Technical Pack

Pack Supporting Detail

Wind Testing & Calculations

Spring Tensioned Lamppost Banners V2.6

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BAYMEDIA®
THE STREET DRESSING SPECIALISTS

StormSpill® Wind Tunnel Test Report

Introduction

An independent test of the Bay Media StormSpill® was developed by TranTek Drive Systems for the purpose of determining load factors on light poles in conjunction with light pole banners. The Bay Media StormSpill® is a patented light pole banner bracket which utilizes a spring tensioned system that keeps the banners in place during normal environmental conditions and it allows the banner to rotate in either direction as wind speed increases for the purposes of decreasing wind-load and light pole liabilities.

Tests were conducted within the TranTek lab using a specially engineered apparatus with load cells attached to the sample light pole, to determine deflection vs. load rates based on two banners supplied by Britten, Inc. The testing process continued at the wind tunnel facilities of Behr America, a subsidiary of Behr GmbH and Co. KG. Wind tunnel tests were conducted and analyzed to determine load vs. wind speed with the StormSpill® bracket, a breakaway bracket and a fixed bracket system.

Summary

The wind tunnel tests, using two 762mm x 2032mm banners, showed that the wind-load, while using the StormSpill® , did not exceed 200lbs [90.71kg] at wind speeds beyond 80-90 miles per hour while other bracket systems exceeded loads of 550lbs [249.47kg] under the same conditions.

Test Procedure

- Record static conditions
- Start wind tunnel and record base wind speed, force on banner pole, and deflection. Wind speeds were held for two minutes while increasing wind speed at 10mph increments.
- Repeat procedure on comparative brackets.

Results

The following curve represents the collected information from the wind tunnel test on the StormSpill® and comparative brackets. The load cell was calibrated using known weights in the ranges of 50.8lbs and 143.6lbs. Linearity of the load cell is 1.25lbs max up to 500lbs. Distance travelled was recorded on two string pot sensors mounted on the test rig and were calibrated by wrapping the wire around two known diameters and calculating the circumference. Wind speed was provided by the test facility. The most obvious and unique condition of the above tests was the load reduction that started to occur between 42 and 52mph. As the force of the wind overcomes the spring force of the system, the banner bracket changed direction of the banner relative to the wind. What started perpendicular to the wind direction, billowed and turned such that over 70mph the middle of the banners were actually partially hidden behind the pole. This rotation was very significant in reducing the exposed area to the wind velocity and limiting the force to the pole. Using identical 762mm x 2032mm banners with two competing brackets, there was no evidence of a breakaway condition in the 0-95mph range and no load reduction as evidenced on the following diagram.

