REACO

January 8, 2019 Meeting Minutes

Redwood Empire Association of Code Officials

***1007-B West College Avenue* # 326 Santa Rosa, CA 95401**

The December 4th meeting was held at Cattlemen's Restaurant Petaluma

1. **CALL TO ORDER AND PLEDGE OF ALLEGIANCE**
   The meeting was called to order at 12:03 by Charles Lucas, the pledge of allegiance was omitted due to the lack of a flag being present.

2. **SELF INTRODUCTIONS (Officers, Guests, Members)**
   There were 24 members and guests in attendance.

3. **APPROVAL OF MINUTES -**
   A motion by Adam Hill and a second by Glenn Schainblatt were made and the minutes of the December meeting were approved.

4. **OFFICERS REPORTS**

   President: Charles Lucas – Reminder to get memberships in and update emails

   Vice President: Jay Bradford – No report.

   Treasurer: Steve Buffenbarger- December Checking Balance: $27,653.33

   Secretary: David Willoughby - No report

   Past President: Tony Piazza – No report

5. **LIAISON REPORTS**

   AIARE: **No Report**

   CSI: **Christian Holbrook:** Christian announced that the February 7th CSI meeting at Charlie's Grill at the Windsor Golf Club from 5:30 pm. to 8:30 pm. will be on rain water catchment. The CSI EXPO Seminar is on March 21, 2019 from 12:00 pm to 4:00 pm. The topic will be "The direction of the 2019 energy standards" new and revised requirements will be summarized. Website is www.recsi.org

   SCFPO: **Glenn Schainblatt:** Glenn highlighted FPO's work with Junior Fire Center, helping work with troubled teens. FPO's meet the third Wednesday of the month at 10:00am. The January meeting will be adjusted and held on January 9, 2019 in Petaluma for the annual award meeting. FPO's meeting schedule can be found at http://sonomachiefs.org/publiceducation.html The FPO code amendment committee is forming Building Officials are encouraged to attend. If interested contact your FPO.

   ICC Rep: **Chris Ochoa:** Sent announcements which are attached to the minutes.

   CBOAC: **Glenn Schainblatt:** Annual Conference & Business Meeting / Pismo Beach / April 28-May2, 2019. The program will be finalized in 2 weeks. The website is www.cboac.org. There are 4 members from this meeting that are planning to attend.

   CALBO: **Brad Wungluck:** Sent report which is attached to the minutes. Business meeting is March 17th in San Diego.

   CEC Rep: **Amie Brousseau**: Amie announced that the 2019 Energy Standards have been completed are posted on their website, www.energy.ca.gov/title24/2019standards/. She mentioned that she is available to provide some energy training.

   IAEI: **Doug Hughes:** Doug Hughes mentioned that The Northern California Officer Installation will occur on the last Saturday of January. IAEI is looking at creating one state chapter instead of 9 chapters, meeting quarterly, enables better state representation. Working on setting up the NFPA NEC update in San Rafael. The class is free and provides a free code book to members.

BAYREN: Carolyn Glanton: Carolyn was not able to attend but she did send an email about the ongoing PV discussion. Two links for web pages were included. The first was for a Policy by the ICC Tri-Chapter Uniform Code Committee which is committed to enhance regional consistency in the application and enforcement of the codes by developing guidelines for code interpretation - http://www.eastbayicc.org/images/TriChapter/2016_TUCC_Policy_111__Resi_Roof_Mounted_PV_Systems.pd and a SEAC document – www.seacgroup.org/resources

REGION 1: Glen Schainblatt: No report at meeting (report emailed to me later included as attachment).

6. **COMMITTEE REPORTS**

Education Committee:

Eric Seabrook: Eric is looking at classes coming up this spring.

Web-Site Committee:

Board members: Posting on the calendar and flyer for H&S issues with cannabis processing. Doug suggested we add a link for the Remodelers Association and CBOAC. Also, Michael Enright noticed a couple mistakes that need to be corrected, 1. correct spelling of past president and 2. bylaws have the old name, so may need to upload the revised bylaws with the correct name (need to contact Dwayne Starnes for official copy of the bylaws).

Nominating Committee:

Glenn Schainblatt: No report.

Audit Committee:

Michael Enright: No report

7. **CORRESPONDENCE AND ANNOUNCEMENTS**

Charles Lucas: Discussed providing a donation to the Alisa Ann Ruch Burn Foundation – how much gave last year to help burn victims. No motion was made to donate.

Tony Piazza: Looking for instructors for the building trades at Sonoma State Univ, Rohnert Park satellite.

Jobs: Jobs open at City of Berkley and City of Santa Rosa for inspectors.

8. **PROGRAM**

Brian Osborn from West Coast SIPs: Provided an overview of the company and the SIPs industry with practical information about using the product.

9. **NEW BUSINESS**

Charles Lucas: the 2019 Budget was scheduled for discussion, but due to the program running overtime the budget was passed out and it was decided to review and discuss/vote on next meeting.

10. **OLD BUSINESS**

Discussed the battery backup requirement for garage doors (implementation date of July 1, 2019) The legislation link is https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB969

Bay Ren is assisting in developing Energy Storage systems Permit Streamlining guidance documents.

11. **LEGISLATIVE NEWS**

1. **CALBO website:** Legislative updates - https://www.calbo.org/capitol-corner-update
2. **DSA Notice:** pursuant to AB-3002 - https://www.documents.dgs.ca.gov/dsa/other/AB3002Notice.pdf

12. **CODE ISSUES**

David Willoughby and Steve Buffenbarger: Continued the discussion on California Solar Permitting Guidebook recommendations for PV racking supports for conventionally framed and truss roofs. Supplied a handout with information and proposed a subcommittee to look into coming up with a PV policy we can all agree on. Perhaps updating the previous REACO Policy.

13. **ADJOURNMENT**

The meeting was adjourned at approximately 1:52 pm by Charles Lucas.

Next meeting will be February 5, 2019, at the Cattleman's Restaurant in Petaluma.

Region 1 Jan. 22, 2019 Conference Call

The Executive Board and sixteen Chapters participated in the call.
Kevin McOsker President gave the opening remarks.

Treasurer's report-Mike Brinkman $11,479.87 total funds

ICC Board Liaison- Jim Sayers gave a report on ICC's 20/25 Vision Strategic Plan

Region1 will be hosting a Hospitality Suite at the ICC Annual Business meeting. They welcome any donations from any of the Chapters to help fund the event.

Education Benefit: Every paid Chapter member is eligible to enter a drawing at the CALBO ABM for the Region 1 Chapter Education benefit. This is the way they did it was done last year at ICC ABM.

Region1 will not be involved in making specific code proposals. They will provide a list of Region 1 code proposals that came from member Chapters.

Next meeting will be a face to face meeting at the CALBO ABM in San Diego on Monday at 4:00 PM.

NOTICE TO APPLICANTS FOR BUSINESS LICENSES AND COMMERCIAL BUILDING PERMITS:

Under federal and state law, compliance with disability access laws is a serious and significant responsibility that applies to all California building owners and tenants with buildings open to the public. You may obtain information about your legal obligations and how to comply with disability access laws at the following agencies:

DEPARTMENT OF GENERALSERVICES, Division of the State Architect, CASp Program

www.dgs.ca.gov/dsa

www.dgs.ca.gov/casp

DEPARTMENT OF REHABILITATION Disability Access Services

www.dor.ca.gov

www.rehab.cahwnet.gov/disabilityaccessinfo

DEPARTMENT OF GENERALSERVICES, California Commission on Disability Access

www.ccda.ca.gov

www.ccda.ca.gov/resources-menu/

CERTIFIED ACCESS SPECIALIST INSPECTION SERVICES

Compliance with state and federal construction-related accessibility standards ensures that public places are accessible and available to individuals with disabilities. Whether your business is moving into a newly constructed facility or you are planning an alteration to your current facility, by engaging the services of a Certified Access Specialist (CASp) early in this process you will benefit from the advantages of compliance and under the Construction-Related Accessibility Standards Compliance Act (CRASCA, Civil Code 55.51-55.545), also benefit from legal protections.

Although your new facility may have already been permitted and approved by the building department, it is important to obtain CASp inspection services after your move-in because unintended access barriers and violations can be created, for example, placing your furniture and equipment in areas required to be maintained clear of obstructions. For planned alterations, a CASp can provide plan review of your improvement plans and an access compliance evaluation of the public accommodation areas of your facility that may not be part of the alteration.

A CASp is a professional who has been certified by the State of California to have specialized knowledge regarding the applicability of accessibility standards. CASp inspection reports prepared according to CRASCA entitle business and facility owners to specific legal benefits, in the event that a construction-related accessibility claim is filed against them.

To find a CASp, visit www.apps2.dgs.ca.gov/DSA/casp/casp_certified_list.aspx.

GOVERNMENT TAX CREDITS, TAX DEDUCTIONS AND FINANCING

State and federal programs to assist businesses with access compliance and access expenditures are available:

Disabled Access Credit for Eligible Small Businesses

FEDERAL TAX CREDIT—Internal Revenue Code Section 44 provides a federal tax credit for small businesses that incur expenditures for the purpose of providing access to persons with disabilities. For more information, refer to Internal Revenue Service (IRS) Form 8826: Disabled Access Credit at *www.irs.gov*.

STATE TAX CREDIT—Revenue and Taxation Code Sections 17053.42 and 23642 provide a state tax credit similar to the federal Disabled Access Credit, with exceptions. For more information, refer to Franchise Tax Board (FTB) Form 3548: Disabled Access Credit for Eligible Small Businesses at *www.ftb.ca.gov*.

Architectural and Transportation Barrier Removal Deduction

FEDERAL TAX DEDUCTION—Internal Revenue Code Section 190 allows businesses of all sizes to claim an annual deduction for qualified expenses incurred to remove physical, structural and transportation barriers for persons with disabilities. For more information, refer to IRS Publication 535: Business Expenses at *www.irs.gov*.

California Capital Access Financing Program

STATE FINANCE OPTION—The California Capital Access Program (CalCAP) Americans with Disabilities Act (CalCAP/ADA) financing program assists small businesses with financing the costs to alter or retrofit existing small business facilities to comply with the requirements of the federal ADA. Learn more at *www.treasurer.ca.gov/cpcfa/calcap/*.

FEDERAL AND STATE LEGAL REQUIREMENTS ON ACCESSIBILITY FOR INDIVIDUALS WITH DISABILITIES

AMERICANS WITH DISABILITIES ACT OF 1990 (ADA) —The ADA is a federal civil rights law that prohibits discrimination against individuals with disabilities, and requires all public accommodations and commercial facilities to be accessible to individuals with disabilities. Learn more at *www.ada.gov*.

CALIFORNIA BUILDING CODE (CBC)—The CBC contains the construction-related accessibility provisions that are the standards for compliant construction. A facility's compliance is based on the version of the CBC in place at the time of construction or alteration. Learn more at *www.bsc.ca.gov*.

