



مركز الاستشارات الهندسية
للتنفيذ والتأثيرات الطرق
(خدمات استشارية)



المكتب الهندسي
للتنفيذ والتأثيرات
(P&M)



وزارة النقل
Ministry of Transport

مشروع القطار الكهربائي، فائق السرعة قطاع (العلمين - فوكة)

أعمال تشكيل الجسر الترابي

المقارنة المعدلة لنود الأعمال تنفيذ مكتب الحسنى للمقاولات المتكاملة التجار رأس الحكمة

القطاع من المحطة ٦٠٠+٤٥٢ إلى ٦٠٠+٤٥٤

رقم البند	بيان الأعمال	الوحدة	الكمية	ملاحظة	الاجملي
١	أعمال الحفر				
١.١	بالمتر المكعب أعمال حفر باستخدام المعدات الميكانيكية لجميع أنواع التربة عدا التربة الصخرية وسموية السطح بالات (وتسوية السطح بالعمد الاصطناعية للوصول إلى نسبة الرطوبة المطلوبة والدمك الجيد بالهراسات للوصول إلى أقصى كثافة جافة (95%) من الكثافة الجافة القصوى) ومحمل على البند تحميل ولحق الأتربة الزائدة لمسافة ٥٠٠ متر من محور الطريق ويتم التغليف طبقاً للمناسيب التصميمية والقطاعات العرضية الموضوعة والرسومات التفصيلية المعدلة وفي حالة زيادة مسافة نقل ناتج الحفر عن ٥٠٠ متر من محور الطريق يتم حساب ٨ جنية لكل متر زيادة	م ^٣	١٥٨٨٧.٣	٢٠	٣١٧.١٤٦
٢.١	بالمتر المكعب أعمال الحفر باستخدام المعدات الميكانيكية في التربة المتناسقة عدا التربة الصخرية (باستخدام البيلدور (وتسوية السطح بالات التسوية والرش بالعمد الاصطناعية للوصول إلى نسبة الرطوبة المطلوبة والدمك الجيد بالهراسات للوصول إلى أقصى كثافة جافة (95%) من الكثافة الجافة القصوى) ومحمل على البند تحميل ولحق الأتربة الزائدة لمسافة ٥٠٠ متر من محور الطريق ويتم التغليف طبقاً للمناسيب التصميمية والقطاعات العرضية الموضوعة والرسومات التفصيلية المعدلة وفي حالة زيادة مسافة نقل ناتج الحفر عن ٥٠٠ متر من محور الطريق يتم حساب ٨ جنية لكل متر زيادة	م ^٣	١٧١٩٨	٢٣	٣٩٣.١٥٤
٣	أعمال الردم				
١.٣	أعمال تحميل وتوريد ولحق التربة مطابقة للمواصفات وتشغيلها باستخدام آلات التسوية بسلك لا يزيد عن ٥ سم حتى متسوب (2.00 متر) ويسمك لا يزيد عن ٢٥ سم لاستكمال المنسوب التصميمي لتشكيل الجسر الترابي والاختلاف (نسبة تحمل كاليفورنيا لا تقل عن ٩٥%) ورشها بالعمد الاصطناعية للوصول إلى نسبة الرطوبة المطلوبة والدمك الجيد بالهراسات للوصول إلى أقصى كثافة جافة (95%) من الكثافة الجافة القصوى) ويتم التغليف طبقاً للمناسيب التصميمية والقطاعات العرضية الموضوعة والرسومات التفصيلية المعدلة وفي حالة زيادة مسافة نقل ناتج الردم عن ٥٠٠ متر من محور الطريق يتم حساب ٨ جنية لكل متر زيادة	م ^٣	١٣٠٠٧.٤٨	٥٥	٧٠٩.٢٣٦
	مسافة النقل حتى ٢ كم ويتم احتساب علاوة ١.٤ جنية لكل متر زيادة أو النقص				
	السعر يشمل عمل تنويشات وتخطيط وإخبارات ونقل لموقع العمل حتى مسافة ٢ كم				
	السعر يشمل قيمة المادة الحجرية				
	علاوة مسافة النقل ٢٠.٦ كم				
	علاوة تحصيل الكارته والموازين طبقاً للاحقة الشقة الوطنية				
	الاجملي				٥٧٠٠٠٠.٠٠

(خمسة ملايين وسبع مائة ألف جنيه فقط لا غير)

مدير عام المشروعات
م / محمد حسني فياض

مدير المشروع المالي
م / إبراهيم الحناوي

مدير المشروع الاستشاري
م / مصطفى كرم

مدير المشروع المقاول
م / عبد الرحمن

يعتمد
رئيس الإدارة المركزية
منطقة غرب الدلتا
الاسكندرية - مرسى مطروح
عميد مهندس /

هاني محمد محمود طه
١٠٠٤

الحسنى
للمقاولات المتكاملة
٥٥٢ - ٢٣٢ - ١٩٠٠
٥٥٢ - ٢٣٢ - ١٩٠٠

محضر استلام موقع

مشروع: اعمال الجسر الترابي والاعمال الصناعية لمشروع القطار الكهربائي السريع (العين السخنة -العاصمة الادارية -العلمين -مطروح) قطاع غرب النيل لتنفيذ المسافة من الكم 453+600 الى الكم 454+600 بطول 1 كم اتجاه رأس الحكمة .

تنفيذ: مكتب الحسن للمقاولات المتكاملة

إشراف : المنطقة الخامسة – منطقة غرب الدلتا

طبقاً للعقد رقم (2182 / 2022/ 2023) بتاريخ 2023/06/11

إنه في يوم الاثنين الموافق 2023/06/12 اجتمع كل من:-

- 1- السيد المهندس /محمد حسني فياض مدير عام المشروعات- الهيئة العامة للطرق والكباري
- 2- السيد المهندس /إبراهيم الحناوي مهندس العملية - الهيئة العامة للطرق والكباري
- 3- السيد المهندس / علاء عبدالرحمن مدير مشروع – مكتب الحسن للمقاولات المتكاملة

وذلك للمرور على مسار العملية المذكورة عاليه لاستلام الموقع :-

وقد تبين أن الموقع خالياً من العوائق الظاهرية ويسمح بالبداية في التنفيذ وبناء عليه يعتبر تاريخ 2023/06/12 هو تاريخ استلام الموقع وبداية الأعمال بالعملية واقفل المحضر على ذلك ووقع الحضور

التوقيعات

3- علاء عبد الرحمن

2- 

1- 

رئيس الإدارة المركزية

منطقة غرب الدلتا

الاسكندرية – مرسى مطروح

عميد . مهندس /

هاني محمد محمود طه

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 /


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 /



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



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 : 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 /



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	
		(A-1-a)	(A-1-b)
• 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

Signature /

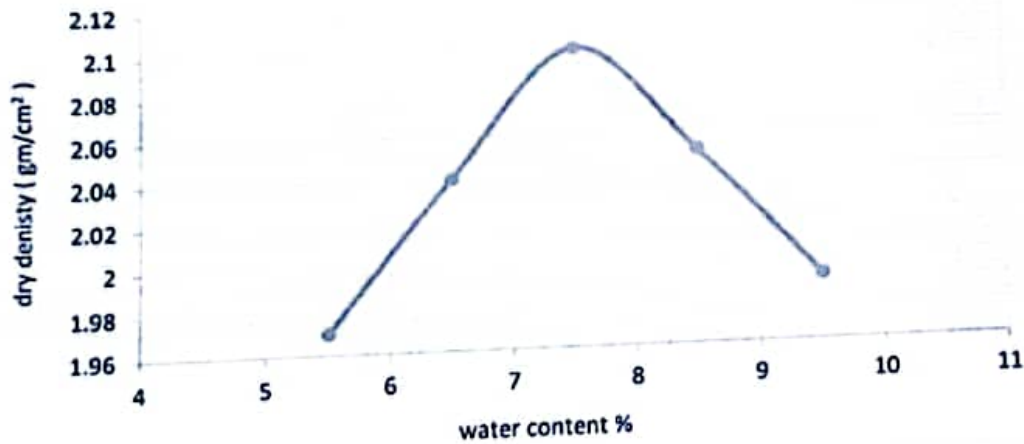
3 El Malek El Afdal Street
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Company Name : مكتب الحسن للمقاولات المتكاملة
Project : Electric Express Train, from Al Ain Sokhna to Marsa Matrouh
Location : St. (453+600) : (454+260)
Type of sample : Soil Embankment (Upper Embankment)
Delivery Date : 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

CEL
مكتب معامل الاستشارات الهندسية
المساحل الشمالي
رقم تسجيل المهندس : ٢٧٣٦٣٠٩٣
إدارة الترخيص : ١٣ شارع شاذي النجار - القاهرة

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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

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 /



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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

Signature / ...

