



Arts, Recreation and Entertainment
Ports, Coastal and Waterfront
Real Estate Development
Public Infrastructure
Transportation
Government
Healthcare
Education
Industrial
Energy

July 1, 2019

Stageline Mobile Stage Inc.
700 Marsolais Street
L'Assomption, Quebec, Canada, J5W 2G9

Email : Yvan@stageline.com

Attn: Mr. Yvan Miron

Re: SAM550 Mobile Stage – Use in the United States
McLaren File No. 103096 Phase 37

McLaren Engineering Group (McLaren) has reviewed the SAM550 Mobile Stage system 2005 version for general use in the United States. The calculations and drawings were produced under the direct supervision and responsible charge of "the undersigned." The final documents are the result of a comprehensive evaluation by McLaren and include approved revisions as needed resulting from these engineering reviews. **We believe that the erected system will safely support the approved loading and environmental conditions if properly assembled and used in accordance with manufacturer's recommendations and as noted herein.**

The assessment by McLaren only considers the fully erected SAM550 Mobile Stage structure and its standard features, including wind walls, adjustable "Line Array" sound hangers, front-of-house rigging trusses, and optional extension floors. Additional items such as auxiliary components, P.A. side platforms, access ramp, hydraulic systems and erection devices were not considered in this review. The fabrication, design and operational procedures meet or exceed the requirements of ANSI E1.21-2013 "Entertainment Technology – Temporary Structures Used for Technical Production of Outdoor Entertainment Events." The design loads were derived from ASCE 7 and ANSI E1.21. Steel design was performed using AISC-LRFD provisions. Plywood was designed using APA provisions.

The design and construction of the erected stage assembly meets the applicable requirements of IBC-2018 Chapter 16, with the following suitable adjustments:

1. The mobile stage is erected for a very short period of time and protective actions will be taken by trained personnel under specified environmental conditions. Environment loads in ASCE 7 and IBC, including wind, are based on statistical probabilities that relate to time. Reductions in design loads have been taken using the provisions of ANSI E1.21 to account for such conditions. The wind design loads for the mobile stage far exceed the minimum permissible using E1.21.
2. ANSI E1.21 allows reduced wind loads compared with IBC only if weather is monitored and if certain actions by trained personnel can be accomplished. The

CERTIFICATE VALID FOR:

***** SAM550 #270 *****

DATE OF ISSUE: 2019-10-15

EXPIRY DATE: 2020-01-31



McLaren Technical Services, Inc.

530 Chestnut Ridge Road
Woodcliff Lake, NJ 07677
Phone (201) 775-6000

Offices: New York, New Jersey, Maryland, Florida, Connecticut, California, Georgia, Pennsylvania

Licensed in:
Alabama•Alaska•Arizona•Arkansas•California•Colorado•Connecticut•Delaware•District of Columbia•Florida•Georgia•Hawaii•Idaho•Illinois
Indiana•Iowa•Kansas•Kentucky•Louisiana•Maine•Maryland•Massachusetts•Michigan•Minnesota•Mississippi•Missouri•Montana•Nebraska
Nevada•New Hampshire•New Jersey•New Mexico•New York•North Carolina•Ohio•Oklahoma•Oregon•Pennsylvania•Puerto Rico•Rhode Island
So. Carolina•So. Dakota•Tennessee•Texas•Trinidad & Tobago•Utah•USVI•Vermont•Virginia•Washington•West Virginia•Wisconsin•Wyoming

e-mail: mgmclaren@mgmclaren.com
On the web: www.mgmclaren.com

procedures in the User's Manual comply with and exceed the minimum requirements of E1.21.

Design Wind Speeds:

There was a significant change to the way wind speeds were implemented in the ASCE7-10 standard which is referenced in some recent codes. Most notably, the wind speeds shown in the wind maps were increased; however, the new code has a 0.6 reduction factor for wind pressures in the load combinations. When these reduction factors are applied, they result in very similar wind pressures at 115 mph for ASCE7-10 as compared to the 90 mph wind speed as referenced in ASCE7-05. This change in wind map numbers is a change in how the engineering equations are put together, but the resulting forces are essentially unchanged.