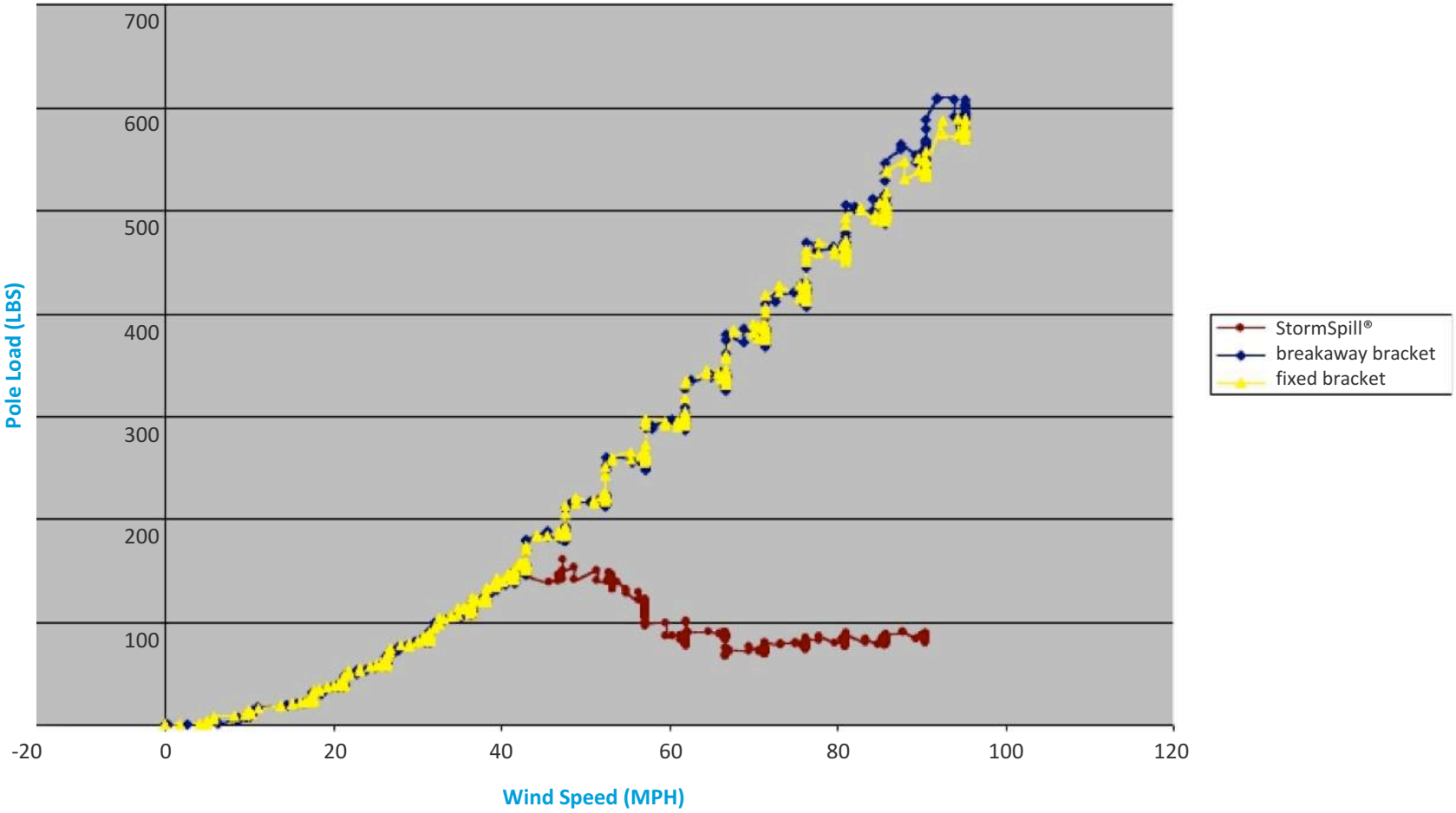
Calculated Reduction of Area

Now that we have a measured force to velocity curve, we can utilize the known equation A (sq. ft.) = .0256*V (mph)2/F(lbs) to develop the percent area that is reduced at 90mph for each system based upon known force and velocity.

	StormSpill	Breakaway	Fixed
Percent Reduction of Area	87%	21%	23%

Note: TEST results are for two banners per column Bay install ONLY ONE banner per column (please adjust loading calculations down accordingly)

Force From Two 762mm x 2032mm Banners



Note: TEST results are for two banners per column Bay install ONLY ONE banner per column (please adjust loading calculations down accordingly)

Data

BAY MEDIA STORM SPILL®

Test Time Seconds	Time of Day HH:MM:SS.S	Output_1 Vdc	Output_2 Vdc	0-10Vsignal Vdc	TUNNEL_TEMP_FDBK C	TUNNEL_HUM_FDBK RH%	AIR_SPEED (during test) km/h	Corrected Airspeed km/h	mph	subtract pole wind force Force on pole from banners alone LBS
961.888	7:44:20	-1.3499	1.1902	0.2978	23.5	0	38.77	40.563	25.206	58.112
1111.295	7:46:50	-1.3209	1.1715	0.4318	23.6	0	46.96	48.357	30.049	78.297
1241.86	7:49:00	-1.2487	1.0987	0.6325	23.7	0	54.81	56.584	35.161	108.457
1376.558	7:51:15	-1.1824	1.0352	0.8171	23.9	0	62.84	65.027	40.408	135.972
4243.065	8:39:01	-0.759	0.6165	0.8381	26.6	0	73.41	73.687	45.789	138.363
4256.762	8:39:15	-0.3181	0.1772	0.8546	26.5	0	82.31	82.780	51.440	139.820
4274.861	8:39:33	0.1853	-0.3253	0.78	26.5	0	88.25	88.409	54.938	127.697
4322.42	8:40:21	0.7087	-0.8478	0.5184	26.6	0	97.37	97.286	60.453	86.488
4422.259	8:42:01	0.7709	-0.9071	0.5375	27	0	106.07	106.379	66.104	87.783
4564.064	8:44:22	1.0084	-1.1412	0.4372	27.8	0	113.43	113.956	70.813	70.998
4686.861	8:46:25	1.0418	-1.1796	0.5047	28.5	0	121.03	120.884	75.118	79.767
4811.877	8:48:30	1.0759	-1.2131	0.5397	27.3	0	129.2	129.761	80.633	82.979
4938.778	8:50:37	1.1046	-1.2427	0.5443	27	0	137.22	137.338	85.342	81.709
5020.875	8:51:59	1.1402	-1.2802	0.5687	27.6	0	144.69	145.565	90.454	83.117

