



BUILDING REGULATION DIVISION
COMMUNITY DEVELOPMENT
DEPARTMENT

DANNY SANTANA
DIRECTOR

FELIPE SEGOVIA
BUILDING REGULATIONS

CITY OF TORRANCE

PHOTOVOLTAIC INSPECTION

GENERAL REQUIREMENTS FOR RESIDENTIAL

CODE ENFORCED: 2016 CBC, CEC, CRC, AND (TMC) & AB2188

This information provided in this document is general and intended as a guide only. Each project is unique and additional requirements may be enforced as deemed appropriate.

(small residential rooftop solar energy system under 10k & Thermal under 30k)

*Please allow up to 3 business days turnaround time for small rooftop solar PV.

REQUIREMENTS FOR RESIDENTIAL PERMIT SUBMITTAL:

Before approval and issuance of permit(s) for solar panel/photovoltaic systems, the applicant shall submit:

Two (2) sets of plans (which are drawn to scale, readable, and legible), attached with **Solar check list**, **Best Management practice** and **8 1/2" x 11" plot plan**. Email plans to: solarplancheck@torranceca.gov or submit to Building and Safety.

GENERAL REQUIREMENTS:

The approved plans, permit and installation instructions shall be on site at time of inspection.

Field installation shall be per code/plan. Changes shall be submitted to the city for approval prior to inspection.

If a new roofing system is going to be installed, a **separate roofing permit** and inspections are required. See checklist for specific roof being installed. Flashing and counter flashings are required.

Where "dc" wiring is installed inside the structure a separate rough inspection must be scheduled.

100A Main Service required electrical load calculation. Any service upgrade require **separate electrical permit.**

- Verify **Orange** sticker from utilities is posted on main electrical service. (if new service upgrade need it)
- All connections shall be secure.
- Unused opening shall be closed with protection equivalent to the wall of the enclosure. CEC 408.7
- Installer shall have ladder on site and set up at time of inspection. The ladder shall be extended 36" above the Roof and ladder shall be secured at roof. OSHA
- All equipment shall be open and ready for inspection.
- Provide working clearances per CEC 110.26.
- Provide work space of a height of 6' 6". CEC 110.26 (A)(3)
- All metallic raceways and equipment shall be bonded and electrically continuous.
- Where junction boxes are installed under the array and not readily accessible, the module shall be removed for Inspection.

MAIN ELECTRIC SERVICE

- The inspector shall check existing panel for hot spots or unsafe conditions. If existing panel is found to be unsafe, it may be necessary for the property owner to hire a licensed electrician to make repairs or replace equipment. Any repairs or replacement shall happen prior to the photovoltaic final or hook ups.
- Verify utility ac disconnect is located within sight and within 10 feet of main electrical service. AC disconnect shall be readily accessible with visible-blades, and lockable.
- Verify utility point of interconnection is per plan, does not exceed 20% of the bus rating and is installed at the opposite end from the input feeder. CEC 705.12(B)(2) and 705.12(7)
- Circuit breakers shall be of the same manufacturer (Listed) as the main electrical service.
- When a back fed breaker is the method of utility interconnection, breaker shall not read **"line and load"**
- Verify existing ac grounding electrode system UFER or 2 driven ground rods. The connection to the grounding electrode shall remain accessible. CEC 250.68 (a)
- If there is not an existing ac grounding electrode, PV contractor shall install two driven ground rods at the main electrical service per CEC 250.52(5).
- Where the existing grounding electrode is a single driven ground rod, an additional ground rod shall be driven. Ground rods shall be a minimum of 6' apart. CEC 250.53

PANELBOARD

- Where the system is backfeeding a panelboard, the breaker must be installed at the opposite end from the input feeders or main circuit location. Exception: Where the rating of the panelboard is less than the sum of the OCPD supplying it. CEC 690.64.(B)(7)
- Center fed electrical services cannot use the 125% rule per CEC 690.64

