



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 الحسنى 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 بسبك لايزيد عن ٥٠ سم حتى مسوب (2.00 متر) وبنسبة لايزيد عن ٢٥ سم لاستكمال المنسوب التصميمي لتشكيل الجسر الترابي والاكتاف (نسبة تعمل كالبورنوا لا تقل عن ١٥%) ورشها بالمياه الاصولية للوصول الى نسبة الرطوبة المطلوبة والسك الجهد بالمهاسك للوصول الى الصي كثافة جافة (95%) من الكثافة الجافة القصوى) ويتم التنفيذ طبقا للمناسيب التصميمية والقطاعات العرضية التمنوجية والرسومات التفصيلية المعتمدة والبند بجميع مقتملاته طبقا لاصول الصناعة ومواصفات الهيئة العامة للطرق والكبارى وتعليمات المهندسين المشرفين.	م ^٢	١٤,٨٥٩,٢٣	٨٥
	مسافة النقل حتى ٢ كم ويتم احتساب علامة ١,٤ جنيهه لكم بالزيادة او النقصان			
	المسح بشمل عمل تقويمات وتخليط واختبارات ونقل لموقع العمل حتى مسافة ٢ كم			
	المسح بشمل قيمة المادة المحجوبة			
	علاوة مسافة النقل ٢٠٦ كم			
	علاوة تحصيل الكوتة والموازين طبقا للائحة الشركة الوطنية			
	الاجمالي			
	(خمسة ملايين وسبعماية الف جنيها لفظ لاغير)			

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

الحسنى 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

الحسنى 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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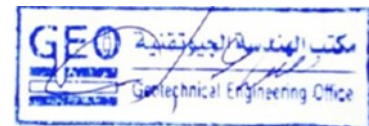
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1- INTRODUCTION

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

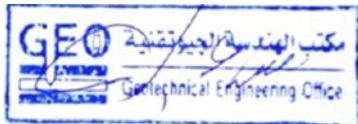
This report deals with the area specified to the Electric Express Train at Al-Dabaa. 19 plate loading tests were conducted in accordance with the DIN 18134 slandered specifications. The plate loading tests were conducted by **Horema** (LTD). The relationship between the loading and soil settlement for 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,
Prof. of Geotechnical Engineering
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APPENDIX (A)

