TOWN OF WESTPORT
BUILDING PERMIT APPLICATION

This Section To Be Completely Filled Out By Applicant

Address of Work:			List Number:
Owners Name:			
Address:	City/Town:	State:	Zip:
Phone (home & day):		E-mail:	
Lessee information (if applicable):			

Contractor:	Contact:		
Address:	City/Town:	State:	Zip:
Phone (office & cell):		E-mail:	
Registration No.:	Expiration Date:	C.B.Y.D. No.:	

Architect:		Phone:	
Address:	City/Town:	State:	Zip:

This Section To Be Filled Out By Plan Reviewer

Tax Clearance No.:	Owner's Authorization ☐	Workers Comp. ☐	or Aff. ☐
Zoning Permit No.:	Date:	Flood Zone:	Plan Rev.:
Work Description:			
Use Group:	Construction Classification:	ResCheck:	

Subcontractor permits required:

- ☐ Electric
- ☐ Service
- ☐ H.V.A.C.
- ☐ Heating
- ☐ Air Conditioning
- ☐ Plumbing
- ☐ Fireplace
- ☐ Fuel Tank
- ☐ Alarm
- ☐ Sprinkler
- ☐ Hood & duct

Estimated Cost of Construction: $_____

Permit Fee: $_____

CT Education Tax: $_____

FD Administration Fee: $_____

Total: $_____

I, THE UNDERSIGNED, hereby affirm and attest that I am familiar with the requirements and provisions of the BUILDING CODE of the STATE of CONNECTICUT and the Ordinances of the TOWN of WESTPORT as they apply to the work described above, and I agree to satisfy those requirements in every portion of that work, and to give the applicable local and state requirements precedence over other written specifications, drawings and instructions.

I further agree to cooperate with and assist the Officials of the TOWN of WESTPORT in their inspections of this work, and in the enforcement of applicable local and state codes and regulations.

I hereby certify that I am the Owner or Authorized Agent of the Owner of the Property herein described, and that I have the necessary legal right and authority to proceed with the work herein outlined, and that the information I have given is true and correct, and that the cost estimate is accurate to the best of my knowledge.

I authorize the Town of Westport to properly dispose of all residential construction plans two years after issuance of the Certificate of Occupancy unless written request is submitted to the Building Department within that time.

Note: Except in cases of emergency, construction or repair work that is accompanied by noise shall be prohibited within the Town of Westport between the hours of 8:00 p.m. and 7:00 a.m. on weekdays and 9:00 a.m. on Saturday, Sunday and legal holidays.

Print Name: Signature: Date:

TOWN OF WESTPORT

ELECTRICAL PERMIT APPLICATION

This Section To Be Completely Filled Out By Applicant

Address of Work:		Building Permit No.:	
Owners Name:			
Address:	City/Town:	State:	Zip:
Phone (home & day):			
Lessee information (if applicable):			

Contractor:			
License Holder:			
Address:	City/Town:	State:	Zip:
Phone (office & cell):		E-mail:	
License Type:	Registration No.:	Expiration Date:	

Work type: Residential ☐ Commercial (Requires FD Administration Fee) ☐

Electric Code: 2011 NEC (NFPA-70) ☐ 2009 IRC (Part VIII): ☐

Work Description:

Service Size (new):

Service Size (upgrade)

From:

To:

CRS # (required):

Estimated Cost of Construction: $_____

Permit Fee: $_____

CT Education Tax: $_____

FD Administration Fee: $_____

Total: $_____

NOTICE:

- **THE TOWN OF WESTPORT AND THE BUILDING CODE OF THE STATE OF CONNECTICUT REQUIRES THAT SMOKE AND CO DETECTORS BE INSTALLED TO CODE BEFORE CO'S ARE ISSUED.**

- LOCATION OF GENERATORS MUST BE SHOWN ON A PLOT PLAN APPROVED BY THE PLANNING AND ZONING DEPARTMENT.

I, THE UNDERSIGNED, in accordance with the Building Code of the State of Connecticut, hereby applies for a permit to perform electrical work as listed herein and agrees to conform strictly to the Building Code and to give notice when the work is ready for roughing and final inspections.

