



Solar PV System Application Checklist

This checklist will assist in gathering all the required documents for the above permit application on ePlace:

Permits for a Rooftop Mounted or Ground Mounted PV system from Construction Services & Inspections:

Rooftop Mounted	Ground Mounted
Solar Building Commercial – Rooftop Mounted	Solar Building Commercial – Ground Mounted
Solar Building Residential – Rooftop Mounted	Solar Building Residential – Ground Mounted
Electrical – Apply through the State	Electrical – Apply through the State

ROOFTOP MOUNTED PROJECTS:

The following will need to be provided in PDF format when applying for this permit on ePlace:

1. Solar Packet including:

- **Site Plan** - See [Site & Survey Packet](#) for more information
- **PV Placement Plan** – Roof plan with **scaled** PV placement shown with roof access pathways, landings, and required ridge setbacks
- **Manufacturer’s Instructions** – Mounting and fastening Information for racking/panel support, specifications for panels and inverters, line diagram, labeling information, & rapid shutdown equipment
- **Roof Analysis** – Required for all Commercial and for Residential projects that do not meet the **Residential Exceptions** – Structural documents, in plan or letter format fully describing either the structural soundness of the mounting area, or specific structural requirements of the reinforcing the area for the solar installation. These shall include specific for reinforcing members and how they will be fastened. **Must be stamped and signed by a Minnesota Structural Engineer**

Residential Exceptions – Trusses installed after 2007 or Rafters that meet current Minnesota Residential Code

GROUND MOUNTED PROJECTS:

The following will need to be provided in PDF format when applying for this permit on ePlace:

2. Solar Packet including:

- **Site Plan** - See [Site & Survey Packet](#) for more information
- **Survey** - See [Site & Survey Packet](#) for more information
- **Foundations & Connection Details** – Depth and size of foundation with connection detail between the PV array racking system and the foundation. **Must be stamped and signed by a Minnesota Structural Engineer**
- **Manufacturer’s Instructions** – Mounting and fastening Information for racking/panel support, specifications for panels and inverters, line diagram, labeling information, & rapid shutdown equipment

Additional permits may be needed in addition to the above; call specific department with any questions.

Construction Services Permits 218-730-5250	Planning Department Permits 218-730-5580	Engineering Department Permits 218-730-5200
Structural reinforcement added to the building, for roof top projects. Footing, piers, foundations for ground mounted solar	Shoreland, Special Use, etc	Excavation-digging in the right-of-way Erosion Control – may be required if disturbing the ground

Minnesota Residential & Building Codes provide requirements for solar energy systems. A Minnesota licensed architect may be helpful in the planning and creating drawings and compiling permit submittal materials for commercial solar projects. For residential solar energy requirements, refer to Section 324 of the 2020 MSRC. For commercial solar energy requirements, refer to Section 3111 of the Minnesota Building Code. Solar PV installations must also comply with the Minnesota State Fire Code and the Minnesota Electrical Code



Samples for Solar PV System Submittals

Data Sheet - Line Diagram - Site Plan – Array Layout - Labeling Information - Specification Sheet
Sample Manufacturer’s Installation/Data Sheet

APS YC500A-K Microinverter Datasheet

INPUT DATA (DC)

Maximum Input Voltage	55V
Maximum Input Current	24A

OUTPUT DATA (AC)

Rated Output Power	500W
Maximum Output Current - 240V	2.08A
Maximum Output Current - 208V	2.4A
Nominal Output Voltage/Range - 240V	211-264V*
Nominal Output Voltage/Range - 208V	183-233V*
Nominal Output Frequency/Range	60Hz / 59.3-60.5Hz*
Power Factor	>0.99
Total Harmonic Distortion	<3%
Maximum Units Per Branch	7 per 20A / 9 per 25A breaker

EFFICIENCY

Peak Efficiency	95.5%
CEC Weighted Efficiency	94.5%
Nominal MPP Tracking Efficiency	99.0%

MECHANICAL DATA

Storage Temperature Range	-40°F to +185°F (-40°C to +85°C)
Operating Temperature Range (Ambient)	-40°F to +149°F (-40°C to +65°C)
Operating Temperature Range (Internal)	-40°F to +185°F (-40°C to +85°C)
Dimensions (WxHxD) inches	7.9" x 6.3" x 1.1"
Dimensions (WxHxD) mm	200mm x 160mm x 29mm
Weight	5.5 lbs (2.5kg)
Enclosure Rating	NEMA 3R
Cooling	Natural Convection