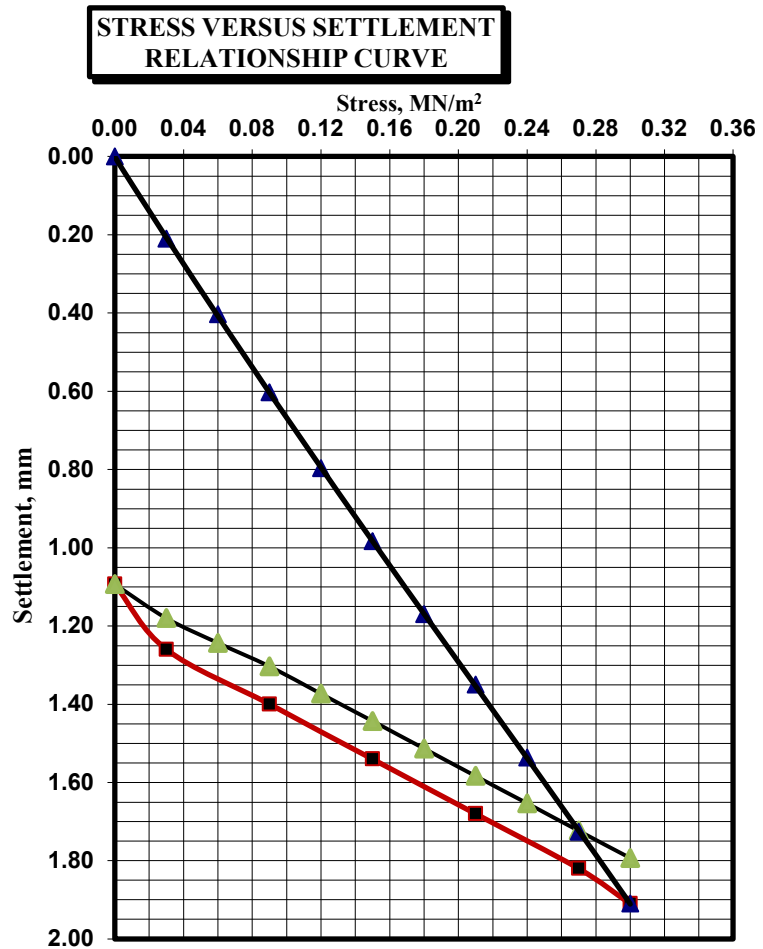
Plate Load Tests of Soils
DIN 18134

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

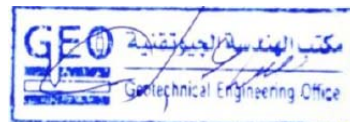
**** Note : Soil is Wet**

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

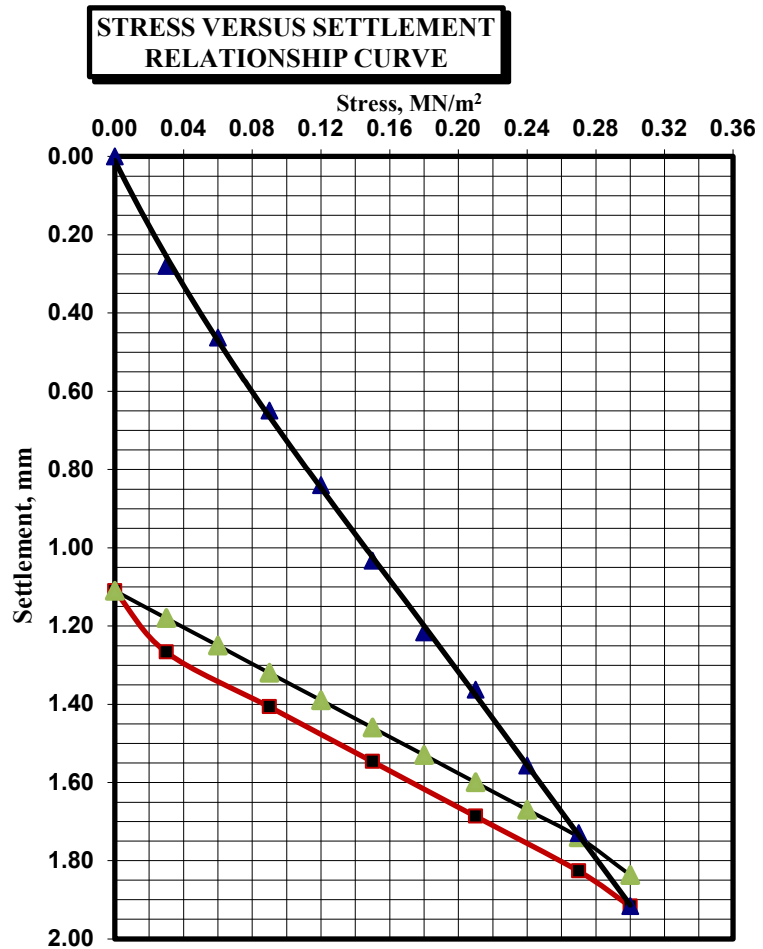
Plate Load Tests of Soils
DIN 18134

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

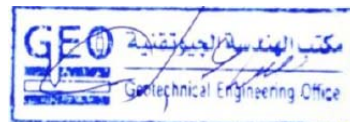
**** Note : Soil is Wet**

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

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

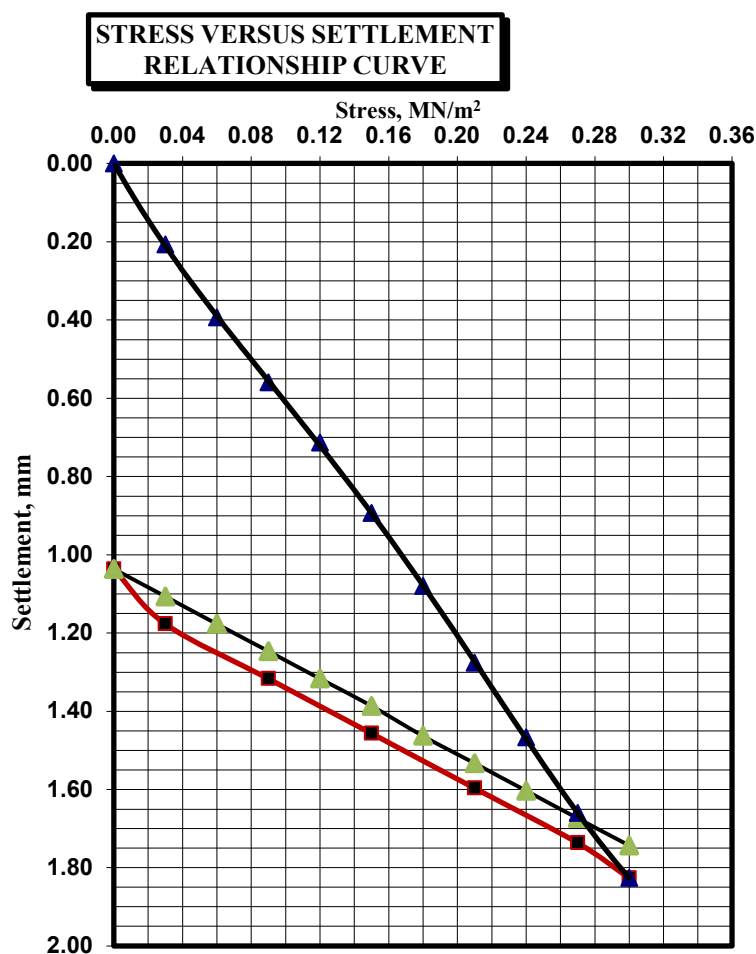
Plate Load Tests of Soils
DIN 18134

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, Ev

	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, Ks

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

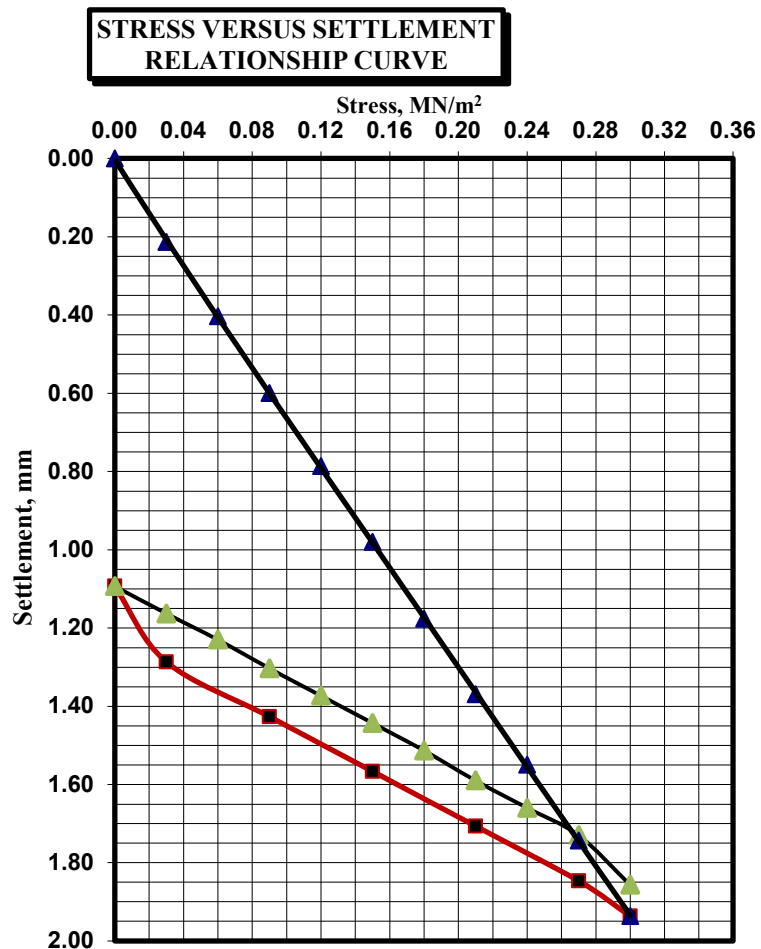
Plate Load Tests of Soils
DIN 18134

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

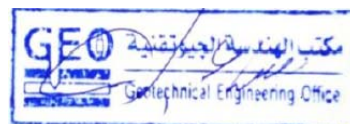
