

WERNER BILFINGER

**CRITÉRIOS DE SEGURANÇA DE FUNDAÇÕES EM
ESTACAS CRAVADAS COM CONSIDERAÇÃO DE
CONTROLES EXECUTIVOS**

Tese apresentada à Escola
Politécnica da Universidade
de São Paulo para obtenção
do Título de Doutor em
Engenharia

v.2

São Paulo
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Área de Concentração:
Engenharia de Solos

Orientador:
Prof. Livre Docente
Waldemar Coelho Hachich

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Anexo I

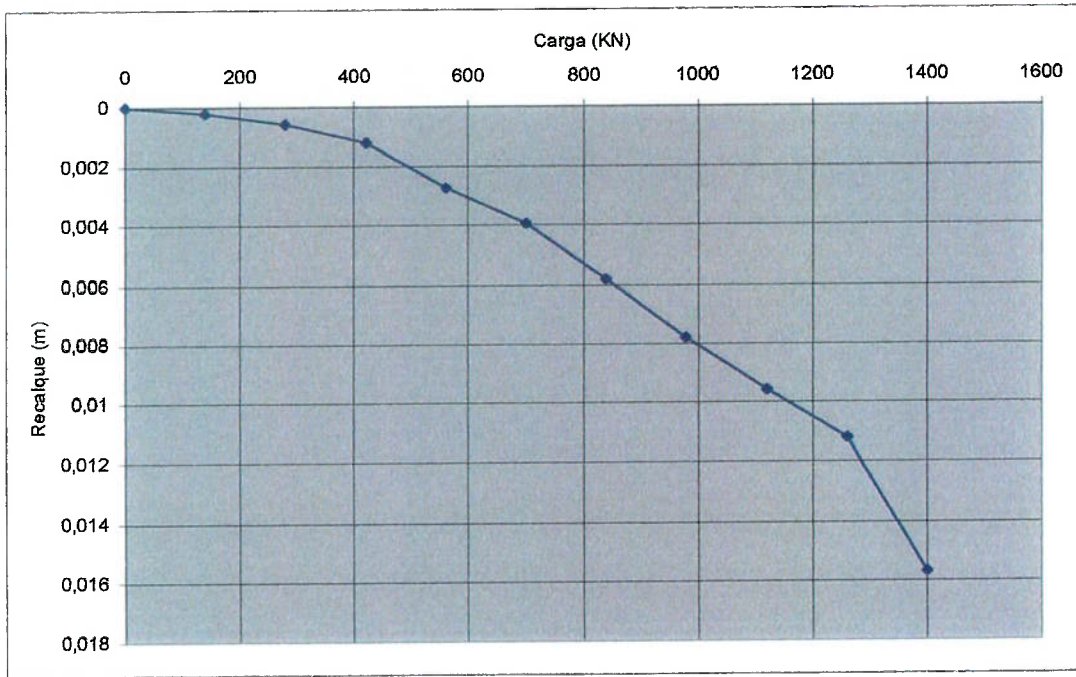
Comparação entre Provas de Carga Estáticas e Dinâmicas

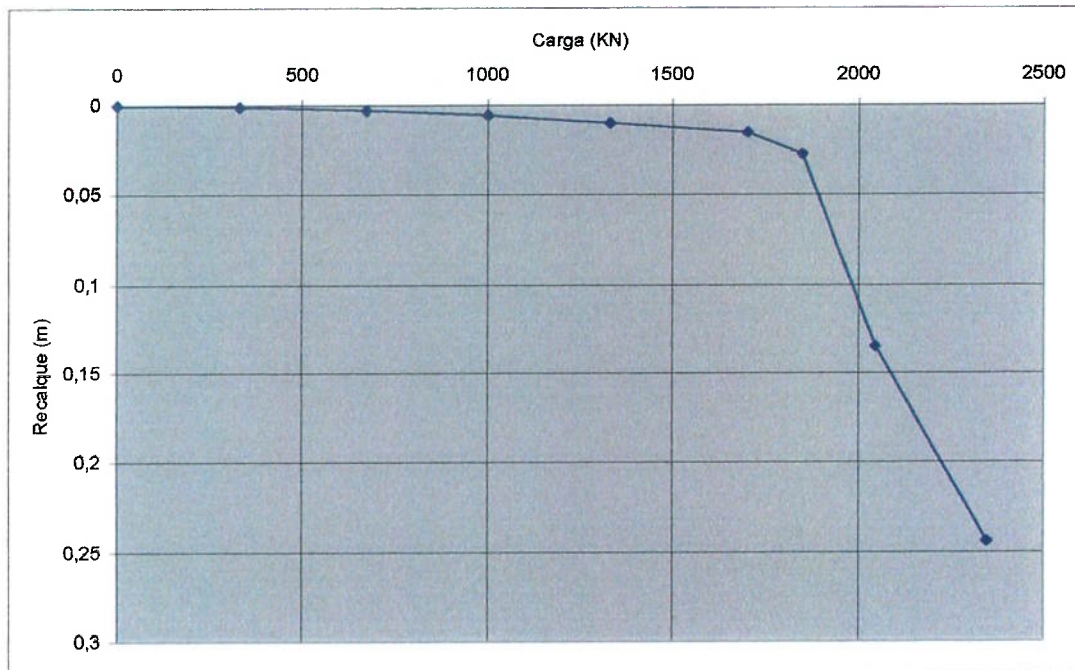
Referência	Estática (KN)	Dinâmica (KN)
Pump et al (1998) - ST1	15300	15120
Pump et al (1998) - ST2	16800	16220
Zheng et al (2000) - Gaozan Market 33	1900	1863
Zheng et al (2000) - Gaozan Market 76	1900	1881
Zheng et al (2000) - Gaozan Market 85	1980	2188
Zheng et al (2000) - Bigui Garden 27*	4060	4007
Zheng et al (2000) - Yujing Garden 113	2160	2051
Zheng et al (2000) - Meidi Shore Garden 27*	5100	4710
Zheng et al (2000) - Meidi Shore Garden 81*	4700	4453
Zheng et al (2000) - Huarun Dope Plant 429*	5225	4734
Zheng et al (2000) - Huarun Dope Plant 709*	3000	2943
Guran & Jiaduo (2000) - A-6*	7248,4	7326
Guran & Jiaduo (2000) - T-2	8303,2	10567
Guran & Jiaduo (2000) - B-3*	7269,6	7890
Guran & Jiaduo (2000) - B-3a	8001,7	8453
Guran & Jiaduo (2000) - B-3b	5448,6	5636
Guran & Jiaduo (2000) - B-3c*	6729,6	6199
Guran & Jiaduo (2000) - B-2*	6703,4	6199
Guran & Jiaduo (2000) - E-6*	12784,7	12768,1
Wakiya et al (2000)	4655	4923
Wakiya et al (2000)	5485	4843
Wakiya et al (2000)	4658	4604
Wakiya et al (2000)	8232	8820
Wakiya et al (2000)	3822	4234
Wakiya et al (2000)	14700	15798
Wakiya et al (2000)	2156	2176
Zengxuan et al (1999)	1300	1239
Zengxuan et al (1999)	1100	1476
Zengxuan et al (1999)	1400	1369
Zengxuan et al (1999)	1100	1208
Zengxuan et al (1999)	1100	1265
Zengxuan et al (1999)	1300	1182
Zengxuan et al (1999)	500	546
Zengxuan et al (1999)	5600	4308
Zengxuan et al (1999)	1000	1180
Zengxuan et al (1999)	480	589
Zengxuan et al (1999)	400	576
Zengxuan et al (1999)	720	787
Zengxuan et al (1999)	640	762
Zengxuan et al (1999)	10000	12008
Zengxuan et al (1999)	5000	5106
Zengxuan et al (1999)	5120	4680
Zengxuan et al (1999)	5120	4980
Zengxuan et al (1999)	1300	1126

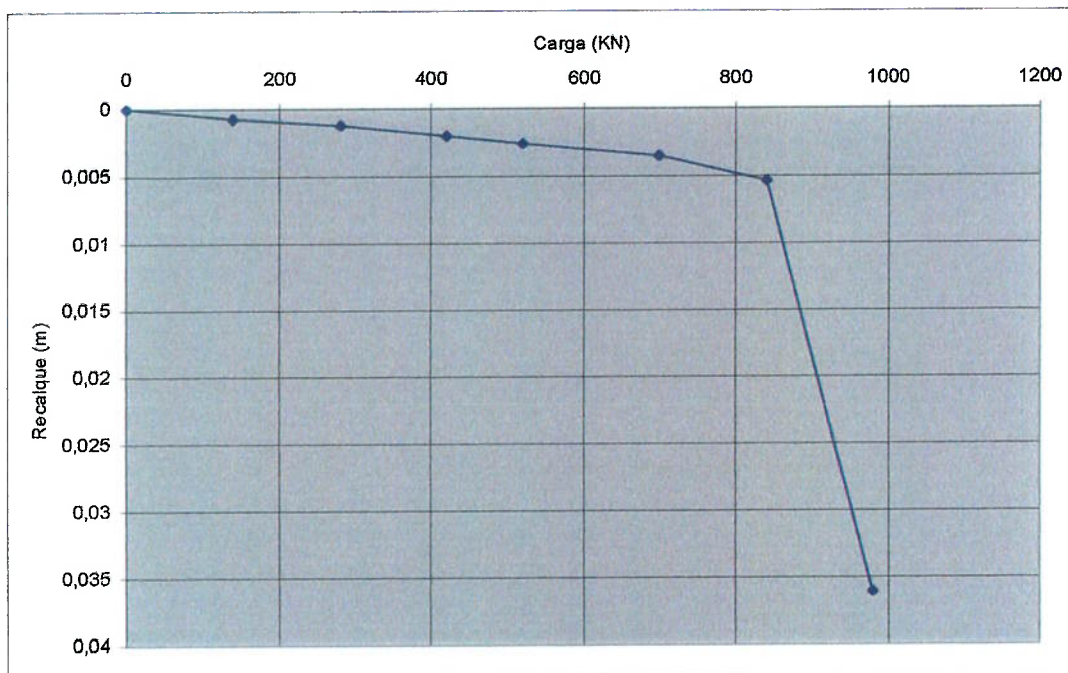
Zengxuan et al (1999)	1100	1093
Zengxuan et al (1999)	1200	960
Zengxuan et al (1999)	1400	1362
Zengxuan et al (1999)	1200	985
Zengxuan et al (1999)	1200	1137
Zengxuan et al (1999)	1100	718
Zengxuan et al (1999)	1400	1236
Zengxuan et al (1999)	1300	1361
Zengxuan et al (1999)	1400	1189
Aoki e Alonso (1989)	970	570
Aoki e Alonso (1989)	1150	880
Aoki e Alonso (1989)	650	650
Aoki e Alonso (1989)	960	950
Aoki e Alonso (1989)	1470	1300
Aoki e Alonso (1989)	1010	950
Aoki e Alonso (1989)	1590	1110
Aoki e Alonso (1989)	1810	900
Aoki e Alonso (1989)	820	820
Aoki e Alonso (1989)	1680	2210
Aoki e Alonso (1989)	4220	2600
Aoki e Alonso (1989)	4220	4220
Aoki e Alonso (1989)	4220	3370
Aoki e Alonso (1989)	4220	3400
Aoki e Alonso (1989)	6900	5800
Aoki e Alonso (1989)	1070	1270
Aoki e Alonso (1989)	410	540
Aoki e Alonso (1989)	580	560
Aoki e Alonso (1989)	710	560
Albuquerque e Carvalho (1998)	262	216