CEL
مكتب معامل الاستشارات الهندسية
المنطقة الشمالية
رقم تسجيل تجاري: 537 - 091 - 27363093
شارع النيل 31
المنطقة الشمالية

CELConsulting Engineering Bureau & Laboratories
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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 / ...

مكتب معامل الاستشارات الهندسية
أنساجل الشمصالي
رقم تسجيل مصري 210-001-027
مركز شامس : شارع محمد النور - شبراخيت

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 %

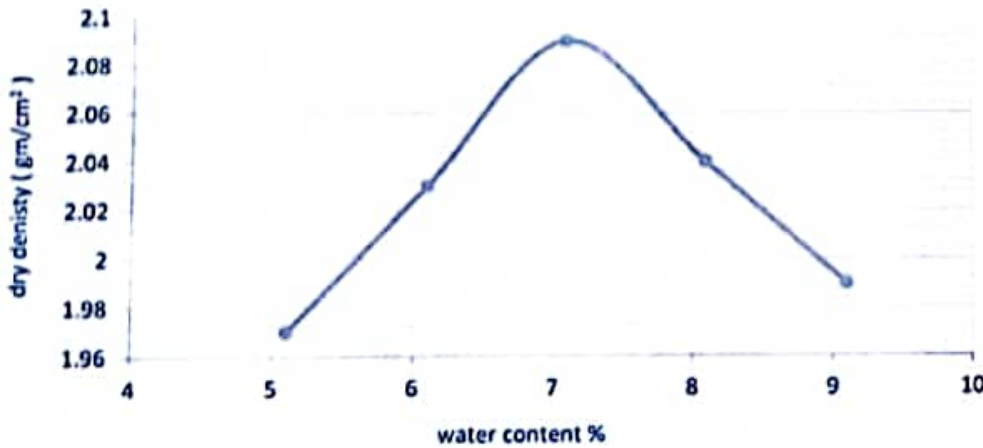
The test results are (☒ Comply - ☐ Not Comply) with specifications limits

مكتب معامل الاستشارات الهندسية
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بم. تسجيل قطري 319-091-037
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2019

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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
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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 Kg

Signature / ...

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الساحل الشمالي
رقم تسجيل قديم : 537 - 991
مركز شاتيس : شارع هبة الازهر - الزمالة - القاهرة

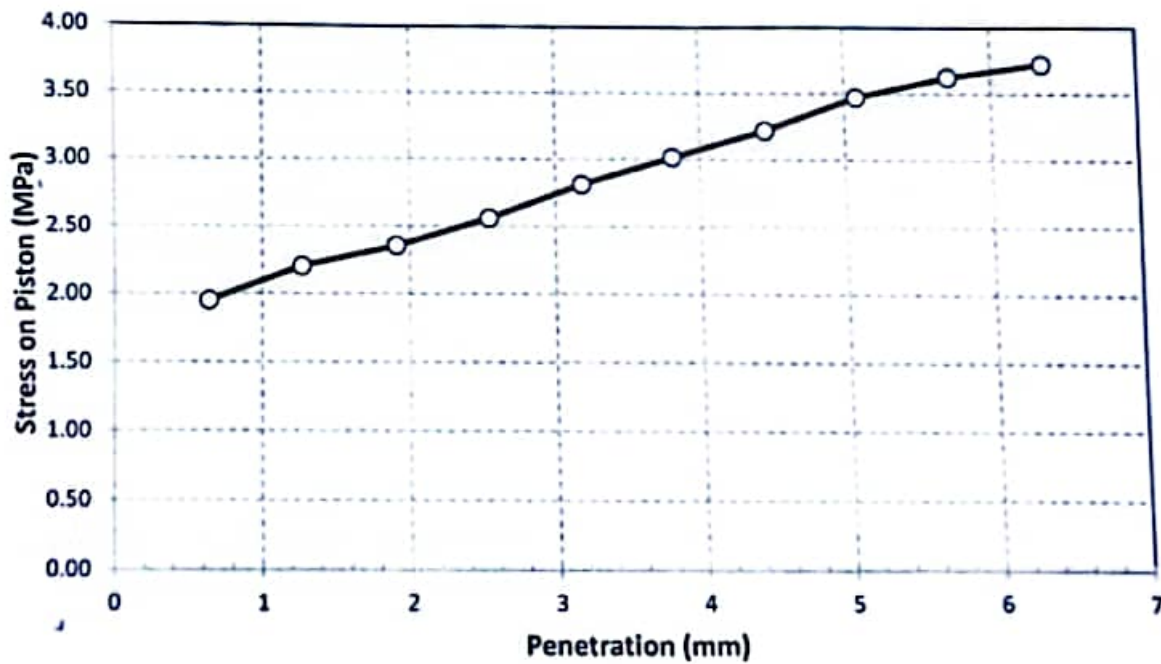
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Company Name : مكتب الحسن للمقاولات المتكاملة
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Location : St. (453+760) : (454+600)
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Delivery Date : 09/01/2023
Reporting Date : 15/01/2023
Reporting No. : 13
Sample No. : 02

Load Penetration Curve of CBR Test
ASTM D-1883



Signature /



Horema for Soil Investigation & QC.

5 Mostafa Kamel st., Smouha, Alexandria

Tel./Fax : +203 4243784 , +203 4272604

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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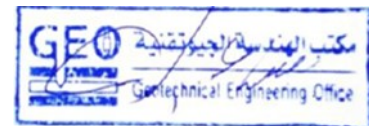
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APPENDIX (A)	

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

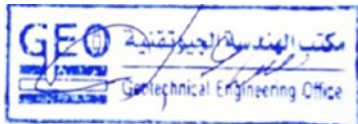
This report deals with the area specified to the Electric Express Train at Al-Dabaa. 19 plate loading tests were conducted in accordance with the DIN 18134 slandered specifications. The plate loading tests were conducted by **Horema** (LTD). The relationship between the loading and soil settlement for 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
Cairo University – Egypt





APPENDIX (A)

