Solar Roofing Best Practices
Asphalt Shingle Roofs
Training Topics

• The benefits of quality waterproofing

• Common problems

• Roofing codes, standards, and best practices

• Mount installation and waterproofing
Quick Mount PV Products
Made in the USA 🇺🇸

• Steep Slope Roof Flashed Mounts
  – Composition Asphalt Shingles
  – Tile
  – Shake
  – Slate
  – Metal Shingles

• Low Slope Roofs Mounts

• Conduit Mounts & Penetration Flashing
  – Composition Asphalt Shingles
  – Tile
NEW! L-Mount for shingle roofs

- Cost effective flashed mount for asphalt shingle roofs
- Elevated water seal
- L-foot included!

- Rounded corners and Alignment Guide notches make installation faster and easier
Classic Conduit Mount

• NEW!
  – Rounded corners and “Alignment Guide” positioning notches make installation easier and faster
E-Mount Lag - now with rounded corners!

Rounded Corners and Alignment Guide
Notches make installation faster and easier

Thick washer seals entire QBlock cavity
New Product!
Universal Accessory Frame Bracket

• Universal Accessory Frame Bracket
  – Provides grounded connection between module level electronics and PV module frame
  – Installs in seconds
  – Universal bracket
    • Fits most module frames
  – UL 2703 listed
Tile Replacement Mount – now available
NEW! Tile Replacement Flashing

- Eliminate tile cutting
- Get matching replacement tile for every hook installed
- Works with Quick Hook and other tile hooks
Q Box flashed transition box

• The Easy Way to bring the conduit into the attic
Conduit Penetration Flashing and Conduit Mount

Tile Conduit Penetration Flashing

Conduit Mount for Tile
Quick Rack rail-free mounting system

Installation as Easy as...

1. Ships in a few small boxes reducing material costs and simplifying shipping and handling.


3. Works with standard modules. Simply drop in the modules, tighten down the clamps, and you’re done.
Free Sample
www.quickmountpv.com

Click green button to a free Quick Mount PV sample
New Podcast Series – Solar Roof Talk

Addressing issues of interest to rooftop solar installers

• Episode 1
  – Recap NABCEP CE Conference 2017 in Dallas

• Episode 2 and 3
  – Rail vs. rail-free racking

• Episode 4
  – Solar shingles vs. standard roof racking with modules

• Episode 5
  – Suniva trade case
Mobile Training Center

- Comp shingle, metal shingle, tile, and more
- Rail-Free Quick Rack™ system
- Onsite training
- flat screen TV in side window!
- Solar battery powered system

power
Jeff Spies - Biography

- **Quick Mount PV: Sr. Director of Policy**
- **NABCEP: Secretary - solar certification org**
- **CALSEIA: Board Member, Codes/Standards committee chair**
- **UL2703: Taskgroup leader Bonding/Grounding**

- Mechanical Engineering degree
- **30 years experience in technical training**
  - Organized several of the largest solar tech training conferences
  - Thousands have attended technical trainings
    - Solar Business Practices, Codes and Standards, Roofing Practices
  - Frequent author for trade pubs
  - Frequent speaker at industry events
Jeff Spies - solar techno geek
Jeff Spies tile roof home system in SolarPro
NABCEP Continuing Education Credits

• You will receive 1 NABCEP Continuing Education Credit for each hour of training
  – You must participate for a minimum of 60 minutes to get credit!

• You will receive email within 1-2 weeks containing:
  – NABCEP CE Credit certificate
  – Links to presentation PDFs and previously recorded webinars
  – Check your spam filter!
Survey after training

• After completion of today's training you will be able to fill out a short survey

• Please rate the webinar and provide us with any feedback to help us improve the webinar
Why Respect The Roof?
Solar array lifespan versus roof life

• Solar panels can last 30+ years

• Will the flashed roof mounts and roof last this long?

