S5-B-IN

MATERIAL APPROVAL REQUEST

Inshaa

Contractor Company	INSHAA GENERAL OF CONSTRUCTION Company		Designer Company	(SPECTRUM) Engineering Consulting Office
	Name	Sign	Date/Serial Number	Time
Issued by Contractor	Eng. Mahmoud shaban	3 / 3 / 2023	30-03-2023 (M.A.R.) (1.1)	1:30
Received by GARB CONSULTANT	Eng. Mazen Essamy			

MAR	C1	C2	C3	DD	MM	YY	HH	MM
	372	000	[illegible]	01				

CODE-1	S1 to S21 Station Reference	D1 to S3 Depot Reference Work Activity Sub Element of Activity	Kp XXX Note For Kilometer point only Start Km is used
CODE - 2			
CODE - 3			

Description of Materials	Fill Layer Total Quantity (5000 m3) Upper Embankment		
Location to be Used	From Station (371+000) to Station (371+500)		
Sample only	Yes	Materials Type	Fill layers
Supplier Name		Data Sheet provided	Yes attached INSHAA GENERAL OF CONSTRUCTION Company contracting ASTM D (1557)
Reference in BoQ		Specification	EARTH-WORK SPECIFICATIONS & TESTING REPORT (CG21-41.21 VERSION 2 BY CIVECON GROUP
Prequalification reference		Test Samples Results	
Reference Photos	No/Yes	Other	

Comments by: Eng. Mazen Essamy (SPECTRUM)

1-Quality test Result By Third Party Lab is Approved.

2-This Sample Representive (5000 m3) only.

SPECTRUM CONSULTING

Comments by: Eng. Alaa Abd-Allatif (ER)

2-Results report attached and acceptable with the project specifications.

3-Final approval is subject to above mentioned comments

شركة انشاء للمقاولات العامة INSHAA GENERAL CONTRACTING

Wait for Chemical analysis Result

Done 8-4-2023

APPROVAL STATUS

Organisation	Name	Sign	Date	A AWC-R
Contractor	Eng. Mahmoud shaban	3 / 3 / 2023	31-03-2033	A
QA/QC *	Eng. Mazen Essamy			A
GARB**	Eng. Mohammed Fayad			
Employers Representative	Eng. Alaa Abd-Allatif	for	8-4-2023	AWC

* Designer

** Alignment/Bridges: Culvert only

File: M-A-R. 1 (2)

COMIBASSAL International Controllers
Internal inspection and laboratories sector
Accredited by : Egyption General Authority for Petroleum under No. 34/29-11-2011
Accredited by : Egyption Accreditation council (EGAC) under No. 031706/1A

I- Introduction

General Consultant	:	SYSTRA
Consultant	:	SPECTRUM
Contractor	:	شركة انشاء للمقاولات
Sample	:	FERMA
Station	:	St(371+000) to St(371+500)
Date of Test	:	31/03/2023
QC	:	1359

II- Sample description:

Gravel and sand

III- Required tests and Results

Required Tests		Results
1- Grain size analysis and classification	Grain size analysis	As showed in appendix
	Classification	A-1-a
2- Modified compaction (Proctor test)	MDD	2.116
	OMC	6.3%
3- Liquid limit, plastic limit and plasticity index	LL	Non plastic
	PL	Non plastic
	PI	Non plastic
4- California bearing ratio (CBR)	CBR ratio	42%

IV- Notes

1- Samples were brought by : Client
2- Samples are responsible from the Person who brought it.
3- The results are applying only for the present report.

SPECTRUM CONSULTING

LAB DIRECTOR

Eng / Eman kandil

Geotechnical consultant

Dr. Mohamed Mostafa Badry

شركة انشاء للمقاولات العامة
IGC
inshaa general construction

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Email : civdept@comibassal.com
WebSite : www.comibassal.com

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Tel: 002 033920176 - 002 033931482
Fax :002 033900476
Email : internal-inspection@comibassal.com

PARTICLE SIZE DISTRIBUTION ANALYSIS
ASTM C-136 / AASHTO T27

	WEIGHT RETAINED (gm)	CUMULATIVE WEIGHT RETAINED (gm)	CUMULATIVE PERCENTAGE RETAINED (%)	CUMULATIVE PERCENTAGE PASSING (%)	STANDURD SPECIFICATION LIMITS	
2	158.00	158.00	1.58	98.4		
1 1/2	358.00	516.00	5.16	94.8		
1	965.00	1481.00	14.81	85.2		
3/4	957.00	2438.00	24.38	75.6		
1/2	1050.00	3488.00	34.88	65.1		
3/8	785.00	4273.00	42.73	57.3		
No.4	1387.00	5660.00	56.60	43.4		
No.10	60.00	60.00	12.00	38.2		
No.40	174.00	174.00	34.80	28.3		
No.200	387.00	387.00	77.40	9.8		

Total sample weight = 10000.00 pass No.4= 4340.0 Total fine aggregates weight = 500 gm
% 43.4

Soil classification: A- 1- a (Non Plastic)

Modified Proctor Test Report
ASTM - D 1557

Mould Number :- 1
Volume of mould = 2120 cm³
Weight of mould = 5657 g
G.S = 2.6 g/cm3

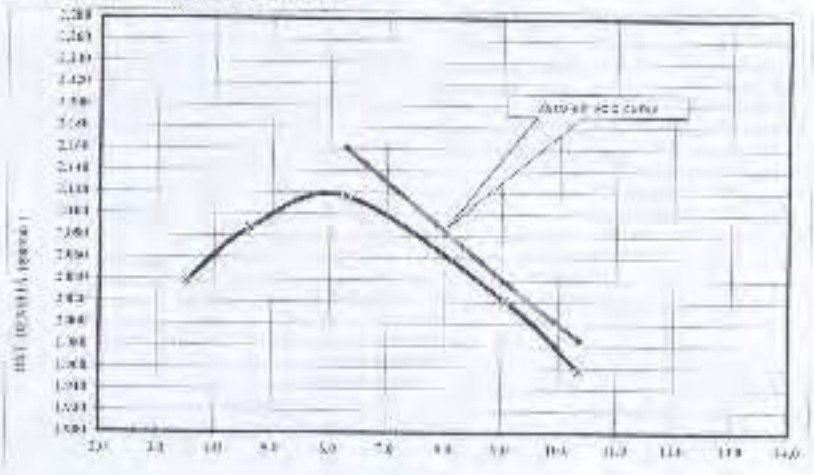
A- Density Calculations :-

	1	2	3	4	5
Weight of wet soil+mould (g)	10130	10285	10425	10330	10236
Weight of mould (g)	5657	5657	5657	5657	5657
Weight of wet soil (g)	4473	4628	4768	4673	4579
Volume of mould (cm³)	2120	2120	2120	2120	2120
Wet density (g/cm³)	2.110	2.183	2.249	2.204	2.160
Dry density (g/cm³)	2.038	2.087	2.116	2.021	1.957
Zero-air Void curve			2.160	2.038	1.986

B- Moisture Calculations :-

Weight of wet soil+container (g)	250.0	250.0	250.0	250.0	250.0
Weight of dry soil+container (g)	244.3	242.5	240.0	236.2	234.8
Weight of container (g)	82.0	80.0	81.0	84.0	88.0
moisture content(%)	3.5	4.6	6.3	9.1	10.4

C- Dry density-Moisture relationship:-



M.D.D= 2.116 gm/cm³
O.M.C= 6.3 %

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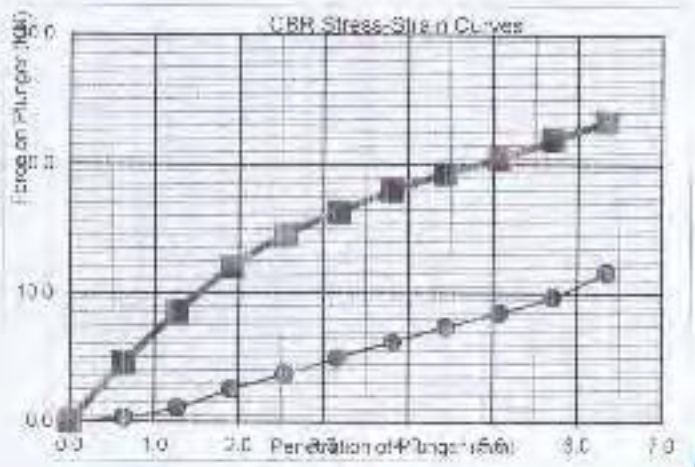
Accredited by : Egyption Accreditation council (EGAC) under No. 031706/LA

Report Of CBR Test - ASTM - D 1883

NO OF BLOWS	56			Swell %			
MOULD NO	1				56		
WT OFMOULD+SOIL	11930			Start	0.00		
WT OF MOULD	7010			End	0.00		
WT OF SOIL	4920			Swell	0.00		
VOLUME OF MOULD	2198						
WET DENSITY	2.238						
	MC before soaking			Weight of Rammer			4.54Kg
TIN NO	1				MDD	Kg/m3	2.116
WT OF WET SOIL+TIN	250.00						
WT OF DRY SOIL+TIN	240.5				OMC	%	6.3
WT OF WATER	9.50						
WT OF TIN	92				PROVING RING		
WT OF DRY SOIL	148.5				Div/KN		0.0210
MOISTURE CONTENT	6.4						
DRY DENSITY	2.104				Capacity (KN)		50

Pen	Reading (Div)			Bearing (KN)			CBR		
mm	56			56			standar	56	
0.00	0			0.0			0.0		
0.64	32			0.3			4.5		
1.27	108			1.1			8.6		
1.91	255			2.5			12.0		
2.54	375			3.7			14.5	28	
3.17	505			5.0			16.3		
3.81	632			6.2			18.0		
4.45	753			7.4			19.3		
5.08	865			8.5			20.5	42	
5.71	987			9.7			21.9		
6.35	1186			11.6			23.3		



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Report	:	541 - 1 - Center
Date	:	08/06/2023

CHEMICAL ANALYSIS

General Consultant	:	SYSTRA
Consultant	:	SPECTRUM
Contractor	:	شركة انشاء للمقاولات
Project	:	Electric express train
Sample	:	FERMA
Station	:	ST (371 +0.00) : (371 + 500)
Date of Test	:	31-3-2023

Temperature : 25 °C Humidity : 40%

ANALYSIS	RESULTS	TEST METHOD
ORGANIG MATTER	NEGATIVE	ASTM D 2974

LAB DIRECTOR
CH/ Mostafa Asker
Por Amany Amin

SPECTRUM CONSULTING

شركة انشاء للمقاولات العامة
IGC
inshaa general construction

S5-B-IN

MATERIAL APPROVAL REQUEST

Inshaa

Contractor Company	INSHAA GENERAL OF CONSTRUCTION Company			Designer Company		(SPECTRUM) Engineering Consulting Office			
Issued by Contractor	Name	Sign		Date/Serial Number		Time			
	Eng. Mohamed Hassan			07-04-2023 (M.A.R.) Rev (P.S.G.1)		1:30			
Received by GARB CONSULTANT	Eng. Mazen Essamy		MAR	C1	C2	C3	DD	MM	YY	HH	MM
				371	EW	C5	08	04	23	10	30

CODE-1	S1 to S21 Station Reference	D1 to S3 Depot Reference	Kp XXX Note For Kilometer point only Start Km is used
CODE - 2	Work Activity		
CODE - 3	Sub Element of Activity		

Description of Materials	Prepared Subgrade Total Quantity (5000 m3)		
Location to be Used	From Station (371+000) to Station (371+500)		
Sample only	Yes	Materials Type	Prepared Subgrade
Supplier Name		Data Sheet provided	Yes attached INSHAA GENERAL OF CONSTRUCTION Company contracting ASTM D (1557)
Reference in BoQ	4.11	Specification	EARTHWORK SPECIFICATIONS & TESTING REPORT (CG21-41.2) VERSION 2 BY CIVECON GROUP
Prequalification reference		Test Samples Results	
Reference Photos	No/Yes	Other	

Comments by: Eng. Mazen Essamy (SPECTRUM)	Comments by: Eng. Alaa Abd-Allatif (ER)
1-Quality test Result By Third Party Lab is Approved. 2-This Sample Representive (5000 m3) only.	1- All tests were carried-out by third Party lab (combassal international) 2-Results report attached and acceptable with the project specifications. 3-Final approval is subject to above mentioned comments.

APPROVAL STATUS				
Organisation	Name	Sign	Date	A-AWC-R
Contractor	Eng. Mohamed Hassan		08-04-2023	A
QA/QC *	Eng. Mazen Essamy			A
GARB**	Eng. Mohammed Fayad			
Employers Representative	Eng. Alaa Abd-Allatif		12-4-2023	Awc

* Designer
** Alignment/Bridges/ Culvert only

I- Introduction

General Consultant	:	SYSTRA
Consultant	:	SPECTRUM
Contractor	:	شركة انشاء للمقاولات
Sample	:	Prepare Sub-Grade
Station	:	St(371+000) to st(371+500)
Date of Test	:	08/04/2023
QC	:	883-3

II- Sample description:

Crushed stone and sand

III- Required tests

1- Grain size analysis and classification
2- Modified compaction (Proctor test)
3- Liquid limit, plastic limit and plasticity index
4- California bearing ratio (CBR)
5- Specific gravity (SG)
6- Los Angeles test

شركة انشاء للمقاولات العامة IGC
Inshaa general construction

IV- Results

1- Grain size analysis and classification	Grain size analysis	As showed in appendix
	Classification	A-1-a
2- Modified compaction(Proctor test)	MDD	2.155
	OMC	6.30%
3- Liquid limit, plastic limit and plasticity index	LL	Non plastic
	PL	Non plastic
	PI	Non plastic
4- California bearing ratio (CB	CBR ratio	92%
5- Specific gravity (SG), absorption and degradation	S S D	2.569
	Absorption	1.2%
	Degradation	0.2%
6- Los Angeles test	Abrasion ratio	27.2%

LAB DIRECTOR
Eman
Eng / Eman kandil

COMIBASSAL INTERNATIONAL CONTROLLERS

Geotechnical consultant
For. Dr. M
Dr. Mohamed Mostafa Badr

SPECTRUM CONSULTING

APPENDIX

COMIBASSAL International Controllers
Internal inspection and laboratories sector
Accredited by : Egyption General Authority for Petroleum under No. 34/29-11-2011
Accredited by : Egyption Accreditation council (EGAC) under No. 031706/1A

PARTICLE SIZE DISTRIBUTION ANALYSIS
ASTM C-136 / AASHTO T27

	WEIGHT RETAINED (gm)	CUMULATIVE WEIGHT RETAINED (gm)	CUMULATIVE PERCENTAGE RETAINED (%)	CUMULATIVE PERCENTAGE PASSING (%)	STANDURD SPECIFICATION LIMITS	
5	0.00	0.00	0.00	100.0	100	100
4	0.00	0.00	0.00	100.0	95	100
3	0.00	0.00	0.00	100.0	75	100
1.5	150.00	150.00	1.54	98.5	50	100
3/4	4355.00	6085.00	62.45	37.5	25	75
3/8	1255.00	7338.00	75.34	24.7	15	50
No.10	138.00	138.00	27.60	17.9	0	35
No.200	405.00	405.00	81.00	4.7	0	12

Total sample weight = 9740.00 pass No.3/8= 3980.0 Total fine aggregates weight = 500 gm\
3/8 40.9

Soil classification: A-1-a (Non Plastic)

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Internal inspection and laboratories sector
Accredited by : Egyption General Authority for Petroleum under No. 34/29-11-2011
Accredited by : Egyption Accreditation council (EGAC) under No. 031706/1A

Modified Proctor Test Report
ASTM - D 1557

Mould Number :- 1
Volume of mould = 2190 cm³
Weight of mould = 7047 g
G.S = 2.56 g/cm3

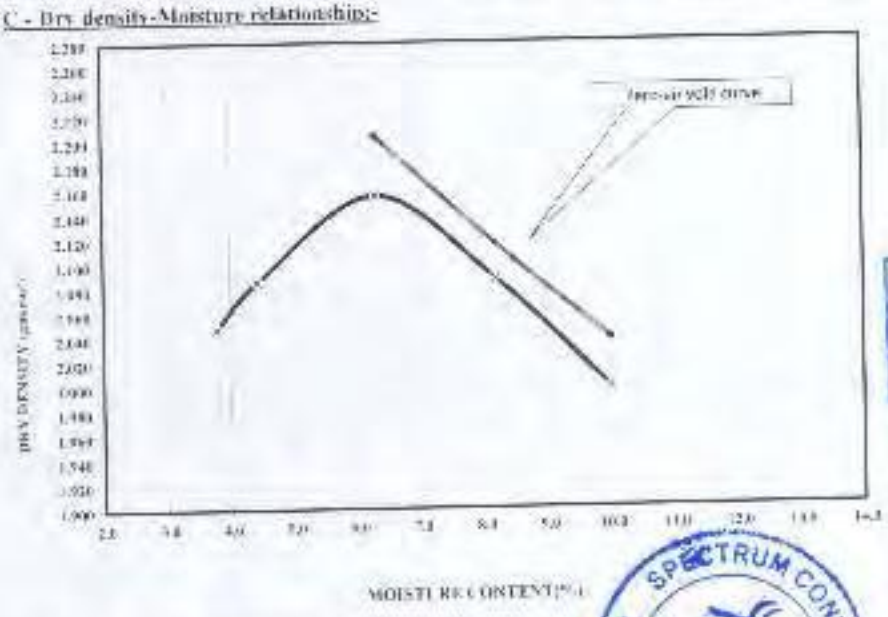
A- Density Calculations :-

	1	2	3	4	5
Weight of wet soil+mould (g)	11700	11818	12065	11993	11860
Weight of mould (g)	7047	7047	7047	7047	7047
Weight of wet soil (g)	4653	4771	5018	4946	4813
Volume of mould (cm³)	2190	2190	2190	2190	2190
Wet density (g/cm³)	2.125	2.179	2.291	2.258	2.198
Dry density (g/cm³)	2.047	2.086	2.155	2.087	1.998
Zero-air Void curve			2.204	2.116	2.038

B- Moisture Calculations :-

Weight of wet soil+container (g)	250.0	250.0	250.0	250.0	250.0
Weight of dry soil+container (g)	244.0	243.0	240.2	237.5	235.0
Weight of container (g)	85.5	85.5	85.0	85.0	85.0
moisture content(%)	3.8	4.4	6.3	8.2	10.0

C - Dry density-Moisture relationship:-



M.D.D= 2.155 gm/cm³
O.M.C= 6.30 %

شركة انشاء للمقاولات العامة IGC
insha general construction

SPECTRUM CONSULTING

COMIBASSAL INTERNATIONAL CONTROLLERS

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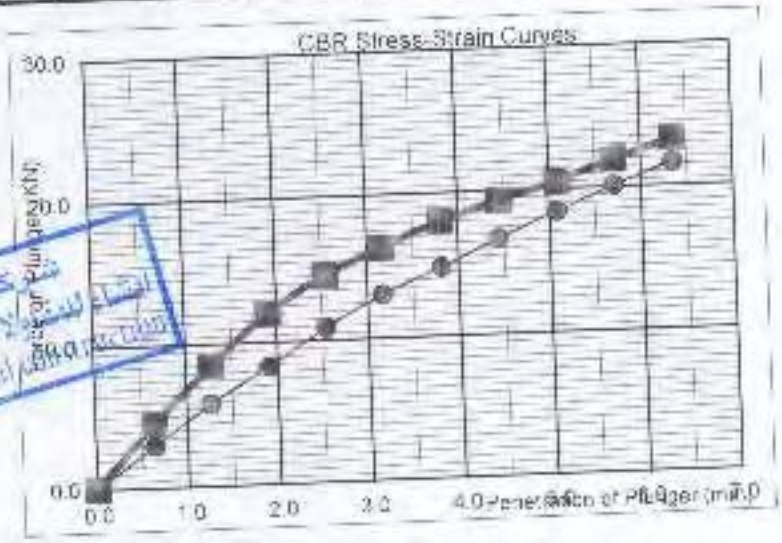
SOCOTEC UKAS EGAC Accredited

COMIBASSAL International Controllers
Internal inspection and laboratories sector
Accredited by : Egyption General Authority for Petroleum under No. 34/29-11-2011
Accredited by : Egyption Accreditation council (EGAC) under No. 031706/1A

Report Of CBR Test - ASTM - D 1883

NO OF BLOWS	56			Swell %			
MOULD NO	1				56		
WT OFMOULD+SOIL	12120			Start	0.00		
WT OF MOULD	7047			End	0.00		
WT OF SOIL	5073			Swell	0.00		
VOLUME OF MOULD	2196						
WET DENSITY	2.316						
	MC before soaking			Weight of Rammer			4.54Kg
					MDD	Kg/m3	2.171
TIN NO	1						
WT OF WET SOIL+TIN	250.00				OMC	%	6.3
WT OF DRY SOIL+TIN	240						
WT OF WATER	10.00				PROVING RING		
WT OF TIN	92				DIWKN		
WT OF DRY SOIL	148	2.125					
MOISTURE CONTENT	6.8						
DRY DENSITY	2.172				Capacity (KN)		50

	97			Reading (KN)			CBR		
Pen. mm	56			56			standar	56	
0.00	0			FALSE			0.0		
0.64	302			3.0			4.5		
1.27	595			5.8			8.5		
1.91	850			8.3			12.3		
2.54	1110			10.9			14.5	82	
3.17	1320			13.0			16.3		
3.81	1510			14.8			18.0		
4.45	1700			16.7			19.3		
5.08	1880			18.4			20.5	92	
5.71	2050			20.1			21.9		
6.35	2210			21.7			23.3		



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Absorption & Specific Gravity for Aggregate
AASHTO T85 - ASTM C127

Weight of sample	2500
Weight of saturated - dry surface sample (B)	2525
Weight of saturated sample in water (C)	1542
Weight of dry sample aftre heating (A)	2495

Results:-

Saturation surface dry spicific gravity = B / (B-C)	2.569
Bulk spicific gravity = A / (B-C)	2.538
Apparent spicific gravity = A /(A-C)	2.618
Asorbtion of water = (B-A)/A*100	1.2
Degradation of aggregate = (2500-A)/ A*100	0.2

ABRASION AND IMPACT " LOS ANGELES " TEST

(For coarse aggregate)

ASTM- C 131-96 / AASHTO-T-96

Speed	Rotate at 30 to 33 Rpm For 500 Revolution
Trial Grading	A
Intitial Weight (W1) gms	5000
Weight of tested sample (W2) gms Retained on sieve No.12	3640
% abrasion By Weight Passing from Sieve No.12	27.2%

شركة انشاء للمقاولات العامة
IGC
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COMIBASSAL
INTERNATIONAL CONTROLLERS

COMIBASSAL International Controllers
Internal inspection and laboratories sector
Accredited by : Egyption General Authority for Petroleum under No. 34/29-11-2011
Accredited by : Egyption Accreditation council (EGAC) under No. 031706/1A

Report	:	379 - 6 - Center
Date	:	12/04/2023

CHEMICAL ANALYSIS

General Consultant	:	SYSTRA
Consultant	:	SPECTRUM
Contractor	:	شركة انشاء للمقاولات
Project	:	Electric express train
Sample	:	Prepard Sub Grade
Station	:	ST (373 +0.00) : (374 +0.00)
Date of Test	:	8-4-2023

Temperature : 20 °C

Humidity : 40%

ANALYSIS	RESULTS	TEST METHOD
CHLORIDE	0.0014%	ASTM D 2974
SULPHATE	0.0080%	
ORGANIG MATTER	NEGATIVE	

LAB DIRECTOR
CH/ Mostafa Asker

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S5-B-IW

MATERIAL APPROVAL REQUEST

Inshaa

Contractor Company	INSHAA GENERAL OF CONSTRUCTION Company		Designer Company	(SPECTRUM) Engineering Consulting Office
	Name	Sign	Date/Serial Number	Time
Issued by Contractor	Eng. Mahmoud shaban		28-04-2023 (M.A.R.) Rev (B.S.1)	1:30
Received by GARB CONSULTANT	Eng. Mazen Essamy	MAR		

C1	C2	C3	DD	MM	YY	HH	MM
371	EM	CS	29	04	23	01	30

CODE-1	S1 to S21 Station Reference	D1 to S3 Depot Reference	Kp XXX Note For Kilometer point only Start Km is used
CODE - 2	Work Activity		
CODE - 3	Sub Element of Activity		

Description of Materials	Sub-Ballast Total Quantity (5000 m3)		
Location to be Used	From Station (371+000) to Station (371+500)		
Sample only	Yes	Materials Type	Prepared Subgrade
Supplier Name		Data Sheet provided	Yes attached INSHAA GENERAL OF CONSTRUCTION Company contracting ASTM D (1557)
Reference in BoQ		Specification	EARTHWORK SPECIFICATIONS & TESTING REPORT (C621-41.2) VERSION 2.29 CIVECON GROUP
Prequalification reference		Test Samples Results	
Reference Photos	No/Yes	Other	

Comments by: Eng. Mazen Essamy (SPECTRUM)	Comments by: Eng. Alaa Abd-Allatif (ER)
1-Quality test Result By Third Party Lab is Approved 2-This Sample Representive (5000 m3) only.	1- All tests were carried out by third party (combassal international) 2-Results report attached and acceptable with the project specifications. 3-Final approval is subject to above mentioned comments.