DC DISCONNECT

- A ground bushing is required around remaining pre-punched concentric or eccentric knockouts on the dc side. CEC 250.97
- Where dc conductors are installed underground, conductors shall be buried 18" or more below grade and a warning tape installed 12" above the conduit. Label conduit per the "Sign and Label" requirements. CEC 300.5 (L)
- **Imbedded conduit** in built-up, laminate, or membrane roofing materials in roof areas not covered by PV modules must be clearly marked. CEC 690.4(F)
- DC conductors installed inside the structure shall be installed in a metallic conduit such as RMC.
- Dc wires shall be installed in a metallic raceway where the maximum system voltages are greater than 30 volts. CEC 690.31(A)
- Dc Must be rated 600 Vdc.
- Where fuses are installed, verify they are rated 600 Vdc and are of the same amperage as specified on the approved drawings.
- Label fuse size inside dc disconnects if different than the disconnect ampacity.
- Array conductors must be connected to the line side input terminals at the top of the main dc disconnect and conductors to inverter input shall be connected to the load side output terminals (bottom) of dc disconnect.
- The equipment grounding lug shall be as specified by the manufacturer. Verify the lug matches the part number as specified on the inside of the door.
- Remove any insulating finish, such as paint, under the equipment grounding lug prior to installation. CEC 250.12
- Verify grounding lugs are located where specified by the manufacturer.
- Disconnects shall be installed so that the top of the operating handle, at its highest position, is not more than 6'-7' above the floor or working platform and shall be located in a readily accessible location. CEC 404.8(A)(1)
- ***PV Source & Output Circuits and Inverter Circuits:** must be labeled at all termination, connections and splice points. CEC 690.4(B)(2)
The grounded conductors are not switched and must marked be white or gray. (White negative conductors for negatively grounded systems and a white positive conductor for positively grounded systems.)

INVERTER LOCATION

*The ac and dc conductors shall be **grouped and identified** at all terminations, connections and splices by means of separate color coding, tape, or tagging. CEC 690.4(B)(4)

***Arc-Fault Circuit Protection:** Photovoltaic systems (80 volts or greater) must be protected by an arc-fault device. CEC 690.11

- AC and DC disconnects shall be located at inverter. CEC 690.14 (a)-(c)
- Verify clear plastic barrier is returned to its original position separating the ac/dc wiring from the communication wires.
- Verify GEC and EGC are installed at the terminals as marked/specified by the manufacturer.
- ***Verify grounding electrode system.** The grounding electrode system should include one of the following: 1) GEC from inverter to a separate ground rod then bonded to existing ac grounding electrode. 2) GEC from inverter to the ac grounding electrode. 3) GEC combined with the EGC from the inverter to the grounding busbar in the associated ac equipment.
- **Supports:** RMC shall be securely fastened in place at least every 10' and within 3' of each outlet box, junction box, device box, cabinet, conduit body or other termination. 344.30 (A)
- **Negatively grounded systems:** The negative conductor must be white. The positive conductor may be any color other than green or white.
- **Positively grounded systems:** The positive conductor must be white. The negative conductor may be any color other than green or white.

- ***Circuit Routing:** ALL PV source and PV output conductors shall be routed along building structural framing members. **CEC 690.4(F)**
- ***Beneath Roofs:** Wiring methods must be 10" below the roof surface except where covered by the array. **CEC 690.31(E)(1)**

AC DISCONNECT

- Verify utility ac disconnect is located within sight and within 10 feet of main electrical service. AC disconnect shall be readily accessible with visible-blades, and lockable. Per CPAU
- The line side (top) terminals - circuits from the utility, load side (bottom) terminals - circuits from inverter.
- Disconnects shall be installed so that the top of the operating handle, at it's highest position, is not more than 6'-7' above the floor or working platform and shall be located in a readily accessible location. CEC 404.8(A)(1)

STRUCTURAL ATTACHMENT:

- Verify attachment method is per the approved plans.
- The lag screw must have a minimum 2 ½" embedment into rafter.
- Verify framing and load bearings wall are per plans.
- Composition roofing/shingles – Use a sealant under the shingles to adhere the shingles to the flashing.
- Verify equipment and conduit locations to address any issues.

ROOF TOP INSPECTION

- **Module classification:** All roof top modules must have the same fire rating as the roof system. CRC R908.1.3, R902.4 & CBC 1505.1
- The equipment grounding conductor (EGC) must be routed with the PV array circuit conductors within the same raceway. 690.43(D)
- PV source circuit conductors and PV output circuit conductors shall be protected from physical damage when installed outside of the array. (RMC) **Rigid Metal Conduit.**
- Connectors require the use of a tool to open. CEC 690.33(C)
- Connectors shall also be marked "Do Not Disconnect Under Load" or Not for Current Interrupting." CEC 690.33(C)(2)
- Connectors, used as disconnecting means, shall be tested and listed as load break with the specific micro/mini inverter installed. CEC 690.17 > 690.33
- All equipment on the roof requiring servicing shall meet the required clearances of CEC 110.26.
- Verify roof penetrations are flashed and counter flashed.
- Modules shall be of the same manufacturer and per plan.
- Verify grounding lugs, at the module frames, are installed per the module manufacturer's installation instructions. The grounding method must be located at the ground to earth symbol on the module frame.
- Where three or more strings are being combined, combiner box shall be listed and factory assembled.
- Electrical equipment located in the attic shall be accessible.
- Exposed pressure treated wood is not allowed.

