRIMARY AND SECONDARY WINDINGS.

- J. TRANSFORMERS SHALL MEET THE ENERGY EFFICIENCY REQUIREMENTS OF 2016 10 CFR PART 431. THE USE OF FANS TO OBTAIN RATED KVA OR ANY PUBLISHED RATING SHALL NOT BE PERMITTED FOR ALL TRANSFORMER TYPES.

- K. SOUND LEVELS SHALL NOT EXCEED THE FOLLOWING: 150 KVA AND BELOW, 50 DB; ABOVE 150 KVA, 60 DB.

- L. TRANSFORMERS SHALL HAVE THE FOLLOWING FEATURES AND RATINGS:

- (1) ENCLOSURES SHALL MEET UL 506 REQUIREMENTS.
- (2) ENCLOSURE: VENTILATED, NEMA 3R FOR OUTDOOR LOCATIONS.
- (3) INSULATION CLASS: 185C CLASS FOR 37½ KVA TRANSFORMERS OR SMALLER; 220C CLASS FOR TRANSFORMERS LARGER THAN 37½ KVA.
- (4) INSULATION TEMPERATURE RISE: 150C MAXIMUM RISE ABOVE 40C, FOR 220C CLASS INSULATION; 115C MAXIMUM RISE FOR 185C CLASS INSULATION.

## DESIGN AND INSTALL SHALL COMPLY WITH 2023 NEC. DESIGN COMPLIES WITH OR EXCEEDS ALL PREVIOUS NEC CODES / YEARS.

- (5) FOR TRANSFORMER 3KVA AND LARGER, FULL CAPACITY TAPS IN HIGH-VOLTAGE WINDING AS FOLLOWS:
- 3 KVA THROUGH 30 KVA: FOUR 2.5% TAPS, TWO ABOVE AND TWO BELOW NORMAL VOLTAGE.
  - 30 KVA THROUGH 500 KVA: FOUR 2.5% TAPS, TWO ABOVE AND TWO BELOW RATED NORMAL VOLTAGE.

### M. ACCESSORIES:

- (1) CORE AND COIL ASSEMBLIES 30 KVA AND LARGER TO BE MOUNTED ON RUBBER VIBRATION ISOLATORS ON CONCRETE PADS.

- N. ALL CLEARANCES SHALL BE MAINTAINED PER NEC REQUIREMENTS.

6. SAFETY SWITCHES
- A. SAFETY SWITCHES SHALL BE HEAVY DUTY TYPE, RATED FOR EQUIPMENT AS INDICATED ON PLANS AND SCHEDULES; WEATHER-TIGHT NEMA 3R ENCLOSURE FOR OUTDOORS, FUSED OR NON-FUSED AS NOTED ON DRAWINGS.

- B. SWITCHES SHALL HAVE A QUICK-MAKE, QUICK-BREAK OPERATING HANDLE AND MECHANISM WHICH SHALL BE AN INTEGRAL PART OF THE ENCLOSURE, NOT THE COVER.

- C. PROVIDE INTERLOCKS TO PREVENT OPENING THE COVER WITH THE SWITCH IN THE "ON" POSITION OR CLOSING OF THE SWITCH WITH THE DOOR OPEN.

- D. SWITCHES SHALL BE CAPABLE OF WITHSTANDING THE AVAILABLE FAULT LET-THROUGH CURRENT BEFORE THE FUSE OPERATES WITHOUT DAMAGE OR CHANGE IN RATING.

- E. FUSE CLIPS, WHERE REQUIRED, SHALL BE OF THE REJECTION TYPE AND SHALL ACCOMMODATE DUAL ELEMENT, CURRENT LIMITING FUSES ONLY. FUSES SHALL BE SPECIFIED UNDER "FUSES".

- F. FUSES SHALL BE 1 IN UNLESS OTHERWISE SPECIFIED FOR PARTICULAR ITEM OR SYSTEM.

- G. THE SIZE NOTED ON THE DRAWINGS.
- H. THE SIZE REQUIRED BY THE NEC TO ACCOMMODATE THE NUMBER, SIZE AND TYPE OF WIRES SHOWN, SPECIFIED OR REQUIRED. ELECTRICAL CONTRACTOR SHALL ADJUST CONDUIT SIZE FOR CONDUIT FILL AND WIRE SIZE FOR NUMBER OF HOT CURRENT CONDUCTORS, VOLTAGE DROP AND DERATING OF THE CONDUCTORS IN EACH CONDUIT RUN.

7. FUSES
- A. PROVIDE REJECTION FUSES FOR ALL FUSIBLE EQUIPMENT.

- B. FUSES SHALL BE OF THE RATINGS AND TYPES SHOWN ON THE DRAWINGS OR AS RECOMMENDED BY EQUIPMENT MANUFACTURER.

- C. FUSES SHALL BE UL LISTED AND SHALL BE BUSSMAN MANUFACTURING CO., FERRAZ SHAWMUT, OR CEFCO.

