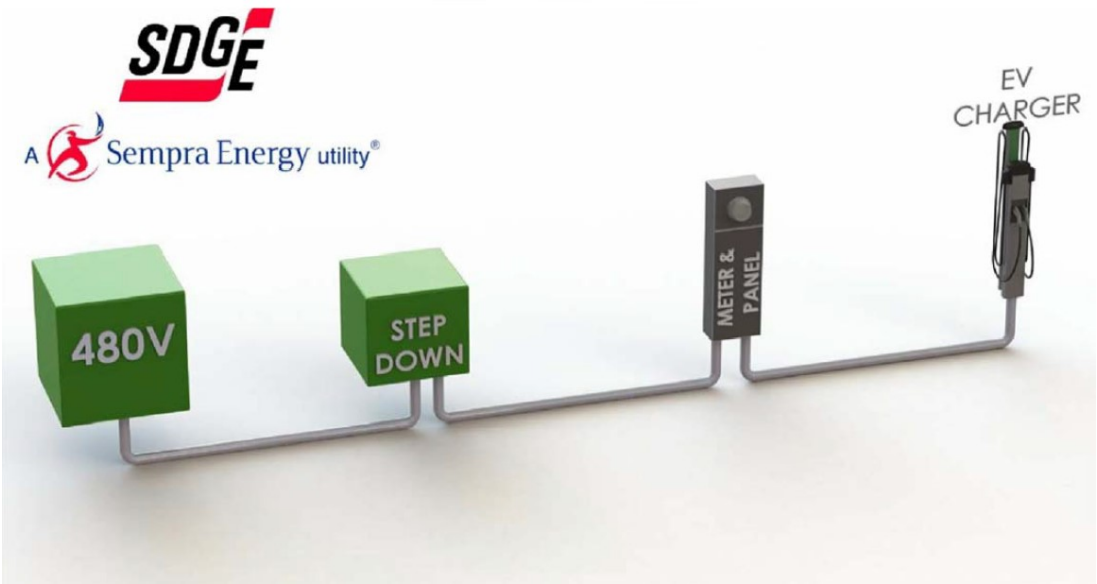
2020
SDG&E ELECTRIC VEHICLE SUPPLY EQUIPMENT STANDARDS

HISTORICAL RECORD: 10/29/2020
INTERNAL & EXTERNAL VERSION



PURPOSE:

THE ELECTRIC VEHICLE CHARGING STATION STANDARD CONTAINS INFORMATION ESSENTIAL TO THE ESTABLISHMENT OF NEW ELECTRIC VEHICLE CHARGING STATIONS OR TO REMODEL OR EXPAND EXISTING ELECTRIC VEHICLE CHARGING STATIONS IN TERRITORIES SERVICED BY SAN DIEGO GAS & ELECTRIC (SDG&E). THIS INFORMATION IS INTENDED FOR USE BY ALL INTERESTED CUSTOMERS**** AND MEMBERS OF TECHNICAL AND PROFESSIONAL TRADES CONCERNED WITH THE DESIGN AND CONSTRUCTION OF FACILITIES TO SERVE ELECTRIC VEHICLE CHARGING STATIONS.

SCOPE:

THE ELECTRIC VEHICLE CHARGING STATION STANDARD PRESENTS GENERAL INFORMATION TO HELP ENSURE THAT AN INSTALLATION WILL BE ADEQUATE FOR PRESENT AND FUTURE NEEDS. THIS MANUAL SEEKS TO OUTLINE REQUIREMENTS IN ACCORDANCE WITH THE REGULATIONS OF BOTH STATE & LOCAL AGENCIES WHO WILL CONDUCT A DETAILED PLAN REVIEW PRIOR TO PERMITTING. THIS MANUAL SERVES AS A GUIDE ONLY AND DOES NOT INCLUDE ALL REQUIREMENTS FOR PERMITTING. THIS MANUAL DETAILS FULL SDG&E PROJECT INSTALLATION, AND SOME OF THESE SECTIONS MAY NOT APPLY TO EVERY SPECIFIC EV PROJECT. APPLY AS MANY OF THESE SECTIONS AS PRACTICAL TO REFLECT SITE CONDITIONS. ALL PLANS MUST BE DESIGNED AND STAMPED BY A LICENSED PROFESSIONAL ENGINEER PRIOR TO PERMITTING. THESE STANDARDS ARE BASED ON SDG&E STANDARDS, SAFETY PRACTICES, AND ELECTRICAL CODES ENFORCED BY THE AUTHORITY HAVING JURISDICTION. GENERAL REFERENCES SHOWN BELOW** (WHEN APPLICABLE):

-2020 CALIFORNIA ELECTRICAL CODE (CEC)
-2020 CEC ARTICLE 210 (BRANCH CIRCUITS)
-2020 CEC ARTICLE 240 (OVERCURRENT PROTECTION)
-2020 CEC ARTICLE 250 (GROUNDING AND BONDING)
-2020 CEC ARTICLE 300 (GENERAL REQUIREMENTS FOR WIRING METHODS AND MATERIALS)
-2020 CEC ARTICLE 310 (CONDUCTORS FOR GENERAL WIRING)
-2020 CEC ARTICLE 400 (FLEXIBLE CORDS AND FLEXIBLE CABLES)
-2020 CEC ARTICLE 625 (ELECTRIC VEHICLE CHARGING SYSTEM)
-2019 TITLE 24, PART 6 CALIFORNIA ENERGY CODE (T24 CEC)
-2019 CALIFORNIA BUILDING CODE (CBC)
-ELECTRIC VEHICLE GUIDELINES - CAL-OPR (EVG)-250.1 (PLUG-IN ELECTRIC VEHICLES: UNIVERSAL CHARGING ACCESS GUIDELINES AND BEST PRACTICES)*
-ELECTRIC VEHICLE GUIDELINES - CAL-OPR (EVG)-812 (ON-SITE ELECTRIC VEHICLE CHARGING STATION SPACES)*
-SAE J1772 - SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) ELECTRIC VEHICLE CONDUCTIVE CHARGE COUPLER
-SAE J1772 CCS1 - SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) ELECTRIC VEHICLE CONDUCTIVE CHARGE COUPLER
-CHARGE DE MOVE (CHAdeMO) - ELECTRIC VEHICLE CONDUCTIVE CHARGE COUPLER
-UNDERWRITERS LABORATORIES CERTIFICATIONS
-SDG&E SERVICE STANDARD AND GUIDE MANUAL***
-SDG&E CONSTRUCTION STANDARDS: UNDERGROUND***
-SDG&E CONSTRUCTION STANDARDS: OVERHEAD***
-SDG&E ELECTRIC DISTRIBUTION AND DESIGN MANUAL***
-SDG&E ELECTRIC TARIFF BOOK ELECTRIC RULES

* ALL ACCESSIBILITY STANDARDS MUST BE FOLLOWED PER THE LATEST EDITION OF CBC CODE AS WELL AS LOCAL GOVERNING CODES.

**SEE CONSTRUCTION DRAWINGS FOR ADDITIONAL LOCAL CODE REFERENCES AS NECESSARY. CONSTRUCTION DRAWINGS SHALL BE DONE IN ACCORDANCE WITH THE LATEST EDITION OF THE CEC AND STATE AND LOCAL CODES AS THEY APPLY.

***SEE MOST RECENT EDITION OF SDG&E STANDARDS AT THE LINK: WWW.SDGE.COM/CONSTRUCTION-TOOLBOX

****CUSTOMERS MAY DESIGN AND INSTALL EV FACILITIES AFTER THE SDG&E SERVICE METER.

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CODE COMPLIANCES

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EV-2.20	LEVEL 2 SPECIFICATIONS
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DRAWINGS:

ALL DRAWINGS CONTAINED WITHIN THIS DOCUMENT ARE FOR ILLUSTRATION ONLY. THE CONSTRUCTION DRAWINGS ARE USED TO SPECIFY REQUIREMENTS BASED ON ACTUAL SITE CONDITIONS AND MATERIAL/EQUIPMENT TO BE USED OR SELECTED BY CUSTOMER.

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EVSE SPECIFICATIONS

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DEFINITIONS

THESE DEFINITIONS PROVIDE ADDITIONAL CLARIFICATION TO SOME OF THE TERMINOLOGY USED FREQUENTLY THROUGHOUT THESE STANDARDS.

AUTHORITY HAVING JURISDICTION (AHJ): AN ORGANIZTION, OFFICE, OR INDIVIDUAL RESPONSIBLE FOR ENFORCING THE REQUIREMENTS OF A CODE, OR STANDARD, OR FOR APPROVING EQUIPMENT, MATERIALS, AN INSTALLATION, OR A PROCEDURE.

COMMERCIAL VEHICLE: A VEHICLE WHICH IS USED OR MAINTAINED FOR THE TRANSPORTATION OF PERSONS FOR HIRE, COMPENSATION, OR PROFIT OR DESIGNED, USED, OR MAINTAINED PRIMARILY FOR THE TRANSPORTATION OF PROPERTY.

CURRENT CARRYING CONDUCTOR: A CONDUCTOR WITHIN THE ELECTRICAL SYSTEM THAT IS DESIGNATED TO NORMALLY CARRY CURRENT FROM SOURCE TO LOAD. THIS INCLUDES THE LINE WIRES OF ANY INSTALLATION, THE NEUTRAL OF A 3 PHASE 4 WIRE SYSTEM WITH HIGH HARMONIC LOADS, THE NEUTRAL WIRE OF A 1 POLE, OR 2 POLE CIRCUIT OF A 3 PHASE 4 WIRE SYSTEM.

DIRECT CURRENT FAST CHARGER (DCFC): AN EV CHARGER THAT CONVERTS AC POWER TO DC WITHIN THE CHARGING STATION AND DELIVERS DC POWER DIRECTLY TO THE BATTERY.

DISCONNECTING MEANS: A DEVICE, OR GROUP OF DEVICES, OR OTHER MEANS BY WHICH THE CONDUCTORS OF A CIRCUIT CAN BE DISCONNECTED FROM THEIR SOURCE OF SUPPLY.

DUAL: AN EVSE WITH TWO OUTPUT CONNECTIONS.

ELECTRIC VEHICLE (EV): ANY VEHICLE WHICH USES ONE, OR MORE ELECTRIC MOTORS FOR PROPULSION.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE): EQUIPMENT DEDICATED TO SUPPLYING ELECTRIC ENERGY TO RECHARGE THE BATTERIES OF AN ELECTRIC VEHICLE.

EVSE LEVEL: A RATING OF EVSE'S, INDICATING VOLTAGE AND AMPERAGE RATINGS OF THE EQUIPMENT RANGING FROM LEVELS 1, 2, AND DC FAST CHARGER. SEE SPECIFIC EVSE LEVEL SPECIFICATIONS FOR ADDITIONAL DETAILS.

GATEWAY: A COMMUNICATION HUB OFTEN REQUIRED BY EVSE MANUFACTURERS TO COLLECT AGGREGATE USAGE DATA FROM A GROUP OF CHARGERS. SEE SPECIFIC MANUFACTURER'S RECOMMENDATIONS FOR GATEWAY INSTALLATION AND LOCATIONS.

GROUNDED (GROUNDING): CONNECTED (CONNECTING) TO GROUND OR TO A CONDUCTIVE BODY THAT EXTENDS THE GROUND CONNECTION.

HANDHOLE: AN ENCLOSURE FOR USE IN UNDERGROUND SYSTEM, PROVIDED WITH AN OPEN OR CLOSED BOTTOM, AND SIZED TO ALLOW PERSONNEL TO REACH INTO, BUT NOT ENTER, FOR THE PURPOSE OF INSTALLING, OPERATING, OR MAINTAINING EQUIPMENT OR WIRING OR BOTH.

KILO AMPERE INTERRUPTING CAPACITY (KAIC) RATING: REFERS TO THE MEASUREMENTS OF THE ABILITY OF AN OCPD TO WITHSTAND A SHORT CIRCUIT, OR GROUND FAULT.

LOAD CENTER: PLUG IN BREAKER PANEL THAT OPERATES AT UP TO 240V 1 PHASE OR 3 PHASE, RATED UP TO 600A.

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METER PEDESTAL/PANEL: FREE STANDING EQUIPMENT (PEDESTAL) OR WALL MOUNTED PANEL THAT INCLUDES A METERING COMPARTMENT WITH CURRENT TRANSFORMERS AS NECESSARY AND A MAIN SERVICE RATED OCPD. PEDESTAL MAY HAVE AN INTEGRAL PANELBOARD DISTRIBUTION SECTION, PANEL MAY REQUIRE A SEPERATE PANELBOARD. OPERATES AT UP TO 600V, AND WILL TYPICALLY BE RATED AT UP TO 600A.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA): DEFINES STANDARDS USED IN NORTH AMERICA FOR VARIOUS GRADES OF ELECTRICAL ENCLOSURES TYPICALLY USED IN INDUSTRIAL APPLICATIONS.

OVERCURRENT: ANY CURRENT IN EXCESS OF THE RATED CURRENT OF EQUIPMENT OR THE AMPACITY OF A CONDUCTOR. IT MAY RESULT FROM OVERLOAD, SHORT CIRCUIT, OR GROUND FAULT.

OVERCURRENT PROTECTION DEVICE (OCPD): A DEVICE CAPABLE OF PROVIDING PROTECTION FOR SERVICE, FEEDER, AND BRANCH CICUITS AND EQUIPMENT OVER THE FULL RANGE OF OVERCURRENTS BETWEEN ITS RATED CURRENTS AND ITS INTERRUPTING RATING.

PANELBOARD: WALL MOUNTED, FLUSH MOUNTED, OR FLOOR MOUNTED ELECTRICAL PANEL WITH BOLT ON BREAKER CONSTRUCTION. OPERATES AT UP TO 600V, AND CAN BE RATED UP TO 1200A ALTHOUGH TYPICALLY EVSE PROJECTS WILL USE NO HIGHER THAN 600A FOR THIS CONSTRUCTION.

PASSENGER VEHICLE: A PASSENGER CAR IS A ROAD MOTOR VEHICLE, OTHER THAN A MOTOR CYCLE, INTENDED FOR THE CARRIAGE OF PASSENGERS AND DESIGNED TO SEAT NO MORE THAN NINE PERSONS (INCLUDING THE DRIVER).

POINT OF CONNECTION (POC): THE LOCATION AT WHICH A PROJECT ESTABLISHES ELECTRICAL CONNECTION TO THE EXISTING UTILITY POWER GRID.

POWER CENTER: ELECTRICAL EQUIPMENT DEDICATED TO HOUSING SERVICE METERING, DISTRIBUTION SECTIONS, OCPD'S, OR ALL OF THESE FOR THE PURPOSE OF DISTRIBUTING POWER TO INDIVIDUAL EVSE'S. TYPICAL CONSTRUCTIONS INCLUDE LOAD CENTERS, PANEL BOARDS, METER PEDESTALS AND SWITCHBOARDS.

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PULL BOX (JUNCTION BOX): A SURFACE MOUNTED ENCLOSURE FOR USE IN AN ELECTRICAL SYSTEM, PROVIDED WITH AN OPEN FACE, AND SIZED TO ALLOW PERSONNEL TO REACH INTO FOR THE PURPOSE OF INSTALLING, OPERATING, OR MAINTAINING EQUIPMENT OR WIRING OR BOTH.

SINGLE: AN EVSE WITH A SINGLE OUTPUT CONNECTION, INTENDED TO CHARGE ONE VEHICLE AT A TIME.

SWITCHBOARD: FREE STANDING BOARD CONSTRUCTION CONTAINING SERVICE METERING COMPARTMENT, SERVICE RATED MAIN OCPD, AND DISTRIBUTION SECTIONS WITH BOLT ON BREAKERS OR FUSED DISCONNECTS AS REQUIRED. OPERATES AT UP TO 600V AND IS RATED AS LOW AS 800A AND UP TO 4000A.

WORKING SPACE: ACCESS AND WORKING SPACE SHALL BE PROVIDED AND MAINTAINED ABOUT ALL ELECTRICAL EQUIPMENT TO PERMIT READY AND SAFE OPERATION AND MAINTENANCE OF SUCH EQUIPMENT.

REFERENCES:

a. SEE CEC ARTICLE 100 DEFINITIONS, MOST RECENT EDITION.

b. SEE CEC ARTICLE 110 REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, MOST RECENT EDITION.

c. SEE SDG&E STANDARD OH 102 PEDESTRIAN PATH OF TRAVEL AND ACCESSIBILITY.

d. SEE SDG&E STANDARD UG 3002 PEDESTRIAN PATH OF TRAVEL AND ACCESSIBILITY.

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EVSE SYMBOL LEGEND:

LEVEL 2 EVSE

DC FAST CHARGER EVSE

UTILITY/ DRY-TYPE TRANSFORMER 3 PHASE

UTILITY/ DRY-TYPE TRANSFORMER 1 PHASE

POWER CENTER PEDESTAL

POWER CENTER FREE STANDING GEAR

POWER CENTER WALL MOUNTED

CLEAR AND LEVEL WORKING SPACE

GROUNDING

CIRCUIT BREAKER

XP #OF POLES
XXXAT AMPS TRIP
XXXAF AMPS FRAME

DISCONNECT SWITCH

– — — – EXISTING EQUIPMENT/LINEWORK

———— NEW EQUIPMENT/LINEWORK

OR EVSE WITH INTERNAL GATEWAY

EXTERNAL GATEWAY

CELLULAR REPEATER

RECEIVING ANTENNA

TRANSMITTING ANTENNA

CELLULAR MODEM & ETHERNET SWITCH

Ø PHASE

INTERNATIONAL SYMBOL OF ACCESSIBILITY

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SYMBOL LEGEND

LEVEL 2 ELECTRICAL VEHICLE SERVICE EQUIPMENT (EVSE):

LEVEL 2 ELECTRIC VEHICLE SERVICE EQUIPMENT UTILIZES TYPICAL VOLTAGE RATING OF 208 VOLTS AC (VAC) 1-PHASE AND 240 VOLTS AC (VAC) 1-PHASE. BRANCH CIRCUIT RATING SUPPLYING LEVEL 2 ELECTRIC VEHICLE SERVICE EQUIPMENT MUST BE RATED AT A MINIMUM OF 40 AMPS (MAXIMUM CURRENT DRAW OF 32 AMPS) AND MAY REACH AS HIGH AS 80 AMPS. SEE CONSTRUCTION DRAWINGS FOR SITE SPECIFIC DETAILS RELATED TO WIRE SIZE & BREAKER RATING (BASED ON VOLTAGE DROP & DERATING CALCULATIONS). SEE MANUFACTURER'S SPECIFICATIONS.

LEVEL 2 ELECTRIC VEHICLE SERVICE EQUIPMENT TECHNICAL SPECIFICATIONS:

INCOMING VOLTAGE AND CONNECTIONS:	240 VAC, SINGLE PHASE, 3-WIRE - LINE 1, LINE 2 AND GROUND (240V 3-PHASE DELTA NOT TO BE USED DUE TO HIGH LEG ON ONE PHASE) 208 VAC, 1-PHASE, 3-WIRE - ANY TWO PHASES AND GROUND (REFER TO CONSTRUCTION DRAWINGS FOR BALANCE DETAILS)
INPUT FREQUENCY:	60 Hz
INCOMING CURRENT:	30 AMPS - 80 AMPS (CHARGER SPECIFIC)
OUTPUT VOLTAGE:	240V AC / 208V AC
OUTPUT FREQUENCY:	60 Hz
OUTPUT CURRENT:	30 - 80 AMPS (MAXIMUM, CONTINUOUS). 60 AMPS OR MORE REQUIRES A READILY ACCESSIBLE DISCONNECTING MEANS. SEE CEC ARTICLE 625.43 - DISCONNECTING MEANS.
INTERLOCKED POWER OUTPUT:	YES
STATUS INDICATORS:	YES - POWER, CHARGING, FAULT, SERVICE (ADDITIONAL INDICATORS VARY BY MFG.)
ELECTRIC VEHICLE CONNECTOR:	J1772, CONNECTER SHALL BE GROUNDED IN ACCORDANCE WITH CEC ARTICLES 250, AND 625.
CORD LENGTH:	18 FEET MINIMUM, 25 FEET MAXIMUM.
ENVIRONMENT:	OPERATING TEMPERATURE: -30 TO 50 CELSIUS (-22 TO 122 FAHRENHEIT) STORAGE TEMPERATURE: -40 TO 70 CELSIUS (-40 TO 158 FAHRENHEIT) ENCLOSURE RATING: MINIMUM NEMA 3R

REFERENCES:

a. SEE CEC ARTICLE 250 GROUNDING AND BONDING, MOST RECENT EDITION.

b. SEE CEC ARTICLE 625 ELECTRIC VEHICLE POWER TRANSFER SYSTEM, MOST RECENT EDITION.

c. SOCIETY OF AUTOMOB1ILE ENGINEERS (SAE) J1772.

d. UNDERWRITERS LABORATORIES (UL) 2231 PERSONNEL PROTECTION SYSTEMS FOR ELECTRIC VEHICLE CHARGING CIRCUITS.

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DC FAST CHARGER ELECTRICAL VEHICLE SERVICE EQUIPMENT (EVSE):

DC FAST CHARGER ELECTRIC VEHICLE SERVICE EQUIPMENT UTILIZES TYPICAL VOLTAGE RATING OF 480 VOLTS, OR 208 VOLTS AC (VAC) 3-PHASE. BRANCH CIRCUIT RATING SUPPLYING DC FAST CHARGER ELECTRIC VEHICLE SERVICE EQUIPMENT MUST BE RATED AT A MINIMUM OF 30 AMPS (MAXIMUM CURRENT DRAW OF 24 AMPS) AND MAY REACH AS HIGH AS 422 AMPS. SEE CONSTRUCTION DRAWINGS FOR SITE SPECIFIC DETAILS RELATED TO WIRE SIZE & BREAKER RATING (BASED ON VOLTAGE DROP & DERATING CALCULATIONS). SEE MANUFACTURER'S SPECIFICATIONS.

DC FAST CHARGER ELECTRIC VEHICLE SERVICE EQUIPMENT TECHNICAL SPECIFICATIONS:

INCOMING VOLTAGE AND CONNECTIONS:	480 VAC, THREE PHASE, 3-WIRE - LINE 1, LINE 2, LINE 3 AND GROUND 208 VAC, THREE PHASE, 3-WIRE - LINE 1, LINE 2, LINE 3 AND GROUND (NEUTRAL CONFIGURATION NOT TYPICALLY REQUIRED, CHARGER SPECIFIC) 150V LINE TO GROUND OR MORE REQUIRES A READILY ACCESIBLE DISCONNECTING MEANS. SEE CEC ARTICLE 625.43 - DISCONNECTING MEANS.
INPUT FREQUENCY:	60 Hz
INCOMING CURRENT:	24 AMPS - 422 AMPS (CHARGER SPECIFIC)
OUTPUT VOLTAGE:	200V-1000V DC (TYPICAL RANGE, SEE SPECIFIC CHARGERS).
OUTPUT FREQUENCY:	NA
OUTPUT CURRENT:	20 - 1000 AMPS (TYPICAL VALUES, SEE SPECIFIC CHARGER CUTSHEETS). 60 AMPS OR MORE REQUIRES A READILY ACCESSIBLE DISCONNECTING MEANS. SEE CEC ARTICLE 625.43 - DISCONNECTING MEANS.
INTERLOCKED POWER OUTPUT:	YES
STATUS INDICATORS:	YES - POWER, CHARGING, FAULT, SERVICE (ADDITIONAL INDICATORS VARY BY MFG.)
ELECTRIC VEHICLE CONNECTOR:	J1772 CCS, CHADEMO CONNECTER SHALL BE GROUNDED IN ACCORDANCE WITH CEC ARTICLES 250, AND 625.
CORD LENGTH:	18 FEET MINIMUM, 25 FEET MAXIMUM.
ENVIRONMENT:	OPERATING TEMPERATURE: -30 TO 50 CELSIUS (-22 TO 122 FAHRENHEIT) STORAGE TEMPERATURE: -40 TO 70 CELSIUS (-40 TO 158 FAHRENHEIT) ENCLOSURE RATING: MINIMUM NEMA 3R

REFERENCES:

a. SEE CEC ARTICLE 250 GROUNDING AND BONDING, MOST RECENT EDITION.

b. SEE CEC ARTICLE 625 ELECTRIC VEHICLE POWER TRANSFER SYSTEM, MOST RECENT EDITION.

c. SOCIETY OF AUTOMOBILE ENGINEERS (SAE) J1772.

d. CHARGE DE MOVE (CHADEMO) CONNECTOR.

e. UNDERWRITERS LABORATORIES (UL) 2231 PERSONNEL PROTECTION SYSTEMS FOR ELECTRIC VEHICLE CHARGING CIRCUITS.

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DC FAST CHARGER SPECIFICATIONS

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TYPICAL CHARGERS:

THE FOLLOWING LINK IS A LIST OF APPROVED EVSE MAKES, AND MODELS, AND THEIR LOAD CHARACTERISTICS. THESE CHARGERS WILL BE THE BASIS OF EVSE DESIGNS, AND THIS LIST SHOULD BE REFERENCED BY THOSE INTERESTED IN INSTALLATIONS, OR DESIGNS OF THIS TYPE.

REFERENCES:

a. APPROVED LIST OF LEVEL 2 AND DC FAST CHARGER MAKES AND MODELS BY SDG&E.

HTTPS://WWW.SDGE.COM/SITES/DEFAULT/FILES/DOCUMENTS/SDGE_APPROVED_PRODUCT_LISTING.XLSX

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METERING PRACTICES

THESE ARE THE DIFFERENT METHODS AND COMBINATIONS OF METERING THAT WILL BE SEEN ON TYPICAL EV PROJECTS.

GROUP CHECK METER: THE GROUP CHECK METER OPTION IS REQUIRED FOR INSTALLATIONS IN WHICH CASE SDG&E HAS AN AGREEMENT WITH THE CHARGER MANUFACTURER, WHICH ALLOWS INDIVIDUAL CHARGER'S POWER CONSUMPTION TO BE RECORDED, AND SUBMITTED BACK TO SDG&E FOR DATA COLLECTION.

INDIVIDUAL METERING: THE INDIVIDUAL METERING OPTION COVERS CHARGERS THAT DO NOT HAVE THE AGREEMENT AS DESCRIBED ABOVE WITH SDG&E. THESE SITES ALSO HAVE A GROUP CHECK METER, AND A DEDICATED INDIVIDUAL SOCKET FOR EACH EVSE.

PRIMARY METERING: PRIMARY METERING WILL BE CONSIDERED FOR SITES WITH LARGE NUMBERS OF EVSE. SEE EV-3.10 FOR A BREAKDOWN OF THE CONDITIONS REQUIRED TO BEGIN CONSIDERING THIS OPTION. PROVISIONS FOR THE FUTURE ADDITIONS OF PRIMARY METERING MAY BE ADDED ON SITE, TO BE ENERGIZED AND IN SERVICE NO LATER THAN 10 YEARS IN THE FUTURE.

REFERENCES:

a. SEE SDG&E STANDARD SG 500 ELECTRIC SERVICE AND METERING EQUIPMENT.

b. SEE SDG&E STANDARD EV-2.40 TYPICAL CHARGERS

c. SEE SDG&E STANDARD EV-3.10 - EV-3.11 LOAD SUMMARY GUIDE

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CUSTOMER GENERATION:

EVSE CUSTOMER GENERATION CHARGES ELECTRIC VEHICLES DURING OFF PEAK HOURS, AND TO DISCHARGE AN ELECTRIC VEHICLES BATTERY CAPACITY DURING HOURS OF VEHICLE NON-USAGE AND ON PEAK DEMAND HOURS BACK TO THE GRID. ENERGY MANAGEMENT SCHEMES WILL VARY BASED ON THE MANUFACTURER, THESE ARE TO BE COORDINATED WITH THE CUSTOMERS BY THE MANUFACTURER. THE CUSTOMER GENERATION SHALL COMPLY WITH THE FOLLOWING:

A. CUSTOMER SERVICE TRANSFORMERS MAY NOT HAVE MORE THAN ONE MEANS OF GENERATION. IF A CUSTOMER HAS EXISTING PHOTOVOLTAIC, OR ADDITIONAL CO-GENERATION ON SITE, AN ADDITIONAL TRANSFORMER WILL BE REQUIRED.