SPECTRUM CONSULTING

شركة انشاء العامة للمقاولات
inshaa general construction

APPROVAL STATUS				
Organisation	Name	Sign	Date	A-AWC-R
Contractor	Eng. Mohamed Hassan		29-04-2023	A
QA/QC *	Eng. Mazen Essamy			A
GARB**	Eng. Mohammed Fayad			
Employers Representative	Eng. Alaa Abd-Allatif		6-5-2023	AWC

* Designer

** Alignment/Bridges, Culvert only

I- Introduction

General Consultant	:	SYSTRA
Consultant	:	SPECTRUM
Contractor	:	شركة إنشاء للمقاولات
Sample	:	Sub-Ballast
Station	:	St(371+0.00) to st(371+500)
Date of Test	:	29/04/2023
QC	:	1034-1

II- Sample description:

Crushed stone and sand

III- Required tests

1- Grain size analysis and classification
2- Modified compaction (Proctor test)
3- Liquid limit, plastic limit and plasticity index
4- California bearing ratio (CBR)
5- Specific gravity (SG)
6- Los Angeles test

شركة إنشاء للمقاولات العامة IGC
inshaa general construction

IV- Results

1- Grain size analysis and classification	Grain size analysis	As showed in appendix
	Classification	A-1-a
2- Modified compaction (Proctor test)	MDD	2.184
	OMC	7.5%
3- Liquid limit, plastic limit and plasticity index	LL	Non plastic
	PL	Non plastic
	PI	Non plastic
4- California bearing ratio (CBR)	CBR ratio	95%
5- Specific gravity (SG), absorption and degradation	S S D	2.579
	Absorption	1.3%
	Degradation	0.2%
6- Los Angeles test	Abrasion ratio	30%

LAB DIRECTOR
Eman
Eng / Eman kandil

COMIBASSAL INTERNATIONAL CO.

Geotechnical consultant
For. Dr. M
Dr. Mohamed Mostafa Badry

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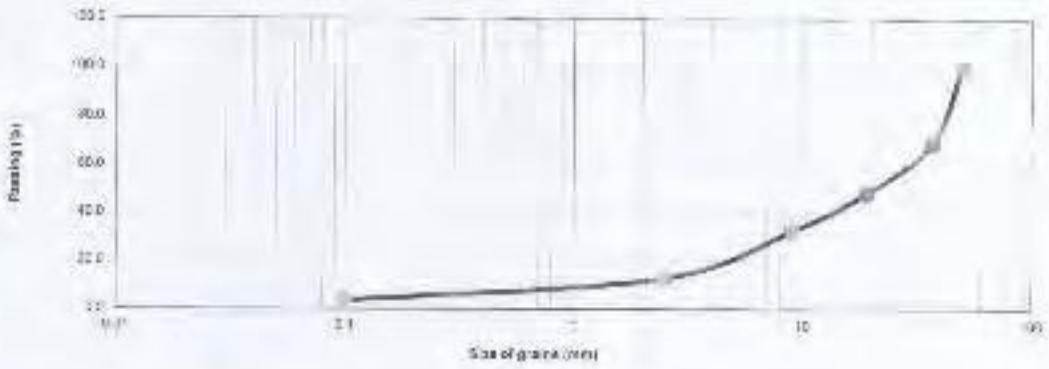
PARTICLE SIZE DISTRIBUTION ANALYSIS
ASTM C-136 / AASHTO T27

	WEIGHT RETAINED (gm)	CUMULATIVE WEIGHT RETAINED (gm)	CUMULATIVE PERCENTAGE RETAINED (%)	CUMULATIVE PERCENTAGE PASSING (%)	STANDURD SPECIFICATION LIMITS	
2	0.00	0.00	0.00	100.0		
1 1/2	3103.00	3103.00	31.03	69.0		
1	1851.00	4954.00	49.54	50.5		
3/4	235.00	5189.00	51.89	48.1		
1/2	855.00	6044.00	60.44	39.6		
3/8	714.00	6758.00	67.58	32.4		
No.4	1110.00	7868.00	78.68	21.3		
No.10	200.00	200.00	40.00	12.8		
No.200	418.00	418.00	83.60	3.5		

total sample weight= 10000.00 pass No.4= **2132.0** Total fine aggregates weight = **500** gm
passing% 21.3

Size analysis distribution curve



Soil classification: A - 1- a - sample is non plastic

COMIBASSAL International Controllers
Internal inspection and laboratories sector
Accredited by : Egyption General Authority for Petroleum under No. 34/29-11-2011
Accredited by : Egyption Accreditation council (EGAC) under No. 031706/1A

Modified Proctor Test Report
ASTM - D 1557

Mould Number :- 3
Volume of mould = 2199 cm
Weight of mould = 7046 g
G.S = 2.7 g/cm3

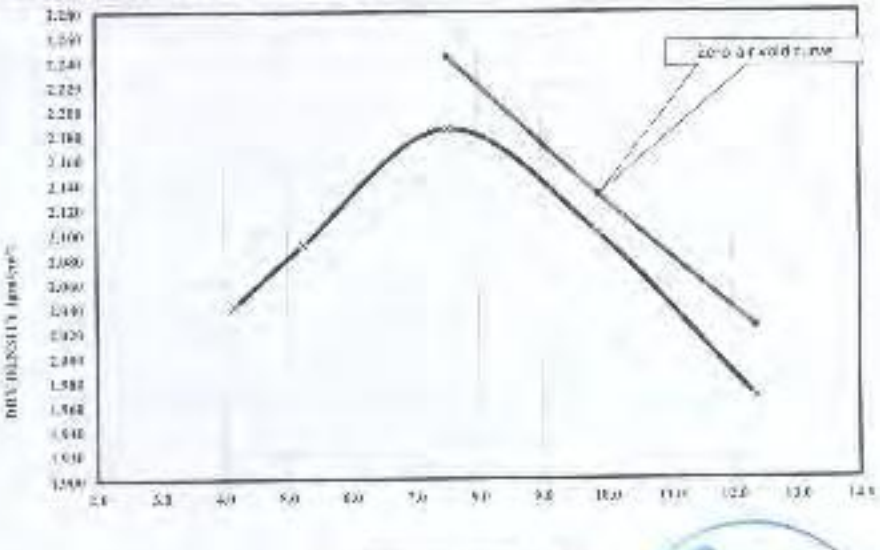
A- Density Calculations :-

	1	2	3	4	5
Weight.of wet soil + mould (g)	11721	11886	12211	12120	11905
Weight.of mould (g)	7046	7046	7046	7046	7046
Weight.of wet soil (g)	4675	4840	5165	5074	4859
Volume of mould (cm^3)	2199	2199	2199	2199	2199
Wet density (g/cm^3)	2.126	2.201	2.349	2.307	2.210
Dry density (g/cm^3)	2.041	2.091	2.184	2.100	1.967
Zero-air Void curve			2.244	2.131	2.024

B- Moisture Calculations :-

Weight.of wet soil (g)	100.0	100.0	100.0	100.0	100.0
Weight.of dry soil (g)	96.0	95.0	93.0	91.0	89.0
moisture content%	4.2	5.3	7.5	9.9	12.4

C - Dry density-Moisture relationship:-



M.D.D= 2.184 gm/cm^3
O.M.C= 7.5 %

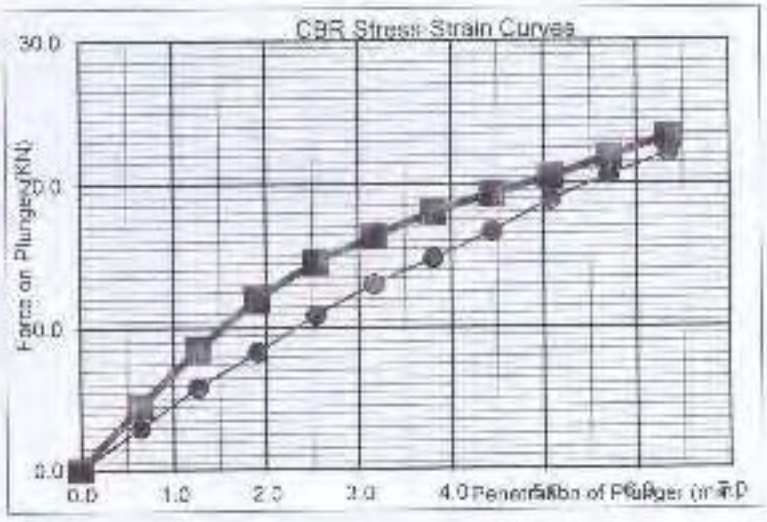
Kilo 23 Alexandria - Cairo Desert Road - Marghem
Tel: 002 03 4704595 - 002 034701191
Email : civdept@comibassal.com
WebSite : www.comibassal.com

49 El Horria Ave. Alex,Egypt
Tel: 002 033920176 - 002 033931482
Fax :002 033900476
Email : internal-inspection@comibassal.com

Report Of CBR Test - ASTM - D 1883

NO OF BLOWS	56			Swel %			
MOULD NO	1				56		
WT OFMOULD+SOIL	12150			Start	0.00		
WT OF MOULD	7047			End	0.00		
WT OF SOIL	5103			Swel	0.00		
VOLUME OF MOULD	2190						
WET DENSITY	2.330						
	MC before soaking			Weight of Rammer			4.54Kg
TIN NO	1				MDD	Kg/m3	2.184
WT OF WET SOIL+TIN	250.00						
WT OF DRY SOIL+TIN	240				OMC	%	7.5
WT OF WATER	10.00						
WT OF TIN	92			PROVING RING			
WT OF DRY SOIL	148	2.120		Dial/KN			
MOISTURE CONTENT	6.8						
DRY DENSITY	2.183				Capacity (KN)		50

Pen mm	97			Bearing (KN)			CBR		
	56			56			standar	56	
0.30	0			FALSE			0.0		
0.64	302			3.0			4.5		
1.27	595			5.8			8.5		
1.91	860			8.3			12.0		
2.54	1110			10.9			14.5	82	
3.17	1330			13.0			16.3		
3.81	1510			14.8			18.0		
4.45	1700			16.7			19.3		
5.08	1925			18.9			20.5	95	
5.71	2100			20.6			21.9		
6.35	2260			22.2			23.3		



Absorption & Specific Gravity for Aggregate
AASHTO T85 - ASTM C127

Weight of sample	2500
Weight of saturated - dry surface sample (B)	2527
Weight of saturated sample in water (C)	1547
Weight of dry sample aftre heating (A)	2494

Results:-

Saturation surface dry spicific gravity = B / (B-C)	2.579
Bulk spicific gravity = A / (B-C)	2.545
Apparent spicific gravity = A /(A-C)	2.634
Asorbtion of water = (B-A)/A*100	1.3
Degradation of aggregate = (2500-A)/ A*100	0.2

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COMIBASSAL INTERNATIONAL CONTROLLERS

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ABRASION AND IMPACT " LOS ANGELES " TEST

(For coarse aggregate)

ASTM- C 131-96 / AASHTO-T-96

Speed	Rotate at 30 to 33 Rpm For 500 Revolution
Trial Grading	A
Intitial Weight (W1) gms	5000
Weight of tested sample (W2) gms Retained on sieve No.12	3500
% abrasion By Weight Passing from Sieve No.12	30.0%

شركة
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Report	:	442 - 1 - Center
Date	:	06/05/2023

CHEMICAL ANALYSIS

General Consultant	:	SYSTRA
Consultant	:	SPECTRUM
Contractor	:	شركة انشاء للمقاولات
Project	:	Electric express train
Sample	:	Sub Ballast
Station	:	ST (371 + 0.00) : (371 + 500)
Date of Test	:	29-4-2023

Temperature : 21 °C Humidity : 55%

ANALYSIS	RESULTS	TEST METHOD
CHLORIDE	0.0053%	ASTM D 2974
SULPHATE	0.0190%	
ORGANIG MATTER	NEGATIVE	

SPECTRUM CONSULTING

LAB DIRECTOR
CH/ Mostafa Asker

شركة انشاء للمقاولات العامة IGC
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S5-B-IN

MATERIAL INSPECTION REQUEST

Contractor Company	INSHAA GENERAL OF CONSTRUCTION Company	Designer Company	(SPECTRUM) Engineering Consulting Office
Issued by Contractor	Name: Eng. Mahmoud shaban	Sign: محمود شعبان	Date/ Serial Number: 09/04/2023 (P.L.T.1) — Time: 01:00 PM
Received by GARB CONSULTANT	Eng. Mazen Essamy	PLT	

C1	C2	C3	DD	MM	YY	HH	MM
371	IW	CS	10	04	2023	2	00

CODE-1	S1 to S21 Station Reference	D1 to S3 Depot Reference	Xp XXX Note For Kilometer point only Start Km is used
CODE-2		Work Activity	
CODE-3		Sub Element of Activity	

Description of Materials	Prepared subgrade level 2		
Location to be Used	St. (371+350) To (373+500)		
MAR Approval No	M.A.R (P.S.G 1)	Date	08/04/2023
Supplier Name			
Test Requirement	P.L.T (DIN 18134)	Specification	EARTHWORK SPECIFICATIONS & TESTING REPORT (CG21-41.2) VERSION 2 BY CIVECON GROUP
Reference Photos	Yes / No	Other	Ref UIR-P.S.G (2)

Item	Description	Unit	Quantity	Arrival Date	Note
1	PLATE LOAD TEST	NUMBER	6	10/04/2023	
2					
3					
4					

Comments by: Eng. Mazen Essamy (SPECTRUM)

1-The Plate Load Test Result P.L.T (DIN 18134) is Approved

SPECTRUM CONSULTING

Comments by: Eng. Alaa Abd-Allatif (ER)

1-Plate Load Test was carried- out by [Faust]
2-Results report attached and acceptable with project specifications.
3-Final approval is subject to above mentioned comments

شركة انشاء للمقاولات العامة
IGC
inshaa general construction

APPROVAL STATUS

Organisation	Name	Sign	Date	A-AWC-R
Contractor	Eng. Mahmoud shaban	محمود شعبان	10-04-2023	A
QA/QC *	Eng. Mazen Essamy			A
GARB**	Eng. Margret magdy			
Employers Representative	Eng. Alaa Abd-Allatif		10-4-2023	AWC

* Designer
** Alignment / Bridges / Culvert Only

Technical Report

Plate Loading Tests

KM 371+475, KM 371+450,
KM 371+425, KM 371+400,
KM 371+375, and KM 371+350

Project

Electric Express Train (Sokhna - New capital - 6th of October city - New Elalamein city)

Prepared for

Inshaa General Construction

3 Mobilka CC - Abu Youssef, Alexandria, Egypt

(April 10, 2023)

1. Introduction

The Civil Engineering Testing & Consulting Unit (CETCU) of the Egypt-Japan University of Science and Technology (EJUST) was retained by Inshaa General Construction to conduct 6 plate loading tests on the Prepared Subgrade 2.0 of the Electric Express Train project at 6 locations (KM 371+475, KM 371+450, KM 371+425, KM 371+400, KM 371+375, and KM 371+350) in accordance with the German Standard DIN18134. The mandate was communicated by Eng. Mahmoud Shaban of Inshaa General Construction. Field team members (Mr.Mohamed Mamdouh) from the working CETCU team visited the project site on April 10, 2023 and performed the required tests. This report summarizes the plate loading test procedure according to DIN18134, the test results and their interpretations, and the CETCU pertaining recommendations.

2. Test Set Up and Instrumentation

- The German standard DIN18134 was applied to define the test setup including the loading system, test conditions, and procedure for the plate loading tests.
- The tests were carried out to determine the Strain Moduli (Ev1 and Ev2) and their ratio (Ev2/Ev1) from a stress – deformation relationship of two consecutive loading from Loading-Unloading-Loading regime
- The loading plate has a diameter of 600 mm and a thickness of 25 mm and it is provided with equally spaced stiffeners. The upper plate face is parallel to the bottom face of the plate to allow a 300-mm plate to be placed on the 600-mm plate top.
- The loading system consisted of a hydraulic pump connected to a hydraulic jack of 700 bar capacity, which can apply and release the load increments.
- The dial gauge used to measure the plate settlement has a resolution of 0.01 mm and the lever ratio was equal to 1.
- The temperature at the time of the test was 19± 1°C.
- The plate was carried out on a Prepared Subgrade 2.0 (according to the company) at 6 points. The test surface area was levelled, and the plate was bedded on this surface.
- The hydraulic jack was placed on the middle of, and normal to, the loading plate beneath the reaction loading system and secured against tilting.
- The reaction loading system was a heavy multi-purpose Loader CAT 950F

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3. Test Procedure and Results

The plate load test was conducted in accordance with the DIN18134. Loading, unloading, and reloading regimes were considered to estimate the resilient modulus of the tested soil. Prior to the test, the force transducer and dial gauge were reset to zero, and then a load corresponding to a stress of 0.01 MN/m2 was applied. The load was increased in the first loading cycle until a normal stress of 0.25 MN/m2 was reached, and the loading increment was 0.025 MN/m2. The load was gradually released in four stages. Following unloading, a second loading cycle was performed, but the load was only increased to the penultimate stage of the first cycle. 10 plate loading tests on the Prepared Subgrade 2.0 of the Electric Express Train project were conducted at 10 locations (KM 371+325, KM 371+300, KM 371+275, KM 371+250, KM 371+225, KM 371+200, KM 371+175, KM 371-150, KM 371+125, and KM 371+100) and the data collected at the 10 test points is included in Appendix A.

Table 1 presents the load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+325), while Table 2 shows the data obtained at the second loading stage.

Table 1: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+325)

Loading stage	Load (F)	Normal	Settleme
	kN	MN/m^2	mm
0	1.414	0.005	0.00
1	7.07	0.025	0.28
2	14.14	0.050	0.34
3	21.21	0.075	0.45
4	28.28	0.100	0.55
5	35.35	0.125	0.64
6	42.42	0.150	0.73
7	49.49	0.175	0.83
8	56.56	0.200	0.92
9	63.63	0.225	1.02
10	70.7	0.250	1.07
11	56.56	0.200	1.07
12	49.49	0.175	1.08
13	35.35	0.125	1.06
14	21.21	0.075	0.95
15	1.414	0.005	0.15

Table 2: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+325)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.15
1	7.07	0.025	0.38
2	14.14	0.050	0.46
3	21.21	0.075	0.55
4	28.28	0.100	0.65
5	35.35	0.125	0.76
6	42.42	0.150	0.83
7	49.49	0.175	0.89
8	56.56	0.200	0.94
9	63.63	0.225	1.00

The load-settlement data obtained in all loading and unloading stages for the test performed at the first location (KM 371+325) are shown in Figure 1. Table 3 shows the calculations of the resilient modulus of the tested soil according to DIN18134. The testing data corresponding to the second testing point (KM 371+300) is provided in Tables 4-6 and Figure 2. The testing data corresponding to the third testing point (KM 371+275) is provided in Tables 7-9 and Figure 3. The testing data corresponding to the fourth testing point (KM 371+250) is provided in Tables 10-12 and Figure 4. The testing data corresponding to the fifth testing point (KM 371+225) is provided in Tables 13-15 and Figure 5.