Anexo II

Provas de Carga Estáticas Analisadas







Origem: Tese Penna 1985 - PC 004
Local: São Paulo, Alameda Franca
Tipo de Estaca: Concreto Armado Centrifugado
Diâmetro: 0,42 m
Área: 0,085451 m²
Módulo de Elasticidade: 2,00E+07 Kpa
Peso do Martelo: 3500 kg
L: 12,5 m
Altura de queda: 0,6 m
Nega: 55 mm/10golpes
Repique: mm

Prova de Carga Dinâmica

Case: KN
Capwap: KN

Carga de Ruptura

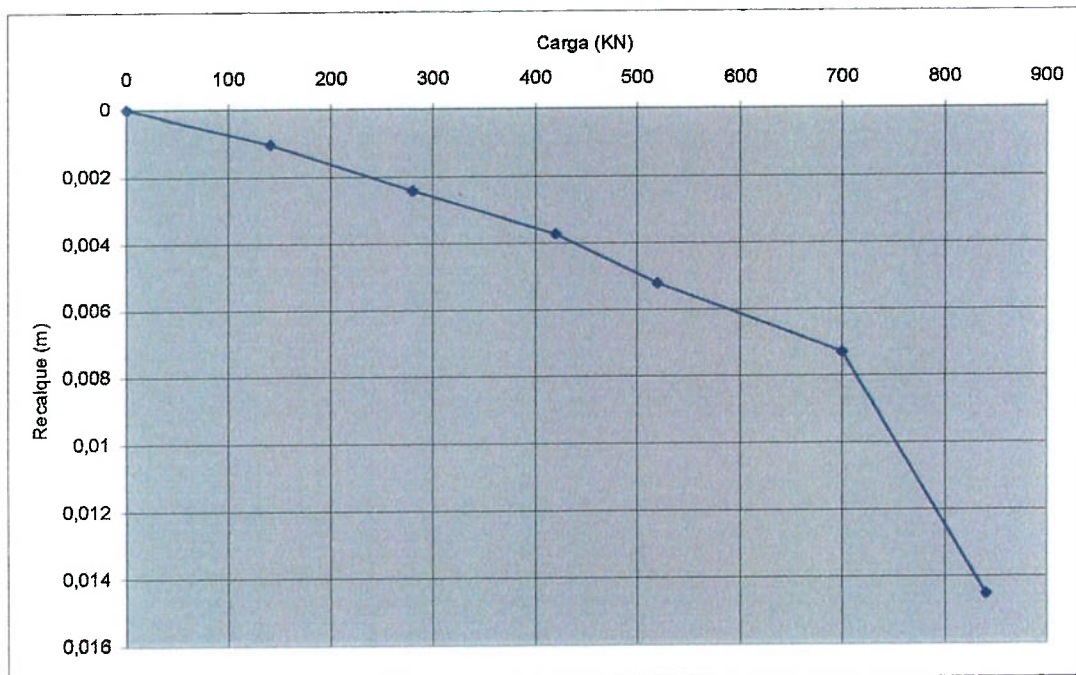
Davisson: 815 KN
Chin: 1043,478261 KN
De Beer: 700 KN
Brinch Hansen 90%: 800 KN
Brinch Hansen 80%: 922,5584708 KN
Mazukierwicz: 920 KN
Van der Veen: 850 KN
Massad: 940,8088235 KN
NBR-6122 KN

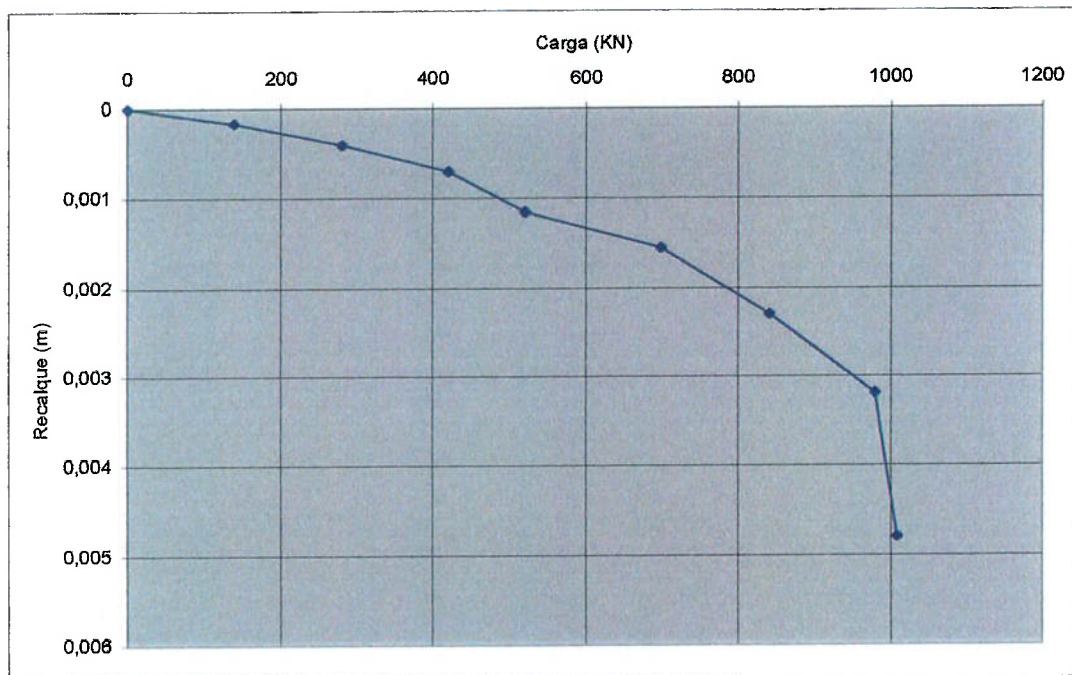
Sondagem

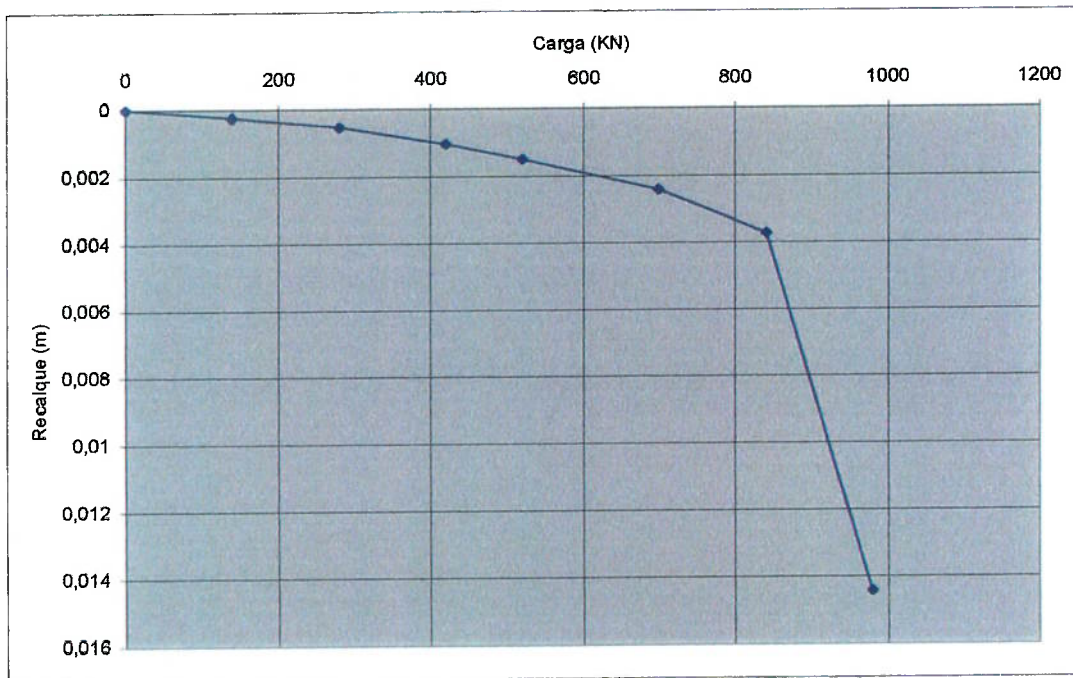
Profundidade (m)	SPT	Tipo de Solo
1	2	310
2	2	310
3	3	310
4	4	310
5	3	310
6	3	310
7	4	310
8	6	130
9	12	130
10	12	130
11	7	320
12	13	320
13	13	320
14	15	320
15	16	320
16	19	320
17	24	320
18	27	320
19	28	320

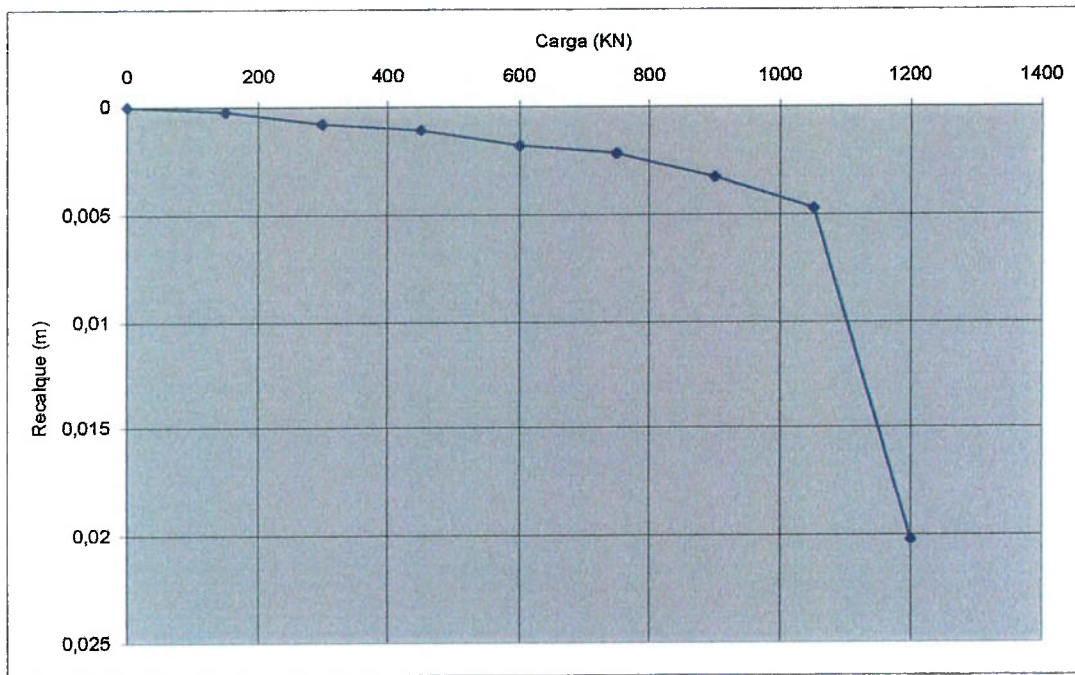
Curva Carga x Recalque

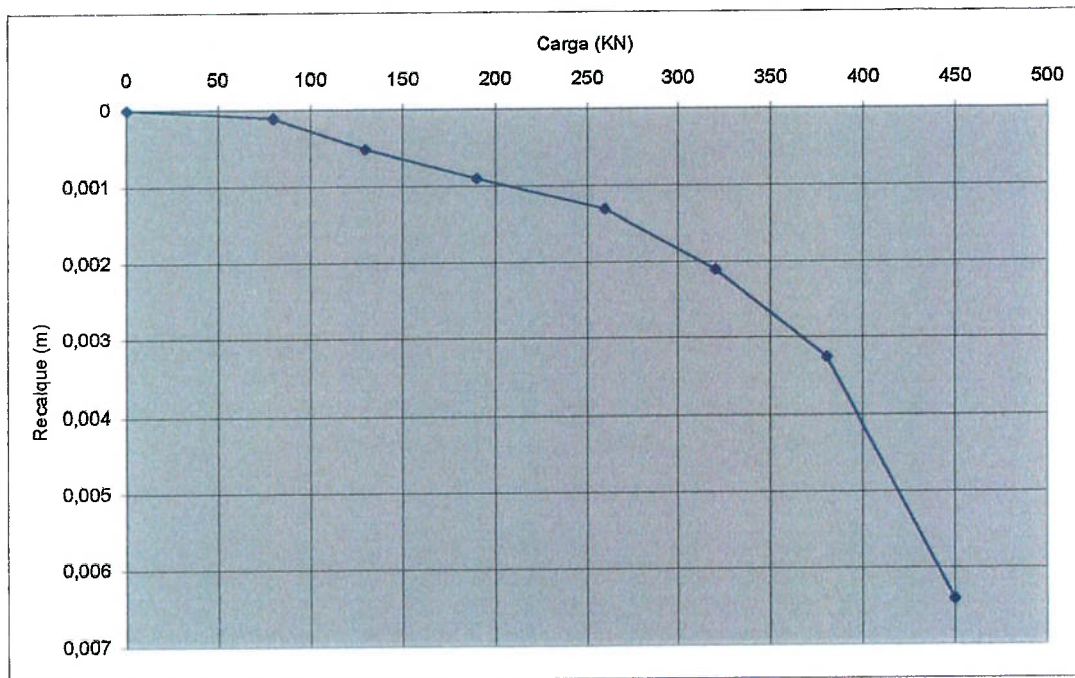
Carga (KN)	Recalque (m)
0	0
140	0,001
280	0,0024
420	0,0037
520	0,0052
700	0,0073
840	0,0145