FIXED BANNER

Test Time Seconds	Time of Day HH:MM:SS.S	Output_1 Vdc	Output_2 Vdc	0-10Vsignal Vdc	TUNNEL_TEMP_FDBK C	TUNNEL_HUM_FDBK RH%	AIR_SPEED (during test) km/h	Corrected Airspeed km/h	mph	subtract pole wind force Force on pole from banners alone LBS
289.185	11:05:19	-1.5262	1.3668	0.3425	23.5	0	38.97	40.563	25.206	58.940
331.192	11:06:01	-1.5012	1.3418	0.5143	23.5	0	47.49	49.656	30.856	85.871
376.691	11:06:46	-1.4812	1.3246	0.6862	23.6	0	55.45	57.233	35.565	112.699
418.472	11:07:28	-1.4546	1.2965	0.8621	23.6	0	62.75	64.594	40.139	140.028
472.391	11:08:22	-1.4187	1.2621	1.1452	23.7	0	72.77	73.254	45.520	184.060
511.267	11:09:01	-1.3968	1.2393	1.3546	23.7	0	81.1	82.131	51.036	216.199
547.87	11:09:37	-1.3512	1.1949	1.6702	23.8	0	88.53	89.275	55.476	265.205
584.891	11:10:14	-1.3337	1.1787	1.8711	23.9	0	96.3	98.152	60.992	295.629
625.165	11:10:55	-1.2809	1.1309	2.1749	24	0	103.79	105.946	65.835	342.347
657.095	11:11:27	-1.2471	1.0962	2.482	24	0	110.73	112.657	70.005	389.654
693.78	11:12:03	-1.2152	1.0656	2.7336	24	0	119.6	121.534	75.521	427.566
725.377	11:12:35	-1.1677	1.0196	2.9895	24	0	126.84	129.761	80.633	466.117
776.079	11:13:25	-1.1356	0.9893	3.2632	23.8	0	134.11	136.905	85.073	507.603
816.07	11:14:05	-1.094	0.9499	3.5392	23.5	0	141.26	145.349	90.320	548.946

BREAKAWAY BANNER

Test Time Seconds	Time of Day	Output_1 Vdc	Output_2 Vdc	0-10Vsignal Vdc	TUNNEL_TEMP_FDBK C	TUNNEL_HUM_FDBK RH%	AIR_SPEED (during test) km/h	Corrected Airspeed km/h	mph	subtract pole wind force Force on pole from banners alone LBS
2187.465	38597.44085	-1.564	1.4059	0.355	23.6	0	39.7	41.429	25.744	59.121
2222.477	38597.44126	-1.5649	1.4046	0.5147	23.6	0	47.39	49.006	30.453	83.278
2258.035	38597.44167	-1.5658	1.4034	0.7068	23.6	0	55.82	57.883	35.968	112.154
2300.359	38597.44216	-1.5662	1.4034	0.9071	23.7	0	63.79	65.893	40.946	142.151
2361.855	38597.44287	-1.563	1.4065	1.2127	23.7	0	72.91	73.254	45.520	188.130
2410.546	38597.44344	-1.563	1.4068	1.4074	23.8	0	80.71	81.481	50.633	216.924
2456.635	38597.44397	-1.5671	1.403	1.6861	23.9	0	88.35	89.492	55.610	258.403
2499.944	38597.44447	-1.5658	1.4046	1.9418	23.9	0	96.16	97.069	60.319	296.273
2529.531	38597.44481	-1.5662	1.4043	2.2374	23.9	0	103.23	104.647	65.028	340.088
2559.055	38597.44516	-1.5658	1.4052	2.4823	24	0	111.26	113.523	70.543	375.743
2590.761	38597.44552	-1.5662	1.4059	2.838	24	0	119	121.967	75.790	428.213
2627.857	38597.44595	-1.5646	1.4065	3.1164	23.9	0	126.81	129.977	80.768	468.802
2660.556	38597.44633	-1.5646	1.4084	3.3935	23.7	0	134.18	137.122	85.208	509.260
2698.357	38597.44677	-1.5643	1.408	3.7223	23.4	0	142.05	145.132	90.185	557.230

