



California Lottery Santa Fe Springs | Santa Fe Springs, CA Credit: LPAS Architecture + Design

An introduction to the Solar and Energy Storage System Permitting & Inspection Guidelines



Acknowledgement

nbi new buildings
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Better Buildings Now



Acknowledgement



www.solsmart.org

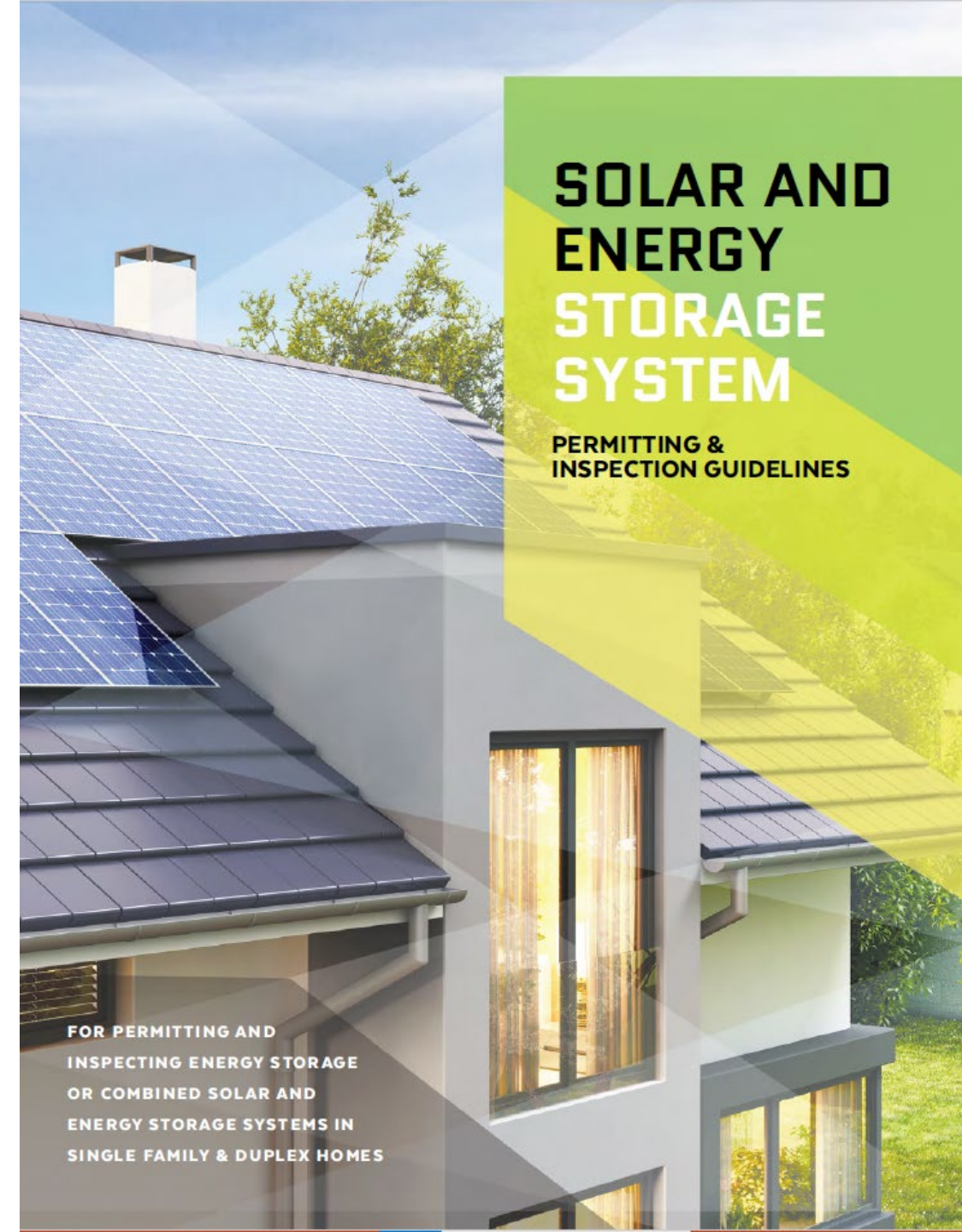


Thank you for your participation and
feedback.



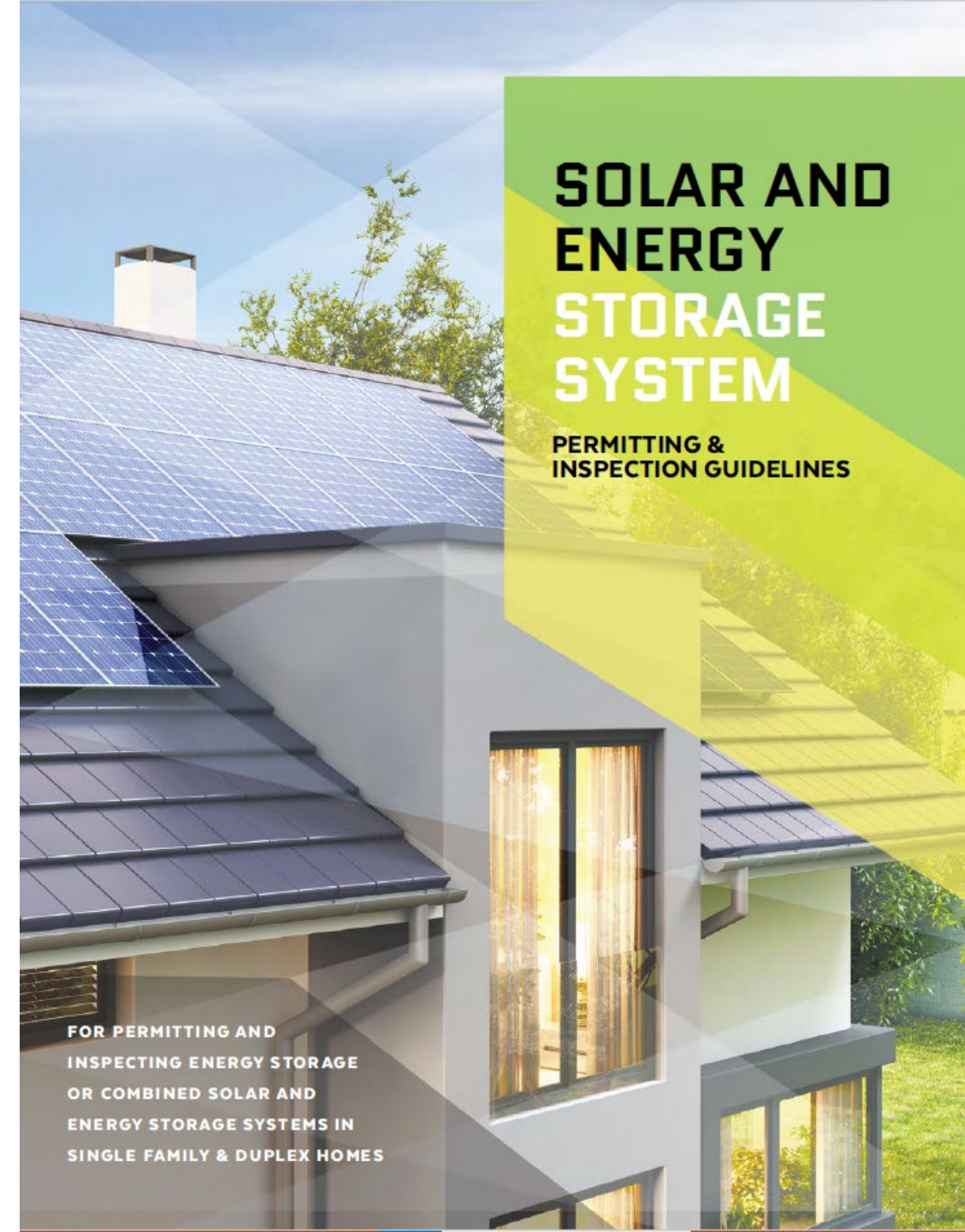
Background

- Increasing interest in Distributed Energy Resources (DER)
- Increasing installations
- Need to change practices
- Supports single-day, simple permitting

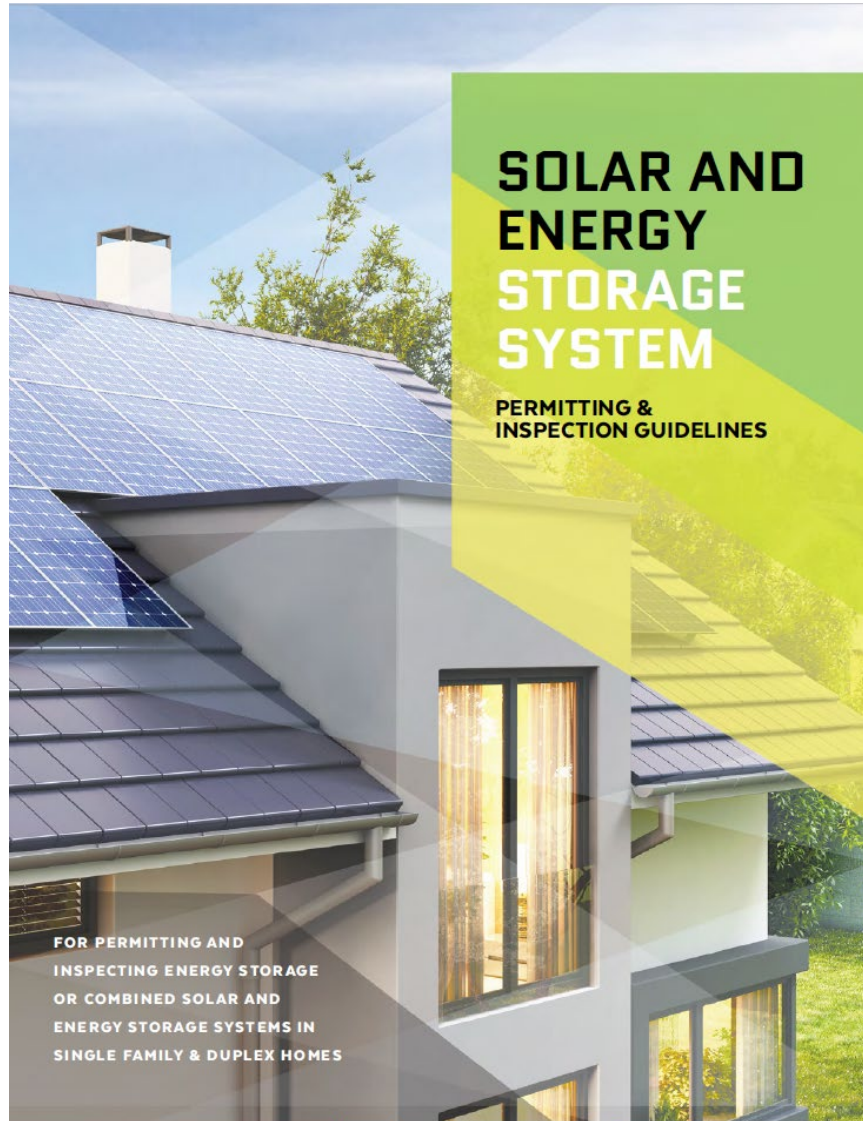


Guides Provide

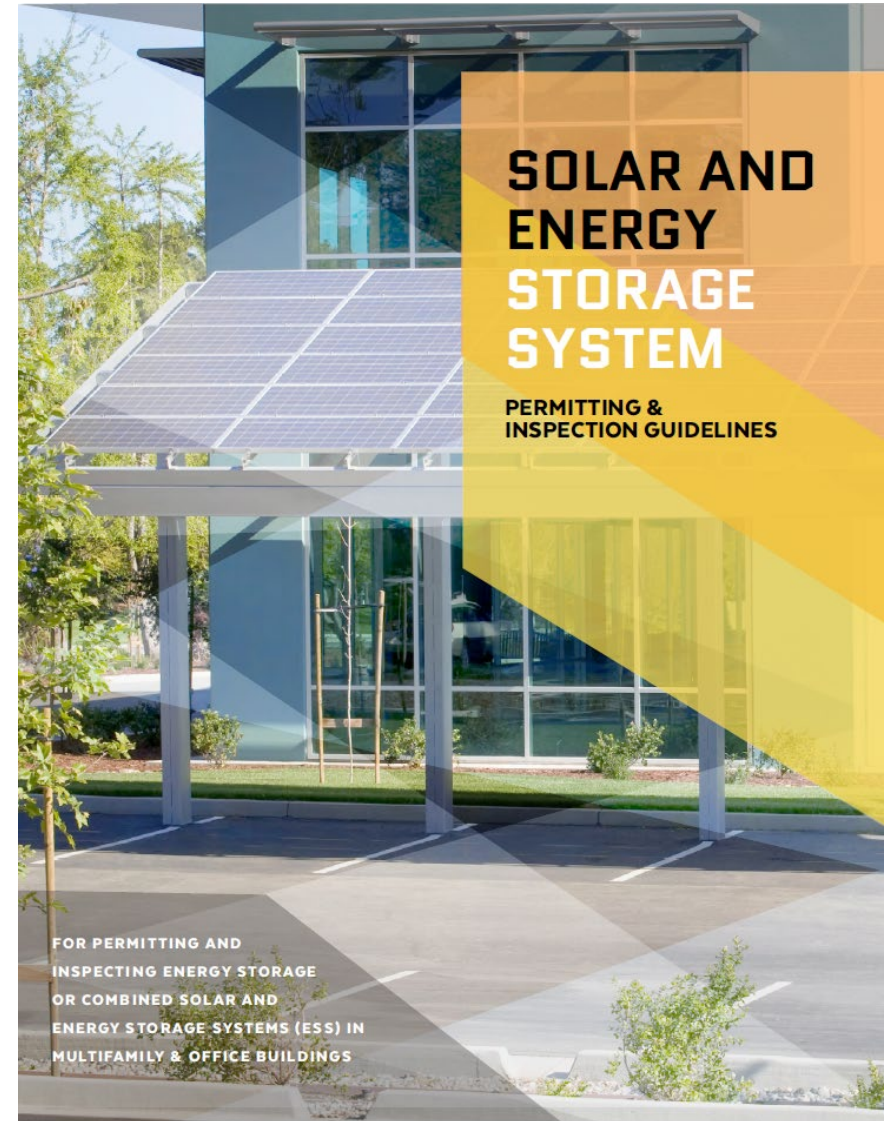
- Overview of code requirements
- List of permitting and inspection requirements
- Reduce information barriers
- Consistent and code compliant installations



Single Family & Duplex



Multifamily & Office



Referenced National Codes

2020 Versions

- 2020 National Electrical Code (NEC)
- 2021 International Building Code (IBC)
- 2021 International Residential Code (IRC)
- 2021 International Fire Code (IFC)

2017 Versions

- 2017 National Electrical Code (NEC)
- 2018 International Building Code (IBC)
- 2018 International Residential Code (IRC)
- 2018 International Fire Code (IFC)



Guide Contents

- Permit Submission Requirements
- General Installation Guides
- Plan Review Checklist
- Field Inspection Checklist

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Permit Approval Requirements Section

Permit Approval Requirements

- **Lithium-ion** energy storage systems
- Energy storage systems with total maximum energy capacity on site of **600kWh**
- Energy storage systems installed with simple **solar systems** meeting [SolSmart criteria](#) that **are less than 15kW** consisting of no more than 2 series strings per inverter and no more than 4 source circuits in total per inverter.



