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Supersedes 7/2010

SAMPLE PERMIT APPLICATION PACKAGE

SUNSOURCE® HOME ENERGY SYSTEM SAMPLE PERMIT APPLICATION PACKAGE



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Application

This document is provided as guidance. Installation of a utility-interactive solar photovoltaic system generally requires a permit from the local authority having jurisdiction (AHJ). This document provides a typical format for a residential permit application to install a SunSource® Home Energy System.

A1 — System Summary



Project Report

For Construction: July 15, 2011

Project #: 666

Client: Mr. Wayne Helms

Address: Granbury, TX

System Size: 2.6 kW

Module: Andalay ST-185-1-AC1-A-A

Microinverter: Enphase

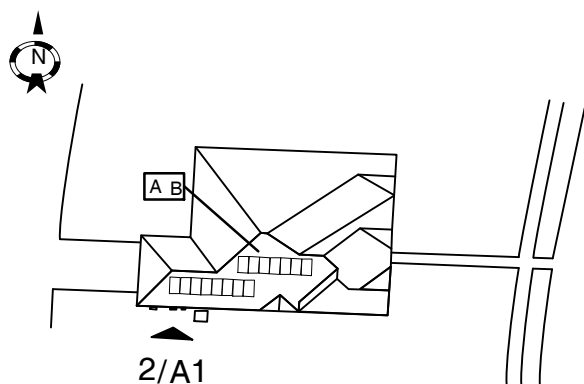
Utility: United Cooperative Service

The following design describes a Solar PV system with a peak STC DC size of 2.6 kW and an estimated electrical generation of 3924 kWh per year.

The modules are mounted on the south facing roof with an 185° azimuth at a 32° tilt. The solar PV AC array consists of (15) Andalay ST-185-1-AC1-A-A solar modules with each solar module in the array connected to an Enphase M190 microinverter. They have 95% CEC efficiency rating

From each module, DC power is connected directly to an Enphase microinverter mounted below each module. 240VAC power from the microinverter passes through a renewable energy credit meter; next, through a disconnect switch and then ties into solar source breaker located in the Lennox SunSource® XC21-060 (5-Ton) air conditioner.

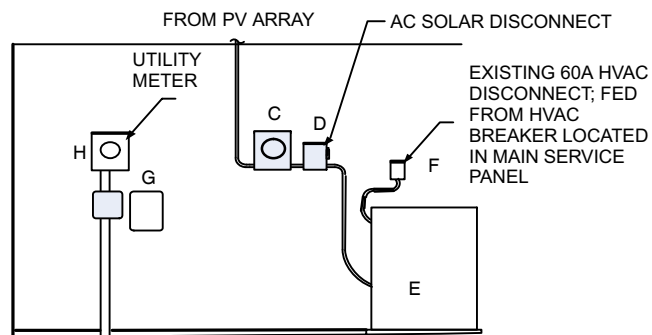
A2 — Site Plan



SCHEDULE OF COMPONENTS

- A Photovoltaic array
- B Microinverters
- C AC utility disconnect
- D Renewable energy credit meter (if requested by electric utility)
- E HVAC unit (existing)
- F HVAC disconnect (existing)
- G Main service panel (existing)
- H Utility meter (existing)