B. SDG&E SERVICE GUIDE 800.

C. SDG&E ELECTRIC TARIFF BOOK ELECTRIC RULE 21.

D. SERVICE EQUIPMENT MUST BE FULLY RATED FOR THE SUM OF MAXIMUM AVAILABLE SECONDARY FAULT CURRENT OF DESIGN MANUAL TABLE 1, OR 2 AS APPLICABLE, AND THE MAXIMUM AVAILABLE FAULT CURRENTS OF THE AC SIDE OF CUSTOMER GENERATION EVSE (INFORMATION FROM MANUFACTURER).

E. CUSTOMER GENERATION APPLICATION WITH NET ENERGY METERING.

REFERENCES:

a. SEE SDG&E STANDARD SG 800 CUSTOMER GENERATION.

b. SEE SDG&E ELECTRIC TARIFF BOOK ELECTRIC RULE 21.

c. SEE SDG&E STANDARD DM 6100 SECTIONALIZING AND PROTECTION.

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EVSE SHORT CIRCUIT RATING:

ELECTRIC VEHICLE CHARGING STATIONS SHALL BE EQUIPPED TO HANDLE THE AVAILABLE FAULT CURRENTS IN THE ELECTRICAL SYSTEM THAT POWERS THEM BY ONE OF THE FOLLOWING METHODS:

A. EVSE SHALL BE FULLY RATED TO THE POWER CENTER SERVICE RATING AS DEFINED IN DM 6142.

B. EVSE SHALL BE SERIES RATED TO THE BRANCH OCPD IN THE ASSOCIATED POWER CENTER AS DEFINED BY CEC SECTION 240.86.

C. THE ENGINEER OF RECORD SHALL PROVIDE A CALCULATION DONE BY AN APPROPRIATE SOFTWARE OR OTHER MEANS TO SHOW THAT AVAILABLE FAULT CURRENTS AT THE CHARGER LOCATIONS IS LOWER THAN THE RATING OF SAID EVSE. SUBJECT TO REVIEW AND APPROVAL BY THE AHJ.

D. THE EVSE MANUFACTURER SHALL PROVIDE PROOF THAT EVSE EQUIPMENT IS RATED TO WITHSTAND AVAILABLE FAULT CURRENTS.

REFERENCES:

a. SEE SDG&E STANDARD DM 6142 SECONDARY FAULT CURRENT CALCULATIONS.

b. SEE CEC 240 OVERCURRENT PROTECTION, MOST RECENT EDITION.

c. SEE SDG&E STANDARD EV-5.00 SINGLE LINE DIAGRAMS.

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EV-3.40	LOAD SUMMARY DC FAST CHARGER 480V
EV-3.50	LOAD SUMMARY LEVEL 2 & DC FAST CHARGER 208V
EV-3.60	LOAD SUMMARY LEVEL 2 & DC FAST CHARGER 480V

DRAWINGS:

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

EVSE LOAD SUMMARY

EVSE LOAD SUMMARY GUIDE:

THIS GUIDE ILLUSTRATES THE MAXIMUM CONNECTED LOAD ALLOWED ON POWER CENTERS. THE SELECTION AND COUNT OF DIFFERENT EVSE WILL DETERMINE THE SIZE AND CONSTRUCTION OF THE REQUIRED POWER CENTER. IF THE CUSTOMER DESIRES PROVISIONS FOR FUTURE INSTALLATIONS OUT TO 10 YEARS AWAY THESE LOADS MAY BE TAKEN INTO CONSIDERATION WHEN SIZING THE POWER CENTERS AS WELL, WITH THE APPROVAL AND AGREEMENT OF SDG&E. MAIN CIRCUIT BREAKERS OF POWER CENTERS SHALL MATCH AMPERE RATING AND AIC RATING OF POWER CENTERS WITH 80% RATED BREAKERS BEING STANDARD BUT CAN BE UPSIZED TO 100% WITH THE APPROVAL AND AGREEMENT OF SDG&E TO AVOID INCREASING POWER CENTER SIZE.

TABLE EV-3.10

POWER CENTER VOLTAGE	POWER CENTER AMPERAGE	TOTAL MAX CONNECTED AMPS	TOTAL MAX CONNECTED KVA	POWER CENTER CONSTRUCTION
240V 1Ø 3W	200A	160A	38.40KVA	PEDESTAL/WALL
	400A	320A	76.80KVA	PEDESTAL/WALL
208V 3Ø 4W	200A	160A	57.64KVA	PEDESTAL/WALL
	400A	320A	115.28KVA	PEDESTAL/WALL
	600A	480A	172.93KVA	PEDESTAL/WALL
	800A	640A	230.57KVA	FREESTANDING GEAR
	1200A	960A	345.85KVA	FREESTANDING GEAR
	1600A	1280A	460.80KVA	FREESTANDING GEAR
	2000A	1600A	576.42KVA	FREESTANDING GEAR
	2500A	2000A	720.00KVA	FREESTANDING GEAR
	3000A	2400A	864.64KVA	FREESTANDING GEAR
	3500A	2800A	1008.00KVA	FREESTANDING GEAR
	4000A	3200A	1152.85KVA	FREESTANDING GEAR
480V 3Ø 4W	200A	160A	133.02KVA	PEDESTAL/WALL
	400A	320A	266.04KVA	PEDESTAL/WALL
	600A	480A	399.06KVA	PEDESTAL/WALL
	800A	640A	532.08KVA	FREESTANDING GEAR
	1200A	960A	798.12KVA	FREESTANDING GEAR
	1600A	1280A	1063.68KVA	FREESTANDING GEAR
	2000A	1600A	1330.21KVA	FREESTANDING GEAR
	2500A	2000A	1662.00KVA	FREESTANDING GEAR
	3000A	2400A	1995.32KVA	FREESTANDING GEAR
	3500A	2800A	2326.80KVA	FREESTANDING GEAR
	4000A	3200A	2660.43KVA	FREESTANDING GEAR

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PRIMARY METERING:

PRIMARY METERING, OR FUTURE PROVISIONS TO INSTALL SUCH IN THE NEXT 10 YEARS MAY BE CONSIDERED PER THE PROVISIONS OF SG 012.

REFERENCES:

a. SEE SDG&E STANDARD SG 012 ELECTRIC SERVICE POLICIES NEW PROJECT TYPES.

b. SEE SDG&E STANDARD DM 5621 INITIAL TRANSFORMER DESIGN LOADING FOR BALANCED LOADS.

c. SEE SDG&E STANDARD DM 6100 SECTIONALIZING AND PROTECTION.

d. SEE SDG&E STANDARD EV-6.30 PRIMARY METERING.

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EVSE LOAD SUMMARY GUIDE:

THE FOLLOWING IS AN EXAMPLE OF POSSIBLE COMBINATIONS OF AN SDG&E INSTALLATION WITH PUBLIC ACCESS WITH LEVEL 2 EVSE ONLY. THERE ARE MULTIPLE COMBINATIONS AND AS SUCH THE SPECIFIC CHARGERS TO BE USED FOR ANY PROJECT MUST BE USED WHEN CALCULATING THE REQUIRED POWER CENTER, AND TRANSFORMER SIZES AS REQUIRED.

EXAMPLE: TABLE EV-3.20

EVSE LEVEL 2 (240V) MANUFACTURER	EVSE LEVEL 2 (240V) MODEL	CHARGER TOTAL COUNT	KVA PER CHARGER	KVA SUMMATION
CHARGEPOINT	CT4000	1	7.2KVA	7.2KVA
CHARGEPOINT	CT4000	2	7.2KVA	14.4KVA
CHARGEPOINT	CT4000	3	7.2KVA	21.6KVA
CHARGEPOINT	CT4000	4	7.2KVA	28.8KVA
CHARGEPOINT	CT4000	5	7.2KVA	36KVA
CHARGEPOINT	CPF50	6	12KVA	48KVA
CHARGEPOINT	CPF50	7	12KVA	60KVA
CHARGEPOINT	CPF50	8	12KVA	72KVA
TOTAL FOR ALL 8 CHARGERS				72KVA
72 KVA / 240V = 300.00A				
BASED ON THE ABOVE CALCULATION, AND THE TABLE IN EV-3.10, THE MINIMUM POWER CENTER REQUIRED TO SERVICE THESE CHARGERS IS A 400A 240V 1Ø 3W.				

REFERENCES:

a. SEE SDG&E STANDARD DM 5621 INITIAL TRANSFORMER DESIGN LOADING FOR BALANCED LOADS.

b. SEE SDG&E STANDARD EV-2.20 LEVEL 2 SPECIFICATIONS, EV-2.30 DC FAST CHARGER SPECIFICATIONS, EV-2.40 TYPICAL CHARGERS.

c. SEE SDG&E STANDARD EV-3.10 LOAD SUMMARY GUIDE.

d. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

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EXAMPLE: TABLE EV-3.21

EVSE LEVEL 2 (208V) MANUFACTURER	EVSE LEVEL 2 (208V) MODEL	CHARGER TOTAL COUNT	KVA PER CHARGER	KVA SUMMATION
CHARGEPOINT	CPF50	1	10.4KVA	10.4KVA
CHARGEPOINT	CPF50	2	10.4KVA	20.8KVA
CHARGEPOINT	CPF50	3	10.4KVA	31.2KVA
CHARGEPOINT	CPF50	4	10.4KVA	41.6KVA
CHARGEPOINT	CPF50	5	10.4KVA	52.0KVA
CHARGEPOINT	CPF50	6	10.4KVA	62.4KVA
CHARGEPOINT	CPF50	7	10.4KVA	72.8KVA
CHARGEPOINT	CPF50	8	10.4KVA	83.2KVA
CHARGEPOINT	CPF50	9	10.4KVA	93.6KVA
CHARGEPOINT	CPF50	10	10.4KVA	104.0KVA
TOTAL FOR ALL 8 CHARGERS				104.0KVA
104.0KVA / (√3 * 208V) = 288.67A				
BASED ON THE ABOVE CALCULATION, AND THE TABLE IN EV-3.10 THE POWER CENTER REQUIRED TO SERVICE THESE CHARGERS IS A 400A 208V 3Ø 4W.				

REFERENCES:

a. SEE SDG&E STANDARD DM 5621 INITIAL TRANSFORMER DESIGN LOADING FOR BALANCED LOADS.

b. SEE SDG&E STANDARD EV-2.20 LEVEL 2 SPECIFICATIONS, EV-2.30 DC FAST CHARGER SPECIFICATIONS, AND EV-2.40 TYPICAL CHARGERS.

c. SEE SDG&E STANDARD EV-3.10 LOAD SUMMARY GUIDE.

d. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

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EVSE LOAD SUMMARY GUIDE:

THE FOLLOWING IS AN EXAMPLE OF POSSIBLE COMBINATIONS OF AN SDG&E INSTALLATION WITH PRIVATE ACCESS WITH DC FAST CHARGERS ONLY. THERE ARE MULTIPLE COMBINATIONS AND AS SUCH THE SPECIFIC CHARGERS TO BE USED FOR ANY PROJECT MUST BE USED WHEN CALCULATING THE REQUIRED POWER CENTER, AND TRANSFORMER SIZES AS REQUIRED.

EXAMPLE: TABLE EV-3.30

DCFC (208V) MANUFACTURER	DCFC (208V) MODEL	CHARGER TOTAL COUNT	KVA PER CHARGER	KVA SUMMATION
BTCPOWER	L3R-25-208-CS	1	25KVA	25KVA
BTCPOWER	L3R-25-208-CS	2	25KVA	50KVA
BTCPOWER	L3R-25-208-CS	3	25KVA	75 KVA
BTCPOWER	L3R-25-208-CS	4	25KVA	100KVA
BTCPOWER	L3R-50-208-CS	5	50KVA	150KVA
BTCPOWER	L3R-50-208-CS	6	50KVA	200KVA
TOTAL FOR ALL 6 CHARGERS				200KVA
200KVA / (√3 * 208V) = 555.14A				
BASED ON THE ABOVE CALCULATION, AND THE TABLE IN EV-3.10 THE POWER CENTER REQUIRED TO SERVICE THESE CHARGERS IS AN 800A 208V 3Ø 4W.				

REFERENCES:

a. SEE SDG&E STANDARD DM 5621 INITIAL TRANSFORMER DESIGN LOADING FOR BALANCED LOADS.

b. SEE SDG&E STANDARD EV-2.20 LEVEL 2 SPECIFICATIONS, EV-2.30 DC FAST CHARGER SPECIFICATIONS, AND EV-2.40 TYPICAL CHARGERS.

c. SEE SDG&E STANDARD EV-3.10 LOAD SUMMARY GUIDE.

d. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

LOAD SUMMARY DC FAST CHARGER 208V

EV-3.30

EVSE LOAD SUMMARY GUIDE:

THE FOLLOWING IS AN EXAMPLE OF POSSIBLE COMBINATIONS OF AN SDG&E INSTALLATION WITH PRIVATE ACCESS WITH DC FAST CHARGERS ONLY. THERE ARE MULTIPLE COMBINATIONS AND AS SUCH THE SPECIFIC CHARGERS TO BE USED FOR ANY PROJECT MUST BE USED WHEN CALCULATING THE REQUIRED POWER CENTER, AND TRANSFORMER SIZES AS REQUIRED.

EXAMPLE: TABLE EV-3.40

DCFC (480V) MANUFACTURER	DCFC (480V) MODEL	CHARGER TOTAL COUNT	KVA PER CHARGER	KVA SUMMATION
ABB	TERRA HP 350KW	1	350KVA	350KVA
ABB	HVC-150C	2	100KVA	450KVA
ABB	HVC-150C	3	100KVA	550KVA
ABB	TERRA 54	4	50KVA	600KVA
ABB	TERRA 54	5	50KVA	650KVA
ABB	TERRA 54	6	50KVA	700KVA
ABB	TERRA 54	7	50KVA	750KVA
ABB	TERRA 54	8	50KVA	800KVA
ABB	TERRA 54	9	50KVA	850KVA
ABB	TERRA 54	10	50KVA	900KVA
TOTAL FOR ALL 10 CHARGERS				900KVA
900KVA / ($\sqrt{3}$ * 480V) = 1082.53A				
BASED ON THE ABOVE CALCULATION, AND THE TABLE IN EV-3.10 THE POWER CENTER REQUIRED TO SERVICE THESE CHARGERS IS A 1600A 480V 3Ø 4W.				

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REFERENCES:

a. SEE SDG&E STANDARD DM 5621 INITIAL TRANSFORMER DESIGN LOADING FOR BALANCED LOADS

b. SEE SDG&E STANDARD EV-2.20 LEVEL 2 SPECIFICATIONS, EV-2.30 DC FAST CHARGER SPECIFICATIONS, AND EV-2.40 TYPICAL CHARGERS.

c. SEE SDG&E STANDARD EV-3.10 LOAD SUMMARY GUIDE.

d. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

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EXAMPLE: EV-3.50

DCFC (208V) MANUFACTURER	DCFC (208V) MODEL	CHARGER TOTAL COUNT	KVA PER CHARGER	KVA SUMMATION
BTCPOWER	L3R-50-208-CS	1	50KVA	50.00KVA
BTCPOWER	L3R-50-208-CS	2	50KVA	100.00KVA
BTCPOWER	L3R-50-208-CS	3	50KVA	150.00KVA
BTCPOWER	L3R-50-208-CS	4	50KVA	200.00KVA
LEVEL 2 (208V) MANUFACTURER	LEVEL 2 (208V) MODEL	CHARGER TOTAL COUNT	KVA PER CHARGER	KVA SUMMATION
BTCPOWER	L2W-70-240-16	5	14.56KVA	214.56KVA
BTCPOWER	L2W-70-240-16	6	14.56KVA	229.12KVA
BTCPOWER	L2W-70-240-16	7	14.56KVA	243.68KVA
BTCPOWER	L2W-70-240-16	8	14.56KVA	258.24KVA
BTCPOWER	L2W-70-240-16	9	14.56KVA	272.80KVA
BTCPOWER	L2W-70-240-16	10	14.56KVA	287.36KVA
TOTAL FOR ALL 10 CHARGERS				287.36KVA
287.36KVA / (√3 * 208V) = 797.63A				
BASED ON THE ABOVE CALCULATION, AND THE TABLE IN EV-3.10 THE POWER CENTER REQUIRED TO SERVICE THESE CHARGERS IS A 1200A 480V 3Ø 4W.				

REFERENCES:

a. SEE SDG&E STANDARD DM 5621 INITIAL TRANSFORMER DESIGN LOADING FOR BALANCED LOADS.

b. SEE SDG&E STANDARD EV-2.20 LEVEL 2 SPECIFICATIONS, EV-2.30 DC FAST CHARGER SPECIFICATIONS, AND EV-2.40 TYPICAL CHARGERS.

c. SEE SDG&E STANDARD EV-3.10 LOAD SUMMARY GUIDE.

d. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

LOAD SUMMARY LEVEL 2 & DC FAST CHARGER 208V

EV-3.50

EVSE LOAD SUMMARY GUIDE:

THE FOLLOWING IS AN EXAMPLE OF POSSIBLE COMBINATIONS OF AN SDG&E INSTALLATION WITH PRIVATE OR PUBLIC ACCESS WITH LEVEL 2 & DC FAST CHARGERS. THERE ARE MULTIPLE COMBINATIONS AND AS SUCH THE SPECIFIC CHARGERS TO BE USED FOR ANY PROJECT MUST BE USED WHEN CALCULATING THE REQUIRED POWER CENTER, AND TRANSFORMER SIZES AS REQUIRED.

EXAMPLE: TABLE EV-3.60

DCFC (480V) MANUFACTURER	DCFC (480V) MODEL	CHARGER TOTAL COUNT	KVA PER CHARGER	KVA SUMMATION
CHARGEPOINT	CPE250C	1	62.5KVA	62.5KVA
CHARGEPOINT	CPE250C	2	62.5KVA	125.0KVA
CHARGEPOINT	CPE250C	3	62.5KVA	187.5KVA
CHARGEPOINT	CPE250C	4	62.5KVA	250KVA
LEVEL 2 (208V) MANUFACTURER	LEVEL 2 (208V) MODEL	CHARGER TOTAL COUNT	KVA PER CHARGER	KVA SUMMATION
CHARGEPOINT	CP50	5	10.4KVA	260.4KVA
CHARGEPOINT	CP50	6	10.4KVA	270.8KVA
CHARGEPOINT	CP50	7	10.4KVA	281.2KVA
CHARGEPOINT	CP50	8	10.4KVA	291.6KVA
CHARGEPOINT	CP50	9	10.4KVA	302.0KVA
CHARGEPOINT	CP50	10	10.4KVA	312.4KVA
TOTAL FOR ALL 10 CHARGERS				312.4KVA
312.4KVA / (√3 * 480V) = 375.76A				
62.4KVA / (√3 * 208V) = 173.2A				
NOTE THERE ARE CHARGERS AT 480V AND 208V, WHICH WILL REQUIRE A STEP DOWN TRANSFORMER, SEE EV-11.00. BASED ON THE ABOVE CALCULATIONS, AND THE TABLE IN EV-3.10 THE POWER CENTER REQUIRED TO SERVICE THESE 480V CHARGERS IS A 600A 480V 3Ø 4W. THE POWER CENTER REQUIRED FOR THE 208V CHARGERS WILL BE A SUB-FEED STEPPED DOWN 400A 208V 3Ø 4W.				

REFERENCES:

a. SEE SDG&E STANDARD DM 5621 INITIAL TRANSFORMER DESIGN LOADING FOR BALANCED LOADS.

b. SEE SDG&E STANDARD EV-2.20 LEVEL 2 SPECIFICATIONS, EV-2.30 DC FAST CHARGER SPECIFICATIONS, AND EV-2.40 TYPICAL CHARGERS.

c. SEE SDG&E STANDARD EV-3.10 LOAD SUMMARY GUIDE.

d. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

e. SEE SDG&E STANDARD EV-11.00 DRY-TYPE TRANSFORMERS.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

LOAD SUMMARY LEVEL 2 & DC FAST CHARGER 480V

EV-3.60

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EV-4.50 - 4.51	HARD WIRED COMMUNICATIONS

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

COMMUNICATION BLOCK DIAGRAMS

COMMUNICATIONS:

SDG&E SERVICE METERING EQUIPMENT, AND EVSE REQUIRE ADEQUATE SIGNAL COVERAGE TO REMOTELY REPORT RESPECTIVE RECORDED AGGREGATE USAGE DATA. THIS IS ACHIEVED THROUGH MEANS OF EITHER CELLULAR MODEMS 3G/4G, OR GATEWAY CONFIGURATIONS AS SHOWN IN EV-4.20 TO EV-4.50. SEE MANUFACTURER'S SPECIFICATIONS FOR APPROVED CHARGER SIGNAL CONNECTIONS.

THE BEST WAY TO ENSURE THAT SERVICE METERING EQUIPMENT, AND EVSE HAVE ADEQUATE COVERAGE IS TO LOCATE ALL OF THE EQUIPMENT OUTSIDE AS MUCH AS POSSIBLE. IF THE EQUIPMENT IS LOCATED INDOORS, ESPECIALLY BELOW GRADE LEVEL CELLULAR COVERAGE MAY NOT BE ADEQUATE. INDOOR CONFIGURATIONS FOR EVSE ARE SHOWN EV-7.40.

FOR SDG&E PROGRAMS WHETHER EVSE ARE LOCATED INDOORS, OR OUTDOORS THE RELATIVE CELLULAR SIGNAL QUALITY AND STRENGTH ARE TO BE MEASURED DURING THE INITIAL SITE VISIT BY THE PROJECT FCA USING A SQUID, OR OTHER DESIGNATED CELLULAR TESTING DEVICE. IF THE DESIRED LOCATIONS OF EVSE ARE LACKING IN EITHER SIGNAL QUALITY OR STRENGTH THE TEAM MUST FIND A LOCATION ON SITE TO HOST A CELLULAR REPEATER, OR HARD WIRED COMMUNICATIONS SITE CONTROLLER.

REFERENCES:

a. SEE SDG&E STANDARD UG 3370 UNDERGROUND DISTRIBUTION (UD) TRENCHES AND UTILITY POSITIONING - S.D. COUNTY.

b. SEE SDG&E STANDARDS EV-4.20 INTERNAL GATEWAY - MODEM, EV-4.30 EXTERNAL GATEWAY - MODEM, EV-4.40 CELLULAR REPEATERS, AND EV-4.50 HARD WIRED COMMUNICATIONS.

c. SEE SDG&E STANDARD EV-7.40 PARKING LAYOUT - PARKING GARAGE.

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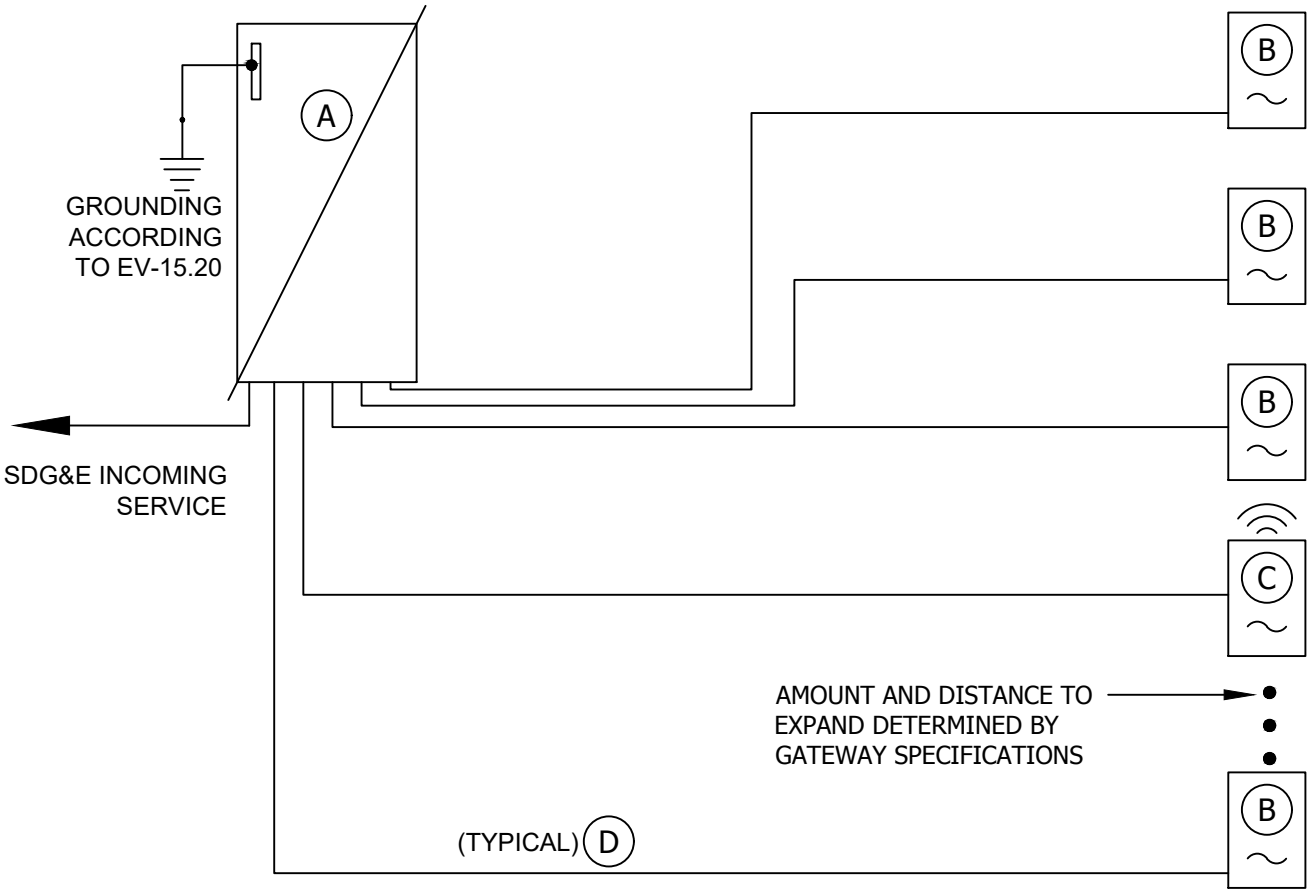

DESIGN:

(A) COMMERCIAL POWER CENTER, SERVICE SIZED AS NECESSARY PER EV-3.00.

(B) ELECTRIC VEHICLE SERVICE EQUIPMENT (EVSE). QUANTITY, AND SIZE PER CUSTOMER'S REQUIREMENTS AND TO BE COORDINATED DURING DESIGN PHASE.

(C) ELECTRIC VEHICLE SERVICE EQUIPMENT (EVSE) WITH INTERNAL GATEWAY/MODEM. QUANTITY, AND SIZE PER CUSTOMER'S REQUIREMENTS AND TO BE COORDINATED DURING DESIGN PHASE. LOCATIONS TO ACCOMMODATE MANUFACTURERS REQUIREMENTS FOR COMMUNICATION WITH OTHER CHARGERS.