$$\begin{aligned} P_{05} &= 0.00256 * K_z * K_{zt} * K_d * I * V_{05}^2 & \text{and} & & P_{10} &= 0.00256 * K_z * K_{zt} * K_d * V_{10}^2 \\ \text{Where } I &= 1 & & & \text{Where 0.6 Load Factor is applied} \\ P_{05} &= 0.6 * P_{10} & \text{or} & & V_{05}^2 &= 0.6 * V_{10}^2 \\ \sqrt{V_{05}^2} &= \sqrt{(0.6 * V_{10}^2)} \\ V_{05} &= (\sqrt{0.6}) * V_{10} \\ V_{05} &= 0.775 * V_{10} & \text{or} & & V_{10} &= V_{05} / 0.775 & \text{or} & & V_{10} &= 90 / 0.775 = 116.1 \text{ mph} \end{aligned}$$

Throughout the current documentation, wind speeds listed are actual speeds (service level), which would be measured or reported by forecasts. In contrast, ASCE 7-10 uses factored wind speeds that apply directly to engineering equations. In this case, a 90 mph actual wind corresponds with a 115 mph factored wind as used in ASCE 7-10.

Stageline Mobile Stage Inc. furnished the following material for review:

1. SAM550 (2005) Mobile Stage Design Brief, dated January 2005.
2. SAM550 (2005) User's Manual, dated January 2005.
3. Matrix structural computer model analysis results using "Visual Design" software by Civil Design Inc.
4. SAM550 (2005) assembly drawings and select detail shop drawings.
5. Load test reports for selected components.
6. Stageline Mobile Stage Equipment "Wind Resistance and Procedures in Case of Heavy Wind," 2019 edition.

The SAM550 Mobile Stage is to be used as a performance or similar platform for short-term temporary use in outdoor environments. The mobile stage travels as a tractor trailer; when it arrives on site, the Certified Operator and crew deploy and erect the stage roof and stage platform assembly. The trailer chassis remains in place as the center portion of the stage. The mobile stage bears on grade that is suitable to support the truck and tractor trailer. The Certified Operator in conjunction with the Event Producer are responsible for confirming that the ground bearing conditions are suitable as per the User's Manual.

The mobile stage has a roof, available rigging points, and optional fabric wind walls. The stage is a temporary performance platform and not a legitimate theater stage, and as

CERTIFICATE VALID FOR:

***** SAM550 #270 *****

DATE OF ISSUE: 2019-10-15

EXPIRY DATE: 2020-01-31



such, is not subject to the same live loads. The SAM550 has a stage live load rating of 150 psf. The SAM 550 has a roof live load rating of 20 psf unriggered or 2 psf of live load and 24,000 lbs and 6,600 lbs for each sound extension rigging truss, based on the rigging plan in the SAM 550 User's Manual. Standard Stageline stairs and guardrails are appropriate for performance use. Netting must be added to the guardrails for events in which the general public will have access to the stage area. The wood pads under the stabilizers must be the type with rubber.

The stage roof is intended to support rigging loads, wind, and rain. It is not generally intended to support the weight of snow and ice. Use in locations and time periods where snow and ice are a possibility shall be reviewed and approved in writing by a professional engineer for the combined effects of rigged loads, wind, snow, rain and/or ice.

Users must understand and carefully adhere to the Rigging Diagram provided in the User's Manual. If the desired rigging loads deviate from or exceed those specified on the Rigging Diagram, contact Stageline Mobile Stage Inc. for advice. No adjustments or modifications should be made to the SAM550 without first being reviewed and approved by Stageline Mobile Stage Inc.

As stated in the SAM550 User's Manual, the stage system must be operated under the supervision of Stageline trained and certified personnel.

The mobile stage assembly is designed to resist a service level 90 mph 3-second wind gust without the wind walls, and service level 60 mph 3-second wind gust with the wind walls in place. These service level wind speeds are equivalent to factored design wind speeds of 115 mph and 77 mph 2-second wind gusts as per ASCE 7-10. (Please note that while ASCE 7-10 references factored wind speeds for load calculation purposes, wind speeds that are actually measured and reported by weather stations and weather information services will be service level wind speeds.) A Stageline Certified Operator is required to monitor wind forecasts from an official weather information service for the entire period the structure is assembled. Stageline recommends that the Operator use an anemometer to measure wind on site for improved real-time wind monitoring. The Certified Operator shall take recommended actions listed in the User's Manual and in the attached "Wind Resistance and Procedures in Case of Heavy Wind" document, if wind gusts approaching the applicable limit are possible or measured. Depending on the situation, such actions include lowering of the roof if time permits, removal of vulnerable equipment, rapid mitigation of wind resistance from wind walls, and evacuation of personnel to a safe distance from the assembly.