Table 3: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+325)

Parameters	1st loading cycle	2nd loading cycle
(s_0,max) MN/m^2	0.25	0.25
a_0 (mm)	0.16	0.17
a_1 (mm/(MN/m²))	3.96	5.96
a_2 (mm/(MN2/m⁴))	-1.03	-10.43
$Ev = 1.5\,r/(a_1 + a_2 \cdot s_{0,max})$	121.65	134.10
Ev_2/Ev_1	1.10	

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E-JUST CETC Unit

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Table 17: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+350)

Loading stage	Load (F) kN	Normal stress (s_o) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.22
1	7.07	0.025	0.42
2	14.14	0.050	0.50
3	21.21	0.075	0.57
4	28.28	0.100	0.66
5	35.35	0.125	0.73
6	42.42	0.150	0.80
7	49.49	0.175	0.83
8	56.56	0.200	0.86
9	63.63	0.225	0.91

Table 18: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+350)

Parameters	1st loading cycle	2nd loading cycle
$[s_o]_{max}$ MN/m^2	0.25	0.25
a_0 (mm)	0.09	0.24
a_1 $(mm/(MN/m^2))$	3.11	5.31
a_2 $(mm/(MN2/m^4))$	-0.55	-10.77
$Ev = 1.5 r/(a_1 + a_2 s_{o,max})$	151.18	171.72
Ev_2/Ev_1	1.14	

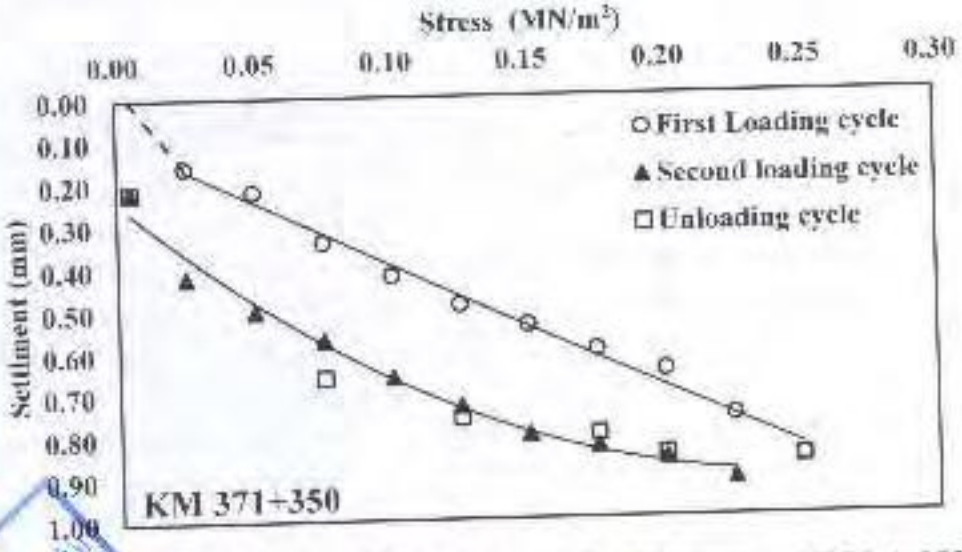

Figure 6: Load-settlement data: plate loading test performed at (KM 371+350)

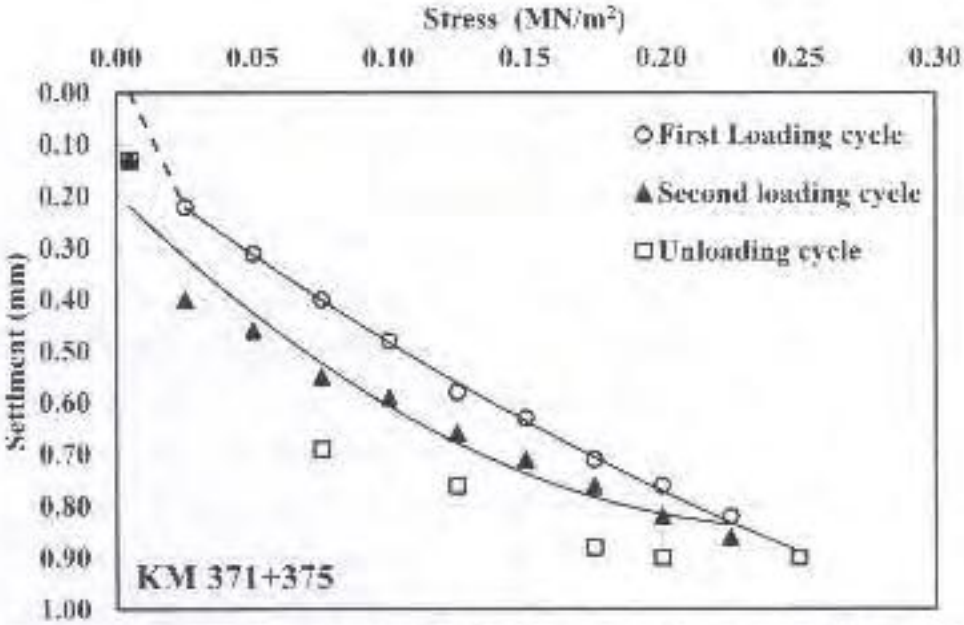

Figure 5: Load-settlement data: plate loading test performed at (KM 371+375)

Table 16: Load-settlement data obtained at the first loading and unloading stages of the

Loading stage	Load (F) kN	Normal stress (s_0) MN/m²	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.16
2	14.14	0.050	0.22
3	21.21	0.075	0.34
4	28.28	0.100	0.42
5	35.35	0.125	0.49
6	42.42	0.150	0.54
7	49.49	0.175	0.60
8	56.56	0.200	0.65
9	63.63	0.225	0.76
10	70.7	0.250	0.86
11	56.56	0.200	0.85
12	49.49	0.175	0.80
13	35.35	0.125	0.76
14	21.21	0.075	0.66
15	1.414	0.005	0.22

Table 13: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+375)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.22
2	14.14	0.050	0.31
3	21.21	0.075	0.40
4	28.28	0.100	0.48
5	35.35	0.125	0.58
6	42.42	0.150	0.63
7	49.49	0.175	0.71
8	56.56	0.200	0.76
9	63.63	0.225	0.82
10	70.7	0.250	0.90
11	56.56	0.200	0.90
12	49.49	0.175	0.88
13	35.35	0.125	0.76
14	21.21	0.075	0.69
15	1.414	0.005	0.13

Table 14: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+375)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.13
1	7.07	0.025	0.40
2	14.14	0.050	0.46
3	21.21	0.075	0.55
4	28.28	0.100	0.59
5	35.35	0.175	0.66
6	42.42	0.150	0.71
7	49.49	0.175	0.76
8	56.56	0.200	0.82
9	63.63	0.225	0.86

Table 15: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+375)

Parameters	1st loading cycle	2nd loading cycle
(s_0, max) MN/m^2	0.25	0.25
a_1 (mm)	0.12	0.19
a_1 (mm/(MN/m²))	3.95	5.16
a_2 (mm/(MN2/m²))	-3.58	-10.27
Ev= 1.5 r/ (a_1, [illegible]	[illegible]	[illegible]
Ev_2/Ev_1	1.18	

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Table 11: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+400)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.24
1	7.07	0.025	0.45
2	14.14	0.050	0.57
3	21.21	0.075	0.59
4	28.28	0.100	0.63
5	35.35	0.125	0.68
6	42.42	0.150	0.73
7	49.49	0.175	0.82
8	56.56	0.200	0.87
9	63.63	0.225	0.91

Table 12: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+400)

Parameters	1st loading cycle	2nd loading cycle
($s_{0,max}$) MN/m^2	0.25	0.25
a_0 (mm)	0.16	0.29
a_1 (mm/(MN/m^2))	2.65	4.14
a_2 (mm/(MN2/m^4))	1.76	-6.43
Ev_2= 1.5 r/ (a_1+a_2· $s_{0,max}$)	145.57	177.88
Ev_2/Ev_1	1.22	

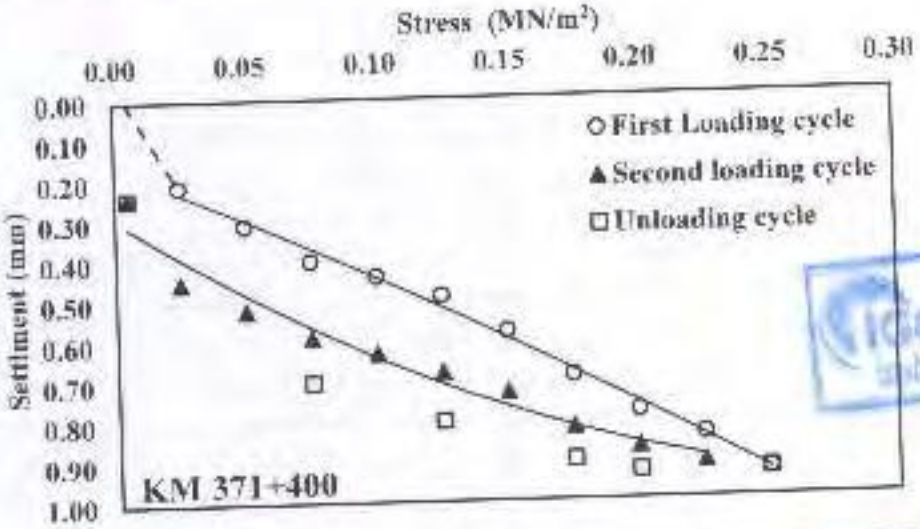

Figure 4: Load-settlement data: plate loading test performed at (KM 371+400)

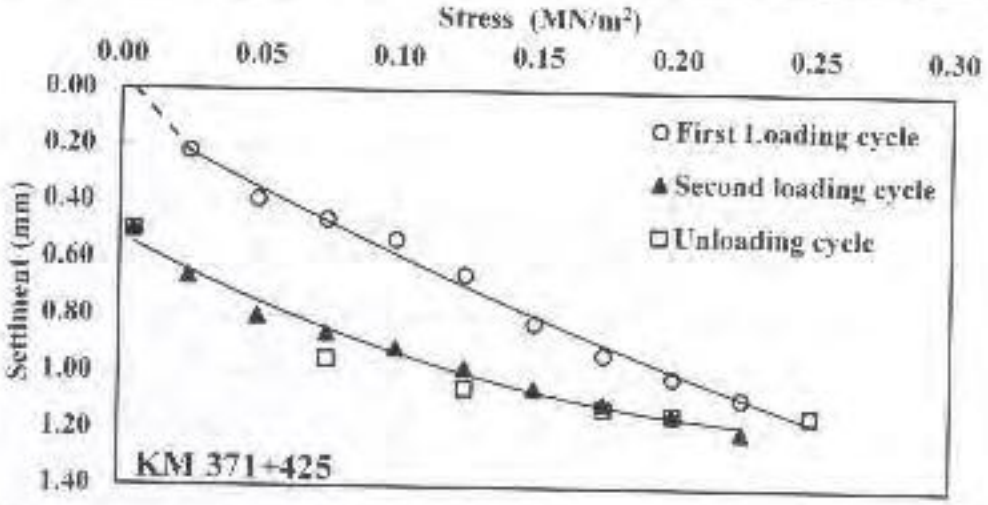

Figure 3: Load-settlement data: plate loading test performed at (KM 371+425)

Table 10: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+400)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m²	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.21
2	14.14	0.050	0.31
3	21.21	0.075	0.40
4	28.28	0.100	0.44
5	35.35	0.125	0.49
6	42.42	0.150	0.58
7	49.49	0.175	0.69
8	56.56	0.200	0.78
9	63.63	0.225	0.84
10	70.7	0.250	0.93
11	56.56	0.200	0.93
12	49.49	0.175	0.90
13	35.35	0.125	0.80
14	21.21	0.075	0.70
15	1.414	0.005	0.24

Table 7: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+425)

Loading stage	Load (F)	Normal stress (s_0)	Settlement (S)
	kN	MN/m^2	mm
0	1.414	0.005	0.00
1	7.07	0.025	0.22
2	14.14	0.050	0.39
3	21.21	0.075	0.46
4	28.28	0.100	0.53
5	35.35	0.125	0.65
6	42.42	0.150	0.82
7	49.49	0.175	0.93
8	56.56	0.200	1.01
9	63.63	0.225	1.08
10	70.7	0.250	1.14
11	56.56	0.200	1.14
12	49.49	0.175	1.12
13	35.35	0.125	1.05
14	21.21	0.075	0.95
15	1.414	0.005	0.50

Table 8: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+425)

Loading stage	Load (F)	Normal stress (s_0)	Settlement (S)
	kN	MN/m^2	mm
0	1.414	0.005	0.50
1	7.07	0.025	0.66
2	14.14	0.050	0.80
3	21.21	0.075	0.86
4	28.28	0.100	0.91
5	35.35	0.125	0.98
6	42.42	0.150	1.05
7	49.49	0.175	1.10
8	56.56	0.200	1.14
9	63.63	0.225	1.20

Table 9: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+425)

Parameters	1st loading cycle	2nd loading cycle
(s_0,max) MN/m^2	0.25	0.25
a_0 (mm)	0.10	0.52
a_1 (mm/(MN/m^2))	5.23	4.95
a_2 (mm/(MN2/m^4))	-3.82	-3.07
$Ev = 1.5\ r/(a_1+a_2\ s_{0,max})$	105.31	167.89
Ev_2/Ev_1		1.59

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Table 5: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+450)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.47
1	7.07	0.025	0.73
2	14.14	0.050	0.83
3	21.21	0.075	0.89
4	28.28	0.100	0.95
5	35.35	0.125	1.05
6	42.42	0.150	1.10
7	49.49	0.175	1.20
8	56.56	0.200	1.24
9	63.63	0.225	1.29

Table 6: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+450)

Parameters	1st loading cycle	2nd loading cycle
($s_0$max) MN/m^2	0.25	0.25
a_0 (mm)	0.14	0.53
a_1 (mm/(MN/m^2))	3.81	5.50
a_2 (mm/(MN2/m^4))	2.61	-9.65
Ev= 1.5 r/ (a_1+a_2. s_0 Max)	100.91	145.58
Ev_2/Ev_1	1.44	

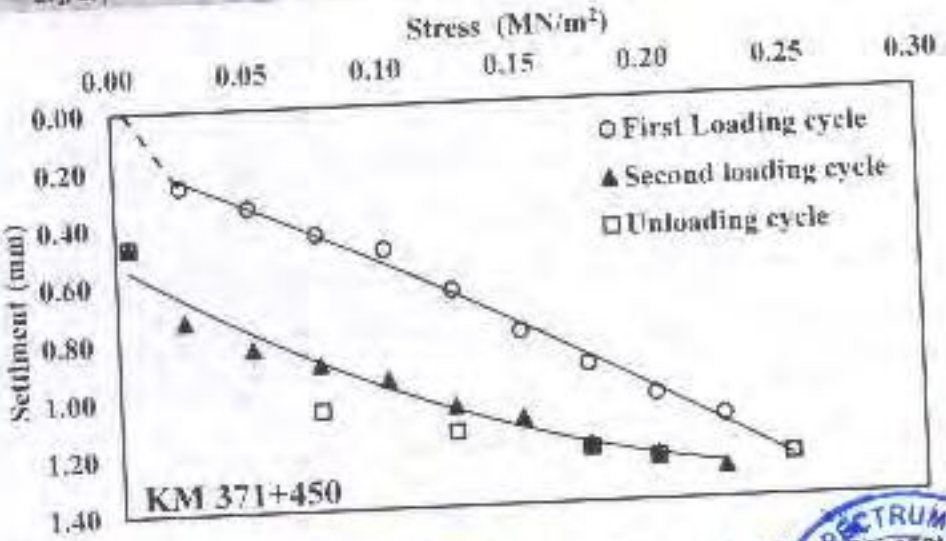

Figure 2: Load-settlement data, plate loading test performed at (KM 371+450)

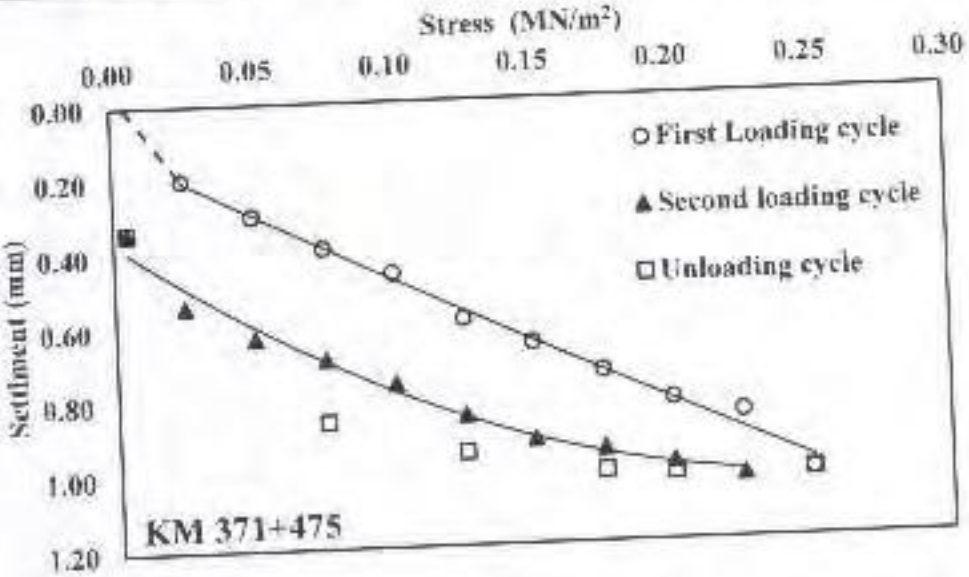

Figure 1: Load-settlement data: plate loading test performed at (KM 371+475)

Table 4: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+450)

Loading stage	Load (F) kN	Normal stress (σ_n) MN/m²	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.26
2	14.14	0.050	0.34
3	21.21	0.075	0.44
4	28.28	0.100	0.50
5	35.35	0.125	0.65
6	42.42	0.150	0.80
7	49.49	0.175	0.92
8	56.56	0.200	1.03
9	63.63	0.225	1.11
10	70.7	0.250	1.25
11	56.56	0.200	1.25
12	49.49	0.175	1.21
13	35.35	0.125	1.14
14	21.[illegible]	0.075	1.0[illegible]
15	1.41[illegible]	0.005	0.47

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Table 2: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+475)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.34
1	7.07	0.025	0.54
2	14.14	0.050	0.63
3	21.21	0.075	0.69
4	28.28	0.100	0.76
5	35.35	0.125	0.85
6	42.42	0.150	0.92
7	49.49	0.175	0.95
8	56.56	0.200	0.99
9	63.63	0.225	1.03

The load-settlement data obtained in all loading and unloading stages for the test performed at the first location (KM 371+475) are shown in Figure 1. Table 3 shows the calculations of the resilient modulus of the tested soil according to DIN18134. The testing data corresponding to the second testing point (KM 371+450) is provided in Tables 4-6 and Figure 2. The testing data corresponding to the third testing point (KM 371+425) is provided in Tables 7-9 and Figure 3. The testing data corresponding to the fourth testing point (KM 371+400) is provided in Tables 10-12 and Figure 4. The testing data corresponding to the fifth testing point (KM 371+375) is provided in Tables 13-15 and Figure 5. The testing data corresponding to the sixth testing point (KM 371+350) is provided in Tables 16-18 and Figure 6.

Table 3: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+475)

Parameters	1st loading cycle	2nd loading cycle
($s_{0,max}$) MN/m^2	0.25	0.25
s_0 (mm)	0.11	0.37
a_1 (mm/(MN/m^2))	3.77	5.19
a_2 (mm/(MN2/m^4))	-1.03	-10.18
$Ev = 1.5\ r/\ (a_1 + a_2 \cdot s_{0,max})$	**128.29**	**170.24**
Ev_2/Ev_1	**1.33**	

3. Test Procedure and Results

The plate load test was conducted in accordance with the DIN18134. Loading, unloading, and reloading regimes were considered to estimate the resilient modulus of the tested soil. Prior to the test, the force transducer and dial gauge were reset to zero, and then a load corresponding to a stress of 0.01 MN/m2 was applied. The load was increased in the first loading cycle until a normal stress of 0.25 MN/m2 was reached, and the loading increment was 0.025 MN/m2. The load was gradually released in four stages. Following unloading, a second loading cycle was performed, but the load was only increased to the penultimate stage of the first cycle. 6 plate loading tests on the Prepared Subgrade 2.0 of the Electric Express Train project were conducted at 6 locations (KM 371+475, KM 371+450, KM 371+425, KM 371+400, KM 371+375, and KM 371+350) and the data collected at the 6 test points is included in Appendix A.

Table 1 presents the load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+475), while Table 2 shows the data obtained at the second loading stage.

Table 1: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+475)

Loading stage	Load (F) kN	Normal MN/m^2	Settleme mm
0	1.414	0.005	0.00
1	7.07	0.025	0.20
2	14.14	0.050	0.30
3	21.21	0.075	0.39
4	28.28	0.100	0.46
5	35.35	0.125	0.59
6	42.42	0.150	0.66
7	49.49	0.175	0.74
8	56.56	0.200	0.82
9	63.63	0.225	0.86
10	70.7	0.250	1.02
11	56.56	0.200	1.02
12	49.49	0.175	1.01
13	35.35	0.125	0.95
14	21.21	0.075	0.86
15	1.414	0.005	0.34

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4. Closure

Test results presented herein report the load-settlement data obtained from 6 plate loading tests conducted on the Prepared Subgrade 2.0 of the Electric Express train project at 6 locations (KM 371+475, KM 371+450, KM 371+425, KM 371+400, KM 371+375, and KM 371+350) in accordance with German Standard, DIN18134.

Location	E_{v1} MN/m2	E_{v2} MN/m2	E_{v2}/E_{v1} ratio
KM 371+475	128.29	170.24	1.33
KM 371+450	100.91	145.58	1.44
KM 371+425	105.31	167.69	1.59
KM 371+400	145.57	177.88	1.22
KM 371+375	147.31	173.53	1.18
KM 371+350	151.18	171.72	1.14

• Note: Before interpreting these test results for future applications, the Prepared Subgrade 2.0 in-situ variability between the testing locations should be considered.