FEATURES & COMPLIANCE

Communication	Power line
Design Lifetime	25 years
Emissions & Immunity (EMC) Compliance	FCC PART 15, ANSI C63.4 2003, ICES-003
Safety Class Compliance	UL 1741 , CSA C22.2, No. 107.1-01 Text
Grid Connection Compliance	IEEE 1547

* Programmable per customer and utility requirements
All settings UL approved

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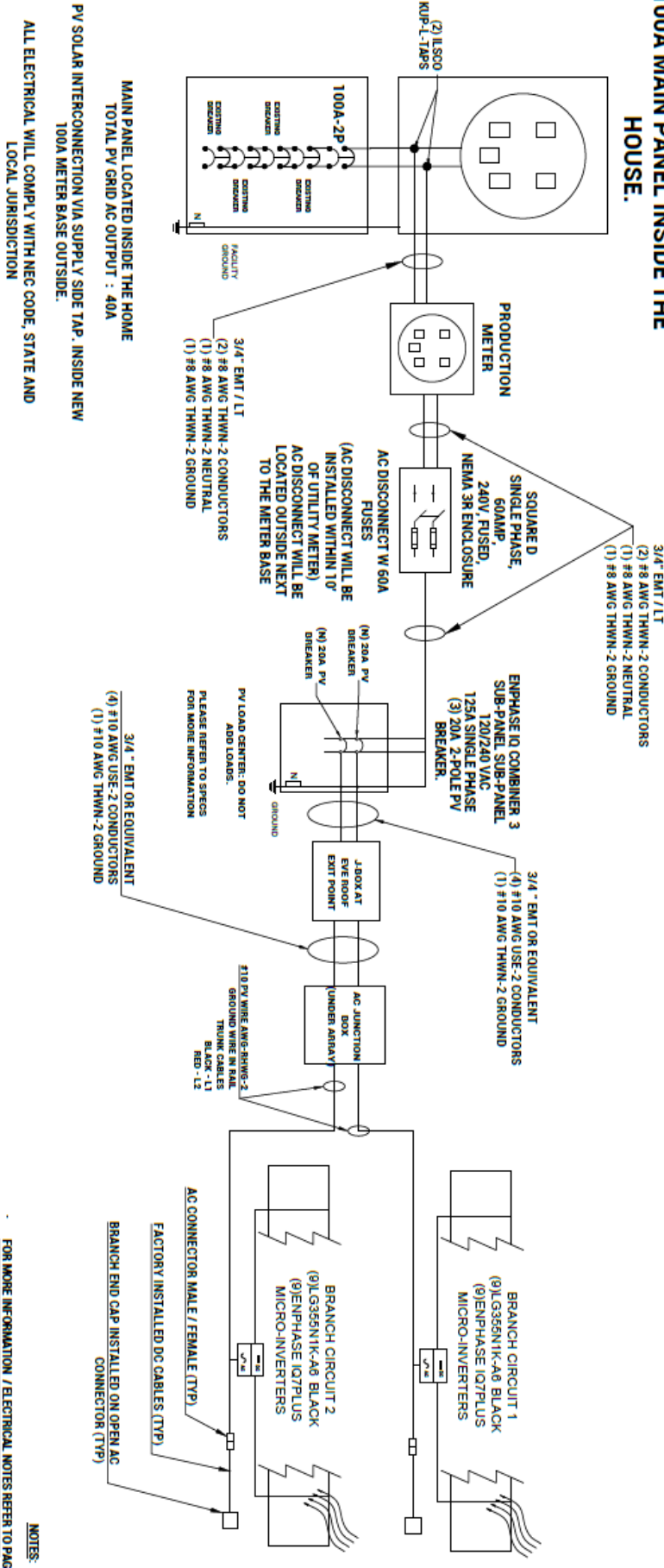
duluthmn.gov/csi | 218-730-5240 | permittingservices@duluthmn.gov



Construction Services & Inspections

Sample Line Diagram

NEW SERVICE PANEL 100A METER BASE, WITH EXISTING 100A MAIN PANEL INSIDE THE HOUSE.



NOTES:

FOR MORE INFORMATION / ELECTRICAL NOTES REFER TO PAGE 1 OF SUBMITTALS.