Although not ordinarily required by governmental authorities for temporary structures, seismic loads have been considered for moderate and high seismic regions. The seismic loads do not govern the design.

McLaren acknowledges that the SAM550 Mobile Stage is a piece of equipment that serves the live event industry and it is not practical to involve engineers in typical usage. As such, it is the responsibility of the Stageline Certified Operator to adhere to the manufacturer's guidelines. In addition, if the mobile stage is part of a larger event with other structures, it is the responsibility of the Event Producer to understand the requirements of the Stageline equipment, to understand the responsibilities of the Stageline Certified Operator, and coordinate the Stageline mobile stage requirements with the event operational management plan. It is the responsibility of the mobile stage Owner to comply with the documented

CERTIFICATE VALID FOR:

***** SAM550 #270 *****

DATE OF ISSUE: 2019-10-15

EXPIRY DATE: 2020-01-31

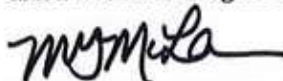


guidelines, including proper use, maintenance, and periodic inspections and testing. Such inspections include visual and functional testing of all hydraulic, structural and mechanical components. Stageline recommends that such inspections be conducted by qualified personnel once every year according to the manufacturer's guidelines. The inspection and testing reports must be properly filed along with the maintenance records of the mobile stage. The mobile stage must have been inspected within the last 24 months by a competent authority for this certificate to be valid. If critical defects were found on the structure during the inspection, repairs and procedures must have been approved by a structural engineer and completed according to professional standards. Inspection, engineering approval (if applicable) and repair documents must be presented upon request.

Please feel free to contact our office if you have any questions about our review.

Very truly yours,

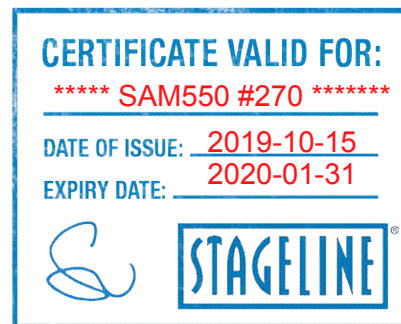
The Office of
McLaren Technical Services, Inc.
d/b/a McLaren Engineering Group









Malcolm G. McLaren, P.E., SECB
CEO

MGM/WBG/lhg/scd

Attachments: Stageline Wind Resistance and Procedures in Case of Heavy Wind
State P.E. and S.E. seals



R:_Entertainment\Client Project Files\Stageline Letters and Documentation\07 - SAM550 US Letter 2019-07-01.docx

<p>Alabama</p>  <p>Malcolm G. McLaren, P.E. AL PE #30536-E</p>	<p>Arizona</p>  <p>William B. Gorlin, P.E. AZ PE#61198</p>	<p>Arkansas</p>  <p>Malcolm G. McLaren, P.E. AR PE#9849</p>
<p>California</p>  <p>Malcolm G. McLaren, P.E. CA PE#C34109</p>	<p>Colorado</p>  <p>William B. Gorlin, P.E. CO PE#50853</p>	<p>Connecticut</p>  <p>William B. Gorlin, P.E. CT PE#16429</p>
<p>Delaware</p>  <p>Malcolm G. McLaren, P.E. DE PE#10093</p>	<p>Florida</p>  <p>William B. Gorlin, P.E. FL PE #59789</p>	<p>Georgia</p>  <p>Malcolm G. McLaren, P.E. GA PE #14239</p>

Hawaii



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

04/30/2020

Expiration Date of the License

Signature

William B. Gorlin, P.E.
HI PE#13502

Idaho



William B. Gorlin, P.E.
ID PE#13185

Illinois



William B. Gorlin, S.E.
IL SE#081.006019

Indiana



Malcolm G. McLaren, P.E.
IN PE#60900241

Iowa



William B. Gorlin, P.E.
IA PE#20250

Kansas



Malcolm G. McLaren, P.E.
KS PE#20393

Kentucky



Malcolm G. McLaren, P.E.
KY PE#13871

Louisiana



Malcolm G. McLaren, P.E.
LA PE#29960

Maine






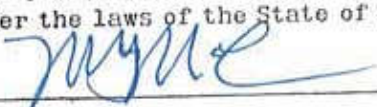





Malcolm G. McLaren, P.E.
ME PE#12192

CERTIFICATE VALID FOR:

*****SAM550 #270*****

DATE OF ISSUE: 2019-10-15

EXPIRY DATE: 2020-01-31

<p>Maryland</p>  <p>Malcolm G. McLaren, P.E. MD PE#10663</p>	<p>Massachusetts</p>  <p>William B. Gorlin, P.E. MA PE#52322</p>	<p>Michigan</p>  <p>Malcolm G. McLaren, P.E. MI PE#6201033778</p>
<p>Minnesota</p> <p>I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.</p>  <p>Date 07/01/2019 Registration No. 25312</p> <p>Malcolm G. McLaren, P.E. MN PE#25312</p>	<p>Mississippi</p>  <p>Malcolm G. McLaren, P.E. MS PE #12055</p>	<p>Missouri</p>  <p>Malcolm G. McLaren, P.E. MO PE#023163</p>
<p>Montana</p>  <p>William B. Gorlin, P.E. MT PE#20095</p>	<p>Nebraska</p>  <p>Malcolm G. McLaren, P.E. NE PE#11416</p>	<p>Nevada</p>  <p>William B. Gorlin, P.E. NV SE #10110</p>

CERTIFICATE VALID FOR:

***** SAM550 #270 *****

DATE OF ISSUE: 2019-10-15

EXPIRY DATE: 2020-01-31



McLaren Technical Services, Inc.












<p>New Hampshire</p>  <p>Malcolm G. McLaren, P.E. NH PE#4392</p>	<p>New Mexico</p>  <p>William B. Gorlin, P.E. NM PE #23145</p>	<p>New Jersey</p>  <p>William B. Gorlin, P.E. NJ PE#24GE05240500</p>
<p>New York</p>  <p>William B. Gorlin, P.E. NY PE#067163</p>	<p>North Carolina</p>  <p>Malcolm G. McLaren, P.E. NC PE#17978</p>	<p>Ohio</p>  <p>Malcolm G. McLaren, P.E. OH PE#E-48017</p>
<p>Oklahoma</p>  <p>Malcolm G. McLaren, P.E. OK PE#20741</p>	<p>Oregon</p>  <p>Malcolm G. McLaren, P.E. OR PE#12000PE</p>	<p>Pennsylvania</p>  <p>Malcolm G. McLaren, P.E. PA PE#37653</p>

CERTIFICATE VALID FOR:

*** SAM550 #270 *****

DATE OF ISSUE: 2019-10-15

EXPIRY DATE: 2020-01-31








<p>Rhode Island</p>  <p>Malcolm G. McLaren, P.E. RI PE#8774</p>	<p>South Carolina</p>  <p>Malcolm G. McLaren, P.E. SC PE #16783</p>	<p>South Dakota</p>  <p>William B. Gorlin, P.E. SD PE #13438</p>
<p>Tennessee</p>  <p>Malcolm G. McLaren, P.E. TN PE#17943</p>	<p>Texas</p>  <p>William B. Gorlin, P.E. TX PE#122574</p>	<p>United States Virgin Islands</p>  <p>Malcolm G. McLaren, P.E. USVI PE#1072-E</p>
<p>Utah</p>  <p>William B. Gorlin, S.E. UT SE#188525-2203</p>	<p>Vermont</p>  <p>Malcolm G. McLaren, P.E. VT PE#18-0005595</p>	<p>Virginia</p>  <p>Malcolm G. McLaren, P.E. VA PE#9787</p>

CERTIFICATE VALID FOR:

***** SAM550 #270 *****

DATE OF ISSUE: 2019-10-15

EXPIRY DATE: 2020-01-31

<p>Washington</p>  <p>William B. Gorlin, P.E. WA PE#53601</p>	<p>Washington D.C.</p>  <p>Malcolm G. McLaren, P.E. DC PE#007125</p>	<p>West Virginia</p>  <p>Malcolm G. McLaren, P.E. WV PE#14682</p>
<p>Wisconsin</p>  <p>Malcolm G. McLaren, P.E. WI PE# 34077-006</p>	<p>Wyoming</p>  <p>William B. Gorlin, P.E. WY PE#12607</p>	<p>CERTIFICATE VALID FOR: ***** SAM550 #270 ***** DATE OF ISSUE: 2019-10-15 EXPIRY DATE: 2020-01-31</p>  



Certification 2019

Stageline Mobile Stage Equipment Wind Resistance and Procedures in case of Heavy Winds

Expiration date: January 31, 2020

CERTIFICATE VALID FOR:

***** SAM550 #270 *****

DATE OF ISSUE: 2019-10-15

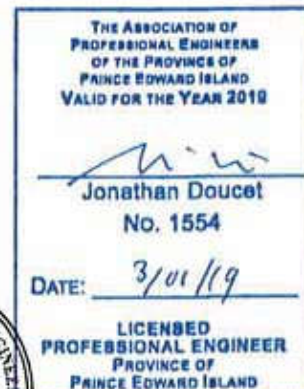
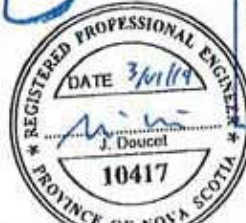
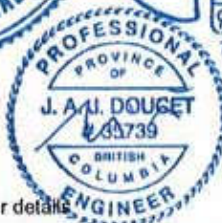
EXPIRY DATE: 2020-01-31



Stageline Mobile Stage Inc. certifies that the components identified below have been specified by the engineering department to meet the following wind resistance and also the NFPA 701-04 and ULC S-109 regulations (Standard Methods of Fire Tests for Flame Propagation of Textiles and Films).

MODEL	WIND Resistance 3S ¹	WIND Resistance (without windwalls) 3S ¹	WINDWALL AREA
SL50 *	77 mph (123 km/h)	102 mph (165 km/h)	200ft ² (18.6m ²) + 2 x 86ft ² (8.0m ²)
SL75	77 mph (123 km/h)	115 mph (185 km/h)	200ft ² (18.6m ²) + 2 x 86ft ² (8.0m ²)
SL100 (2005)	77 mph (123 km/h)	102 mph (165 km/h)	348ft ² (32.4m ²) + 2 x 147ft ² (13.7m ²)
SL100 (2018)	77 mph (123 km/h)	115 mph (185 km/h)	348ft ² (32.4m ²) + 2 x 147ft ² (13.7m ²)
SL100MIX	77 mph (123 km/h)	102 mph (165 km/h)	348ft ² (32.4m ²) + 2 x 147ft ² (13.7m ²)
SL200	77 mph (123 km/h)	115 mph (185 km/h)	490ft ² (45.5m ²) + 2 x 198ft ² (18.4m ²)
SL250 CLASSIC	77 mph (123 km/h)	115 mph (185 km/h)	528ft ² (49.1m ²) + 2 x 153ft ² (14.2m ²)
SL250NG	77 mph (123 km/h)	115 mph (185 km/h)	566ft ² (52.6m ²) + 2 x 243ft ² (22.6m ²)
SL260	77 mph (123 km/h)	115 mph (185 km/h)	599ft ² (55.6m ²) + 2 x 257ft ² (23.9m ²)
SL320	77 mph (123 km/h)	115 mph (185 km/h)	991ft ² (92.1m ²) + 2 x 600ft ² (55.7m ²)
PROMOBILE	77 mph (123 km/h)	115 mph (185 km/h)	594ft ² (55.2m ²) + 2 x 288ft ² (26.8m ²)
SAM440	77 mph (123 km/h)	115 mph (185 km/h)	1147ft ² (106.6m ²) + 2 x 731ft ² (67.9m ²)
SAM550	77 mph (123 km/h)	115 mph (185 km/h)	2 x 690ft ² (64.1m ²) + 2 x 747ft ² (69.4m ²)
SAM555	77 mph (123 km/h)	115 mph (185 km/h)	2 x 805ft ² (74.8m ²) + 2 x 793ft ² (73.7m ²)
SAM575	77 mph (123 km/h)	115 mph (185 km/h)	2 x 805ft ² (74.8m ²) + 2 x 793ft ² (73.7m ²)
SL250/260 Covered Wings	64 mph (103 km/h)	115 mph (185 km/h)	632ft ² (58.7m ²) + 2 x 112ft ² (10.4m ²) per side
SAM555 Covered Wings	64 mph (103 km/h)	115 mph (185 km/h)	2100ft ² (195.1m ²) + 275ft ² (25.5m ²) per side
SAM575 Covered Wings	64 mph (103 km/h)	115 mph (185 km/h)	2100ft ² (195.1m ²) + 275ft ² (25.5m ²) per side
SAM750 (incl. Covered Wings)	77 mph (123 km/h)	115 mph (185 km/h)	2x2075ft ² (192.8m ²) + 4x430ft ² (39.9m ²) + 2x3177ft ² (295.2m ²)
HY Tower (screen area)	77 mph (123 km/h)	115 mph (185 km/h)	144 ft ² (13.4m ²) without ballast, 384ft ² (35.7m ²) with ballast
FOH2424	77 mph (123 km/h) ²	115 mph (185 km/h) ²	250ft ² (23.3m ²) + 175ft ² (16.3m ²) + 2x261ft ² (24.3m ²) + 613ft ² (56.9m ²)
FOH3224	77 mph (123 km/h) ²	115 mph (185 km/h) ²	261ft ² (24.2m ²) + 165ft ² (15.3m ²) + 2x362ft ² (33.6m ²) + 813ft ² (75.5m ²)