Permit Submission Requirements - Single Family

PERMIT SUBMISSION REQUIREMENTS



TO APPLY FOR A PERMIT SUBMIT THE FOLLOWING:

- 1) **Permit application**¹ (see Appendix A) which include basic information about the project, location and installer.
- 2) **Site plan** (see Appendix B) drawn to scale showing:
 - i) Location of PV array and ESS components on the property,
 - ii) Primary use of the space or area where the ESS will be installed,
 - iii) ESS spacing,
 - iv) PV and ESS setback and access pathways,
 - v) Fire detection, and fire suppression systems if applicable.
- 3) **A standard electrical line diagram** (see Appendix B) that accurately indicates:
 - i) PV array configuration (if applicable),
 - ii) Mounting details,
 - iii) ESS components,
 - iv) Conductors, cables, and conduit types, sizes, and markings,
 - v) Type and size rating of overcurrent protection and disconnects
 - vi) Inverters,
 - vii) Required signs,
 - viii) Connection to the premises wiring system, and
 - ix) Location of additional meters, main electrical service panel, distribution panels or subpanels.
- 4) **Specification sheets and installation manuals for all major system components including: ESS and PV components, inverters, and mounting systems. PV modules, DC-to-DC converters.**
- 5) **Documentation showing that ESS meets utility interconnection requirements**
- 6) **Electrical Load Calculation**

¹ Jurisdiction can fill this text box with link to their own permit application. A sample permit application is shown as an Appendix A to this guide.

- Permit application
- Site plan
- Standard electrical diagram
- Specification sheets
- ESS interconnection requirements documentation
- Electrical load calculations

Permit Submission Requirements - Multifamily

PERMIT SUBMISSION REQUIREMENTS



TO APPLY FOR A PERMIT SUBMIT THE FOLLOWING:

- 1) **Permit application**¹ (See Appendix A) which include basic information about the project, location and installer.
- 2) **Site plan (see Appendix B) drawn to scale showing:**
 - i) Location of PV array and ESS components on the property,
 - ii) Primary use of the space or area where the ESS will be installed,
 - iii) ESS spacing,
 - iv) PV and ESS setback and access pathways,
 - v) Fire detection, and fire suppression systems if applicable.
- 3) **A standard electrical line diagram (see Appendix B) that accurately indicates:**
 - i. PV array configuration (if applicable),
 - ii. Mounting details,
 - iii. ESS components,
 - iv. Conductors, cables, and conduit types, sizes, and markings,
 - v. Type and size rating of overcurrent protection and disconnects
 - vi. Inverters,
 - vii. Required signs,
 - viii. Connection to the premises wiring system, and
 - ix. Location of additional meters, main electrical service panel, distribution panels or subpanels.
- 4) **Specification sheets and installation manuals for all major system components including: ESS and PV components, inverters, and mounting systems. PV modules, DC-to-DC converters.**
- 5) **Structural Load Calculation**
- 6) **Electrical Load Calculation**

¹ Jurisdiction can fill this text box with link to their own permit application. A sample permit application is shown as an Appendix A to this guide.

- Permit application
- Site plan
- Standard electrical diagram
- Specification sheets
- Structural load calculations
- Electrical load calculations

Link to your application

PERMIT SUBMISSION REQUIREMENTS



TO APPLY FOR A PERMIT SUBMIT THE FOLLOWING:

- 1) **Permit application**¹ (see Appendix A) which include basic information about the project, location and installer.

- Jurisdiction can add a link to their own application
- A permit application is included in Appendix A

Appendix A – Sample Permit Application

APPENDIX A: SOLAR AND/OR ESS PERMIT APPLICATION

FOR OFFICE USE ONLY

Application Number:
Permit Number:
Issued By:
Date Applied:
Date Issued:

SECTION 1 - GENERAL INFO

PROJECT ADDRESS

PROPERTY OWNER'S NAME PHONE NUMBER EMAIL

PROPERTY OWNER'S MAILING ADDRESS (IF DIFFERENT FROM PROJECT ADDRESS)

SECTION 2 - PROJECT DETAILS

BUILDING TYPE/EXISTING USE

☐ SINGLE FAMILY ☐ DUPLEX ☐ MULTI-FAMILY
☐ COMMERCIAL/ INDUSTRIAL ☐ NEW CONSTRUCTION ☐ OTHER:

NEW OR EXISTING PV SYSTEM

☐ NEW SYSTEM
☐ ADDITIONAL SYSTEM
☐ SYSTEM REPLACEMENT

PV SYSTEM TYPE

☐ ROOF MOUNT
☐ GROUND MOUNT
☐ BUILDING INTEGRATED/ OTHER

INVERTER CONFIGURATION

☐ STRING INVERTER
☐ STRING INVERTER W/ DC CONVERTERS
☐ MICROINVERTERS OR AC MODULES

TOTAL PV SYSTEM SIZE kW DC TOTAL SQ. FT. OF PV SYSTEM SQ FT PROJECT VALUATION \$

INCLUDES ENERGY STORAGE SYSTEM ☐ YES ☐ NO TOTAL SYSTEM CAPACITY RATING kWh POWER RATING kW
☐ AC ☐ DC

PROJECT DESCRIPTION:

SECTION 3 - CONTRACTOR INFORMATION

CONTRACTOR BUSINESS NAME CONTRACTOR LICENSE NUMBER

BUSINESS ADDRESS
CONTRACTOR CONTACT NAME PHONE NUMBER EMAIL

SECTION 4 - PERMIT FEE

[Include fee schedule/options and/or instructions for calculating fee, directions on how and when to submit the permit fee.]

SECTION 5 - IMPORTANT NOTICE

A permit must be obtained for all installations or alterations of electrical equipment BEFORE WORK STARTS. Refer to EVSE Permitting Checklist for additional documents required. Failure to provide all required documents, including (1) Site Plan, (2) Electrical Diagram, and (3) Specification Sheets and Installation Manuals will delay permit approval. All permits expire six (6) months after date of issuance. Failure to start the work authorized by a permit within this six-month period renders the permit invalid and a new permit must be obtained. Once work begins, noticeable progress must continue until completion. All work must be complete within eighteen (18) months of a permit issue date.

Please Submit the following additional documents with the EVSE Permit Application

- Site Plan
- Electrical Diagram

- Structural Load Calculation
- Additional Document - edit or delete as necessary

Submit Permit Application

[Describe the submission process, how should the permits be submitted? In-person, on-line, e-mail, fax, etc.]

SECTION 6 - APPLICANT SIGNATURE

I, the undersigned, certify that I have proper authority to apply for this permit, that the Contractor has obtained a signed contract from the Property Owner for the specified work, that all contractors have consented to being listed, and that all the information contained on this application is true and accurate to the best of my knowledge.

NAME TITLE

SIGNATURE DATE

- Permit application
- Site plan
- Standard electrical diagram
- Specification sheets
- ESS interconnection requirements documentation
- Electrical load calculations

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Standard Electrical Diagram

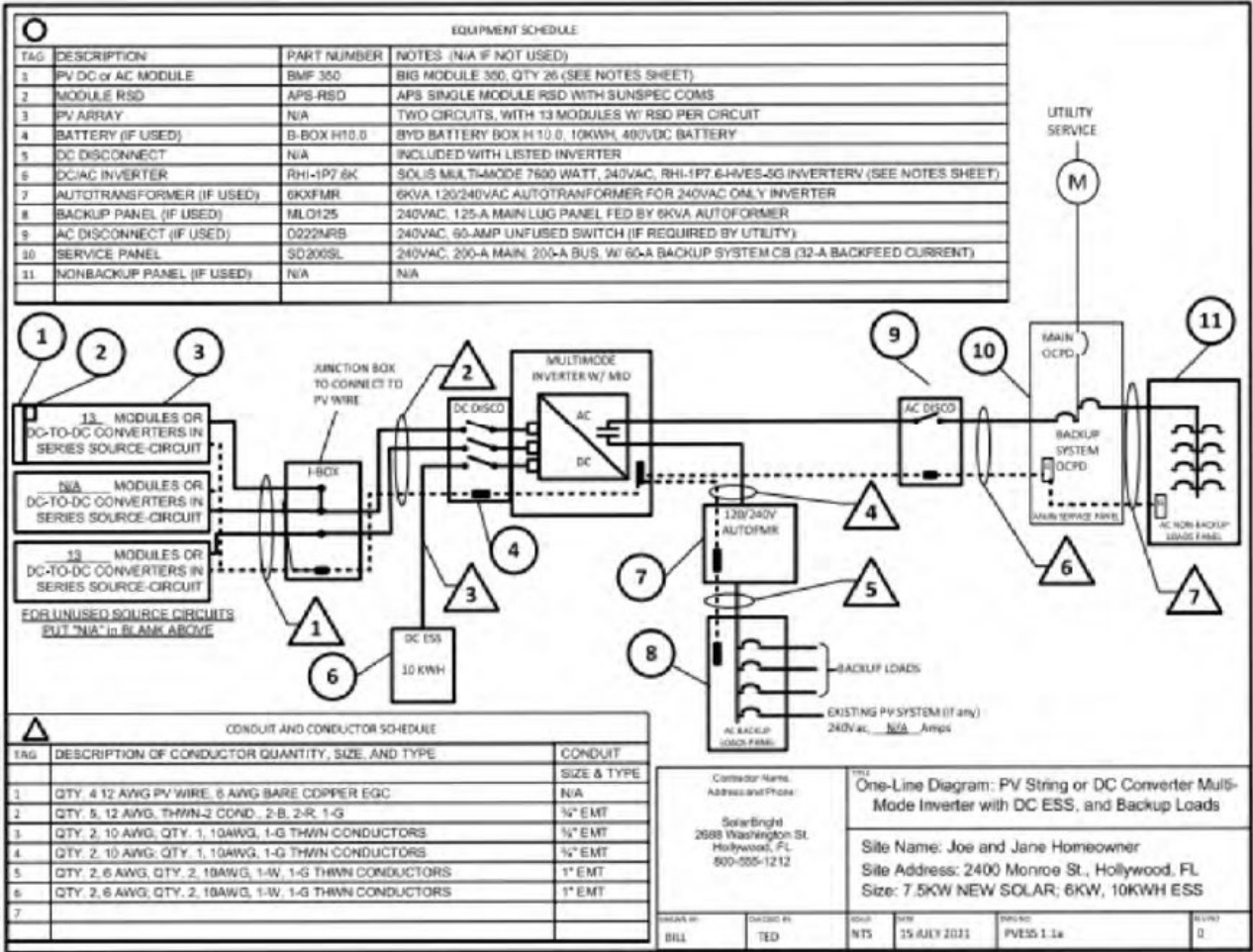


FIGURE 18: ONE-LINE PV AND ESS WITH MULTI-MODE INVERTER

Specification sheets



SILFAB PRIME

SS-310HC

SILFAB[®] SOLAR[®]

**RELIABLE ENERGY.
DIRECT FROM THE SOURCE.**

Designed to outperform.
Dependable, durable, high-performance
solar panels engineered for North
American homeowners.

SILFABSOLAR.COM

CHUBB
CHUBB provides solar and energy insurance in 38 states and DC.

CE, ISO 9001, IEC 61215, Fraunhofer ISE

[illegible]




Enphase IQ8X-BAT Microinverter

The high-powered smart grid-ready Enphase IQ8X-BAT Microinverter is an integral part of the Enphase IQ Battery system.

Part of the Enphase IQ System, the IQ8X-BAT Microinverter resides in the Enphase IQ Battery and integrates with the Enphase App monitoring and analyses software.

The IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing.

Efficient and Reliable

- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Smart Grid Ready

- Complies with the latest advanced grid support
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21.5, DER-S4



UL
CERTIFIED

UL Listed
UL Classified
UL Recognized

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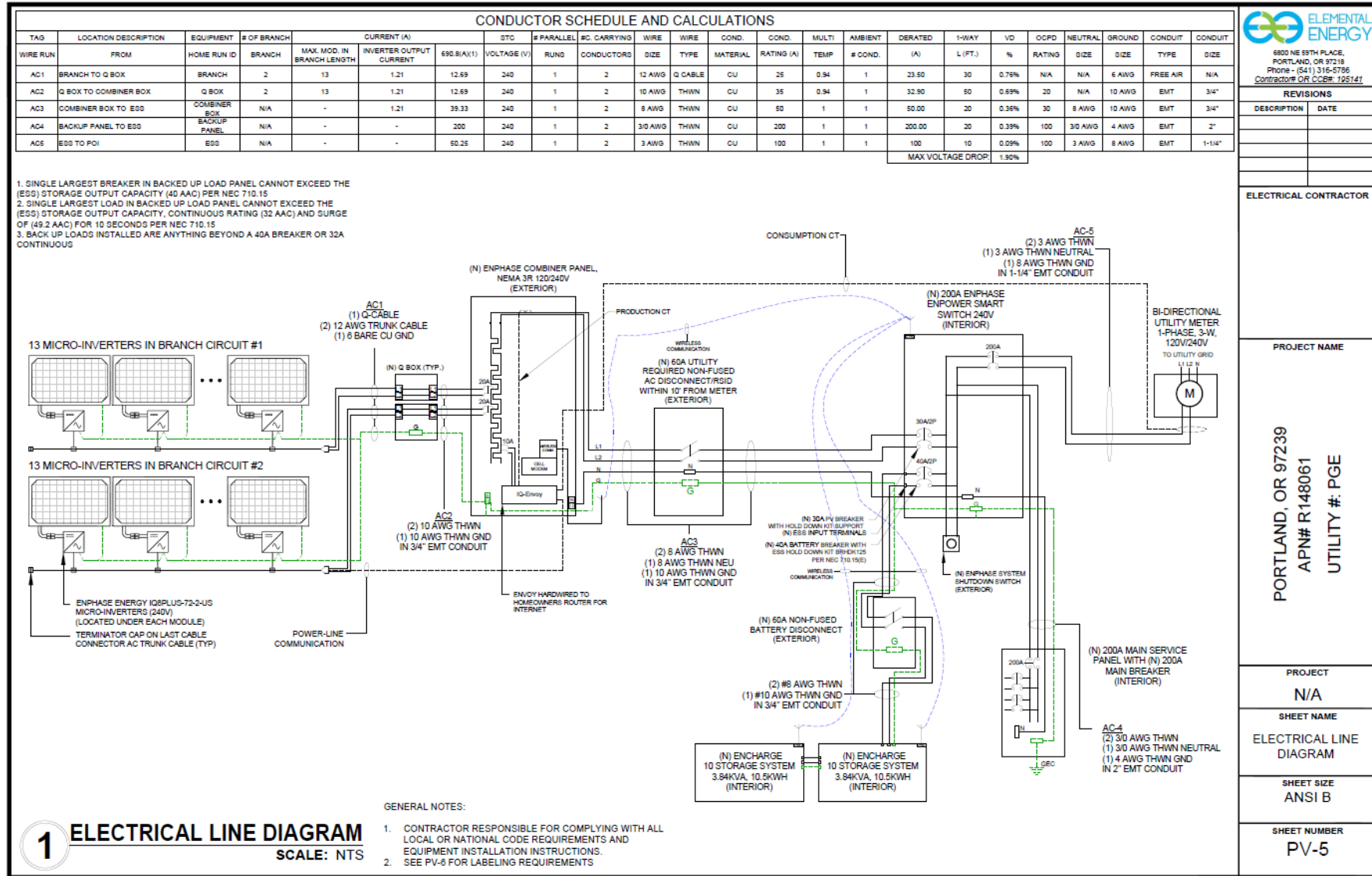
DER-S4-001-05-0042-01-02-05-00-00-00-00

