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MateriaLab

Report No. : 090562CH100001

HKLAS 015

Test Report on Analysis of Soil

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of soil
Client sample ID.	:	Drillhole No. - 912/SIL/D243
		Sample No. / Type - M
		Sample Depth (m) - 2.0~3.0
		Soil Recovery (%) - 100
		Geological Stratum - FILL
Test required	:	1. Organic matter content
		2. Total sulphate content (as SO_3)
		3. Water-soluble sulphate content (as SO_3)
		4. Water-soluble chloride content (as Cl^-)
		5. pH value

Laboratory Information

Laboratory sample ID.	:	CH100001/1
Date of receipt of sample	:	12/01/2010
Date test commenced	:	12/01/2010
Date test completed	:	19/01/2010
Test method used	:	1. GEOSPEC 3: 2001 Test 9.1
		2 & 3. GEOSPEC 3: 2001 Test 9.3
		4. GEOSPEC 3: 2001 Test 9.4
		5. GEOSPEC 3: 2001 Test 9.5

Results :

Sample passing a 2mm test sieve by oven-dry mass of the original sample	90 %
1. Qualitative check for (i) sulphides	Not detected
(ii) chlorides	Not detected
The organic matter content by oven-dry mass of the fraction of soil passing a 2 mm test sieve.....	0.2 %
2. Total sulphate content (as SO_3) by oven-dry mass of the fraction of soil passing a 2 mm test sieve.....	0.02 %
3. Water-soluble sulphate content (as SO_3) in the 2:1 water-soil extract	0.01 g/L
4. Water-soluble chloride content (as Cl^-) in the 2:1 water-soil extract	<0.01%
5. pH value of sample	4.1

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 21/1/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100001(1)

Test Report on Analysis of Soil

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of soil
Client sample ID.	:	Drillhole No. - 912/SIL/D243 Sample No. / Type - M Sample Depth (m) - 2.0~3.0 Soil Recovery (%) - 100 Geological Stratum - FILL
Test required	:	Carbonate content (as CO_2)

Laboratory Information

Laboratory sample ID.	:	CH100001/1
Date of receipt of sample	:	12/01/2010
Date test commenced	:	12/01/2010
Date test completed	:	19/01/2010
Test method used	:	BS 1377: Part 3: 1990 Cl.6.3

Result :

Carbonate content (as CO_2) by oven-dry mass of the sample ..... 0.35 %

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 21/1/2010

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MateriaLab

Report No. : 090562CH100001(2)

Test Report on Analysis of Soil

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of soil
Client sample ID.	:	Drillhole No. - 912/SIL/D243 Sample No. / Type - M Sample Depth (m) - 2.0~3.0 Soil Recovery (%) - 100 Geological Stratum - FILL
Test required	:	Sulphide and hydrogen sulphide content

Laboratory Information

Laboratory sample ID.	:	CH100001/1
Date of receipt of sample	:	12/01/2010
Date test commenced	:	12/01/2010
Date test completed	:	19/01/2010
Test method used	:	In-house method C-T-096

Results :

Sulphide content (as $S^{=}$) by oven-dry mass of the sample ..... <0.01 %

Hydrogen sulphide content (as H_2S) by oven-dry mass of the sample ..... <0.01 %

Supervised by : Bruce K.M. Au

Certified by :

Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 21/1/2010

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MateriaLab

HKLAS 015

Report No. : 090562CH100001(3)

Test Report on Analysis of Soil

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of soil
Client sample ID.	:	Drillhole No. - 912/SIL/D243
		Sample No. / Type - M
		Sample Depth (m) - 4.5~5.5
		Soil Recovery (%) - 100
		Geological Stratum - CDT
Test required	:	1. Organic matter content
		2. Total sulphate content (as SO_3)
		3. Water-soluble sulphate content (as SO_3)
		4. Water-soluble chloride content (as Cl^-)
		5. pH value

Laboratory Information

Laboratory sample ID.	:	CH100001/2
Date of receipt of sample	:	12/01/2010
Date test commenced	:	12/01/2010
Date test completed	:	19/01/2010
Test method used	:	1. GEOSPEC 3: 2001 Test 9.1
		2 & 3. GEOSPEC 3: 2001 Test 9.3
		4. GEOSPEC 3: 2001 Test 9.4
		5. GEOSPEC 3: 2001 Test 9.5

Results :

Sample passing a 2mm test sieve by oven-dry mass of the original sample	89 %
1. Qualitative check for (i) sulphides	Not detected
(ii) chlorides	Not detected
The organic matter content by oven-dry mass of the fraction of soil passing a 2 mm test sieve	0.2 %
2. Total sulphate content (as SO_3) by oven-dry mass of the fraction of soil passing a 2 mm test sieve	0.02 %
3. Water-soluble sulphate content (as SO_3) in the 2:1 water-soil extract	0.01 g/L
4. Water-soluble chloride content (as Cl^-) in the 2:1 water-soil extract	<0.01%
5. pH value of sample	4.0

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 19/1/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100001(4)

Test Report on Analysis of Soil

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of soil
Client sample ID.	:	Drillhole No. - 912/SIL/D243 Sample No. / Type - M Sample Depth (m) - 4.5~5.5 Soil Recovery (%) - 100 Geological Stratum - CDT
Test required	:	Carbonate content (as CO_2)

Laboratory Information

Laboratory sample ID.	:	CH100001/2
Date of receipt of sample	:	12/01/2010
Date test commenced	:	12/01/2010
Date test completed	:	19/01/2010
Test method used	:	BS 1377: Part 3: 1990 Cl.6.3

Result :

Carbonate content (as CO_2) by oven-dry mass of the sample ..... 0.09 %

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 21/1/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100001(5)

Test Report on Analysis of Soil

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of soil
Client sample ID.	:	Drillhole No. - 912/SIL/D243 Sample No. / Type - M Sample Depth (m) - 4.5~5.5 Soil Recovery (%) - 100 Geological Stratum - CDT
Test required	:	Sulphide and hydrogen sulphide content

Laboratory Information

Laboratory sample ID.	:	CH100001/2
Date of receipt of sample	:	12/01/2010
Date test commenced	:	12/01/2010
Date test completed	:	19/01/2010
Test method used	:	In-house method C-T-096

Results :

Sulphide content (as $S^{=}$) by oven-dry mass of the sample ..... <0.01 %

Hydrogen sulphide content (as H_2S) by oven-dry mass of the sample ..... <0.01 %

Supervised by : Bruce K.M. Au

Certified by :

Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 21/1/2010

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MateriaLab

Report No. : 090562CH100001(6)

HKLAS 015

Test Report on Analysis of Soil

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of soil
Client sample ID.	:	Drillhole No. - 912/SIL/D244
		Sample No. / Type - M
		Sample Depth (m) - 2.0~2.9
		Soil Recovery (%) - 88
		Geological Stratum - HDT
Test required	:	1. Organic matter content
		2. Total sulphate content (as SO_3)
		3. Water-soluble sulphate content (as SO_3)
		4. Water-soluble chloride content (as Cl^-)
		5. pH value

Laboratory Information

Laboratory sample ID.	:	CH100001/3
Date of receipt of sample	:	12/01/2010
Date test commenced	:	12/01/2010
Date test completed	:	19/01/2010
Test method used	:	1. GEOSPEC 3: 2001 Test 9.1
		2 & 3. GEOSPEC 3: 2001 Test 9.3
		4. GEOSPEC 3: 2001 Test 9.4
		5. GEOSPEC 3: 2001 Test 9.5

Results :

Sample passing a 2mm test sieve by oven-dry mass of the original sample	94 %
1. Qualitative check for (i) sulphides	Not detected
(ii) chlorides	Not detected
The organic matter content by oven-dry mass of the fraction of soil passing a 2 mm test sieve	<0.1 %
2. Total sulphate content (as SO_3) by oven-dry mass of the fraction of soil passing a 2 mm test sieve	0.02 %
3. Water-soluble sulphate content (as SO_3) in the 2:1 water-soil extract	0.01 g/L
4. Water-soluble chloride content (as Cl^-) in the 2:1 water-soil extract	<0.01%
5. pH value of sample	4.6

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 21/1/2010

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Report No. : 090562CH100001(7)

Test Report on Analysis of Soil

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of soil
Client sample ID.	:	Drillhole No. - 912/SIL/D244 Sample No. / Type - M Sample Depth (m) - 2.0~2.9 Soil Recovery (%) - 88 Geological Stratum - HDT
Test required	:	Carbonate content (as CO_2)

Laboratory Information

Laboratory sample ID.	:	CH100001/3
Date of receipt of sample	:	12/01/2010
Date test commenced	:	12/01/2010
Date test completed	:	19/01/2010
Test method used	:	BS 1377: Part 3: 1990 Cl.6.3

Result :

Carbonate content (as CO_2) by oven-dry mass of the sample ..... 0.53 %

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 21/1/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100001(8)

Test Report on Analysis of Soil

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of soil
Client sample ID.	:	Drillhole No. - 912/SIL/D244 Sample No. / Type - M Sample Depth (m) - 2.0~2.9 Soil Recovery (%) - 88 Geological Stratum - HDT
Test required	:	Sulphide and hydrogen sulphide content

Laboratory Information

Laboratory sample ID.	:	CH100001/3
Date of receipt of sample	:	12/01/2010
Date test commenced	:	12/01/2010
Date test completed	:	19/01/2010
Test method used	:	In-house method C-T-096

Results :

Sulphide content (as $S^{=}$) by oven-dry mass of the sample ..... <0.01 %

Hydrogen sulphide content (as H_2S) by oven-dry mass of the sample ..... <0.01 %

Supervised by : Bruce K.M. Au

Certified by :

Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 21/1/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643A

HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/TP267A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	pH value

Laboratory Information

Laboratory sample ID.	:	CH100643/1
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.5

Result :

pH value of sample ..... 6.5 at 21.5°C

Remark : This report is to supersede our former report #090562CH100643.

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 5/5/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(1)

HKAS HKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/TP267A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Sulphate content (as SO_3)

Laboratory Information

Laboratory sample ID.	:	CH100643/1
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.3

Result :

Sulphate content (as SO_3) of sample ..... 0.09 g/L

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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Report No. : 090562CH100643(2)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/TP267A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Chloride content (as Cl^-)

Laboratory Information

Laboratory sample ID.	:	CH100643/1
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. GEOSPEC 3: 2001 Test 9.4

Result :

Chloride content (as Cl^-) of sample ..... 16 mg/L

Supervised by : Bruce K.M. Au

Certified by

Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

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Report No. : 090562CH100643(3)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/TP267A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Resistivity

Laboratory Information

Laboratory sample ID.	:	CH100643/1
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. ASTM D1125:1982 Method B exclude clause 7

Result :

Resistivity of sample ..... 4.0×10^{-3} Ω-cm

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

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MateriaLab

Report No. : 090562CH100643(4)A

HKAS HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D266A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	pH value

Laboratory Information

Laboratory sample ID.	:	CH100643/2
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.5

Result :

pH value of sample ..... 6.8 at 21.5°C

Remark : This report is to supersede our former report #090562CH100643(4).

Supervised by : Bruce K.M. Au

Certified by :

Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 5/5/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(5)

HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D266A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Sulphate content (as SO_3)

Laboratory Information

Laboratory sample ID.	:	CH100643/2
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.3

Result :

Sulphate content (as SO_3) of sample ..... 0.04 g/L

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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Website : www.materialab.com.hk

MateriaLab

Report No. : 090562CH100643(6)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D266A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Chloride content (as Cl^-)

Laboratory Information

Laboratory sample ID.	:	CH100643/2
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. GEOSPEC 3: 2001 Test 9.4

Result :

Chloride content (as Cl^-) of sample ..... 12 mg/L

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

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MateriaLab

Report No. : 090562CH100643(7)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D266A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Resistivity

Laboratory Information

Laboratory sample ID.	:	CH100643/2
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. ASTM D1125:1982 Method B exclude clause 7

Result :

Resistivity of sample ..... 6.7×10^{-3} Ω-cm

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(8)A

HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D286 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	pH value

Laboratory Information

Laboratory sample ID.	:	CH100643/3
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.5

Result :

pH value of sample ..... 7.0 at 21.4°C

Remark : This report is to supersede our former report #090562CH100643(8).

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 5/5/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(9)

HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D286 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Sulphate content (as SO_3)

Laboratory Information

Laboratory sample ID.	:	CH100643/3
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.3

Result :

Sulphate content (as SO_3) of sample ..... 0.06 g/L

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(10)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D286 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Chloride content (as Cl^-)

Laboratory Information

Laboratory sample ID.	:	CH100643/3
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. GEOSPEC 3: 2001 Test 9.4

Result :

Chloride content (as Cl^-) of sample ..... 20 mg/L

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

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MateriaLab

Report No. : 090562CH100643(11)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D286 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Resistivity

Laboratory Information

Laboratory sample ID.	:	CH100643/3
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. ASTM D1125:1982 Method B exclude clause 7

Result :

Resistivity of sample ..... 2.7×10^{-3} Ω-cm

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(12)A

HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D220 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	pH value

Laboratory Information

Laboratory sample ID.	:	CH100643/4
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.5

Result :

pH value of sample ..... 6.8 at 21.7°C

Remark : This report is to supersede our former report #090562CH100643(12).

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 5/5/2010

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MateriaLab

HOKLAS 015

Report No. : 090562CH100643(13)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D220 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Sulphate content (as SO_3)

Laboratory Information

Laboratory sample ID.	:	CH100643/4
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.3

Result :

Sulphate content (as SO_3) of sample ..... 0.04 g/L

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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Website : www.materialab.com.hk

MateriaLab

Report No. : 090562CH100643(14)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D220 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Chloride content (as Cl^-)

Laboratory Information

Laboratory sample ID.	:	CH100643/4
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. GEOSPEC 3: 2001 Test 9.4

Result :

Chloride content (as Cl^-) of sample ..... 14 mg/L

Supervised by : Bruce K.M. Au

Certified by :

Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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Website : www.materialab.com.hk

MateriaLab

Report No. : 090562CH100643(15)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D220 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Resistivity

Laboratory Information

Laboratory sample ID.	:	CH100643/4
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. ASTM D1125:1982 Method B exclude clause 7

Result :

Resistivity of sample ..... 4.3×10^{-3} Ω-cm

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(16)A

HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D247A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	pH value

Laboratory Information

Laboratory sample ID.	:	CH100643/5
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.5

Result :

pH value of sample ..... 12.6 at 21.5°C

Remark : This report is to supersede our former report #090562CH100643(16).

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 5/5/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(17)

HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D247A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Sulphate content (as SO_3)

Laboratory Information

Laboratory sample ID.	:	CH100643/5
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.3

Result :

1`6+455556

Sulphate content (as SO_3) of sample ..... 0.03 g/L

Supervised by : Bruce K.M. Au

Certified by :

Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(18)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 912/SIL/D247A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Chloride content (as Cl^-)

Laboratory Information

Laboratory sample ID.	:	CH100643/5
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. GEOSPEC 3: 2001 Test 9.4

Result :

Chloride content (as Cl^-) of sample ..... 210 mg/L

Supervised by : Bruce K.M. Au

Certified by :

Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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Report No. : 090562CH100643(19)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 1024/SIL/D247A Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Resistivity

Laboratory Information

Laboratory sample ID.	:	CH100643/5
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. ASTM D1125:1982 Method B exclude clause 7

Result :

Resistivity of sample ..... 1.7×10^{-4} Ω-cm

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(20)A

HKAS HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 1024/SIL/D083 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	pH value

Laboratory Information

Laboratory sample ID.	:	CH100643/6
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.5

Result :

pH value of sample ..... 7.1 at 21.3°C

Remark : This report is to supersede our former report #090562CH100643(20).

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 5/5/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(21)

HOKLAS 015

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 1024/SIL/D083 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Sulphate content (as SO_3)

Laboratory Information

Laboratory sample ID.	:	CH100643/6
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	GEOSPEC 3: 2001 Test 9.3

Result :

Sulphate content (as SO_3) of sample ..... 1.33 g/L

Supervised by : Bruce K.M. Au

Certified by : _____
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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Website : www.materialab.com.hk

MateriaLab

Report No. : 090562CH100643(22)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 1024/SIL/D083 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Chloride content (as Cl^-)

Laboratory Information

Laboratory sample ID.	:	CH100643/6
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. GEOSPEC 3: 2001 Test 9.4

Result :

Chloride content (as Cl^-) of sample ..... 11300 mg/L

Supervised by : Bruce K.M. Au

Certified by :
Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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MateriaLab

Report No. : 090562CH100643(23)

Test Report on Analysis of Water

Information Supplied by Client

Client	:	MTR Corporation Limited
Client's address	:	-
Project	:	Contract 912, Ground Investigation for South Island Line (East)
Sample description	:	One sample of groundwater
Client sample ID.	:	Drillhole No. - 1024/SIL/D083 Sample Depth (m) - - Sample No. / Type - - / Water Sample
Test required	:	Resistivity

Laboratory Information

Laboratory sample ID.	:	CH100643/6
Date of receipt of sample	:	24 & 26/03/2010
Date test commenced	:	26/03/2010
Date test completed	:	09/04/2010
Test method used	:	Ref. ASTM D1125:1982 Method B exclude clause 7

Result :

Resistivity of sample ..... 3.6×10^{-5} Ω-cm

Supervised by : Bruce K.M. Au

Certified by :

Approved Signatory: HO Kin Man, John
Manager – Chemical & Environmental

Date : 13/4/2010

Note : This report refers only to the sample(s) tested.

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REPORT ON SOIL AND ROCK TESTS

CLIENT : MTR Corporation Limited

PROJECT : Contract No.912-Ground Investigation for South Island Line East

SIL REPORT NO. : VOLUME 1 - PART 2 OF 4

MTR SCHEDULE NOS. : C902-1, C902-3, C903-1, C903-2, C903-3

MTR CORPORATION LIMITED

CONTRACT NO. 912- GROUND INVESTIGATION FOR SOUTH ISLAND LINE EAST

LABORATORY TEST REPORT SUMMARY CONTENTS LIST

VOLUME NUMBER	REPORTED SCHEDULES	PART NOS.	CONTENTS	REMARKS
VOLUME 1	C902-1	1 OF 4	Soil Summary Tables, Classification Tests, Chemical Tests	Results from 5 Nos. schedules collated in one report presented in Drillhole/ trial pit order
	C902-3	2 OF 4	Triaxial Tests	
	C903-1	3 OF 4	Triaxial Tests	
	C903-2	4 OF 4	Consolidation Tests and Rock Tests	
	C903-3			
VOLUME 2	C903-4	1 OF 1	Soil Summary Tables, Classification Tests, Chemical Tests,Triaxial Test & Rock Test Results	Results from 1 No. schedule collated in one report presented
VOLUME 3	C902-5	1 OF 2	Soil Summary Tables, Classification Tests, Chemical Tests, Triaxial Tests and Consolidation Tests	Results from 2 Nos. schedule collated in one report presented in Drillhole/ trial pit order
	C902-6	2 OF 2	Rock Test Results	
VOLUME 4	C902-7	1 OF 3	Soil Summary Tables, Classification Tests, Chemical Tests	Results from 2 No. schedules collated in one report presented in Drillhole/ trial pit order
	C904-1	2 OF 3	Compaction Test Results and Triaxial Test & Rock Test Results	
		3 OF 3	Rock Test Results	

PROJECT : CONTRACT NO.912 - GROUND INVESTIGATION FOR SOUTH ISLAND LINE EAST

CLIENT : MTR CORPORATION LIMITED

SOIL AND ROCK LABORATORY TEST REPORT

VOLUME 1

CONTENTS

PART 1	APPENDIX A.	Summary of Soil and Rock Test Results
	APPENDIX B.	Moisture Content
	APPENDIX C.	Bulk Density
	APPENDIX D.	Particle Density
	APPENDIX E.	Liquid and Plastic Limits
	APPENDIX F.	Particle Size Distribution
	APPENDIX G.	Compaction Tests
	APPENDIX H.	Chemical Tests
PART 2	APPENDIX I.	1 Triaxial Compression tests (Drillhole 912/SIL/D222 to D230)
PART 3	APPENDIX I.	2 Triaxial Compression tests (Drillhole 912/SIL/D231 to D265)
PART 4	APPENDIX I.	3 Triaxial Compression tests (Drillhole 912/SIL/D272(P) to D275(P))
	APPENDIX J.	One Dimensional Consolidation Test
	APPENDIX K.	Porosity / Density Determination of Rock Speciment Using Saturation and Buoyancy Techniques
	APPENDIX L.	Point Load Test
	APPENDIX M.	Unconfined Compressive Strength of Rock Core
	APPENDIX N.	Determination of the Elastic Moduli of Rock Core
	APPENDIX O.	Direct Shear Test
	APPENDIX P.	Dimensional and Shape Tolerances for UCS Test on Rock Core

APPENDIX I.1 TRIAXIAL COMPRESSION TEST (DRILLHOLE 912/SIL/D222 TO D230)

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

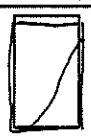
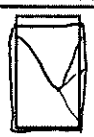
Client : MTR Corporation Limited
Client's Address : Not requested to be reported
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 11
Borehole No. : D222
Depth(m) From : 6.00
To : -
Sample origin : CDS
Soil description : -

Laboratory Information

Date sample received : 21-08-2009
Date test(s) commenced : 07-09-2009
Date test(s) completed : 11-09-2009
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum 24.0 °C Minimum : 20.0 °C

Lab. sample I.D. : SL90169/1
Sample type : M

Specimen reference			A			B			C	
Specimen depth(m)	From		6.20			6.40			6.60	
	To		6.40			6.60			6.80	
Effective pressure		kPa	40			80			160	
*Measurements and Calculations			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.4	73.7	79.1	74.5	73.4	77.8	74.5	72.7	77.6
Length		mm	150.0	148.7	129.1	150.0	147.8	131.7	150.1	146.5	128.5
Volume		cm^3	652.12	634.72	634.72	653.87	625.57	625.57	654.31	608.31	608.31
Wet mass		g	1275.2	1259.2	1259.2	1276.0	1249.8	1249.8	1264.1	1219.1	1219.1
Dry mass		g	990.7	990.7	990.7	997.0	997.0	997.0	973.0	973.0	973.0
Moisture content		%	28.7	27.1	27.1	28.0	25.4	25.4	29.9	25.3	25.3
Bulk density		Mg/m^3	1.96	1.98	1.98	1.95	2.00	2.00	1.93	2.00	2.00
Dry density		Mg/m^3	1.52	1.56	1.56	1.52	1.59	1.59	1.49	1.60	1.60
Void ratio			0.74	0.70	0.70	0.74	0.66	0.66	0.78	0.66	0.66
Degree of saturation		%	102.2	102.9	102.9	100.5	101.4	101.4	101.4	102.1	102.1
Saturation Stage											
Volume change of water		cm^3	1.4			2.1			1.0		
Consolidation Stage											
Side drain used			No			No			No		
Initial pore pressure		kPa	280.0			320.0			400.0		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm^3	17.4			28.3			46.0		
m_{vi}		m^2/MN	0.76			0.58			0.45		
t_{50}		min	10.00			11.00			7.20		
c_{vi}	(from t_{50})	m^2/yr	445.97			403.12			610.90		
t_{100}		min	21.16			11.56			11.56		
c_{vi}	(from t_{100})	m^2/yr	420.95			770.28			762.01		
Sketch of failed specimen (Failure Mode)			Brittle			 Brittle			 Brittle		
Visual description			Moist, greyish brown spotted with white, black and dark brown, slightly gravelly, sandy SILT/CLAY.			Moist, greyish brown spotted with white, black and dark brown, slightly gravelly, sandy SILT/CLAY.			Moist, greyish brown spotted with white, black and dark brown, slightly gravelly, sandy SILT/CLAY.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)
Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : K.M. Fung
Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)
Date : 27 OCT 2009

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line
(EAST)

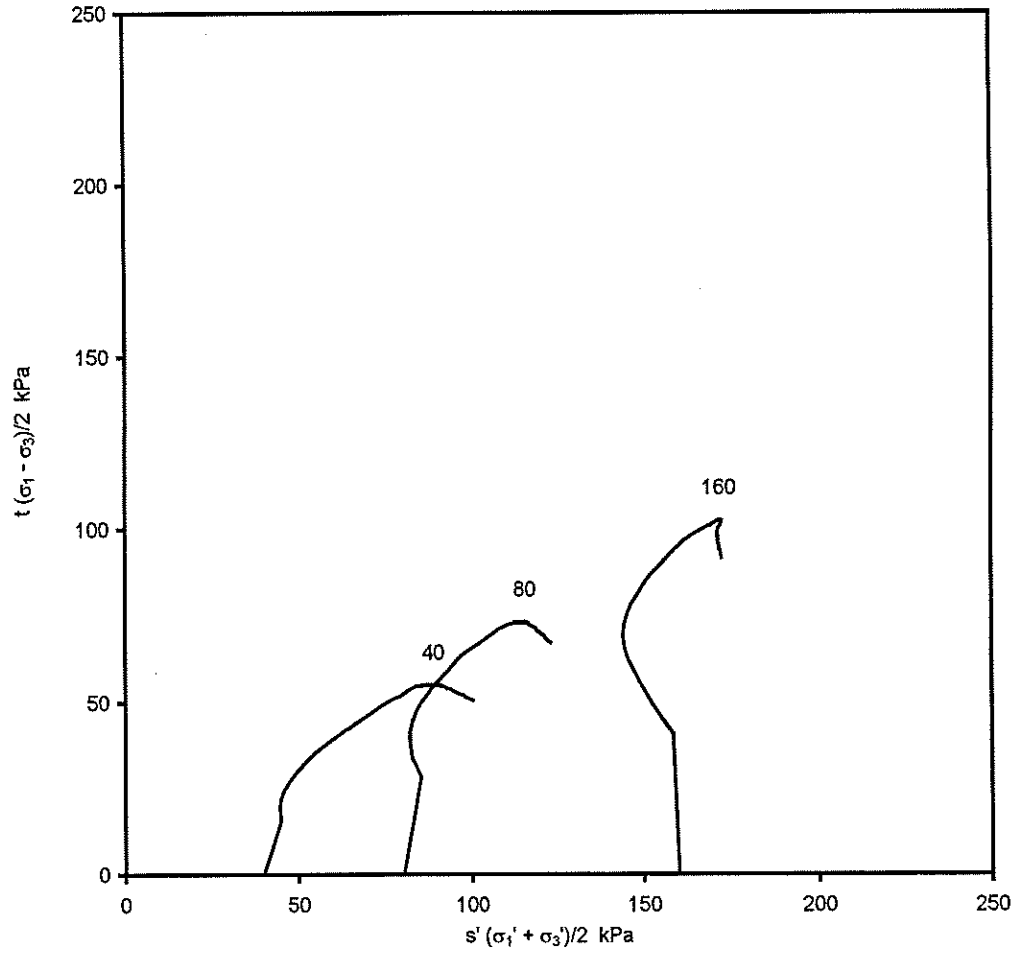
Client sample No. : 11
Borehole No. : D222
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL90169/1
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
A	40	7.9	251.2	110.0	88.8	55.0
B	80	5.9	282.7	146.3	115.4	73.1
C	160	7.2	335.6	204.8	171.8	102.4



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

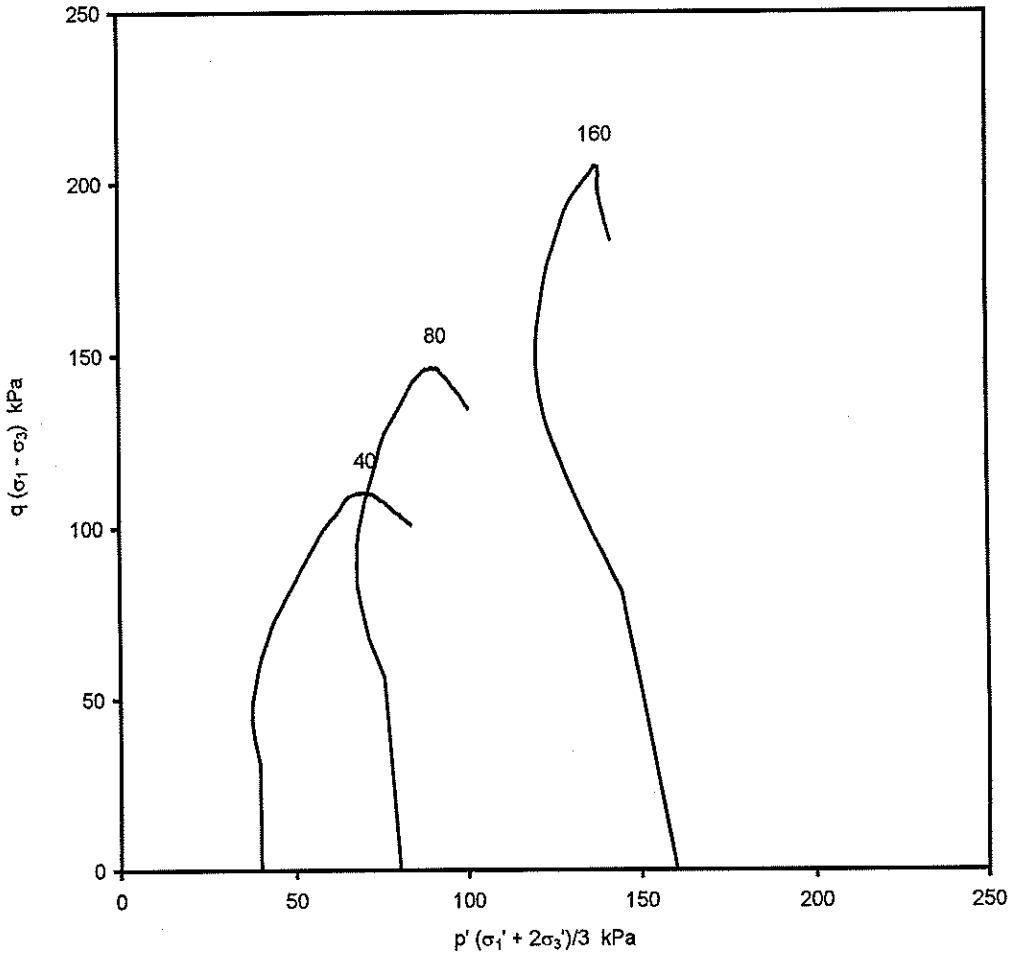
Client sample No. : 11
Borehole No. : D222
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL90169/1
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	40	7.9	251.2	110.0	70.5	110.0
B	80	5.9	282.7	146.3	91.1	146.3
C	160	7.2	335.6	204.8	137.7	204.8



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HKAS HOKLAS 015

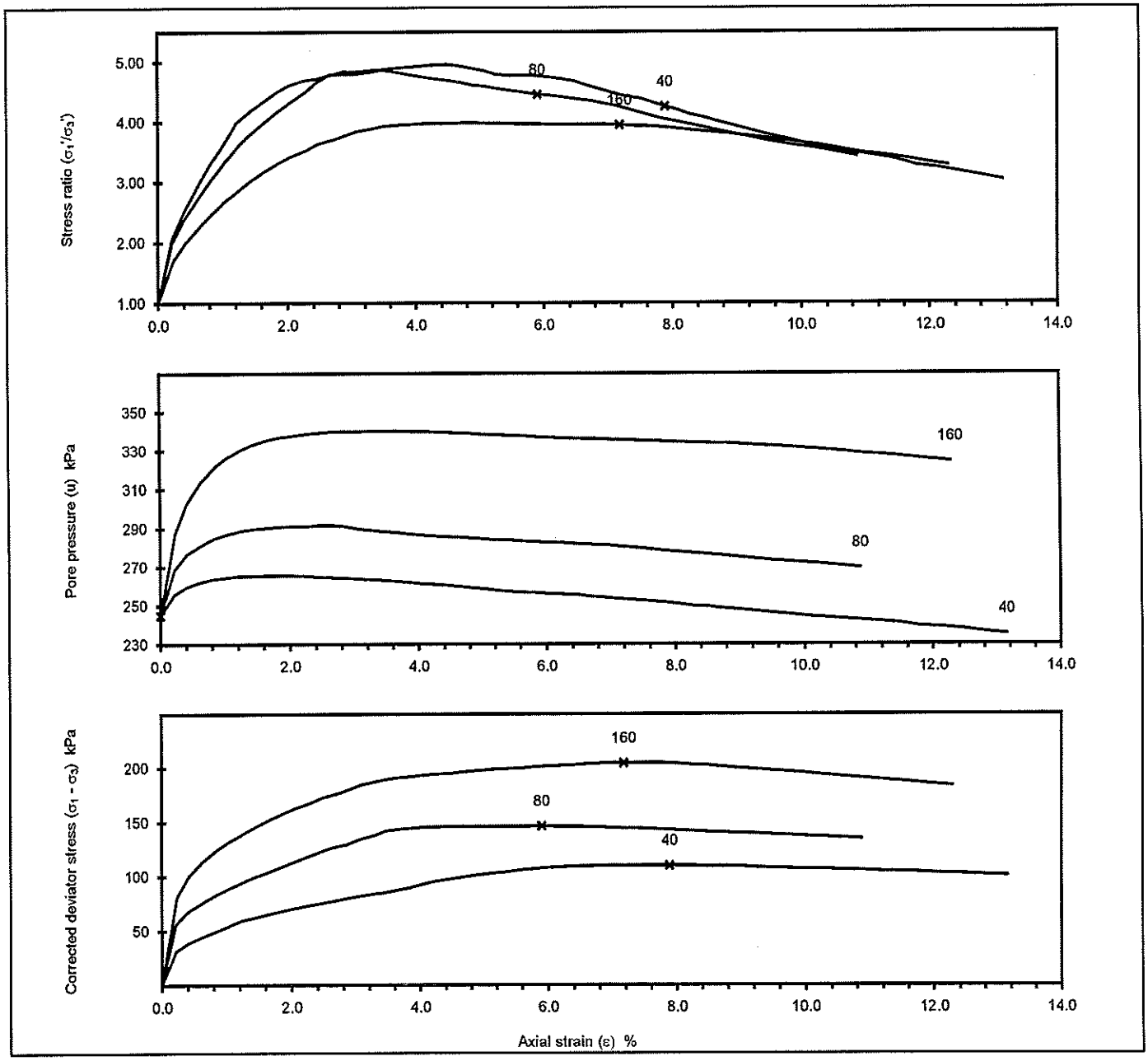
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	11
Project	:	Contract 912 Ground Investigation for South Island Line (EAST)	Borehole No.	:	D222
			Depth(m) From	:	6.00
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/1
Specimen ref.	:	A, B, C



