SANDAG & Center for Sustainable Energy

San Diego Association of Governments
• Forum for regional decision-making
• Transportation planning and construction
• Sustainable development

Center for Sustainable Energy
Independent nonprofit organization
Our mission: Accelerating the transition to a sustainable world powered by clean energy
• Program management
• Training and education
• Technical assistance
Program Goal: Ensure the San Diego region is ready for plug-in electric vehicles

Local Governments: Resources to advance regional consistency in EV charging plan review, inspection and installation
Growth of the PEV Market in San Diego

Number of Plug-in Electric Vehicles

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000

2010 2011 2012 2013 2014 2015

Plug-in SD
Anticipated Growth in ZEVs

![Graph showing the anticipated growth in the number of Zero Emission Vehicles (ZEVs) from 2010 to 2025. The number of ZEVs is expected to increase from a few thousand in 2010 to over 160,000 in 2025.]
AB 1236, Streamlined EV Permitting
What is AB1236?

Bill requires adoption of an ordinance to streamline and expedite the permitting process for EV charging stations

- September 30, 2016 requirement for larger cities (population > 200,000)
- September 30, 2017 requirement for smaller cities (population < 200,000)
- Checklist for expedited permit review
- Publish checklist and permit documents on the web
- Allow for electronic submittal
## AB 1236 vs. AB 2188

<table>
<thead>
<tr>
<th>AB 2188 (Muratsuchi), Solar Permitting</th>
<th>Like AB 2188, AB 1236 says</th>
<th>AB 1236 (Chiu and Low), EV Permitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Assures a single inspection that must be performed in a timely manner</td>
<td>✓ Requires cities and counties to adopt an expedited permitting ordinance</td>
<td>✓ Permit application must demonstrate compliance with the utility’s policies prior to approval</td>
</tr>
<tr>
<td>✓ Substantially conform to the current version of OPR’s California Solar Permitting Guidebook</td>
<td>✓ Permits electronic signatures on relevant permitting documents and electronic submittals</td>
<td>✓ Refer to guidelines contained in OPR’s ZEV Guidebook and the PEV Infrastructure Permitting Checklist</td>
</tr>
<tr>
<td>✓ 45 days from the date of application receipt to be denied in writing, otherwise shall be deemed approved</td>
<td>✓ Adopt a checklist of requirements to be eligible for expedited review</td>
<td>✓ Allows modification of checklists and standards found in the Guidebooks due to unique conditions</td>
</tr>
<tr>
<td></td>
<td>✓ Allows modification of checklists and standards found in the Guidebooks due to unique conditions</td>
<td></td>
</tr>
</tbody>
</table>
AB 1236 & Plug-in SD

Plug-in SD can help with AB1236 compliance

- Best Practices Report
- Permit and inspection correction sheets
- Installation checklists
- Standardized language for websites
- EV Expert assistance
Best Practices Report

- Common barriers to EVCS installations
- Existing permit processes
- Best practices:
  - Clear, consistent website language
  - EVCS permit guide/checklist
  - Plan review/inspection correction lists
  - Online services
  - Fillable application
  - Permit fee incentives
Regional Efforts

What is your jurisdiction doing? What plans does your jurisdiction have?
What the Region is Doing

- Information Bulletins for Permits for Electrical Vehicle Charging Systems
- Electric Vehicle Charging Station Permit Application
What the Region is Doing

- Permit Guide for Electric Vehicle Supply Equipment (EVSE)
- Electric Vehicle Charger Guidelines

Residential Electric Vehicle Charger Guidelines

The purpose of this guideline is to assist permit applicants in streamlining the Permitting, installation and inspection process for Residential EV Chargers.

Be aware that there are different types of Electric Vehicle (EV) Chargers. There are 2 basic types of EV chargers for home use (Level 1 and Level 2). Level 1 Chargers are smaller units that plug directly into a standard 120 volt receptacle outlet. These types of chargers typically require a longer period of time to recharge the vehicle. As long as the receptacle outlet being used to plug-in the Level 1 Charger exists, there is no requirement to secure a permit from the Building Division. On the other hand, if you will be installing a new 120 volt receptacle outlet for the charger, you will need to obtain a permit - but you will not need to provide any plans or electrical load calculations as would be required for the more powerful Level 2 type charging systems.

A Level 2 EV charging system requires a 240 volt electrical circuit and charges the vehicle battery much faster than a Level 1 charger. Level 2 charger installations typically require an electrical permit and inspections of the installation. In order to obtain the permit you will need to provide some basic information to show that your existing electrical service can handle the added load.

What Information do I need to provide in order to obtain the permit?