**** Note : Soil is Wet**

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

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

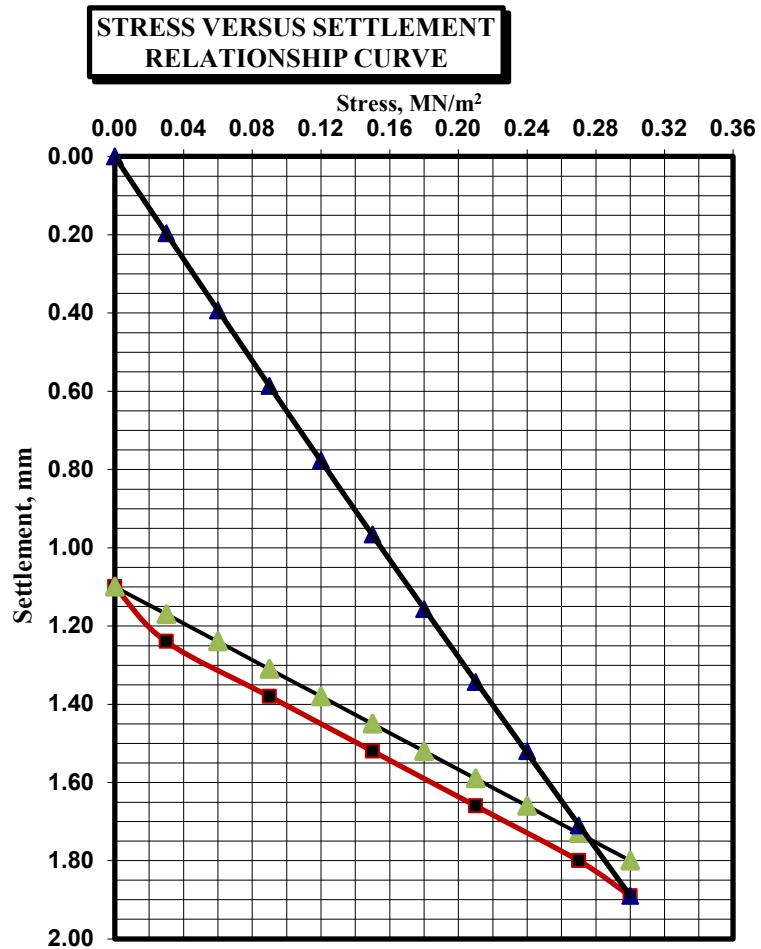
Plate Load Tests of Soils
DIN 18134

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

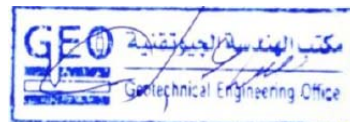
**** Note : Soil is Wet**

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

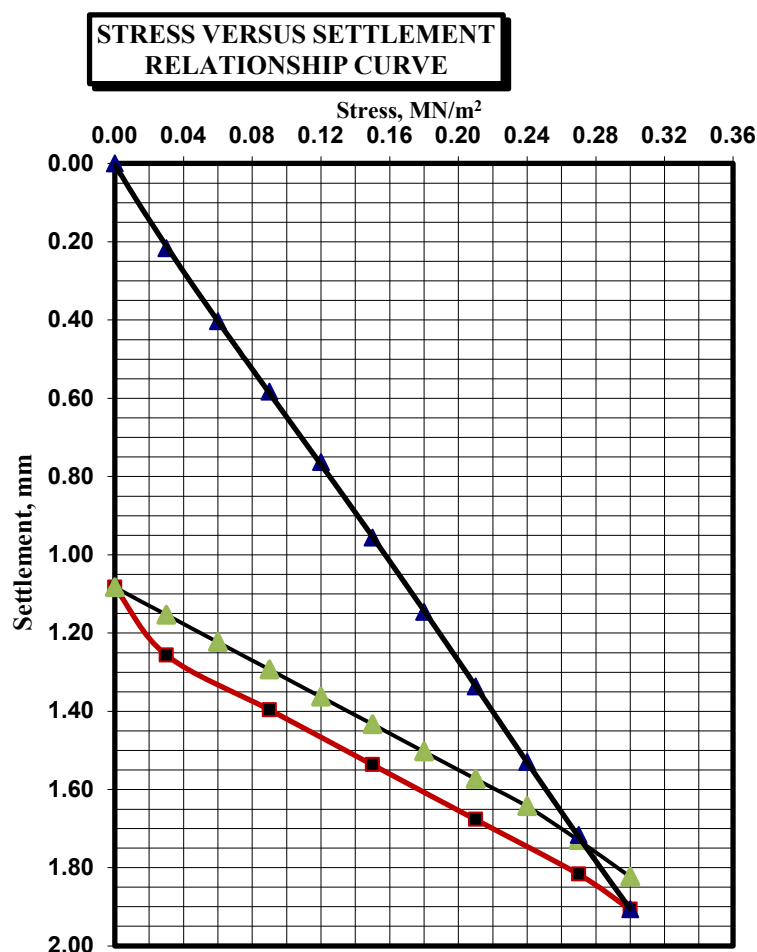
Plate Load Tests of Soils
DIN 18134

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

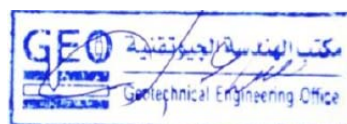
**** Note : Soil is Wet**

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

$k_s = \Delta\sigma/\Delta s$ 157.6 MN/m³

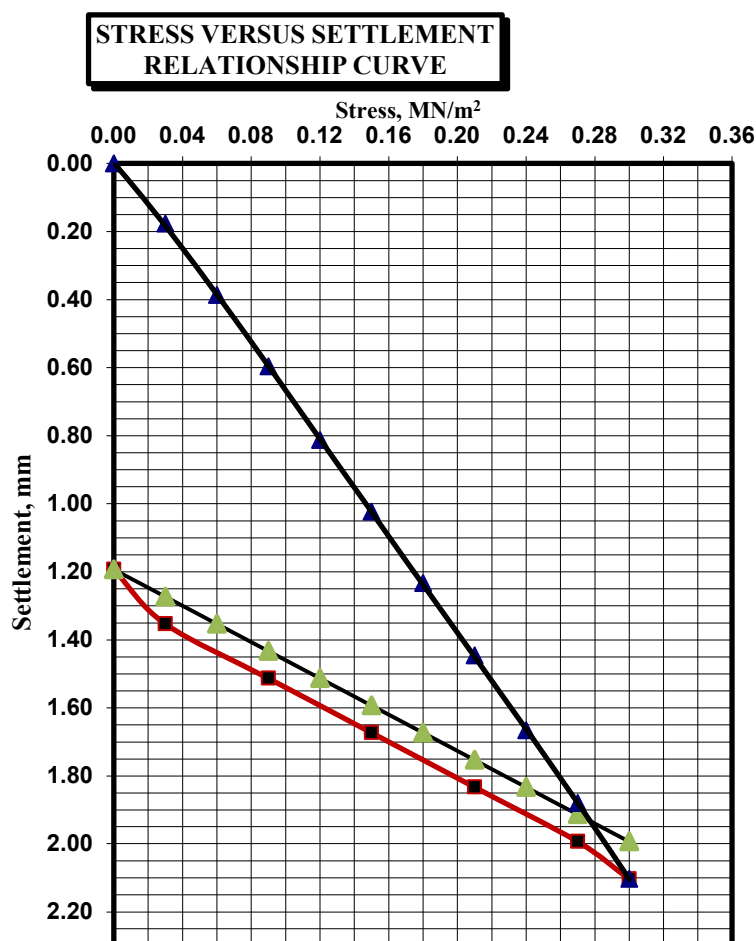
Plate Load Tests of Soils
DIN 18134

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

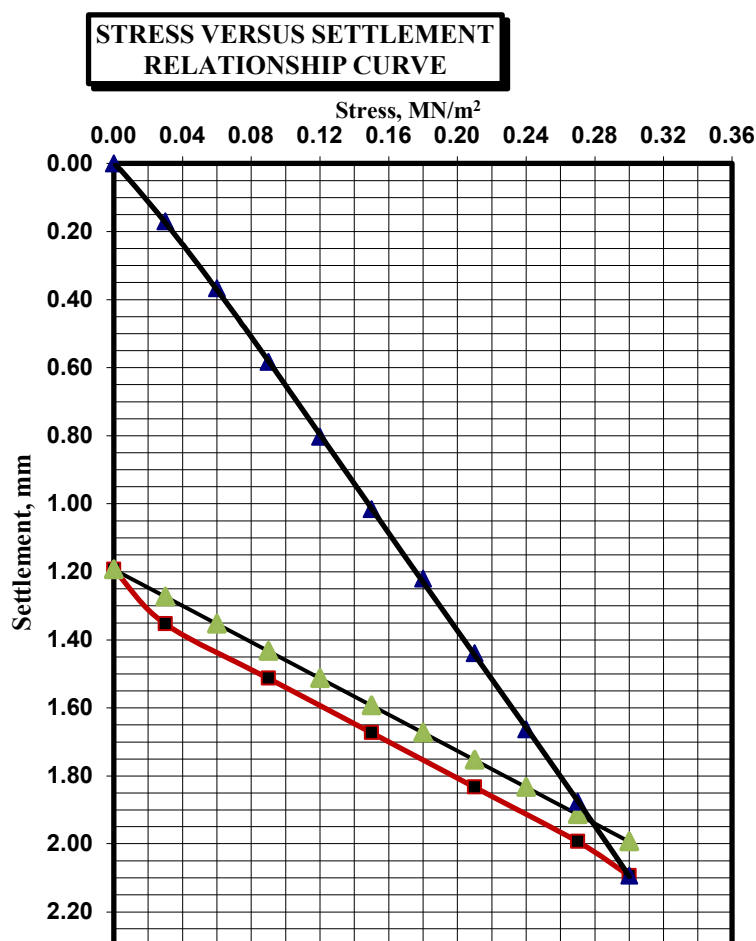
Plate Load Tests of Soils
DIN 18134

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

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

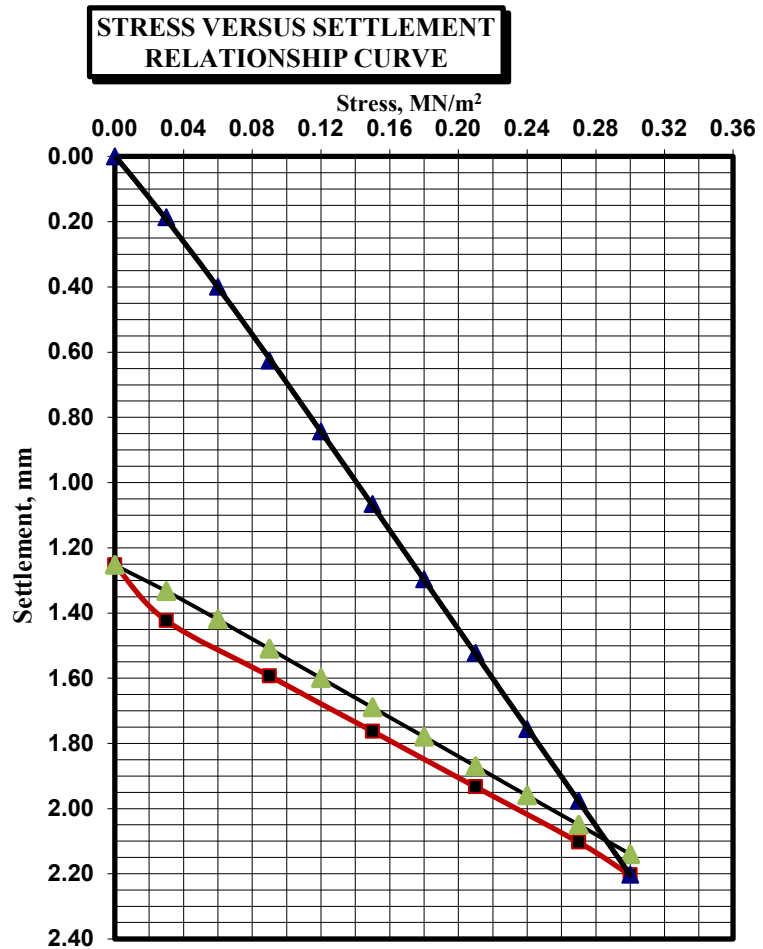
Plate Load Tests of Soils
