



CITY OF MISSION VIEJO

Building Division
200 Civic Center
Mission Viejo, CA 92691
(949) 470-3054
www.cityofmissionviejo.org

2016 CALIFORNIA CODES

02/01/2017
EFFECTIVE DATE

Eligibility Checklist for Expedited Solar Photovoltaic Permitting
Under 10 kw AC for One- and Two-Family Dwellings

Job Address: _____ Permit No. _____

Contractor/Engineer Name: _____ Lic. # & Class _____

Applicant/Engineer Signature: _____ Date: _____

Size of system kw AC? _____ Name of Electric Utility Company? [] SDG&E [] SCE
Number of modules? _____ Total square feet of PV System? _____ S.F.
Number of disconnects? _____ Number of branch circuits? _____
Lineal feet of conduit? _____ Number Inverters or micro inverters? _____

General Requirements

- A. System size is 10 kw AC CEC rating or less? If "No" Stop your project does not qualify [] YES [] NO
B. The solar array is roof-mounted on one or two-family dwelling or accessory structure [] YES [] NO
C. The solar panel/module arrays will not exceed the maximum legal building height [] YES [] NO
D. Solar system is utility interactive and without battery storage [] YES [] NO
E. Permit application is completed and attached [] YES [] NO

Electrical Requirements

- A. No more than four photovoltaic module strings are connected to each Maximum PowerPoint Tracking (MPPT) input where source circuit fusing is included in the inverter [] YES [] NO
a. No more than two strings per MPPT input where source circuit fusing is not included [] YES [] NO
b. Fuses (if needed) are rated to the series fuse rating of the PV module [] YES [] NO
c. No more than one non-inverter-integrated DC combiner is utilized per inverter [] YES [] NO
B. For central string inverter systems: No more than two inverters are utilized [] YES [] NO
C. The PV system is interconnected to a single-phase AC service panel of nominal 120/220 Vac with a bus bar rating of 225 A or less [] YES [] NO
D. The PV system is connected to the load side of the utility distribution equipment [] YES [] NO
E. Mission Viejo's Solar Standard Plan and supporting documentation is completed and attached? [] YES [] NO

Structural Requirements

- A. A completed Structural Criteria and supporting documentation is attached (if required per 3B) [] YES [] NO

Fire Safety Requirements

- A. Clear access pathways provided [] YES [] NO
B. Fire classification solar system is provided [] YES [] NO
C. All required markings and labels are provided [] YES [] NO
D. A diagram of the roof layout of all panels, modules, clear access pathways and approximate locations of electrical disconnecting means and roof access points is completed and attached [] YES [] NO

Notes:

- 1. These criteria are intended for expedited solar permitting process.
2. If any items are checked NO, revise design to fit within Eligibility Checklist, otherwise permit application may go through standard process.



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Structural Criteria for Residential Roof-top Solar Energy Installations

1. Roof Checks

A. Visual Review/Contractor's Site Audit of Existing Conditions:

- 1) Is the roof a single roof without a reroof overlay? YES NO
- 2) Does the roof structure appear structurally sound, without signs of alterations or significant structural deterioration or sagging, as illustrated in Figure 1? YES NO

B. Roof Structure Data:

- 1) Measured Roof slope (e.g. 6:12) _____ :12
- 2) Measured rafter spacing (center-to center) _____ inches
- 3) Type of roof framing (rafter or manufactured truss): Rafter Truss
- 4) Specify measured rafter size, not nominal rafter size. (e.g. 1-1/2" x 3-1/2", not 2x4): _____"in x _____"in
- 5) Measured rafter horizontal span (see Figure 4) _____' ft - _____"in
- 6) Horizontal rafter span per Table 2: _____' ft - _____"in
- 7) Is measured horizontal rafter span less than Table 2 span? YES NO Truss

2. SOLAR ARRAY CHECKS

A. Flush-mounted Solar Array:

- 1) Is the plane of the modules (panels) parallel to the plane of the roof? YES NO
- 2) Is there a 2" to 10" gap between underside of module and the roof surface? YES NO
- 3) Modules do not over-hanging roof edges (ridges, hips, gable ends, eaves)? YES NO

B. Do the modules plus support components weigh no more than: 4 psf for photovoltaic arrays or 5 psf for solar thermal arrays?