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 11
Borehole No. : D222
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL90169/1

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	40		80		160	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		25	20	25	20	25	20
		50	45	50	45	50	45
		75	70	75	70	75	70
		100	95	100	95	100	95
		125	120	150	145	150	145
		150	145	200	195	200	195
		175	170	250	245	250	245
		200	195				
		225	220				
		250	245				

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	245.0	245.0	245.0
B value		1.00	1.00	1.00
Volume change	cm^3	1.4	2.1	1.0

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1255.7	1246.8	1215.5
Final moisture content	%	26.7	25.1	24.9
Final bulk density	Mg/m^3	1.98	1.99	2.00

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

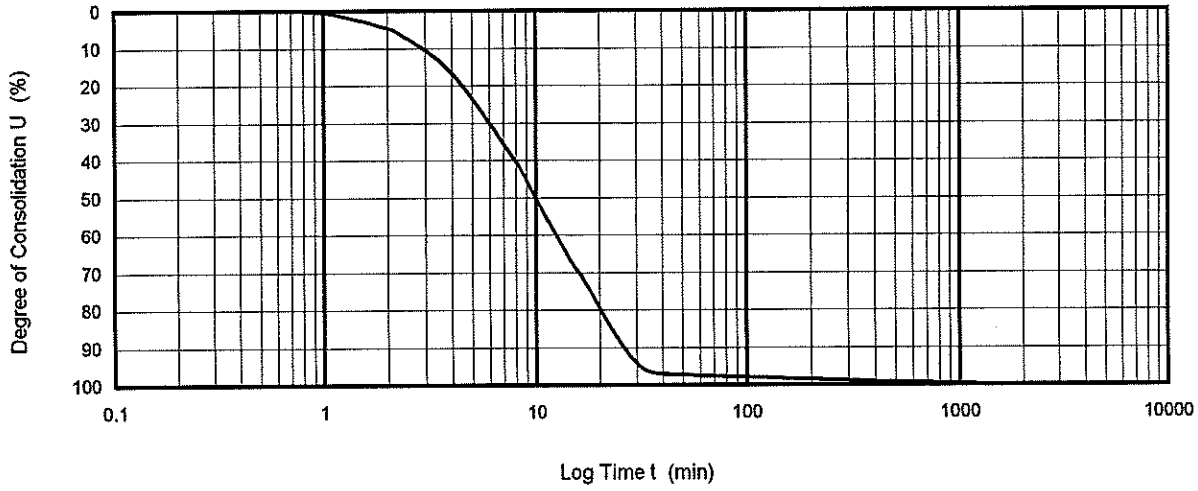
Client	:	MTR Corporation Limited	Client sample No.	:	11
Project	:	Contract 912 Ground Investigation for South Island Line (EAST)	Borehole No.	:	D222
			Depth(m) From	:	6.00
			To	:	-

Laboratory Information

Cell pressure	:	285 kPa	Lab. sample I.D.	:	SL90169/1
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	40 kPa			

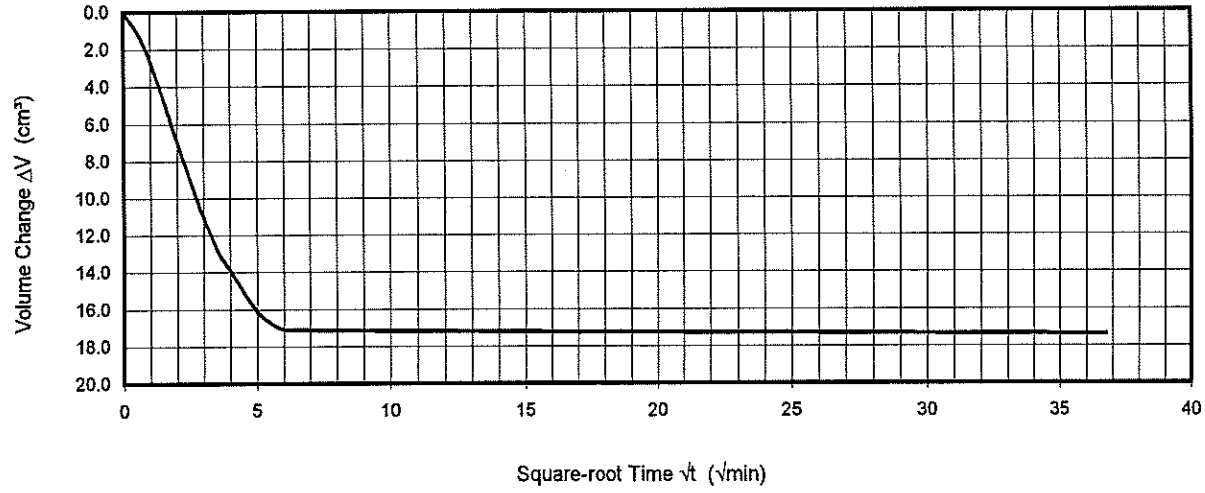
Degree of Consolidation vs. Log Time

t_{50} = 10.00 min ΔV = 17.4 cm³



Volume Change vs. Square-root Time

t_{100} = 21.16 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

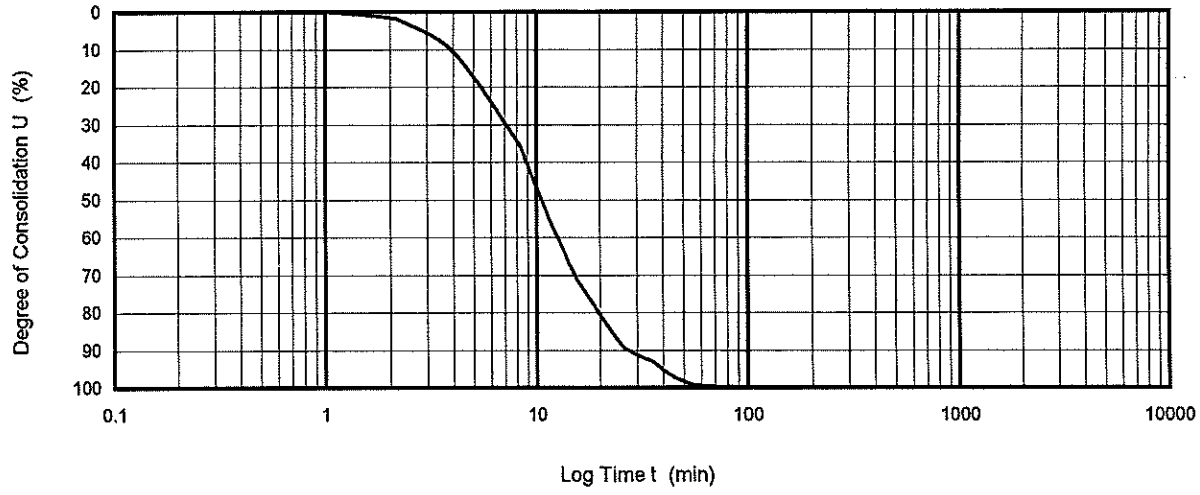
Client	:	MTR Corporation Limited	Client sample No.	:	11
Project	:	Contract 912	Borehole No.	:	D222
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	6.00
			To	:	-

Laboratory Information

Cell pressure	:	325 kPa	Lab. sample I.D.	:	SL90169/1
Back pressure	:	245 kPa	Specimen ref.	:	B
Effective pressure	:	80 kPa			

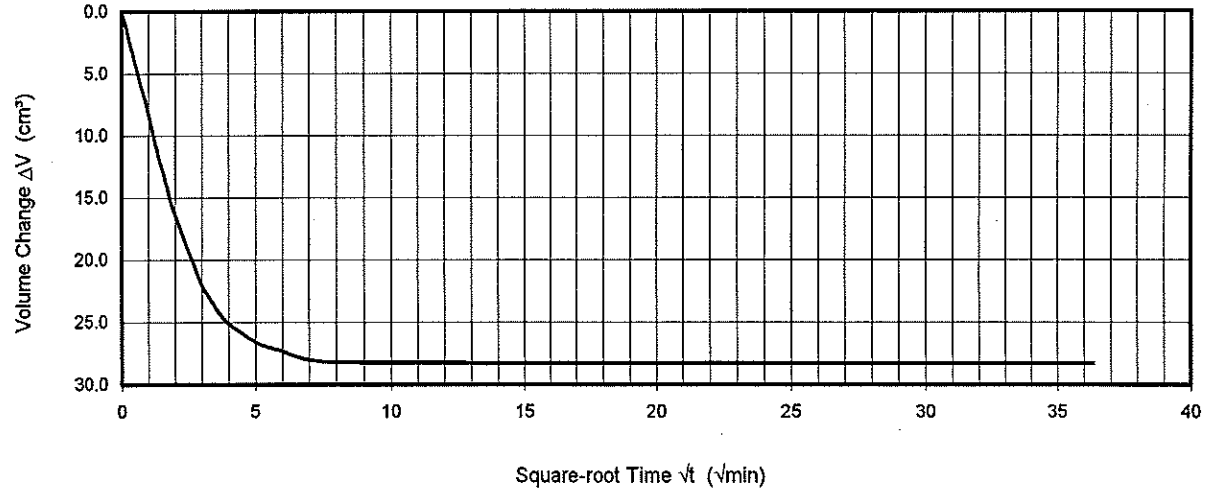
Degree of Consolidation vs. Log Time

t_{50} = 11.00 min ΔV = 28.3 cm³



Volume Change vs. Square-root Time

t_{100} = 11.56 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

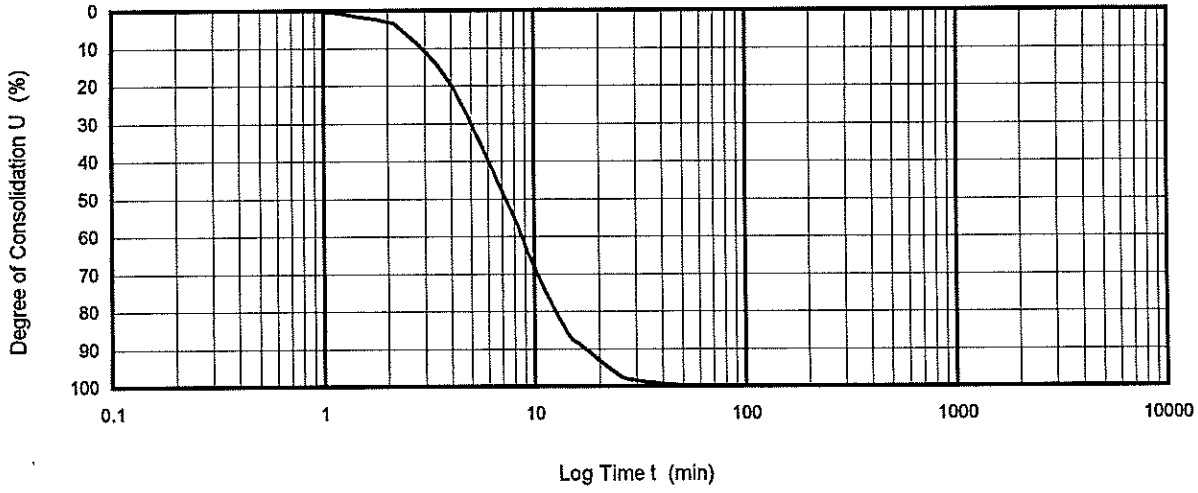
Client	:	MTR Corporation Limited	Client sample No.	:	11
Project	:	Contract 912 Ground Investigation for South Island Line (EAST)	Borehole No.	:	D222
			Depth(m) From	:	6.00
			To	:	-

Laboratory Information

Cell pressure	:	405 kPa	Lab. sample I.D.	:	SL90169/1
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	160 kPa			

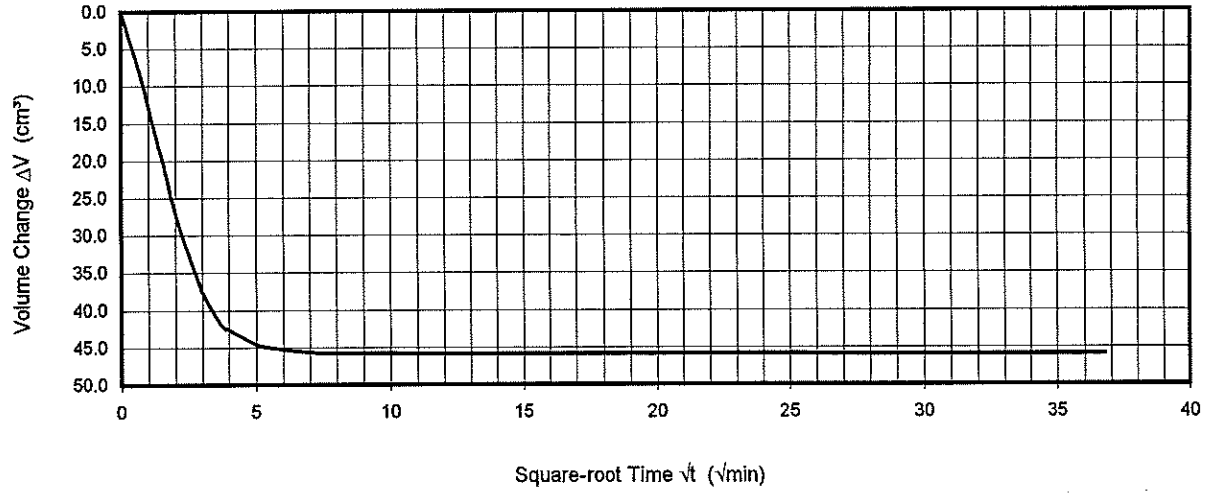
Degree of Consolidation vs. Log Time

t_{50} = 7.20 min ΔV = 46.0 cm^3



Volume Change vs. Square-root Time

t_{100} = 11.56 min



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	11
Project	:	Contract 912 Ground Investigation for South Island Line (EAST)	Borehole No.	:	D222
			Depth(m) From	:	6.00
			To	:	-

Laboratory Information

Date shearing commenced	:	09/09/2009	Time : 09:00	Lab. sample I.D.	:	SL90169/1	
Date shearing completed	:	09/09/2009	Time : 15:59	Specimen ref.	:	A	
Proving ring serial No.	:	12540		Cell pressure	:	285	kPa
Type of membrane	:	rubber		Back pressure	:	245	kPa
Corrections				Effective pressure	:	40	kPa
Side drain, σ_{dr}	:	0.000	kPa/%	Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.67	mm	Volume V_c	:	634.72	cm^3
Rate of axial displacement	:	0.050	mm/min	Area A_c	:	4269.8	mm^2
Pore pressure coefficient, A_f	:	0.06		Length L_c	:	148.7	mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	175	127.0	0.0	0.00	0.00	0.0	40.0	0.0	40.0	0.0	1.00
255.6	32	361	260.7	0.2	0.00	0.06	31.2	45.0	15.6	39.8	31.2	2.06
259.6	60	405	291.9	0.4	0.00	0.11	38.4	44.6	19.2	38.2	38.4	2.51
262.1	90	440	316.8	0.6	0.00	0.16	44.0	44.9	22.0	37.6	44.0	2.92
263.7	120	471	338.8	0.8	0.00	0.21	49.0	45.8	24.5	37.6	49.0	3.30
264.4	150	502	360.8	1.0	0.00	0.26	53.9	47.6	27.0	38.6	53.9	3.62
265.2	180	534	383.5	1.2	0.00	0.31	59.0	49.3	29.5	39.5	59.0	3.98
265.4	216	563	400.3	1.5	0.00	0.37	62.7	50.9	31.3	40.5	62.7	4.20
265.5	240	577	410.2	1.6	0.00	0.41	64.8	51.9	32.4	41.1	64.8	4.33
265.5	272	598	425.2	1.8	0.00	0.47	68.1	53.5	34.0	42.2	68.1	4.49
265.5	300	613	435.8	2.0	0.00	0.51	70.3	54.7	35.2	42.9	70.3	4.61
265.2	337	632	449.3	2.3	0.00	0.57	73.2	56.4	36.6	44.2	73.2	4.70
264.8	365	645	458.6	2.5	0.00	0.61	75.1	57.8	37.6	45.2	75.1	4.72
264.4	399	663	471.4	2.7	0.00	0.67	77.8	59.5	38.9	46.5	77.8	4.78
264.2	429	677	481.3	2.9	0.00	0.71	79.9	60.7	39.9	47.4	79.9	4.84
263.8	450	687	488.4	3.0	0.00	0.75	81.3	61.9	40.7	48.3	81.3	4.84
263.3	489	704	500.5	3.3	0.00	0.80	83.8	63.6	41.9	49.6	83.8	4.86
263.0	510	713	506.9	3.4	0.00	0.84	85.1	64.5	42.5	50.4	85.1	4.87
262.5	542	730	519.0	3.6	0.00	0.88	87.6	66.3	43.8	51.7	87.6	4.89
262.0	572	746	530.4	3.8	0.00	0.93	89.9	68.0	45.0	53.0	89.9	4.91
261.3	605	768	546.0	4.1	0.00	0.97	93.2	70.3	46.6	54.8	93.2	4.93
260.8	630	784	557.4	4.2	0.00	1.01	95.5	72.0	47.8	56.0	95.5	4.95
260.3	664	799	568.1	4.5	0.00	1.06	97.6	73.5	48.8	57.2	97.6	4.95
259.8	691	810	575.9	4.6	0.00	1.09	99.1	74.8	49.6	58.2	99.1	4.93
259.1	723	823	585.1	4.9	0.00	1.14	100.9	76.4	50.5	59.5	100.9	4.90
258.4	754	834	593.0	5.1	0.00	1.18	102.4	77.8	51.2	60.7	102.4	4.85
257.6	783	844	600.1	5.3	0.00	1.22	103.7	79.3	51.9	62.0	103.7	4.79
257.1	814	855	607.9	5.5	0.00	1.26	105.2	80.5	52.6	63.0	105.2	4.77
256.8	842	865	615.0	5.7	0.00	1.30	106.5	81.5	53.3	63.7	106.5	4.78
256.5	871	873	620.7	5.9	0.00	1.33	107.5	82.3	53.8	64.3	107.5	4.77
256.1	903	880	625.7	6.1	0.00	1.37	108.3	83.1	54.2	65.0	108.3	4.75
255.7	931	886	629.9	6.3	0.00	1.41	109.0	83.8	54.5	65.6	109.0	4.72
255.3	964	889	632.1	6.5	0.00	1.45	109.2	84.3	54.6	66.1	109.2	4.68
254.6	993	893	634.9	6.7	0.00	1.49	109.5	85.2	54.8	66.9	109.5	4.60
254.0	1025	896	637.0	6.9	0.00	1.53	109.7	85.8	54.8	67.6	109.7	4.54

Final volume (cm^3): 634.72 Final length (mm): 129.1 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 11
Borehole No. : D222
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL90169/1
Specimen ref. : A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
253.4	1050	899	639.2	7.1	0.00	1.56	109.9	86.6	55.0	68.2	109.9	4.48	
252.9	1082	901	640.6	7.3	0.00	1.59	109.9	87.1	55.0	68.7	109.9	4.42	
252.5	1115	903	642.0	7.5	0.00	1.63	109.9	87.5	55.0	69.1	109.9	4.38	
251.8	1144	905	643.4	7.7	0.00	1.67	110.0	88.2	55.0	69.9	110.0	4.31	
251.2	1173	907	644.9	7.9	0.00	1.70	110.0	88.8	55.0	70.5	110.0	4.25	«
250.6	1203	908	645.6	8.1	0.00	1.74	109.9	89.3	54.9	71.0	109.9	4.19	
249.8	1231	909	646.3	8.3	0.00	1.77	109.8	90.1	54.9	71.8	109.8	4.12	
249.3	1264	910	647.0	8.5	0.00	1.80	109.6	90.5	54.8	72.2	109.6	4.07	
248.6	1293	911	647.7	8.7	0.00	1.84	109.5	91.1	54.7	72.9	109.5	4.01	
248.0	1325	911	647.7	8.9	0.00	1.87	109.2	91.6	54.6	73.4	109.2	3.95	
247.4	1352	910	647.0	9.1	0.00	1.90	108.8	92.0	54.4	73.9	108.8	3.89	
246.4	1401	908	645.6	9.4	0.00	1.95	108.0	92.6	54.0	74.6	108.0	3.80	
245.3	1454	908	645.6	9.8	0.00	2.01	107.6	93.5	53.8	75.6	107.6	3.71	
244.2	1503	907	644.9	10.1	0.00	2.06	107.0	94.3	53.5	76.5	107.0	3.62	
243.4	1555	906	644.2	10.5	0.00	2.12	106.3	94.8	53.2	77.0	106.3	3.56	
242.5	1603	905	643.4	10.8	0.00	2.16	105.7	95.4	52.9	77.7	105.7	3.49	
241.7	1656	904	642.7	11.1	0.00	2.22	105.1	95.9	52.6	78.3	105.1	3.43	
240.9	1704	903	642.0	11.5	0.00	2.26	104.5	96.4	52.3	78.9	104.5	3.37	
239.4	1751	901	640.6	11.8	0.00	2.31	103.8	97.5	51.9	80.2	103.8	3.28	
238.7	1803	900	639.9	12.1	0.00	2.36	103.2	97.9	51.6	80.7	103.2	3.23	
237.6	1855	898	638.5	12.5	0.00	2.41	102.4	98.6	51.2	81.5	102.4	3.16	
236.4	1902	896	637.0	12.8	0.00	2.45	101.7	99.5	50.9	82.5	101.7	3.09	
235.2	1954	894	635.6	13.1	0.00	2.50	101.0	100.3	50.5	83.5	101.0	3.03	

Final volume (cm³): 634.72 Final length (mm): 129.1 Termination criterion : Maximum deviator stress

Remarks:

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MaterialLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 11
Borehole No. : D222
Depth(m) From : 6.00
To : -

Laboratory Information

Date shearing commenced : 10/09/2009 Time : 09:00
Date shearing completed : 10/09/2009 Time : 14:57
Proving ring serial No. : 12540
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.26

Lab. sample I.D. : SL90169/1
Specimen ref. : B
Cell pressure : 325 kPa
Back pressure : 245 kPa
Effective pressure : 80 kPa
Dimensions at starting of compression
Volume V_c : 625.57 cm^3
Area A_c : 4232.5 mm^2
Length L_c : 147.8 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	199	144.5	0.0	0.00	0.00	0.0	80.0	0.0	80.0	0.0	1.00	
268.2	31	535	384.2	0.2	0.00	0.06	56.5	85.0	28.2	75.6	56.5	1.99	
276.4	61	609	433.0	0.4	0.00	0.11	67.8	82.5	33.9	71.2	67.8	2.39	
281.5	96	665	472.8	0.6	0.00	0.17	76.9	81.9	38.4	69.1	76.9	2.77	
284.6	123	703	499.8	0.8	0.00	0.22	83.0	81.9	41.5	68.1	83.0	3.06	
286.9	152	740	526.1	1.0	0.00	0.27	89.0	82.6	44.5	67.8	89.0	3.34	
288.8	187	779	553.9	1.3	0.00	0.33	95.2	83.8	47.6	67.9	95.2	3.63	
289.6	212	806	573.1	1.4	0.00	0.37	99.4	85.1	49.7	68.5	99.4	3.81	
290.1	240	833	592.3	1.6	0.00	0.42	103.7	86.7	51.8	69.5	103.7	3.97	
290.7	270	862	612.9	1.8	0.00	0.47	108.2	88.4	54.1	70.4	108.2	4.15	
290.9	305	897	637.8	2.1	0.00	0.53	113.6	90.9	56.8	72.0	113.6	4.33	
291.0	336	930	661.2	2.3	0.00	0.58	118.7	93.4	59.4	73.6	118.7	4.49	
291.4	361	956	679.7	2.4	0.00	0.62	122.8	95.0	61.4	74.5	122.8	4.65	
291.5	394	984	699.6	2.7	0.00	0.67	127.0	97.0	63.5	75.8	127.0	4.79	
290.9	423	1002	712.4	2.9	0.00	0.72	129.6	98.9	64.8	77.3	129.6	4.80	
289.7	454	1032	733.7	3.1	0.00	0.77	134.2	102.4	67.1	80.0	134.2	4.80	
288.9	489	1060	753.6	3.3	0.00	0.82	138.3	105.3	69.2	82.2	138.3	4.83	
288.2	513	1086	772.1	3.5	0.00	0.86	142.3	107.9	71.1	84.2	142.3	4.87	
287.6	544	1095	778.5	3.7	0.00	0.90	143.4	109.1	71.7	85.2	143.4	4.83	
286.9	575	1104	784.9	3.9	0.00	0.95	144.5	110.3	72.2	86.3	144.5	4.79	
286.3	603	1111	789.9	4.1	0.00	0.99	145.3	111.3	72.6	87.1	145.3	4.75	
285.8	633	1116	793.5	4.3	0.00	1.03	145.7	112.1	72.9	87.8	145.7	4.72	
285.5	662	1119	795.6	4.5	0.00	1.07	145.9	112.4	72.9	88.1	145.9	4.69	
285.1	694	1122	797.7	4.7	0.00	1.12	146.0	112.9	73.0	88.6	146.0	4.66	
284.6	721	1125	799.9	4.9	0.00	1.16	146.1	113.5	73.1	89.1	146.1	4.62	
284.2	755	1128	802.0	5.1	0.00	1.20	146.2	113.9	73.1	89.5	146.2	4.58	
283.8	782	1130	803.4	5.3	0.00	1.24	146.2	114.3	73.1	89.9	146.2	4.55	
283.5	814	1132	804.8	5.5	0.00	1.28	146.2	114.6	73.1	90.2	146.2	4.52	
283.1	843	1134	806.3	5.7	0.00	1.32	146.1	115.0	73.1	90.6	146.1	4.49	
282.7	872	1137	808.4	5.9	0.00	1.36	146.3	115.4	73.1	91.1	146.3	4.46	«
282.5	903	1139	809.8	6.1	0.00	1.40	146.2	115.6	73.1	91.2	146.2	4.44	
282.2	931	1140	810.5	6.3	0.00	1.44	146.0	115.8	73.0	91.5	146.0	4.41	
281.8	964	1141	811.2	6.5	0.00	1.48	145.8	116.1	72.9	91.8	145.8	4.37	
281.5	993	1142	811.9	6.7	0.00	1.51	145.6	116.3	72.8	92.0	145.6	4.35	
281.1	1022	1142	811.9	6.9	0.00	1.55	145.3	116.5	72.6	92.3	145.3	4.31	

Final volume (cm^3): 625.57 Final length (mm): 131.7 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 11
Borehole No. : D222
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL90169/1
Specimen ref. : B

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
280.7	1050	1141	811.2	7.1	0.00	1.58	144.8	116.7	72.4	92.6	144.8	4.27
279.4	1104	1140	810.5	7.5	0.00	1.65	144.0	117.6	72.0	93.6	144.0	4.16
278.2	1157	1138	809.1	7.8	0.00	1.71	143.0	118.3	71.5	94.5	143.0	4.06
277.4	1205	1136	807.7	8.2	0.00	1.77	142.2	118.7	71.1	95.0	142.2	3.99
276.5	1253	1134	806.3	8.5	0.00	1.82	141.3	119.1	70.6	95.6	141.3	3.91
275.3	1306	1132	804.8	8.8	0.00	1.88	140.4	119.9	70.2	96.5	140.4	3.82
274.4	1354	1130	803.4	9.2	0.00	1.94	139.5	120.3	69.7	97.1	139.5	3.76
273.2	1402	1127	801.3	9.5	0.00	1.99	138.5	121.0	69.2	98.0	138.5	3.67
272.4	1453	1125	799.9	9.8	0.00	2.05	137.6	121.4	68.8	98.5	137.6	3.62
271.6	1505	1123	798.4	10.2	0.00	2.10	136.7	121.7	68.3	99.0	136.7	3.56
270.5	1557	1120	796.3	10.5	0.00	2.16	135.6	122.3	67.8	99.7	135.6	3.49
269.4	1606	1117	794.2	10.9	0.00	2.21	134.6	122.9	67.3	100.5	134.6	3.42

Final volume (cm^3): 625.57 Final length (mm): 131.7 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	11
Project	:	Contract 912	Borehole No.	:	D222
		Ground Investigation for South Island Line	Depth(m) From	:	6.00
		(EAST)	To	:	-

Laboratory Information

Date shearing commenced	:	10/09/2009	Time :	09:00	Lab. sample I.D.	:	SL90169/1	
Date shearing completed	:	10/09/2009	Time :	15:10	Specimen ref.	:	C	
Proving ring serial No.	:	12202			Cell pressure	:	405	kPa
Type of membrane	:	rubber			Back pressure	:	245	kPa
Corrections					Effective pressure	:	160	kPa
Side drain, σ_{dr}	:	0.000	kPa/%		Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.64	mm		Volume V_c	:	608.31	cm^3
Rate of axial displacement	:	0.050	mm/min		Area A_c	:	4152.4	mm^2
Pore pressure coefficient, A_f	:	0.44			Length L_c	:	146.5	mm

Pore pressure u	Axial strain reading	Proving ring reading	Axial force	Axial strain ε	Side drain correction σ_{dr}	Membrane correction σ_{mb}	Corr. Dev. stress $\sigma_1-\sigma_3$	s'	t	p'	q	Stress ratio σ_1'/σ_3'
kPa	div	div	N	%	kPa	kPa	kPa	kPa	kPa	kPa	kPa	
245.0	0	0.101	176.2	0.0	0.00	0.00	0.0	160.0	0.0	160.0	0.0	1.00
287.4	33	0.295	514.7	0.2	0.00	0.06	81.3	158.2	40.6	144.7	81.3	1.69
302.5	60	0.339	591.4	0.4	0.00	0.10	99.5	152.2	49.7	135.7	99.5	1.97
313.4	91	0.373	650.7	0.6	0.00	0.16	113.4	148.3	56.7	129.4	113.4	2.24
322.3	128	0.403	703.1	0.9	0.00	0.22	125.6	145.5	62.8	124.6	125.6	2.52
326.3	150	0.418	729.2	1.0	0.00	0.25	131.6	144.5	65.8	122.6	131.6	2.67
330.0	180	0.435	758.9	1.2	0.00	0.30	138.3	144.1	69.1	121.1	138.3	2.84
333.0	210	0.452	788.6	1.4	0.00	0.35	145.0	144.5	72.5	120.3	145.0	3.01
335.2	240	0.468	816.5	1.6	0.00	0.40	151.3	145.4	75.6	120.2	151.3	3.17
336.8	270	0.483	842.6	1.8	0.00	0.45	157.1	146.7	78.5	120.6	157.1	3.30
337.8	300	0.497	867.1	2.0	0.00	0.49	162.5	148.4	81.2	121.4	162.5	3.42
338.8	335	0.510	889.7	2.3	0.00	0.55	167.4	149.9	83.7	122.0	167.4	3.53
339.5	361	0.523	912.4	2.5	0.00	0.59	172.3	151.7	86.2	122.9	172.3	3.63
339.8	397	0.534	931.6	2.7	0.00	0.64	176.3	153.4	88.2	124.0	176.3	3.70
339.9	429	0.546	952.5	2.9	0.00	0.69	180.8	155.5	90.4	125.4	180.8	3.78
340.0	453	0.556	970.0	3.1	0.00	0.73	184.5	157.3	92.3	126.5	184.5	3.84
340.1	486	0.564	983.9	3.3	0.00	0.77	187.3	158.5	93.6	127.3	187.3	3.89
340.1	514	0.572	997.9	3.5	0.00	0.81	190.1	160.0	95.1	128.3	190.1	3.93
340.1	543	0.576	1004.9	3.7	0.00	0.85	191.3	160.6	95.7	128.7	191.3	3.95
339.9	572	0.580	1011.9	3.9	0.00	0.89	192.5	161.3	96.2	129.3	192.5	3.96
339.8	605	0.584	1018.8	4.1	0.00	0.94	193.6	162.0	96.8	129.7	193.6	3.97
339.6	625	0.587	1024.1	4.3	0.00	0.97	194.5	162.7	97.3	130.2	194.5	3.97
339.3	662	0.591	1031.1	4.5	0.00	1.02	195.5	163.5	97.8	130.9	195.5	3.98
339.0	694	0.595	1038.0	4.7	0.00	1.06	196.7	164.3	98.3	131.6	196.7	3.98
338.6	725	0.599	1045.0	4.9	0.00	1.10	197.8	165.3	98.9	132.3	197.8	3.98
338.2	752	0.602	1050.2	5.1	0.00	1.14	198.5	166.1	99.3	133.0	198.5	3.97
338.0	784	0.605	1055.5	5.4	0.00	1.18	199.2	166.6	99.6	133.4	199.2	3.97
337.6	816	0.608	1060.7	5.6	0.00	1.22	199.9	167.4	100.0	134.0	199.9	3.97
337.4	841	0.611	1065.9	5.7	0.00	1.25	200.7	168.0	100.4	134.5	200.7	3.97
337.0	870	0.614	1071.2	5.9	0.00	1.29	201.4	168.7	100.7	135.1	201.4	3.96
336.7	903	0.617	1076.4	6.2	0.00	1.33	202.1	169.4	101.1	135.7	202.1	3.96
336.4	936	0.620	1081.6	6.4	0.00	1.37	202.8	170.0	101.4	136.2	202.8	3.96
336.2	963	0.623	1086.9	6.6	0.00	1.40	203.5	170.5	101.7	136.6	203.5	3.96
336.0	994	0.626	1092.1	6.8	0.00	1.44	204.2	171.1	102.1	137.1	204.2	3.96
335.8	1021	0.628	1095.6	7.0	0.00	1.47	204.5	171.5	102.3	137.4	204.5	3.96

