



مركز الإستشارات الهندسية
للنقل و المطارات و الطرق
(خبراء دوليون)
دكتور/ سعد الجيوشي



الهيئة العامة
للمطارات و الطرق
(GARB)



وزارة النقل
MINISTRY OF TRANSPORT
و البنية التحتية

مشروع القطار الكهربائي فائق السرعة قطاع (العلمين - فوكة) المقايضة التقديرية لبنود الاعمال تنفيذ شركة الحسن للمقاولات المتكاملة اتجاة برج العرب القطاع من المحطة ٤٥٣+٦٠٠ الى ٤٥٤+٦٠٠				
رقم البند	بيان الأعمال	الوحدة	الكمية	القيمة
٢	أعمال الردم			
١٠٢	أعمال تعمير وتوريد ونقل اثربة مطابقة للمواصفات وتشغيلها باستخدام الات الترسية بسك لايزيد عن ٥٠ سم حتى مسوب (2.00 متر) وبسك لايزيد عن ٢٥ سم لاستكمال المنسوب التصميمي لتشكيل الجسر الترابي والاكتاف (نسبة تعمل كالبورنيا لا تقل عن ١٥%) ورشها بالمياه الاصولية للوصول الى نسبة الرطوبة المطلوبة والسك الجهد بالمهريسك للوصول الى الصي كثافة جافة (95%) من الكثافة الجافة القصوى) ويتم التنفيذ طبقا للمناسيب التصميمية والقطاعات العرضية التمنجية والرسومات التفصيلية المعتمدة والبند بجميع مقتملاته طبقا لاصول الصناعة ومواصفات الهيئة العامة للطرق والكبارى وتعليمات المهندسين المشرفين.	م ^٢	١٤,٨٥٩,٢٣	١,٢٦٧,٠٣٤
١٠٣	مسافة النقل حتى ٢ كم ويتم احتساب علامة ١,٤ جنيهه لكم بالزيادة او النقصان السعر يشمل عمل تقويمات وتخليط واختبارات ونقل لموقع العمل حتى مسافة ٢ كم السعر يشمل قيمة المادة المحجربة	م ^٢	١٤,٨٥٩,٢٣	٢٨٥,٦٠
	علاوة مسافة النقل ٢٠٦ كم	م ^٢	١٤,٨٥٩,٢٣	١٣,٠٠
	علاوة تحصيل الكوتة والموازن طبقا للائحة الشركة الوطنية	م ^٢	١٤,٨٥٩,٢٣	١٣,٠٠
	الاجمالي			٥,٧٠٠,٠٠٠
(خمسة ملايين وسبعمائة ألف جنيهها لفظ لا غير)				

مدير عام المشروعات
م / محمد حمدي لياض

مدير المشروع المالك
م / ابراهيم نظاري

مدير المشروع الاستشاري
م / مصطفى نجم

مدير المشروع المقاول
م / عمر عماد الدين

الحسن للمقاولات المتكاملة
حسن جمعة حسن عواد
س ت: ٦٢٤٨ ب ض: ٨٩٠ - ٢٢٢ - ٥٥٢

رئيس الإدارة المركزية
م / محمد محمود طه
م / محمد محمود طه

الحسن للمقاولات المتكاملة
حسن جمعة حسن عواد
ب ض: ٨٩٠ - ٢٢٢ - ٥٥٢
س ت: ٦٢٤٨



Horema for Soil Investigation & QC.

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El-Hassan company

**GEOTECHNICAL REPORT
FOR ANALYSING OF EIGHT PLATE LOADING TESTS
CARRIED OUT AT ALDABAA
FOR THE PROJECT OF ELECTRIC EXPRESS TRAIN**

Station 453+600 to 455+600

Level -1.50 m

Prepared by Prof. Dr Mostafa Abu Kiefa

2023

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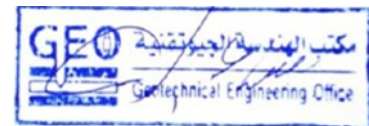
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1- INTRODUCTION

This report has been prepared upon the request of Al-Hassan Company. The study deals with the area specified to the Electric Express Train at Al-Dabaa. 19 double repetitive static plate loading tests were conducted in accordance with the DIN 18134 slandered specifications. The plate loading tests were conducted by **Horema** (LTD). The purpose of these tests is to obtain the relationship between the loading and soil settlement due to each load, which can be used to determine the soil strain modulus (E_v) and the modulus of sub-grade reaction (k_s).

2- DESCRIPTION OF EXPERIMENTS

The loading experiments were conducted at certain locations at the route of the Electric Express Train at Al-Dabaa. 19 plate load tests were carried out on Silty SAND with Gravel at **wet** conditions using a load disc of 75 cm diameter in locations identified by the Client. The plate loading tests were conducted (at-1.50 m) in accordance with the DIN 18134 slandered specifications. As per code DIN 18134 apply the load to the soil in cumulative equal increments. The conducted stress increment was 0.30 kg/cm^2 (0.03 MN/m^2)(Mpa). A gradual applied loading up to 3 kg/cm^2 (0.30 MN/m^2)(Mpa) and the corresponding soil settlement was measured per load increment. Each test was carried out into two loading cycles. The first loading cycles consisted of loading and reloading, while the second loading cycle consisted of loading only. The results of all tests are shown in appendix (A).



3- ANALYSIS OF RESULTS

The obtained results showed that the loading and settlement curves did not show any shear failure occurred to the **wet** soil during the test. The settlements values corresponding to the final stage of two loading cycles did not exceed 1/10 of the load diameter. The strain modulus (E_v) and the modulus of sub-grade reaction (k_s) for the conducted tests are shown in appendices (A). In order to

evaluated the obtained results of the repetitive plate loading tests, the following target values were considered:

The following table shows a summary of the obtained results:



PL T No .	Station Al-Dabaa level -1.5	E_{v1} (MN/m ²) (Mpa)	E_{v2} (MN/m ²) (Mpa)	E_{v2}/E_{v1}	Sub-Grade Reaction k_s (MN/m ³)
21	454+200 to 454+300	89.1	243.6	2.73	156.8
22	454+100 to 454+200	93	236.1	2.54	156.8
23	454+000 to 454+100	93.9	241.1	2.57	164
24	453+900 to 454+00	87.9	227.4	2.59	154.4
25	453+800 to 453+900	89.5	241.1	2.69	158.4
26	453+700 to 453+800	89.9	232.1	2.58	157.6
27	453+600 to 453+700	92.9	241.1	2.59	156.8
28	454+300 to 454+400	79.3	210.9	2.66	143.2
29	454+400 to 454+500	79	210.9	2.67	144
30	454+500 to 454+600	75.4	188.7	2.5	136.8
31	454+600 to 454+700	80.9	210.9	2.61	144
32	454+800 to 454+900	77.3	198.6	2.57	139.2
33	454+900 to 455+000	75.5	198.6	2.63	135.2
34	455+000 to 455+100	77.3	198.6	2.57	138.4
35	455+100 to 455+200	71.6	187.5	2.62	128
36	455+200 to 455+300	71.5	185.6	2.6	128.8
37	455+300 to 455+400	80.4	201.5	2.51	142.4
38	455+400 to 455+500	90.8	244.1	2.69	159.2
39	455+500 to 455+600	84.3	224.1	2.66	148
Minimum		71.50	185.60	2.50	128.00
Average		83.13	216.97	2.61	146.95

4- CONCLUSIONS

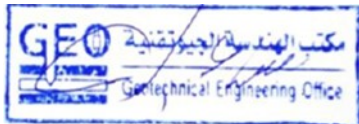
This report deals with the area specified to the Electric Express Train at Al-Dabaa. 19 plate loading tests were conducted in accordance with the DIN 18134 slandered specifications. The plate loading tests were conducted by **Horema** (LTD). The relationship between the loading and soil settlement for each test was obtained and soil strain modulus (E_v) and the modulus of sub-grade reaction (k_s) were determined.

Consulting Engineer

M. Abu Kiefa

Dr. Mostafa Abu Kiefa

Geotechnical Engineering Office,
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APPENDIX (A)

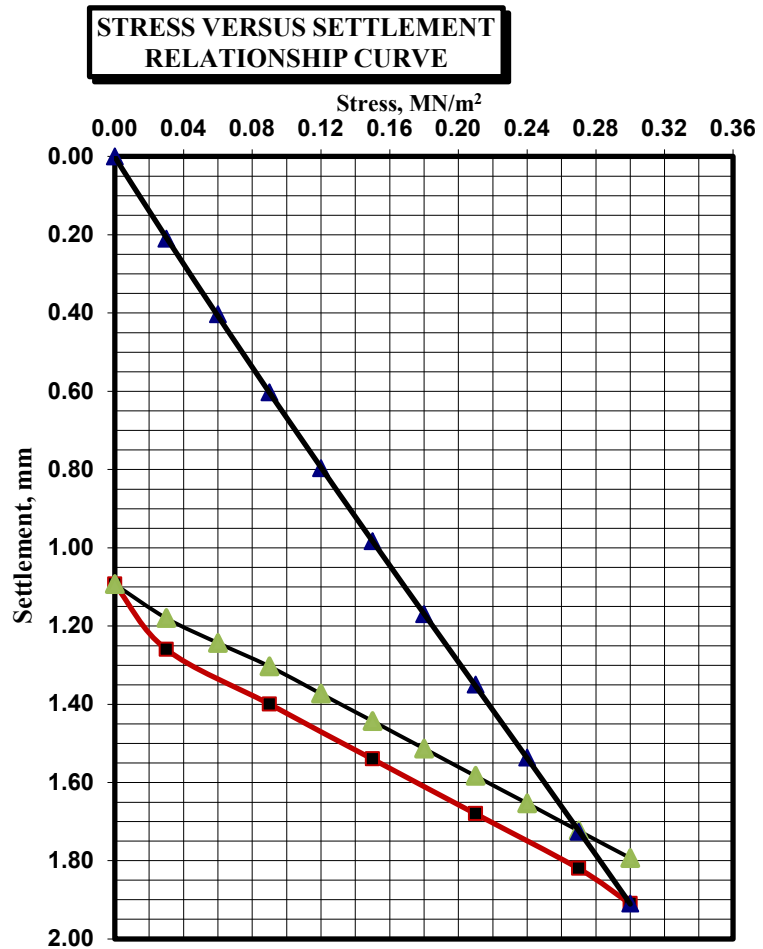
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+200) to (454+300) level (-1.5)
PLATE LOAD NO. PLT-21
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 6:00 AM
TIME FINISH: 9:00 AM
DATE 11-Jan-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