Print Name: Signature: Date:

USAGE GUIDE FOR STRUCTURAL REVIEW WORKSHEET

This Structural Review Worksheet can be used to evaluate the integrity of a roof's framing for a proposed solar PV system. To use this Worksheet in an official capacity, you will need permission from the municipal building department. The Worksheet identifies structural conditions in a home's roof framing that may raise concerns with the installation of solar PV, including increased dead load and wind uplift.

This worksheet only applies to installations that meet the following basic criteria, as well as the more detailed criteria below and elsewhere in the Worksheet:

- Installation on one or two family home built after 1900
- Installation on home with regular, stick-built framing (not home with trusses)
- Installation on home with asphalt shingle or standing metal seam roof
- Solar PV panels are flush mounted (i.e., installed parallel to the roof)

User Qualifications for the Structural Review Worksheet

Users of this worksheet should have demonstrable knowledge of typical residential roof framing systems. A number of certification programs may be acceptable evidence of qualifications, if approved by the local jurisdiction, for example:

- Registered Design Professional (Professional Engineer or Architect)
- Licensed Home Inspector
- Engineer-in-Training (EIT)
- North American Board of Certified Energy Practitioners (NABCEP) PV Installation Professional certification
- Other approved certifications that require training in structural inspection of residential framing systems.

Visibility Requirements

Worksheet users must be able to view the roof framing to evaluate its strength. Enough of the framing must be exposed to be able to determine at a minimum:

- Rafter size and spacing
- Ridge board versus ridge beam
- Configuration of rafter cross-ties (e.g. attic floor, collar ties), including size and spacing
- Existence of framing irregularities (e.g. skylights, dormers) in the vicinity of the proposed PV panels
- Type of roof sheathing (e.g. plywood, oriented strand board (OSB), straight board sheathing)

If the framing is concealed by finishes, such as in spaces with cathedral ceilings, a Registered Design Professional should investigate the framing and review the proposed installation. Openings may be required in the finishes to observe the framing and document the construction details listed above.

Anchorage to Structure

Use of this worksheet is contingent upon fastening the PV system directly to the rafters. If the installer wishes to attach to the sheathing between the rafters, a registered design professional should evaluate the proposed design and confirm the available sheathing capacity. If the sheathing alone is not adequate to resist downward gravity and wind uplift forces, the addition of blocking between the rafters at the attachment locations may be a possible solution.

Structural Information

(To be used as a standalone supplemental form or in conjunction with the Structural Evaluation portion of this Worksheet on the following pages, 3-4)

Please fill in the following Roof Description Information

ROOF DESCRIPTION:

Wind Exposure Category (B / C / D):[1] _____

Roofing Type (e.g. asphalt shingle, slate, clay tile, cedar shake, metal seam, single-ply membrane, built-up): _____

_____

Age of roof:_____Number of Layers: _____

Roof Type (e.g. gable, hipped, flat):_____

Framing Type (e.g. stick-built, trusses): _____

If trusses, list manufacturer, if known:_____

Rafter Material (wood, steel, etc.; if wood, specify rafter species[2]): _____

Rafter Size (e.g. 2x6): _____Rafter Spacing (e.g. 16"): _____

Maximum unsupported rafter span: _____ Feet _____ Inches

Ceiling joist or rafter tie size and spacing (e.g. 2x6@16"):_____

Ceiling joist or rafter tie orientation (relative to rafters): ☐ parallel ☐ perpendicular

Height of ceiling joist or rafter tie measured vertically above top of rafter support walls (enter "0" if ceiling joists are located at the top of the support walls): _____

Height of roof ridge measured vertically above top of rafter support walls:_____

Ridge type (beam or board):_____

Framing Irregularities in vicinity of proposed panel installation (e.g. modifications, skylights, dormers that interrupt rafter spans): _____

Heavy equipment or unusual loads suspended from rafters in the vicinity of proposed panel installation:_____

_____

Other information/Comments: _____

_____

[1] http://publicecodes.cyberregs.com/icod/irc/2009/icod_irc_2009_3_par010.htm

[2] Obtain species from grade stamps on the rafters. If no grade stamps, assume Spruce-Pine-Fir #2.