Final volume (cm^3): 608.31 Final length (mm): 128.5 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 11
Borehole No. : D222
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL90169/1
Specimen ref. : C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
335.6	1051	0.63	1099.1	7.2	0.00	1.50	204.8	171.8	102.4	137.7	204.8	3.95	«
335.2	1085	0.631	1100.8	7.4	0.00	1.54	204.6	172.1	102.3	138.0	204.6	3.93	
335.1	1110	0.632	1102.6	7.6	0.00	1.57	204.6	172.2	102.3	138.1	204.6	3.93	
334.8	1144	0.633	1104.3	7.8	0.00	1.61	204.5	172.4	102.2	138.4	204.5	3.91	
334.5	1171	0.633	1104.3	8.0	0.00	1.64	204.0	172.5	102.0	138.5	204.0	3.89	
334.2	1203	0.632	1102.6	8.2	0.00	1.68	203.1	172.4	101.6	138.5	203.1	3.87	
333.8	1251	0.631	1100.8	8.5	0.00	1.73	201.9	172.2	101.0	138.5	201.9	3.84	
333.5	1305	0.629	1097.3	8.9	0.00	1.79	200.3	171.6	100.1	138.3	200.3	3.80	
332.9	1354	0.627	1093.9	9.2	0.00	1.84	198.7	171.5	99.4	138.3	198.7	3.76	
332.3	1403	0.625	1090.4	9.6	0.00	1.89	197.2	171.3	98.6	138.4	197.2	3.71	
331.4	1455	0.623	1086.9	9.9	0.00	1.94	195.6	171.4	97.8	138.8	195.6	3.66	
330.7	1502	0.621	1083.4	10.3	0.00	1.99	194.1	171.3	97.0	139.0	194.1	3.61	
329.6	1556	0.618	1078.2	10.6	0.00	2.04	192.1	171.5	96.1	139.4	192.1	3.55	
328.4	1601	0.615	1072.9	10.9	0.00	2.09	190.3	171.7	95.1	140.0	190.3	3.48	
327.6	1657	0.613	1069.4	11.3	0.00	2.14	188.6	171.7	94.3	140.3	188.6	3.44	
326.5	1704	0.611	1065.9	11.6	0.00	2.18	187.2	172.1	93.6	140.9	187.2	3.38	
325.4	1753	0.608	1060.7	12.0	0.00	2.23	185.3	172.2	92.6	141.4	185.3	3.33	
324.3	1800	0.605	1055.5	12.3	0.00	2.27	183.5	172.4	91.7	141.9	183.5	3.27	

Final volume (cm^3): 608.31 Final length (mm): 128.5 Termination criterion : Maximum deviator stress

Remarks:

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Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

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MateriaLab

HKAS HOKLAS 015

Test Report No. : 090562SL90169(5) Page 1 of 17

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

SUMMARY OF TEST

Information supplied by Client

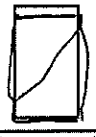
Client : MTR Corporation Limited
Client's Address : Not requested to be reported
Project : Contract 912 Ground Investigation for South Island Line (EAST)

Client sample No. : 30
Borehole No. : D222
Depth(m) From : 18.20
To : -
Sample origin : CDS
Soil description : -

Laboratory Information

Date sample received : 21-08-2009
Date test(s) commenced : 08-09-2009
Date test(s) completed : 14-09-2009
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum 24.5 °C Minimum : 20.0 °C

Lab. sample I.D. : SL90169/2
Sample type : M

Specimen reference			A			B			C		
Specimen depth(m)	From		18.60			18.80			19.00		
	To		18.80			19.00			19.20		
Effective pressure		kPa	90			180			360		
*Measurements and Calculations			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.8	74.2	80.0	74.7	73.4	80.1	74.6	73.4	78.8
Length		mm	150.3	149.2	128.6	150.1	147.6	124.1	150.3	147.9	128.4
Volume		cm^3	660.47	645.87	645.87	657.83	624.93	624.93	656.94	625.44	625.44
Wet mass		g	1352.4	1367.0	1367.0	1330.7	1311.3	1311.3	1355.2	1359.8	1359.8
Dry mass		g	1158.1	1158.1	1158.1	1100.3	1100.3	1100.3	1180.3	1180.3	1180.3
Moisture content		%	16.8	18.0	18.0	20.9	19.2	19.2	14.8	15.2	15.2
Bulk density		Mg/m^3	2.05	2.12	2.12	2.02	2.10	2.10	2.06	2.17	2.17
Dry density		Mg/m^3	1.75	1.79	1.79	1.67	1.76	1.76	1.80	1.89	1.89
Void ratio			0.51	0.48	0.48	0.58	0.51	0.51	0.47	0.40	0.40
Degree of saturation		%	87.0	100.0	100.0	95.0	100.6	100.6	82.7	99.7	99.7
Saturation Stage											
Volume change of water		cm^3	29.2			13.5			36.1		
Consolidation Stage											
Side drain used			No			No			No		
Initial pore pressure		kPa	330.0			420.0			598.6		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm^3	14.6			32.9			31.5		
m_{vi}		m^2/MN	0.26			0.29			0.14		
t_{50}		min	0.79			2.15			4.70		
c_{vi}	(from t_{50})	m^2/yr	5676.63			2060.43			945.73		
t_{100}		min	1.32			3.24			8.70		
c_{vi}	(from t_{100})	m^2/yr	6877.47			2767.73			1023.24		
Sketch of failed specimen (Failure Mode)			Brittle			Brittle			 Brittle		
Visual description			Moist, brown spotted with white, black and dark brown, silty/clayey, gravelly SAND.			Moist, brown spotted with white, black and dark brown, silty/clayey, gravelly SAND.			Moist, brown spotted with white, black and dark brown, silty/clayey, gravelly SAND.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 OCT 2009

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

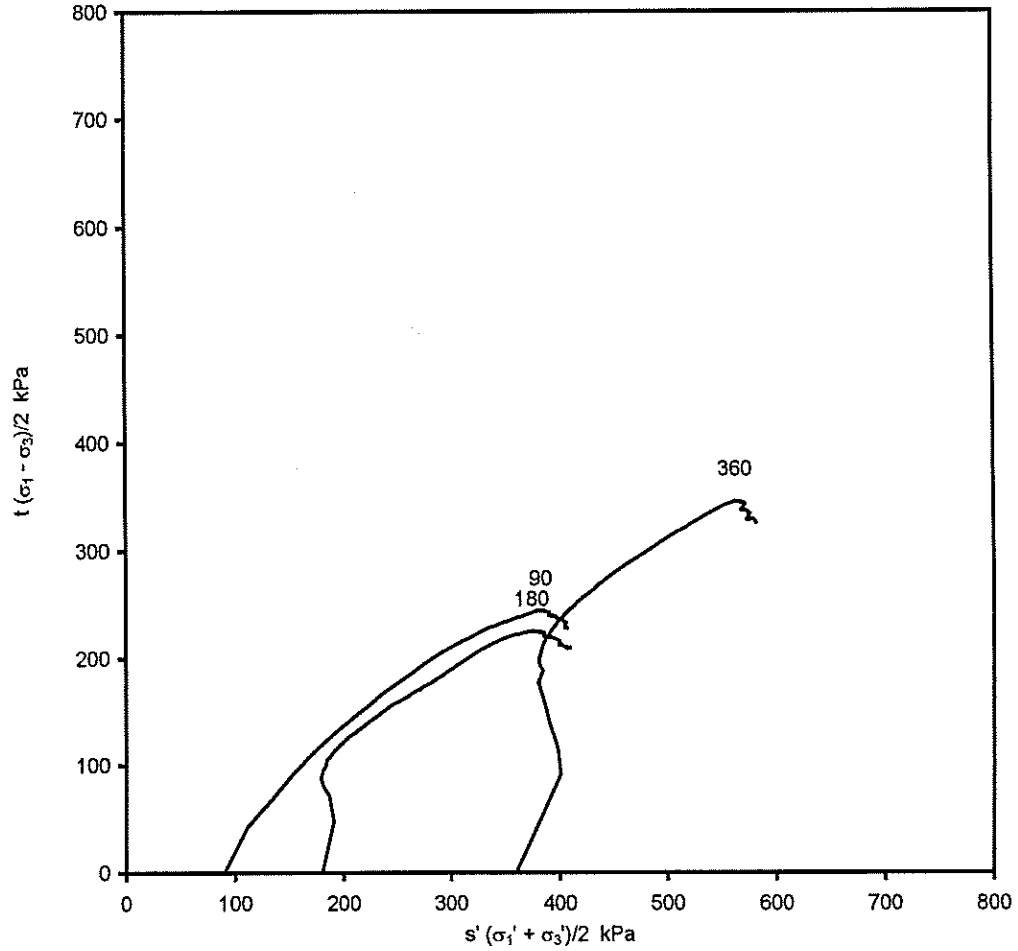
Client sample No. : 30
Borehole No. : D222
Depth(m) From : 18.20
To : -

Laboratory Information

Lab. sample I.D. : SL90169/2
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
A	90	8.7	196.9	487.9	382.0	243.9
B	180	10.6	275.7	449.5	374.1	224.8
C	360	8.1	387.6	690.2	562.5	345.1



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

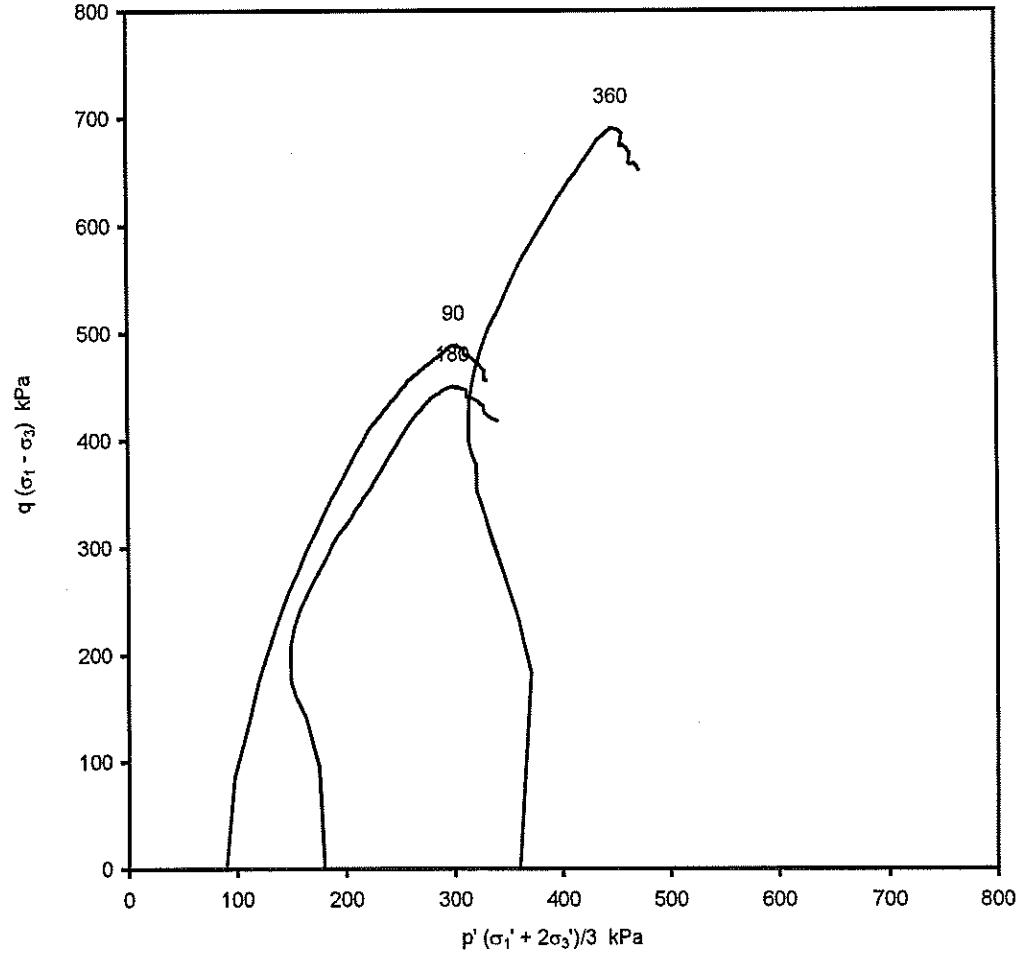
Client sample No. : 30
Borehole No. : D222
Depth(m) From : 18.20
To : -

Laboratory Information

Lab. sample I.D. : SL90169/2
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	90	8.7	196.9	487.9	300.7	487.9
B	180	10.6	275.7	449.5	299.1	449.5
C	360	8.1	387.6	690.2	447.5	690.2



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

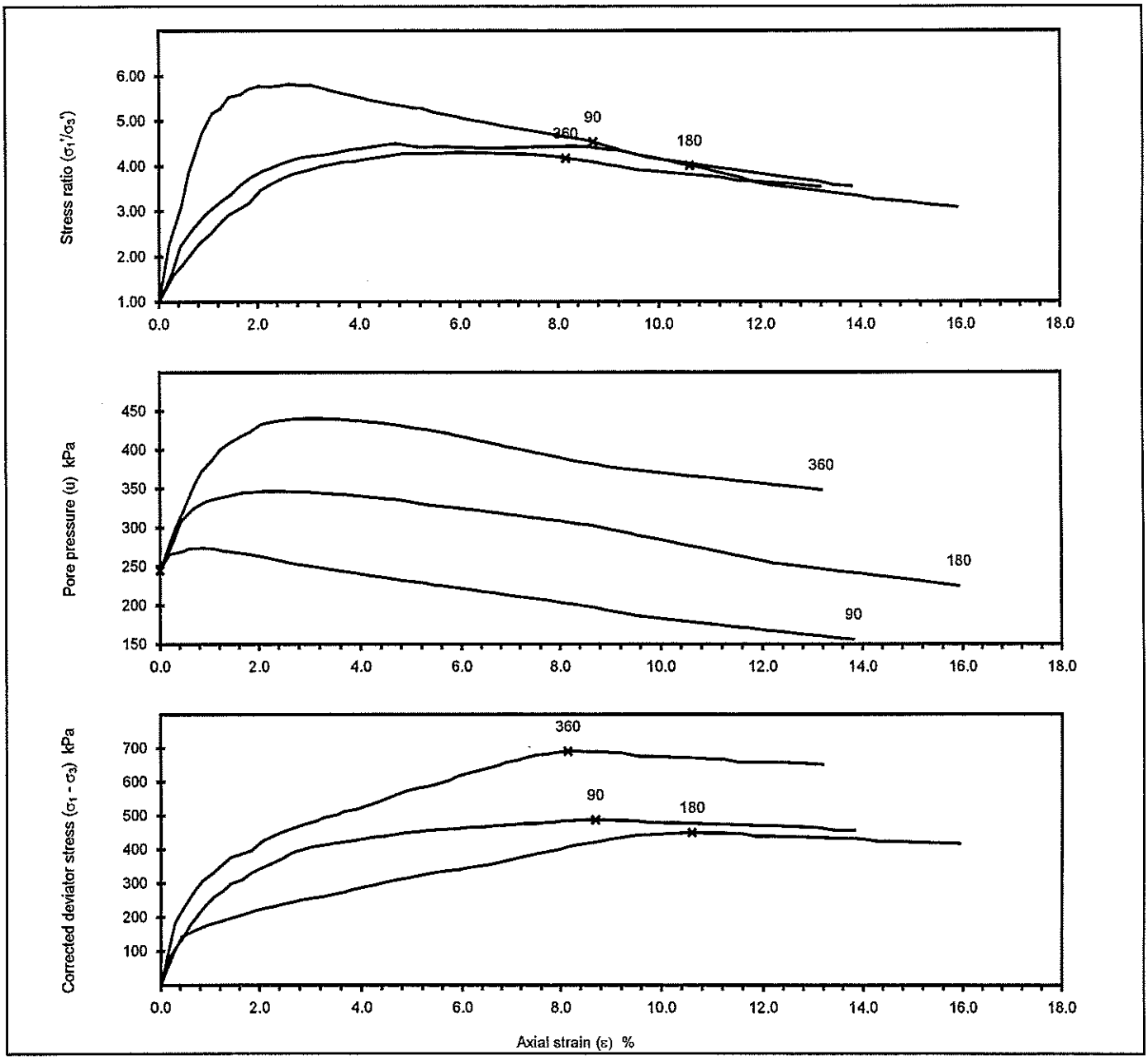
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	30
Project	:	Contract 912	Borehole No.	:	D222
		Ground Investigation for South Island Line	Depth(m) From	:	18.20
		(EAST)	To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/2
Specimen ref.	:	A, B, C



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 30
Borehole No. : D222
Depth(m) From : 18.20
To : -

Laboratory Information

Lab. sample I.D. : SL90169/2

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	90		180		360	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		25	20	25	20	25	20
		50	45	50	45	50	45
		75	70	75	70	75	70
		100	95	100	95	100	95
		125	120	125	120	125	120
		150	145	150	145	150	145
		200	195	200	195	200	195
		250	245	250	245	250	245

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	245.0	245.0	245.0
B value		0.98	0.98	0.98
Volume change	cm^3	29.2	13.5	36.1

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1364.6	1309.2	1357.0
Final moisture content	%	17.8	19.0	15.0
Final bulk density	Mg/m^3	2.11	2.09	2.17

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

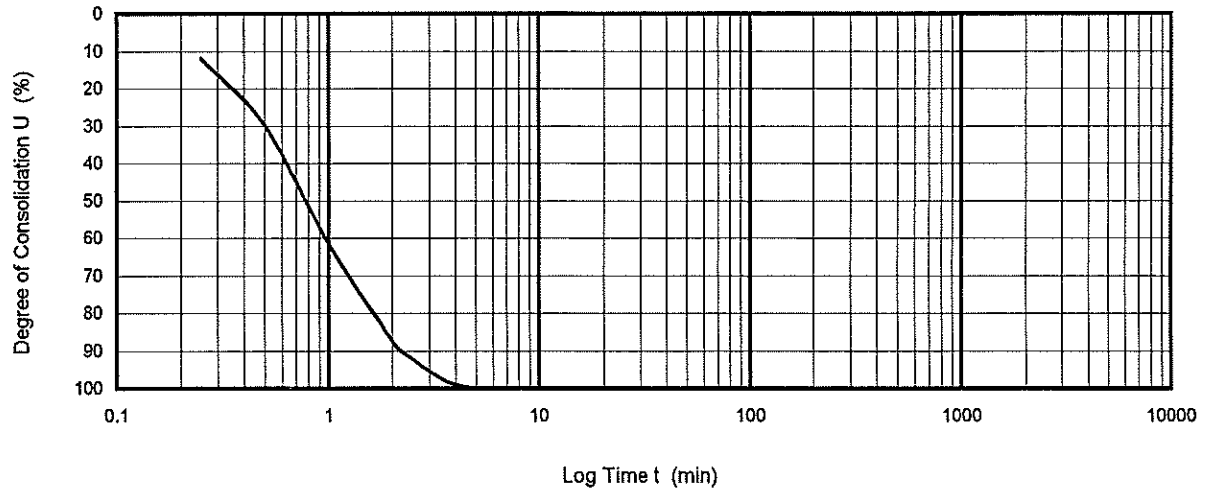
Client	:	MTR Corporation Limited	Client sample No.	:	30
Project	:	Contract 912	Borehole No.	:	D222
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.20
			To	:	-

Laboratory Information

Cell pressure	:	335 kPa	Lab. sample I.D.	:	SL90169/2
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	90 kPa			

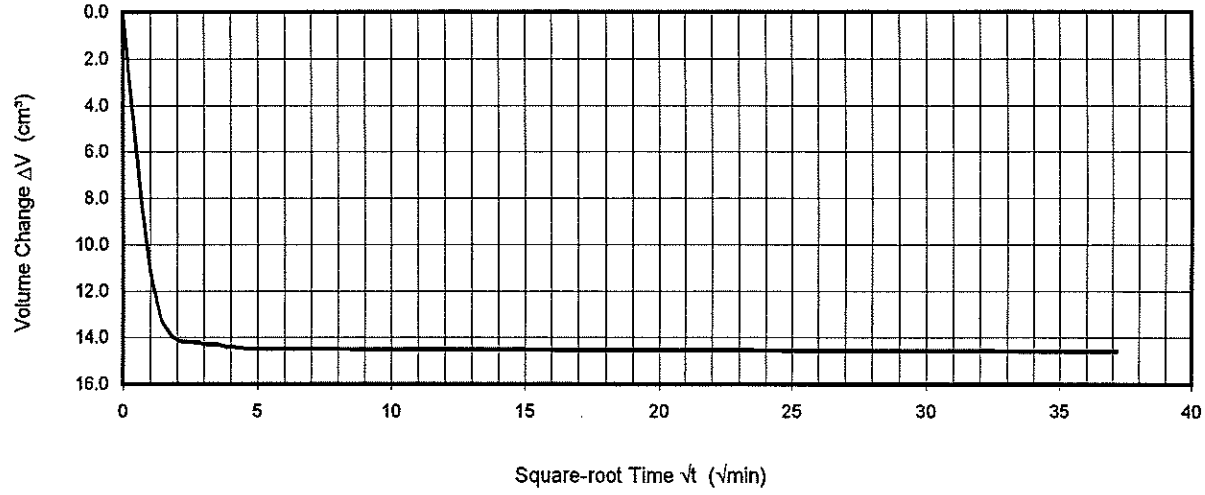
Degree of Consolidation vs. Log Time

t_{50} = 0.79 min ΔV = 14.6 cm³



Volume Change vs. Square-root Time

t_{100} = 1.32 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

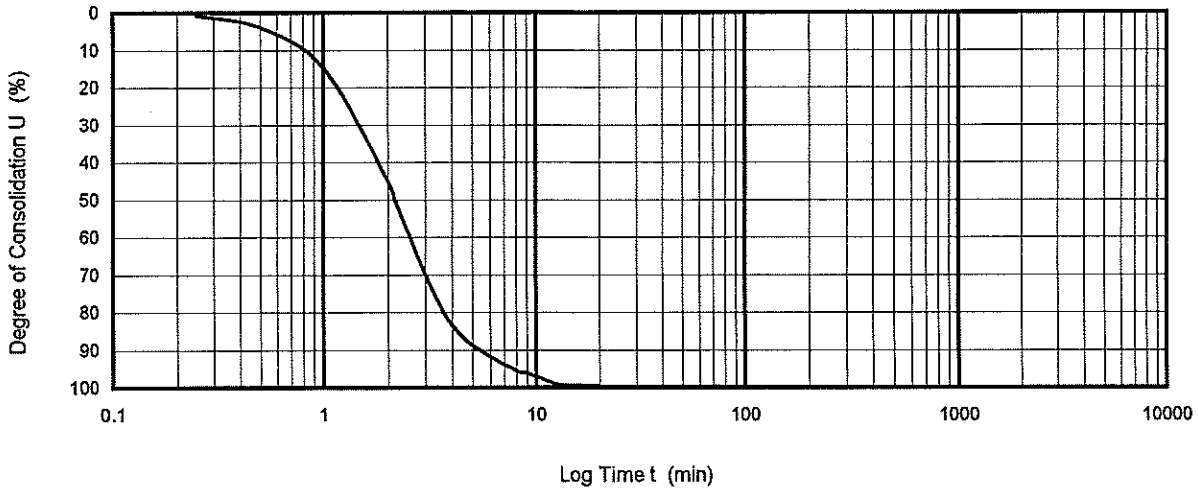
Client	:	MTR Corporation Limited	Client sample No.	:	30
Project	:	Contract 912 Ground Investigation for South Island Line (EAST)	Borehole No.	:	D222
			Depth(m) From	:	18.20
			To	:	-

Laboratory Information

Cell pressure	:	425 kPa	Lab. sample I.D.	:	SL90169/2
Back pressure	:	245 kPa	Specimen ref.	:	B
Effective pressure	:	180 kPa			

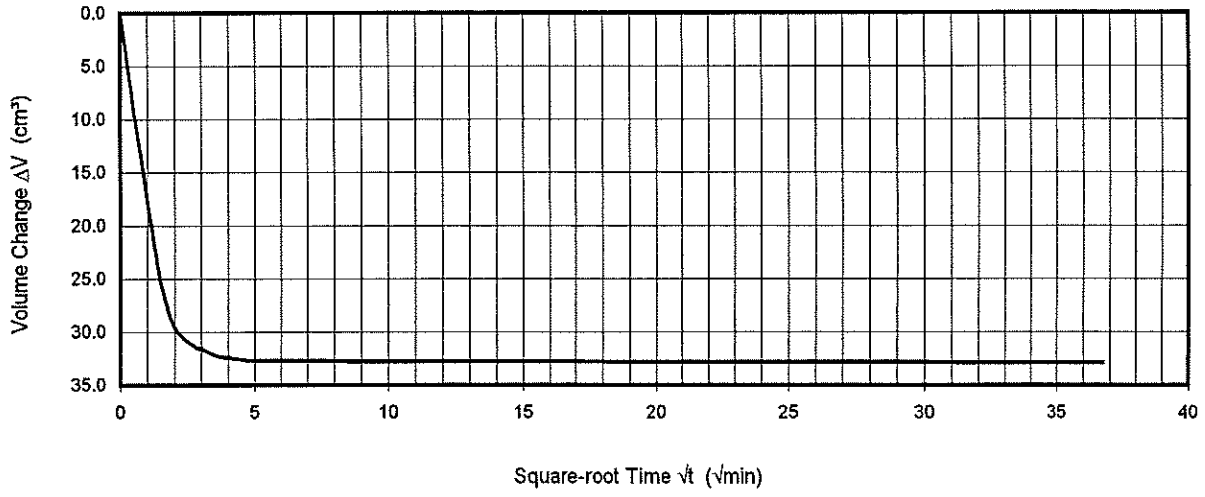
Degree of Consolidation vs. Log Time

t_{50} = 2.15 min ΔV = 32.9 cm³



Volume Change vs. Square-root Time

t_{100} = 3.24 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

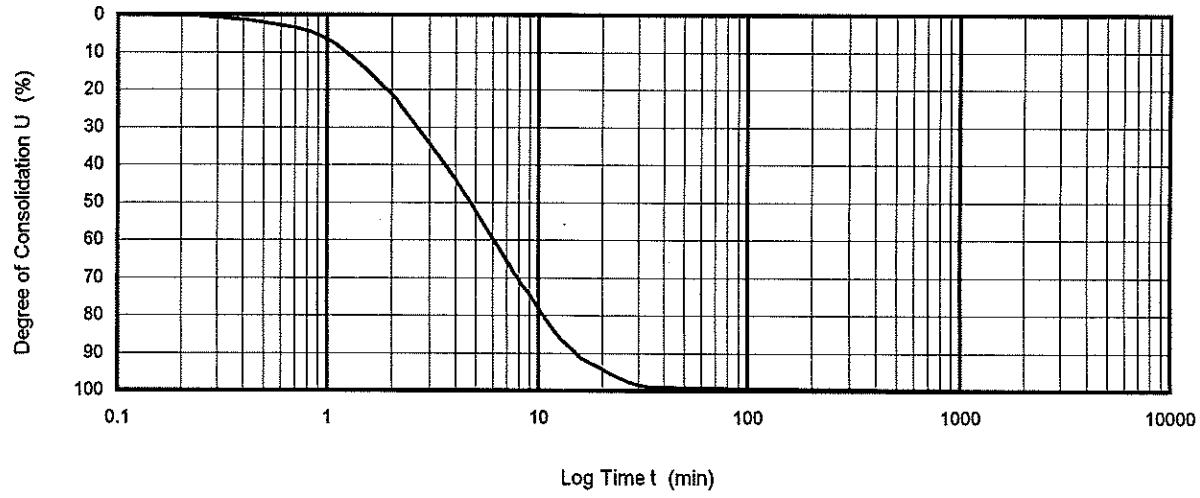
Client	:	MTR Corporation Limited	Client sample No.	:	30
Project	:	Contract 912	Borehole No.	:	D222
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.20
			To	:	-

Laboratory Information

Cell pressure	:	605 kPa	Lab. sample I.D.	:	SL90169/2
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	360 kPa			

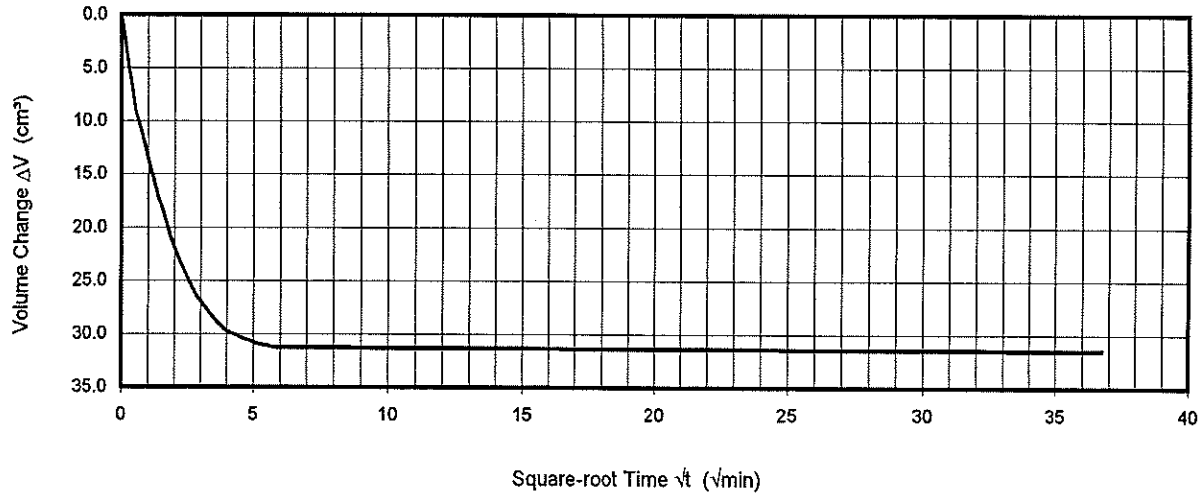
Degree of Consolidation vs. Log Time

t_{50} = 4.70 min ΔV = 31.5 cm³



Volume Change vs. Square-root Time

t_{100} = 8.70 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	30
Project	:	Contract 912	Borehole No.	:	D222
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.20
			To	:	-

Laboratory Information

Date shearing commenced	:	12/09/2009	Time :	09:00	Lab. sample I.D.	:	SL90169/2	
Date shearing completed	:	12/09/2009	Time :	16:17	Specimen ref.	:	A	
Proving ring serial No.	:	10175			Cell pressure	:	335	kPa
Type of membrane	:	rubber			Back pressure	:	245	kPa
Corrections					Effective pressure	:	90	kPa
Side drain, σ_{dr}	:	0.000	kPa/%		Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.64	mm		Volume V_c	:	645.87	cm^3
Rate of axial displacement	:	0.050	mm/min		Area A_c	:	4329.3	mm^2
Pore pressure coefficient, A_f	:	-0.10			Length L_c	:	149.2	mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.096	173.0	0.0	0.00	0.00	0.0	90.0	0.0	90.0	0.0	1.00
265.7	30	0.302	544.3	0.2	0.00	0.05	85.5	112.1	42.8	97.8	85.5	2.23
269.2	67	0.430	775.1	0.4	0.00	0.11	138.3	135.0	69.2	111.9	138.3	3.10
272.9	90	0.522	940.9	0.6	0.00	0.15	176.1	150.2	88.1	120.8	176.1	3.84
274.0	129	0.644	1160.8	0.9	0.00	0.22	226.0	174.0	113.0	136.3	226.0	4.70
272.9	160	0.725	1306.8	1.1	0.00	0.27	258.8	191.5	129.4	148.4	258.8	5.17
270.3	186	0.771	1389.7	1.2	0.00	0.31	277.2	203.3	138.6	157.1	277.2	5.28
269.0	212	0.824	1485.2	1.4	0.00	0.35	298.4	215.2	149.2	165.5	298.4	5.52
267.1	246	0.858	1546.5	1.6	0.00	0.40	311.6	223.7	155.8	171.8	311.6	5.59
265.3	270	0.898	1618.6	1.8	0.00	0.44	327.4	233.4	163.7	178.8	327.4	5.70
262.6	304	0.944	1701.5	2.0	0.00	0.49	345.4	245.1	172.7	187.5	345.4	5.77
259.2	340	0.985	1775.4	2.3	0.00	0.54	361.1	256.4	180.6	196.2	361.1	5.76
256.7	368	1.019	1836.7	2.5	0.00	0.59	374.2	265.4	187.1	203.0	374.2	5.78
254.2	394	1.058	1907.0	2.6	0.00	0.62	389.3	275.5	194.7	210.6	389.3	5.82
252.0	422	1.081	1948.4	2.8	0.00	0.67	397.8	281.9	198.9	215.6	397.8	5.79
249.9	456	1.109	1998.9	3.1	0.00	0.71	408.1	289.2	204.1	221.1	408.1	5.80
247.8	486	1.123	2024.2	3.3	0.00	0.76	412.9	293.6	206.4	224.8	412.9	5.73
245.7	512	1.137	2049.4	3.4	0.00	0.79	417.7	298.2	208.9	228.5	417.7	5.68
243.6	544	1.151	2074.6	3.6	0.00	0.84	422.4	302.6	211.2	232.2	422.4	5.62
241.5	578	1.165	2099.9	3.9	0.00	0.89	426.9	307.0	213.5	235.8	426.9	5.57
239.4	604	1.178	2123.3	4.0	0.00	0.92	431.3	311.3	215.7	239.4	431.3	5.51
237.3	632	1.191	2146.7	4.2	0.00	0.96	435.6	315.5	217.8	242.9	435.6	5.46
235.2	666	1.204	2170.2	4.5	0.00	1.00	439.7	319.7	219.9	246.4	439.7	5.41
233.4	698	1.217	2193.6	4.7	0.00	1.05	443.8	323.5	221.9	249.5	443.8	5.37
231.6	722	1.230	2217.0	4.8	0.00	1.08	448.2	327.5	224.1	252.8	448.2	5.33
229.8	756	1.240	2235.0	5.1	0.00	1.12	451.0	330.7	225.5	255.5	451.0	5.29
228.8	783	1.251	2254.9	5.2	0.00	1.15	454.5	333.4	227.2	257.7	454.5	5.28
226.2	812	1.261	2272.9	5.4	0.00	1.19	457.4	337.5	228.7	261.3	457.4	5.20
224.4	844	1.269	2287.3	5.7	0.00	1.23	459.5	340.4	229.8	263.8	459.5	5.15
222.6	878	1.277	2301.7	5.9	0.00	1.27	461.5	343.1	230.7	266.2	461.5	5.11
220.8	903	1.285	2316.1	6.1	0.00	1.30	463.8	346.1	231.9	268.8	463.8	5.06
219.0	932	1.293	2330.6	6.2	0.00	1.34	465.9	348.9	232.9	271.3	465.9	5.02
217.2	964	1.301	2345.0	6.5	0.00	1.37	467.9	351.7	233.9	273.8	467.9	4.97
215.4	998	1.309	2359.4	6.7	0.00	1.41	469.8	354.5	234.9	276.2	469.8	4.93
213.6	1023	1.317	2373.8	6.9	0.00	1.44	472.0	357.4	236.0	278.7	472.0	4.89