(D) ELECTRIC POWER CONDUIT AND WIRING FROM POWER CENTER TO ELECTRIC VEHICLE SERVICE EQUIPMENT. QUANTITIES OF CONDUITS AND ASSOCIATED WIRING PER NUMBER OF CHARGING STATIONS TO BE INSTALLED PER EV-15.00

REFERENCES:

a. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

b. SEE SDG&E STANDARD EV-4.10 COMMUNICATIONS.

c. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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INTERNAL GATEWAY - MODEM

EV-4.20

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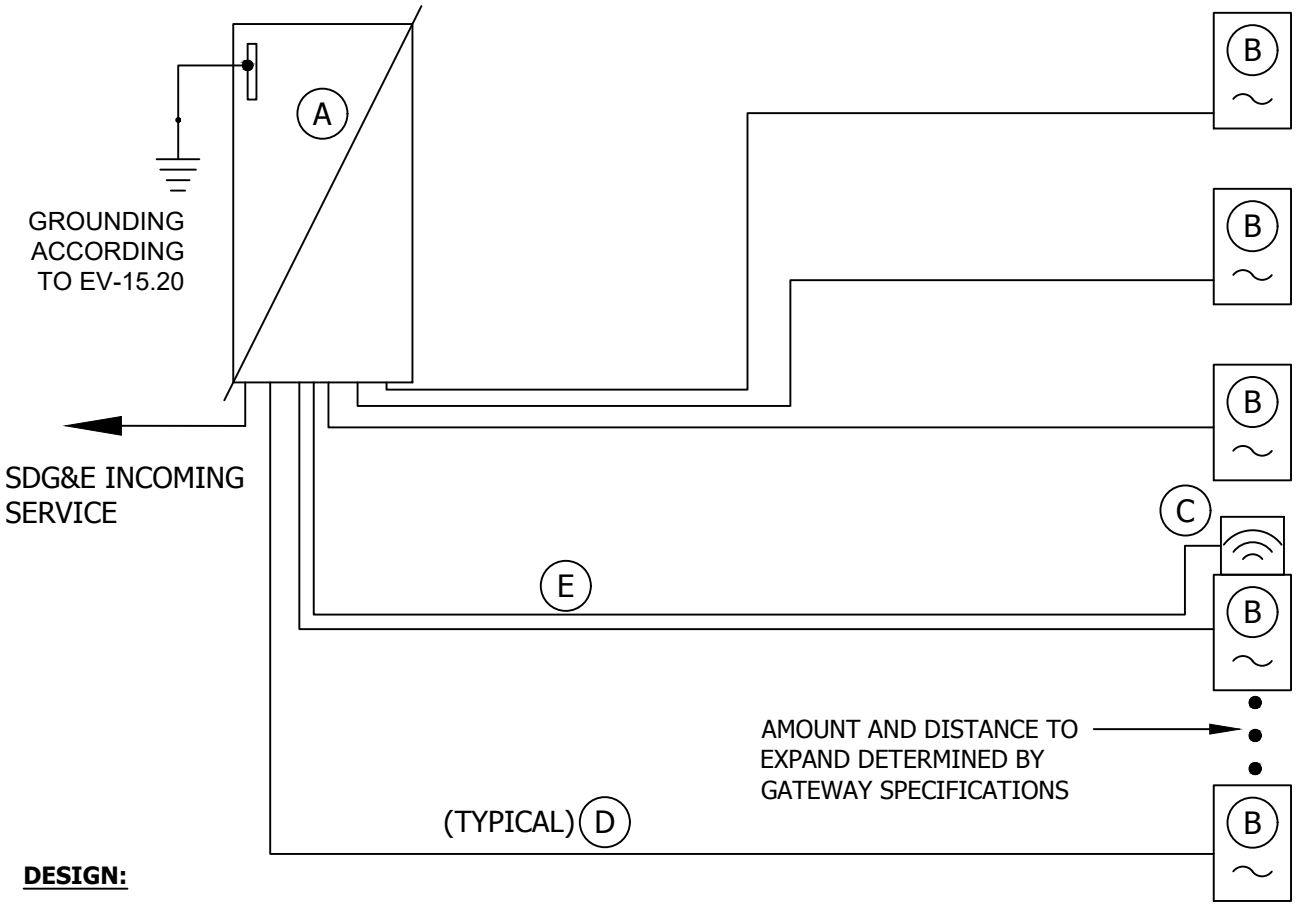

DESIGN:

(A) COMMERCIAL POWER CENTER, SERVICE SIZED AS NECESSARY PER EV-3.00.

(B) ELECTRIC VEHICLE SERVICE EQUIPMENT (EVSE). QUANTITY, AND SIZE PER CUSTOMER'S REQUIREMENTS AND TO BE COORDINATED DURING DESIGN PHASE.

(C) EXTERNAL GATEWAY/MODEM. QUANTITY, TO CONNECT TO ELECTRIC VEHICLE SERVICE EQUIPMENT PER CUSTOMER'S REQUIREMENTS AND PER MANUFACTURER'S SPECIFICATIONS. LOCATIONS TO ACCOMMODATE MANUFACTURERS REQUIREMENTS FOR COMMUNICATION WITH OTHER CHARGERS.

(D) ELECTRIC POWER CONDUIT AND WIRING FROM POWER CENTER TO ELECTRIC VEHICLE SERVICE EQUIPMENT. QUANTITIES OF CONDUITS AND ASSOCIATED WIRING PER NUMBER OF CHARGING STATIONS TO BE INSTALLED PER EV-15.00

(E) GATEWAY POWER CONDUIT AND WIRING TO BE INSTALLED PER EV-15.00 AND MANUFACTURER REQUIREMENTS.

REFERENCES:

a. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

b. SEE SDG&E STANDARD EV-4.10 COMMUNICATIONS.

c. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

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EXTERNAL GATEWAY - MODEM

EV-4.30

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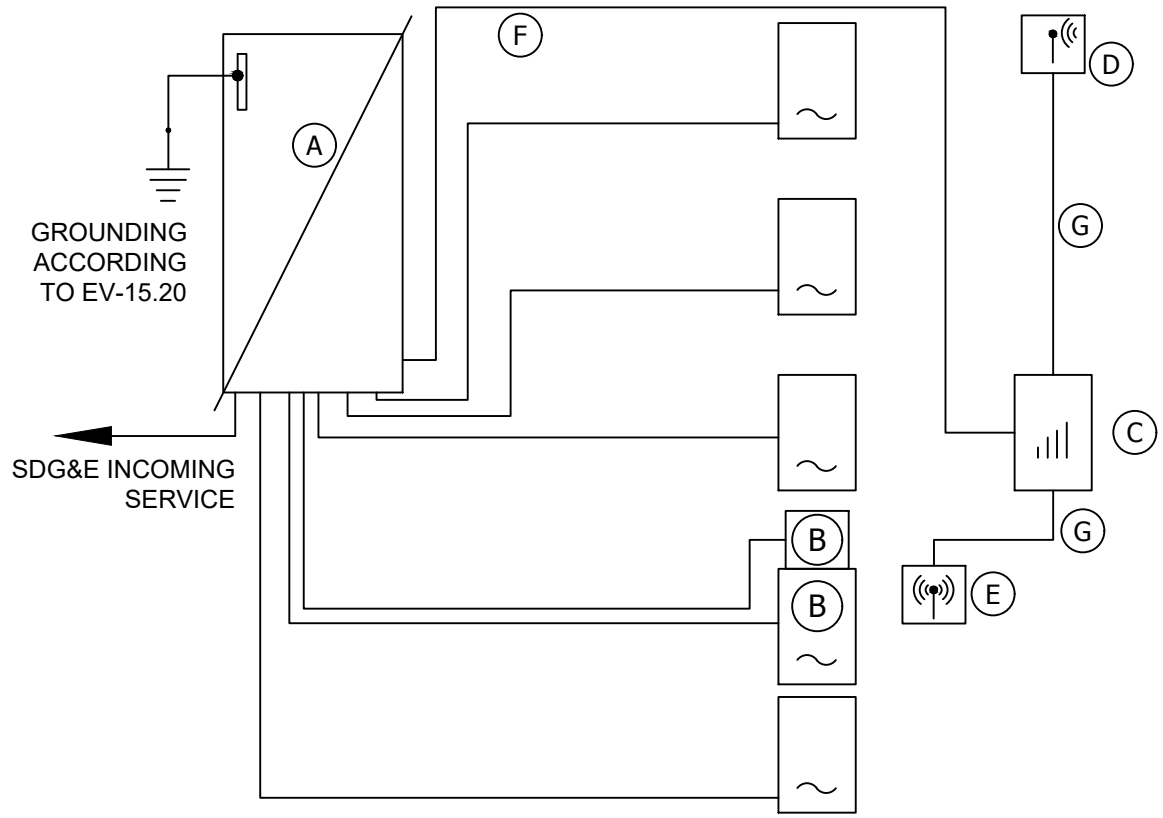

DESIGN:

(A) COMMERCIAL POWER CENTER, SERVICE SIZED AS NECESSARY PER EV-3.00,

(B) EVSE WITH INTERNAL / EXTERNAL GATEWAY/MODEM AS APPLICABLE, SEE EV-4.20 AND EV-4.30.

(C) CELLULAR REPEATER IN SEPARATE WALL MOUNTED ENCLOSURE.

(D) CELLULAR REPEATER RECEIVER ANTENNA, MOUNT OUTDOORS IN SUITABLE LOCATION TO RECEIVE ADEQUATE CELLULAR COVERAGE. MOUNT PER MANUFACTURER'S SPECIFICATIONS.

(E) CELLULAR TRANSMITTER ANTENNA, MOUNT INDOORS IN SUITABLE LOCATION TO TRANSMIT ADEQUATE CELLULAR COVERAGE TO GATEWAYS ON SITE. MOUNT PER MANUFACTURER'S SPECIFICATIONS.

(F) CELLULAR REPEATER POWER CONDUIT AND WIRING TO BE INSTALLED PER EV-15.00.

(G) CELLULAR REPEATER TRANSMISSION CABLES PER MANUFACTURER'S SPECIFICATIONS.

REFERENCES:

a. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

b. SEE SGDG&E STANDARDS EV-4.20 INTERNAL GATEWAY - MODEM, AND EV-4.30 EXTERNAL GATEWAY - MODEM.

c. SEE SDG&E STANDARD EV-7.40 PARKING LAYOUT - PARKING GARAGE.

d. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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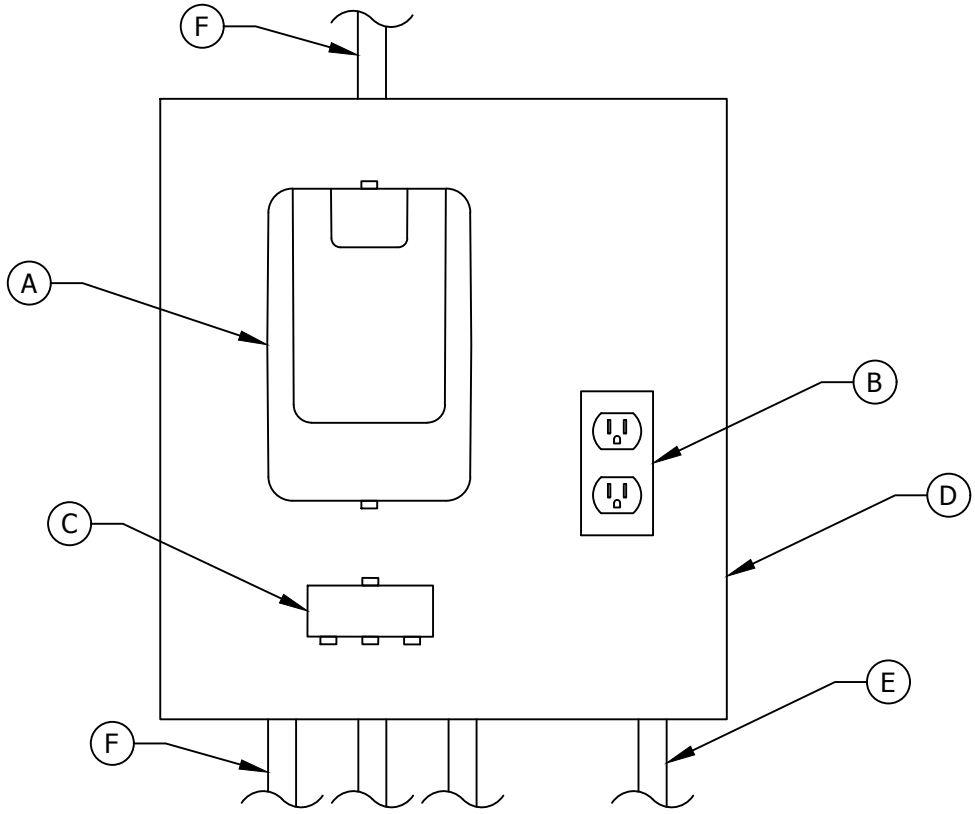

DESIGN:

(A) CELLULAR REPEATER, BRAND MAKE AND MODEL TO BE CHOSEN BASED ON SPECIFIC ELECTRIC VEHICLE CHARGERS CELLULAR REQUIREMENTS. ENSURE REPEATER SUPPORTS CELLULAR CARRIER THAT CHARGERS ACCEPT.

(B) 120V DUPLEX RECEPTACLE MOUNTED INSIDE ENCLOSURE. USED TO POWER PLUG IN CELL REPEATER, AND FOR CONVENIENCE. PROVIDE DEDICATED CIRCUIT, PER EV-15.00.

(C) COAXIAL SPLITTER AS REQUIRED, TO HAVE AS MANY OUTPUT CONNECTIONS AS REQUIRED FOR INDOOR ANTENNAS.

(D) ENCLOSURE TO BE SIZED MINIMUM FOR THE ENCLOSED EQUIPMENT, AND FOR WIRING BENDS INSIDE THE EQUIPMENT AS REQUIRED. ADEQUATELY RATE FOR ENVIRONMENTAL CONDITIONS.

(E) POWER CONDUIT AND WIRING FOR DEDICATED BRANCH CIRCUIT FOR ENCLOSURE.

(F) COAXIAL WIRING AND CONDUITS FOR INDOOR OR OUTDOOR ANTENNAS AS REQUIRED.

REFERENCES:

a. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

b. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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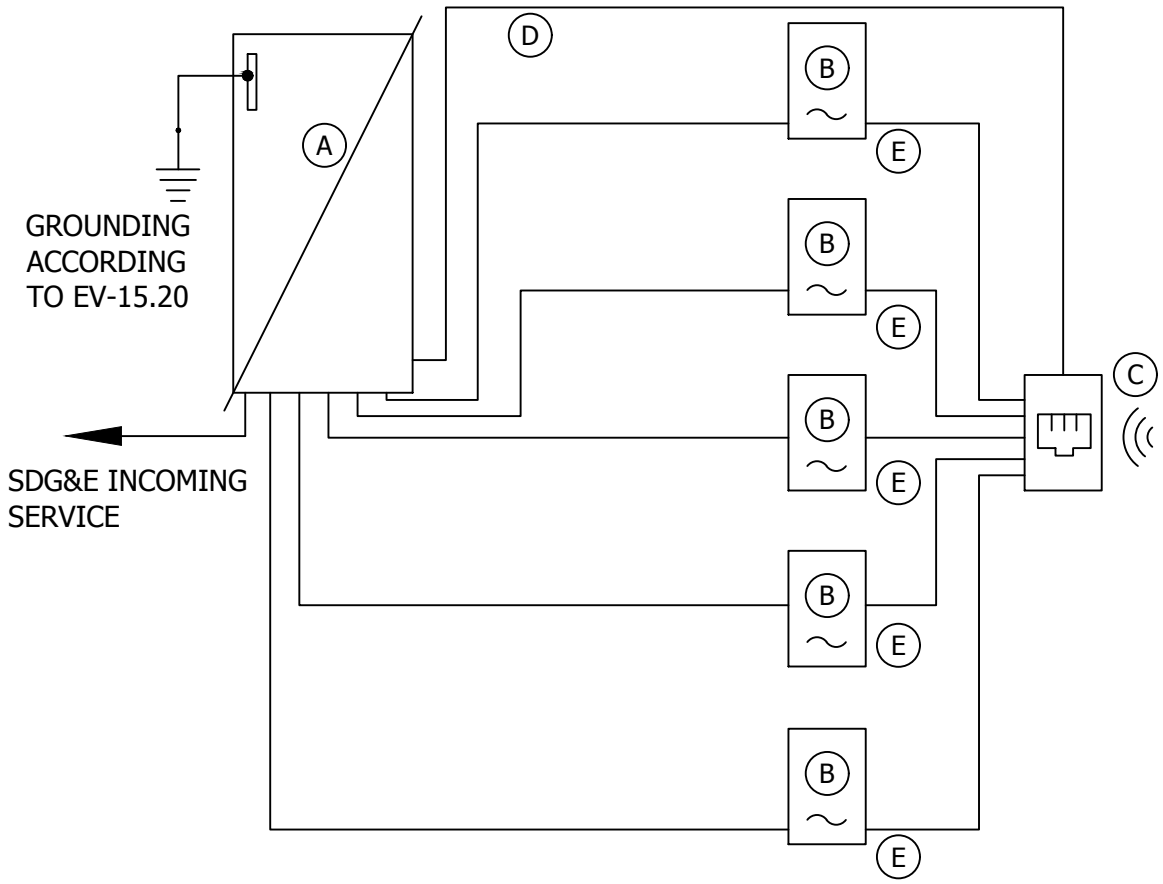

DESIGN:

(A) COMMERCIAL POWER CENTER, SERVICE SIZED AS NECESSARY PER EV-3.00.

(B) EVSE WHICH REQUIRE HARD WIRED CONNECTIONS.

(C) ENCLOSURE CONTAINING CELLULAR MODEM, AND ETHERNET SWITCH WITH ADEQUATE PORTS FOR NUMBER OF DESIRED EVSE. MOUNT OUTDOORS IN SAFE LOCATION WITH ADEQUATE CELLULAR RECEPTION.

(D) CELLULAR REPEATER POWER CONDUIT AND WIRING TO BE INSTALLED PER EV-15.00.

(E) HARD WIRED COMMUNICATION CONNECTION, PER EVSE MANUFACTURER'S SPECIFICATIONS.

REFERENCES:

a. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

b. SEE SDG&E STANDARD EV-4.10 COMMUNICATIONS.

c. SEE SDG&E STANDARD EV-7.40 PARKING LAYOUT - PARKING GARAGE.

d. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

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HARD WIRED COMMUNICATIONS

EV-4.50

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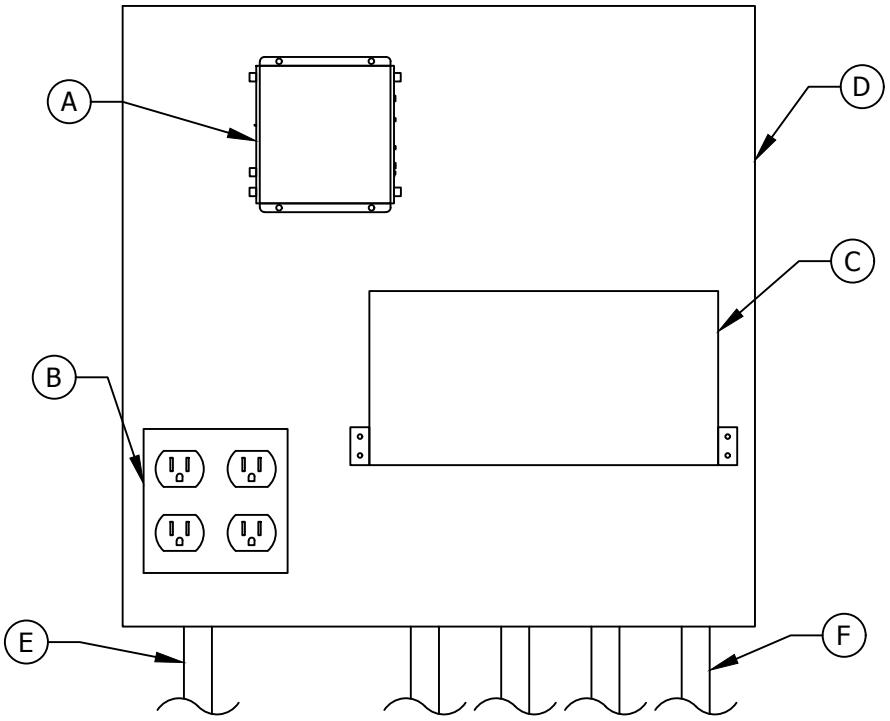

DESIGN:

(A) CELLULAR MODEM, BRAND MAKE AND MODEL TO BE CHOSEN BASED ON AVAILABLE CELLULAR SIGNALS AND STRENGTHS AT SITE LOCATION. ENSURE MODEM SUPPORTS CELLULAR CARRIER THAT IS AVAILABLE.

(B) 120V QUADPLEX RECEPTACLE MOUNTED INSIDE ENCLOSURE. USED TO POWER PLUG IN CELLULAR MODEM, ETHERNET SWITCH, AND FOR CONVENIENCE. PROVIDE DEDICATED CIRCUIT, PER EV-15.00.

(C) ETHERNET SWITCH, TO HAVE AS MANY OUTPUT CONNECTIONS AS REQUIRED FOR NUMBER OF ELECTRIC VEHICLE CHARGERS THAT REQUIRE HARD WIRED CONNECTION.

(D) ENCLOSURE TO BE SIZED MINIMUM FOR THE ENCLOSED EQUIPMENT, AND FOR WIRING BENDS INSIDE THE EQUIPMENT AS REQUIRED. ADEQUATELY RATE FOR ENVIRONMENTAL CONDITIONS. METALLIC ENCLOSURES SIGNIFICANTLY REDUCE THE SIGNAL QUALITY OF CELLULAR MODEMS, AND FIBERGLASS CONSTRUCTION IS PREFERRED FOR SIGNAL QUALITY. IF FIBERGLASS IS NOT AN OPTION DUE TO SECURITY REASONS SUCH AS BEING PLACED NEAR ACCESS TO THE PUBLIC METALLIC ENCLOSURES MAY BE USED, HOWEVER THE ANTENNA OF THE MODEMS MAY NEED TO BE PLACED OUTSIDE OF THE ENCLOSURE. IF THIS IS DONE THE ENVIRONMENTAL RATING OF THE ENCLOSURE MUST ALSO BE MAINTAINED.

(E) POWER CONDUIT AND WIRING FOR DEDICATED BRANCH CIRCUIT FOR ENCLOSURE.

(F) LAN CONDUIT AND WIRING TO ELECTRIC VEHICLE CHARGERS. CAT-5E OR BETTER, REFER TO MANUFACTURER'S SPECIFICATIONS.

REFERENCES:

a. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

b. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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EV-5.40	800A-4000A SERVICE
EV-5.50	PRIMARY METERING SERVICE

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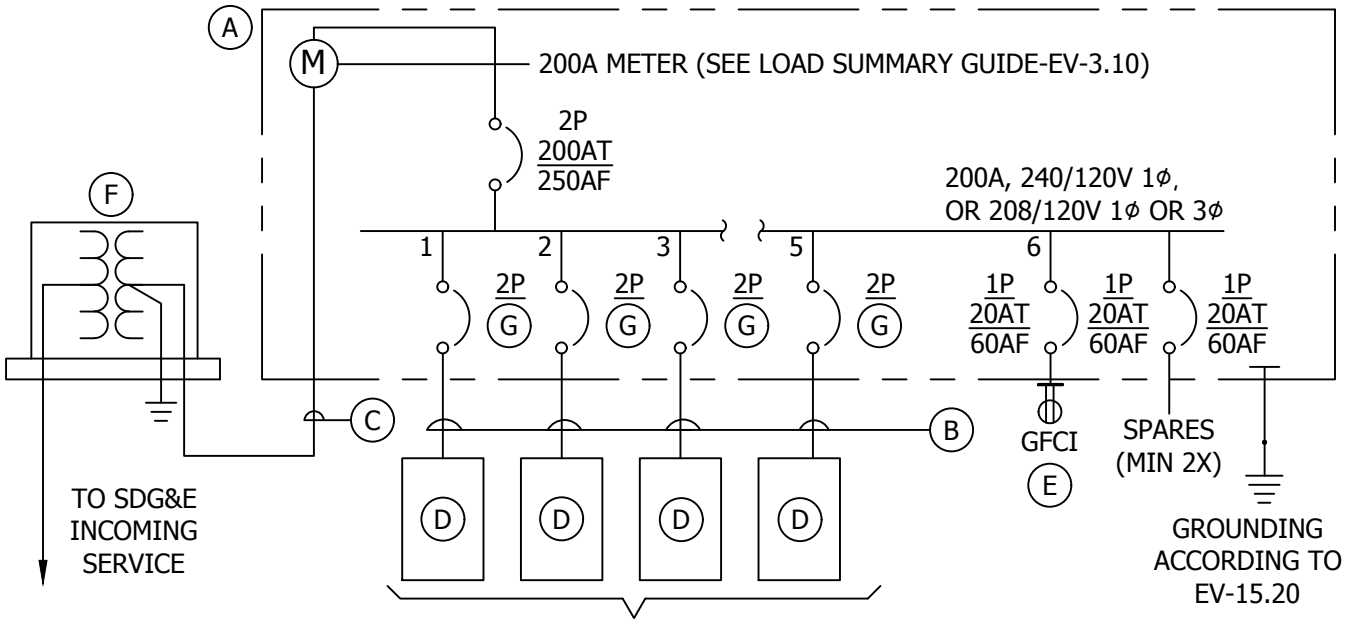
SINGLE LINE DIAGRAMS

EV-5.00



DESIGN:

(A) COMMERCIAL SERVICE METER PEDESTAL. SIZE OF SERVICE PER EV-3.00.

(B) SIZE CONDUIT AND CONDUCTORS IN ACCORDANCE WITH EV-15.00.

(C) UNDERGROUND CONDUIT, INSTALL PER SGD&E STANDARD SG 300.

(D) ELECTRIC VEHICLE SERVICE EQUIPMENT, SEE EV-2.00 FOR SPECIFICATIONS.

(E) GROUND-FAULT CIRCUIT INTERRUPTER RECEPTACLE (NEMA 5-20R) IN WEATHERPROOF ENCLOSURE AS APPLICABLE. GFCI RECEPTACLE MAY BE INSTALLED INTERNALLY IN LIEU OF EXTERNAL INSTALLATION IN A NEMA ENCLOSURE.

(F) NEW OR EXISTING SDG&E TRANSFORMER. SEE EV-6.00.

(G) ELECTRIC VEHICLE SERVICE EQUIPMENT OVERCURRENT PROTECTION DEVICE. SIZE PER EV-15.00.

REFERENCES:

a. SEE SDG&E STANDARD SG 300 UNDERGROUND ELECTRIC SERVICE.

b. SEE SDG&E STANDARD EV-2.00 EVSE SPECIFICATIONS.

c. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

d. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

e. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

0-200A SERVICE AT 208V OR 240V

EV-5.10

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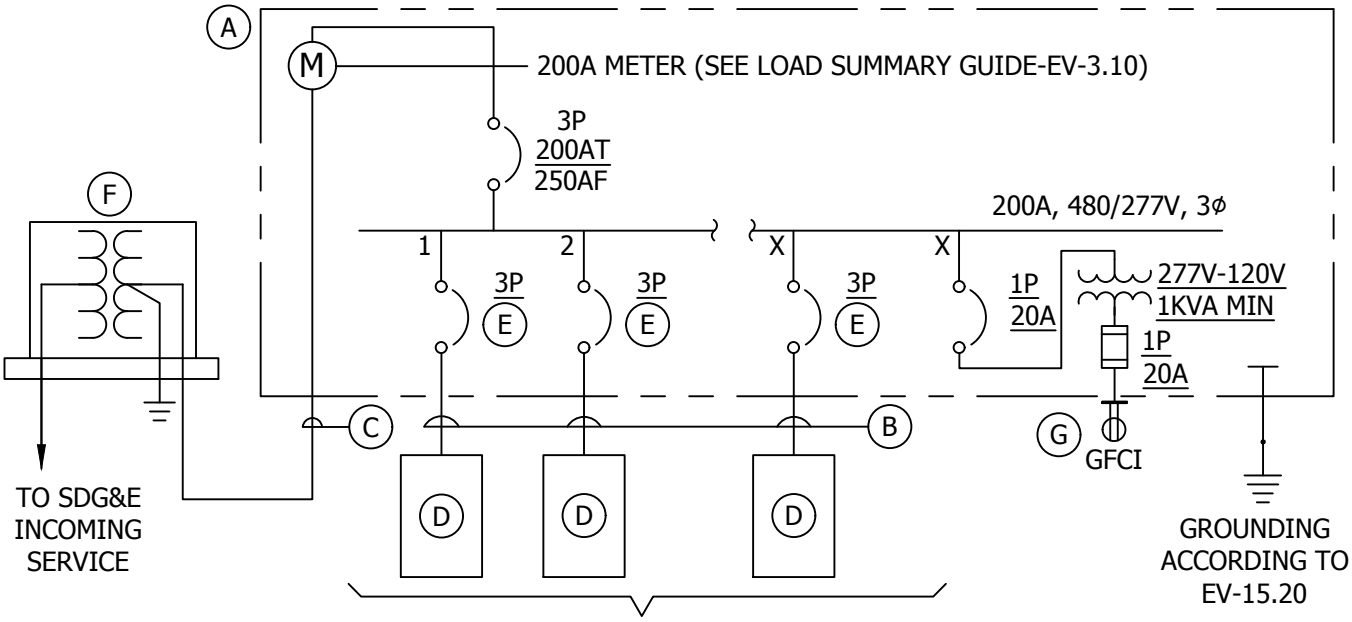

MAXIMUM NUMBER PER EV-3.00.

DESIGN:

(A) COMMERCIAL SERVICE METER PEDESTAL. SIZE OF SERVICE PER EV-3.00.

(B) SIZE CONDUIT AND CONDUCTORS IN ACCORDANCE WITH EV-15.00.

(C) UNDERGROUND CONDUIT, INSTALL PER SGD&E STANDARD SG 300.

(D) ELECTRIC VEHICLE SERVICE EQUIPMENT, SEE EV-2.00 FOR SPECIFICATIONS.

(E) ELECTRIC VEHICLE SERVICE EQUIPMENT OVERCURRENT PROTECTION DEVICE. SIZE PER EV-15.00.