DIN 18134

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

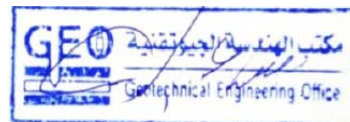
**** Note : Soil is Wet**

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

$$k_s = \Delta\sigma / \Delta s \quad 136.8 \quad \text{MN/m}^3$$

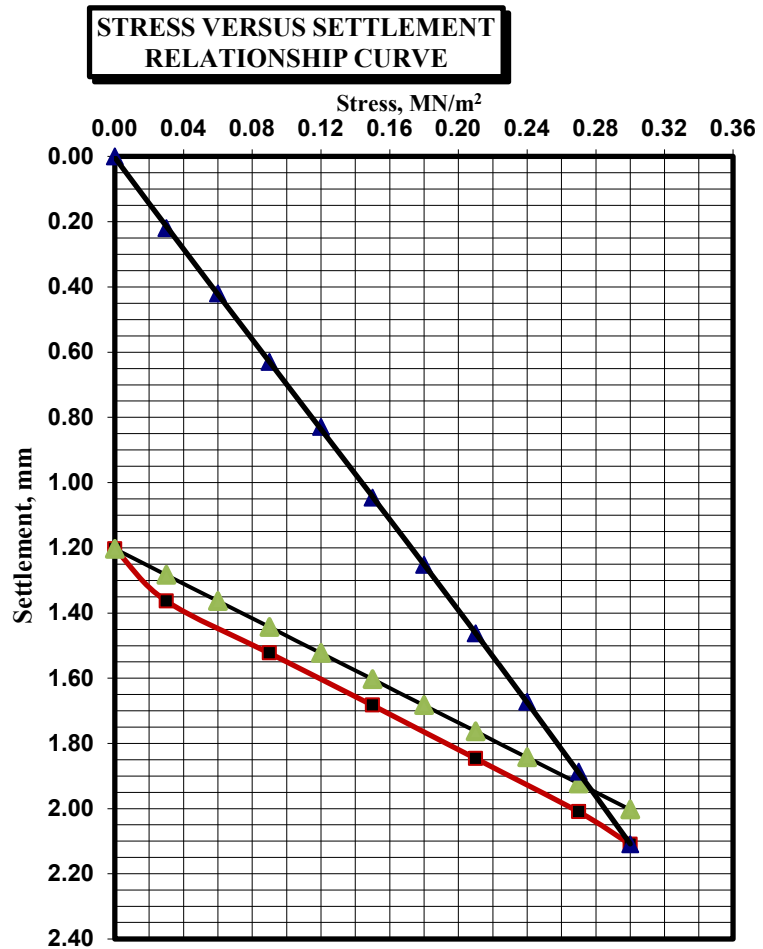
Plate Load Tests of Soils
DIN 18134

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

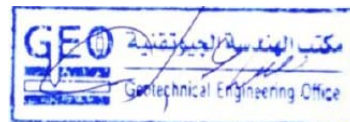
**** Note : Soil is Wet**

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

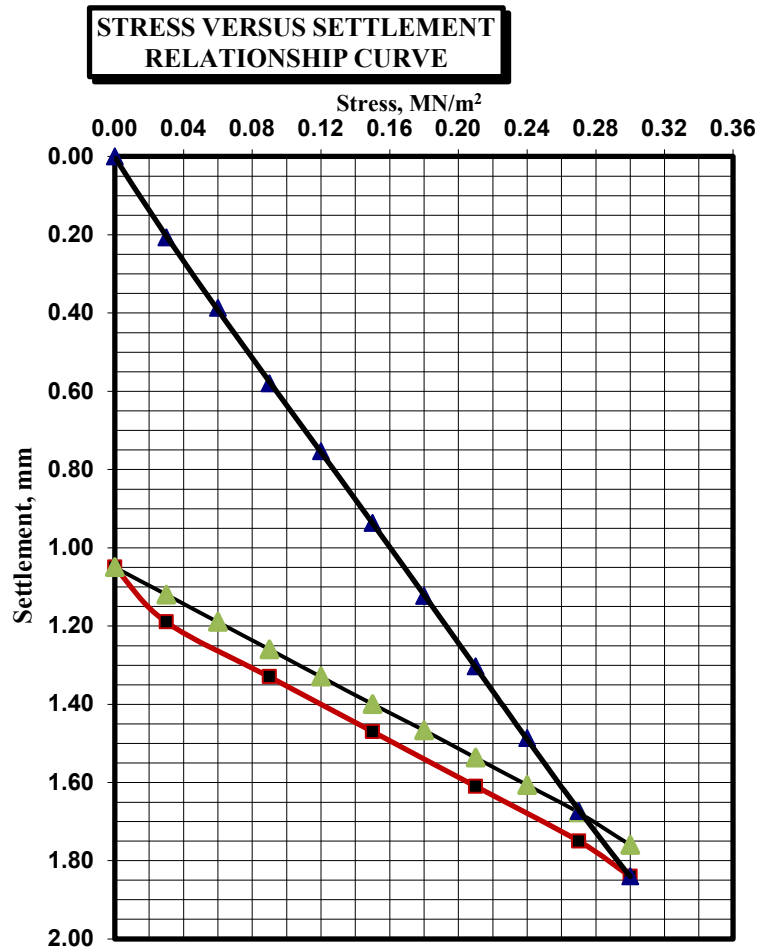
Plate Load Tests of Soils
DIN 18134

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

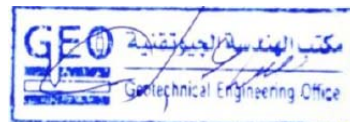
**** Note : Soil is Wet**

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

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

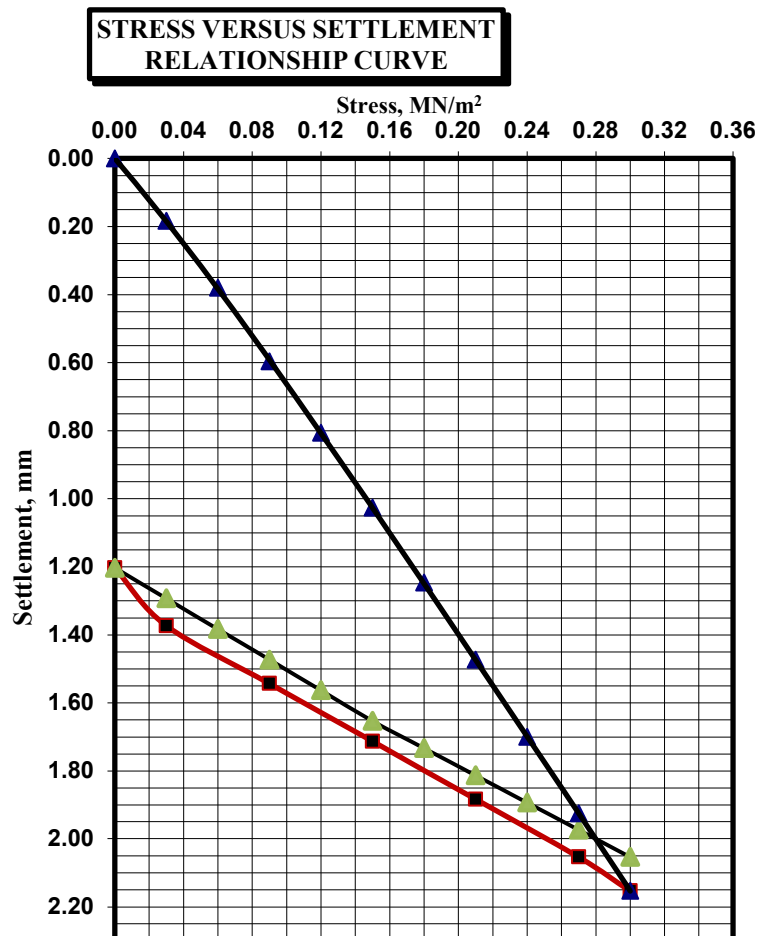
Plate Load Tests of Soils
DIN 18134

CLIENT شركة الحسن
PROJECT Electric Express Train
LOCATION Al-dabaa (454+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