Final volume (cm^3): 645.87 Final length (mm): 128.6 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 30
Borehole No. : D222
Depth(m) From : 18.20
To : -

Laboratory Information

Lab. sample I.D. : SL90169/2
Specimen ref. : A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
211.8	1056	1.325	2388.2	7.1	0.00	1.48	474.0	360.2	237.0	281.2	474.0	4.85	
210.0	1087	1.333	2402.7	7.3	0.00	1.52	476.0	363.0	238.0	283.7	476.0	4.81	
208.2	1124	1.340	2415.3	7.5	0.00	1.56	477.3	365.5	238.7	285.9	477.3	4.76	
206.4	1150	1.348	2429.7	7.7	0.00	1.59	479.5	368.3	239.7	288.4	479.5	4.73	
204.6	1178	1.356	2444.1	7.9	0.00	1.62	481.5	371.2	240.8	290.9	481.5	4.69	
202.8	1203	1.366	2462.1	8.1	0.00	1.64	484.5	374.4	242.2	293.7	484.5	4.66	
201.0	1233	1.373	2474.8	8.3	0.00	1.68	486.0	377.0	243.0	296.0	486.0	4.63	
199.2	1264	1.380	2487.4	8.5	0.00	1.71	487.6	379.6	243.8	298.3	487.6	4.59	
196.9	1297	1.384	2494.6	8.7	0.00	1.74	487.9	382.0	243.9	300.7	487.9	4.53	«
194.4	1322	1.386	2498.2	8.9	0.00	1.77	487.7	384.5	243.9	303.2	487.7	4.47	
192.0	1356	1.386	2498.2	9.1	0.00	1.81	486.4	386.2	243.2	305.1	486.4	4.40	
189.6	1384	1.386	2498.2	9.3	0.00	1.83	485.4	388.1	242.7	307.2	485.4	4.34	
187.2	1416	1.386	2498.2	9.5	0.00	1.87	484.2	389.9	242.1	309.2	484.2	4.28	
184.8	1456	1.377	2482.0	9.8	0.00	1.91	479.4	389.9	239.7	310.0	479.4	4.19	
182.4	1508	1.380	2487.4	10.1	0.00	1.96	478.6	391.9	239.3	312.1	478.6	4.14	
180.1	1552	1.383	2492.8	10.4	0.00	2.00	478.1	393.9	239.0	314.3	478.1	4.09	
177.6	1607	1.384	2494.6	10.8	0.00	2.05	476.4	395.6	238.2	316.2	476.4	4.03	
175.2	1654	1.385	2496.4	11.1	0.00	2.10	475.1	397.3	237.5	318.2	475.1	3.97	
172.8	1702	1.386	2498.2	11.4	0.00	2.14	473.7	399.0	236.8	320.1	473.7	3.92	
170.4	1756	1.386	2498.2	11.8	0.00	2.19	471.7	400.4	235.8	321.8	471.7	3.87	
168.0	1800	1.387	2500.0	12.1	0.00	2.23	470.4	402.2	235.2	323.8	470.4	3.82	
165.6	1854	1.387	2500.0	12.4	0.00	2.28	468.4	403.6	234.2	325.5	468.4	3.77	
163.2	1903	1.387	2500.0	12.8	0.00	2.33	466.6	405.1	233.3	327.3	466.6	3.72	
160.8	1957	1.387	2500.0	13.1	0.00	2.37	464.6	406.5	232.3	329.1	464.6	3.67	
158.4	2004	1.369	2467.6	13.4	0.00	2.42	456.4	404.8	228.2	328.7	456.4	3.58	
156.0	2061	1.373	2474.8	13.8	0.00	2.47	455.7	406.9	227.9	330.9	455.7	3.55	

Final volume (cm³): 645.87 Final length (mm): 128.6 Termination criterion : Maximum deviator stress
Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	30	
Project	:	Contract 912	Borehole No.	:	D222	
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.20	
			To	:	-	

Laboratory Information

Date shearing commenced	:	10/09/2009	Time :	09:00	Lab. sample I.D.	:	SL90169/2	
Date shearing completed	:	10/09/2009	Time :	17:13	Specimen ref.	:	B	
Proving ring serial No.	:	10175			Cell pressure	:	425	kPa
Type of membrane	:	rubber			Back pressure	:	245	kPa
Corrections					Effective pressure	:	180	kPa
Side drain, σ_{dr}	:	0.000	kPa/%		Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.66	mm		Volume V_c	:	624.93	cm^3
Rate of axial displacement	:	0.050	mm/min		Area A_c	:	4235.2	mm^2
Pore pressure coefficient, A_f	:	0.07			Length L_c	:	147.6	mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.116	209.1	0.0	0.00	0.00	0.0	180.0	0.0	180.0	0.0	1.00
281.4	40	0.339	611.0	0.3	0.00	0.07	94.6	190.9	47.3	175.1	94.6	1.66
308.8	64	0.450	811.1	0.4	0.00	0.11	141.4	186.9	70.7	163.3	141.4	2.22
325.0	102	0.499	899.4	0.7	0.00	0.18	161.7	180.8	80.8	153.9	161.7	2.62
333.2	137	0.532	958.9	0.9	0.00	0.24	175.2	179.4	87.6	150.2	175.2	2.91
335.0	150	0.543	978.7	1.0	0.00	0.26	179.6	179.8	89.8	149.9	179.6	3.00
338.7	183	0.568	1023.8	1.2	0.00	0.32	189.7	181.1	94.8	149.5	189.7	3.20
341.2	214	0.590	1063.4	1.5	0.00	0.37	198.4	183.0	99.2	149.9	198.4	3.37
344.7	246	0.615	1108.5	1.7	0.00	0.42	208.4	184.5	104.2	149.8	208.4	3.60
345.7	276	0.638	1150.0	1.9	0.00	0.47	217.5	188.1	108.8	151.8	217.5	3.74
346.6	310	0.660	1189.6	2.1	0.00	0.52	226.1	191.5	113.1	153.8	226.1	3.88
346.7	336	0.674	1214.9	2.3	0.00	0.56	231.5	194.1	115.8	155.5	231.5	3.96
346.7	368	0.693	1249.1	2.5	0.00	0.61	238.8	197.7	119.4	157.9	238.8	4.05
346.5	395	0.710	1279.7	2.7	0.00	0.65	245.4	201.2	122.7	160.3	245.4	4.13
346.0	420	0.725	1306.8	2.8	0.00	0.69	251.1	204.6	125.6	162.7	251.1	4.18
345.3	450	0.740	1333.8	3.0	0.00	0.74	256.7	208.1	128.4	165.3	256.7	4.22
344.4	482	0.753	1357.2	3.3	0.00	0.78	261.5	211.3	130.7	167.8	261.5	4.24
343.5	510	0.768	1384.3	3.5	0.00	0.83	267.1	215.0	133.5	170.5	267.1	4.28
342.6	540	0.785	1414.9	3.7	0.00	0.87	273.4	219.1	136.7	173.5	273.4	4.32
341.1	570	0.808	1456.4	3.9	0.00	0.91	282.2	225.0	141.1	178.0	282.2	4.36
339.8	600	0.826	1488.8	4.1	0.00	0.95	288.9	229.7	144.5	181.5	288.9	4.39
338.6	630	0.845	1523.1	4.3	0.00	1.00	296.0	234.4	148.0	185.1	296.0	4.43
337.5	661	0.864	1557.3	4.5	0.00	1.04	303.0	239.0	151.5	188.5	303.0	4.46
336.0	697	0.886	1597.0	4.7	0.00	1.09	311.1	244.6	155.6	192.7	311.1	4.50
333.8	727	0.899	1620.4	4.9	0.00	1.13	315.7	249.0	157.8	196.4	315.7	4.46
331.2	756	0.916	1651.0	5.1	0.00	1.17	321.9	254.7	160.9	201.1	321.9	4.43
329.1	784	0.932	1679.9	5.3	0.00	1.20	327.6	259.7	163.8	205.1	327.6	4.42
327.7	812	0.948	1708.7	5.5	0.00	1.24	333.4	264.0	166.7	208.4	333.4	4.43
326.2	846	0.962	1734.0	5.7	0.00	1.28	338.1	267.9	169.1	211.5	338.1	4.42
324.9	877	0.972	1752.0	5.9	0.00	1.32	341.3	270.8	170.7	213.9	341.3	4.41
323.8	900	0.985	1775.4	6.1	0.00	1.35	345.9	274.2	173.0	216.5	345.9	4.42
322.2	932	0.997	1797.0	6.3	0.00	1.39	349.9	277.7	174.9	219.4	349.9	4.40
320.3	964	1.011	1822.3	6.5	0.00	1.43	354.6	282.0	177.3	222.9	354.6	4.39
318.6	996	1.029	1854.7	6.8	0.00	1.47	360.9	286.8	180.4	226.7	360.9	4.39
316.9	1024	1.048	1889.0	6.9	0.00	1.51	367.6	291.9	183.8	230.6	367.6	4.40

Final volume (cm^3): 624.93 Final length (mm): 124.1 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 30
Borehole No. : D222
Depth(m) From : 18.20
To : -

Laboratory Information

Lab. sample I.D. : SL90169/2
Specimen ref. : B

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
315.2	1056	1.067	1923.2	7.2	0.00	1.54	374.2	296.9	187.1	234.5	374.2	4.41	
313.5	1084	1.086	1957.5	7.3	0.00	1.58	380.9	302.0	190.5	238.5	380.9	4.42	
311.8	1112	1.105	1991.7	7.5	0.00	1.61	387.6	307.0	193.8	242.4	387.6	4.42	
310.1	1146	1.124	2026.0	7.8	0.00	1.65	394.0	311.9	197.0	246.2	394.0	4.43	
308.3	1178	1.143	2060.2	8.0	0.00	1.68	400.5	316.9	200.2	250.2	400.5	4.43	
306.5	1203	1.162	2094.4	8.2	0.00	1.71	407.2	322.1	203.6	254.2	407.2	4.44	
304.7	1234	1.181	2128.7	8.4	0.00	1.75	413.6	327.1	206.8	258.2	413.6	4.44	
302.9	1266	1.197	2157.5	8.6	0.00	1.78	418.8	331.5	209.4	261.7	418.8	4.43	
300.2	1298	1.213	2186.4	8.8	0.00	1.82	424.0	336.8	212.0	266.1	424.0	4.40	
297.5	1324	1.228	2213.4	9.0	0.00	1.85	428.9	342.0	214.5	270.5	428.9	4.36	
294.8	1356	1.246	2245.9	9.2	0.00	1.88	434.8	347.6	217.4	275.1	434.8	4.34	
292.1	1388	1.258	2267.5	9.4	0.00	1.91	438.4	352.1	219.2	279.0	438.4	4.30	
289.2	1410	1.268	2285.5	9.6	0.00	1.94	441.5	356.5	220.7	283.0	441.5	4.25	
286.5	1446	1.276	2299.9	9.8	0.00	1.98	443.3	360.2	221.7	286.3	443.3	4.20	
283.8	1478	1.284	2314.3	10.0	0.00	2.01	445.3	363.8	222.6	289.6	445.3	4.15	
281.1	1507	1.292	2328.8	10.2	0.00	2.04	447.3	367.6	223.7	293.0	447.3	4.11	
278.4	1533	1.297	2337.8	10.4	0.00	2.07	448.3	370.8	224.2	296.0	448.3	4.06	
275.7	1564	1.303	2348.6	10.6	0.00	2.10	449.5	374.1	224.8	299.1	449.5	4.01	«
273.3	1600	1.305	2352.2	10.8	0.00	2.13	449.0	376.2	224.5	301.4	449.0	3.96	
270.3	1626	1.307	2355.8	11.0	0.00	2.16	448.9	379.1	224.4	304.3	448.9	3.90	
267.6	1658	1.308	2357.6	11.2	0.00	2.19	448.1	381.5	224.1	306.8	448.1	3.85	
264.9	1684	1.308	2357.6	11.4	0.00	2.21	447.2	383.7	223.6	309.2	447.2	3.79	
262.2	1716	1.308	2357.6	11.6	0.00	2.25	446.1	385.8	223.0	311.5	446.1	3.74	
259.5	1744	1.294	2332.4	11.8	0.00	2.27	439.8	385.4	219.9	312.1	439.8	3.66	
256.8	1773	1.295	2334.2	12.0	0.00	2.30	439.2	387.8	219.6	314.6	439.2	3.61	
254.1	1800	1.297	2337.8	12.2	0.00	2.33	439.0	390.4	219.5	317.2	439.0	3.57	
251.4	1858	1.299	2341.4	12.6	0.00	2.38	437.7	392.4	218.8	319.5	437.7	3.52	
248.7	1907	1.300	2343.2	12.9	0.00	2.43	436.3	394.5	218.2	321.7	436.3	3.48	
246.0	1956	1.300	2343.2	13.3	0.00	2.47	434.6	396.3	217.3	323.9	434.6	3.43	
243.3	2004	1.300	2343.2	13.6	0.00	2.51	432.9	398.2	216.5	326.0	432.9	3.38	
240.6	2056	1.301	2345.0	13.9	0.00	2.56	431.5	400.1	215.7	328.2	431.5	3.34	
237.9	2100	1.287	2319.8	14.2	0.00	2.60	424.8	399.5	212.4	328.7	424.8	3.27	
235.2	2157	1.290	2325.2	14.6	0.00	2.65	423.9	401.8	212.0	331.1	423.9	3.23	
232.5	2208	1.290	2325.2	15.0	0.00	2.70	422.2	403.6	211.1	333.2	422.2	3.19	
229.8	2256	1.290	2325.2	15.3	0.00	2.74	420.5	405.5	210.3	335.4	420.5	3.15	
227.1	2302	1.290	2325.2	15.6	0.00	2.78	418.9	407.4	209.5	337.5	418.9	3.12	
224.4	2350	1.292	2328.8	15.9	0.00	2.82	418.0	409.6	209.0	339.9	418.0	3.08	

Final volume (cm³): 624.93 Final length (mm): 124.1 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	30
Project	:	Contract 912	Borehole No.	:	D222
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.20
			To	:	-

Laboratory Information

Date shearing commenced	:	10/09/2009	Time : 09:00	Lab. sample I.D.	:	SL90169/2	
Date shearing completed	:	10/09/2009	Time : 15:41	Specimen ref.	:	C	
Proving ring serial No.	:	15862		Cell pressure	:	605	kPa
Type of membrane	:	rubber		Back pressure	:	245	kPa
Corrections				Effective pressure	:	360	kPa
Side drain, σ_{dr}	:	0.000	kPa/%	Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.68	mm	Volume V_c	:	625.44	cm^3
Rate of axial displacement	:	0.050	mm/min	Area A_c	:	4230.0	mm^2
Pore pressure coefficient, A_f	:	0.21		Length L_c	:	147.9	mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.045	247.3	0.0	0.00	0.00	0.0	360.0	0.0	360.0	0.0	1.00
295.4	43	0.186	1022.0	0.3	0.00	0.08	182.5	400.9	91.3	370.4	182.5	1.59
322.9	71	0.224	1230.8	0.5	0.00	0.13	231.3	397.7	115.6	359.2	231.3	1.82
357.2	105	0.265	1456.0	0.7	0.00	0.19	283.5	389.6	141.8	342.3	283.5	2.14
370.7	122	0.282	1549.5	0.8	0.00	0.22	305.1	386.8	152.5	336.0	305.1	2.30
386.4	156	0.302	1659.3	1.1	0.00	0.28	330.0	383.6	165.0	328.6	330.0	2.51
401.2	182	0.320	1758.2	1.2	0.00	0.32	352.5	380.0	176.2	321.3	352.5	2.73
409.2	210	0.339	1862.6	1.4	0.00	0.37	376.1	383.8	188.0	321.2	376.1	2.92
417.8	246	0.349	1917.6	1.7	0.00	0.43	387.9	381.1	193.9	316.5	387.9	3.07
423.2	272	0.357	1961.5	1.8	0.00	0.47	397.3	380.5	198.7	314.2	397.3	3.19
432.9	305	0.380	2086.3	2.1	0.00	0.53	425.3	384.7	212.6	313.9	425.3	3.47
435.7	332	0.390	2140.2	2.2	0.00	0.57	436.9	387.7	218.4	314.9	436.9	3.58
438.1	360	0.401	2199.5	2.4	0.00	0.62	449.7	391.7	224.8	316.8	449.7	3.69
439.9	399	0.414	2269.5	2.7	0.00	0.68	464.5	397.4	232.3	319.9	464.5	3.81
440.3	430	0.423	2318.1	2.9	0.00	0.73	474.6	402.0	237.3	322.9	474.6	3.88
440.7	465	0.432	2366.6	3.1	0.00	0.78	484.5	406.5	242.2	325.8	484.5	3.95
440.3	483	0.440	2409.7	3.3	0.00	0.81	493.7	411.6	246.9	329.3	493.7	4.00
440.0	524	0.449	2458.2	3.5	0.00	0.87	503.3	416.6	251.6	332.8	503.3	4.05
438.9	542	0.457	2501.3	3.7	0.00	0.90	512.5	422.3	256.2	336.9	512.5	4.09
437.8	578	0.463	2533.7	3.9	0.00	0.95	518.4	426.4	259.2	340.0	518.4	4.10
436.9	600	0.470	2571.4	4.1	0.00	0.98	526.2	431.2	263.1	343.5	526.2	4.13
436.0	630	0.479	2619.9	4.3	0.00	1.03	536.0	437.0	268.0	347.7	536.0	4.17
434.1	662	0.490	2679.2	4.5	0.00	1.07	548.1	445.0	274.1	353.6	548.1	4.21
432.1	693	0.501	2738.5	4.7	0.00	1.11	560.2	453.0	280.1	359.6	560.2	4.24
430.0	723	0.512	2797.8	4.9	0.00	1.16	572.3	461.2	286.2	365.8	572.3	4.27
427.6	757	0.520	2841.0	5.1	0.00	1.20	580.6	467.7	290.3	370.9	580.6	4.27
426.0	784	0.526	2873.3	5.3	0.00	1.24	586.7	472.3	293.3	374.6	586.7	4.28
424.3	810	0.532	2905.7	5.5	0.00	1.28	592.8	477.1	296.4	378.3	592.8	4.28
421.2	846	0.542	2959.6	5.7	0.00	1.32	603.2	485.4	301.6	384.9	603.2	4.28
418.4	872	0.553	3018.9	5.9	0.00	1.36	615.2	494.2	307.6	391.7	615.2	4.30
415.6	904	0.563	3072.8	6.1	0.00	1.40	625.7	502.3	312.9	398.0	625.7	4.30
412.8	936	0.570	3110.5	6.3	0.00	1.44	632.6	508.5	316.3	403.1	632.6	4.29
410.1	966	0.578	3153.6	6.5	0.00	1.48	640.7	515.3	320.4	408.5	640.7	4.29
407.2	998	0.586	3196.8	6.7	0.00	1.52	648.7	522.2	324.4	414.0	648.7	4.28
404.4	1020	0.594	3239.9	6.9	0.00	1.55	657.1	529.2	328.6	419.6	657.1	4.28

Final volume (cm^3): 625.44 Final length (mm): 128.4 Termination criterion : Maximum deviator stress

Remarks:

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HKAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	30
Project	:	Contract 912	Borehole No.	:	D222
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.20
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/2
Specimen ref.	:	C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
401.6	1056	0.602	3283.0	7.1	0.00	1.59	664.8	535.8	332.4	425.0	664.8	4.27	
398.8	1088	0.610	3326.1	7.4	0.00	1.63	672.7	542.5	336.3	430.4	672.7	4.26	
396.1	1112	0.617	3363.9	7.5	0.00	1.66	679.7	548.8	339.9	435.5	679.7	4.25	
393.2	1146	0.621	3385.4	7.8	0.00	1.70	682.7	553.1	341.3	439.4	682.7	4.22	
390.4	1178	0.626	3412.4	8.0	0.00	1.74	686.9	558.1	343.5	443.6	686.9	4.20	
387.6	1204	0.630	3434.0	8.1	0.00	1.77	690.2	562.5	345.1	447.5	690.2	4.18	«
385.3	1232	0.631	3439.4	8.3	0.00	1.80	690.0	564.7	345.0	449.7	690.0	4.14	
383.0	1264	0.632	3444.7	8.5	0.00	1.83	689.5	566.7	344.7	451.8	689.5	4.11	
380.8	1296	0.633	3450.1	8.8	0.00	1.87	688.9	568.7	344.5	453.8	688.9	4.07	
378.4	1323	0.633	3450.1	8.9	0.00	1.90	687.5	570.4	343.8	455.8	687.5	4.03	
376.1	1358	0.633	3450.1	9.2	0.00	1.94	685.7	571.7	342.8	457.5	685.7	4.00	
373.8	1416	0.626	3412.4	9.6	0.00	2.00	674.6	568.5	337.3	456.1	674.6	3.92	
371.5	1458	0.628	3423.2	9.9	0.00	2.05	674.7	570.9	337.4	458.4	674.7	3.89	
369.2	1504	0.629	3428.6	10.2	0.00	2.10	673.5	572.5	336.7	460.3	673.5	3.86	
366.9	1556	0.630	3434.0	10.5	0.00	2.15	671.9	574.1	336.0	462.1	671.9	3.82	
364.6	1608	0.630	3434.0	10.9	0.00	2.20	669.2	575.0	334.6	463.5	669.2	3.78	
362.3	1657	0.631	3439.4	11.2	0.00	2.25	667.8	576.6	333.9	465.3	667.8	3.75	
360.0	1704	0.624	3401.6	11.5	0.00	2.30	657.5	573.7	328.7	464.2	657.5	3.68	
357.7	1755	0.626	3412.4	11.9	0.00	2.35	657.1	575.8	328.5	466.3	657.1	3.66	
355.4	1806	0.629	3428.6	12.2	0.00	2.40	657.8	578.5	328.9	468.9	657.8	3.64	
353.1	1856	0.630	3434.0	12.6	0.00	2.45	656.3	580.1	328.2	470.7	656.3	3.61	
350.8	1902	0.630	3434.0	12.9	0.00	2.49	654.0	581.2	327.0	472.2	654.0	3.57	
348.5	1950	0.630	3434.0	13.2	0.00	2.54	651.5	582.2	325.7	473.7	651.5	3.54	

Final volume (cm³): 625.44 Final length (mm): 128.4 Termination criterion : Maximum deviator stress

Remarks:

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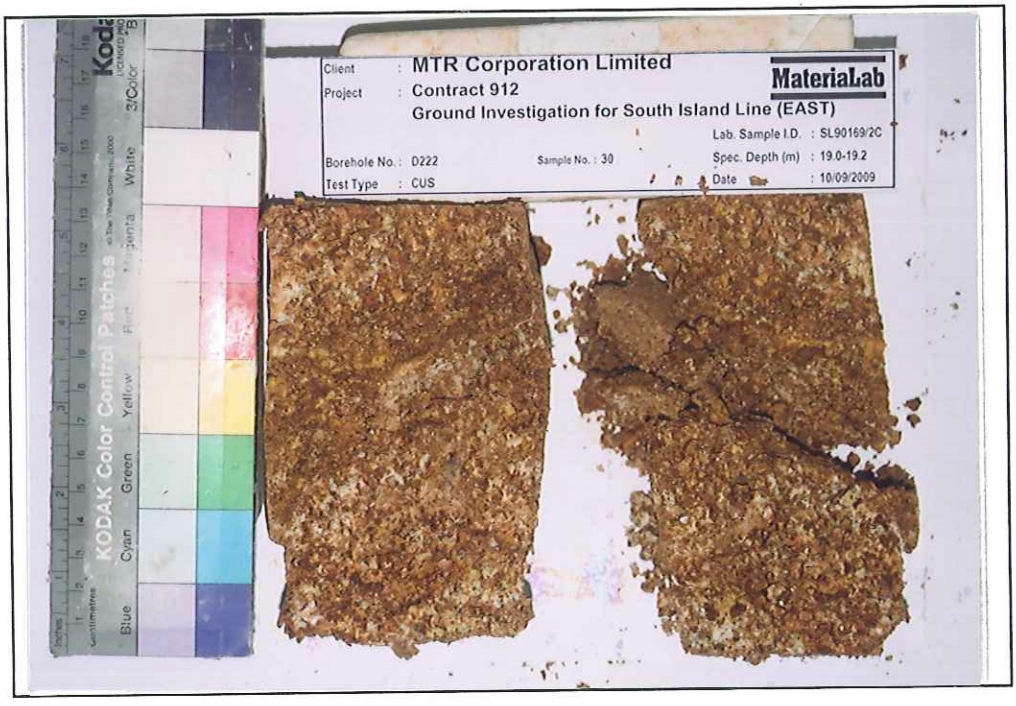
Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

Photographic Records for Triaxial Test



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 5.50
To : -
Sample origin : FILL
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 29-01-2010
Date test(s) completed : 06-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 19.5 °C
Visual description : Moist, brown spotted with red and white, silty/clayey, gravelly SAND.

Lab. sample I.D. : SL100076/1
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 6.30
To : 6.50
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	25			50			100	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.6	74.4	75.4	75.2	76.1		75.7	80.4
Length	mm	150.2	149.8	145.9	145.4	141.8		141.2	125.2
Volume	cm³	656.50	651.60	651.60	645.10	645.10		636.20	636.20
Wet mass	g	1252.7	1259.3	1259.3	1252.8	1252.8		1243.9	1243.9
Dry mass	g	981.7	981.7	981.7	981.7	981.7		981.7	981.7
Moisture content	%	27.6	28.3	28.3	27.6	27.6		26.7	26.7
Bulk density	Mg/m³	1.91	1.93	1.93	1.94	1.94		1.96	1.96
Dry density	Mg/m³	1.50	1.51	1.51	1.52	1.52		1.54	1.54
Void ratio		0.77	0.76	0.76	0.74	0.74		0.72	0.72
Degree of saturation	%	94.7	98.7	98.7	98.7	98.7		98.7	98.7
Saturation Stage									
**Volume change of water	cm³	11.5							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	265.0			284.1			323.3	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	4.9			6.5			8.9	
m_{vl}	m²/MN	0.37			0.26			0.18	
t_{50}	min	4.60			5.60			4.40	
c_{vl} (from t_{50})	m²/yr	978.43			757.97			910.24	
t_{100}	min	13.69			13.69			10.56	
c_{vl} (from t_{100})	m²/yr	660.19			673.89			888.70	
Sketch of failed specimen (Failure Mode)								Plastic	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

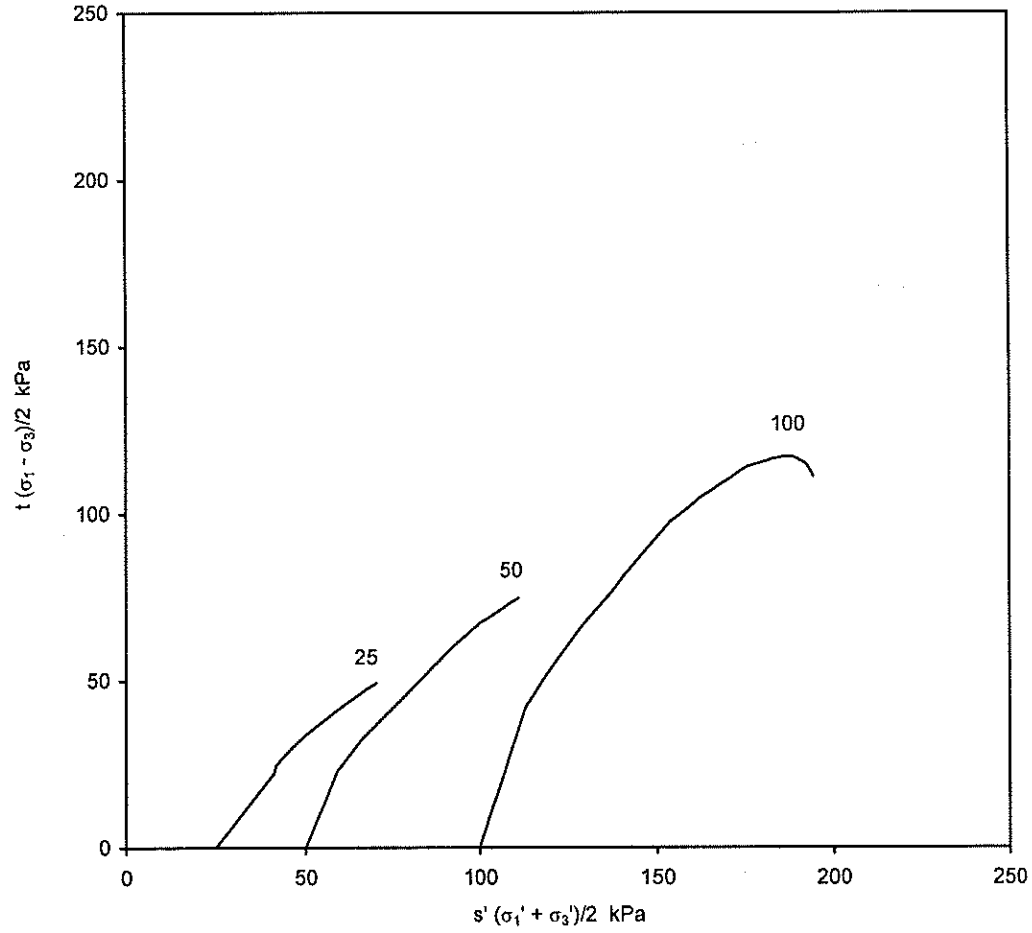
Client sample No. : -
Borehole No. : D224
Depth(m) From : 5.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/1
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	25	2.4	2.4	250.1	94.7	67.3	47.4
2	50	2.3	5.2	259.5	146.9	109.0	73.5
3	100	6.2	11.9	274.8	234.0	187.2	117.0



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

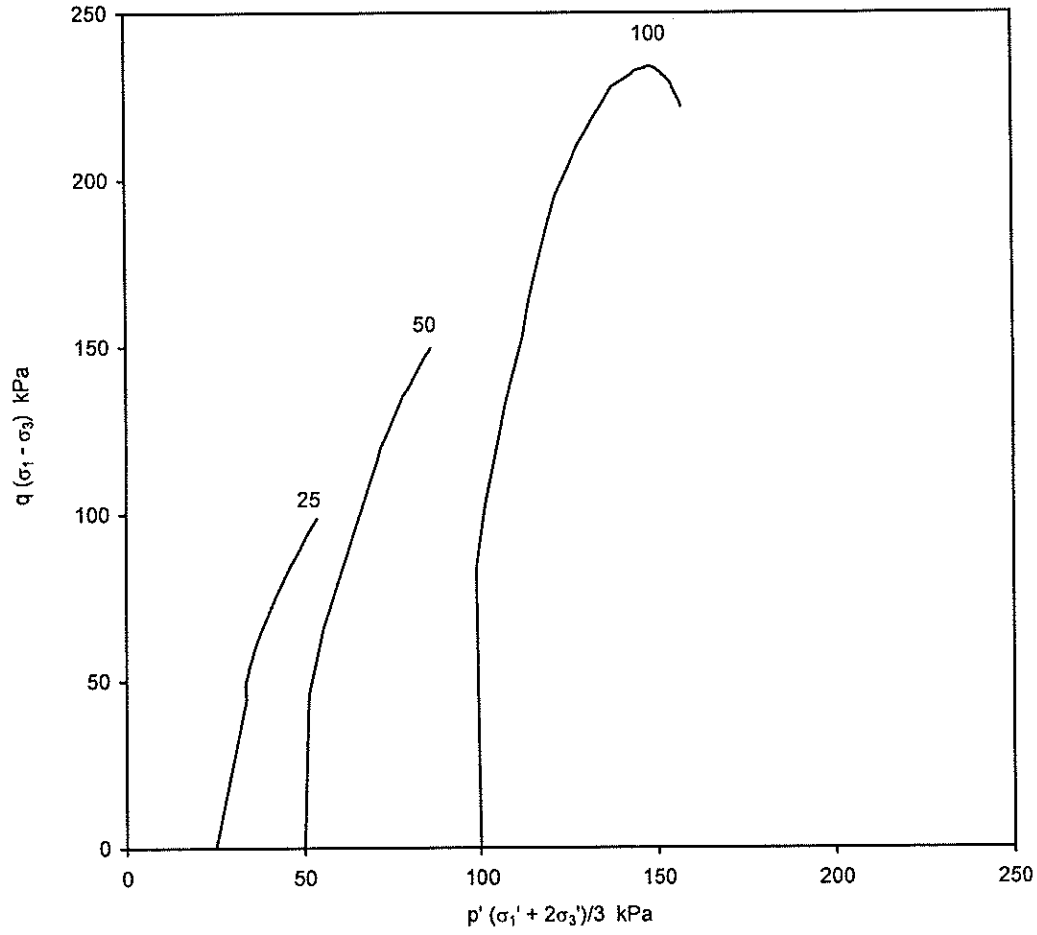
Client sample No. : -
Borehole No. : D224
Depth(m) From : 5.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/1
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	25	2.4	2.4	250.1	94.7	51.5	94.7
2	50	2.3	5.2	259.5	146.9	84.5	146.9
3	100	6.2	11.9	274.8	234.0	148.2	234.0



