Solar Industry®

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An Installer's Field Guide To Required Labeling For Solar Projects

Conflicting guidance regarding the required verbiage and physical attributes of PV project warning signs can be misleading for installers.

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Solar installation labeling has become an issue that leaves many installers uncertain when it comes to compliance. There is a great deal of information available on labeling, but, in reality, there is no single application standard that fully satisfies the various local and national codes.

Some of the main providers of guidance when it comes to solar installation labeling include the National Electrical Code (NEC), the Occupational Safety and Health Administration (OSHA), the American National Standards Institute (ANSI), Underwriters Laboratories (UL), California Department of Forestry and Fire Protection (CAL FIRE) and the International Fire Code (IFC). In addition, the authority having jurisdiction (AHJ) will apply local requirements to the mix, which makes the solar installation labeling inspection process somewhat subjective.

Installation labeling is mandatory, as it is needed to warn installers of the electrical hazards associated with a typical PV system. Failing to label or labeling incorrectly will result in a failure to pass inspection. Moreover, industry professionals agree that safety is a chief concern and that communicating effectively through proper labeling is critical.

Installers must strike a balance between selecting labeling that communicates the basic attributes of an installation and addressing the concerns about label durability, label life and the cost of meeting both local and industry code requirements. There also is a great deal of confusion and misinformation with regard to what is acceptable and what is reasonable for labels to identify when they are describing the critical components of any installation.

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Because there are no common regulations, local jurisdictions may have label requirements that communicate the same basic information, but whose format is different from community to community, creating confusion and waste.

For instance, one AHJ might insist on a sign with embossed or engraved lettering, while another community might not even specify a sign type. One city might state that the sign must read, "This service is fed from multiple sources - grid and PV array." Yet another might indicate that the same label must read,"Dual sources: second source is photovoltaic," while still another might require descriptions of "dual power supply."

All of these signs communicate the same basic message, but the installer must interpret the applicable local standard and determine how much flexibility is allowed when posting a sign. Installers must determine if an engraved plate is mandatory or if a vinyl label will be acceptable, and they must ensure that the basic message is communicated clearly.

What the regulations cover

In all three dual-source examples listed above, not one community included the word "warning" when stating the required or suggested sign verbiage and design. The word "warning" is typically used when communicating a potentially hazardous condition that could result in the death or serious injury of workers and/or the general public if not avoided.

This lack of standardization means that there is some conflict between local ordinances and NEC, IFC, UL, OSHA and ANSI requirements for labeling. This conflict becomes more important when dealing with signage that communicates a potentially hazardous condition.

It is interesting to note that the NEC regulations do not specifically address the design or layout of a label, nor do they specify that labels need to last 20 years. This is why there is so much variability at the local level. In the 2011 version of the NEC, the requirements for labeling, simply stated, are that the markings shall be of sufficient durability to withstand the environment involved. They do not specify the material of the marker or any specific time period for outdoor durability.

Because the PV industry is rela-

Examples of required PV labeling. *Images courtesy of HellermannTyton*

tively new, the market and the local communities have not yet caught up with installers' needs. In California, for instance, the local municipalities do not have to adopt the most recent NEC codes. Some only review them every three years, and others may not review them on a regular basis - which means that many use standards that are two or three revisions old.

Many installers, just to be safe, will create the signs they require by visiting a local trophy shop and purchasing phenolic engraved plates that are mechanically fastened to the breaker boxes and panels. On average, these types of plates can cost as much as $60 to $70 per installation.

However, the market is slowly changing. Many new requirements and changes are either in place or will be very soon. First, fire safety has become a very important part of solar installation labeling, and the Fire Marshal Guidelines found in the IFC are more specific than some other standards.

In the 2012 addition of the IFC, the standard states that the materials used for marking shall be reflective, weather-resistant and suitable for the environment. CAL FIRE specifies that vinyl signs need to meet the requirements of UL 969 and, in some cases, would need to be reflective. The NEC 2011 code can be interpreted as stating that almost any type of sign could be used, including - but not limited to - plastic phenolic signs, steel signs, labels or direct printing on the surface of the box.

However, if you take into account the IFC requirements for UL 969, only an adhesive-backed label can qualify for UL 969 status. This requirement would tend to point toward a move away from plastic plates to potentially more durable adhesive labels.

Label locations

With regard to the IFC, it has become critical that labels provide emergency responders with appropriate warning and guidance about isolating the solar electric system. This information includes identifying energized electrical lines that connect the solar modules to the inverter, as these should not be cut when venting smoke from a burning building.

Cutting into a live conduit could result in a 520-volt jolt, so safety is a primary concern. The IFC/NEC specifies that EMT conduit and raceways must be marked no less than every 10 feet, at every turn, above and below penetrations, and on all exposed raceways, cable trays and other wiring methods. The labels also must be visible on the covers or enclosures of pull boxes, and junction boxes and conduit bodies in which any of the available conduit openings are unused.

The label is to be printed with the following text: photovoltaic power source. Furthermore, the IFC requires that these labels have reflective properties so that they are clearly visible in the beam of a flashlight. The IFC specifies that the markings must be visible from a distance, which means that the minimum text height is 3/8 inch using white lettering on a red background.

All other warning and caution labels can have a heading that is at least 1/4 inch tall and body text that is at least 1/16 inch tall. In comparison, OSHA's 1910.145 and ANSI Z535 specify that signs must be visible at a safe viewing distance from the hazard. They also recommend the use of safety alert symbols where applicable.

When assembling all the components required for labeling an installation, the installer must weigh the costs and time required to comply. For instance, ordering an engraved plate may require several trips back to the installation, possibly delaying project inspections.

In addition, selecting any label choice, the installer must now consider the following questions: Is the marker UV stable? Does it need to meet UL 969? Does it need to be reflective? Does it come in the colors required? Does it meet the requirements of the installation?

The label industry has had UV-stable materials available for years. Although there is no label material manufacturer that will warrant a label for 20 years, on average, manufacturers will typically advertise outdoor durability to be five to nine years.

This stated time frame does not mean that the label will degrade and fall off in that time, but it does mean that the label should show little or no signs of degradation in that time period when directly exposed to the elements. After five to nine years, the labels will slowly degrade. However, because many installations are in shade for a good portion of the time, shielded by overhangs or placed indoors, the labels can last years longer than the expected outdoor life.

Label adhesives are also critical. When selecting a UV-stable label material, be sure that the adhesive is able to bond to both baked enamel and powder-coat painted surfaces. Many new breaker boxes and panels are moving to powder-coat paint surfaces, which are low-energy surfaces that are not friendly to typical adhesives. Adhesives specifically designed for

the application will not be affected by temperature, water and chemicals, and will last the entire life of the label.

The growing emphasis on label standards for PV installations is creating more awareness of the need to standardize installation labeling. Following specific local ordinances for PV labeling will always be a critical factor, but as more communities come to understand the complexities of labeling regulations, many will move toward common integration within the industry.

There is no doubt that the industry will see more transformations to labeling design and implementation. Those changes will continue to provide more definitive guidance when it comes to solar installation labeling requirements - resulting in less cost, greater durability and safer end results.

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