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BUDGET WORKSHEET FOR CALENDAR YEAR 2018-19

Budget Worksheet Prepared 1/8/2019	Budget for 2018	Actual 2018	Difference Budget/Actual	Proposed Amount Change	Notes	Proposed Budget for 2019
SAVINGS ACCOUNT						
Balance 1/1/2018 $25,340						
Balance 1/1/2019 $27,653						
Proposed Balance 1/1/2020 $27,363				-$290		
REVENUE						
Career Succession Classes	$10,000	$2,843	-$7,157	$0	No Change	$10,000
Lunch Meetings	$5,600	$4,957	-$643	-$700	Decrease due to lunch revenue less than budgeted	$4,900
Membership Dues	$2,500	$3,025	$525	$250	Increase due to projected membership registration	$2,750
Executive Board Meeting	$0.00	$185.00	$185.00	$0.00	Rework fee structure to eliminate line item	$0.00
Total Revenue	$18,100	$11,010	-$7,090	-$450		$17,650
EXPENDITURES						
Career Succession Classes	$5,000	$343	$4,666	$0	No change	$5,000
Lunch Meetings	$5,500	$5,669	-$169	$200	Increase due to lunch cost more than budgeted	$5,700

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Memberships & Dues	$2,000	$450	$1,550	-$1,000	Includes; ICC & preferred provider. RESCI booth moved to sponsorship. What about CALBO and IAEI mebership?	$1,000
Executive Board Meeting	$650	$616	$34	$0	5 Board members, 10 meetings @ $15 ea.	$650
Professional Processing Fees	$0	$153	-$138	$15	B of A fee, reduction due to no additional purchase of checks or binder	$15
Professional Fees Website	$750	$683	$67	-$175	Reduction due to no IT help	$575
Professional Fees Legal and Accounting	$750	$750	$0	$0	bis lic, tax acct, 199 form	$750
Office Supplies & Post box rental	$350	$853	-$503	-$100	Post box prepaid 2 years until 2020). Outed Pres Award.	$250
Donations	$2,000	$0	$2,000	$0	No change	$2,000
Scholarships / Sponsorship	$2,000	$475	$1,525	$0	RESCI booth, CBOAC	$2,000
Total Expenditures	$19,000	$9,992	$9,032	-$1,060		$17,940

Efficiency Division Updates

REACO Monthly Meeting
January 8, 2018

CALIFORNIA ENERGY COMMISSION

Efficiency Division Updates and Resources

- At the business meeting on December 10, 2018 the Commission approved the compliance manuals and compliance documents to support the 2019 Building Energy Efficiency Standards. The Commission approved the City of Arcata's local ordinance under the 2016 Building Energy Efficiency Standards. The next business meeting is January 9. Business Meetings Agendas and Minutes: **www.energy.ca.gov/business_meetings**
- On December 5, the California Building Standards Commission approved the next triennial updates to Title 24, Part 1, Part 6, and Part 11. Approved updates will have an effective date of January 1, 2020. **http://www.bsc.ca.gov/Home.aspx**
- Final Documents for 2019 Building Energy Efficiency Standards are now available: 2019 Energy Standards, Reference Appendices, Compliance Manuals, Compliance documents and supporting content. **https://www.energy.ca.gov/title24/2019standards/index.html**

Energy Standards Training and Events

- Energy Commission upcoming training dates and locations: **www.energy.ca.gov/title24/orc/schedule_oe/index.php**
  - 2/13: Diablo Valley College, Pleasant Hill, CA – Residential Envelope
  - 2/14: LA Basin ICC Chapter, Alhambra, CA – 2019 Standards Changes
  - 3/17-3/21: CALBO ABM, San Diego, CA - Booth
- Energy Code Ace training: **www.energycodeace.com/training**
- PG&E training: **www.pge.com/pec**
- BayREN training: **www.bayrencodes.org/services/trainings/**

Energy Standards Resources

- Online Resource Center: **www.energy.ca.gov/title24/orc**
- Energy Standards Hotline: 800-772-3300 or **Title24@energy.ca.gov**

To receive regular updates, sign up and respond to the confirmation email:

- Building Standards: **www.energy.ca.gov/title24/orc/**
- Blueprint Newsletter: **www.energy.ca.gov/efficiency/blueprint/**
- Appliance Standards: **www.energy.ca.gov/appliances/**

ICC Government Relations Chapter Monthly Update – January 2019

Follow **@ICC_GR on Twitter** for breaking news & announcements throughout the month

Deadline to submit change proposals to the 2021 Group B I-Codes is pushed back to January 14
Due to scheduling complications from the recent holidays, the deadline for the 2021 International Codes Group B code change proposals has been changed from Monday, Jan. 7, 2019, to Monday, Jan. 14, 2019, at 11:59 p.m. Pacific. You can submit changes and participate in discussions on changes by logging in to cdpACCESS. Hearings on Group B proposals are set for:

- April 28 – May 8, 2019 Committee Action Hearing - Albuquerque Convention Center, Albuquerque, N.M. Click here for pre-registration and meetings schedules.
- October 23 – 30, 2019 Public Comment Hearing – Rio Hotel/Convention Center, Las Vegas, Nev.

This year's code hearings offer ICC members/non-members, code officials, architects, builders, engineers, fire and energy conservation professionals the opportunity to provide input on proposed code changes to the Group B international Codes. The 2021 Group B Codes include:

- Admin: (Chapter 1) of all the I-Codes
- International Building Code® (IBC®) — IBC-S
- International Existing Building Code® (IEBC®)
- International Energy Conservation Code® (IECC®) — IECC-C, IECC-R/IRC-E
- International Green Construction Code® (IgCC®) — (Chapter 1)
- International Residential Code® (IRC®) — IRC-B

New Year's Day means it's time to update your ICC voting status to participate during 2019
Whether you attend the hearings or participate online via cdpACCESS, you help to ensure the next generation of I-Codes benefits our communities with safe, sustainable and resilient structures. In order to participate in the Online Assembly Floor Motion Vote that follows the Committee Action Hearings, all ICC Primary Member Representatives must validate their Governmental Member Voting Representatives online by March 29. Check your voting status online today! And to help you stay on top of developments and save time, sign up to receive text message updates about the progress of code change hearings during ICC's 2019 Committee Action Hearings. Opt-in to receive text messages. Standard text messaging charges may apply. To unsubscribe, text *STOP* to 77453. For help, text *HELP*.

ICC membership review and comments sought on Section R602.10.1.2 (2015 IRC) until January 25
A proposed committee interpretation to Section R602.10.1.2 (Offsets along a Braced Wall Line) of the 2015 International Residential Code is available for ICC membership review and comment until January 25. Technical Opinions on codes and standards are an exclusive benefit of ICC Membership. Committee Interpretations provide technical support and clarification of code text for adopting jurisdictions, design professionals, and members of the construction industry. Read more on the process here.

Home Depot joins as a key sponsor of the 2019 Building Safety Month celebrations across the USA
Code Council members and stake holders, like Home Depot are preparing local events for the 2019 Building Safety Month. With its theme **"No Code, No Confidence,"** we have expanded our Building Safety Month campaign to all year round. Here are the weekly themes for the month of May:

- **Week 1** – (May 1- May 5): Preparing for disasters: Build strong, build smart
- **Week 2** – (May 6- May 12): Ensuring a safer future through training and education
- **Week 3** – (May 13- May 19): Securing clean, abundant water for all communities
- **Week 4** – (May 20- May 26): Construction professionals and homeowners: Partners in safety
- **Week 5** – (May 27- May 31): Innovations in building safety

The 2019 campaign poster is now available for download. Join us on social media using the hashtag **#BuildingSafety365**. Check back here often for updates on the 2019 celebration.

January 15 is the deadline to apply for the ICC Solar Thermal Standard Consensus Committee
The International Code Council is currently accepting applications for the ICC Solar Thermal Standard Consensus Committee. Once appointed, this committee will convene to revise two current ICC solar

thermal standards; ICC 900/SRCC 300-2015 Solar Thermal Systems Standard and ICC 901/SRCC 100-2015 Solar Thermal Collector Standard. The committee will be appointed by the ICC Board of Directors. Click here for more information. Application deadline: January 15, 2019.

SAVE THE DATE! June 3-5 are the dates for the 2019 ICC Chapter Leadership Academy in Denver
On June 3-5, 2019, the Code Council will host its fourth annual Chapter Leadership Academy at the Hyatt Regency Tech Center in Denver, Colo. This highly popular, exclusive event for ICC Chapter leaders focuses on management skills for ICC Chapters. Chapter leaders may use their annual Chapter benefit for either complimentary travel, hotel expenses and registration for the 2019 Chapter Leadership Academy in June ***or*** complimentary registration for the 2019 Annual Conference in October.

January 31 is deadline to submit applications for education presentations at 2019 Annual Conference
The Code Council is seeking education presentations for its 2019 Annual Conference Education Sessions and the Building Safety & Design Expo in Las Vegas October 20-23. The first step to present at the Annual Conference is to submit applications by January 31. Step 2 is to submit education presentation materials by May 10. All presentation topics should focus on providing educational and technical information. Education sessions of the ABM should focus on basic or specialized provisions in the I-Codes, including but not limited to fire/life safety, plumbing and mechanical topics and leading-edge innovations in the building industry. Presentations should help to educate attendees about building code compliance, building safety, leadership and building technology. Read more here.

Free download publication explains the urgent need for community resilience and provides examples
You can receive a download copy of "Building Community Resilience through Modern Model Building Codes" which addresses the urgent need for community resilience in the face of repeated major disasters. Provided by the Code Council and the Alliance for National & Community Resilience (ANCR), a 501(c)(3) national coalition of public and private sector stakeholders, this publication provides a comprehensive overview of community resilience, what it entails, and why it's important. In addition to an extensive literature review, the document provides a number of examples of communities with effective pre-disaster mitigation strategies and outlines code provisions from the International Codes that were put in place to mitigate future risk. Read more here and obtain your free download.

HUD rule change on high value FHA-backed loans expected to save money each year for home buyers
A final rule published recently in the Federal Register by the U.S. Department of Housing & Urban Development removes the requirement that borrowers pay for a 10-year protection plan as a condition for securing FHA-backed loans for new homes with a high loan to value. HUD removed the requirement because of "the significant improvements in building technology and the quality of housing, as well as the adoption of uniform building codes and local jurisdictions' more stringent enforcement of building codes," both of which "mitigate HUD's previous concerns about needing to protect property owners from defects in workmanship and materials." This will save the roughly 55,000 borrowers likely to be directly affected about $540 per year, according to the Federal Register.

Recent 14-nation network focuses on an official British government review of the tragic Grenfell Fire
The Code Council joins a network of building regulatory officials from 14 different countries, called the Inter-Jurisdictional Regulatory Collaboration Committee (IRCC), twice each year to discuss current global issues in building safety. The second meeting of 2018 took place in early October in The Hague, Netherlands, and included a workshop entitled, "Building Quality — Improving the Compliance to Building Regulations." The workshop featured a keynote address delivered by Dame Judith Hackitt, chair of the task force that produced the report of England's Independent Review of Building Regulations and Fire Safety, in the wake of the tragic Grenfell Fire. Dame Judith presented a comprehensive overview of the process that her commission undertook to investigate the regulatory system under which this disaster occurred. You can read more about her report and discussion here.