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

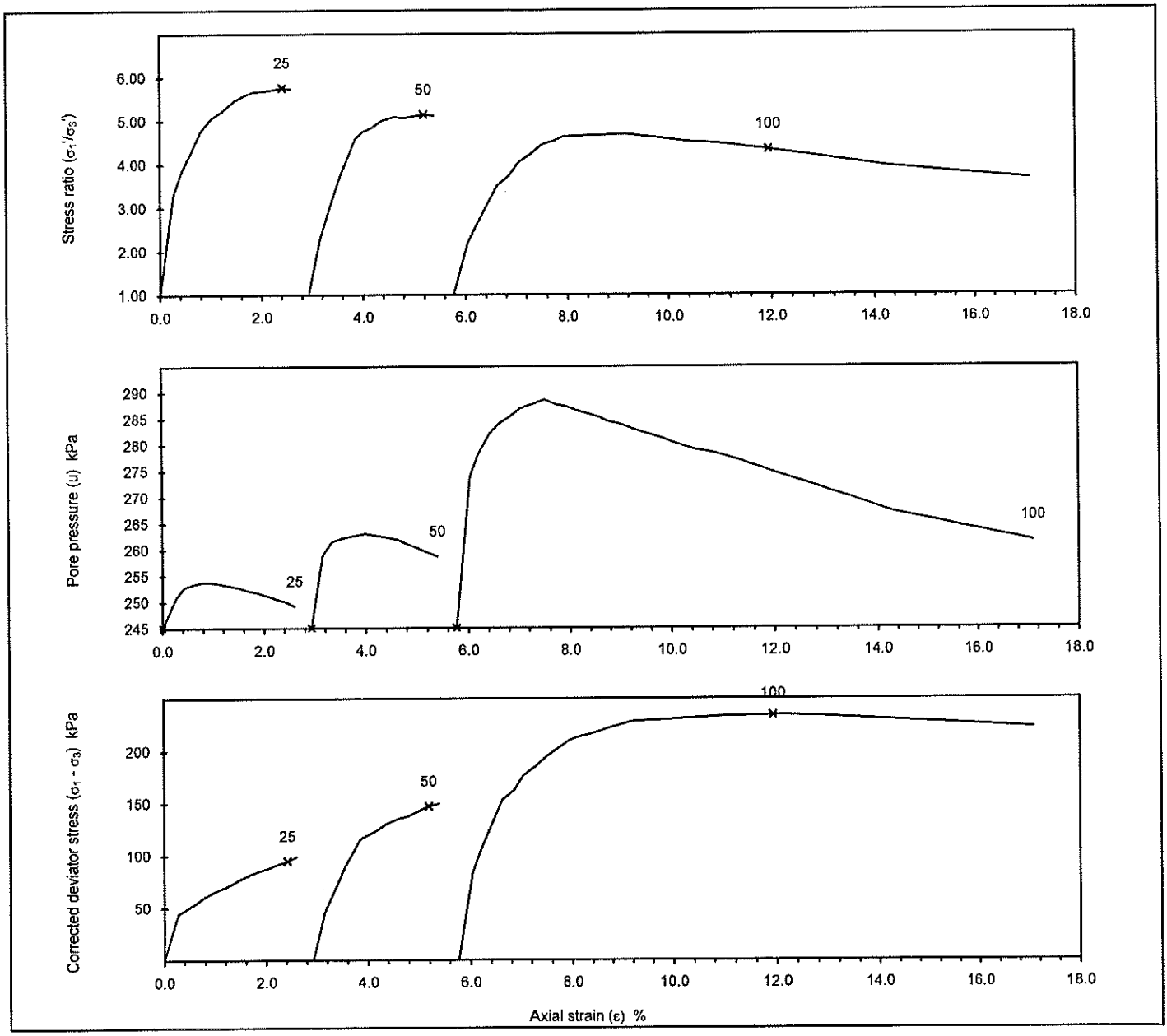
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 5.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/1
Specimen ref. : A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 5.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/1
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	25	
	Stage 2	kPa	50	
	Stage 3	kPa	100	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			125	120
			150	145
			175	170
			200	195
			225	220
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		0.98
Volume change	cm^3	11.5

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1241.8
Final moisture content	%	26.5
Final bulk density	Mg/m^3	1.95

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

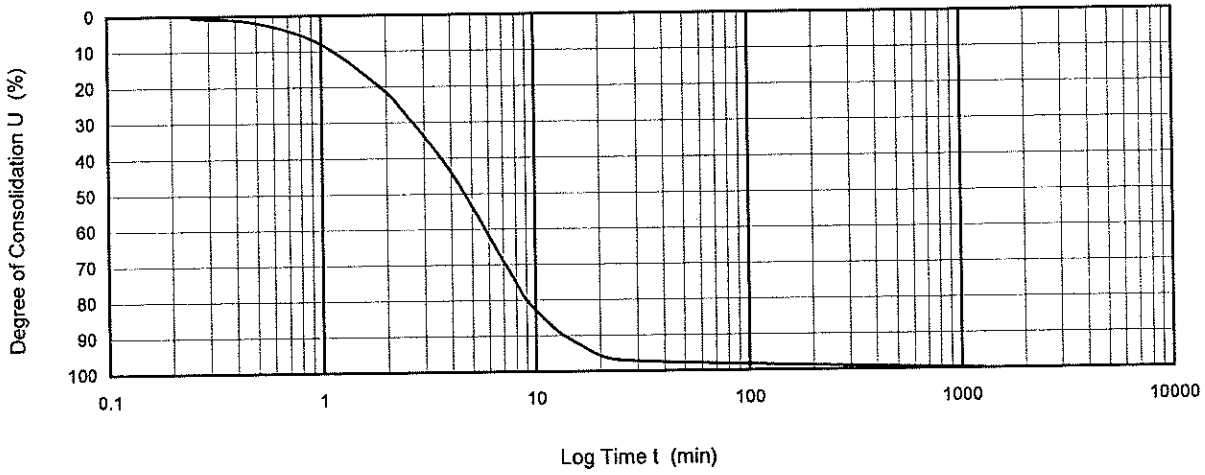
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	5.50
			To	:	-

Laboratory Information

Cell pressure	:	270 kPa	Lab. sample I.D.	:	SL100076/1
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	25 kPa			

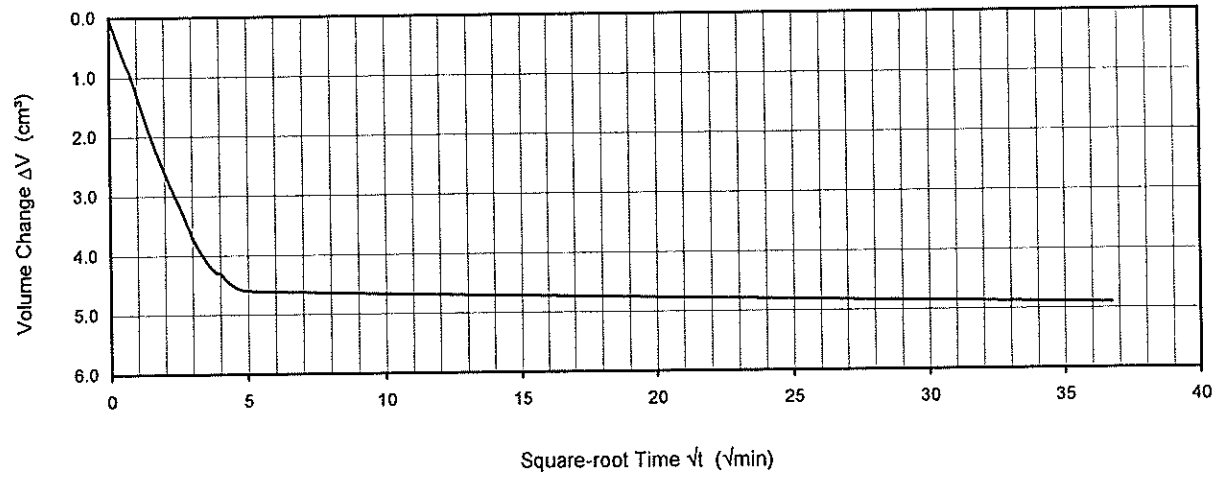
Degree of Consolidation vs. Log Time

t_{50} = 4.60 min ΔV = 4.9 cm^3



Volume Change vs. Square-root Time

t_{100} = 13.69 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

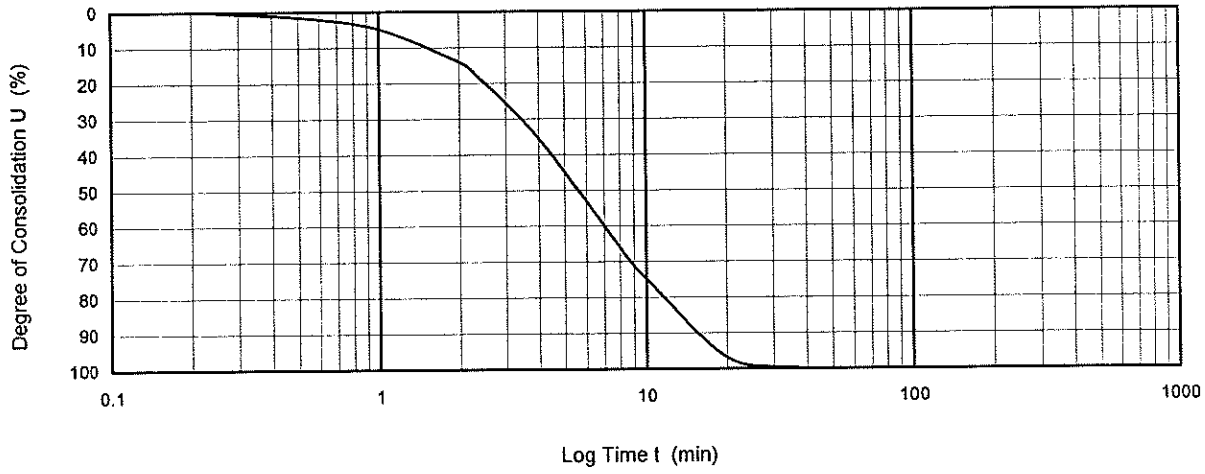
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	5.50
			To	:	-

Laboratory Information

Cell pressure	:	295 kPa	Lab. sample I.D.	:	SL100076/1
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	50 kPa			

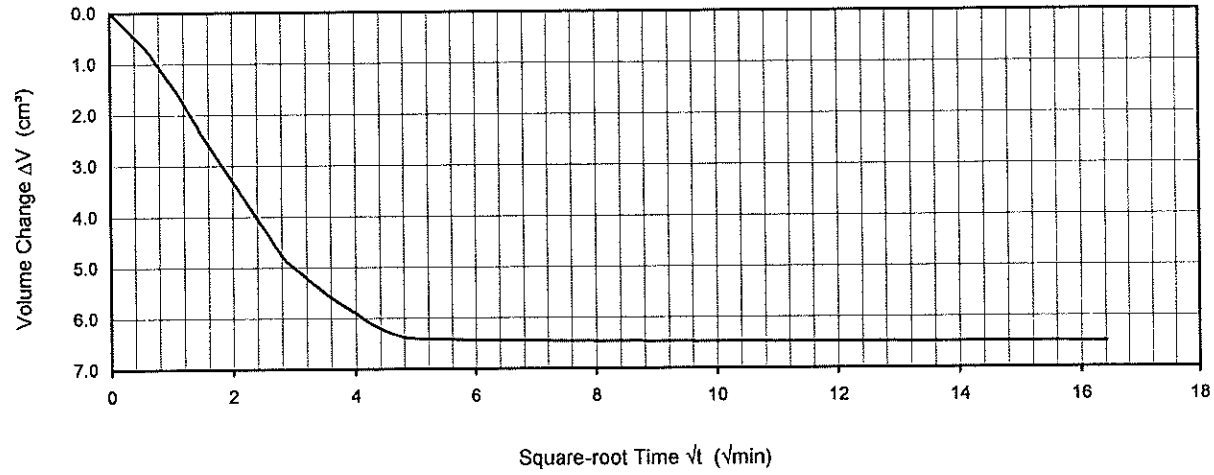
Degree of Consolidation vs. Log Time

t_{50} = 5.60 min ΔV = 6.5 cm^3



Volume Change vs. Square-root Time

t_{100} = 13.69 min



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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

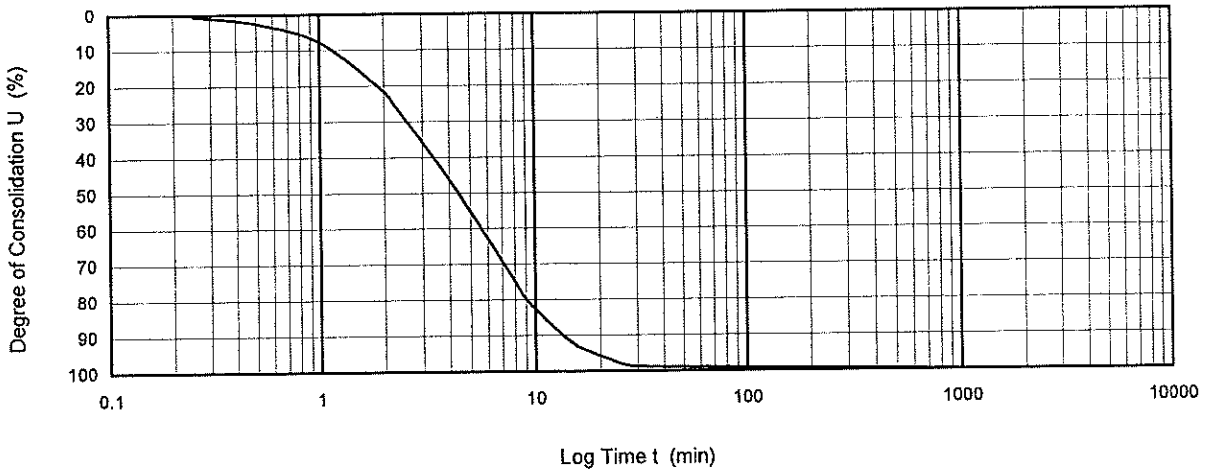
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	5.50
			To	:	-

Laboratory Information

Cell pressure	:	345 kPa	Lab. sample I.D.	:	SL100076/1
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	100 kPa			

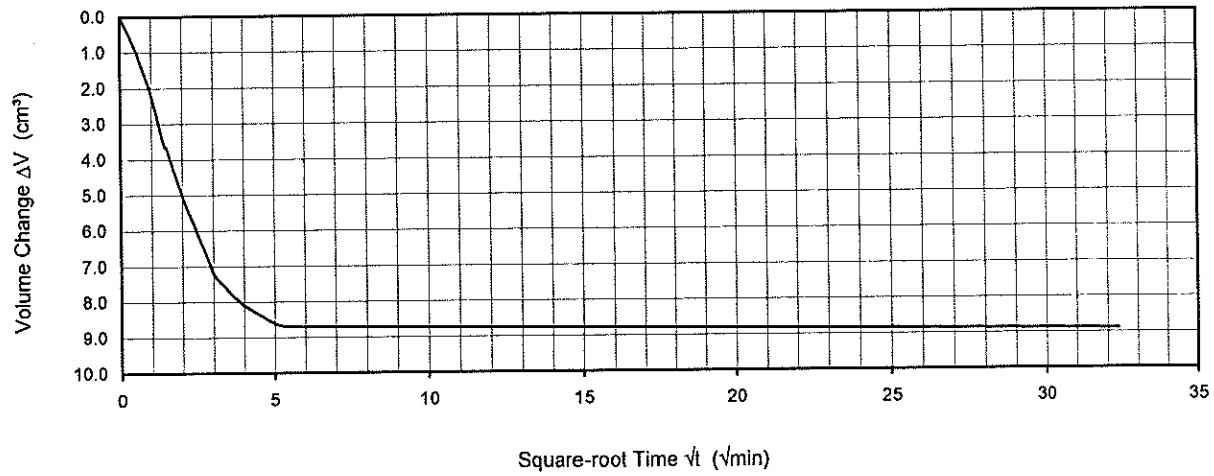
Degree of Consolidation vs. Log Time

t_{50} = 4.40 min ΔV = 8.9 cm^3



Volume Change vs. Square-root Time

t_{100} = 10.56 min



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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 5.50
To : -

Laboratory Information

Date shearing commenced : 04/03/2010 Time : 09:00
Date shearing completed : 04/03/2010 Time : 10:31
Proving ring serial No. : 15167
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.05

Lab. sample I.D. : SL100076/1
Specimen ref. : A
Cell pressure : 270 kPa
Back pressure : 245 kPa
Effective pressure : 25 kPa

Dimensions at starting of compression
Volume V_c : 651.60 cm^3
Area A_c : 4349.1 mm^2
Length L_c : 149.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.179	120.9	0.0	0.0	0.00	0.00	0.0	25.0	0.0	25.0	0.0	1.00	
251.0	42	0.466	314.9	0.3	0.3	0.00	0.08	44.4	41.2	22.2	33.8	44.4	3.34	
252.8	65	0.496	335.1	0.4	0.4	0.00	0.12	48.9	41.7	24.5	33.5	48.9	3.84	
253.4	92	0.532	359.5	0.6	0.6	0.00	0.16	54.3	43.8	27.2	34.7	54.3	4.27	
253.8	120	0.576	389.2	0.8	0.8	0.00	0.21	61.0	46.7	30.5	36.5	61.0	4.76	
253.7	152	0.611	412.8	1.0	1.0	0.00	0.27	66.2	49.4	33.1	38.4	66.2	5.06	
253.3	184	0.641	433.1	1.2	1.2	0.00	0.32	70.6	52.0	35.3	40.2	70.6	5.23	
252.8	221	0.684	462.2	1.5	1.5	0.00	0.38	76.9	55.7	38.5	42.8	76.9	5.47	
252.2	252	0.718	485.1	1.7	1.7	0.00	0.44	81.9	58.7	40.9	45.1	81.9	5.60	
251.8	280	0.741	500.7	1.9	1.9	0.00	0.48	85.2	60.8	42.6	46.6	85.2	5.68	
251.3	304	0.758	512.2	2.0	2.0	0.00	0.52	87.6	62.5	43.8	47.9	87.6	5.68	
250.6	335	0.786	531.1	2.2	2.2	0.00	0.57	91.6	65.2	45.8	49.9	91.6	5.72	
250.1	363	0.808	545.9	2.4	2.4	0.00	0.61	94.7	67.3	47.4	51.5	94.7	5.76	«
249.2	390	0.835	564.2	2.6	2.6	0.00	0.66	98.6	70.1	49.3	53.7	98.6	5.74	

Final volume (cm^3): 651.60 Final length (mm): 145.9 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MaterialLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 5.50
To : -

Laboratory Information

Date shearing commenced : 04/02/2010 Time : 13:30
Date shearing completed : 04/02/2010 Time : 15:02
Proving ring serial No. : 15167
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.10

Lab. sample I.D. : SL100076/1
Specimen ref. : A
Cell pressure : 295 kPa
Back pressure : 245 kPa
Effective pressure : 50 kPa

Dimensions at starting of compression
Volume V_c : 645.10 cm^3
Area A_c : 4435.6 mm^2
Length L_c : 145.4 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.193	130.4	0.0	2.9	0.00	0.73	0.0	50.0	0.0	50.0	0.0	1.00	
259.0	33	0.501	338.5	0.2	3.2	0.00	0.78	46.0	59.0	23.0	51.3	46.0	2.28	
261.5	60	0.632	427.0	0.4	3.3	0.00	0.83	65.8	66.4	32.9	55.4	65.8	2.96	
262.2	90	0.784	529.7	0.6	3.5	0.00	0.87	88.6	77.1	44.3	62.3	88.6	3.70	
262.8	135	0.966	652.7	0.9	3.9	0.00	0.94	115.7	90.1	57.9	70.8	115.7	4.59	
263.1	156	0.992	670.3	1.1	4.0	0.00	0.97	119.4	91.6	59.7	71.7	119.4	4.74	
262.7	184	1.026	693.2	1.3	4.2	0.00	1.01	124.3	94.4	62.1	73.7	124.3	4.85	
262.4	210	1.068	721.6	1.4	4.4	0.00	1.05	130.3	97.8	65.2	76.0	130.3	5.00	
261.9	247	1.105	746.6	1.7	4.6	0.00	1.10	135.5	100.8	67.7	78.3	135.5	5.09	
261.1	272	1.121	757.4	1.9	4.8	0.00	1.14	137.6	102.7	68.8	79.8	137.6	5.06	
260.3	302	1.157	781.8	2.1	5.0	0.00	1.18	142.6	106.0	71.3	82.2	142.6	5.11	
259.5	330	1.188	802.7	2.3	5.2	0.00	1.22	146.9	109.0	73.5	84.5	146.9	5.14	«
258.7	360	1.208	816.2	2.5	5.4	0.00	1.26	149.5	111.1	74.8	86.1	149.5	5.12	

Final volume (cm^3): 645.10 Final length (mm): 141.8 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 5.50
To : -

Laboratory Information

Date shearing commenced : 05/02/2010 Time : 09:00
Date shearing completed : 05/02/2010 Time : 14:53
Proving ring serial No. : 15167
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.13

Lab. sample I.D. : SL100076/1
Specimen ref. : A
Cell pressure : 345 kPa
Back pressure : 245 kPa
Effective pressure : 100 kPa

Dimensions at starting of compression

Volume V_c : 636.20 cm^3
Area A_c : 4506.2 mm^2
Length L_c : 141.2 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.230	155.4	0.0	5.8	0.00	1.33	0.0	100.0	0.0	100.0	0.0	1.00	
273.9	38	0.798	539.2	0.3	6.0	0.00	1.38	83.6	112.9	41.8	99.0	83.6	2.18	
278.0	60	0.938	633.8	0.4	6.2	0.00	1.41	104.3	119.1	52.1	101.8	104.3	2.56	
282.2	95	1.125	760.1	0.7	6.4	0.00	1.46	131.8	128.7	65.9	106.7	131.8	3.10	
284.0	122	1.268	856.8	0.9	6.6	0.00	1.50	152.8	137.4	76.4	111.9	152.8	3.50	
285.6	156	1.338	904.1	1.1	6.9	0.00	1.54	162.8	140.8	81.4	113.7	162.8	3.74	
286.9	180	1.426	963.5	1.3	7.0	0.00	1.57	175.5	145.8	87.7	116.6	175.5	4.02	
287.7	212	1.489	1006.1	1.5	7.3	0.00	1.61	184.3	149.5	92.2	118.7	184.3	4.22	
288.6	246	1.564	1056.8	1.7	7.5	0.00	1.66	194.9	153.8	97.4	121.4	194.9	4.46	
287.7	278	1.620	1094.6	2.0	7.7	0.00	1.70	202.6	158.6	101.3	124.8	202.6	4.54	
287.3	307	1.672	1129.7	2.2	7.9	0.00	1.73	209.8	162.6	104.9	127.6	209.8	4.64	
286.6	332	1.696	1145.9	2.4	8.1	0.00	1.76	212.9	164.8	106.4	129.4	212.9	4.65	
285.9	368	1.722	1163.5	2.6	8.4	0.00	1.81	216.1	167.1	108.0	131.1	216.1	4.66	
285.3	396	1.745	1179.1	2.8	8.6	0.00	1.84	219.0	169.2	109.5	132.7	219.0	4.67	
284.5	420	1.768	1194.6	3.0	8.7	0.00	1.87	221.9	171.4	110.9	134.5	221.9	4.67	
283.9	456	1.794	1212.2	3.2	9.0	0.00	1.91	225.0	173.6	112.5	136.1	225.0	4.68	
283.2	483	1.816	1227.0	3.4	9.2	0.00	1.94	227.7	175.7	113.9	137.7	227.7	4.68	
282.5	512	1.824	1232.4	3.6	9.4	0.00	1.97	228.4	176.7	114.2	138.6	228.4	4.65	
281.8	546	1.833	1238.5	3.9	9.6	0.00	2.01	229.1	177.7	114.5	139.6	229.1	4.62	
281.1	578	1.840	1243.2	4.1	9.9	0.00	2.05	229.5	178.6	114.7	140.4	229.5	4.59	
280.4	603	1.848	1248.6	4.3	10.0	0.00	2.08	230.2	179.7	115.1	141.3	230.2	4.56	
279.7	633	1.856	1254.1	4.5	10.3	0.00	2.11	230.8	180.7	115.4	142.2	230.8	4.53	
279.0	666	1.864	1259.5	4.7	10.5	0.00	2.15	231.3	181.7	115.7	143.1	231.3	4.50	
278.7	694	1.872	1264.9	4.9	10.7	0.00	2.18	231.9	182.3	116.0	143.6	231.9	4.50	
278.3	722	1.880	1270.3	5.1	10.9	0.00	2.21	232.5	183.0	116.3	144.2	232.5	4.49	
277.6	756	1.886	1274.3	5.4	11.1	0.00	2.24	232.8	183.8	116.4	145.0	232.8	4.45	
276.9	788	1.892	1278.4	5.6	11.3	0.00	2.28	233.0	184.6	116.5	145.8	233.0	4.42	
276.2	813	1.897	1281.8	5.8	11.5	0.00	2.30	233.3	185.4	116.6	146.6	233.3	4.39	
275.5	846	1.904	1286.5	6.0	11.8	0.00	2.34	233.6	186.3	116.8	147.4	233.6	4.36	
274.8	872	1.910	1290.5	6.2	11.9	0.00	2.36	234.0	187.2	117.0	148.2	234.0	4.33	«
274.1	904	1.913	1292.6	6.4	12.2	0.00	2.40	233.8	187.8	116.9	148.8	233.8	4.30	
273.4	934	1.916	1294.6	6.6	12.4	0.00	2.43	233.7	188.4	116.8	149.5	233.7	4.26	
272.7	966	1.918	1295.9	6.8	12.6	0.00	2.46	233.3	189.0	116.7	150.1	233.3	4.23	
272.0	997	1.919	1296.6	7.1	12.8	0.00	2.49	232.9	189.4	116.4	150.6	232.9	4.19	

Final volume (cm^3): 636.20 Final length (mm): 125.2 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 5.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/1
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
271.3	1023	1.920	1297.3	7.2	13.0	0.00	2.52	232.5	190.0	116.3	151.2	232.5	4.16
270.6	1055	1.920	1297.3	7.5	13.2	0.00	2.55	231.9	190.4	116.0	151.7	231.9	4.12
269.9	1086	1.920	1297.3	7.7	13.5	0.00	2.58	231.3	190.8	115.7	152.2	231.3	4.08
269.2	1114	1.921	1298.0	7.9	13.7	0.00	2.61	230.9	191.3	115.5	152.8	230.9	4.05
268.5	1144	1.921	1298.0	8.1	13.9	0.00	2.63	230.4	191.7	115.2	153.3	230.4	4.01
267.8	1174	1.921	1298.0	8.3	14.1	0.00	2.66	229.8	192.1	114.9	153.8	229.8	3.98
267.2	1200	1.921	1298.0	8.5	14.3	0.00	2.69	229.3	192.5	114.7	154.2	229.3	3.95
266.4	1253	1.922	1298.6	8.9	14.6	0.00	2.74	228.4	192.8	114.2	154.7	228.4	3.91
265.7	1308	1.922	1298.6	9.3	15.0	0.00	2.79	227.4	193.0	113.7	155.1	227.4	3.87
265.0	1355	1.922	1298.6	9.6	15.4	0.00	2.84	226.5	193.3	113.3	155.5	226.5	3.83
264.3	1400	1.922	1298.6	9.9	15.7	0.00	2.88	225.7	193.5	112.8	155.9	225.7	3.80
263.6	1456	1.923	1299.3	10.3	16.1	0.00	2.93	224.7	193.8	112.4	156.3	224.7	3.76
262.9	1502	1.923	1299.3	10.6	16.4	0.00	2.97	223.9	194.0	111.9	156.7	223.9	3.73
262.2	1554	1.923	1299.3	11.0	16.8	0.00	3.02	222.9	194.2	111.4	157.1	222.9	3.69
261.5	1600	1.923	1299.3	11.3	17.1	0.00	3.06	222.0	194.5	111.0	157.5	222.0	3.66

Final volume (cm^3): 636.20 Final length (mm): 125.2 Termination criterion : Maximum deviator stress
Remarks: ε_c - cumulative axial strain

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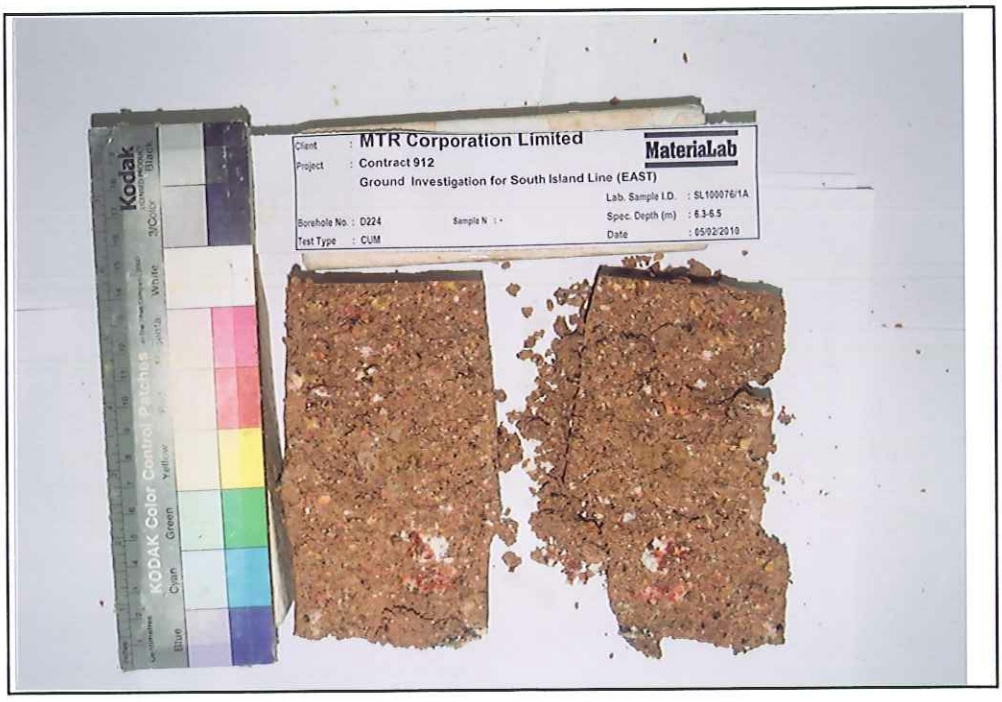
Photographic Records for Triaxial Test



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

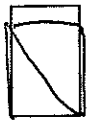
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -
Sample origin : CDM
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 01-02-2010
Date test(s) completed : 01-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 18.5 °C

Lab. sample I.D. : SL100076/2
Sample type : M

Specimen reference			A			B			C	
Specimen depth(m)	From		8.40			8.60			8.80	
	To		8.60			8.80			8.90	
Effective pressure		kPa	40			80			160	
*Measurements and Calculations			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.6	74.0	78.7	74.8	73.9	77.9	74.6	72.9	77.3
Length		mm	150.1	148.9	131.9	150.1	148.2	133.2	150.2	146.8	130.7
Volume		cm^3	656.07	641.07	641.07	659.59	635.09	635.09	656.50	613.10	613.10
Wet mass		g	1232.3	1218.7	1218.7	1216.6	1201.6	1201.6	1254.7	1221.2	1221.2
Dry mass		g	907.8	907.8	907.8	894.7	894.7	894.7	982.7	982.7	982.7
Moisture content		%	35.7	34.2	34.2	36.0	34.3	34.3	27.7	24.3	24.3
Bulk density		Mg/m^3	1.88	1.90	1.90	1.84	1.89	1.89	1.91	1.99	1.99
Dry density		Mg/m^3	1.38	1.42	1.42	1.36	1.41	1.41	1.50	1.60	1.60
Void ratio			0.92	0.87	0.87	0.95	0.88	0.88	0.77	0.65	0.65
Degree of saturation		%	103.5	104.2	104.2	100.0	103.2	103.2	95.2	98.4	98.4
Saturation Stage											
Volume change of water		cm^3	1.4			9.5			9.9		
Consolidation Stage											
Side drain used			No			No			No		
Initial pore pressure		kPa	279.8			319.0			394.8		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm^3	15.0			24.5			43.4		
m_{vi}		m^2/MN	0.66			0.50			0.44		
t_{50}		min	8.90			22.00			4.80		
c_{vi}	(from t_{50})	m^2/yr	502.41			202.26			918.93		
t_{100}		min	17.64			42.25			17.64		
c_{vi}	(from t_{100})	m^2/yr	510.38			214.34			502.13		
Sketch of failed specimen (Failure Mode)			 Brittle			Brittle			Brittle		
Visual description			Moist, brown dappled with black and white, slightly gravelly, sandy SILT/CLAY.			Moist, brown dappled with black and white, slightly gravelly, sandy SILT/CLAY.			Moist, brown spotted with white, mottled with black, slightly gravelly, sandy SILT/CLAY.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by :

~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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MateriaLab

HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

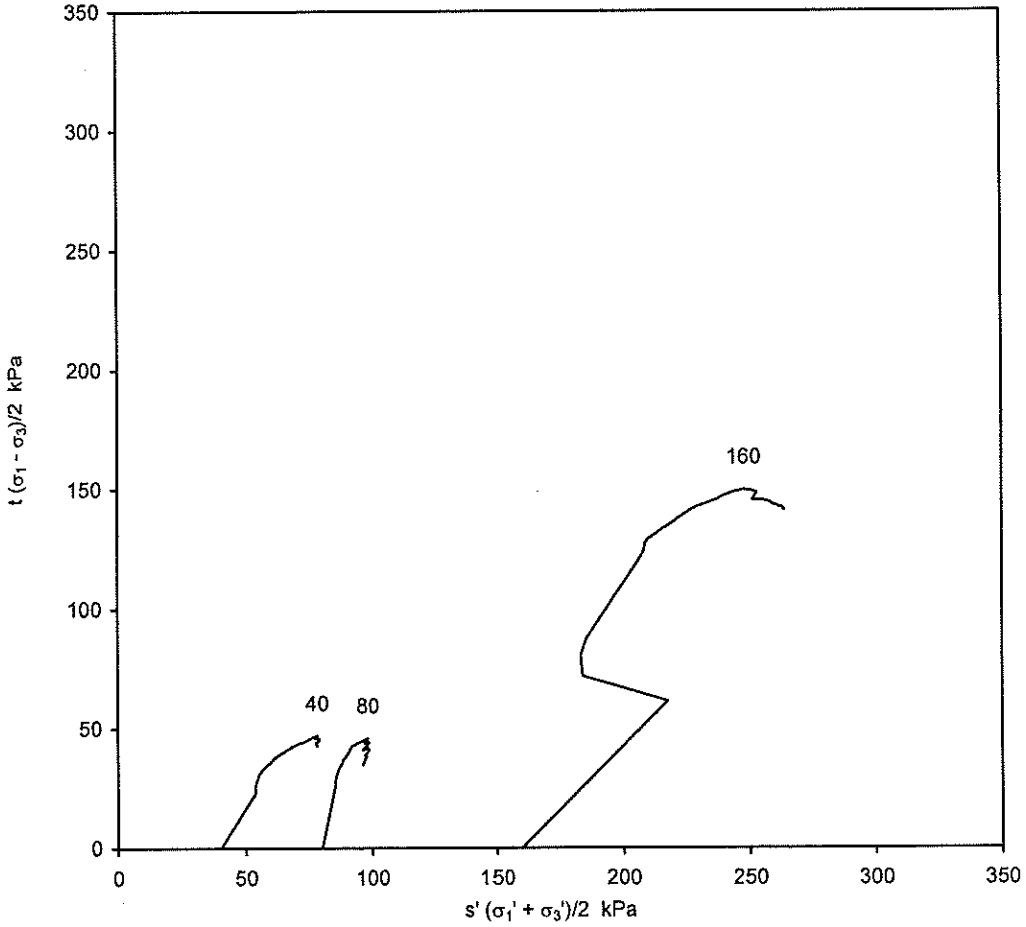
Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/2
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
A	40	6.3	253.7	93.9	78.2	46.9
B	80	4.4	272.5	91.6	98.3	45.8
C	160	5.9	306.8	299.1	247.7	149.5