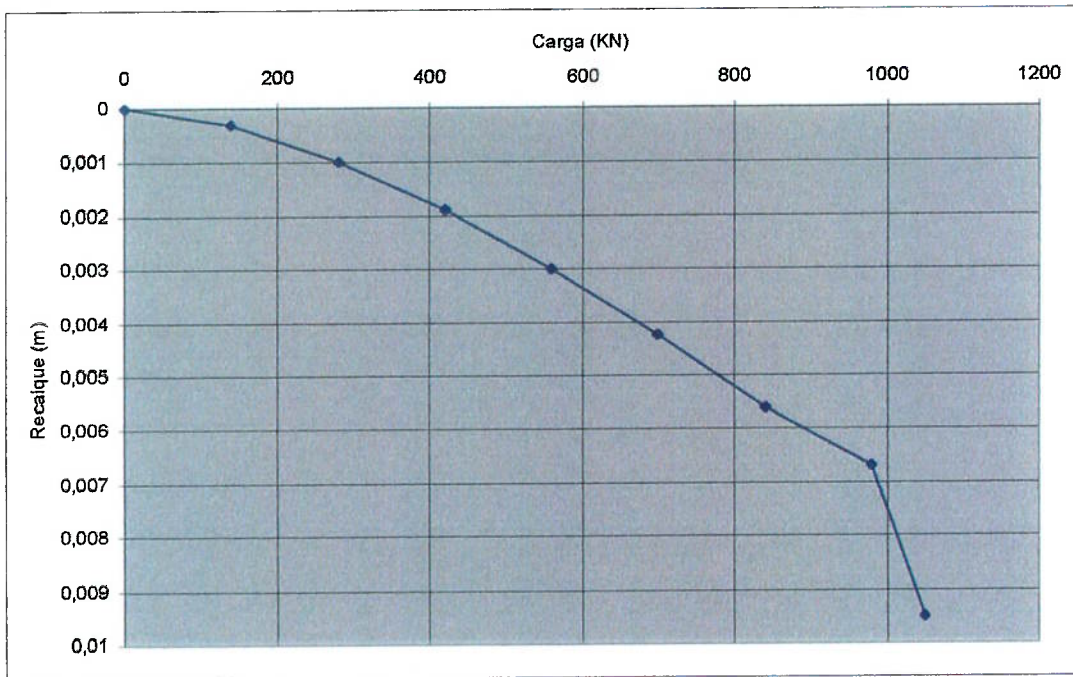


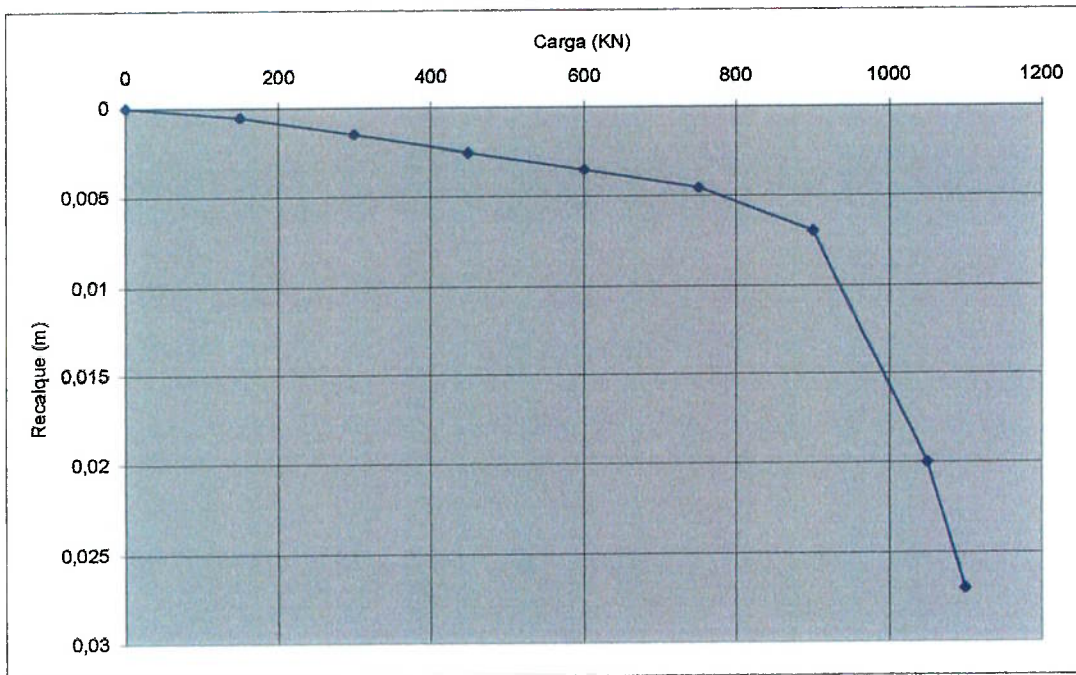


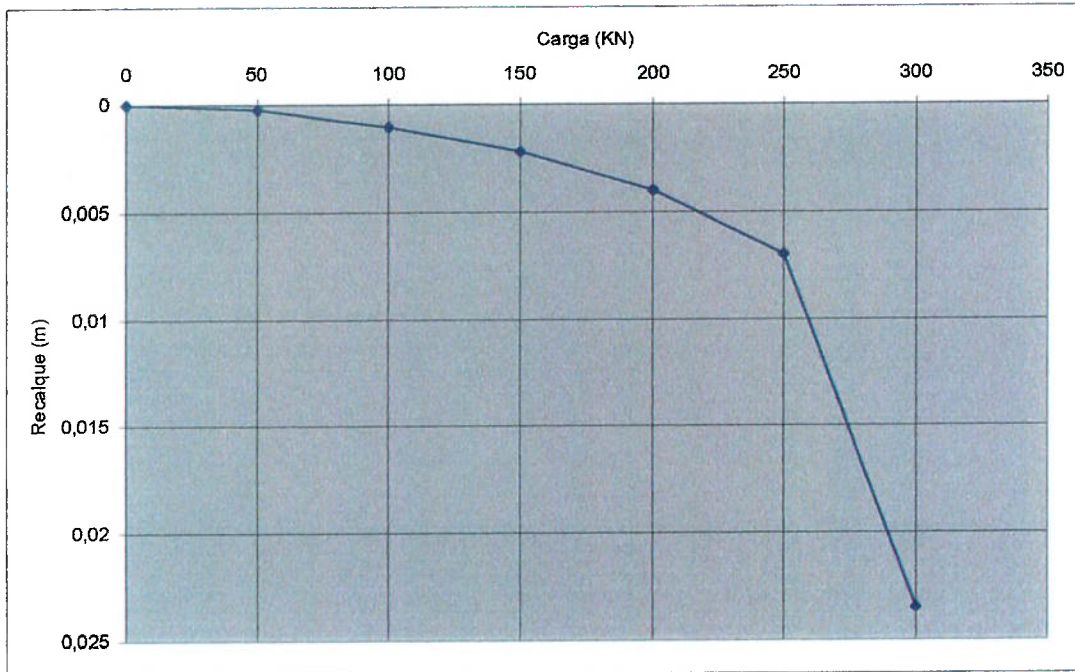


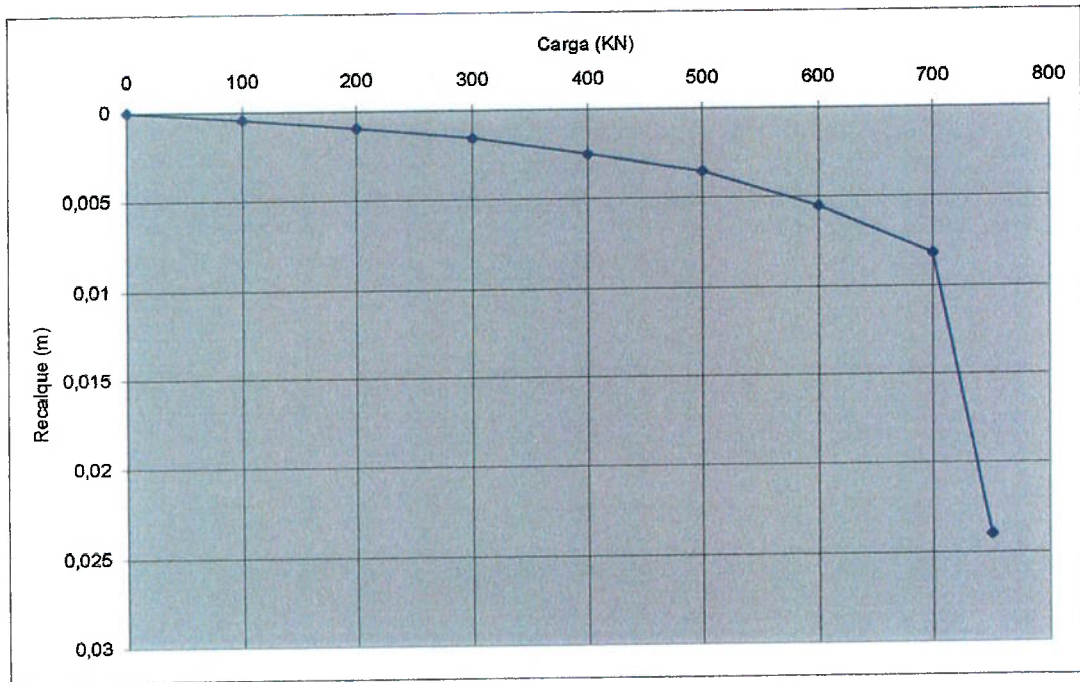


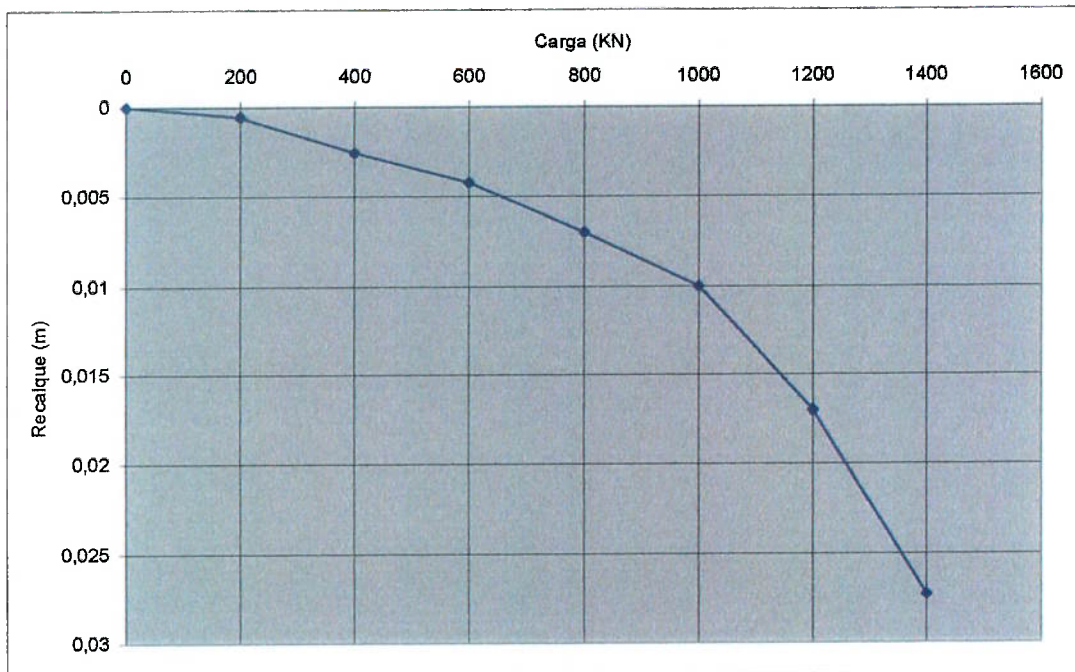


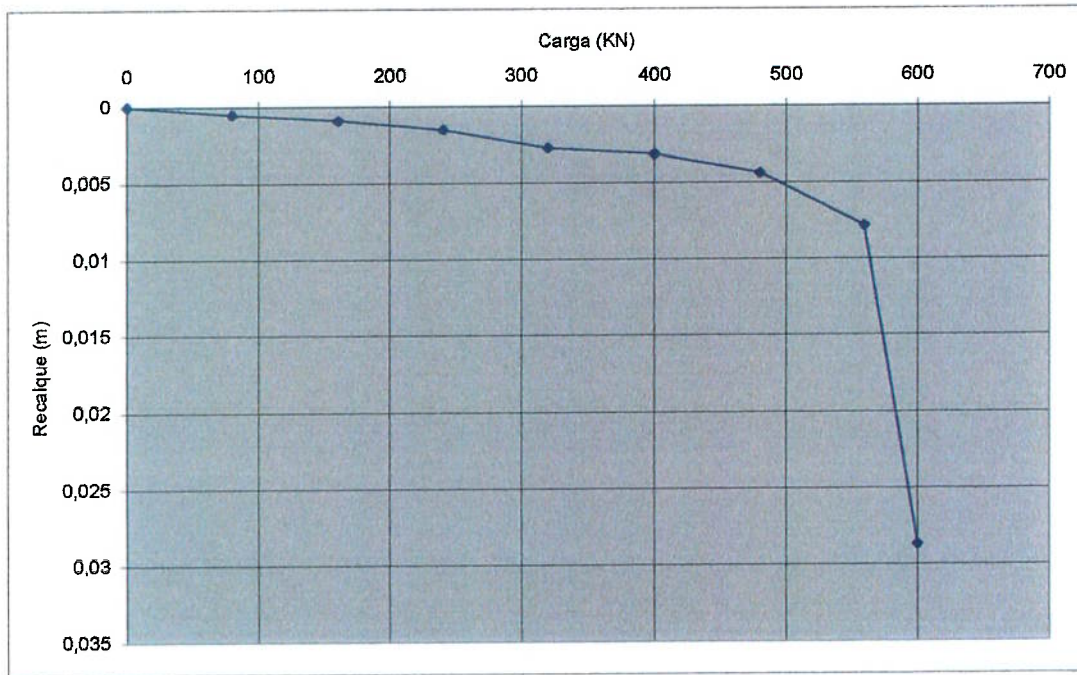


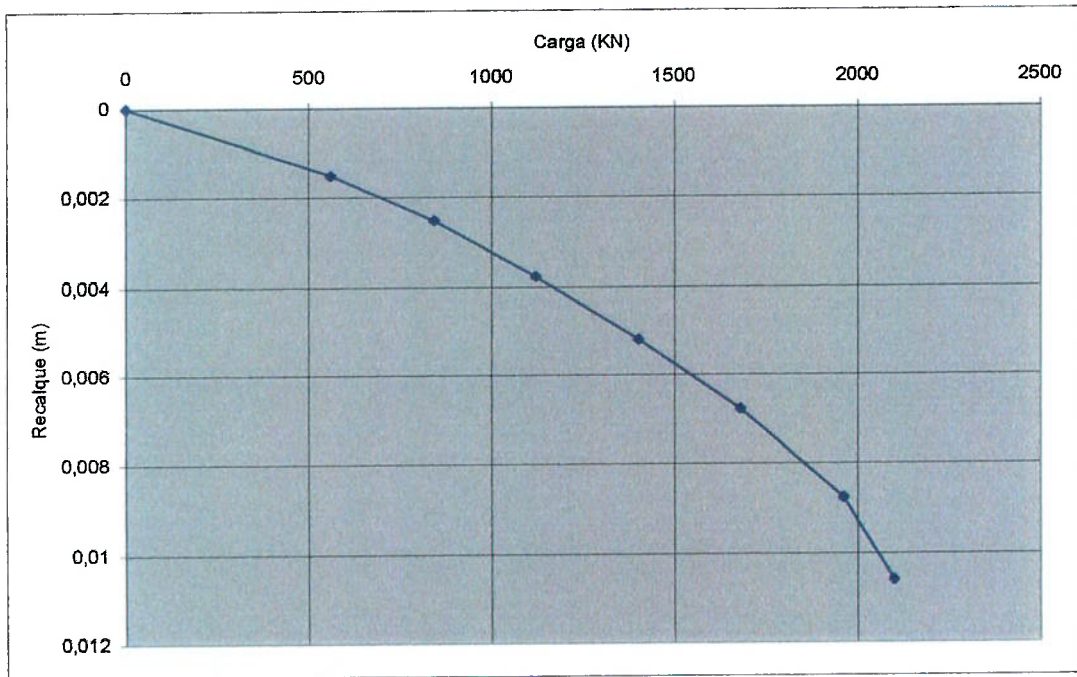


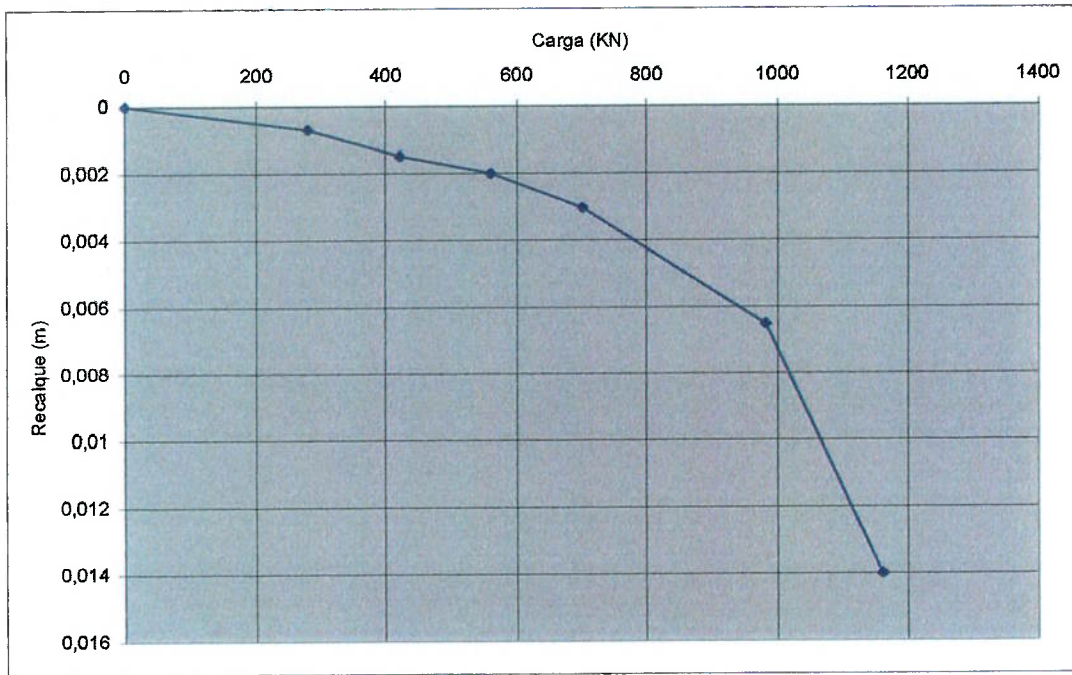


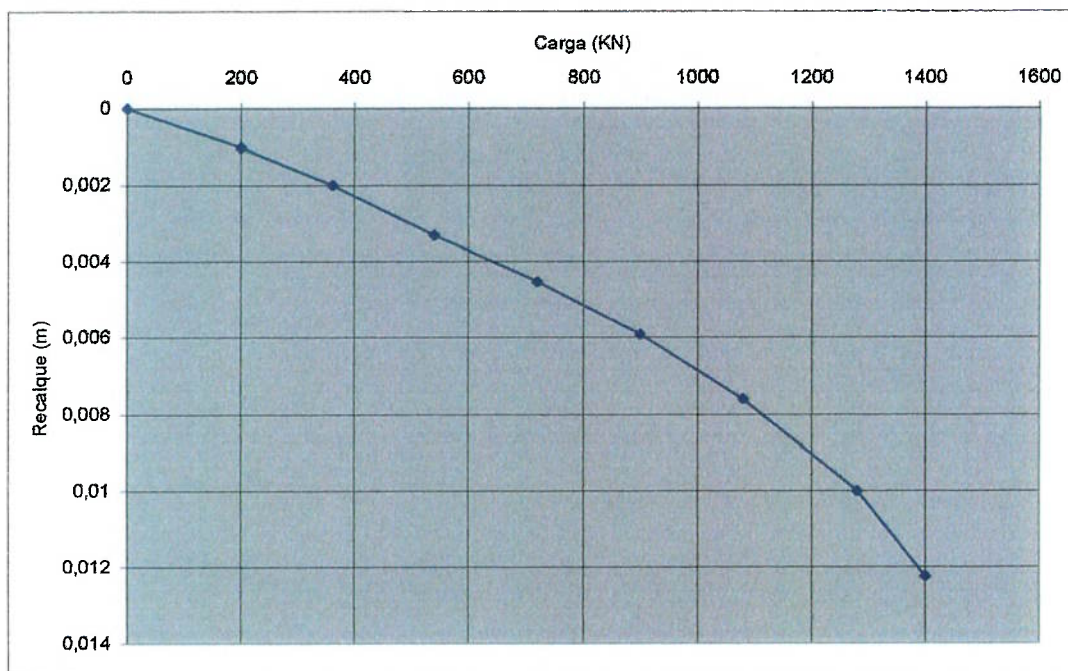


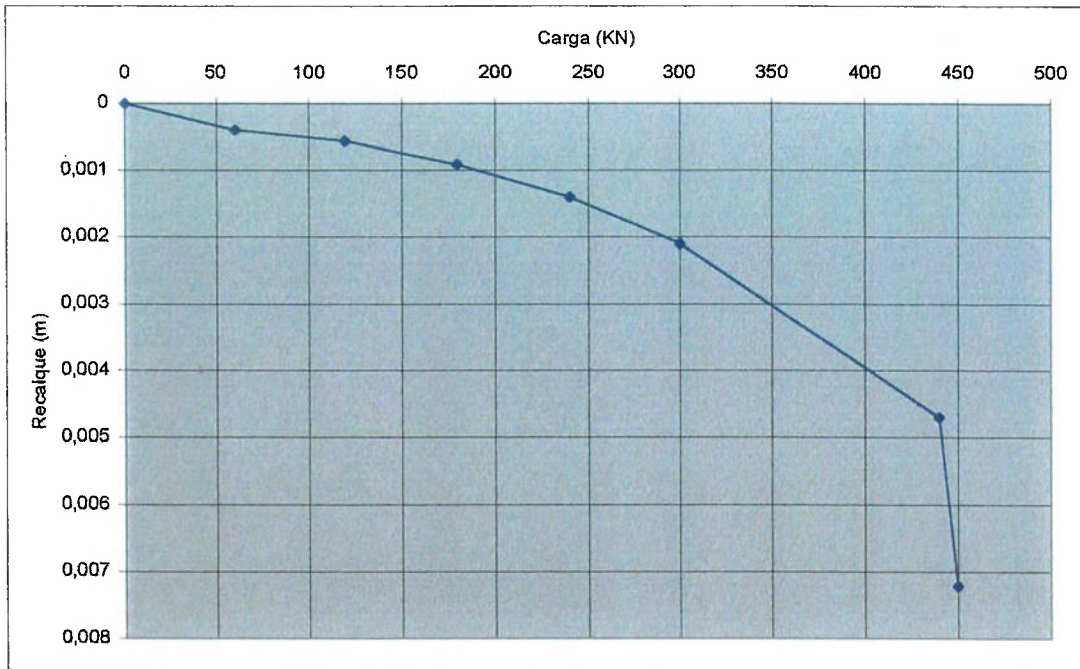


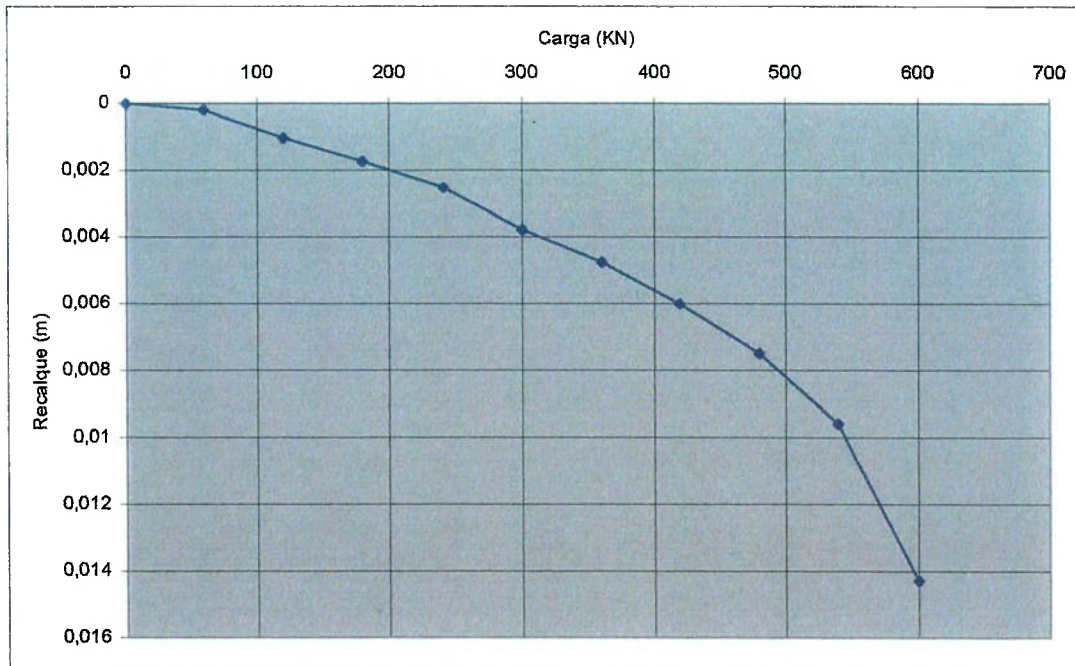


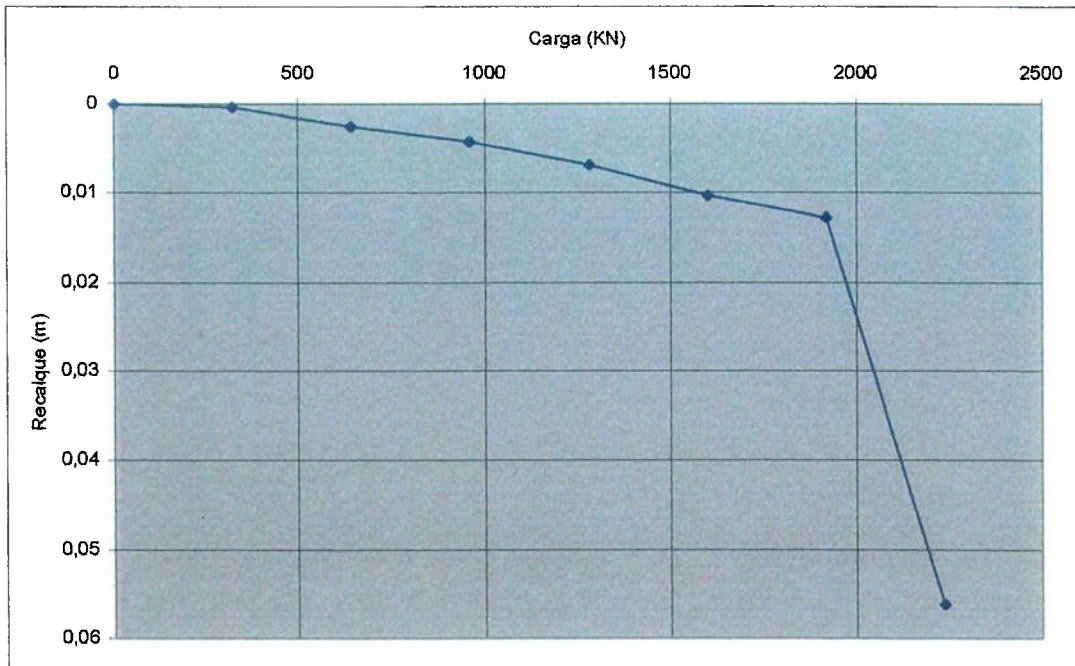


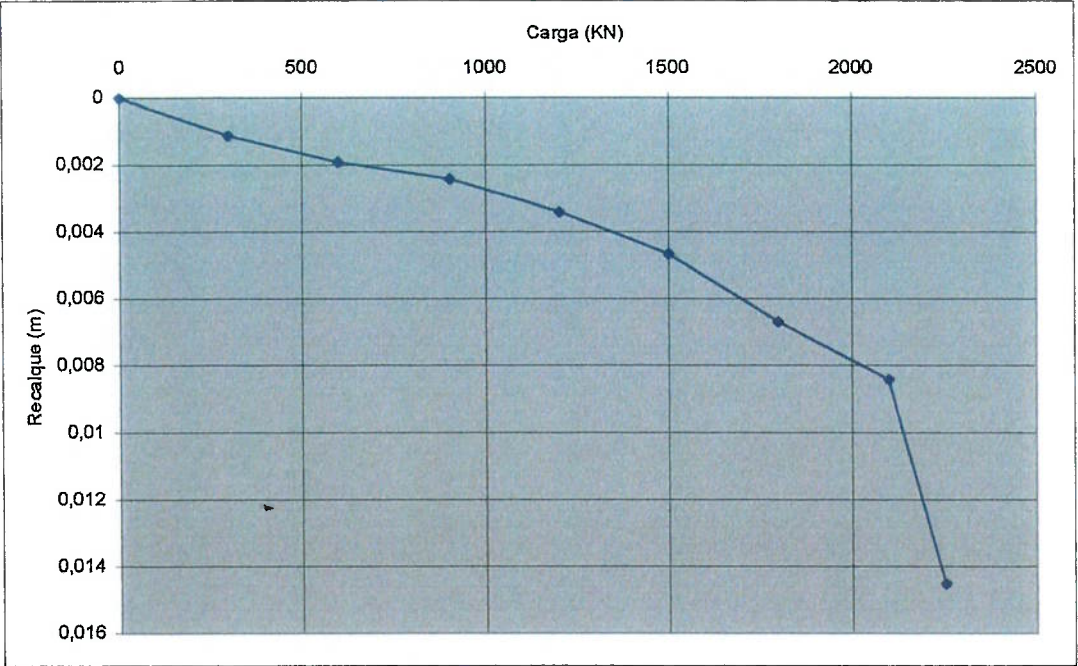


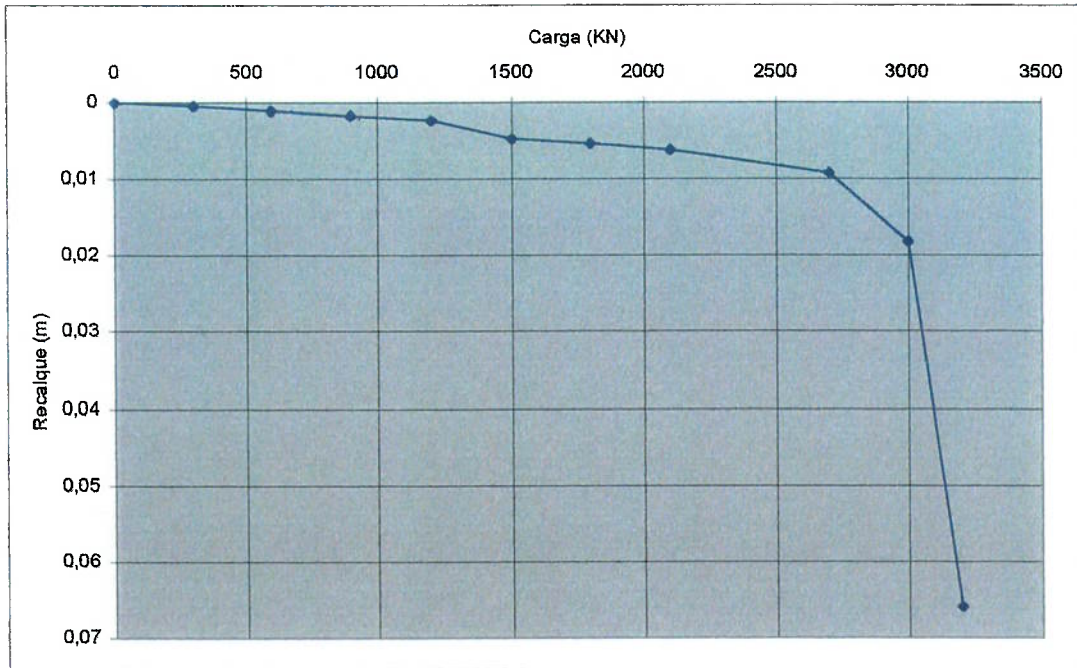


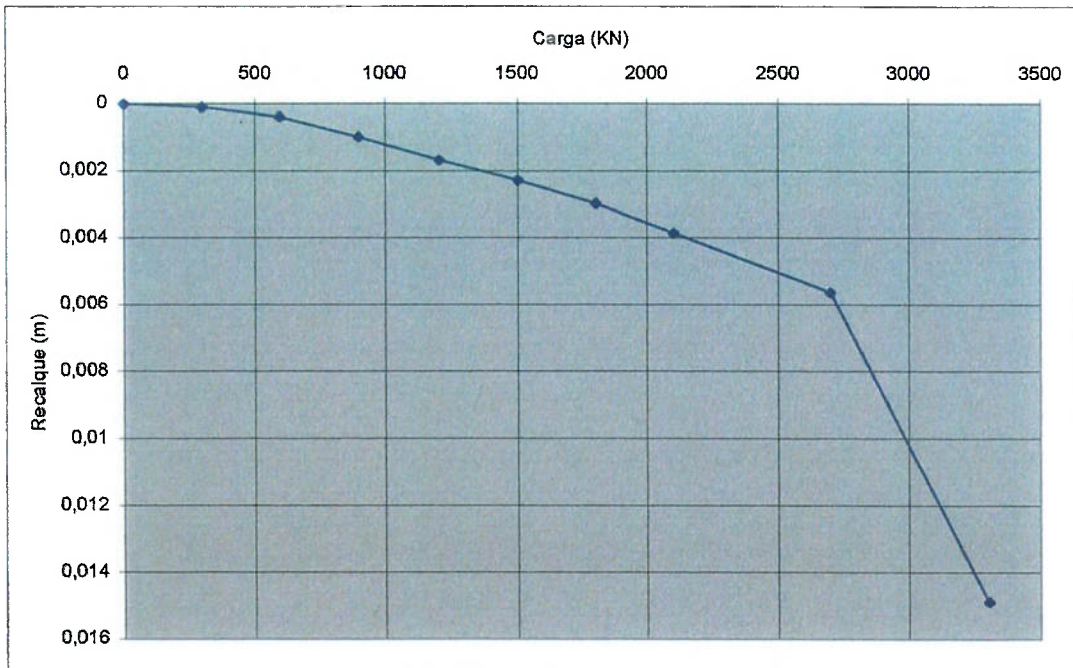