Technical committee

Dr. Mahmoud Ahmed

Prof. Dr. Mohamed F. M. Fahmy

Lab Engineer

Mohamed A. Al-Najjar

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Appendix A

شركة انشاء للمقاولات العامة
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الجامعة المصرية اليابانية للعلوم و التكنولوجيا
وحدة اختبارات و استشارات الهندسة المدنية
E-JUST CETC Unit

Location of test site:	KM 371+475		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	10/4/2023
Diameter of loading plate	600		Time	9:02:00 AM
				9:28:00 AM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	—			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.80	
	2	14.14	9.70	
	3	21.21	9.61	
	4	28.28	9.54	
	5	35.35	9.41	
	6	42.42	9.34	
	7	49.49	9.26	
	8	56.56	9.18	
	9	63.63	9.14	
	10	70.7	8.98	
Unloading Stage	11	56.56	8.98	
	12	49.49	8.99	
	13	35.35	9.05	
	14	21.21	9.14	
	15	1.414	9.66	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.66	
	1	7.07	9.46	
	2	14.14	9.37	
	3	21.21	9.31	
	4	28.28	9.24	
	5	35.35	9.15	
	6	42.42	9.08	
	7	49.49	9.05	
	8	56.56	9.01	
	9	63.63	8.98	

شركة انشاء لمشروع مد السكك Inshaa general construction

Location of test site:	KM 371+450		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	10/4/2023
Diameter of loading plate	600		Time	9:35:00 AM
				10:03:00 AM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	0			
Temperature	19°C			
Test regime	Loading Stage No.	Load (KN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.74	
	2	14.14	9.66	
	3	21.21	9.56	
	4	28.28	9.50	
	5	35.35	9.35	
	6	42.42	9.20	
	7	49.49	9.08	
	8	56.56	8.97	
	9	63.63	8.89	
	10	70.7	8.75	
Unloading Stage	11	56.56	8.75	
	12	49.49	8.79	
	13	35.35	8.86	
	14	21.21	8.95	
	15	1.414	9.53	
Test regime	Loading Stage No.	Load (KN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.53	
	1	7.07	9.27	
	2	14.14	9.17	
	3	21.21	9.11	
	4	28.28	9.05	
	5	35.35	8.95	
	6	42.42	8.90	
	7	49.49	8.80	
	8	56.56	8.76	
	9	63.63	8.71	

شركة انشاء للمقاولات العامة
IGC inshaa general construction

Location of test site:	KM 371+425		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	10/4/2023
Diameter of loading plate	600		Time	10:10:00 AM 10:38:00 AM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	—			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.78	
	2	14.14	9.61	
	3	21.21	9.54	
	4	28.28	9.47	
	5	35.35	9.35	
	6	42.42	9.18	
	7	49.49	9.07	
	8	56.56	8.99	
	9	63.63	8.92	
	10	70.7	8.86	
Unloading Stage	11	56.56	8.86	
	12	49.49	8.88	
	13	35.35	8.95	
	14	21.21	9.05	
	15	1.414	9.50	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.50	
	1	7.07	9.34	
	2	14.14	9.20	
	3	21.21	9.14	
	4	28.28	9.09	
	5	35.35	9.02	
	6	42.42	8.95	
	7	49.49	8.90	
	8	56.56	8.86	
	9	63.63	8.80	

Location of test site:	KM 371+400		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	10/4/2023
Diameter of loading plate	600		Time	10:45:00 AM 11:13:00 AM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Redding material	---			
Temperature	19°C			
Test regime	Loading Stage No.	Load (KN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.79	
	2	14.14	9.69	
	3	21.21	9.60	
	4	28.28	9.56	
	5	35.35	9.51	
	6	42.42	9.42	
	7	49.49	9.31	
	8	56.56	9.22	
	9	63.63	9.16	
	10	70.7	9.07	
Unloading Stage	11	56.56	9.07	
	12	49.49	9.10	
	13	35.35	9.20	
	14	21.21	9.30	
	15	1.414	9.76	
Test regime	Loading Stage No.	Load (KN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.76	
	1	7.07	9.55	
	2	14.14	9.48	
	3	21.21	9.41	
	4	28.28	9.37	
	5	35.35	9.32	
	6	42.42	9.27	
	7	49.49	9.18	
	8	56.56	9.13	
	9	63.63	9.09	

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Location of test site:	**KM 371+375**		**Field team**	**Mr.Mohamed Mamdouh**
Project title:	Electric Express Train Project - Inshaa General Construction		**Date:**	10/4/2023
Diameter of loading plate	600		**Time**	11:20:00 AM
				11:48:00 AM
Lever ratio	1		**Note:** CAT 966F	
Type of Soil	**Prepared Subgrade 2.0**			
Redding material	---			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.78	
	2	14.14	9.69	
	3	21.21	9.60	
	4	28.28	9.52	
	5	35.35	9.42	
	6	42.42	9.37	
	7	49.49	9.29	
	8	56.56	9.24	
	9	63.63	9.18	
	10	70.7	9.10	
Unloading Stage	11	56.56	9.10	
	12	49.49	9.12	
	13	35.35	9.24	
	14	21.21	9.31	
	15	1.414	9.87	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.87	
	1	7.07	9.60	
	2	14.14	9.54	
	3	21.21	9.45	
	4	28.28	9.41	
	5	35.35	9.34	
	6	42.42	9.29	
	7	49.49	9.24	
	8	56.56	9.18	
	9	63.63	9.14	

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Location of test site:	KM 371+350		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	10/4/2023
Diameter of loading plate	600		Time	11:55:00 AM 12:23:00 PM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	--			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.84	
	2	14.14	9.78	
	3	21.21	9.66	
	4	28.28	9.58	
	5	35.35	9.51	
	6	42.42	9.46	
	7	49.49	9.40	
	8	56.56	9.35	
	9	63.63	9.24	
	10	70.7	9.14	
Unloading Stage	11	56.56	9.15	
	12	49.49	9.20	
	13	35.35	9.24	
	14	21.21	9.34	
	15	1.414	9.78	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.78	
	1	7.07	9.58	
	2	14.14	9.50	
	3	21.21	9.43	
	4	28.28	9.34	
	5	35.35	9.27	
	6	42.42	9.20	
	7	49.49	9.17	
	8	56.56	9.14	
	9	63.63	9.09	

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E-JUST CETC Unit

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SPECTRUM CONSULTING

Location of test site:	KM 371+325		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/4/2023
Diameter of loading plate	600		Time	9:02:00 AM
				9:28:00 AM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	--			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.72	
	2	14.14	9.66	
	3	21.21	9.55	
	4	28.28	9.45	
	5	35.35	9.36	
	6	42.42	9.27	
	7	49.49	9.17	
	8	56.56	9.08	
	9	63.63	8.98	
	10	70.7	8.93	
Unloading Stage	11	56.56	8.93	
	12	49.49	8.94	
	13	35.35	8.95	
	14	21.21	9.05	
	15	1.414	9.85	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.85	
	1	7.07	9.62	
	2	14.14	9.54	
	3	21.21	9.45	
	4	28.28	9.35	
	5	35.35	9.24	
	6	42.42	9.17	
	7	49.49	9.11	
	8	56.56	9.06	
	9	63.63	9.00	

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E-JUST CETC Unit

S5-B-1N

MATERIAL INSPECTION REQUEST

Contractor Company	INSHAA GENERAL OF CONSTRUCTION Company	Designer Company	(SPECTRUM) Engineering Consulting Office
Issued by Contractor	Name: Eng. Mahmoud shaban / Sign	Date/ Serial Number: 10/04/2023 (P.L.T. 2)	Time: 01:00 PM
Received by GARB CONSULTANT	Eng. Mazen Essamy	P.L.T	

C1	C2	C3	SO	MM	YY	HH	MM
371	IW	CS	11	04	2023	2	00

CODE 1	S1 to S71 Station Reference	D1 to S3 Depot Reference	Kp XXX Note For Kilometer point only Start Km is used
CODE 2		Work Activity	
CODE 3		Sub Element of Activity	

Description of Materials	Prepared subgrade level 2		
Location to be Used	St. (371+100) To (373+350)	Date	08/04/2023
MAR Approval No	M.A.R (P.S.G 1)		
Supplier Name		Specification	EARTHWORK SPECIFICATIONS & TESTING REPORT (DG21-41.2) VERSION 2 BY LOVECON GROUP
Test Requirement	P.L.T (DIN 18134)	Other	Ref UIR-P.S.G (3&4)
Reference Photos	Yes / No		

Item	Description	Unit	Quantity	Arrival Date	Note
1	PLATE LOAD TEST	NUMBER	10	11/04/2023	
2					
3					
4					

Comments by: Eng. Mazen Essamy (SPECTRUM)

1. The Plate Load Test Result P.L.T (DIN 18134) is Approved

SPECTRUM CONSULTING

Comments by: Eng. Alaa Abd-Allatif (ER)

1 Plate Load Test was carried- out by (E-just)
2-Results report attached and acceptable with project specifications.
3-Final approval is subject to above mentioned comments

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APPROVAL STATUS

Organisation	Name	Sign	Date	A-AWC-R
Contractor	Eng. Mahmoud shaban		11 04-2023	A
QA/QC *	Eng. Mazen Essamy			A
GARB**	Eng. Margret magdy			
Employers Representative	Eng. Alaa Abd-Allatif		11-4-2023	AWC

* Designer
** Alignment / Bridges, Culvert Only

T (n, pt, mm)

Technical Report

Plate Loading Tests

KM 371+325, KM 371+300, KM 371+275, KM 371+250, KM 371+225, KM 371+200, KM 371+175, KM 371+150, KM 371+125, and KM 371+100

Project

Electric Express Train (Sokhna - New capital - 6th of October city - New Elalamein city)

Prepared for

Inshaa General Construction

3 Mobilka CC - Abu Youssef, Alexandria, Egypt

(April 11, 2023)

أمين عام الجامعة
لواء مهندس / أسامة فتحي

الجامعة المصرية اليابانية للعلوم والتكنولوجيا
وحدة اختبارات و استشارات الهندسة المدنية
E-JUST CETC Unit

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1. Introduction

The Civil Engineering Testing & Consulting Unit (CETCU) of the Egypt-Japan University of Science and Technology (EJUST) was retained by Inshaa General Construction to conduct 10 plate loading tests on the Prepared Subgrade 2.0 of the Electric Express Train project at 10 locations (KM 371+325, KM 371+300, KM 371+275, KM 371+250, KM 371+225, KM 371+200, KM 371+175, KM 371+150, KM 371+125, and KM 371+100) in accordance with the German Standard DIN18134. The mandate was communicated by Eng. Mahmoud Shaban of Inshaa General Construction. Field team members (Mr.Mohamed Mamdouh) from the working CETCU team visited the project site on April 11, 2023 and performed the required tests. This report summarizes the plate loading test procedure according to DIN18134, the test results and their interpretations, and the CETCU pertaining recommendations.

2. Test Set Up and Instrumentation

- The German standard DIN18134 was applied to define the test setup including the loading system, test conditions, and procedure for the plate loading tests.
- The tests were carried out to determine the Strain Moduli (Ev1 and Ev2) and their ratio (Ev2/Ev1) from a stress – deformation relationship of two consecutive loading from Loading-Unloading-Loading regime.
- The loading plate has a diameter of 600 mm and a thickness of 25 mm and it is provided with equally spaced stiffeners. The upper plate face is parallel to the bottom face of the plate to allow a 300-mm plate to be placed on the 600-mm plate top.
- The loading system consisted of a hydraulic pump connected to a hydraulic jack of 700 bar capacity, which can apply and release the load increments.
- The dial gauge used to measure the plate settlement has a resolution of 0.01 mm and the lever ratio was equal to 1.
- The temperature at the time of the test was 19± 1°C.
- The plate was carried out on a Prepared Subgrade 2.0 (according to the company) at 10 points. The test surface area was levelled, and the plate was bedded on this surface.
- The hydraulic jack was placed on the middle of, and normal to, the loading plate beneath the reaction loading system and secured against tilting.
- The reaction loading system was a heavy multi-purpose Loader CAT 980.

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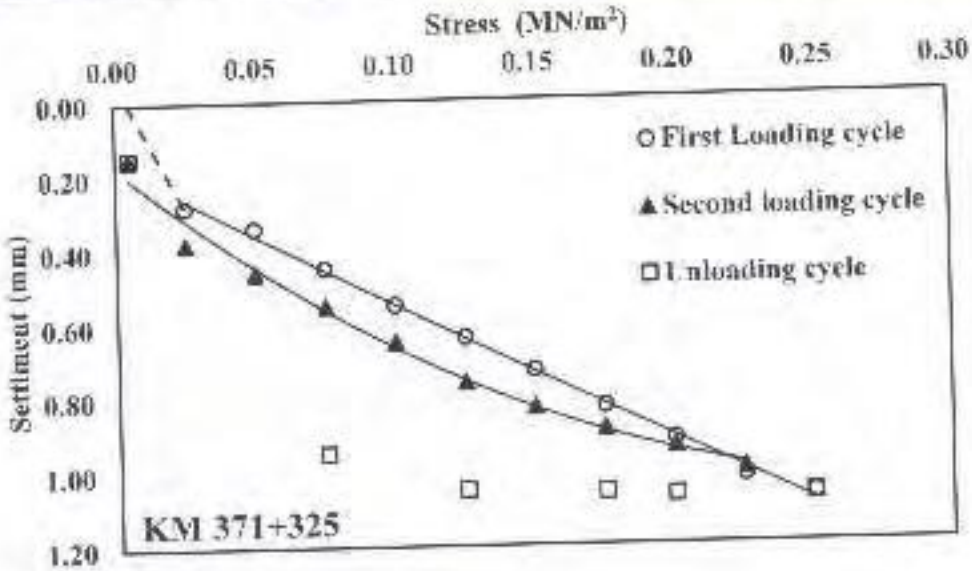

Figure 1: Load-settlement data: plate loading test performed at (KM 371+325)

Table 4: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+300)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m²	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.25
2	14.14	0.050	0.30
3	21.21	0.075	0.40
4	28.28	0.100	0.51
5	35.35	0.125	0.60
6	42.42	0.150	0.72
7	49.49	0.175	0.80
8	56.56	0.200	0.87
9	63.63	0.225	0.93
10	70.7	0.250	1.02
11	56.56	0.200	1.02
12	49.49	0.175	1.02
13	35.35	0.125	0.98
14	21.21	0.075	0.88
15	1.414	0.005	0.30

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Table 5: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+300)

Loading stage	Load (F) kN	Normal stress (s_p) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.30
1	7.07	0.025	0.46
2	14.14	0.050	0.53
3	21.21	0.075	0.59
4	28.28	0.100	0.69
5	35.35	0.125	0.77
6	42.42	0.150	0.85
7	49.49	0.175	0.92
8	56.56	0.200	0.95
9	63.63	0.225	1.00

Table 6: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+300)

Parameters	1st loading cycle	2nd loading cycle
($s_{0,max}$) MN/m^2	0.25	0.25
a_0 [mm]	0.12	0.31
a_1 [mm/(MN/m²)]	4.23	4.59
a_2 [mm/(MN2/m⁴)]	-2.43	-6.68
$Ev = 1.5\, r / (a_1 + a_2 \cdot s_{p,max})$	124.31	154.08
Ev_2/Ev_1	1.24	

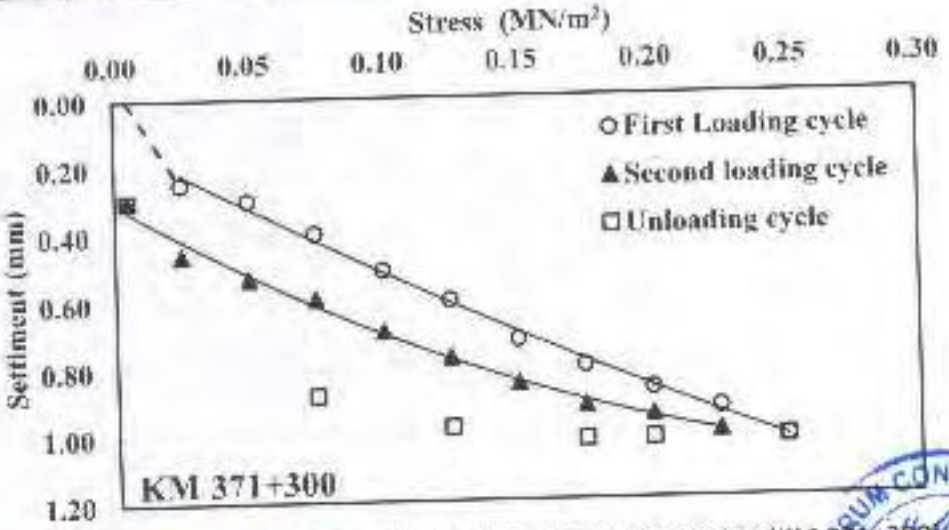

Figure 7: Load-settlement data: plate loading test performed at (KM 371+300)

Table 7: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+275)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.29
2	14.14	0.050	0.36
3	21.21	0.075	0.48
4	28.28	0.100	0.57
5	35.35	0.125	0.64
6	42.42	0.150	0.75
7	49.49	0.175	0.86
8	56.56	0.200	0.95
9	63.63	0.225	1.03
10	70.7	0.250	1.16
11	56.56	0.200	1.16
12	49.49	0.175	1.16
13	35.35	0.125	1.10
14	21.21	0.075	0.99
15	1.414	0.005	0.30

Table 8: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+275)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.30
1	7.07	0.025	0.55
2	14.14	0.050	0.67
3	21.21	0.075	0.75
4	28.28	0.100	0.81
5	35.35	0.125	0.90
6	42.42	0.150	0.93
7	49.49	0.175	1.00
8	56.56	0.200	1.05
9	63.63	0.225	1.10

Table 9: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+275)

Parameters	1st loading cycle	2nd loading cycle
(s_0,max) MN/m^2	0.25	0.25
a_0 (mm)	0.20	0.35
a_1 (mm/(MN/m^2))	3.51	6.01
a_2 (mm/(MN2/m^4))	1.21	12.49
E_v= 1.5 r/ (a_1+a_2. s_0, max)	118.02	155.57
E_{v2}/E_{v1}	1.32	

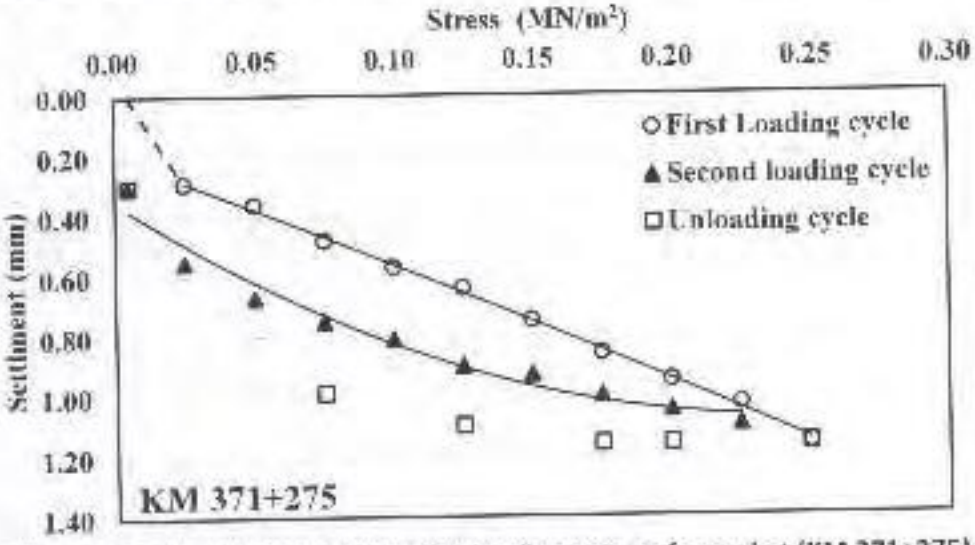

Figure 3: Load-settlement data: plate loading test performed at (KM 371+275)

Table 10: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+250)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m²	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.31
2	14.14	0.050	0.38
3	21.21	0.075	0.45
4	28.28	0.100	0.53
5	35.35	0.125	0.61
6	42.42	0.150	0.72
7	49.49	0.175	0.80
8	56.56	0.200	0.86
9	63.63	0.225	0.95
10	70.7	0.250	1.05
11	56.56	0.200	1.05
12	49.49	0.175	1.04
13	35.35	0.125	0.95
14	21.21	0.075	0.86
15	1.414	0.005	0.26

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Table 11: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+250)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.26
1	7.07	0.025	0.48
2	14.14	0.050	0.54
3	21.21	0.075	0.65
4	28.28	0.100	0.74
5	35.35	0.125	0.83
6	42.42	0.150	0.86
7	49.49	0.175	0.93
8	56.56	0.200	1.00
9	63.63	0.225	1.05

Table 12: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+250)

Parameters	1st loading cycle	2nd loading cycle
($s_{0,max}$) MN/m^2	0.25	0.25
a_0 (mm)	0.23	0.29
a_1 (mm/(MN/m^2))	2.97	5.45
a_2 (min/(MN2/m^2))	1.21	9.54
$Ev= 1.5\ r/\ [a_1+a_2.\ s_{0,max}]$	137.52	146.62
Ev_2/Ev_1	1.07	

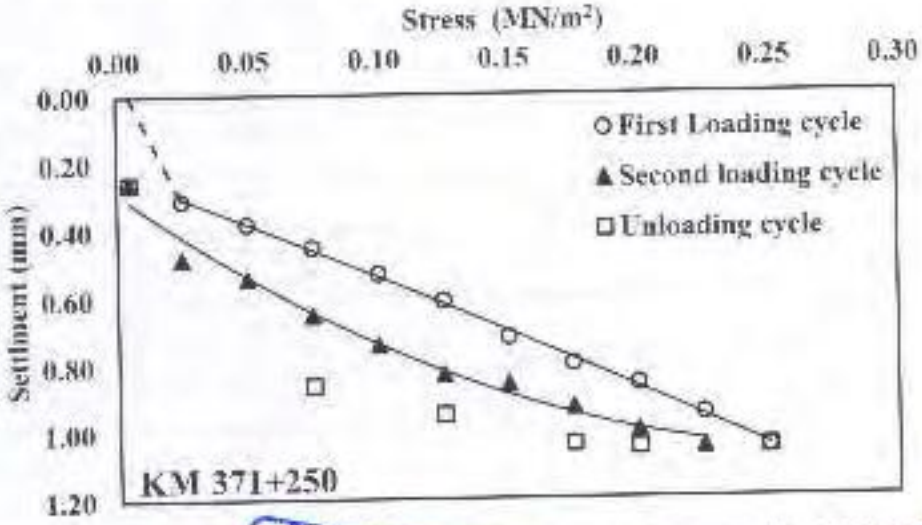

Figure 4: Load-settlement data, plate loading test performed at (KM 371+250)