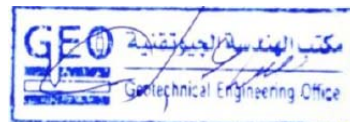
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.21
0.06	0.40
0.09	0.60
0.12	0.80
0.15	0.98
0.18	1.17
0.21	1.35
0.24	1.54
0.27	1.73
0.30	1.91
0.27	1.82
0.21	1.68
0.15	1.54
0.09	1.40
0.03	1.26
0.00	1.09
0.03	1.18
0.06	1.24
0.09	1.30
0.12	1.37
0.15	1.44
0.18	1.51
0.21	1.58
0.24	1.65
0.27	1.72
0.30	1.79



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.511	2.302
a_2 [mm/(MN ² /m ⁴)]	-0.66	0.024
E_v [MN/m ²][Mpa]	89.1	243.6
E_{v2}/E_{v1}	2.73	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 156.8 MN/m³

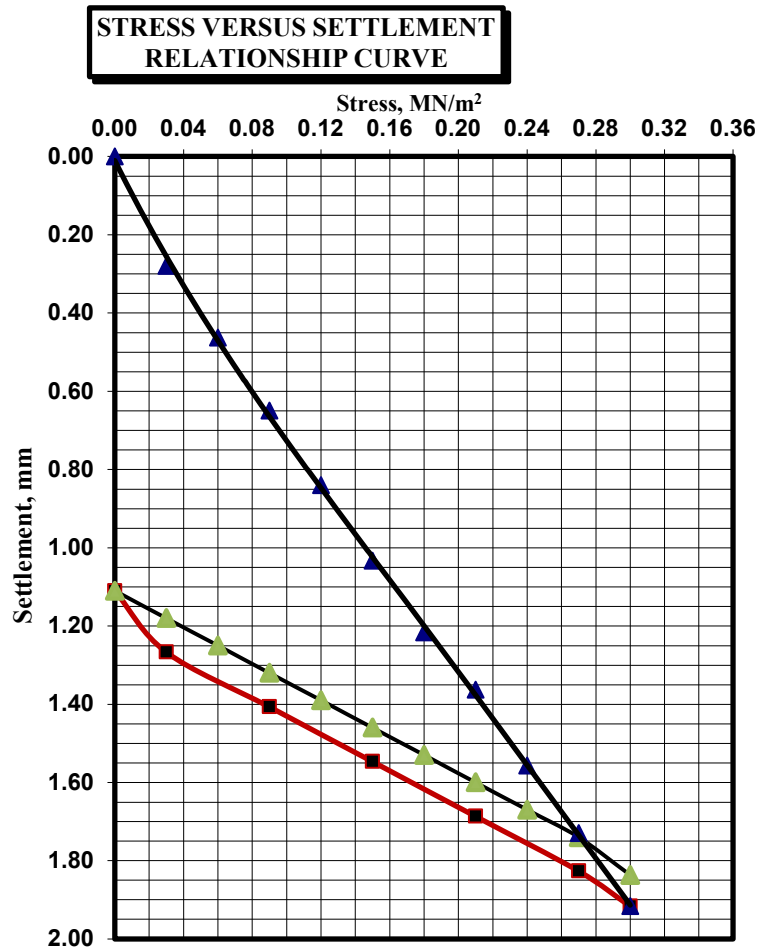
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+100) to (454+200) level (-1.5)
PLATE LOAD NO. PLT-22
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 9:00 AM
TIME FINISH: 12:00 PM
DATE 11-Jan-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

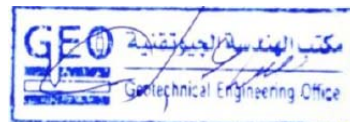
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.28
0.06	0.46
0.09	0.65
0.12	0.84
0.15	1.03
0.18	1.22
0.21	1.36
0.24	1.56
0.27	1.73
0.30	1.92
0.27	1.83
0.21	1.69
0.15	1.55
0.09	1.41
0.03	1.27
0.00	1.11
0.03	1.18
0.06	1.25
0.09	1.32
0.12	1.39
0.15	1.46
0.18	1.53
0.21	1.60
0.24	1.67
0.27	1.74
0.30	1.84



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.16	2.222
a_2 [mm/(MN ² /m ⁴)]	-0.378	0.536
E_v [MN/m ²][Mpa]	93.0	236.1
E_{v2}/E_{v1}	2.54	



MODULUS OF SUB-GRADE REACTION, K_s

$$k_s = \Delta\sigma/\Delta s \quad 156.8 \quad \text{MN/m}^3$$

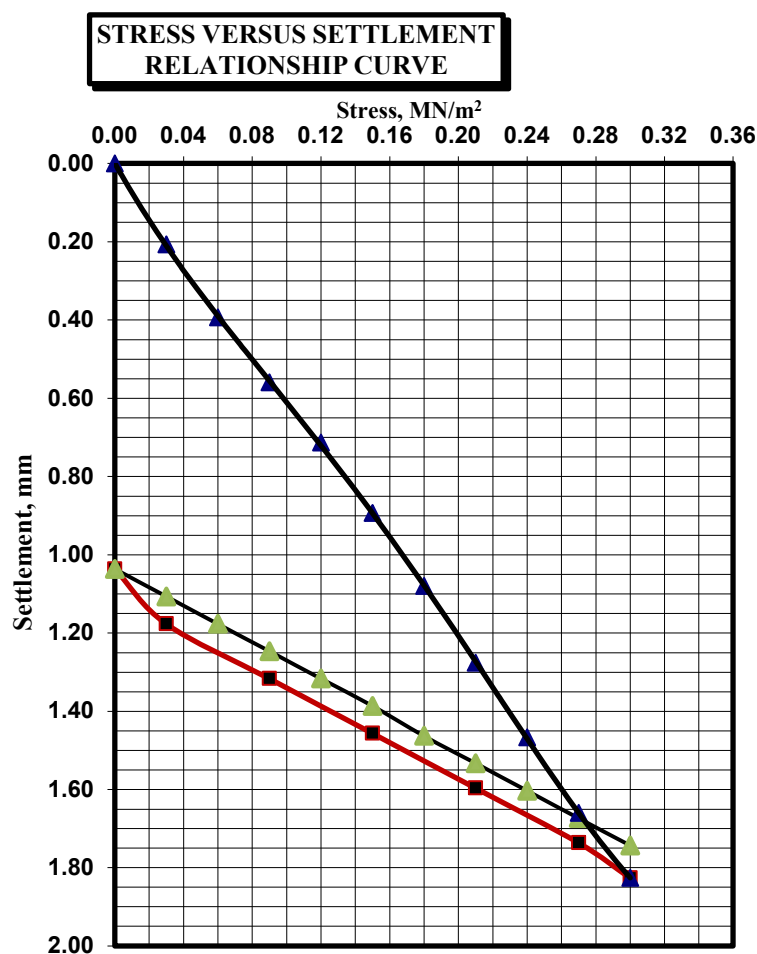
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+000) to (454+100) level (-1.5)
PLATE LOAD NO. PLT-23
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 12:00 PM
TIME FINISH: 3:00 PM
DATE 11-Jan-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

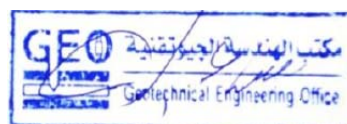
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.21
0.06	0.39
0.09	0.56
0.12	0.71
0.15	0.89
0.18	1.08
0.21	1.28
0.24	1.47
0.27	1.66
0.30	1.83
0.27	1.74
0.21	1.60
0.15	1.46
0.09	1.32
0.03	1.18
0.00	1.04
0.03	1.11
0.06	1.18
0.09	1.25
0.12	1.32
0.15	1.39
0.18	1.46
0.21	1.53
0.24	1.60
0.27	1.67
0.30	1.74



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	5.532	2.333
a_2 [mm/(MN ² /m ⁴)]	1.53	0
E_v [MN/m ²][Mpa]	93.9	241.1
E_{v2}/E_{v1}	2.57	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 164.0 MN/m³