This Residential EV Charger Permit Guideline has been developed to streamline the permit, installation and inspection process. In most cases, you or your contractor merely need to fill in the blanks on this document, attach the manufacturer’s installation instructions and charger specifications and submit it to the Building Division for an on-the-counter review and permit issuance. If all of the information is provided and the proposal complies with the applicable codes, the review and approval process can usually be performed on the same day or within a day or two depending upon workloads and staffing levels at the time of submittal. Once the permit is issued, the installation may begin. When the installation is complete, an inspection of the work must be scheduled with the Building Inspector. Inspections are typically performed on the work day following your request for an inspection. Keep in mind that someone will need to be present during the inspection so that the Building Inspector can access the location of the electrical meter and EV charger (typically in the garage).

Electric Vehicle Supply Equipment Permit Guide

If you install Electric Vehicle Supply Equipment (EVSE), otherwise known as electric vehicle charging stations, you must first obtain a building permit. As a permit applicant, you will need to complete the forms listed below and pay the necessary plan check fees to the Finance Department. For rules describing who can obtain a permit, visit: http://www.ci.national-city.ca.us/index.aspx?page=166.

1. Forms to Complete

   Building Permit Application:
   At plan submittal time, you will need the job address (a unique address for the EVSE installation that is used for billing), parcel number, existing use, description of work, name, address, and contact information of the applicant and the owner.
   - For both residential and non-residential permits:
     You must submit a completed and signed “Building Permit Application” to a Building Services Technician in the Building Department.

2. Plan Check and Permit Fees

   The plan check fees must be paid at the time the plans are submitted. The payment can be submitted by cash, credit card, or check. Please make checks payable to the “City of National City”. A description of the fees is below.
   - The cost is $118.00/hour of plan check
   - One hour is due at the time of submittal
   - There is a $148.00 fee for the permit issuance and two inspections, due at the time the permit is issued. Additionally, if the plan review exceeds one hour, the additional fees will be due at this time
   - An electrical service upgrade costs $39.00/100 amps on the electric service panel
Resources for the San Diego Region
Plug-in SD Resource Integration

Intent to Install EVCS

Website

Permit Application

Inspection

Installation Checklists

Operational EVCS
Plug-in SD Resources for EV Charging

- **Website Language**
  - Specific direction for the general public
  - Guide covers requirements and approach for permitting
Correction Sheets & Checklists

Intended to cover common situations (80% of installations across SF, MF, and commercial property types)
Plug-in SD Resources for EV Charging

**INSTALLATION CHECKLIST FOR RESIDENTIAL ELECTRIC VEHICLE CHARGING STATION (EVCS)**

Installations must be completed by a licensed electrical contractor (C-10). (Local Regulations, California Electrical Code CEC Article 625) Plans must show conformance with the California Electrical Code Title 24, Part 3, the California Building Code (Volume 1 and 2), Title 24, Part 2, and other applicable local municipal codes.

**Submittal Documents required**

- **Permit Application**
  > a. Include job address (a unique address for the EVCS installation that is used for billing), parcel number, existing use, description of work, name, address, and contact information of the applicant and the owner

- **Plan Sets (#, size of plans)**
  > a. Site/Plot Plan
  > i. Show the proposed location of the EV charging unit.
  > b. Electrical Plan
  > i. Provide a complete electrical single line drawing showing the main service, sub panels and disconnecting means as applicable, and proposed EV charging unit include; size of overcurrent protection devices (in amperes) for main service, sub panels, disconnects and EV charger circuit supply, show conduit sizes and types, and conductor sizes and types.
  > ii. If trenching is required, provide a trenching detail and call out trench work in scope of work. Trenching may result in a structural plan review if conduit trenches undermine foundations.
  > iii. Note electrical feeder requirements when trenching structure to structure (CEC 225). The feeder from structure to structure should be noted in the scope of work.
  > iv. Provide EVSE manufacturer’s specification sheets showing listing to UL 2200 and indoor or outdoor rating.

- **Electrical Load Calculation Worksheet**
  > a. Include existing and proposed load to estimate if existing electrical service will handle the new load from EVCS and wiring methods. Note: Unless electrical service equipment is 100% rated, the calculated load demand on the main service shall not exceed 80% of the nameplate rating of the main service over-current protection device (OCPD).

