SECTION 26 31 00.01

PHOTOVOLTAIC COLLECTOR ATTACHMENT SYSTEM

This section has been prepared by Metal Roof Innovations, Ltd. for use in the preparation of a project specification. Attachment may be by one of the following methods:

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Photovoltaic Collector Attachment for metal roofs.
2. **[Non-penetrating attachment system.]**
3. **[Exposed fastened/Face fastened attachment system.]**

1.2 RELATED SECTIONS

A. Division 01: Administrative, procedural, and temporary work requirements apply to this section.

B. Section 07 41 13 - Metal Roof Panels

C. Section 07 61 00 - Sheet Metal Roofing

D. Section 07 62 00 – Sheet Metal Flashing and Trim

E. Section 07 72 00 – Roof Accessories

F. Section 13 34 19 – Metal Building Systems

G. Section 26 31 00 – Photovoltaic Collectors

1.3 REFERENCES

A. Aluminum Association (AA) - Aluminum Standards and Data, Current Edition.

B. ASTM International (ASTM):
1. A484/A484M-16 – Standard Specifications for General Requirements for Stainless Steel Bars, Billets, and Forgings.
2. A554-16 – Standard Specification for Welded Stainless Steel Mechanical Tubing
3. A555/A555M-16 – Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods
4. B85-03 - Standard Specification for Aluminum-Alloy Die Castings.
5. F836M-02 (Current) – Standard Specification for Style 1 Stainless Steel Metric Nuts (Metric).
6. F880-12 – Standard Specification for Stainless Steel Socket, Torx, Square Head, and Slotted Headless-Set Screws.

C. ICC Evaluation Service (www.icc-es.org):

1. Division: 05 00 00 – METALS: Section: 05 05 23 – METAL FASTENERS Evaluation Report ESR-3869

D. Underwriters Laboratory (UL)
1. UL 2703 – Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for use with Flat-Plate Photovoltaic Modules.

1.4 SUBMITTALS

A. Action Submittal:
1. Shop Drawings: Include roof plans showing locations of photovoltaic attachment devices on roof and attachment details and spacing.
2. Product Data:
a. Product description.
b. Construction details.
c. Material descriptions.
d. Individual component dimensions.
e. Finishes.
f. Test report.
g. Installation instructions.
3. Samples:
a. Clamp or Bracket samples.
b. All associated attachment hardware.

B. Informational Submittals:
1. Test results: Results of product tensile load testing of attachment clamp, issued by a recognized ISO/IEC 17025 independent testing laboratory, showing ultimate load-to-failure value of attachment specific to the manufacturer of the roofing, profile of the roof panel, and material of the roofing.
2. Proof of Product Testing: Results of appropriate product tensile load testing, issued by a recognized ISO 17025 accredited independent testing laboratory, showing the mean (of a minimum three test pulls) ultimate load-to-failure value of attachment **[bracket] [clamping device]** proposed on the specimen material named in B.1. Proof of UL 2703 listing.
3. Proof of Certified Production: Copy of manufacturer current ISO 9001 certificate (latest edition).
4. Proof of Best Practice Compliance: Manufacturer duly executed letter stating full compliance with all provisions of Metal Construction Association.

C. Closeout Submittals:
1. Certification: Installer's certification or duly executed letter stating utility attachment system was installed in accordance with manufacturer's instructions and approved Shop Drawings.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer to specialize in production of Metal Roof Attachment Products of the type specified with a minimum of 10 years documented experience.

B. Manufactured in an ISO 9001 certified facility; ICC audited facility.

C. Installer Qualifications: Installer to be certified in Photovoltaic Collector installation and specialized in installation of Metal Roof Attachment Products with a minimum of 5 years documented experience.

D. Mockup:
1. Size: Minimum **[8] [__]** feet long.
2. Show: Photovoltaic attachment clamps, attachment hardware, and accessories.

3. Locate **[where directed.] [____.]**
4. Approved mockup may remain as part of the Work.

E. Field Testing:
1. Installer to complete required field testing of Photovoltaic Attachment devices as required by building codes.

F. Warranty:
1. Lifetime material/workmanship warranty on all products.

1.6 DELIVERY, STORGE AND HANDLING

A. Deliver components to jobsite properly packaged to provide protection during transport, delivery and handling.

B. Store products in manufacturer's original labeled and unopened packaging in a clean and dry location, protected from potential damage, until ready for application.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Attachment system to provide attachment to standing seam metal roofs:
1. With only minor dimpling of panel seams.
2. Without penetrations through roof seams or panels.
3. Without use of sealers or adhesives.
4. Without voiding roof warranty.

B. Attachment system to provide attachment to exposed fastened/face fastened rib, trapezoidal of corrugated metal roofs:
1. Attached with gasketed fasteners.
2. With use of integrated EPDM seals if fixed above the water plane.
3. With use of integrated butyl seals if fixed below the water plane.
4. Without voiding roof warranty.