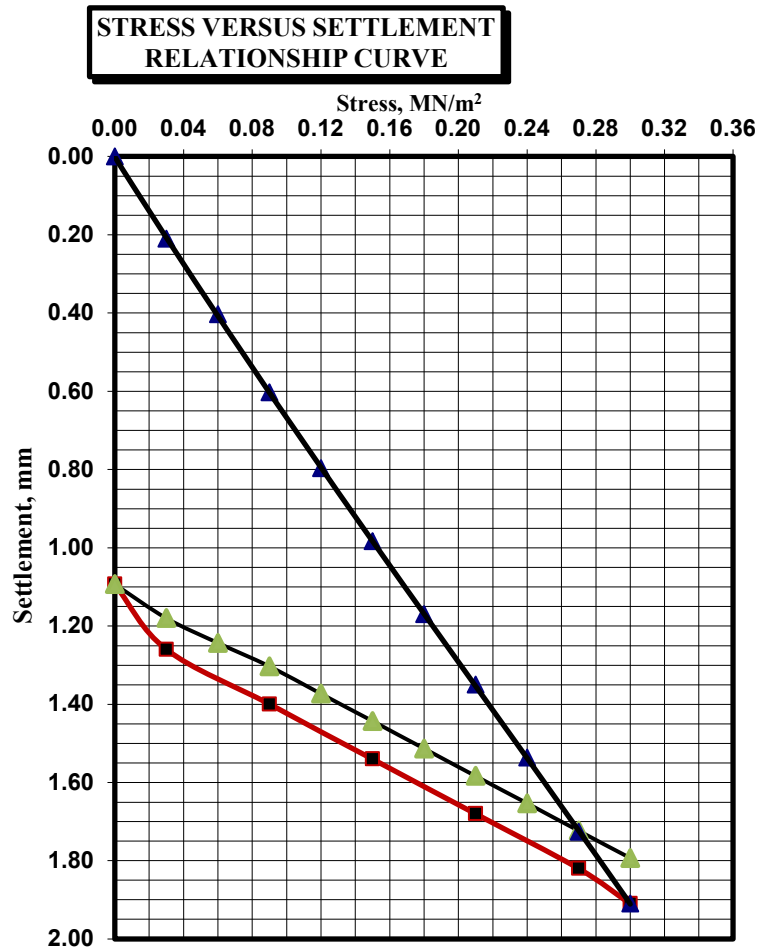
Plate Load Tests of Soils
DIN 18134

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

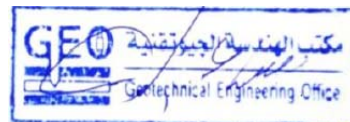
**** Note : Soil is Wet**

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

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

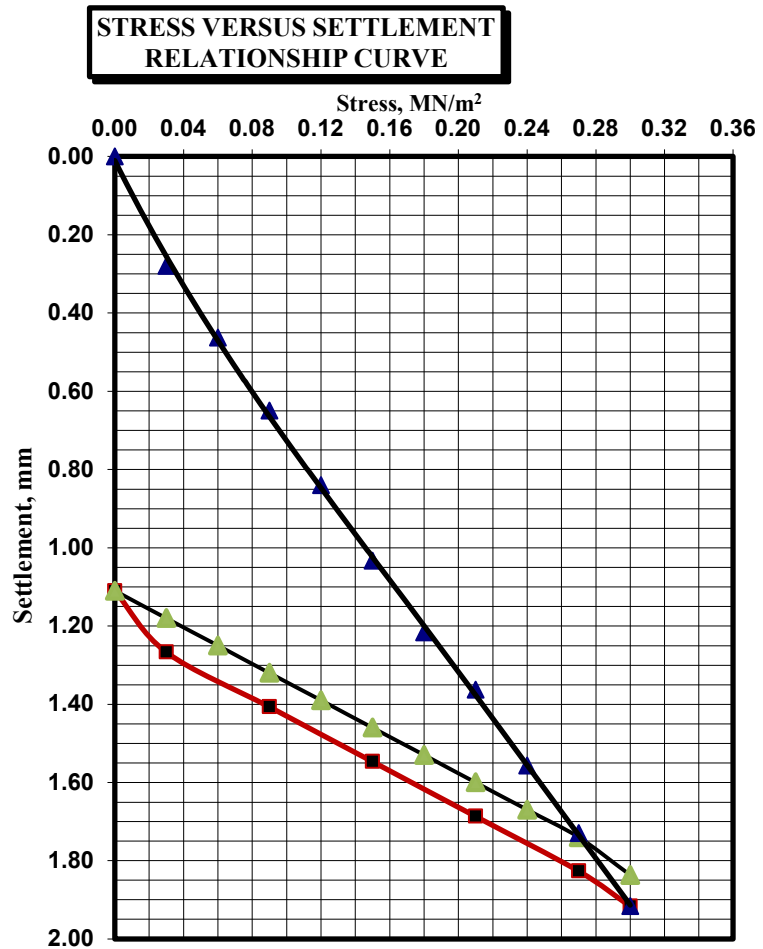
Plate Load Tests of Soils
DIN 18134

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

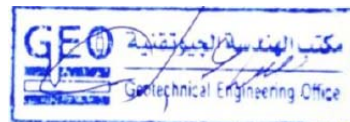
**** Note : Soil is Wet**

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

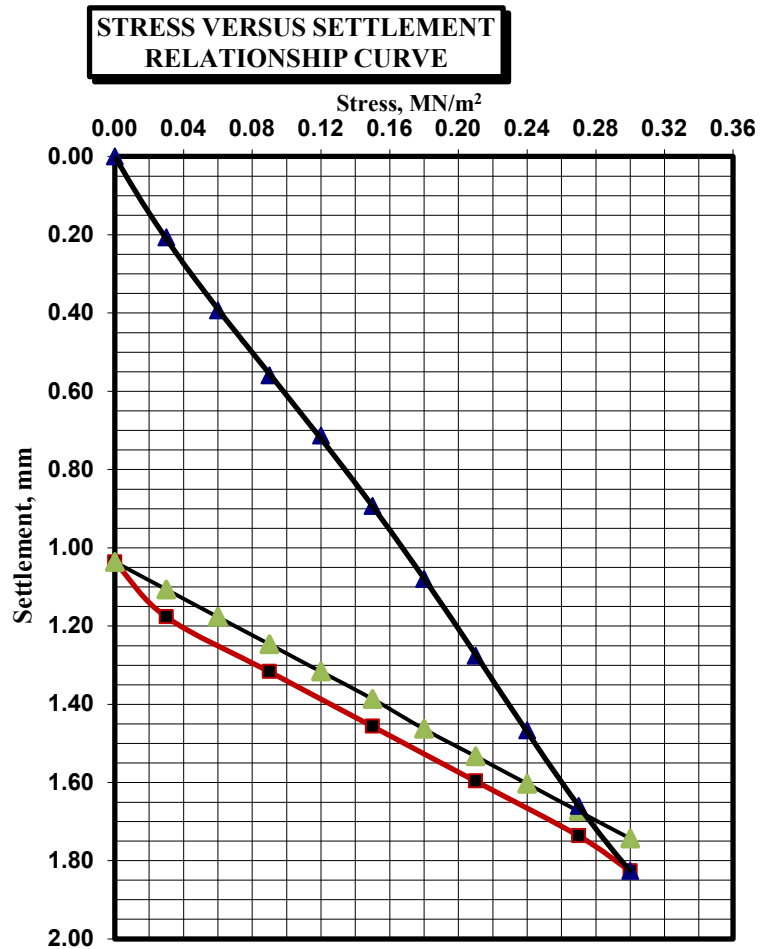
Plate Load Tests of Soils
DIN 18134

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

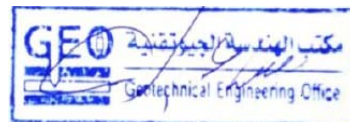
**** Note : Soil is Wet**

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, 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

