AIR SPRING
banner system

EN40 COMPLIANT

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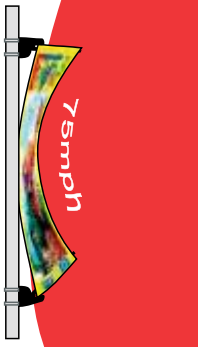
Wind Tunnel Test Results

EN40 COMPLIANT



Our Air Spring brackets were developed for reducing wind loading on a lighting column caused by the installation of banners.

Testing carried out on a single lighting column with:
2 Lamp column banners, size 760mm wide x 2030mm in depth (total 3.08sq.m – 1.54sq.m per banner). Installed back to back using 2 sets of Air Spring banner brackets. Brackets were installed using 19mm stainless steel banding.

Methods and Apparatus used:
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 our test facility

Test Procedure
All tests were conducted by our test facility with specialist equipment for measuring wind loading vs deflection. The test was carried out with double banners on a single lighting column.
Static conditions were recorded at commencement of test.
Wind tunnel started and base wind speed, force on banner pole, and deflection were recorded. Wind speeds were held for two minutes while increasing wind speed at 10mph increments.
Procedure repeated on fixed arm banner system for comparative measures and the results shown on graph on following page.

Loading Results
Air Spring max loading of 63.42kgs @ 50mph (Based on 2 banners installed on one column total 3.08sq.m).

Results
Linearity of the load cell is 0.57kgs max up to 63.42kgs.
Load reduction starts occurring between 42 and 52mph.
Wind force overcame the spring force of the system at the above speed, the Air Spring bracket changed direction of the banner according to the direction of wind. The banner rotated to such a degree that at 70mph some of which started in a perpendicular position to the wind direction, billowed and turned, such that at 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.

Calculated Reduction in Area
Calculated using A = F / 1/2pCdu2, where reduction in area % was calculated at 90mph or 144.84kmph.

Reduction in Loading Area: 87.98%.
This means that from a total banner area of 3.08sq.m the Air Spring effectively reduced the wind load area to 0.4sq.m. When this is applied to a single banner installation of 1.54sq.m (760mm x 2030mm) conformity to EN40 is achieved by reducing the wind load area to 0.2sq.m (EN40 stipulates that a standard lighting column must be capable of taking the maximum wind loading exerted by a standard rigid road sign of 0.3sq.m).

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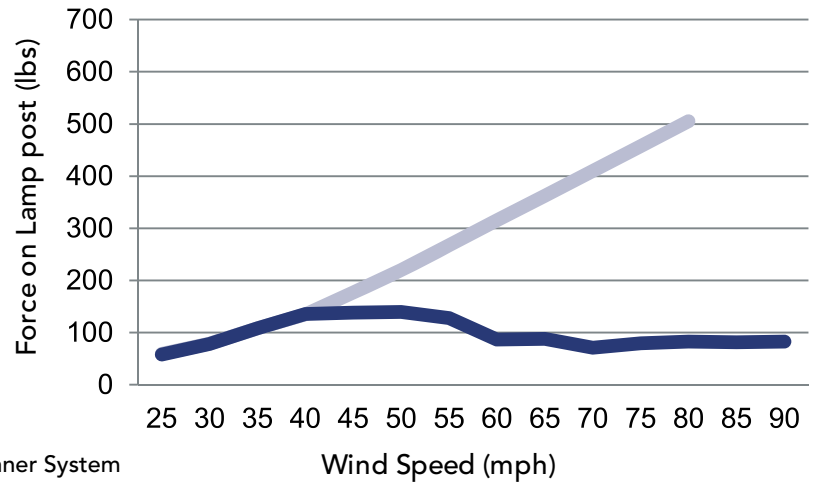
Wind Tunnel Test Report



Results show wind loading and deflection data from the testing of 2 banners installed onto a single column. Individual banner size 760mm x 2030mm (total 3.08sq/m)

Time	Airspeed		Output_1	Output_2	0 - 10 Vsignal	Force caused by Banner only	**Reduction in Area ($A = F / 0.256 * V^2$)**
Seconds	kmph	mph	Vdc	Vdc	Vdc	lbs	%
1000	40.23	25	-1.350	1.191	0.298	58.030	**0.00**
1100	48.28	30	-1.320	1.172	0.432	78.301	**0.00**
1200	56.33	35	-1.250	1.098	0.633	108.452	**0.00**
1400	64.37	40	-1.184	1.035	0.817	135.969	**0.40**
2500	72.42	45	-0.760	0.616	0.838	138.359	**19.92**
4000	80.47	50	-0.318	0.176	0.855	139.825	**34.45**
4250	88.51	55	0.186	-0.325	0.780	127.698	**50.53**
4500	96.56	60	0.709	-0.847	0.518	86.484	**71.84**
4600	104.61	65	0.770	-0.907	0.538	87.777	**75.65**
4700	112.65	70	1.009	-1.141	0.437	70.980	**83.02**
4800	120.70	75	1.043	-1.179	0.505	79.763	**83.38**
4900	128.75	80	1.077	-1.213	0.540	81.699	**85.04**
5000	136.79	85	1.106	-1.242	0.544	82.976	**86.54**
5000	144.84	90	1.1396	-1.280	0.568	83.105	**87.98 %**