Please perform the following Roof Load Calculations

ROOF LOAD CALCULATIONS:

a. Total weight of PV modules, rails, mountings, hardware and wiring	_____	Lbs
b. Total number of attachments (mountings)	_____	Mountings
c. Weight per attachment point (mounting) a÷b	_____	**Lbs/Attachment**
d. Maximum spacing between adjacent attachment (mounting) points	_____	Feet-Inches
e. Total surface area of PV modules (square feet)	_____	Ft^2
f. Distributed weight of PV modules a÷e	_____	**Lbs/ft^2**

Structural Evaluation

Please answer the questions in the Maximum Rafter Span Table Qualifier

MAXIMUM RAFTER SPAN TABLE QUALIFIER:

1. Was the house built after 1900?	☐ Yes	☐ No
2. Does the roof have only one layer of asphalt roofing shingles or standing metal seam?	☐ Yes	☐ No
3. Does the roof have a slope of 4:12 or greater?	☐ Yes	☐ No
4. Is roof framing stick-built wood framing?	☐ Yes	☐ No
5. Are rafters continuously tied with ceiling framing from one supporting wall to the other at the eave level, noting that the ceiling framing must match the rafter spacing and direction?	☐ Yes	☐ No
6. Is the framing in the vicinity of the solar array free of irregularities (see Roof Description for examples)?	☐ Yes	☐ No
7. Is the framing in the vicinity of the solar array free of heavy equipment or unusual loads?	☐ Yes	☐ No
8. Is the roof framing free of visible indications of distress (e.g. ridge sagging, walls out of plumb, significant ceiling cracks, split rafters)?	☐ Yes	☐ No
9. Is the roof framing free of signs or knowledge of previous damage (e.g. water incursion, fire damage, impact from an object, termite damage, etc.)?	☐ Yes	☐ No
10. Is the new PV system flush mounted, with a maximum angle of 5 degrees relative to the roof line and a maximum gap of 6" between the roof surface and the solar panels?	☐ Yes	☐ No
11. Is the maximum weight of PV modules less than or equal to 4 lbs/ft^2 (see "Roof Load Calculations" p. 2)?	☐ Yes	☐ No
12. Is the "weight per attachment point" less than 45 lbs (see "Roof Load Calculations" p. 2)?	☐ Yes	☐ No

If all answers are "Yes," proceed to Rafter Span Verification. If any answer is "No," enter "NA" for your answer to Question 13 on the next page and employ a Registered Design Professional to evaluate the roof structure.

Structural Evaluation

RAFTER SPAN VERIFICATION

Refer to the Rafter Span Table below to determine whether the "Maximum Unsupported Span" (provided in the "Roof Description" on page 2) is less than the maximum allowed rafter span. (Consider wood species, rafter size, and rafter spacing in your assessment)

MAXIMUM RAFTER SPANS

Ground snow load = 30 psf

Maximum Dead Load Including PV Panels = 14 psf

Ceiling not attached to rafters (deflection ≤ L/180)

		Rafter Size				
		2x4	2x6	2x8	2x10	2x12
Rafter Spacing	Species and Grade	Maximum Rafter Spans (ft-in)				
12"	Spruce-Pine-Fir #2	8'-4"	12'-4"	15'-8"	19'-1"	22'-2"
	Douglas Fir-Larch #2	8'-10"	12'-11"	16'-5"	20'-0"	23'-3"
	Hem-Fir #2	8'-10"	12'-11"	16'-5"	20'-0"	23'-3"
16"	Spruce-Pine-Fir #2	7'-4"	10'-8"	13'-7"	16'-7"	19'-2"
	Douglas Fir-Larch #2	7'-8"	11'-2"	14'-2"	17'-4"	20'-1"
	Hem-Fir #2	7'-8"	11'-2"	14'-2"	17'-4"	20'-1"
19.2"	Spruce-Pine-Fir #2	6'-8"	9'-9"	12'-4"	15'-1"	17'-6"
	Douglas Fir-Larch #2	7'-0"	10'-3"	12'-11"	15'-10"	18'-4"
	Hem-Fir #2	7'-0"	10'-3"	12'-11"	15'-10"	18'-4"
24"	Spruce-Pine-Fir #2	6'-0"	8'-9"	11'-1"	13'-6"	15'-8"
	Douglas Fir-Larch #2	6'-3"	9'-2"	11'-7"	14'-2"	16'-5"
	Hem-Fir #2	6'-3"	9'-2"	11'-7"	14'-2"	16'-5"

13. According to the Rafter Span Table, is the observed "Maximum Unsupported Span" less than the "Maximum Rafter Span" listed in the table? ☐ Yes ☐ No ☐ NA

STRUCTURAL REVIEW WORKSHEET CONCLUSION:

If your answer to Question 13 is "Yes," you do not need to employ a Registered Design Professional to evaluate the roof structure unless required to do so by the local jurisdiction.