UNGROUND SYSTEMS:

- The source circuit conductors **cannot** be white. These conductors will be black and red and identified as PV Wire. CEC 200.6 CEC 690.35 (D)

SIGNS AND LABELS

Labels shall be phenolic where exposed to sunlight. Labels required on conduit shall be permanent, weather resistant and suitable for the environment. Labels shall be red background w/white lettering. The following labels must be provided:

Article	Location of Label	Verbiage
690.5 (c)	Utility-interactive inverter & battery enclosure	"WARNING: ELECTRIC SHOCK HAZARD IF A GROUND FAULT IS INDICATED, NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED"
690.35(F)	All enclosures with ungrounded circuits Or devices which are energized and may be exposed during service	"WARNING: ELCTRIC SHOCK HAZARD. THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED."
690.53	On the DC disconnects	Operating current ____ Operating voltage ____ Maximum system voltage ____ Short circuit current ____
690.54	At interactive points of interconnection, usually the main service	RATED AC OUTPUT CURRENT _____ AMPS NORMAL OPERATING AC VOLTAGE ____ VOLTS
690.56(B), 690.14(D)(4), 705.10	At the electrical service and at the photovoltaic inverter if not located at the same location	A directory providing the location of the service disconnecting means and the photovoltaic system disconnecting means
690.4 (D), 705.10	MULTIPLE INVERTERS: Each dc and ac PV system disconnecting means and at the main service	Provide a directory showing the location of all ac and dc disconnects.
690.17	DC disconnects	"WARNING! ELECTRIC SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMAINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION"
705.12(2)(D)	Inverter output OCPD	"WARNING: INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE"
690.31(G)(3)(4) CFC 605.11.1.2	On conduit, raceways, enclosures, mark every 10', within 10" of turns and penetrations at roof/ceiling assemblies, walls or barriers On the inverter where PV systems are positively grounded	"WARNING: PHOTOVOLTAIC POWER SOURCE" POSITIVE GROUNDED SYSTEM
UTILITIES REQUIREMENT	At the main electrical service when a supply side tap is used	"CAUTION! SUPPLY SIDE TAP. OPEN AND LOCK AC PV DISCONNECT BEFORE REMOVING METER"
690.55	Battery enclosure	MAXIMUM OPERATING VOLTAGE EQUALIZATION VOLTAGE POLARITY OF GROUNDED CONDUCTORS
When approve by AHJ NEC Load Calc's Are required.	Main electric service or load center	"MAXIMUM MAIN BREAKER SIZE: ____ AMPS"



City of Torrance
 Community Development Department, Building and Safety Division
Building Permit Application
 3031 Torrance Blvd., Torrance CA 90503 (310) 618-5910

BLD

Required Information

Property/ Job Address:			
Person Preparing This Form:		Date:	
Property Owner:		Owner Phone:	
Owner's Address: (if different)			
Business / Tenant Name:		Phone :	
Architect / Engineer:		Phone:	
Architect / Engineer Address:			
Contractor: (As shown on License)		Contractor License #:	Class
Business Address:		Bus. Lic:	
		Phone:	

PROJECT INFORMATION

Project Valuation (include all remodel areas) \$	Size in Square Feet
No. of Buildings Now on Lot	No. of Stories
Uses of Existing Buildings	Lot Area
Description of Work	

OTHER PERMITS REQUIRED FOR PROJECT COMPLETION:

- ELECTRICAL
 PLUMBING
 MECHANICAL

LIST OF SUB-CONTRACTORS REQUIRED PRIOR TO FINAL

The projects General Contractor or Owner Builder shall require all sub-contractors to have a current Torrance Business License. The General Contractor or Owner Builder shall be responsible for full license fees for any unlicensed sub-contractor.

All contractors and sub-contractors must have a city business license for the dates during which they worked on the project.

I have read and understood the above, and have received the 'Sub-Contractor's List' form. I further understand that this list must be submitted to the Business License Section fifteen (15) days prior to final inspection.

I certify that no sub-contractors will be employed during the course of this project.

signature	title	date
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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Any person applying for a **non-residential** building permit must complete the following checklist. If you have any questions about completing this **non-residential** checklist, please call 1-800-288-7664 for assistance.

