Building a Custom Solar-Ready Home

A Guide for Architects & Builders

Get Smarter Solar

Having designed hundreds of solar systems that have been retrofitted on existing homes throughout Southern California, we at **Get Smarter Solar** with Axia by Qcells offer these guidelines for both architects and general contractors on how to design and construct homes so that an optimal solar system can be easily customized to the needs of the first occupants and those thereafter.

OPTIMAL DESIGN AND CONSTRUCTION

- The home should be designed to have at least one roof plane with the following:
    - an optimal azimuth solar that faces anywhere between due south (180°), due west (270°) or southwest (between) with a roof plane is broad as possible. The most optimal azimuth in this hemisphere is 180°.
    - sloped between 4/18 and 5/23 (18 to 23 degrees).
    - unobstructed with dormers, hips, chimneys, vents and other roof irregularities. Vents and chimneys should be placed on the north or east roof slopes, avoiding the choice roof faces.
    - rectangular as possible with ample space side to side and from eave to ridge line. While triangular roof faces are workable, they are not as optimal.
- It is best if there is at least one choice roof face for solar that is not on the front of the home. This is an issue for Homeowners Association (HOA) communities and more aesthetically minded home-owners.
- Choice roof faces for solar should have adequate attic space underneath them to maneuver in to complete the conduit during the install process.
- The Main Electrical Service Panel (MSP) should ideally have a designated breaker for solar at the top, and have at least a 200 amp buss bar with the main breaker at the top, bottom or apart. An MSP with a 225 amp buss bar and a 200 amp main disconnect is preferred, which will allow up to 70 amps back feed for a residential solar system up 15kW. If the homeowner does not need all 200 amps, the 200 amp main breaker can be de-rated to 175 or 150 amps, which will allow for an even larger solar system.
- Conduit for the future solar system should be run through attic crawl space and through the wall to the MSP. When the solar system is installed, a minor amount of conduit can be run in the crawl space to exactly where the solar system is going above, so that the conduit remains in the crawl space. The conduit elbows should be appropriate for pulling wire.
- The property should be landscaped to avoid tree shade on the choice roof faces.