These modules are producing more than 85% of rated power after 35 years of continuous use
Quality waterproofing saves money

- Cost to remove/reinstall array

  50¢ - $1.50/watt

  $2,500 - $7,500

- Cost of quality flashed mounts

  7¢ - 15¢/watt*

  $350 - $750

*Price/watt based on 5 kW system, asphalt shingle roof, 20 PV modules, 32 mounts, E-Mount priced at $11, Universal Tile Mount priced at $17

- Quality flashed mounts are cheap insurance
BEWARE!
Long term waterproofing is a challenge

• Solar PV is challenging to seal for more than 10 years

• Array racking, and mounting structure flex daily
  – Thermal expansion contraction
  – Wind loads flex mounts
BEWARE!
The statistics increase the risk

- Solar installations require dozens of penetrations in the roof
- Quality flashings are imperative!
BEWARE! - the low price per watt trap

• Inexpensive flashed mounts offer minimal savings by using smaller thinner flashings

• QMPV flashings
  – Thicker wider flashings with superior seal provide 30 years of worry free performance

• Why risk it?
  – A modest $100-300 savings may result in $2000-$7000 in repairs
Why Respect the Roof?

• Roof leak risks are significant

• “...80% of construction litigation stems from water intrusion”
  – Pitched Roof Racking article
  – Nov ’08 issue of SolarPro magazine
Quality waterproofing saves money

• Removing & reinstalling a PV array to costs 20-40% of the cost of a brand new system!
  – More than replacing inverter
  – High likelihood of racking, grounding, wiring damage
  – Wood rot and mold can drive price up even higher
Born In The Trades

• Quick Mount PV is the leading manufacturer of residential flashed mounts for rooftop solar installs

• 25 years experience in metal fabrication, construction, and solar installation

• Dedicated to quality, code-compliant, waterproof solar installations
  – ISO9001 certified

• Committed to the future of solar power & sustainability
Waterproofing

Common Problems
What’s wrong with this picture?

• No fall protection
• Penetrations not staggered on trusses
• No flashing
  – Fails to meet code
  – Fails to meet roofing industry best practices
• Roofing warranty void!
Unflashed Roof Attachments Rely on Sealant

Attaching brackets or L-feet directly to a composition roof **might look okay at first**…

...but these penetrations are **entirely dependent on sealant** for waterproofing…
Sealants without flashing leaks over time

Over time leaks are inevitable

It is unrealistic to depend on sealant for decades of waterproofing service
Goop and a Prayer is not reliable

Note water damage rotted sheathing above rail
Extra “goop and a prayer” does not help

- Leak-prone
- Code violation
- Short term reliability
  - Note: the best sealant warranties last only 5 years
Hole in sealant

- Small holes often become funnel points
Common Problem:
Thin rubber boots

- Inverted boots will wear out prematurely
- ½” space between shingle and flashing cone helps shingle seal flush to roof and minimize wind driven rain concerns
Common Problem:
Nails and improper installation

Face nailing is leak risk

Inverted rubber boot and bent flashing capture water

incorrectly installed flashing caused a leak
Flashing upper edge is not above 3\textsuperscript{rd} course

Sealant added at keyway to try to stop leak
Some seals are vulnerable to leaks over time.
Elevated Water Seal = Superior Protection

Quick Mount PV comp shingle roof mounts position the seal above the waterline for long term protection.
Solar waterproofing video

Powerful sales tool for solar sales professionals!

The problem with deck level seals

QBlock Elevated Water Seal
Missing the rafters

- Common mistake
- Increased leak potential
Respect the Roof!

- Extensive wood rot
- Sheathing and rafters must be replaced
Wood rot can be ugly

- Rotted sheathing common when sealant fails
Resulting leaks!

