November 8, 2018

Mr. Clifford Schrock
SUNMODO
14800 NE 65th St.
Vancouver, WA 98682

Subject: EZ 2" Standard Standing Seam Clamp with L-Foot Laboratory Load Testing Part #K50210-001 Attached to 24ga MS-200 by Taylor Systems

Dear Mr. Schrock:

As requested, Applied Materials & Engineering, Inc. (AME) has completed load-testing the EZ 2" Standard Standing Seam Clamp, (Part #K50210-001) with L-Foot; see Appendix A, Figure A1. The purpose of our testing was to evaluate the tensile (uplift) and lateral (shear) load capacity of the EZ 2" Standard Standing Seam Clamp attached to a 24ga MS-200 roofing sample manufactured by Taylor Systems.

SAMPLE DESCRIPTION

Mockup samples were delivered to our laboratory on October 19, 2018. Mockup configuration consists of a 1/2" Structural I plywood test sample reinforced with a 2"x4" wood frame to minimize the flexing of the plywood. The 24ga MS-200 roofing sample is fastened to a 2"x4" wood rafter through the Structural I plywood via 3/8"Øx2.5" lag screws. The EZ 2" Standard Standing Seam Clamp with L-Foot is attached to the 24ga MS-200 roofing sample via two M10 set screws. The test samples can be seen in Appendix B.

TEST PROCEDURES & RESULTS

1. Tensile (Uplift) Load Test

A total of three tests were conducted for tensile (uplift) load capacity on October 29, 2018 using a United Universal testing machine. Samples were rigidly attached to the testing machine and an uplift (tensile) load was applied to each clamp. The samples were loaded in tension at a constant rate of axial deformation of 0.10 in. /min. without shock until failure occurred; deflection at maximum load was recorded.

Based on the above testing, the average maximum uplift load of the EZ 2" Standard Standing Seam Clamp with L-Foot attached to a 24ga MS-200 roofing sample by Taylor Systems was determined to be 425 lbf. Detailed results are provided in Table I and Figure 1. Test setup and mode of failure are provided in Appendix B, Figure B1.

NOTE: THESE LOADS SHOW NO FACTOR OF SAFETY (FOS). A FOS = 2 IS RECOMMENDED FOR LOAD CAPACITY VALUES.
2. Lateral (Shear) Load Test Parallel to Rafter and Seam

A total of three tests were conducted for lateral (shear) load capacity on October 30, 2018 using a United Universal testing machine. Samples were rigidly attached to the testing machine and a shear load (parallel to the rafter and roofing sample seam) was applied to each clamp. The samples were loaded in a downward direction at a constant rate of axial deformation of 0.10 in./min. without shock until failure occurred; displacement at maximum load was recorded.

Based on the above testing, the average maximum shear load of the EZ 2" Standard Standing Seam Clamp with L-Foot attached to a 24Ga MS-200 roofing sample by Taylor Systems was determined to be 237 lbf. Detailed results are provided in Table II and Figure 2. Test setup and mode of failure are provided in Appendix B, Figure B2.

Respectfully Submitted,

APPLIED MATERIALS & ENGINEERING, INC.

Joseph Gapuz
Laboratory Manager

Reviewed by:

Armen Tajirian, Ph.D., P.E.
Principal
TABLE I
TENSILE (UPLIFT) LOAD TEST RESULTS
EZ 2" STANDARD STANDING SEAM Clamp w/ L-FOOT
(PART #K50210-001)

PROJECT NUMBER 1180828C

<table>
<thead>
<tr>
<th>TEST NUMBER</th>
<th>MAXIMUM TENSILE LOAD (lbf)</th>
<th>DEFLECTION AT MAXIMUM LOAD (in.)</th>
<th>MODE OF FAILURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2459</td>
<td>441</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>2505</td>
<td>404</td>
<td>1.0</td>
<td>Seam Clamp Slippage</td>
</tr>
<tr>
<td>2543</td>
<td>431</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>AVERAGE</td>
<td>425</td>
<td>1.0</td>
<td>..</td>
</tr>
</tbody>
</table>