LEGEND FOR EXAMPLES ON THE FOLLOWING PAGES

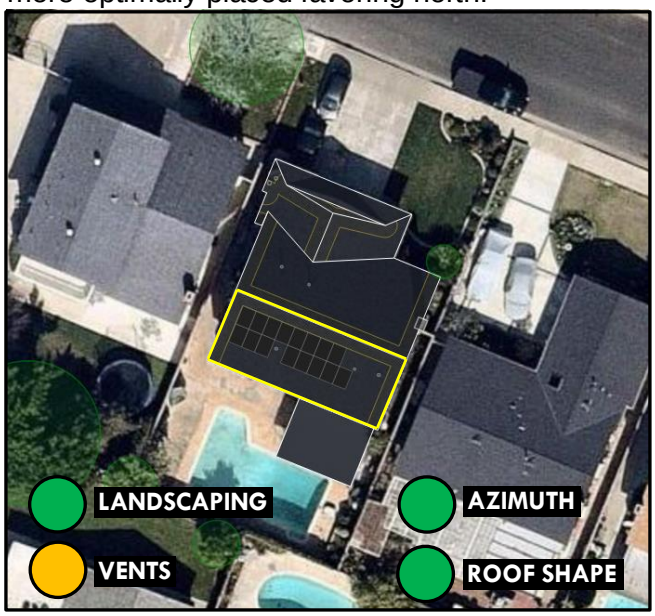
 **GOOD**

 **OK, BUT COULD BE BETTER**

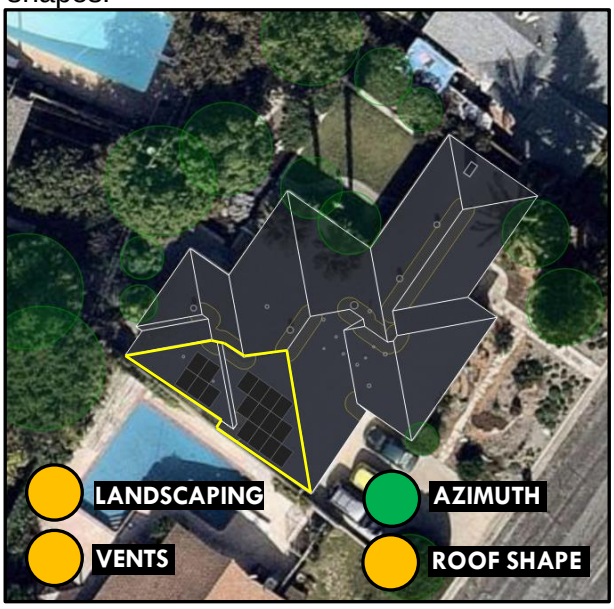
 **BAD**

EXAMPLES OF A SOLAR ARRAY ON A MAIN HOUSE

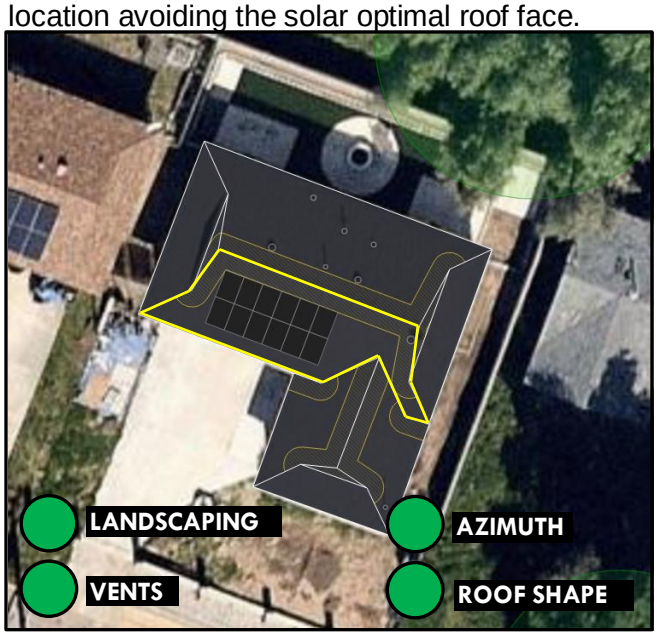
Example of optimal azimuth with optimal rectangular roof face and optimal aesthetic face avoiding the front of the home. Vents could be more optimally placed favoring north.



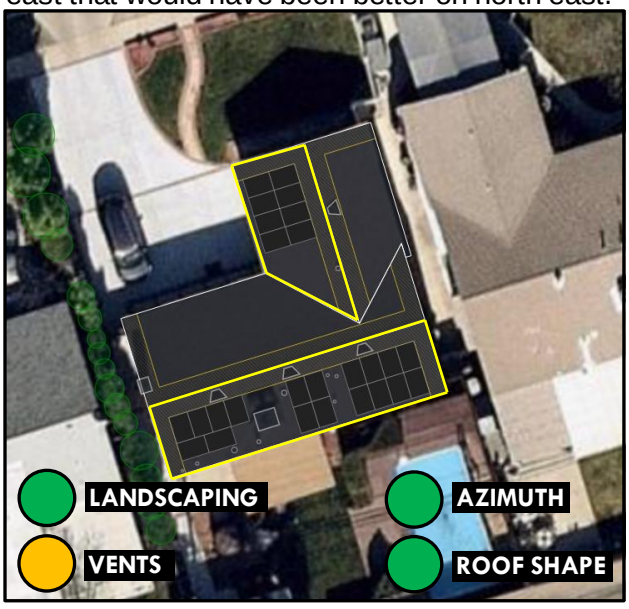
Example optimal azimuth and optimal aesthetic face, with less optimal triangular roof shapes.



Example of optimal azimuth with optimal vent location avoiding the solar optimal roof face.



Example of both optimal and acceptable azimuths with non-optimal vents put on south east that would have been better on north east.



DETACHED STRUCTURES

- If the home has a detached garage it may be a good candidate for all or part of the homes solar system. Uninhabitable structures like garages and carports do not need the same fire setbacks as a home, so more solar modules can be placed on the same amount of roof area on a garage as on a home.