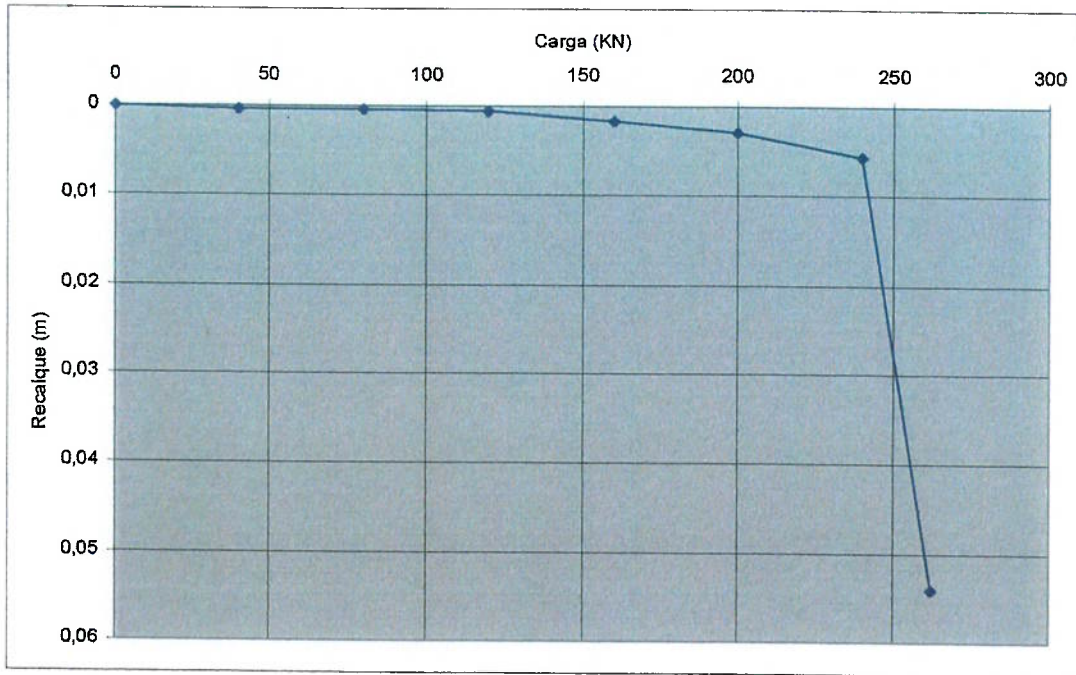


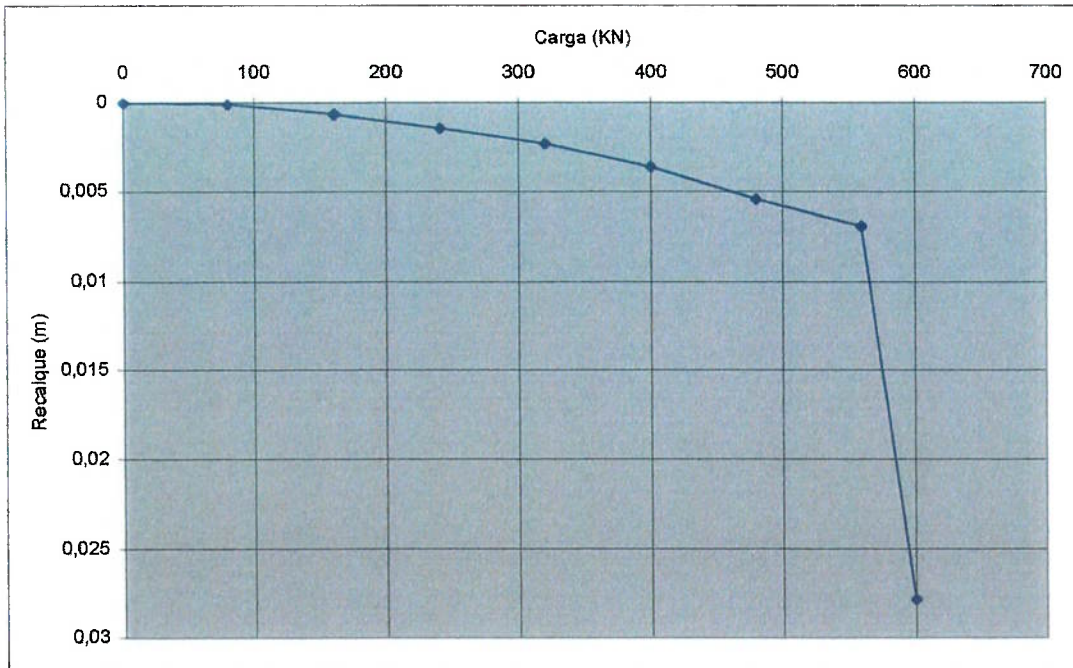


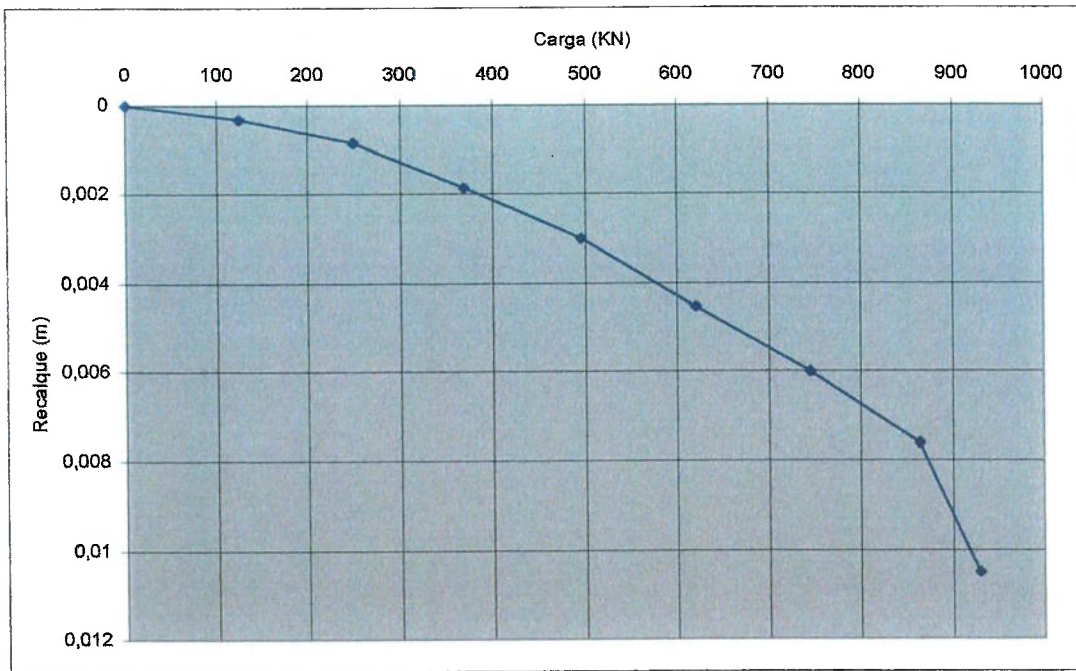


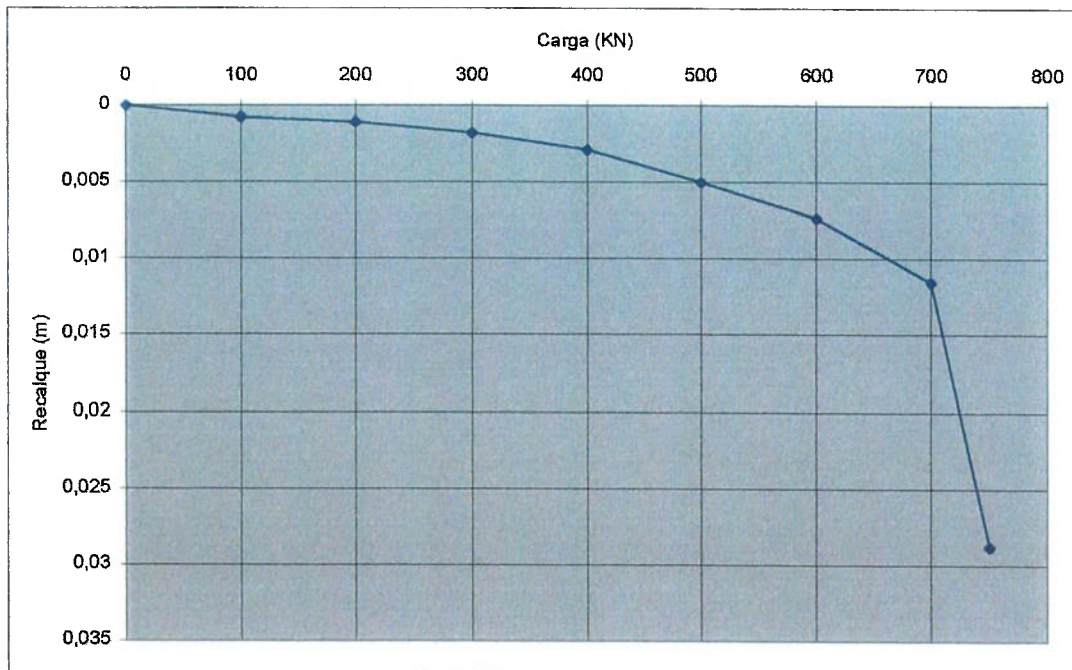


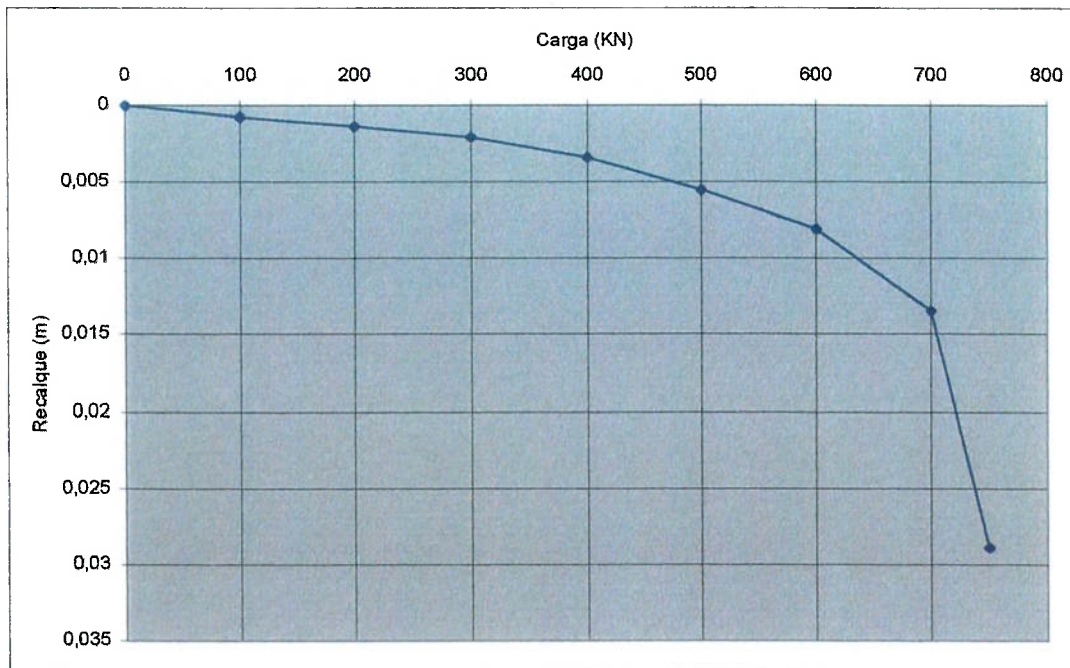


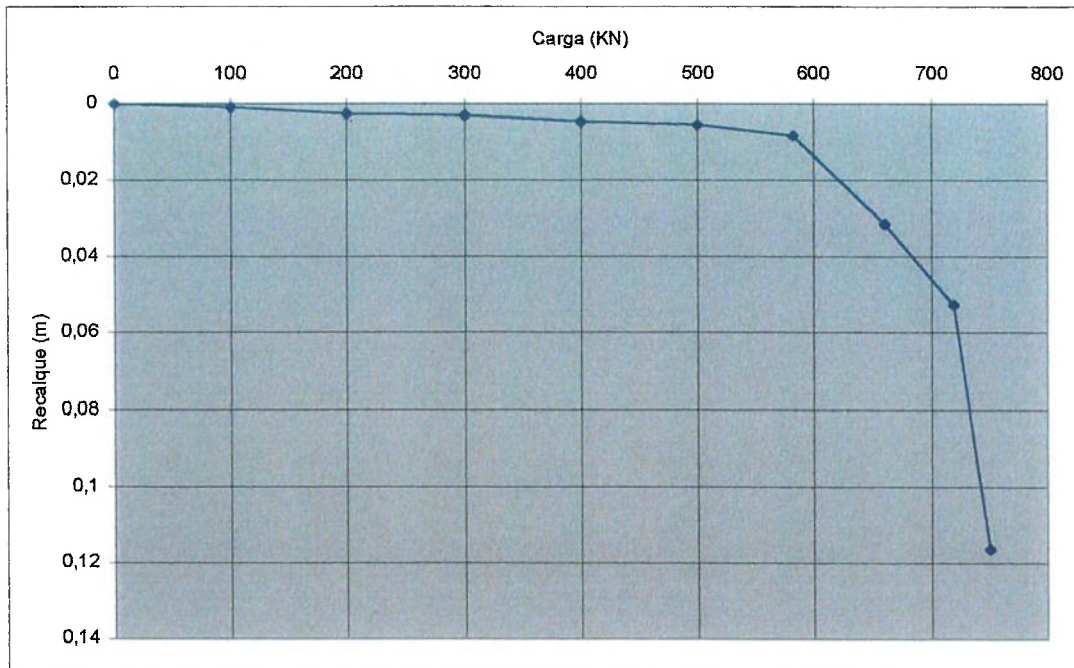


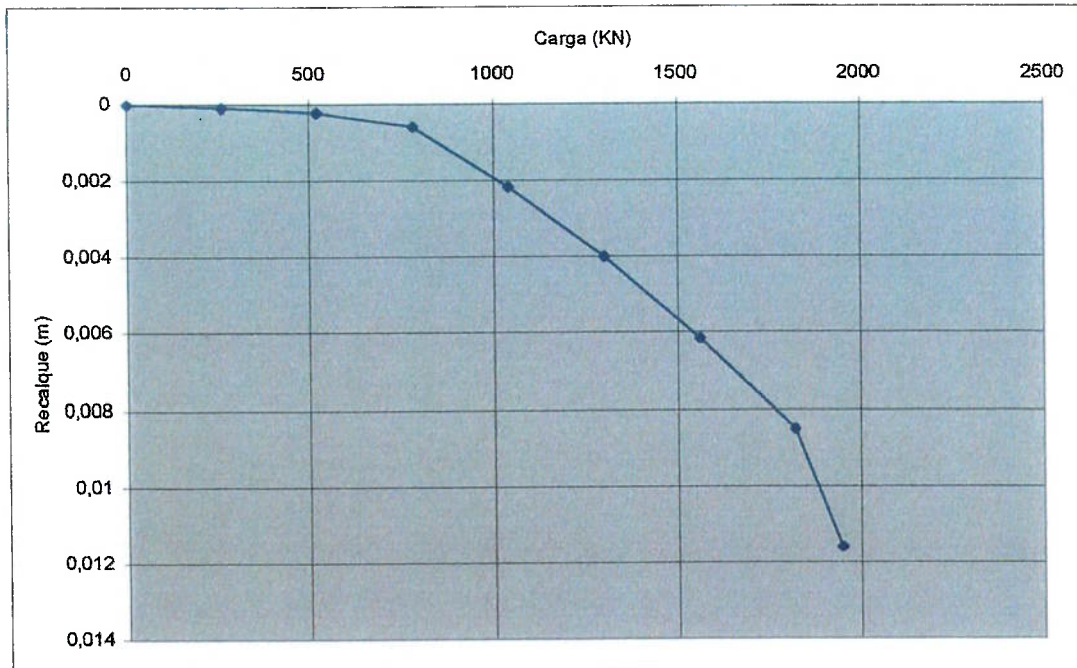


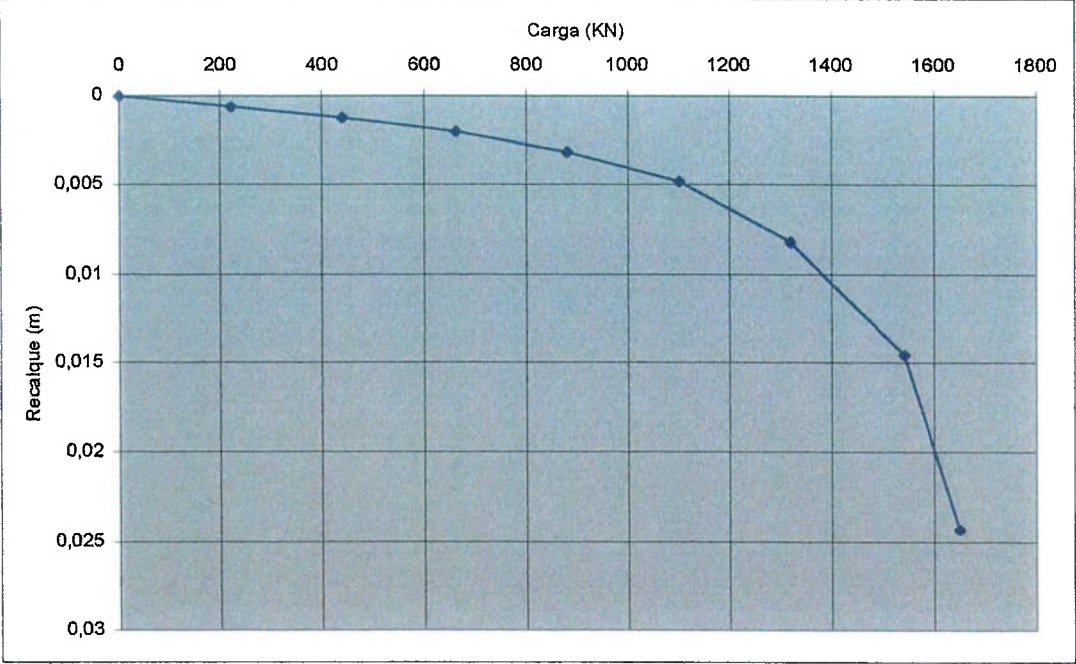


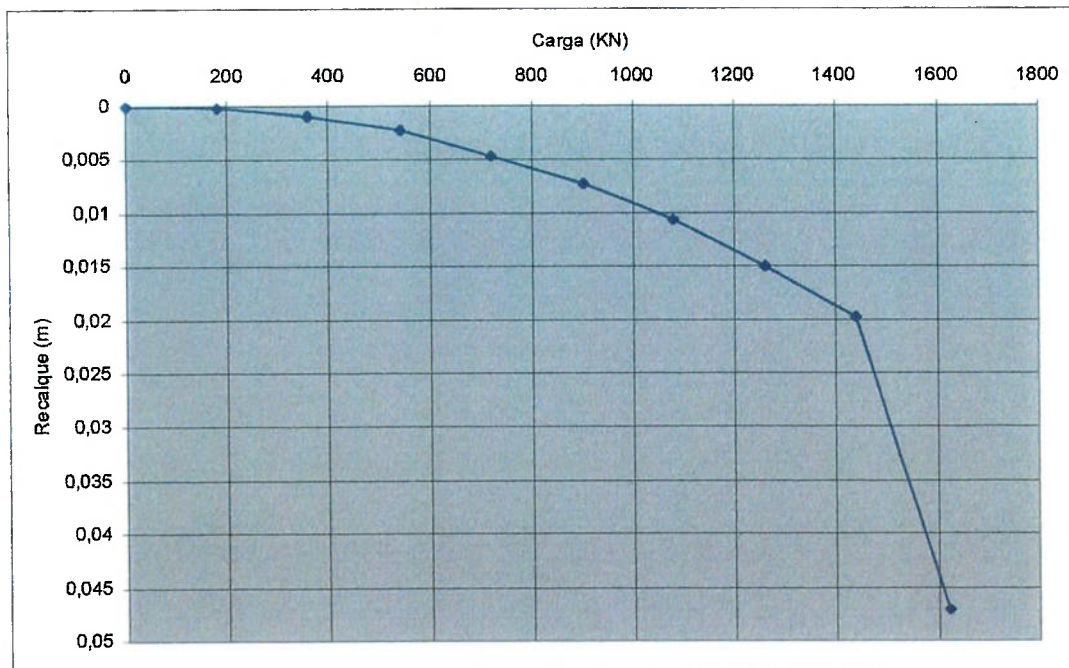


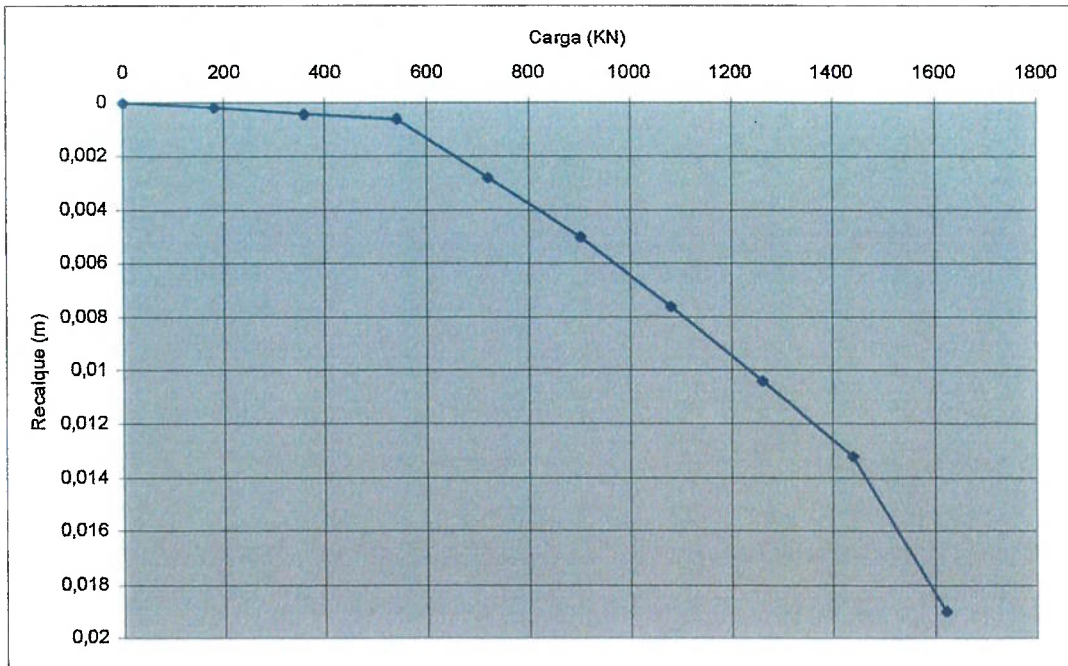


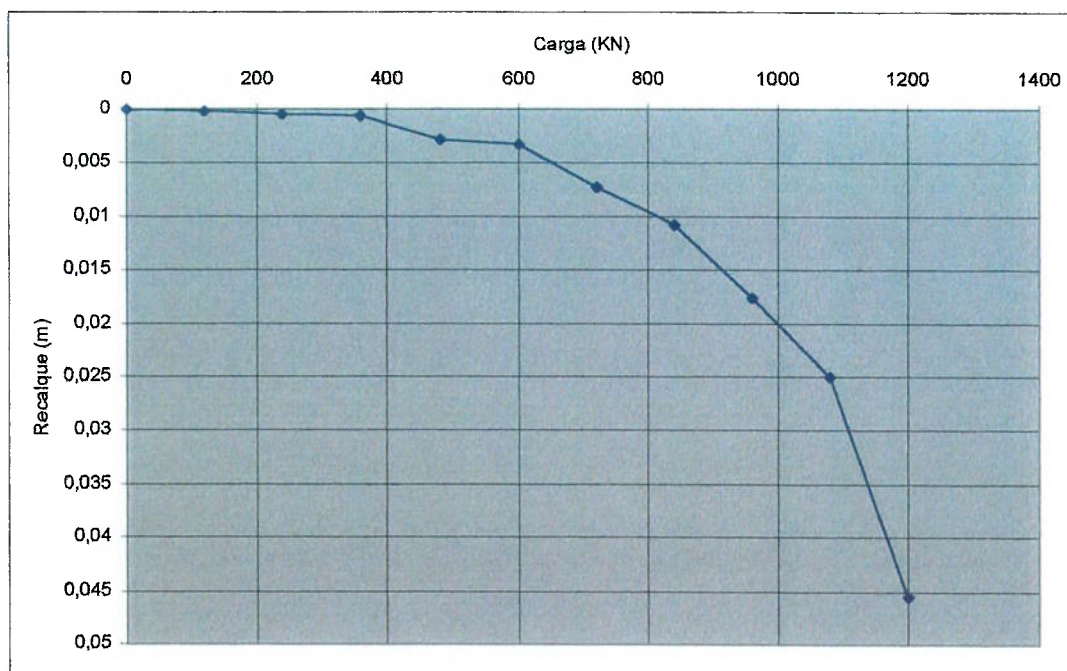


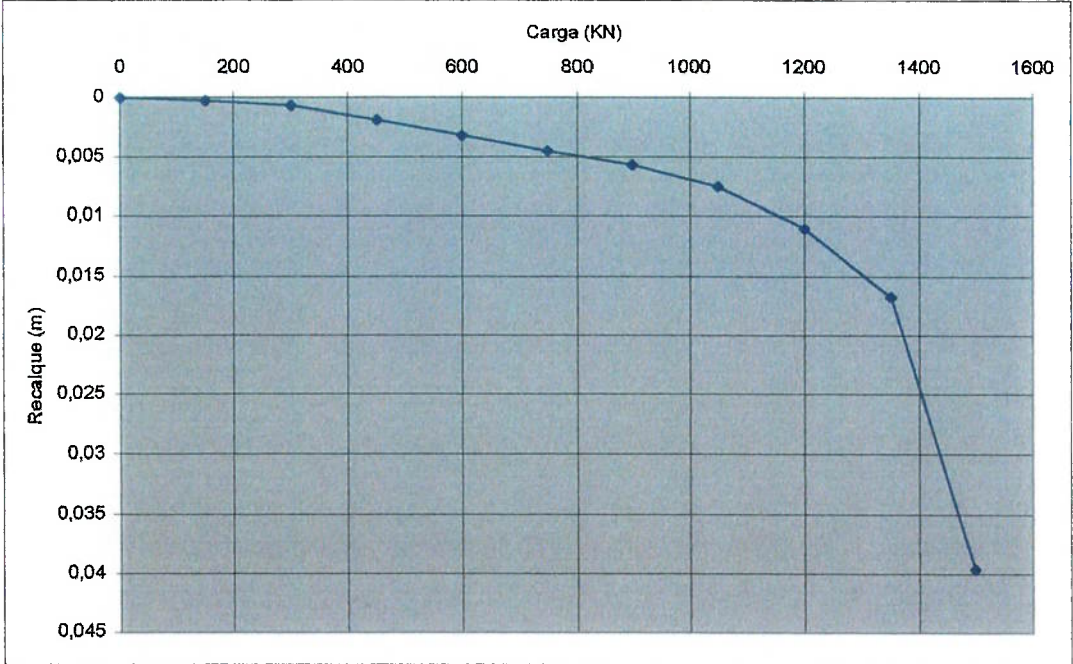


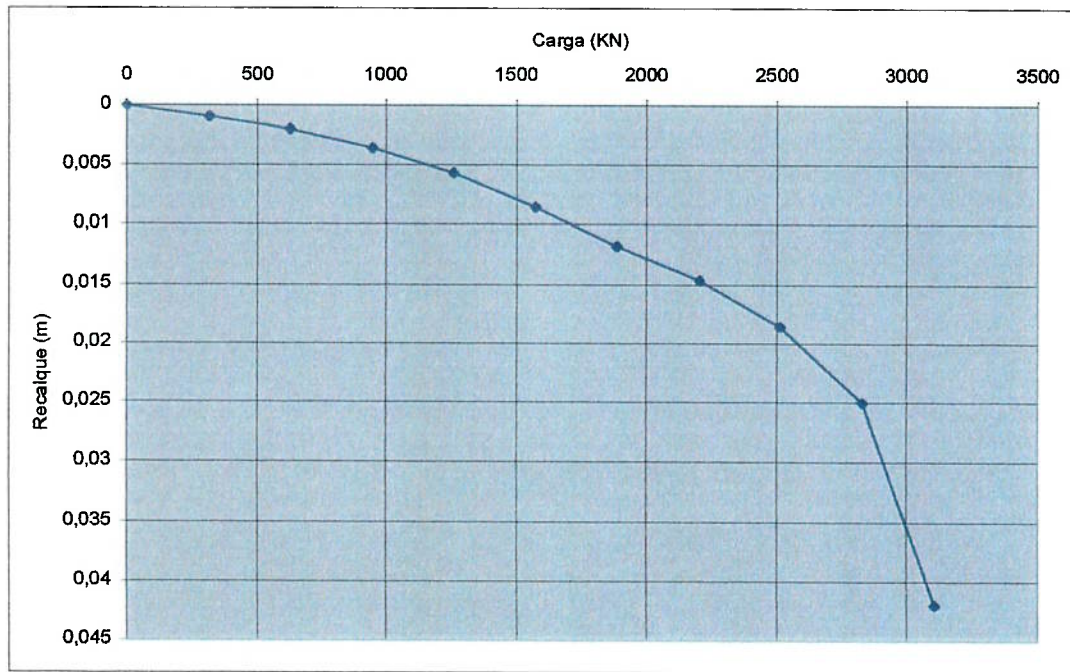












Anexo III