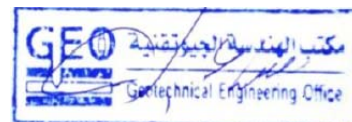
**** Note : Soil is Wet**

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

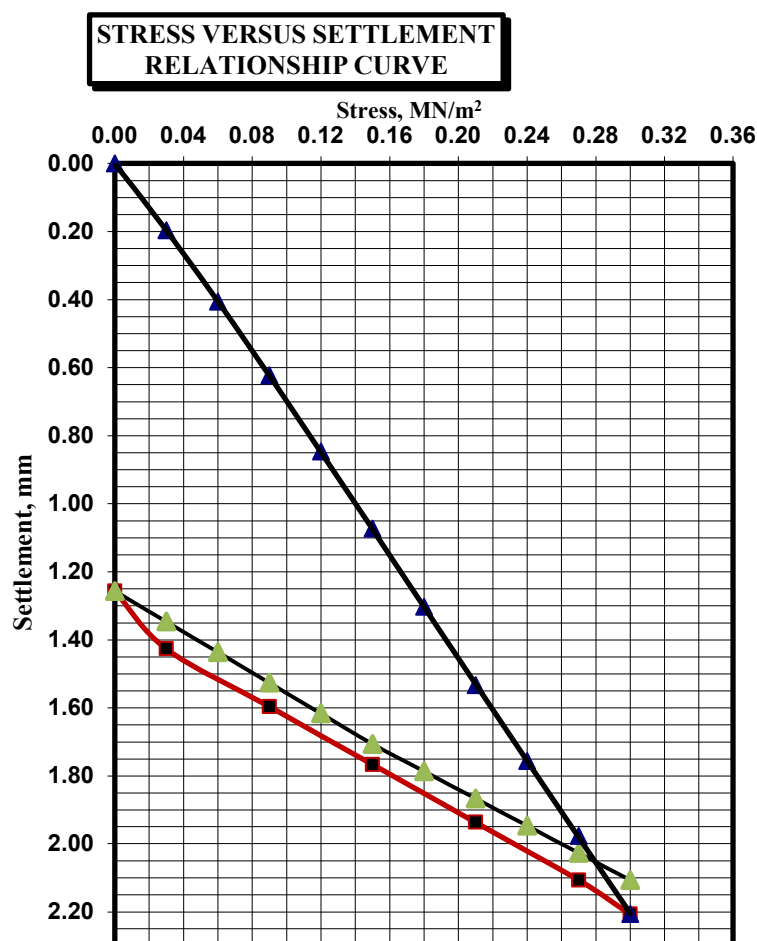
Plate Load Tests of Soils
DIN 18134

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

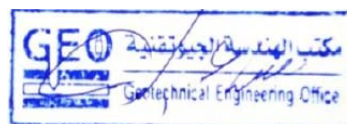
**** Note : Soil is Wet**

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

$$k_s = \Delta\sigma/\Delta s \quad 135.2 \quad \text{MN/m}^3$$

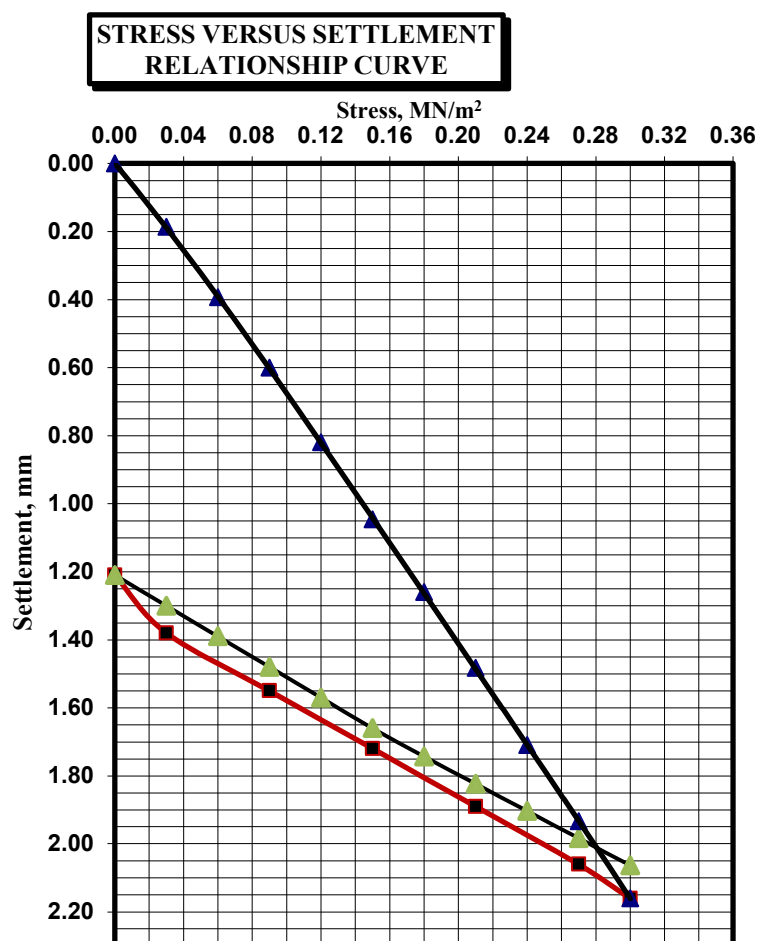
Plate Load Tests of Soils
DIN 18134

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

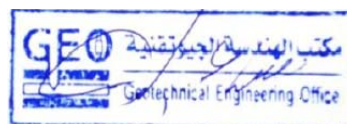
**** Note : Soil is Wet**

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

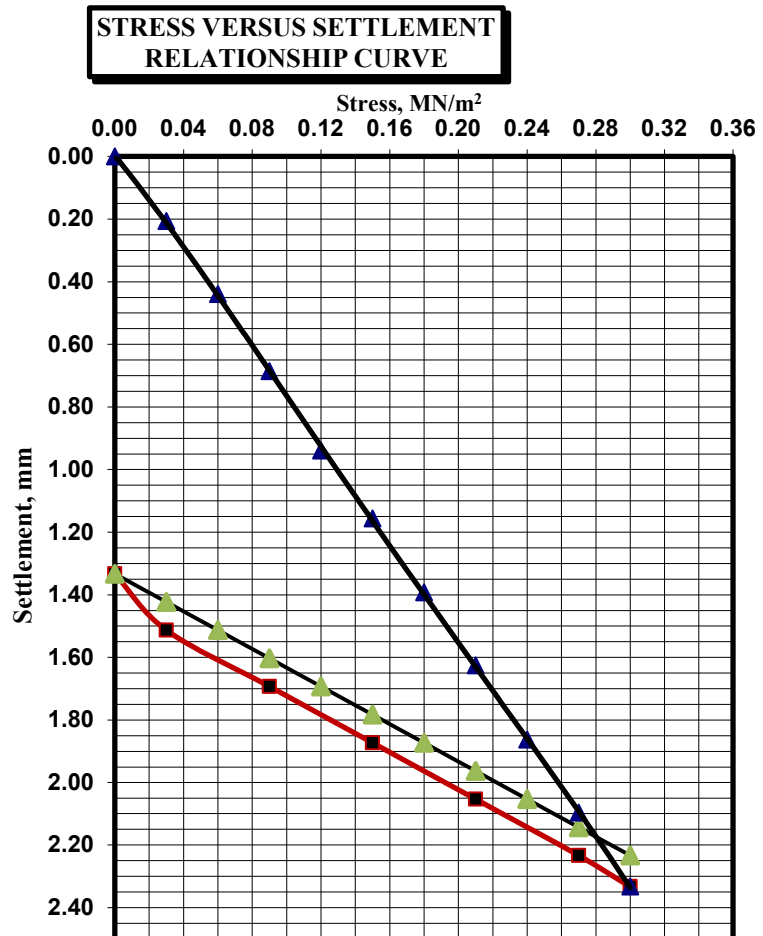
Plate Load Tests of Soils
DIN 18134

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

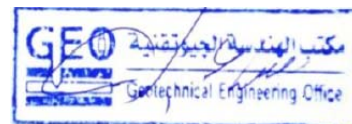
**** Note : Soil is Wet**

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

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

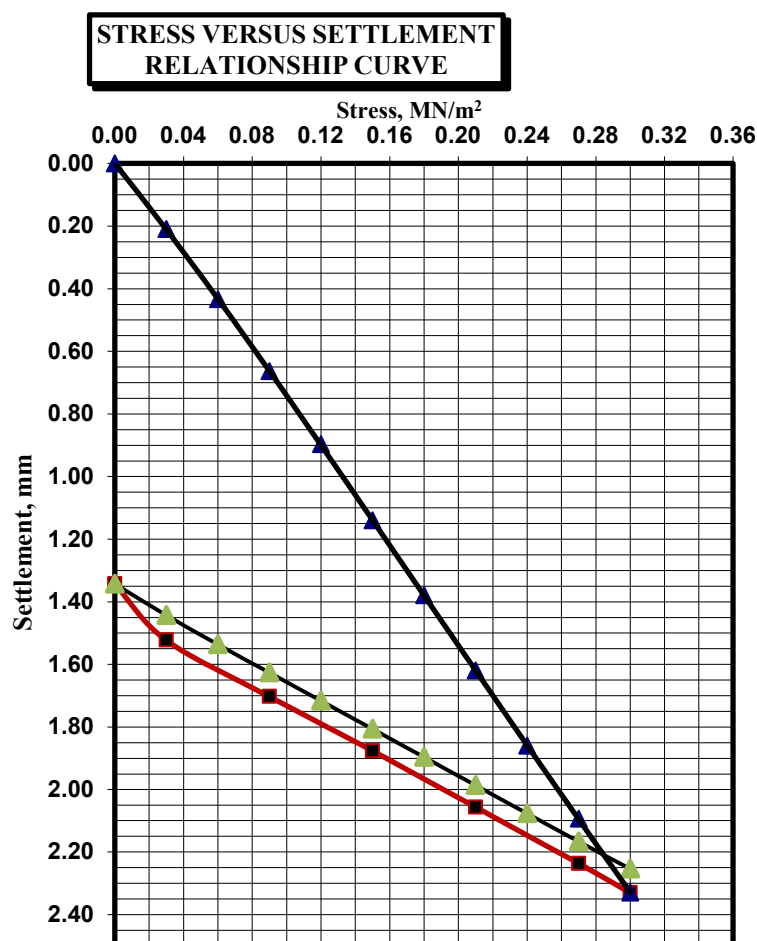
Plate Load Tests of Soils
DIN 18134

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

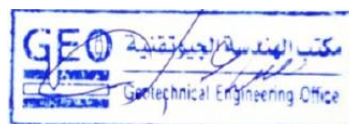
**** Note : Soil is Wet**

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

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

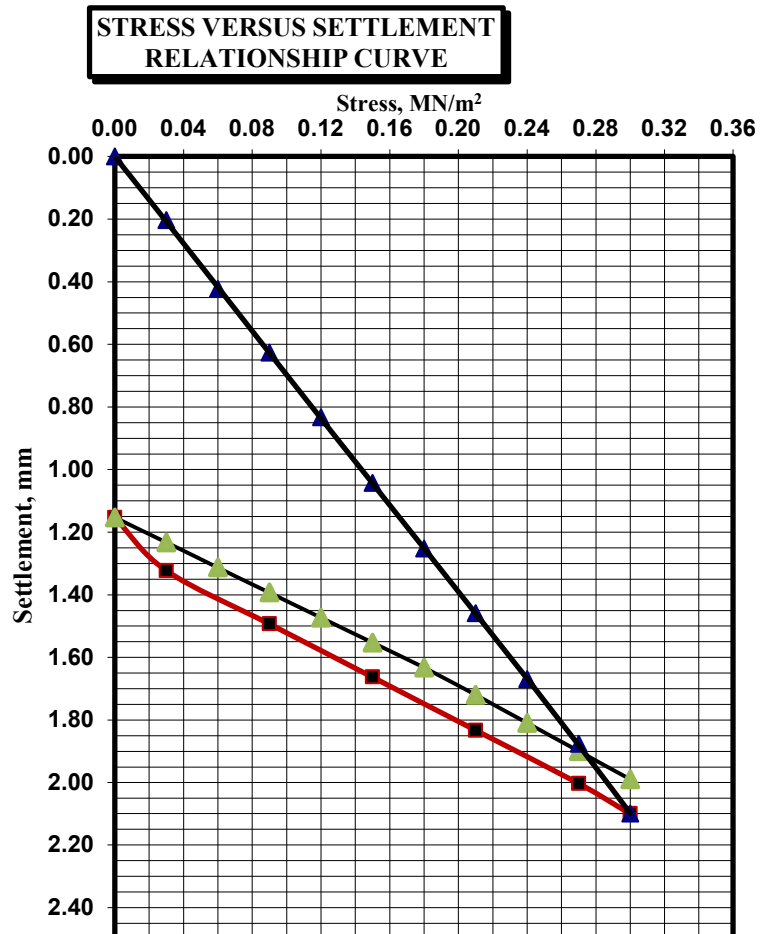
Plate Load Tests of Soils
DIN 18134

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

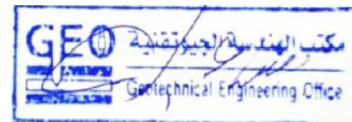
**** Note : Soil is Wet**

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

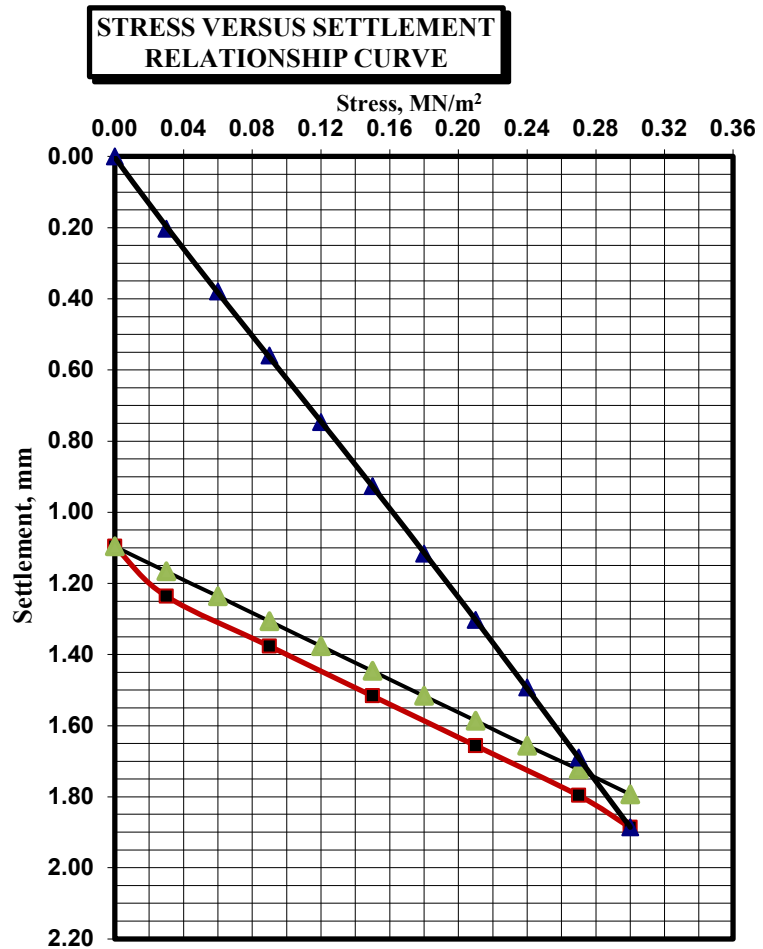
Plate Load Tests of Soils
DIN 18134

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

