superstructures, on a building's rooftop to help determine the space available for a potential PV system. To address any areas lost to shading or shadowing, the heights of parapet walls and other structures on a roof can be calculated by using some comparative geometry. Employing an online ruler to measure the shadow length of a known height item, such as a car on the same viewing screen, it's possible to figure out the height of any roof equipment by simply measuring its shadow height.

Shade projections for each item can then be calculated using a basic shade distance-to-height ratio, depending on latitude. For instance, using a shade-to-height ratio of 2:1 (assuming an HVAC unit is three feet taller than the PV system), a PV system would need to be six feet away from the south, east, and west walls of the HVAC unit. Again, simply use an Excel spreadsheet to quickly calculate shading losses.

It's important to note, however, that since shading can have a large impact on reducing the available space for solar power, there may be value in raising the PV system's height to reduce any shade losses and to attain the desired system size.

3. Module spacing

Once a tilt angle is selected, the interspacing between solar modules can be established, so that the reduction in available module space can be calculated. For example, with a five-degree tilt and a 2:1 shade ratio, the space lost between module rows is 15%. As a rough indicator, the space reduction for shade allowance is about three percent for each degree of tilt angle. Now, by dividing the remaining available area by the area per module, the total number of modules can be attained to determine the solar capacity based on roof size.

Depending on a roof's configuration, it's sometimes advisable to have a further reduction factor to account for any areas on a roof, which might be difficult to utilize.

Conclusion

This provides a quick method with little or no site visitation time to assess the solar capacity for a particular rooftop. This information can be used to prepare a preliminary proposal, or to help a customer quantify that the solar capacity for a specific building is sufficient to meet their power usage reduction objectives. Once there is sufficient interest or a commitment made, a more thorough building evaluation can take place.

ISA Corporation
www.isa-corporation.com

Module-to-module grounding system

Solar installations with the new DYNOBOND grounding system will reduce installation time and cut costs in half. The patent-pending, UL-recognized DYNOBOND is designed to be used as a jumper between modules and rows, making the module frame the medium for the equipment ground path. DYNOBOND replaces the conventional method of installing one ground lug per solar module, and running a solid six-gauge copper wire to bond the modules. Engineered for commercial and residential applications, the DYNOBOND is: clean, as the wire is virtually hidden on the system; corrosion-resistant, using stainless steel clips and tin-plated copper wire that are paired for reduced electrochemical potential; and UL recognized to 467 and 2703. Available in wire lengths from 8" (204mm) to 96" (2438mm).

DynoRaxx | www.dynoraxx.com

YOUR BOTTOM LINE IS OUR PRIORITY

We've done the innovating to reduce your total racking system cost

"My roots managing an investment fund focused on metal fabrication and solar power plants have helped us understand what solar investors require: total system cost reduction while meeting the demands for bankability."

ANDREW WORDEN - CEO & Founder, GameChange Racking

POUR-IN-PLACE™ GROUND SYSTEM
- Self-leveling technology: 68% faster install than precast
- Large ballast footprint reduces landfill cap loading
- Panels mount rapidly with T-bolts and top clamps on robust aluminum rails
- Wind tunnel tested and rated for 150mph wind, ETL/UL 2703 tested
- 7" vertical adjustability, 5 to 35° tilt, multiple inter-row spacing options
- Unbeatable price - starts $0.189/w, $0.205/w including ballast

MAXSCALE POST GROUND SYSTEM
- Fast installation with minimum components count and simple design
- Turnkey installation, geotech and pull test
- Available with GameChange StickyPost™ piers, earth screws and helical piles
- Wind tunnel tested and rated for 150 mph wind
- Three axes of adjustability, 5 to 35° tilt
- Unbeatable price - starts $0.139/w

PAVER RAIL BALLASTED GROUND SYSTEM
- Standard inexpensive pavers stack on ballast trays
- Large ballast footprint reduces landfill cap loading
- Panels mount rapidly with T-bolts and top clamps on robust aluminum rails
- Wind tunnel tested and rated for 120mph wind, ETL/UL 2703 tested
- 3" vertical adjustability, 5 to 35° tilt, multiple inter-row spacing options
- Unbeatable price - starts $0.199/w, $0.229/w including ballast

ROOF SYSTEM
- Just two snap-together components
- Integrated grounding and wire management
- Fastest install time - 50% less than competitors
- Wind tunnel tested and rated for 120mph wind, ETL/UL 2703 tested
- Aluminum and stainless steel components, 5, 10 and 15° tilt
- Unbeatable price - starts $0.129/w

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GAMECHANGE™ RACKING
STRONG. SIMPLE.

GameChange Racking

Product: GC MaxScale Post Driven Ground System

Application: Ground-mount

Type: Fixed

Angle: 5° to 35° tilt, with multiple inter-row spacing options

Material: G235 galvanized steel posts; G90 galvanized steel purlins; Magnacoat and stainless steel hardware

Pre- or Post-Assembly? Post-assembly

Certifications/Approvals: Wind tunnel tested and rated for 150 mph wind speed by CPP; meets IBC and ASME standards for structural loading; ETL/UL 467 GameChange grounding strips included

Warranty: 20 years

Key Features:

- Adaptable to all foundations (including GameChange standard posts, round posts, I beams, helical piles, and earth screws);
- Panels rapidly mount using T-bolts in slots and top-mount clamps;
- Available with robust aluminum rails, with integrated wire management trays; and
- Provides up to three feet of ground clearance, eliminating snow and vegetation shading issues.

www.gamechangeracking.com

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STEEL TREE structures

Steel Tree Structures Ltd.