- Drywall repair often expensive
  - Extensive painting may be necessary
- Damage to furnishings can be expensive
- Mold damage even more costly
Asphalt Shingle Roofs
Shingle mount types

**Integrated flashed mount**

- Mount positioned on top of flashing
- Retrofit friendly

**Standoff and flashing**

- Flashing installed over mount
- Preferred for new roofs and re-roofs
Solar Roofing Checklist for Composition Shingle Roofs

✓ Original roofer of record
✓ Roofing material manufacturer(s)
✓ Roof slope
  ✓ Use caution for shingle roofs less than 4:12 slope
✓ Existing roof warranties
  ✓ Contractor or manufacturer?
  ✓ Materials and workmanship?
✓ Roof condition and construction
  ✓ Age and remaining life
  ✓ Structural: Is repair needed? Is blocking required?
  ✓ Waterproofing: Is there any evidence of leaks?
  ✓ Materials: sheathing, underlayment, rafter size and spacing, # of layers of roofing
✓ Engineering design and layout of racking system
✓ Proper mounting and flashing system
Roof slope matters!

Asphalt shingles must be installed on roofs 2:12 pitch or greater.

Rolled roofing required for low slope roofs.
Singles – Roof Pitch Matters

• Shingles rely on gravity for proper water shedding
  – 4/12 pitch or steeper best
  – Special underlayment under 4:12 pitch

• 2:12 is minimum allowable pitch
  – IBC 1507.2.2: “asphalt shingles shall only be used on roof slopes of two units vertical in 12 units horizontal or greater”
Improper roof slope!

- Low slope shingle roof
  - Code violation
  - Leak prone

- In a freeze zone
  - Big leak risk

- With a solar array
  - HUGE LEAK RISK!
Don’t use shingles on low slope roofs!!

This 1:12 pitch shingle roof saw leaks in first year

Drywall damage

Improper roof pitch causes leak
GAF guidelines shingle roofs with 2:12 to 4:12 pitch

Low slope roofs require specific underlayment because lower slopes make it harder for a shingle roof to shed water

- Shingles are not appropriate for slopes less that 2-inch rise in a 12-inch run
- Decreasing exposure diminishes the wind and fire ratings
Comp shingle roofing forensics

- Inspect for water damage in attic, look for staining on sheathing
- Inspect shingles for bruising, cracking, curling, cupping, blistering, mold or missing granules
- If damaged, re-roof before installing solar
- South facing roof surfaces degrade faster
Protect the Roof
Spaghetti Matting

• Comp shingle roofs easily damaged when too cold or too hot
  – Brittle under 45° F, very soft over 85° F
  – Check shingle manufacturer specs for safe working temperatures

• Spaghetti matting or carpeting
  – Helps in slippery conditions
  – Protects comp shingles and tile from damage
  – Prevents tools from slipping off roof
  – $400 for 4 ft. x 20 ft. roll
Protect the Roof
Proper Footwear

• Avoid pivoting on foot when standing on shingles
• Soft soled footwear best
  – Skateboarding shoes
  – Cougar Paws
    • Replaceable foam sole offers maximum traction on slippery roofs
    • Protects shingle roofs from foot traffic damage
    • http://www.cougarpaws.com/
Classic Composition Mount

• Most robust flashed mount on the market
• Works with all standard racking systems
• Patented multi-level waterproofing
• Simple one-bolt installation
• No shingle cutting required
• Aluminum flashing lasts 30+ years
  – Stainless steel hardware included
Classic Comp Mount

Wider thicker flashing provides superior waterproofing protection

Reasons for oversizing:
1. Protects against wind-driven rain
2. Extra width covers missed pilot holes
3. Extra thickness minimizes deflection

4" recommended standard
5.8" QMPV

\[.032" - \text{code}\]
\[.050" - \text{QMPV}\]
Works with any racking system

Compatible with all standard solar racking systems
Elevated water seal

- Primary sealing washer positioned 0.7” above waterline
- Secondary seal prevents water getting to primary seal
Flashing Size Makes a Difference

- Wider flashing keeps wind driven rainwater out
- Thicker flashing prevents compression deflection
Superior Waterproofing Technology

Patented technology allows a strong, permanently watertight seal without welding.

Two EPDM rubber washers lock out moisture. Resistance to heat, ozone and weather means years of effective use.

Thicker all-aluminum flashing and mount have 50-year life expectancy.