8. CONDUITS, FITTINGS AND SUPPORTS
- A. CONDUIT

- (1) ALL CONDUIT SHALL BE MINIMUM 1" UNO.

- (2) ELECTRIC METALLIC TUBING (EMT) SHALL BE THIN WALL STEEL PIPE, GALVANIZED, THREADLESS, MAXIMUM 4" .

- (3) RIGID METALLIC CONDUIT (RMC)
- SHALL BE FULL WEIGHT STEEL PIPE, HOT DIP GALVANIZED INSIDE AND OUTSIDE, THREADED.
  - SHALL BE FACTORY INSTALLED PVC COATING WHERE LOCATED UNDERGROUND OR BELOW SLAB.

- (1) LIQUID-TIGHT FLEXIBLE METAL CONDUIT (LFMC) SHALL CONSIST OF A CORE OF FLEXIBLE GALVANIZED SHEET TUBING OVER WHICH IS EXTRUDED A LIQUID-TIGHT JACKET OF POLYVINYL CHLORIDE (PVC), FLEXIBLE METAL CONDUIT SHALL BE IN ACCORDANCE WITH FEDERAL SPECIFICATION WW-C-566 AND UL-360.

- (2) RIGID POLYVINYL CHLORIDE CONDUIT (PVC) SHALL BE SCHEDULE 40 UNLESS OTHERWISE INDICATED, SCHEDULE 80 WHERE SUBJECT TO PHYSICAL DAMAGE, OR DIRECT BORE TYPE PVC AS REQUIRED, RATED FOR USE WITH CONDUCTORS RATED 90 DEGREES C.

- (3) COUPLINGS AND CONNECTORS FOR EMT SHALL BE MADE OF STEEL ONLY, RAIN AND CONCRETE TIGHT FITTINGS FOR LIQUID-TIGHT FLEXIBLE CONDUIT SHALL BE IN ACCORDANCE WITH FEDERAL SPECIFICATION WW-F-406B AND UL-360 INCORPORATING A THREADED GROUND CONE, A STEEL OR PLASTIC COMPRESSION RING AND A GLAND FOR TIGHTENING. FITTINGS SHALL BE MADE OF STEEL ONLY WITH INSULATED THROATS.

- (8) DIE-CAST ZINC OR OTHER MATERIAL SHALL NOT BE USED ON EMT, FLEX AND RMC CONDUIT.

- (9) FITTINGS FOR FLEXIBLE METAL CONDUIT SHALL BE IN ACCORDANCE WITH FEDERAL SPECIFICATION WW-F-406B AND UL-360 MADE OF STEEL AND HAVING INSULATED THROATS.

- (10) FITTINGS FOR PVC SHALL BE LISTED AND LABELED AS COMPLYING WITH UL 651; MATERIAL TO MATCH CONDUIT.

- (11) EXPANSION FITTINGS SHALL BE AS FOLLOWS:
- TYPE A - DEFLECTION AND EXPANSION FITTING-CROUSE HINDS, TYPE XD OR O.Z. TYPE DX.
  - TYPE B - EXPANSION FITTING - SPRING CITY TYPE EF OR O.Z. TYPE EX.

- B. CLOSING OF OPENINGS
- (1) ALL PENETRATIONS MADE IN RATED WALLS AND FLOORS FOR THE PURPOSE OF ROUTING ELECTRICAL SERVICES OR COMMUNICATION CABLES SHALL BE FIRE STOPPED ONCE SERVICE CONDUITS, SLEEVES, OR CABLES ARE IN PLACE. EACH TRADE SHALL BE RESPONSIBLE FOR SEALING AFTER CONDUIT OR CABLE HAS BEEN INSTALLED.

- (2) FILLING MATERIALS FOR OPENING SHALL BE FIRE-RESISTIVE, WITH A RATING EQUAL TO THE MATERIAL OF THE WALL OF SLAB ITSELF AND FINISHED SO AS TO PREVENT PASSAGE OF WATER, SMOKE AND FUMES.

- (3) THE FILLING MATERIAL SHALL BE CHASE TECHNOLOGY CORPORATION "CHASE FOAM" TYPE CTC PR-855 SILICONE FOAM FIRE STOP.

- C. CONDUIT SLEEVES SHALL BE GALVANIZED STEEL, CAST IRON, PLASTIC OR DUCTILE IRON PIPE WHEN THEY ARE LOCATED IN CONCRETE WALLS OR FOUNDATIONS. IN OTHER LOCATIONS, SLEEVES SHALL BE CONSTRUCTED OF 22 GAUGE GALVANIZED SHEET STEEL HAVING LOCK SEAM JOINTS.

- D. CONDUIT SUPPORTS
- (1) ENSURE THAT ALL CONDUIT IS SUPPORTED INDEPENDENTLY FROM BUILDING STRUCTURE AND PER NEC REQUIREMENTS.