**MATRIZ DE VALORES DE K PARA PREVISÕES PELOS
MÉTODOS DÉCOURT E QUARESMA, JANBU E CHELLIS
MODIFICADO**

Cada uma das tabelas abaixo é um plano da matriz tridimensional, na qual o eixo “z” é aquele representado pelos valores de $K_{D\&Q} = D\&Q/CASE_{corr}$. O eixo “y” representa os valores de K_{Janbu} , e o eixo “x” representa os valores de $K_{Chellis\ mod}$. Cada uma das tabelas representa um plano “x” versus “y”, para um determinado valor fixo de “z”.

As faixas coloridas significam regiões de “iso K”, ou seja, regiões nas quais o valor mínimo de K é o mesmo. Os números em cada célula é o número de casos que se encaixa nas faixas definidas.

D&Q/CASE _{corr} = 0.2-0.4		0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0
Janbu\Chel	0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0	
0.4-0.6						1					
0.6-0.8											
0.8-1.0			1			1					
1.0-1.2				1	1		1	1			1
1.2-1.4											
1.4-1.6											
1.6-1.8											
1.8-2.0											
>2.0											

D&Q/CASE _{corr} = 0.4-0.6		0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0
Janbu\Chel	0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0	
0.4-0.6			1	4							
0.6-0.8			1	4							
0.8-1.0					6	2	1				
1.0-1.2				2	5	2	2				
1.2-1.4					2	1					
1.4-1.6							2				