Note: TEST results are for two banners per column Bay install ONLY ONE banner per column (please adjust loading calculations down accordingly)

Percent Reduced Area by Calculation at ~90 MPH

Bay Media StormSpill®

Velocity mph	Force ave lbs	ft^2 calculated area=F/.00256v^2	starting area ft^2	percent reduced area
90.58887	93.45391	4.448440535	33.33333333	86.655
85.80027	82.20864	4.362145416		86.914
81.03702	80.32677	4.778079401		85.666
76.32836	77.28562	5.181873979		84.454

Breakaway Bracket

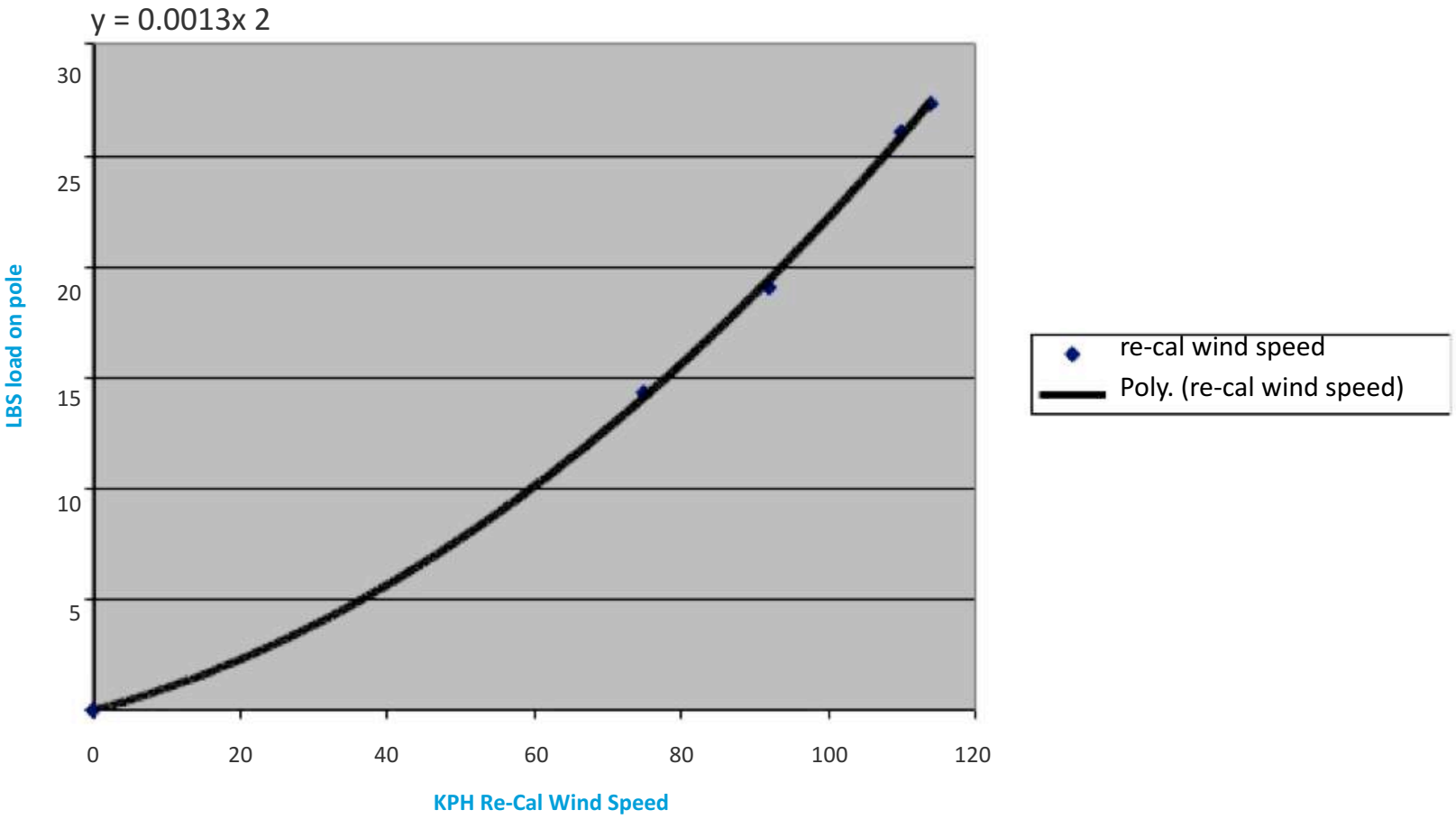
Velocity mph	Force ave lbs	ft^2 calculated area=F/.00256v^2	starting area ft^2	percent reduced area
90.58887	551.1321	26.23409171	33.33333333	21.298