All stainless steel hardware included.
Classic Composition Mount Box Contents

• Each case includes 12 mounts

• Flashing
  – Aluminum mounting block attached to .05" thick, 12" x 12" aluminum flashing

• Hardware kit (ALL mounting hardware is included)
  – Stainless steel hanger bolt, 5/16" x 6" (longer bolts available)
  – Stainless steel EPDM rubberized sealing washer
  – Two stainless steel 5/16" hex nuts
  – Solid EPDM sealing washer with 60 durometer hardness
  – Stainless steel flat washer
  – Stainless steel lock washer
Elevated waterproofing
seal vs. flashing level seal

Patented QBlock
Elevated Water Seal

Flashing level seal
Deck level waterproofing seal

- Rubber seals break down over time allowing water entry
- Seeping leaks lead to wood rot
- Structural connection to roof is compromised

Catch basin is the entire roof above mount

Rubber seal is leak risk
Elevated waterproofing seal

Rain water flowing down the roof never comes into contact with the elevated seal.

Seal is .7'' above the waterline.

Catch basin minimized.
Elevated Water Seal rises above the competition

- The Quick Mount PV Elevated Water Seal delivers decades of waterproofing reliability
  - Don’t let deck level seals sink your company’s reputation
The new E-Mount

Economical
Easy to Install
Elevated Water Seal
Get Industry-Leading Technology at a Great Value

Now even the most price-sensitive jobs can benefit from Quick Mount PV's made-in-USA quality.

Easy
- Integrated flashing and mounting block with fast, single-bolt installation
- Lighter 9 x 12-inch flashing

Economical
- Competitively priced
- 10-year limited product warranty

Elevated
- Patented Elevated Water Seal raises the waterproofing barrier off the roof
- Seal protected from the elements in all-aluminum QBlock

Single-bolt attachment with stainless steel hardware included
QBlock with Elevated Water Seal
Integrated aluminum flashing
E-Mount Lag now available!

Thick sealing washer seals QBlock cavity

Faster, simpler, more economical
# E-Mount vs. Classic Comp

<table>
<thead>
<tr>
<th>Feature</th>
<th>QMSE E-Mount</th>
<th>QMSC Classic Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flashing</td>
<td>9x12</td>
<td>12x12</td>
</tr>
<tr>
<td>Thickness</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>Finish</td>
<td>Aluminum mill finish</td>
<td>Aluminum mill, Clear, Bronze</td>
</tr>
<tr>
<td>Warranty</td>
<td>10-year limited warranty</td>
<td>20-year limited warranty</td>
</tr>
<tr>
<td>Technology</td>
<td>QBlock Elevated Water Seal</td>
<td>QBlock Elevated Water Seal</td>
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<tr>
<td>Certifications</td>
<td>In process</td>
<td>ICC-ES Certified</td>
</tr>
<tr>
<td>Won’t Void Roofing</td>
<td>In process</td>
<td>Yes</td>
</tr>
<tr>
<td>Warranty Letters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stainless Steel Hardware</td>
<td>Included</td>
<td>Included</td>
</tr>
<tr>
<td>Manufactured</td>
<td>Made in USA</td>
<td>Made in USA</td>
</tr>
</tbody>
</table>
Quick Block seal display kit

Mini Demo Classic sample (reduced size flashing) demonstrates the QBlock Elevated Water Seal technology
Common Problems:
Keyways and shingle cutting

Flashing must extend above key up **under** the 3rd course

Some flashings require cutting the shingle (bibbing) to allow flashing to get up under the 3rd course
Common Problem:
Thin rubber boots

- Inverted boot
- Shingle cutting problem
- Boot losing grip
- Cracked rubber boot
Common problems:
Face nailing, improper installation

- Ponding water and biological growth will damage seal
- Face nailing creates leak risk
  – note corrosion around nails
- Flashing not installed under shingle
- Thin rubber boot is leak risk
Quick and Easy Installation

1. Lift shingle and clear nails

2. Drill 7/32” pilot hole for lag bolt

3. Add roof sealant compatible with roofing materials to pilot hole

4. Slide Classic Comp into place

NOTE: 7/32” drill bit should be “long style” bit (aka “aircraft extension” bit) to drill 3” deep hole into rafter
Quick and Easy Installation