$$k_s = \Delta\sigma/\Delta s \quad 164.0 \quad \text{MN/m}^3$$

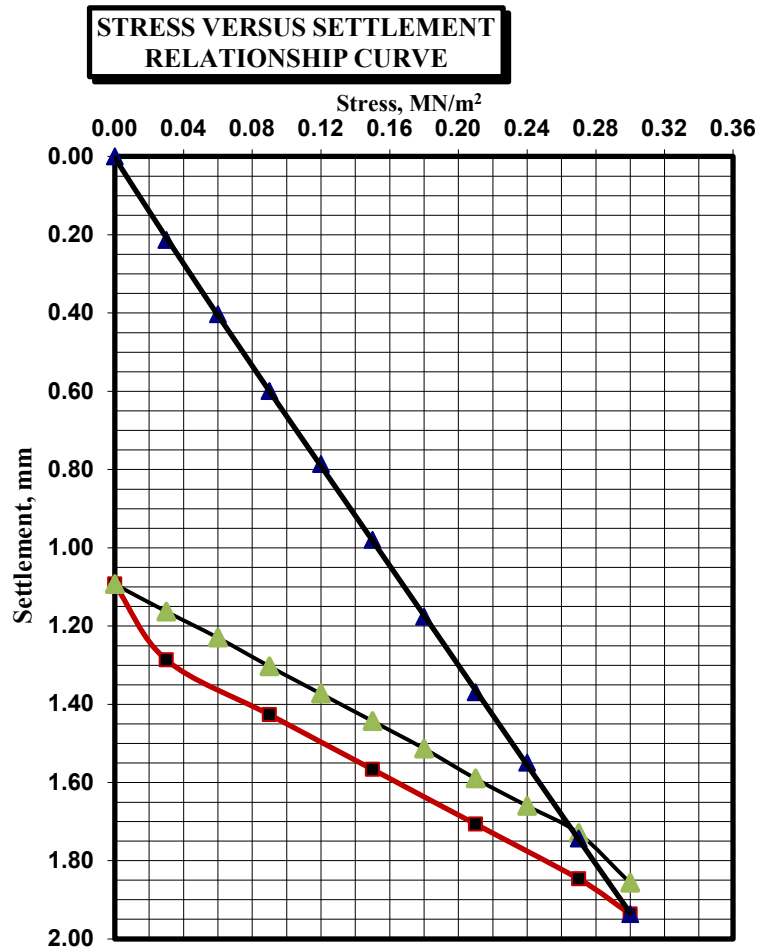
Plate Load Tests of Soils
DIN 18134

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

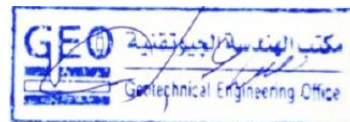
**** Note : Soil is Wet**

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

$k_s = \Delta\sigma/\Delta s$ 154.4 MN/m³

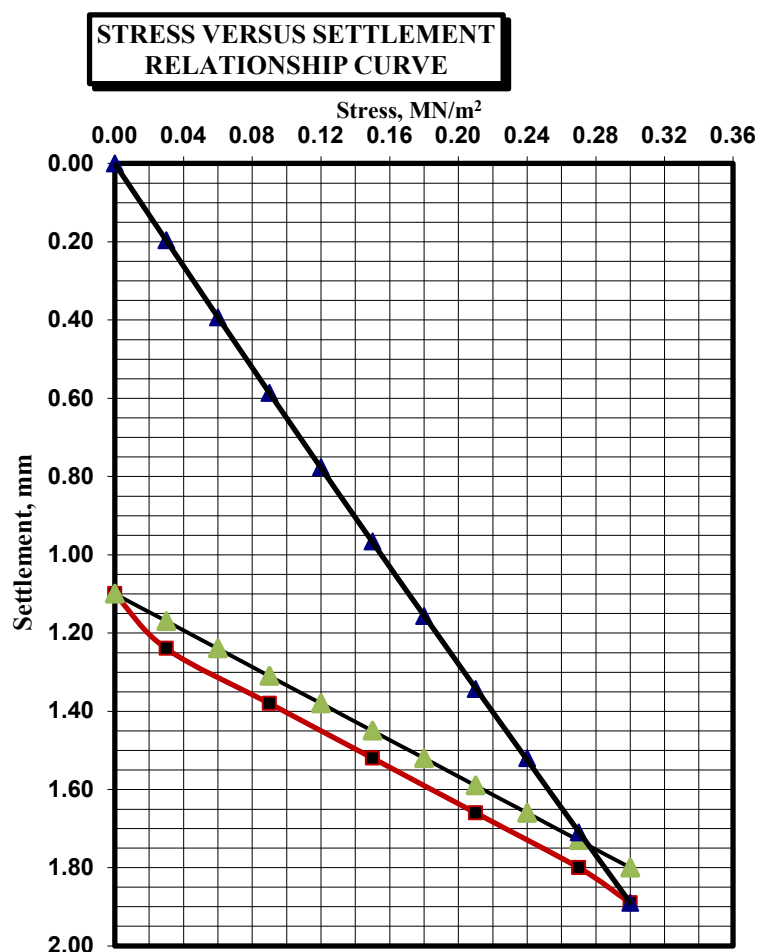
Plate Load Tests of Soils
DIN 18134

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

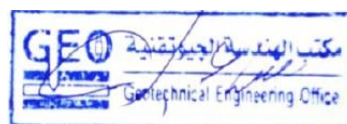
**** Note : Soil is Wet**

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

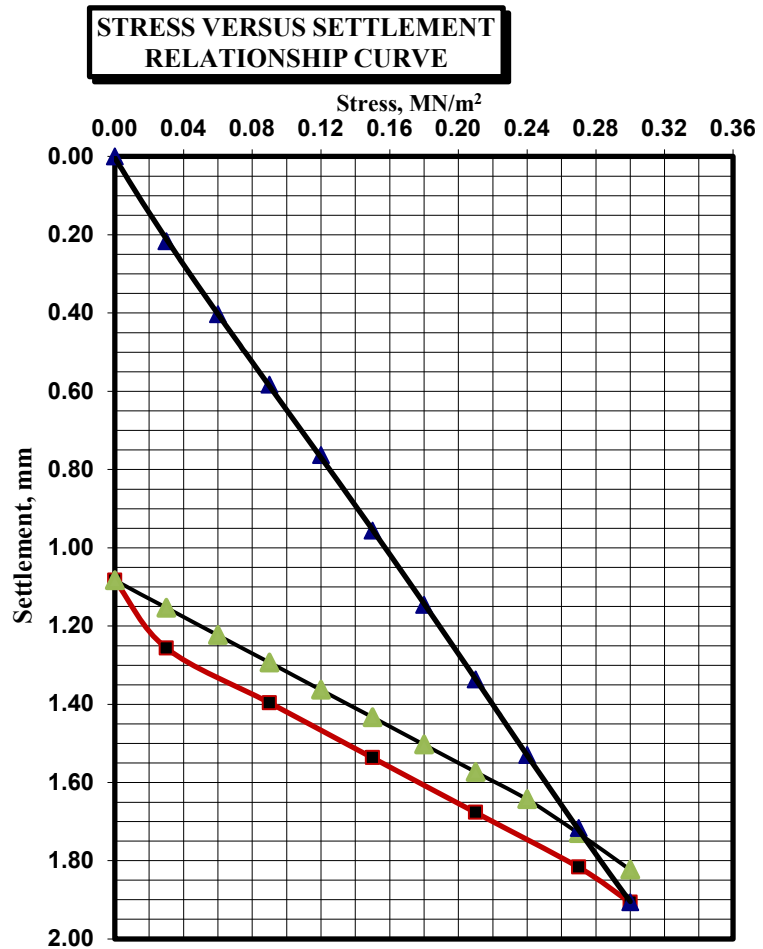
Plate Load Tests of Soils
DIN 18134

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

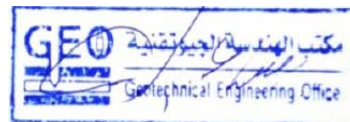