(F) NEW OR EXISTING SDG&E TRANSFORMER. SEE EV-6.00.

(G) GROUND-FAULT CIRCUIT INTERRUPTER RECEPTACLE (NEMA 5-20R) 120V IN WEATHERPROOF ENCLOSURE AS APPLICABLE, AND ASSOCIATED STEP DOWN CONTROL POWER TANSFORMER, PRIMARY BREAKER, AND SECONDARY FUSING. GFCI RECEPTACLE MAY BE INSTALLED INTERNALLY IN LIEU OF EXTERNAL INSTALLATION IN A NEMA ENCLOSURE.

REFERENCES:

a. SEE SDG&E STANDARD SG 300 UNDERGROUND ELECTRIC SERVICE.

b. SEE SDG&E STANDARD EV-2.00 EVSE SPECIFICATIONS.

c. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

d. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

e. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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0-200A SERVICE AT 480V

EV-5.20

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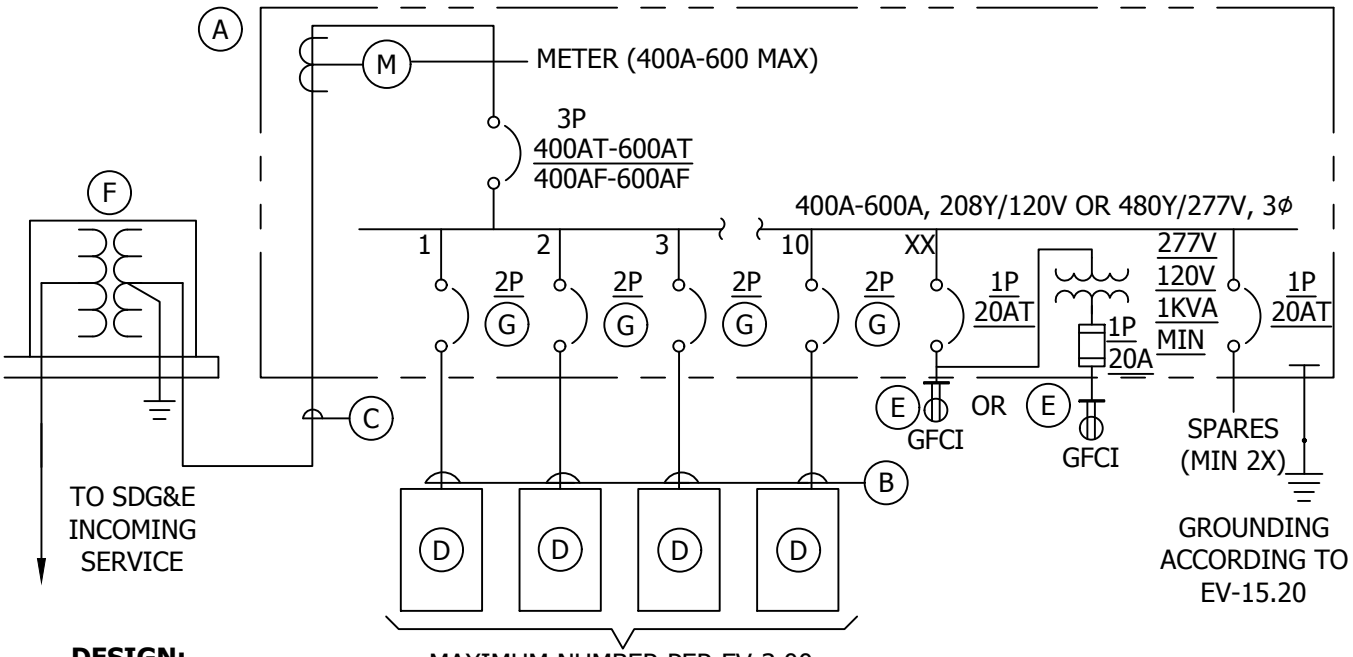

DESIGN:

(A) COMMERCIAL SERVICE METER PEDESTAL. SIZE OF SERVICE PER EV-3.00.

(B) SIZE CONDUIT AND CONDUCTORS IN ACCORDANCE WITH EV-15.00.

(C) UNDERGROUND CONDUIT, INSTALL PER SGD&E STANDARD SG 300.

(D) ELECTRIC VEHICLE SERVICE EQUIPMENT, SEE EV-2.00 FOR SPECIFICATIONS.

(E) GROUND-FAULT CIRCUIT INTERRUPTER RECEPTACLE (NEMA 5-20R) 120V IN WEATHERPROOF ENCLOSURE AS APPLICABLE. GFCI RECEPTACLE MAY BE INSTALLED INTERNALLY IN LIEU OF EXTERNAL INSTALLATION IN A NEMA ENCLOSURE. TRANSFORMER AS REQUIRED FOR 480V SERVICES.

(F) NEW OR EXISTING SDG&E TRANSFORMER. SEE EV-6.00.

(G) ELECTRIC VEHICLE SERVICE EQUIPMENT OVERCURRENT PROTECTION DEVICE. SIZE PER EV-15.00.

REFERENCES:

a. SEE SDG&E STANDARD SG 300 UNDERGROUND ELECTRIC SERVICE.

b. SEE SDG&E STANDARD EV-2.00 EVSE SPECIFICATIONS.

c. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

d. SEE SDG&E STANDARD EV-6.00 OVERALL EQUIPMENT LAYOUT.

e. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

400A-600A SERVICE UP TO 480V

EV-5.30

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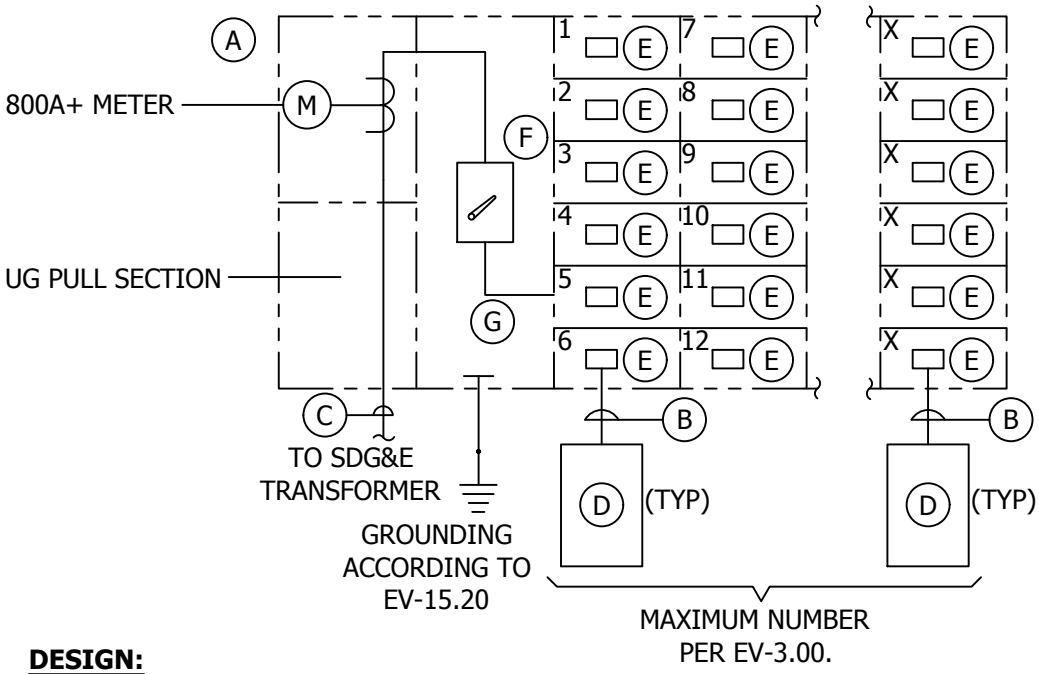

DESIGN:

(A) COMMERCIAL METERED SWITCHGEAR. SIZE OF SERVICE PER EV-3.00.

(B) SIZE CONDUIT AND CONDUCTORS IN ACCORDANCE WITH EV-15.00.

(C) UNDERGROUND CONDUIT, INSTALL PER SGD&E STANDARD SG 300.

(D) ELECTRIC VEHICLE SERVICE EQUIPMENT, SEE EV-2.00 FOR SPECIFICATIONS.

(E) ELECTRIC VEHICLE SERVICE EQUIPMENT OVERCURRENT PROTECTION DEVICE. SIZE PER EV-15.00.

(F) MAIN OVERCURRENT PROTECTION BREAKER. SIZE PER EV-3.00.

(G) SEE LOAD SUMMARY GUIDE EV-3.00 FOR MINIMUM BUS RATING.

REFERENCES:

a. SEE SDG&E STANDARD SG 300 UNDERGROUND ELECTRIC SERVICE.

b. SEE SDG&E STANDARD EV-2.00 EVSE SPECIFICATIONS.

c. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

d. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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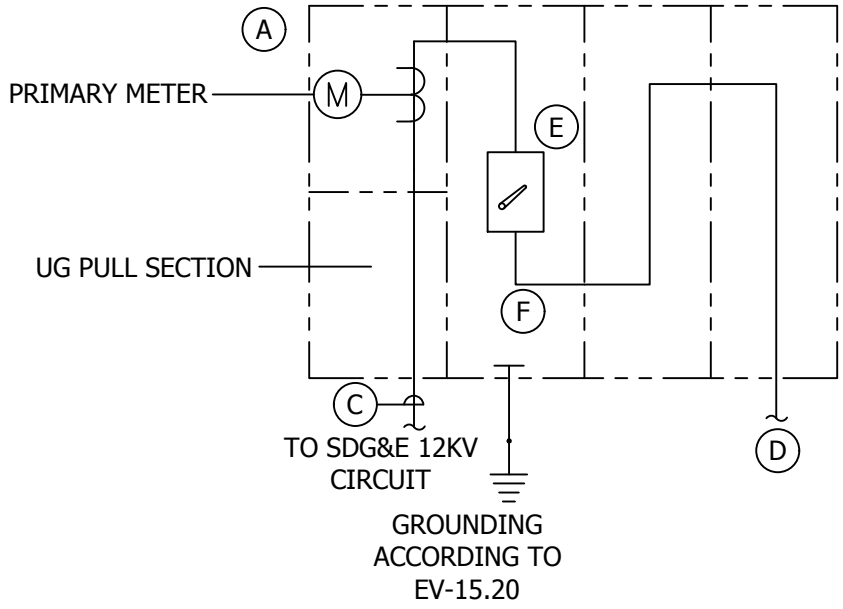

DESIGN:

(A) COMMERCIAL METERED 12KV SWITCHGEAR. SIZE OF SERVICE PER EV-3.00 AND SG 600.

(B) SIZE CONDUIT AND CONDUCTORS IN ACCORDANCE WITH SG 300.

(C) UNDERGROUND CONDUIT, INSTALL PER SGD&E STANDARD SG 300.

(D) TO CUSTOMER OWNED DISTRIBUTION.

(E) MAIN 12KV FUSED OVERCURRENT PROTECTION. REFER TO SDG&E SG 600.

(F) SEE LOAD SUMMARY GUIDE EV-3.00 FOR MINIMUM BUS RATING.

REFERENCES:

a. SEE SDG&E STANDARD SG 300 UNDERGROUND ELECTRIC SERVICE.

b. SEE SDG&E STANDARD SG 600 MEDIUM VOLTAGE ELECTRIC SERVICE & METERING EQUIPMENT.

c. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

d. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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PRIMARY METERING SERVICE

EV-5.50

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EV-6.10	UNDERGROUND POC - EXISTING SERVICE
EV-6.11	UNDERGROUND POC - NEW SERVICE
EV-6.20	OVERHEAD POC
EV-6.30	PRIMARY METERING

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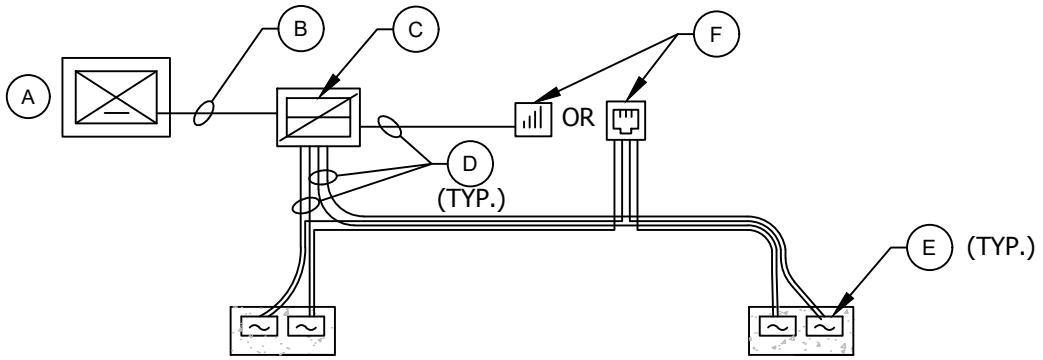
OVERALL EQUIPMENT LAYOUT

EV-6.00



DESIGN:

A EXISTING SDG&E TRANSFORMER, VOLTAGE, AND ALLOWABLE LOADS PER SDG&E UG 3700. IF TRANSFORMER MUST BE UPSIZED SEE SDG&E DM 5600, AND 3400 FOR PADS.

B UNDERGROUND SERVICE CONDUIT PER SDG&E SG 300.

C COMMERCIAL POWER CENTER, SERVICE SIZED AS NECESSARY PER EV-3.00. PHYSICAL DIMENSIONS PER MANUFACTURER'S SPECIFICATIONS, ENSURE SITE CONDITIONS MAY ACCOMMODATE POWER CENTER REQUIRED CLEAR AND LEVEL WORKING SPACES PER SDG&E SG 500.

D POWER CONDUIT AND WIRING PER SDG&E EV-15.00.

E ELECTRIC VEHICLE SERVICE EQUIPMENT PER SDG&E EV-2.00. COORDINATE SELECTIONS AND COUNT TO FULFIL CUSTOMER'S NEEDS. PARKING STALL LAYOUT PER EV-7.00.

F COMMUNICATIONS EQUIPMENT AS REQUIRED PER EV-4.00. COMMUNICATION WIRING AND CONDUITS AS REQUIRED IF A SITE CONTROLLER IS INSTALLED.

REFERENCES:

a. SEE SDG&E STANDARD SG 300 UNDERGROUND ELECTRIC SERVICE.

b. SEE SDG&E STANDARD SG 500 ELECTRIC SERVICE & METERING EQUIPMENT.

c. SEE SDG&E STANDARD UG 3400 PADS, RETAINING WALLS, CLEARANCES.

d. SEE SDG&E STANDARD UG 3700 TRANSFORMERS.

e. SEE SDG&E STANDARD DM 5600 TRANSFORMERS.

f. SEE SDG&E STANDARD EV-2.00 EVSE SPECIFICATIONS.

g. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

h. SEE SDG&E STANDARD EV-4.00 COMMUNICATION BLOCK DIAGRAMS.

i. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

j. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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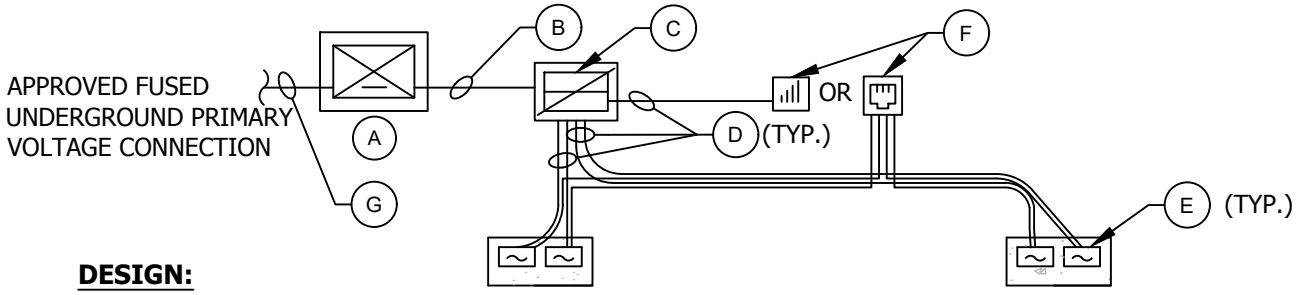

DESIGN:

(A) NEW SDG&E TRANSFORMER, VOLTAGE, PER SDG&E UG 3700. NEW TRANSFORMER PAD AND CLEARANCES PER SDG&E UG 3400. SIZE PER SDG&E DM 5600, AND 3400 FOR PADS.

(B) UNDERGROUND SERVICE CONDUIT PER SDG&E SG 300.

(C) COMMERCIAL POWER CENTER, SERVICE SIZED AS NECESSARY PER EV-3.00. PHYSICAL DIMENSIONS PER MANUFACTURER'S SPECIFICATIONS, ENSURE SITE CONDITIONS MAY ACCOMMODATE POWER CENTER REQUIRED CLEAR AND LEVEL WORKING SPACES PER SDG&E SG 500.

(D) POWER CONDUIT AND WIRING PER SDG&E EV-15.00.

(E) ELECTRIC VEHICLE SERVICE EQUIPMENT PER SDG&E EV-2.00. COORDINATE SELECTIONS AND COUNT TO FULFIL CUSTOMER'S NEEDS. PARKING STALL LAYOUT PER EV-7.00.

(F) COMMUNICATIONS EQUIPMENT AS REQUIRED PER EV-4.00. COMMUNICATION WIRING AND CONDUITS AS REQUIRED IF A SITE CONTROLLER IS INSTALLED.

(G) PRIMARY CONDUCTORS PER SDG&E UG 4000.

REFERENCES:

a. SEE SDG&E STANDARD SG 300 UNDERGROUND ELECTRIC SERVICE.

b. SEE SDG&E STANDARD SG 500 ELECTRIC SERVICE & METERING EQUIPMENT.

c. SEE SDG&E STANDARD UG 3400 PADS, RETAINING WALLS, CLEARANCES.

d. SEE SDG&E STANDARD UG 3700 TRANSFORMERS.

e. SEE SDG&E STANDARD UG 4000 CABLES.

f. SEE SDG&E STANDARD DM 5600 TRANSFORMERS.

g. SEE SDG&E STANDARD EV-2.00 EVSE SPECIFICATIONS.

h. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

i. SEE SDG&E STANDARD EV-4.00 COMMUNICATION BLOCK DIAGRAMS.

j. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

k. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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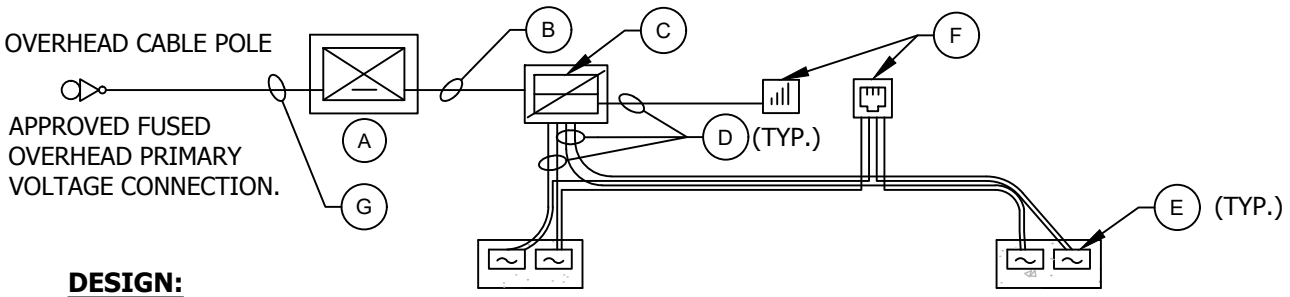

DESIGN:

(A) NEW SDG&E TRANSFORMER, VOLTAGE, PER SDG&E UG 3700. NEW TRANSFORMER PAD AND CLEARANCES PER SDG&E UG 3400. SIZE PER SDG&E DM 5600, AND 3400 FOR PADS.

(B) UNDERGROUND SERVICE CONDUIT PER SDG&E SG 300.

(C) COMMERCIAL POWER CENTER, SERVICE SIZED AS NECESSARY PER EV-3.00. PHYSICAL DIMENSIONS PER MANUFACTURER'S SPECIFICATIONS, ENSURE SITE CONDITIONS MAY ACCOMMODATE POWER CENTER REQUIRED CLEAR AND LEVEL WORKING SPACES PER SDG&E SG 500.

(D) POWER CONDUIT AND WIRING PER SDG&E EV-15.00.

(E) ELECTRIC VEHICLE SERVICE EQUIPMENT PER SDG&E EV-2.00. COORDINATE SELECTIONS AND COUNT TO FULFIL CUSTOMER'S NEEDS. PARKING STALL LAYOUT PER EV-7.00.

(F) COMMUNICATIONS EQUIPMENT AS REQUIRED PER EV-4.00. COMMUNICATION WIRING AND CONDUITS AS REQUIRED IF A SITE CONTROLLER IS INSTALLED.

(G) PRIMARY CONDUCTORS PER SDG&E UG 4000. CABLE RISER PER SDG&E OH 1400/ UG 4200.

REFERENCES:

a. SEE SDG&E STANDARD SG 300 UNDERGROUND ELECTRIC SERVICE.

b. SEE SDG&E STANDARD SG 500 ELECTRIC SERVICE AND METERING EQUIPMENT.

c. SEE SDG&E STANDARD UG 3400 PADS, RETAINING WALLS, CLEARANCES.

d. SEE SDG&E STANDARD UG 3700 TRANSFORMERS.

e. SEE SDG&E STANDARD UG 4000 CABLES.

f. SEE SDG&E STANDARD OH 1400 / UG 4200 CABLE POLES.

g. SEE SDG&E STANDARD DM 5600 TRANSFORMERS.

h. SEE SDG&E STANDARD EV-2.00 EVSE SPECIFICATIONS.

i. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

j. SEE SDG&E STANDARD EV-4.00 COMMUNICATIONS BLOCK DIAGRAMS.

k. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

l. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

SHEET 1 OF 1

OVERHEAD POC

EV-6.20

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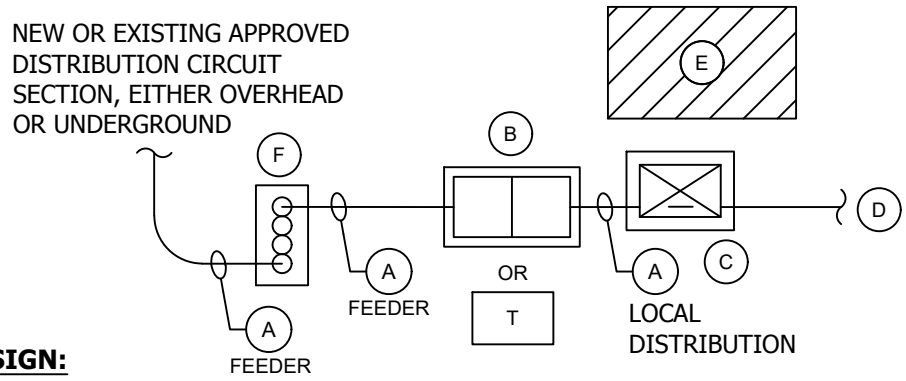

DESIGN:

(A) PRIMARY CONDUCTORS PER SDG&E UG 4000. CABLE RISER AS APPLICABLE PER SDG&E OH 1400/ UG 4200. FEEDER SIZED CONDUCTORS UP TO HANDHOLE/ TERMINATING CABINET, LOCAL DISTRIBUTION AFTERWARDS.

(B) DISTRIBUTION HANDHOLE/ ABOVE GROUND TERMINATING CABINET, AS SITE CONDITIONS REQUIRE. SEE UG 3300 FOR HANDHOLE, OR UG 3524 FOR 600/200A TERMINATING CABINET.

(C) NEW SDG&E TRANSFORMER, VOLTAGE, PER SDG&E UG 3700. NEW TRANSFORMER PAD AND CLEARANCES PER SDG&E UG 3400. SIZE PER SDG&E DM 5600.

(D) SEE EV-6.10, AND EV-6.20 FOR EQUIPMENT CONFIGURATIONS AFTER TRANSFORMER.

(E) FUTURE SPACE ON SITE FOR PRIMARY METERING EQUIPMENT, ADEQUATELY SIZED FOR EQUIPMENT AND READILY ACCESSIBLE TO SDG&E SERVICE TRUCKS.

(F) NEW OR EXISTING TRAYER SWITCH PER UG 3550. IF TRAYER SWITCH IS INSTALLED AT A TIME BEFORE PRIMARY METERING EQUIPMENT, POSITION TO SUPPLY EQUIPMENT MUST BE FUSED.

REFERENCES:

a. SEE SDG&E STANDARD SG 300 UNDERGROUND ELECTRIC SERVICE.

b. SEE SDG&E STANDARD SG 500 ELECTRIC SERVICE & METERING EQUIPMENT.

c. SEE SDG&E STANDARD UG 3400 PADS, RETAINING WALLS, CLEARANCES.

d. SEE SDG&E STANDARD UG 3700 TRANSFORMERS.

e. SEE SDG&E STANDARD UG 4000 CABLES.

f. SEE SDG&E STANDARD OH 1400 / UG 4200 CABLE POLES.

g. SEE SDG&E STANDARD DM 5600 TRANSFORMERS.

h. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

i. SEE SDG&E STANDARD EV-4.00 COMMUNICATION BLOCK DIAGRAM.

j. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

k. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

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PRIMARY METERING

EV-6.30

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EV-7.20	ADA PARKING LAYOUT
EV-7.30	COMMON PARKING LAYOUT FLEET & PRIVATE CHARGING
EV-7.40	COMMON PARKING LAYOUT - PARKING GARAGE

DRAWINGS:

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

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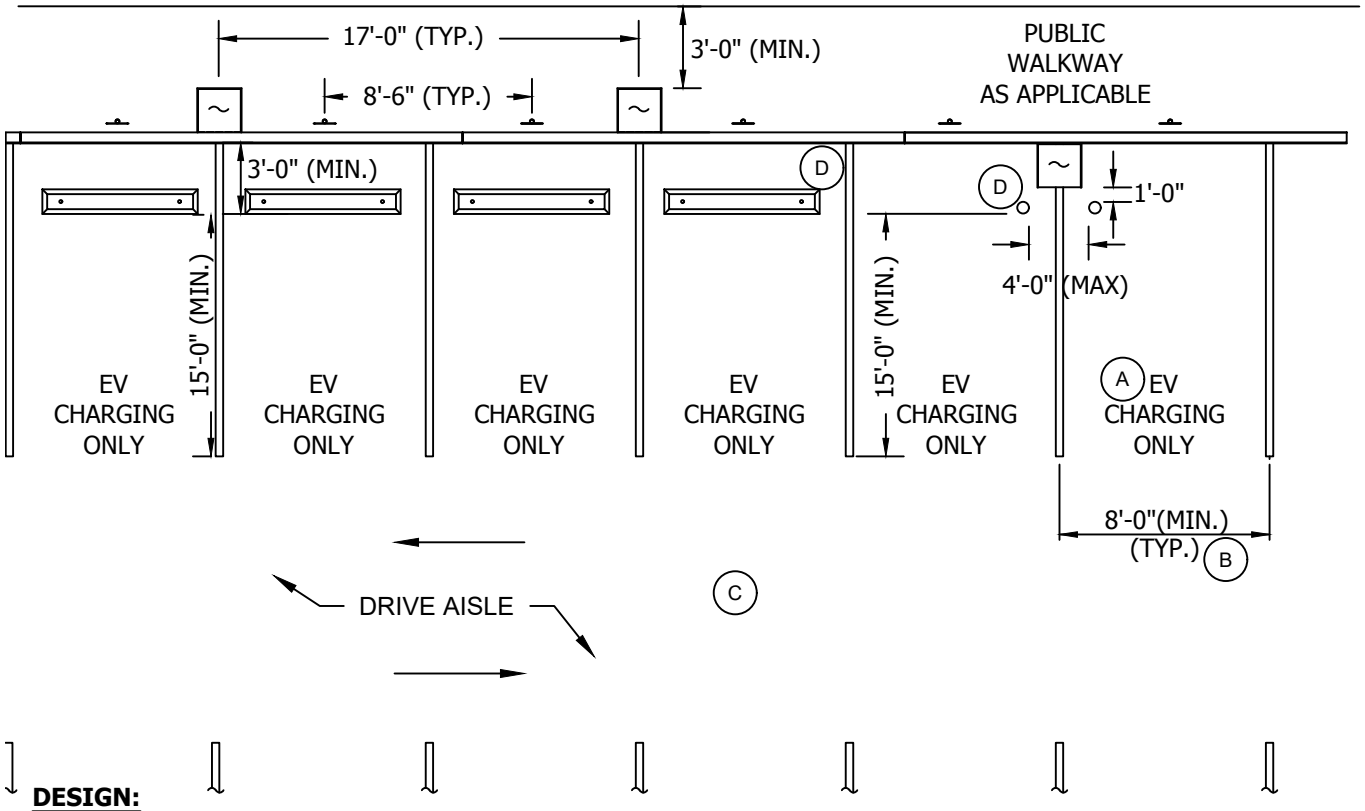
TYPICAL PARKING LAYOUT

EV-7.00



DESIGN:

A STALLS MUST BE MARKED IN ACCORDANCE BY LATEST CALIFORNIA BUILDING CODE 11B.