YES NO

C. Does the array cover no more than half of the total roof area (all roof planes)?

YES NO

D. Are solar support component manufacturer's project-specific completed worksheets, tables with relevant cells circled, or web-based calculator results attached?

YES NO

E. Is a roof plan of the module and anchor layout attached? (see Figure 2)

YES NO

F. Downward Load Check (Anchor Layout Check):

YES NO

- 1) Proposed anchor horizontal spacing (see Figure 2): _____' ft - _____"in
- 2) Horizontal anchor spacing per Table 1: _____' ft - _____"in
- 3) Is proposed anchor horizontal spacing equal to or less than Table 1 spacing? YES NO

G. Wind Uplift Check (Anchor Fastener Check):

- 1) Anchor fastener data (see Figure 3)
- a) Diameter of lag screw, hanger bolt or self-drilling screw: _____ inches
- b) Embedment depth of rafter: _____ inches
- c) Number of screws per anchor (typically one): _____
- d) Are 5/16" diameter lag screws with a minimum 2.5" embedment into the rafter used,
OR does the anchor fastener meet the manufacturer's guidelines YES MFG

3. Structural Criteria Summary

- A. If all items 1 through 2 G 1) d) above are checked YES. No additional structural calculations are required. YES NO
- B. One or more items 1 through 2 G 1) d) above are checked NO? Attach project-specific drawings and calculations wet stamped and signed by a Ca-licensed civil or structural engineer. YES NO

Table 1. Maximum Horizontal Spacing				
Roof Slope		Rafter Spacing		
		16" o.c.	24" o.c.	32" o.c.
Photovoltaic Arrays (4 psf max)				
Flat to 6:12	0° to 26°	5'-4"	6'-0"	5'-4"
7:12 to 12:12	27° to 45°	1'-4"	2'-0"	2'-8"
13:12 to 24:12	46° to 63°	1'-4"	2'-0"	2'-8"
Solar Thermal Arrays (5 psf max)				
Flat to 6:12	0° to 26°	4'-0"	4'-0"	5'-4"
7:12 to 12:12	27° to 45°	1'-4"	2'-0"	2'-8"
13:12 to 24:12	46° to 63°	Calc. Req'd	Calc. Req'd	Calc. Req'd

Solar support component manufacturer's guidelines may be relied upon to ensure the array above the roof is properly designed, but manufacturer's guidelines typically do NOT check to ensure that the roof itself can support the concentrated loads from the solar array. Table 1 assumes that the roof complied with the building code in effect at the time of construction, and places limits on anchor horizontal spacing to ensure that a roof structure is not overloaded under either downward loads or wind uplift loads. Note 4 below lists the basic assumptions upon which this table is based.

Table 1 Notes:

1. Anchors are also known as "stand-offs," "feet," "mounts" or "points of attachment." Horizontal anchor spacing is also known as "cross-slope" or "east-west" anchor spacing (see Figure 2).
2. If anchors are staggered from row-to-row going up the roof, the anchor spacing may be twice that shown above, but no greater than 6'-0".
3. For manufactured plated wood trusses at slopes of flat to 6:12, the horizontal anchor spacing shall not exceed 4'-0" and anchors in adjacent rows shall be staggered.
4. This table is based on the following assumptions:
 - The roof structure conformed to building code requirements at the time it was built.
 - The attached list of criteria is met.
 - Mean roof height is not greater than 40 feet.
 - Roof sheathing is at least 7/16" thick oriented strand board or plywood. 1x skip sheathing is acceptable.
 - The dwelling is located within in Wind Exposure C (within 500 yards of large open fields or grasslands), all of the following conditions apply.
 - Design wind speed is 110 mph or less (not in a Special Wind Region).
 - The dwelling is not located on the top half of a tall hill.
 - The solar array displaces roof live loads (temporary construction loads) that the roof was originally designed to carry.
 - The Structural Technical Appendix provides additional information about analysis assumptions.