**** Note : Soil is Wet**

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

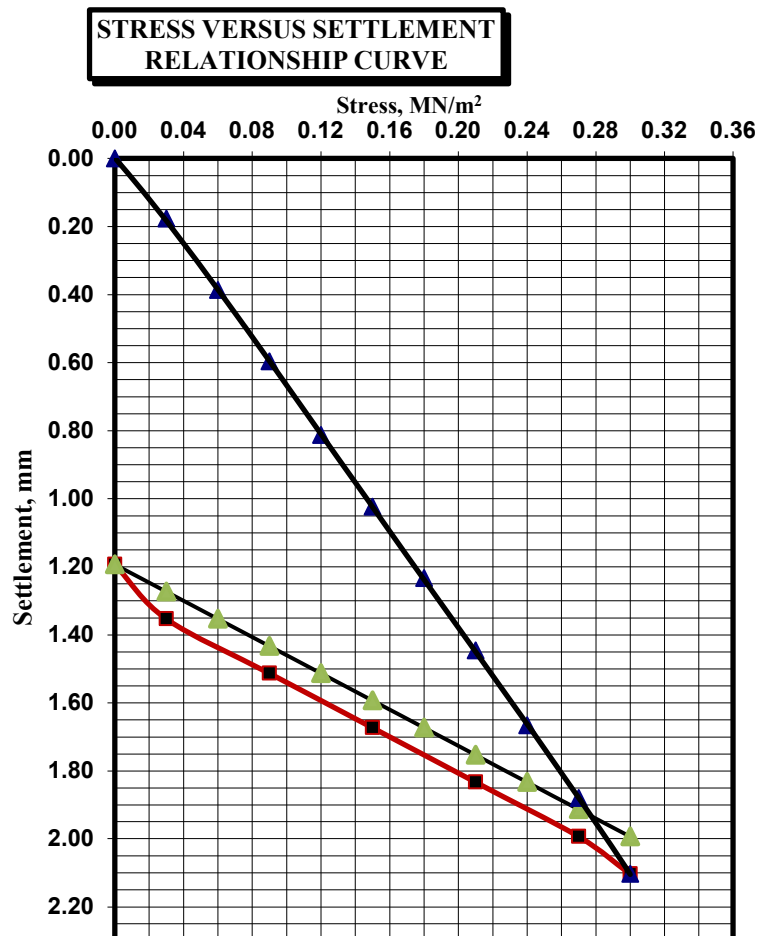
Plate Load Tests of Soils
DIN 18134

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

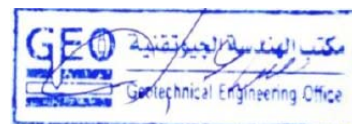
**** Note : Soil is Wet**

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

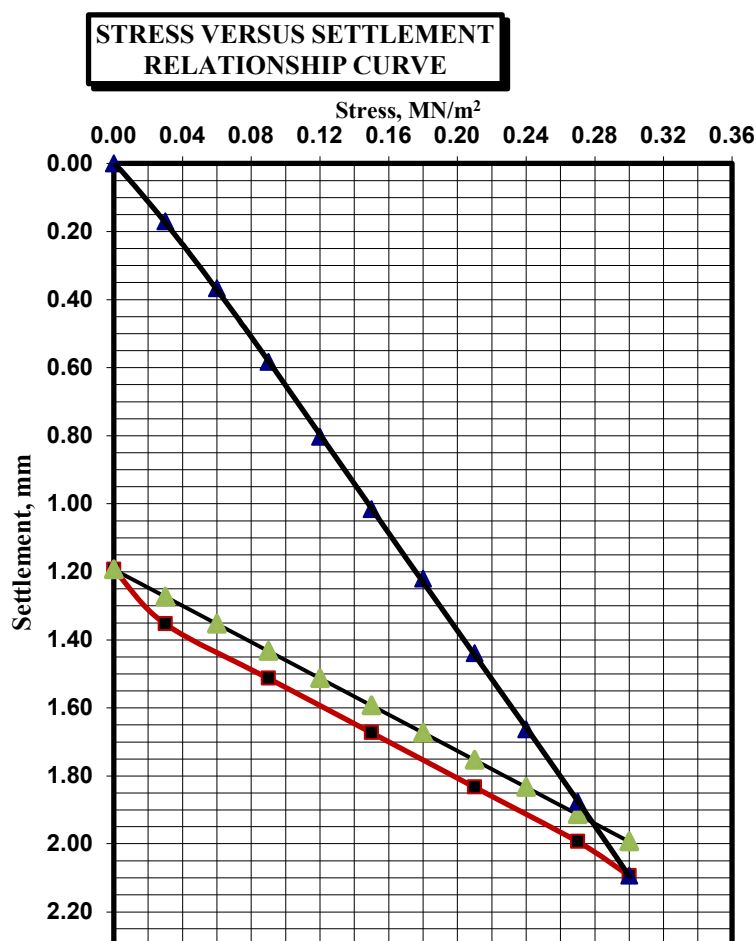
Plate Load Tests of Soils
DIN 18134

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

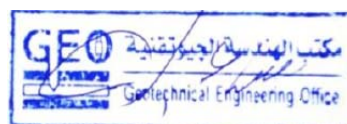
**** Note : Soil is Wet**

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, E_v

	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, K_s

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

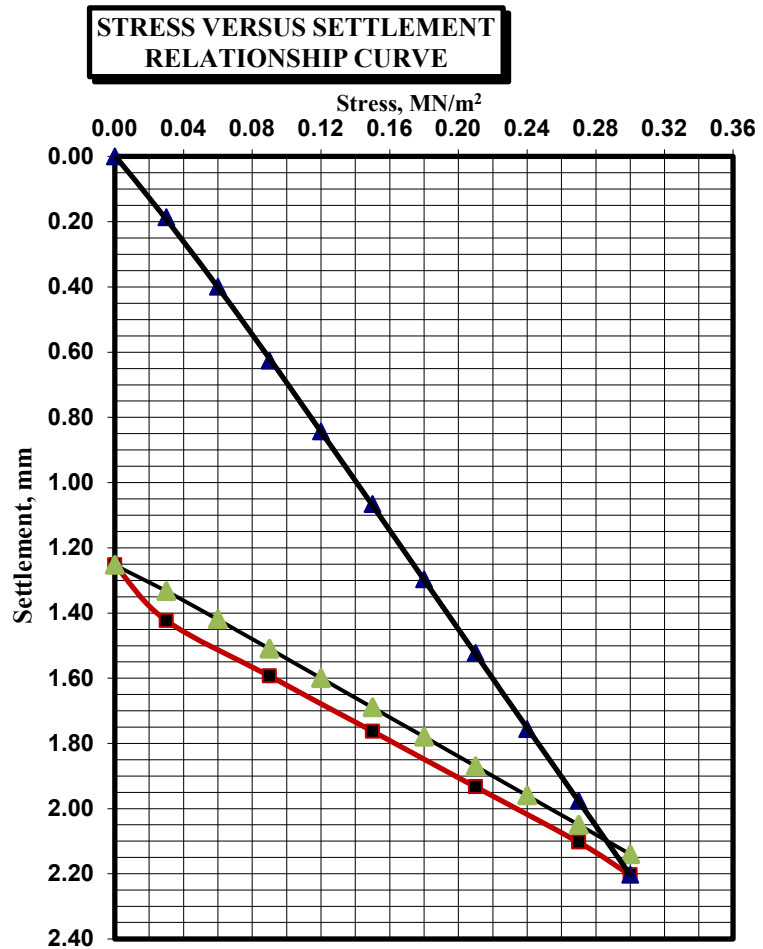
Plate Load Tests of Soils
DIN 18134