This equipment must have been inspected within the last 24 months by a competent authority for this certificate to be valid. If critical defects were found on the structure during the inspection, repairs and procedures must have been approved by a structural engineer and completed in accordance with professional standards. Inspection, engineering approval (if applicable) and repair documents must remain available for presentation upon request.



Research & Engineering

* Unit #536 and up

¹ 3 seconds wind gust

² Ballast weights are required, see Technical Drawings for details



Procedures in case of Heavy Winds

Expiration date: January 31st 2020

CERTIFICATE VALID FOR:

***** SAM550 #270 *****

DATE OF ISSUE: 2019-10-15

EXPIRY DATE: 2020-01-31



Windy weather conditions:

A) During setup and dismantling of the stage and windwalls

The windwalls are the elements most at risk in windy conditions and the installation can become problematic. Wait until the wind has subsided before installing windwalls. If this is not possible, roll up windwalls and fasten with ratchet straps to the roof before raising the structure so it does not lash out and hurt anyone. We also suggest increasing your staff to have this operation completed more rapidly and safely. If wind speeds exceed 40 mph (64 km/h), windwalls and stage installation are not recommended. We strongly suggest you wait until the wind has diminished before completing the setup or dismantling the stage and windwalls.

B) Prior to the start of the event

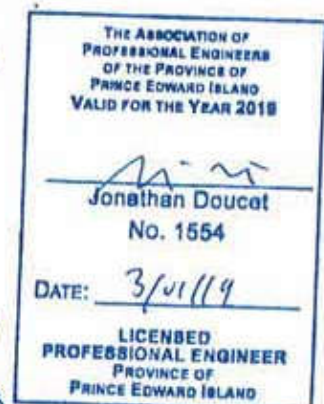
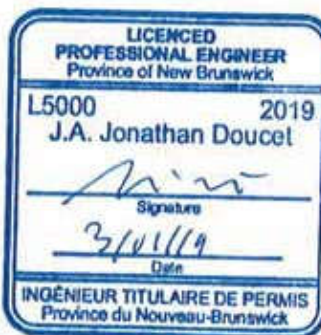
The Stageline mobile stages are designed to resist 3 seconds wind gusts up to 115 mph¹ (185 km/h). However, this wind resistance depends on a proper installation of the stage and its equipment (refer to User's Manual for details). In any weather condition, the stage must be inspected by a certified technician and all its components must be secured.

1. If wind gusts are expected to exceed 50 mph (80 km/h) (40 mph if covered wings are installed):
 - a) Roof structure should be lowered to reduce exposed surface.
 - b) Windwalls should be removed. If not possible, roll up all access doors.
 - c) Remove, lower and secure all movable parts i.e. speakers, screens, lighting equipment or banners to limit any movement.

C) During the event

1. If wind gusts exceed 40 mph (64 km/h) (30 mph if covered wings are installed):
 - a) Roll up all access doors.
 - b) Remove, lower and secure all movable parts i.e. speakers, screens or lighting equipment, banners, to limit any movement.
2. If wind gusts exceed 50 mph (80 km/h) (40 mph if covered wings are installed):
 - a) Unclass the windwalls or slash openings in the windwalls.
 - b) The public and all non-essential personnel must remain at least 100 ft (30 m) away from the stage.
3. If wind gusts exceed 60 mph (97 km/h) (50 mph if covered wings are installed):
 - a) All remaining personnel must remain at least 100 ft (30 m) away from the stage.

Note: The most probable scenario during a violent storm is that the windwalls will be torn away. This is why it is so important to keep all technicians and the crowd at a safe distance.



Research & Engineering

¹Unit #536 and up

¹102 mph (165 km/h) for an SL50*, SL100 (2005) or SL100MIX; for FOH structures, ballast weights are required, see Technical Drawings for details