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

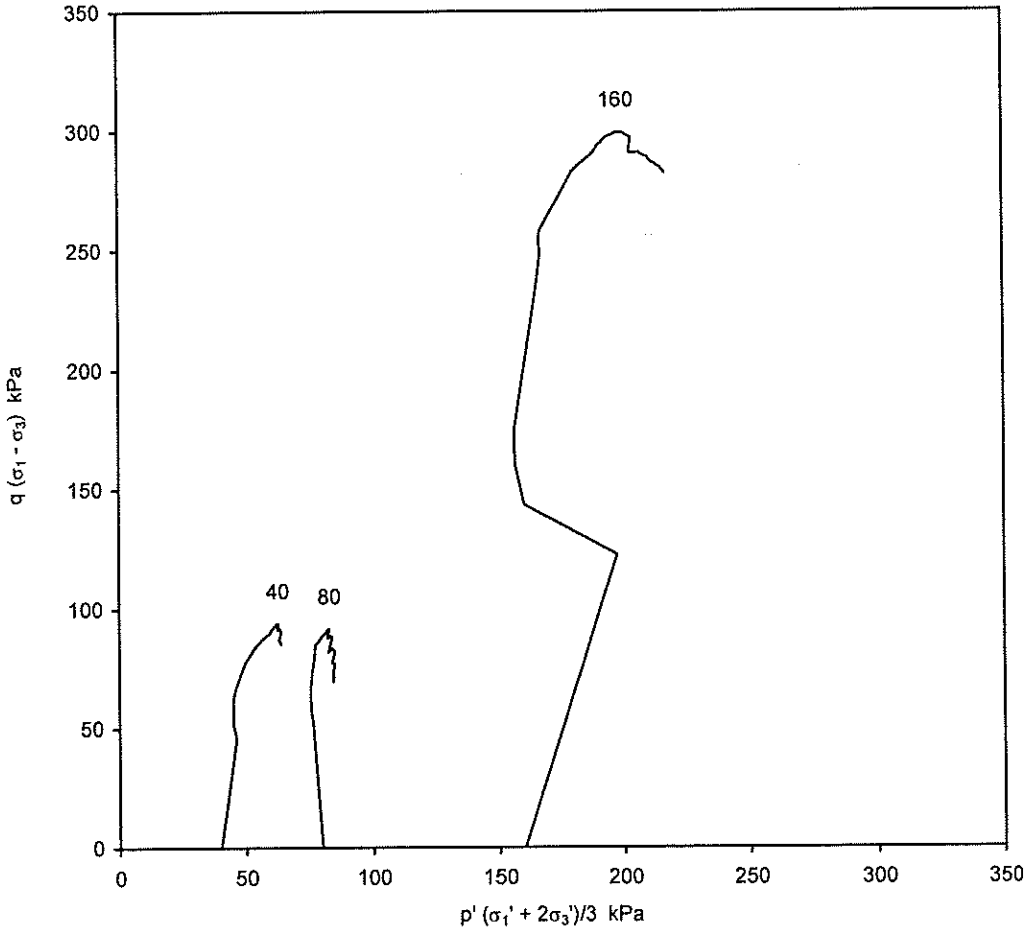
Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/2
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	40	6.3	253.7	93.9	62.6	93.9
B	80	4.4	272.5	91.6	83.0	91.6
C	160	5.9	306.8	299.1	197.9	299.1



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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

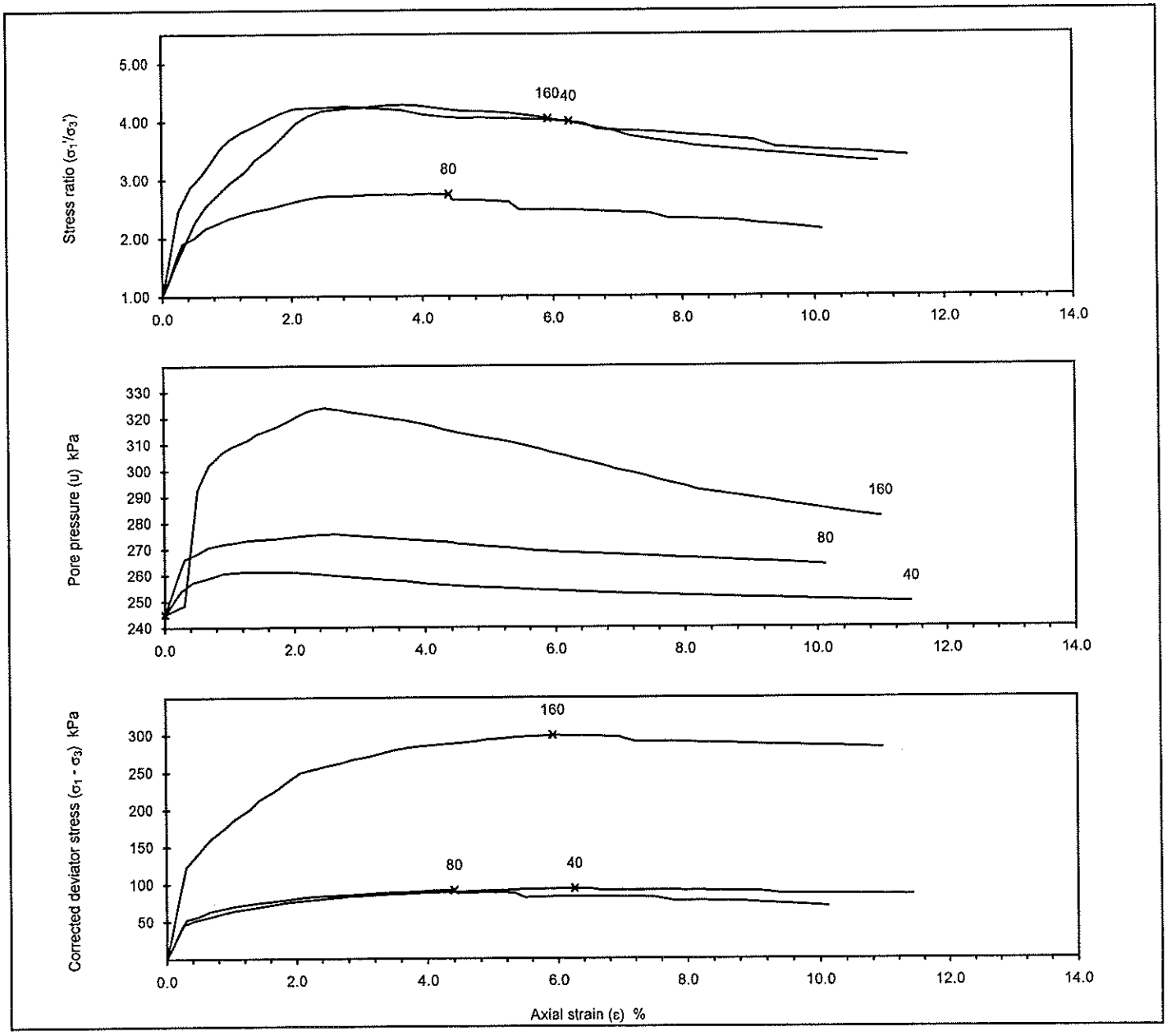
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/2
Specimen ref. : A, B, C



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/2

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	40		80		160	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		25	20	25	20	25	20
		50	45	50	45	50	45
		75	70	75	70	75	70
		100	95	100	95	100	95
		125	120	150	145	150	145
		150	145	200	195	200	195
		175	170	250	245	250	245
		200	195				
		225	220				
		250	245				

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	245.0	245.0	245.0
B value		0.98	0.98	0.98
Volume change	cm^3	1.4	9.5	9.9

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1215.7	1180.3	1218.7
Final moisture content	%	33.9	31.9	24.0
Final bulk density	Mg/m^3	1.90	1.86	1.99

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

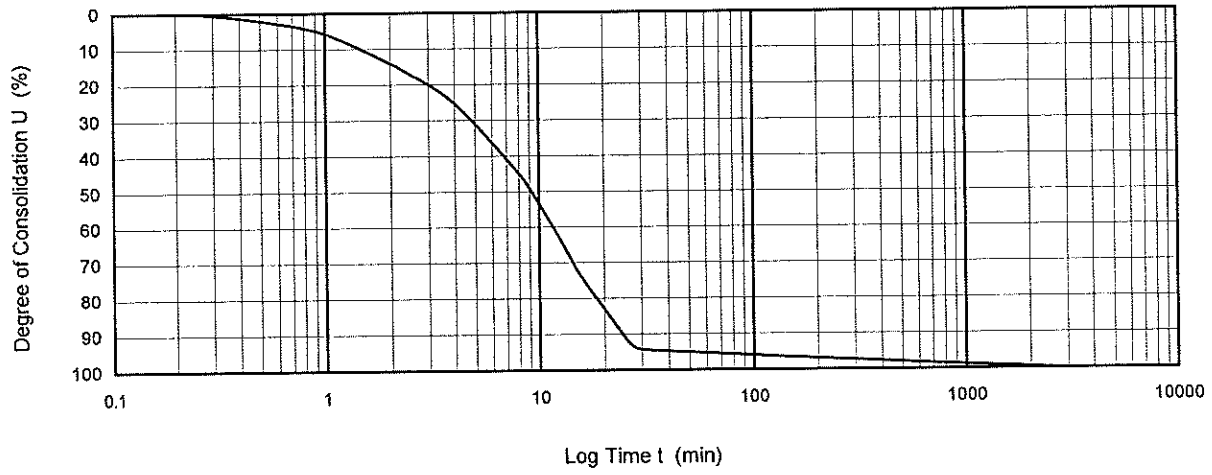
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	8.00
			To	:	-

Laboratory Information

Cell pressure	:	285 kPa	Lab. sample I.D.	:	SL100076/2
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	40 kPa			

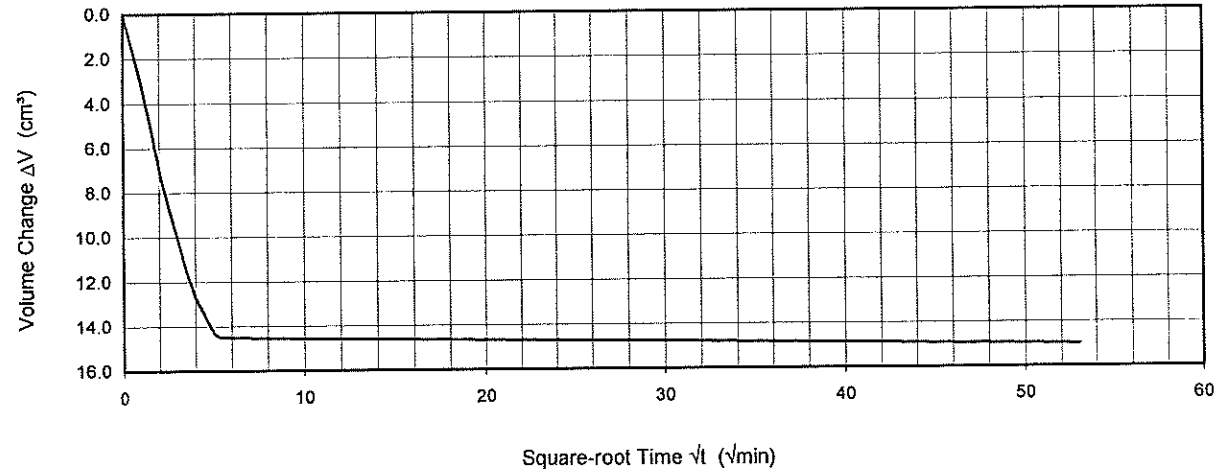
Degree of Consolidation vs. Log Time

t_{50} = 8.90 min ΔV = 15.0 cm³



Volume Change vs. Square-root Time

t_{100} = 17.64 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

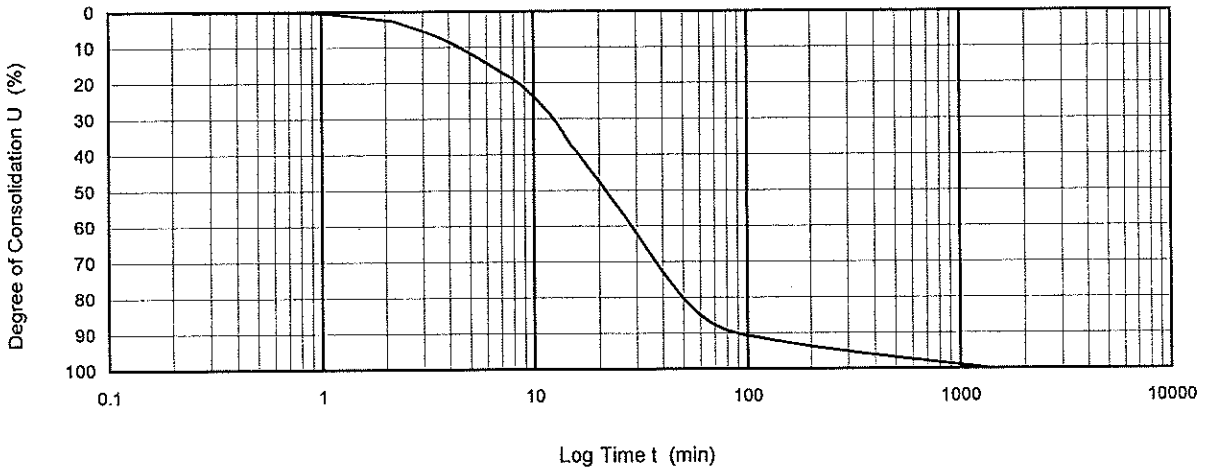
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	8.00
			To	:	-

Laboratory Information

Cell pressure	:	325 kPa	Lab. sample I.D.	:	SL100076/2
Back pressure	:	245 kPa	Specimen ref.	:	B
Effective pressure	:	80 kPa			

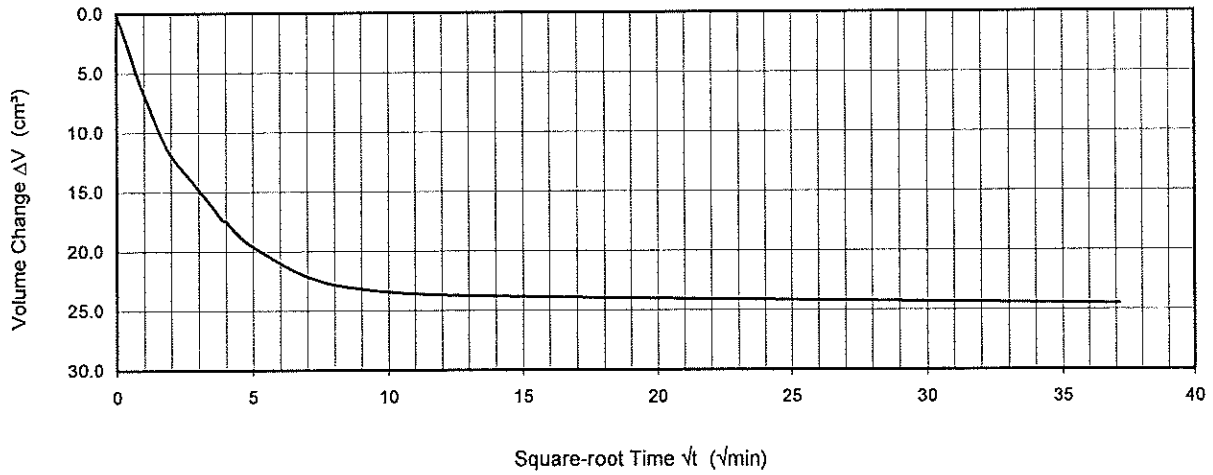
Degree of Consolidation vs. Log Time

t_{50} = 22.00 min ΔV = 24.5 cm³



Volume Change vs. Square-root Time

t_{100} = 42.25 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

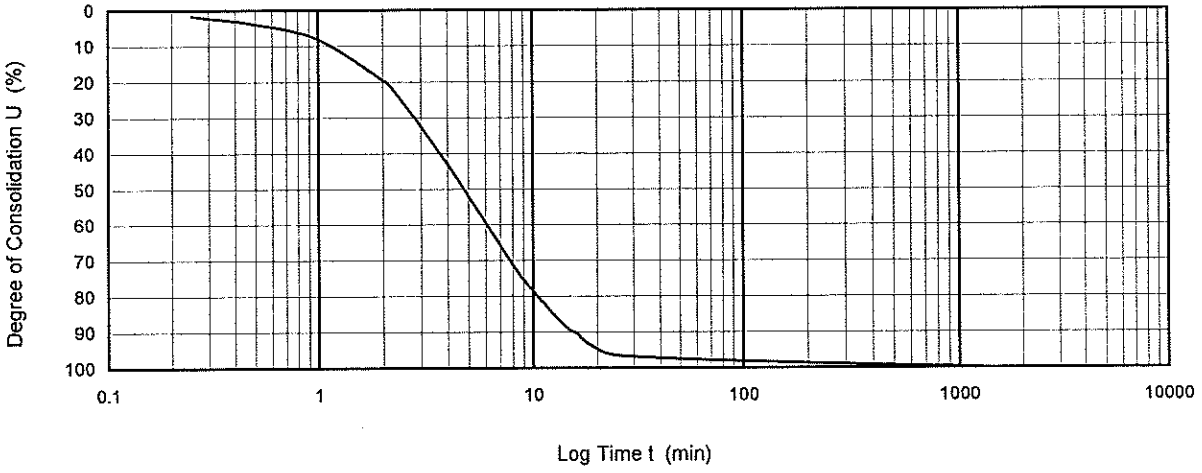
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	8.00
			To	:	-

Laboratory Information

Cell pressure	:	405 kPa	Lab. sample I.D.	:	SL100076/2
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	160 kPa			

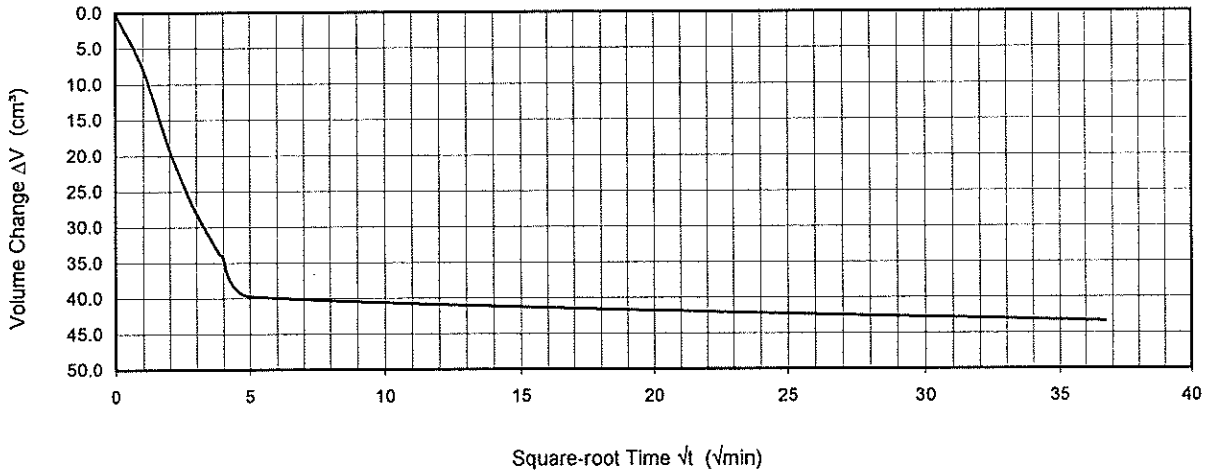
Degree of Consolidation vs. Log Time

t_{50} = 4.80 min ΔV = 43.4 cm³



Volume Change vs. Square-root Time

t_{100} = 17.64 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Date shearing commenced : 10/02/2010 Time : 09:00
Date shearing completed : 10/02/2010 Time : 14:52
Proving ring serial No. : 9689
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.09

Lab. sample I.D. : SL100076/2
Specimen ref. : A
Cell pressure : 285 kPa
Back pressure : 245 kPa
Effective pressure : 40 kPa

Dimensions at starting of compression

Volume V_c : 641.07 cm^3
Area A_c : 4304.0 mm^2
Length L_c : 148.9 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.176	125.4	0.0	0.00	0.00	0.0	40.0	0.0	40.0	0.0	1.00	
254.0	38	0.452	322.1	0.3	0.00	0.07	45.5	53.8	22.8	46.2	45.5	2.47	
257.3	65	0.491	349.9	0.4	0.00	0.12	51.8	53.6	25.9	45.0	51.8	2.87	
258.4	90	0.512	364.8	0.6	0.00	0.16	55.1	54.2	27.6	45.0	55.1	3.07	
260.7	135	0.554	394.8	0.9	0.00	0.24	61.8	55.2	30.9	44.9	61.8	3.54	
261.0	156	0.571	406.9	1.0	0.00	0.28	64.4	56.2	32.2	45.5	64.4	3.68	
261.3	184	0.587	418.3	1.2	0.00	0.32	66.9	57.1	33.4	46.0	66.9	3.82	
261.2	220	0.608	433.3	1.5	0.00	0.39	70.1	58.8	35.0	47.2	70.1	3.94	
261.2	246	0.624	444.7	1.7	0.00	0.43	72.5	60.1	36.3	48.0	72.5	4.05	
261.1	272	0.640	456.1	1.8	0.00	0.47	74.9	61.4	37.5	48.9	74.9	4.14	
261.0	304	0.656	467.5	2.0	0.00	0.52	77.3	62.7	38.7	49.8	77.3	4.22	
260.7	332	0.665	473.9	2.2	0.00	0.57	78.6	63.6	39.3	50.5	78.6	4.23	
260.3	360	0.675	481.0	2.4	0.00	0.61	80.0	64.7	40.0	51.4	80.0	4.24	
259.8	392	0.688	490.3	2.6	0.00	0.66	81.9	66.1	40.9	52.5	81.9	4.25	
259.4	420	0.699	498.1	2.8	0.00	0.71	83.4	67.3	41.7	53.4	83.4	4.26	
258.9	456	0.708	504.5	3.1	0.00	0.76	84.6	68.4	42.3	54.3	84.6	4.24	
258.5	486	0.715	509.5	3.3	0.00	0.81	85.5	69.3	42.8	55.0	85.5	4.23	
258.1	510	0.722	514.5	3.4	0.00	0.84	86.5	70.1	43.2	55.7	86.5	4.21	
257.8	546	0.728	518.8	3.7	0.00	0.90	87.1	70.8	43.6	56.2	87.1	4.20	
257.2	572	0.734	523.0	3.8	0.00	0.94	87.9	71.8	44.0	57.1	87.9	4.16	
256.6	600	0.739	526.6	4.0	0.00	0.98	88.5	72.6	44.2	57.9	88.5	4.12	
256.1	642	0.744	530.2	4.3	0.00	1.04	89.0	73.4	44.5	58.6	89.0	4.08	
255.8	667	0.749	533.7	4.5	0.00	1.07	89.5	74.0	44.8	59.0	89.5	4.07	
255.5	696	0.754	537.3	4.7	0.00	1.11	90.1	74.6	45.1	59.5	90.1	4.05	
255.3	720	0.760	541.6	4.8	0.00	1.15	90.9	75.1	45.4	60.0	90.9	4.06	
255.1	756	0.765	545.1	5.1	0.00	1.19	91.4	75.6	45.7	60.4	91.4	4.06	
254.8	788	0.770	548.7	5.3	0.00	1.24	91.9	76.2	46.0	60.8	91.9	4.04	
254.6	810	0.776	553.0	5.4	0.00	1.27	92.7	76.7	46.3	61.3	92.7	4.05	
254.3	840	0.780	555.8	5.6	0.00	1.31	93.1	77.2	46.5	61.7	93.1	4.03	
254.2	876	0.784	558.7	5.9	0.00	1.35	93.4	77.5	46.7	61.9	93.4	4.03	
253.9	904	0.787	560.8	6.1	0.00	1.39	93.6	77.9	46.8	62.3	93.6	4.01	
253.7	932	0.790	562.9	6.3	0.00	1.43	93.9	78.2	46.9	62.6	93.9	4.00	«
253.4	966	0.790	562.9	6.5	0.00	1.47	93.6	78.4	46.8	62.8	93.6	3.96	
253.2	996	0.776	553.0	6.7	0.00	1.51	91.2	77.4	45.6	62.2	91.2	3.87	
253.0	1020	0.778	554.4	6.8	0.00	1.54	91.3	77.7	45.7	62.4	91.3	3.85	

Final volume (cm^3): 641.07 Final length (mm): 131.9 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/2
Specimen ref. : A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
252.8	1056	0.781	556.5	7.1	0.00	1.58	91.5	77.9	45.7	62.7	91.5	3.84
252.6	1104	0.784	558.7	7.4	0.00	1.64	91.6	78.2	45.8	62.9	91.6	3.83
252.3	1155	0.787	560.8	7.8	0.00	1.70	91.6	78.5	45.8	63.2	91.6	3.80
252.0	1200	0.788	561.5	8.1	0.00	1.75	91.4	78.7	45.7	63.5	91.4	3.77
251.7	1263	0.789	562.2	8.5	0.00	1.82	91.1	78.8	45.5	63.7	91.1	3.73
251.4	1308	0.789	562.2	8.8	0.00	1.87	90.7	79.0	45.4	63.8	90.7	3.70
251.2	1355	0.789	562.2	9.1	0.00	1.93	90.3	79.0	45.2	63.9	90.3	3.67
251.0	1404	0.768	547.3	9.4	0.00	1.98	86.8	77.4	43.4	62.9	86.8	3.55
250.7	1456	0.769	548.0	9.8	0.00	2.03	86.5	77.6	43.3	63.1	86.5	3.52
250.4	1508	0.771	549.4	10.1	0.00	2.09	86.4	77.8	43.2	63.4	86.4	3.50
250.2	1557	0.772	550.1	10.5	0.00	2.14	86.2	77.9	43.1	63.5	86.2	3.48
250.0	1600	0.773	550.8	10.7	0.00	2.18	86.0	78.0	43.0	63.7	86.0	3.46
249.7	1656	0.773	550.8	11.1	0.00	2.24	85.6	78.1	42.8	63.8	85.6	3.43
249.4	1703	0.774	551.5	11.4	0.00	2.29	85.4	78.3	42.7	64.1	85.4	3.40

Final volume (cm^3): 641.07 Final length (mm): 131.9 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Date shearing commenced : 04/02/2010 Time : 09:00
Date shearing completed : 04/02/2010 Time : 14:03
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.30

Lab. sample I.D. : SL100076/2
Specimen ref. : B
Cell pressure : 325 kPa
Back pressure : 245 kPa
Effective pressure : 80 kPa

Dimensions at starting of compression

Volume V_c : 635.09 cm^3
Area A_c : 4284.8 mm^2
Length L_c : 148.2 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	42	146.5	0.0	0.00	0.00	0.0	80.0	0.0	80.0	0.0	1.00	
266.1	45	107	373.3	0.3	0.00	0.08	52.7	85.2	26.3	76.5	52.7	1.89	
268.4	75	113	394.3	0.5	0.00	0.14	57.4	85.3	28.7	75.7	57.4	2.01	
270.7	100	121	422.2	0.7	0.00	0.18	63.7	86.2	31.9	75.5	63.7	2.17	
271.9	133	126	439.6	0.9	0.00	0.24	67.6	86.9	33.8	75.6	67.6	2.27	
272.4	156	130	453.6	1.1	0.00	0.28	70.6	87.9	35.3	76.1	70.6	2.34	
273.2	184	133	464.1	1.2	0.00	0.33	72.9	88.2	36.4	76.1	72.9	2.41	
273.6	210	136	474.5	1.4	0.00	0.37	75.1	88.9	37.5	76.4	75.1	2.46	
273.9	246	139	485.0	1.7	0.00	0.43	77.2	89.7	38.6	76.8	77.2	2.51	
274.4	277	142	495.5	1.9	0.00	0.48	79.4	90.3	39.7	77.1	79.4	2.57	
274.9	308	145	505.9	2.1	0.00	0.53	81.6	90.9	40.8	77.3	81.6	2.63	
275.3	332	147	512.9	2.2	0.00	0.57	83.0	91.2	41.5	77.4	83.0	2.67	
275.6	364	149	519.9	2.5	0.00	0.62	84.4	91.6	42.2	77.5	84.4	2.71	
275.7	396	150	523.4	2.7	0.00	0.67	84.9	91.8	42.5	77.6	84.9	2.72	
275.3	422	151	526.9	2.8	0.00	0.71	85.5	92.5	42.8	78.2	85.5	2.72	
274.9	456	153	533.8	3.1	0.00	0.76	86.8	93.5	43.4	79.0	86.8	2.73	
274.5	488	155	540.8	3.3	0.00	0.81	88.2	94.6	44.1	79.9	88.2	2.75	
274.2	513	156	544.3	3.5	0.00	0.85	88.8	95.2	44.4	80.4	88.8	2.75	
273.8	544	157	547.8	3.7	0.00	0.90	89.3	95.9	44.7	81.0	89.3	2.74	
273.4	576	158	551.3	3.9	0.00	0.94	89.8	96.5	44.9	81.5	89.8	2.74	
273.1	604	160	558.3	4.1	0.00	0.98	91.2	97.5	45.6	82.3	91.2	2.76	
272.5	652	161	561.8	4.4	0.00	1.05	91.6	98.3	45.8	83.0	91.6	2.74	«
272.1	660	156	544.3	4.5	0.00	1.06	87.6	96.7	43.8	82.1	87.6	2.66	
271.6	694	157	547.8	4.7	0.00	1.11	88.1	97.5	44.1	82.8	88.1	2.65	
271.1	720	158	551.3	4.9	0.00	1.15	88.7	98.3	44.4	83.5	88.7	2.65	
270.7	756	158	551.3	5.1	0.00	1.20	88.4	98.5	44.2	83.8	88.4	2.63	
270.3	788	158	551.3	5.3	0.00	1.24	88.2	98.8	44.1	84.1	88.2	2.61	
269.8	812	150	523.4	5.5	0.00	1.27	81.9	96.1	40.9	82.5	81.9	2.48	
269.4	840	151	526.9	5.7	0.00	1.31	82.4	96.8	41.2	83.1	82.4	2.48	
269.1	872	152	530.4	5.9	0.00	1.35	83.0	97.4	41.5	83.6	83.0	2.48	
268.7	900	153	533.8	6.1	0.00	1.39	83.5	98.1	41.8	84.1	83.5	2.48	
268.4	953	153	533.8	6.4	0.00	1.45	83.1	98.2	41.6	84.3	83.1	2.47	
268.0	1004	153	533.8	6.8	0.00	1.52	82.7	98.4	41.4	84.6	82.7	2.45	
267.6	1053	153	533.8	7.1	0.00	1.58	82.4	98.6	41.2	84.9	82.4	2.44	
267.2	1110	153	533.8	7.5	0.00	1.65	82.0	98.8	41.0	85.1	82.0	2.42	

Final volume (cm^3): 635.09 Final length (mm): 133.2 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/2
Specimen ref. : B

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
266.7	1156	147	512.9	7.8	0.00	1.70	77.1	96.9	38.6	84.0	77.1	2.32
266.4	1204	148	516.4	8.1	0.00	1.76	77.5	97.4	38.8	84.4	77.5	2.32
266.0	1256	148	516.4	8.5	0.00	1.82	77.2	97.6	38.6	84.7	77.2	2.31
265.5	1307	148	516.4	8.8	0.00	1.87	76.8	97.9	38.4	85.1	76.8	2.29
265.1	1358	145	505.9	9.2	0.00	1.93	74.3	97.0	37.1	84.7	74.3	2.24
264.7	1404	144	502.4	9.5	0.00	1.98	73.2	96.9	36.6	84.7	73.2	2.21
264.2	1456	142	495.5	9.8	0.00	2.04	71.4	96.5	35.7	84.6	71.4	2.17
263.7	1500	140	488.5	10.1	0.00	2.08	69.6	96.1	34.8	84.5	69.6	2.14

Final volume (cm³): 635.090 Final length (mm): 133.2 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Date shearing commenced : 04/02/2010 Time : 09:00
Date shearing completed : 04/02/2010 Time : 14:30
Proving ring serial No. : 6499
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.21

Lab. sample I.D. : SL100076/2
Specimen ref. : C
Cell pressure : 405 kPa
Back pressure : 245 kPa
Effective pressure : 160 kPa