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

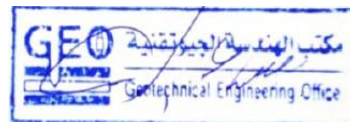
**** Note : Soil is Wet**

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

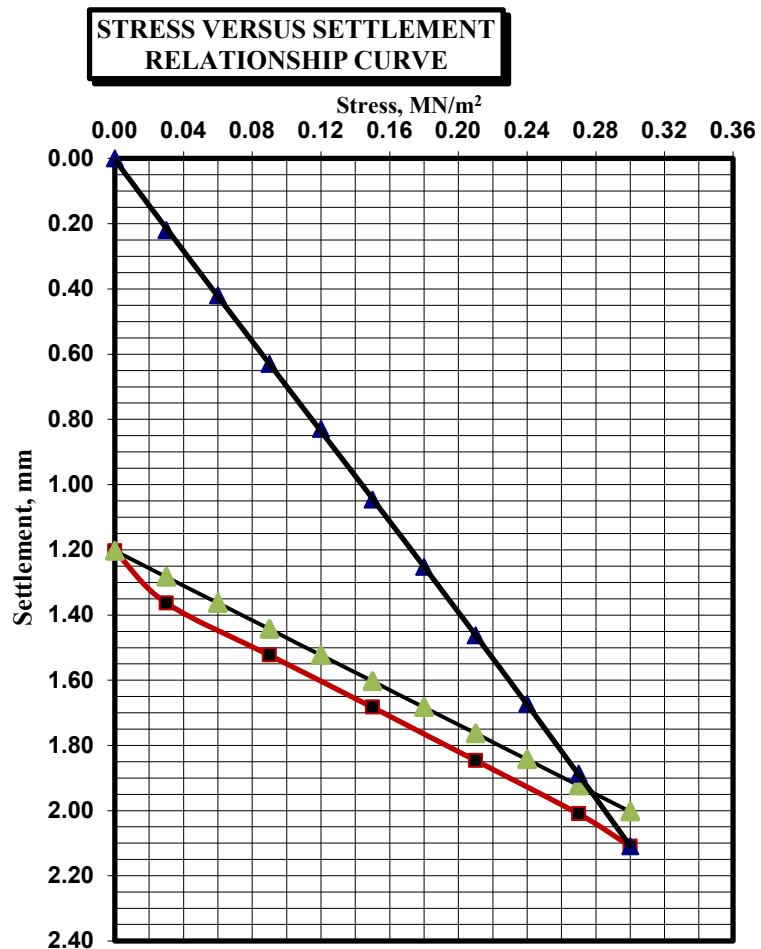
Plate Load Tests of Soils
DIN 18134

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

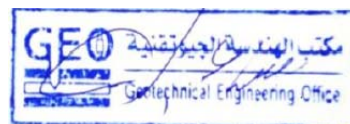
**** Note : Soil is Wet**

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

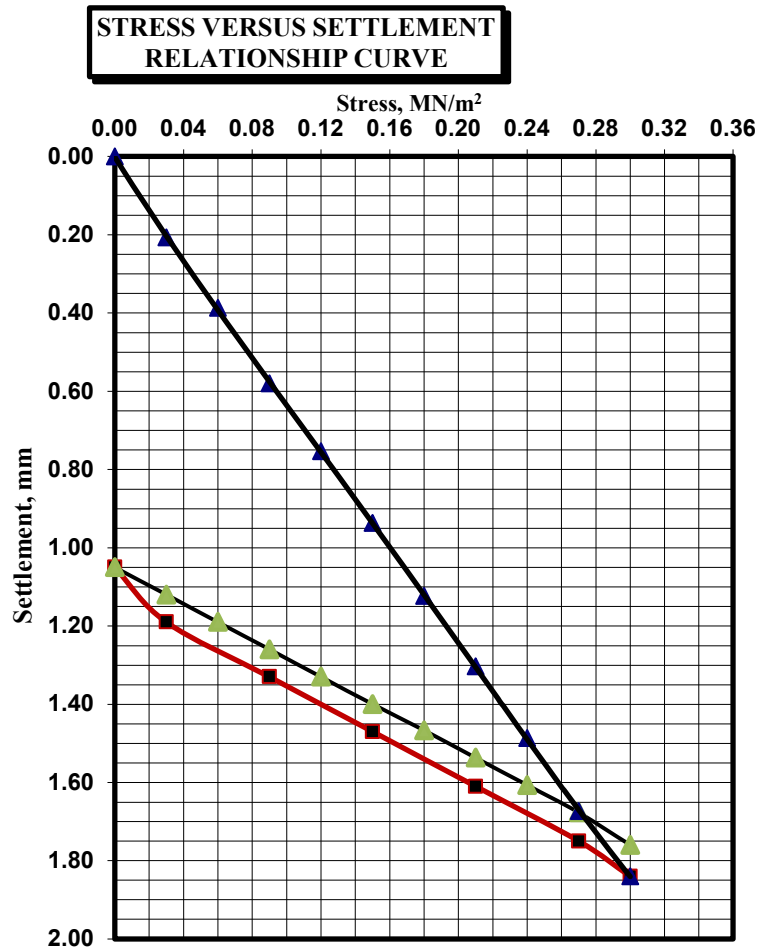
Plate Load Tests of Soils
DIN 18134

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

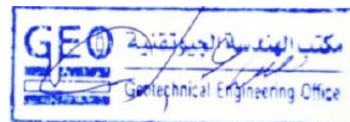
**** Note : Soil is Wet**

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

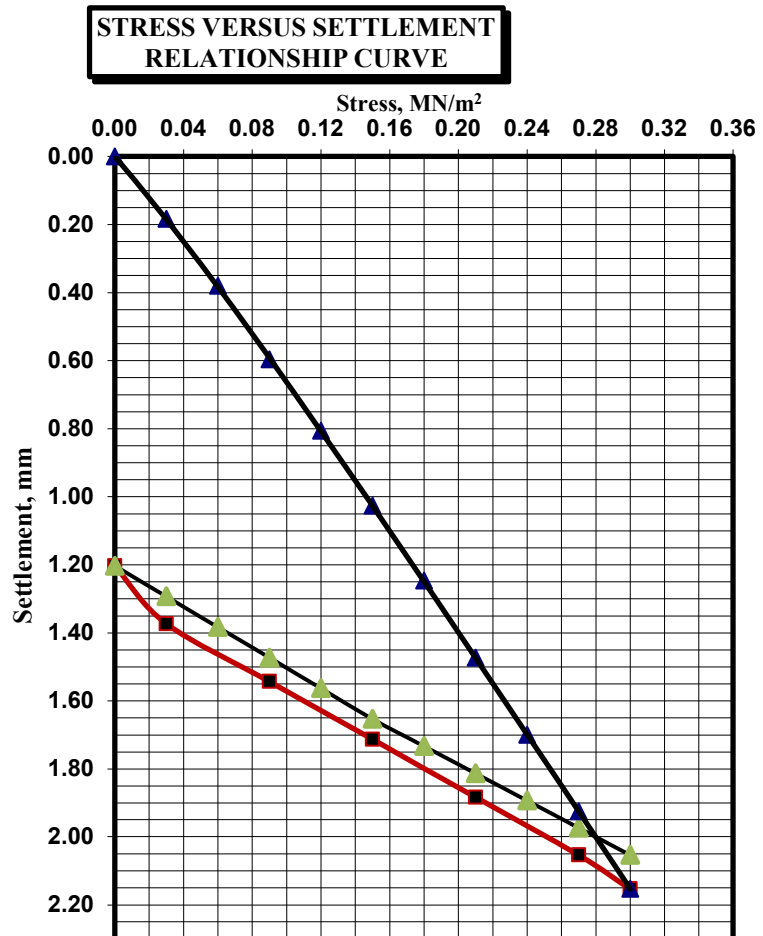
Plate Load Tests of Soils
DIN 18134

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