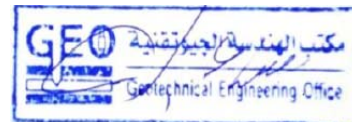
**** Note : Soil is Wet**

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

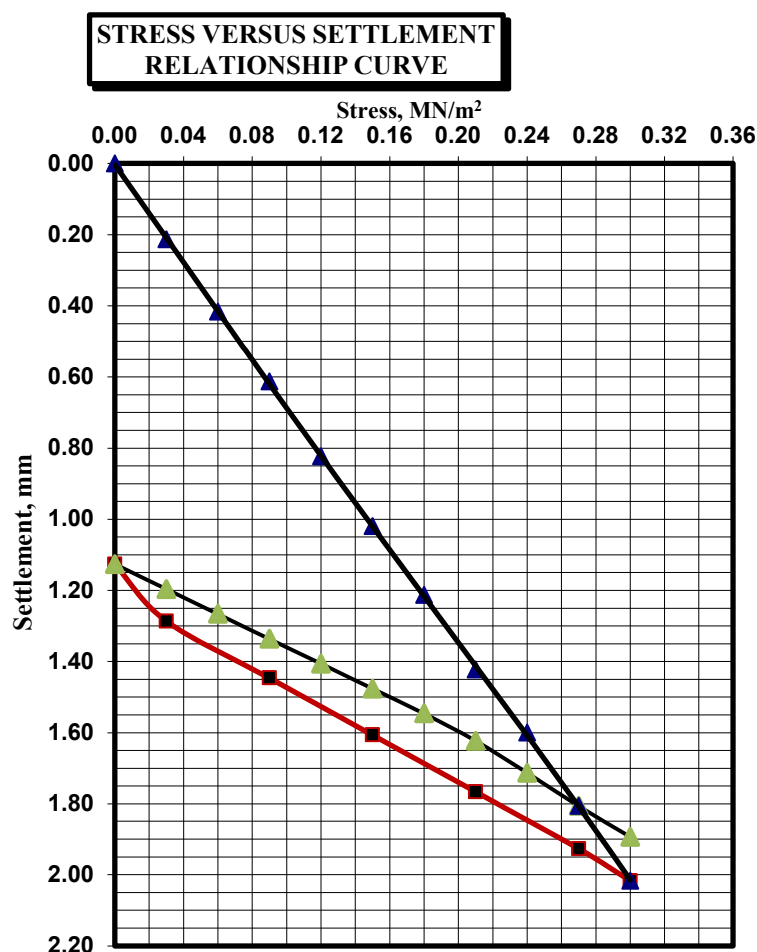
Plate Load Tests of Soils
DIN 18134

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

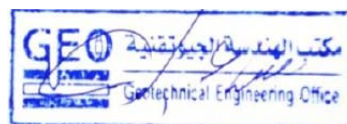
**** Note : Soil is Wet**

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

$$k_s = \Delta\sigma/\Delta s \quad 148.0 \quad \text{MN/m}^3$$

Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 06/01/2023
Reporting Date : 12/01/2023
Reporting No. : 12
Sample No. : 01

Dear Gentleman,

Attached here with the Soil Embankment delivered on 06/01/2023

Materials test

1. Sieve analysis according to ASTM D-422.
2. Material finer than sieve No. 200 according to ASTM D-1140.
3. Liquid limits and plasticity index of soil according to ASTM D-4318.
4. Soil classification according to Project Specs.
5. Proctor Test according to ASTM D-1557

Note: The sample was brought by the client to our laboratory and the laboratory is not responsible for the way it is taken

Signature /

مكتب معامل الاستشارات الهندسية
المساحل الشمالي
رقم سجل تجاري: 537 - 537
المرکز الرئيسي: 3 شارع مكة الفضل - القاهرة

3 El Malek El Afdal Street
Zamalek, Cairo.
Tel. & Fax : 27367231 - 27363093



3 ش الملك الأفضل
الزمالك - القاهرة
تليفون + فاكس : ٢٧٣٦٧٢٣١ - ٢٧٣٦٣٠٩٣
www.cel-egypt.com

Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 06/01/2023
Reporting Date : 12/01/2023
Reporting No. : 12
Sample No. : 01

RESULTS OF SIEVE ANALYSIS According to ASTM D-422.

Sieve Size (mm)	Passing %
50	100
37.5	97.2
25	91.6
19	86.5
12.50	75.1
9.50	64.7
4.75	50.4
2.36	48.8
2.00	47.4
1.18	33.8
0.600	29.6
0.425	27.1
0.300	20.8
0.150	16.9

Signature /.....