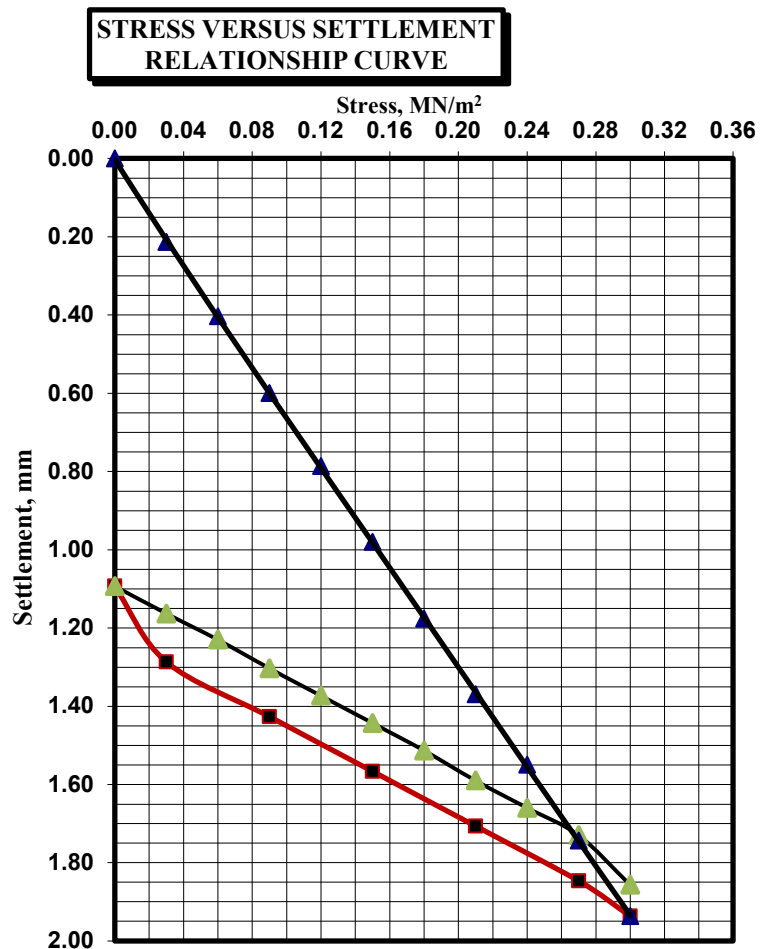
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (453+900) to (454+000) level (-1.5)
PLATE LOAD NO. PLT-24
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 3:00 PM
TIME FINISH: 6:00 PM
DATE 11-Jan-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

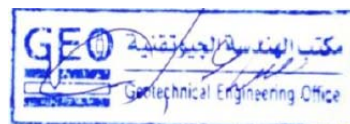
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.21
0.06	0.40
0.09	0.60
0.12	0.79
0.15	0.98
0.18	1.18
0.21	1.37
0.24	1.55
0.27	1.74
0.30	1.94
0.27	1.85
0.21	1.71
0.15	1.57
0.09	1.43
0.03	1.29
0.00	1.09
0.03	1.16
0.06	1.23
0.09	1.30
0.12	1.37
0.15	1.44
0.18	1.51
0.21	1.59
0.24	1.66
0.27	1.73
0.30	1.86



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.483	2.096
a_2 [mm/(MN ² /m ⁴)]	-0.281	1.257
E_v [MN/m ²][Mpa]	87.9	227.4
E_{v2}/E_{v1}	2.59	



MODULUS OF SUB-GRADE REACTION, K_s

$$k_s = \Delta\sigma/\Delta s \quad 154.4 \quad \text{MN/m}^3$$

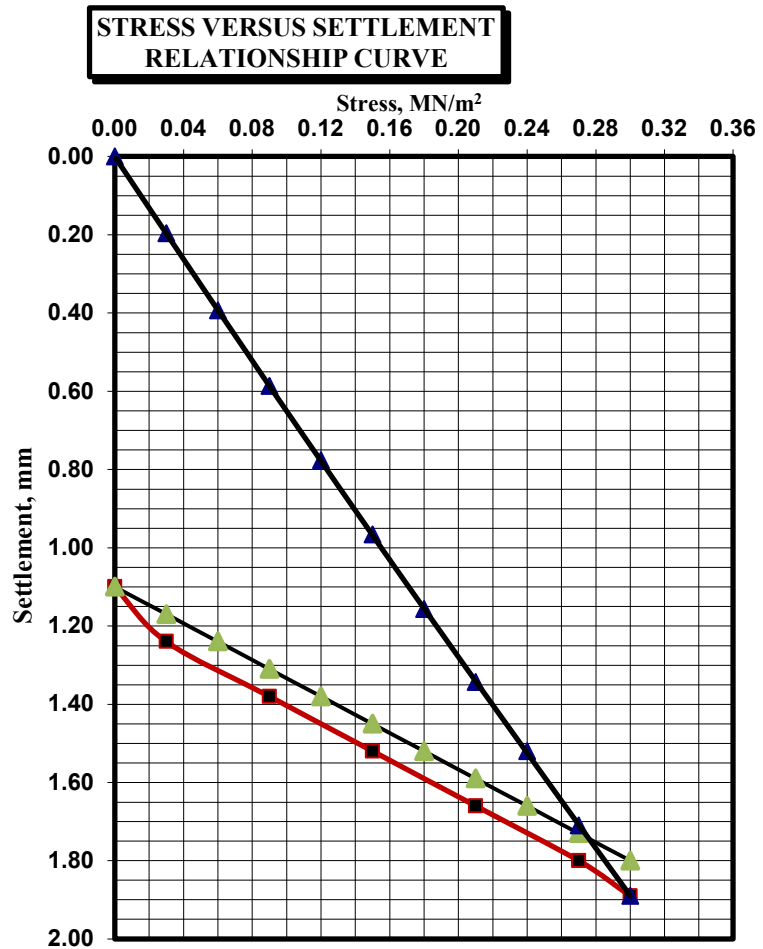
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (453+800) to (453+900) level (-1.5)
PLATE LOAD NO. PLT-25
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 6:00 AM
TIME FINISH: 9:00 AM
DATE 11-Jan-23
TESTED BY : Ashraf Hanafy
LAB. REF. 11031

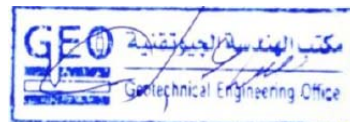
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.20
0.06	0.39
0.09	0.59
0.12	0.78
0.15	0.97
0.18	1.16
0.21	1.34
0.24	1.52
0.27	1.71
0.30	1.89
0.27	1.80
0.21	1.66
0.15	1.52
0.09	1.38
0.03	1.24
0.00	1.10
0.03	1.17
0.06	1.24
0.09	1.31
0.12	1.38
0.15	1.45
0.18	1.52
0.21	1.59
0.24	1.66
0.27	1.73
0.30	1.80



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.576	2.333
a_2 [mm/(MN ² /m ⁴)]	-0.974	0
E_v [MN/m ²][Mpa]	89.5	241.1
E_{v2}/E_{v1}	2.69	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 158.4 MN/m³

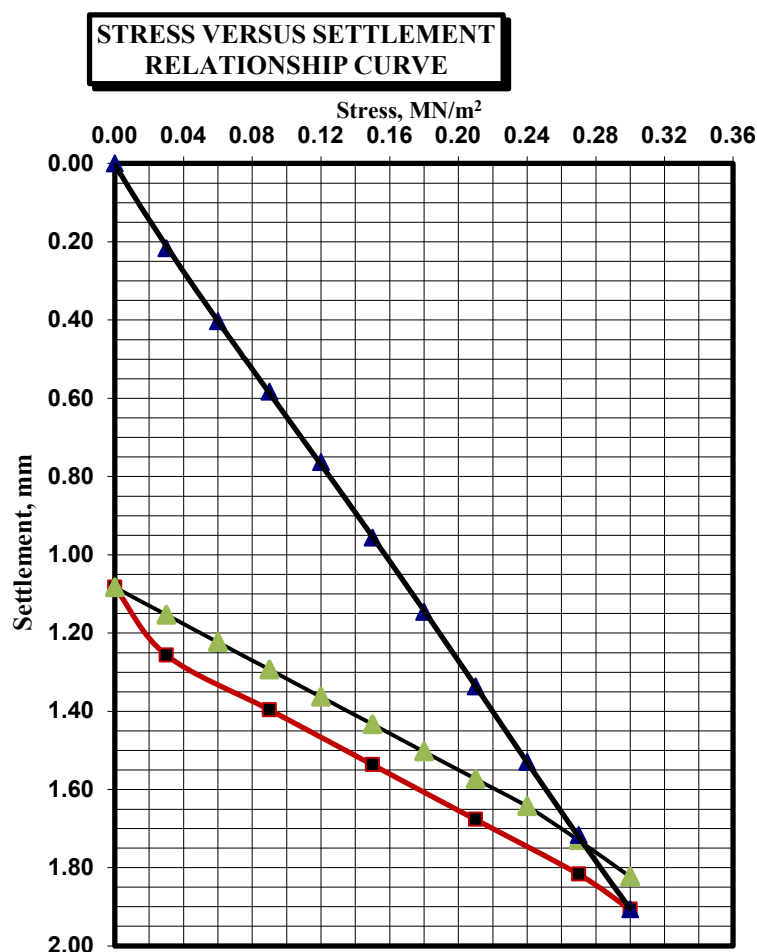
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (453+700) to (453+800) level (-1.5)
PLATE LOAD NO. PLT-26
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 9:00 AM
TIME FINISH: 12:00 PM
DATE 11-Jan-23
TESTED BY : Ashraf Hanafy
LAB. REF. 11031