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Table 13: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+225)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.20
2	14.14	0.050	0.29
3	21.21	0.075	0.40
4	28.28	0.100	0.49
5	35.35	0.125	0.58
6	42.42	0.150	0.64
7	49.49	0.175	0.71
8	56.56	0.200	0.80
9	63.63	0.225	0.88
10	70.7	0.250	0.99
11	56.56	0.200	0.99
12	49.49	0.175	0.97
13	35.35	0.125	0.87
14	21.21	0.075	0.74
15	1.414	0.005	0.19

Table 14: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+225)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.19
1	7.07	0.025	0.38
2	14.14	0.050	0.45
3	21.21	0.075	0.53
4	28.28	0.100	0.61
5	35.35	0.125	0.69
6	42.42	0.150	0.79
7	49.49	0.175	0.85
8	56.56	0.200	0.90
9	63.63	0.225	0.96

Table 15: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+225)

Parameters	1st loading cycle	2nd loading cycle
(s_0,max) MN/m^2	0.25	0.25
a_0 (mm)	0.12	0.21
a_1 (mm/(MN/m^2))	3.72	4.81
a_2 (mm/($MN2/m^4$))	-1.21	-6.69
$Ev = 1.5\ r/(a_1+a_2 \cdot s_0)$ (MN/m²)	131.76	143.45
Ev_2/Ev_1	1.09	

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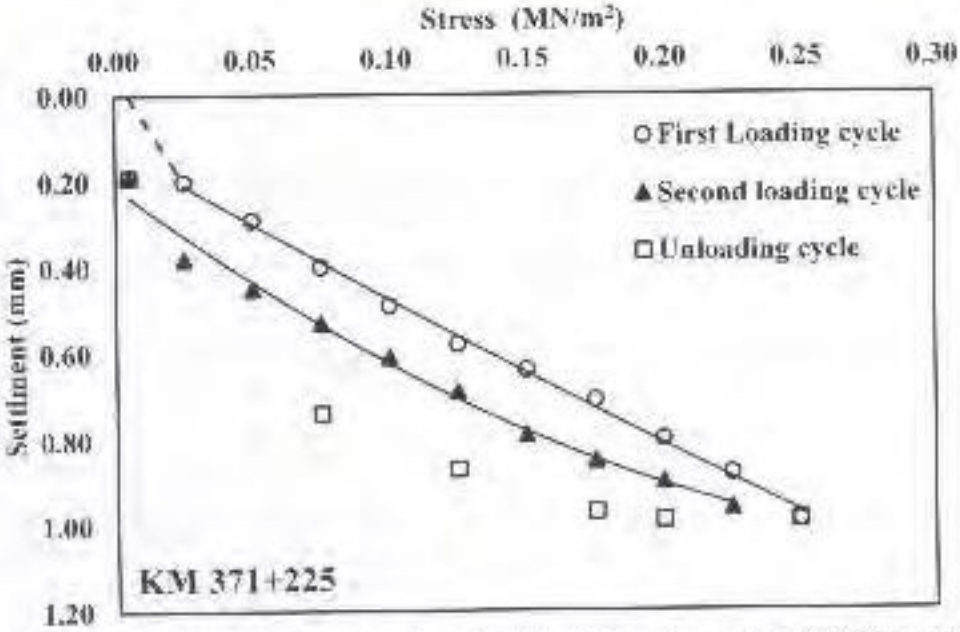

Figure 5: Load-settlement data: plate loading test performed at (KM 371+225)

The testing data corresponding to the sixth testing point (KM 371+200) is provided in Tables 16-18 and Figure 6. The testing data corresponding to the seventh testing point (KM 371+175) is provided in Tables 19-21 and Figure 7. The testing data corresponding to the eighth testing point (KM 371+150) is provided in Tables 22-24 and Figure 8. The testing data corresponding to the ninth testing point (KM 371+125) is provided in Tables 25-27 and Figure 9. The testing data corresponding to the tenth testing point (KM 371+100) is provided in Tables 28-30 and Figure 10.

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Table 16: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+200)

Loading stage	Load (F)	Normal stress (s_0)	Settlement (S)
	kN	MN/m^2	mm
0	1.414	0.005	0.00
1	7.07	0.025	0.25
2	14.14	0.050	0.32
3	21.21	0.075	0.40
4	28.28	0.100	0.52
5	35.35	0.125	0.69
6	42.42	0.150	0.80
7	49.49	0.175	0.91
8	56.56	0.200	1.02
9	63.63	0.225	1.13
10	70.7	0.250	1.23
11	56.56	0.200	1.23
12	49.49	0.175	1.23
13	35.35	0.125	1.15
14	21.21	0.075	1.04
15	1.414	0.005	0.44

Table 17: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+200)

Loading stage	Load (F)	Normal stress (s_0)	Settlement (S)
	kN	MN/m^2	mm
0	1.414	0.005	0.44
1	7.07	0.025	0.61
2	14.14	0.050	0.67
3	21.21	0.075	0.78
4	28.28	0.100	0.86
5	35.35	0.125	0.93
6	42.42	0.150	1.00
7	49.49	0.175	1.08
8	56.56	0.200	1.14
9	63.63	0.225	1.23

Table 18: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+200)

Parameters	1st loading cycle	2nd loading cycle
$[s_0 max]$ MN/m^2	0.25	0.25
a_0 (mm)	0.11	0.46
a_1 (mm/(MN/m²))	4.39	4.47
a_2 (mm/(MN2/m²))	0.67	-5.02
$Ev = 1.5 s_0 / [a_0 + a_1 s_0 + a_2 s_0^2]$	98.71	139.89
E_{v2}/E_{v1}	1.42	

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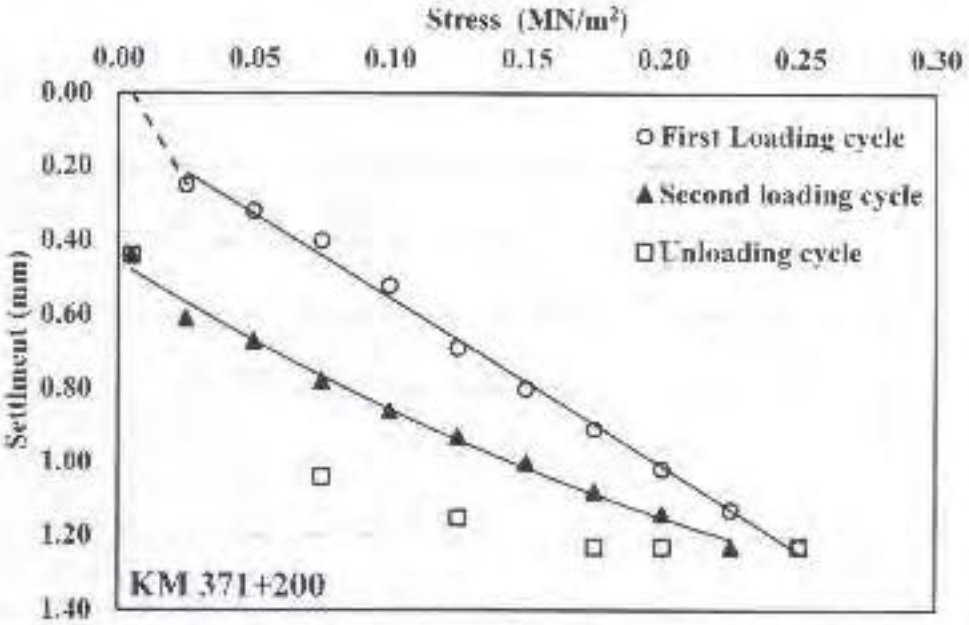

Figure 6: Load-settlement data: plate loading test performed at (KM 371+200)

Table 19: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+175)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m²	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.26
2	14.14	0.050	0.35
3	21.21	0.075	0.46
4	28.28	0.100	0.56
5	35.35	0.125	0.68
6	42.42	0.150	0.77
7	49.49	0.175	0.93
8	56.56	0.200	1.03
9	63.63	0.225	1.13
10	70.7	0.250	1.30
11	56.56	0.200	1.30
12	49.49	0.175	1.28
13	35.35	0.125	1.22
14	21.21	0.075	1.12
15	1.414	0.005	0.45

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Table 20: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+175)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.45
1	7.07	0.025	0.70
2	14.14	0.050	0.76
3	21.21	0.075	0.85
4	28.28	0.100	0.95
5	35.35	0.125	1.02
6	42.42	0.150	1.10
7	49.49	0.175	1.20
8	56.56	0.200	1.23
9	63.63	0.225	1.30

Table 21: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+175)

Parameters	1st loading cycle	2nd loading cycle
($s_0$max) MN/m^2	0.25	0.25
a_0 (mm)	0.16	0.49
a_1 (mm/(MN/m^2))	3.64	5.50
a_2 (mm/(MNZ/m^4))	3.40	-8.70
Ev= 1.5 r/ (a_1+a_2.$s_{0,max}$)	100.21	135.45
Ev_2/Ev_1	1.35	

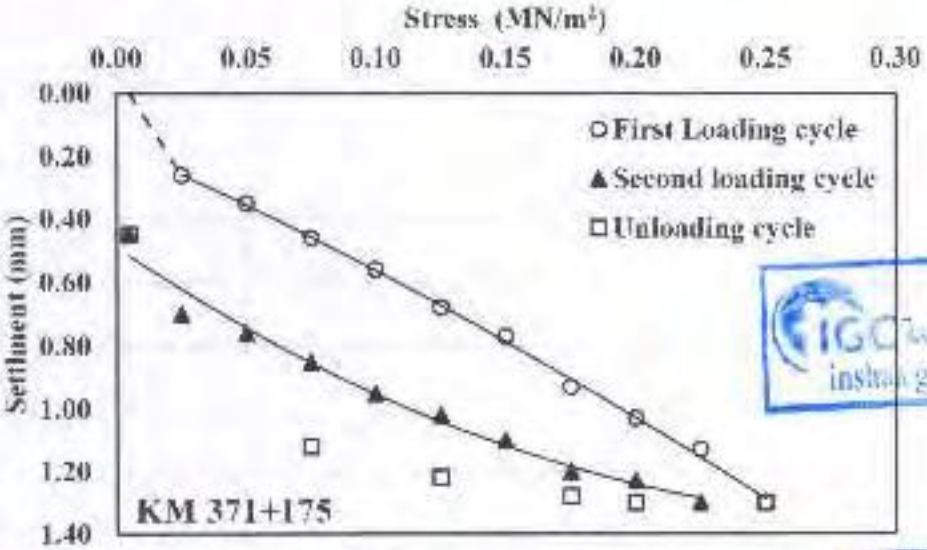

Figure 7: Load-settlement data: plate loading test performed at (KM 371+175)

Table 22: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+150)

Loading stage	Load (F)	Normal stress (s_o)	Settlement (S)
	kN	MN/m^2	mm
0	1.414	0.005	0.00
1	7.07	0.025	0.30
2	14.14	0.050	0.38
3	21.21	0.075	0.55
4	28.28	0.100	0.66
5	35.35	0.125	0.82
6	42.42	0.150	0.95
7	49.49	0.175	1.08
8	56.56	0.200	1.19
9	63.63	0.225	1.31
10	70.7	0.250	1.48
11	56.56	0.200	1.48
12	49.49	0.175	1.47
13	35.35	0.125	1.45
14	21.21	0.075	1.36
15	1.414	0.005	0.66

Table 23: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+150)

Loading stage	Load (F)	Normal stress (s_o)	Settlement (S)
	kN	MN/m^2	mm
0	1.414	0.005	0.66
1	7.07	0.025	0.88
2	14.14	0.050	0.96
3	21.21	0.075	1.09
4	28.28	0.100	1.19
5	35.35	0.125	1.30
6	42.42	0.150	1.38
7	49.49	0.175	1.47
8	56.56	0.200	1.53
9	63.63	0.225	1.57

Table 24: Calculations of the resilient modulus of the tested soil according to DIN 18134: (KM 371+150)

Parameters	1st loading cycle	2nd loading cycle
(s_o, max) MN/m^2	0.25	0.25
a_0 (mm)	0.15	0.67
a_1 (mm/(MN/m²))	5.23	6.40
a_2 (mm/(MN2/m⁴))	0.12	-10.64
$Ev = 1.5 s_o / (a_1 + a_2 s_o max)$	85.49	120.18
Ev_2/Ev_1	1.41	

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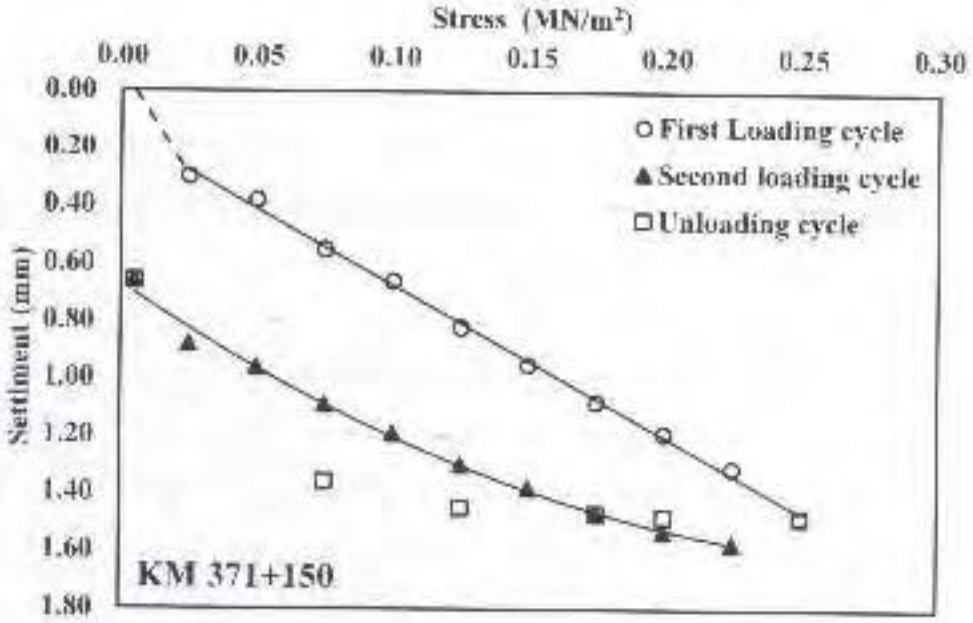

Figure 8: Load-settlement data: plate loading test performed at (KM 371+150)

Table 25: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+125)

Loading stage	Load (F)	Normal stress (s_o)	Settlement (S)
	kN	MN/m^2	mm
0	1.414	0.005	0.00
1	7.07	0.025	0.26
2	14.14	0.050	0.30
3	21.21	0.075	0.43
4	28.28	0.100	0.53
5	35.35	0.125	0.67
6	42.42	0.150	0.79
7	49.49	0.175	0.86
8	56.56	0.200	0.96
9	63.63	0.225	1.07
10	70.7	0.250	1.15
11	56.56	0.200	1.19
12	49.49	0.175	1.18
13	35.35	0.125	1.12
14	21.21	0.075	1.01
15	1.414	0.005	0.40

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Table 26: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+125)

Loading stage	Load (F) kN	Normal stress (s_n) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.40
1	7.07	0.025	0.63
2	14.14	0.050	0.69
3	21.21	0.075	0.78
4	28.28	0.100	0.86
5	35.35	0.125	0.93
6	42.42	0.150	1.03
7	49.49	0.175	1.10
8	56.56	0.200	1.16
9	63.63	0.225	1.21

Table 27: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+125)

Parameters	1st loading cycle	2nd loading cycle
($s_{n,max}$) MN/m^2	0.25	0.25
a_2 (mm)	0.13	0.44
a_1 ($mm/(MN/m^2)$)	4.18	5.10
a_2 ($mm/(MN2/m^4)$)	0.74	-7.50
$Ev = 1.5\ r/(a_1 + a_2 \cdot s_{n,max})$	106.08	139.54
Ev_2/Ev_1	1.32	

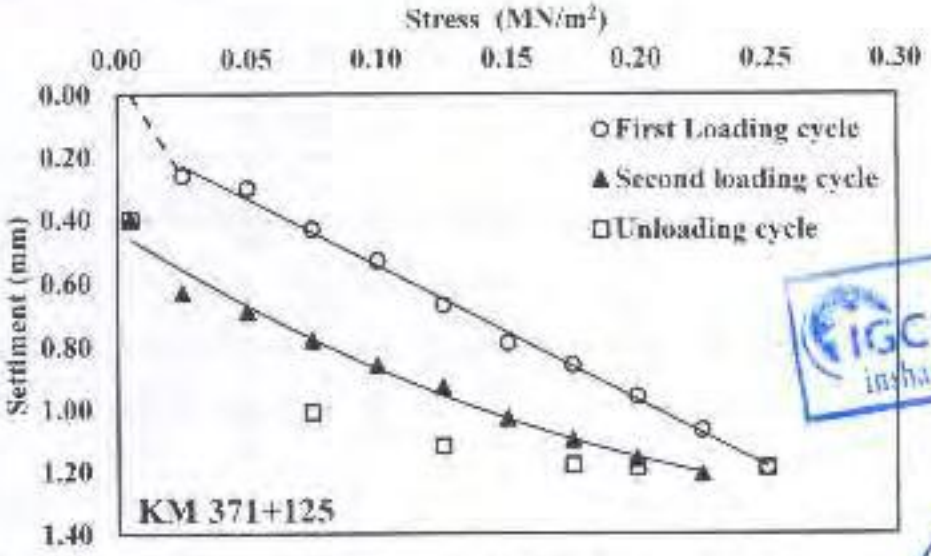

Figure 9: Load-settlement data: plate loading test performed at (KM 371+125)

Table 28: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+100)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.35
2	14.14	0.050	0.41
3	21.21	0.075	0.50
4	28.28	0.100	0.60
5	35.35	0.125	0.76
6	42.42	0.150	0.90
7	49.49	0.175	1.00
8	56.56	0.200	1.13
9	63.63	0.225	1.22
10	70.7	0.250	1.37
11	56.56	0.200	1.37
12	49.49	0.175	1.36
13	35.35	0.125	1.21
14	21.21	0.075	1.07
15	1.414	0.005	0.34

Table 29: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+100)

Loading stage	Load (F) kN	Normal stress (s_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.34
1	7.07	0.025	0.70
2	14.14	0.050	0.79
3	21.21	0.075	0.85
4	28.28	0.100	0.97
5	35.35	0.125	1.09
6	42.42	0.150	1.15
7	49.49	0.175	1.24
8	56.56	0.200	1.30
9	63.63	0.225	1.37

Table 30: Calculations of the resilient modulus of the tested soil according to DIN 18134 (KM 371+100)

Parameters	1st loading cycle	2nd loading cycle
(s_0,max) MN/m^2	0.25	0.25
a_0 (mm)	0.22	0.42
a_1 (mm/(MN/m²))	3.84	7.02
a_2 (mm/(MN2/m²))	3.09	-12.86
$Ev = 1.5r/(a_1 + a_2 \cdot s_{0,max})$	97.57	118.34
Ev_{avg}	1.21	

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E-JUST CETC Unit

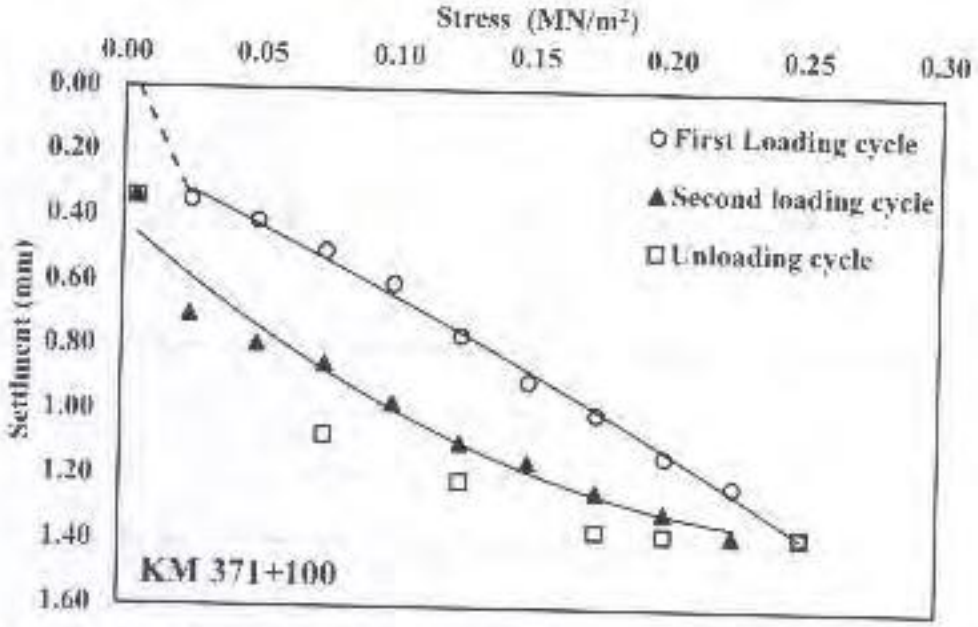

Figure 10: Load-settlement data: plate loading test performed at (KM 371+100)

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4. Closure

Test results presented herein report the load-settlement data obtained from 10 plate loading tests conducted on the Prepared Subgrade 2.0 of the Electric Express train project at 10 locations (KM 371+325, KM 371+300, KM 371+275, KM 371+250, KM 371+225, KM 371+200, KM 371+175, KM 371+150, KM 371+125, and KM 371+100) in accordance with German Standard, DIN18134.