SOLID #8 AWG COPPER GROUND WIRE TO EXTEND FROM EACH ROOF J-BOX AND CONNECT TO EACH ROW OF RAILS VIA A TIN-PLATED COPPER GROUND LUG THAT IS LISTED FOR OUTDOOR USE. CHANGES ON STRING MIGHT CHANGE, DEPENDING ON INSTALLATION, BUT WILL BE KEPT IN ACCORDANCE WITH THE ORIGINAL DESIGN.

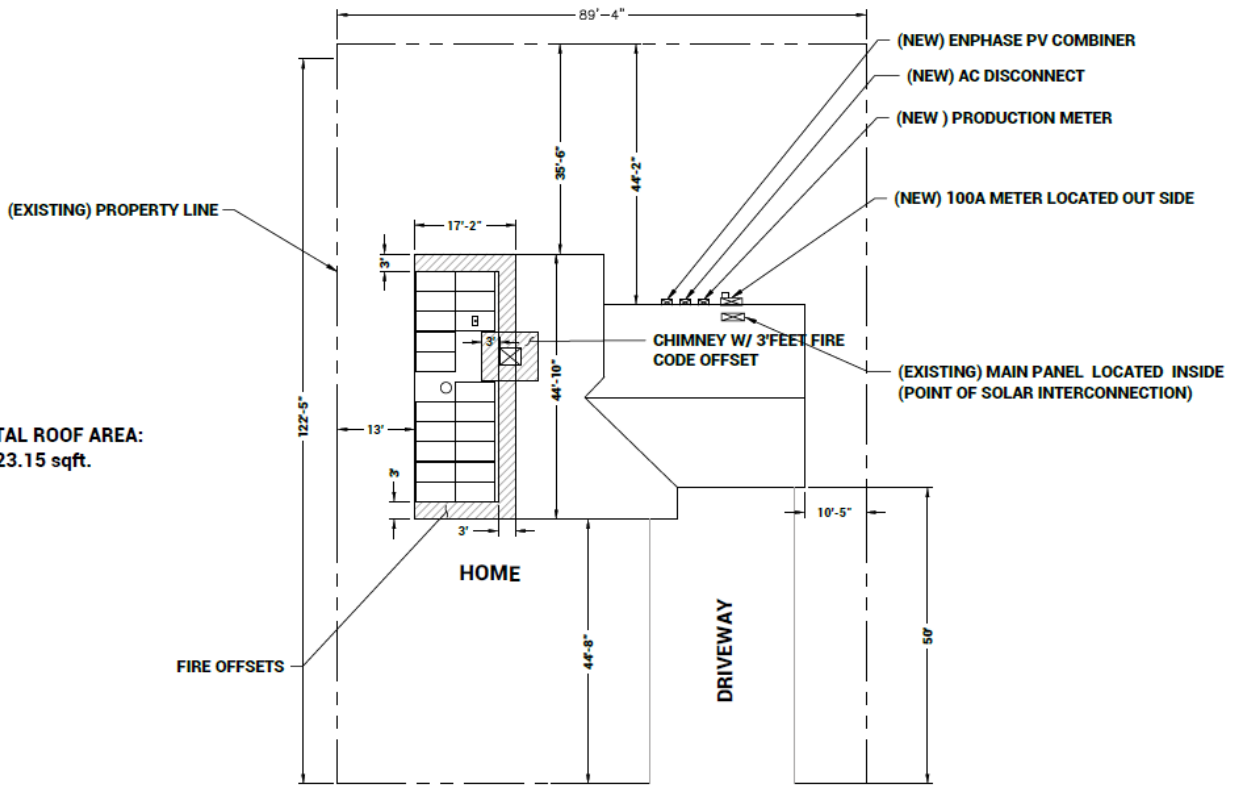
ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE AND WIRING MUST BE PERMANENTLY AND COMPLETELY FIELD OFF OF THE ROOF SURFACE. SEE NEC 110.2, 110.5(A), 110.5(G), AND 300.4

CONDUCTORS PER SPES SHEET.

Sample Site Plan



HOME TOTAL ROOF AREA:
2,523.15 sqft.