**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.22
0.06	0.40
0.09	0.58
0.12	0.76
0.15	0.96
0.18	1.15
0.21	1.34
0.24	1.53
0.27	1.72
0.30	1.91
0.27	1.82
0.21	1.68
0.15	1.54
0.09	1.40
0.03	1.26
0.00	1.08
0.03	1.15
0.06	1.22
0.09	1.29
0.12	1.36
0.15	1.43
0.18	1.50
0.21	1.57
0.24	1.64
0.27	1.73
0.30	1.82



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.07	2.163
a_2 [mm/(MN ² /m ⁴)]	0.627	0.867
E_v [MN/m ²][Mpa]	89.9	232.1
E_{v2}/E_{v1}	2.58	



MODULUS OF SUB-GRADE REACTION, K_s

$$k_s = \Delta\sigma / \Delta s \quad 157.6 \quad \text{MN/m}^3$$

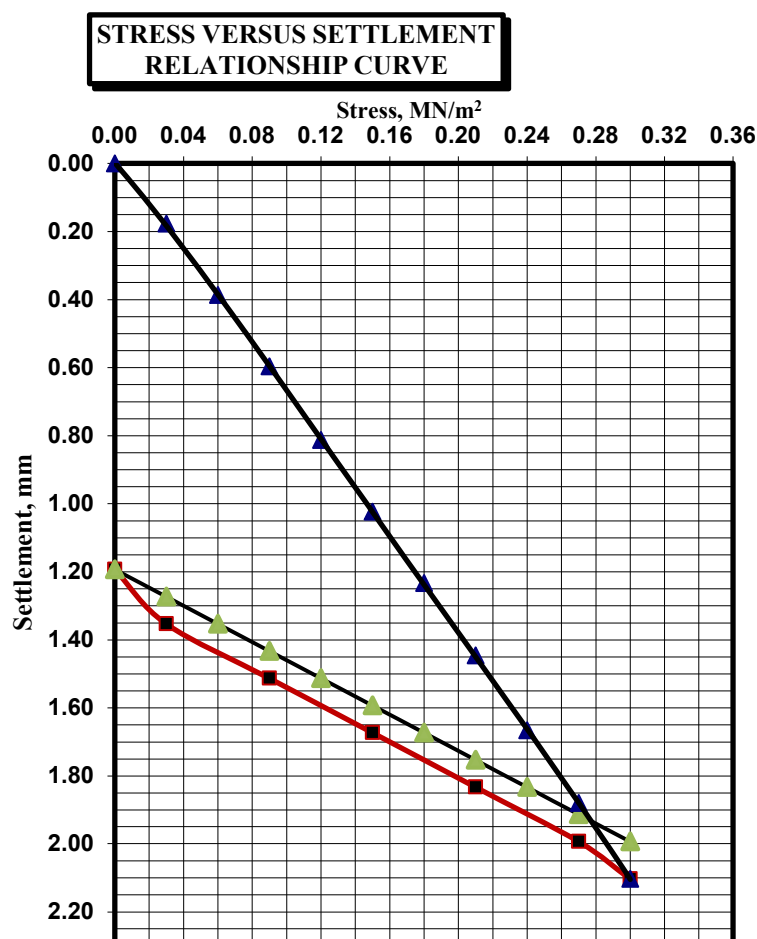
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+300) To (454+400) Level (-1.50)
PLATE LOAD NO. PLT-28
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 8:00 AM
TIME FINISH: 10:00 AM
DATE 12-Mar-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.18
0.06	0.39
0.09	0.60
0.12	0.81
0.15	1.02
0.18	1.23
0.21	1.45
0.24	1.67
0.27	1.88
0.30	2.10
0.27	1.99
0.21	1.83
0.15	1.67
0.09	1.51
0.03	1.35
0.00	1.19
0.03	1.27
0.06	1.35
0.09	1.43
0.12	1.51
0.15	1.59
0.18	1.67
0.21	1.75
0.24	1.83
0.27	1.91
0.30	1.99



STRAIN MODULUS, Ev

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.911	2.667
a_2 [mm/(MN ² /m ⁴)]	0.61	0
E_v [MN/m ²][Mpa]	79.3	210.9
E_{v2}/E_{v1}	2.66	



MODULUS OF SUB-GRADE REACTION, Ks

$k_s = \Delta\sigma/\Delta s$ 143.2 MN/m³

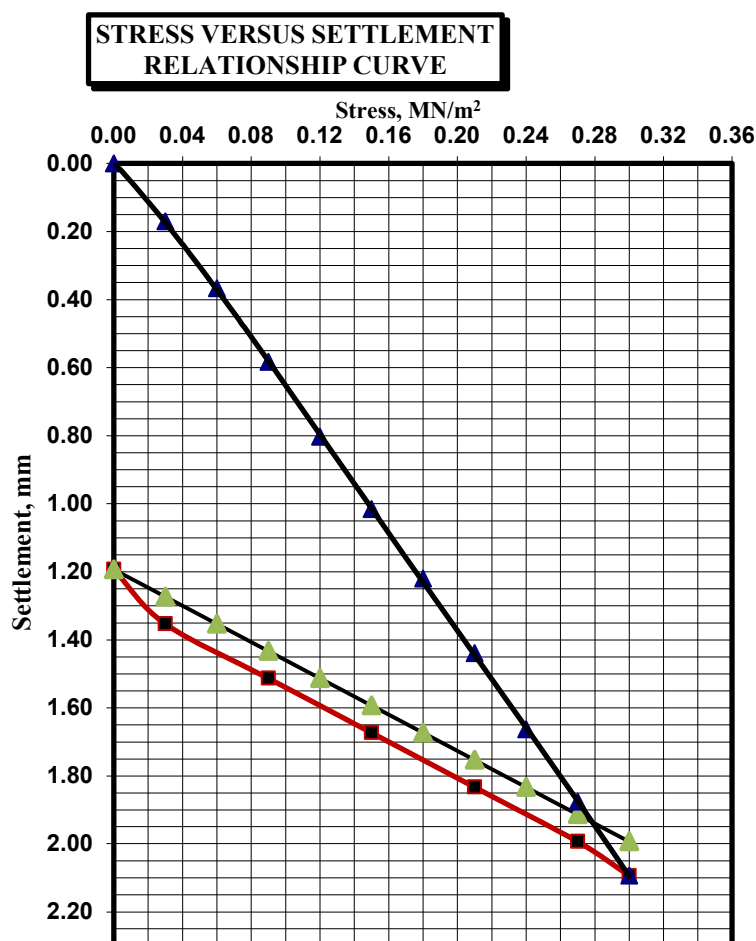
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+400)To(454+500)Level (-1.50)
PLATE LOAD NO. PLT-29
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 10:00 AM
TIME FINISH: 12:00 PM
DATE 12-Mar-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.17
0.06	0.37
0.09	0.58
0.12	0.80
0.15	1.02
0.18	1.22
0.21	1.44
0.24	1.66
0.27	1.88
0.30	2.09
0.27	1.99
0.21	1.83
0.15	1.67
0.09	1.51
0.03	1.35
0.00	1.19
0.03	1.27
0.06	1.35
0.09	1.43
0.12	1.51
0.15	1.59
0.18	1.67
0.21	1.75
0.24	1.83
0.27	1.91
0.30	1.99



STRAIN MODULUS, Ev

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.967	2.667
a_2 [mm/(MN ² /m ⁴)]	0.516	0
E_v [MN/m ²][Mpa]	79.0	210.9
E_{v2}/E_{v1}	2.67	



MODULUS OF SUB-GRADE REACTION, Ks

$$k_s = \Delta\sigma/\Delta s \quad 144.0 \quad \text{MN/m}^3$$

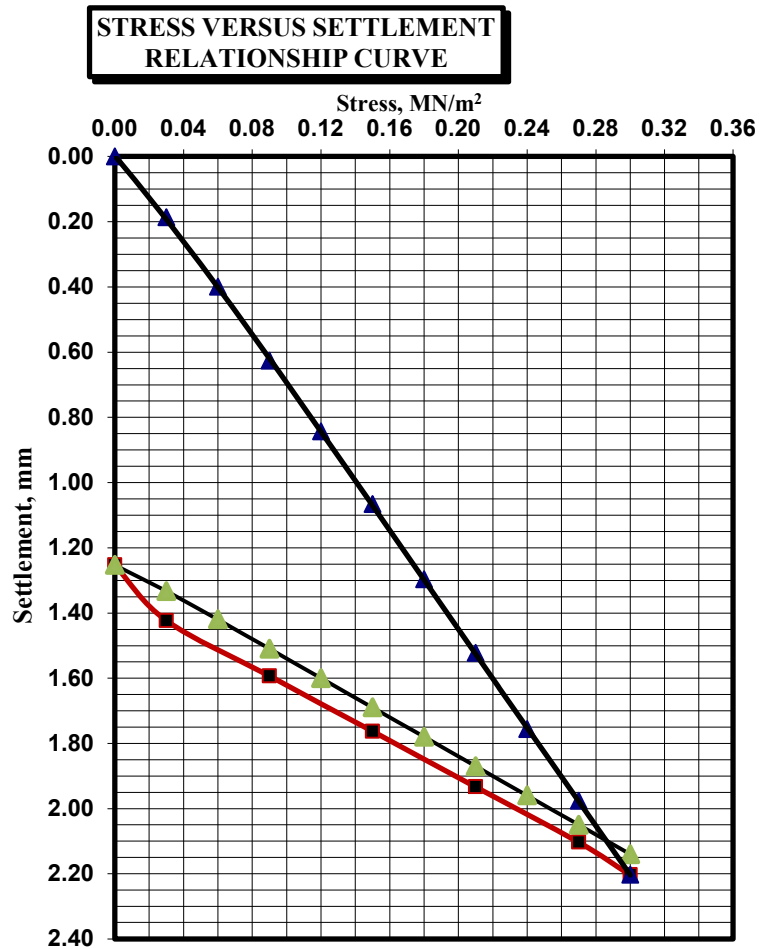
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+500)To(454+600)Level (-1.50)
PLATE LOAD NO. PLT-30
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 12:00 PM
TIME FINISH: 2:00 PM
DATE 12-Mar-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

