



# STANDING SEAM SPOTLIGHT

An Educational Bulletin for Metal Roofing Professionals

## Don't Throw Caution to the Wind

By Mark Ricigliano and Bobby Addison

When designing and specifying a metal roof, a wind uplift analysis is crucial to ensuring that the desired panel profile, width and gauge will meet code requirements. International Building code (IBC) requires that pressures are determined for an individual structure in accordance with ASCE 7, and



recommend ASTM E 1592 testing to demonstrate that the allowable wind uplift capacity of the proposed roofing system meets or exceeds the design wind uplift loading on the individual structure.



| <b>PROJECT</b> Example 6  |                        |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
|---|------------------------|--------|--------|--------|--------|--------|--------|---------------------|------|------|------|------|------|-------------------------|------|------|------|--|--|-----------------|------|------|------|------|------|--------------------|------|------|------|------|------|-----------------------|--|--|--|--|--|-----------------------|--------|--|--|--|--|-------------------------|----------|--|--|--|--|
| <b>DATE</b> 3/9/08  |                        |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| <b>BASIC VELOCITY PRESSURE</b> 32.53 psf  |                        |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| <b>DESIGN CODE</b> ASCE 7-95  |                        |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| <b>Panel &amp; Fastener Data</b>  |                        |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| PANEL TYPE  | 2-3/8" Mechanical Seam |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| PANEL WIDTH   | 18 in                  |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| PANEL/CAP MATERIAL  | 0.040 Aluminum         |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| SUBSTRATE MATERIAL  | Steel                  |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| SUBSTRATE THICKNESS   | 22 gauge               |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| FASTENER TYPE   | * #14 Deck Screw Rawl  |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| FASTENERS PER CLIP  | 2                      |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| FASTENER SAFETY FACTOR  | 1.875                  |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| CLIP PRY COEFFICIENT  | 1.65                   |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| ULTIMATE FASTENER PULLOUT   | 505 lbs/screw          |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| ALLOWABLE CLIP LOAD   | 326 lbs/clip           |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| PANEL SAFETY FACTOR   | 1.650                  |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| MAX. PANEL THERMAL LENGTH   | 32.00 ft               |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| <b>Building &amp; Site Data</b>   |                        |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| BASIC WIND SPEED  | 105 mph                |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| EXPOSURE CATEGORY   | C                      |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| TOPOGRAPHY FACTOR   | 1.00                   |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| BUILDING TYPE   | Enclosed               |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| DESIGN ROOF HEIGHT  | 33.00 ft               |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| IMPORTANCE CLASS / FACTOR   | II   1.15              |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| MIN. BLDG WIDTH   | 74 ft                  |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| HURRICANE PRONE   | NO                     |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| PARAPET   | NO                     |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| ROOF ANGLE  | 9.46 deg               |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| STRUCTURAL DECK   | NO                     |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| ROOF TYPE   | Gable/Hip              |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| EXTREME THERMAL RANGE   | 200 deg F              |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| <table border="1"> <thead> <tr> <th></th> <th>ZONE 1</th> <th>ZONE 2</th> <th>ZONE 3</th> <th>ZONE 4</th> <th>ZONE 5</th> </tr> </thead> <tbody> <tr> <td>ROOF PRESSURE (psf)</td> <td>38.4</td> <td>64.4</td> <td>96.9</td> <td>38.1</td> <td>46.8</td> </tr> <tr> <td>OVERHANG PRESSURE (psf)</td> <td>55.3</td> <td>55.3</td> <td>91.1</td> <td></td> <td></td> </tr> <tr> <td>PANEL SPAN (ft)</td> <td>4.42</td> <td>3.27</td> <td>2.07</td> <td>4.42</td> <td>4.03</td> </tr> <tr> <td>FASTENER SPAN (ft)</td> <td>5.15</td> <td>3.07</td> <td>2.04</td> <td>5.20</td> <td>4.22</td> </tr> <tr> <td>FM RATING (FMRC 4471)</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>EDGE ZONE WIDTH "a" -</td> <td>7.4 ft</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>MAX. THERMAL MOVEMENT -</td> <td>1.000 in</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> |                        |        | ZONE 1 | ZONE 2 | ZONE 3 | ZONE 4 | ZONE 5 | ROOF PRESSURE (psf) | 38.4 | 64.4 | 96.9 | 38.1 | 46.8 | OVERHANG PRESSURE (psf) | 55.3 | 55.3 | 91.1 |  |  | PANEL SPAN (ft) | 4.42 | 3.27 | 2.07 | 4.42 | 4.03 | FASTENER SPAN (ft) | 5.15 | 3.07 | 2.04 | 5.20 | 4.22 | FM RATING (FMRC 4471) |  |  |  |  |  | EDGE ZONE WIDTH "a" - | 7.4 ft |  |  |  |  | MAX. THERMAL MOVEMENT - | 1.000 in |  |  |  |  |
|   | ZONE 1                 | ZONE 2 | ZONE 3 | ZONE 4 | ZONE 5 |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| ROOF PRESSURE (psf)   | 38.4                   | 64.4   | 96.9   | 38.1   | 46.8   |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| OVERHANG PRESSURE (psf)   | 55.3                   | 55.3   | 91.1   |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| PANEL SPAN (ft)   | 4.42                   | 3.27   | 2.07   | 4.42   | 4.03   |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| FASTENER SPAN (ft)  | 5.15                   | 3.07   | 2.04   | 5.20   | 4.22   |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| FM RATING (FMRC 4471)   |                        |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| EDGE ZONE WIDTH "a" -   | 7.4 ft                 |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |
| MAX. THERMAL MOVEMENT -   | 1.000 in               |        |        |        |        |        |        |                     |      |      |      |      |      |                         |      |      |      |  |  |                 |      |      |      |      |      |                    |      |      |      |      |      |                       |  |  |  |  |  |                       |        |  |  |  |  |                         |          |  |  |  |  |

Basic building information is all that is required to run a wind up-lift analysis using ASCE 7-02 in conjunction with ASTM 1592. Most quality metal roofing manufactures will provide you with this type of engineering. And since the total roof design can be affected by the results of a wind uplift analysis, including type, width, and gauge of panel, material, underlayment, nail board and deck, obtaining a wind uplift analysis prior to designing or specifying a roof will eliminate unforeseen costs and risks.

For example, a designer may be considering an 18-inch, 24-gauge architectural panel, with clips spaced 4-feet on center. But when a wind uplift analysis concludes that in order to remain compliant using the intended architectural panel system, 12-inch 22-gauge panels must be installed 2-feet on center, and that an underlayment will also be needed. This revelation will dramatically impact the cost of the intended system.

The same analysis also reveals, however, that an 18-inch 24-gauge structural panel with clips spaced 4-feet on center will comply and require only perimeter underlayment. So, while the designer had chosen what he believed to be a cost-effective architectural panel, the wind uplift analysis exposed potential "hidden" costs with the architectural system. The analysis also showed that the actual lower-cost solution is the more reliable and resilient structural system, since it meets code requirements using a lighter gauge material with a wider seam, and reduces labor costs with no underlayment required and fewer clips to install.



The now well-informed designer can recommend a high performance structural panel with a much better water-tightness warranty while preserving the budget by considering the total cost of the roofing system. So, don't throw caution to the wind by looking merely at the panel cost to choose your roofing system. Obtain a wind up-lift analysis, and equip yourself with the information you need to choose the right system for your individual project.

*For help determining the right kind of system for your project, contact your IMETCO representative.*