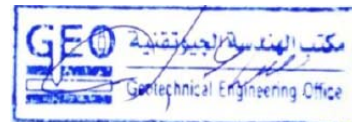
**** Note : Soil is Wet**

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

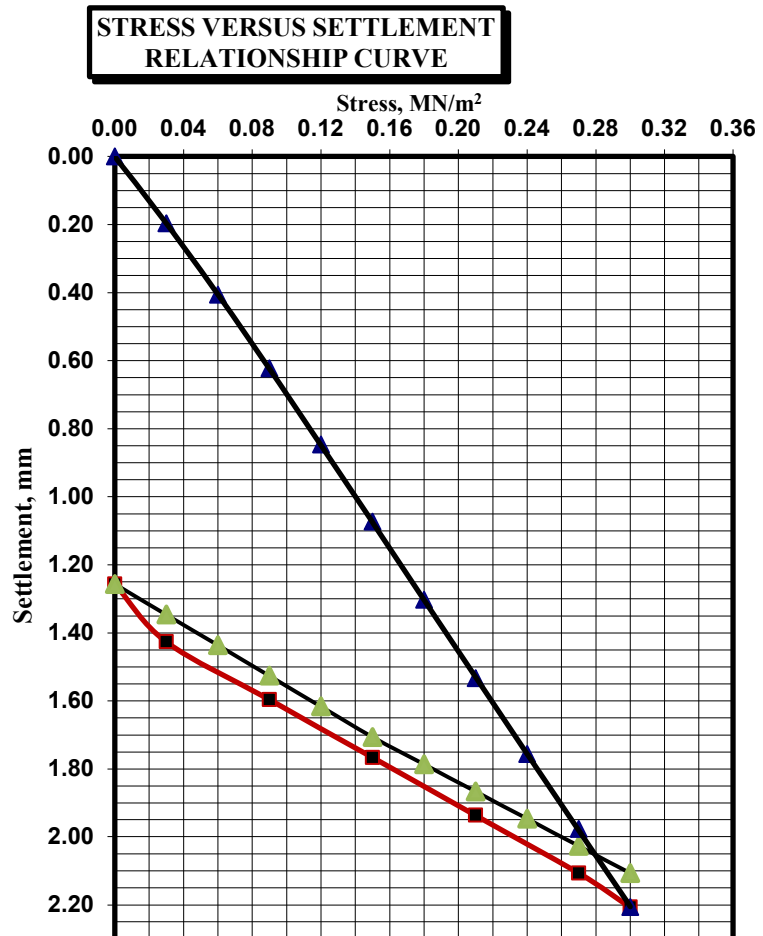
Plate Load Tests of Soils
DIN 18134

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

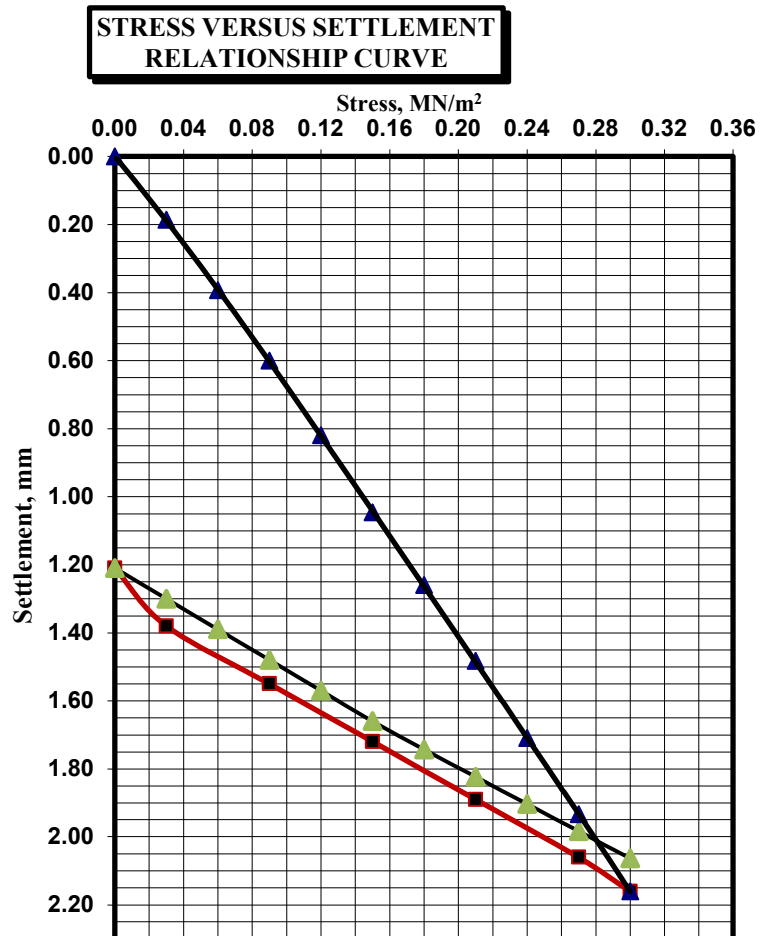
Plate Load Tests of Soils
DIN 18134

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

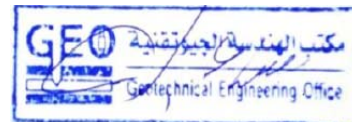
**** Note : Soil is Wet**

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

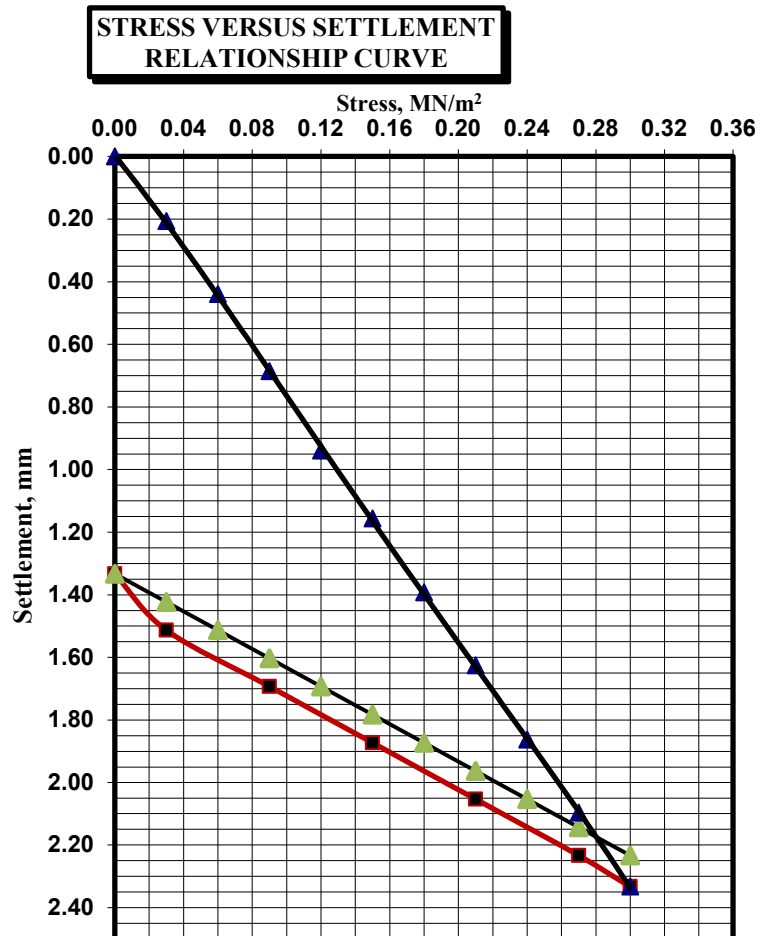
Plate Load Tests of Soils
DIN 18134

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

$k_s = \Delta\sigma/\Delta s$ 128.0 MN/m³

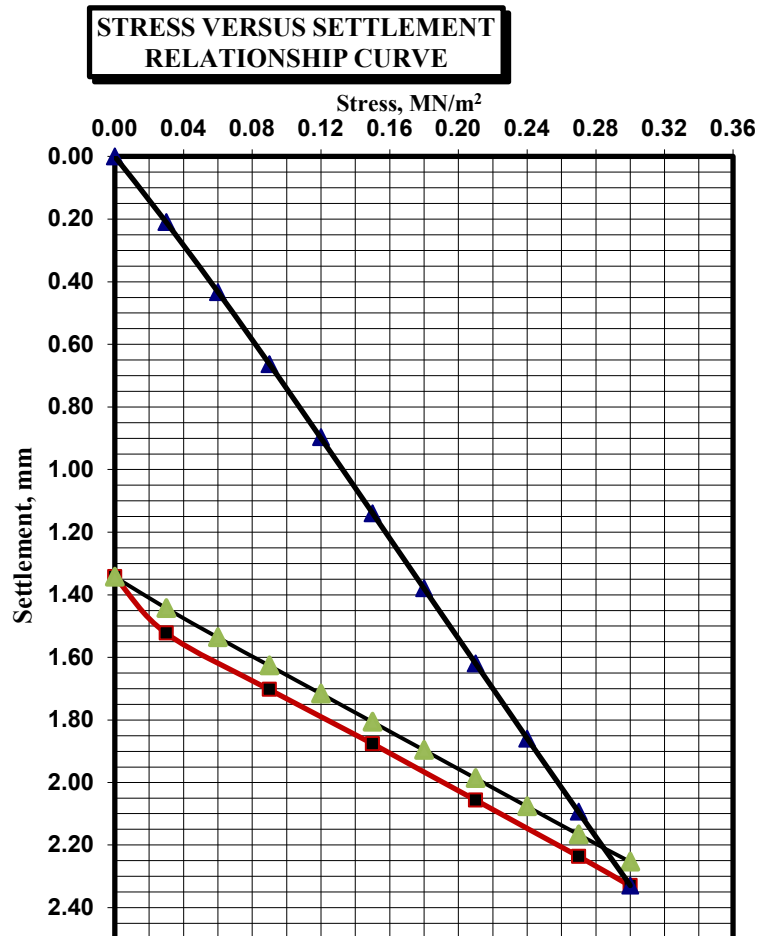
Plate Load Tests of Soils
DIN 18134

