CONCRETE CAST-IN-PLACE PILE

Client:		**Designed By:**	*A. Shaikhzadeh*	**Date:**	*24-Feb-21*
Job Name:		**Verified By:**		**Revision:**	*100%*

PILE MODELLING STIFFNESS	**70408**	kN/m	==>	7180	ton/m
MAIN REBARS	**O.K.**				
MAIN REBARS D/C	**0.62**				
TIE REBARS	**O.K.**				
TIE REBARS D/C	**0.34**				
COMPRESSION CAPACITY	**1877**	kN	==>	191	ton
TENSION CAPACITY	**6796**	kN	==>	693	ton

https://strenca.com

INPUT DATA

PILE DIAMETER AT TOP	800	mm
PILE DIAMETER AT BASE	2400	mm
TOTAL LENGTH OF PILE, L	10000	mm
CONCRETE COMPRESSIVE STRENGTH, f'_c	25	MPa
ALLOWABLE BEARING CAPACITY OF SOIL AT BASE, q_a	415	kN/m^2
SUBGRADE MODULUS OF SOIL AT BASE, k_s	16550	kN/m^3
UNIT WEIGHT OF SOIL, γ_s	18	kN/m^3
FACTOR OR SAFETY FOR TENSION CAPACITY, FS	3	

REBAR YIELD STRENGTH, F_y	400	MPa
MAIN REBAR DIAMETER	18	mm
NUMBER OF MAIN REBARS	16	
TIE REBAR DIAMETER	14	mm
SPACING OF TIE REBARS, s	150	mm

SPRING STIFFNESS FOR MODELLING

$E = 4700\,(f'_c)^{0.5}$	23500	MPa	Modulus of elasticity of concrete	ACI 318-19 (19.2.2.1.b)
A_{top}	502655	mm^2	Pile top cross-sectional area	
A_{base}	4523893	mm^2	Pile base cross-sectional area	
$k_{pile} = A_{top} E/L$	1181239	kN/m	Stiffness of pile	
$k_{base} = k_s A_{base}$	74870	kN/m	Spring stiffness of base soil	
$K_{total} = (k_{pile} k_{base})/(k_{pile} + k_{base})$	**70408**	kN/m	Total spring stiffness of pile and base which are in series	

REINFORCEMENT

$A_{s,\,min}$	2513	mm^2	Minimum required area of main reinforcement	
$A_{s,\,max}$	15080	mm^2	Maximum area of main reinforcement allowed	
$A_{s,\,provided}$	4072	mm^2	Provided area of main reinforcement	
Status	**O.K.**			
D/C	**0.62**			
$A_{v,\,min}$	105	mm^2	Minimum required area of transverse reinforcement	ACI 318-19 (10.6.2.2)
$A_{v,\,provided}$	308	mm^2	Provided area of transverse reinforcement	
Status	**O.K.**			
D/C	**0.34**			

COMPRESSION CAPACITY OF PILE

$P_1 = q_a A_{base}$	1877	kN	Compression capacity based on soil bearing capacity	
$\phi P_2 = \phi 0.85 f'_c (A_g - A_{st}) + f_y A_{st}$	9779	kN	Compression capacity based on concrete section	ACI 318-19 (22.4.2.2)
$P_{max} = \min(P_1, P_2)$	**1877**	kN	Maximum allowable compression force of pile	

TENSION CAPACITY OF PILE

V_{soil}	1133	m^3	Volume of soil cone (45 degrees) around pile
$W_{soil} = V_{soil}\,\gamma_s$	20388	kN	Weight of soil cone around pile

$T_{max} = W_{soil} / FS$ **6796** kN Maximum allowable tension force of pile with saftey factor