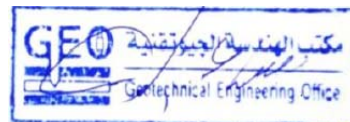
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.19
0.06	0.40
0.09	0.63
0.12	0.84
0.15	1.07
0.18	1.30
0.21	1.52
0.24	1.76
0.27	1.98
0.30	2.20
0.27	2.10
0.21	1.93
0.15	1.76
0.09	1.59
0.03	1.42
0.00	1.25
0.03	1.33
0.06	1.42
0.09	1.51
0.12	1.60
0.15	1.69
0.18	1.78
0.21	1.87
0.24	1.96
0.27	2.05
0.30	2.14



STRAIN MODULUS, Ev

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	7.229	2.907
a_2 [mm/(MN ² /m ⁴)]	0.755	0.246
E_v [MN/m ²] [Mpa]	75.4	188.7
E_{v2}/E_{v1}	2.50	



MODULUS OF SUB-GRADE REACTION, Ks

$k_s = \Delta\sigma/\Delta s$ 136.8 MN/m³

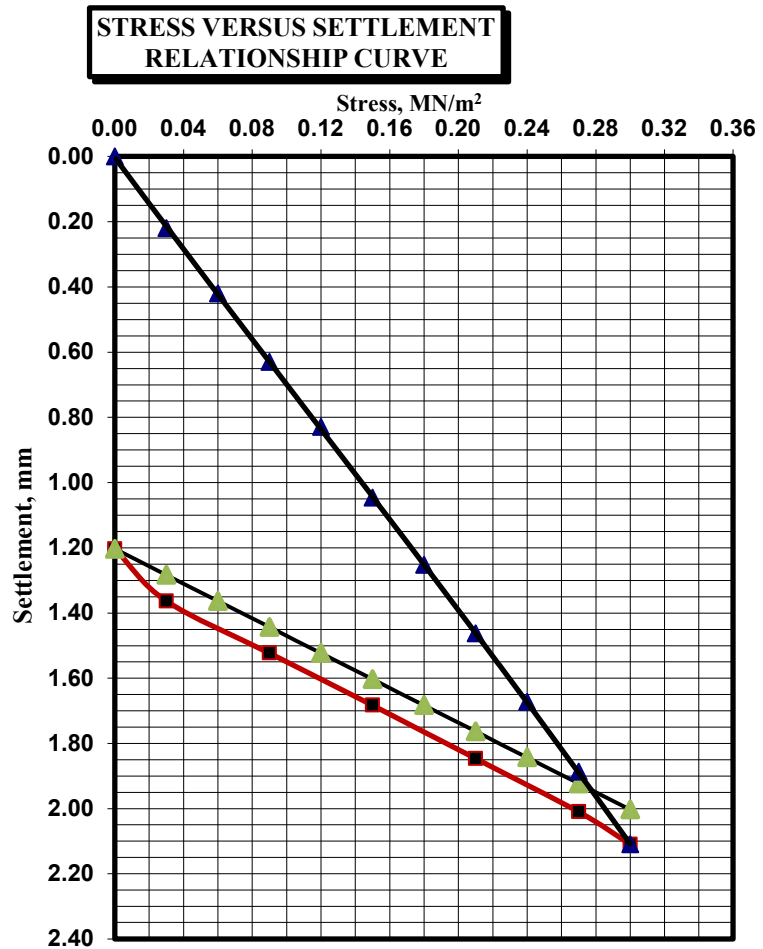
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+600)to(454+700)Level (-1.50)
PLATE LOAD NO. PLT-31
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 2:00 PM
TIME FINISH: 4:00 PM
DATE 12-Mar-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

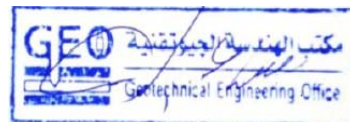
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.22
0.06	0.42
0.09	0.63
0.12	0.83
0.15	1.05
0.18	1.25
0.21	1.46
0.24	1.67
0.27	1.89
0.30	2.11
0.27	2.01
0.21	1.85
0.15	1.68
0.09	1.52
0.03	1.36
0.00	1.20
0.03	1.28
0.06	1.36
0.09	1.44
0.12	1.52
0.15	1.60
0.18	1.68
0.21	1.76
0.24	1.84
0.27	1.92
0.30	2.00



STRAIN MODULUS, Ev

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.659	2.667
a_2 [mm/(MN ² /m ⁴)]	0.981	0
E_v [MN/m ²] [Mpa]	80.9	210.9
E_{v2}/E_{v1}	2.61	



MODULUS OF SUB-GRADE REACTION, Ks

$k_s = \Delta\sigma/\Delta s$ 144.0 MN/m³

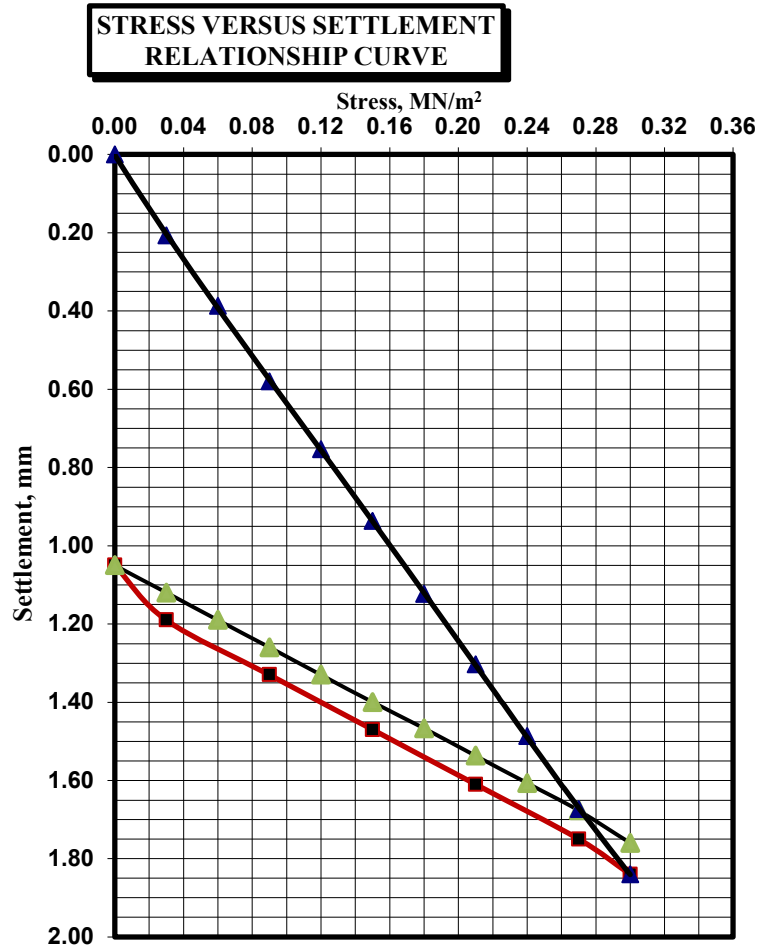
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (453+600) to (453+700) level (-1.5)
PLATE LOAD NO. PLT-27
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 12:00 PM
TIME FINISH: 3:00 PM
DATE 11-Jan-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

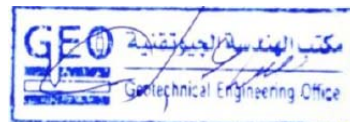
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.21
0.06	0.39
0.09	0.58
0.12	0.75
0.15	0.94
0.18	1.12
0.21	1.30
0.24	1.49
0.27	1.67
0.30	1.84
0.27	1.75
0.21	1.61
0.15	1.47
0.09	1.33
0.03	1.19
0.00	1.05
0.03	1.12
0.06	1.19
0.09	1.26
0.12	1.33
0.15	1.40
0.18	1.47
0.21	1.54
0.24	1.61
0.27	1.68
0.30	1.76



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.134	2.333
a_2 [mm/(MN ² /m ⁴)]	-0.271	0
E_v [MN/m ²][Mpa]	92.9	241.1
E_{v2}/E_{v1}	2.59	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 156.8 MN/m³