Alaska's top elected officials praise building codes as preventing far worse damages from earthquake
Recent comments by leading elected officials point to building codes having minimized damages from a massive 7.0 magnitude earthquake that hit Anchorage, Alaska, on November 30th and contributed to a

rapid post-disaster recovery. The Alaska earthquake did not result in any collapsed buildings, widespread damage to infrastructure or loss of life, partially due to the strong building codes the state adopts – the International Codes (I-Codes). Comments include:

- Governor Bill Walker praised the state's building codes while commenting on minor damages to his own home: "Building codes mean something."
- Anchorage Mayor Ethan Berkowitz credited building codes for minimizing structural damage and said, "Considering the scale of earthquake, the extent of damage was relatively small."
- U.S. Senator Lisa Murkowski stated, "We have worked as communities in our state to be prepared for disasters when they should come. We have some of the most stringent building codes in the world, and for the most part, our buildings held up."
- U.S. Senator Dan Sullivan said, "We were fortunate that there were no deaths...Given how many earthquakes we have had over the years, we have learned a lot. The first thing we learned is about building codes. Fortunately–again, thank God–we had no buildings collapse. We have a lot of structures–homes, businesses, schools–that have severe structural damage, but a collapsing building is where you get a lot of deaths...Strong, strict building codes...[help] to prevent that."

These results are consistent with several studies that demonstrate that well-enforced building codes help mitigate earthquake risk.

ICC online training events offer live, one-on-one instructor contact without the travel expenses

Live training events are available from any location with an internet connection. Virtual classrooms are different from web sessions. When you join a virtual classroom, you can actually see your instructor and those in the physical classroom and they can see you. A Virtual Classroom is a hybrid learning environment where you participate remotely and experience the same collaboration, instructor interaction and learning benefits as if you were physically in the classroom. According to a recent study done by Training Magazine, 86% of virtual classroom participants rated the experience "just as engaging" or "more engaging than" traditional classroom training. Here are benefits of Virtual Training:

- Saves you money by eliminating travel costs
- Saves you time because you never have to leave your home or office
- Obtain CEUs to apply towards certification renewal
- Gets remote teams training together
- Encourages collaboration among the learning group both virtually and in the physical classroom

See the list of new live training classes at the end of this **Chapter Monthly Update**.

Deadline is June 30 for executive development program applications to the Emory Rodgers Fellowship

Completed application materials for the Emory Rodgers Fellowship must be submitted by June 30 to Vice President of Member Services Karla Higgs at khiggs@iccsafe.org for electronic applications or at 900 Montclair Rd., Birmingham, AL 35213 for paper applications. Examples of eligible programs include those hosted by higher education institutions that focus on executive-level training, strategic management, leadership development, or other similar concentrations. Beyond covering program costs, ICC has no involvement in an eligible program's curriculum or schedule. Emory R. Rodgers devoted more than four decades to the building safety profession and the creation and development of the International Codes. As a leader in the industry and in the Code Council community, he put forth unprecedented efforts in educating and preparing the next generation of building safety professionals.

Recent 2nd Annual PHRC Residential Construction Career Fair photos featured on Facebook page

We thought you might enjoy seeing some of the faces of potential future code officials and leaders in the built environment who participated in the 2nd Annual PHRC Residential Construction Career Fair at Penn State. They are posted on this special Facebook page hosted by the Pennsylvania Housing Research Center (PHRC). PHRC hosted some of the leading residential construction builders, designers, code officials, and material manufacturers to mix and mingle with Penn State architectural and engineering students. For more information on the career fair, contact John M. Eby by email jeby@latwp.org.

'Best Practices' submissions sought by the ICC Major Jurisdictions Committee to spotlight innovations

The ICC Major Jurisdiction Committee (MJC) invites major jurisdictions to submit "Best Practices" that your jurisdiction has successfully used in a code administration environment. Best practices are

professional procedures that are accepted or prescribed as being correct or most effective. For examples of Best Practices, visit the Best Practices Guide on the MJC website. After review by the MJC Steering Committee, outstanding contributions will be posted as examples of code officials helping one another. All submittals need to be submitted in the same format to simplify the search process. **Please review this linked form for your "Best Practices" submission**. You can submit your forms via email at mjc@iccsafe.org. If you have any other comments or questions, submit them to mjc@iccsafe.org.

REPORT: Structurlam cross-laminated timber products are compliant with existing codes, standards
The ICC Evaluation Service (ICC-ES) and the Engineered Wood Association (APA) released their first joint evaluation report for cross-laminated timber products (CLT). This program certifies CLT products for compliance with ICC-ES Acceptance Criteria for Cross-Laminated Timber Panels for Use as Components in Floor and Roof Decks (AC455) and ANSI/APA PRG 320 Standard for Performance-Rated Cross-Laminated Timber. The joint evaluation report, ESR-3631, was issued in September 2018 to Structurlam Mass Timber Corporation for its Structurlam CrossLam CLT panels. Read more here.

***GOT PULSE?* ICC Senior Director of PMG interviews his former trainee on careers in plumbing**
Code Council Senior Director of PMG Resources Lee Clifton appears as the guest host for episode 11 of the ICC Pulse Podcast. Clifton's former trainee Damon Premer joins for a conversation about building a career in plumbing. Premer has worked in the plumbing trade for 32 years and is a senior project executive at All Area Plumbing in Commerce, Calif. *Click here to listen.*

Upcoming from the ICC Learning Center: Institutes, training, seminars, webinars, etc.
Online learning is available from the ICC Learning Center. Find course listings you'd like to attend in the **Learning Center** using the Search function. Single-day training events are an opportunity to focus on topics to ensure your code knowledge stays up to date, with some seminars offering a Virtual Classroom option so you can participate in the event from any location with an internet connection:

- **January 9** - **Administration and Adoption**
- **January 10** - 2015 IPC® Webinar Series **Chapters 1, 2, 3**
- **January 15-22** - Multi Day Virtual Event, **Inspector Skills**
- **January 15** - **2018 IRC® Essentials**
- **January 16** - **Building Planning Part I**
- **January 17** - 2015 IPC® Webinar Series **Chapters 4, 5, 6**
- **January 17** - **2018 IBC® Means of Egress**
- **January 18** - **Basic Code Enforcement**
- **January 18** - **2018 IPMC® Overview**
- **January 23** - **Building Planning Part II**
- **January 24** - 2015 IPC® Webinar Series **Chapters 7 and 8**
- **January 30** - **Legal Aspects of Code Administration**
- **January 30** – **IRC Chapters 4–10 Part I**
- **January 31** - 2015 IPC® Webinar Series **Chapters 9 and 10**
- **February 4** - 2015 IPC® Webinar Series **Chapters 11-14**
- **February 6** - **Chapters 4–10 Part II**
- **February 7** - **2016 CBC Essentials**
- **February 7** - Permit Technicians series **Building Department Processes**
- **February 13** - **Existing Buildings**
- **February 14** - **2016 CRC Essentials**
- **February 14** - Permit Technicians series **Overview of Code Enforcement**
- **February 21**- Permit Technicians series **Simple Plan Review**
- **February 28** - Permit Technicians series **Reading Construction Documents**
- **March 7** - Permit Technicians series **Legal Principles**
- **March 14** - Permit Technicians series **Finding the Answers in the I-Codes®**

The following is the updated list of **ICC Institutes** and other training opportunities across the nation, many of which offer virtual options for those who cannot travel. Find course listings you'd like to attend in the **Learning Center** using the Search function:

- **January 11** at Country Club Hills, Ill., **2018 IRC Wood Wall Bracing Provisions.**
- **January 16** in Pittsburgh, Penn., **Significant Changes from ASCE 7–10 to ASCE 7–16.**
- **January 18 and 25** at Micro Tek in Chicago, **Basic Code Enforcement**.
- **January 24** in Miami Beach, Fla., **Significant Changes from ASCE 7–10 to ASCE 7–16.**
- **January 28-31,** in Brea, Calif., **Code Official Institute**.
- **January 30** at Micro Tek in Chicago, **Legal Aspects of Code Administration**.
- **February 4-8,** in Chaska, Minn., **Upper Great Plains Region III Educational Institute**.
- **February 6,** in Austin, Texas, **Significant Changes from ASCE 7–10 to ASCE 7–16.**
- **February 11-13** in Portland, Ore., **Principles of Building Safety Institute**.
- **February 15** at Country Club Hills, Ill., **Accessibility & Usability: Commercial and Residential.**
- **February 22** at Country Club Hills, Ill., **2018 IFC® & IBC® Hazardous Materials Provisions.**
- **March 5** at Charleston, S.C., **Significant Changes from ASCE 7–10 to ASCE 7–16.**
- **March 11-15** at Las Vegas, Nev., **EduCode 2019**.
- **April 15** at Sacramento, Calif., **Permit Tech Institute**.

Certification Test Academies feature interactive and question-based review for the exam. Students will receive a voucher to take the exam at a later date. Upcoming Academies:

- **Available daily, 2015 Permit Technician 14 Study Guide** online.
- **May 6-8,** at Sacramento, Calif., and online, **14 - Permit Technician Certification Test Academy 2015**.

Susan Dowty
ICC Government Relations Manager
3060 Saturn Street, Suite 100
Brea, CA 92821
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sdowty@iccsafe.org

INTERNATIONAL CODE COUNCIL

January 2019 ICC Announcements

ICC Calendar of Upcoming Dates:

- Jan 2019 — It's a new year and it's time to validate voters!
- Jan 14 — Deadline for Group B Code Changes Extended
- Jan 15 — Application for ICC Solar Thermal Standard Consensus Committee
- Jan 28-31 — Code Official Insitute in Brea, CA
- Jan 31 — Deadline to Submit a Presentation for the 2019 ICC Annual Conf/BSD Expo
- Feb 7 — 2016 CBC Essentials in El Segundo and Virtual
- Feb 8 — 2016 CRC Essential in El Segundo and Virtual
- Mar 1 — 2018 Means of Egress in Brea, CA
- Mar 8 — Report Writing for Code Officials in Brea, CA
- Mar 19 — Procedures for Officers and Inspectors in Brea, CA
- Mar 17-21 — CALBO Annual Conference
- April 15-16 — Permit Tech Institute in Sacramento and Virtual
- Apr 28 – May 2 — County Building Officials Association of CA Annual Conference
- Apr 28 – May 8 — 2019 Committee Action Hearings (Group B Codes)
- May 2019 — Everything you need to know about 2019 Building Safety Month
- May 6-8 — Permit Technician Certification Test Academy in Sacramento and Virtual
- Jun 3 - 5 — Chapter Leadership Academy in Denver, CO
- June 30 — Application deadline for Emory R. Rodgers' Leadership in Building Safety Fellowship
- Oct 20 -30 — 2019 ICC Annual Conference and Group B Hearings in Las Vegas

TABLE OF CONTENTS FOR PV INFO

David Willoughby

From: Tony Piazza <Tony@mkmassociates.com>
Sent: Tuesday, January 08, 2019 7:46 AM
To: Charles Lucas; David Willoughby; Bradford, Jay; Steve Buffenbarger
Subject: FW: January 8th Meeting-Solar Permitting Guidebook

Links to some additional information from Carolyn regarding the Solar Permitting Guidebook.