Signature of person who completed this form _____ Date _____

Name (printed) _____ Company Name _____

Contact Information (address and phone number) _____

TOWN OF WESTPORT

BUILDING DEPARTMENT

CHECKLIST FOR PHOTOVOLTAIC POWER SYSTEM INSTALLATIONS

Users should note the following:

1. References in brackets [ ] are to the 2005 and 2008 NEC and other relevant documents. Changes related to 2008 NEC requirements are noted in {brackets}. 2011 differences are in (parenthesis). ***As of February 2014, Connecticut abides by the 2011 NEC; other years are provided as reference.***

2. Access to the 2011 NEC is provided online, for free, by the National Fire Protection Association (NFPA): http://www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=70

1. PV ARRAYS

- ☐ PV modules listed to UL Standard 1703 [110.3] {690.4(D)}

a. Mechanical Attachment

- ☐ Modules attached to the mounting structure according to the manufacturer's instructions [110.3(B)]
- ☐ Roof penetrations secure and weather tight

b. Grounding

- ☐ Each module grounded using the appropriate hardware, the grounding point identified on the module and the manufacturer's instructions.
    - **Note:** Bolting the module to a "grounded" structure usually will not meet NEC requirements [110.3(B)]. Array PV mounting racks are usually not identified as equipment-grounding conductors (Note 690.43(C) and (D) in 2011 have additional provisions and allowances for grounding with mounting structure).
- ☐ Properly sized equipment-grounding conductors routed with the circuit conductors [690.45] Note differences between 2005, 2008 and 2011 NEC.

c. Conductors

- ☐ Conductor type- If exposed: USE-2, UF (usually inadequate at 60°C), or SE, 90°C, wet-rated and sunlight resistant. [690.30(B)] {2008 NEC restricts exposed single-conductor wiring to USE-2 and listed PV/ Photovoltaic wire/cable} – If in conduit: RHW-2, THWN-2, or XHHW-2 90°C, wet-rated conductors are required [310.15]
- ☐ Conductor insulation rated at 90°C [UL – 1703] to allow for operation at 70°C+ near modules and in conduit exposed to sunlight (add 17-20°C to ambient temperature – 2005 NEC) {see Table 310.15(B)(2) in the 2008 NEC}
- ☐ Temperature-derated ampacity calculations based on 156% of short-circuit current (Isc), and the derated ampacity greater than 156% Isc rating of overcurrent device [690.8,9].
    - **Note:** Suggest temperature derating factors of 65°C in installations where the backs of the module receive cooling air (6" or more from surface) and 75°C where no cooling air can get to the backs of the modules. Ambient temperatures in excess of 40°C may require different derating factors.

      (2011 NEC 690.8 substantially updates ampacity calculations to parallel calculations in other sections of the NEC)
- ☐ Portable power cords allowed only for tracker connections [690.31 (C), 400.3,7,8]
- ☐ Strain reliefs/cable clamps or conduit used on all cables and cords [300.4,400.10]
- ☐ Listed for the application and the environment? Fine stranded, flexible conductor cables properly terminated with terminals listed for such conductors (690.31(E))
- ☐ Cables and flexible conduits installed and properly marked (690.31(E))
- ☐ Exposed conductors in readily accessible areas in a raceway if over 30 volts {690.31(A)}
    - **Note:** Raceways cannot be installed on modules. Make conductors not readily accessible.