(COMMERCIAL ONLY) AIR QUALITY PERMIT CHECKLIST																																														
<p>1 Will the facility have any of the following equipment?</p> <table style="width:100%;"> <tr> <td></td> <td align="center">Y</td> <td align="center">N</td> </tr> <tr> <td>Charbroiler, dry cleaning machine, spray booth</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Printing press (screen / lithograph / flexographic)</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Internal combustion engine (> 50 hp - excluding motor vehicles)</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Boiler/combustion equipment (> 2 million BTU/hr max input)</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Abrasive blasting cabinet / room</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Baghouse / cartridge-type dust filter / scrubber</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Motor fuel storage and dispensing equipment</td> <td align="center">[]</td> <td align="center">[]</td> </tr> </table> <p>Does this project involve the use or emission of chemicals listed as hazardous materials per Section 65850-2 of the California Government Code? [] []</p>		Y	N	Charbroiler, dry cleaning machine, spray booth	[]	[]	Printing press (screen / lithograph / flexographic)	[]	[]	Internal combustion engine (> 50 hp - excluding motor vehicles)	[]	[]	Boiler/combustion equipment (> 2 million BTU/hr max input)	[]	[]	Abrasive blasting cabinet / room	[]	[]	Baghouse / cartridge-type dust filter / scrubber	[]	[]	Motor fuel storage and dispensing equipment	[]	[]	<p>2 Will any of the following operations be performed?</p> <table style="width:100%;"> <tr> <td></td> <td align="center">Y</td> <td align="center">N</td> </tr> <tr> <td>Application of paints or adhesives</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Etching, plating, casting, or melting of metals</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Molding, extruding, or curing of plastics</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Mixing and blending of liquids and/or powders</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Storage of acids, solvents, organic liquids, or fuels</td> <td align="center">[]</td> <td align="center">[]</td> </tr> <tr> <td>Production of fumes, dust, smoke, or strong odors</td> <td align="center">[]</td> <td align="center">[]</td> </tr> </table> <p>Does this project require a release from AQMD per the AQMD checklist? [] []</p>		Y	N	Application of paints or adhesives	[]	[]	Etching, plating, casting, or melting of metals	[]	[]	Molding, extruding, or curing of plastics	[]	[]	Mixing and blending of liquids and/or powders	[]	[]	Storage of acids, solvents, organic liquids, or fuels	[]	[]	Production of fumes, dust, smoke, or strong odors	[]	[]
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<p>Signature _____ date _____</p> <p align="center"><small>Person preparing this form</small></p>																																														
<p>If you marked "No" in ALL the boxes, an air quality permit is NOT needed at this time. This checklist is your written release.</p> <p>If you marked "Yes" in ANY of the boxes, you must contact: South Coast Air Quality Management District (AQMD) 21865 E. Copley Drive, Diamond Bar, CA 91765-4182 (909) 396-3529 (800) 288-7664 FAX: (909) 396-2461</p>																																														



CITY OF TORRANCE

COMMUNITY DEVELOPMENT DEPARTMENT

BUILDING & SAFETY DIVISION

CHECKLIST FOR SOLAR PANEL INSTALLATIONS

REQUIREMENTS FOR RESIDENTIAL PERMIT SUBMITTAL:

Before approval and issuance of permit(s) for solar panel/photovoltaic systems, the applicant shall submit:

two (2) sets of plans or email to: solarplancheck@torranceca.gov which are drawn to scale, readable, and legible

Complete and attach this checklist to each set of drawings

Note drawing page number for each item below or mark N/A

General:

- 1) Title Sheet must include:
 - a. Project address
 - b. Owner's name, address, and phone number
 - c. Name, address, phone number of firm making the plans
 - d. Scope of work statement
 - e. Sheet index with each sheet title and number
 - f. Legend for used symbols, abbreviations, and notations
- 2) Provide a site plan with the property lines, approximate location of all structures and panels, the main service location, and the north arrow. Page _____
- 3) Provide a **separate** site plan, same as item 2, on **8½"x11"** paper, adding the owner's name and project address.
- 4) Provide Note: All work to comply with the 2016 CBC, CMC, CPC, CEC ART. 690, and 2012 NDS. Page _____
- 5) Provide the overall building height with the solar panels (overall height may not exceeds zoning limits). Page _____
- 6) **Provide completed BMP form with each plan set** Page _____

Electrical:

- 7) Solar panel system kW rating? Page _____
- 8) Provide an electrical line diagram: panel layout, panel power source short circuit current rating, conductor size, type, locations and length of runs, wiring methods, grounding points, inverter location, disconnect locations, battery locations (if applicable), point of connection to existing electrical system. Include the existing service size and number of meters. Page _____
- 9) Specify the locations of all the equipment (i.e., west wall) indicate any interior locations Page _____
- 10) Provide manufacturer's specification on all components including but not limited to inverters and panels, include the make, model, listing, size, weight, etc. Page _____
- 11) Provide residential load calculations, for all Existing 100amp MSP & All de-rating breaker