B DIMENSIONS SHOWN ABOVE ARE TYPICAL MINIMUM DESIGN DIMENSIONS FOR STANDARD NON-ADA EV STALLS. SEE EV-7.20 FOR ADA STALL DIMENSIONS.

C MODIFICATIONS TO PARKING STALL ORIENTATION, COUNT, AND STRIPING, OR TO DRIVE AISLE IN ACCORDANCE WITH LATEST CALIFORNIA BUILDING CODE. TO BE DESIGNED AND REVIEWED BY CIVIL TEAM, WITH APPROVAL OF THE AHJ.

D EVSE MUST BE PROTECTED BY EITHER A WHEELSTOP OR BOLLARD (WHEELSTOPS ARE AN OPTION FOR CHARGERS ONLY). CHARGERS MAY BE PROTECTED BY WHEEL STOPS IN STALLS INTENDED FOR PASSENGER VEHICLES BUT MUST BE PROTECTED BY BOLLARDS IN STALLS INTENDED FOR COMMERCIAL VEHICLES. MINIMUM 1' CLEAR BACK OF BOLLARD, OR 3' CLEAR FRONT OF WHEELSTOP. SEE UG 3481.

REFERENCE:

a. SEE SDG&E STANDARD UG 3481 EQUIPMENT BARRIER PROTECTION AND CLEARANCE.

b. SEE SDG&E STANDARD EV-7.20 ADA PARKING LAYOUT.

c. SEE SDG&E STANDARD EV-9.00 PRE-CAST CONCRETE WHEEL STOP DETAIL.

d. SEE CALIFORNIA BUILDING CODE MOST RECENT EDITION.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

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COMMON PARKING LAYOUTS PUBLIC CHARGING

EV-7.10

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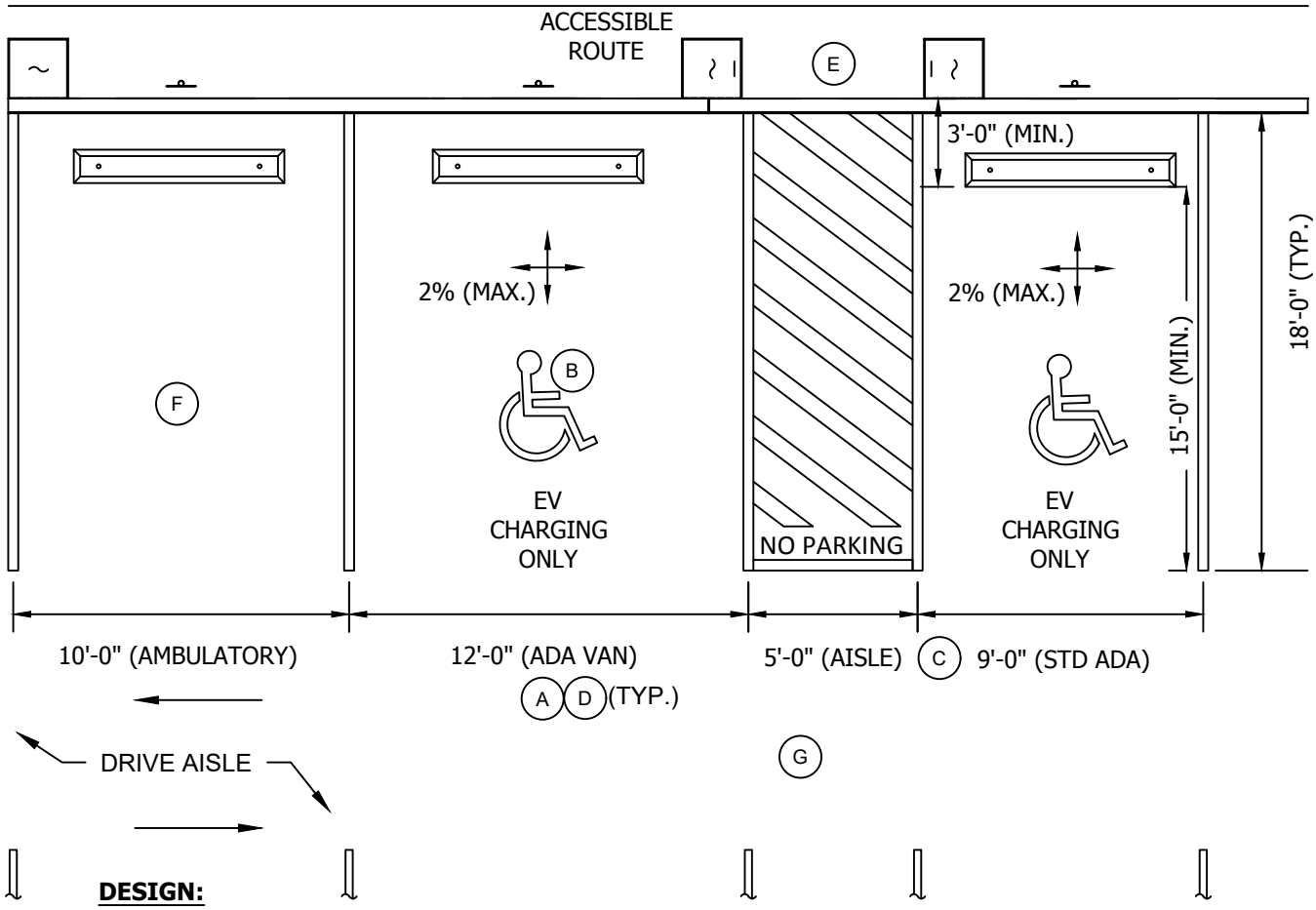

DESIGN:

A ADA ACCESSIBLE STALLS ARE REQUIRED FOR PROJECTS IN WHICH EV STALLS ARE AVAILABLE TO PUBLIC USAGE. MINIMUM COUNT PER TABLE ON EV-7.21.

B ADA STALLS MUST BE MARKED AND HAVE IDENTIFICATION SIGNS IN ACCORDANCE BY LATEST CALIFORNIA BUILDING CODE 11B-812.

C DIMENSIONS SHOWN ABOVE ARE TYPICAL MINIMUM DESIGN DIMENSIONS FOR STANDARD ADA, VAN ACCESSIBLE, AND AMBULATORY EV STALLS.

D ADA STALLS, AISLES, AND ROUTES REQUIRE 98" OVERHEAD CLEARANCE.

E ACCESSIBLE ROUTE REQUIRES 30"x48" MINIMUM CLEARANCE FLOOR SPACE ADJACENT TO CHARGER FACE.

F AMBULATORY STALLS DO NOT REQUIRE ADA SIGNAGE OR MARKING.

G MODIFICATIONS TO PARKING STALL ORIENTATION, COUNT, AND STRIPING, OR TO DRIVE AISLE IN ACCORDANCE WITH LATEST CALIFORNIA BUILDING CODE. TO BE DESIGNED AND REVIEWED BY CIVIL TEAM, WITH APPROVAL OF THE AHJ.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

SHEET 1 OF 2

ADA PARKING LAYOUT

EV-7.20

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TABLE EV-7.21

ELECTRIC VEHICLE CHARGING STATIONS FOR PUBLIC USE AND COMMON USE			
TOTAL NUMBER OF EVCS AT A FACILITY	MINIMUM NUMBER (BY TYPE) OF EVCS REQUIRED TO COMPLY WITH SECTION 11B-812		
	VAN ACCESSIBLE	STANDARD ACCESSIBLE	AMBULATORY
1 TO 4	1	0	0
5 TO 25	1	1	0
26 TO 50	1	1	1
51 TO 75	1	2	2
76 TO 100	1	3	3
101 AND OVER	1, PLUS 1 FOR EACH 300, OR FRACTION THEREOF, OVER 100	3, PLUS 1 FOR EACH 60, OR FRACTION THEREOF, OVER 100	3, PLUS 1 FOR EACH 50, OR FRACTION THEREOF, OVER 100
NOTE: CONFIRM WITH LOCAL JURISDICTIONS FOR MORE STRINGENT MINIMUM ACCESSIBLE STALL COUNTS			

REFERENCES:

a. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

b. SEE SDG&E STANDARD EV-9.10 PRE-CAST CONCRETE WHEEL STOP DETAIL.

c. SEE CALIFORNIA BUILDING CODE MOST RECENT EDITION.

d. SEE CALIFORNIA BUILDING CODE TABLE 11B-228.3.2.1 MOST RECENT EDITION.

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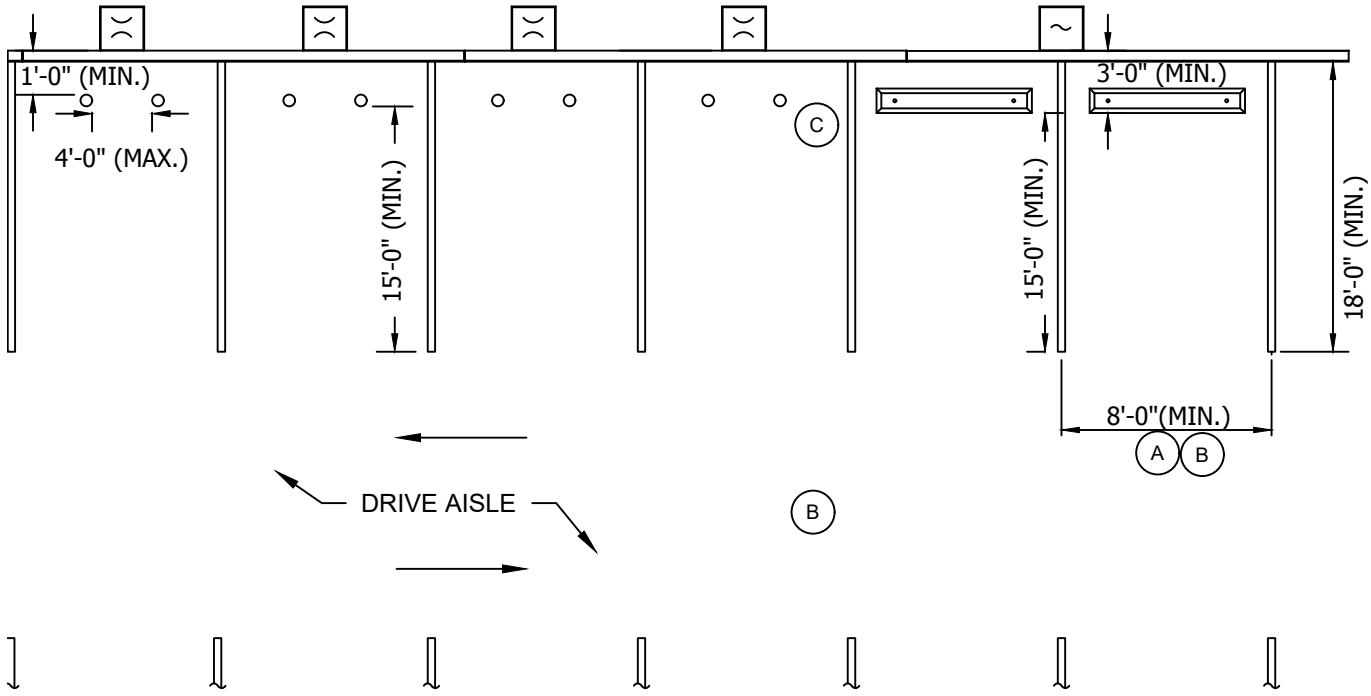

DESIGN:

(A) DIMENSIONS SHOWN ABOVE ARE MINIMUM DESIGN DIMENSIONS FOR FLEET AND PRIVATELY OWNED ELECTRIC VEHICLE CHARGING STALLS FOR MEDIUM/ HEAVY DUTY ELECTRIC VEHICLES. SIZE APPROPRIATELY TO ACCOMMODATE CUSTOMER ELECTRIC VEHICLE SELECTION. TYPICAL MAXIMUM STALL DIMENSIONS ARE 12'-0" W X 40'-0" L.

(B) MODIFICATIONS TO PARKING STALL ORIENTATION, COUNT, AND STRIPING, OR TO DRIVE AISLE IN ACCORDANCE WITH LATEST CALIFORNIA BUILDING CODE. TO BE DESIGNED AND REVIEWED BY CIVIL TEAM, WITH APPROVAL OF THE AHJ.

(C) EVSE MUST BE PROTECTED BY EITHER A WHEELSTOP OR BOLLARD (WHEELSTOPS ARE AN OPTION FOR CHARGERS ONLY). CHARGERS MAY BE PROTECTED BY WHEEL STOPS IN STALLS INTENDED FOR PASSENGER VEHICLES BUT MUST BE PROTECTED BY BOLLARDS IN STALLS INTENDED FOR COMMERCIAL VEHICLES. MINIMUM 1' CLEAR BACK OF BOLLARD, OR 3' CLEAR FRONT OF WHEELSTOP. SEE UG 3481.

REFERENCES:

a. SEE SDG&E STANDARD UG 3481 EQUIPMENT BARRIER PROTECTION AND CLEARANCE.

b. SEE SDG&E STANDARD EV-9.00 PRE-CAST CONCRETE WHEEL STOP DETAIL.

c. SEE CALIFORNIA BUILDING CODE MOST RECENT EDITION.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

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COMMON PARKING LAYOUT FLEET & PRIVATE CHARGING

EV-7.30

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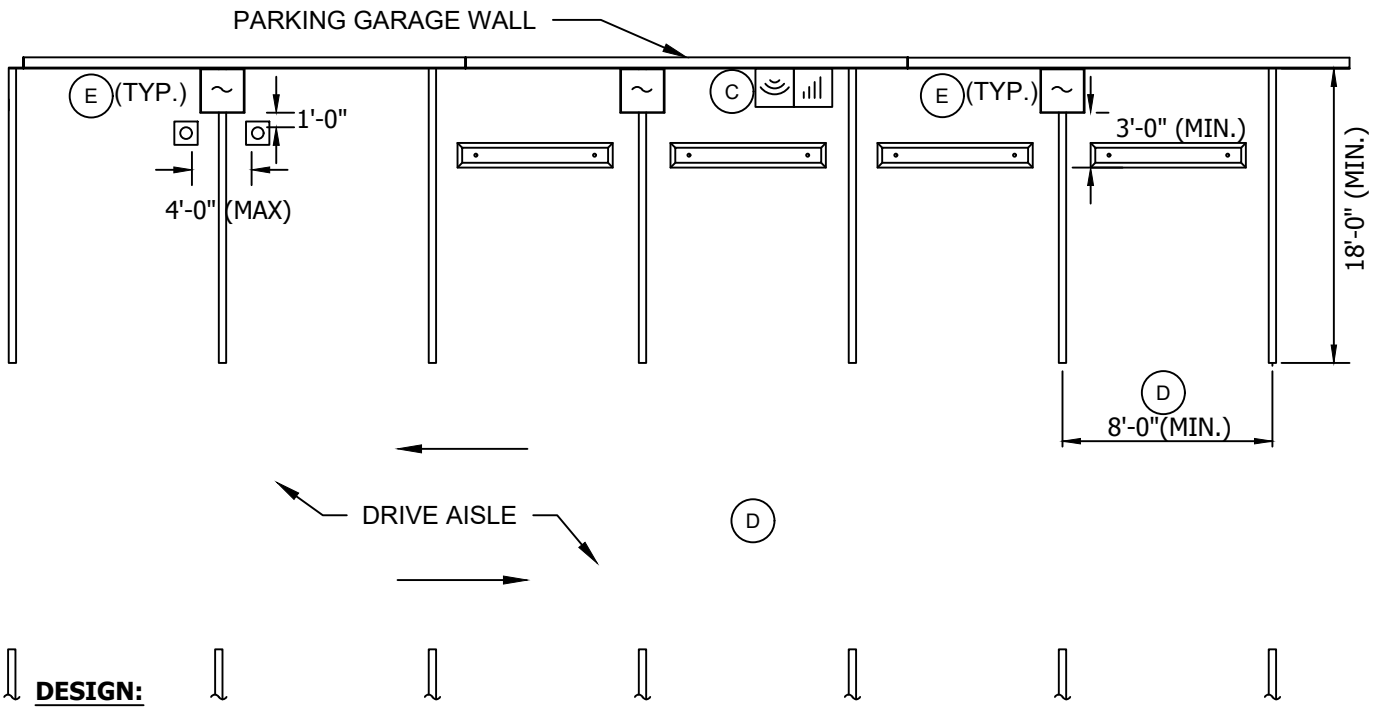

DESIGN:

A PARKING GARAGES WHICH REQUIRE NEW ELECTRICAL SERVICES SHALL LOCATE SERVICE EQUIPMENT OUTDOORS, OR WITHIN ELECTRICAL ROOM (NOT SHOWN). IF CANNOT BE MET THEN A DEVIATION IS REQUIRED.

B IF MULTIPLE SERVICES FOR ONE PARKING GARAGE ARE REQUIRED THEY SHALL BE INSTALLED PER SG-013 (NOT SHOWN).

C EVSE INSTALLED INSIDE PARKING GARAGES MUST BE TESTED FOR RECEPTION QUALITY AND STRENGTH BEFORE LOCATIONS ARE FINALIZED. ADDITIONAL COMMUNICATIONS EQUIPMENT MAY BE REQUIRED PER EV-4.00.

D MODIFICATIONS TO PARKING STALL ORIENTATION, COUNT, AND STRIPING, OR TO DRIVE AISLE IN ACCORDANCE WITH LATEST CALIFORNIA BUILDING CODE. TO BE DESIGNED AND REVIEWED BY CIVIL TEAM, WITH APPROVAL OF THE AHJ.

E STALLS ON POST TENSION SLAB SHALL INCLUDE WHEEL STOPS FOR STALLS INTENDED FOR PASSENGER VEHICLES AND SHALL USE PLATE MOUNTED BOLLARDS FOR STALLS INTENDED FOR COMMERCIAL VEHICLES AS DESIGNED IN STRUCTURAL/CIVIL PLANS PLANS. MINIMUM 1' CLEAR BACK OF BOLLARD, OR 3' CLEAR FRONT OF WHEELSTOP.

REFERENCES:

a. SEE SDG&E STANDARD SG 013 ELECTRIC SERVICE POLICIES - EXISTING CUSTOMER.

b. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

c. SEE SDG&E STANDARD EV-4.00 COMMUNICATION BLOCK DIAGRAMS.

d. SEE SDG&E STANDARD EV-9.10 PRE-CAST CONCRETE WHEEL STOP DETAIL.

e. SEE CALIFORNIA BUILDING CODE MOST RECENT EDITION.

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PARKING LAYOUT - PARKING GARAGE

EV-7.40

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EV-8.20	EVSE WALL MOUNTING DETAILS
EV-8.30	EQUIPMENT MOUNTING DETAILS

DRAWINGS:

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EVSE MOUNTING DETAILS

EV-8.00

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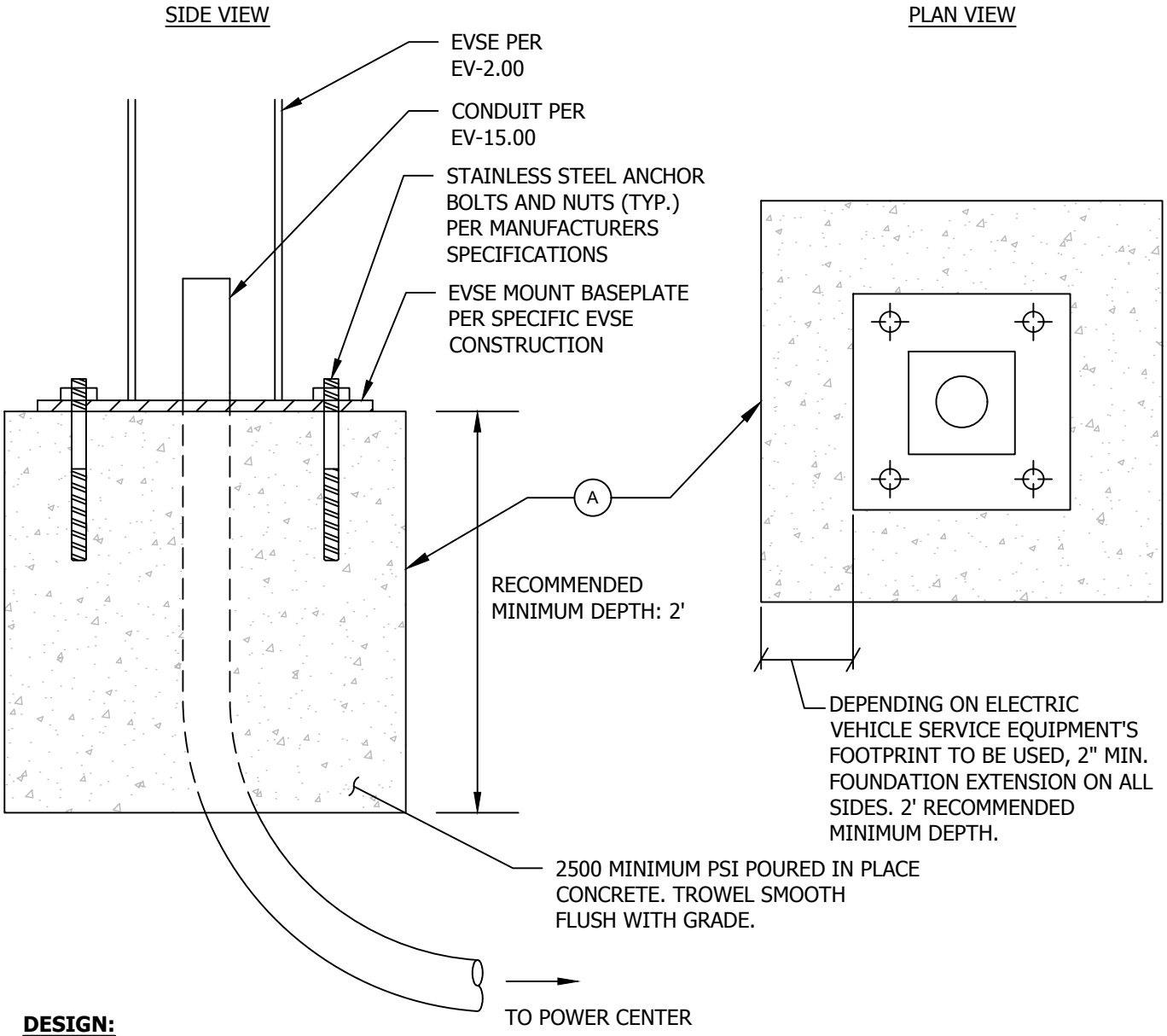

DESIGN:

(A) CAST IN PLACE CONCRETE PAD FOR LEVEL 2 OR DC FAST CHARGERS ARE TO BE DESIGNED BY STRUCTURAL ENGINEER WITH APPROVAL OF THE AHJ. SEE SPECIFIC CONSTRUCTION DRAWINGS.

REFERENCES:

a. SEE EVSE MANUFACTURERS INSTALLATION GUIDE.

b. SEE SDG&E STANDARD EV-2.00 EVSE SPECIFICATIONS.

c. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

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EVSE CAST IN PLACE PAD DETAILS

EV-8.10

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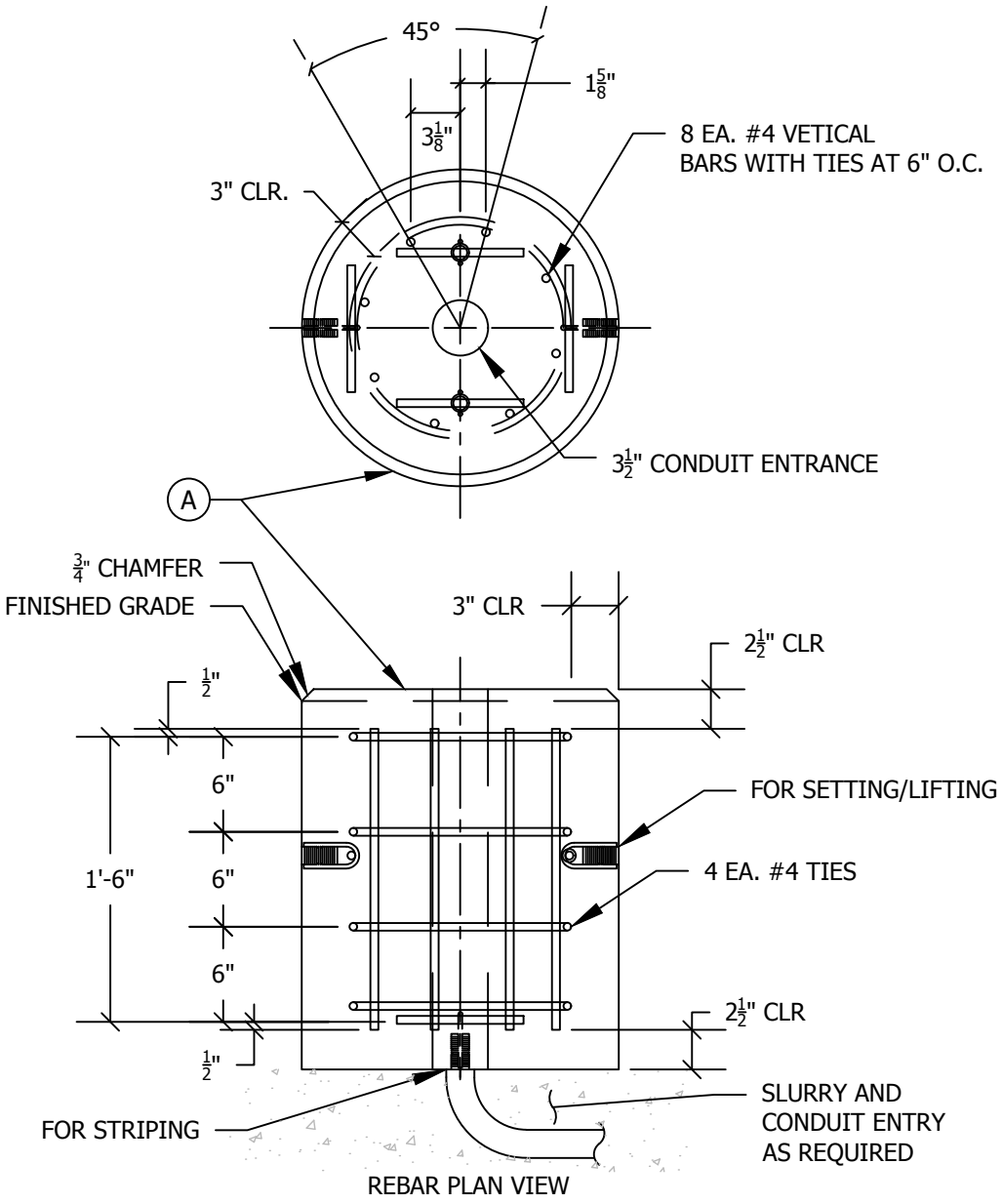

DESIGN:

(A) PRECAST EV CHARGER BASE. CONFIRM WITH SDG&E WHICH CHARGERS MAY BE USED WITH THIS PRECAST BASE BEFORE CONSTRUCTION.