Location	E_{v1} MN/m2	E_{v2} MN/m2	E_{v2}/E_{v1} ratio
KM 371+325	121.65	134.10	1.10
KM 371+300	124.31	154.08	1.24
KM 371+275	118.02	155.57	1.32
KM 371+250	137.52	146.62	1.07
KM 371+225	131.76	143.45	1.09
KM 371+200	98.71	139.89	1.42
KM 371+175	100.21	135.45	1.35
KM 371+150	85.49	120.18	1.41
KM 371+125	106.08	139.54	1.32
KM 371+100	97.57	118.34	1.21

- Note: Before interpreting these test results for future applications, the Prepared Subgrade 2.0 in-situ variability between the testing locations should be considered.

Technical committee

Dr. Mahmoud Ahmed

Prof. Dr. Mohamed T. M. Fahmy

E-JUST CETC Unit

Lab Engineer

Mohamed A. Al-Najjar

شركة انشاء للمقاولات العامة
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Appendix A

E-JUST CETC Unit

Location of test site:	KM 371+300		Field team	Mr.Mohamed Mandnoh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/4/2023
Diameter of loading plate	600		Time	9:35:00 AM
				10:03:00 AM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	0			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.75	
	2	14.14	9.70	
	3	21.21	9.60	
	4	28.28	9.49	
	5	35.35	9.40	
	6	42.42	9.28	
	7	49.49	9.20	
	8	56.56	9.13	
	9	63.63	9.07	
	10	70.7	8.98	
Unloading Stage	11	56.56	8.98	
	12	49.49	8.98	
	13	35.35	9.02	
	14	21.21	9.12	
	15	1.414	9.70	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.70	
	1	7.07	9.54	
	2	14.14	9.47	
	3	21.21	9.41	
	4	28.28	9.31	
	5	35.35	9.23	
	6	42.42	9.15	
	7	49.49	9.08	
	8	56.56	9.05	
	9	63.63	9.00	

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SPECTRUM CONSULTING

Location of test site:	KM 371+275		**Field team**	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		**Date:**	11/4/2023
Diameter of loading plate	600		**Time**	10:10:00 AM
				10:38:00 AM
Lever ratio	1		**Note:** CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	—			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.71	
	2	14.14	9.64	
	3	21.21	9.52	
	4	28.28	9.43	
	5	35.35	9.36	
	6	42.42	9.25	
	7	49.49	9.14	
	8	56.56	9.05	
	9	63.63	8.97	
	10	70.7	8.84	
Unloading Stage	11	56.56	8.84	
	12	49.49	8.84	
	13	35.35	8.90	
	14	21.21	9.01	
	15	1.414	9.70	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.70	
	1	7.07	9.45	
	2	14.14	9.33	
	3	21.21	9.25	
	4	28.28	9.19	
	5	35.35	9.10	
	6	42.42	9.07	
	7	49.49	9.00	
	8	56.56	8.95	
	9	63.63	8.90	

شركة إنشاء للمقاولات العامة IGC inshaa general construction

E-JUST CETC Unit

SPECTRUM CONSULTING

Location of test site:	KM 371+250		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/4/2023
Diameter of loading plate	600		Time	10:45:00 AM
				11:12:00 AM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	—			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.69	
	2	14.14	9.62	
	3	21.21	9.55	
	4	28.28	9.47	
	5	35.35	9.39	
	6	42.42	9.28	
	7	49.49	9.20	
	8	56.56	9.14	
	9	63.63	9.05	
	10	70.7	8.95	
Unloading Stage	11	56.56	8.95	
	12	49.49	8.96	
	13	35.35	9.05	
	14	21.21	9.14	
	15	1.414	9.74	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.74	
	1	7.07	9.52	
	2	14.14	9.46	
	3	21.21	9.35	
	4	28.28	9.26	
	5	35.35	9.17	
	6	42.42	9.14	
	7	49.49	9.07	
	8	56.56	9.00	
	9	63.63	8.95	

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Location of test site:	KM 371+225		Field team	Mr Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/4/2023
Diameter of loading plate	600		Time	11:20:00 AM
				11:48:00 AM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	—			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.80	
	2	14.14	9.71	
	3	21.21	9.60	
	4	28.28	9.51	
	5	35.35	9.42	
	6	42.42	9.36	
	7	49.49	9.29	
	8	56.56	9.20	
	9	63.63	9.12	
	10	70.7	9.01	
Unloading Stage	11	56.56	9.01	
	12	49.49	9.03	
	13	35.35	9.13	
	14	21.21	9.26	
	15	1.414	9.81	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.81	
	1	7.07	9.62	
	2	14.14	9.55	
	3	21.21	9.47	
	4	28.28	9.39	
	5	35.35	9.31	
	6	42.42	9.21	
	7	49.49	9.15	
	8	56.56	9.10	
	9	63.63	9.04	

شركة إنشاء للمقاولات العامة
IGC inshaa general construction

Location of test site:	**KM 371+200**		**Field team**	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		**Date:**	11/4/2023
Diameter of loading plate	600		**Time**	11:55:00 AM
				12:23:00 PM
Lever ratio	1		**Note:** CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	—			
Temperature	19°C			
Test regime	Loading Stage No.	Load (KN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.75	
	2	14.14	9.68	
	3	21.21	9.60	
	4	28.28	9.48	
	5	35.35	9.31	
	6	42.42	9.20	
	7	49.49	9.09	
	8	56.56	8.98	
	9	63.63	8.87	
	10	70.7	8.77	
Unloading Stage	11	56.56	8.77	
	12	49.49	8.77	
	13	35.35	8.85	
	14	21.21	8.96	
	15	1.414	9.56	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.56	
	1	7.07	9.39	
	2	14.14	9.33	
	3	21.21	9.22	
	4	28.28	9.14	
	5	35.35	9.07	
	6	42.42	9.00	
	7	49.49	8.92	
	8	56.56	8.86	
	9	63.63	[illegible]	

شركة إنشاء للمقاولات العامة
GC inshaa general construction

Location of test site:	**KM 371+175**		**Field team**	Mr Mohamed Mandour
Project title:	Electric Express Train Project - Inshaa General Construction		**Date:**	11/4/2023
Diameter of loading plate	600		**Time**	12:30:00 PM
				12:58:00 PM
Lever ratio	1		**Note:** CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	—			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.74	
	2	14.14	9.65	
	3	21.21	9.54	
	4	28.28	9.44	
	5	35.35	9.32	
	6	42.42	9.23	
	7	49.49	9.07	
	8	56.56	8.97	
	9	63.63	8.87	
	10	70.7	8.70	
Unloading Stage	11	56.56	8.70	
	12	49.49	8.72	
	13	35.35	8.78	
	14	21.21	8.88	
	15	1.414	9.55	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.55	
	1	7.07	9.30	
	2	14.14	9.24	
	3	21.21	9.15	
	4	28.28	9.05	
	5	35.35	8.98	
	6	42.42	8.90	
	7	49.49	8.80	
	8	56.56	8.7[illegible]	
	9	63.63	8.40	

شركة إنشاء للمقاولات العامة IGC inshaa general construction

Location of test site:	KM 371+150		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/4/2023
Diameter of loading plate	600		Time	1:07:00 PM
				1:35:00 PM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	—			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.70	
	2	14.14	9.62	
	3	21.21	9.45	
	4	28.28	9.34	
	5	35.35	9.18	
	6	42.42	9.05	
	7	49.49	8.92	
	8	56.56	8.81	
	9	63.63	8.69	
	10	70.7	8.52	
Unloading Stage	11	56.56	8.52	
	12	49.49	8.53	
	13	35.35	8.55	
	14	21.21	8.64	
	15	1.414	9.34	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.34	
	1	7.07	9.12	
	2	14.14	9.04	
	3	21.21	8.91	
	4	28.28	8.81	
	5	35.35	8.70	
	6	42.42	8.62	
	7	49.49	8.53	
	8	56.56	8.47	
	9	63.63	8.41	

شركة انشاء للمقاولات العامة IGC
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Location of test site:	KM 371+125		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/4/2023
Diameter of loading plate	600		Time	1:43:00 PM
				2:10:00 PM
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	---			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.74	
	2	14.14	9.70	
	3	21.21	9.57	
	4	28.28	9.47	
	5	35.35	9.33	
	6	42.42	9.21	
	7	49.49	9.14	
	8	56.56	9.04	
	9	63.63	8.93	
	10	70.7	8.81	
Unloading Stage	11	56.56	8.81	
	12	49.49	8.82	
	13	35.35	8.88	
	14	21.21	8.99	
	15	1.414	9.60	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.60	
	1	7.07	9.37	
	2	14.14	9.31	
	3	21.21	9.22	
	4	28.28	9.14	
	5	35.35	9.07	
	6	42.42	8.97	
	7	49.49	8.90	
	8	56.56	8.84	
	9	63.63	8.7[illegible]	

شركة انشاء للمقاولات العامة
IGC inshaa general construction

Location of test site:	**KM 371+100**		**Field team**	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		**Date:**	11/4/2023
Diameter of loading plate	600		**Time**	2:18:00 PM
				2:48:00 PM
Lever ratio	1		**Note:** CAT 966F	
Type of Soil	Prepared Subgrade 2.0			
Bedding material	—			
Temperature	19°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.65	
	2	14.14	9.59	
	3	21.21	9.50	
	4	28.28	9.40	
	5	35.35	9.24	
	6	42.42	9.10	
	7	49.49	9.00	
	8	56.56	8.87	
	9	63.63	8.78	
	10	70.7	8.63	
Unloading Stage	11	56.56	8.63	
	12	49.49	8.64	
	13	35.35	8.79	
	14	21.21	8.93	
	15	1.414	9.66	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.66	
	1	7.07	9.30	
	2	14.14	9.21	
	3	21.21	9.15	
	4	28.28	9.03	
	5	35.35	8.91	
	6	42.42	8.85	
	7	49.49	8.76	
	8	56.56	8.70	
	9	63.63	8.63	

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IGC
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S5-B-IN

MATERIAL INSPECTION REQUEST

Contractor Company	INSHAA GENERAL OF CONSTRUCTION Company		Designer Company	(SPECTRUM) Engineering Consulting Office	
Issued by Contractor	Name: Eng. Moahmed hassen elssyd	Sign	Date/ Serial Number: 10-05-2023 (P.L.T.4)	Time: 01:00 PM	
Received by GARB CONSULTANT	Eng. Mazen Essamy		PLT		

C1	C2	C3	D2	MM	YY	HH	MM
371	EW	CS	11	05	2023	3	00

CODE-1	S1 to S21 Station Reference	D1 to S3 Depot Reference	Kp XXX Note For Kilometer point only Start Km is used
CODE-2		Work Activity	
CODE-3		Sub Element of Activity	

Description of Materials	Prepared sub grade level 2		
Location to be Used	St. (371+000) To (371+100)		
MAR Approval No	M.A.R. P.S.G 1	Date	08/04/2023
Supplier Name	ALFARDI		
Test Requirement	P.L.T (DIN 18134)	Specification	EARTHWORK SPECIFICATIONS & TESTING REPORT (CG21-41.2) VERSION 2 BY CIVECON GROUP
Reference Photos	Yes / No	Other	Rev UIR- P.S.G 6

Item	Description	Unit	Quantity	Arrival Date	Note
1	PLATE LOAD TEST	NUMBER	4	11/05/2023	
2					
3					
4					

Comments by: Eng. Mazen Essamy (SPECTRUM)

1-The Plate Load Test Result P.L.T (DIN 18134) is Approved.

SPECTRUM CONSULTING

Comments by: Eng. Alaa Abd-Allatif (ER)

1-Plate Load Test Was Carried-out By (E-just)
2-Results report attached and acceptable with project specifications.
3-Final approval is subject to above mentioned comments.

شركة إنشاء للمقاولات العامة
INGC Inshaa general contracting Co.

APPROVAL STATUS

Organisation	Name	Sign	Date	A-AWC-R
Contractor	Eng. Mohamed Hassan		11-05-2023	A
QA/QC *	Eng. Mazen Essamy			A
GARB**	Eng. Mohammed Fayad			
Employers Representative	Eng. Alaa Abd-Allatif		12-5-2023	AWC

* Designer
** Alignment / Bridges: Culvert Only

Technical Report

Plate Loading Tests

KM 371+000 to 371+025, KM 371+025 to 371+050, KM 371+050 to 371+075, and KM 371+075 to 371+100

Prepared Subgrade 2

Project

Electric Express Train (Sokhna - New capital - 6th of October city - New Elalamein city)

Prepared for

Inshaa General Construction

3 Mobilka CC - Abu Youssef, Alexandria, Egypt

يعتمد ،،،
أمين عام الجامعة
لواء مهندس / أسامة فتحي

(May 11, 2023)

E-JUST CETC Unit

1. Introduction

The Civil Engineering Testing & Consulting Unit (CETCU) of the Egypt-Japan University of Science and Technology (EJUST) was retained by Inshaa General Construction to conduct 4 plate loading tests on the Prepared Subgrade 2 of the Electric Express Train project at 4 locations (KM 371+000 to 371+025, KM 371+025 to 371+050, KM 371+050 to 371+075, and KM 371+075 to 371+100) in accordance with the German Standard DIN18134. The mandate was communicated by Eng. Mahmoud Shaban of Inshaa General Construction. Field team members (Mr.Mohamed Mamdouh) from the working CETCU team visited the project site on May 11, 2023 and performed the required tests. This report summarizes the plate loading test procedure according to DIN18134, the test results and their interpretations, and the CETCU pertaining recommendations.

2. Test Set Up and Instrumentation

- The German standard DIN18134 was applied to define the test setup including the loading system, test conditions, and procedure for the plate loading tests.
- The tests were carried out to determine the Strain Moduli (Ev1 and Ev2) and their ratio (Ev2/Ev1) from a stress – deformation relationship of two consecutive loading from Loading-Unloading-Loading regime.
- The loading plate has a diameter of 600 mm and a thickness of 25 mm and it is provided with equally spaced stiffeners. The upper plate face is parallel to the bottom face of the plate to allow a 300-mm plate to be placed on the 600-mm plate top.
- The loading system consisted of a hydraulic pump connected to a hydraulic jack of 700 bar capacity, which can apply and release the load increments.
- The dial gauge used to measure the plate settlement has a resolution of 0.01 mm and the lever ratio was equal to 1.
- The temperature at the time of the test was 24± 1°C.
- The plate was carried out on a Prepared Subgrade 2 (according to the company) at 4 points (KM 371+000 to 371+025, KM 371+025 to 371+050, KM 371+050 to 371+075, and KM 371+075 to 371+100). The test surface area was levelled, and the plate was bedded on this surface.
- The hydraulic jack was placed on the middle of, and normal to, the loading plate beneath the reaction loading system and secured against Lilting.
- The reaction loading system was a heavy multipurpose Loader CAT 966F.

3. Test Procedure and Results

The plate load test was conducted in accordance with the DIN18134. Loading, unloading, and reloading regimes were considered to estimate the resilient modulus of the tested soil. Prior to the test, the force transducer and dial gauge were reset to zero, and then a load corresponding to a stress of 0.01 MN/m2 was applied. The load was increased in the first loading cycle until a normal stress of 0.25 MN/m2 was reached, and the loading increment was 0.025 MN/m2. The load was gradually released in four stages. Following unloading, a second loading cycle was performed, but the load was only increased to the penultimate stage of the first cycle. 4 plate loading tests on the Prepared Subgrade 2 of the Electric Express Train project were conducted at 4 locations (KM 371+000 to 371+025, KM 371+025 to 371+050, KM 371+050 to 371+075, and KM 371+075 to 371+100) and the data collected at the 4 test points is included in Appendix A.

Table 1 presents the load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+000 to 371+025), while Table 2 shows the data obtained at the second loading stage.

Table 1: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+000 to 371+025)

Loading stage	Load (F) kN	Normal MN/m^2	Settleme mm
0	1.414	0.005	0.00
1	7.07	0.025	0.20
2	14.14	0.050	0.28
3	21.21	0.075	0.35
4	28.28	0.100	0.51
5	35.35	0.125	0.71
6	42.42	0.150	0.84
7	49.49	0.175	1.00
8	56.56	0.200	1.14
9	63.63	0.225	1.23
10	70.7	0.250	1.36
11	56.56	0.200	1.36
12	49.49	0.175	1.34
13	35.35	0.125	1.32
14	21.21	0.075	1.24
15	1.414	0.005	0.69

Table 2: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+000 to 371+025)

Loading stage	Load (F)	Normal stress (σ_0)	Settlement (S)
	kN	MN/m^2	mm
0	1.414	0.005	0.69
1	7.07	0.025	0.85
2	14.14	0.050	0.95
3	21.21	0.075	1.00
4	28.28	0.100	1.07
5	35.35	0.125	1.15
6	42.42	0.150	1.20
7	49.49	0.175	1.28
8	56.56	0.200	1.33
9	63.63	0.225	1.40

The load-settlement data obtained in all loading and unloading stages for the test performed at the first location (KM 371+000 to 371+025) are shown in Figure 1. Table 3 shows the calculations of the resilient modulus of the tested soil according to DIN18134. The testing data corresponding to the second testing point (KM 371+025 to 371+050) is provided in Tables 4-6 and Figure 2. The testing data corresponding to the third testing point (KM 371+050 to 371+075) is provided in Tables 7-9 and Figure 3. The testing data corresponding to the fourth testing point (KM 371+075 to 371+100) is provided in Tables 10-12 and Figure 4.

Table 3: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+000 to 371+025)

Parameters	1st loading cycle	2nd loading cycle
(s_0, max) MN/m^2	0.25	0.25
s_0 (mm)	0.02	0.72
a_1 $(mm/(MN/m^2))$	5.22	4.19
a_2 $(mm/(MN2/m^4))$	0.97	-5.42
$Ev = 1.5\ r/(a_1 + a_2 \cdot s_{0,MAX})$	**82.34**	**158.76**
Ev_2/Ev_1	**1.93**	

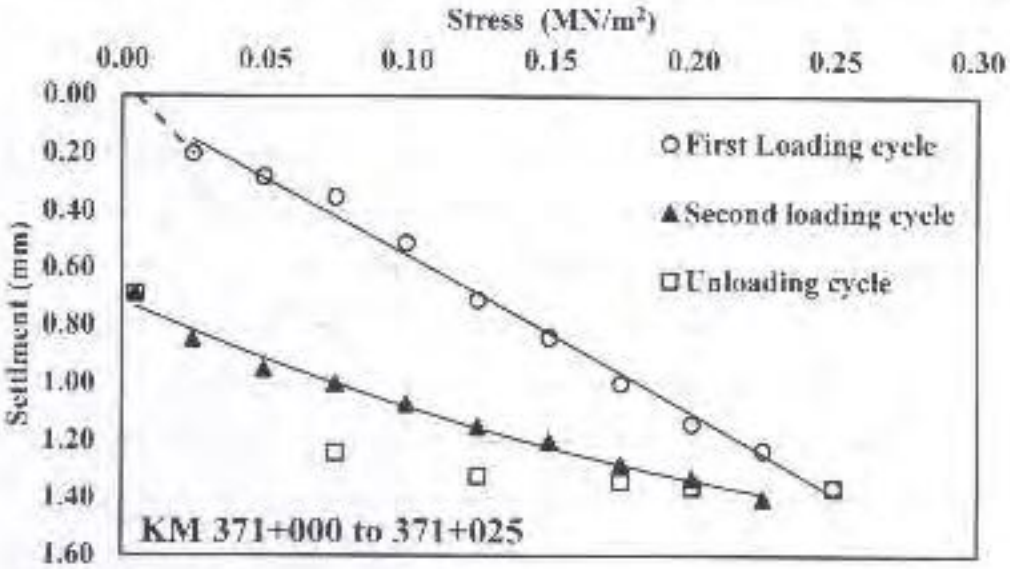

Figure 1: Load-settlement data: plate loading test performed at (KM 371+000 to 371+025)

Table 4: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+025 to 371+050)

Loading stage	Load (F) kN	Normal stress (σ_0) MN/m²	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.35
2	14.14	0.050	0.40
3	21.21	0.075	0.45
4	28.28	0.100	0.54
5	35.35	0.125	0.65
6	42.42	0.150	0.73
7	49.49	0.175	0.81
8	56.56	0.200	0.90
9	63.63	0.225	1.00
10	70.7	0.250	1.08
11	56.56	0.200	1.08
12	49.49	0.175	1.07
13	35.35	0.125	1.0[illegible]
14	21.21	0.075	0.9[illegible]
15	1.414		0.34

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Table 5: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+025 to 371+050)

Loading stage	Load (F) kN	Normal stress (σ_0) MN/m²	Settlement (S) mm
0	1.414	0.005	0.34
1	7.07	0.025	0.57
2	14.14	0.050	0.65
3	21.21	0.075	0.73
4	28.28	0.100	0.80
5	35.35	0.125	0.88
6	42.42	0.150	0.92
7	49.49	0.175	0.96
8	56.56	0.200	1.00
9	63.63	0.225	1.05

Table 6: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+025 to 371+050)

Parameters	1st loading cycle	2nd loading cycle
(s_0,max) MN/m²	0.25	0.25
a_0 (mm)	0.27	0.38
a_1 (mm/(MN/m²))	2.61	5.46
a_2 (mm/(MN2/m⁴))	2.79	-11.55
Ev= 1.5 r/ (a_1+a_2. $s_{0,max}$)	136.24	174.64
Ev_2/Ev_1	1.28	

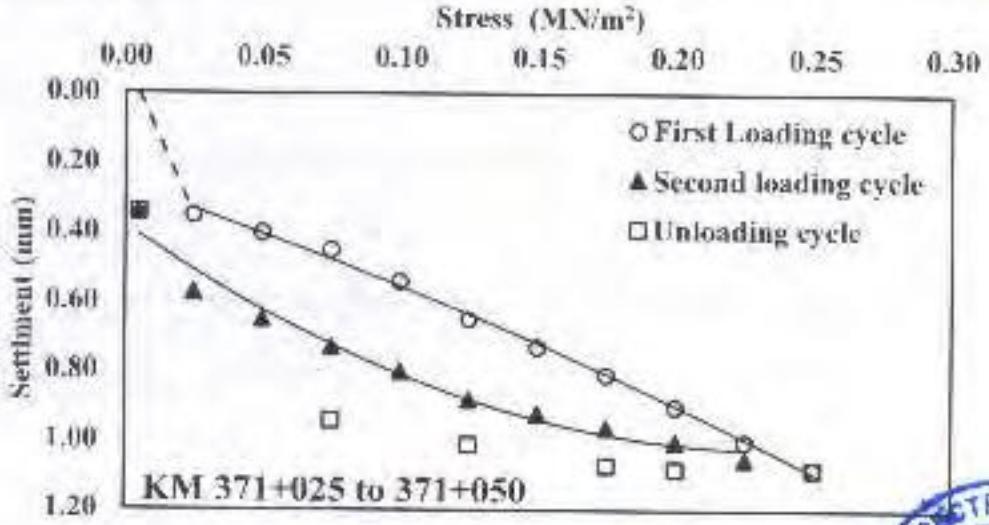

Figure 2: Load-settlement data: plate loading test performed at (KM 371+025 to 371+050)