Ephase IQX-BAT Microcontroller		
Related Data Sheet		Part Number
Maximum input DC voltage	V	93V
Operating voltage	V	12.0Vdc - 16.5V
Max. DC short-circuit current	A	20.0A
Overvoltage limit (DC voltage)	V	0
DC output short-circuit current	A	0
Output Power		Power Loss
Test output power	W	10W
Maximum continuous output power	W	240W
Normal (1.2Vdc) surge ¹	W	285 (270-360)
Peak output current	A	1.0 (0.75-1.5) (Average)
Maximum continuous output current	A (RMS)	1.0 (0.65)
Normal frequency	Hz	50
Extended frequency range	Hz	50 - 160
AC short-circuit fault current over 3 cycles	A	6000 Arms
Maximum output L-L line-to-line current	A	12.0 (RMS) (16.0A @ 300V)
Overvoltage limit AC (V)	V	0
AC output fault (short-circuit)	W	100
Power factor (full grid)		>0.92 w-1
Power factor (grid tied)	%	>0.98 w-0.95
Efficiency		Power Loss
CEC weighted efficiency	%	96.5%
Additional Data		
Active frequency range	Hz	400Hz to 4070Hz
Relative humidity range	%	4% to 95% (noncondensing)
Control type		Feedback (FV) controller
Dimensions (mm)		272 mm x 162 mm x 16 mm (surface mounted)
Weight		108 g (2.38 oz)
Coating		Normal corrosion - no harm
Approved for wet locations		Yes
Pollution degree		POL2
End-use		Class II double insulated, corrosion resistant polymeric enclosures
Enclosures		UL94 Type of material
Enclosure	Compliance with UL94 material rating	UL94 V-0 (UL94 V-0)
Communication		
Modulation		Phase-Shift Modulation (PSM)
Monitoring		Engineer desktop software and/or user interface for real-time monitoring options Compatible with Synphix G3 Gateway
Compliance		UL 9740, UL 1910, UL 1916, UL 1917, UL 1918, UL 1919, UL 1920, UL 1921, UL 1922, UL 1923, UL 1924, UL 1925, UL 1926, UL 1927, UL 1928, UL 1929, UL 1930, UL 1931, UL 1932, UL 1933, UL 1934, UL 1935, UL 1936, UL 1937, UL 1938, UL 1939, UL 1940, UL 1941, UL 1942, UL 1943, UL 1944, UL 1945, UL 1946, UL 1947, UL 1948, UL 1949, UL 1950, UL 1951, UL 1952, UL 1953, UL 1954, UL 1955, UL 1956, UL 1957, UL 1958, UL 1959, UL 1960, UL 1961, UL 1962, UL 1963, UL 1964, UL 1965, UL 1966, UL 1967, UL 1968, UL 1969, UL 1970, UL 1971, UL 1972, UL 1973, UL 1974, UL 1975, UL 1976, UL 1977, UL 1978, UL 1979, UL 1980, UL 1981, UL 1982, UL 1983, UL 1984, UL 1985, UL 1986, UL 1987, UL 1988, UL 1989, UL 1990, UL 1991, UL 1992, UL 1993, UL 1994, UL 1995, UL 1996, UL 1997, UL 1998, UL 1999, UL 2000, UL 2001, UL 2002, UL 2003, UL 2004, UL 2005, UL 2006, UL 2007, UL 2008, UL 2009, UL 2010, UL 2011, UL 2012, UL 2013, UL 2014, UL 2015, UL 2016, UL 2017, UL 2018, UL 2019, UL 2020, UL 2021, UL 2022, UL 2023, UL 2024, UL 2025, UL 2026, UL 2027, UL 2028, UL 2029, UL 2030, UL 2031, UL 2032, UL 2033, UL 2034, UL 2035, UL 2036, UL 2037, UL 2038, UL 2039, UL 2040, UL 2041, UL 2042, UL 2043, UL 2044, UL 2045, UL 2046, UL 2047, UL 2048, UL 2049, UL 2050, UL 2051, UL 2052, UL 2053, UL 2054, UL 2055, UL 2056, UL 2057, UL 2058, UL 2059, UL 2060, UL 2061, UL 2062, UL 2063, UL 2064, UL 2065, UL 2066, UL 2067, UL 2068, UL 2069, UL 2070, UL 2071, UL 2072, UL 2073, UL 2074, UL 2075, UL 2076, UL 2077, UL 2078, UL 2079, UL 2080, UL 2081, UL 2082, UL 2083, UL 2084, UL 2085, UL 2086, UL 2087, UL 2088, UL 2089, UL 2090, UL 2091, UL 2092, UL 2093, UL 2094, UL 2095, UL 2096, UL 2097, UL 2098, UL 2099, UL 2100, UL 2101, UL 2102, UL 2103, UL 2104, UL 2105, UL 2106, UL 2107, UL 2108, UL 2109, UL 2110, UL 2111, UL 2112, UL 2113, UL 2114, UL 2115, UL 2116, UL 2117, UL 2118, UL 2119, UL 2120, UL 2121, UL 2122, UL 2123, UL 2124, UL 2125, UL 2126, UL 2127, UL 2128, UL 2129, UL 2130, UL 2131, UL 2132, UL 2133, UL 2134, UL 2135, UL 2136, UL 2137, UL 2138, UL 2139, UL 2140, UL 2141, UL 2142, UL 2143, UL 2144, UL 2145, UL 2146, UL 2147, UL 2148, UL 2149, UL 2150, UL 2151, UL 2152, UL 2153, UL 2154, UL 2155, UL 2156, UL 2157, UL 2158, UL 2159, UL 2160, UL 2161, UL 2162, UL 2163, UL 2164, UL 2165, UL 2166, UL 2167, UL 2168, UL 2169, UL 2170, UL 2171, UL 2172, UL 2173, UL 2174, UL 2175, UL 2176, UL 2177, UL 2178, UL 2179, UL 2180, UL 2181, UL 2182, UL 2183, UL 2184, UL 2185, UL 2186, UL 2187, UL 2188, UL 2189, UL 2190, UL 2191, UL 2192, UL 2193, UL 2194, UL 2195, UL 2196, UL 2197, UL 2198, UL 2199, UL 2200, UL 2201, UL 2202, UL 2203, UL 2204, UL 2205, UL 2206, UL 2207, UL 2208, UL 2209, UL 2210, UL 2211, UL 2212, UL 2213, UL 2214, UL 2215, UL 2216, UL 2217, UL 2218, UL 2219, UL 2220, UL 2221, UL 2222, UL 2223, UL 2224, UL 2225, UL 2226, UL 2227, UL 2228, UL 2229, UL 2230, UL 2231, UL 2232, UL 2233, UL 2234, UL 2235, UL 2236, UL 2237, UL 2238, UL 2239, UL 2240, UL 2241, UL 2242, UL 2243, UL 2244, UL 2245, UL 2246, UL 2247, UL 2248, UL 2249, UL 2250, UL 2251, UL 2252, UL 2253, UL 2254, UL 2255, UL 2256, UL 2257, UL 2258, UL 2259, UL 2260, UL 2261, UL 2262, UL 2263, UL 2264, UL 2265, UL 2266, UL 2267, UL 2268, UL 2269, UL 2270, UL 2271, UL 2272, UL 2273, UL 2274, UL 2275, UL 2276, UL 2277, UL 2278, UL 2279, UL 2280, UL 2281, UL 2282, UL 2283, UL 2284, UL 2285, UL 2286, UL 2287, UL 2288, UL 2289, UL 2290, UL 2291, UL 2292, UL 2293, UL 2294, UL 2295, UL 2296, UL 2297, UL 2298, UL 2299, UL 2300, UL 2301, UL 2302, UL 2

[illegible]

<h1>Enphase Encharge 10</h1>	
MODEL NUMBER	
ENCHARGE 10-SP-BA	<ul style="list-style-type: none"> Encharge 10 battery storage system with integrated Enphase Microinverters and battery management system (BMS), including: <ul style="list-style-type: none"> Three 1500 W, 24 kWh units with 240V-208V-3-Ø-30-30-30 Encharge 10 power wire with 100 ft and mounting brackets, watertight conduit, and, mounting hardware for wiring between battery units (240V-208V-3-Ø-30-30-30)
ACCESSORIES	
ENCHARGE-ENH10L1	<ul style="list-style-type: none"> Encharge 10 battery storage system with installation hardware <ul style="list-style-type: none"> 9 1/4" x 19" x 19"
OPTIONAL	<ul style="list-style-type: none"> 240V-208V-3-Ø-30-30-30
Rated (continuous) output power	3.6 kW AC
Peak output power	4.5 kW (1500 W/1500 W)
Rated voltage / range	240 V / 208 VAC
Rated frequency / range	60 Hz / 60 Hz
Rated output current	8.6 A
Peak output current	10.4 A (1500 W/1500 W)
Power factor (discharge)	0.95 lagging
Maximum units per 24 0 branch circuit	1 unit (single phase)
Interconnection	Single phase
Maximum AC short-circuit fault current one cycle	65 kA AC
Power up efficiency ¹	92.4 %
BATTERY	
Total capacity	10.5 kWh
Usable capacity	7.0 kWh (66%)
Round trip efficiency	90.1 %
Maximum DC voltage	47.2 V
Maximum DC voltage / range	47.2 V / 47.2 V
Ambient operating temperature range	32 °F to 53° F (0 °C to 13° F) for non-condensing
Optimal operating temperature range	37 °C to 50° F (95 °F to 122 °F)
Chemistry	Lithium iron phosphate (LFP)
Mechanical Data	
Dimensions (WxHxD)	10 1/8" x 8 1/4" x 19 1/8" (261.3 x 214.3 x 12.96 in)
Weight	<ul style="list-style-type: none"> Three individual 42.7 kg (94 lb) on base plus 17.1 kg (37.8 lb) case and mounting bracket, net 15.7 kg (34.5 lb)
Enclosure	NEMA type 3F
Material	Aluminum
Cooling	Natural convection – No fans
Ambient	30 to 50 °C (86 to 122 °F)
Mounting	Wall mount
FEATURES AND COMPLIANCE	
Compatibility	Compatible with all grid-tied PV systems. Compatible with Enphase 100, 150, 200 and 300 Series inverters and Enphase 500 and Enphase 600 Series for backup operation.
Communication	Wi-Fi, 2.4 GHz
Services	Enphase, solarintegrator, TQ2, Demand Charge, NEM integrator
Monitoring	Enphase Manager and MyEnphase mobile app, 48V integrations
Compliance	<ul style="list-style-type: none"> UL954, UL955, UL956, UL957, UL958, UL959, UL960, UL961, UL962, UL963, UL964, UL965, UL966, UL967, UL968, UL969, UL970, UL971, UL972, UL973, UL974, UL975, UL976, UL977, UL978, UL979, UL980, UL981, UL982, UL983, UL984, UL985, UL986, UL987, UL988, UL989, UL990, UL991, UL992, UL993, UL994, UL995, UL996, UL997, UL998, UL999, UL1000, UL1001, UL1002, UL1003, UL1004, UL1005, UL1006, UL1007, UL1008, UL1009, UL1010, UL1011, UL1012, UL1013, UL1014, UL1015, UL1016, UL1017, UL1018, UL1019, UL1020, UL1021, UL1022, UL1023, UL1024, UL1025, UL1026, UL1027, UL1028, UL1029, UL1030, UL1031, UL1032, UL1033, UL1034, UL1035, UL1036, UL1037, UL1038, UL1039, UL1040, UL1041, UL1042, UL1043, UL1044, UL1045, UL1046, UL1047, UL1048, UL1049, UL1050, UL1051, UL1052, UL1053, UL1054, UL1055, UL1056, UL1057, UL1058, UL1059, UL1060, UL1061, UL1062, UL1063, UL1064, UL1065, UL1066, UL1067, UL1068, UL1069, UL1070, UL1071, UL1072, UL1073, UL1074, UL1075, UL1076, UL1077, UL1078, UL1079, UL1080, UL1081, UL1082, UL1083, UL1084, UL1085, UL1086, UL1087, UL1088, UL1089, UL1090, UL1091, UL1092, UL1093, UL1094, UL1095, UL1096, UL1097, UL1098, UL1099, UL1100, UL1101, UL1102, UL1103, UL1104, UL1105, UL1106, UL1107, UL1108, UL1109, UL1110, UL1111, UL1112, UL1113, UL1114, UL1115, UL1116, UL1117, UL1118, UL1119, UL1120, UL1121, UL1122, UL1123, UL1124, UL1125, UL1126, UL1127, UL1128, UL1129, UL1130, UL1131, UL1132, UL1133, UL1134, UL1135, UL1136, UL1137, UL1138, UL1139, UL1140, UL1141, UL1142, UL1143, UL1144, UL1145, UL1146, UL1147, UL1148, UL1149, UL1150, UL1151, UL1152, UL1153, UL1154, UL1155, UL1156, UL1157, UL1158, UL1159, UL1160, UL1161, UL1162, UL1163, UL1164, UL1165, UL1166, UL1167, UL1168, UL1169, UL1170, UL1171, UL1172, UL1173, UL1174, UL1175, UL1176, UL1177, UL1178, UL1179, UL1180, UL1181, UL1182, UL1183, UL1184, UL1185, UL1186, UL1187, UL1188, UL1189, UL1190, UL1191, UL1192, UL1193, UL1194, UL1195, UL1196, UL1197, UL1198, UL1199, UL1200, UL1201, UL1202, UL1203, UL1204, UL1205, UL1206, UL1207, UL1208, UL1209, UL1210, UL1211, UL1212, UL1213, UL1214, UL1215, UL1216, UL1217, UL1218, UL1219, UL1220, UL1221, UL1222, UL1223, UL1224, UL1225, UL1226, UL1227, UL1228, UL1229, UL1230, UL1231, UL1232, UL1233, UL1234, UL1235, UL1236, UL1237, UL1238, UL1239, UL1240, UL1241, UL1242, UL1243, UL1244, UL1245, UL1246, UL1247, UL1248, UL1249, UL1250, UL1251, UL1252, UL1253, UL1254, UL1255, UL1256, UL1257, UL1258, UL1259, UL1260, UL1261, UL1262, UL1263, UL1264, UL1265, UL1266, UL1267, UL1268, UL1269, UL1270, UL1271, UL1272, UL1273, UL1274, UL1275, UL1276, UL1277, UL1278, UL1279, UL1280, UL1281, UL1282, UL1283, UL1284, UL1285, UL1286, UL1287, UL1288, UL1289, UL1290, UL1291, UL1292, UL1293, UL1294, UL1295, UL1296, UL1297, UL1298, UL1299, UL1300, UL1301, UL1302, UL1303, UL1304, UL1305, UL1306, UL1307, UL1308, UL1309, UL1310, UL1311, UL1312, UL1313, UL1314, UL1315, UL1316, UL1317, UL1318, UL1319, UL1320, UL1321, UL1322, UL1323, UL1324, UL1325, UL1326, UL1327, UL1328, UL1329, UL1330, UL1331, UL1332, UL1333, UL1334, UL1335, UL1336, UL1337, UL1338, UL1339, UL1340, UL1341, UL1342, UL1343, UL1344, UL1345, UL1346, UL1347, UL1348, UL1349, UL1350, UL1351, UL1352, UL1353, UL1354, UL1355, UL1356, UL1357, UL1358, UL1359, UL1360, UL1361, UL1362, UL1363, UL1364, UL1365, UL1366, UL1367, UL1368, UL1369, UL1370, UL1371, UL1372, UL1373, UL1374, UL1375, UL1376, UL1377, UL1378

ESS Interconnection



Electrical Load Calculations

PERMIT SUBMISSION REQUIREMENTS



TO APPLY FOR A PERMIT SUBMIT THE FOLLOWING:

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 - vi) Inverters,
 - vii) Required signs,
 - viii) Connection to the premises wiring system, and
 - ix) Location of additional meters, main electrical service panel, distribution panels or subpanels.
- 4) Specification sheets and installation manuals for all major system components including: ESS and PV components, inverters, and mounting systems. PV modules, DC-to-DC converters.
- 5) Documentation showing that ESS meets utility interconnection requirements
- 6) Electrical Load Calculation

¹ Jurisdiction can fill this text box with link to their own permit application. A sample permit application is shown as an Appendix A to this guide.