  Part of the challenge of using a garage is that the solar system usually needs to be connected to the home in some way, since the MSP is more commonly on the home than on the detached garage. Here are the things to consider in order to make sure that the detached garage is an option for solar:

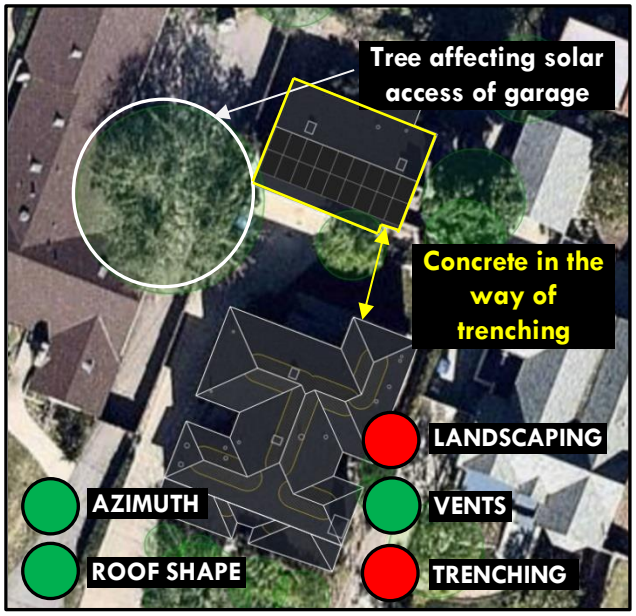
  - **ROOF FACES:** Garage roof faces should be optimal for solar according to the same principles as the home in terms of azimuth, pitch and solar access.

  - **STRUCTURE/RAFTERS:** The garage should be designed to structurally accommodate the weight of a solar system with an appropriately robust rafter design.

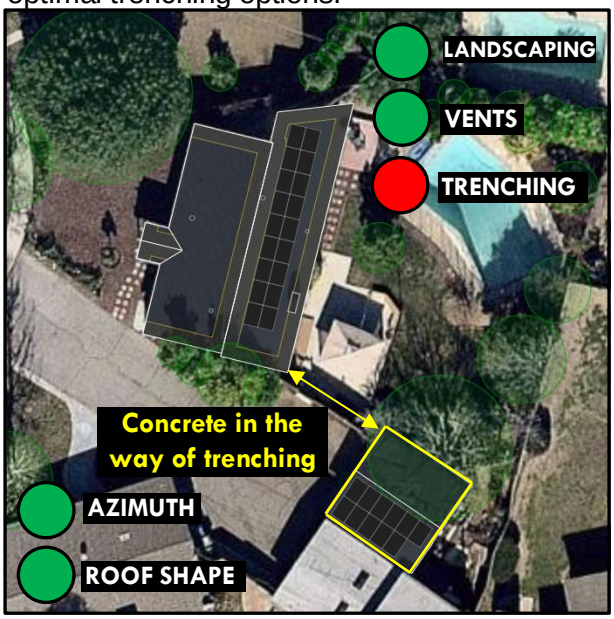
  - **CONDUIT PATH:** To connect solar modules to the MSP, a path for conduit should be considered when planning concrete and other landscaping between the main house and the garage. By code conduit must be run 3 feet below ground with a 1.5 feet clearance on either side above ground. It is best to make sure there is a path of soft earth that meets these code requirements that is not covered by concrete or landscaped with trees or bushes where conduit can be run at the time of the solar system installation. It is also best if there is going to be installed an underground sprinkler system that it be routed to avoid the path of future conduit to the garage.

