Issue Date: September 6, 2011

Code/Section: IBC 1604.9, IBC 1604.1 and ASCE 7-05, Chapters 11 - 15

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**Issue:**

The question is whether structural supports for photovoltaic panels installed on a structure or a roof system require positive connection or can be exempt per ASCE 7-05, 13.1.4 – Exemptions.

**Interpretation:**

Typically photovoltaic panels are installed using structural supports on a structure or a roof system. Panels can be categorized as either mechanical or electrical components. ASCE 7-05, Chapter 11 defines supports such as: braces, frames, legs, lugs, snubbers, hangers, saddles, or struts as structural members, responsible for transmitting loads between the non-structural components and the structure.

It is the intent of the code that any support member used for non-structural component shall be bolted, welded or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity, therefore excluded from 13.4.1 – Exemptions. For the design of the attachment capacities, appropriate seismic coefficients for mechanical and electrical components and their supports shall be selected from Table 13.6-1.

**Alternate Design approach:**

Ballasted mounting method for Photovoltaic Systems shall be acceptable under PBCC Section 104.10. All calculations and drawings details shall be under the seal and signature of responsible Arizona registrant. Following stipulations apply:

When evaluating the seismic resistance force, please refer to following coefficient of friction values:
Materials and Material Combinations | Static Frictional Coefficient - $\mu_s$ | Clean and Dry Surfaces | Lubricated and Greasy Surfaces
--- | --- | --- | ---
Aluminum | Aluminum | 1.05 - 1.35 | 0.3
Aluminum | Mild Steel | 0.61 | |
Cast Iron | Cast Iron | 0.15 | 0.07
Cast Iron | Oak | 0.49\(^{1)}\) | 0.0751
Cast Iron | Mild Steel | 0.23 | 0.21, 0.133
Copper-Lead alloy | Steel | 0.22 | |
Copper | Copper | 1 | 0.08
Copper | Cast Iron | 0.29 | |
Copper | Mild Steel | 0.36 | 0.18
Hemp rope | Timber | 0.5 | |
Polystyrene | Polystyrene | 0.5 | 0.5
Polystyrene | Steel | 0.3-0.35 | 0.3 - 0.35
Polythene | Steel | 0.2 | 0.2
Polystyrene | Polystyrene | 0.5 | 0.5
Rubber | Cardboard | 0.5 - 0.8 | |
Rubber | Dry Asphalt | 0.9 (0.5 - 0.8) | |
Rubber | Wet Asphalt | 0.25 - 0.75 | |
Rubber | Dry Concrete | 0.6 - 0.85 | |
Tarred fiber | Cast Iron | 0.15 | |
Tarred fiber | Aluminum | 0.18 | |
Wood | Clean Wood | 0.25 - 0.5 | |
Wood | Wet Wood | 0.2 | |
Wood | Clean Metal | 0.2 - 0.6 | |
Wood | Wet Metals | 0.2 | |
Wood | Concrete | 0.62 | |
Wood | Brick | 0.6 | |
Wood - waxed | Dry snow | 0.04 | |

Source: www.EngineeringToolBox.com

\(^{1)}\) Kinetic or sliding frictional coefficient - holds only when there is a relative motion between the surfaces; otherwise they are somewhat higher.

Required ballast load for the new system and roof live load original design criteria shall be identified on the structural plans along with any design revisions required per analysis. If the ballast and equipment loads exceed the design live load for which the roof and its members were designed, structural calculations shall be performed and submitted for review to the City per 3403.2.

Revised roof drainage plans are required to show water shed off pathway, locations of existing roof drains and any design considerations to mitigate potential ponding issues.

Rain load analysis may be required as per IBC Section 1611, ASCE 7-05 Chapter C8.