① **Site Plan**
NTS

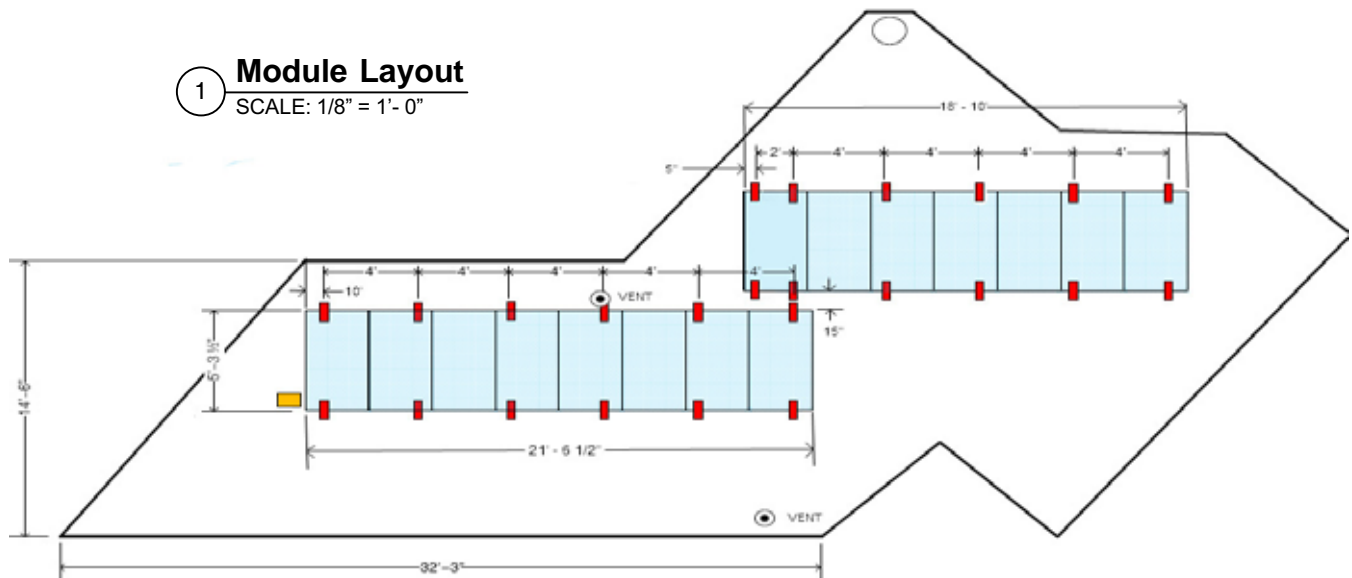


② **Elevation @ Utility Meter**

SCALE 1/2" = 1' - 0"

A3 — Module Layout



1 Module Layout SCALE: 1/8" = 1'-0"



SOUTH FACING ROOF: 1.4 KW PV ARRAY DETAILS

- (15) Andalay ST-185-1-AC1-A-A solar PV AC modules in one AC circuit.
- (15) Enphase M190-72-240 microinverter
- 90MPH designed wind speed and exposure category B.
- Composition shingle roof on 1/2" OSB decking with 2" x 6" at 24" O. C.