Sincerely,

Tony Piazza
Project Manager, SE 4816
tony@mkmassociates.com

MKM & Associates
structural engineering
5880 Commerce Boulevard, Suite 105
Rohnert Park, CA 94928
T 707.578.8185 ext. 119 | F 707.578.7153
mkmassociates.com | Facebook | LinkedIn

From: Carolyn Glanton <carolyn.glanton@rcpa.ca.gov>
Sent: Tuesday, January 8, 2019 6:44 AM
To: REACO ICC <reacoicc@gmail.com>; Tony Piazza <Tony@mkmassociates.com>
Subject: Re: January 8th Meeting

Hi Tony,
I won't be able to attend today's meeting but wanted to share some thoughts ahead of time. Curious to hear what comes out of the discussion.

I looked at resources/guidance from both the Tri-Chapter Uniform Code Committee and the Sustainable Energy Action Committee on this topic. Both reference the Solar Permitting Guidebook:

- TUCC (technically links to the 2015 version): http://www.eastbayicc.org/images/Tri-Chapter/2016_TUCC_Policy_11-1_-_Resi_Roof_Mounted_PV_Systems.pdf
- SEAC: https://www.seacgroup.org/resources

Especially with some of the caveats include in the reference cited by Healdsburg. I would agree that it is within the jurisdiction's authority to either a) use and enforce the guidance cited, or b) use professional judgement and expertise to waive that guidance.

Let me know if you'd like me to do further digging on this with either TUCC or SEAC.

Best,
Carolyn

Sent from my iPhone

On Jan 7, 2019, at 10:16 PM, REACO ICC <reacoicc@gmail.com> wrote:

Happy New Year,
Our January meeting will be at Cattlemen's Restaurant on Tuesday January 8th.
The Draft December Meeting Minutes and the Agenda have been posted to the reacoicc.org website.

We look forward to seeing you on Tuesday,

2019 REACO Board

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David Willoughby

From: Steve Buffenbarger
Sent: Friday, December 07, 2018 3:20 PM
To: cbsc@dgs.ca.gov
Cc: David Willoughby; kris kuntz; Joe Irvin
Subject: Question Regarding Solar Permitting Guidebook Table 1, Footnote 3

Mr. Sasaki,

The jurisdictions here in Sonoma County are having an ongoing debate regarding the spacing of rack anchors onto plated wood trusses for roof mounted PV solar arrays in accordance with the Solar Permitting Guidebook Table 1, footnote 3. We have corresponded with John Wolfe of Mar Structural Engineering, who helped develop the Guidebook. He has reaffirmed the appropriateness of footnote 3 as a prescriptive design requirement.

My question to you is; with new homes built in 2020 and required to have rooftop PV solar, do you foresee that these new homes which mostly use manufactured plated wood trusses, at slopes of flat to 6:12 that the rack's horizontal anchor spacing will continue to be required to not exceed 4'-0" and anchors in adjacent rows shall be staggered?

The purpose of this question is that we are formulating a response to complaints from the PV solar industry that, this spacing pattern is excessive. The complaints do not include any engineering to back-up the claim of excessiveness. But we as the administrative authority do not want to maintain a hardline on a prescriptive measure that may soon be eliminated.

Thank you in advance for your response.

STEVE BUFFENBARGER, CBO, CBCO, CASp | Building Official
City of Healdsburg Community Development Dept
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Building Inspection service is available Monday-Friday 8:30 to 3:00 (except City holidays)
City Hall Hours are Monday-Thursday 7:30am-5:30pm, Friday 8:00am-5:00pm, closed every other Friday

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David Willoughby

From: Joe Cain <JCain@SEIA.org>
Sent: Tuesday, December 11, 2018 9:46 PM
To: Steve Buffenbarger; John.K.Taecker@ul.com; osama.younan@lacity.org
Cc: David Willoughby; Joe Irvin; Evelyn Butler; Justin Baca
Subject: RE: Question Regarding Solar Permitting Guidebook Table 1, Footnote 3

Hi Steve and all,

Thank you for thinking of us as you form a response to concerns from solar stakeholders and develop your policies moving forward, with consideration of the 2019 Building Energy Efficiency Standards.

There are certainly several considerations here. There are some differences in addressing structural concerns for existing homes and new homes. You mentioned there are solar PV industry stakeholders who have expressed concern over the stringency of tables in the California Solar Permitting Handbook. Are you able to identify those PV stakeholders for us to contact so we can learn their perspective and concerns firsthand? Perhaps this email is the first part our response, and we could provide further response after talking with them.

We understand you are required to have an "expedited, streamlined permitting process," and that AB-2188 references the California Solar Permitting Guidebook (CSPG). In forming your positions, we hope to not lose sight of the essential element of streamlining – to simplify; and the fundamental purpose of the Guidebook – to standardize and expedite permitting.

You are likely aware that opinions on how to consider structural loads for residential rooftop PV systems range from "do nothing" (aka "Trust Everybody" on page 19 of the Structural Technical Appendix) to "do everything" (the most-rigorous engineering checks). Ultimately, the CSPG gives you the flexibility to choose your path.

In the lightest touch, we consider that construction codes allow a second layer of composition shingles without any engineering check. This second layer often has a weight that is approximately equal to the distributed load of a PV system. So if an existing roof has only one layer of composition shingles (and even with minimal snow load) there is no further concern. The earliest expedited permitting guidance documents included a short list of simple thresholds. If within those simple thresholds, then it's truly simple; you're done.

On the other end of the range, everything is considered: dead load, live load, wind load, snow load; uniform loads and concentrated loads; wind down & wind up; load combinations; load cases; concentrated load-sharing factors for sheathing; plywood or OSB sheathing thickness & stiffness; lumber species & grade; assumption of zero snow load; and so forth. In the CSPG, after all of this detailed engineering analysis is reduced and combined into "simplified" criteria such as Table 1, it is inherently conservative. Each value in this table must represent many different variables and assumptions, and each value is constrained by the worst-case scenario. We can applaud John Wolfe's engineering acuity, expertise, and effort (and we do), as his engineering analysis is excruciatingly technically correct in a way that can satisfy the most rigorous of Structural Engineers. (And we know this because John Wolfe brought his body of work to SEAOC PV Systems Committee for review & comment.)

However, we must ask ourselves, is this really necessary? Is the problem really so complex that a 96-page technical appendix is needed? Is there some pattern of failures or collapsed residential roofs with PV systems attached? How many residential roof structural failures are you aware of in Sonoma County where the root cause was determined to be the incremental loads associated with PV systems? Does this exhaustive engineering analysis and extreme conservatism really represent value added for homeowners?

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The CSPG does provide an "offramp" under the heading "Currently Used Expedited Solar Permitting Approaches" on page 45. This section acknowledges that the local permitting authority has the freedom to use criteria other than provided in Table 1 and the footnotes.

All that said, your question targeted new homes built in 2020 and required to have rooftop PV solar. One thing to consider is that the detailed structural recommendations of the CSPG are primarily framed for structural *analysis* of an existing home rather than structural *design* of a new home. In an ideal case of PV installed with original construction of new homes, a new opportunity presents itself. The PV design team could develop the structural loads resultant from the PV system and then hand off those loads to the designer of the roof trusses. This would add complexity to truss design for floor plans built in multiple orientations, as PV system layout will likely vary to favor solar access. Or truss designers might include some generalized collateral load to simplify their calculations.

As a "next step" we would like to ask some of the new homes teams of our member companies how they have addressed these issues in new developments of solar homes, and speak with some of those local PV stakeholders you've encountered.

We welcome further conversation on this topic.

Thanks,

Joe Cain, P.E.
jcain@seia.org
408-605-3934

From: Steve Buffenbarger <sbuffenbarger@ci.healdsburg.ca.us>
Sent: Monday, December 10, 2018 3:19 PM
To: Joe Cain <JCain@SEIA.org>; John.K.Taecker@ul.com; osama.younan@lacity.org
Cc: David Willoughby <dwilloughby@ci.healdsburg.ca.us>; Joe Irvin <jirvin@ci.healdsburg.ca.us>
Subject: Question Regarding Solar Permitting Guidebook Table 1, Footnote 3

Colleagues,

Building Standards Commissioner Ken Sasaki and CBSC Deputy Executive Director Michael Nearman, asked that I forward the following injury to engineers that were involved in the initial Solar Guidebook creation and that are more familiar with the solar mounting standards.

The jurisdictions here in Sonoma County are having an ongoing debate regarding the spacing of rack anchors onto plated wood trusses for roof mounted PV solar arrays in accordance with the Solar Permitting Guidebook Table 1, footnote 3. We have corresponded with John Wolfe of Mar Structural Engineering, who helped develop the Guidebook. He has reaffirmed the appropriateness of footnote 3 as a prescriptive design requirement.

My question is; with new homes built in 2020 and required to have rooftop PV solar, do you foresee that these new homes which mostly use manufactured plated wood trusses, at slopes of flat to 6:12 that the rack's horizontal anchor spacing will continue to be required to not exceed 4'-0" and anchors in adjacent rows shall be staggered?

The purpose of this question is that we are formulating a response to complaints from the PV solar industry that, this spacing pattern is excessive. The complaints do not include any engineering to back-up the claim of excessiveness. But we as the administrative authority do not want to maintain a hardline on a prescriptive measure that may soon be eliminated.

Thank you in advance for your response.

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What's happening at SEIA®:
SEIA Women's Empowerment Summit - Nov 13, 2018, Chicago, IL
Solar Power Midwest - Nov 14-15, 2018, Chicago, IL
SEIA Federal & State Policy Summit - Dec. 4-6, 2018, Washington, DC

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David Willoughby

From: John Wolfe <john.wolfe@marstructuraldesign.com>
Sent: Friday, November 10, 2017 10:50 AM
To: David Willoughby
Subject: Re: Structural requirements for residential PV rooftop systems

David,

In general, you are following the California Solar Permitting Guidebook (specifically Toolkit #5), which is founded on sound structural engineering principles, and have succinctly summarized those rules. A few minor comments, below:

Note that in your rules below, four feet and six feet mount spacing should only refer to cross-slope spacing, perpendicular to rafters. Upslope/downslope mount spacing parallel to rafters can be greater (i.e. modules in portrait mode instead of landscape mode are OK, even if the support rails and mounts are more than four feet apart in the upslope/downslope direction).

1. If the roof framing consists of factory built trusses and the module roof support spacing is 4' max cross slope spacing and anchors in adjacent rows shall be staggered then no structural engineering is required.

In the big picture, it's probably more important for the installer to coordinate the mount layout in a clever fashion to avoid hitting panel points (the wood sandwiched between the truss plates), than it is to stagger the mounts. Unstaggered mounts at 4 feet on center attached to trusses at 24" on center are fine in virtually all cases, since they load every other truss. Unstaggered mounts at 4 feet on center attached to trusses at 16" on center load every third truss, and may not work in a few cases - should probably be either calculated or staggered to avoid the issue. Because we didn't want to set overly complicated rules, the permitting guidelines didn't distinguish between trusses at 24" and 16" centers, where the former could have orthogonal 4 ft spacing and the latter would need 4 ft staggered spacing.