Table 2. Roof Rafter Maximum Horizontal Span (Feet – Inches) 1								
Assumed Vintage	Nominal Size	Actual Size	Non-Tile Roof ²			Tile Roof ³		
			Rafter Spacing					
			16" o.c.	24" o.c.	32" o.c.	16" o.c.	24" o.c.	32" o
Post-1960	2x4	1½"x3½"	9'-10"	8'-0"	6'-6"	8'-6"	6'-11"	5'-6"
	2x6	1½"x5½"	14'-4"	11'-9"	9'-6"	12'-5"	10'-2"	8'-0"
	2x8	1½"x7¼"	18'-2"	14'-10"	12'-0"	15'-9"	12'-10"	10'-3"
Pre-1960	2x4	1¾"x3¾"	11'-3"	9'-9"	7'-9"	10'-3"	8'-6"	6'-9"
	2x6	1¾"x5¾"	17'-0"	14'-0"	11'-3"	14'-9"	12'-0"	9'-9"
	2x8	1¾"x7¾"	22'-3"	18'-0"	14'-6"	19'-0"	15'-6"	12'-6"

Table 2 is used to provide additional assurance by requiring a check of existing roof rafter spans, and supports optional criteria 1.B.5 and 1.B.6. For post-1960 construction, these span tables match the rafter span tables found in the 2016 California Building and Residential codes. For pre-1960 construction, the rafter span tables are based on structural calculations with lumber sizes and wood species and grade appropriate for older construction. Note 5 below lists the basic assumptions upon which this table is based.

Table 2 Notes:

1. See Figure 4 for definition of roof rafter maximum horizontal span.
2. "Non-tile Roof" = asphalt shingle, wood shingle and wood shake, with an assumed roof assembly weight of 10 psf.
3. "Tile Roof" = clay tile or cement tile, with an assumed roof assembly weight of 20 psf
4. Unaltered manufactured plated-wood trusses may be assumed to be code compliant and meet intent of Table 2.
5. This table is based on the following assumptions:
 - Span/deflection ratio is equal to or greater than 180.
 - For post-1960 construction, wood species and grade is Douglas Fir-Larch No. 2.
 - For pre-1960 construction, wood species and grade is Douglas Fir-Larch No. 1.
 - Other wood species and/or grade are also acceptable if allowable bending stress is equal or greater to that listed.