Symbol Table

	Roof Attachment
	Transition Box

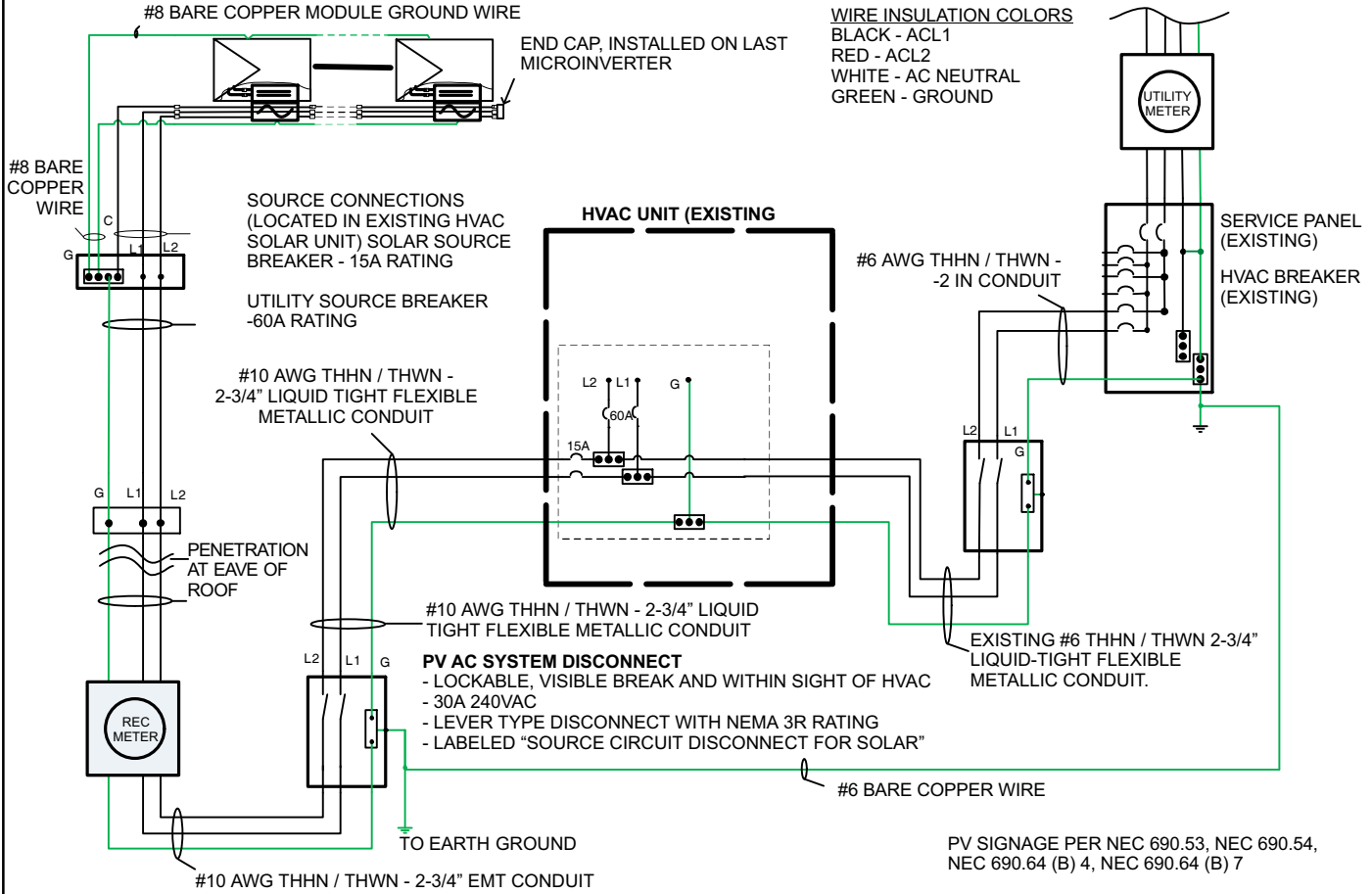
NOTE - Module Grounding:

1. Modules are grounded by stainless tee splices that connect the panels structurally.
2. Ground wire is lugged at the end of each row, at the factory designated grounding locations.

B1 — Wiring Diagram

2.6 KW STC DEC (15) ANDALAY ST-185-1-AC1-A-A SOLAR PV AC MODULES IN ONE AC STRING OF 15.

STRING OF 15 MODULES



B2 — Wire Calculations

AC Wire Sizing

Description AC Run from Inverter through ACV Disconnect to Solar Source Breaker

1) Design Current

• Micro Inverter Max Current	12 A AC	Maximum Current	12 A AC
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2) Wire Size

• Maximum Average Ambient Temperature	115°F (46°C)	Temperature Derate Factor	0.87
• Number of Current Wires	2 Per Conduit	Conduit Derate Factor	1
• Maximum Wire Temperature Allowed	167°F (75°C)		
• Selected Wire Size	10 AWG		
• Insulation Type	THHN/ THWN-2	Specified Wire Ampacity	30.45 Amps

3) Conduit Size

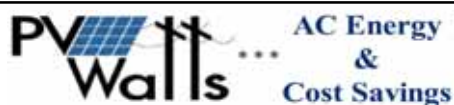
• Conduit Specified	¾"
• Conduit Type	EMT

4) Breaker Size

• AC Over Current Protection Device (OCPD) Size Specified	15 A AC	Minimum Breaker Size	15
• Voltage Rating of OCPD	240 VAC	Maximum Breaker Size	30

5) Voltage Drop

• Vnom	240 VAC	Voltage Drop	1.3 VAC
• Inom	12.0 A AC	Voltage Loss Percentage	0.5%
• Wire Distance	45 Feet (13.7 Meters)	Power Loss	16 W