REFERENCES:

a. SEE EVSE MANUFACTURERS INSTALLATION GUIDE.

b. SEE SDG&E STANDARD EV-2.00 EVSE SPECIFICATIONS.

c. SEE SDG&E STANDARD EV-15.00 ADDITIONAL RESOURCES.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

SHEET 2 OF 2

EVSE PRECAST PAD DETAILS

EV-8.11

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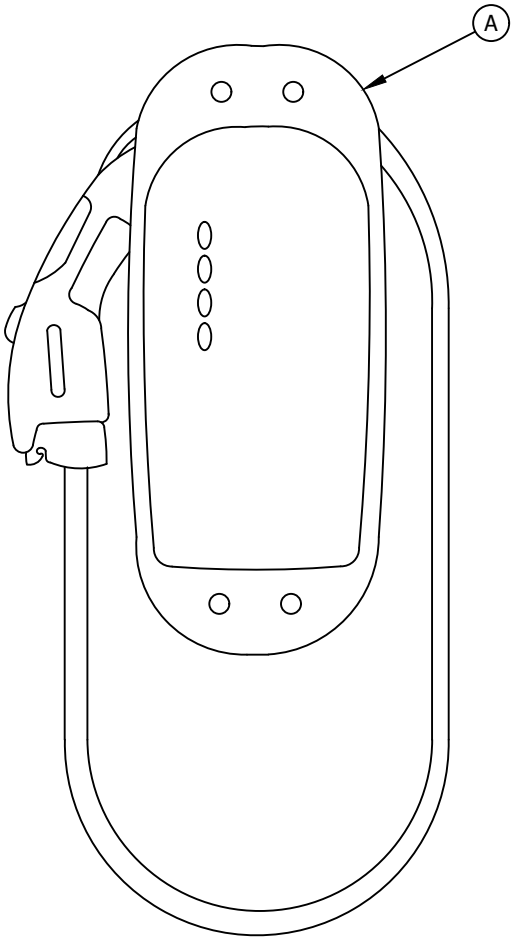

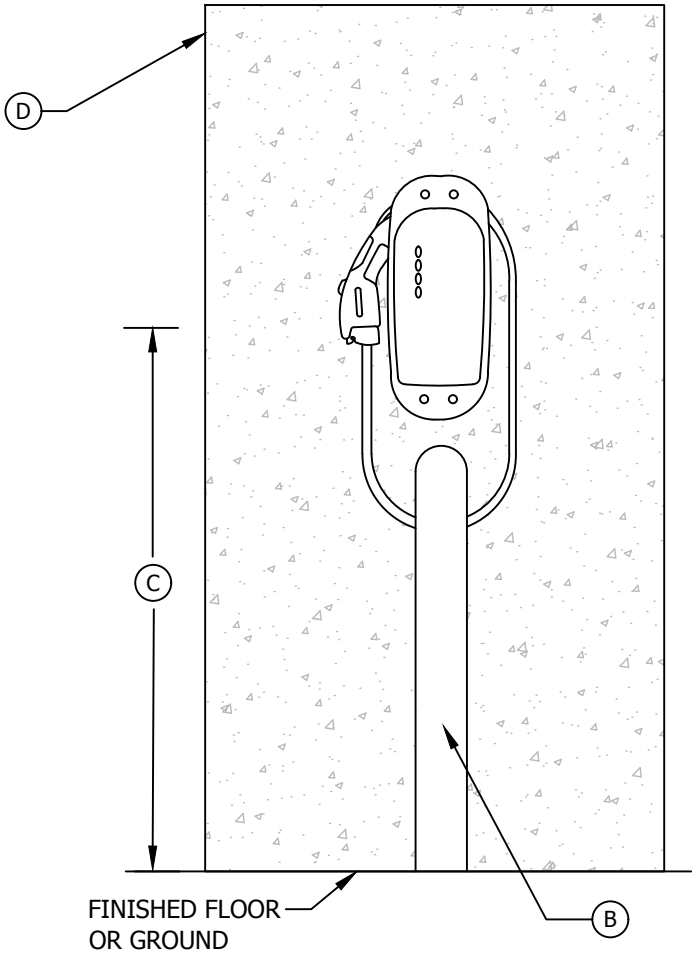

DESIGN:

(A) EVSE THAT REQUIRE WALL MOUNTING. ANCHOR TYPE & LOCATION PER EVSE SPECIFIC CONSTRUCTION.

(B) PROTECTIVE BARRIER, BOLLARD, OR WHEELSTOP. SEE SDG&E STANDARD UG 3821 OR EV-9.00 AS APPLICABLE PER EV-7.00.

(C) EVSE MOUNTING HEIGHT PER MANUFACTURER'S SPECIFICATIONS.

(D) CMU, CONCRETE, OR BRICK WALL WITH ADEQUATE SPACE TO MOUNT EVSE. IF NONE OF THESE ARE PRESENT THEN A UNISTRUT SYSTEM MAY BE DESIGNED BY A STRUCTURAL ENGINEER, WITH APPROVAL OF THE AHJ.

REFERENCES:

a. SEE SDG&E STANDARD UG 3481 EQUIPMENT BARRIER PROTECTION AND CLEARANCE.

b. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

c. SEE SDG&E STANDARD EV-9.00 PRE-CAST CONCRETE WHEEL STOP DETAIL.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

EVSE WALL MOUNTING DETAILS

EV-8.20

DESIGN:

(A) ANY EQUIPMENT WHICH REQUIRES WALL MOUNTING, WHETHER THAT BE A DISCONNECT, ENCLOSURE, EVSE SHALL BE MOUNTED PERMANENTLY TO A STRUCTURAL WALL BY MEANS DESIGNED BY A STRUCTURAL ENGINEER. IN THE ABSENCE OF A STRUCTURAL WALL A UNISTRUT SUPPORT SYSTEM MAY BE DESIGN BY A STRUCTURAL ENGINEER WITH THE APPROVAL OF THE AHJ.

(B) ANY CONDUIT THAT IS MOUNTED ON A STRUCTURE, OR ON A SUPPORT SYSTEM AND ANY CORING OF WALL FOR CORRESPONDING CONDUIT MUST ALSO BE DETAILED ON CONSTRUCTION DRAWINGS BY A STRUCTURAL ENGINEER.

REFERENCES:

a. SEE SDG&E STANDARD UG 3481 EQUIPMENT BARRIER PROTECTION AND CLEARANCE.

b. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

c. SEE SDG&E STANDARD EV-9.00 PRE-CAST CONCRETE WHEEL STOP DETAIL.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

EQUIPMENT MOUNTING DETAILS

EV-8.30

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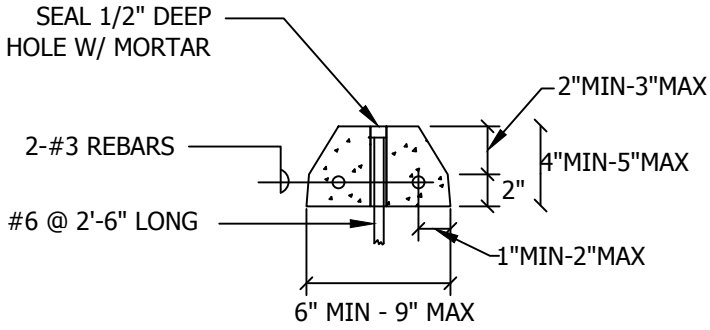
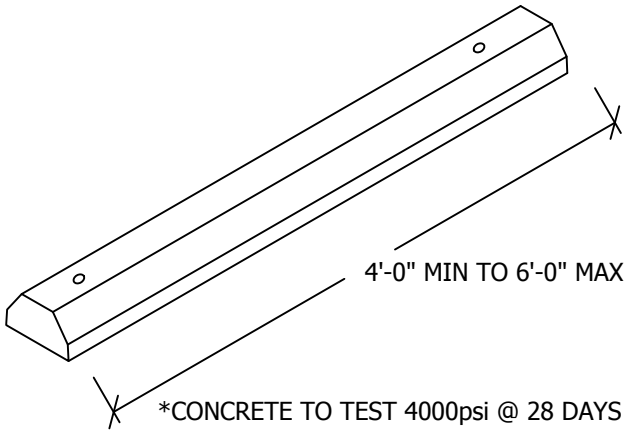
PRE-CAST CONCRETE WHEEL STOP DETAIL

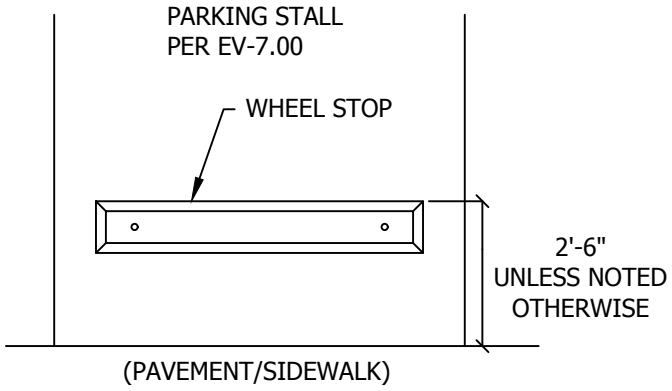
EV-9.00



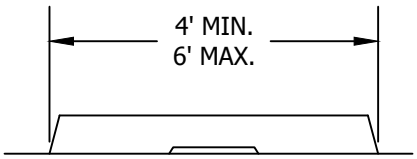
SECTION VIEW



ISOMETRIC VIEW



PLAN VIEW



ELEVATION VIEW

DESIGN:

(A) PHYSICAL BARRIER REQUIRED FOR ELECTRIC VEHICLE SERVICE EQUIPMENT'S PROTECTION. WHEEL STOPS AND/OR CONCRETE BOLLARDS ARE RECOMMENDED TO PREVENT A VEHICLE FROM CONTACTING OR DAMAGING ELECTRIC VEHICLE SERVICE EQUIPMENT. REFER TO SDG&E UG 3481 FOR BOLLARD INSTALLATION DETAILS. REFER TO EV-7.00 FOR TYPICAL STALL LAYOUTS.

(B) A WHEEL STOP CONSTRUCTION MAY BE SPECIALLY DESIGNED FOR EVSE STALLS. THESE WHEEL STOPS SHALL MEET OR EXCEED THE SPECIFICATIONS OF THIS DETAIL AND SHALL BE APPROVED BY THE AHJ.

REFERENCES:

a. SEE SDG&E STANDARD UG 3481 EQUIPMENT BARRIER PROTECTION AND CLEARANCE.

b. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

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PRE-CAST CONCRETE WHEEL STOP DETAIL

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SIGN POLE DETAILS

EV-10.00

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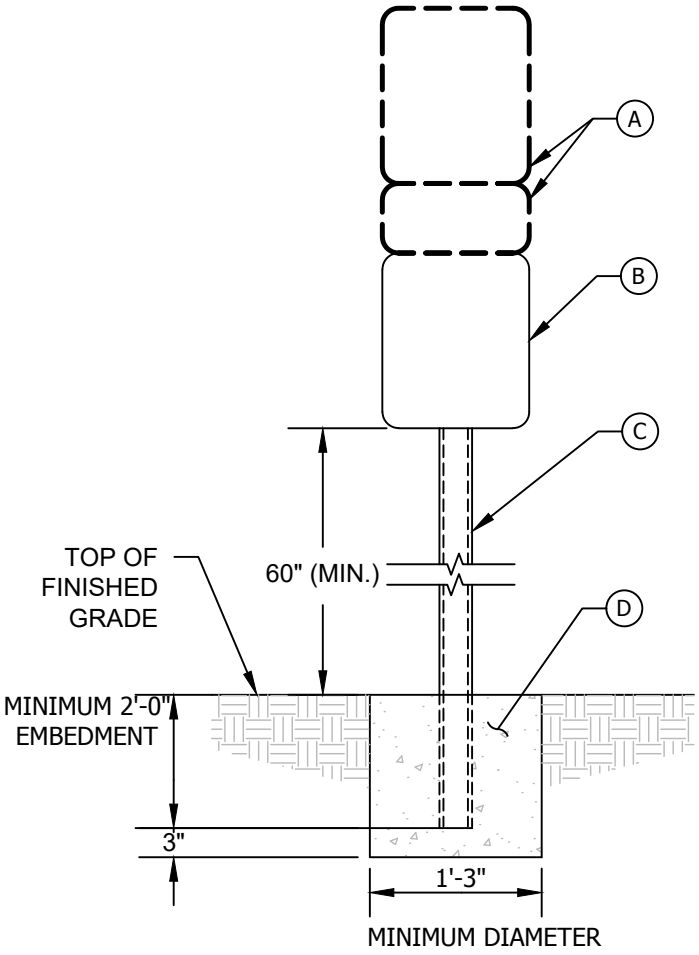

DESIGN:

(A) ADA SIGNAGE (AS REQUIRED) PER CBC 2019 SIGNAGE BACKGROUND NOT SMALLER THAN 70 SQ. INCHES & CENTERED IN FRONT OF ACCESSIBLE STALL OR RELATIVE LOCATION.

(B) EV CHARGING SIGN. SEE DRAWINGS EV-10.20 FOR ADDITIONAL SIGN DETAILS. REFER TO CONSTRUCTION DRAWINGS FOR SIGN PLACEMENT. SITES WITH PUBLIC ACCESS CHARGING SIGNS ARE REQUIRED. PRIVATE ACCESS CHARGING, NON ADA STALL SIGNS ARE OPTIONAL.

(C) 2" DIAMETER GALVANIZED STEEL POST, MIN 9' TALL INCLUDING 2' MIN EMBEDMENT.

(D) 2500 MINIMUM PSI POURED-IN-PLACE CONCRETE, SMOOTH TROWEL FLUSH WITH GRADE.

REFERENCES:

a. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

b. SEE SDG&E STANDARD EV-10.20 EVSE STALL SIGNAGE EXAMPLE.

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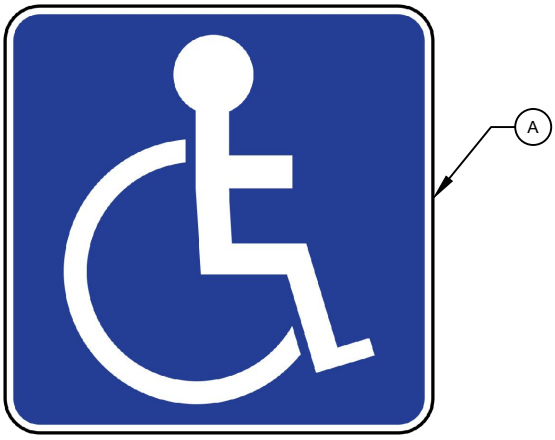
SIGN POLE DETAILS

EV-10.10

STANDARD SIGNAGE:

ADA SIGNAGE:



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DESIGN:

(A) CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES SIGN D9-6.

(B) CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES SIGN R7-8B.

(C) CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES SIGN R113A (CA).

REFERENCES:

a. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

b. CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

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EVSE STALL SIGNAGE EXAMPLE

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EV-11.20	DRY TYPE TRANSFORMER ENCLOSURES

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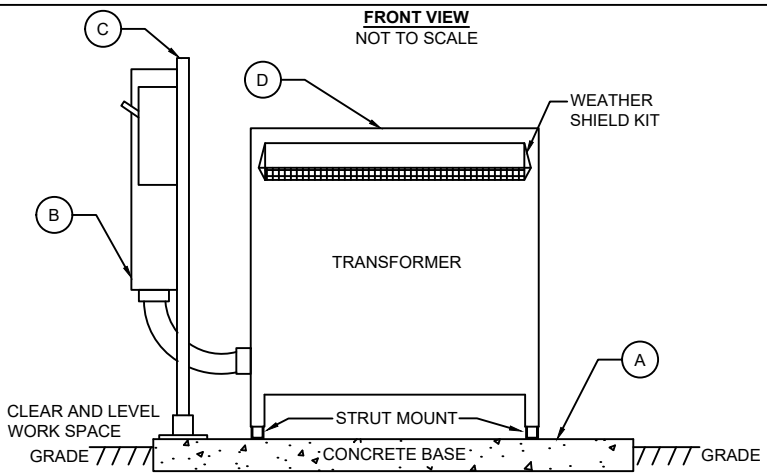
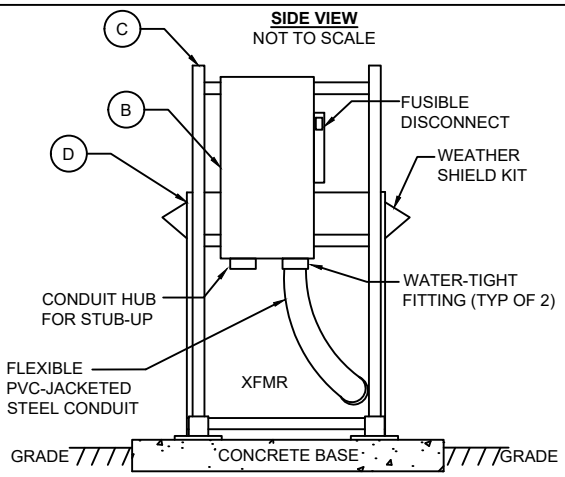
DRY TYPE TRANSFORMERS





DESIGN:

(A) DRY TYPE TRANSFORMERS MUST BE MOUNTED TO A STRUCTURAL BASE (PRECAST PAD, CAST IN PLACE PAD, NON POST TENSION SLAB, AND POST TENSION SLAB CHECKED WITH GROUND PENETRATING RADAR FOR POST TENSION CABLE).

(B) FUSED DISCONNECTING MEANS SHALL BE REQUIRED ON ANY SIDE OF THE TRANSFORMER THAT IS CONNECTED TO AN ELECTRICAL SUPPLY IF THERE IS NOT ANOTHER READILY ACCESSIBLE DISCONNECTING MEANS.

(C) UNISTRUT RACK PER STRUCTURAL CONSTRUCTION DRAWINGS AS APPLICABLE. STRUCTURAL WALL MAY BE USED IN LIEU OF UNISTRUT FOR MOUNTING DISCONNECT.

(D) TRANSFORMERS SHALL BE VENTILATED, NEMA 3R, 80°C RISE WITH 220°C INSULATION SYSTEM. TRANSFORMER SHALL BE TP-1 ENERGY-EFFICIENT WITH 2016 ENCLOSURE CONSTRUCTION. TRANSFORMER SHALL HAVE (2) 2-1/2% ABOVE RATED VOLTAGE TAPS AND (2) 2-1/% BELOW RATED VOLTAGE TAPS.

TABLE EV-11.10

TYPICAL TRANSFORMERS 3ϕ			MAXIMUM LOAD 3ϕ	MAXIMUM OCPD'S 3ϕ	
KVA RATING	DIMENSIONS	WEIGHT	CONNECTED KVA	480V	208V
75 KVA	29.00"W X 22.00"L	643LBS	75 KVA	125A	250A
112.5 KVA	28.22"W X 23.42"L	876LBS	112.5 KVA	175A	400A
150 KVA	28.22"W X 23.42"L	1064LBS	150 KVA	225A	500A
225 KVA	31.44"W X 24.67"L	1569LBS	225 KVA	350A	800A
300 KVA	36.69"W X 32.65"L	2050LBS	300 KVA	450A	1000A
500 KVA	44.20"W X 36.23"L	3681LBS	500 KVA	800A	1600A
TYPICAL TRANSFORMERS 1ϕ			MAXIMUM LOAD 1ϕ	MAXIMUM OCPD'S 1ϕ	
KVA RATING	DIMENSIONS	WEIGHT	CONNECTED KVA	480V	240V
75 KVA	24.22"W X 23.84"L	657LBS	75 KVA	200A	400A
100 KVA	29.97"W X 33.97"L	803LBS	100 KVA	250A	500A
NOTE: THESE ARE TYPICAL DIMENSIONS, ACTUAL DIMENSIONS ARE TO BE CONFIRMED BEFORE CONSTRUCTION.					

REFERENCES:

a. SEE SDG&E STANDARD EV-3.00.

b. SEE CEC ARTICLE 240 MOST RECENT EDITION.

c. SEE CEC ARTICLE 450 MOST RECENT EDITION.

d. SEE SDG&E STANDARD EV-15.60.

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TYPICAL TRANSFORMERS

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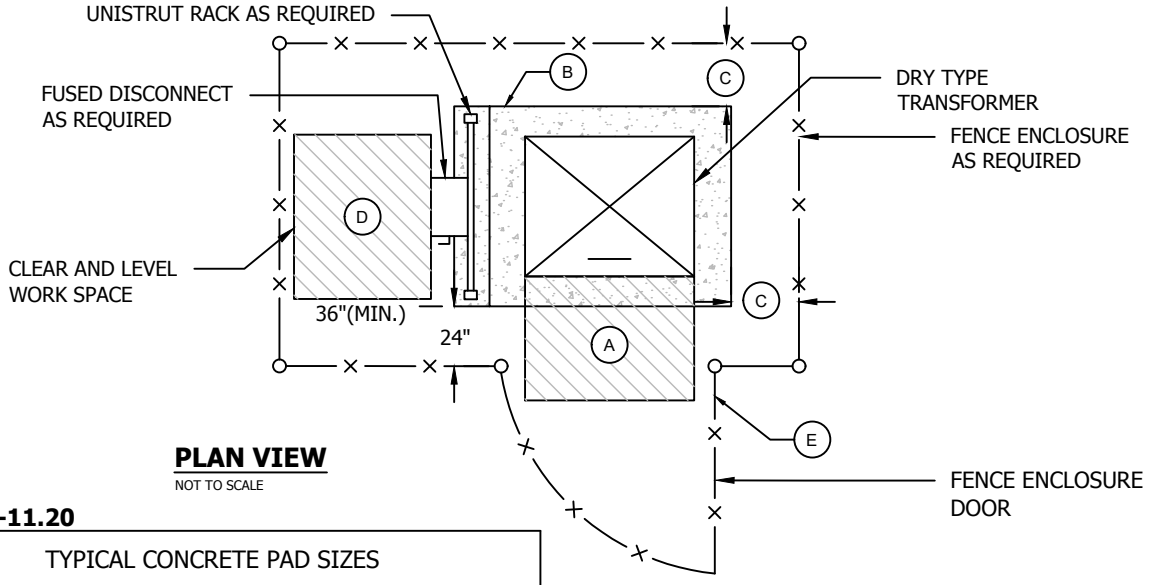

PLAN VIEW
NOT TO SCALE

TABLE EV-11.20

TYPICAL CONCRETE PAD SIZES	
KVA RATING	DIMENSIONS
75 KVA	41.00"W X 34.00"L
112.5/100 KVA	40.22"W X 35.42"L
150 KVA	40.22"W X 35.42"L
225 KVA	43.44"W X 36.67"L
300 KVA	48.69"W X 44.65"L
500 KVA	56.20"W X 48.23"L
NOTE: ACTUAL CONCRETE PAD DIMENSIONS SHALL REFLECT ACTUAL DRY TYPE TRANSFORMERS DIMENSIONS	

DESIGN:

(A) CLEAR AND LEVEL SPACE MINIMUM OF 36" DEEP X TRANSFORMER WIDTH FROM FRONT OF TRANSFORMER.

(B) STRUCTURAL BASE A MINIMUM OF 6" AROUND DIMENSIONS OF TRANSFORMER. TYPICAL SIZES PER TABLE ON THIS SHEET.

(C) A MINIMUM OF 12" FROM EDGE OF PAD, AND 18" TO EDGE OF TRANSFORMER.

(D) CLEAR AND LEVEL WORK SPACE FOR ELECTRICAL EQUIPMENT PER CEC 110.26.

(E) FENCED ENCLOSURE IS REQUIRED FOR DRY TYPE TRANSFORMERS LOCATED IN PUBLIC ACCESS, SHALL BE A MINIMUM OF 8' HIGH WITH MINIMUM 36" WIDE SWING OUT DOOR. OVERALL DIMENSIONS TO ACCOMMODATE REQUIRED CLEARANCES.

REFERENCES:

a. SEE SDG&E STANDARD 110.26 SPACES ABOUT ELECTRICAL EQUIPMENT

b. SEE SDG&E STANDARD EV-7.00 TYPICAL PARKING LAYOUT.

c. SEE SDG&E STANDARD EV-10.20 EVSE STALL SIGNAGE EXAMPLE.

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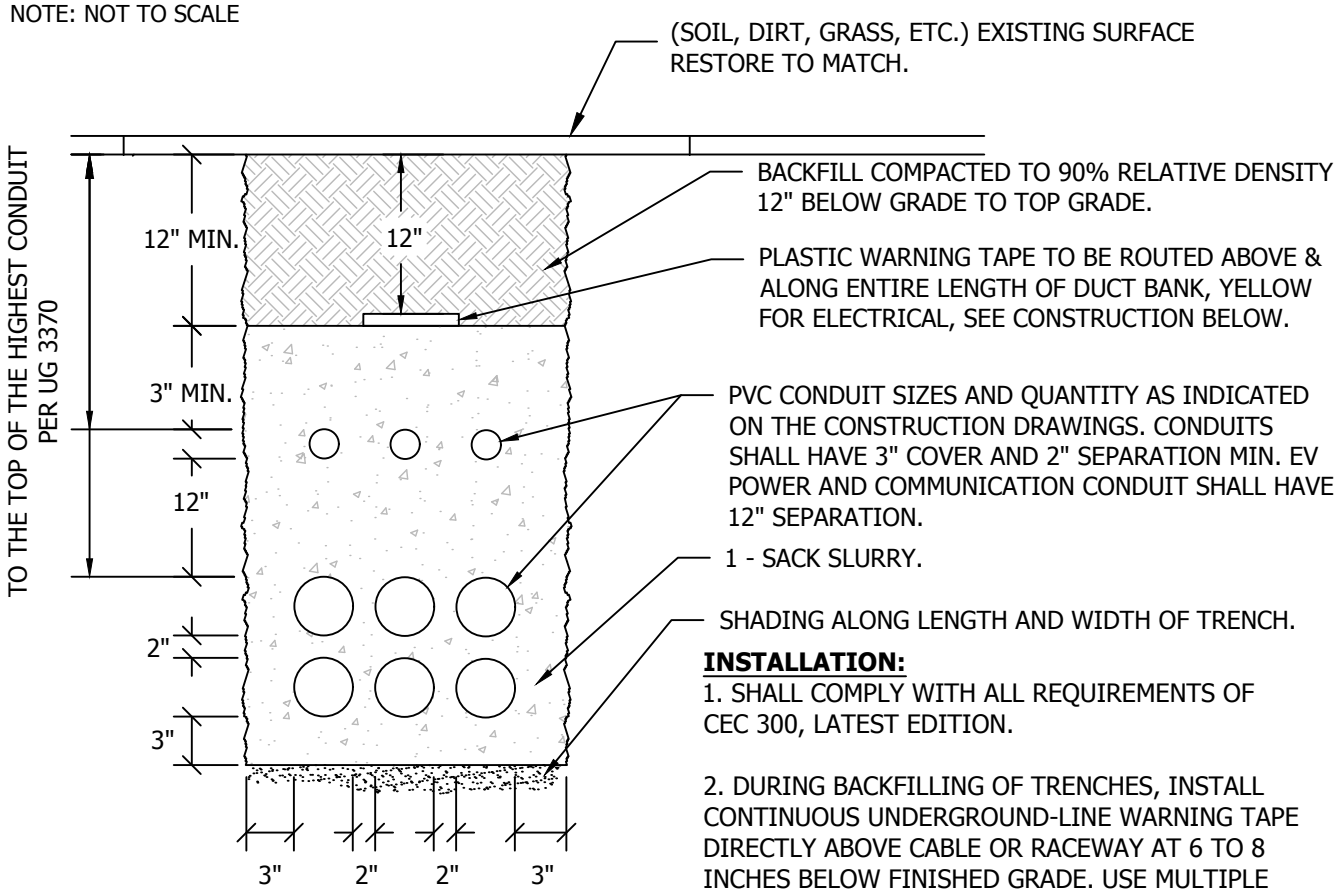
EVSE TRENCHING DETAILS

EV-12.00

TRENCHING DETAIL (THROUGH LANDSCAPE)

NOTE: NOT TO SCALE



INSTALLATION:

1. SHALL COMPLY WITH ALL REQUIREMENTS OF CEC 300, LATEST EDITION.

2. DURING BACKFILLING OF TRENCHES, INSTALL CONTINUOUS UNDERGROUND-LINE WARNING TAPE DIRECTLY ABOVE CABLE OR RACEWAY AT 6 TO 8 INCHES BELOW FINISHED GRADE. USE MULTIPLE TAPES WHERE WIDTH OF MULTIPLE LINES INSTALLED IN A COMMON TRENCH EXCEEDS 16 INCHES OVERALL.

CONSTRUCTION:

A. RECOMMENDED BY MANUFACTURER FOR THE METHOD OF INSTALLATION AND SUITABLE TO IDENTIFY AND LOCATE UNDERGROUND ELECTRICAL LINES.

B. PRINTING ON TAPE SHALL BE PERMANENT AND SHALL NOT BE DAMAGED BY BURIAL OPERATIONS.

C. TAPE MATERIAL AND INK SHALL BE CHEMICALLY INERT AND NOT SUBJECT TO DEGRADATION WHEN EXPOSED TO ACIDS, ALKALIS, AND OTHER DESTRUCTIVE SUBSTANCES COMMONLY FOUND IN SOILS.

