



MANTA RAY HOLDING CAPACITIES

In KIP's

Soil Description	Blow count (N)	MR-88 Ultimate= 10 kips	MR-4 Ultimate= 16 kips	MR-3 Ultimate= 20 kips	MR-2 Ultimate= 40 kips	MR-1 Ultimate= 40 kips	MR-SR Ultimate= 40 kips	MK-B Ultimate= 40 kips
Very dense/cemented sands; Coarse gravel and cobbles	60+	10 (1,3)	16 (1,3)	20 (1,3)	28-40 (1,3,4)	40 (1,3)	40 (1,3,5)	40 (1,3,5)
Dense fine compacted sands, very hard silts or clays	45-60	6 -10 (2,3,4)	9 - 16 (2,3,4)	17 - 20 (2,3,4)	21 - 28 (2,4)	36 - 40 (1,3,4)	40 (1,3)	40 (1,3,5)
Dense Clays, Sands and gravels, hard silts and clays	35-50	4-6 (4)	6 - 9 (4)	12 - 18 (2,4)	15-22 (2,4)	24 - 36 (2,4)	32 - 40 (2,3,4)	40 (1,3)
Medium dense sandy gravel, stiff to hard silts and clays	24-40	3-4 (4)	4.5-5.5 (4)	9 -14 (4)	12-18 (4)	18-20 (2,4)	24 - 34 (2,4)	32 - 40 (2,3,4)
Medium Dense Coarse sand and sandy gravel, Stiff to Very stiff silts and Clays	14-25	2-3 (4)	3.5-4.5 (4)	7-9 (4)	9-12 (4)	15-20 (4)	18-24 (4)	24-32 (2,4)
Loose to Medium Dense Fine to Coarse Sand: Firm to Stiff Clays and Silts	7-14	1.5-2.5 (4)	2.5-4 (4)	5-8 (4)	7-10 (4)	10-15 (4)	14-18 (4)	20- 24 (4)
Loose Fine Sand, Alluvium, Soft Clays, Fine saturated Silty Sand	4-8	.9-1.5 (4,6)	1.5-2.5 (4,6)	3-5 (4,6)	5-8 (4,6)	8-12 (4,6)	9-14 (4,6)	13-20 (4,6)

- 1) Drilled pilot hole required for efficient installation
- 2) Ease of installation may be improved by drilling a pilot hole
- 3) Holding capacity limited by ultimate strength of anchors
- 4) Holding capacity limited by soil structure
- 5) Not recommended in these soils
- 6) Wide variation in soil properties reduces prediction accuracy. Pre construction field test is recommended.