General Installation Guide

General Installation Guide

Requirements Covered:

- ESS System Requirements
- ESS Installation
- ESS Size Location
- Interconnection ESS to PV
- PV Electrical Code
- PV Mounting & Installation

GENERAL INSTALLATION GUIDE

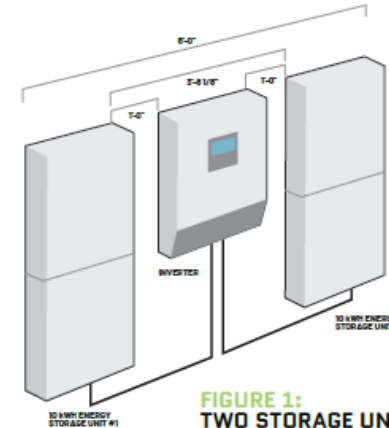


FIGURE 1:
TWO STORAGE UNITS
COMPLYING WITH 3
FOOT SEPARATION

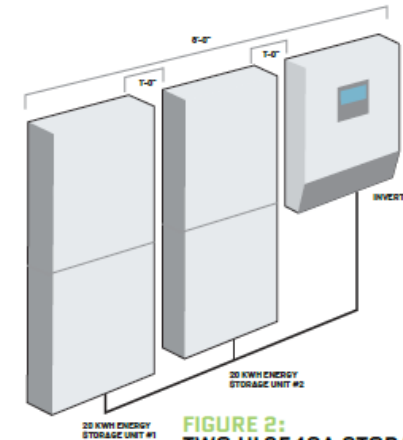


FIGURE 2:
TWO UL9540A STORAGE
UNITS COMPLYING
WITH MANUFACTURER
INSTRUCTIONS



ENERGY STORAGE SYSTEM REQUIREMENTS

- 1 ESS is listed to UL9540 or UL9540a by a Nationally Recognized Testing Laboratory (NRTL). (IFC 1207.3)
- 2 ESS is listed to UL1973. (NEC 706.5)
- 3 Inverters are certified to UL1741. (NEC 690.4(B))



ENERGY STORAGE SYSTEM INSTALLATION REQUIREMENTS

- 4 ESS is installed according to manufacturer installation instructions. (NEC 110.3(B))
- 5 All work is done in a neat and workmanlike manner. (NEC 110.12)
- 6 Access and working space for ESS equipment such as ESS units, battery units, inverters, disconnecting means, and panelboards is adequate. Working space is at least 30 inches in width, 6.5 feet in height and 4 feet in depth or the width, height and depth of the equipment, whichever is greater. (NEC 110.26)
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- 8 The individual ESS units are no larger than 20kWh. (IRC R328.5)
- 9 ESS units that are UL9540 certified are separated by 3 feet. (IRC R328.3.1, IFC1207.1.5)
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FIGURE 3: LARGE SCALE FIRE TESTED LABEL

**CERTIFIED
TO UL9540** **SAFETY
TESTED
UL9540A**

General Installation Guide

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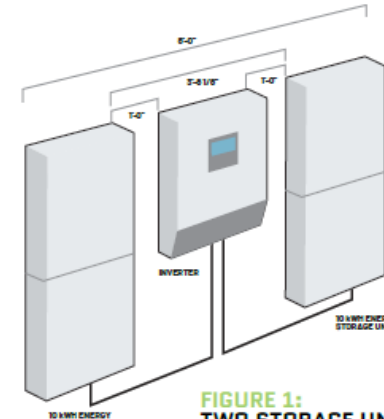


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TWO STORAGE UNITS
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FOOT SEPARATION

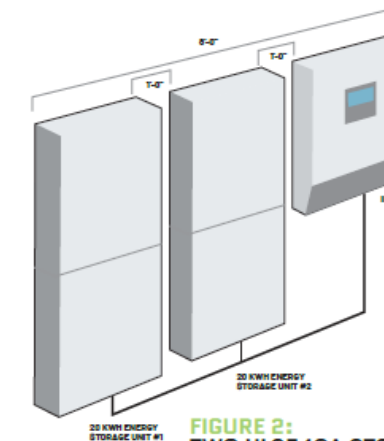


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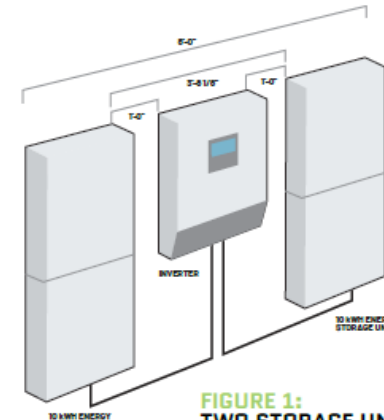
**CERTIFIED
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TESTED
UL9540A**

General Installation Guide

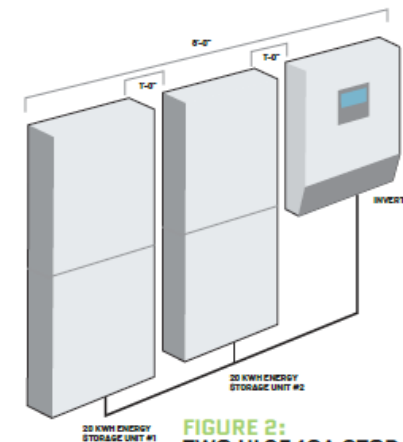
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GENERAL INSTALLATION GUIDE



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TWO STORAGE UNITS
COMPLYING WITH 3
FOOT SEPARATION**



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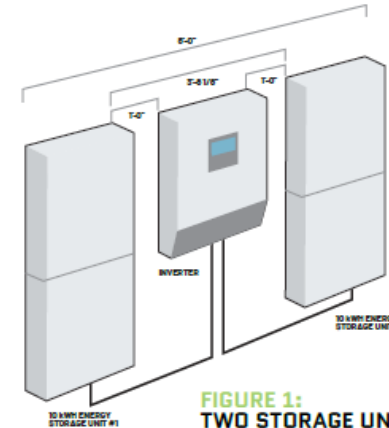
**CERTIFIED
TO UL9540** **SAFETY
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UL9540A**

General Installation Guide

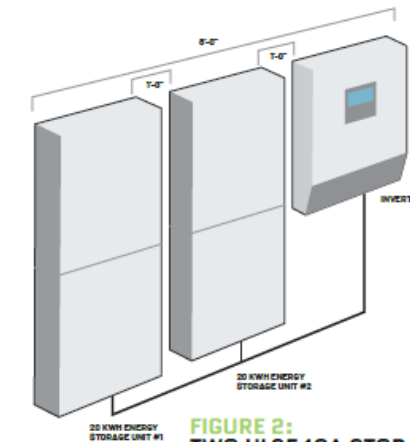
2017 Version Code References

8. The individual ESS units are no larger than 20kWh. (2021 IRC R328.5)
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GENERAL INSTALLATION GUIDE



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**CERTIFIED
TO UL9540**

**SAFETY
TESTED
UL9540A**

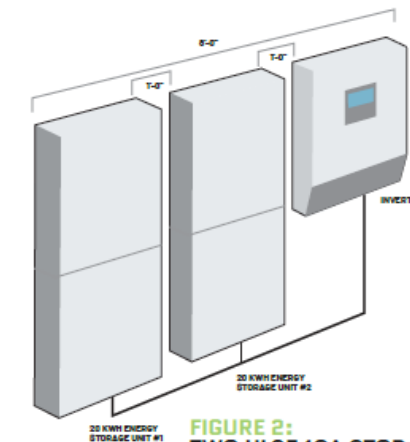
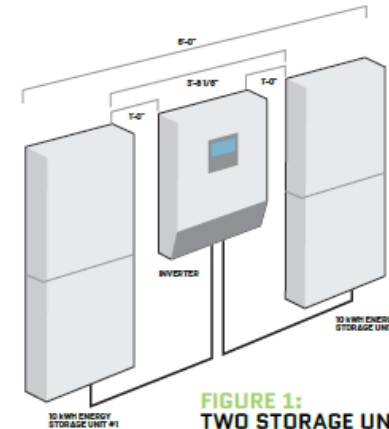
General Installation Guide

2017 Version Code References

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(2021 IRC R328.5)

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GENERAL INSTALLATION GUIDE



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**CERTIFIED
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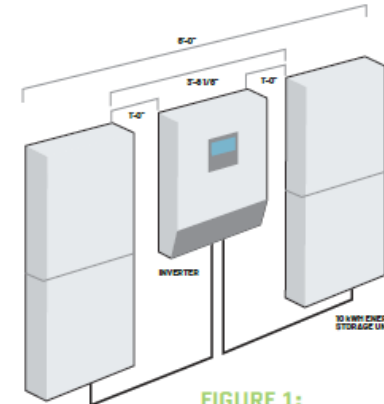
**SAFETY
TESTED
UL9540A**

General Installation Guide

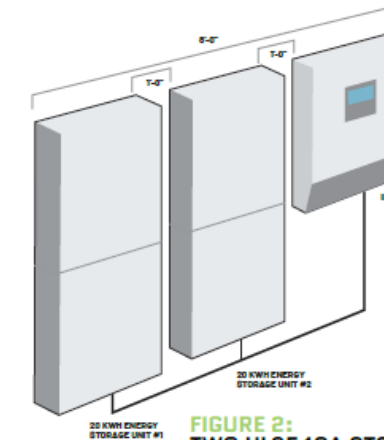
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GENERAL INSTALLATION GUIDE



**FIGURE 1:
TWO STORAGE UNITS
COMPLYING WITH 3
FOOT SEPARATION**



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TWO UL9540A STORAGE
UNITS COMPLYING
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FIGURE 3: LARGE SCALE FIRE TESTED LABEL

**CERTIFIED
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General Installation Guide

ESS Size Location Requirements

11. Each ESS unit meets one of the size and location limitations shown below: (IRC R328.4, IRC R328.5)

- a. 80 kWh in attached garages separated from the dwelling unit living space with 1/2" gypsum board between garages and residence or attics and 5/8" Type X gypsum between garage and habitable room above garage. If sheetrock rating of homes built under a code older than the 2009 IRC cannot be verified, sheetrock is installed to meet this requirement. (IRC R302.6)
- b. 80 kWh on exterior walls a minimum 3 feet (914 mm) from doors and windows directly entering the dwelling unit. There is no restriction on how close an ESS unit can be to windows or doors entering a garage because the garage is not considered part of the dwelling unit.
- c. 40 kWh within utility closets, basements, and storage or utility spaces with finished or noncombustible walls and ceilings. Walls and ceilings of unfinished wood-framed construction shall be provided with minimum 5/8" Type X gypsum.
- d. 80 kWh in detached garages and detached accessory structures.
- e. 80 kWh outdoors on the ground a minimum 3 feet from doors and windows directly entering the dwelling unit. There is no restriction on how close an ESS unit can be to windows or doors entering a garage because the garage is not considered part of the dwelling unit.



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12. ESS is protected from vehicular impact by one of the following: (IRC 328.8, IFC 1207.4.5, 312)
- a. Installed in a location not subject to vehicular impact such as on a side wall (area highlighted in yellow) or 4' above floor level, or
 - b. Protected by guard posts located 6 inches or more away from the ESS.
 - c. Protected by wheel barriers anchored in place located 4.5 feet or more away from the ESS.
 - d. Protected by other barriers where approved
13. Smoke alarms are installed in dwelling units and basements in which ESS is installed. (IRC R328.7, IRC R314)
14. For ESS installed in unconditioned indoor spaces such as dwelling units and attached garages that can exceed the temperature limits of smoke alarms (32°F-100°F), heat alarms are installed. (IRC R328.7)