2. If the roof framing consists of conventional rafter/ceiling joist framing and meets the span tables found in the 2016 CBC or CRC (or the framing can be prescriptively braced) and the module roof support spacing is max 6' on center (I still like to see the staggered rows) then no structural engineering is required.

The 6 ft spacing (for rafters at 24" o.c.) and 5'-4" spacing for rafters at 16" o.c. can work fine, even without staggering. Encouraging but not mandating staggering is OK - staggering always creates a more quasi-uniform loading pattern, and can reduce the possibility of minor annoyances like plaster or gypsum board hairline cracking or bulging at loaded rafters, especially at exposed cathedral ceilings. If ground design snow load is over 15 psf, the mounts definitely need to be staggered, and also reduce to four feet spacing.

3. If the roof framing or anchor spacing does not meet the above requirements then structural engineering is required addressing gravity and lateral loads.

Check gravity loads yes, wind loads yes, seismic no. Except for ballasted systems with no positive attachment on flat roofs, seismic virtually never controls the design and doesn't need to be checked.

While I wrote the discussion below a few years back regarding plated wood trusses (ref:: Structural Technical Appendix, Part 6), I would re-write the second paragraph today to distinguish between trusses at 24" o.c.

(mount on every other truss, n=2) which would NOT require staggered mounts, and at 16" o.c. (mount on every 3rd truss, n=3), which would require staggered mounts.

6.4 Manufactured Plated Wood Trusses

Manufactured plated wood trusses differ from simple span roof rafters in several significant ways. Wood trusses typically span the full width of the building, rather than from eave to ridge. They consist of individual members interconnected by plate connectors. Manufactured wood trusses are typically design/build elements; in addition to the dead plus live load combination, manufacturers also design the top chords to resist the 250 pound live load of a worker standing midway between panel points, which imposes bending in addition to axial compression. The concentrated load from the anchor of a solar array will usually be less than 250 pounds, even considering downward wind effects, so problems are not anticipated when anchoring to truss top chords between panel points.

Back-of-the-envelope calculations suggest that trusses are stiffer than common rafters, so the concentrated load sharing factor should be somewhat lower than that for common rafters. For this reason, for manufactured wood trusses, footnote 3 in Table 1 reduces the anchor maximum horizontal spacing to 4'-0". Footnote 3 also requires that anchors in adjacent rows be staggered, thereby creating a quasi-uniform load distribution that removes any reliance on load redistribution and the concentrated load sharing factor C_{LSF}.

One truss connector company, Mitek, recommends that, at least for new trusses, solar array lag screws should be fastened to blocking between trusses instead of to the truss's 2x top chord. The concern seems to be about 5/16" lag screws installed close to plate connectors at top chords, where negative moments may create high tension stresses along the top surface of the top chord. In general, until more research is conducted, solar installers may want to avoid fastening lag screws directly into or close to truss panel points, where plate connectors occur.

Hope this helps you in your expedited permitting decisions.

Best.

John Wolfe, SE
Partner

2629 7th Street, Suite C
Berkeley CA 94710
Direct: 510.991.1103
Main: 510.991.1101
www.marstructuraldesign.com

On Thu, Nov 9, 2017 at 3:43 PM, David Willoughby <dwilloughby@ci.healdsburg.ca.us> wrote:

Hi John,

Have you had time to think about my original question?

DAVID WILLOUGHBY | Sr. Building Inspector

City of Healdsburg Community Development Dept
401 Grove Street, Healdsburg, CA 95448
707.473-4465 | dwilloughby@ci.healdsburg.ca.us

From: John Wolfe [mailto:john.wolfe@marstructuraldesign.com]
Sent: Thursday, November 09, 2017 11:52 AM
To: David Willoughby
Subject: Re: Structural requirements for residential PV rooftop systems

The 13/4 and 33/4 is an annoying typesetting error that I thought they finally corrected. It's meant to be 1-3/4 x 3-3/4.

John Wolfe, SE

Partner

2629 7th Street, Suite C
Berkeley CA 94710
Direct: 510.991.1103
Main: 510.991.1101

www.marstructuraldesign.com

On Thu, Nov 9, 2017 at 11:27 AM, David Willoughby <dwilloughby@ci.healdsburg.ca.us> wrote:

Hi John,

There is no snow load in Healdsburg (elev. 105').

Also, I had one more question about the structural criteria toolkit document in the state guidebook. On the checkbox sheet under 3.B.1.4) Optional additional rafter span check criteria it states "measured rafter size (e.g. 13/4 x 33/4, not 2x4):" what is the 13/4 x 33/4?

Thank you,

DAVID WILLOUGHBY | Sr. Building Inspector

City of Healdsburg Community Development Dept
401 Grove Street, Healdsburg, CA 95448
707.473-4465 | dwilloughby@ci.healdsburg.ca.us

From: John Wolfe [mailto:john.wolfe@marstructuraldesign.com]
Sent: Thursday, November 09, 2017 10:59 AM
To: David Willoughby
Subject: Re: Structural requirements for residential PV rooftop systems

Hi David,

Before answering, can you remind me what the design ground snow load is in Healdsburg (if any)?

John Wolfe, SE

Partner

2629 7th Street, Suite C
Berkeley CA 94710
Direct: 510.991.1103
Main: 510.991.1101

www.marstructuraldesign.com

On Thu, Nov 9, 2017 at 10:54 AM, David Willoughby <dwilloughby@ci.healdsburg.ca.us> wrote:

Hi John,

I was looking for information on structural requirements for rooftop PV systems and found that you were involved with writing the State Solar permitting guidebook and the Technical appendix. I was wondering if you might have time to answer a question for me?

I am new to the City of Healdsburg and I am having a lot of pushback from local solar contractors regarding plan review comments I am making on residential rooftop PV system permit applications. I am requiring the following:

1. If the roof framing consists of factory built trusses and the module roof support spacing is 4' max cross slope spacing and anchors in adjacent rows shall be staggered then no structural engineering is required.

2. If the roof framing consists of conventional rafter/ceiling joist framing and meets the span tables found in the 2016 CBC or CRC (or the framing can be prescriptively braced) and the module roof support spacing is max 6' on center (I still like to see the staggered rows) then no structural engineering is required.

3. If the roof framing or anchor spacing does not meet the above requirements then structural engineering is required addressing gravity and lateral loads.

In your opinion as an engineer is the above a correct interpretation of our current building code requirements? Please give me your honest opinion.

Thank you,

Residential Rooftop Photovoltaic Systems

For Jurisdictions Within Sonoma County

Purpose

In an effort to promote a consistent methodology for processing permits by all jurisdictions within Sonoma County, this standardized permit submittal has been developed for residential (one and two family dwellings and legally permitted accessory buildings) roof mounted PV systems in cooperation with the Redwood Empire Association of Code Officials and Solar Sonoma County. If the project is located in a historical district, in a homeowner's association, or is a ground mount system, additional requirements for review may be required.

Effective Dates: This document is effective September 10, 2012 through December 31, 2013. Revisions may be necessary based upon adoption and effective date of 2013 California Code of Regulations, Title 24, and/or local amendments.

Design and Review

1. All PV applications shall be reviewed at the front counter for completeness. If possible, every attempt will be made to review and approve projects that are residential PV systems "over-the-counter".
2. Systems using new technology (i.e., microinverters, thin film panels, etc.) may be required to submit detailed plans and specifications for plan review.
3. All PV system plans shall specify:
   a. Conductor wiring methods and wire type, system and solar panel grounding methods as per inverter and solar panel manufacturer's listings, and PV system DC and AC disconnects.
   b. Signage [on panel(s), disconnects and transmission line conductors].
   c. Placement of equipment and modules with associated access and pathways.
   d. Equipment type, listing, testing agency approvals, etc.
   e. Module attachment details.
4. Printed material shall be resistant to fading per UL 969, and CEC Article 690.

Worksheet Requirements

1. General information: Name of applicant, address of project, name of licensed contractor, size of system (DC Rating) being installed.
2. Completion of system detail worksheet and site plan. (attached)
3. Single line diagram of electrical equipment clearly showing size of main panel, sub panels, PV system equipment, including make, model, size of units, and disconnects.

4. Listing information, including mounting attachment to roof, wire type, method of grounding, of PV modules and mounting racks.

Photovoltaic Disconnect Requirements

1. PV disconnect shall be installed in a readily accessible location and located together when possible. All electrical panel disconnecting means shall be designed to shut off all power (solar and domestic).
2. Microinverter systems must have label on the exterior of the main service panel stating "Microinverter System Solar Breaker inside Panel is PV System Disconnect".

Protection of Emergency Responders

The following conditions shall be verified and apply to all roof and ground mount solar PV systems:

1. All sharp edges and fastener tips shall be covered or crimped over to eliminate sharp edges. This will minimize risk of injury to emergency responders (or any other individual accessing the roof top).
2. All roof surface mounted conduits, pipes, braces, etc. crossing the pathways are to be clearly identified by a red/white reflective tape, or other approved identifying material. Check with the local jurisdiction for the disconnect requirements of these systems.

Access Requirements & Array Configurations

All arrays shall be mounted per the listing installation instructions of the system. Pathways shall be established in the design of the solar installation and clearly indicated on the plans. All roof access pathways shall be located at a structurally supported location on the building, such as over a bearing wall, or beam lines. Arrays shall be located in a manner that provides access pathways for the following conditions:

1. Residential buildings with hip roof layouts: Modules shall be located in a manner that provides one 3 ft. wide clear pathway from the eave to the ridge on each roof slope where panels are located.
2. Residential buildings with a single ridge: Modules shall be located in a manner that provides two three-foot (3') wide access pathways from the eave to the ridge on each roof slope where arrays are located.
3. Hips and valleys: Panels/modules shall be located no closer than 18 inches (457 mm) to a hip or a valley if panels/modules are to be placed on both sides of a hip or valley. If the panels are to be located on only one side of a hip or valley that is of equal length then the panels shall be permitted to be placed directly adjacent to the hip or valley.

Modules shall be located no higher than 3 ft. below the ridge for fire ventilation purposes.

Project shall comply with local fire codes of the respective jurisdictions. The State Fire Marshal Guidelines or proposed International Fire Code changes have been adopted by local jurisdictions as amendments to the 2010 California Fire Code and are enforced by local jurisdictions. It is recommended that for installations not in conformance with the State Fire Marshal Guidelines, you contact the local fire and building department prior to submitting your application.

SUBMIT AND SIGN THE COMPLETED CHECKLIST WITH YOUR APPLICATION

PROPERTY OWNER _____

PROJECT LOCATION _____

INSTALLER'S COMPANY NAME, ADDRESS, & LICENSE NUMBER

COMPANY NAME _____

BUSINESS ADDRESS _____

BUSINESS PHONE _____ STATE LIC. NO. _____

INSTALLER'S SIGNATURE _____ **DATE** _____

By signing, I certify the information I have provided is correct and agree to comply with all applicable city or county ordinances and state laws and that the project identified above will be installed in accordance with the requirements set forth in the 2010 California Code of Regulations, Title 24, and local code amendments.