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SECONDARY TRENCHING THROUGH LANDSCAPE

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TRENCHING DETAIL (THROUGH HARDSCAPE)
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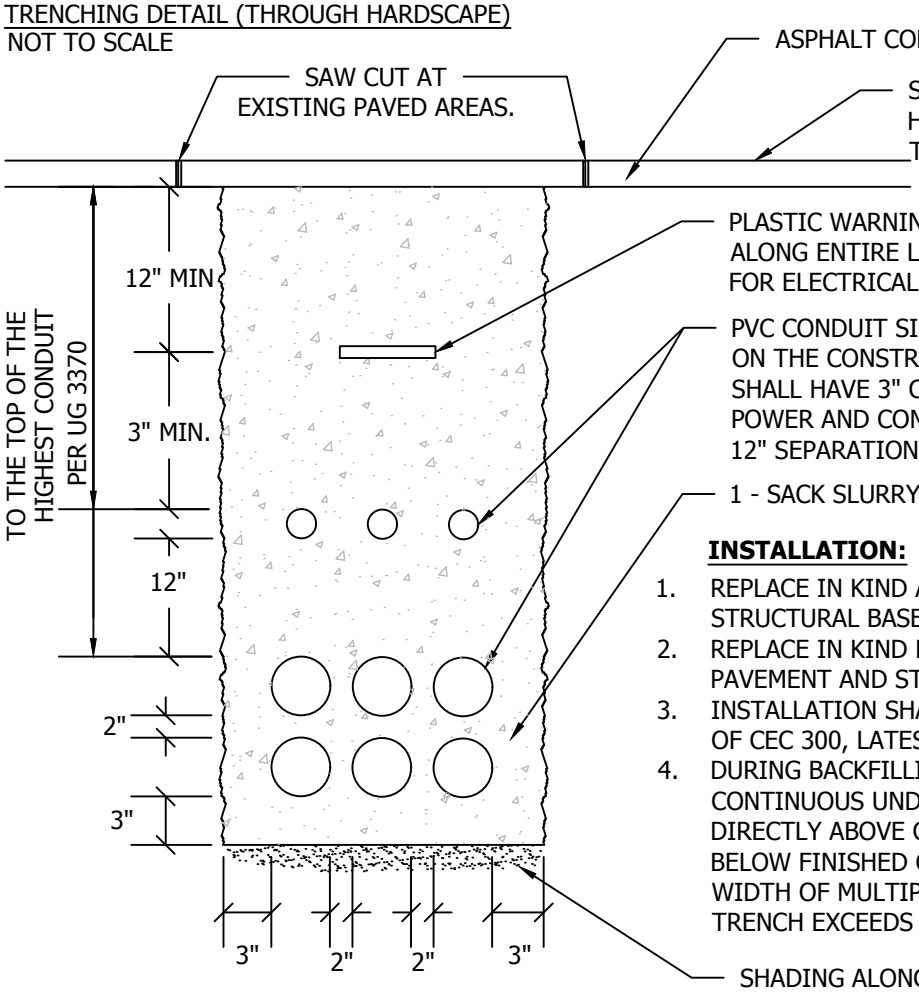

INSTALLATION:

1. REPLACE IN KIND ASPHALT CONCRETE PAVEMENT AND STRUCTURAL BASE.
2. REPLACE IN KIND PORTLAND CEMENT CONCRETE (PCC) PAVEMENT AND STRUCTURAL BASE.
3. INSTALLATION SHALL COMPLY WITH ALL REQUIREMENTS OF CEC 300, LATEST EDITION.
4. DURING BACKFILLING OF TRENCHES, INSTALL CONTINUOUS UNDERGROUND-LINE WARNING TAPE DIRECTLY ABOVE CABLE OR RACEWAY AT 12 INCHES BELOW FINISHED GRADE. USE MULTIPLE TAPES WHERE WIDTH OF MULTIPLE LINES INSTALLED IN A COMMON TRENCH EXCEEDS 16 INCHES OVERALL.

CONSTRUCTION:

A. RECOMMENDED BY MANUFACTURER FOR THE METHOD OF INSTALLATION AND SUITABLE TO IDENTIFY AND LOCATE UNDERGROUND ELECTRICAL LINES.

B. PRINTING ON TAPE SHALL BE PERMANENT AND SHALL NOT BE DAMAGED BY BURIAL OPERATIONS.

C. TAPE MATERIAL AND INK SHALL BE CHEMICALLY INERT AND NOT SUBJECT TO DEGRADATION WHEN EXPOSED TO ACIDS, ALKALIS, AND OTHER DESTRUCTIVE SUBSTANCES COMMONLY FOUND IN SOILS.

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SECONDARY TRENCHING THROUGH HARDSCAPE

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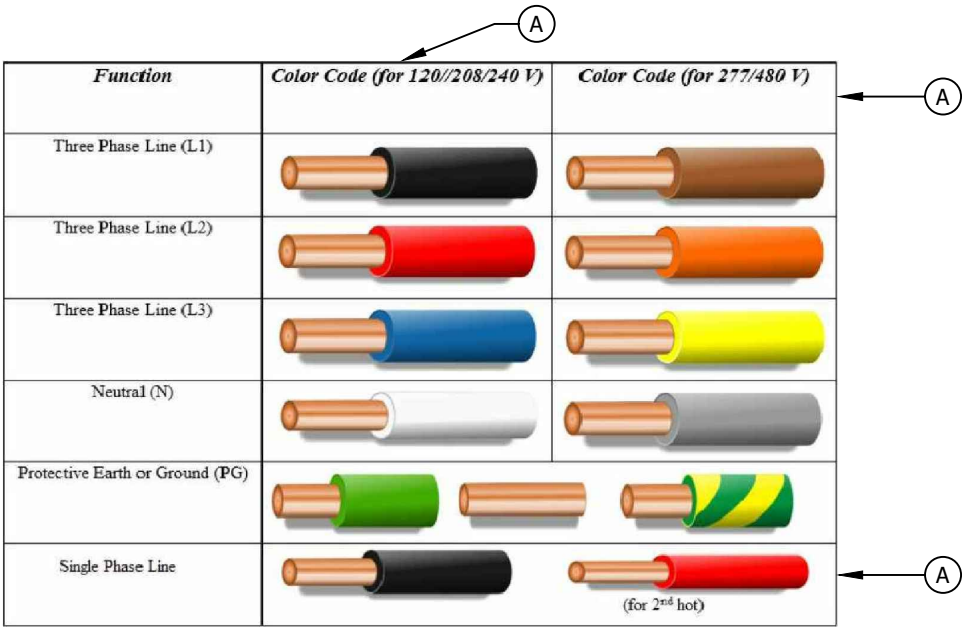
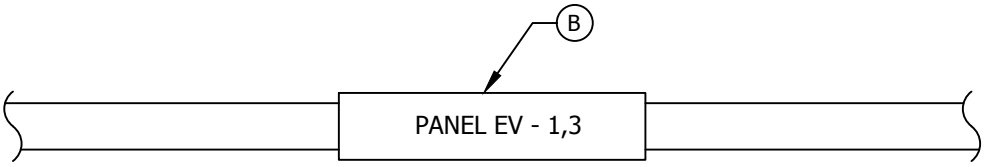
EQUIPMENT IDENTIFICATION





(EXAMPLE LABEL: PANEL NAME - CORRESPONDING CIRCUIT NUMBERS)

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DESIGN:

(A) CONDUCTOR COLOR CODING PER PHASE IDENTIFICATION, 600V OR LESS. USE CORRESPONDING TABLE FOR SINGLE OR THREE PHASE CIRCUITS FOR THE APPLICABLE VOLTAGE SYSTEMS.

(B) ALL CONDUCTORS TO BE IDENTIFIED WITH THEIR RESPECTIVE CIRCUIT BY SELF-ADHESIVE LABELS OR MARKER TAPE. ON EACH ITEM, INSTALL UNIQUE DESIGNATION LABEL THAT IS CONSISTENT WITH SINGLE LINE DIAGRAMS, SCHEDULES, AND OPERATION AND MAINTENANCE MANUALS. UNLESS OTHERWISE INDICATED, PROVIDE A SINGLE LINE OF TEXT WITH 1/2 INCH HIGH LETTERS ON 1-1/2 INCH HIGH LABEL; WHERE TWO LINES OF TEXT ARE REQUIRED, USE LABELS 2 INCHES HIGH.

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BRANCH CIRCUIT WIRING IDENTIFICATION

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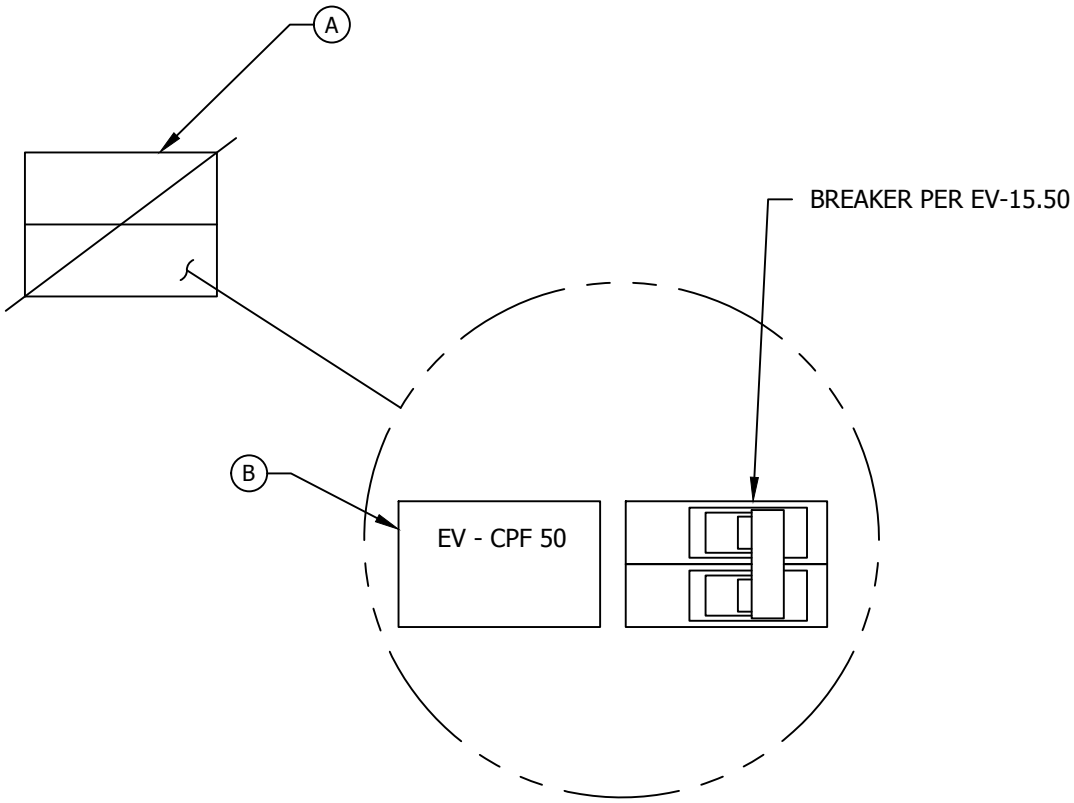

(EXAMPLE LABEL: ELECTRIC VEHICLE CHARGER MODEL)

DESIGN:

(A) POWER CENTERS MUST BE LABELED PER SDG&E STANDARD SG 017.

(B) CIRCUIT BREAKER TO BE IDENTIFIED WITH PERMANENT MEANS.

REFERENCES:

a. SEE SDG&E STANDARD SG 017 PLAQUE SPECIFICATIONS & EXAMPLES.

b. SEE SDG&E STANDARD EV-3.00 EVSE LOAD SUMMARY.

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EQUIPMENT IDENTIFICATION

EV-13.20

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DRAWINGS:

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

TYPICAL MATERIALS

TYPICAL MATERIALS
(SEE CONSTRUCTION DRAWINGS FOR SITE SPECIFIC MATERIAL LIST)

TABLE EV-14.10

ITEM #	TYPE	ITEM DESCRIPTION	MANUFACTURER/ SUPPLIER	MODEL	SDG&E STANDARD
1	CONCRETE	CONCRETE - 6 SACK (3/4" ROCK MIX)			
2	CONCRETE	CAST IN PLACE PAD, 24x24x24 - CHARGE STATION - COMPLETE			EV 7.1
3	CONCRETE	PRECAST PAD, TRANSFORMER			3421
4	CMU BLOCK	CONCRETE BLOCK 8 X 8 X 16 IN			3487.6
5	REBAR	REINFORCING ROD #4 1/2 IN			
6	REBAR	REINFORCING ROD #3 3/8 IN			
7	1" CONDUIT EVSE	CONDUIT, EMT, 1 INCH X 10 FOOT, GALVANIZED	WHEATLAND	7037 (DOT)	
8	1" CONDUIT EVSE	CONDUIT, BODY, TYPE C, 1"	PW PIPE	4752972 (DOT)	
9	1" CONDUIT EVSE	CONDUIT, BODY, TYPE LL, 1"	PW PIPE	#61360100	
10	1" CONDUIT EVSE	CONDUIT, BODY, TYPE LR, 1"	PW PIPE	19278 (DOT)	
11	1" CONDUIT EVSE	CONDUIT, BODY, TYPE T, 1"	PW PIPE	19307 (DOT)	
12	1" CONDUIT EVSE	CONDUIT STRAP, EMT, 1"	BRDGPRT	4285187 (DOT)	
13	1" CONDUIT EVSE	CONDUIT HANGAR, EMT, 1"	BRDGPRT	4441652 (DOT)	
14	1" CONDUIT EVSE	CONDUIT LIQUIDTIGHT, 1 INCH, NON METALLIC, FLEXIBLE (100 FT COILS)	ELECTRIFLEX	#81032	
15	3" CONDUIT BEND	CONDUIT, 45 DEGREE. 36 INCH, RIGHT ELBOW 3 INCH, D860 PVC	PW PIPE	2703515 (DOT)	
16	CONNECTOR	CONNECTOR, COMPRESSION, 1 IN EMT, F-F	ARLINGTON	#832	
17	CONNECTOR	CONNECTOR, COMPRESSION, 1 IN EMT, INSU, M-F	ARLINGTON	#822A	
18	CONNECTOR	CONNECTOR, COMBINATION, 1 IN EMT TO RIGID F-F	BRIDGEPORT	292-MS	
19	CONNECTOR	CONNECTOR, LIQUIDTIGHT, STRAIGHT 1 IN	AMERICAN FITTINGS	NML100	
20	CONNECTOR	CONNECTOR, LIQUIDTIGHT, 90 DEG, 1 IN	AMERICAN FITTINGS	NML10090	
21	CONDUIT	CONDUIT, 1 1/2" (1.5"") SCH 40 PVC			
22	CONDUIT	CONDUIT, 45° ELBOW 1 1/2" (1.5") SCH 40 PVC	PW PIPE	PVL15045	
23	CONDUIT	CONDUIT, 90° ELBOW 1 1/2" (1.5") SCH 40 PVC	PW PIPE	PV04080B	
24	CONDUIT	CONDUIT, 3" D860 PVC	2703462	PVFTG 3 PVC D860	3373.1
25	CONDUIT	CONDUIT, 90° 36" R. ELBOW 3" D860 PVC			3373.2
26	CONDUIT	CONDUIT, 22.5° 25" R. ELBOW 3" D860 PVC			3373.2
27	HANDHOLE	HANDHOLE, 3313 W/TRAFFIC COVER	OLDCASTLE PRECAST		3313
28	CABLE	CABLE, 3-350 MCM & 1 - #3/0 USA (2 RUNS)			4002.1
29	CABLE	CABLE, 3-500 MCM & 1 - #3/0 USA (2 RUNS)			4002.1
30	CONNECTOR	CONNECTOR, 4 WAY, #8 - 500 MCM			4173.1
31	CONNECTOR	LUG, 2 BOLT 350 MCM USA			4171.1
32	CONNECTOR	LUG, 2 BOLT #3/0 USA			4171.1
33	DISCONNECT-FUSED	200AT, 200AF, 480V PRIMARY (FOR 112.5 KVA)			
34	DISCONNECT-FUSED	300AT, 250AF, 480V PRIMARY (FOR 150 KVA)			
35	DISCONNECT-FUSED	200AT, 200AF, 480V PRIMARY (FOR 225 KVA)			
36	WIRE	3/0, COPPER, THWN BLACK	CERRO WIRE	24334 (DOT)	
37	WIRE	#6, COPPER, THHN BLACK	CERRO WIRE	24311	
38	WIRE	#6, COPPER, THHN RED	CERRO WIRE	24315	
39	WIRE	#6, COPPER, THHN GREEN	CERRO WIRE	24314	
40	WIRE	#6, COPPER, THHN BLUE	CERRO WIRE	24313	
41	WIRE	#6, COPPER, THHN YELLOW	CERRO WIRE	802312	
42	WIRE	#6, COPPER, THHN ORANGE	CERRO WIRE	802310	
43	WIRE	#6, COPPER, THHN WHITE	CERRO WIRE	24316	
44	WIRE	#6, COPPER, THHN BROWN	CERRO WIRE	24321	
45	WIRE	#6, COPPER, THHN GRAY	CERRO WIRE	1072867	
46	WIRE	#8, COPPER, THHN BLACK	CERRO WIRE	24318	
47	WIRE	#8, COPPER, THHN RED	CERRO WIRE	24325	
48	WIRE	#8, COPPER, THHN GREEN	CERRO WIRE	24322	

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TYPICAL MATERIALS
(SEE CONSTRUCTION DRAWINGS FOR SITE SPECIFIC MATERIAL LIST)

TABLE EV-14.11

ITEM #	TYPE	ITEM DESCRIPTION	MANUFACTURER / SUPPLIER	MODEL	SDG&E STANDARD
49	WIRE	#8, COPPER, THHN BLUE	CERRO WIRE	24320	
50	WIRE	#8, COPPER, THHN YELLOW	CERRO WIRE	24327	
51	WIRE	#8, COPPER, THHN ORANGE	CERRO WIRE	24324	
52	WIRE	#8, COPPER, THHN WHITE	CERRO WIRE	24326	
53	WIRE	#8, COPPER, THHN BROWN	CERRO WIRE	24321	
54	WIRE	#8, COPPER, THHN GRAY	CERRO WIRE	2758526	
55	WIRE	#10, COPPER, THHN GREEN	CERRO WIRE	24122	
56	HARDWARE	5/8" X 12" ANCHOR BOLT - CAST IN PLACE OR EPOXY	HILTI	4813458 (DOT)	
57	HARDWARE	5/8" X 6" - WEDGE ANCHOR	CULLY	4525807 (DOT)	
58	HARDWARE	THREADED ROD, 1/4", STAINLESS	CULLY	3312733 (DOT)	
59	HARDWARE	FASTENER, HILTI, 3/4" LONG SHANK - POWDER ACTUATED (CONDUIT HANGER)	HILTI	4813466 (DOT)	
60	HARDWARE	3/8" X 3" - WEDGE ANCHOR	CULLY	4403808 (DOT)	
61	EVSE-L2	CHARGEPOINT CT4011 208/240 30A L2 SINGLE BOLLARD UNIT WITH CORD MANAGEMENT	CHARGEPOINT	CP4011P	
62	EVSE-L2	CHARGEPOINT CT4011 208/240 30A L2 SINGLE PEDESTAL WITH GATEWAY WITH CORD MANAGEMENT	CHARGEPOINT	CP4011P-GW	
63	EVSE-L2	CHARGEPOINT CT4013 208/240 30A L2 SINGLE WALL WITH CORD MANAGEMENT	CHARGEPOINT	CP4013W	
64	EVSE-L2	CHARGEPOINT CT4013 208/240 30A L2 SINGLE WALL MOUNT WITH GATEWAY WITH CORD MANAGEMENT	CHARGEPOINT	CP4013W-GW	
65	EVSE-L2	CHARGEPOINT CT4021 208/240 30A L2 DUAL BOLLARD WITH CORD MANAGEMENT	CHARGEPOINT	CP4021P	
66	EVSE-L2	CHARGEPOINT CT4021 208/240 30A L2 DUAL BOLLARD WITH GATEWAY WITH CORD MANAGEMENT	CHARGEPOINT	CP4021P-GW	
67	EVSE-L2	CHARGEPOINT CT4023 208/240 30A L2 DUAL WALL MOUNT WITH CORD MANAGEMENT	CHARGEPOINT	CP4023W	
68	EVSE-L2	CHARGEPOINT CT4023 208/240 30A L2 DUAL WALL WITH GATEWAY WITH CORD MANAGEMENT	CHARGEPOINT	CP4023W-GW	
69	EVSE-L2	CHARGEPOINT CPF25 208/240 32A L2 WALL MOUNT	CHARGEPOINT	CPF25W	
70	EVSE-L2	CHARGEPOINT CPF25 208/240 32A L2 PEDESTAL MOUNT, NO CORD MANAGEMENT	CHARGEPOINT	CPF25SP	
71	EVSE-L2	CHARGEPOINT CPF25 208/240 32A L2 WALL MOUNT, ACCESS CONTROL	CHARGEPOINT	CPF25WA	
72	EVSE-L2	CHARGEPOINT CPF25 208/240 32A L2 PEDESTAL MOUNT, ACCESS CONTROL	CHARGEPOINT	CPF25SPA	
73	EVSE-L2	CHARGEPOINT CPF25 208/240 32A L2 DUAL PEDESTAL MOUNT, ACCESS CONTROL	CHARGEPOINT	CPF25DPA	
74	EVSE-L2	CHARGEPOINT CPF25 208/240 32A L2 SINGLE WALL MOUNT, ACCESS CONTROL	CHARGEPOINT	CPF25DPA	
75	EVSE-L2	GREENLOTS EVBOX 32A L2 PEDESTAL, 25' CORD	GREENLOTS	EVBOX	
76	EVSE-L2	GREENLOTS SIEMENS 32A L2 WALL MOUNT 20' CORD	GREENLOTS	SMNS32W	
77	EVSE-L2	GREENLOTS CRADLEPOINT MODEM	GREENLOTS	CRDLMODE	
78	EVSE-L2	GREENLOTS SIEMENS COMMSBOX WALL MOUNT	GREENLOTS	COMMSBOX	
79	EVSE-L2	CHARGEPOINT SINGLE OUTPUT, NON-GATEWAY (INCL. OPTIONAL WALL MOUNT KIT)	CHARGEPOINT	CPF25	
80	EVSE-L2	CHARGEPOINT CPF25 CORD MANAGEMENT KIT, 6'	CHARGEPOINT	CPF25-CMK6	
81	EVSE-L2	CHARGEPOINT PEDESTAL MOUNTING KIT FOR SINGLE CPF25 CMK	CHARGEPOINT	CPF25-CMK-PDMNT	
82	EVSE-L2	CHARGEPOINT PEDESTAL MOUNTING KIT FOR DUAL CPF25 CMK	CHARGEPOINT	CPF25-CMK-PDMNT-DUAL	
83	EVSE-L2	CHARGEPOINT WALL MOUNTING KIT FOR SINGLE CPF25 CMK	CHARGEPOINT	CPF25-CMK-WALLMNT	
84	EVSE-L2	CHARGEPOINT CHARGING CORD, 18' WITH J1772 CONNECTOR	CHARGEPOINT	CPF25CORD-L-18	
85	EVSE-L2	CHARGEPOINT PEDESTAL MOUNT KIT	CHARGEPOINT	CPF25-PDMNT	
86	EVSE-L2	CHARGEPOINT PEDESTAL MOUNTING KIT FOR DUAL CPF25	CHARGEPOINT	CPF25-PDMNT-DUAL	

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TYPICAL MATERIALS
(SEE CONSTRUCTION DRAWINGS FOR SITE SPECIFIC MATERIAL LIST)

TABLE EV-14.12

ITEM #	TYPE	ITEM DESCRIPTION	MANUFACTURER/ SUPPLIER	MODEL	SDG&E STANDARD
87	EVSE-L2	CHARGEPOINT PEDESTAL STAND	CHARGEPOINT	CPF-PD	
88	EVSE-L2	CHARGEPOINT GATEWAY FOR CPF25 NON-GATEWAYS	CHARGEPOINT	CPGW	
89	EVSE-L2	CHARGEPOINT CT4000 CORD MANAGEMENT KIT, 6'	CHARGEPOINT	CT4000-CMK	
90	EVSE-L2	CHARGEPOINT BOLLARD MOUNT BODY WITH MOUNTING KIT	CHARGEPOINT	CT4001-BD	
91	EVSE-L2	CHARGEPOINT BOLLARD MOUNT CAP	CHARGEPOINT	CT4001-CAP	
92	EVSE-L2	CHARGEPOINT WALL MOUNT BODY WITH MOUNTING KIT	CHARGEPOINT	CT4003-BD	
93	EVSE-L2	CHARGEPOINT WALL MOUNT CAP	CHARGEPOINT	CT4003-CAP	
94	EVSE-L2	CHARGEPOINT SINGLE OUTPUT HEAD, NON-GATEWAY	CHARGEPOINT	CT4010-HD	
95	EVSE-L2	CHARGEPOINT SINGLE OUTPUT HEAD, GATEWAY (INCL. CT4000-NEK1)	CHARGEPOINT	CT4010-HD-GW1	
96	EVSE-L2	CHARGEPOINT DUAL OUTPUT HEAD, NON-GATEWAY	CHARGEPOINT	CT4020-HD	
97	EVSE-L2	CHARGEPOINT DUAL OUTPUT HEAD, GATEWAY (INCL. CT4000-NEK1)	CHARGEPOINT	CT4020-HD-GW1	
98	METER	TESCO METER PEDESTAL - 3PH 4W 600A 120/208V	TESCO		
99	METER	TESCO METER PEDESTAL 27-123204 - 3PH 4W 200A 120/208V	TESCO		
100	METER	TESCO METER PEDESTAL 24-404323 - 3PH 4W 400A 120/208V	TESCO	24-400	
101	METER	TESCO METER PEDESTAL 24-4063204 - 3PH 4W 600A 120/208V	TESCO		
102	METER	TESCO METER PEDESTAL 24-4083204 - 3PH 4W 800A 120/208V	TESCO		
103	METER	MILBANK METER PEDESTAL - 3PH 4W 200A 120/208V	MILLBANK		
104	METER	MILBANK METER PEDESTAL - 3PH 4W 400A 120/208V	MILLBANK		
105	METER	MILBANK METER PEDESTAL - 3PH 4W 600A 120/208V	MILLBANK		
106	METER	MILBANK METER PEDESTAL - 3PH 4W 800A 120/208V	MILLBANK		
107	METER	METER PEDESTAL BASE	MILLBANK	CP-32X24PDMNT	
108	UG TRANSFORMER -DRY TYPE	225.0KVA, 480V TO 208Y/120V NEMA3R	ABB		
109	UG TRANSFORMER -DRY TYPE	112.5 KVA, 240V TO 208Y/120V NEMA3R	ABB		
110	UG TRANSFORMER-D RY TYPE	112.5KVA, 480V TO 208Y/120V, NEMA3R	ABB		
111	UG TRANSFORMER-D RY TYPE	150KVA, 480V TO 208Y/120V, NEMA3R	ABB		
112	SIGN	SIGN, 12" X 12" PKE-20675 PARKING HANDICAPPED	BRADY	PKE-20675	
113	SIGN	SIGN, R113A (CA), EV PARKING ONLY	BRADY	CST1020	
114	SIGN	VAN ACCESSIBLE			
115	POST	STEEL POST, GALVANIZED, 10' X 2"	STATEWIDE	4806780 (DOT)	
116	POST	SIGN POST BRACKET (INCLUDED IN ADA-EV)			
117	POST	CAP FOR SIGN POST (INCLUDED IN EVPOLE)			
118	PROTECTION	WHEEL STOP, REINF. CONCRETE, 9" X 72"	OLDCASTLE PRECAST		
119	PROTECTION	BOLLARD, NON-REMOVABLE (NPS 4" SCH 40 X 72" LG BLASTED)	DO IT AMERICAN		3481

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DESIGN:

A. THE ABOVE LIST IS MEANT TO REPRESENT TYPICAL MATERIAL USED FOR THIS TYPE OF PROJECT. REFER TO CONSTRUCTION DRAWINGS FOR SITE SPECIFIC BILL OF MATERIALS.