Station Identification	
City:	Fort_Worth
State:	Texas
Latitude:	32.83° N
Longitude:	97.05° W
Elevation:	164 m
PV System Specifications	
DC Rating:	2.6 kW
DC to AC Derate Factor:	0.819
AC Rating:	2.1 kW
Array Type:	Fixed Tilt
Array Tilt:	32.9°
Array Azimuth:	185.0°
Energy Specifications	
Cost of Electricity:	12.0 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	4.32	278	33.36
2	4.76	275	33.00
3	5.50	342	41.04
4	5.99	355	42.60
5	6.02	361	43.32
6	6.28	354	42.48
7	6.39	365	43.80
8	6.31	360	43.20
9	5.82	327	39.24
10	5.57	335	40.20
11	4.42	271	32.52
12	4.10	263	31.56
Year	5.46	3885	466.20

Component Derate Factors	Component Derate Values	Range of Acceptable Values
PV module nameplate DC rating	0.95	0.80 - 1.05
Inverter and Transformer	0.945	0.88 - 0.98
Mismatch	0.995	0.97 - 0.995
Diodes and connections	0.995	0.99 - 0.997
DC wiring	0.99	0.97 - 0.99
AC wiring	0.99	0.98 - 0.993
Soiling	0.95	0.30 - 0.995
System availability	0.99	0.00 - 0.995
Shading	1.00	0.00 - 1.00
Sun-tracking	1.00	0.95 - 1.00
Age	1.00	0.70 - 1.00
Overall DC to AC derate factor	0.819	

USED ON SOLAR
DISCONNECT
SWITCH

⚠ WARNING

**ELECTRIC SHOCK HAZARD
RISK OF INJURY OR DEATH
DO NOT TOUCH TERMINALS.
TERMINALS ON BOTH THE LINE
AND LOAD SIDES CAN BE
ENERGIZED IN THE OPEN
POSITION. THIS HVAC SYSTEM
HAS TWO DISCONNECTS
(HVAC DISCONNECT AND
THIS SOLAR SOURCE
DISCONNECT).**

11F 

103325-01

USED ON HVAC
DISCONNECT
SWITCH

NOTICE


SOURCE CIRCUIT DISCONNECT FOR
HVAC UNIT
(DISCONNECT BOTH POWER SOURCES
BEFORE PERFORMING REPAIRS OR
OPENING EQUIPMENT SERVICE PANEL)

USED ON UNIT
CB10 PLASTIC
COVER

HVAC BREAKER (CB10)
NOT A SERVICE DISCONNECT

USED ON UNIT
CB40 PLASTIC
COVER

SOLAR BREAKER (CB40)
NOT A SERVICE DISCONNECT

<p>⚠ ADVERTISSEMENT</p> <p>Risque de Choc Électrique.</p> <ul style="list-style-type: none"> Peut causer blessures ou perte de vie. Débrancher toutes les sources d'alimentation électrique à distance avant d'ouvrir un panneau de l'unité. L'unité peut avoir plusieurs sources d'alimentation électrique. Ce panneau doit rester fermé seul pour son entretien. 		<p>⚠ WARNING</p> <p>Electric Shock Hazard.</p> <ul style="list-style-type: none"> Can cause injury or death. Disconnect all remote electric power supplies before opening any panel. Unit may have multiple power supplies. This panel to remain closed except when servicing. <p>10000-01A</p>
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E1 — Module Data Sheet

SPECIFICATIONS

Maximum output power	190W
Nominal output current	800mA
Nominal voltage/range	240V/211V-264V
Extended voltage/range	240V/206V-269V
Nominal frequency/range	60.0/59.3-60.5
Extended frequency/range	60.0/59.2-60.6
Power factor	>0.95
Maximum units per branch	15
Peak inverter efficiency	95.5%
CEC weighted efficiency	95.0%
Nominal MPP tracking	99.6%
Operating temperature range	-40°C to +65°C
Night time power consumption	30mW
Weight (lbs.)	45
Cooling	Natural Convection No Fans
Enclosure environmental rating	Inverter - Outdoor NEMA 6
Communication	Powerline
Compliance	UL1741/IEEE1547 FCC Part 15 Class B

ELECTRICAL CHARACTERISTICS

(At Standard Test Conditions)