WORKSHEET INFORMATION - ROOF DESIGN
PV SYSTEM COMPONENTS

APPROXIMATE AGE OF ROOF: _____ ROOFING TYPE: ☐ COMP SHINGLE ☐ TILE ☐ SHAKE ☐ METAL ☐ OTHER

RAFTER SIZE: _____ **X** _____ RAFTER SPACING: ☐ 16" O.C ☐ 24" O.C. ☐ OTHER: _____

WORST CASE RAFTER SPAN SUPPORTING ARRAY (FT-IN.): _____ ARRAY WEIGHT: _____ LBS. PER SF.

RAFTERS THAT ARE OVER-SPANNED OR IF THE ARRAY IS OVER 5 LBS. PER SF., DESIGN BY A LICENSED PROFESSIONAL MAY BE REQUIRED

PV MODULE RATINGS

MODULE MANUFACTURER _____

MODULE MODEL _____

MAX POWER-POINT CURRENT (IMP) _____ A

MAX POWER-POINT VOLTAGE (vMP) _____ V

OPEN-CIRCUIT VOLTAGE (VOC) _____ V

SHORT-CIRCUIT CURRENT (ISC) _____ A

MAX SERIES FUSE (OCPD) _____ A

MAXIMUM POWER (PMAX) _____ W

MAX VOLTAGE (TYP 600VDC) _____ V

VOC TEMP COEFF _____

IF COEFF SUPPLIED CIRCLE UNITS _____

MODULE CONFIGURATION

NO. MODULES IN SERIES _____

NO. OF STRINGS IN PARALLEL _____

TOTAL RATED POWER OF SYSTEM (@STC)

AC GROUNDING ELECTRODE CONDUCTOR _____ AWG CEC Sec 690.47 (eC) (2)

INVERTER RATING

INVERTER MANUFACTURER _____

INVERTER MODEL _____

MAX DC VOLT RATING _____ V

MAX POWER @ 40° C _____ W

NORMAL AC VOLTAGE _____ V

MAX AC CURRENT _____ A

MAX OCPD RATING _____ A

SIGN FOR DC DISCONNECT
PHOTOVOLTAIC POWER SOURCE

RATED MPP CURRENT _____ A

RATED MPP VOLTAGE _____ V

MAX SYSTEM VOLTAGE _____ V

MAX CIRCUIT VOLTAGE _____ A

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

AC OUTPUT CURRENT _____ A

NOMINAL AC VOLTAGE _____ V

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Plan Submittal Checklist

1. All PV system plans shall show and/or specify in the following order.

   ☐ a. Basic site plan provided showing location of structure and equipment.

   ☐ b. Array configuration and placement of equipment and modules on roof with dimensioned access and pathways.

   ☐ c. Electrical single line drawing including:

      ☐ showing size and location of the main electrical panel and sub panels
      ☐ equipment grounding
      ☐ combiner/junction box location
      ☐ the AC / DC disconnect box
      ☐ conduit size from the array to the power source
      ☐ inverter string sizing or micro inverter branch circuit details
      ☐ conductor wiring methods and insulation rating, system and solar panel grounding methods as per inverter and solar panel manufacturer's listings, and PV system DC and AC disconnects
      ☐ listing information, including mounting, wire type, method of grounding, of PV modules and mounting racks

   ☐ d. Signage (on panel(s), disconnects and transmission line conductors).

   ☐ e. Provide cut sheets for all PV equipment and mounting systems including, but not limited to:

      ☐ PV modules
      ☐ rack mounting system
      ☐ mounting brackets
      ☐ grounding hardware
      ☐ inverters or micro inverters
      ☐ panel and rack attachment details

   ☐ f. Equipment type, listing, testing agency approvals, etc.

   ☐ g. Plans must show compliance with amendments to the California Fire Code by the local jurisdiction (see attachment).

   ☐ h. Permanent labels and signage with a red background and white lettering resistant to fading pursuant to UL 969 and California Electrical Code Article 690 and permanently affixed.

   **Points 1a. and 1b. may be listed on the same diagram.*

PV TOOLKIT DOCUMENT #5

Structural Criteria for Residential Rooftop Solar Energy Installations

Use of this document

This toolkit document includes a one-page list of structural criteria for over-the-counter or online approval, as well as attached tables and figures that supplement the criteria and explain their use.

This document applies to flush-mounted solar arrays installed on the roofs of wood-framed one- and two-family dwellings. "Flush-mounted" means the modules are installed parallel to, and relatively close to, the roof surface (see the "Solar Array Check" section of the Structural Criteria for specific qualifying requirements). This list is intended to be a simple pre-installation check to gain reasonable assurance that the design of the solar array complies with the structural provisions of the 2016 California Building Code (CBC) and 2016 California Residential Code (CRC). It is not intended to provide post-installation inspection criteria.

Currently Used Expedited Solar Permitting Approaches

This document is intended for jurisdictions without an expedited process for residential solar structural permitting, and is not intended to replace or supplant procedures for jurisdictions with an expedited process already in place. Good examples from jurisdictions with provisions for expedited structural permitting include the City of Los Angeles, which exempts residential solar installations from structural permitting if five simple requirements are met, and the East Bay Green Corridor's streamlined solar permitting process, which uses structural criteria tailored to typical conditions for that consortium of nine cities.

Regional and Site Assumptions

This document is based on the following regional and site assumptions:

- The dwelling is located in a ZERO snow load area (see Map 1).
- The dwelling is not in Wind Exposure D (within 200 yards of the ocean or a large coastal bay).
- If in Wind Exposure B (urban, suburban or wooded areas), the dwelling may be located:
  - in a Special Wind Region (see Map 2) with design wind speeds between 110 and 130 mph.
  - on a tall hill, provided average slope is no steeper than 15%.
- If in Wind Exposure C (within 500 yards of large open fields or grasslands), the dwelling is:
  - in a standard 110 mph design wind speed region.
  - not on a hill with a grade steeper than 5%.

Additional Options

The Chief Building Official (CBO) may consider adding rows to the structural criteria, based on personal judgment and their jurisdiction's conditions and history. Possible additional questions include:

- Regional and Site Checks
  - If the jurisdiction is in a mixed snow load area, with zero snow load only at lower elevations, consider asking, "Is the dwelling lower than elevation___feet?"

(Introductory text provided for jurisdiction's reference only. Do not attach to Criteria that follow.)

  - If the jurisdiction is in a coastal region, consider asking, "Is the dwelling farther than 200 yards from the ocean or a large coastal bay?" to verify the dwelling is not in Wind Exposure D.
  - If the jurisdiction is in a Special Wind Region with design wind speeds between 115 and 130 mph, consider verifying that the dwelling is in Wind Exposure B by asking, "Is the dwelling in an urban, suburban or wooded area, and *not* within 500 yards of open fields and grasslands?"
  - If the jurisdiction is in a Special Wind Region with design wind speeds between 115 and 130 mph, consider verifying that there are no significant topographic wind speed-up effects by asking, "Is the dwelling in a relatively flat area (grade less than 5%) and not within 500 yards of the crest of a tall hill?"
- Roof Check
  - Based on the jurisdiction's one- and two-family housing stock and code compliance history, many CBOs will find it reasonable to assume that most dwellings' roof structures were designed to the building code in effect at the time the houses were built. If so, the roof structure code compliance check consists of the Contractor's visual roof audit, checking for unusual sagging or deterioration, without requiring additional measurements of existing rafters to check against span tables.
  - For CBOs of jurisdictions with evidence of structurally deficient one- and two-family housing stock or poor structural code compliance history, the CBO may elect to add the rafter span check option described in the criteria.

The Structural Toolkit and CRC Wind Speeds

The 2013 CRC contained an inconsistency related to wind speeds. Despite referencing ASCE 7-10 as its standard, the 2016 CRC's text and tables use outdated ASCE 7-05 wind speeds. Under the old ASCE 7-05/CBC 2010, the basic design wind speed in most regions of the state was 85 mph (max. 3 second gust in 50 years). Under ASCE 7-10/CBC 2016, the design wind speed has increased to 110 mph (max. 3 second gust in 700 years). Despite the different definitions of wind speed, design wind pressures remain essentially unchanged.

Because the toolkit's structural document is intended to be forward looking, all wind speeds in the toolkit document are based on the ASCE 7-10. This is clearly stated in the caption to the state wind speed map, and in the Table 1 footnotes. This anticipates an obvious and expected correction to the CRC; otherwise the toolkit would become immediately outdated when the CRC is amended to change the base design wind speed from 85 mph to 110 mph.

2013 CRC text (ASCE 7-05) wind speeds equivalent to the 2016 CRC and CBC Reference Standard (ASCE 7-10) are shown below. See ASCE 7-10 Table C26.5-6 for additional information.

2013 CRC text ASCE 7-05	2016 CRC and CBC Referenced Standard ASCE 7-10
85 mph	110 mph
90 mph	115 mph
95 mph	120 mph
100 mph	126 mph
105 mph	133 mph

(Introductory text provided for jurisdiction's reference only. Do not attach to Criteria that follow.)

Structural Technical Appendix

This toolkit document is supported by a Structural Technical Appendix that describes the technical analysis behind these criteria, which are based on structural engineering principles and the California Building and Residential Codes. The Technical Appendix also provides some additional guidance to address non-conforming items, such as when an anchor layout is not based on a solar support component manufacturer's guidelines, or when a coastal site is located within 200 yards of the ocean (Exposure D). This document can be found online.