*All plans and documents listed above must be provided for residential electric vehicle charging stations at time of permit submittal prior to issuance.*

**Installation Checklists**

- Broken down by type: Residential, Non-Residential, MUD
- General and electrical contractors permitting and installing EVCS
- More consistent applications, plans and installations
Plug-in SD Resources for EV Charging

• Permitting and Inspection Correction Sheets
  – Broken down by type: Residential, Non-Residential, MUD
  – AHJ staff performing plan review and inspection
  – Consistent expedited execution

<table>
<thead>
<tr>
<th>Check One</th>
<th>Type of Charging Station(s) Proposed</th>
<th>Power Levels (proposed circuit rating)</th>
<th>Typical NON-RES Charging Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>□</td>
<td>Level1</td>
<td>110/120 volt alternating current (VAC) at 15 or 20 Amps</td>
<td>Commercial office building</td>
</tr>
<tr>
<td>□</td>
<td>Level2 - 3.3kW (low)</td>
<td>208/240 VAC at 30 Amps</td>
<td></td>
</tr>
<tr>
<td>□</td>
<td>Level2 - 6.6kW (medium)</td>
<td>208/240 VAC at 40 Amps</td>
<td>Multi-unit dwellings</td>
</tr>
<tr>
<td>□</td>
<td>Level2 - 9.6kW (high)</td>
<td>208/240 VAC at 50 Amps</td>
<td>Commercial office building</td>
</tr>
<tr>
<td>□</td>
<td>Level2 - 19.2kW (highest)</td>
<td>208/240 VAC at 100 Amps</td>
<td>Public access</td>
</tr>
<tr>
<td>□</td>
<td>DC Fast Charging</td>
<td>440 or 480 VAC</td>
<td>Public access</td>
</tr>
<tr>
<td>□</td>
<td>Other (provide detail)</td>
<td></td>
<td>Large commercial office buildings or parks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hospitality &amp; recreation</td>
</tr>
</tbody>
</table>

Section 1: PERMIT APPLICATION

1) Is the permit application complete with the following information: Project address, parcel #, builder/owner name, contractor name, valid contractor license #, and any other

Permit Number (for use by jurisdiction staff): ___________
Key Considerations for EVCS

• **Electrical System Evaluation**
  – Power supply requirements
  – Equipment Upgrades (Transformer, Wiring, Panel)

• **Physical Requirements**
  – Proximity of electrical power supply to desired charging location (service room, transformer, etc.)
  – Physical protection of equipment (wheel stops, bollards, clear floor space, etc.)
  – Signage, stencil, and striping
  – Layout within parking areas
Residential Installation
### Operating Current

<table>
<thead>
<tr>
<th>Rotary Switch Position</th>
<th>Maximum Output Current</th>
<th>Circuit Breaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Test mode</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>12A</td>
<td>15A</td>
</tr>
<tr>
<td>2</td>
<td>16A</td>
<td>20A</td>
</tr>
<tr>
<td>3</td>
<td>20A</td>
<td>25A</td>
</tr>
<tr>
<td>4</td>
<td>24A</td>
<td>30A</td>
</tr>
<tr>
<td>5</td>
<td>28A</td>
<td>35A</td>
</tr>
<tr>
<td>6</td>
<td>32A</td>
<td>40A</td>
</tr>
<tr>
<td>7</td>
<td>36A</td>
<td>45A</td>
</tr>
<tr>
<td>8</td>
<td>40A</td>
<td>50A</td>
</tr>
<tr>
<td>9</td>
<td>48A</td>
<td>60A</td>
</tr>
<tr>
<td>A</td>
<td>56A</td>
<td>70A</td>
</tr>
<tr>
<td>B</td>
<td>64A</td>
<td>80A</td>
</tr>
<tr>
<td>C</td>
<td>72A</td>
<td>90A</td>
</tr>
<tr>
<td>D</td>
<td>80A</td>
<td>100A</td>
</tr>
<tr>
<td>E</td>
<td>Not a valid selection</td>
<td>N/A</td>
</tr>
<tr>
<td>F</td>
<td>Slave mode</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Set the Operating Current**

Follow these instructions to configure the DIP switch. The following illustration shows an enlarged view of the DIP and rotary switches.
# Residential Installation

<table>
<thead>
<tr>
<th>MODEL</th>
<th>TURBODOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLTAGE</td>
<td>120VAC/240VAC</td>
</tr>
</tbody>
</table>
| OUTPUT POWER | 16 Amps continuous @120VAC  
20 Amps @120/240VAC |
| CIRCUIT BREAKER RATING | 20 Amps @120VAC  
20 Amps @240/208VAC |
| FREQUENCY | 60Hz |
| CABLE LENGTH | 20 ft. (6.1 m) |
| WEIGHT (MODULE) | 5.5 lbs (2.5 kg) |
| WEIGHT (MOUNTING OPTIONS) | 28.5 lbs. (12.9 kg) - pedestal kit  
2.5 lbs (1.1 kg) - wall mount |
| OPERATING TEMPERATURE | -40C to +50C (-40F to 122F) |
| INDOOR / OUTDOOR | Yes | NEMA 3R |
| CHARGE COUPLER | SAE J1772 compliant |
| CERTIFICATION | UL and cUL |
EV Charging at Multi-Unit Dwellings