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

$k_s = \Delta\sigma/\Delta s$ 128.8 MN/m³

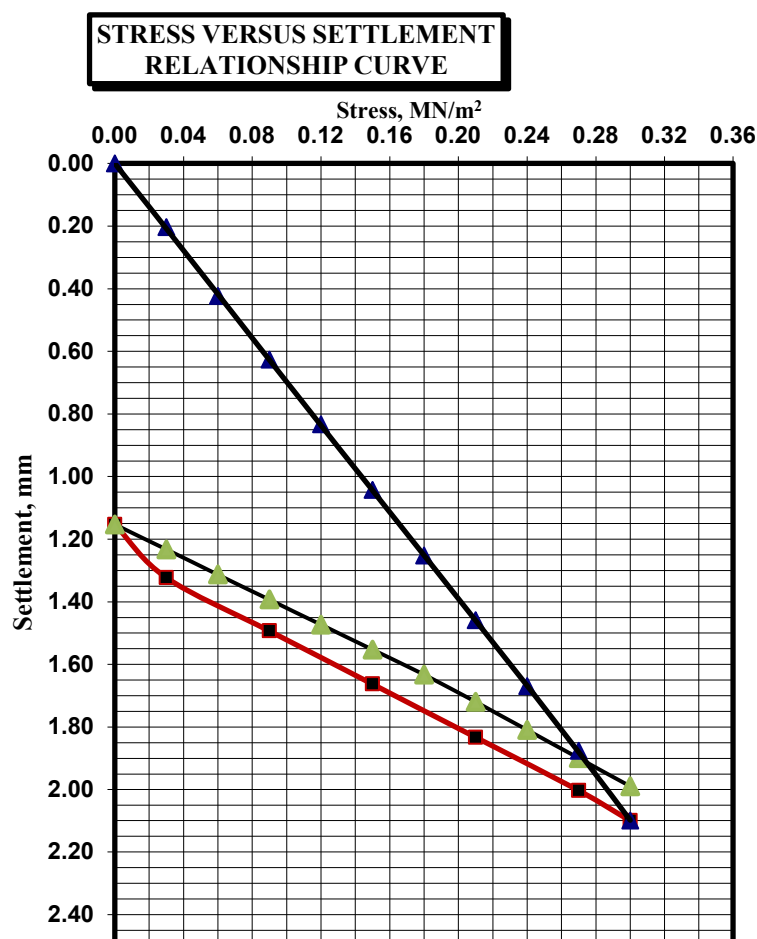
Plate Load Tests of Soils
DIN 18134

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

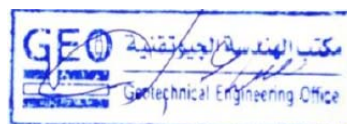
**** Note : Soil is Wet**

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

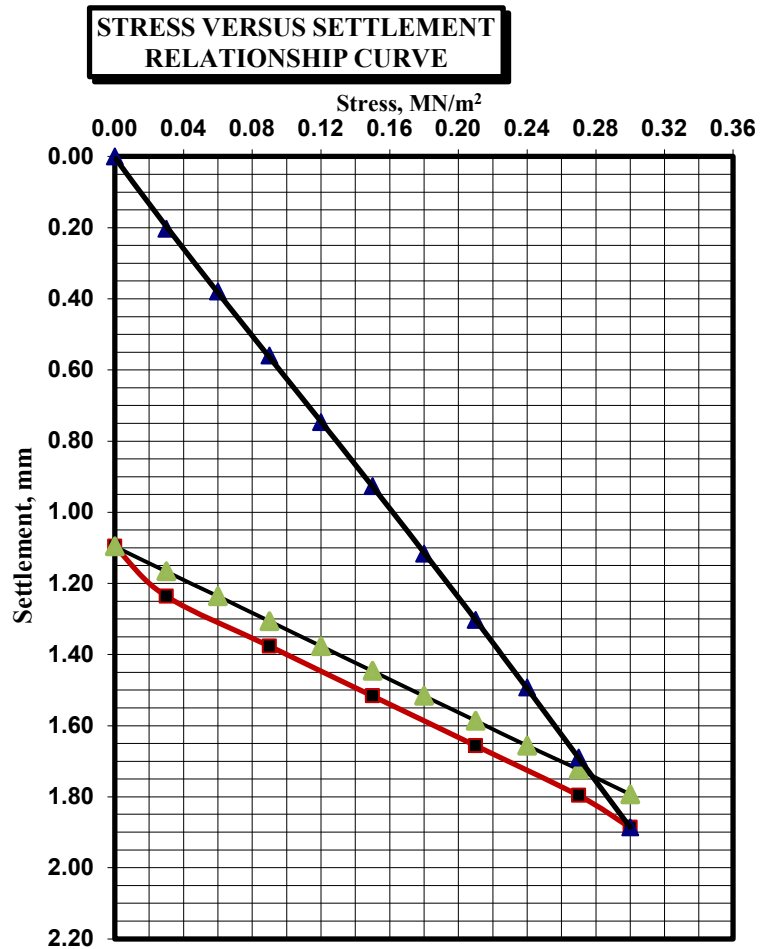
Plate Load Tests of Soils
DIN 18134

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

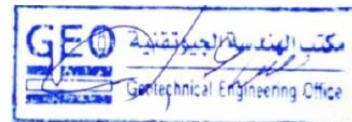
**** Note : Soil is Wet**

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

$$k_s = \Delta\sigma/\Delta s \quad 159.2 \quad \text{MN/m}^3$$

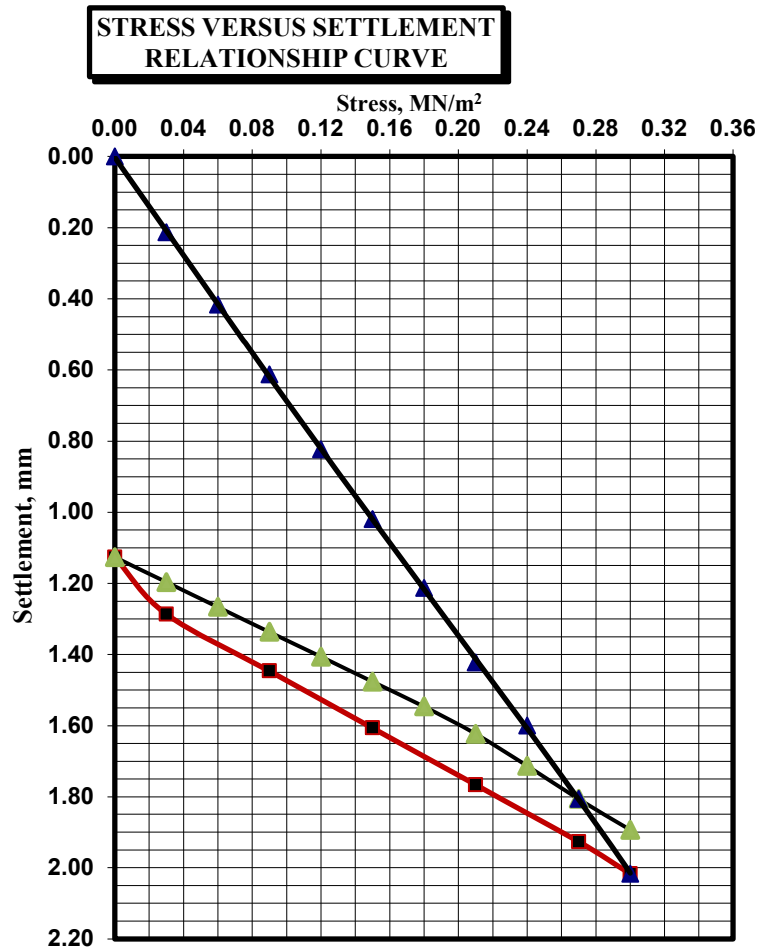
Plate Load Tests of Soils
DIN 18134

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