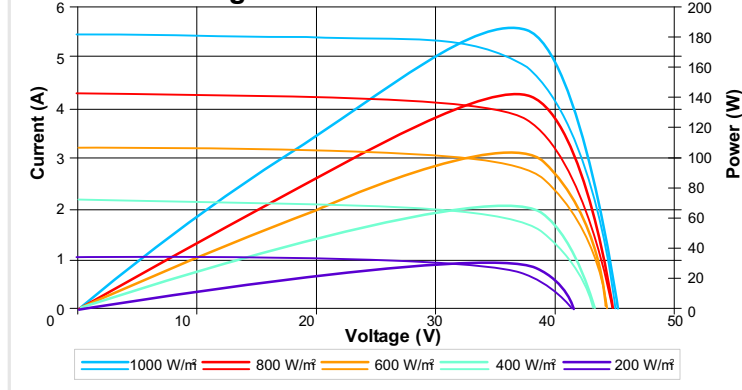
STC: irradiance of 1000W/m²
spectrum AM 1.5g, and cell temperature of 25 °C

¹ Peak Power	P _{max}	185W
Output Tolerance		0/+5W
Rated Current	I _{mp}	5.09A
Rated Voltage	V _{mp}	36.4V
Short-Circuit Current	I _{sc}	5.43A
Open-Circuit Voltage	V _{oc}	45.0V
Series Fuse Rating		15A
Maximum System Voltage		600V
Temperature Coefficients	Power	-0.45%/°C
	Voltage	-0.34%/°C
	Current	-0.050%/°C
Cell Technology		72 Cell Mono-Si, 125 x 125 mm

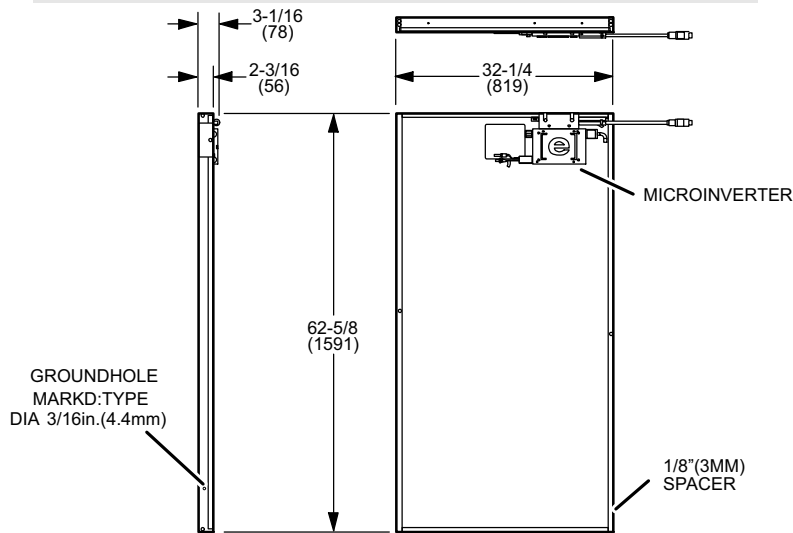
¹Peak Power at Output Tolerance

PERFORMANCE CHARACTERISTICS – DC POWER

Current vs. Voltage at °C



DIMENSIONS – INCHES (MM)



E2 — Microinverter Data Sheet

The Enphase Energy Microinverter System improves energy harvest, increases reliability, and dramatically simplifies design, installation and management of solar power systems. The Enphase System includes the microinverter, the Envoy Communications Gateway, and the web-based Enlighten monitoring and analysis website.

- PRODUCTIVE**
 - Maximum energy production
 - Resilient to dust, debris and shading
 - Performance monitoring per module
- RELIABLE**
 - MTBF of 331 years
 - System availability greater than 99.8%
 - No single point of system failure
- SMART**
 - Quick & simple design, installation and management
 - 24/7 monitoring and analysis