5. Drive hanger bolt into rafter until QBlock stops rotating

6. Add secondary sealing washer

7. Attach preferred rails

8. Move on to the next row
Faster Installation Means More Profit

- Fast Installation
- Less Labor
- Lower Cost

“Quick Mount PV saves our crew at least four hours per job – and with zero chance of leaks.”
- Matt Steiner Plumbing, Electric & Heating
Typical reveal dimension is between 5.00" and 5.625". But can be up to 8" for specialty shingles.
Removing nails

- Break seal between 2\textsuperscript{nd} and 3\textsuperscript{rd} course of shingles using roofing bar
- Break seal between 1\textsuperscript{st} and second course of shingles
- Use roofing bar to pry up nail(s)
- Insert roofing bar between 2\textsuperscript{nd} and 3\textsuperscript{rd} course, use tip of bar or nail hook to extract nail from sheathing
- Remove nail from under 2\textsuperscript{nd} course shingle
Proper Flashing Placement

Incorrect position!
- Moisture/debris accumulation
- Early shingle degradation

Preferred position
- Properly flashed above 3rd course
- Shingle cutting not required!

You must remove nails!

Shingle cutting acceptable
- Recommended ½" gap between block and shingle
High profile shingles

Tooth removal may be necessary

Insert cut section of shingle to shim under flashing for optimal flatness
High profile shingles

Incorrect position
Flashing installed on top of 2nd course
High profile shingles

Correct position
Flashing installed under 2nd course
High profile shingles

Removed portion of shingle tab (aka tooth) to make room for mount
Incorrect High Profile shingle installation

Incorrect positioning of flashing on high profile shingles
Larger reveal shingle flashing

Problem, Some large reveal shingles have large reveal distances.

Solution: 18”x18” Classic Shake Mount works on large reveal shingles.
Common Problem:
Thin flashing and compression deflection

- Compression deflection is possible whenever shingle temp is over 85°F
  - Shingle temps up to 60° hotter than ambient
  - Asphalt softens and will squeeze out from under mount
  - Thinner flashing sensitive to compression deflection

Compression deflection often occurs on sunny days over 60° F
Lag bolt or lag screw torque

- Pivot base mount as you tighten nut on hanger bolt or lag screw
- When mount stops pivoting freely, **immediately** stop tightening
- **DO NOT OVERTORQUE**
  - Over-torquing results in compression deflection of flashing

Pivoting Q-Block while torquing nut on hanger bolt is good torque indicator
### Common Sealants

- Check with roofing manufacturer for sealant compatibility
- List above is consolidated from sealant manufacturer specifications

<table>
<thead>
<tr>
<th>Sealant</th>
<th>Geocel 2300</th>
<th>Geocel 3500</th>
<th>Geocel 4500</th>
<th>Chem Link M1</th>
<th>#900 Solar Seal</th>
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</thead>
<tbody>
<tr>
<td>Bonds to metal</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bonds to Tile</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Bonds to asphalt</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Bonds to wood</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Bonds to concrete</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Bonds to EPDM</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Non-solvent based</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Solvent based</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Cures underwater</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cures without exposure to air</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Time to cure</td>
<td>1.5 - 4 days</td>
<td>1.5 - 3 days</td>
<td>1 - 4 days</td>
<td>24 hours</td>
<td>3-4 weeks</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>224 psi</td>
<td>175.58 psi</td>
<td>248.8 psi</td>
<td>300 psi</td>
<td>259 psi</td>
</tr>
<tr>
<td>Elongation at break</td>
<td>1025%</td>
<td>408%</td>
<td>428%</td>
<td>300%</td>
<td>400%</td>
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<tr>
<td>Type of sealant</td>
<td>Polyurethane</td>
<td>Polyurethane</td>
<td>Scyclomer</td>
<td>Polyether</td>
<td>Terpolymer</td>
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<tr>
<td>Service Temp</td>
<td>-20° F to 150° F</td>
<td>-20° F to 150° F</td>
<td>30° F to 120° F</td>
<td>-40°F to 200°F</td>
<td>-40°F to 300°F</td>
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<tr>
<td>Shelf Life</td>
<td>1 year</td>
<td>1 year</td>
<td>1 year</td>
<td>1 year</td>
<td>2 years</td>
</tr>
</tbody>
</table>
Drill holes and apply sealant