B. CONSULT WITH ENGINEER PRIOR TO CONSTRUCTION IF ANY MATERIAL DISCREPANCIES ARISE.

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EV-15.30 - 15.34	CEC VOLTAGE DROP CALCULATIONS
EV-15.40 - 15.42	CEC CONDUIT FILL CALCULATIONS, AND TABLE
EV-15.50 - 15.51	CIRCUIT BREAKER CALCULATIONS

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TABLE EV-15.10

ALLOWABLE AMPACITIES OF INSULATED COPPER CONDUCTORS RATED UP TO AND INCLUDING 2000 VOLTS, 60°C, 75°C, 90°C			
SIZE AWG OR KCMIL	60°C (140°F)	75°C (167°F)	90°C (194°F)
	TYPE TW	TYPE THWN	TYPE THHN
12	20A	25A	30A
10	30A	35A	40A
8	40A	50A	55A
6	55A	65A	75A
4	70A	85A	95A
2	95A	115A	130A
1/0	125A	150A	170A
2/0	145A	175A	195A
3/0	165A	200A	225A
4/0	195A	230A	260A
250	215A	255A	290A
300	240A	285A	320A
350	260A	310A	350A
400	280A	335A	380A
500	320A	380A	430A

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DESIGN:

THE AMPACITY OF A CIRCUIT IS LIMITED TO THE THERMAL RATING OF THE LOWEST RATED CONNECTION. THE RATINGS OF THE TERMINALS ON EITHER THE LINE OR LOAD SIDES OF ANY CIRCUIT MAY BE LOWER THAN THE RATING OF THE CONDUCTORS. THE AMPACITY OF THAT ENTIRE CIRCUIT IS EQUAL TO THE VALUE FROM THE COLUMN OF THE ENTIRE CIRCUIT'S LOWEST THERMAL RATING.

PER CEC 110.14 WIRING FOR CIRCUITS UP TO 100A, WITH WIRING FROM #14 AWG TO #1 AWG SHALL USE THE AMPACITY OF COLUMN 60°C (140°F).

PER CEC 110.14 WIRING FOR CIRCUITS OVER 100A, WITH WIRING LARGER THAN #1 AWG SHALL USE THE AMPACITY OF COLUMN 75°C (167°F).

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TABLE EV-15.11

ADJUSTMENT FACTORS FOR MORE THAN THREE CURRENT-CARRYING CONDUCTORS	
NUMBER OF CURRENT CARRYING CONDUCTORS	PERCENT OF VALUES IN TABLE ABOVE AS ADJUSTED FOR AMBIENT TEMPERATURE IF NECESSARY
4-6	80
7-9	70
10-20	50
21-30	45
31-40	40
41 AND ABOVE	35

REFERENCES:

a. SEE CEC 110.14 ELECTRICAL CONNECTIONS, MOST RECENT EDITION.

b. SEE CEC TABLE 310.15 (B) (16), MOST RECENT EDITION.

c. SEE CEC TABLE 310.15 (B) (3) (a), MOST RECENT EDITION.

d. SEE SDG&E STANDARD EV-2.10 DEFINITIONS.

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GROUNDING:

DESIGNERS SHALL FAMILIARIZE THEMSELVES WITH ALL PORTIONS OF CEC ARTICLE 250. THESE REFERENCES ARE SOME OF THE MOST COMMONLY REFERENCED, BUT NOT THE TOTAL EXTENT OF SECTIONS THAT MAY APPLY TO EVSE DESIGNS.

WHEN INSTALLING SERVICES FOLLOW THE PROVISIONS OF 250.24.

WHEN INSTALLING SEPERATELY DERIVED SYSTEMS, SUCH AS BUT NOT LIMITED TO THOSE AFTER A DRY TYPE TRANSFORMER, FOLLOW THE PROVISIONS OF CEC 250.30.

WHEN ESTABLISHING EITHER A NEW GROUNDING SYSTEM, OR A CONNECTION TO THE EXISTING GROUNDING ELECTRODE SYSTEM, FOLLOW THE PROVISIONS OF CEC 250.50.

WHEN SIZING FOR AN EQUIPMENT GROUNDING CONDUCTOR THE SIZES CALLED OUT IN TABLE 250.122 ARE THE MINIMUM. WHEN ACTUALLY CHOOSING A GROUNDING CONDUCTOR BE SURE TO CHOOSE THE LARGEST OF THE FOLLOWING:

- UPSIZING GROUND WIRES PER CEC 250.122(b) (WHEN LINE WIRING IS UPSIZED FOR VOLTAGE DROP, AMPACITY DERATING PER EV-15.11, OR ANY OTHER REASON)
- BRANCH CIRCUIT GROUND WIRE PER CHARGER MANUFACTURER'S SPECIFICATIONS

REFERENCES:

a. SEE SDG&E STANDARD EV-15.10 CEC CABLE AMPACITIES.

b. SEE CEC ARTICLE 250 GROUNDING AND BONDING, MOST RECENT EDITION

c. SEE CEC SECTION 250.24 GROUNDING SERVICE-SUPPLIED ALTERNATING-CURRENT SYSTEMS, MOST RECENT EDITION

d. SEE CEC SECTION 250.30 GROUNDING SEPERATELY DERIVED SYSTEMS, MOST RECENT EDITION.

e. SEE CEC SECTION 250.50 GROUNDING ELECTRODE SYSTEM, MOST RECENT EDITION.

f. SEE CEC SECTION 250.66 SIZE OF ALTERNATING-CURRENT GROUNDING ELECTRODE CONDUCTOR, MOST RECENT EDITION.

g. SEE CEC SECTION 250.122 SIZE OF EQUIPMENT GROUNDING CONDUCTORS, MOST RECENT EDITION.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

CEC GROUND WIRE TABLES

TABLE EV-15.21A

GROUNDING ELECTRODE CONDUCTOR FOR ALTERNATING-CURRENT SYSTEMS		
SIZE OF LARGEST UNGROUNDED SERVICE-ENTRANCE CONDUCTOR OR EQUIVALENT AREA FOR PARALLEL CONDUCTORS (AWG/KCMIL)		SIZE OF GROUNDING ELECTRODE CONDUCTOR (AWG/KCMIL)
COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	COPPER
2 OR SMALLER	1/0 OR SMALLER	8
1 OR 1/0	2/0 OR 3/0	6
2/0 OR 3/0	4/0 OR 250	4
OVER 3/0 THROUGH 350	OVER 250 THROUGH 500	2
OVER 350 THROUGH 600	OVER 500 THROUGH 900	1/0
OVER 600 THROUGH 1100	OVER 900 THROUGH 1750	2/0
OVER 1100	OVER 1750	3/0

TABLE EV-15.21B

MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT	
RATING OR SETTING OF AUTOMATIC OVERCURRENT DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC., NOT EXCEEDING (AMPERES)	SIZE (AWG OR KCMIL) COPPER
20	12
60	10
100	8
200	6
300	4
400	3
500	2
600	1
800	1/0
1000	2/0
1200	3/0
1600	4/0
2000	250

REFERENCES:

a. SEE CEC TABLE 250.66, MOST RECENT EDITION.

b. SEE CEC TABLE 250.122, MOST RECENT EDITION.

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VOLTAGE DROP:

VOLTAGE DROP AS DEFINED IN SECTION 8.4 OF THE NONRESIDENTIAL COMPLIANCE MANUAL OF TITLE 24 PART 6 BY THE CALIFORNIA ENERGY COMMISSION IS LIMITED TO 5% TOTAL FROM POINT OF SERVICE TO THE FURTHEST LOAD. IT IS ALSO CONSIDERED GOOD PRACTICE TO KEEP THE VOLTAGE DROP OF ANY ONE BRANCH CIRCUIT UNDER 3% WITHIN ANY ELECTRICAL SYSTEM. THE FORMULA TO CALCULATE VOLTAGE DROP IS AS FOLLOWS:

$$\text{3 PHASE: } VD = \sqrt{3} * I * (R * \cos(\Theta) + X * \sin(\Theta)) * L / N$$

$$\text{1 PHASE: } VD = 2 * I * (R * \cos(\Theta) + X * \sin(\Theta)) * L / N$$

$$\text{DC: } VD = 2 * I * R * L / N$$

$$\%VD = (VD / \text{SYSTEM VOLTAGE}) * 100$$

FOR A VAST MAJORITY OF ELECTRIC VEHICLE CHARGING STATIONS THE POWER FACTOR OF THE SYSTEM IS GREATER THAN 0.99. WHEN POWER FACTOR IS SO CLOSE TO 1 THE (SIN(Θ)) PORTION OF THE EQUATION CAN BE ASSUMED TO BE 0 AND THE (COS(Θ)) CAN BE ASSUMED TO BE 1 WITH NEGLIGIBLE LOSS OF ACCURACY TO THE CALCULATIONS. INCLUDE THE FULL CALCULATION FOR ANY CIRCUIT WITH <0.95 POWER FACTOR.

UNITS:

VD = VOLTS DROPPED (VOLTS)

I = CURRENT OF THE CIRCUIT (AMPS)

R = CONDUCTIVE RESISTANCE (OHMS/1000FT)

X = INDUCTIVE REACTANCE (OHMS/1000FT)

Θ = PHASE ANGLE (DEGREES)
(COS(Θ) = POWER FACTOR OF THE SYSTEM)

L = DISTANCE OF CIRCUIT (IN TERMS OF 1000FT)

N = NUMBER OF PARALLEL RUNS OF CONDUCTORS IN SPECIFIC CIRCUIT (INTEGER VALUE)

REFERENCES:

a. SEE SECTION 8.4 OF THE NONRESIDENTIAL COMPLIANCE MANUAL OF TITLE 24 PART 6 BY THE CALIFORNIA ENERGY COMMISSION, MOST RECENT EDITION

b. SEE CEC CHAPTER 9 TABLE 8, MOST RECENT EDITION.

c. SEE CEC CHAPTER 9 TABLE 9, MOST RECENT EDITION.

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TABLE EV-15.31

CONDUCTOR PROPERTIES	
SIZE (AWG OR KCMIL)	DIRECT-CURRENT RESISTANCE AT 75°C FOR UNCOATED COPPER (OHM/kFT)
12	1.98
10	1.24
8	0.778
6	0.491
4	0.308
2	0.194
1/0	0.122
2/0	0.0967
3/0	0.0766
4/0	0.0608
250	0.0515
300	0.0429
350	0.0367
400	0.0321
500	0.0258

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TABLE EV-15.32

ALTERNATING-CURRENT RESISTANCE AND REACTANCE FOR 600-VOLT CABLES, 3-PHASE, 60 HZ, 75°C - THREE SINGLE CONDUCTORS IN CONDUIT (OHMS TO NEUTRAL PER 1000 FEET)					
	X_L (REACTANCE) FOR ALL WIRES		ALTERNATING-CURRENT RESISTANCE FOR UNCOATED COPPER WIRES		
SIZE (AWG OR KCMIL)	PVC, ALUMINUM CONDUITS	STEEL CONDUIT	PVC CONDUIT	ALUMINUM CONDUIT	STEEL CONDUIT
12	0.054	0.068	2.0	2.0	2.0
10	0.050	0.063	1.2	1.2	1.2
8	0.052	0.065	0.78	0.78	0.78
6	0.051	0.064	0.49	0.49	0.49
4	0.048	0.060	0.31	0.31	0.31
2	0.045	0.057	0.19	0.20	0.20
1/0	0.044	0.055	0.12	0.13	0.12
2/0	0.043	0.054	0.10	0.10	0.10
3/0	0.042	0.052	0.077	0.082	0.079
4/0	0.041	0.051	0.062	0.067	0.063
250	0.041	0.052	0.052	0.057	0.054
300	0.041	0.051	0.044	0.049	0.045
350	0.040	0.050	0.038	0.043	0.039
400	0.040	0.049	0.033	0.038	0.035
500	0.039	0.048	0.027	0.032	0.029

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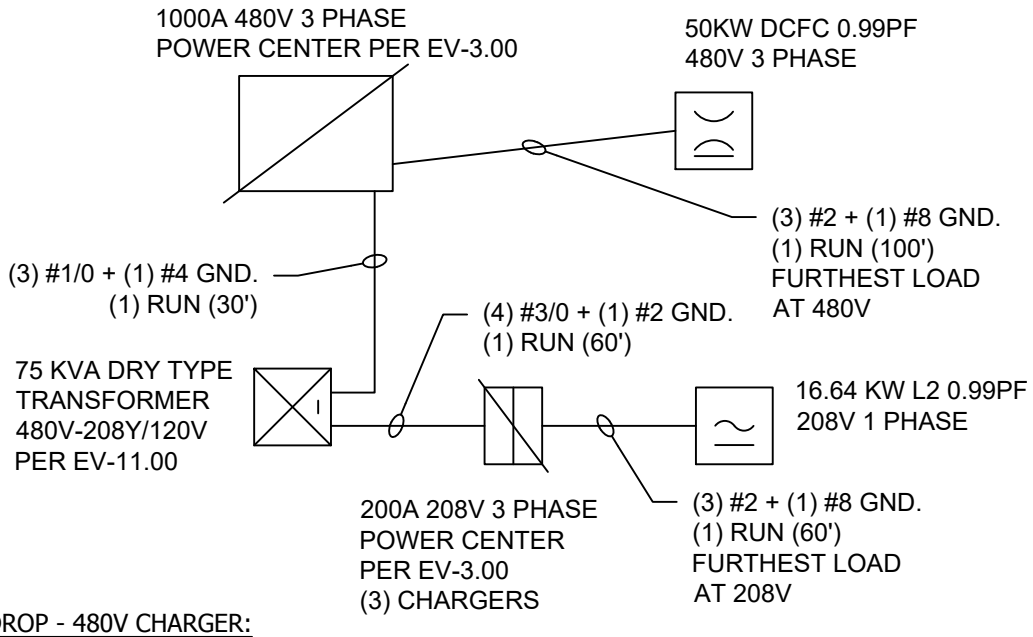
EXAMPLE CALCULATION:



VOLTAGE DROP - 480V CHARGER:

VD = √3 * 60.17A * (0.190OHM * 1 + 0.045OHM * 0) * 0.100' / 1 = 1.98V

%VD = 1.98V/480V * 100% = 0.41% VD THIS IS ACCEPTABLE.

VOLTAGE DROP - DT XFMR - 200A POWER CENTER - 208V CHARGER:

16.64KW * 3 = 49.92KW

VD = √3 * 60.07A * (0.120OHM * 1 + 0.044OHM * 0) * 0.030' / 1 = 0.37V

%VD = 0.37V/480V * 100% = 0.08%

VD = √3 * 138.66A * (0.077OHM * 1 + 0.042OHM * 0) * 0.060' / 1 = 1.11V

%VD = 1.11V/208V * 100% = 0.53%

VD = 2 * 80.00A * (0.19OHM * 1 + 0.045OHM * 0) * 0.060' / 1 = 1.82V

%VD = 1.82V/208V * 100% = 0.88%

TOTAL %VD = 0.08% + 0.53% + 0.88% = 1.49% VD THIS IS ACCEPTABLE

AT BOTH 480V & 208V NO PART OF THE CIRCUIT IS > 3%, AND TOTAL TO FURTHEST LOAD IS < 5%. THIS SYSTEM PASSES.

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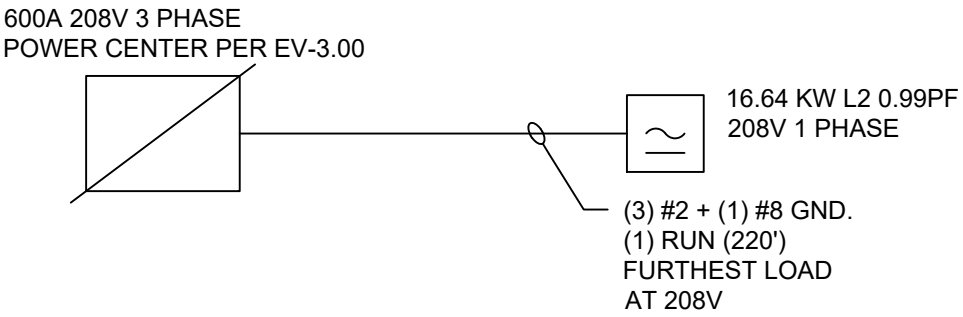
EXAMPLE CALCULATION:

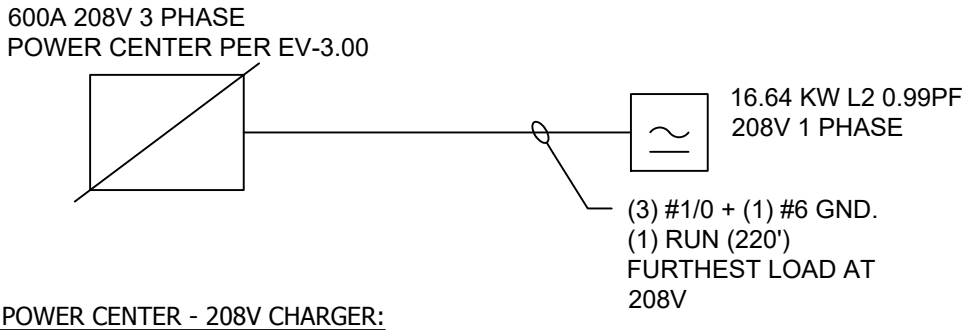


VOLTAGE DROP - 600A POWER CENTER - 208V CHARGER:

VD = 2 * 80.00A * (0.19OHM * 1 + 0.045OHM * 0) * 0.22' / 1 = 6.69V

%VD = 6.69V/208V * 100% = 3.22% VD THIS IS NOT ACCEPTABLE

UPSIZE CABLES FROM (3) #2 TO (3) #1/0 (ALSO UPSIZE GROUND WIRE TO #6)



VOLTAGE DROP - 600A POWER CENTER - 208V CHARGER:

VD = 2 * 80.00A * (0.12OHM * 1 + 0.044OHM * 0) * 0.22' / 1 = 4.22V

%VD = 4.22V/208V * 100% = 2.03% VD THIS IS ACCEPTABLE

UPSIZE CABLES FROM (3) #2 TO (3) #1/0 (ALSO UPSIZE GROUND WIRE TO #6)

AT 208V NO PART OF THE CIRCUIT IS > 3%, AND TOTAL TO FURTHEST LOAD IS < 5%. THIS SYSTEM PASSES.

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TABLE EV-15.40A

PERCENT OF CROSS SECTION OF CONDUIT AND TUBING FOR CONDUCTORS AND CABLES	
NUMBER OF CONDUCTORS AND/OR CABLES	CROSS-SECTIONAL AREA (%)
1	53
2	31
OVER 2	40

TABLE EV-15.40B

DIMENSIONS AND PERCENT AREA OF CONDUIT AND TUBING FOR ELECTRICAL METALLIC TUBING (EMT)		
TRADE SIZE	OVER 2 WIRES 40% (IN.^{2})	TOTAL AREA 100% (IN.^{2})
1	0.346	0.864
$1\frac{1}{2}$	0.814	2.036
2	1.342	3.356
3	3.538	8.846
4	5.901	14.753

TABLE EV-15.40C

DIMENSIONS AND PERCENT AREA OF CONDUIT AND TUBING FOR RIGID METAL CONDUIT (RMC)		
TRADE SIZE	OVER 2 WIRES 40% (IN.^{2})	TOTAL AREA 100% (IN.^{2})
1	0.355	0.887
$1\frac{1}{2}$	0.829	2.071
2	1.363	3.408
3	3.000	7.499
4	5.153	12.882
5	8.085	20.212
6	11.663	29.158

REFERENCES:

A. SEE CEC CHAPTER 9 TABLE 1, MOST RECENT EDITION.

B. SEE CEC CHAPTER 9 TABLE 4, MOST RECENT EDITION.

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TABLE EV-15.41A

DIMENSIONS AND PERCENT AREA OF CONDUIT AND TUBING FOR RIGID PVC CONDUIT (PVC), SCHEDULE 40, AND HPDE CONDUIT (HPDE)		
TRADE SIZE	OVER 2 WIRES 40% ($IN.^2$)	TOTAL AREA 100% ($IN.^2$)
1	0.333	0.832
$1\frac{1}{2}$	0.794	1.986
2	1.316	3.291
3	2.907	7.268
4	5.022	12.554
5	7.904	19.761

TABLE EV-15.41B

DIMENSIONS OF INSULATED CONDUCTORS AND FIXTURE WIRES	
THHN SIZE (AWG OR KCMIL)	APPROXIMATE AREA (IN^2)
12	0.0133
10	0.0211
8	0.0366
6	0.0507
4	0.0824
2	0.1158
1/0	0.1855
2/0	0.2223
3/0	0.2679
4/0	0.3237
250	0.3970
300	0.4608
350	0.5242
400	0.5863
500	0.7073

REFERENCES:

A. SEE CEC CHAPTER 9 TABLE 4, MOST RECENT EDITION.

B. SEE CEC CHAPTER 9 TABLE 5, MOST RECENT EDITION.

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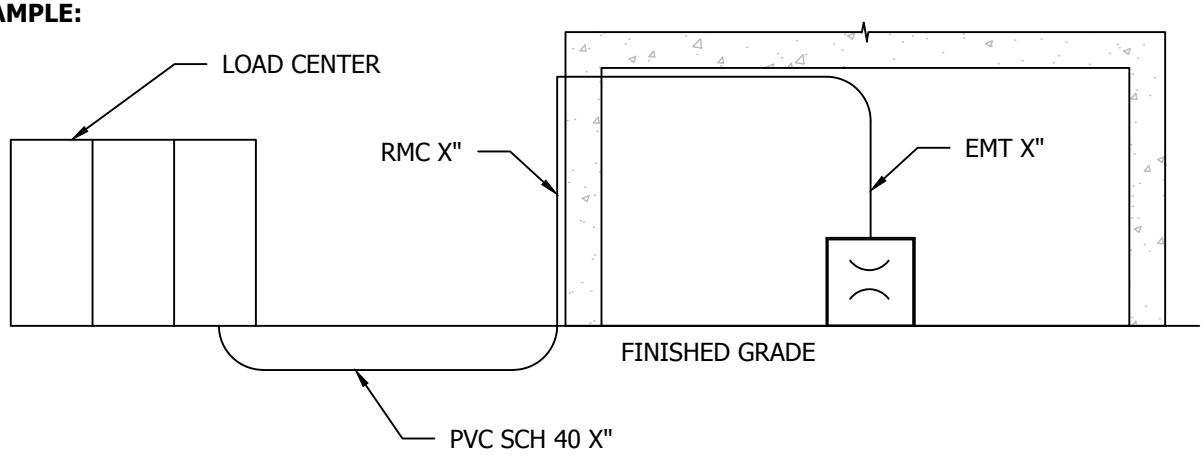
CONDUIT FILL:

USING THESE TABLES THE DESIGNER IS ABLE TO DETERMINE THE MINIMUM SIZED CONDUIT REQUIRED FOR ANY COMBINATION OF APPROPRIATELY RATED CIRCUIT WIRING. TO DO THIS THE SUM OF THE CROSS SECTIONAL AREA AND COUNT OF THE WIRE SIZES IS COMPARED TO THE SMALLEST PERCENTAGE FILL ALLOWABLE.

NOTE: MOST ALL EV CIRCUIT INSTALLATIONS WILL BE OVER 2 WIRES AND 40% FILL CROSS SECTION AREA WILL BE THE MOST COMMON ALLOWED CONDUIT FILL.

EXAMPLE:



DC FAST CHARGER IS 50KW 3P 4W AT 208V WITH 150A BREAKER FEEDING THE CIRCUIT. THIS REQUIRES (4) #2 + (1) #6 GND THHN WIRES.

(4) #2 THHN: 4 X 0.1158 SQ IN.
(1) #6 THHN: 1 X 0.0507 SQ IN
TOTAL: 0.5139 SQ IN

COMPARISON OF CROSS SECTIONAL AREAS (SQ IN)			
CONDUIT	1"	1$\frac{1}{2}$"	2"
PVC SCH 40	0.333	0.794	1.310
EMT	0.346	0.814	1.342
RMC	0.355	0.829	1.363

BY COMPARISON OF THESE CROSS SECTIONAL AREA OF CONDUCTORS TO THAT OF THE 40% FILL OF CONDUIT SIZES WE CAN DETERMINE THAT 1" CONDUIT IS INSUFFICIENT FOR PVC SCH 40, EMT, AND RMC. THIS BRANCH CIRCUIT WILL REQUIRE AT LEAST 1$\frac{1}{2}$" SIZE CONDUIT FOR ANY OF THESE CONSTRUCTIONS.

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SDG&E ELECTRIC VEHICLE CHARGING STATION STANDARDS

CEC CONDUIT FILL CALCULATIONS AND TABLE

EV-15.42

TABLE EV-15.50

VOLTAGE, PHASE, # OF POLES	MAXIMUM CONTINUOUS AMPS (FULL LOAD)	MAXIMUM POWER (KW)	CIRCUIT BREAKER AMPERE RATING
120V, 1Ø, 1P	0.0-16.0	1.92	20
120V, 1Ø, 1P	16.01-20.0	2.40	25
120V, 1Ø, 1P	20.01-24.0	2.88	30
240V, 1Ø, 2P	0.0-16.0	3.84	20
240V, 1Ø, 2P	16.01-20.0	4.80	25
240V, 1Ø, 2P	20.01-24.0	5.76	30
240V, 1Ø, 2P	24.01-32.0	7.68	40
240V, 1Ø, 2P	32.01-40.0	9.60	50
240V, 1Ø, 2P	40.01-48.0	11.52	60
240V, 1Ø, 2P	48.01-56.0	13.44	70
240V, 1Ø, 2P	56.01-64.0	15.36	80
240V, 1Ø, 2P	64.01-80.0	19.20	100
208V, 1Ø, 2P	0.0-16.0	3.84	20
208V, 1Ø, 2P	16.01-24.0	5.76	30
208V, 1Ø, 2P	24.01-32.0	7.68	40
208V, 1Ø, 2P	32.01-40.0	9.60	50
208V, 1Ø, 2P	40.01-48.0	11.52	60
208V, 1Ø, 2P	48.01-56.0	13.44	70
208V, 1Ø, 2P	56.01-64.0	15.36	80
208V, 1Ø, 2P	64.01-80.0	19.20	100
480V, 1Ø, 2P	0.0-16.0	7.68	20
480V, 1Ø, 2P	16.01-24.0	11.52	30
480V, 1Ø, 2P	24.01-32.0	15.36	40
480V, 1Ø, 2P	32.01-40.0	19.20	50
480V, 1Ø, 2P	40.01-48.0	23.04	60
480V, 1Ø, 2P	48.01-56.0	26.88	70
480V, 1Ø, 2P	56.01-64.0	30.72	80
480V, 1Ø, 2P	64.01-80.0	38.40	100

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TABLE EV-15.51

VOLTAGE, PHASE, # OF POLES	MAXIMUM CONTINUOUS AMPS (FULL LOAD)	MAXIMUM POWER (KW)	CIRCUIT BREAKER AMPERE RATING
208V, 3Ø, 3P	0.0-16.0	5.76	20
208V, 3Ø, 3P	16.01-24.0	8.64	30
208V, 3Ø, 3P	24.01-32.0	11.52	40
208V, 3Ø, 3P	32.01-40.0	14.41	50
208V, 3Ø, 3P	40.01-48.0	17.29	60
208V, 3Ø, 3P	48.01-56.0	20.17	70
208V, 3Ø, 3P	56.01-64.0	23.05	80
208V, 3Ø, 3P	64.01-80.0	28.82	100
208V, 3Ø, 3P	80.01-160.0	57.64	200
208V, 3Ø, 3P	160.01-240.0	86.46	300
208V, 3Ø, 3P	240.01-320.0	115.28	400
208V, 3Ø, 3P	320.01-480.0	179.92	600
480V, 3Ø, 3P	0.0-16.0	13.30	20
480V, 3Ø, 3P	16.01-24.0	19.95	30
480V, 3Ø, 3P	24.01-32.0	26.60	40
480V, 3Ø, 3P	32.01-40.0	33.25	50
480V, 3Ø, 3P	40.01-48.0	39.90	60
480V, 3Ø, 3P	48.01-56.0	46.55	70
480V, 3Ø, 3P	56.01-64.0	53.20	80
480V, 3Ø, 3P	64.01-80.0	66.50	100
480V, 3Ø, 3P	80.01-120.0	99.76	150
480V, 3Ø, 3P	120.01-160.0	133.01	200
480V, 3Ø, 3P	160.01-200.0	166.27	250
480V, 3Ø, 3P	200.01-240.0	199.52	300
480V, 3Ø, 3P	240.01-320.0	266.03	400
480V, 3Ø, 3P	320.01-400.0	332.54	500
480V, 3Ø, 3P	400.01-480.0	399.05	600
208V, 3Ø, 3P	(CB X 0.8)	(CB * 0.8) * 208 * 1.732	CB
480V, 3Ø, 3P	(CB X 0.8)	(CB * 0.8) * 480 * 1.732	CB

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