C. Performance Requirements: Provide attachments to withstand exposure to the weather and environmental elements, and resist design forces without failure due to defective manufacture.

2.2 MANUFACTURER

A. Basis of Design: S-5!® div. of Metal Roof Innovations, Ltd., 500 W. Highway St., Iowa Park, TX 76367; Tel: 888-825-3432; Fax: 719-495-0045; Email: support@s-5.com; Web: www.s-5.com

B. Acceptable Manufactures if products meet specification requirements:
1. S-5!® div. of Metal Roof Innovations, Ltd. https://www.s-5.com/
2. Aerocompact Inc. https://www.aerocompact.com/en-us/
3. SnapNrack. https://snapnrack.com/

C. Substitutions: [Under provisions in Division 1.] Not permitted.

2.3 PHOTOVOLTAIC ATTACHMENT SYSTEMS FOR STANDING SEAM METAL ROOFS

A. Basis of Design: S-5-PV Kit 2.0 manufactured by S-5! Metal Roof Innovations, Ltd.
B. Components:
    1. Clamps:
        a. Manufactured from 6000 series aluminum extrusions conforming to ASTM B221 or aluminum castings conforming to ASTM B85 and to AA Aluminum Standards and Data.
            1) Clamp model to be as recommended by the manufacturer for the specific seam profile used on the project.
        b. Set screws: 300 Series stainless steel, 18-8 alloy, 3/8-inch diameter, with round head point.
    2. PVKIT 2.0 EdgeGrab/StandOff Assembly:
        a. Manufactured from 6000 series aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data.
            1) Model: S-5-PVKIT 2.0 Edge
    3. PVKIT 2.0 MidGrab/StandOff Assembly:
        a. Manufactured from 6000 series aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data.
            1) Model: S-5-PVKIT 2.0 Mid
    4. Universal Mounting stud and disk:
        a. Manufactured from 300 series stainless steel conforming to ASTM A484/A484M-16 for mounting disk and stainless-steel conforming to ASTM A555/A555M-16 for mounting stud.
            1) Model: PV Disk (included in the PVKIT 2.0)

2.4 PHOTOVOLTIAC ATTACHMENT SYSTEMS FOR EXPOSED FASTENED/FACE FASTENED RIB, TRAPEZOIDAL AND CORRUGATED METAL ROOFS

A. Basis of Design: S-5-PVKIT 2.0 manufactured by S-5! div. of Metal Roof Innovations, Ltd.
B. Components:
    1. Brackets:
        a. Manufactured from 6000 series aluminum extrusions conforming to ASTM B221 or aluminum castings conforming to ASTM B85 and to AA Aluminum Standards and Data or stainless-steel conforming to ASTM A484/A484M-16 and A554-16.
            1) Bracket model to be as recommended by the manufacturer for the specific seam profile used on the project. Bracket model to be as recommended by the manufacturer for the specific exposed fastened roof profile used on the project.
        b. Set screws: 300 Series stainless steel, 18-8 alloy, 3/8-inch diameter, with round head point, Torx T30.
        c. Bracket gasket: Factory applied EPDM or butyl depending on bracket.
        d. Attachment screws: 1/4" (6.3mm) Diameter - 1" (25mm) Length - Stainless Steel Self-Tapping Screw with Hardened Steel Piercing Point - 5/16" (8mm) Hex Head - 5/8" (16mm) Stainless Steel/EPDM Sealing Washer.

PART 3- EXECUTION

3.1 EXAMINATION

Prior to beginning installation, verify that:
1. Panel seaming or fastening is complete.
2. Roof panel attachment is sufficient to withstand loads applied by the photovoltaic attachment system, photovoltaic system and associated components.
3. Installation will not impede roof drainage.

3.2 PREPARATION

A. Clean areas to receive attachments; remove loose and foreign matter that could interfere with installation or performance.

3.3 INSTALLATION

A. Install system in accordance with current manufacturer's instructions and approved Shop Drawings

B. S-5-PVKIT 2.0 EdgeGrab System on Standing Seam Metal Roofs:

1. Place clamps as required by PV layout and in-service loads. Install the first row of S-5! clamps, at the edge of the array: It is critical this row is straight. Install a clamp at both ends of the row, by measuring from a reference point such as the eave of the roof. Tighten the setscrews to the specified torque. Stretch a string line between the two end clamps to provide a true line to mount the remaining edge clamps.

2. Place clamps in straight, aligned rows.

3. Tighten set screws to manufacturer's recommended torque. Randomly test set screw torque using calibrated torque wrench.

4. Mount the PVDisks and the EdgeGrab/StandOff Assembly to the first row of clamps per manufacturer’s instructions. Place the PV Disk atop the clamp and thread the Male Portion of the StandOff through the disk and into the clamp. Drive the EdgeGrab/StandOff Assembly down with provided bit tip until the base of the StandOff seats the disk in place and breaks the thread locking seal between the StandOff and Low-Profile Bolt. Leave the grab up, to allow space for a module frame. A 1/2” open end wrench can be used to further tighten the StandOff atop the disk if desired.