- (2) PIPE STRAPS SHALL BE TYPE I STYLE A OR B IN ACCORDANCE WITH FEDERAL SPECIFICATION PF-S-760A.

- (3) INDIVIDUAL AND MULTIPLE PIPE HANGERS AND RISE CLAMPS INCLUDING ALL PARTS AND HARDWARE SHALL BE HOT DIPPED GALVANIZED THROUGHOUT. ALL U-BOLTS, CLAMPS, ATTACHMENTS AND HARDWARE FOR HANGER ASSEMBLY AND CONDUITS SHALL BE PROVIDED. EACH MULTIPLE HANGER SHALL BE DESIGNED TO SUPPORT A LOAD EQUAL TO OR GREATER THAN THE SUM OF THE WEIGHTS OF THE CONDUITS, WIRES AND HANGER ITSELF, PLUS 200 POUNDS.

- (1) HANGERS AND HARDWARE SHALL BE IN ACCORDANCE WITH FEDERAL SPECIFICATIONS WW-H-1/1-D.

- E. UTILIZATION
- (1) OUTDOOR UNDERGROUND CONCRETE ENCASED, BELOW BUILDING OR AWAY FROM BUILDING - RMC, PVC.

- (2) OUTDOOR ABOVE GROUND EXPOSED OR CONCEALED - RMC, EMT, PVC.

- (3) OUTDOOR ABOVE GROUND FINAL CONNECTION TO VIBRATING EQUIPMENT: TRANSFORMERS - LFMC.

- (4) INDOOR - EMT

- F. INSTALLATION
- (1) CONDUIT SHALL BE RUN HORIZONTALLY AND VERTICALLY SQUARE TO COLUMN LINES.

- (2) THE SIZE OF EACH RUN OF CONDUIT SHALL BE THE LARGER OF THE FOLLOWING:
- THE MINIMUM SIZE, WHICH SHALL BE 1 IN UNLESS OTHERWISE SPECIFIED FOR PARTICULAR ITEM OR SYSTEM.
  - THE SIZE NOTED ON THE DRAWINGS.
  - THE SIZE REQUIRED BY THE NEC TO ACCOMMODATE THE NUMBER, SIZE AND TYPE OF WIRES SHOWN, SPECIFIED OR REQUIRED. ELECTRICAL CONTRACTOR SHALL ADJUST CONDUIT SIZE FOR CONDUIT FILL AND WIRE SIZE FOR NUMBER OF HOT CURRENT CONDUCTORS, VOLTAGE DROP AND DERATING OF THE CONDUCTORS IN EACH CONDUIT RUN.

- G. EXPANSION JOINTS
- (1) PROVIDE EXPANSION JOINTS FOR ALL CONDUITS CROSSING STRUCTURAL EXPANSION JOINTS.

- (2) IN ADDITION TO THE GROUNDING RING, A SEPARATE EQUIPMENT GROUNDING CONDUCTOR SHALL BE PROVIDED. FREE END OF CONDUITS IN EXPANSION JOINTS SHALL BE PROVIDED WITH INSULATED BUSHINGS.

- H. FITTINGS
- (1) THREE PIECE THREADED COUPLINGS SHALL BE USED TO JOIN TWO CONDUITS COMING TOGETHER FROM OPPOSITE DIRECTIONS WHEN STANDARD THREADED COUPLINGS CAN NOT BE USED.

- (2) ONLY STEEL FITTINGS SHALL BE USED WITH STEEL CONDUITS. CONDUIT NIPPLES WITH RUNNING THREADS SHALL NOT BE USED. SPLIT COUPLINGS SHALL NOT BE USED UNLESS SPECIFICALLY APPROVED BY THE ENGINEER FOR USE IN LOCATIONS WHERE STANDARD COUPLINGS CAN NOT BE EMPLOYED.

9. BOXES
- A. PULL BOXES

- (1) PULL BOXES EXPOSED TO RAIN OR INSTALLED IN DAMP/WET LOCATIONS SHALL BE OF CAST VAPOR TIGHT TYPE.

- (2) PULL BOXES CONNECTED TO CONCEALED CONDUITS SHALL BE PROVIDED WITH ACCESS BY MEANS OF AN APPROVED ACCESS DOOR.

- (3) UNDERGROUND BOXES: IN-GROUND, OPEN BOTTOM BOXES FURNISHED WITH FLUSH, NON-SKID COVERS WITH LEGEND INDICATING TYPE OF SERVICE AND STAINLESS STEEL TAMPER RESISTANT COVER BOLTS.

- (4) ALL INTERIOR PULL BOXES SHALL BE HOT DIPPED GALVANIZED STEEL.

- B. INSTALLATION
- (1) WHERE CONCEALED CONDUITS ARE TO BE CONNECTED TO A SURFACE WITH MOUNTED CABINET, A FLUSH CABINET BACKPLATE SHALL BE PROVIDED WITH AN ACCESSIBLE OPENING OF SIZE TO MATCH THE PULL BOX.