• Drill pilot holes with 7/32" aircraft extension drill bit
  – Drill hole in center third of rafter
  – 6" bit for full depth pilot hole
  – Short drill bits do get full depth
    • increase potential for blown out rafter

• Use roofing compatible sealant
  – Small amount in pilot hole
  – Apply U-shaped bead of sealant to bottom of flashing

7/32" aircraft extension bit

U-shaped bead of sealant
Re-seal shingles with roofing cement

- Use roofing cement or sealant to reseal shingle
- Apply dabs of sealant that are ¼” to ½” in diameter – too much will blister shingles
Available in 3 Finishes

1. Aluminum mill
   - Least expensive
   - Most common
2. Clear anodized
   - Better long term corrosion resistance
3. Bronze anodized
   - Black anodized improves appearance and durability
Install bronze only where mounts are visible

Bronze only on perimeter
Comp Mounts
Classic vs. QBase Comp Mount

Classic Comp Mount

QBase Comp Mount

All-In-One Flashing & Mount
- Integrated flashed mount
- Excellent solution for existing roofs
- Quick & easy installation
- No shingle cutting required
- Cuts down labor costs

Standoff Post & Flashing
- Base and post with flashing
- Excellent solution for new roofs
- Preserves roofer’s warranty
- When installed on new roof, waterproofing becomes roofer responsibility
QBase Comp Mount perfect for new roof and re-roof

- Can be installed by roofer during roofing installation
- Roofers comfortable installing QBase Comp Mount
- Spun-cone flashing has no seam vulnerable to leaks
QBase Comp Mount Installation

1) Snap chalk lines, drill 7/32" holes

2) Secure base with 2 lag bolts into truss

3) Screw standoff into base

NOTE: 7/32" drill bit should be “long style” bit (aka “aircraft extension” bit) to drill 3” deep hole into rafter.
QBase Comp Mount Installation

4) Cut comp shingles around QBase

5) Install flashing

6) Finished – super strong and super waterproofing
Mounting Solar Thermal Panels

Strong engineering allows for mounting solar thermal collectors with or without rails

12/6/17
Solar Thermal Collector Mounting
QM Classic Composition Mount with L-foot and Unirac rail
QM Classic Composition Mount with low-profile ProSolar rail
QM Classic Composition Mount with Iron Ridge Rail and Racking System
GAF, Certainteed, Owens Corning, Malarkey, and other roofing manufacturers have approved Quick Mount PV’s Composition Mount to not void warranty!
## Engineering Test Results
### Classic Comp Mounts

**Pullout average 2554 lbs**

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Wood Species</th>
<th>Ultimate Load (lbs)</th>
<th>Failure Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>T--1</td>
<td>Douglas Fir</td>
<td>2660</td>
<td>Lag screw pulled out</td>
</tr>
<tr>
<td>T--2</td>
<td>Douglas Fir</td>
<td>2567</td>
<td>Lag screw pulled out</td>
</tr>
<tr>
<td>T--3</td>
<td>Douglas Fir</td>
<td>2434</td>
<td>Lag screw pulled out</td>
</tr>
<tr>
<td>Average</td>
<td>....</td>
<td>2554</td>
<td></td>
</tr>
<tr>
<td>T-4</td>
<td>Cedar</td>
<td>1323</td>
<td>Lag screw pulled out</td>
</tr>
<tr>
<td>T-5</td>
<td>Cedar</td>
<td>1309</td>
<td>Lag screw pulled out</td>
</tr>
<tr>
<td>T-6</td>
<td>Cedar</td>
<td>1433</td>
<td>Lag screw pulled out</td>
</tr>
<tr>
<td>Average</td>
<td>...</td>
<td>1355</td>
<td></td>
</tr>
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</table>
Shear average 2203 lbs