5. Install the first row of modules: Place first module in the grabs pushing on the frame to seat the module against the EdgeGrabs and Module Placement Bevel Guide. Drive the Low-Profile Bolt to tighten the grabs to manufacturer’s recommended torque. Check torque periodically during installation to ensure the tool is achieving torque.

6. Install MidGrab/StandOff Assembly & PV Disk on Clamps: the PV Disk and MidGrab/StandOff Assembly should be mounted to the clamps before mounting the clamps to the roof. Place the PV Disk atop the clamp and thread the male portion of the StandOff through the disk and into the clamp. Drive the MidGrab/StandOff Assembly down with the provided bit tip in similar fashion to Step 4.

7. Place MidGrab/StandOff/Disk and Clamp Assemblies: using the PV module as a guide, place the throat of the clamp over the seam and slide the assembly into place so the edge of the module is seated against the wall of the MidGrab and the Module Placement Bevel Guide; tighten bolts to manufacturer's recommended torque.

8. Repeat until final row. The final row will be finished with the EdgeGrab/StandOff Assemblies. Periodically look back at the modules you’ve installed to double check that the MidGrabs were tightened.

9. See manufacturer’s instructions for wire management and bonding and grounding recommendations.

C. S-5-PVKIT 2.0 EdgeGrab System on Exposed Fastened/Face Fastened Rib, Trapezoidal or Corrugated Metal Roofs:

1. Place brackets as required by PV layout and in-service loads.

2. Install the first row of S-5! brackets, at the edge of the array. It is critical that this row is straight. Install a bracket at both ends of the row, by measuring from a reference point such as the eave of the roof. Stretch a string line between the brackets to provide a true line to mount the remaining edge brackets.

3. Peel protective strip from factory applied EPDM or butyl seals prior to attaching bracket. Attach brackets to metal roof with included fasteners. Do not remove EPDM Sealing Washer on fastener. Do not over-drive fastener. Install according to manufacturer's installation instructions.

4. Secure the RibBracket directly into the crown of the roof profile by driving the included fasteners into the pre-punched holes. To achieve tested holding strength, secure the RibBracket by using all pre-punched hole locations. Drive the fastener in until it is tight, and the washer is firmly seated. Be careful not to over-drive fasteners. A slight extrusion of rubber around the washer is a good visual-tightness check. Please see S-5! bracket installation instructions for specific install information.

5. Mount the PVDisks and the EdgeGrab/StandOff Assembly to the first row of brackets: Place the PV Disk atop the brackets and thread the male portion of the StandOff through the disk and into the M8 nut inserted in the bracket (nut provided with brackets). Drive the EdgeGrab/StandOff assembly down with the provided bit tip until the base of the Stand-Off seats the disk in place and breaks the thread locking seal between the StandOff and the Low-Profile Bolt. Leave the grab up, to allow space for a module frame. A 1/2" open-end wrench can be used to further tighten the StandOff atop the disk if desired.

6. Install the first row of modules: Place the first module in the grabs pushing on the frame to seat the module against the EdgeGrabs and Module Placement Bevel Guide. Drive the Low-Profile Bolt with the provided Torx bit tip to tighten the grabs. Low-Profile Bolt and Standoff should be torqued to 120-130 in lbs (13.6-14.7 Nm). Check torque periodically during install to ensure the tool is achieving torque.

7. Install MidGrab/StandOff Assembly & PV Disk on Brackets: The PV Disk and MidGrab/StandOff Assembly should be mounted to the brackets before mounting the brackets to the roof. Place the PV Disk atop the brackets and thread the male portion of the StandOff through the disk and into the M8 nut inserted in the bracket (nut provided with brackets). Drive the EdgeGrab/ StandOff assembly down with the provided bit tip until the base of the Stand-Off seats the disk in place in similar fashion to Step 5. Note: When using CorruBrackets, the bracket must be secured to the roof prior to fixing the S-5-PVKIT 2.0 EdgeGrab or MidGrab assembly to bracket.

8. Place MidGrab/StandOff/Disk & Bracket Assemblies: Using the PV module as a guide, place the bracket on the rib and move into place so that the edge of the module is seated against the wall of the MidGrab and the Module Placement Bevel Guide. Secure the RibBracket directly into the crown of the roof profile by driving the fasteners (included with RibBrackets) into the pre-punched holes as described in step 2 above. At this point the grabs should be left in the open position, at least partially to accommodate the next row of modules.

9. Install additional PV modules-repeating steps 6-8: Place another module in the MidGrabs that were left open in the previous step. Tighten the downslope row of grabs each time a module is placed and leave the upslope MidGrabs open until the next module is placed. The final row will be finished with EdgeGrab/StandOff Assemblies. Periodically look back at the modules you've installed to double check the MidGrabs were tightened.

10. See manufacturer's instructions for wire management and bonding and grounding recommendations.

END OF SECTION