Probability of Code Compliance

The Structural Technical Appendix includes a section that examines the probabilities associated with the assumptions behind Table 1 that allows six feet cross-slope anchor spacing in some circumstances. That statistical analysis estimates that the probability of code noncompliance for six feet anchor spacing is only 2 in a thousand installations (0.2%). Note that probability of structural failure is orders of magnitude lower than the probability of code *noncompliance.*

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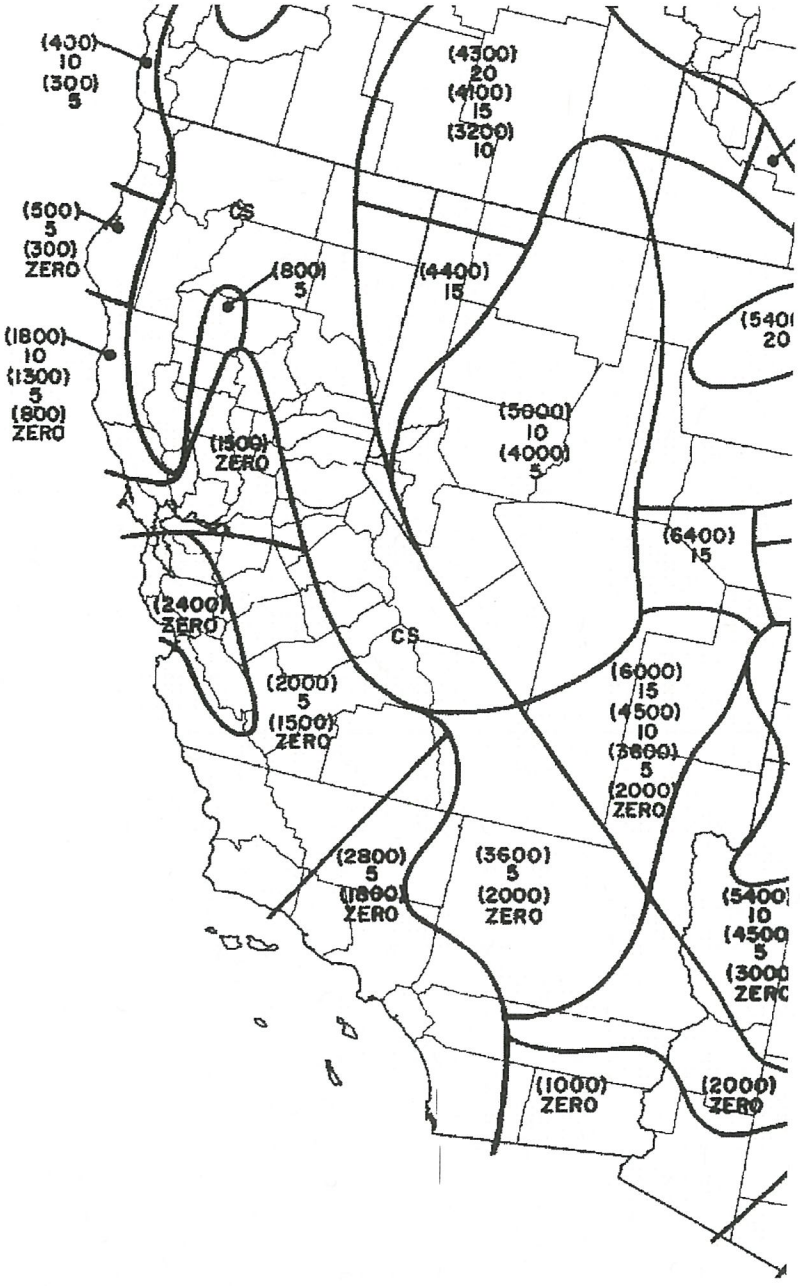
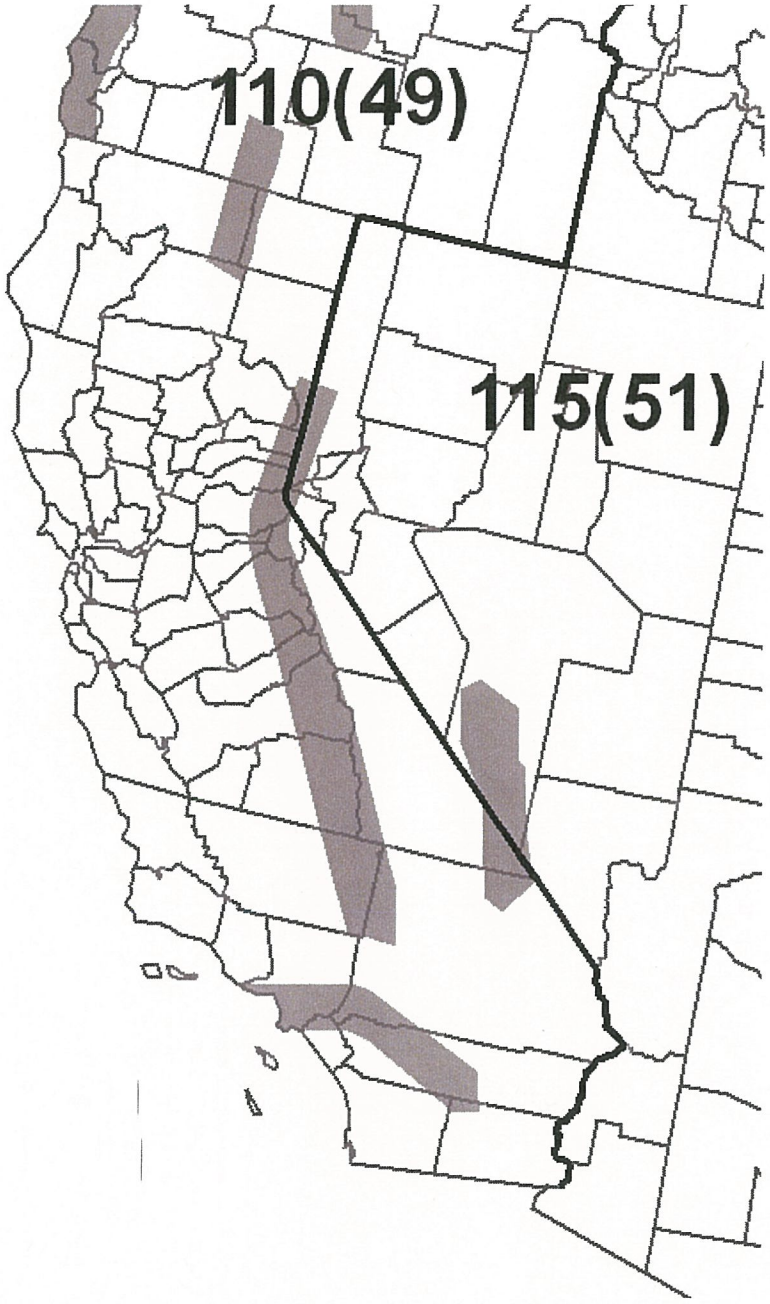


Map 1. California Ground Snow Load Map (Ref: ASCE 7-10).
The numbers in parentheses represent the upper elevation limits in feet for the ground snow load in psf listed below the elevation. Example: (2400) ZERO in the South San Francisco Bay Area indicates that zero ground snow loads occur from sea level up to an elevation of 2,400 feet. CS indicates "Case Studies" where extreme local variations in ground snow loads occur. Non-zero snow load areas and CS areas are excluded from the use of this structural toolkit document. See the Technical Appendix for additional information.

(Map provided for jurisdiction's reference only. Do not attach to Criteria that follow.)



Map 2. California Design Wind Speed Map (Ref: ASCE 7-10).

The number outside the parentheses represents the design wind speed in mph. Typical design wind speed is 110 mph. The gray shaded areas on the map indicate "Special Wind Regions" where higher wind speeds may apply. When the project is in a gray shaded area, contact the local building department for the design wind speed.

(Map provided for jurisdiction's reference only. Do not attach to Criteria that follow.)

STRUCTURAL CRITERIA FOR RESIDENTIAL FLUSH-MOUNTED SOLAR ARRAYS

1. ROOF CHECKS

A. Visual Review/Contractor's Site Audit of Existing Conditions:
- 1) Is the roof a single roof without a reroof overlay? ☐ Y ☐ N
- 2) Does the roof structure appear structurally sound, without signs of alterations or significant structural deterioration or sagging, as illustrated in Figure 1? ☐ Y ☐ N

B. Roof Structure Data:
- 1) Measured roof slope (e.g. 6:12): _____:12
- 2) Measured rafter spacing (center-to-center): _____inch
- 3) Type of roof framing (rafter or manufactured truss): ☐ Rafter ☐ 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? ☐ Y ☐ N
- 2) Is there a 2" to 10" gap between underside of module and the roof surface? ☐ Y ☐ N
- 3) Modules do not overhang any roof edges (ridges, hips, gable ends, eaves)? ☐ Y ☐ N

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

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

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

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

F. Downward Load Check (Anchor Layout Check):
- 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? ☐ Y ☐ N

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: _____inch
  - b. Embedment depth of rafter: _____inch
  - c. Number of screws per anchor (typically one): _____
  - d. Are 5/16" diameter lag screws with 2.5" embedment into the rafter used, OR does the anchor fastener meet the manufacturer's guidelines? ☐ Y ☐ N

3. SUMMARY

☐ A. All items above are checked YES. No additional calculations are required.

☐ B. One or more items are checked NO. Attach project-specific drawings and calculations stamped and signed by a California-licensed civil or structural engineer.

Job Address: _____ Permit #: _____

Contractor/Installer: _____ License # & Class: _____

Signature: _____ Date: _____ Phone #: _____

Optional Additional Rafter Span Check Criteria

[At option of CBO, insert rows (4) to (7) below into table above after row 1.B.(3)]

1. ROOF CHECKS

B. Roof Structure Data:
- 4) Measured rafter size (e.g. 13/4 x 33/4, not 2x4): ____ x ____ inch
- 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? ☐ Y ☐ N ☐ Truss

(Jurisdictions may delete "Optional Additional Rafter Span Check" at bottom of this page, or incorporate into main list of Structural Criteria above.)

Table 1. Maximum Horizontal Anchor 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.
   - If the dwelling is in Wind Exposure B (typical urban, suburban or wooded areas farther than 500 yards from large open fields), no more than one of the following conditions apply:
     - The dwelling is located in a Special Wind Region with design wind speed between 115 and 130 mph per ASCE 7-10.
     - The dwelling is located on the top half of a tall hill, provided average slope is less than 15%.
   - If the dwelling is 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.c.
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"

Beyond a visual review by the contractor checking for unusual sagging or deterioration, some CBOs may want additional assurance that the roof structure complies with structural building code requirements. Table 2 is an optional table some CBOs may elect to use 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.

(Attach Table 2 ONLY if the Optional Additional Rafter Span Check is added to the list of Structural Criteria.)

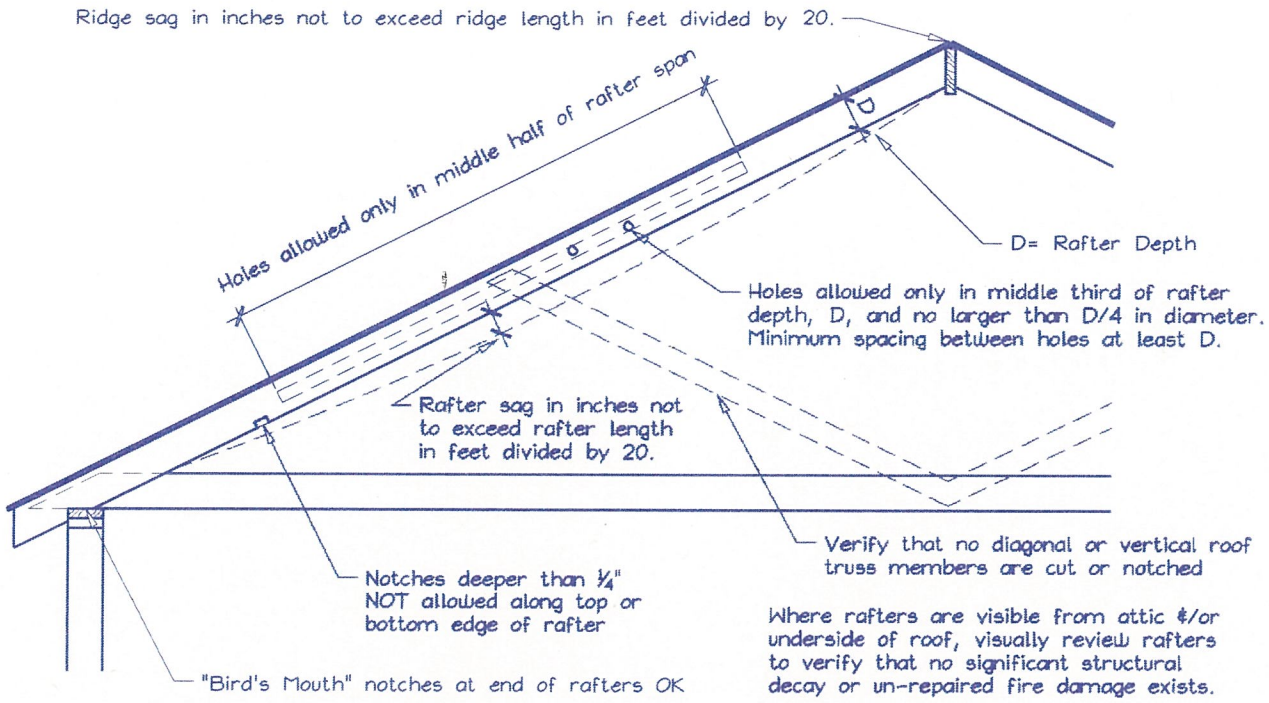


Figure 1. Roof Visual Structural Review (Contractor's Site Audit) of Existing Conditions.