Fixed Bracket

Velocity mph	Force ave lbs	ft^2 calculated area=F/.00256v^2	starting area ft^2	percent reduced area
90.58887	542.1115	25.80470644	33.33333333	22.586

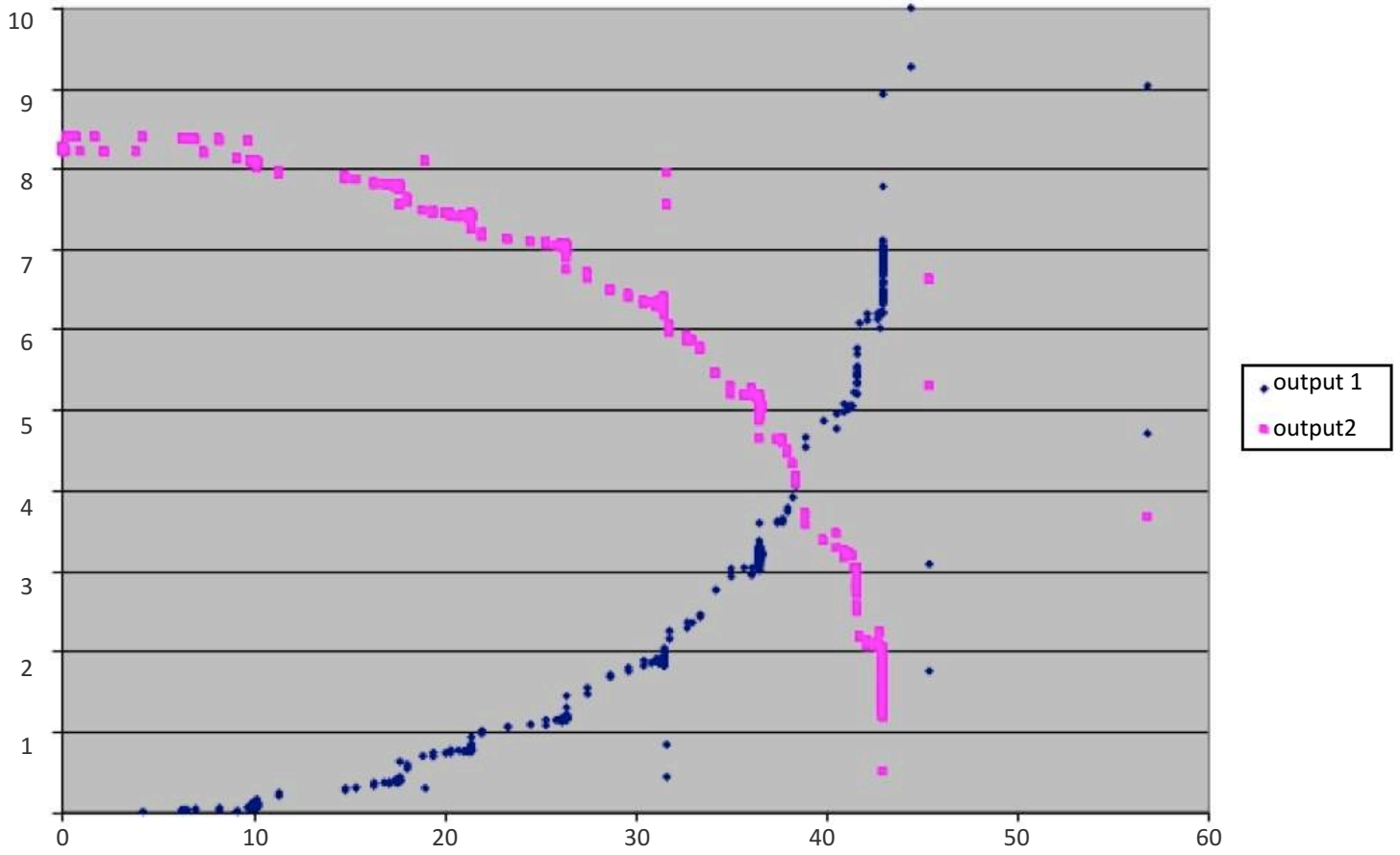
Note: TEST results are for two banners per column Bay install ONLY ONE banner per column (please adjust loading calculations down accordingly)