General Installation Guide

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General Installation Guide

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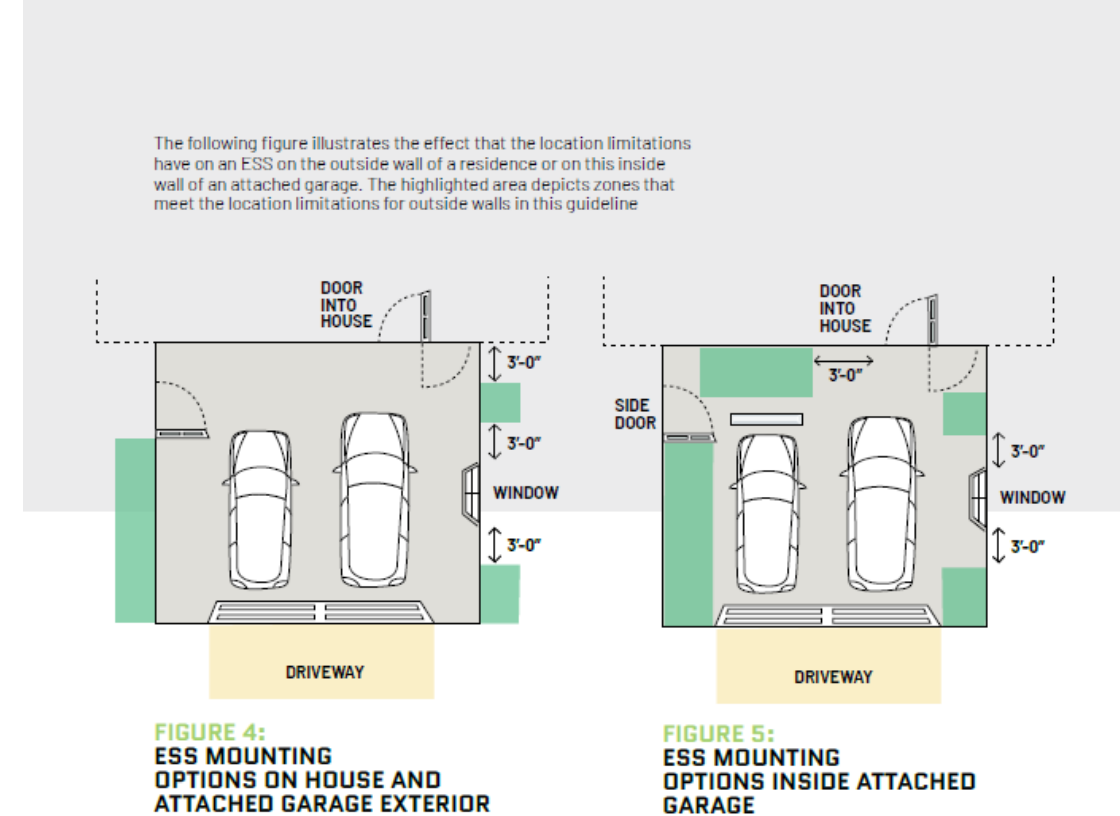
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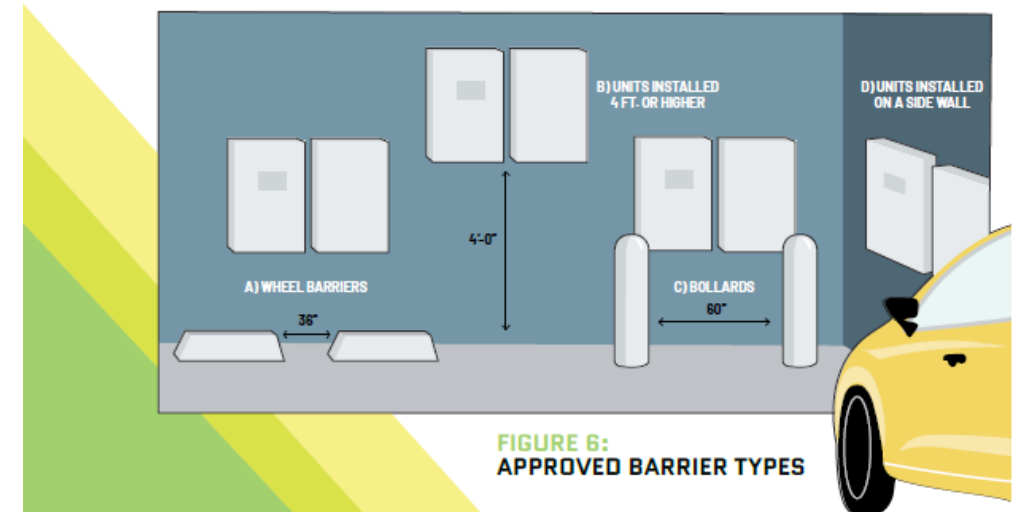
General Installation Guide

ESS Size Location

The following figure illustrates the effect that the location limitations have on an ESS on the outside wall of a residence or on this inside wall of an attached garage. The highlighted area depicts zones that meet the location limitations for outside walls in this guideline



Single Family Version

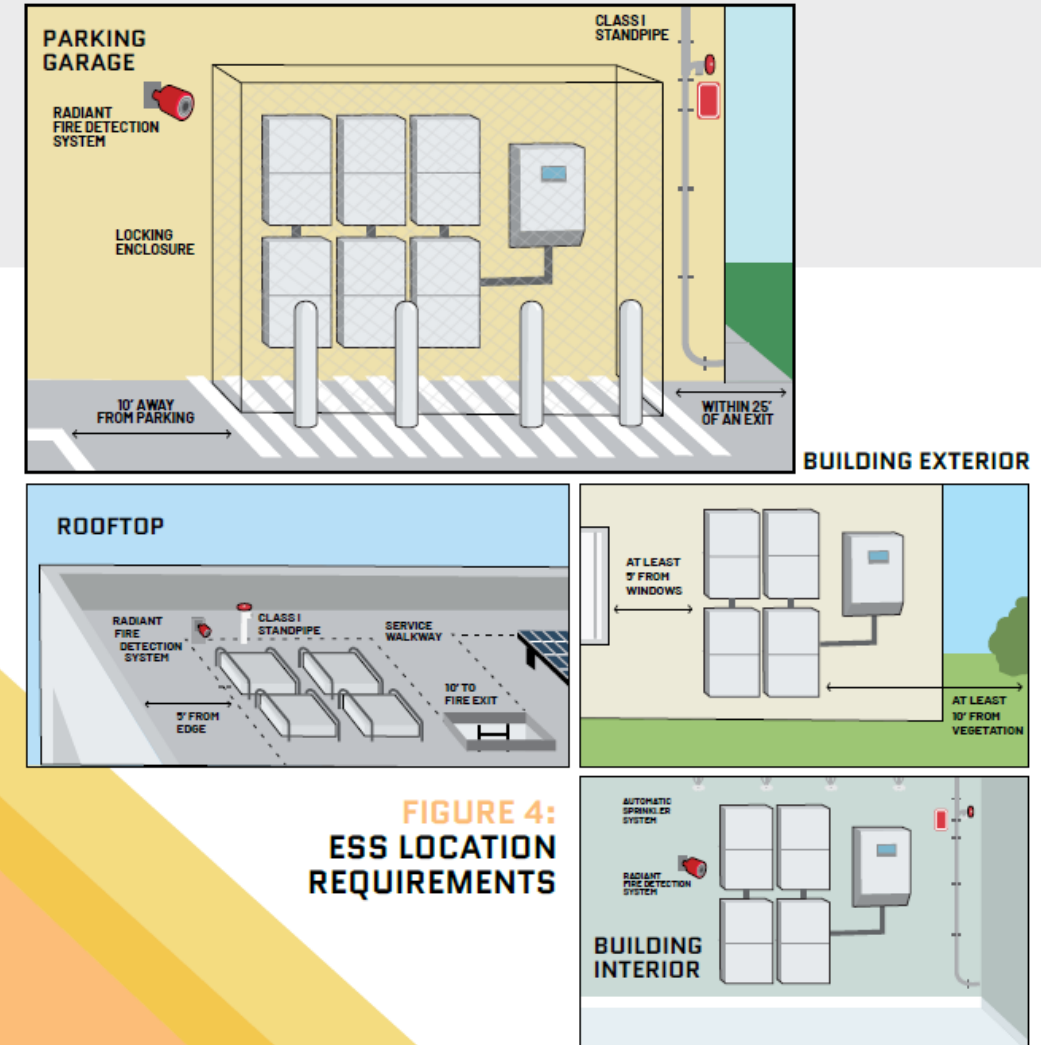


General Installation Guide

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General Installation Guide

Photovoltaic and Energy Storage System Interconnection Requirements

15. The inverter installation meets the requirements of one of the items below: (NEC 705)

B. Load-side connection complies with the following:

- a. Each source interconnection is made at a dedicated circuit breaker or fusible disconnecting means. (NEC 705.12 (A))
- b. The bus amp meet the 120% busbar rating allowance in a building. Table 2: AC 15 Interconnection Options below displays several AC Interconnection options. (NEC 705.12 (B))
- c. Equipment containing OCPD is marked to indicate the presence of all sources (705.12 (C))
- d. Fused disconnects is suitable for backfeed. Circuit breakers must either not be marked “line” or “load” or be specifically rated for backfeed. (705.12 (D))
- e. Circuit breakers backfed from power sources that are interactive do not need a fastener. (705.12 (E))



PHOTOVOLTAIC AND ENERGY STORAGE SYSTEM INTERCONNECTION REQUIREMENTS

15 The inverter installation meets the requirements of one of the items below: (NEC 705)

A. Supply-side connection complies with the following: (NEC 705.11)

- a. The sum of the power source continuous current output rating on a service does not exceed the capacity of the service conductors. (NEC 705.11(A))
- b. The power source output circuit conductors to the first OCPD device are no smaller than 6AWG copper and sized at 125% of maximum current or maximum current with adjustment and correction factors. (NEC 705.11(B), 705.28)
- c. Power source output circuit conductors are protected by an OCPD. (NEC 705.11(C), 705.30)
- d. When power source output circuit conductors make connection to service outside the building, OCPD are located in a readily accessible location outside the building or where the power source conductors enter the building. (NEC 705.11(C))
- e. When power source output circuit conductors make their connection to the service inside a building, OCPD are either within 10 feet of conductor length in dwelling units and 16.5 feet in other than dwelling units from the point of connection to the service or located within 71 feet of conductor length from the point of connection to service. (NEC 705.11(C))

B. Load-side connection complies with the following:

- a. Each source interconnection is made at a dedicated circuit breaker or fusible disconnecting means. (NEC 705.12(A))
- b. The bus amp meet the 120% busbar rating allowance in a building. Table 2: AC

Interconnection Options below displays several AC Interconnection options. (NEC 705.12 (B))

- c. Equipment containing OCPD is marked to indicate the presence of all sources (705.12 (C))
- d. Fused disconnects is suitable for backfeed. Circuit breakers must either not be marked “line” or “load” or be specifically rated for backfeed. (705.12 (D))
- e. Circuit breakers backfed from power sources that are interactive do not need a fastener. (705.12 (E))

C. Load-side Power Control Systems which use controls to prevent overcurrent of equipment are listed to UL1741 CRD shall comply with the following:

- a. Each source interconnection is made at a dedicated circuit breaker or fusible disconnecting means. (NEC 705.12 (A))
- b. The bus amp meet the 120% busbar rating allowance in a building. Table 2: AC Interconnection Options below displays several AC Interconnection options. (NEC 705.12 (B))
- c. Equipment containing OCPD is marked to indicate the presence of all sources (NEC 705.12 (C))
- d. Fused disconnects are suitable for backfeed. Circuit breakers must either not be marked “line” or “load” or be specifically rated for backfeed. (NEC 705.12 (D))
- e. Circuit breakers backfed from power sources that are interactive do not need a fastener. (NEC 705.12 (E))

D. Load-side distribution equipment listed to combine sources and supply loads.

Maximum Inverter Current	Required Inverter OCPD Size	Minimum Conductor Size (Copper) in Conduit	Minimum Busbar / Main Breaker Combinations Busbar Amps/Main Amps
64 Amps	80 Amps	4 AWG	400/400; 200/150
56 Amps	70 Amps	4 AWG	225/200; 250/225
48 Amps	60 Amps	6 AWG	300/300; 200/175
40 Amps	50 Amps	8 AWG	125/100; 150/125
32 Amps	40 Amps	8 AWG	225/225; 200/200; 150/125
24 Amps	30 Amps	10 AWG	150/150
16 Amps	20 Amps	12 AWG	100/100; 70/60
12 Amps	15 Amps	12 AWG	80/80

TABLE 1:
AC
INTERCONNECTION
OPTIONS

General Installation Guide

Photovoltaic and Energy Storage System Interconnection Requirements

15. The inverter installation meets the requirements of one of the items below: (NEC 705)

C. Load-side Power Control Systems which use controls to prevent overcurrent of equipment are listed to UL1741 CRD shall comply with the following:

- a. Each source interconnection is made at a dedicated circuit breaker or fusible disconnecting means. (NEC 705.12 (A))
- b. The bus amp meet the 120% busbar rating allowance in a building. Table 2: AC Interconnection Options below displays several AC Interconnection options. (NEC 705.12 (B))
- c. Equipment containing OCPD is marked to indicate the presence of all sources NEC 705.12(C))
- d. Fused disconnects are suitable for backfeed. Circuit breakers must either not be marked “line” or “load” or be specifically rated for backfeed. (NEC 705.12 (D))
- e. Circuit breakers backfed from power sources that are interactive do not need fastener. (NEC705.12 (E))

D. Load-side distribution equipment listed to combine sources and supply loads.



PHOTOVOLTAIC AND ENERGY STORAGE SYSTEM INTERCONNECTION REQUIREMENTS

15 The inverter installation meets the requirements of one of the items below: (NEC 705)

A. Supply-side connection complies with the following: (NEC 705.11)

- a. The sum of the power source continuous current output rating on a service does not exceed the capacity of the service conductors. (NEC 705.11(A))
- b. The power source output circuit conductors to the first OCPD device are no smaller than 6AWG copper and sized at 125% of maximum current or maximum current with adjustment and correction factors. (NEC 705.11(B), 705.28)
- c. Power source output circuit conductors are protected by an OCPD. (NEC 705.11(C), 705.30)
- d. When power source output circuit conductors make connection to service outside the building, OCPD are located in a readily accessible location outside the building or where the power source conductors enter the building. (NEC 705.11(C))
- e. When power source output circuit conductors make their connection to the service inside a building, OCPD are either within 10 feet of conductor length in dwelling units and 16.5 feet in other than dwelling units from the point of connection to the service or located within 71 feet of conductor length from the point of connection to service. (NEC 705.11(C))

B. Load-side connection complies with the following:

- a. Each source interconnection is made at a dedicated circuit breaker or fusible disconnecting means. (NEC 705.12 (A))
- b. The bus amp meet the 120% busbar rating allowance in a building. Table 2: AC

Interconnection Options below displays several AC Interconnection options. (NEC 705.12 (B))

- c. Equipment containing OCPD is marked to indicate the presence of all sources (705.12 (C))
- d. Fused disconnects is suitable for backfeed. Circuit breakers must either not be marked “line” or “load” or be specifically rated for backfeed. (705.12 (D))
- e. Circuit breakers backfed from power sources that are interactive do not need a fastener. (705.12 (E))

C. Load-side Power Control Systems which use controls to prevent overcurrent of equipment are listed to UL1741 CRD shall comply with the following:

- a. Each source interconnection is made at a dedicated circuit breaker or fusible disconnecting means. (NEC 705.12 (A))
- b. The bus amp meet the 120% busbar rating allowance in a building. Table 2: AC Interconnection Options below displays several AC Interconnection options. (NEC 705.12 (B))
- c. Equipment containing OCPD is marked to indicate the presence of all sources (NEC 705.12 (C))
- d. Fused disconnects are suitable for backfeed. Circuit breakers must either not be marked “line” or “load” or be specifically rated for backfeed. (NEC 705.12 (D))
- e. Circuit breakers backfed from power sources that are interactive do not need a fastener. (NEC 705.12 (E))

D. Load-side distribution equipment listed to combine sources and supply loads.

Maximum Inverter Current	Required Inverter OCPD Size	Minimum Conductor Size (Copper) in Conduit	Minimum Busbar / Main Breaker Combinations Busbar Amps/Main Amps
64 Amps	80 Amps	4 AWG	400/400; 200/150
56 Amps	70 Amps	4 AWG	225/200; 250/225
48 Amps	60 Amps	6 AWG	300/300; 200/175
40 Amps	50 Amps	8 AWG	125/100; 150/125
32 Amps	40 Amps	8 AWG	225/225; 200/200; 150/125
24 Amps	30 Amps	10 AWG	150/150
16 Amps	20 Amps	12 AWG	100/100; 70/60
12 Amps	15 Amps	12 AWG	80/80

TABLE 1:
AC
INTERCONNECTION
OPTIONS

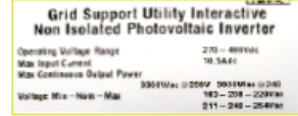

General Installation Guide

PV Electrical Code Installation Requirements

16. All work done in a neat and workmanlike manner. (NEC 110.12)
17. Access and working space is provided for PV equipment such as inverters, disconnecting means, and panelboards (not required for PV modules). (NEC 110.26)
18. Exposed cables are properly secured, supported, and routed to prevent physical damage.
19. Grounding/bonding of rack, modules, inverter(s), and other electrical equipment according to the manufacturer's instructions. (NEC 110.3(B))
20. PV system markings, labels, and signs according to the NEC. (NEC 690.13(B), 690.53, 690.54, 690.56)
21. Major electrical components including PV modules, DC-to-DC converters, and inverters, are identified for use in PV systems.
22. Inverters are listed as utility interactive in accordance with UL 1741.
23. PV panel systems and array mounting system are listed and identified with a fire classification in accordance with UL 2703. (NEC 690.43 (A))
24. PV Modules are listed as UL 1703, UL 61730-1, or UL 61730-2. (NEC 690.4(B))
25. The PV array consists of no more than 2 series strings per inverter input and no more than 4 source circuit strings in total per inverter.