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مكتب معامل الاستشارات الهندسية

Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 06/01/2023
Reporting Date : 12/01/2023
Reporting No. : 12
Sample No. : 01

Materials finer than 75 μ m (no.200) sieve
by washing ASTM D-1140.

Test	Results (%)
Percentage of material finer than Sieve Size 75 μ m (No.200)	14.5



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3

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Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 06/01/2023
Reporting Date : 12/01/2023
Reporting No. : 12
Sample No. : 01

**Results of liquid limit and plasticity index
of soils according to ASTM D-4318**

Test	Results (%)
Liquid Limit	NP
Plastic Limit	NP
Plasticity Index	NP

Signature /
مكتب معامل الاستشارات الهندسية
النساجل الشوكتي
رقم التسجيل 837 - 27367231 - 27363093
البريد الإلكتروني : info@cel-egypt.com

Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 06/01/2023
Reporting Date : 12/01/2023
Reporting No. : 12
Sample No. : 01

Soil Classification According to Project Specs (Embankment)

TEST	Results (%)	Limits according Projects Specs	
• Group Classification	(A-1-a)	(A-1-a)	(A-1-b)
2.00 mm (No.10).	47.4	Max 50 %	-----
0.425 mm (No. 40).	27.1	Max 30 %	Max 50 %
0.075 mm (No. 200).	14.5	Max 15 %	Max 15 %
Characteristics of fraction passing 0.425 mm (No.40)			
Liquid Limit	NP	-----	-----
Plasticity index	NP	Max 6 %	Max 6 %

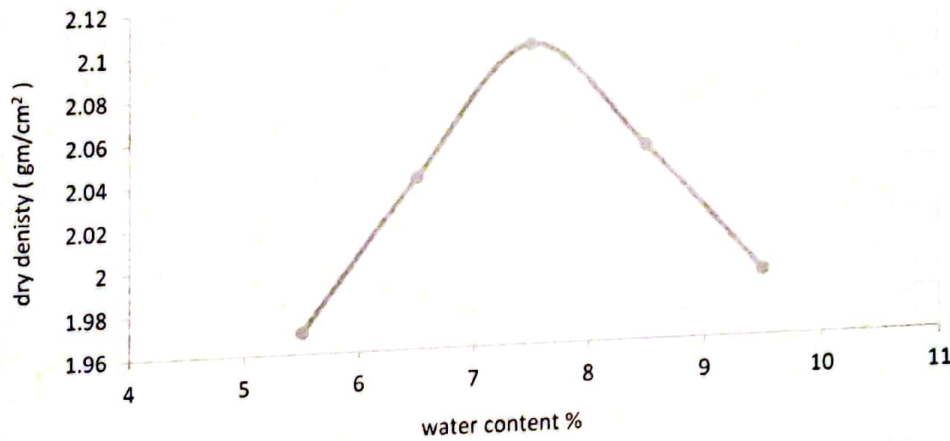
The test results are ☒ Comply ☐ Not Comply) with specifications limits

مكتب معامل الاستشارات الهندسية
الاساسات الشبكية
رقم تسجيل المصنوع 837 - 284 - 210
مركز تقياس 31 شارع الملك فيصل - القاهرة - الجيزة

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Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 06/01/2023
Reporting Date : 12/01/2023
Reporting No. : 12
Sample No. : 01

Moisture – Density relation of soil
Test result (Modified proctor test)
ASTM D-1557



- Max dry density (gm/cm³) : 2.10
- Optimum moisture content % : 7.5

Signature

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مكتب معامل الاستشارات الهندسية
الدكتور/ محمد الشاذلي
رئيس قسم الاختبارات
مركز الهندسة - القاهرة

Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+760) : (454+600)
Type of sample : Soil Embankment (Middle Embankment)
Delivery Date : 09/01/2023
Reporting Date : 15/01/2023
Reporting No. : 13
Sample No. : 02

Dear Gentleman,

Attached here with the Soil Embankment delivered on 09/01/2023

Materials test

1. Sieve analysis according to ASTM D-422.
2. Material finer than sieve No. 200 according to ASTM D-1140.
3. Liquid limits and plasticity index of soil according to ASTM D-4318.
4. Soil classification according to Project Specs.
5. Proctor Test according to ASTM D-1557
6. CBR according to ASTM D-1883

Note: The sample was brought by the client to our laboratory and the laboratory is not responsible for the way it is taken

Signature /


مكتب معامل الاستشارات الهندسية
أنساحل الشمالي
رقم التسجيل الخاص: ٥٣٧-٥٥١-٥٥١
مركز الرئيس: ٣ شارع الملك الأفديل - الزمالك - القاهرة

3 El Malek El Afdal Street
Zamalek, Cairo.
Tel.& Fax : 27367231 - 27363093



٣ ش الملك الأفديل
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تليفون + فاكس : ٢٧٣٦٧٢٣١ - ٢٧٣٦٣٠٩٣
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Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+760) : (454+600)
Type of sample : Soil Embankment (Middle Embankment)
Delivery Date : 09/01/2023
Reporting Date : 15/01/2023
Reporting No. : 13
Sample No. : 02

RESULTS OF SIEVE ANALYSIS According to ASTM D-422.

Sieve Size (mm)	Passing %
50	100
37.5	96.1
25	93.6
19	87.3
12.50	78.2
9.50	63.5
4.75	46.2
2.36	43.8
2.00	40.4
1.18	35.9
0.600	30.2
0.425	28.1
0.300	22.2
0.150	15.9

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مكتب معامل الاستشارات الهندسية
الساحل الشمالي
رقم تسجيل الترخيص: 537 - 091 - 219
(مركز شاسي : 3 شارع شاسي)

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Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+760) : (454+600)
Type of sample : Soil Embankment (Middle Embankment)
Delivery Date : 09/01/2023
Reporting Date : 15/01/2023
Reporting No. : 13
Sample No. : 02

Materials finer than 75 μ m (no.200) sieve
by washing ASTM D-1140.

Test	Results (%)
Percentage of material finer than Sieve Size 75 μ M (No.200)	13.9

Signature



Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+760) : (454+600)
Type of sample : Soil Embankment (Middle Embankment)
Delivery Date : 09/01/2023
Reporting Date : 15/01/2023
Reporting No. : 13
Sample No. : 02

Results of liquid limit and plasticity index
of soils according to ASTM D-4318

Test	Results (%)
Liquid Limit	NP
Plastic Limit	NP
Plasticity Index	NP

Signature / ...



Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+760) : (454+600)
Type of sample : Soil Embankment (Middle Embankment)
Delivery Date : 09/01/2023
Reporting Date : 15/01/2023
Reporting No. : 13
Sample No. : 02

Soil Classification According to Project Specs (Embankment)

TEST	Results (%)	Limits according Projects Specs	
• Group Classification	(A-1-a)	(A-1-a)	(A-1-b)
2.00 mm (No.10).	40.4	Max 50 %	-----
0.425 mm (No. 40).	28.1	Max 30 %	Max 50 %
0.075 mm (No. 200).	13.9	Max 15 %	Max 15 %
Characteristics of fraction passing 0.425 mm (No.40)			
Liquid Limit	NP	-----	-----
Plasticity index	NP	Max 6 %	Max 6 %

The test results are ☒ Comply - ☐ Not Comply) with specifications limits

Signature /



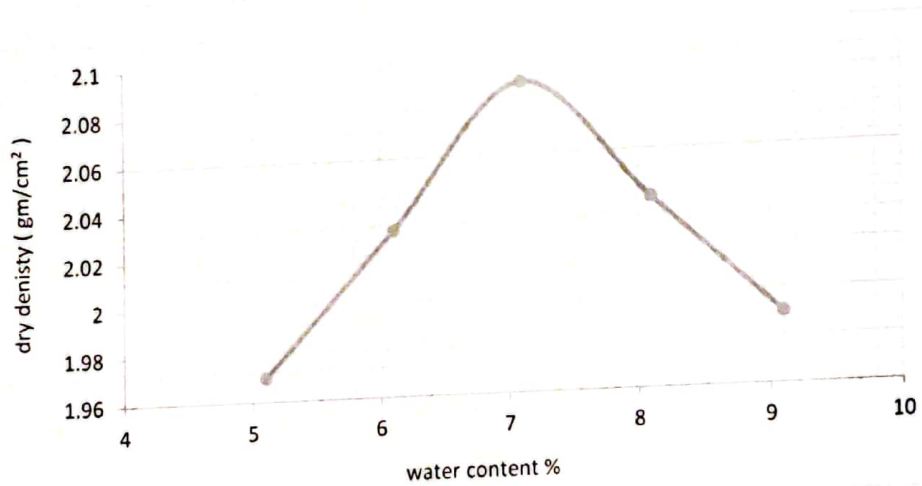
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Tel.& Fax : 27367231 - 27363093



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Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+760) : (454+600)
Type of sample : Soil Embankment (Middle Embankment)
Delivery Date : 09/01/2023
Reporting Date : 15/01/2023
Reporting No. : 13
Sample No. : 02

Moisture – Density relation of soil
Test result (Modified proctor test)
ASTM D-1557



- Max dry density (gm/cm³) : 2.09
- Optimum moisture content % : 7.1

Signature /



Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+760) : (454+600)
Type of sample : Soil Embankment (Middle Embankment)
Delivery Date : 09/01/2023
Reporting Date : 15/01/2023
Reporting No. : 13
Sample No. : 02

Test Results of California Bearing Ratio on Base Materials
ASTM D 1883

penetration		stress on piston (Mpa)
mm	Inch	
0.64	0.025	1.95
1.27	0.050	2.21
1.91	0.075	2.36
2.54	0.100	2.56
3.18	0.125	2.81
3.81	0.150	3.02
4.45	0.175	3.22
5.08	0.200	3.47
5.71	0.225	3.63
6.35	0.250	3.73

CBR Result	Stress (Mpa)		CBR %
At 0.1 inch (2.54 mm) penetration	St. Value	Sample results	37.1
	6.90	2.56	

Notes :

- 1- Attached graph shows penetration resistance versus penetration magnitude.
- 2- The sample was compacted to dry density of 2.09 (gm /cm³) at 7.1 % optimum water content.
- 3- Surcharge load 4.50 K

Signature / ...