Dimensions at starting of compression

Volume V_c : 613.10 cm^3
Area A_c : 4176.0 mm^2
Length L_c : 146.8 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.058	177.4	0.0	0.00	0.00	0.0	160.0	0.0	160.0	0.0	1.00	
248.4	45	0.226	691.1	0.3	0.00	0.08	122.6	217.9	61.3	197.5	122.6	1.78	
292.6	75	0.255	779.8	0.5	0.00	0.13	143.4	184.1	71.7	160.2	143.4	2.28	
301.9	100	0.279	853.2	0.7	0.00	0.17	160.6	183.4	80.3	156.6	160.6	2.56	
306.9	132	0.299	914.4	0.9	0.00	0.22	174.7	185.4	87.3	156.3	174.7	2.78	
309.2	156	0.317	969.4	1.1	0.00	0.26	187.4	189.5	93.7	158.3	187.4	2.96	
311.5	188	0.335	1024.5	1.3	0.00	0.32	199.9	193.5	100.0	160.1	199.9	3.14	
313.9	210	0.353	1079.5	1.4	0.00	0.35	212.6	197.4	106.3	162.0	212.6	3.33	
316.1	246	0.371	1134.6	1.7	0.00	0.41	225.0	201.4	112.5	163.9	225.0	3.53	
318.4	277	0.390	1192.7	1.9	0.00	0.46	238.1	205.6	119.0	166.0	238.1	3.75	
320.9	304	0.406	1241.6	2.1	0.00	0.50	249.1	208.6	124.5	167.1	249.1	3.96	
323.0	332	0.413	1263.0	2.3	0.00	0.54	253.5	208.8	126.8	166.5	253.5	4.09	
323.9	364	0.420	1284.4	2.5	0.00	0.59	257.9	210.1	129.0	167.1	257.9	4.18	
323.2	396	0.427	1305.8	2.7	0.00	0.64	262.3	212.9	131.1	169.2	262.3	4.21	
322.3	422	0.434	1327.2	2.9	0.00	0.68	266.8	216.1	133.4	171.6	266.8	4.23	
321.5	456	0.440	1345.6	3.1	0.00	0.73	270.3	218.7	135.2	173.6	270.3	4.24	
320.7	483	0.447	1367.0	3.3	0.00	0.77	274.7	221.7	137.4	175.9	274.7	4.26	
319.9	512	0.454	1388.4	3.5	0.00	0.81	279.1	224.6	139.5	178.1	279.1	4.28	
319.1	546	0.460	1406.7	3.7	0.00	0.86	282.6	227.2	141.3	180.1	282.6	4.29	
318.0	577	0.464	1419.0	3.9	0.00	0.90	284.7	229.4	142.4	181.9	284.7	4.27	
316.9	604	0.467	1428.1	4.1	0.00	0.94	286.3	231.2	143.1	183.5	286.3	4.25	
315.6	630	0.470	1437.3	4.3	0.00	0.97	287.8	233.3	143.9	185.3	287.8	4.22	
314.3	662	0.473	1446.5	4.5	0.00	1.01	289.2	235.3	144.6	187.1	289.2	4.19	
313.1	697	0.477	1458.7	4.7	0.00	1.06	291.2	237.5	145.6	189.0	291.2	4.17	
312.4	722	0.481	1470.9	4.9	0.00	1.09	293.4	239.3	146.7	190.4	293.4	4.17	
311.5	756	0.484	1480.1	5.1	0.00	1.14	294.8	240.9	147.4	191.8	294.8	4.15	
310.7	780	0.487	1489.3	5.3	0.00	1.17	296.3	242.4	148.1	193.1	296.3	4.14	
309.4	812	0.490	1498.5	5.5	0.00	1.21	297.6	244.4	148.8	194.8	297.6	4.11	
308.1	846	0.492	1504.6	5.8	0.00	1.25	298.3	246.0	149.1	196.3	298.3	4.08	
306.8	870	0.494	1510.7	5.9	0.00	1.28	299.1	247.7	149.5	197.9	299.1	4.05	«
305.5	904	0.495	1513.8	6.2	0.00	1.32	299.0	249.0	149.5	199.2	299.0	4.00	
304.2	932	0.496	1516.8	6.3	0.00	1.36	299.0	250.3	149.5	200.5	299.0	3.97	
302.9	966	0.496	1516.8	6.6	0.00	1.40	298.2	251.2	149.1	201.5	298.2	3.92	
301.6	996	0.496	1516.8	6.8	0.00	1.43	297.6	252.2	148.8	202.6	297.6	3.88	
300.3	1020	0.496	1516.8	6.9	0.00	1.46	297.0	253.2	148.5	203.7	297.0	3.84	

Final volume (cm^3): 613.10 Final length (mm): 130.7 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 8.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/2
Specimen ref. : C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
299.1	1056	0.488	1492.4	7.2	0.00	1.50	290.7	251.3	145.4	202.8	290.7	3.75
297.7	1088	0.489	1495.4	7.4	0.00	1.54	290.7	252.6	145.3	204.2	290.7	3.71
296.4	1112	0.49	1498.5	7.6	0.00	1.57	290.8	254.0	145.4	205.5	290.8	3.68
295.1	1144	0.491	1501.5	7.8	0.00	1.60	290.8	255.3	145.4	206.8	290.8	3.65
293.8	1178	0.491	1501.5	8.0	0.00	1.64	290.0	256.2	145.0	207.9	290.0	3.61
292.5	1203	0.491	1501.5	8.2	0.00	1.67	289.4	257.2	144.7	209.0	289.4	3.57
291.2	1255	0.492	1504.6	8.5	0.00	1.73	288.9	258.3	144.5	210.1	288.9	3.54
289.9	1308	0.492	1504.6	8.9	0.00	1.78	287.7	259.0	143.9	211.0	287.7	3.50
288.6	1358	0.492	1504.6	9.2	0.00	1.84	286.6	259.7	143.3	211.9	286.6	3.46
287.3	1402	0.493	1507.6	9.5	0.00	1.88	286.2	260.8	143.1	213.1	286.2	3.43
286.0	1456	0.493	1507.6	9.9	0.00	1.94	285.0	261.5	142.5	214.0	285.0	3.40
284.7	1502	0.494	1510.7	10.2	0.00	1.98	284.6	262.6	142.3	215.2	284.6	3.37
283.4	1552	0.494	1510.7	10.6	0.00	2.03	283.5	263.3	141.7	216.1	283.5	3.33
282.1	1610	0.494	1510.7	11.0	0.00	2.09	282.2	264.0	141.1	217.0	282.2	3.30

Final volume (cm^3): 613.10 Final length (mm): 130.7 Termination criterion : Maximum deviator stress
Remarks:

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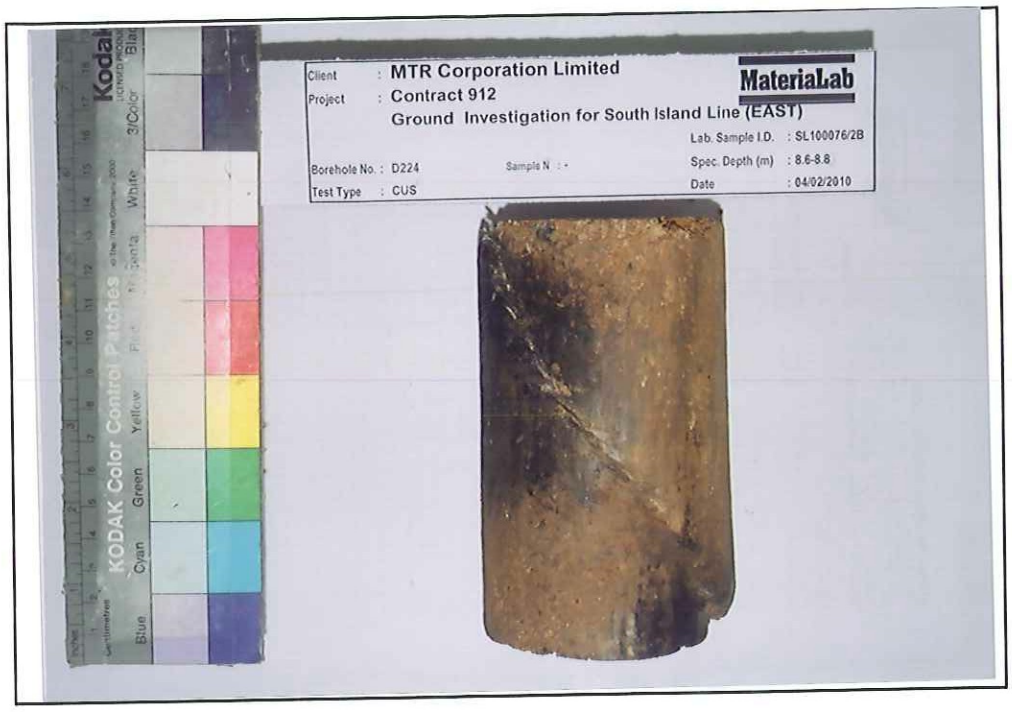
Photographic Records for Triaxial Test

Photographic Records for Triaxial Test



Photographic Records for Triaxial Test

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

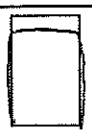
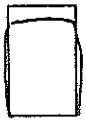
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -
Sample origin : CDM
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 02-02-2010
Date test(s) completed : 09-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 19.5 °C

Lab. sample I.D. : SL100076/3
Sample type : M

Specimen reference			A			B			C	
Specimen depth(m)	From		18.40			18.60			18.80	
	To		18.60			18.80			19.00	
Effective pressure		kPa	90			180			360	
*Measurements and Calculations			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.6	73.4	79.8	74.6	73.0	79.2	74.7	72.4	78.6
Length		mm	150.2	147.7	124.7	150.3	147.1	125.1	150.2	145.7	123.7
Volume		cm^3	656.50	624.40	624.40	656.94	615.64	615.64	658.27	600.47	600.47
Wet mass		g	1259.7	1230.3	1230.3	1277.7	1240.9	1240.9	1269.8	1216.7	1216.7
Dry mass		g	971.7	971.7	971.7	1002.9	1002.9	1002.9	989.5	989.5	989.5
Moisture content		%	29.6	26.6	26.6	27.4	23.7	23.7	28.3	23.0	23.0
Bulk density		Mg/m^3	1.92	1.97	1.97	1.94	2.02	2.02	1.93	2.03	2.03
Dry density		Mg/m^3	1.48	1.56	1.56	1.53	1.63	1.63	1.50	1.65	1.65
Void ratio			0.79	0.70	0.70	0.74	0.63	0.63	0.76	0.61	0.61
Degree of saturation		%	99.4	100.3	100.3	98.7	100.3	100.3	98.4	100.1	100.1
Saturation Stage											
Volume change of water		cm^3	2.7			4.5			4.7		
Consolidation Stage											
Side drain used			No			No			No		
Initial pore pressure		kPa	330.0			420.0			598.8		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm^3	32.1			41.3			57.8		
m_{vi}		m^2/MN	0.58			0.36			0.25		
t_{50}		min	5.10			4.10			34.00		
c_{vi}	(from t_{50})	m^2/yr	870.11			1078.49			128.73		
t_{100}		min	9.00			6.25			4.84		
c_{vi}	(from t_{100})	m^2/yr	990.12			1416.94			1825.74		
Sketch of failed specimen (Failure Mode)			 Plastic			 Plastic			Brittle		
Visual description			Moist, brown spotted with white, silty/clayey, gravelly SAND.			Moist, brown spotted with white, silty/clayey, gravelly SAND.			Moist, brown spotted with white, silty/clayey, gravelly SAND.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by :

~~Paul Richard Cooper (Operations Manager - CMT)~~ /
Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

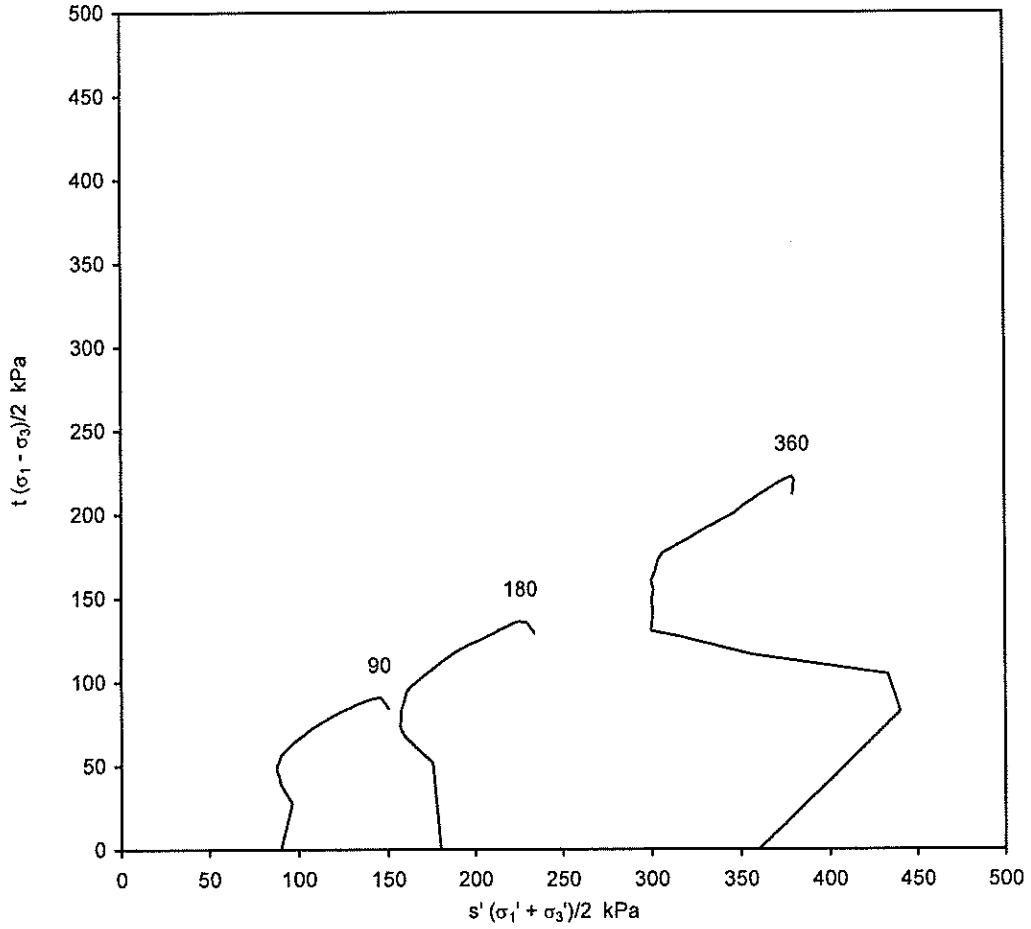
Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/3
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
A	90	9.6	280.4	181.1	145.1	90.5
B	180	9.2	335.5	272.0	225.5	136.0
C	360	10.0	448.1	444.3	379.1	222.2



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

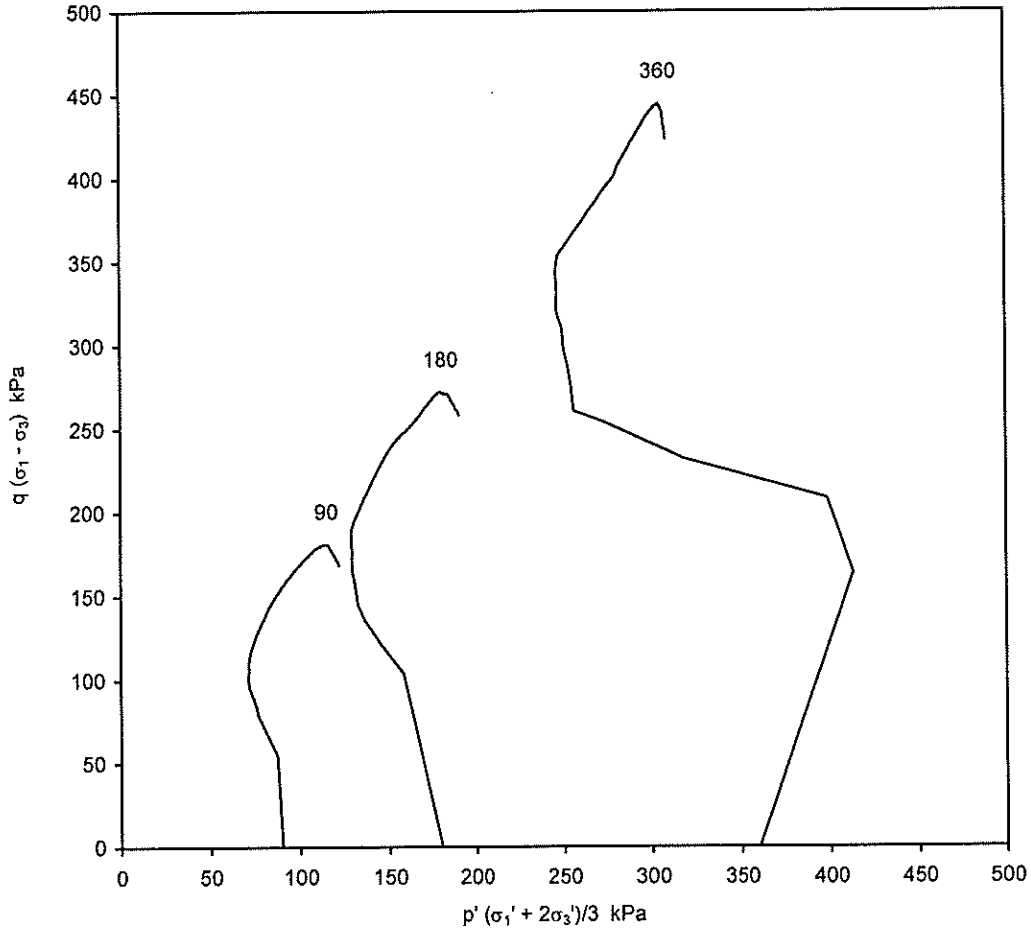
Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/3
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	90	9.6	280.4	181.1	115.0	181.1
B	180	9.2	335.5	272.0	180.2	272.0
C	360	10.0	448.1	444.3	305.0	444.3



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HOKLAS 015

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STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

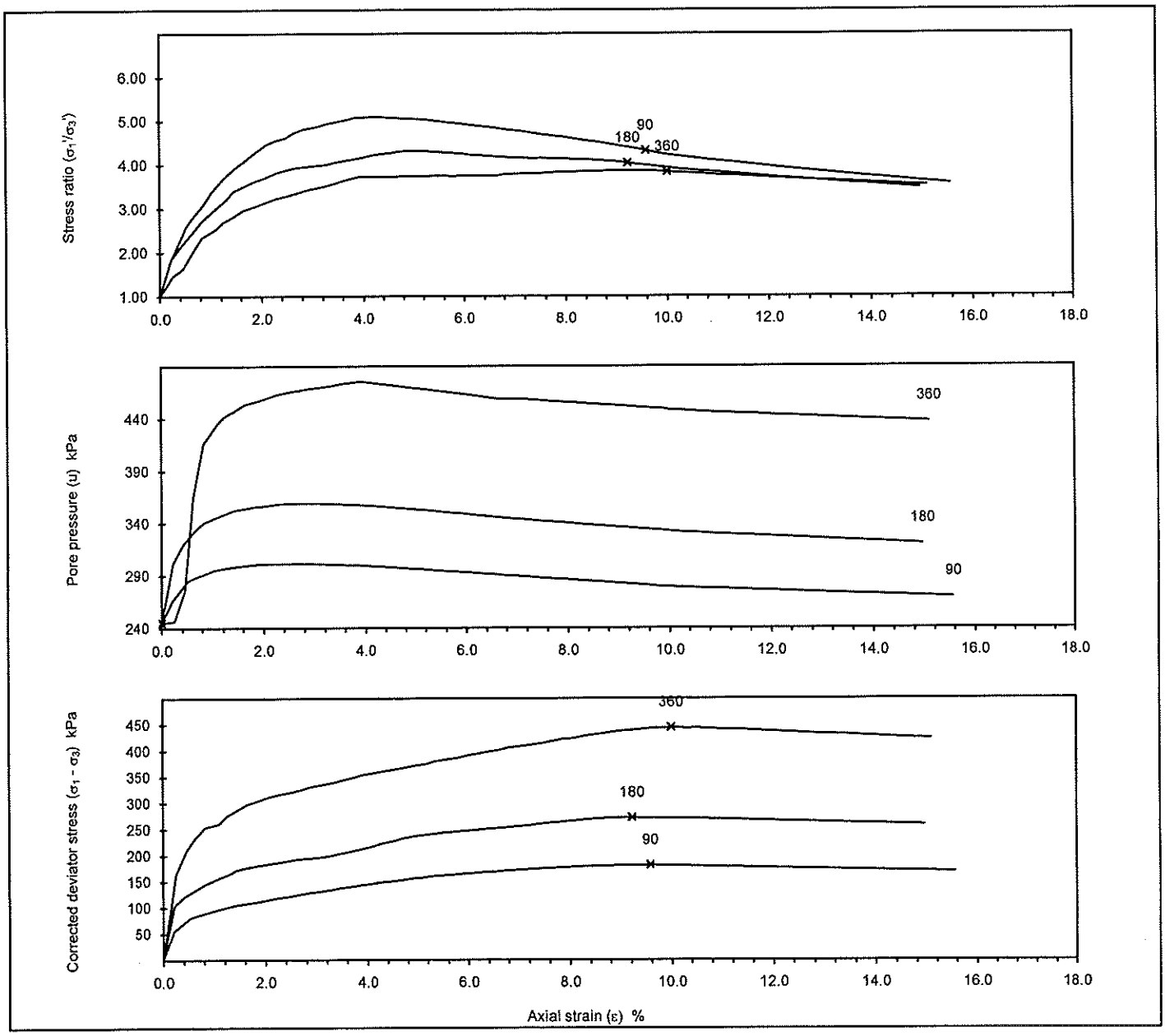
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/3
Specimen ref. : A, B, C



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HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/3

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	90		180		360	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		25	20	25	20	25	20
		50	45	50	45	50	45
		75	70	75	70	75	70
		100	95	100	95	100	95
		150	145	125	120	125	120
		200	195	150	145	150	145
		250	245	200	195	200	195
				250	245	250	245

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	2450.0	245.0	245.0
B value		0.98	0.98	0.97
Volume change	cm^3	2.7	4.5	4.7

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1228.2	1238.5	1214.4
Final moisture content	%	26.4	23.5	22.7
Final bulk density	Mg/m^3	1.97	2.01	2.02

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

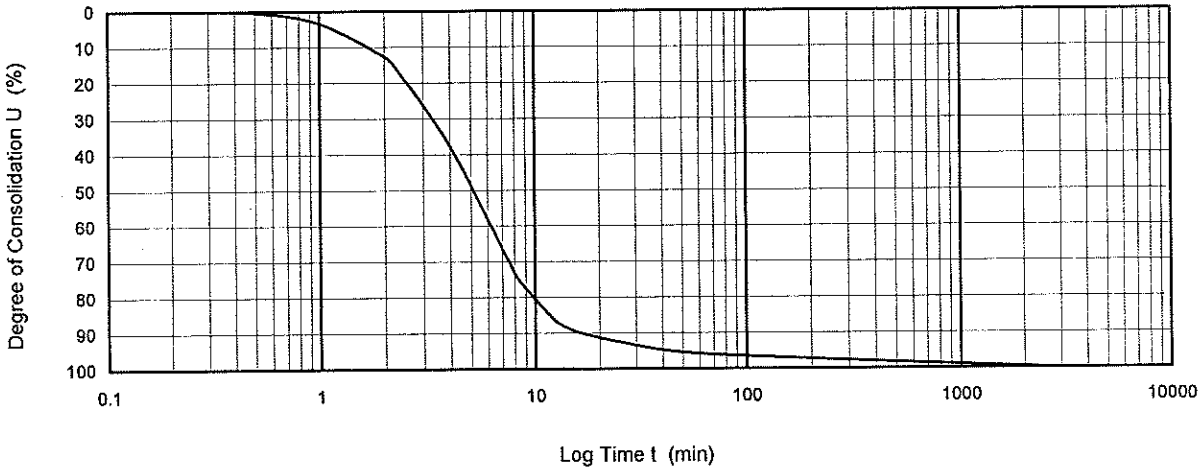
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.00
			To	:	-

Laboratory Information

Cell pressure	:	335 kPa	Lab. sample I.D.	:	SL100076/3
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	90 kPa			

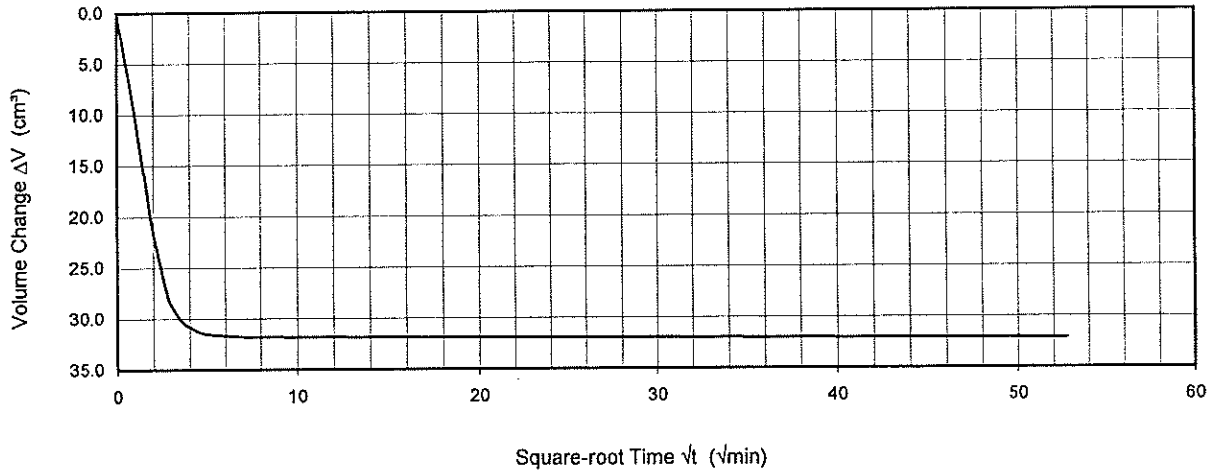
Degree of Consolidation vs. Log Time

t_{50} = 5.10 min ΔV = 32.1 cm³



Volume Change vs. Square-root Time

t_{100} = 9.00 min



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

CONSOLIDATION STAGE

Information supplied by Client

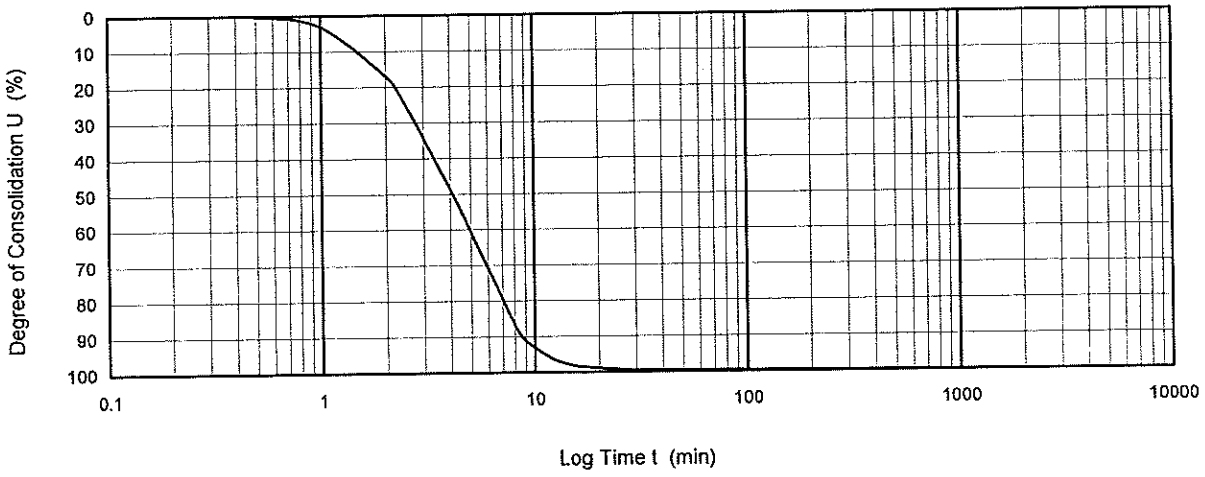
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.00
			To	:	-

Laboratory Information

Cell pressure	:	425 kPa	Lab. sample I.D.	:	SL100076/3
Back pressure	:	245 kPa	Specimen ref.	:	B
Effective pressure	:	180 kPa			

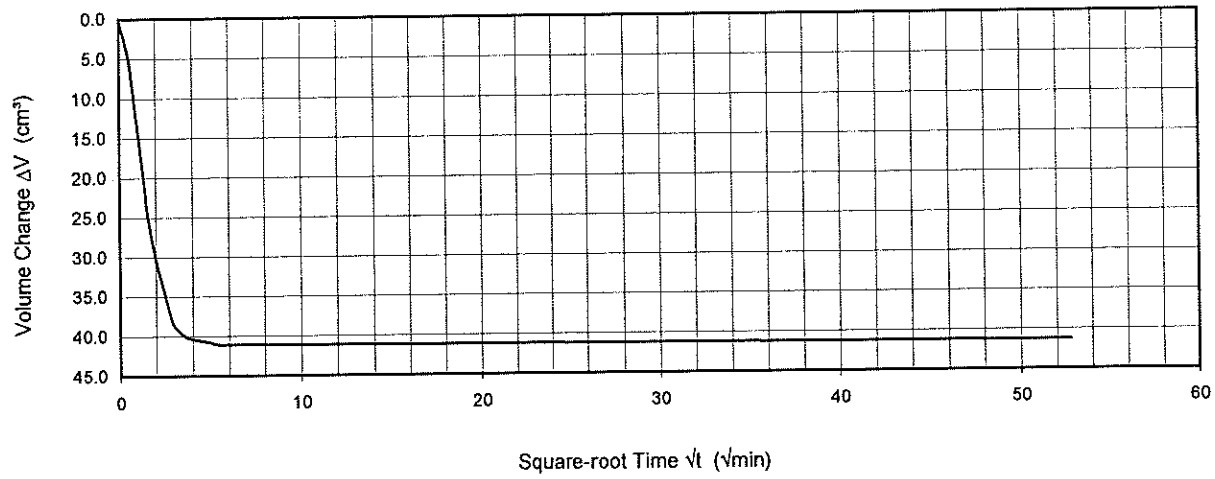
Degree of Consolidation vs. Log Time

t_{50} = 4.10 min ΔV = 41.3 cm^3



Volume Change vs. Square-root Time

t_{100} = 6.25 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

CONSOLIDATION STAGE

Information supplied by Client

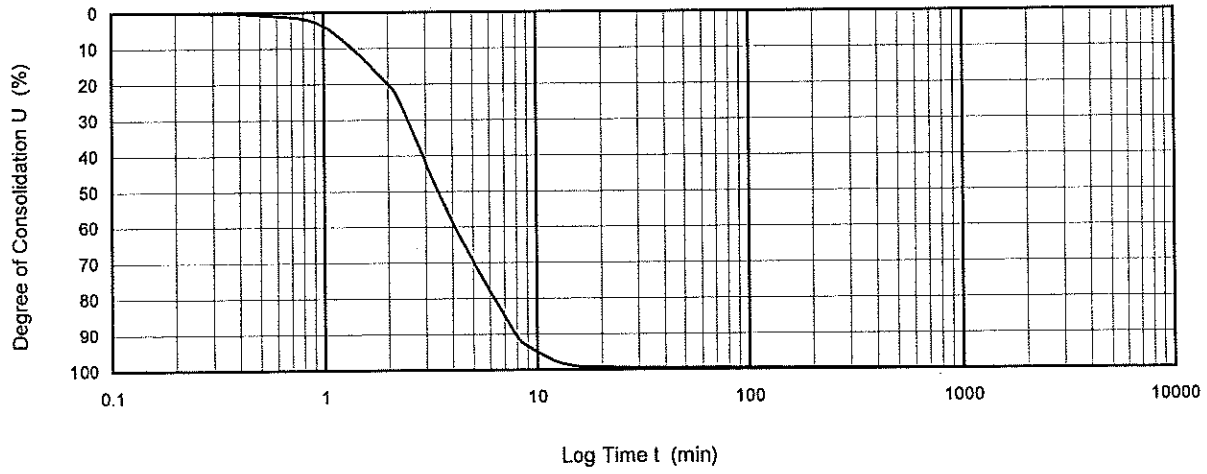
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.00
			To	:	-

Laboratory Information

Cell pressure	:	605 kPa	Lab. sample I.D.	:	SL100076/3
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	360 kPa			

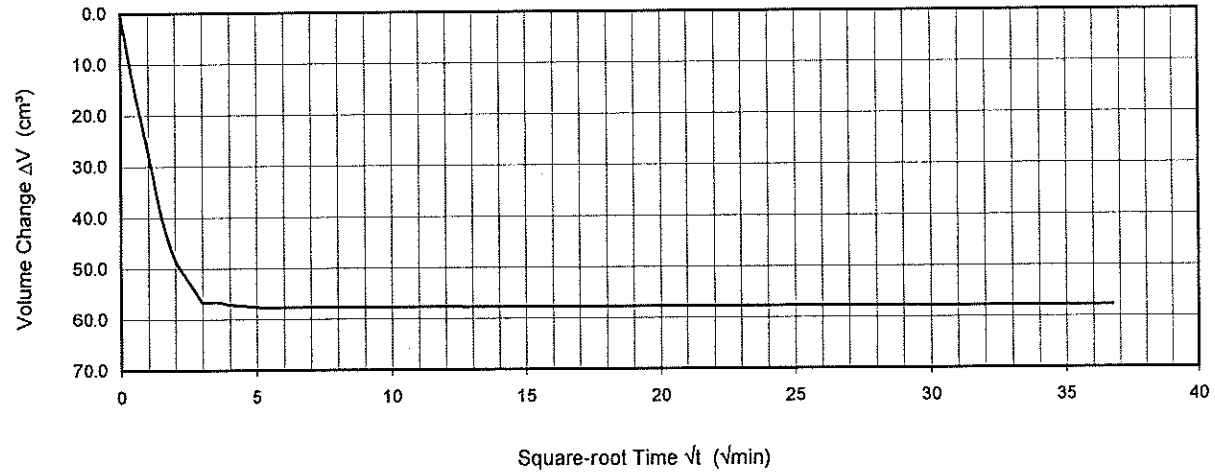
Degree of Consolidation vs. Log Time

t_{50} = 34.00 min ΔV = 57.8 cm³



Volume Change vs. Square-root Time

t_{100} = 4.84 min



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HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -

Laboratory Information

Date shearing commenced : 08/02/2010 Time : 09:00
Date shearing completed : 08/02/2010 Time : 17:04
Proving ring serial No. : 9689
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.20

Lab. sample I.D. : SL100076/3
Specimen ref. : A
Cell pressure : 335 kPa
Back pressure : 245 kPa
Effective pressure : 90 kPa