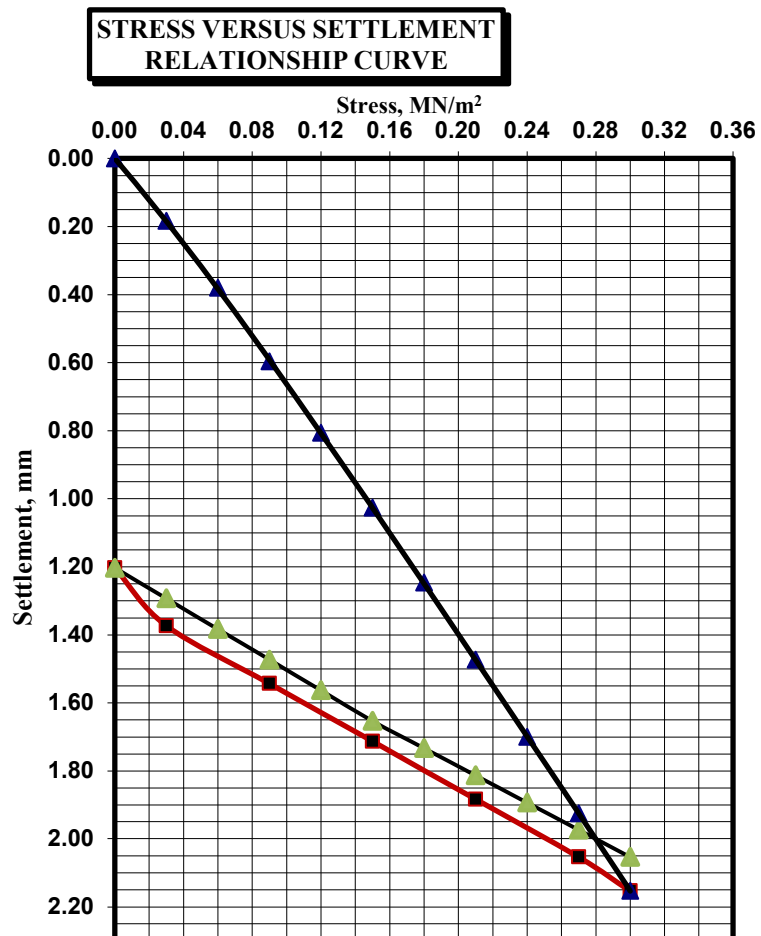
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+800) to (454+900) level (-1.50)
PLATE LOAD NO. PLT-32
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 8:00 AM
TIME FINISH: 10:00 AM
DATE 30-Mar-23
TESTED BY : Ashraf Hanafy
LAB. REF. 11031

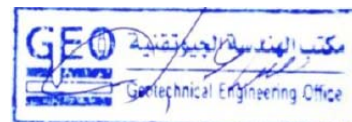
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.18
0.06	0.38
0.09	0.60
0.12	0.81
0.15	1.03
0.18	1.25
0.21	1.47
0.24	1.70
0.27	1.93
0.30	2.15
0.27	2.05
0.21	1.88
0.15	1.71
0.09	1.54
0.03	1.37
0.00	1.20
0.03	1.29
0.06	1.38
0.09	1.47
0.12	1.56
0.15	1.65
0.18	1.73
0.21	1.81
0.24	1.89
0.27	1.97
0.30	2.05



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.823	3.117
a_2 [mm/(MN ² /m ⁴)]	1.501	-0.95
E_v [MN/m ²][Mpa]	77.3	198.6
E_{v2}/E_{v1}	2.57	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 139.2 MN/m³

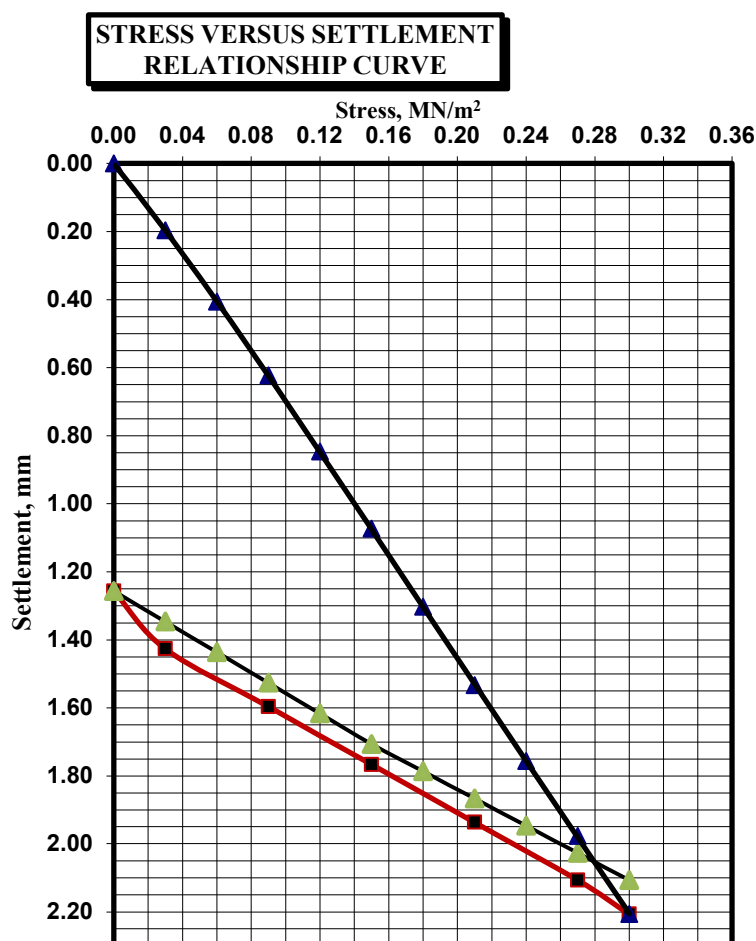
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+900) to (455+000) level (-1.50)
PLATE LOAD NO. PLT-33
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 10:00 AM
TIME FINISH: 12:00 PM
DATE 30-Mar-23
TESTED BY : Ashraf Hanafy
LAB. REF. 11031

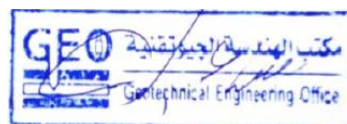
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.20
0.06	0.41
0.09	0.62
0.12	0.85
0.15	1.07
0.18	1.30
0.21	1.53
0.24	1.76
0.27	1.98
0.30	2.21
0.27	2.11
0.21	1.94
0.15	1.77
0.09	1.60
0.03	1.43
0.00	1.26
0.03	1.35
0.06	1.44
0.09	1.53
0.12	1.62
0.15	1.71
0.18	1.79
0.21	1.87
0.24	1.95
0.27	2.03
0.30	2.11



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	7.133	3.117
a_2 [mm/(MN ² /m ⁴)]	1.061	-0.95
E_v [MN/m ²][Mpa]	75.5	198.6
E_{v2}/E_{v1}	2.63	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 135.2 MN/m³

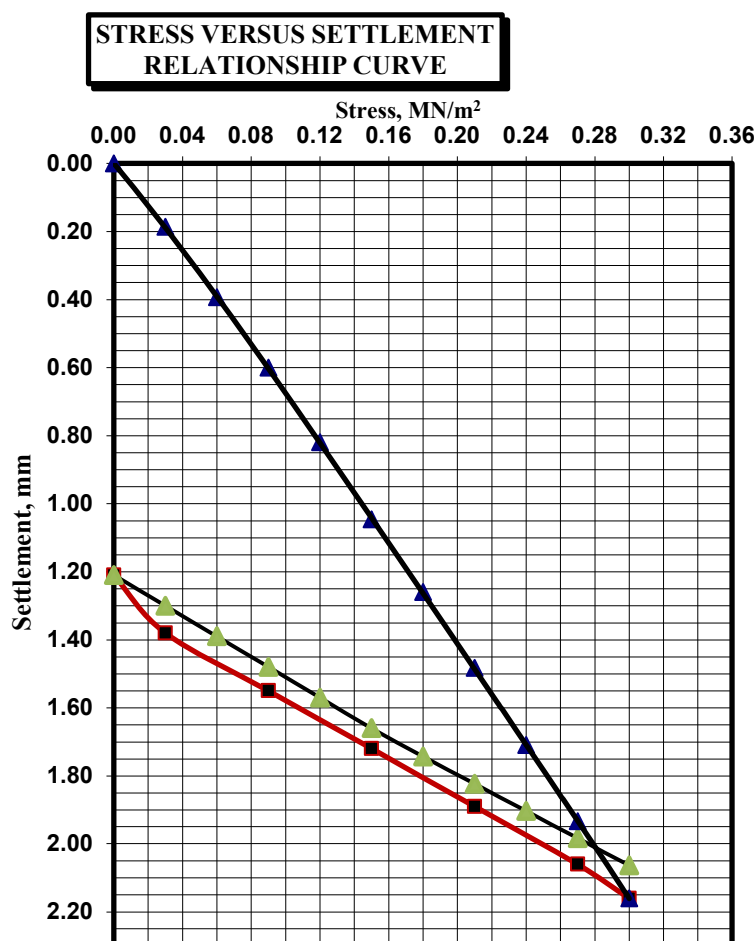
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (455+000) to (455+100) level (-1.50)
PLATE LOAD NO. PLT-34
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 12:00 PM
TIME FINISH: 2:00 PM
DATE 30-Mar-23
TESTED BY : Ashraf Hanafy
LAB. REF. 11031