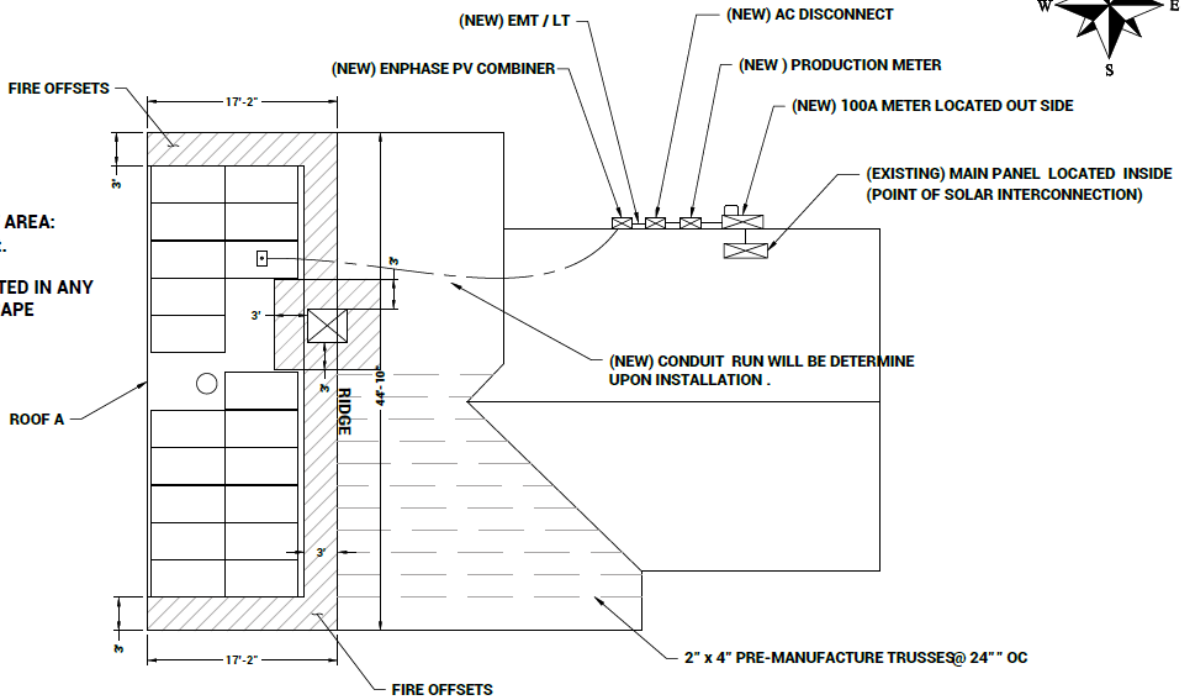
Sample Array Layout

ROOF INFORMATION			
ROOF SECTIONS	# OF MODULES	TILT	AZIMUTH
A	18	40°	270°






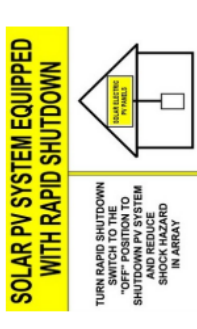






HOME TOTAL ROOF AREA:
2,523.15 sqft.