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 unrepaired 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.

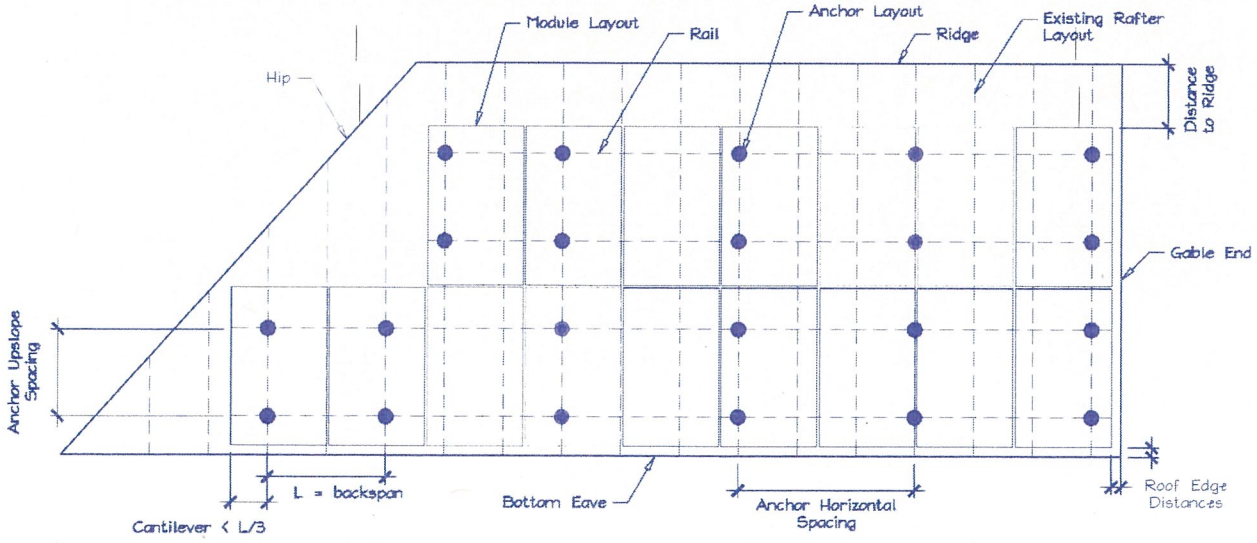


Figure 2. Sample Solar Panel Array and Anchor Layout Diagram (RoofPlan).

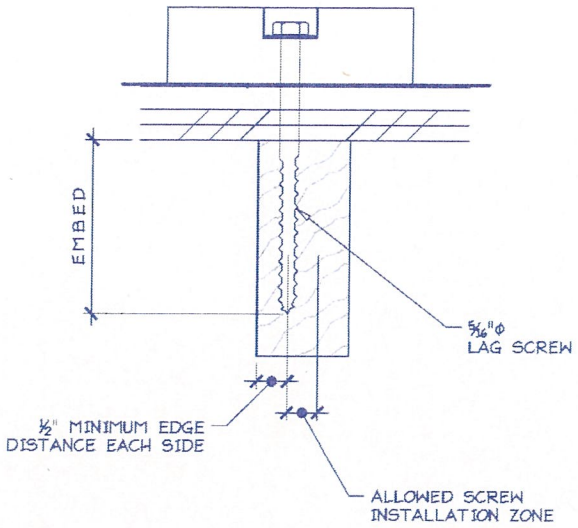


Figure 3. Typical Anchor with Lag Screw Attachment.

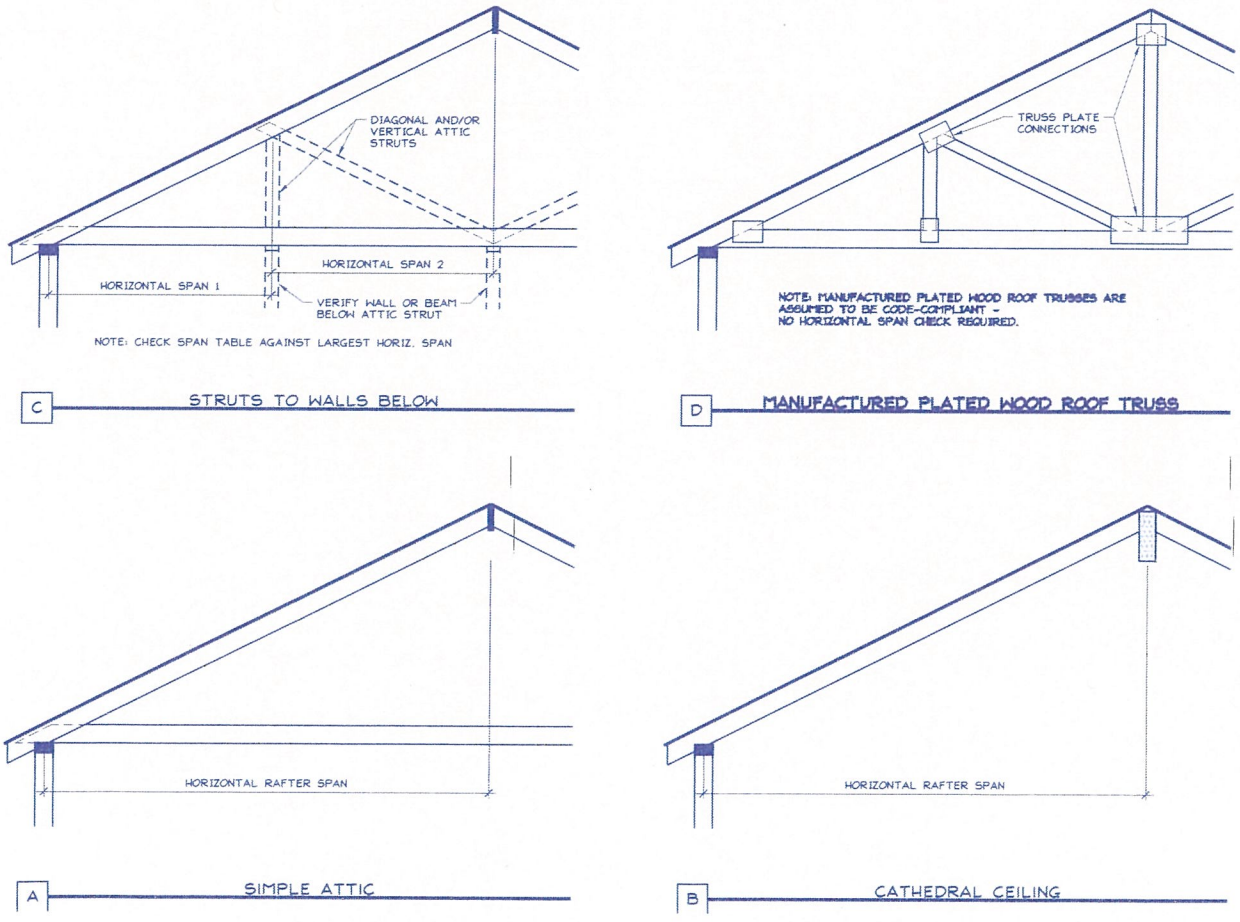


Figure 4. Definition of Rafter Horizontal Span.

(Attach Figure 4 ONLY if the Optional Additional Rafter Span Check is added to the list of Structural Criteria.)

6.2 Dynamic Resonance:
There has been some discussion in the wind research community that some solar arrays may have structural vibration frequencies that match wind flutter at certain wind speeds. Such resonant vibration could substantially amplify wind uplift pressures.

6.3 Wood-Framed Residential Roof Downward Load Capacity:
Dr. Stephan Dwyer of Sandia National Laboratories has been investigating the actual downward load capacity of typical residential wood-framed roofs. Preliminary results suggest that residential wood roofs have substantially greater capacity than that suggested by code. This reserve capacity is probably due to load sharing, catenary membrane action and composite member action between the roof sheathing and rafters, and other effects.

6.4 Manufactured Plated Wood Trusses

Manufactured plated wood trusses differ from simple span roof rafters in several significant ways. Wood trusses typically span the full width of the building, rather than from eave to ridge. They consist of individual members interconnected by plate connectors. Manufactured wood trusses are typically design/build elements; in addition to the dead plus live load combination, manufacturers also design the top chords to resist the 250 pound live load of a worker standing midway between panel points, which imposes bending in addition to axial compression. The concentrated load from the anchor of a solar array will usually be less than 250 pounds, even considering downward wind effects, so problems are not anticipated when anchoring to truss top chords between panel points.

Back-of-the-envelope calculations suggest that trusses are stiffer than common rafters, so the concentrated load sharing factor should be somewhat lower than that for common rafters. For this reason, for manufactured wood trusses, footnote 3 in Table 1 reduces the anchor maximum horizontal spacing to 4'-0". Footnote 3 also requires that anchors in adjacent rows be staggered, thereby creating a quasi-uniform load distribution that removes any reliance on load redistribution and the concentrated load sharing factor C_{LSF}.

One truss connector company, Mitek, recommends that, at least for new trusses, solar array lag screws should be fastened to blocking between trusses instead of to the truss's 2x top chord. The concern seems to be about 5/16" lag screws installed close to plate connectors at top chords, where negative moments may create high tension stresses along the top surface of the top chord. In general, until more research is conducted, solar installers may want to avoid fastening lag screws directly into or close to truss panel points, where plate connectors occur.

6.5 Lag Screw Edge Distance Under Seismic Loads

5/16" lag screws into 2x rafters meet the 1.5 diameter edge distance requirement for loads parallel to rafter (i.e. downslope loads), but technically do not meet the 4 diameter edge distance requirement for minor seismic loads perpendicular to the rafter. Because of the light weight of solar panels, seismic design forces are quite modest (2-4 psf), an order of magnitude less than many wind and snow design loads (20-40psf).

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