



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL ENGINEERING UNIT

Estimated Axial Resistance Table for Driven Piles

SPT-N (bpf)	Estimated Resistance for HP 12 x 53 Steel Piles and 12" P/S Concrete Piles (kips/ft)			
	Sand			Clay/Silt (All Depths)
	(< 50 ft)	(50 ft - 100 ft)	(> 100 ft)	
0	0.00	0.00	0.00	0.00
1	0.29	0.87	1.45	0.58
2	0.58	1.74	2.90	1.15
3	0.86	2.62	4.34	1.73
4	1.15	3.49	5.79	2.30
5	1.44	4.36	7.24	2.88
6	1.50	4.54	7.54	3.19
7	1.56	4.72	7.85	3.50
8	1.62	4.90	8.15	3.82
9	1.68	5.08	8.46	4.13
10	1.74	5.26	8.76	4.44
11	1.80	5.44	9.06	4.75
12	1.86	5.62	9.37	5.06
13	1.92	5.80	9.67	5.38
14	1.98	5.98	9.98	5.69
15	2.04	6.16	10.28	6.00
16	2.06	6.22	10.38	6.16
17	2.08	6.29	10.49	6.31
18	2.10	6.35	10.59	6.47
19	2.13	6.42	10.70	6.63
20	2.15	6.48	10.80	6.79
21	2.17	6.54	10.90	6.94
22	2.19	6.61	11.01	7.10
23	2.21	6.67	11.11	7.26
24	2.23	6.74	11.22	7.42
25	2.25	6.80	11.32	7.57
26	2.27	6.86	11.42	7.73
27	2.30	6.93	11.53	7.89
28	2.32	6.99	11.63	8.05
29	2.34	7.06	11.74	8.20
30	2.36	7.12	11.84	8.36
31	2.38	7.17	11.93	8.59
32	2.40	7.22	12.02	8.82
33	2.41	7.28	12.10	9.06
34	2.43	7.33	12.19	9.29
35	2.45	7.38	12.28	9.52
36	2.47	7.43	12.37	9.75
37	2.49	7.48	12.46	9.98
38	2.50	7.54	12.54	10.22
39	2.52	7.59	12.63	10.45
40	2.54	7.64	12.72	10.68
41	2.56	7.69	12.81	10.91
42	2.58	7.74	12.90	11.14
43	2.59	7.80	12.98	11.38
44	2.61	7.85	13.07	11.61
45	2.63	7.90	13.16	11.84
46	2.65	7.95	13.25	12.07
47	2.67	8.00	13.34	12.30
48	2.68	8.06	13.42	12.54
49	2.70	8.11	13.51	12.77
50	2.72	8.16	13.60	13.00
>50	2.72	8.16	13.60	13.00

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Notes:

The Engineer of Record (EOR) is responsible for verifying that boring depths and sampling methods are sufficient to develop the geotechnical design recommendations in accordance with the AASHTO LRFD Bridge Design Specification. This tool may be used by field professionals under the direction of the EOR to assist in determining boring termination depths in conjunction with the following:

- 1) Borings for driven pile foundations may be terminated when one of the following are met:
 - a) at an estimated axial resistance of 550 kips with no additional drives required.
 - b) fifteen feet of material exhibiting SPT N-values (blows per foot) of 100+.
 - c) SPT refusal as defined on the GEU Soil and Rock Legend.
- 2) Sedimentary rock layers less than 4 feet in thickness and/or with a SPT-N (bpf) less than 51 should be considered a sand for resistance calculations.
- 3) Cemented sands shall be limited to a maximum estimated resistance equivalent of SPT-N (bpf) equal to 30.
- 4) Coring may be required when drilled pier or other non-driven pile foundations are anticipated. Coring depths are determined by the EOR or by a field professional under EOR direction with the following criteria for minimum core depths.

RQD (%)	Core Depth (ft)
75 - 100	10 - 15
50 - 75	15 - 20
25 - 50	20 - 25
0 - 25	25 - 30

- 5) When SPT refusal is encountered at end bents within 10 feet of bottom of cap, the boring must be cored to evaluate bedrock versus boulder.
- 6) For situations not covered by these notes or the Geotechnical Investigations and Recommendations Manual, seek guidance from the EOR.

References:

- 1) NCDOT Geotechnical Engineering Unit Analysis, Tuttle and Santee, 2021

Last Updated: 5/28/2025