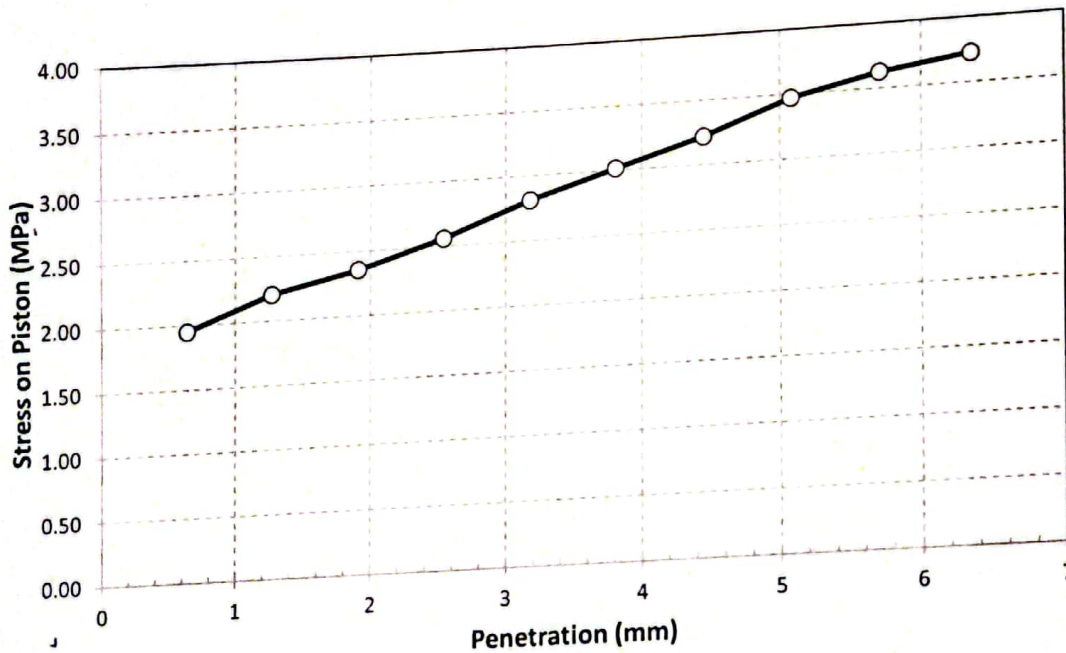
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Tel.& Fax : 27367231 - 27363093



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تليفون + فاكس : ٢٧٣٦٧٢٣١ - ٢٧٣٦٣٠٩٣
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Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+760) : (454+600)
Type of sample : Soil Embankment (Middle Embankment)
Delivery Date : 09/01/2023
Reporting Date : 15/01/2023
Reporting No. : 13
Sample No. : 02

Load Penetration Curve of CBR Test
ASTM D-1883



Signature /



Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 25/02/2023
Reporting Date : 03/03/2023
Reporting No. : 14
Sample No. : 03

Dear Gentleman,

Attached here with the Soil Embankment delivered on 25/02/2023

Materials test

1. Sieve analysis according to ASTM D-422.
2. Material finer than sieve No. 200 according to ASTM D-1140.
3. Liquid limits and plasticity index of soil according to ASTM D-4318.
4. Soil classification according to Project Specs.
5. Proctor Test according to ASTM D-1557

Note: The sample was brought by the client to our laboratory and the laboratory is not responsible for the way it is taken

Signature /



Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 25/02/2023
Reporting Date : 03/03/2023
Reporting No. : 14
Sample No. : 03

RESULTS OF SIEVE ANALYSIS According to ASTM D-422.

Sieve Size (mm)	Passing %
50	100
37.5	97.1
25	92.7
19	86.8
12.50	75.5
9.50	46.9
4.75	50.9
2.36	45.4
2.00	42.7
1.18	37.0
0.600	33.9
0.425	29.3
0.300	21.2
0.150	15.2

Signature : 
مكتب معامل الاستشارات الهندسية
الساحل الشمالي
رقم تسجيل المهندس : 537 - 2004
الشارع : 3 شارع الملك الناصر - الزمالك - القاهرة

Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 25/02/2023
Reporting Date : 03/03/2023
Reporting No. : 14
Sample No. : 03

**Materials finer than 75 μ m (no.200) sieve
by washing ASTM D-1140.**

Test	Results (%)
Percentage of material finer than Sieve Size 75 μ M (No.200)	11.9

Signature /



Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 25/02/2023
Reporting Date : 03/03/2023
Reporting No. : 14
Sample No. : 03

**Results of liquid limit and plasticity index
of soils according to ASTM D-4318**

Test	Results (%)
Liquid Limit	NP
Plastic Limit	NP
Plasticity Index	NP

Signature / ... 

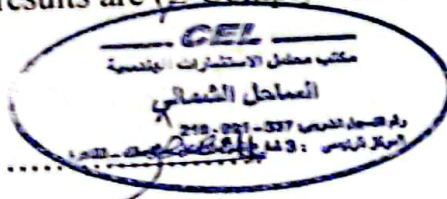
Company Name : مكتب الحسن للمطاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 25/02/2023
Reporting Date : 03/03/2023
Reporting No. : 14
Sample No. : 03

Soil Classification According to Project Specs (Embankment)

TEST	Results (%)	Limits according Projects Specs	
		(A-1-a)	(A-1-b)
• Group Classification	(A-1-a)	(A-1-a)	(A-1-b)
2.00 mm (No.10).	42.7	Max 50 %	-----
0.425 mm (No. 40).	29.3	Max 30 %	Max 50 %
0.075 mm (No. 200).	11.9	Max 15 %	Max 15 %
Characteristics of fraction passing 0.425 mm (No.40)			
Liquid Limit	NP	-----	-----
Plasticity index	NP	Max 6 %	Max 6 %

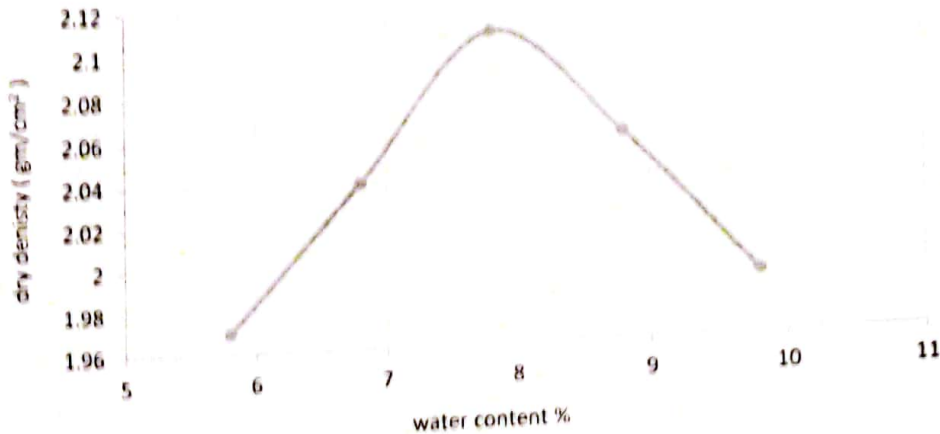
The test results are (☒ Comply - ☐ Not Comply) with specifications limits

Signature /



Name : مكتب الحسن للمقاولات المتكاملة
 : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
 : St. (453+600) : (454+260)
 : Soil Embankment (Upper Embankment)
 Delivery Date : 25/02/2023
 Reporting Date : 03/03/2023
 Reporting No. : 14
 Sample No. : 03

Moisture - Density relation of soil
Test result (Modified proctor test)
ASTM D-1557



- Max dry density (gm/cm³) : 2.11
- Optimum moisture content % : 7.8

Signature /

