New DSA Requirements for Further Review of Solar Panel Attachment Details

Effective August 14, 2017, the Division of the State Architect (DSA) will enforce the following new requirements on free-standing, open-framed steel structures supporting solar panels. DSA will conduct further review of panel attachment details on these types of projects if the project was not approved by DSA prior to August 14, 2017. Project plans will not be approved until this review is conducted.

These requirements apply to pre-check plans (PCs) based on the 2013 CBC, as well as projects designed for a specific site (not based on a PC) and/or installed on top of another structure (e.g., on top of a parking garage). DSA may amend these requirements in the future as further information is obtained. Development of design criteria for 2016 CBC PCs for free-standing, open-framed steel structures supporting solar panels is currently in progress.

Which Projects Are Affected by These New Requirements?

- The new requirements apply to free-standing, open-framed steel structures supporting solar panels.
- DSA's new requirements apply to project construction documents that were NOT approved by DSA prior to August 14, 2017.
- If project construction documents were approved by DSA prior to August 14, 2017 and construction has commenced, these projects are not subject to these requirements and do not require updates or retrofit.
- If project construction documents were approved by DSA prior to August 14, 2017 but construction has not yet commenced, the new requirements are not mandatory. However, DSA recommends that project plans be updated or retrofit in accordance with these requirements.

Why Are These New Requirements Necessary?

DSA recently discovered that solar panels at three separate school campuses dislodged from free-standing, open-framed, steel structures during moderate winds.

Based on the limited information obtained, DSA believes several factors may possibly contribute to these attachment failures:

- Advancements in solar panel design have resulted in thinner, higher performing, lightweight photovoltaic panels. The flexibility of the panels, possibly coupled with the differential movements of the structure caused by wind gusts, may have resulted in shifting or deformation of the panels and/or the connection hardware, allowing the panels to dislodge from the structure.
- Free-standing, open-framed, steel structures are flexible and therefore susceptible to racking, twisting and deflecting under certain wind loads. This movement may place structural loading on the solar panels and panel-to-structure connections, which they were not designed to accommodate.

Options to Meet New Panel Attachment Requirements

The following requirements provide the responsible design professional with several options to enhance panel attachment to the structure in order to improve performance

over the cyclical nature of wind events and prevent the dislodging of panels from the support structure:

1. Panel attachment details utilizing through-bolted connections that fasten the panel frames directly to the structural member will be considered for use on projects subject to the following conditions:
    a. The through-bolted detail is already included as an option in the 2013 CBC PC, ***and***
    b. The size, material grade and/or strength, and quantity of bolts, as well as washers, nuts, or other hardware, must utilize the more restrictive of that determined by calculation and the solar panel manufacturer's recommendations.

    If the applicant wishes to utilize a through-bolted detail but it is not included as an option in the 2013 CBC PC, then the detail must be submitted as a revision to the PC in accordance with the *further review submittal procedure* (as outlined below).

2. For connections utilizing clamping devices, the structural members may be stiffened and/or the clamps may be configured in a manner to prevent dislodgement due to shifting or movement of panels and/or deflection of support under design loads (gravity, wind, and seismic).

    Such methods might include clamps equipped with extended or modified flanges or additional clamps installed. The applicant must demonstrate how the proposed methods consider and comply with deformation compatibility requirements (see ASCE 7-10 1.3.1) to prevent dislodgement of panels.

3. In lieu of demonstrating that bolted or clamped panel connections satisfy item 1 or item 2 above, additional safety devices may be applied that will restrain the panels while subject to wind and seismic loads from becoming a falling hazard in case of dislodgement. The safety device shall be designed for all applicable load combinations with the panel in the dislodged position.

4. In lieu of an enhanced panel attachment per items 1-3 above, the complete structure, solar panels and connection assemblies may be analyzed utilizing three-dimensional methodologies. Alternatively, full-scale testing of the complete structure, solar panels and connection assemblies may be performed to evaluate the entire system. Either method must demonstrate compliance with deformation compatibility requirements (see ASCE 7-10 1.3.1) to prevent dislodgement of panels for all applicable load combinations.

Further Review Submittal Procedure

Project construction documents approved prior to August 14, 2017 that are resubmitted for further review of panel attachments, will not be subject to additional DSA review fees. Similarly, projects approved prior to August 14, 2017 that have commenced

construction and submit panel attachment construction change documents in accordance with the requirements above, are not subject to additional DSA review fees.

The following outlines the process to submit a 2013 CBC PC for further review of panel attachment detail(s):

- The engineer in responsible charge shall notify the respective DSA Regional Office that approved the 2013 CBC PC of his or her intent to update or request further review of the connection design as a revision to the PC.

  DSA will do everything possible to expedite review and approval of the revision to the PC and will not require a six-week advance registration for a project submittal. The fee for this process will be based upon our hourly rate of $215 per hour.

- Except as noted in panel attachment recommendation #1 above, 2013 CBC PCs for free-standing, open-framed steel structures supporting solar panels must have a revision stamp date of August 14, 2017 or later to be considered for use on projects approved by DSA as of August 14, 2017.

- If a 2013 CBC PC is submitted to DSA for further review of panel attachment detail and the documentation is found by DSA to be in compliance with the applicable requirements as noted above, thus resulting in no change to the panel attachment detail on the original PC, DSA shall make note of this and re-stamp the PC with the date the updated review was completed.