Load with Just Pole and One Fibreglass Rod



Note: TEST results are for two banners per column Bay install ONLY ONE banner per column (please adjust loading calculations down accordingly)

Deflection vs Speed



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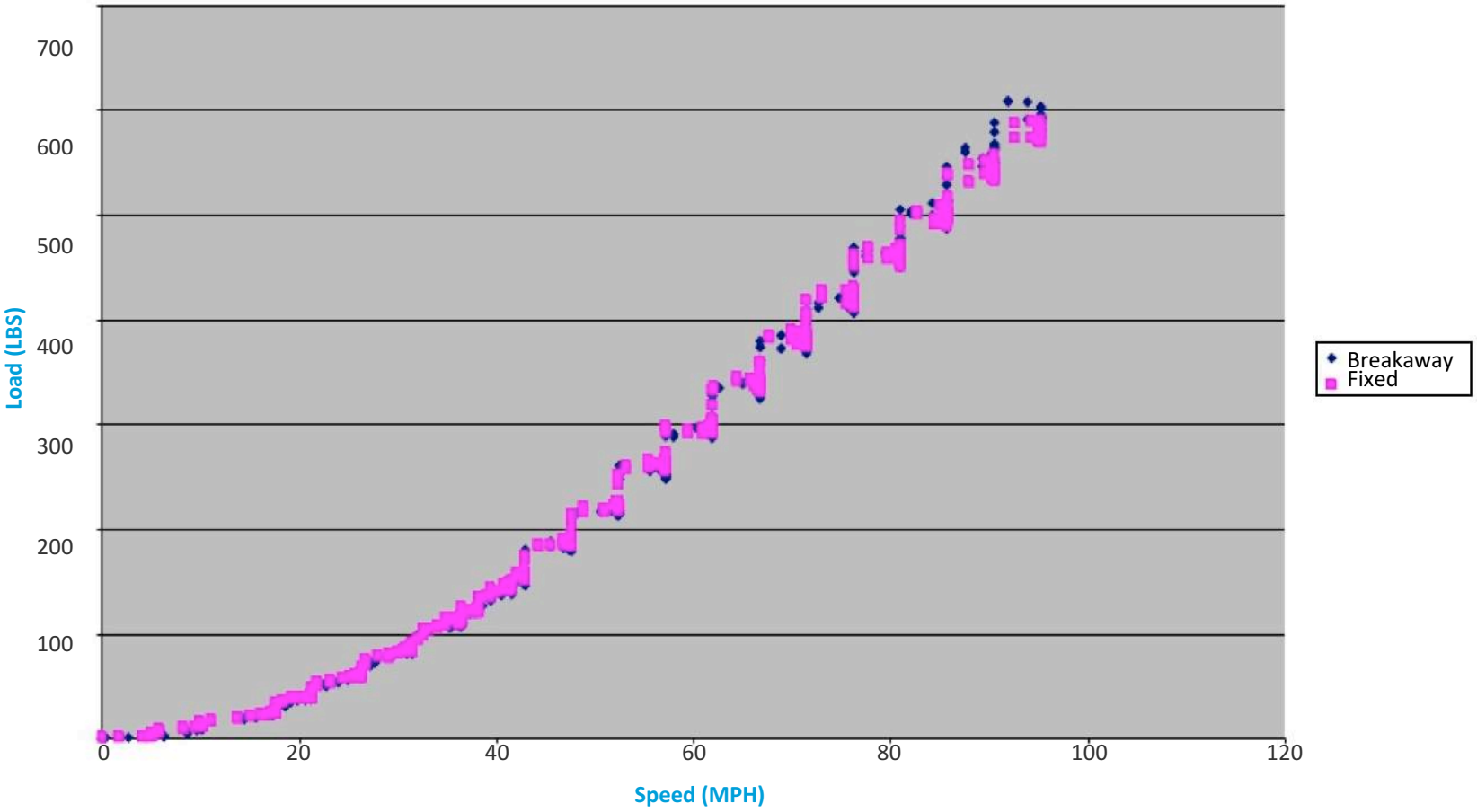
Note: TEST results are for two banners per column Bay install ONLY ONE banner per column (please adjust loading calculations down accordingly)

