

High-Performance BEMO Roof Systems Survivability for Sustained Gale-Force Winds

Category 4 and 5 Super Typhoons, a devastating hurricane in Puerto Rico and **27 named hurricanes in Florida**, all without a single roof panel being blown off a Bemo roof system.

CASE STUDY

180 mph Sustained Winds with Reported Gusts of 256 mph!



Aftermath of the 2018 Super Typhoon Yutu and 2016 Super Typhoon Soudelor. Saipan International Airport.



Two Super Typhoons, 25 Named Hurricanes in Florida and Puerto Rico Without a Single Panel Loss

In 2015, the South Pacific islands of Tinian and Saipan were struck by Category 5 Super Typhoon Soudelor whose record-breaking 178mph winds were strong enough to tear bark from trees. Just 2-years later Category 5 Super Typhoon Yutu slammed the small islands with its sustained winds of 180mph. The aftermath of these two storms revealed destroyed buildings, devastating damage to the island's infrastructure, and isolation from outside resources. Throughout both Typhoons the BEMO Roof systems that had been installed on Tinian Airport and the Saipan International Airports held strong.

Even though buildings in and around the airports were heavily damaged or destroyed, the Bemo roof panel systems stayed in place and protected these vital transportation hubs. As a result, both of the airports were able to return to operation very quickly. The Saipan International Airport had been re-roofed with BEMO 65/305 panels in 2005 while the Tinian airport main terminal building was roofed in 2014. Both of these Factory Mutual tested roofing installations not only met but far exceeded all design loads. In Saipan, the commuter terminal building that was designed and built as a pre-engineered metal building structure had the roof blown off and the entire building collapsed. However, the Bemo roof on the main terminal kept the interior safe and secure.

Since 2004, twenty-four named hurricanes have been recorded in Florida. Some storms were so large and destructive that their names are burned into memories. Today in Florida, BEMO roof systems are installed on over 100 projects from port facilities to airports and transportation centers. Even when Florida's hurricanes were at record strength, not a single roof panel was blown off of any structure.

In September 2017, Category 5 Hurricane Maria hit the island of Puerto Rico with maximum sustained winds of 175mph. After passing directly over the island, damage to property and infrastructure was estimated to be \$91.61 billion. Immediately after the storm passed, the Puerto Rico Convention Center was used as a relief center for storm victims. The convention center survived the cyclone without substantial damage. The Bemo USA manufactured roof system was installed in 2003 and once again, not a single roof panel was blown off.



Hurricane Michael, October 2018

BEMO Roof systems and installation components are engineered, tested, and certified to withstand the most extreme conditions found in nature. Bemo USA manufactures custom panels that can be roll-formed and curved on-site to assure a lasting engineered solution. BEMO Hook Clips in several variations firmly secure the panels to the structure while allowing for panel expansion and contraction. The standard BEMO Hook Clip compensates for the expansion of steel panels up to 300' while the BEMO Long-slide Hook Clip allows contiguous steel panels of over 400'. Both are engineered and tested for high-performance survivability for gale-force winds.

BEMO Roofs Located Directly in the Path of Hurricane Force Winds

2018	Hurricane Michael	155 mph	Bay County Airport – Panama City, FL
2017	Hurricane Maria	175 mph	Puerto Rico Convention Center – Puerto Rico
2018	Super Typhoon Yutu	180 mph	Saipan Intl Airport & Tinian Intl Airport – Saipan and Tinian Islands
2016	Super Typhoon Soudelor	156 mph	Saipan Intl Airport & Tinian Intl Airport – Saipan and Tinian Islands
2004	Hurricane Frances	145 mph	United States Federal Courthouse – Ft. Pierce, FL

Testing & Certifications

Dade County NOAA Certification:

TAS 125-03 Standard requirements for metal roofing systems (noa certification -219.6 psf)

TAS 114-95 (APPENDIX G) Test procedure for susceptibility to leakage for roof system assemblies

TAS 100-95 Test procedure for wind & wind driven rain resistance of discontinuous roof systems

SBCCI (SSTD 12-99) Impact resistance test from wind-borne debris

ASTM1592 Structural performance of BEMO sheet metal roof

ASTM E1592 Dynamic Loading

ASTM E283 & E331 Air and Water

ASTM E1646 & E1680 Air and Water 100,000 Cycle Thermal Test

ASTM E2140-01 Standard test method for water penetration of metal roof panel systems by static water pressure head

Factory Mutual Global:

Windstorm Classification 4471

– Class 1-90

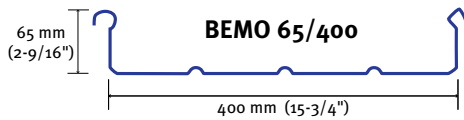
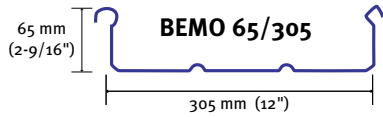
– Class 1-105

– Class 1-120

– Class 1-180



BEMO Roof Panels Systems for Survivability in Extreme Conditions



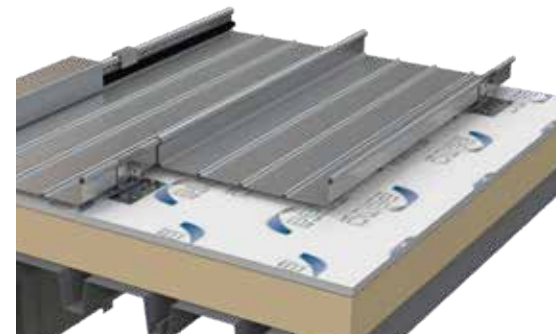
Metal panel profiles available in 3 standard widths using Stainless Steel, Zinc, Copper, Aluminum, Steel and Titanium. Custom widths are also available.



Convex, concave or even “S” curves can be easily and efficiently accommodated by the Bemo roof system. Bemo roof panels can be curved using a specially developed rolling mill that can curve the BEMO panels smoothly to a radius as tight as 10’ (3.01 m) or less, depending on the profile and material used.

BEMO Hook Clips Engineered for High-Wind Environments

Each component is designed, engineered and tested to ensure exceptional performance. BEMO Hook Clips allow for the expansion and contraction of various lengths of the roof panel and are the industry’s only zero-wear system in a 100,000 cycle test. BEMO Hook Clips are also available in several different corrosion-resistant alloys.



Rendering showing a BEMO 65/400 Roof Panel using BEMO Hook Clips to secure panels to structure.



BEMO Hook Clip to accommodate metal panels as long as 300' (steel).



BEMO Long-slide Hook Clip with 7.5" of travel to accommodate metal panels as long as 400' (steel).



Puerto Rico Convention Center



Architectural Integrity

Featuring the Hamad International Airport with over 3 million sf (300,000 m²) of stainless steel.



Custom Shapes and Curves

Smooth curving and tapered panel technologies in natural metals or with high-performance coatings.



BEMO Custom Walls and Soffits

Unique wall panel applications for every design.



Environmentally Responsive

High recycled content metals, low emissivity coatings and on-site manufacturing all provide for a more environmentally responsible system.



Economical, Flexible, Weather-tight

Natural non-coated metal systems offer long term low life-cycle cost roofing solutions.



Quality From Start to Finish

BEMO Mobile Factory Mills, field technical services, engineering assistance.



Components and Custom Applications

High-performance clips, underlayments, detail treatments and fabrications.



BEMO Flexibility and Performance

Factory Mutual, Metro Dade County Approval, UL Listings, ASTM Performance, acoustic applications, fire ratings.



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