EXAMPLES OF A SOLAR ARRAY ON A DETACHED STRUCTURE

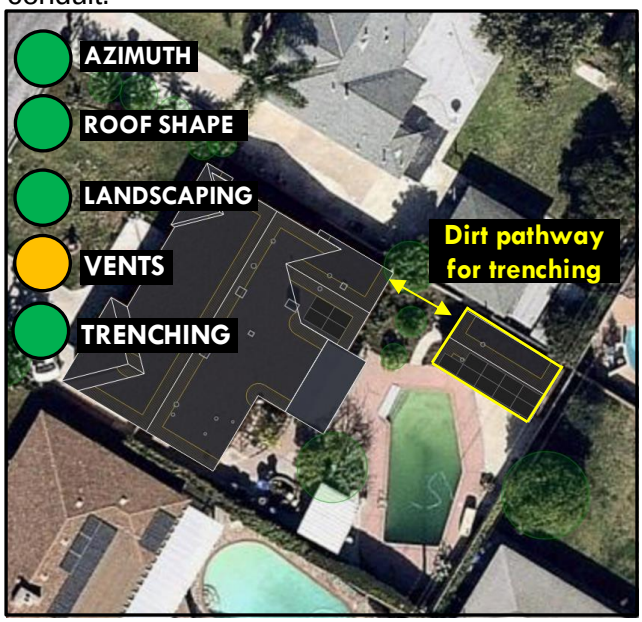
Example of detached structure with optimal azimuth but non-optimal landscaping and non-optimal trenching options for conduit.



Example of detached structure with optimal azimuth and optimal landscaping but non-optimal trenching options.



Example of detached structure with optimal azimuth and an optimal trenching option for conduit.



- **Preferred:** Composite shingle, Cement tile over 10 lbs per tile,. Heavier tile will be less likely to break during the solar installation. Standing seam metal is also very easy to install with special clamp racking requiring no roof penetration

- **Not preferred but workable:** Curved Metal shingle (Decra), Clay and cement tile under 10 lbs per tile, Rolled Composite.

INLAY "SKYLIGHT" SOLAR SYSTEMS

Curved clay "S" roof tiles are typically not robust enough to be walked on without the risk of cracking when walked on, so a solar installation on this type of roof requires that a layer of composite roof be laid down first, with the solar installed low profile on the composite roof, and then the fragile tiles are back-filled around the solar system.

While this is attractive aesthetically, it also more expensive to retro-fit solar to an existing clay "S" tile roof. *If a home is being built the roof is being redesigned with these tiles, it is recommended that the roof area intended for solar have composite tiles installed first.* After the solar system is installed the clay tiles will be backfilled around the solar system so that the roof appears to be entirely clay tile around the solar system.

EXAMPLE OF INLAY "SKYLIGHT" SOLAR SYSTEM

RAFTER MARKERS ON COMPOSITE ROOFS

It is very helpful if the roofer marks on the roof where the rafters meet the ridge. This will enable the solar installer to plumb line the rafter from the eave to the ridge to make sure that footing penetrations go directly into the rafter. This can be done by with a marking that is small enough and close enough to the existing color of the roof so that will only be visible to someone directly on the roof and not visible from the street. A cross with the long line oriented along the rafter and the short line oriented along the ridge is preferred (see example next page).

EXAMPLE

FLAT ROOFS:

When designing and constructing a home with a roof pitch of less than 10 degrees, make sure to route and consolidate vents and obstructions as much as possible to leave a space on the flat roof designated for a solar system to be able to occupy. The less the solar system must "navigate" vents and obstructions the more optimally it can be designed for best, aesthetics and solar access.

WHAT WE RECOMMEND TO AVOID

- **Pre-Installed Stanchions:** modern solar stanchions are designed to be easily installed on an existing composite roof.

- **Solar Roof Tiles:** Solar roof tile technology has been around for the past two decades and continues to develop as there has been interest in it and investment from the likes of Elon Musk. Here are some concerns about solar roof tiles in relation to more conventional solar modules:

    1. They are more expensive to install relative to the cost using traditional roof materials used alongside solar modules. The roof material must match the look of solar tiles to keep the whole look of the roof consistent.

    2. Relative to solar modules, solar roof tiles are not as proven in terms of their long-term durability.

    3. There are many possible points of failure to know where to replace a defective tile that may also be affecting the rest of the system.

    4. There is little to no air flow beneath solar roof tiles to keep them cool, as they are fixed to the roof. As heat degrades the efficiency of a solar modules, solar roof tiles have a challenge remaining as efficient as conventional solar modules.

Get Smarter Solar with Axia by Qcells **recommends high efficiency** Axia by QCell **solar modules over conventional solar modules or solar roof tiles.**

CONTACT US FOR A CONSULTATION BEFORE YOU BUILD

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