- (2) EACH PULL BOX SHALL BE PROVIDED WITH CLAMPS, GRIDS OR OTHER SUPPORTS TO WHICH CABLES SHALL BE SECURED SO THAT NO CABLE WILL HAVE AN UNSUPPORTED LENGTH OF MORE THAN 30 INES.

10. 600 VOLT WIRE AND CABLE
- A. PROVIDE WIRE AND CABLE COMPRISED OF COPPER CONDUCTORS, PER DRAWINGS, IN ACCORDANCE WITH ASTM AND IPCEA STANDARDS.

- B. INSULATION SHALL BE TYPE RECOGNIZED BY NEC AS APPROVED FOR PARTICULAR APPLICATION. UNLESS A SPECIFIC TYPE IS SPECIFIED OR NOTED, WITH MINIMUM INSULATION RATINGS OR VALUES AS FOLLOWS:

- (1) FEEDERS AND ALL BRANCH WIRING: TYPE THW, OR THHN, THHW OR XHHW.

- (2) WIRING IN HIGH TEMPERATURE AREAS GREATER THAN 90 DEGREE C: TYPE AVL IN WET, 600 VOLT.

- (3) PROVIDE CONDUCTORS OF SAME INSULATION TYPE IF USED FOR A SIMILAR PURPOSE.

- C. CONDUCTORS
- (1) COPPER ONLY.

- (2) THE MINIMUM SIZE CONDUIT SHALL BE NO. 12 AWG SOLID; NO. 6 AWG AND LARGER CONDUCTORS SHALL BE STRANDED.

- (3) PROVIDE THE FOLLOWING MINIMUM WIRE SIZES, EXCEPT WHERE OTHERWISE NOTED ON DRAWINGS, OR SHOWN ON MANUFACTURER'S WIRING DIAGRAMS. ALL SIZES SHOWN ON DRAWINGS ARE FOR COPPER UNLESS SPECIFICALLY NOTED OTHERWISE:

- MISCELLANEOUS CONTROL OR SIGNAL CIRCUITS: SIZE AS REQUIRED BY MANUFACTURER'S RECOMMENDATIONS.
- BRANCH CIRCUITS: NO. 12 AWG, WHEN PROTECTED BY A 15- OR 20-AMP CIRCUIT BREAKER.
- ALL WIRE SIZES ARE RATED FOR 75 DEGREE C MINIMUM AND 90C TEMPERATURE WHEN MORE THAN 3 CURRENT CARRYING CONDUCTORS ARE IN ONE CONDUIT, UNLESS OTHERWISE NOTED. OTHER TEMPERATURE RATINGS SHALL NOT BE USED UNLESS WRITTEN APPROVAL IS GIVEN BY ENGINEER.

- (4) SERVICE FEEDER AND BRANCH CIRCUIT CONDUCTORS THROUGHOUT THE ELECTRICAL SYSTEM SHALL BE COLOR CODED AS FOLLOWS:

VOLTS	COLOR	PHASE
277 VOLTS	BROWN	A
120 VOLTS	ORANGE	B
	YELLOW	C
	GREY	NEUTRAL
	GREEN	GROUND

- D. CABLE SPlicing AND TERMINATIONS
- (1) SPLICES IN WIRE SIZES NO. 8 AWG AND SMALLER SHALL BE MADE WITH INSULATED SPRING TYPE WIRE CONNECTORS, "SCOTCHLOK".

- (2) SPLICES IN LARGER WIRE AND CABLES SHALL BE MADE WITH IDENT CONNECTORS APPROVED FOR THE PURPOSE.

- (3) ALL INSULATING TAPE USED ON 600 VOLTS AND LESS SHALL BE 3-M #88 OR PLYMOUTH SLIPKNOT GRAY.

- (4) INSULATING MATERIALS FOR SPLICES AND CONNECTIONS SHALL BE OF THE TYPE FOR THE PARTICULAR USE, LOCATION, AND VOLTAGE AND SHALL BE APPLIED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

- E. INSTALLATION
- (1) WIRES AND CABLES CONNECTED TO EQUIPMENT OPERATING AT 100 TO 480 VOLTS SHALL BE RATED AT 600 VOLTS MINIMUM WHERE SPECIFIED OR WHERE THE OPERATING VOLTAGE IS LESS THAN 100 VOLTS, THE WIRES OR CABLES MAY BE INSULATED FOR 300 VOLTS, PROVIDED THEY ARE COMPLETELY ISOLATED FROM OTHER HIGH VOLTAGE SYSTEM.

- (2) WIRES AND CABLES FOR SECONDARY SERVICE, FEEDERS AND BRANCH CIRCUIT SHALL BE SINGLE CONDUCTOR UNLESS OTHERWISE SPECIFIED.

- (3) PROVIDE SEPARATE NEUTRAL FOR ALL CIRCUITS.