PANELS ARE NOT LOCATED IN ANY
EMERGENCY ESCAPE

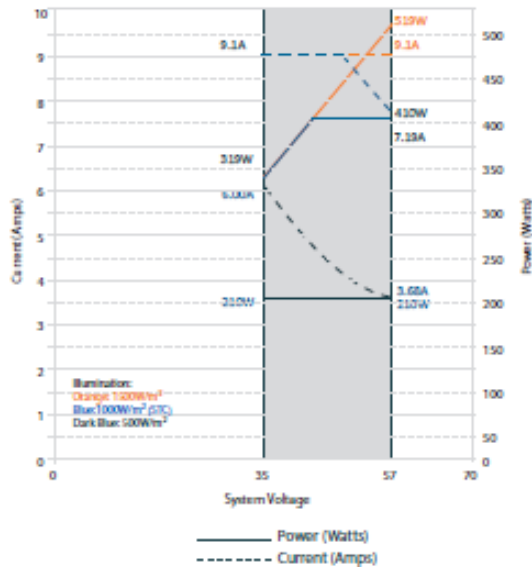


2020 NEC Labeling Requirements

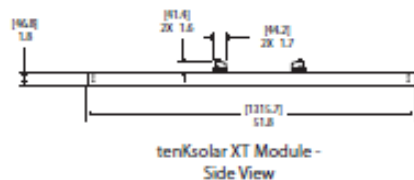
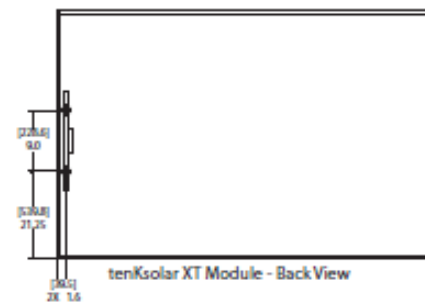
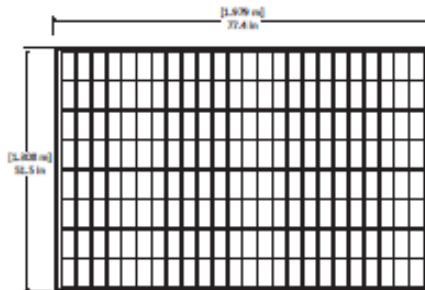
Section	Location of Label	Label Text and Appearance	Section	Location of Label	Label Text and Appearance
690.54	All interactive system(s) points of interconnection with other sources shall be marked at an accessible location at the disconnecting means as a power source and with the rated ac output current and the nominal operating ac voltage.		705.12	Permanent warning labels shall be applied to distribution equipment	
690.56(B) 690.4(D) 705.10 705.12	A permanent plaque or directory, denoting all electric power sources on or in the premises, shall be installed at each service equipment location and at locations of all electric power production sources capable of being interconnected.		705.12	A permanent warning label shall be applied to the distribution equipment adjacent to the back-fed breaker from the inverter.	
690.13(B)	Each PV system disconnecting means shall plainly indicate whether in the open (off) or closed (on) position and be permanently marked: "PV SYSTEM DISCONNECT" Or equivalent.		690.56 (C) Buildings with Rapid Shutdown PV systems shall have permanent labels as described in 690.56(C)(1) through (C)(2)	(1)(a) For PV systems that shut down the array and conductors leaving the array: The title "SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN" shall utilize capitalized characters with a minimum height of 3/8 in. in black on yellow background, and the remaining characters shall be capitalized with a minimum height of 3/16 in. in black on white background. (2) A rapid shutdown switch shall have a label located on or no more than 3 ft from the switch that includes this wording. The label shall be reflective, with all letters capitalized and having a minimum height of 3/8 in., in white on red background.	
690.53	A permanent label for the direct-current PV power source indicating the information specified in (1) through (3) shall be provided by the installer at the PV disconnecting means.				
690.31(D)(2)	The following wiring methods and enclosures that contain PV power source conductors shall be marked: (1) Exposed raceways, cable trays, and other wiring methods (2) Covers or enclosures of pull boxes and junction boxes (3) Conduit bodies in which any of the available conduit openings are unused				
690.13(B) 690.15	Where all terminals of the disconnecting means may be energized in the open position, a warning sign shall be mounted on or adjacent to the disconnecting means.				

RAIS® XT-A PV Module 410W_p

Typical IV Curve: RAIS® XT-A 410W_p PV Module



Module Dimensions



Application Options	
Direct Grid Connect Inverters	
Battery Only Systems	
Hybrid Inverters	

Specifications	
Power Output at STC (Pmax)	410W _p
Power Tolerance	+/- 3%
Cell Type	Polycrystalline Silicon
Number of Cells	192 Half Cells
Glass	3.2mm Tempered Glass
Maximum Current Output	9.1A
Maximum Series Fuse Rating	80A
DC Voltage Output	35V Minimum / 57V Maximum
Ground Fault Detect	Integrated (Compatible w/ Inverter GFDD)
Internal Ground Fault Limit	500 mA
Frame Size (not including optional extensions)	77.4" x 51" (1979mm x 1295mm)
Frame / Background	Silver / White
Backsheet Material	PET Covered Aluminum
Bypass Diodes	None
Ambient Operating Temperature Range	-40°F to 185°F (-40°C to 85°C)
Module NOCT (Nominal Operating Cell Temperature)	109°F (43°C)
Temperature Coefficient	-0.46% / °C
Static Load Capacity	50 psf / 2400 Pa
Hail Resistance	Direct 1" impact at 52mph (84kph)
Weight	71 lbs (32.2 kgs)
Certifications	UL 1703/UL 1741 IEC 61215 EN 61730
Warranty	12 Year Limited Product Warranty, 25 Year Linear Power Warranty: 3% Power Degradation First Year; 0.2% Linear Degradation per year after First Year

Shipping Information	
Max Quantity per Pallet	23
Pallet Dimensions	82 W x 55" D (1.4m x 2.1m)
Fully Loaded Pallet Weight	1735 lbs (787 kg)

Specifications and design are subject to change without notice. Read operating instructions carefully before using this product.

Patents Pending
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