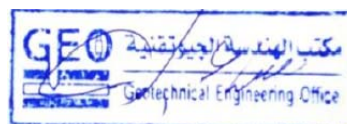
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.19
0.06	0.39
0.09	0.60
0.12	0.82
0.15	1.05
0.18	1.26
0.21	1.48
0.24	1.71
0.27	1.93
0.30	2.16
0.27	2.06
0.21	1.89
0.15	1.72
0.09	1.55
0.03	1.38
0.00	1.21
0.03	1.30
0.06	1.39
0.09	1.48
0.12	1.57
0.15	1.66
0.18	1.74
0.21	1.82
0.24	1.90
0.27	1.98
0.30	2.06



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.896	3.117
a_2 [mm/(MN ² /m ⁴)]	1.269	-0.95
E_v [MN/m ²][Mpa]	77.3	198.6
E_{v2}/E_{v1}	2.57	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 138.4 MN/m³

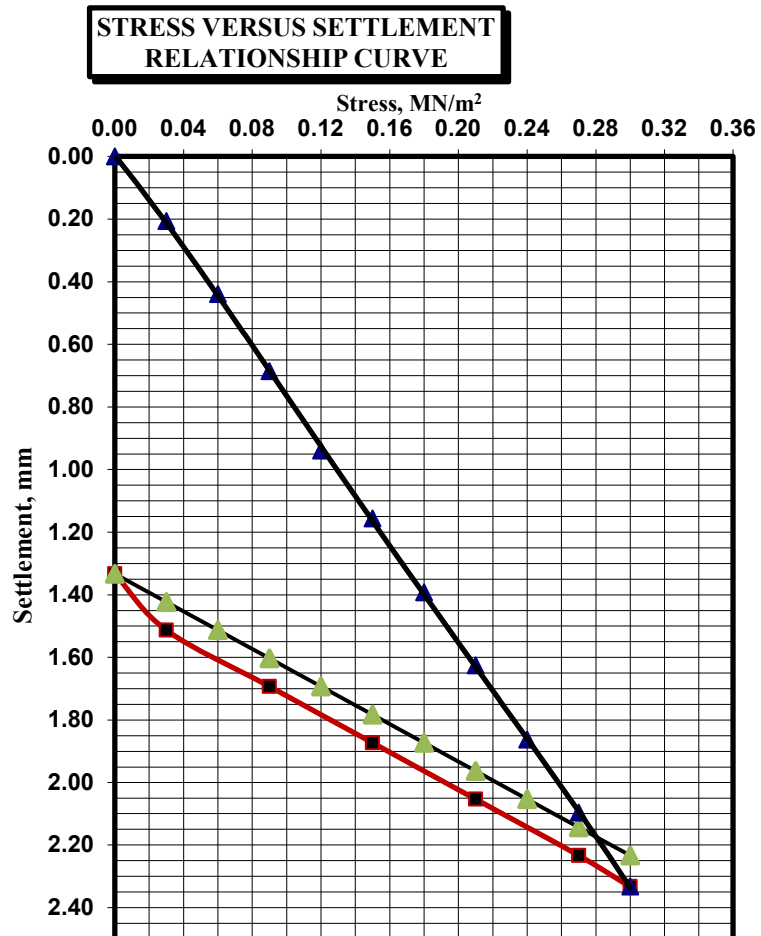
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (455+100) to (455+200) level (-1.50)
PLATE LOAD NO. PLT-35
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 2:00 PM
TIME FINISH: 4:00 PM
DATE 30-Mar-23
TESTED BY : Ashraf Hanafy
LAB. REF. 11031

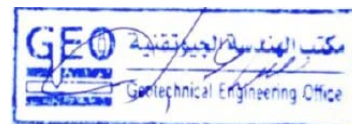
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.21
0.06	0.44
0.09	0.69
0.12	0.94
0.15	1.16
0.18	1.39
0.21	1.63
0.24	1.86
0.27	2.10
0.30	2.33
0.27	2.23
0.21	2.05
0.15	1.87
0.09	1.69
0.03	1.51
0.00	1.33
0.03	1.42
0.06	1.51
0.09	1.60
0.12	1.69
0.15	1.78
0.18	1.87
0.21	1.96
0.24	2.05
0.27	2.14
0.30	2.23



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	8.044	3
a_2 [mm/(MN ² /m ⁴)]	-0.641	0
E_v [MN/m ²][Mpa]	71.6	187.5
E_{v2}/E_{v1}	2.62	



MODULUS OF SUB-GRADE REACTION, K_s

$$k_s = \Delta\sigma/\Delta s \quad 128.0 \quad \text{MN/m}^3$$

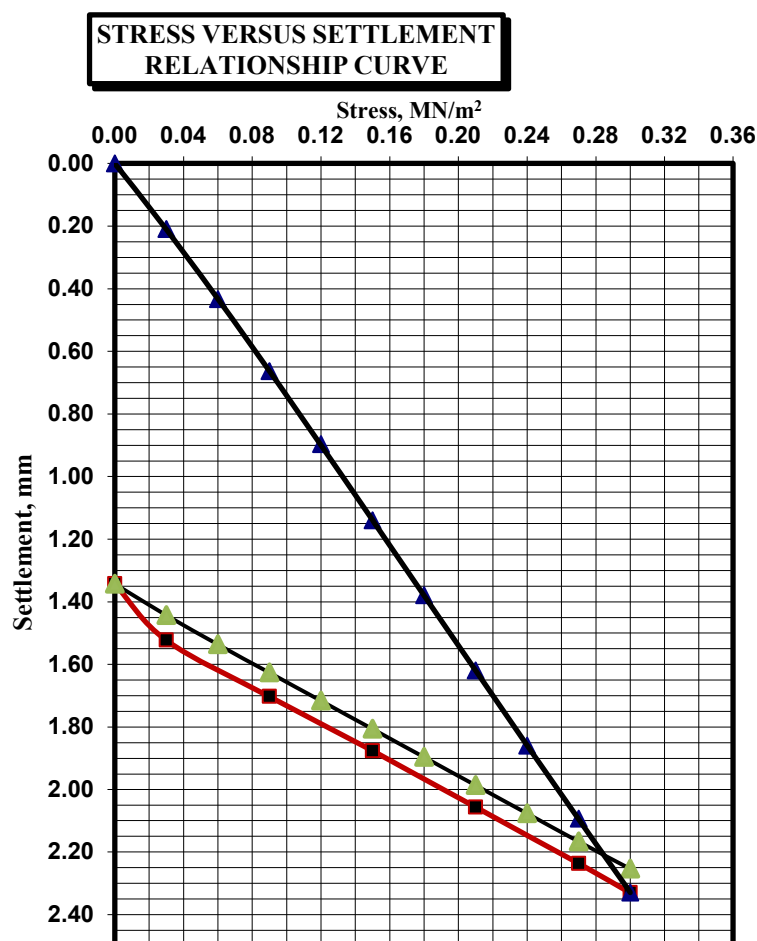
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (455+200) to (455+300) level (-1.50)
PLATE LOAD NO. PLT-36
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 8:00 AM
TIME FINISH: 10:00 AM
DATE 30-Mar-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

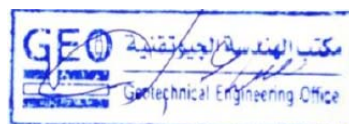
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.21
0.06	0.43
0.09	0.66
0.12	0.90
0.15	1.14
0.18	1.38
0.21	1.62
0.24	1.86
0.27	2.09
0.30	2.33
0.27	2.24
0.21	2.06
0.15	1.88
0.09	1.70
0.03	1.52
0.00	1.34
0.03	1.44
0.06	1.54
0.09	1.63
0.12	1.72
0.15	1.81
0.18	1.90
0.21	1.99
0.24	2.08
0.27	2.17
0.30	2.25



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	7.684	3.241
a_2 [mm/(MN ² /m ⁴)]	0.622	-0.702
E_v [MN/m ²][Mpa]	71.5	185.6
E_{v2}/E_{v1}	2.60	



MODULUS OF SUB-GRADE REACTION, K_s

$$k_s = \Delta\sigma / \Delta s \quad 128.8 \quad \text{MN/m}^3$$

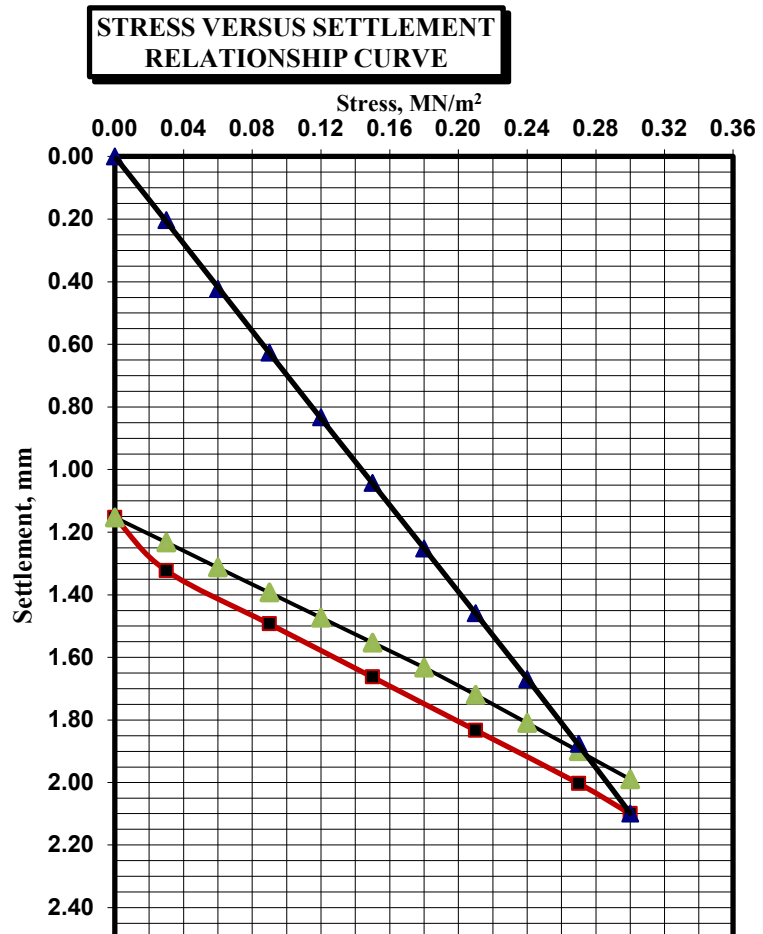
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (455+300) to (455+400) level (-1.50)
PLATE LOAD NO. PLT-37
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 10:00 AM
TIME FINISH: 12:00 PM
DATE 30-Mar-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