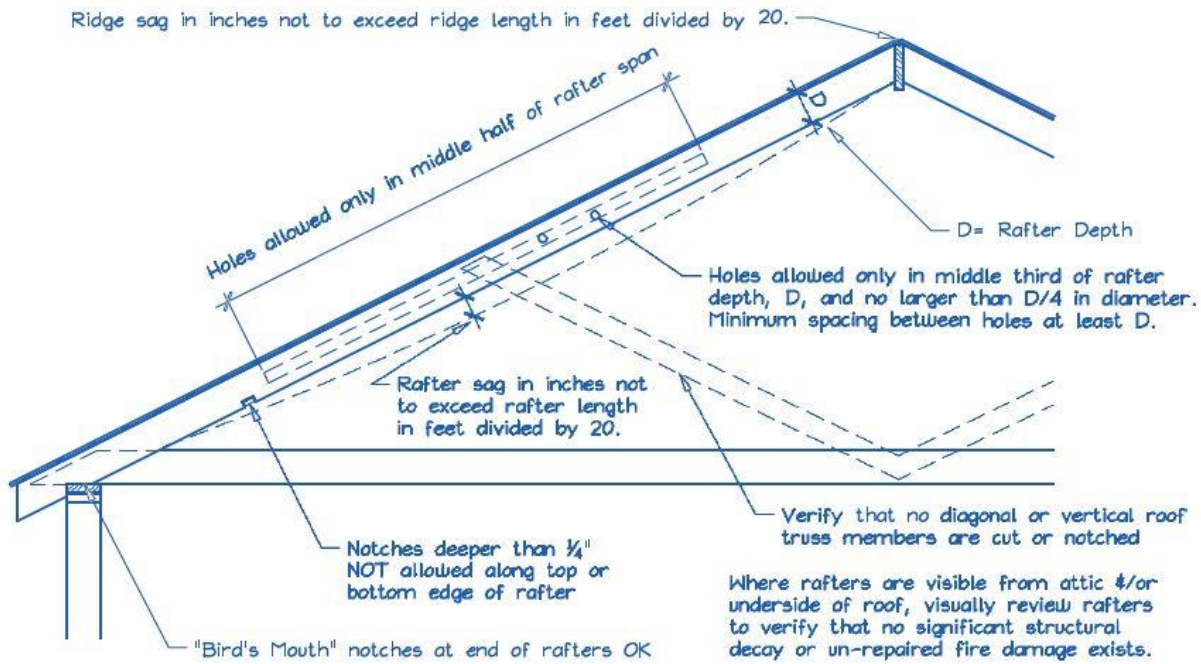


Figure 1. Roof Visual Structural Review of Existing Conditions. (Site Audit)

The site auditor should verify the following:

1. No visually apparent disallowed rafter holes, notches and truss modifications as shown above.
2. No visually apparent structural decay or un-repaired fire damage.
3. Roof sag, measured in inches, is not more than the rafter or ridge beam length in feet divided by 20.

Rafters that fail the above criteria should not be used to support solar arrays unless they are first strengthened.

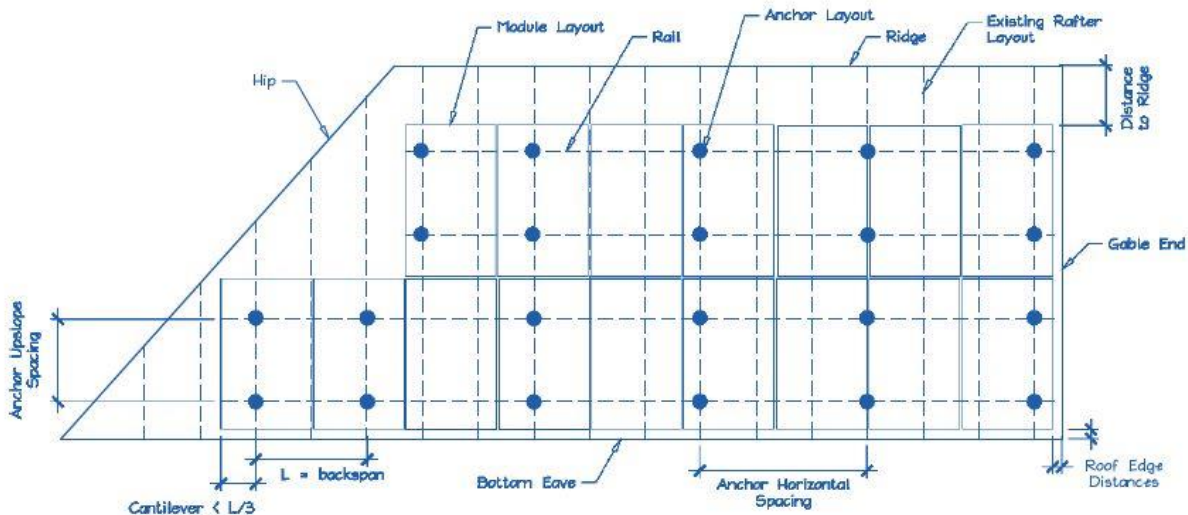


Figure 2. Sample Solar Panel Array and Anchor Layout Diagram (Roof Plan).