2. OVERCURRENT PROTECTION

- ☐ Overcurrent devices in the dc circuits listed for dc operation – if device not marked dc, verify dc listing with manufacturer. Auto, marine and telecom devices are not acceptable.
- ☐ Rated at 1.25 x 1.25 = 1.56 times short-circuit current from modules [UL – 17093, 690.8, module instructions]
    - **Note:** Both 125% factors are now in the NEC, but a duplicate 125% remains in the module instructions and should be removed in 2011. Supplementary listed devices are allowed in PV source circuits only, but branch-circuit rated devices preferred [690.9(C)].
- ☐ Each module or series string of modules have an overcurrent device protecting the module [UL-1703/NEC 110.3(B)]
    - **Note:** Frequently, installers ignore this requirement marked on the back of the modules. Listed combiner PV combiner boxes meeting this requirement are available. One or two strings of modules do not require overcurrent devices, but three strings or more in parallel will usually require an overcurrent device. The module maximum series fuse must be at least 1.56 Isc.
- ☐ Located in a position in the circuit to protect the module conductors from backfed currents from parallel module circuits or from the charge controller or battery [690-9(A) FPN]
- ☐ Smallest conductor used to wire modules protected – sources of overcurrent are parallel-connected modules, batteries, and ac backfeed through inverters [690-9(A)]
- ☐ User-accessible fuses in “touch-safe” holders or capable of being changed without touching live contacts [690.16] Strengthened for 2011 to include distance between overcurrent device and disconnect.
- ☐ Fuses must be able to be de-energized for service per NEC 690.16(B)

3. ELECTRICAL CONNECTIONS

- ☐ Pressure terminals tightened to the recommended torque specification
- ☐ Crimp-on terminals listed and installed with listed crimping tools by the same manufacturer [110.3(B)]
- ☐ Twist-on wire connectors listed for the environment (e.g. dry, damp, wet or direct burial) and installed per the manufacturer’s instructions
- ☐ Pressure lugs or other terminals listed for the environment (e.g. inside, outside, wet, direct burial)
- ☐ Power distribution blocks listed and not just UL recognized
- ☐ Terminals containing more than one conductor listed for multiple conductors
- ☐ Connectors or terminals using flexible, fine-stranded conductors listed for use with such conductors? {690.31(F), 690.74}
- ☐ Locking (tool-required) on readily accessible PV conductors operating over 30 volts {690.33 (C)}

4. CHARGE CONTROLLERS

- ☐ Charge controller listed to UL Standard 1741 [110.3] {690.4(D)}
- ☐ Exposed energized terminals not readily accessible
- ☐ Diversion controller has an independent backup control method [690.72(B)(1)]

5. DISCONNECTS

- ☐ Disconnects listed for dc operation in dc circuits. Automotive, marine and telecom devices are not acceptable
- ☐ PV disconnect readily accessible and located at first point of penetration of PV conductors
- ☐ PV conductors outside structure until reaching first readily accessible disconnect unless in a metallic raceway [690.14, 690.31(F)]
- ☐ Disconnects for all current-carrying conductors of PV source [690.13]
- ☐ Disconnects for equipment [690.17]
- ☐ Grounded conductors not fused or switched – Bolted disconnects OK.
    - **Note:** Listed PV Centers by Xamtrex, Outback, and others for 12, 24 and 48-volt systems contain charge controllers, disconnects and overcurrent penetration for entire dc system with possible exception of source circuit or module protective fuses.

6. INVERTERS (Stand-alone systems)

- ☐ Inverter listed to UL Standard 1741 [110.3] {690.4(D)}
    - **Note:** Inverters listed to telecommunications or other standards do not meet NEC requirements
- ☐ DC input currents calculated for cable and fuse requirements. Input current = rated ac output in watts divided by lowest battery voltage divided by inverter efficiency at that power level [690.8(B)(4)]
- ☐ Cables to batteries sized 125% of calculated inverter input currents [690.8(A)]
- ☐ Overcurrent/Disconnects mounted near batteries and external to PV load centers if cables are longer than 4-5 feet to batteries or inverter
- ☐ High interrupt, listed, dc-rated fuses or circuit breakers used in batter circuits. AIR/AIC at least 20,000 amps [690.71(C), 110.9]
- ☐ No multiwire branch circuits where single 120-volt inverters connected to 120/240-volt load centers [100-Branch Circuit, Multiwire], [690.10(C)]