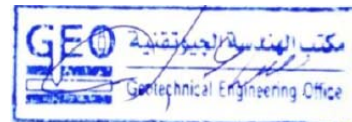
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.20
0.06	0.42
0.09	0.63
0.12	0.83
0.15	1.04
0.18	1.25
0.21	1.46
0.24	1.67
0.27	1.88
0.30	2.10
0.27	2.00
0.21	1.83
0.15	1.66
0.09	1.49
0.03	1.32
0.00	1.15
0.03	1.23
0.06	1.31
0.09	1.39
0.12	1.47
0.15	1.55
0.18	1.63
0.21	1.72
0.24	1.81
0.27	1.90
0.30	1.99



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.932	2.531
a_2 [mm/(MN ² /m ⁴)]	0.219	0.868
E_v [MN/m ²][Mpa]	80.4	201.5
E_{v2}/E_{v1}	2.51	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 142.4 MN/m³

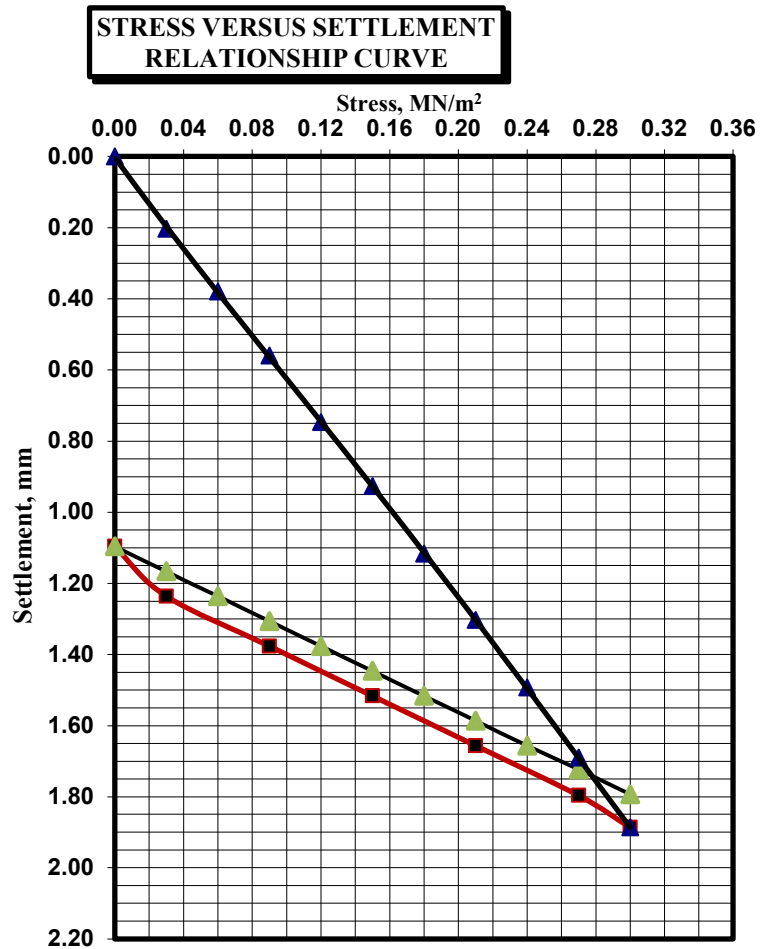
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (455+400) to (455+500) level (-1.50)
PLATE LOAD NO. PLT-38
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 12:00 PM
TIME FINISH: 2:00 PM
DATE 30-Mar-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

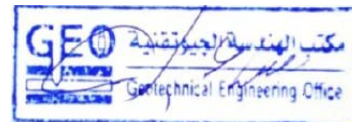
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.20
0.06	0.38
0.09	0.56
0.12	0.75
0.15	0.93
0.18	1.12
0.21	1.30
0.24	1.49
0.27	1.69
0.30	1.89
0.27	1.80
0.21	1.66
0.15	1.52
0.09	1.38
0.03	1.24
0.00	1.10
0.03	1.17
0.06	1.24
0.09	1.31
0.12	1.38
0.15	1.45
0.18	1.52
0.21	1.59
0.24	1.66
0.27	1.72
0.30	1.79



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	5.816	2.381
a_2 [mm/(MN ² /m ⁴)]	1.268	-0.255
E_v [MN/m ²][Mpa]	90.8	244.1
E_{v2}/E_{v1}	2.69	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 159.2 MN/m³

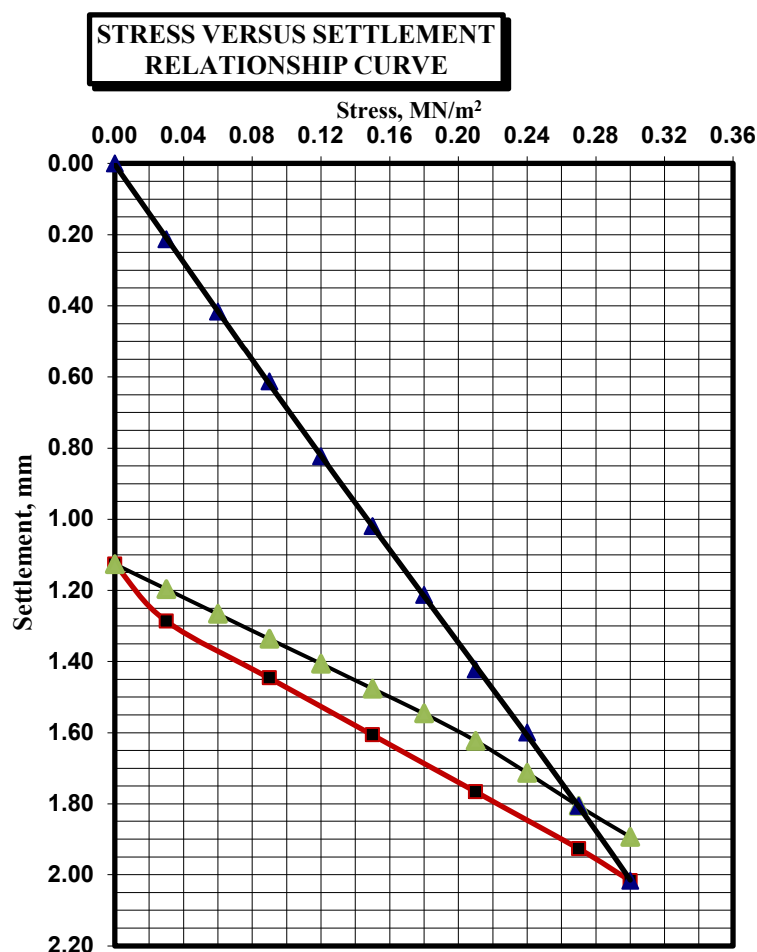
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (455+500) to (455+600) level (-1.50)
PLATE LOAD NO. PLT-39
PLATE DIAMETER (cm) 75.00
TYPE OF SOIL Silty SAND with gravel

TIME START: 2:00 PM
TIME FINISH: 4:00 PM
DATE 30-Mar-23
TESTED BY : Mohamed Issa
LAB. REF. 11031

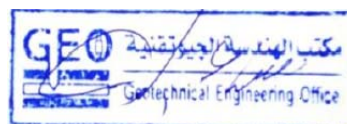
**** Note : Soil is Wet**

Stress MN/m ²	Settlement mm
0.00	0.00
0.03	0.21
0.06	0.42
0.09	0.61
0.12	0.82
0.15	1.02
0.18	1.21
0.21	1.42
0.24	1.60
0.27	1.81
0.30	2.02
0.27	1.93
0.21	1.77
0.15	1.61
0.09	1.45
0.03	1.29
0.00	1.13
0.03	1.20
0.06	1.27
0.09	1.34
0.12	1.41
0.15	1.48
0.18	1.55
0.21	1.62
0.24	1.71
0.27	1.81
0.30	1.89



STRAIN MODULUS, E_v

	1 st loading	2 st loading
σ_{0max}	0.30	0.30
a_1 [mm/(MN/m ²)]	6.733	2.077
a_2 [mm/(MN ² /m ⁴)]	-0.191	1.442
E_v [MN/m ²][Mpa]	84.3	224.1
E_{v2}/E_{v1}	2.66	



MODULUS OF SUB-GRADE REACTION, K_s

$k_s = \Delta\sigma/\Delta s$ 148.0 MN/m³