Aquaterra Apartments

- EV Chargers are noted in the green boxes
- EV Charger in the yellow box is for future charging; pedestal in place but no charger
EV Charging at Multi-Unit Dwellings

Existing charging cord

For future EV charging
EV Charging at Multi-Unit Dwellings

Broadstone Corsair Multi-Unit Apartments
ADA striping of accessible EVCS space connects to existing path of travel
Workplace Installation

4 EV Chargers powered through T-bar drop ceiling in offices; through landscape

Approximate electrical room
Site Plan- Commercial Installation

- Spaces for existing and future charging identified
- CALGreen requirements for new construction to be “EV Capable”
  - Raceway
  - Panel capacity for 40A 208/240V
  - Identifying future spaces
Commercial Installation

SDG&E Transformer

Meter Pedestal Panel

Step-up Transformer

Disconnect w/in line of sight

Physical protection
Commercial Installation - Indoor Garage

Vertical clearance

Second junction box for future EV charger
Installing Infrastructure
### CALGreen Non-Residential Requirements

- For non-residential new construction only

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Current Mandatory</th>
<th>Proposed new CALGreen Mandatory</th>
<th>Proposed new CALGreen Voluntary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum threshold</td>
<td>51 parking spaces</td>
<td>10 parking spaces</td>
<td>Tier 1: 10 parking spaces</td>
</tr>
<tr>
<td>Percent of new parking spaces</td>
<td>3%</td>
<td>~6%</td>
<td>Tier 2: 1 parking space</td>
</tr>
<tr>
<td>that are EV capable</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Tier 1 and Tier 2 requirements vary based on the project size and context.*
### CALGreen Residential Requirements

#### Single family New Construction

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Mandatory</th>
<th>Voluntary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical panel capacity; raceway</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Wiring</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

#### Multi-family New Construction

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Mandatory</th>
<th>Voluntary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum threshold</td>
<td>17 units</td>
<td>17 units</td>
</tr>
<tr>
<td>Percent of new parking spaces that are EV-capable</td>
<td>3%</td>
<td>5%</td>
</tr>
</tbody>
</table>
The number of charging ports that can simultaneously charge vehicles is considered the number of EVCS at a facility for regulatory purposes.
Accessibility for EV Charging

ELECTRIC VEHICLE CHARGING STATIONS
CONFIGURATIONS FOR SMALL INSTALLATIONS

Image Example from DGS Presentation

ISA required for installations of 5 or more EVCS
Best Practices

• EVCS guidelines and checklists
• Clear and consistent website info
• Standardization of EVCS building codes and installation requirements
• Adoption of voluntary CALGreen codes
• Online permitting and inspection services
• Permit application for EVCS
  – Specific, fillable application
• Incentives for permit fees and installations
  – EVCS financing programs
• Training for electrical contractors
Technical Assistance: EV Expert

- Technical infrastructure questions
- Call/email or set up an in-person meeting
- EV Expert FAQ

[Link to FAQ](www.energycenter.org/pluginsd)

Email

[Email](EVexpert@energycenter.org)

Phone (866) 967-5816
Thank you to the San Diego Regional Clean Cities Coalition for providing breakfast
Questions and Discussion

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Electric Vehicles 101
Plug-in Electric Vehicles (PEVs)

Battery Electric Vehicles

- All electric, zero-emissions
- 16 models available*
- Examples: Nissan Leaf, Tesla Model S, BMW i3

Plug-in Hybrid Electric Vehicles

- Electric battery and gasoline
- 10 models available*
- Examples: Chevrolet Volt, Toyota Plug-in Prius

*Eligible for the California Clean Vehicle Rebate Program (CVRP)
CVRP Rebates in the San Diego Region

Source: Clean Vehicle Rebate Project Statistics as of April 2016
EVCS in San Diego

EV Charger Locations

- Quick charge locations
- Standard charge locations

- 377 charging locations in the SD region (with a total of about 1,000 plug-in points)

- 19,000 plug-in vehicles in the region

Source: SANDAG InfoBits (2016)
Charging: Level 1 vs. Level 2

**AC Level 1**
- Uses a standard 110/120-volt alternating current (VAC) three-pronged wall plug

**AC Level 2**
- Uses 208/240 VAC and can be hardwired or connected with a plug
Charging: DC Fast Charging

- Uses commercial-grade 440/480 VAC – produces direct current (DC) to charge
- Commercial/Public – due to costs
- Provides fast charge for some BEVs