Table 7: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+050 to 371+075)

Loading stage	Load (F) kN	Normal stress (σ_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.00
1	7.07	0.025	0.25
2	14.14	0.050	0.32
3	21.21	0.075	0.43
4	28.28	0.100	0.57
5	35.35	0.125	0.67
6	42.42	0.150	0.83
7	49.49	0.175	0.93
8	56.56	0.200	1.08
9	63.63	0.225	1.17
10	70.7	0.250	1.31
11	56.56	0.200	1.30
12	49.49	0.175	1.29
13	35.35	0.125	1.22
14	21.21	0.075	1.15
15	1.414	0.005	0.45

Table 8: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+050 to 371+075)

Loading stage	Load (F) kN	Normal stress (σ_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.45
1	7.07	0.025	0.63
2	14.14	0.050	0.75
3	21.21	0.075	0.88
4	28.28	0.100	0.94
5	35.35	0.125	1.00
6	42.42	0.150	1.07
7	49.49	0.175	1.13
8	56.56	0.200	1.19
9	63.63	0.225	1.25

Table 9: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+050 to 371+075)

Parameters	1st loading cycle	2nd loading cycle
(s_0,max) MN/m^2	0.25	0.25
a_0 (mm)	0.12	0.48
a_1 (mm/(MN/m²))	4.28	6.80
a_2 (mm/(MN2/m⁴))	2.00	10.81
$Ev_1 = 1.5\ r/\ (a_1+a_2 \cdot s_{0,max})$	93.86	145.26
Ev_2/Ev_1	1.55	

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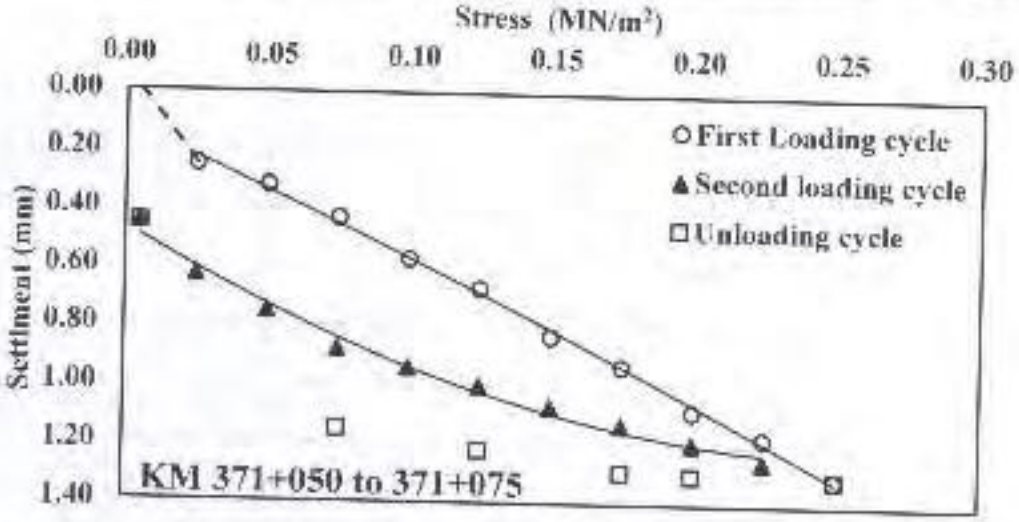

Figure 3: Load-settlement data: plate loading test performed at (KM 371+050 to 371+075)

Table 10: Load-settlement data obtained at the first loading and unloading stages of the plate loading test performed at the location (KM 371+075 to 371+100)

Loading stage	Load (F)	Normal stress (σ_0)	Settlement (S)
	kN	MN/m^2	mm
0	1.414	0.005	0.00
1	7.07	0.025	0.26
2	14.14	0.050	0.41
3	21.21	0.075	0.50
4	28.28	0.100	0.55
5	35.35	0.125	0.65
6	42.42	0.150	0.74
7	49.49	0.175	0.85
8	56.56	0.200	0.94
9	63.63	0.225	1.03
10	70.7	0.250	1.13
11	56.56	0.200	1.13
12	49.49	0.175	1.12
13	35.35	0.125	1.05
14	21.21	0.075	0.99
15	1.414	0.005	0.30

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Table 11: Load-settlement data obtained at the second loading and unloading stages of the plate loading test performed at the location (KM 371+075 to 371+100)

Loading stage	Load (F) kN	Normal stress (σ_0) MN/m^2	Settlement (S) mm
0	1.414	0.005	0.30
1	7.07	0.025	0.53
2	14.14	0.050	0.67
3	21.21	0.075	0.79
4	28.28	0.100	0.88
5	35.35	0.125	0.96
6	42.42	0.150	1.01
7	49.49	0.175	1.09
8	56.56	0.200	1.15
9	63.63	0.225	1.22

Table 12: Calculations of the resilient modulus of the tested soil according to DIN18134: (KM 371+075 to 371+100)

Parameters	1st loading cycle	2nd loading cycle
(s_0,max) MN/m^2	0.25	0.25
a_0 (mm)	0.20	0.33
a_1 (mm/(MN/m^2))	3.69	6.80
a_2 (mm/($MN2/m^4$))	0.12	13.26
$Ev = 1.5\ r/(a_1+a_2.s_{0,max})$	120.92	129.14
Ev_2/Ev_1	1.07	

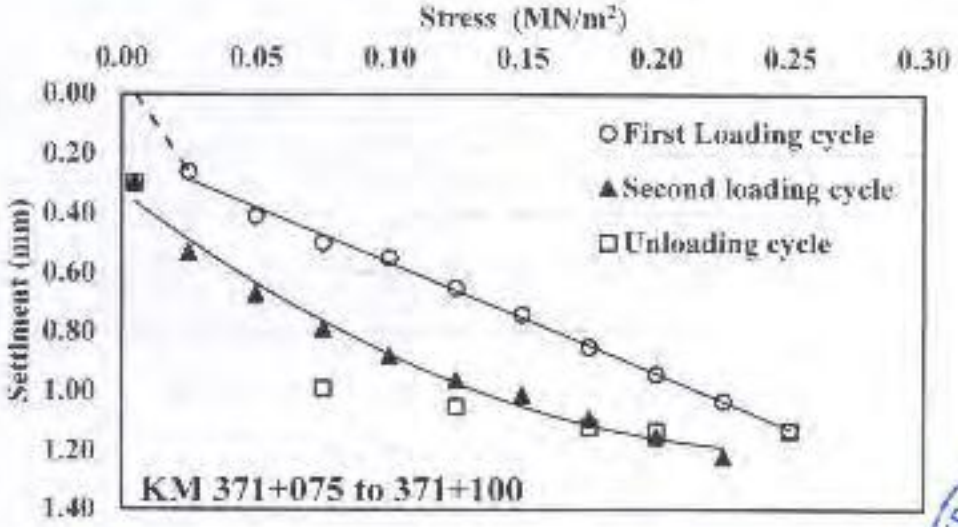

Figure 4: Load-settlement data: plate loading test performed at (KM 371+075 to 371+100)

4. Closure

Test results presented herein report the load-settlement data obtained from 4 plate loading tests conducted on the Prepared Subgrade 2 of the Electric Express train project at 4 locations (KM 371+000 to 371+025, KM 371+025 to 371+050, KM 371+050 to 371+075, and KM 371+075 to 371+100) in accordance with German Standard, DIN18134.

Location	E_{v1} MN/m2	E_{v2} MN/m2	E_{v2}/E_{v1} ratio
KM 371+000 to 371+025	82.34	158.76	1.93
KM 371+025 to 371+050	136.24	174.64	1.28
KM 371+050 to 371+075	93.86	145.26	1.55
KM 371+075 to 371+100	120.92	129.14	1.07

- Note: Before interpreting these test results for future applications, the Prepared Subgrade 2 in-situ variability between the testing locations should be considered.

Technical committee

Dr. Mahmoud Ahmed

Prof. Dr. Mohamed F. M. Fahmy

Lab Engineer

Mohamed A. Al-Najjar

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Appendix A

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Location of test site:	KM 371+000 to 371+025		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/5/2023
Diameter of loading plate	600		Time	10:30:00 am
				10:58:00 am
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2			
Bedding material	—			
Temperature	24°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.80	
	2	14.14	9.72	
	3	21.21	9.65	
	4	28.28	9.49	
	5	35.35	9.29	
	6	42.42	9.16	
	7	49.49	9.00	
	8	56.56	8.86	
	9	63.63	8.77	
	10	70.7	8.64	
Unloading Stage	11	56.56	8.64	
	12	49.49	8.66	
	13	35.35	8.68	
	14	21.21	8.76	
	15	1.414	9.31	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.31	
	1	7.07	9.15	
	2	14.14	9.05	
	3	21.21	9.00	
	4	28.28	8.93	
	5	35.35	8.88	
	6	42.42	8.80	
	7	49.49	8.72	
	8	56.56	8.67	
	9	63.63	8.60	

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Location of test site:	KM 371+025 to 371+050		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/5/2023
Diameter of loading plate	600		Time	11:05:00 am
				11:33:00 am
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2			
Bedding material	—			
Temperature	24°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.65	
	2	14.14	9.60	
	3	21.21	9.55	
	4	28.28	9.46	
	5	35.35	9.35	
	6	42.42	9.27	
	7	49.49	9.19	
	8	56.56	9.10	
	9	63.63	9.00	
	10	70.7	8.92	
Unloading Stage	11	56.56	8.92	
	12	49.49	8.93	
	13	35.35	8.99	
	14	21.21	9.06	
	15	1.414	9.66	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.66	
	1	7.07	9.43	
	2	14.14	9.35	
	3	21.21	9.27	
	4	28.28	9.20	
	5	35.35	9.12	
	6	42.42	9.08	
	7	49.49	9.04	
	8	56.56	9.00	
	9	63.63	8.95	

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Location of test site:	KM 371+050 to 371+075		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/5/2023
Diameter of loading plate	600		Time	11:40:00 am
				12:08:00 pm
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2			
Bedding material	—			
Temperature	24°C			
Test regime	Loading Stage No.	Load (KN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.75	
	2	14.14	9.68	
	3	21.21	9.57	
	4	28.28	9.43	
	5	35.35	9.33	
	6	42.42	9.17	
	7	49.49	9.07	
	8	56.56	8.92	
	9	63.63	8.83	
	10	70.7	8.69	
Unloading Stage	11	56.56	8.70	
	12	49.49	8.71	
	13	35.35	8.78	
	14	21.21	8.85	
	15	1.414	9.55	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.55	
	1	7.07	9.37	
	2	14.14	9.25	
	3	21.21	9.12	
	4	28.28	9.06	
	5	35.35	9.00	
	6	42.42	8.93	
	7	49.49	8.87	
	8	56.56	8.81	
	9	63.63	8.75	

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Location of test site:	KM 371+075 to 371+100		Field team	Mr.Mohamed Mamdouh
Project title:	Electric Express Train Project - Inshaa General Construction		Date:	11/5/2023
Diameter of loading plate	600		Time	12:15:00 pm
				12:43:00 pm
Lever ratio	1		Note: CAT 966F	
Type of Soil	Prepared Subgrade 2			
Bedding material	---			
Temperature	24°C			
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Loading Stage	0	1.414	10.00	
	1	7.07	9.74	
	2	14.14	9.59	
	3	21.21	9.50	
	4	28.28	9.45	
	5	35.35	9.35	
	6	42.42	9.26	
	7	49.49	9.15	
	8	56.56	9.06	
	9	63.63	8.97	
	10	70.7	8.87	
Unloading Stage	11	56.56	8.87	
	12	49.49	8.88	
	13	35.35	8.95	
	14	21.21	9.01	
	15	1.414	9.70	
Test regime	Loading Stage No.	Load (kN)	Dial Gauge Reading (mm)	
Reloading Stage	0	1.414	9.70	
	1	7.07	9.47	
	2	14.14	9.33	
	3	21.21	9.21	
	4	28.28	9.12	
	5	35.35	9.04	
	6	42.42	8.99	
	7	49.49	8.91	
	8	56.56	8.85	
	9	63.63	8.78	

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S5-B-IN

MATERIAL INSPECTION REQUEST

Contractor Company	INSHAA GENERAL OF CONSTRUCTION Company			Designer Company			(SPECTRUM) Engineering Consulting Office		
Issued by Contractor	Name	Sign		Date/ Serial Number			Time		
	Eng. Mahmoud shaban			19/06/2023 (P.L.T.5)			02:00 PM		
Received by GARB CONSULTANT	Eng. Mazen Essamy		PLT	C1	C2	C3	C0	MM	YY	HH	MM
				371	PW	CS	20	06	2023	2	00

CODE-1	S1 to S21 Station Reference	D1 to S1 Depot Reference	Ro XXX Note For Kilometer point only Start Km is used
CODE-2		Work Activity	
CODE-3		Sub Element of Activity	

Description of Materials	Sub Ballast 2.		
Location to be used	St. (371+000) To (371+100)		
MAR Approval No	M.A.R (B.S 1)	Date	29/04/2023
Supplier Name			
Test Requirement	P.L.T (DIN 18134)	Specification	EARTHWORK SPECIFICATIONS & TESTING REPORT (DG21-PL2) VERSION 2 BY CIVECON GROUP
Reference Photos	Yes / No	Other	Rev UIR-S.B-(7)

Item	Description	Unit	Quantity	Arrival Date	Note
1	PLATE LOAD TEST	NUMBER	4	20/06/2023	
2					
3					
4					

Comments by: Eng. Mazen Essamy (SPECTRUM)

1-The Plate Load Test Result P.L.T (DIN 18134) Is Approved

SPECTRUM CONSULTING

Comments by: Eng. Alaa Abd-Allatif (ER)

1-Plate Load Test was carried out by (Comibassal)
2-Results report attached and acceptable with project specifications.
3-Final approval is subject to above mentioned comments.

شركة انشاءات عبد الصبور العامة
Inshaa general construction

APPROVAL STATUS

Organisation	Name	Sign	Date	A-A/C-R
Contractor	Eng. Mahmoud shaban		20-06-2023	A
QA/QC *	Eng. Mazen Essamy			A
GARB**	Eng. Margret magdy			
Employers Representative	Eng. Alaa Abd-Allatif		21-6-2023	

* Designer
** Alignment / Bridges: Culvert Only

COMIBASSAL International Controllers
Internal inspection and laboratories sector
Accredited by : Egyption General Authority for Petroleum under No. 34/29-11-2011
Accredited by : Egyption Accreditation council (EGAC) under No. 031706/1A

Technical report

of Plate Loading Test (DIN 18134)

General	:	SYSTRA
Consultant	:	SPECTRUM
Contractor	:	شركة إنشاء للمقاولات العامة
Project	:	ELECTRIC EXPRESS TRAIN
Sample	:	Sub-Ballast (2)
Station	:	ST(371+000) TO ST(371+100)
Date of Test	:	20/6/2023
QC	:	1453

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49 El Horria Ave. Alex.Egypt
Tel: 002 033920176 - 002 033931482
Fax :002 033900476
Email : internal-inspection@comibassal.com

Introduction:

The Plate Load test is designed to determine the vertical deformation and strength characteristics of soil by assessing the force and amount of penetration with time when a rigid plate is made to penetrate the soil.
The test to be carried out on the native soil according to German specifications DIN 18134.

Test methods :

1- The German standard DIN 18134 was applied to define the apparatus used, the loading system, test conditions, and procedure for plate load test.
2- Loading plates with a diamter of 600 mm have a thickness of 25mm and are provided with equally spaced stiffners with even upper faces parallel to the plate bottom face to allow 300 mm plate to be placed on top of it.
3- The loading system consisted of a hydrulic pump connected to a hydrulic jack of 700 bar capacity, which is capable of applying and releasing the load stages.
4- The dial gauge used to measure the plate settlement has a resolution of 0.01mm and the lever ratio was equal to 1.
5- The temperature at the time of the test was 25°.
6- The plate was carried out on a native soil (sand-gravel). The test surface area was level ed and the plate was bedded on this surface.
7- The hyrulic jack was placed on the middle of, and at normal to, the loading plate beneth the reaction loading system and secured against tiliting.
8- The reaction loading system was a heavey multi-purpose excavator (more than 20 ton).

Description of exprement:

1- Loading, unloading and reloading regims were applied according to DIN 18134 for the plate load test to estimate the resilient modulus
2- Prior to the test, the force transeducer and dial guage were set to zero, after which a load was applied corresponding to a stress of 0.01 MN/m2.
3- In the first loading cycle, the load was increased until a normal stress of 0.25 MN/m2 was reached, and the loading increaement was 0.025 MN/m2. The load was released in four stages.
4- Following unloading, a further second loading cycle was carried out, in which, the load was increased only to the penultimate stage of the first cycle.

St (371+000) to (371+025) km

600

Table 1: Measured values for first loading cycle and unloading cycle

Loading stage no.	Load (P) kN	Normal stress (σ_z) MN/m^2	Settlement of loading plate S (mm)
0	1.414	0.005	0.00
1	7.07	0.025	0.07
2	14.14	0.050	0.14
3	21.21	0.075	0.21
4	28.28	0.100	0.26
5	35.35	0.125	0.32
6	42.42	0.150	0.38
7	49.49	0.175	0.44
8	56.56	0.200	0.50
9	63.63	0.225	0.55
10	70.7	0.250	0.60
11	56.56	0.200	0.59
12	49.49	0.175	0.58
13	35.35	0.125	0.47
14	21.21	0.075	0.35
15	1.414	0.005	0.17

Table 2: Measured values for second loading cycle

Loading stage no.	Load (P) kN	Normal stress (σ_0) MN/m2	Settlement of loading plate S (mm)
15	1.414	0.005	0.17
16	7.07	0.025	0.25
17	14.14	0.050	0.29
18	21.21	0.075	0.35
19	28.28	0.100	0.41
20	35.35	0.125	0.46
21	42.42	0.150	0.52
22	49.49	0.175	0.58
23	56.56	0.200	0.63
24	63.63	0.225	0.65

Table 3: Compilation of results

Parameters	3rd loading cycle	2nd loading cycle
(σ_{3max}) MN/m^2	0.250	0.250
a_0 (mm)	0.008	0.164
a_1 (mm/(MN/m^2))	2.680	2.747
a_2 (mm/(MN^2/m^4))	1.152	-2.298
$E_v = 1.5 r/a_1 (1 - a_2 \sigma_{max})$	188.12	207.13
Ev2/Ev1	1.10	

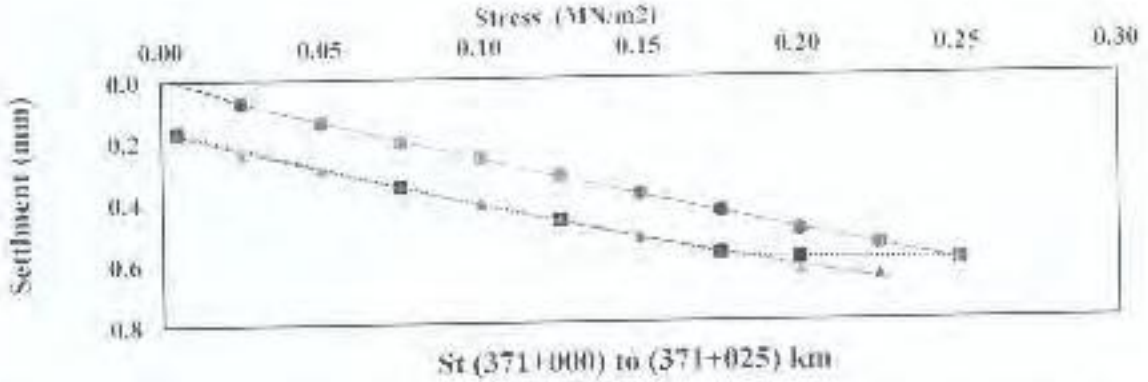

Fig. 1: Load-settlement curve, fitting curves according to Table 1 and Table 2 for the first and second loading cycles

- Measurment points from the first loading cycle
- Measurment points from the unloading cycle
- Measurment points from the second loading cycle

S Settlement in mm

σ_z Normal stress MN/m^2

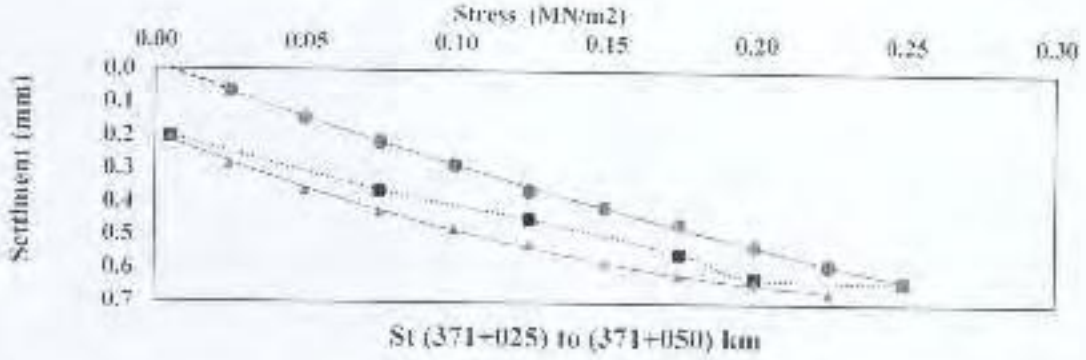

Fig. 2: Load-settlement curve, fitting curves according to Table 4 and Table 5 for the first and second loading cycles

