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Dear Sir / Madam

Re: Inflatable Amusement Device Tie Down Requirements

Under the Australian Inflatable Standard AS3533.4.1 Specific requirements – Land-borne inflatable devices, continuously blown inflatables are to be designed for a minimum wind speed of 11.1m/s (40 Km/h).

The number of anchorage points to address wind loads from any direction shall be calculated in accordance with Appendix B of AS3533.4.1.

Inflatable designed to this standard will have anchorage points located around the base and side of the inflatable, based on a minimum horizontal wind force of 1.6kN (160kgf).

The inflatable pegs (anchors) shall be placed at the end of a rated guy rope with a working capacity of a minimum of 800 kg. the pegs or anchors shall be driven at 90° to the guy rope, into solid ground with good resistance.

The standard requires that pegs shall be a minimum diameter of 16mm steel rod or 30mm leg length star picket.

Based on the ASTM F2374.2021 Standard practice for Design, Manufacture, Operation and Maintenance of Inflatable Amusement Devices Appendix X2 Anchoring System Design, Table x2.1 pull out capacity

FIG. X2.1 Anchoring Design Force Assessment

TABLE X2.1 Pullout Capacity for Various Stake Configurations and Soil Types

Table Correction Factor (C_f)	Soil Consistency[E]	Pullout Capacity for 1 in. Diameter Steel Stake[F] (P_c) in pounds									
		40 in.	(101.6 cm)	36 in.	(91 cm)	30 in.	(76 cm)	24 in.	(61 cm)	18 in.	(46 cm)
BASELINE (P_b)[A]	Hard	2900	1316 kg	2500	1134 kg	1900	862 kg	1350	612 kg	800	363 kg
	Very Stiff	1855	842	1600	726	1215	551	865	392	510	231
	Stiff	930	422	800	363	610	277	430	195	255	n/s
	Medium	465	211	400	n/s	305	n/s	215	n/s	125	n/s
For 53° Load Angle[B] C_f = 0.85	Hard	2465	1118	2125	964	1615	733	1150	522	680	308
	Very Stiff	1575	715	1360	617	1035	470	735	333	435	197
	Stiff	790	358	680	308	520	236	365		215	n/s
	Medium	395	179	340	n/s	260	n/s	185	n/s	105	n/s
For 15-30° Stake Inclination[C] C_f = 0.77	Hard	2235	1014	1925	873	1465	665	1040	472	615	279
	Very Stiff	1430	649	1230	558	935	422	665	302	395	n/s
	Stiff	715	324	615	279	470	213	335		195	n/s
	Medium	360	163	310	n/s	235	n/s	165	n/s	95	n/s
For both 15-30° Stake Inclination and 53° Load Angle[D] C_f = 0.65	Hard	1900	862	1635	742	1245	565	885	401	525	238
	Very Stiff	1215	551	1045	474	795	361	565	256	335	n/s
	Stiff	610	277	525	238	400	n/s	280	n/s	165	n/s
	Medium	305	138	260	n/s	200	n/s	140	n/s	80	n/s

Pull Out Capacity (P_c) = Baseline Capacity (P_b) × Correction Factor (C_f)

$$P_c = P_b \times C_f$$

[A] Baseline assumes a correction factor of 1 (C_f = 1). Stake must be installed vertically with no more the 2 in. above ground with load angle of approximately 45°.
[B] Use correction factor (C_f) of 0.85 when load angle from horizontal is approximately 53°.
[C] Use correction factor (C_f) of 0.77 when stake inclination is between 15 and 30°.
[D] Use correction factor (C_f) of 0.65 when load angle is approximately 53° and stake inclination is between 15 and 30°.
[E] Soil consistency categories based on Field Test Procedure for Stake Penetration Resistance (see section X2.2.3).
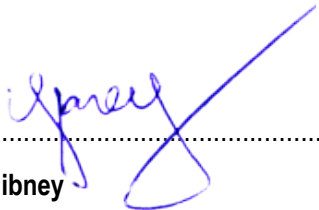[F] Stake length dimensions refer to the overall length of the stake, and are embedded with 2 in. of the stake head exposed (for example, the 18 in. stake has 16 in. embedded in soil).

The pullout figures shown in Table x2.1 are based on the following soil strength and peg inclinations:-

Hard soil each blow of a 8 kg sledge hammer penetrates < 5 mm
Very Stiff   <12 mm
Stiff   <38 mm
Medium   <75 mm
Greater than 75 mm   do not stake

Load angles mentioned in Table x2.1 are the angle between the ground surface and the guy rope and peg inclination measured from the vertical.

The pegs used by Aussie Events and Amusements, being 900mm x 27mm diameter will give a pull-out capacity of 363 kg in a stiff soil. This exceeds the requirement set out in AS3533.4.1-2018.

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Tim Gibney

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