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Wood Species</th>
<th>Ultimate Load in Tension (lbs)</th>
<th>Failure Mode</th>
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</thead>
<tbody>
<tr>
<td>S-1</td>
<td>Douglas Fir</td>
<td>2351</td>
<td>Bent lag screw</td>
</tr>
<tr>
<td>S-2</td>
<td>Douglas Fir</td>
<td>2012</td>
<td>Bent lag screw</td>
</tr>
<tr>
<td>S-3</td>
<td>Douglas Fir</td>
<td>2245</td>
<td>Bent lag screw</td>
</tr>
<tr>
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<td>Average</td>
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<tr>
<td>S-4</td>
<td>Cedar</td>
<td>2060</td>
<td>Bent lag screw</td>
</tr>
<tr>
<td>S-5</td>
<td>Cedar</td>
<td>1907</td>
<td>Bent lag screw</td>
</tr>
<tr>
<td>S-6</td>
<td>Cedar</td>
<td>1903</td>
<td>Bent lag screw</td>
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<tr>
<td></td>
<td>Average</td>
<td>1957</td>
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</tr>
</tbody>
</table>
Conduit Penetration Flashing

- Code compliant waterproof flashing
- 12" x 12" aluminum flashing
- ½", ¾", and 1" conduit
Conduit Penetration Flashing

1) Drill hole with spade bit next to rafter ⅛" larger than OD of conduit

2) Cut shingle with hook blade

3) Apply sealant compatible with roofing materials on underside of the flashing

4) Slide flashing into place and apply bead of sealant on top side of flashing

½" conduit: ⅜" hole
¾" conduit: 1" hole
1" conduit: 1 ¾" hole
Conduit Penetration Flashing

5) Secure flashing with roofing nails in the top corners. Apply sealant over nail heads

6) Cut EPDM collar to conduit size

7) Apply bead of sealant between collar and top of aluminum cone and slide collar down to the flashing

8) Secure conduit to rafters in attic per NEC and building code requirements
Which Mount is Code Compliant?
Conduit Mount

Raise the conduit off the roof!

• Protects wiring from overheating
• Allows proper draining
• Completely code compliant, waterproof penetrations
• For composition and wood shake
• 9" x 12" flashing
• Standard single-hole conduit clamp for 1/2" through 1-1/2" conduits
Classic Conduit Mount

• NEW!
  – Rounded corners and “Alignment Guide” positioning notches make installation easier and faster
Elevated Conduit Mounting configuration

- Mount conduit 1.3'' to 5.3'' off the roof
- Meets roof spacing code requirements in the most demanding jurisdictions
Accessories

Roofing Bar
- Works with all types of shingles and tile
- Easy on the roof
- Faster & more efficient installations
- 24-inch offset handle minimizes knuckle injuries
- Nail hooks and offset handle aid in nail removal

Extensions
- Extruded aluminum extensions for standard composition and shake mounts
- Add height for additional airflow between the modules and roof or clear obstructions
- Available in 2-1/2, 3-1/4, and 4-inch lengths

Hanger Bolts
- Lengths of 6, 8, 10 and 12 inches.
- Longer bolt spans insulated roof decks
- Maintains pull out and shear strength
- Custom lengths available
Height Extensions

2½", 3¼", and 4" lengths
Quality Speaks

Stronger engineering =

Longer spans =

Fewer roof penetrations =

LOWER COST

Mounts are staggered on the trusses for added load capacity – snow, wind, etc..
Respect the Roof!
Respect The Roof
Quick Mount PV Products
Made in the USA 🇺🇸

• Steep Slope Roof Flashed Mounts
  – Composition Asphalt Shingles
  – Tile
  – Shake
  – Slate
  – Metal Shingles

• Low Slope Roofs Mounts

• Conduit Mounts & Penetration Flashing
  – Composition Asphalt Shingles
  – Tile
NEW! L-Mount for shingle roofs

- Cost effective flashed mount for asphalt shingle roofs
- Elevated water seal
- L-foot included!