PV SYSTEM ELECTRICAL CODE INSTALLATION REQUIREMENTS

- 16 All work done in a neat and workmanlike manner. (NEC 110.12)
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- 22 Inverters are listed as utility interactive in accordance with UL 1741.

- 23 PV panel systems and array mounting system are listed and identified with a fire classification in accordance with UL 2703. (NEC 690.43 (A), IBC 1505.9)

- 24 PV Modules are listed as UL 1703, UL 61730-1, or UL 61730-2. (NEC 690.4(B))
- 25 The PV array consists of no more than 2 series strings per inverter input and no more than 4 source circuit strings in total per inverter.
- 26 All exposed PV source circuit wiring is a minimum 10 AWG copper PV wire. (NEC 690.31)
- 27 The maximum PV DC system voltage for a multifamily or office building is limited to 600Vdc. Use either the checklist shown below or methods described in 690.7(A)(1) or 690.7(A)(3) to ensure the system is designed and connected so that 600Vdc is not exceeded on the average coldest day of the year. (NEC 690.7)
 - a. ASHRAE Extreme Annual Mean Minimum Design Dry Bulb Temperature (one source is <https://energyresearch.ucf.edu/solar-certification/solar-reference-map/>) = _____; Table 690.7(A) (NEC) value _____
 - b. Max module Voc (adjusted at minimum temperature):
Rated Voc _____ V x Table 690.7(A) value = _____ V
 - c. DC-to-DC converter(s) or microinverter rated maximum input voltage: _____ V (must be greater than Max module Voc in (b.))
 - d. Maximum number of DC-to-DC converters allowed in series (up to 600Vdc*): _____
 - e. Maximum number of DC-to-DC converters allowed in series (up to 600Vdc*): _____
 - f. Inverter(s) rated maximum input voltage: _____ V (must be greater than g. below)
 - g. Inverter input max V: Max module Voc (b.) _____ V x max # in series = _____ V
- 28 PV system circuits on buildings meet requirements for controlled conductors.
 - a. Controlled conductors more than one foot from the array are capable of being shutdown to below 30 volts within 30 seconds
 - b. PV array wiring within the array are either listed to the PV Hazard Control product safety standard (UL3741) or limited to not more than 80 volts within 30 seconds of rapid shutdown initiation. (NEC 690.12)
- 29 The PV System disconnecting means is sized for the maximum short circuit current and voltage and installed in a readily accessible location. (NEC 690.13(A))

General Installation Guide

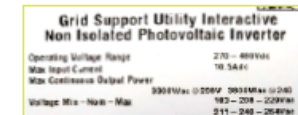
PV Electrical Code Installation Requirements

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- b. Max module Voc (adjusted at minimum temperature): Rated Voc _____ V x Table 690.7(A) value = _____ V
- c. DC-to-DC converter(s) or microinverter rated maximum input voltage: _____ V (must be greater than Max module Voc in (b.))
- d. Maximum number of DC-to-DC converters allowed in series (up to 600Vdc*): _____
- e. Maximum number of DC-to-DC converters allowed in series (up to 600Vdc*): _____
- f. Inverter(s) rated maximum input voltage: _____ V (must be greater than g. below)
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PV SYSTEM ELECTRICAL CODE INSTALLATION REQUIREMENTS

- 16 All work done in a neat and workmanlike manner. (NEC 110.12)
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- 19 Grounding/bonding of rack, modules, inverter(s), and other electrical equipment according to the manufacturer's instructions. (NEC 110.3(B))
- 20 PV system markings, labels, and signs according to the NEC. (NEC 690.13(B), 690.53, 690.54, 690.56)
- 21 Major electrical components including PV modules, DC-to-DC converters, and inverters, are identified for use in PV systems.
- 22 Inverters are listed as utility interactive in accordance with UL 1741.
- 23 PV panel systems and array mounting system are listed and identified with a fire classification in accordance with UL 2703. (NEC 690.43 (A), IBC 1505.9)
- 24 PV Modules are listed as UL 1703, UL 61730-1, or UL 61730-2. (NEC 690.4(B))
- 25 The PV array consists of no more than 2 series strings per inverter input and no more than 4 source circuits strings in total per inverter.
- 26 All exposed PV source circuit wiring is a minimum 10 AWG copper PV wire. (NEC 690.31)
- 27 The maximum PV DC system voltage for a multifamily or office building is limited to 600Vdc. Use either the checklist shown below or methods described in 690.7(A)(1) or 690.7(A)(3) to ensure the system is designed and connected so that 600Vdc is not exceeded on the average coldest day of the year. (NEC 690.7)
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- b. Max module Voc (adjusted at minimum temperature): Rated Voc _____ V x Table 690.7(A) value = _____ V
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- d. Maximum number of DC-to-DC converters allowed in series (up to 600Vdc*): _____
- e. Maximum number of DC-to-DC converters allowed in series (up to 600Vdc*): _____
- f. Inverter(s) rated maximum input voltage: _____ V (must be greater than g. below)
- g. Inverter input max V: Max module Voc (b.) _____ V x max # in series = _____ V
- 28 PV system circuits on buildings meet requirements for controlled conductors.
- a. Controlled conductors more than one foot from the array are capable of being shutdown to below 30 volts within 30 seconds
- b. PV array wiring within the array are either listed to the PV Hazard Control product safety standard (UL3741) or limited to not more than 80 volts within 30 seconds of rapid shutdown initiation. (NEC 690.12)
- 29 The PV System disconnecting means is sized for the maximum short circuit current and voltage and installed in a readily accessible location. (NEC 690.13(A))



**FIGURE 7:
UTILITY
INTERACTIVE
INVERTER
LISTING**



**FIGURE 8:
UL2703
LISTED
GROUNDING
DEVICE**

General Installation Guide

PV Electrical Code Installation Requirements

28. PV system circuits on buildings meet requirements for controlled conductors.
- Controlled conductors more than one foot from the array are capable of being shutdown to below 30 volts within 30 seconds
 - PV array wiring within the array are either listed to the PV Hazard Control product safety standard (UL3741) or limited to not more than 80 volts within 30 seconds of rapid shutdown initiation. (NEC 690.12)
29. The PV System disconnecting means is sized for the maximum short circuit current and voltage and installed in a readily accessible location. (NEC 690.13(A))



PV SYSTEM ELECTRICAL CODE INSTALLATION REQUIREMENTS

- 16** All work done in a neat and workmanlike manner. (NEC 110.12)
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- 24** PV Modules are listed as UL 1703, UL 61730-1, or UL 61730-2. (NEC 690.4(B))
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- 26** All exposed PV source circuit wiring is a minimum 10 AWG copper PV wire. (NEC 690.31)
- 27** The maximum PV DC system voltage for a multifamily or office building is limited to 600Vdc. Use either the checklist shown below or methods described in 690.7(A)(1) or 690.7(A)(3) to ensure the system is designed and connected so that 600Vdc is not exceeded on the average coldest day of the year. (NEC 690.7)
- ASHRAE Extreme Annual Mean Minimum Design Dry Bulb Temperature (one source is <https://energyresearch.ucf.edu/solar-certification/solar-reference-map/>) = ; Table 690.7(A) (NEC) value
 - Max module Voc (adjusted at minimum temperature):
Rated Voc V x Table 690.7(A) value = V
 - DC-to-DC converter(s) or microinverter rated maximum input voltage: V (must be greater than Max module Voc in (b.))
 - Maximum number of DC-to-DC converters allowed in series (up to 600Vdc*):
 - Maximum number of DC-to-DC converters allowed in series (up to 600Vdc*):
 - Inverter(s) rated maximum input voltage: V (must be greater than g. below)
 - Inverter input max V: Max module Voc (b.) V x max # in series = V
- 28** PV system circuits on buildings meet requirements for controlled conductors.
- Controlled conductors more than one foot from the array are capable of being shutdown to below 30 volts within 30 seconds
 - PV array wiring within the array are either listed to the PV Hazard Control product safety standard (UL3741) or limited to not more than 80 volts within 30 seconds of rapid shutdown initiation. (NEC 690.12)
- 29** The PV System disconnecting means is sized for the maximum short circuit current and voltage and installed in a readily accessible location. (NEC 690.13(A))

Grid Support Utility Interactive Non Isolated Photovoltaic Inverter	
Operating Voltage Range	270 – 600Vdc
Max Input Current	10.5A
Max Continuous Output Power	3000Wdc @ 200V, 3000WdcMax @ 240V
Voltage Min – Nom – Max	160 – 208 – 209VAC 211 – 240 – 250VAC

**FIGURE 7:
UTILITY
INTERACTIVE
INVERTER
LISTING**



**FIGURE 8:
UL2703
LISTED
GROUNDING
DEVICE**

General Installation Guide

Structural PV Array Mounting & Installation Location Requirements

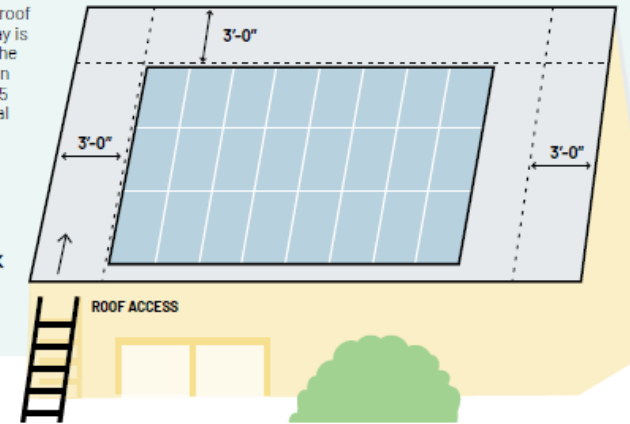
30. PV arrays are located to meet the IRC fire setback and access pathway requirements. At least two pathways not less than 3 feet wide are provided on separate roof planes from lowest roof edge to ridge. At least one pathway is on the street or driveway side of the roof. PV arrays occupying less than 1/3 of the roof area are set back 1.5 feet on both sides of the horizontal ridge. PV arrays occupying more than 1/3 of the roof area have a 3 foot setback on both sides of a horizontal ridge. (IRC 324.6)



STRUCTURAL PV ARRAY MOUNTING AND INSTALLATION LOCATION REQUIREMENTS

- 30 PV arrays are located to meet the IRC fire setback and access pathway requirements. At least two pathways not less than 3 feet wide are provided on separate roof planes from lowest roof edge to ridge. At least one pathway is on the street or driveway side of the roof. PV arrays occupying less than 1/3 of the roof area are set back 1.5 feet on both sides of the horizontal ridge. PV arrays occupying more than 1/3 of the roof area have a 3 foot setback on both sides of a horizontal ridge. (IRC 324.6)

FIGURE 9:
SITE PLAN WITH FIRE SETBACK
AND ACCESS PATHWAY
REQUIREMENTS DETAILED



- 31 The weight of the PV system is 4 lbs/square foot or less.
- 32 The attachment points of the mounting system are either staggered or installed in a low snow load (10 psf or less) and low wind load (120 mph or less) location.
- 33 Roof penetrations flashed/sealed according to the approved plan and manufacturers' instructions. (NEC 110.3(B))
- 34 The maximum spacing in inches between adjacent attachment points of the mounting system is either 2 feet or less or no larger than 6 feet in a low snow load (10 psf or less) and low wind load (120 mph or less) location.
- 35 The array is on a single roof face. If no check, how many roof surfaces at different slopes and/or orientations will be used for installation? The PV array is flush mounted (parallel to roof) or the maximum distance off the roof is no greater than 10'.
- 36 The solar module and mounting system rated by the manufacturer to withstand the upward force of the local wind speed and evenly distribute load into the supporting structure at the proposed maximum spacing, and confirmed in UL 1703 or 61730, and 2703 listings.
- 37 The individual roof structure appears to be structurally sound, without signs of alterations or significant structural deterioration or sagging. There are no visually apparent disallowed rafter holes, notches or truss modifications, no visually apparent structural decay or unrepaired fire damage. Roof sag, measured in inches is not more than the rafter or ridge beam length in feet divided by 20.
- 38 What is the roof covering material? Click or tap here to enter text. Standing seam metal roofs are limited to a design snow load of no greater than 15 psf.
- 39 What is the slope of the roof. If multiple roof faces are used that have different slopes, each slope should be recorded here?

General Installation Guide

Structural PV Array Mounting & Installation Location Requirements

- 31. The weight of the PV system is 4 lbs/square foot or less.
- 32. The attachment points of the mounting system are either staggered or installed in a low snow load (10 psf or less) and low wind load (120 mph or less) location.
- 33. Roof penetrations flashed/sealed according to the approved plan and manufacturers' instructions. (NEC 110.3(B))
- 34. The maximum spacing in inches between adjacent attachment points of the mounting system is either 2 feet or less or no larger than 6 feet in a low snow load (10 psf or less) and low wind load (120 mph or less) location.
- 35. The array is on a single roof face. If no check, how many roof surfaces at different slopes and/ or orientations will be used for installation? The PV array is flush mounted (parallel to roof) or the maximum distance off the roof is no greater than 10".



STRUCTURAL PV ARRAY MOUNTING AND INSTALLATION LOCATION REQUIREMENTS

- 30 PV arrays are located to meet the IRC fire setback and access pathway requirements. At least two pathways not less than 3 feet wide are provided on separate roof planes from lowest roof edge to ridge. At least one pathway is on the street or driveway side of the roof. PV arrays occupying less than 1/3 of the roof area are set back 1.5 feet on both sides of the horizontal ridge. PV arrays occupying more than 1/3 of the roof area have a 3 foot setback on both sides of a horizontal ridge. (IRC 324.6)

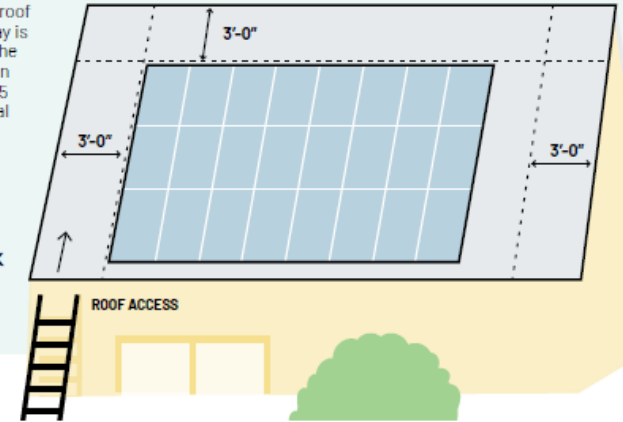


FIGURE 9:
SITE PLAN WITH FIRE SETBACK
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REQUIREMENTS DETAILED

- 31 The weight of the PV system is 4 lbs/square foot or less.
- 32 The attachment points of the mounting system are either staggered or installed in a low snow load (10 psf or less) and low wind load (120 mph or less) location.
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- 36 The solar module and mounting system rated by the manufacturer to withstand the upward force of the local wind speed and evenly distribute load into the supporting structure at the proposed maximum spacing, and confirmed in UL 1703 or 61730, and 2703 listings.
- 37 The individual roof structure appears to be structurally sound, without signs of alterations or significant structural deterioration or sagging. There are no visually apparent disallowed rafter holes, notches or truss modifications, no visually apparent structural decay or unrepaired fire damage. Roof sag, measured in inches is not more than the rafter or ridge beam length in feet divided by 20.
- 38 What is the roof covering material? Click or tap here to enter text. Standing seam metal roofs are limited to a design snow load of no greater than 15 psf.
- 39 What is the slope of the roof. If multiple roof faces are used that have different slopes, each slope should be recorded here?

