ARTICLE **590**SOLAR PHOTOVOLTAIC (PV) SYSTEMS

Introduction to Article 690–Solar Photovoltaic (PV) Systems

You have seen, or maybe own, devices powered by photovoltaic cells, such as night lights, car coolers, and toys. These generally consist of a small solar module powering a small device running on a few volts and a fraction of an ampere. A solar PV system that powers a building or interconnects with an electric utility operates on the same principals but on a much larger scale.

Solar PV systems that provide electrical power to an electrical system are complex. There are many issues that require expert knowledge in electrical, structural, and architectural issues.

The purpose of the *NEC* is to safeguard persons and property from the hazards arising from the use of electricity [90.1(A)]. Article 690 is focused on the electrical hazards that may arise from installing and operating a PV system. It consists of eight parts.

The general Code requirements of Chapters 1 through 4 also apply to these installations, except as specifically modified by this article [90.3].

690.47 Grounding Electrode System

Scan this QR code for a video of Mike explaining this topic; it's a sample from the videos that accompany this textbook. www.MikeHolt.com/20PVvideos

(A) Required Grounding Electrode System. A building or structure supporting a PV <u>system</u> must <u>utilize</u> a grounding electrode system installed in accordance with Part III of Article 250. ▶Figure 690–86



▶ Figure 690-86

Author's Comment:

Part III of Article 250 addresses the grounding electrode system, the grounding electrode types, and the grounding electrode installation requirements.

(1) Functionally Grounded PV Systems. Functionally grounded PV systems are grounded to the building grounding electrode system when the PV output ac circuit equipment grounding conductor terminates to distribution equipment. ►Figure 690–87

The use of the PV output circuit equipment grounding conductor to serve as the required PV equipment grounding conductor connection to ground is the only connection to ground required for the functionally grounded PV system. ▶Figure 690–88

Note. Most PV systems are functionally grounded rather than solidly grounded. For functionally grounded systems, the inverter equipment grounding conductor is connected to the grounded distribution equipment. This connection is used for the ground-fault protection and equipment grounding of the PV array.





▶ Figure 690-88

(B) Additional Grounding Electrode. Additional grounding of the PV system is permitted (but not required) in accordance with 250.52 and 250.54 for auxiliary electrodes. The auxiliary electrode grounding conductor must be sized in accordance with 250.66. Figure 690–89

<u>A support structure for</u> a ground-mounted PV array can be used as an auxiliary grounding electrode if it meets the requirements of 250.52. Figure 690–90







Figure 690-90

PV arrays mounted to buildings can use the metal frame of the building structure as a grounding electrode conductor where the requirements of 250.68(C)(2) are met.