Product: Elevated East West or North South

Application: Custom-designed roof-mount

Type: Fixed

Angle: 15° to 30°

Material: Light-gauge galvanized or galvalume steel

Pre- or Post-assembly: Pre-assembly

Certifications/Approvals: N/A

Warranty: Two-year manufacturer's warranty

Key Features:

- Racking systems are pre-assembled with modules mounted onto racks prior to shipment to a project site;
- Ability to elevate racking over rooftop equipment, increasing PV density; and
- Ability to span building beam lines.

www.steeltreestructures.com

ROOF TECH INC.

Product: RT-[E] Mount

Application: Roof-mount

Type: Fixed

Angle: Flush-mount

Material: Aluminum and stainless steel

Pre- or Post-assembly? Onsite assembly

Certifications/Approvals: ETL Classified to UL 2703

Warranty: 10 years

Key Features:

- Instead of placing solar panels on top of long rails, attach RT-[E] Mount brackets to rafters, or anywhere else on roof decking (according to the PE reports and the AHJ);
- Once panels are fastened to brackets, the system array is electrically bonded;
- Compact and easy to install, all parts come in one compact box, complete with butyl rubber flashing, renowned for its watertight durability.

www.roof-tech.us

Ecolibrium Solar

Product: Ecofoot2+

Application: Roof-mount

Type: Fixed

Angle: 4° to 12°

Material: ASA resin

Pre- or Post-assembly? Pre-assembled

Certifications/Approvals: PE Certified in every state

Warranty: 25 years

Key Features:

- Pre-assembled universal clamp reduces the time and difficulty of installation;
- Utilizes integrated grounding without the need for weebs, thereby eliminating the need to run copper and grounding lugs, and reducing time spent on the roof;
- Lightweight, modular design includes few parts, which easily install around obstacles; and
- Embraces EPDM on the bottom of the foot, facilitating a roof's natural drainage.

www.ecolibriumsolar.com

Pour-in-Place ballasted ground system

GameChange Racking's Pour-in-Place Ballasted Ground System utilizes self-leveling technology, which substantially reduces installation time. The Pour-in-Place forms are placed and supported, then the concrete is poured, and the panels are mounted. A major advantage of the Pour-in-Place system is that only after leveling is completed is the ballast or concrete added, making installation much faster than pre-cast systems. Utilization of the Pour-in-Place system will also result in substantial labor savings, as it eliminates the necessity to move and place heavy, pre-cast blocks. Available in one and two-panel up portrait, the panels mount rapidly using T-bolts in slots and top-mount clamps. An integrated wire management tray is on robust aluminum rails, and the integrated grounding includes module grounding strips. Approved by ETL to UL 467, the Pour-in-Place system is wind tunnel tested and rated for 150 mph wind speeds, meeting IBC and ASME standards for structural loading.

GameChange Racking
www.gamechangeracking.com

Solar roof mount solutions

EcoFasten Solar recently announced the launch of their newest product, a solution for mounting conduit. Like all of the products in their line of solar solutions, this newest product is fast, easy, and straightforward to install. Take GreenFasten, for example, a system designed for mounting solar panels to a composition shingle roof. Utilizing the company's patented, watertight technology, GreenFasten is compatible with a variety of EcoFasten Solar compression brackets. EcoFasten Solar manufactures roof-mount solutions for all roof types—new or retrofit. When working with metal standing seam roofs, EcoFasten's ASG-U2 clamps are cost-effective, efficient roof-mount attachment options that won't pierce roofing material. EcoFasten Solar offers some of the strongest attachment points currently available, and backed by IAPMO Certification.

EcoFasten Solar
www.ecofastensolar.com

Ballasted ground-mount

One of the many challenges with landfill and brownfield solar installations is the ability of the racking design to follow land contours, while minimizing soil disturbance and maximizing usable space. Patriot Solar Group's Delta Series Ballasted Ground Mount comes standard with multiple adjustment features to minimize site preparation, as well as the need for any excavation—saving costs and valuable time during critical completion deadlines. Patriot's adjustment features include: a telescoping post, allowing for up and down vertical adjustment; a tilting post bracket, letting blocks follow land contours; slotted attachment holes, providing for minor in-field tuning; pre-punched truss angles, permitting 10- to 40-degrees of panel tilt; and wedged rails, allowing for further east/west spacing correction and thermal expansion. Patriot's racking design meets a minimum 24" module height clearance for vegetation O&M, and is backed by a 10-year structural warranty.

Patriot Solar | www.patriotsolargroup.com

Clip & cable tie assemblies

Mudge Fasteners and SolarFastenerExpert.com introduce Edge Clip and UV Stabilized Solar Cable Tie Assemblies. Edge Clips and UV Stabilized Cable Tie Assemblies are designed specifically to route cables by securing them to a metal or plastic frame rail edge, eliminating the need for mounting holes and mechanical fasteners. They are easy to secure, and the extraction force is high due to the integrated metal clamp that holds the Edge Clip in place—allowing cable ties to firmly hold the cable, while preventing chafing of the cable.

Mudge Fasteners
www.mudgefasteners.com
www.solarfastenerexpert.com