**Objective:** To support the inspection community and rapidly growing energy storage industry in California, SEAC has developed the following inspection guideline.

*Inspection Guideline for Storage Battery Systems in One- and Two-Family Dwelling with Solar Photovoltaic System (2016 CEC, based on 2014 NEC. References shown in [brackets] are from the 2017 NEC and provided for comparison.*

This Inspection Guideline contains the recommended inspection procedures of a new interactive battery storage systems for one- and two-family dwellings with a solar photovoltaic system. The system must interconnect to a single-phase ac service panel of nominal 120/240Vac with a bus bar rating of 225A or less. This guide list is not intended for integration with bipolar or hybrid PV systems. Systems must be in compliance with current California Building Standards Codes and local amendments of the authority having jurisdiction (AHJ). Consult the jurisdiction for additional information.

**General**

- Confirm the installation matches the approved plan (Model #s, conductor types/sizes, OCPDs) 110.2
- All components bear the appropriate listing mark of a Nationally Recognized Testing Laboratory where such marking is required as part of the listing. 110.2 [706.5]
- The completed installation is free from obvious defects, and performed in a neat and workmanlike manner.110.12
- The manufacturer’s installation instructions were followed, including clearances, location, and the appropriate selection of fasteners. 110.3(B)
  - Note: Section 608 of the 2016 CFC contains additional requirements that may apply to stationary battery installations that exceed a certain weight or volume of electrolyte, depending on battery chemistry used.
• If equipment is subject to physical damage, it is protected by its construction, design, location or other approved method in accordance with its listing. 110.27(B)

• Working clearances are adequate for components that are likely to require service while energized. 110.26, 480.9(C)

• The selected wiring methods are appropriate for the location and installed in accordance with their intended use. NEC Chapter 3

• Where equipment grounding means are in the form of a wire, they are identified as either bare, green, or green with continuous yellow stripe(s). 250.119

• Any required grounded conductors have been properly identified. 200.6(A) and (B)

• Include scope of work statement.

• Denote whether battery storage system is ac-coupled or dc-coupled.
  o If system is dc-coupled, show that the rapid shutdown functionality for controlled conductors of a roof-mounted PV system remains unaffected by dc-coupled storage battery circuit(s).

• Show all markings and labels required for newly installed equipment.

**Charge Controller**

• Charge controllers and related components mounted/installed in accordance with its listing and manufacturer's instructions. 110.3(B)

• Charge controllers that are not inverter-integrated match approved plans. 690.72

**Batteries**

• If applicable to the specific type installed, batteries are properly ventilated 690.71(A), 480.9(A)

• Battery dc conductors are protected from accidental contact. 690.71(B)(2), [690.71(B)(2)]

• Battery system voltage is limited to 50Vdc nominal. [690.71(B)(1)] - [100V for 2017 NEC] *Exception* may apply if live parts are not accessible during routine maintenance. 690.71(B)(1), [706.30(A)]
For individual batteries installed on racks - A minimum clearance of 1" has been provided between a cell container and any wall or structure on the side not requiring access for maintenance. 480.9(C)

**Overcurrent Protection**

- Where applicable, fuses or circuit breakers are properly sized and match approved plans.
  
  Article 240, 690.9(A), [706.21(B)]

**TABLE - Disconnecting Means**

Systems will vary, and not all disconnects in this table may be required.

<table>
<thead>
<tr>
<th>Article</th>
<th>Applies to:</th>
<th>Location</th>
</tr>
</thead>
</table>
| 690.12 – Rapid Shutdown | **PV System** conductors more than 5 ft (length) inside a building, or more than 10 ft (distance) from an array. | - Not specified in 2014  
- Plaque or directory is required. 690.56(C)  
- Initiation Device could also serve as PV System or Equipment Disconnect 690.13, 690.15 |
| 690.13 – PV System Disconnect* | **DC** Conductors of PV System  
*R*Required characteristics are defined in 690.17(A) through (E) | - Readily Accessible.  
- Either outside or nearest the point of entry, unless dc conductors are run in metal cable, raceways or enclosures per 690.31(G).  
- Disconnect not allowed in bathrooms.  
- Max. number of PV System Disconnects is (6), must be grouped. |
| 690.15 – Equipment Disconnect | Equipment, such as:  
- Inverters  
- Batteries  
- Charge controllers | - Disconnects for all sources connected to equipment must be grouped and identified  
- A single disconnecting means is allowed for combined outputs of ac inverters or modules.  
- *For inverters installed in not readily accessible locations*, a disconnecting means is required within sight of or in each inverter. |
<table>
<thead>
<tr>
<th>Article</th>
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<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>690.71(E) – Series Battery Circuits</td>
<td>Battery circuits subject to field servicing, where more than (24) 2-volt cells connected in series.</td>
<td>• Located such that it breaks the series strings into segments of 24 cells or less.</td>
</tr>
<tr>
<td>690.71(F) – Battery Maintenance Disconnect</td>
<td>The grounded conductor in battery circuits where more than (24) 2-volt cells connected in series.</td>
<td>• Accessible only to qualified persons</td>
</tr>
<tr>
<td>690.71(G)(3) – Ungrounded Battery Systems</td>
<td>Ungrounded input/output conductors in battery circuits where more than (24) 2-volt dc cells connected in series.</td>
<td>• Not defined here, however provisions of 690.15 would also apply if this disconnect also serves as the required equipment disconnect.</td>
</tr>
<tr>
<td>690.71(H)</td>
<td>Energy storage devices where dc input and output terminals are more than 5ft from connected equipment, or where circuits connected to these terminals pass through a wall or partition.</td>
<td>• Disconnecting means and overcurrent protection shall be provided at the energy storage system end of the circuit. • Where not grouped with the PV system disconnect a second disconnect located at the connected equipment is also required when the above disconnect is not within sight of the connected equipment. This additional disconnect may satisfy the requirements of 690.15. • Cannot be installed in storage device enclosures where explosive atmospheres may exist.</td>
</tr>
<tr>
<td>480.6(A)</td>
<td>All ungrounded dc conductors derived from a battery system with a nominal voltage over 50v.</td>
<td>• Readily Accessible • Within sight of the battery system • Remote actuation is permissible, provided the location of controls are field marked on the disconnect, and the disconnect is lockable.</td>
</tr>
</tbody>
</table>

- Where battery systems include an inverter operating in parallel with a primary source(s) of electricity, the inverter interconnection must meet the requirements of Article 705.
Labeling

- The energy storage system is marked with the maximum operating voltage. 690.55

- A sign that indicates the type and location of all power sources on or in the building is placed at the utility service equipment location. 690.56, 702.7, 705.10 [706.11(A)]

- Panelboards that contain feed-through conductors (as may be present with backed-up branch circuits) are labelled to identify the closest disconnecting means for those conductors. 312.8, 408.4(A)

- If required by CEC 480.6, the dc battery disconnecting means is labeled with:
  - Nominal battery voltage
  - Maximum available short-circuit current derived from the stationary battery system
  - Date the calculation was performed

Applicable to whom:

The recommendations would apply to all solar PV and energy storage stakeholders.

Disclaimer: The Recommended Practices of SEAC are tools and information to assist those enforcing the electrical and building codes as they relate to storage batteries and energy storage systems. Recommended Practices published by SEAC that are not directly quoting code requirements are non-binding and/or regulatory.

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