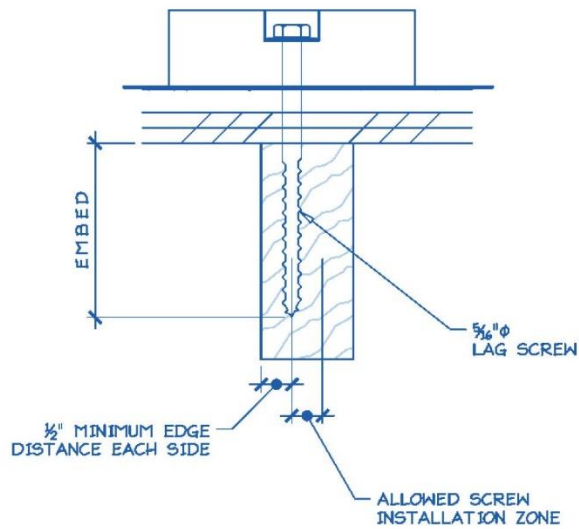
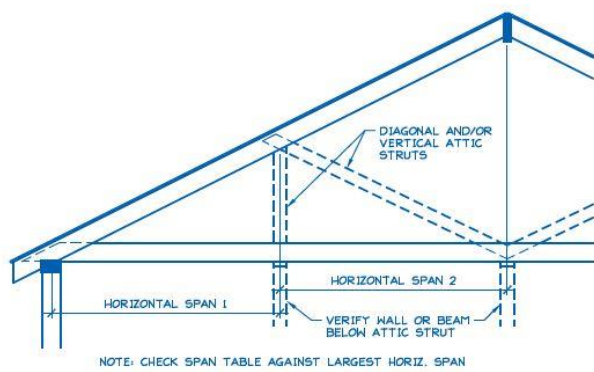
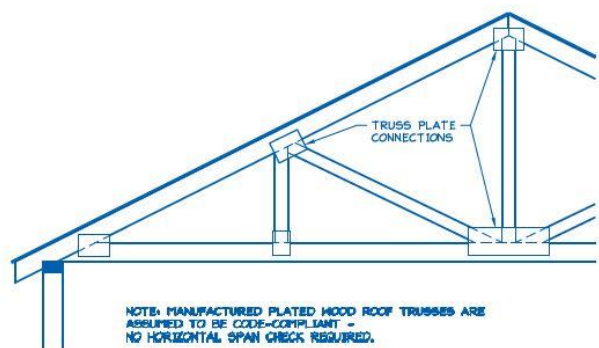


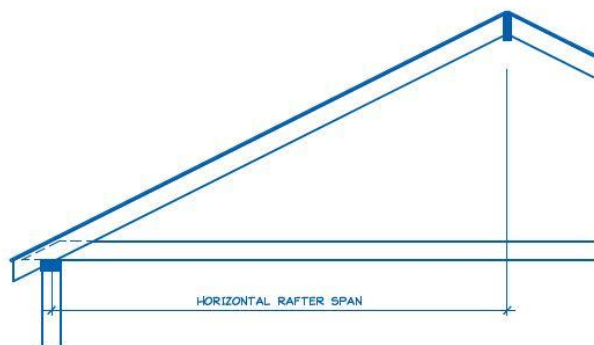
Figure 3. Typical Anchor with Lag Screw Attachment.



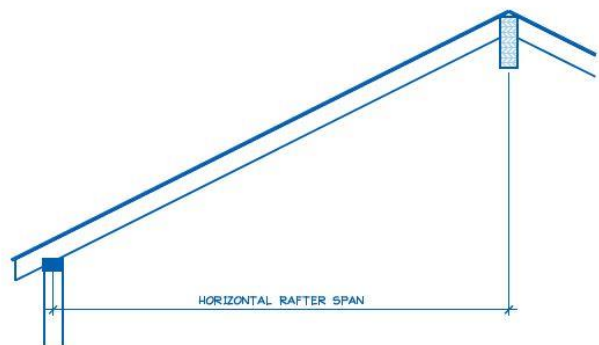
C STRUTS TO WALLS BELOW



D MANUFACTURED PLATED WOOD ROOF TRUSS



A SIMPLE ATTIC



B CATHEDRAL CEILING

Figure 4. Typical Anchor with Lag Screw Attachment.