- ● Measurment points from the first loading cycle
- ■ Measurment points from the unloading cycle
- ▲ Measurment points from the second loading cycle

S Settlment in mm

σ_c Normal stress MN/m^2

St (371+050) to (371+075) km

600

Table 7: Measured values for first loading cycle and unloading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m²	Settlement of loading plate S (mm)
0	1.414	0.005	0.00
1	7.07	0.025	0.09
2	14.14	0.050	0.14
3	21.21	0.075	0.19
4	28.28	0.100	0.20
5	35.35	0.125	0.26
6	42.42	0.150	0.32
7	49.49	0.175	0.39
8	56.56	0.200	0.45
9	63.63	0.225	0.52
10	70.7	0.250	0.55
11	56.56	0.200	0.62
12	49.49	0.175	0.55
13	35.35	0.125	0.44
14	21.21	0.075	0.32
15	1.414	0.005	0.16

Table 8: Measured values for second loading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m2	Settlement of loading plate S (mm)
15	1.414	0.005	0.16
16	7.07	0.025	0.20
17	14.14	0.050	0.25
18	21.21	0.075	0.31
19	28.28	0.100	0.36
20	35.35	0.125	0.42
21	42.42	0.150	0.47
22	49.49	0.175	0.52
23	56.56	0.200	0.57
24	63.63	0.225	0.62

Table 9: Compilation of results

Parameters	1st loading cycle	2nd loading cycle
($\sigma_{1,lim}$) MN/m²	0.250	0.250
a_0 (mm)	0.056	0.150
a_1 (mm/(MN/m²))	1.607	2.165
a_2 (mm/(MN²/m²))	2.547	-0.288
[illegible]	220.21	215.00
[illegible]/E-1	0.59	

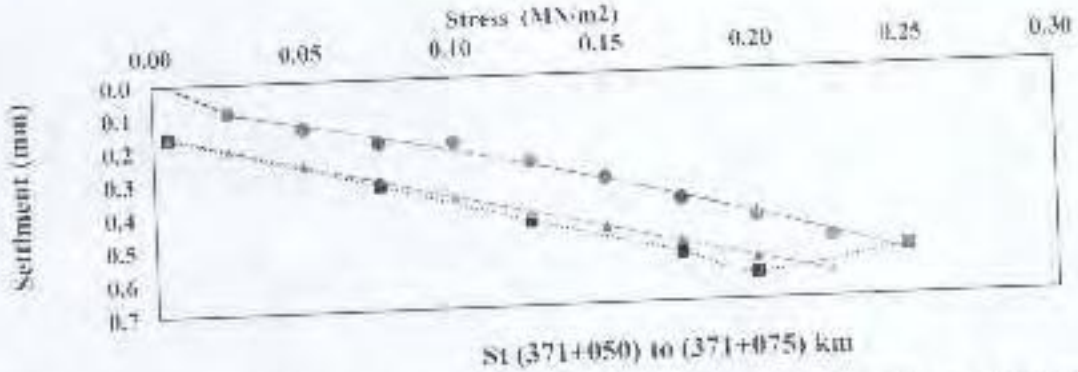

Fig. 3: Load-settlement curve, fitting curves according to Table 7 and Table 8 for the first and second loading cycles

- Measurment points from the first loading cycle
- Measurment points from the unloading cycle
- Measurment points from the second loading cycle

S: Settlement in mm

σ_z: Normal stress MN/m^2

St (371+075) to (371+100) km

600

Table 10: Measured values for first loading cycle and unloading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m²	Settlement of loading plate S (mm)
0	1.414	0.005	0.00
1	7.07	0.025	0.07
2	14.14	0.050	0.15
3	21.21	0.075	0.22
4	28.28	0.100	0.28
5	35.35	0.125	0.34
6	42.42	0.150	0.40
7	49.49	0.175	0.45
8	56.56	0.200	0.50
9	63.63	0.225	0.54
10	70.7	0.250	0.58
11	56.56	0.200	0.57
12	49.49	0.175	0.50
13	35.35	0.125	0.43
14	21.21	0.075	0.30
15	1.414	0.005	0.20

Table 11: Measured values for second loading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m2	Settlement of loading plate S (mm)
15	1.414	0.005	0.20
16	7.07	0.025	0.28
17	14.14	0.050	0.32
18	21.21	0.075	0.38
19	28.28	0.100	0.43
20	35.35	0.125	0.48
21	42.42	0.150	0.52
22	49.49	0.175	0.57
23	56.56	0.200	0.59
24	63.63	0.225	0.63

Table 12: Compilation of results

Parameters	1st loading cycle	2nd loading cycle
$[\sigma_{max}]$ MN/m²	0.250	0.250
s_0 [mm]	-0.001	0.196
a_1 [mm/(MN/m²)]	2.197	2.098
a_2 [mm/(MN²/m²)]	-3.456	3.515
[illegible]	192.44	337.34
[illegible]	1.29	

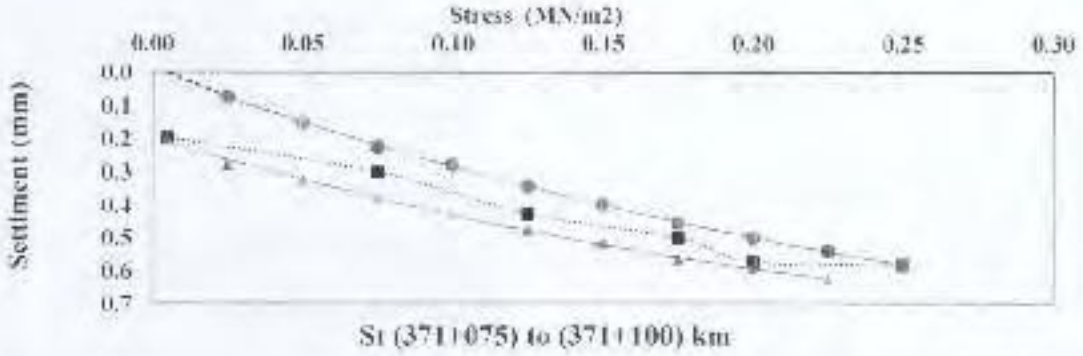

Fig. 4: Load-settlement curve, fitting curves according to Table 10 and Table 11 for the first and second loading cycles

- ● Measurment points from the first loading cycle
- ■ Measurment points from the unloading cycle
- ▲ Measurmem points from the second loading cycle

S: Settlement in mm

σ_0 Normal stress MN/m²

S5-B-IN

MATERIAL INSPECTION REQUEST

Contractor Company	INSHAA GENERAL OF CONSTRUCTION Company			Designer Company			[SPECTRUM] Engineering Consulting Office		
Issued by Contractor	Name	Sign		Date/ Serial Number			Time		
	Eng. Mahmoud shaban			20/06/2023 (P.L.T.6)			02:00 PM		
Received by GARB CONSULTANT	Eng. Mazen Essamy		PLT	CT	CZ	CZ	ZO	MM	YY	HH	MM
				371	HW	CS	21	06	2023	2	00

CODE-1	S1 to S21 Station Reference	D1 to S3 Depot Reference	Kp XXX Note For Kilometer point only Start Km is used
CODE - 2		Work Activity	
CODE - 3		Sub Element of Activity	

Description of Materials	Sub Ballast 2.		
Location to be Used	St. (371+100) To (371+275)		
MAR Approval No	M.A.R (B.S 1)	Date	29/04/2023
Supplier Name			
Test Requirement	P.L.T (DIN 18134)	Specification	EARTHWORK SPECIFICATIONS & TESTING REPORT (CG21-41.2) VERSION 2 BY CIVECON GROUP
Reference Photos	Yes / No	Other	Rev UIR-S.B-(8)&(9)

Item	Description	Unit	Quantity	Arrival Date	Note
1	PLATE LOAD TEST	NUMBER	7	21/06/2023	
2					
3					
4					

Comments by: Eng. Mazen Essamy (SPECTRUM)	Comments by: Eng. Alaa Abd-Allatif (ER)
1-The Plate Load Test Result R[illegible] DIN 18134 Approved	1-Plate Load Test was carried out by (Combissar) 2-Results report attached and acceptable with project specifications. 3-Final approval is subject to above mentioned comments.

SPECTRUM CONSULTING

شركة انشاء للمقاولات العامة Inshaa general contractor

APPROVAL STATUS

Organisation	Name	Sign	Date	A-A/W-C-R
Contractor	Eng. Mahmoud shaban		21-06-2023	A
QA/QC *	Eng. Mazen Essamy			A
GARB**	Eng. Margret magdy			
Employers Representative	Eng. Alaa Abd-Allatif		22-6-2023	AWC

* Designer
** Alignment / Bridges / Culvert Only

COMIBASSAL International Controllers
Internal inspection and laboratories sector
Accredited by : Egyption General Authority for Petroleum under No. 34/29-11-2011
Accredited by : Egyption Accreditation council (EGAC) under No. 031708/1A

Technical report

of Plate Loading Test (DIN 18134)

General	:	SYSTRA
Consultant	:	SPECTRUM
Contractor	:	شركة إنشاء للمقاولات العامة
Project	:	ELECTRIC EXPRESS TRAIN
Sample	:	Sub-Ballast (2)
Station	:	ST(371+100) TO ST(371+275)
Date of Test	:	21/6/2023
QC	:	1459

شركة
انشاء للمقاولات العامة IGC
Inshaa general construction

SPECTRUM CONSULTING

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Introduction:

The Plate Load test is designed to determine the vertical deformation and strength characteristics of soil by assessing the force and amount of penetration with time when a rigid plate is made to penetrate the soil.
The test to be carried out on the native soil according to German specif cations DIN 18134.

Test methods :

1- The German standard DIN 18134 was applied to define the apparatus used, the loading system, test conditions, and procedure for plate load test.
2- Loading plates with a diamter of 600 mm have a thickness of 25mm and are provided with equally spaced stiffners with even upper faces parallel to the plate bottom face to allow 300 mm plate to be placed on top of it.
3- The loading system consisted of a hydrulic pump connected to a hydrulic jack of 700 bar capacity, which is capable of applying and releasing the load stages.
4- The dial gauge used to measure the plate settlement has a resolution of 0.01mm and the lever ratio was equal to 1.
5- The temperature at the time of the test was 25°.
6- The plate was carried out on a native soil (sand-gravel). The test surface area was levelled and the plate was bedded on this surface.
7- The hyrulic jack was placed on the middle of, and at normal to, the loading plate beneth the reaction loading system and secured against tilting.
8- The reaction loading system was a heavey multi-purpose excavator (more than 20 ton).

Description of exprement:

1- Loading, unloading and reloading regims were applied according to DIN 18134 for the plate load test to estimate the resilient modulus
2- Prior to the test, the force transeducer and dial guage were set to zero, after which a load was applied corressponding to a stress of 0.01 MN/m2.
3- In the first loading cycle, the load was increased until a normal stress of 0.25 MN/m2 was reached, and the loading increaement was 0.025 MN/m2. The load was released in four stages.
4- Following unloading, a further second loading cycle was carried out, in which, the load was increased only to the penultimate stage of the first cycle.

St (371+100) to St (371+125) km

600

Table 1: Measured values for first loading cycle and unloading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_N) MN/m^2	Settlement of loading plate S (mm)
0	1.414	0.005	0.00
1	7.07	0.025	0.07
2	14.14	0.050	0.12
3	21.21	0.075	0.17
4	28.28	0.100	0.22
5	35.35	0.125	0.28
6	42.42	0.150	0.34
7	49.49	0.175	0.40
8	56.56	0.200	0.46
9	63.63	0.225	0.52
10	70.7	0.250	0.58
11	56.56	0.200	0.57
12	49.49	0.175	0.55
13	35.35	0.125	0.44
14	21.21	0.075	0.31
15	1.414	0.005	0.15

Table 2: Measured values for second loading cycle

Loading stage no.	Load (F) kN	Normal stress(σ_N) MN/m2	Settlement of loading plate S (mm)
16	1.414	0.005	0.13
17	7.07	0.025	0.17
18	14.14	0.050	0.21
19	21.21	0.075	0.26
20	28.28	0.100	0.31
21	35.35	0.125	0.36
22	42.42	0.150	0.42
23	49.49	0.175	0.47
24	56.56	0.200	0.54
	63.63	0.225	0.58

Table 3: Compilation of results

Parameters	1st loading cycle	2nd loading cycle
($\sigma_{N,max}$) MN/m^2	0.250	0.250
a_0 (mm)	0.016	0.121
a_1 (mm/(MN/m^2))	1.917	1.975
a_2 (mm/(MN^2/m^4))	1.415	0.873
$L_{c,0.05}$ (a_0, a_1, a_2)	195.19	215.15
[illegible]	1.09	

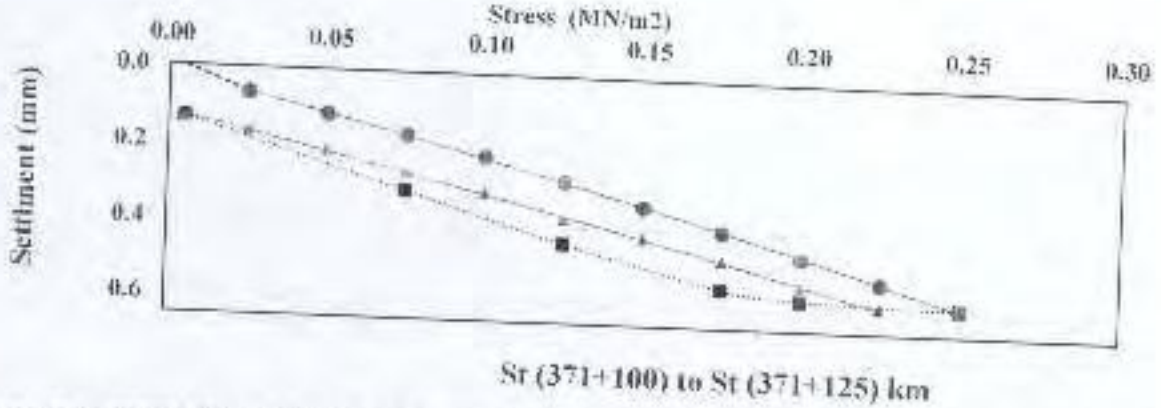

Fig. 1: Load-settlement curve, fitting curves according to Table 1 and Table 2 for the first and second loading cycles

- ● Measurment points from the first loading cycle
- ■ Measurment points from the unloading cycle
- ▲ Measurment points from the second loading cycle
- S Settlement in mm
- σ_3 Normal stress MN/m^2

St (371+125) to St (371+150) km

600

Table 4: Measured values for first loading cycle and unloading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m²	Settlement of loading plate S (mm)
0	1.414	0.005	0.00
1	7.07	0.025	0.07
2	14.14	0.050	0.12
3	21.21	0.075	0.16
4	28.28	0.100	0.21
5	35.35	0.125	0.27
6	42.42	0.150	0.32
7	49.49	0.175	0.38
8	56.56	0.200	0.44
9	63.63	0.225	0.50
10	70.7	0.250	0.57
11	56.56	0.200	0.56
12	49.49	0.175	0.54
13	35.35	0.125	0.42
14	21.21	0.075	0.33
15	1.414	0.005	0.11

Table 5: Measured values for second loading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m2	Settlement of loading plate S (mm)
15	1.414	0.005	0.11
16	7.07	0.025	0.16
17	14.14	0.050	0.21
18	21.21	0.075	0.26
19	28.28	0.100	0.31
20	35.35	0.125	0.37
21	42.42	0.150	0.41
22	49.49	0.175	0.46
23	56.56	0.200	0.51
24	63.63	0.225	0.57

Table 6: Compilation of results

Parameters	1st loading cycle	2nd loading cycle
$(\sigma_{n,max})$ MN/m²	0.250	0.250
a_0 (mm)	0.034	0.104
a_1 (mm/(MN/m²))	1.556	2.077
a_2 (mm/(MN²/m²))	2.344	-0.211
$E_v = 1.5 \times (a_1 + 2 \times a_2)$	208.93	222.27
E_{v2}/E_{v1}	1.06	

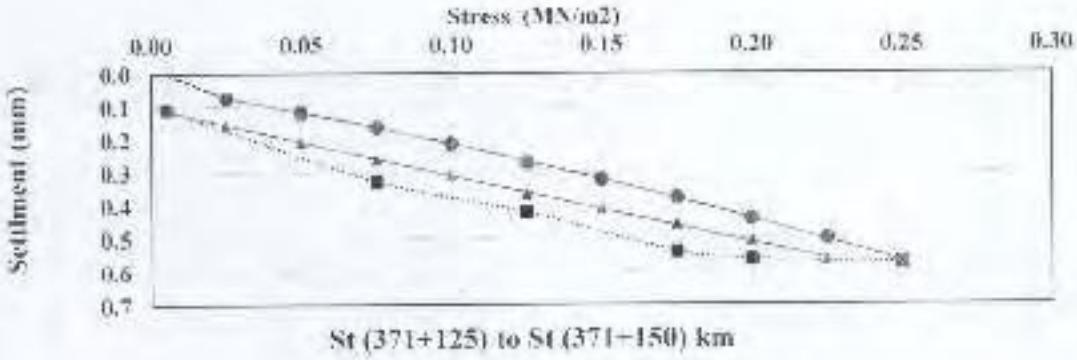

Fig. 2: Load-settlement curve, fitting curves according to Table 4 and Table 5 for the first and second loading cycles

- ● Measurment points from the first loading cycle
- ■ Measurment points from the unloading cycle
- ▲ Measurment points from the second loading cycle

S Settlement in mm

σ_u Normal stress MN/m^2

St (371+150) to St (371+175) km

600

Table 7: Measured values for first loading cycle and unloading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m^2	Settlement of loading plate S (mm)
0	1.414	0.005	0.00
1	7.07	0.025	0.05
2	14.14	0.050	0.10
3	21.21	0.075	0.16
4	28.28	0.100	0.21
5	35.35	0.125	0.27
6	42.42	0.150	0.34
7	49.49	0.175	0.40
8	56.56	0.200	0.46
9	63.63	0.225	0.54
10	70.7	0.250	0.61
11	56.56	0.200	0.60
12	49.49	0.175	0.58
13	35.35	0.125	0.45
14	21.21	0.075	0.32
15	1.414	0.005	0.10

Table 8: Measured values for second loading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m2	Settlement of loading plate S (mm)
15	1.414	0.005	0.10
16	7.07	0.025	0.14
17	14.14	0.050	0.15
18	21.21	0.075	0.24
19	28.28	0.100	0.29
20	35.35	0.125	0.35
21	42.42	0.150	0.41
22	49.49	0.175	0.46
23	56.56	0.200	0.53
24	63.63	0.225	0.58

Table 9: Compilation of results

Parameters	1st loading cycle	2nd loading cycle
$\lvert\sigma_{Range}\rvert$ MN/m^2	0.250	0.250
a_0 (mm)	0.001	0.089
a_1 (mm/(MN/m^2))	1.943	1.931
a_2 (mm/(MN^2/m^4))	1.960	1.213
$E_V = 1.5\,r/(a_0 + a_1 S_{max})$	184.77	200.99
	1.09	

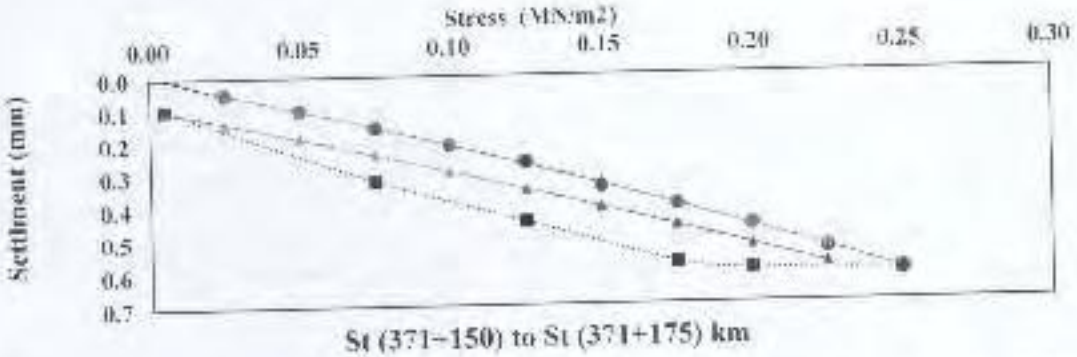

Fig. 3: Load-settlement curve, fitting curves according to Table 7 and Table 8 for the first and second loading cycles

- ● Measurment points from the first loading cycle
- ■ Measurment points from the unloading cycle
- ▲ Measurment points from the second loading cycle

S Settlement in mm

σ_z Normal stress MN/m^2

St (371+175) to St (371+200) km

600

Table 10: Measured values for first loading cycle and rebounding cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m²	Settlement of loading plate S (mm)
0	1.414	0.005	0.00
1	7.07	0.025	0.08
2	14.14	0.050	0.14
3	21.21	0.075	0.19
4	28.28	0.100	0.24
5	35.35	0.125	0.29
6	42.42	0.150	0.34
7	49.49	0.175	0.40
8	56.56	0.200	0.46
9	63.63	0.225	0.51
10	70.7	0.250	0.53
11	56.56	0.200	0.47
12	49.49	0.175	0.55
13	35.35	0.125	0.42
14	21.21	0.075	0.32
15	1.414	0.005	0.12

Table 11: Measured values for second loading cycle

Loading stage no.	Load (F) kN	Normal stress (σ_n) MN/m2	Settlement of loading plate S (mm)
15	1.414	0.005	0.12
16	7.07	0.025	0.17
17	14.14	0.050	0.22
18	21.21	0.075	0.28
19	28.28	0.100	0.32
20	35.35	0.125	0.38
21	42.42	0.150	0.43
22	49.49	0.175	0.47
23	56.56	0.200	0.52
24	63.63	0.225	0.58

Table 12: Compilation of results

Parameters	1st loading cycle	2nd loading cycle
(σ_{max}) MN/m²	0.250	0.250
a_0 (mm)	0.042	0.106
a_1 (mm/(MN/m²))	1.840	2.227
a_2 (mm/(MN²/m²))	1.192	0.731
E_v= 1.5 (mm/(MN/m²))	210.08	186.78
[illegible]	0.99	