1.6-1.8											
1.8-2.0											
>2.0						1	2				

D&Q/CASE _{corr} = 0.6-0.8		0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0
Janbu\Chel	0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0	
0.4-0.6					1						
0.6-0.8				2	4	1					
0.8-1.0			1		2	1	1				
1.0-1.2				2	1						
1.2-1.4					3	1	1				
1.4-1.6											
1.6-1.8					1						
1.8-2.0											
>2.0											

D&Q/CASE _{corr} = 0.8-1.0		0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0
Janbu\Chel	0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0	
0.4-0.6				1	1						
0.6-0.8				1	2						
0.8-1.0			1	2	5	1	1				
1.0-1.2			1		1	1					
1.2-1.4					1	1	1				
1.4-1.6						1					
1.6-1.8				1	2						
1.8-2.0					1						
>2.0							1				

D&Q/CASEcorr =1.8-2.0										
JanbuChe	0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0
0.4-0.6										
0.6-0.8										
0.8-1.0						1				
1.0-1.2										
1.2-1.4										
1.4-1.6										
1.6-1.8					1					
1.8-2.0										
>2.0										

D&Q/CASEcorr >2.0										
JanbuChe	0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	>2.0
0.4-0.6										
0.6-0.8										
0.8-1.0										
1.0-1.2										
1.2-1.4				1						
1.4-1.6					1					
1.6-1.8										
1.8-2.0						1				
>2.0					1		1		2	1