- Rounded corners and Alignment Guide notches make installation faster and easier
Classis Conduit Mount

• NEW!
  – Rounded corners and positioning notches make installation easier and faster
E-Mount Lag - now with rounded corners!

Rounded Corners and Alignment Guide
Notches make installation faster and easier

Thick washer seals entire QBlock cavity
New Product!
Universal Accessory Frame Bracket

• Universal Accessory Frame Bracket
  – Provides grounded connection between module level electronics and PV module frame
  – Installs in seconds
  – Universal bracket
    • Fits most module frames
  – UL 2703 listed
Tile Replacement Mount – now available
NEW! Tile Replacement Flashing

- Eliminate tile cutting
- Get matching replacement tile for every hook installed
- Works with Quick Hook and other tile hooks

Available finishes: aluminum mill (A) and black (B)

Tile hook and Tile Replacement Flashing sold separately
Conduit Penetration Flashing and Conduit Mount

Tile Conduit Penetration Flashing

Conduit Mount for Tile
Quick Rack rail-free mounting system

Installation as Easy as...

1. Ships in a few small boxes reducing material costs and simplifying shipping and handling.
3. Works with standard modules. Simply drop in the modules, tighten down the clamps, and you’re done.
Click green button to a free Quick Mount PV sample
New Podcast Series – Solar Roof Talk

Addressing issues of interest to rooftop solar installers

• Episode 1
  – Recap NABCEP CE Conference 2017 in Dallas

• Episode 2 and 3
  – Rail vs. rail-free racking

• Episode 4
  – Solar shingles vs. standard roof racking with modules

• Episode 5
  – Suniva trade case
Mobile Training Center

- Comp shingle, metal shingle, tile, and more
- Rail-Free Quick Rack™ system
- Onsite training
- flat screen TV in side window!
- Solar battery powered system

![Mobile Training Center images]
Quick Mount PV Support

• Phone us for live technical or sales support
  – (925) 478-8269

• Email
  – jeff.spies@quickmountpv.com - Sr. Director of Policy
  – johan.alfsen@quickmountpv.com - Director of Training
  – sales@quickmountpv.com - Sales
  – tech@quickmountpv.com - Tech Support

• Check out our FAQs
Website resources

• Complete product information
• Engineering documentation
• Training downloads
• Tradeshow events
• List of distributors
• Free sample
# Major Events

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar 13-15</td>
<td>COSEIA Solar Power Colorado</td>
<td>Broomfield, CO</td>
</tr>
<tr>
<td>Mar 21-23</td>
<td>NABCEP CE Conference</td>
<td>Dallas, TX</td>
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<tr>
<td>May 9-11</td>
<td>Oregon Solar Expo</td>
<td>Portland, OR</td>
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<tr>
<td>Jun 16-18</td>
<td>Midwest Renewable Energy Fair</td>
<td>Custer, WI</td>
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<tr>
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<td>Personal Favorite!</td>
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<tr>
<td>Jul 11-13</td>
<td>Intersolar</td>
<td>San Francisco, CA</td>
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<tr>
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<td>Major Event!</td>
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<tr>
<td>Sep 10-13</td>
<td>Solar Power International</td>
<td>Las Vegas, NV</td>
</tr>
<tr>
<td></td>
<td>Major Event!</td>
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</tr>
</tbody>
</table>
Quick Mount PV Training

• Monthly webinars
  – Solar roofing
  – Solar business
  – Roofing code

• Website video tutorials & training downloads

• Hands-on training opportunities
NABCEP Continuing Education Credits

• You will receive 1 NABCEP Continuing Education Credit for each hour of training
  – You must participate for a minimum of 60 minutes to get credit!

• You will receive email within 1-2 weeks containing:
  – NABCEP CE Credit certificate
  – Links to presentation PDFs and previously recorded webinars
  – Check your spam filter!
Survey after training

• After completion of today’s training you will be able to fill out a short survey

• Please rate the webinar and provide us with any feedback to help us improve the webinar
Respect The Roof