- F. IDENTIFICATION TAGS
- (1) NON-FERROUS IDENTIFYING TAGS SHALL BE SECURELY FASTENED TO ALL CABLES AND AT TERMINATIONS. TAGS SHALL BE STAMPED OR EMBOSSED TO CORRESPOND WITH MARKINGS ON DRAWINGS OR MARKED SO THAT THE CABLE CAN BE READILY IDENTIFIED. IF SUSPENDED TYPE TAGS ARE PROVIDED, THEY SHALL BE ATTACHED BY APPROXIMATELY 1/32 IN DIAMETER NYLON 55 POUND TEST MONOFILAMENT LINE ATTACHED TO TAG, USING THREE TWIST, CLIN KNOT OR ESPECIALLY DESIGNED SLIP-FREE PLASTIC CABLE LACING UNIT.

- G. GENERAL WIRING METHODS
- (1) CONDUCTORS NOT LARGER THAN NO.

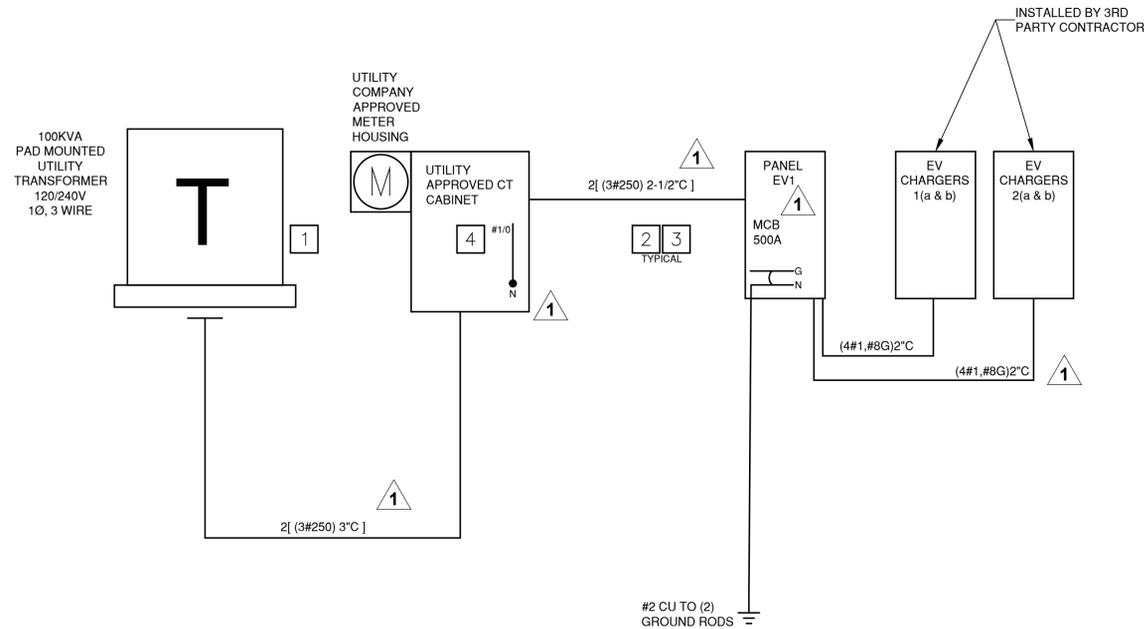
PANEL EV1															
Mounting Method			Fed From			Panel Information									
SURFACE			UTILITY			Volt: 240/120		Bus Rating: 600 AMP							
NEW			NEAR ENCLOSURE			Phase: 1		Main Breaker: 500 AMP							
NEW			SERV/CE RATED			Wire: 3		AIC Rating: 42,000							
Ckt #	Notes	Code	Description	Load VA	Bkr	P	Ph	Ph	P	Bkr	Load VA	Description	Code	Notes	Ckt #
1	A	1	EV CHARGER 1 (a)	19200	100	2	*	2	100	19200	EV CHARGER 2 (a)	1	A	2	1
3			---	/	/	/	/	/	/	/	---	---			4
5	A	1	EV CHARGER 1 (b)	19200	100	2	*	2	100	19200	EV CHARGER 2 (b)	1	A	6	5
7			---	/	/	/	/	/	/	/	---	---			8
9			---	/	/	/	/	/	/	/	---	---			10
11			---	/	/	/	/	/	/	/	---	---			12
13			---	/	/	/	/	/	/	/	---	---			14
15			---	/	/	/	/	/	/	/	---	---			16
17			---	/	/	/	/	/	/	/	---	---			18
19			---	/	/	/	/	/	/	/	---	---			20
21			---	/	/	/	/	/	/	/	---	---			22
23			---	/	/	/	/	/	/	/	---	---			24
25			---	/	/	/	/	/	/	/	---	---			26
27			---	/	/	/	/	/	/	/	---	---			28
29			---	/	/	/	/	/	/	/	---	---			30

Code	Description	Load VA	Dem	Per	Phase	Load Summary
1	EV Charger	76800	125%			
2	Rec up to 10,000		100%	Ph A	38400 VA	
	Rec over 10,000		50%	Ph B	38400 VA	
3	Motor		100%			
	Largest Motor		125%			
4	Heater		100%	Connected		76800 VA
5	Kitchen		100%	Code Demand		96000 VA
6	Other		100%			
7	Sub Panel		100%	Code Demand		400.00 Amps

NOTES:  
 ALL EQUIPMENT AND BREAKERS TO BE RATED ABOVE THE FAULT CURRENT SHOWN ON THE SHORT CIRCUIT CALCULATION.  
 A PROVIDE FIXED BREAKER LOCKOUTS ON DEAD FRONT.