Fire:

- 12) Roof access points shall be located in areas that do not require the placement of ground ladders over opening such as windows or doors, and located at strong point of building construction in locations where the access point does not conflict with overhead obstructions such as tree limbs, wires, or signs.
- 13) Panels and modules installed with roof hips and valleys shall be located no closer than 18" to a hip or a valley where panels and modules are to be place on both sides of a hip or valley.
- 14) For pitched roofs, provide 5' clearance on at least one side of ridge and 3' clear at opposite side. 85.2.7 Ch.6

- 15) Materials used for marking shall be reflective, weather resistant and suitable for the environment. Shall have all letters capitalized with a minimum height of 3/8" inch white on red background.
- 17) Marking content **"WARNING PHOTOVOLTAIC POWER SOURCE"**, shall be placed on interior and exterior DC conduit, raceways, enclosures and cable assemblies every 10' feet and in a clearly visible location adjacent to main service disconnect.

Structural:

- 18) For rooftop panels, specify types roofing Page _____
- 18) Provide roof plan, showing roof slope, rafter size, spacing, span and direction of existing framing. Page _____
- 19) Indicate the weight, in psf, for completely installed system. If the system weight exceeds 5 psf, provide seismic calculations (building & anchorage). Page _____
- 20) Indicate the pitch of the solar panels Page _____
- 21) **If spans exceed allowable in table 1, provide an analysis showing that the existing framing is not overstressed by the panel mounts (wind analysis) if required**, provide strengthening details and include improvements in the description of work. Page _____
- 22) Indicate fasteners type, diameter, and embedment depth (i.e., 5/16" lag screws with 2½" min. embed.) Page _____
- 23) Indicate max fastener spacing Page _____

Table 1
Allowable Roof Rafter Spans

Roof Rafters		Allowable Span	
Size	Spacing	Comp. Shingle Roofing	Clay or Conc. Tile Roofing
2x4	16"	9'-10"	8'-6"
	24"	8'-0"	6'-11"
2x6	16"	14'-4"	12'-5"
	24"	11'-9"	10'-2"
2x8	16"	18'-2"	15'-9"
	24"	14'-10"	12'-10"

Applicable only if **all** following conditions are met:

1. Panels are < 30' above grade and not in the hillside
2. Support spacing does not exceed 64"
3. Panel slope matches roof slope and less than 6:12
4. Not within 600 feet of coastline

Address: _____

Case #: _____

CITY OF TORRANCE

COMMUNITY DEVELOPMENT DEPARTMENT

BEST MANAGEMENT PRACTICES FOR ALL FOR CONSTRUCTION ACTIVITIES*

Project Address: _____ Case No. _____

The Following are Minimum Water Quality Protection Requirements for All Development Construction Projects:

- Eroded sediments and other pollutants must be retained on site and may not be transported from the site via sheetflow, swales, area drains, natural drainage courses or wind.
- Stockpiles of earth and other construction related materials must be protected from being transported from the site by the forces of wind or water.
- Fuels, oils, solvents and other toxic materials must be stored in accordance with their listing and are not to contaminate the soil and surface waters. All approved storage containers are to be protected from the weather. Spills must be cleaned up immediately and disposed of in a proper manner. Spills may not be washed into the drainage system.
- Non-stormwater runoff from equipment and vehicle washing and any other activity shall be contained at the project site.
- Excess or waste concrete may not be washed into the public way or any other drainage system. Provisions shall be made to retain concrete wastes on site until they can be disposed of as solid waste.
- Trash and construction related solid wastes must be deposited into a covered receptacle to prevent contamination of rainwater and dispersal by wind.
- Sediments and other materials may not be tracked from the site by vehicle traffic. The construction entrance roadways must be stabilized so as to inhibit sediments from being deposited into the public way. Accidental depositions must be swept up immediately and may not be washed down by rain or other means.
- Any slopes with disturbed soils or denuded of vegetation must be stabilized so as to inhibit erosion by wind and water.
- Other: _____

As the project owner or authorized agent of the owner, I have read and understand the requirements listed above, necessary to control storm water pollution from sediments, erosion, and construction materials, and I certify that I will comply with these requirements.

Print Name _____
(Owner or authorized agent of the owner)

Signature _____
(Owner or authorized agent of the owner)

Date _____

*The above Best Management Practices are detailed in the California Storm Water Best Management Practices Handbook, January 2003.
www.cabmphandbooks.com