General Installation Guide

Structural PV Array Mounting & Installation Location Requirements

36. The solar module and mounting system rated by the manufacturer to withstand the upward force of the local wind speed and evenly distribute load into the supporting structure at the proposed maximum spacing, and confirmed in UL 1703 or 61730, and 2703 listings.
37. The individual roof structure appears to be structurally sound, without signs of alterations or significant structural deterioration or sagging. There are no visually apparent disallowed rafter holes, notches or truss modifications, no visually apparent structural decay or unrepaired fire damage. Roof sag, measured in inches is not more than the rafter or ridge beam length in feet divided by 20.
38. What is the roof covering material? Click or tap here to enter text. Standing seam metal roofs are limited to a design snow load of no greater than 15 psf.
39. What is the slope of the roof. If multiple roof faces are used that have different slopes, each slope should be recorded here?

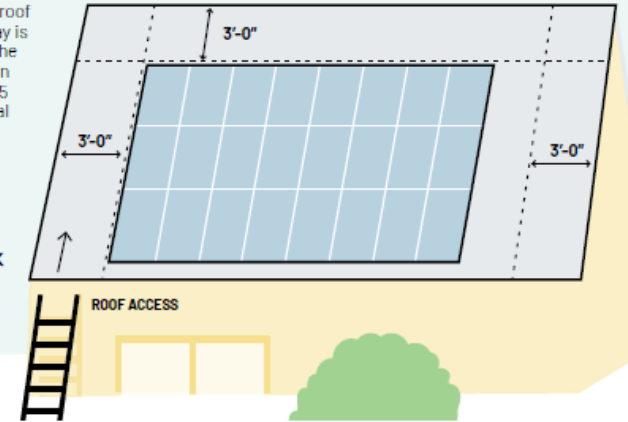
Single Family Version



STRUCTURAL PV ARRAY MOUNTING AND INSTALLATION LOCATION REQUIREMENTS

- 30 PV arrays are located to meet the IRC fire setback and access pathway requirements. At least two pathways not less than 3 feet wide are provided on separate roof planes from lowest roof edge to ridge. At least one pathway is on the street or driveway side of the roof. PV arrays occupying less than 1/3 of the roof area are set back 1.5 feet on both sides of the horizontal ridge. PV arrays occupying more than 1/3 of the roof area have a 3 foot setback on both sides of a horizontal ridge. (IRC 324.6)

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SITE PLAN WITH FIRE SETBACK
AND ACCESS PATHWAY
REQUIREMENTS DETAILED



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- 33 Roof penetrations flashed/sealed according to the approved plan and manufacturers' instructions. (NEC 110.3(B))
- 34 The maximum spacing in inches between adjacent attachment points of the mounting system is either 2 feet or less or no larger than 6 feet in a low snow load (10 psf or less) and low wind load (120 mph or less) location.
- 35 The array is on a single roof face. If no check, how many roof surfaces at different slopes and/or orientations will be used for installation? The PV array is flush mounted (parallel to roof) or the maximum distance off the roof is no greater than 10'.
- 36 The solar module and mounting system rated by the manufacturer to withstand the upward force of the local wind speed and evenly distribute load into the supporting structure at the proposed maximum spacing, and confirmed in UL 1703 or 61730, and 2703 listings.
- 37 The individual roof structure appears to be structurally sound, without signs of alterations or significant structural deterioration or sagging. There are no visually apparent disallowed rafter holes, notches or truss modifications, no visually apparent structural decay or unrepaired fire damage. Roof sag, measured in inches is not more than the rafter or ridge beam length in feet divided by 20.
- 38 What is the roof covering material? Click or tap here to enter text. Standing seam metal roofs are limited to a design snow load of no greater than 15 psf.
- 39 What is the slope of the roof. If multiple roof faces are used that have different slopes, each slope should be recorded here?

General Installation Guide

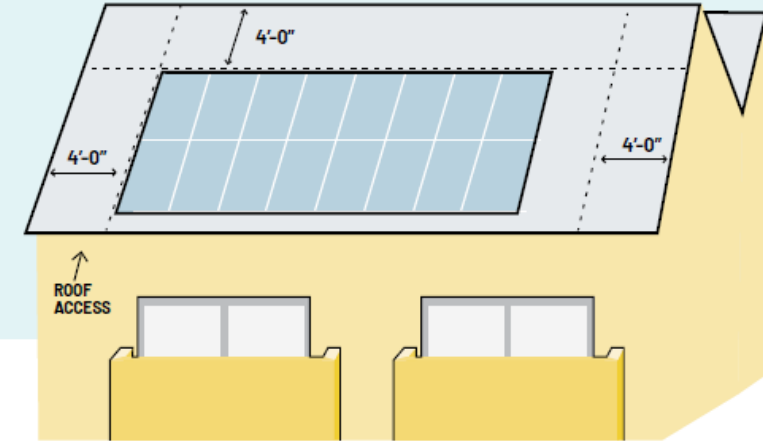
Structural PV Array Mounting & Installation Location Requirements

32. PV arrays are located to meet the fire setback and access pathway requirements: (IFC 1205.3.1 IFC 1205.3.2)
- a. There is a 4-foot wide clear perimeter around the edges of the roof for building sides less than 250 feet. For building sides equal to or larger than 250 feet, 6-foot wide clear perimeter pathways are required.
 - b. Interior pathways are provided at intervals not greater than 150 feet throughout the length and width of the roof.
 - c. A pathway at least 4 feet wide is provided in a straight line to roof standpipes or ventilation hatches.
 - d. A pathway at least 4 feet wide is provided around roof access hatches, with at least one pathway to a parapet or roof edge.
33. Roof structures are designed to resist the applicable uniform concentrated roof live loads with PV panel dead loads and with PV panels present. Roof live loads do not need to be applied if the space between the panels and the roof surface is 2 feet or less. (IBC 1607.14.4.1)



STRUCTURAL PV ARRAY MOUNTING AND INSTALLATION LOCATION REQUIREMENTS

FIGURE 8:
SITE PLAN WITH
FIRE SETBACK AND
ACCESS PATHWAY
REQUIREMENTS
DETAILED



- 32** PV arrays are located to meet the fire setback and access pathway requirements: (IFC 1205.3.1 IFC 1205.3.2)
- a. There is a 4-foot wide clear perimeter around the edges of the roof for building sides less than 250 feet. For building sides equal to or larger than 250 feet, 6-foot wide clear perimeter pathways are required.
 - b. Interior pathways are provided at intervals not greater than 150 feet throughout the length and width of the roof.
 - c. A pathway at least 4 feet wide is provided in a straight line to roof standpipes or ventilation hatches.
 - d. A pathway at least 4 feet wide is provided around roof access hatches, with at least one pathway to a parapet or roof edge.
- 33** Roof structures are designed to resist the applicable uniform concentrated roof live loads with PV panel dead loads and with PV panels present. Roof live loads do not need to be applied if the space between the panels and the roof surface is 2 feet or less. (IBC 1607.14.4.1)
- 34** The roof structure is designed to accommodate PV panels or modules and ballast dead load, including concentrated loads from support frames, roof live loads, snow drift loads created by PV panels and modules if applicable, and other applicable loads. (IBC 1607.14.4.2)
- 35** Roof penetrations flashed/sealed according to manufacturers' instructions. (NEC 110.3(B))

General Installation Guide

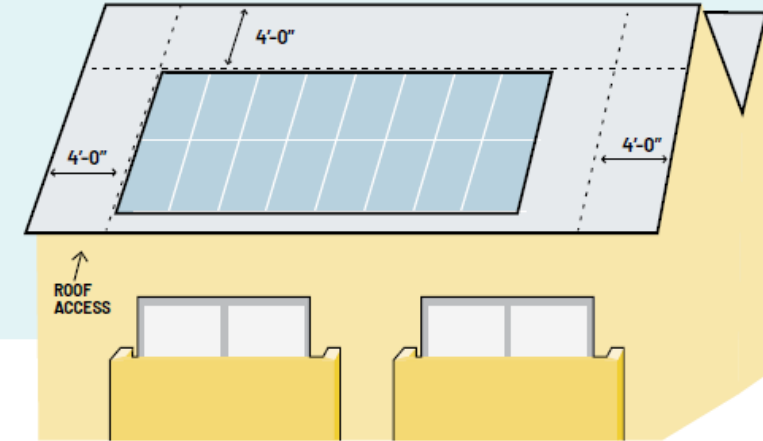
Structural PV Array Mounting & Installation Location Requirements

- 34. The roof structure is designed to accommodate PV panels or modules and ballast dead load, including concentrated loads from support frames, roof live loads, snow drift loads created by PV panels and modules if applicable, and other applicable loads. (IBC 1607.14.4.2)
- 35. Roof penetrations flashed/sealed according to manufacturers' instructions. (NEC 110.3(B))



STRUCTURAL PV ARRAY MOUNTING AND INSTALLATION LOCATION REQUIREMENTS

FIGURE 9:
SITE PLAN WITH
FIRE SETBACK AND
ACCESS PATHWAY
REQUIREMENTS
DETAILED



- 32** PV arrays are located to meet the fire setback and access pathway requirements: (IFC 1205.3.1 IFC 1205.3.2)
 - a. There is a 4-foot wide clear perimeter around the edges of the roof for building sides less than 250 feet. For building sides equal to or larger than 250 feet, 6-foot wide clear perimeter pathways are required.
 - b. Interior pathways are provided at intervals not greater than 150 feet throughout the length and width of the roof.
 - c. A pathway at least 4 feet wide is provided in a straight line to roof standpipes or ventilation hatches.
 - d. A pathway at least 4 feet wide is provided around roof access hatches, with at least one pathway to a parapet or roof edge.
- 33** Roof structures are designed to resist the applicable uniform concentrated roof live loads with PV panel dead loads and with PV panels present. Roof live loads do not need to be applied if the space between the panels and the roof surface is 2 feet or less. (IBC 1607.14.4.1)
- 34** The roof structure is designed to accommodate PV panels or modules and ballast dead load, including concentrated loads from support frames, roof live loads, snow drift loads created by PV panels and modules if applicable, and other applicable loads. (IBC 1607.14.4.2)
- 35** Roof penetrations flashed/sealed according to manufacturers' instructions. (NEC 110.3(B))

Plan Review Checklist



PLAN REVIEW CHECKLIST



ENERGY STORAGE SYSTEM REQUIREMENTS

- ☐ 1 ESS is listed to UL9540 or UL9540a by a Nationally Recognized Testing Laboratory (NRTL).
- ☐ 2 ESS is listed to UL1973.
- ☐ 3 Inverters are certified to UL1741.



ENERGY STORAGE SYSTEM INSTALLATION REQUIREMENTS

- ☐ 4 The individual ESS units are no larger than 20kWh.
- ☐ 5 ESS units that are UL9540 certified are separated by 3 feet.
- ☐ 6 Energy Storage Systems that are UL9540a certified are grouped and separated according to manufacturer instructions.



ENERGY STORAGE SYSTEM SIZE AND LOCATION REQUIREMENTS

- ☐ 7 Each ESS unit meets one of the size and location limitations shown below: (IRC R328.4, IRC R328.5)
 - a. 80 kWh in attached garages separated from the dwelling unit living space with ½" gypsum board between garages and residence or attics and 5/8" Type X gypsum between garage and habitable room above garage. If sheetrock rating of homes built under a code older than the 2009 IRC cannot be verified, sheetrock is installed to meet this requirement.
 - b. 80 kWh on exterior walls a minimum 3 feet (914 mm) from doors and windows directly entering the dwelling unit. There is no restriction on how close an ESS unit can be to windows or doors entering a garage because the garage is not considered part of the dwelling unit.
 - c. 40 kWh within utility closets, basements, and storage or utility spaces with finished or noncombustible walls and ceilings. Walls and ceilings of unfinished wood-framed construction shall be provided with minimum 5/8" Type X gypsum.
 - d. 80 kWh in detached garages and detached accessory structures.
 - e. 80 kWh outdoors on the ground a minimum 3 feet from doors and windows directly entering the dwelling unit. There is no restriction on how close an ESS unit can be to windows or doors entering a garage because the garage is not considered part of the dwelling unit.
- ☐ 8 ESS is protected from vehicular impact by one of the following:
 - a. Installed in a location not subject to vehicular impact such as on a side wall or 4' above floor level, or
 - b. Protected by guard posts located 6 inches or more away from the ESS.
 - c. Protected by wheel barriers anchored in place located 4.5 feet or more away from the ESS.
 - d. Protected by other barriers where approved
- ☐ 9 Smoke alarms are installed in dwelling units and basements in which ESS is installed.
- ☐ 10 For ESS installed in unconditioned indoor spaces such as dwelling units and attached garages that can exceed the temperature limits of smoke alarms (32°F-100°F), heat alarms are installed.



PHOTOVOLTAIC AND ENERGY STORAGE SYSTEM INTERCONNECTION REQUIREMENTS

- ☐ 11 The inverter installation meets the requirements of one of the items below:
 - a. Supply-side connection complies with power source continuous output rating, conductor size, over current protection, connection, and ground fault requirements in NEC 705.11.
 - b. Load-side connection complies with 705.12 and can meet the 120% busbar rating allowance in a residence.
 - c. Load-side Power Control Systems which use controls to prevent overcurrent of equipment are listed to UL1741 CRD and comply with monitoring, setting, overcurrent protection, single power source ratings, and access requirements in NEC 705.13.
 - d. Load-side distribution equipment listed to combine sources and supply loads.



PV SYSTEM ELECTRICAL CODE INSTALLATION REQUIREMENTS

- ☐ 12 Major electrical components including PV modules, DC-to-DC converters, and inverters, are identified for use in PV systems.
- ☐ 13 Inverters are listed as utility interactive in accordance with UL 1741.
- ☐ 14 PV Modules are listed as UL 1703, UL 61730-1, or UL 61730-2.
- ☐ 15 PV panel systems and array mounting system are listed and identified with a fire classification in accordance with UL 2703.
- ☐ 16 The PV array consists of no more than 2 series strings per inverter input and no more than 4 source circuits strings in total per inverter.
- ☐ 17 All exposed PV source circuit wiring is a minimum 10 AWG copper PV wire.
- ☐ 18 The maximum PV DC system voltage for a multifamily or office building is limited to 600Vdc. Use either the checklist shown the general installation guide or methods described in 690.7(A)(1) or 690.7(A)(3) to ensure the system is designed and connected so that 600Vdc is not exceeded on the average coldest day of the year.
- ☐ 19 PV system circuits on buildings meet requirements for controlled conductors.
 - a. Controlled conductors more than one foot from the array are capable of being shutdown to below 30 volts within 30 seconds
 - b. PV array wiring within the array is either listed to the PV Hazard Control product safety standard (UL3741) or limited to not more than 80 volts within 30 seconds of rapid shutdown initiation.
- ☐ 20 The PV System disconnecting means is sized for the maximum short circuit current and voltage and installed in a readily accessible location.