Breakaway & Fixed



Note: TEST results are for two banners per column Bay install ONLY ONE banner per column (please adjust loading calculations down accordingly)

Bay Media StormSpill® – Wind Tunnel Results

October 2005 v.1.002

	Corrected airspeed km/h	Corrected airspeed mph	Load cell calibration lbs	Load cell zeroing lbs	TWO BANNERS physical factor calc from banners alone lbs	SINGLE BANNERS physical factor calc from banners alone lbs	Estimated % of affected Surface area compared to Fixed Banner Bracket
Bay Storm Spill	41	**25**	27	30	**58**	**29**	**99%**
Fixed Banner Bracket	41	25	31	29	59	29	
'Breakaway' - Fixed Banner Bracket with bungee	41	26	32	30	59	30	
Bay Storm Spill	48	**30**	38	40	**78**	**39**	**94%**
Fixed Banner Bracket	50	31	44	42	86	43	
'Breakaway' - Fixed Banner Bracket with bungee	49	30	44	43	83	42	
Bay Storm Spill	57	**35**	54	56	**108**	**54**	**96%**
Fixed Banner Bracket	57	36	58	56	113	56	
'Breakaway' - Fixed Banner Bracket with bungee	58	36	60	58	112	56	
Bay Storm Spill	65	**40**	68	71	**136**	**68**	**97%**
Fixed Banner Bracket	65	40	72	70	140	70	
'Breakaway' - Fixed Banner Bracket with bungee	66	41	76	74	142	71	
Bay Storm Spill	74	**46**	70	72	**138**	**69**	**75%**
Fixed Banner Bracket	73	46	94	93	184	92	
'Breakaway' - Fixed Banner Bracket with bungee	73	46	100	98	188	94	
Bay Storm Spill	83	**51**	71	74	**140**	**70**	**64%**
Fixed Banner Bracket	82	51	111	109	216	108	
'Breakaway' - Fixed Banner Bracket with bungee	81	51	115	114	217	108	
Bay Storm Spill	88	**55**	65	68	**128**	**64**	**48%**
Fixed Banner Bracket	89	55	136	134	265	133	
'Breakaway' - Fixed Banner Bracket with bungee	89	56	137	136	258	129	
Bay Storm Spill	97	**60**	45	47	**86**	**43**	**29%**
Fixed Banner Bracket	98	61	152	150	296	148	
'Breakaway' - Fixed Banner Bracket with bungee	97	60	158	156	296	148	
Bay Storm Spill	106	**66**	46	49	**88**	**44**	**26%**
Fixed Banner Bracket	106	66	176	174	342	171	
'Breakaway' - Fixed Banner Bracket with bungee	105	65	181	179	340	170	
Bay Storm Spill	114	**71**	38	41	**71**	**35**	**18%**
Fixed Banner Bracket	113	70	201	199	390	195	
'Breakaway' - Fixed Banner Bracket with bungee	114	71	201	199	376	188	
Bay Storm Spill	121	**75**	44	46	**80**	**40**	**19%**
Fixed Banner Bracket	122	76	221	219	428	214	
'Breakaway' - Fixed Banner Bracket with bungee	122	76	229	227	428	214	
Bay Storm Spill	130	**81**	46	49	**83**	**41**	**18%**
Fixed Banner Bracket	130	81	241	239	466	233	
'Breakaway' - Fixed Banner Bracket with bungee	130	81	251	249	469	234	
Bay Storm Spill	137	**85**	47	49	**82**	**41**	**16%**
Fixed Banner Bracket	137	85	263	261	508	254	
'Breakaway' - Fixed Banner Bracket with bungee	137	85	273	271	509	255	
Bay Storm Spill	146	**90**	49	51	**83**	**42**	**15%**
Fixed Banner Bracket	145	90	284	283	549	274	
'Breakaway' - Fixed Banner Bracket with bungee	145	90	299	297	557	279	