7. BATTERIES

- ☐ None are listed
- ☐ Building-wire type cables used [Chapter 3]
    - **Note:** Welding, cables, marine, locomotive (DLO) and auto battery cables don't meet NEC. Flexible, listed RHW or THW cables are available. Article 400 flexible cables larger than 2/0 AWG are OK for batter cell connections, but not in conduit or through walls. [690.74, 400.8] Flexible, fine stranded cables require very limited specially listed terminals. See stand-alone inverters for ampacity calculations.
- ☐ Access limited [690.71 (B)]
- ☐ Installed in well-vented areas (garages, basements, outbuildings, and not living areas)
    - **Note:** Manifolds, power venting and single exterior vents to the outside are not required and should be avoided.
- ☐ Cables to inverters, dc load centers and/or charge controllers in conduit
- ☐ Conduit enters the battery enclosure below the tops of the batteries [300.4]
    - **Note:** There are no listed battery boxes. Lockable heavy-duty plastic polyethylene tool boxes are usually acceptable.

8. INVERTERS (Utility-interactive Systems)

- ☐ Inverter listed to UL Standard 1741 and identified for use in interactive photovoltaic power systems [690.4(D), 690.60]
    - **Note:** Inverters listed to telecommunications and other standards do not meet NEC requirements
- ☐ Back up charge controller to regulate the batteries when the grid fails [690.72(B)(1)]
- ☐ Connected to dedicated branch circuit with back-fed overcurrent protection [690.64]
- ☐ Listed dc and ac disconnects and overcurrent protection [690.15, 17]
- ☐ Total rating of overcurrent devices supplying power to ac load center (main breaker plus backfed PV breaker) less than load-center rating (120% of rating in residences) [690.64(B) (2)] The 2008 NEC allows the 120% breaker total on commercial installations if the PV breaker is at the opposite end of the busbar from the main utility breaker

9. GROUNDING

- ☐ Only one bonding conductor (grounded conductor to ground) for dc circuits and one bonding conductor for ac circuits (neutral to ground) for system grounding [250]
    - **Note:** The dc bonds will generally be located inside inverters as part of the ground-fault protection devices. ON stand-alone systems, the dc bonding jumper may be in separate ground fault detection and interruption device or may be built into the charge controller
- ☐ AC and dc grounding electrode conductors connected properly. They may be connected to the same grounding electrode system (ground rod). Separate electrodes, if used, must be bonded together [690.41,47]
    - **Note:** The 2008 NEC in 690.47 allows a combined dc grounding electrode conductor and an ac equipment-grounding conductor, but the conditions and requirements are numerous {690.47} (2011 NEC clarified and combines 2005 and 2008 690.47(C) requirements)
- ☐ Equipment grounding conductors properly sized (even on ungrounded, low-voltage systems) [690.43]
- ☐ Disconnects and overcurrent in both of the ungrounded conductors in each circuit on 12- volt, ungrounded systems or on ungrounded systems at any voltage [240.20(A)], [690.41]
- ☐ Bonding/grounding fittings used with metal conduits when dc system voltage is more than 250V dc [250.97]

10. CONDUCTORS (General)

- ☐ Standard building-wire cables and wiring methods uses [300.1(A)]
- ☐ Wet-rated conductors used in conduits in exposed locations [100 Definition of Location, Wet]
- ☐ Insulations other than black in color will not be as durable as black in the outdoor UV-rich environment
- ☐ DC color codes correct – they are the same as ac color codes – grounded conductors are white and equipment-grounded conductors are green, green/yellow or bare. [200.6(A)] Ungrounded PV array conductors on ungrounded PV arrays will not be white in color.

TOWN OF WESTPORT

BUILDING DEPARTMENT

CERTIFICATION FOR PHOTOVOLTAIC POWER SYSTEM INSTALLATIONS

_____
(date)

Town of Westport
Office of the Building Official
515 Post Road East
Westport, CT 06880

RE: **PHOTOVOLTAIC POWER SYSTEM INSTALLATIONS**

To whom it may concern:

This letter is to certify that the photovoltaic power system installed at:

_____, Westport, CT
(street address)

has been installed and tested as per the requirements of the 2005 State Building Code, including the 2011 National Electrical Code

Sincerely,

_____
(Signature)

_____
(Your name)

_____
(Your company name)

_____
(Your address)

_____
(Your CT license type) (Your CT license #)

_____
CRS#