STRUCTURAL PV ARRAY MOUNTING AND INSTALLATION LOCATION REQUIREMENTS

- ☐ 21 PV arrays are located to meet the IRC fire setback and access pathway requirements. At least two pathways not less than 3 feet wide are provided on separate roof planes from lowest roof edge to ridge. At least one pathway is on the street or driveway side of the roof. PV arrays occupying less than 1/3 of the roof area are set back 1.5 feet on both sides of the horizontal ridge. PV arrays occupying more than 1/3 of the roof area have a 3 foot setback on both sides of a horizontal ridge.
- ☐ 22 The weight of the PV system is 4 lbs/square foot or less.
- ☐ 23 The attachment points of the mounting system are either staggered or installed in a low snow load (10 psf or less) and low wind load (120 mph or less) location.
- ☐ 24 The maximum spacing in inches between adjacent attachment points of the mounting system is either 2 feet or less or no larger than 6 feet in a low snow load (10 psf or less) and low wind load (120 mph or less) location.
- ☐ 25 The array is on a single roof face. If no check, how many roof surfaces at different slopes and/or orientations will be used for installation
- ☐ 26 The PV array is flush mounted (parallel to roof) or the maximum distance off the roof is no greater than 10".
- ☐ 27 The solar module and mounting system rated by the manufacturer to withstand the upward force of the local wind speed and evenly distribute load into the supporting structure at the proposed maximum spacing, and confirmed in UL 1703 or 61730, and 2703 listings.
- ☐ 28 The individual roof structure appears to be structurally sound, without signs of alterations or significant structural deterioration or sagging. There are no visually apparent disallowed rafter holes, notches or truss modifications, no visually apparent structural decay or unrepaired fire damage. Roof sag, measured in inches is not more than the rafter or ridge beam length in feet divided by 20.
- ☐ 29 What is the roof covering material? Standing seam metal roofs are limited to a design snow load of no greater than 15 psf.
- ☐ 30 What is the slope of the roof? If multiple roof faces are used that have different slopes, each slope should be recorded here

Field Inspection Checklist



FIELD INSPECTION CHECKLIST



HELPFUL TIP

Numbers that correspond to the requirement in the permitting checklist are provided next to the same requirement in the field inspection checklist.



ENERGY STORAGE SYSTEM REQUIREMENTS

Make sure all ESS disconnects and circuit breakers are in the open position and verify the following:

- ☐ 1 All work done in a neat and workmanlike manner (NEC 110.12).
- ☐ 2 Equipment installed, listed, and labeled according to the approved plan and manufacturers' instructions (e.g., ESS units, battery units, inverters, disconnects). (1-3)
- ☐ 3 ESS equipment model numbers, quantity, and location according to the approved plan. (see PV+ESS general installation guideline for additional information)
 - a. ESS units no greater than 20 kWh each. (4)
 - b. ESS units have either 3 foot spacing between units or ESS unit is UL9540a listed and manufacturer spacing requirements are followed. A 3 foot space between unit and doors or windows entering the dwelling unit are required. (5, 6)
 - c. ESS maximums are followed (40 kWh inside dwelling or 80 kWh in garage and elsewhere) (7)
- ☐ 4 Access and working space for ESS equipment such as ESS units, battery units, inverters, disconnecting means, and panelboards is adequate. Working space is at least 30 inches in width, 6.5 feet in height and 4 feet in depth or the width, height and depth of the equipment, whichever is greater.
- ☐ 5 Grounding/bonding of ESS units, battery units, inverters, conduit and other electrical equipment according to the NEC and manufacturer's instructions.
- ☐ 6 Conduit and other wiring methods installation according to the NEC and the approved plan. (11)
- ☐ 7 Conductors, cables, and conduit types, sizes, and markings according to the approved plan. (11)
- ☐ 8 Overcurrent devices are the type and size according to the approved plan. (11)
- ☐ 9 Disconnects according to the approved plan and properly located as required by the NEC. (11)
- ☐ 10 For grid-connected systems, documentation is provided to show that ESS meets utility interconnection requirements.
- ☐ 11 PV system electrical interconnection point (supply-side or load-side connection, load-side power control systems, and load-side distribution equipment) complies with approved plan. (11)
- ☐ 12 For garage-installed ESS mounted on end wall of garage, vehicle protection is installed where required. (8)
- ☐ 13 For ESS installed in conditioned spaces, any required smoke alarms are installed. (9)
- ☐ 14 For ESS installed in unconditioned indoor spaces that can exceed the temperature limits of smoke alarms (32°F-100°F), heat alarms are installed. (10)



PHOTOVOLTAIC ELECTRICAL AND STRUCTURAL REQUIREMENTS

Make sure all PV disconnects and circuit breakers are in the open position and verify the following:

- ☐ 1 All work done in a neat and workmanlike manner.
- ☐ 2 PV module model number, quantity, and location according to the approved plan.
- ☐ 3 Array mounting system and structural connections according to the approved plan and manufacturers' instructions. (22-30)
- ☐ 4 Roof penetrations flashed/sealed according to the approved plan and manufacturers' instructions.
- ☐ 5 Exposed cables are properly secured, supported, and routed to prevent physical damage.
- ☐ 6 Conduit installation according to NEC 690.31 and the approved plan. (17)
- ☐ 7 Firefighter access according to IRC R324 and the approved plan. (21)
- ☐ 8 Roof-mounted PV mounting system and modules have sufficient fire classification (15)
- ☐ 9 Grounding/bonding of rack, modules, inverter(s), and other electrical equipment according to the manufacturer's instructions.
- ☐ 10 Equipment installed, listed, and labeled according to the approved plan and manufacturers' instructions (e.g., PV modules, inverters, dc-to-dc converters, rapid shutdown equipment). (12-14)
- ☐ 11 For grid-connected systems, inverter is marked "interactive," or documentation is provided to show that inverter meets utility interconnection requirements. (13)
- ☐ 12 Conductors, cables, and conduit types, sizes, and markings according to the approved plan. (16, 17, 19)
- ☐ 13 Overcurrent devices are the type and size according to the approved plan.
- ☐ 14 Disconnects according to the approved plan and properly located as required by the NEC. (20)
- ☐ 15 PV system electrical interconnection point (supply-side or load-side connection, load-side power control systems, and load-side distribution equipment) complies with approved plan. (11)
- ☐ 16 PV system markings, labels, and signs according to the approved plan.
- ☐ 17 PV system equipment grounding conductors installed according to the approved plan.
- ☐ 18 Access and working space is provided for PV equipment such as inverters, disconnecting means, and panelboards (not required for PV modules).
- ☐ 19 The rapid shutdown system is installed and operational according to the approved plan and manufacturers' instructions. (19)

Supporting Resources

Links to Referenced Codes



SUPPORTING RESOURCES

International Code Council "2021 International Fire Code", Oct. 2020,
<https://codes.iccsafe.org/content/IFC2021P1>

International Code Council "2021 International Building Code", Oct. 2020,
<https://codes.iccsafe.org/content/IBC2021P1>.

National Fire Protection Association. "NFPA 70®." NFPA 70®: National Electrical Code®, Delmar Cengage Learning, 18 Sept. 2019, <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70&access=open>.

"National Simplified Residential PV and Energy Storage Permit Guidelines." SolSmart, <https://solsmart.org/resources/national-simplified-residential-pv-and-energy-storage-permit-guidelines/>.



Appendices

Appendix A – Sample Permit

APPENDIX A: SOLAR AND/OR ESS PERMIT APPLICATION

FOR OFFICE USE ONLY

Application Number:
Permit Number:
Issued By:
Date Applied:
Date Issued:

SECTION 1 - GENERAL INFO

PROJECT ADDRESS

PROPERTY OWNER'S NAME PHONE NUMBER EMAIL

PROPERTY OWNER'S MAILING ADDRESS (IF DIFFERENT FROM PROJECT ADDRESS)

SECTION 2 - PROJECT DETAILS

BUILDING TYPE/EXISTING USE

☐ SINGLE FAMILY ☐ DUPLEX ☐ MULTI-FAMILY
☐ COMMERCIAL/ INDUSTRIAL ☐ NEW CONSTRUCTION ☐ OTHER:

NEW OR EXISTING PV SYSTEM

☐ NEW SYSTEM
☐ ADDITIONAL SYSTEM
☐ SYSTEM REPLACEMENT

PV SYSTEM TYPE

☐ ROOF MOUNT
☐ GROUND MOUNT
☐ BUILDING INTEGRATED/ OTHER

INVERTER CONFIGURATION

☐ STRING INVERTER
☐ STRING INVERTER W/ DC CONVERTERS
☐ MICROINVERTERS OR AC MODULES

TOTAL PV SYSTEM SIZE kW DC TOTAL SQ. FT. OF PV SYSTEM SQ FT PROJECT VALUATION \$

INCLUDES ENERGY STORAGE SYSTEM ☐ YES ☐ NO TOTAL SYSTEM CAPACITY RATING kWh POWER RATING kW
☐ AC ☐ DC

PROJECT DESCRIPTION:

SECTION 3 - CONTRACTOR INFORMATION

CONTRACTOR BUSINESS NAME CONTRACTOR LICENSE NUMBER

BUSINESS ADDRESS
CONTRACTOR CONTACT NAME PHONE NUMBER EMAIL

SECTION 4 - PERMIT FEE

[Include fee schedule/options and/or instructions for calculating fee, directions on how and when to submit the permit fee.]

SECTION 5 - IMPORTANT NOTICE

A permit must be obtained for all installations or alterations of electrical equipment BEFORE WORK STARTS. Refer to EVSE Permitting Checklist for additional documents required. Failure to provide all required documents, including (1) Site Plan, (2) Electrical Diagram, and (3) Specification Sheets and Installation Manuals will delay permit approval. All permits expire six (6) months after date of issuance. Failure to start the work authorized by a permit within this six-month period renders the permit invalid and a new permit must be obtained. Once work begins, noticeable progress must continue until completion. All work must be complete within eighteen (18) months of a permit issue date.

Please Submit the following additional documents with the EVSE Permit Application

- Site Plan
- Electrical Diagram

- Structural Load Calculation
- Additional Document - edit or delete as necessary

Submit Permit Application

[Describe the submission process, how should the permits be submitted? In-person, on-line, e-mail, fax, etc.]

SECTION 6 - APPLICANT SIGNATURE

I, the undersigned, certify that I have proper authority to apply for this permit, that the Contractor has obtained a signed contract from the Property Owner for the specified work, that all contractors have consented to being listed, and that all the information contained on this application is true and accurate to the best of my knowledge.

NAME TITLE

SIGNATURE DATE

Appendix B - Standard Line Diagrams for ESS & PV

APPENDIX B: SOLAR AND ENERGY STORAGE STANDARD ELECTRICAL LINE DIAGRAMS

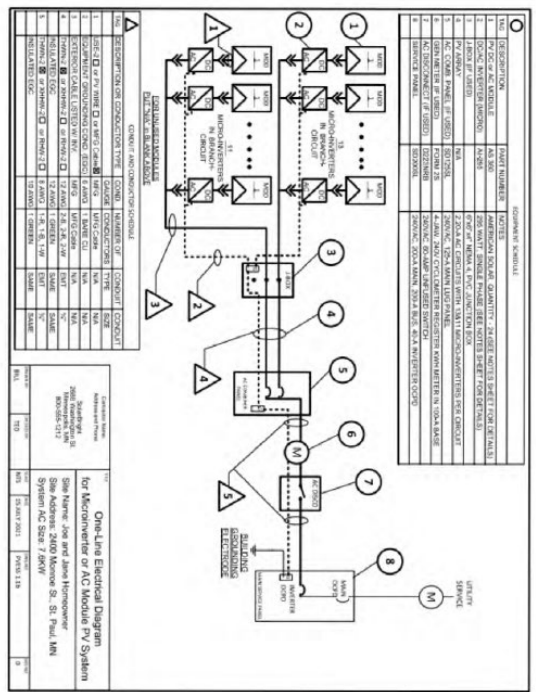


FIGURE 9: ONE LINE PV ONLY WITH MICROINVERTERS

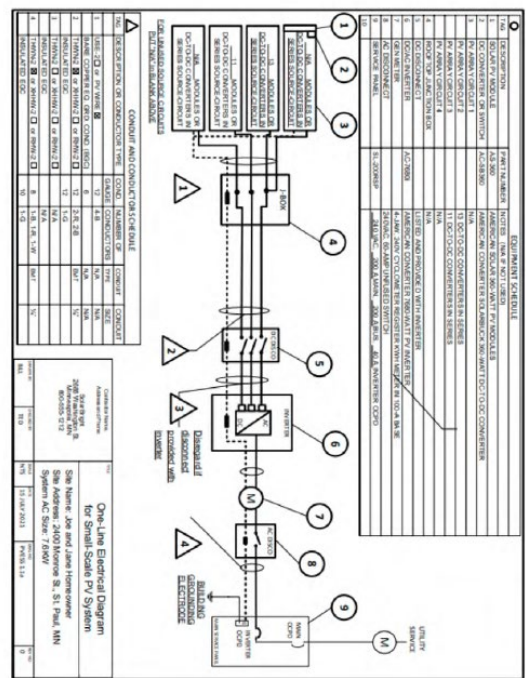


FIGURE 10: ONE LINE PV ONLY WITH DC CONVERTERS

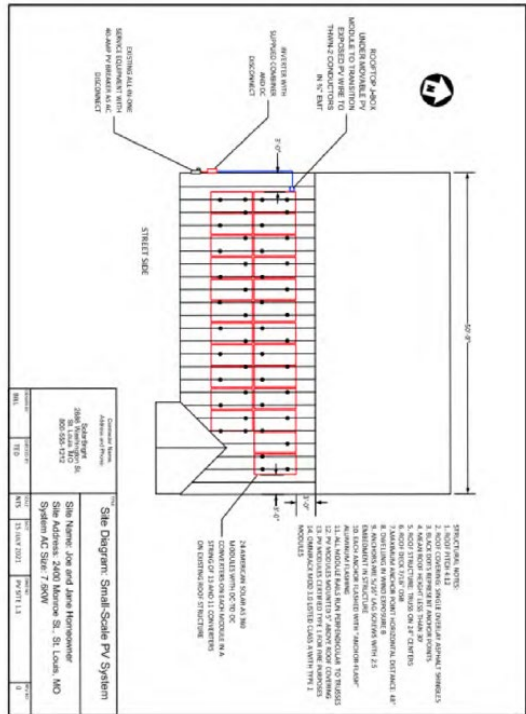


FIGURE 11: SITE DIAGRAM PV ONLY WITH DC CONVERTERS



Aldo Leopold Legacy Center | Baraboo, WI *Credit: The Kubala Washatko Architects, Inc.*

nbi new buildings
institute

Thank You!

Contact Us

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