NOTE: THESE LOADS SHOW NO FACTOR OF SAFETY (FOS). A FOS = 2 IS RECOMMENDED FOR LOAD CAPACITY VALUES.
## TABLE II

**LATERAL (SHEAR) LOAD TEST RESULTS**

**EZ 2” STANDARD STANDING SEAM CLAMP w/ L-FOOT**

(\textit{PART #K50210-001})

**PROJECT NUMBER 1180828C**

<table>
<thead>
<tr>
<th>TEST NUMBER</th>
<th>MAXIMUM SHEAR LOAD (lbf)</th>
<th>DEFLECTION AT MAXIMUM LOAD (in.)</th>
<th>MODE OF FAILURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2557</td>
<td>218</td>
<td>0.9</td>
<td>Seam Clamp Slippage</td>
</tr>
<tr>
<td>2558</td>
<td>235</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>2559</td>
<td>257</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>AVERAGE</td>
<td>237</td>
<td>0.8</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** THESE LOADS SHOW NO FACTOR OF SAFETY (FOS). A FOS = 2 IS RECOMMENDED FOR LOAD CAPACITY VALUES.

**FIGURE 2**

![PART #K50210-001 SHEAR LOAD TEST Load-Deflection Curve](image)
REFERENCES

FIGURE A1

EZ 2" STANDARD STANDING SEAM CLAMP w/ L-FOOT
(PART #K50210-001)

PROJECT NUMBER 1180828C

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**EZ STANDING SEAM ROOF CLAMPS**

<table>
<thead>
<tr>
<th>1&quot; SEAM CLAMP</th>
<th>1&quot; SEAM CLAMP</th>
<th>2&quot; SEAM CLAMP</th>
<th>2&quot; SEAM CLAMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDARD</td>
<td>MINI</td>
<td>STANDARD</td>
<td>MINI</td>
</tr>
<tr>
<td>K50200-001</td>
<td>K50200-002</td>
<td>K50210-001</td>
<td>K50210-002</td>
</tr>
</tbody>
</table>

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| Competitors Clamps | | Competitors Clamps | | Competitors Clamps | | Competitors Clamps |
|---------------------|------------------|---------------------|------------------|---------------------|---------------------|
| Ace A2             | Ace A2-N         | Ace ML             | Ace ML           |
| Ace A2-N           | S-5-B Mini       | S-5-H              | S-5-H Mini       |
| S-5-B              | S-5-E Mini       | S-5-H90            | S-5-H90 Mini     |
| S-5-E              | S-5-N Mini       | S-5-N 1.5          | S-5-N 1.5 Mini   |
| S-5-N              | S-5-R465 Mini    | S-5-Q              | S-5-Q Mini       |
| S-5-R465           | S-5-S Mini       | S-5-S              | S-5-S Mini       |
| S-5-S              | S-5-U Mini       | S-5-T              | S-5-T Mini       |
| S-5-U              | S-5-V Mini       | S-5-U              | S-5-U Mini       |
| S-5-V              | S-5-Z Mini       | S-5-V              | S-5-V Mini       |
| S-5-Z              |                   | S-5-Z              | S-5-Z Mini       |

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APPENDIX B
FIGURE B1

EZ 2” STANDARD STANDING SEAM CLAMP w/ L-FOOT  
(PART #K50210-001)

TENSILE LOAD TEST SETUP

PROJECT NUMBER 1180828C

Figure B1a. Test Setup

Figure B1b. Typical Failure Mode
FIGURE B2

EZ 2" STANDARD STANDING SEAM CLAMP w/ L-FOOT
(PART #K50210-001)

LATERAL (SHEAR) LOAD TEST SETUP

PROJECT NUMBER 1180828C

Figure B2a. Test Setup

Figure B2b. Typical Failure Mode