SHORT CIRCUIT CALCULATION												
FAULT "X"	ISC AVAILABLE	FEEDER SIZE	CONDUIT STEEL	CONDUIT PVC	WIRE TYPE	CONSTANT "C"	# OF SETS	FEEDER LENGTH	VOLTS L TO L	"F" FACTOR	"M" MULTIPLIE	ISC AT FAULT
UTILITY	29,600											
METER/CT CABINET	29,600	250		X	CU	18594	2	30	240	0.1723	0.8530	25,249
PANEL EV1	25,249	250	X		CU	16483	2	5	240	0.0276	0.9731	24,570
EV CHARGER 1(a&b)	24,570	1		X	CU	7493	1	180	240	4.2595	0.1901	4,672
EV CHARGER 2(a&b)	24,570	1		X	CU	7493	1	205	240	4.8511	0.1709	4,199



- GENERAL NOTES:
- THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC IN CHARACTER. LOCATION SHOWN FOR ELECTRICAL EQUIPMENT, DEVICES, CIRCUITING, ETC. ARE APPROXIMATE. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING EXACT LOCATION ON SITE WITH OWNER.
  - REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS. ELECTRICAL CONTRACTOR SHALL ABIDE BY THE SPECIFICATIONS UNLESS OTHERWISE DIRECTED BY OWNER, OR ENGINEER IN A WRITTEN FORM.
  - PROJECT DESIGN PROVIDED BASED ON PROVIDED EQUIPMENT SPECIFICATIONS. THE CONTRACTOR SHALL VERIFY CHARGER ELECTRICAL SPECIFICATIONS AND REQUIREMENTS OPEN DELIVERY PRIOR TO INSTALLATION.
  - SOME UNDERGROUND CONDUITS HAVE BEEN UPSIZED TO ACCOMMODATE INSTALLATION. THE CONTRACTOR SHALL VERIFY IF THE LARGER SIZE WILL WORK WITH SPECIFIED EQUIPMENT PRIOR TO INSTALLATION AND REDUCE SIZE AS REQUIRED.
  - FOR CHARGERS RATED MORE THAN 60A, OR MORE THAN 150 VOLTS TO GROUND, AND IF THE DISCONNECTING MEANS IS INSTALLED REMOTE FROM THE EQUIPMENT, PROVIDE A PLAQUE ON THE EQUIPMENT DENOTING THE LOCATION OF THE DISCONNECTING MEANS.

- KEY NOTES:
- COORDINATE FINAL REQUIREMENTS WITH UTILITY COMPANY.
  - PROVIDE ALL NECESSARY CONNECTIONS AND EQUIPMENT FOR NEW EV CHARGING STATION.
  - SEE SHORT CIRCUIT CALCULATION FOR DISTANCES. ALL DISTANCES ASSUMED FOR SHORT CIRCUIT CALCULATIONS, IF INSTALLED AT SHORTER DISTANCES THAN SHOWN ON SHORT CIRCUIT CALCULATION, CONTACT ENGINEER.
  - PROVIDE SSBJ PER NEC 250.92, PER NEC TABLE 250.102 (C) (1) FROM GROUNDED CONDUCTOR TO METAL ENCLOSURE.



**EV CHARGING**

14012 E TUFTS DR.  
AURORA, CO 80015

DRAWN BY: KM  
 CHECKED BY: LR

REVISIONS:

No.	DESCRIPTION	DATE
1	SITE REVISION	2024.04.26
2	SITE REVISION	2024.10.11

ISSUE RECORD:

No.	DESCRIPTION	DATE
1	PERMIT SET	2023.03.20

SHEET TITLE:  
**ELECTRICAL ONE-LINE AND SCHEDULES**



2024.10.10

DATE: 2023.02.28

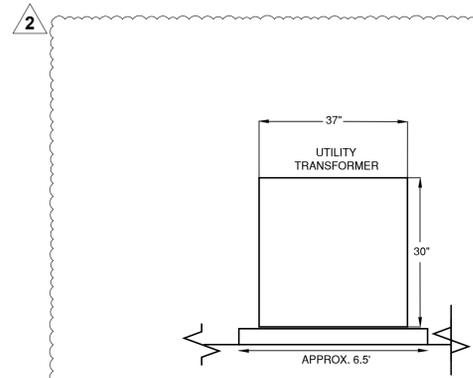
DRAWING NO.:

**E0.1**

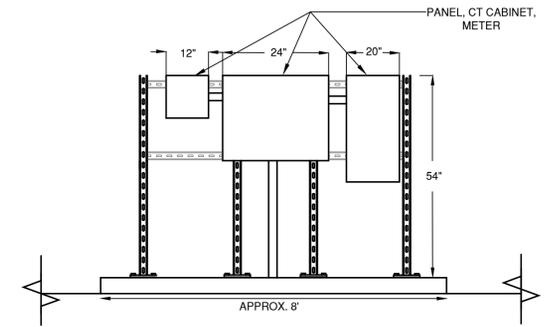
**ELECTRICAL ONE-LINE DIAGRAM**  
 SCALE: NONE

**EV CHARGING**

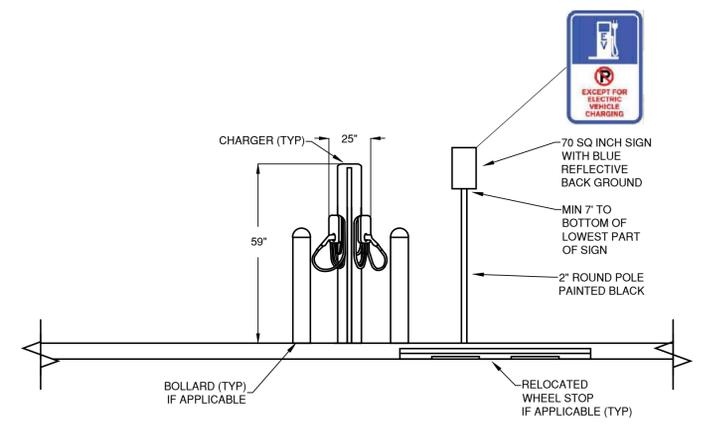
14012 E TUFTS DR.  
AURORA, CO 80015



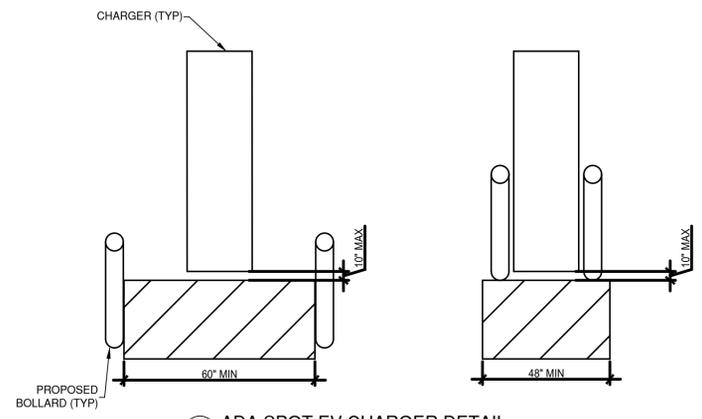
**A** EVSE EQUIPMENT ELEVATION DETAIL  
NTS



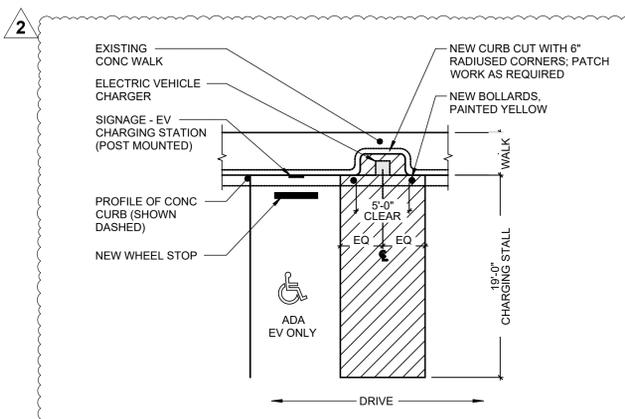
**B** EVSE EQUIPMENT ELEVATION DETAIL  
NTS



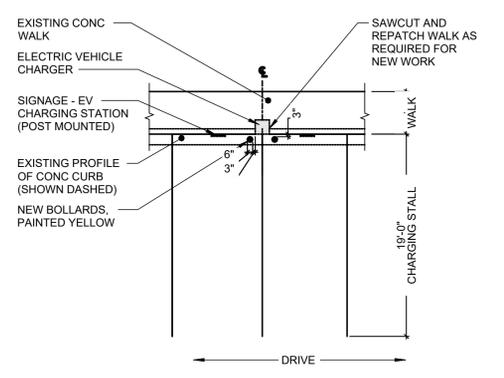
**C** EV CHARGER ELEVATION DETAIL  
NTS



**D** ADA SPOT EV CHARGER DETAIL  
NTS



**E** ADA CHARGING STALL DETAIL  
NTS



**F** STANDARD CHARGING STALL DETAIL  
NTS

DRAWN BY: KM  
CHECKED BY: LR

REVISIONS:

No.	DESCRIPTION	DATE
△	SITE REVISION	2024.04.26
△	SITE REVISION	2024.10.11

ISSUE RECORD:

No.	DESCRIPTION	DATE
1	PERMIT SET	2023.03.20

SHEET TITLE:  
**ELECTRICAL DETAILS**



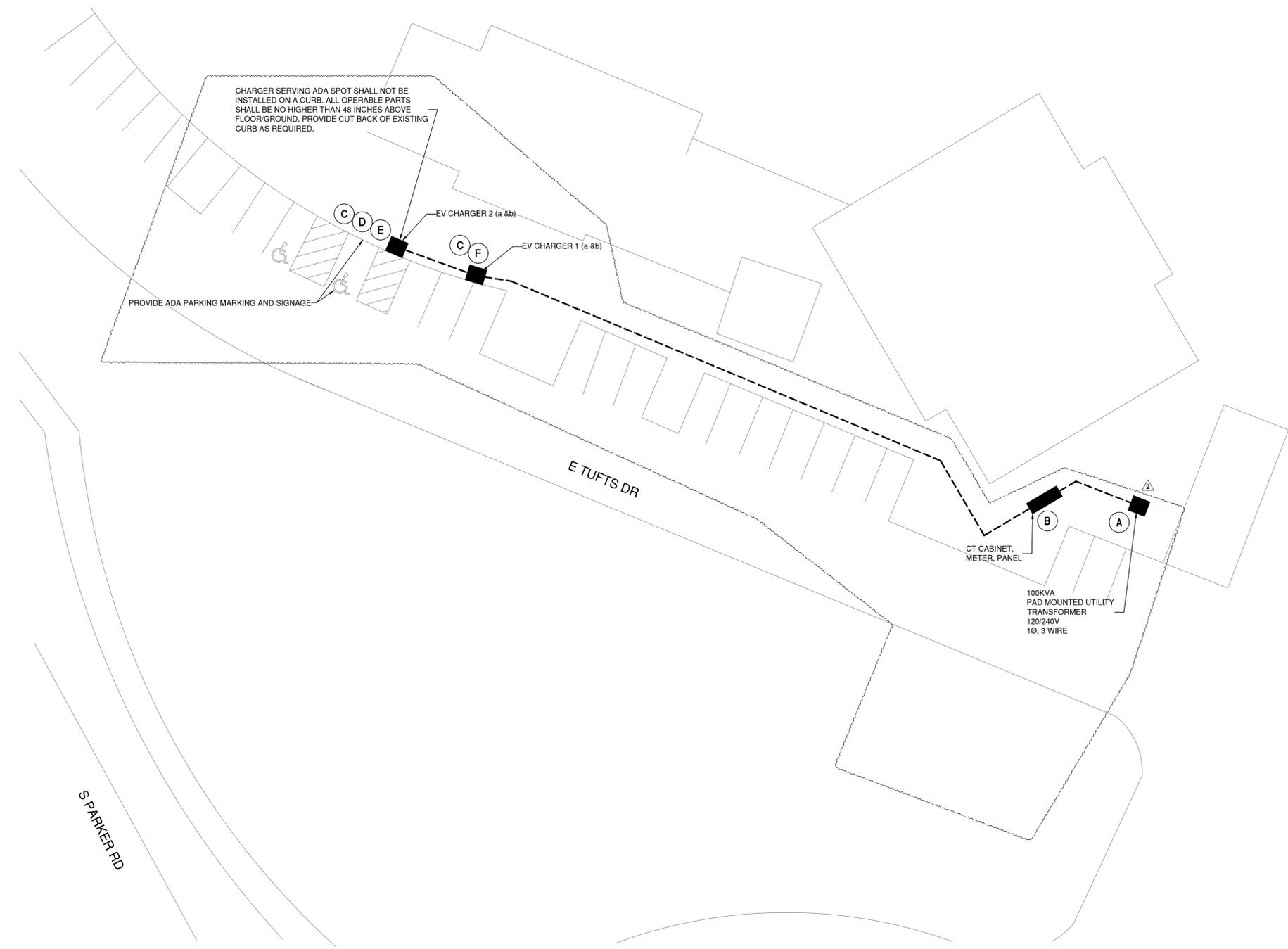
2024.10.10

DATE: 2023.02.28

DRAWING NO.:  
**E0.2**

# EV CHARGING

14012 E TUFTS DR.  
AURORA, CO 80015



DRAWN BY: KM  
CHECKED BY: LR

REVISIONS:

No.	DESCRIPTION	DATE
△	SITE REVISION	2024.04.26
△	SITE REVISION	2024.10.11

ISSUE RECORD:

No.	DESCRIPTION	DATE
1	PERMIT SET	2023.03.20

SHEET TITLE:  
**ELECTRICAL SITE LAYOUT**



2024.10.10

DATE: 2023.02.28

DRAWING NO.:  
**E0.3**