Banners80" x 30"
Bay Storm Spill - 2 off Bay Media Spring Tensioned Wind Releasing System comprisesSPRING TENSIONED brackets& fibreglassarms
Fixed Banner Bracket - 2 off Banner Flex system comprisesfixed bracketswith fibreglassarms
Breakaway' - Fixed Banner Bracket with bungee - 2 off Banner Flex system comprisesfixed brackets with fibreglassarms, banner help using 4 bungees

Wind Effect at High Wind Speeds

Percent Reduced area by calculation at ~90 MPH

Bay Media Wind Releasing banner system

square meters 1.60

Velocity mph	Force ave lbs 2 banners	Force ave lbs 1 banner	ft^2 calculated area=F/.00256v^2	starting area ft^2	Percent reduced area	Wind effect size of 2000mm x 800mm banner (1.6 square meters)	Wind effect smaller than a 0.3 sq m sign
90.58887	93.45391	46.72695	4.448440535	33.33333333	86.655	0.21 square meters	YES
85.80027	82.20864	41.10432	4.362145416		86.914	0.21 square meters	YES
81.03702	80.32677	40.16338	4.778079401		85.666	0.23 square meters	YES
76.32836	77.28562	38.64281	5.181873979		84.454	0.25 square meters	YES

KBW Round Rod Bannerflex Bracket

Velocity mph	Force ave lbs	ft^2 calculated area=F/.00256v^2	starting area ft^2	Percent reduced area		
		25.80470644	33.33333333	22.586	1.24 square meters	NO
90.58887	542.1115					

KBW Airow Bracket (76cm x 152cm)

square meters 1.16

Velocity mph	Force ave lbs	ft^2 calculated area=F/.00256v^2	starting area ft^2	Percent reduced area		
90	116.3157			46.8938	0.61 square meters	NO
80	101.6505			44.8511	0.64 square meters	NO
70	91.4716			39.2328	0.70 square meters	NO

KBW Airow Bracket (76cm x 238cm)

square meters 1.81

Velocity mph	Force ave lbs	ft^2 calculated area=F/.00256v^2	starting area ft^2	Percent reduced area		
90	182.228			46.8938	0.96 square meters	NO
80	159.2525			44.8511	1.00 square meters	NO
70	143.3055			39.2328	1.10 square meters	NO

Further information

For further information, please call Bay Media on +44 (0)20 8343 2525

Our policy is one of continuous product development. This may result in the above specifications changing. All information contained within this document has been extracted from literature provided by the manufacturer and Bay Media bear no responsibility or liability in the event that this information is inaccurate or misleading. It is the lamppost and/or site occupier's/owner's responsibility to determine to its satisfaction that the lampposts (or other poles) are able to withstand the increased load by the installation of any infrastructure by Bay Media on any pole/post. We recommend that a structural engineer assists in making this determination.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Thank you