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Solar Roof Penetrations: What’s Required in Florida?
Solar Roof Penetrations: What’s Required in Florida?

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The roofing industry has been protecting buildings and occupants from water intrusion for centuries, but lately there have been a lot of non-roofers drilling holes in rooftops to install solar PV systems. Since approximately 80 percent of construction litigation results from water intrusion, this subject should command the full attention of Building Code Officials, whose main purpose is to protect lives and property, and I’m glad to say that it has. The weather conditions in the State of Florida are so different and challenging that, while the Florida Building Code (FBC) is influenced heavily by the ICC Standards that are adopted by most states with few modifications, in this state they’ve had to write their own book. In this article we will explore the FBC regulations when it comes to solar roof penetrations on asphalt shingle and tile roofs. We will also review input from organizations that influence the Code.

Focusing on FBC Chapter 9, Roof Assemblies and the language referring to penetrations, we see that R903.2 states “Flashings shall be used to seal roofing systems... and shall be installed in a manner that prevents moisture from entering... penetrations through the roof plane.” That may sound like common sense to a roofer, namely that placing a metal flashing designed to keep water out of a hole you drilled in a roof would be presumed; however, that’s not necessarily the mindset of a solar installer that may get paid by the number of panels they install per day. Code officials have their hands full trying to keep up with what we in the industry refer to as the “solar-coaster” as it climbs fast and steep here in the Sunshine State. Educating code officials and solar installers on solar roofing best practices has become a critical mission for manufacturers of PV mounting systems and organizations like FRSA and the Tile Roofing Industry Alliance (TRI).

Asphalt Shingles

Drilling down to flashing requirements on common roof systems, R905.2.8.4 denotes the code for asphalt shingle roofs as “Flashings against a vertical wall, as well as soil stack, vent pipe and chimney flashing, shall be applied in accordance with the asphalt shingle manufacturer’s printed instructions.” Have you ever tried to read the fine print on that beat-up plastic bag that the shingles come in once it’s arrived onsite? GAF has published a Technical Advisory Bulletin on the subject entitled “Installation of Solar PV Panels Over A GAF Shingle Roof” that is very comprehensive. Looking for additional guidance, we check out what the NRCA offers in their “Steep Slope Roof Systems” manual and the “Guideline for Rooftop Mounted PV Installations.” There you can find a zillion details of valleys, chimneys and soil stacks, but not a single detail for retrofit Solar PV roof attachments. The best reference from them is as follows; “Flashings: PV system support stands should have a flanged base or be used with a prefabricated base plate to facilitate effective flashing installation methods...NRCA recommends support stands be flashed in a fashion similar to a pipe penetration. With this detail, a proper water-shedding installation is achieved by having the upper course of roof covering overlapping the upper flashing flange with the flange extending beyond the head lap of the roof covering. The bottom flange then should overlap the lower course of roof covering.” This language definitely rules out the use of butyl tape-backed products or sealant-only solutions and firmly requires the use of a metal flashing that is installed under both the second and third course of shingles. There is still a lot of
clarification needed in that section – pipe penetrations and PV roof attachments are actually very different in nature, because you don’t attach all your soil stacks together with aluminum racking, which then expands and contracts at a different rate than the roof structure every day! Solar PV roof attachments are literally rocking back and forth on a daily basis to accommodate the material expansion differential between aluminum and wood. In a nutshell, that is why proper flashing designs and installation techniques are critical and sealant-based solutions won’t stand the test of time and temperature.

Tile Roofs
Moving on to tile roofs, luckily we have an advocate in the Tile Roofing Industry Alliance (TRI) that publishes climate-applicable guidelines for installing tile roofing systems and offers comprehensive training and certification. In conjunction with FRSA, they publish a Florida-specific manual, which is cited by the Florida Building Code. R905.3 states that “…flashing and counter flashing shall be provided in accordance with this chapter, the roofing manufacturer’s installation instructions [and] recommendations of the FRSA/TRI Florida High Wind Concrete and Clay Tile Installation Manual, 5th Edition.” Looking inside the one I keep on my desk, I find that pages 28-29 offer details related to roof penetrations, both at the tile and deck level. The references, FHW-07 and FHW-08 respectively, detail the proper methods for flashing tile roof systems. The FRSA/TRI manual differs from the other two TRI manuals at this stage, because it shows the deck level flashing three-coursed on all four sides of the protrusion, rather than just the top and sides. When I discussed this with a code official, he said it’s because water travels uphill in Florida.

These flashing instructions were further clarified in a Technical Brief written in June 2016 by Rick Olson, President and Technical Director of the TRI, stating: “In instances in which roofing contractors or third party vendors must modify roof tiles in a manner that is inconsistent with the roofing industry based installation recommendations, it shall be noted that all penetrations require an approved deck/underlayment flashing and tile flashing.” Aimed directly at non-roofers, he goes on to write “The above recommendations are intended to reiterate roofing and flashing industry standards for the installation of accessories (e.g., solar panels, etc.) where roof tiles are affected.”

According to the Solar Energy Industries Association (SEIA), there were 314,600 residential solar installations last year (mostly on rooftops) and Florida is on track to become the number two solar market in the nation, just behind California. Let’s assume that every installation requires an average of 40 attachments, nationwide, that equates to over a million holes being drilled in rooftops every year! And since these PV systems have no moving parts and can last over 25 years, even a 1 percent leak rate will result in 30 to 50 percent of systems leaking over time. Quality flashings and waterproofing methods are critical and as Olson stated so well, we need solar installers to be guided by roofing industry standards and best practices. Let’s all continue the mission to make that happen in the Sunshine State.

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