PILE LOAD TESTING OF HELICAL PILES AND DRIVEN STEEL PILES IN ANCHORAGE, ALASKA

Mohammed Sakr P.Eng., Almita Manufacturing Ltd., Ponoka, Alberta, Canada
Richard Mitchells, P.E., and Jeffrey Kenzie, Duane Miller Associates,
Anchorage, Alaska, United States of America (USA)

INTRODUCTION

A helical pile consists of a central shaft, and one or more formed steel plates (helixes) welded to the shaft. A round shaft diameter varies between 2 7/8" and 36" while a helix diameter varies between 6" to 48".

- Helical piles resist a variety of axial loads ranging from 5 Kips to 500 Kips.

- The advantages of helical piles include their high compressive and uplift capacities; the high speed of their installation (5 – 8 piles per hour); suitability for construction in very limited access conditions; installationin frozen grounds to swampy soils; unlimited pile length; vibration-free process; smaller equipment to install; and their cost effectiveness.

- Helical piles are used to support residential, commercial and industrial facilities.

PILE LOAD TESTING PROGRAM OVERVIEW

- Test site is located at STG yard in Anchorage, Alaska, USA

- Total of four tests were carried out including two tests for driven steel piles and two tests for screw piles. Both axial compression and tension tests were carried out.

- Soil is very dense sandy gravel soil.

- The axial compression load testing performed using Procedure A for quick tests for piles under axial compressive (ASTM D1143-07). The axial tension load testing followed a Procedure A for quick tests (ASTM D 3689-07).

TEST RESULTS

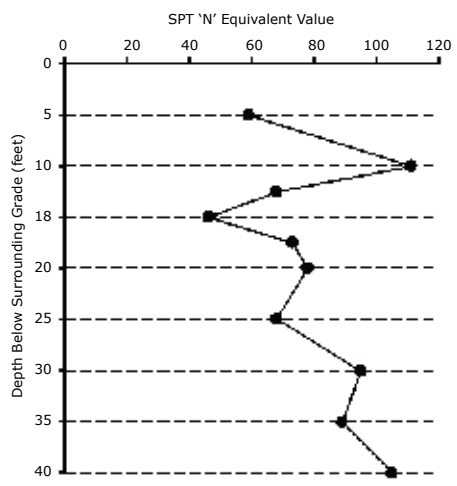
Helical piles with a relatively small shaft diameter were successfully installed into very dense sandy gravel soil and resisted high compression and tension loads.

- Helical piles provided larger compression capacities compared to driven piles by up to 300%.

- The ultimate uplift resistance of a helical pile was about 430% higher than that of driven steel pipe pile.

- The unit skin friction for both helical piles and driven piles was similar despite the differences in installation techniques.

TYPICAL HELICAL PILE INSTALLATION



SUMMARY OF SPT RESULTS

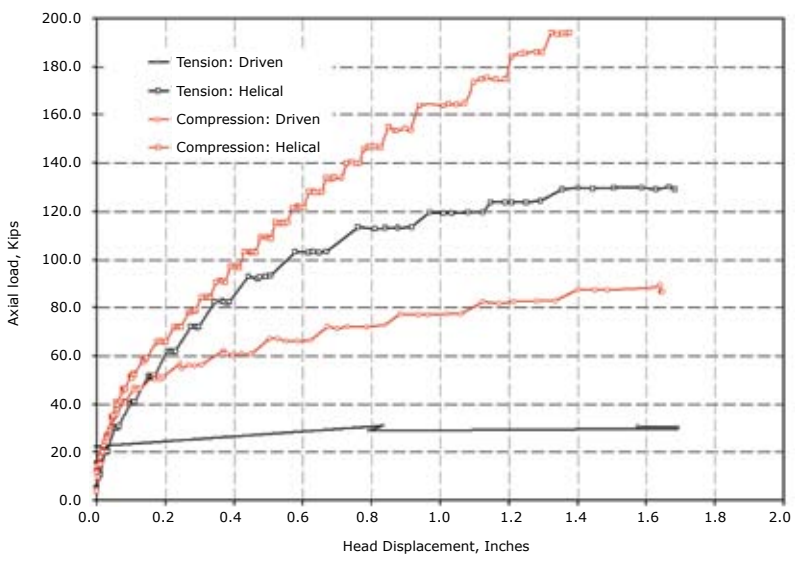
Pile No	Installation Method	Shaft size		Helix Configuration		No of helixes	Embedment depth ft(m)
		Diameter inches (mm)	Wall thickness inches (mm)	Diameter inches (mm)	Thickness inches (mm)		
C1	Torque driven	6.625 (168)	0.28 (7.1)	20(508)	0.75(19)	1	10.2(3.1)
C2	Driven	6.625 (168)	0.28 (7.1)	-	-	-	18(5.5)
T1	Torque driven	6.625 (168)	0.28 (7.1)	20(508)	0.75(19)	1	10.5(3.2)
T2	Driven	6.625 (168)	0.28 (7.1)	-	-	-	18(5.5)

TEST PILE CONFIGURATIONS

AXIAL TENSION (UPLIFT) LOAD TEST SETUP

Pile No	Measured ultimate pile capacity kips(kN)		Estimated ultimate pile capacity kips(kN)			*Prediction ratio (5% criterion)
	5% criterion	Plunging failure	Shaft resistance	Individual helixes/End bearing	Ultimate pile capacity	
Compression Test Results						
C1	165 (734)	194 (863)	13 (58)	183 (814)	196 (872)	1.19
C2	56(249)	86(382)	22 (98)	35 (156)	57 (253)	1.04
Tension (Uplift) Test Results						
T1	120(534)	130(578)	13 (58)	97 (431)	110 (489)	0.93
T2	30(133)	30(133)	31 (138)	-	31 (138)	1.03

SUMMARY OF AXIAL LOAD TEST RESULTS



TEST RESULTS FOR DRIVEN AND SCREW STEEL PILES

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