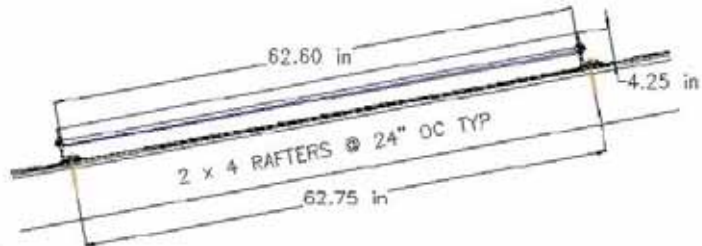
MICROINVERTER TECHNICAL DATA

60 and 72 Cell Modules		
Input Data (DC)	M190-72-208-511/2	M190-72-240-511/2
Recommended input power (STC)	230W	230W
Maximum input DC voltage	54V	54V
Peak power tracking voltage	22V – 40V	22V – 40V
Max. DC short circuit current	12A	12A
Max. input current	10A	10A
Output Data (AC)		
Maximum output power	190W	190W
Nominal output current	920mA	800mA
Nominal voltage/range	208V/183V-229V	240V/211V-264V
Extended voltage/range	208V/179V-232V	240V/206V-269V
Nominal frequency/range	60.0/59.3-60.5	60.0/59.3-60.5
Extended frequency/range	60.0/59.2-60.6	60.0/59.2-60.6
Power factor	>0.95	>0.95
Maximum units per branch	21	15
Efficiency		
Peak inverter efficiency	95.5%	95.5%
CEC weighted efficiency	95.0%	95.0%
Nominal MPP tracking	99.6%	99.6%
Mechanical Data		
Operating temperature range	-40°C to +65°C	-40°C to +65°C
Night time power consumption	30mW	30mW
Dimensions (WxHxD)	8" x 5.25" x 1.25"	
Weight	4.4 lbs	
Cooling	Natural Convection – No Fans	
Enclosure environmental rating	Outdoor – NEMA 6	
Features		
Communication	Powerline	
Warranty	15 Years	
Compliance	UL1741/IEEE1547 FCC Part 15 Class B	

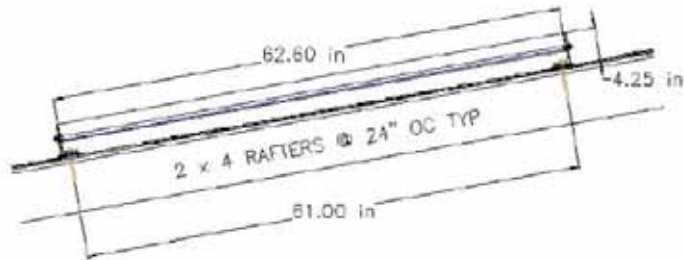
Typical Attachment Method



Lag Spacing: "L": *Same Direction*



Lag Spacing: "L's": *Inward*

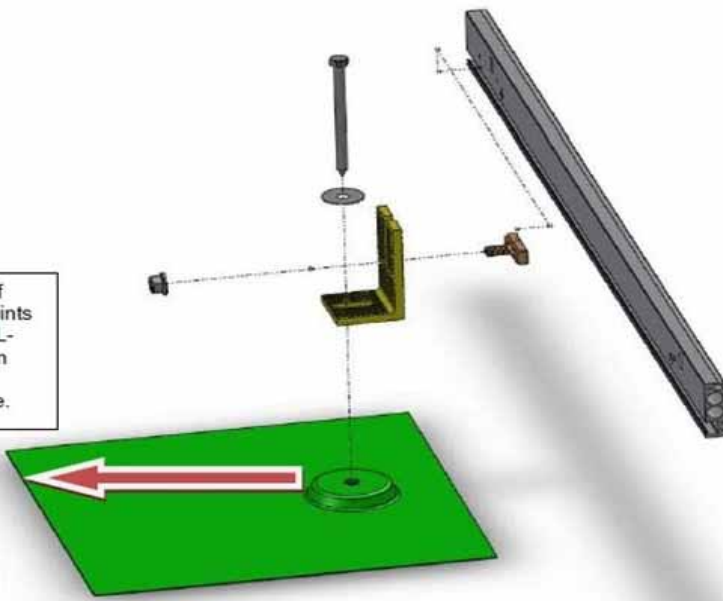


NOTE — Check with local building department to identify any unique wind or snow load requirements that pertain to your jurisdiction. A combination of shortening the maximum span between roof attachments and increasing the length of your lags will enhance the wind load rating of Westinghouse AC. When the proper number of attachment points are included, Westinghouse AC panels are rated for coastal conditions in Florida.

Composition Roof Installation

Composition Shingle Roof Flashing

This end of flashing points UP slope, L-bracket can face up or down slope.



Install the flashing below the upper shingle to allow water to run around the raised penetration point. Seal the penetration and lag screws with appropriate roofing sealant.