Dimensions at starting of compression

Volume V_c : 624.40 cm^3
Area A_c : 4227.2 mm^2
Length L_c : 147.7 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.192	136.8	0.0	0.00	0.00	0.0	90.0	0.0	90.0	0.0	1.00
266.2	30	0.520	370.5	0.2	0.00	0.05	55.1	96.4	27.6	87.2	55.1	1.80
284.8	75	0.664	473.2	0.5	0.00	0.14	79.0	89.7	39.5	76.5	79.0	2.57
287.2	90	0.692	493.1	0.6	0.00	0.16	83.6	89.6	41.8	75.7	83.6	2.75
291.2	122	0.730	520.2	0.8	0.00	0.22	89.7	88.7	44.9	73.7	89.7	3.05
295.0	150	0.765	545.1	1.0	0.00	0.27	95.3	87.7	47.7	71.8	95.3	3.38
297.2	180	0.796	567.2	1.2	0.00	0.32	100.3	87.9	50.1	71.2	100.3	3.65
298.5	212	0.828	590.0	1.4	0.00	0.37	105.3	89.1	52.6	71.6	105.3	3.88
299.8	246	0.850	605.7	1.7	0.00	0.43	108.6	89.5	54.3	71.4	108.6	4.09
300.8	277	0.872	621.4	1.9	0.00	0.48	112.0	90.2	56.0	71.5	112.0	4.27
301.4	308	0.898	639.9	2.1	0.00	0.53	116.0	91.6	58.0	72.3	116.0	4.45
301.4	332	0.918	654.2	2.2	0.00	0.57	119.1	93.1	59.5	73.3	119.1	4.54
301.4	367	0.936	667.0	2.5	0.00	0.63	121.7	94.4	60.8	74.2	121.7	4.62
301.6	390	0.956	681.2	2.6	0.00	0.67	124.7	95.8	62.4	75.0	124.7	4.73
301.4	420	0.980	698.3	2.8	0.00	0.71	128.3	97.8	64.2	76.4	128.3	4.82
301.1	456	1.000	712.6	3.1	0.00	0.77	131.2	99.5	65.6	77.6	131.2	4.87
300.9	488	1.022	728.3	3.3	0.00	0.82	134.5	101.3	67.2	78.9	134.5	4.94
300.4	510	1.042	742.5	3.5	0.00	0.85	137.5	103.3	68.7	80.4	137.5	4.97
300.2	546	1.063	757.5	3.7	0.00	0.90	140.5	105.0	70.2	81.6	140.5	5.04
300.0	570	1.080	769.6	3.9	0.00	0.94	143.0	106.5	71.5	82.7	143.0	5.09
299.4	600	1.099	783.1	4.1	0.00	0.98	145.7	108.5	72.9	84.2	145.7	5.09
298.8	630	1.118	796.7	4.3	0.00	1.03	148.4	110.4	74.2	85.7	148.4	5.10
298.1	662	1.135	808.8	4.5	0.00	1.07	150.8	112.3	75.4	87.2	150.8	5.09
297.4	696	1.152	820.9	4.7	0.00	1.12	153.1	114.1	76.5	88.6	153.1	5.07
296.7	720	1.168	832.3	4.9	0.00	1.15	155.4	116.0	77.7	90.1	155.4	5.06
296.0	756	1.186	845.1	5.1	0.00	1.20	157.8	117.9	78.9	91.6	157.8	5.05
295.3	780	1.202	856.5	5.3	0.00	1.24	160.0	119.7	80.0	93.0	160.0	5.03
294.6	810	1.214	865.1	5.5	0.00	1.28	161.6	121.2	80.8	94.3	161.6	5.00
293.9	846	1.226	873.6	5.7	0.00	1.32	163.0	122.6	81.5	95.4	163.0	4.97
293.2	870	1.240	883.6	5.9	0.00	1.36	164.9	124.3	82.5	96.8	164.9	4.95
292.5	904	1.251	891.4	6.1	0.00	1.40	166.2	125.6	83.1	97.9	166.2	4.91
291.8	930	1.263	900.0	6.3	0.00	1.43	167.7	127.1	83.9	99.1	167.7	4.88
291.1	976	1.275	908.6	6.6	0.00	1.49	169.0	128.4	84.5	100.2	169.0	4.85
290.4	992	1.286	916.4	6.7	0.00	1.51	170.5	129.9	85.3	101.4	170.5	4.82
289.7	1020	1.297	924.2	6.9	0.00	1.55	171.9	131.2	85.9	102.6	171.9	4.79

Final volume (cm^3): 624.40 Final length (mm): 124.7 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/3
Specimen ref. : A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
289.0	1056	1.308	932.1	7.1	0.00	1.59	173.1	132.5	86.5	103.7	173.1	4.76	
288.3	1084	1.317	938.5	7.3	0.00	1.62	174.1	133.8	87.1	104.7	174.1	4.73	
287.6	1112	1.326	944.9	7.5	0.00	1.66	175.1	135.0	87.6	105.8	175.1	4.69	
286.9	1146	1.336	952.0	7.8	0.00	1.70	176.2	136.2	88.1	106.8	176.2	4.66	
286.2	1178	1.345	958.4	8.0	0.00	1.74	177.1	137.4	88.6	107.8	177.1	4.63	
285.5	1204	1.354	964.8	8.2	0.00	1.77	178.1	138.6	89.1	108.9	178.1	4.60	
284.8	1232	1.360	969.1	8.3	0.00	1.80	178.7	139.5	89.3	109.8	178.7	4.56	
284.1	1266	1.367	974.1	8.6	0.00	1.84	179.3	140.5	89.6	110.7	179.3	4.52	
283.4	1296	1.374	979.1	8.8	0.00	1.87	179.9	141.5	89.9	111.6	179.9	4.49	
282.7	1320	1.380	983.4	8.9	0.00	1.90	180.5	142.5	90.2	112.5	180.5	4.45	
281.9	1356	1.385	986.9	9.2	0.00	1.94	180.7	143.5	90.4	113.3	180.7	4.40	
281.2	1388	1.390	990.5	9.4	0.00	1.97	181.0	144.3	90.5	114.1	181.0	4.36	
280.4	1414	1.393	992.6	9.6	0.00	2.00	181.1	145.1	90.5	115.0	181.1	4.32	«
279.6	1446	1.394	993.3	9.8	0.00	2.04	180.8	145.8	90.4	115.7	180.8	4.26	
279.1	1473	1.394	993.3	10.0	0.00	2.07	180.4	146.1	90.2	116.0	180.4	4.23	
278.7	1508	1.394	993.3	10.2	0.00	2.10	179.8	146.2	89.9	116.2	179.8	4.19	
278.1	1556	1.394	993.3	10.5	0.00	2.15	179.1	146.5	89.6	116.6	179.1	4.15	
277.5	1604	1.394	993.3	10.9	0.00	2.20	178.4	146.7	89.2	117.0	178.4	4.10	
276.9	1660	1.395	994.1	11.2	0.00	2.26	177.7	147.0	88.9	117.3	177.7	4.06	
276.3	1708	1.395	994.1	11.6	0.00	2.31	177.0	147.2	88.5	117.7	177.0	4.02	
275.7	1757	1.395	994.1	11.9	0.00	2.36	176.3	147.5	88.2	118.1	176.3	3.97	
275.1	1800	1.395	994.1	12.2	0.00	2.40	175.7	147.7	87.8	118.5	175.7	3.93	
274.5	1854	1.396	994.8	12.6	0.00	2.45	175.0	148.0	87.5	118.8	175.0	3.89	
273.9	1903	1.396	994.8	12.9	0.00	2.50	174.3	148.3	87.2	119.2	174.3	3.85	
273.3	1956	1.396	994.8	13.2	0.00	2.55	173.5	148.5	86.8	119.5	173.5	3.81	
272.7	2000	1.396	994.8	13.5	0.00	2.59	172.9	148.7	86.4	119.9	172.9	3.78	
272.1	2052	1.396	994.8	13.9	0.00	2.64	172.1	149.0	86.1	120.3	172.1	3.74	
271.5	2108	1.396	994.8	14.3	0.00	2.69	171.3	149.2	85.7	120.6	171.3	3.70	
270.9	2156	1.397	995.5	14.6	0.00	2.73	170.7	149.5	85.4	121.0	170.7	3.66	
270.3	2200	1.397	995.5	14.9	0.00	2.77	170.1	149.8	85.1	121.4	170.1	3.63	
269.7	2257	1.397	995.5	15.3	0.00	2.82	169.3	149.9	84.6	121.7	169.3	3.59	
269.1	2300	1.397	995.5	15.6	0.00	2.86	168.6	150.2	84.3	122.1	168.6	3.56	

Final volume (cm³): 624.40 Final length (mm): 124.7 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -

Laboratory Information

Date shearing commenced : 08/02/2010 Time : 09:00
Date shearing completed : 08/02/2010 Time : 16:32
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.33

Lab. sample I.D. : SL100076/3
Specimen ref. : B
Cell pressure : 425 kPa
Back pressure : 245 kPa
Effective pressure : 180 kPa

Dimensions at starting of compression

Volume V_c : 615.64 cm^3
Area A_c : 4185.7 mm^2
Length L_c : 147.1 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	54	188.4	0.0	0.00	0.00	0.0	180.0	0.0	180.0	0.0	1.00
301.5	31	179	624.6	0.2	0.00	0.06	103.9	175.5	52.0	158.1	103.9	1.84
319.4	60	200	697.8	0.4	0.00	0.11	121.1	166.1	60.5	146.0	121.1	2.15
333.6	97	218	760.6	0.7	0.00	0.18	135.6	159.2	67.8	136.6	135.6	2.48
340.9	122	230	802.5	0.8	0.00	0.22	145.3	156.7	72.6	132.5	145.3	2.73
346.4	161	245	854.9	1.1	0.00	0.29	157.2	157.2	78.6	131.0	157.2	3.00
350.3	193	255	889.7	1.3	0.00	0.34	165.0	157.2	82.5	129.7	165.0	3.21
352.8	210	264	921.1	1.4	0.00	0.37	172.2	158.3	86.1	129.6	172.2	3.38
354.2	240	270	942.1	1.6	0.00	0.42	176.7	159.1	88.3	129.7	176.7	3.50
355.9	270	275	959.5	1.8	0.00	0.47	180.4	159.3	90.2	129.2	180.4	3.61
357.0	304	280	977.0	2.1	0.00	0.53	184.0	160.0	92.0	129.3	184.0	3.71
358.6	340	285	994.4	2.3	0.00	0.59	187.5	160.2	93.8	128.9	187.5	3.82
358.9	366	289	1008.4	2.5	0.00	0.63	190.4	161.3	95.2	129.6	190.4	3.88
359.1	392	293	1022.3	2.7	0.00	0.67	193.2	162.5	96.6	130.3	193.2	3.93
359.3	420	295	1029.3	2.9	0.00	0.72	194.4	162.9	97.2	130.5	194.4	3.96
359.1	450	298	1039.8	3.1	0.00	0.76	196.4	164.1	98.2	131.4	196.4	3.98
358.8	482	302	1053.7	3.3	0.00	0.81	199.1	165.8	99.6	132.6	199.1	4.01
358.5	510	308	1074.7	3.5	0.00	0.85	203.5	168.3	101.8	134.3	203.5	4.06
357.9	546	315	1099.1	3.7	0.00	0.91	208.6	171.4	104.3	136.6	208.6	4.11
357.4	577	321	1120.0	3.9	0.00	0.95	212.9	174.0	106.4	138.6	212.9	4.15
357.0	608	328	1144.5	4.1	0.00	1.00	218.0	177.0	109.0	140.7	218.0	4.21
356.1	632	335	1168.9	4.3	0.00	1.03	223.1	180.5	111.6	143.3	223.1	4.24
355.3	668	342	1193.3	4.5	0.00	1.08	228.1	183.7	114.0	145.7	228.1	4.27
354.5	696	349	1217.7	4.7	0.00	1.12	233.1	187.1	116.6	148.2	233.1	4.31
353.5	730	355	1238.7	5.0	0.00	1.17	237.3	190.1	118.6	150.6	237.3	4.32
352.7	765	359	1252.6	5.2	0.00	1.22	239.8	192.2	119.9	152.2	239.8	4.32
351.8	790	362	1263.1	5.4	0.00	1.25	241.7	194.1	120.9	153.8	241.7	4.30
350.9	810	365	1273.6	5.5	0.00	1.28	243.7	195.9	121.8	155.3	243.7	4.29
350.0	846	368	1284.0	5.8	0.00	1.33	245.4	197.7	122.7	156.8	245.4	4.27
349.1	877	371	1294.5	6.0	0.00	1.37	247.1	199.5	123.6	158.3	247.1	4.26
348.0	904	373	1301.5	6.1	0.00	1.40	248.2	201.1	124.1	159.7	248.2	4.22
347.1	930	376	1311.9	6.3	0.00	1.44	250.0	202.9	125.0	161.2	250.0	4.21
346.2	962	379	1322.4	6.5	0.00	1.48	251.7	204.7	125.9	162.7	251.7	4.19
345.2	996	382	1332.9	6.8	0.00	1.52	253.4	206.5	126.7	164.3	253.4	4.18
344.3	1020	385	1343.3	6.9	0.00	1.55	255.2	208.3	127.6	165.8	255.2	4.16

Final volume (cm^3): 615.64 Final length (mm): 125.1 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/3
Specimen ref. : B

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
343.5	1056	388	1353.8	7.2	0.00	1.60	256.8	209.9	128.4	167.1	256.8	4.15	
342.6	1084	392	1367.8	7.4	0.00	1.63	259.4	212.1	129.7	168.9	259.4	4.15	
341.9	1114	396	1381.7	7.6	0.00	1.67	261.8	214.0	130.9	170.4	261.8	4.15	
341.1	1146	399	1392.2	7.8	0.00	1.70	263.5	215.6	131.7	171.7	263.5	4.14	
340.3	1178	402	1402.7	8.0	0.00	1.74	265.1	217.3	132.6	173.1	265.1	4.13	
339.4	1204	405	1413.1	8.2	0.00	1.77	266.9	219.0	133.4	174.6	266.9	4.12	
338.7	1230	408	1423.6	8.4	0.00	1.80	268.6	220.6	134.3	175.8	268.6	4.11	
337.9	1262	411	1434.1	8.6	0.00	1.84	270.2	222.2	135.1	177.2	270.2	4.10	
337.1	1293	413	1441.0	8.8	0.00	1.87	271.1	223.4	135.5	178.3	271.1	4.08	
336.3	1322	415	1448.0	9.0	0.00	1.91	272.0	224.7	136.0	179.4	272.0	4.07	
335.5	1356	416	1451.5	9.2	0.00	1.95	272.0	225.5	136.0	180.2	272.0	4.04	«
334.7	1382	416	1451.5	9.4	0.00	1.97	271.4	226.0	135.7	180.8	271.4	4.01	
334.0	1414	417	1455.0	9.6	0.00	2.01	271.5	226.7	135.7	181.5	271.5	3.98	
333.2	1446	417	1455.0	9.8	0.00	2.04	270.8	227.2	135.4	182.1	270.8	3.95	
332.3	1478	418	1458.5	10.0	0.00	2.08	270.9	228.1	135.4	183.0	270.9	3.92	
331.5	1500	419	1462.0	10.2	0.00	2.10	271.1	229.1	135.6	183.9	271.1	3.90	
330.7	1556	419	1462.0	10.6	0.00	2.16	269.9	229.3	135.0	184.3	269.9	3.86	
329.9	1604	420	1465.5	10.9	0.00	2.21	269.6	229.9	134.8	185.0	269.6	3.84	
329.1	1656	420	1465.5	11.3	0.00	2.26	268.5	230.1	134.2	185.4	268.5	3.80	
328.3	1708	420	1465.5	11.6	0.00	2.31	267.4	230.4	133.7	185.8	267.4	3.76	
327.5	1756	420	1465.5	11.9	0.00	2.36	266.3	230.7	133.2	186.3	266.3	3.73	
326.7	1800	420	1465.5	12.2	0.00	2.41	265.4	231.0	132.7	186.8	265.4	3.70	
325.9	1854	421	1468.9	12.6	0.00	2.46	264.9	231.6	132.5	187.4	264.9	3.67	
325.1	1908	421	1468.9	13.0	0.00	2.51	263.7	231.8	131.9	187.8	263.7	3.64	
324.3	1956	421	1468.9	13.3	0.00	2.56	262.7	232.0	131.3	188.3	262.7	3.61	
323.5	2002	421	1468.9	13.6	0.00	2.60	261.7	232.3	130.8	188.7	261.7	3.58	
322.7	2057	422	1472.4	14.0	0.00	2.65	261.2	232.9	130.6	189.4	261.2	3.55	
321.9	2100	422	1472.4	14.3	0.00	2.69	260.3	233.2	130.1	189.9	260.3	3.52	
321.1	2154	422	1472.4	14.6	0.00	2.74	259.1	233.4	129.5	190.3	259.1	3.49	
320.3	2200	422	1472.4	15.0	0.00	2.78	258.1	233.7	129.0	190.7	258.1	3.47	

Final volume (cm³): 615.641 Final length (mm): 125.1 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D224
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.00
			To	:	-

Laboratory Information

Date shearing commenced	:	06/02/2010	Time :	09:00	Lab. sample I.D.	:	SL100076/3	
Date shearing completed	:	06/02/2010	Time :	16:33	Specimen ref.	:	C	
Proving ring serial No.	:	8775			Cell pressure	:	605	kPa
Type of membrane	:	rubber			Back pressure	:	245	kPa
Corrections					Effective pressure	:	360	kPa
Side drain, σ_{dr}	:	0.000	kPa/%		Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.66	mm		Volume V_c	:	600.47	cm^3
Rate of axial displacement	:	0.050	mm/min		Area A_c	:	4122.1	mm^2
Pore pressure coefficient, A_f	:	0.46			Length L_c	:	145.7	mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	41	254.8	0.0	0.00	0.00	0.0	360.0	0.0	360.0	0.0	1.00
246.6	35	150	932.1	0.2	0.00	0.06	163.8	440.3	81.9	413.0	163.8	1.46
275.9	65	180	1118.5	0.4	0.00	0.12	208.5	433.3	104.2	398.6	208.5	1.63
364.4	90	196	1217.9	0.6	0.00	0.16	232.0	356.6	116.0	317.9	232.0	1.96
416.1	120	211	1311.1	0.8	0.00	0.21	253.9	315.9	127.0	273.5	253.9	2.34
435.5	160	216	1342.2	1.1	0.00	0.28	260.6	299.8	130.3	256.4	260.6	2.54
441.9	180	226	1404.3	1.2	0.00	0.31	275.1	300.7	137.6	254.8	275.1	2.69
447.4	210	234	1454.0	1.4	0.00	0.36	286.4	300.8	143.2	253.1	286.4	2.82
453.6	240	242	1503.7	1.6	0.00	0.41	297.6	300.2	148.8	250.6	297.6	2.97
456.8	276	248	1541.0	1.9	0.00	0.47	305.6	301.0	152.8	250.1	305.6	3.06
459.2	300	252	1565.9	2.1	0.00	0.51	311.0	301.3	155.5	249.5	311.0	3.13
462.8	330	256	1590.7	2.3	0.00	0.56	316.2	300.3	158.1	247.6	316.2	3.22
465.5	370	260	1615.6	2.5	0.00	0.62	321.1	300.1	160.6	246.5	321.1	3.30
467.0	398	264	1640.4	2.7	0.00	0.67	326.3	301.2	163.2	246.8	326.3	3.36
468.5	423	268	1665.3	2.9	0.00	0.70	331.5	302.3	165.8	247.0	331.5	3.43
470.0	456	271	1683.9	3.1	0.00	0.75	335.1	302.5	167.5	246.7	335.1	3.48
471.7	492	275	1708.8	3.4	0.00	0.81	340.0	303.3	170.0	246.6	340.0	3.55
473.2	514	278	1727.4	3.5	0.00	0.84	343.8	303.7	171.9	246.4	343.8	3.61
474.5	544	282	1752.3	3.7	0.00	0.88	348.8	304.9	174.4	246.8	348.8	3.67
475.4	570	286	1777.1	3.9	0.00	0.92	353.9	306.6	177.0	247.6	353.9	3.73
474.1	603	289	1795.8	4.1	0.00	0.97	357.4	309.6	178.7	250.0	357.4	3.73
472.8	632	292	1814.4	4.3	0.00	1.01	360.9	312.7	180.5	252.5	360.9	3.73
471.6	666	295	1833.1	4.6	0.00	1.06	364.3	315.6	182.2	254.8	364.3	3.73
470.4	694	298	1851.7	4.8	0.00	1.10	367.9	318.5	183.9	257.2	367.9	3.73
469.2	722	301	1870.3	5.0	0.00	1.13	371.4	321.5	185.7	259.6	371.4	3.73
468.0	756	304	1889.0	5.2	0.00	1.18	374.7	324.3	187.3	261.9	374.7	3.73
466.8	780	308	1913.8	5.4	0.00	1.21	379.7	328.1	189.9	264.8	379.7	3.75
465.6	812	311	1932.5	5.6	0.00	1.25	383.1	330.9	191.5	267.1	383.1	3.75
464.1	846	314	1951.1	5.8	0.00	1.30	386.3	334.1	193.2	269.7	386.3	3.74
462.9	877	318	1976.0	6.0	0.00	1.34	391.1	337.6	195.5	272.5	391.1	3.75
461.5	904	321	1994.6	6.2	0.00	1.37	394.5	340.8	197.3	275.0	394.5	3.75
460.1	932	324	2013.3	6.4	0.00	1.41	397.9	343.8	198.9	277.5	397.9	3.75
458.7	966	327	2031.9	6.6	0.00	1.45	401.1	346.8	200.5	280.0	401.1	3.74
458.7	992	331	2056.8	6.8	0.00	1.48	405.9	349.2	202.9	281.6	405.9	3.77
458.7	1020	333	2069.2	7.0	0.00	1.52	407.8	350.2	203.9	282.2	407.8	3.79

Final volume (cm^3): 600.47 Final length (mm): 123.7 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D224
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/3
Specimen ref. : C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
458.0	1056	336	2087.8	7.2	0.00	1.56	410.9	352.4	205.4	284.0	410.9	3.80	
457.3	1088	339	2106.5	7.5	0.00	1.60	414.1	354.7	207.0	285.7	414.1	3.80	
456.6	1112	342	2125.1	7.6	0.00	1.63	417.5	357.1	208.7	287.6	417.5	3.81	
455.9	1146	346	2150.0	7.9	0.00	1.67	421.9	360.1	211.0	289.7	421.9	3.83	
455.2	1178	348	2162.4	8.1	0.00	1.70	423.6	361.6	211.8	291.0	423.6	3.83	
454.5	1203	351	2181.0	8.3	0.00	1.73	427.0	364.0	213.5	292.8	427.0	3.84	
453.8	1232	354	2199.7	8.5	0.00	1.76	430.2	366.3	215.1	294.6	430.2	3.84	
453.1	1269	357	2218.3	8.7	0.00	1.80	433.0	368.4	216.5	296.2	433.0	3.85	
452.4	1296	360	2237.0	8.9	0.00	1.83	436.2	370.7	218.1	298.0	436.2	3.86	
451.7	1328	362	2249.4	9.1	0.00	1.87	437.9	372.2	218.9	299.3	437.9	3.86	
451.0	1355	364	2261.8	9.3	0.00	1.90	439.7	373.9	219.9	300.6	439.7	3.86	
450.3	1386	366	2274.2	9.5	0.00	1.93	441.4	375.4	220.7	301.8	441.4	3.85	
449.6	1416	368	2286.7	9.7	0.00	1.96	443.0	376.9	221.5	303.1	443.0	3.85	
448.9	1448	369	2292.9	9.9	0.00	2.00	443.3	377.7	221.6	303.9	443.3	3.84	
448.1	1457	370	2299.1	10.0	0.00	2.01	444.3	379.1	222.2	305.0	444.3	3.83	«
447.4	1500	370	2299.1	10.3	0.00	2.05	442.8	379.0	221.4	305.2	442.8	3.81	
446.8	1532	371	2305.3	10.5	0.00	2.08	443.0	379.7	221.5	305.9	443.0	3.80	
446.1	1566	371	2305.3	10.8	0.00	2.12	441.8	379.8	220.9	306.2	441.8	3.78	
445.4	1606	371	2305.3	11.0	0.00	2.16	440.4	379.8	220.2	306.4	440.4	3.76	
444.7	1656	372	2311.5	11.4	0.00	2.21	440.0	380.3	220.0	307.0	440.0	3.74	
444.1	1708	372	2311.5	11.7	0.00	2.26	438.2	380.0	219.1	307.0	438.2	3.72	
443.3	1753	372	2311.5	12.0	0.00	2.30	436.6	380.0	218.3	307.2	436.6	3.70	
442.6	1800	372	2311.5	12.4	0.00	2.35	434.9	379.9	217.5	307.4	434.9	3.68	
441.9	1858	372	2311.5	12.8	0.00	2.40	432.9	379.6	216.5	307.4	432.9	3.65	
441.2	1902	372	2311.5	13.1	0.00	2.44	431.4	379.5	215.7	307.6	431.4	3.63	
440.5	1955	373	2317.7	13.4	0.00	2.49	430.8	379.9	215.4	308.1	430.8	3.62	
439.8	2006	373	2317.7	13.8	0.00	2.54	429.0	379.7	214.5	308.2	429.0	3.60	
439.0	2057	373	2317.7	14.1	0.00	2.59	427.2	379.6	213.6	308.4	427.2	3.57	
438.4	2108	373	2317.7	14.5	0.00	2.63	425.4	379.3	212.7	308.4	425.4	3.55	
437.7	2155	373	2317.7	14.8	0.00	2.67	423.7	379.2	211.9	308.5	423.7	3.53	
437.0	2200	374	2323.9	15.1	0.00	2.71	423.4	379.7	211.7	309.1	423.4	3.52	

Final volume (cm^3): 600.47 Final length (mm): 123.7 Termination criterion : Maximum deviator stress

Remarks:

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Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 6.00
To : -
Sample origin : CDM
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 29-01-2010
Date test(s) completed : 04-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 19.5 °C
Visual description : Moist, brown spotted with black and white, mottled with grey, silty/clayey, gravelly SAND.

Lab. sample I.D. : SL100076/4
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 6.80
To : 7.00
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	30			60			120	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.6	74.1	75.5	75.1	76.4		75.9	80.4
Length	mm	150.2	149.3	144.1	143.3	138.3		137.4	122.4
Volume	cm³	656.50	644.40	644.40	634.40	634.40		622.10	622.10
Wet mass	g	1222.0	1222.8	1222.8	1212.8	1212.8		1200.5	1200.5
Dry mass	g	933.0	933.0	933.0	933.0	933.0		933.0	933.0
Moisture content	%	31.0	31.1	31.1	30.0	30.0		28.7	28.7
Bulk density	Mg/m³	1.86	1.90	1.90	1.91	1.91		1.93	1.93
Dry density	Mg/m³	1.42	1.45	1.45	1.47	1.47		1.50	1.50
Void ratio		0.86	0.83	0.83	0.80	0.80		0.77	0.77
Degree of saturation	%	94.9	99.1	99.1	99.1	99.1		99.1	99.1
Saturation Stage									
**Volume change of water	cm³	12.9							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	270.0			286.4			327.4	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	12.1			10.0			12.3	
m_{vl}	m²/MN	0.74			0.37			0.24	
t_{50}	min	3.10			2.10			1.65	
c_{vl} (from t_{50})	m²/yr	1446.50			1966.01			2304.10	
t_{100}	min	8.41			5.52			4.41	
c_{vl} (from t_{100})	m²/yr	1070.72			1671.21			2141.89	
Sketch of failed specimen (Failure Mode)								Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

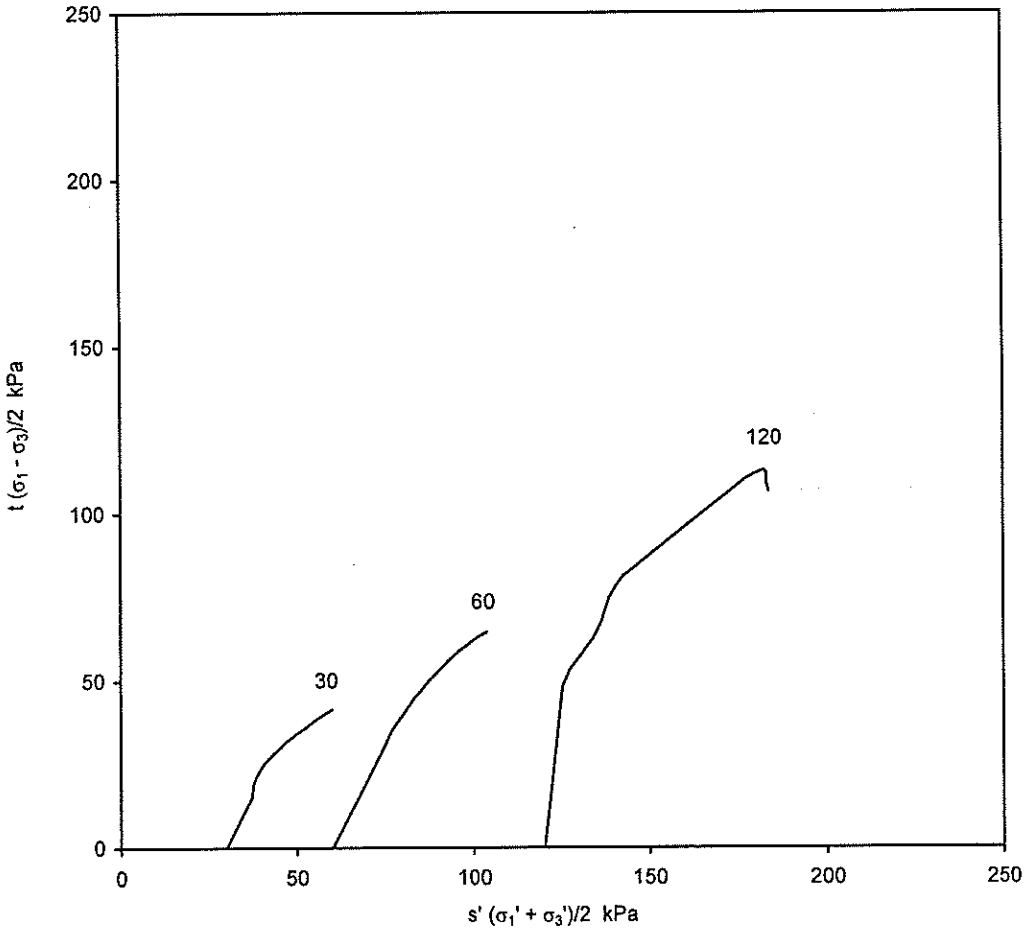
Client sample No. : -
Borehole No. : D225
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/4
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	30	3.2	3.2	257.1	80.9	58.3	40.4
2	60	3.2	7.2	266.2	127.8	102.7	63.9
3	120	5.7	13.6	295.1	225.5	182.7	112.8



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HKAS KOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

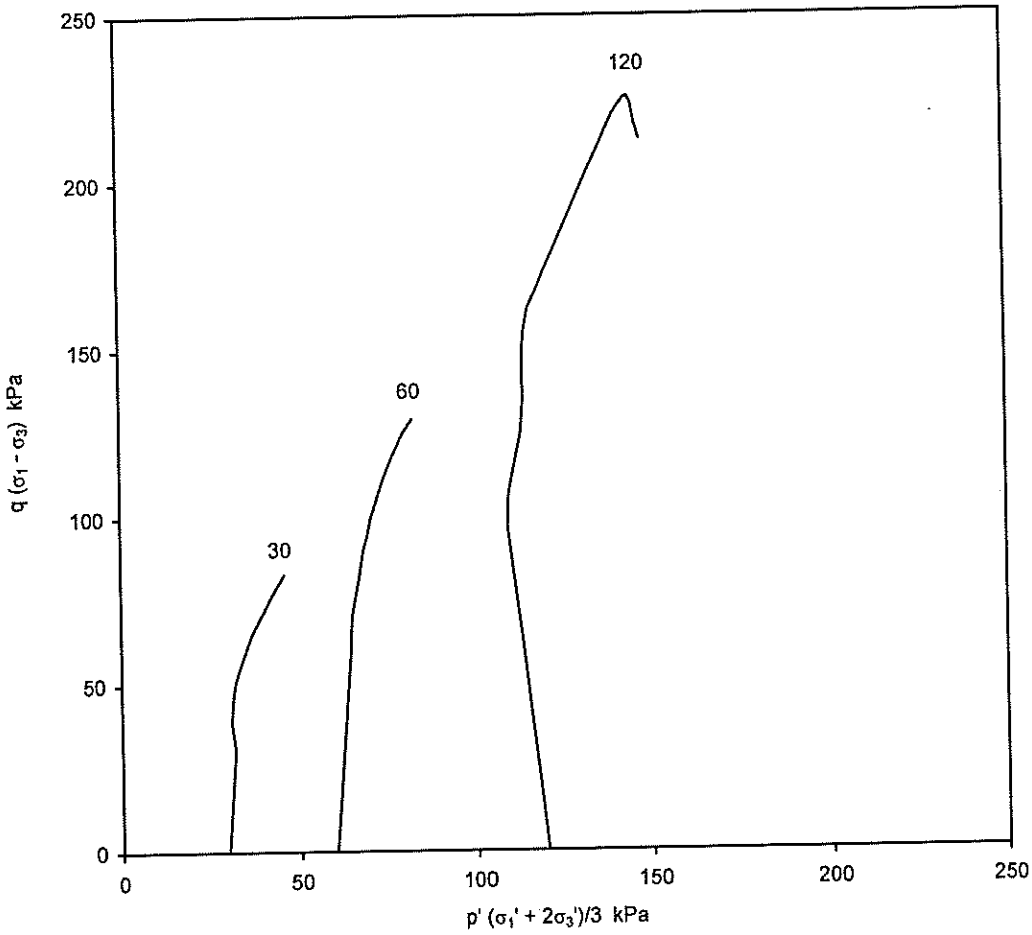
Client sample No. : -
Borehole No. : D225
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/4
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	30	3.2	3.2	257.1	80.9	44.9	80.9
2	60	3.2	7.2	266.2	127.8	81.4	127.8
3	120	5.7	13.6	295.1	225.5	145.1	225.5



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

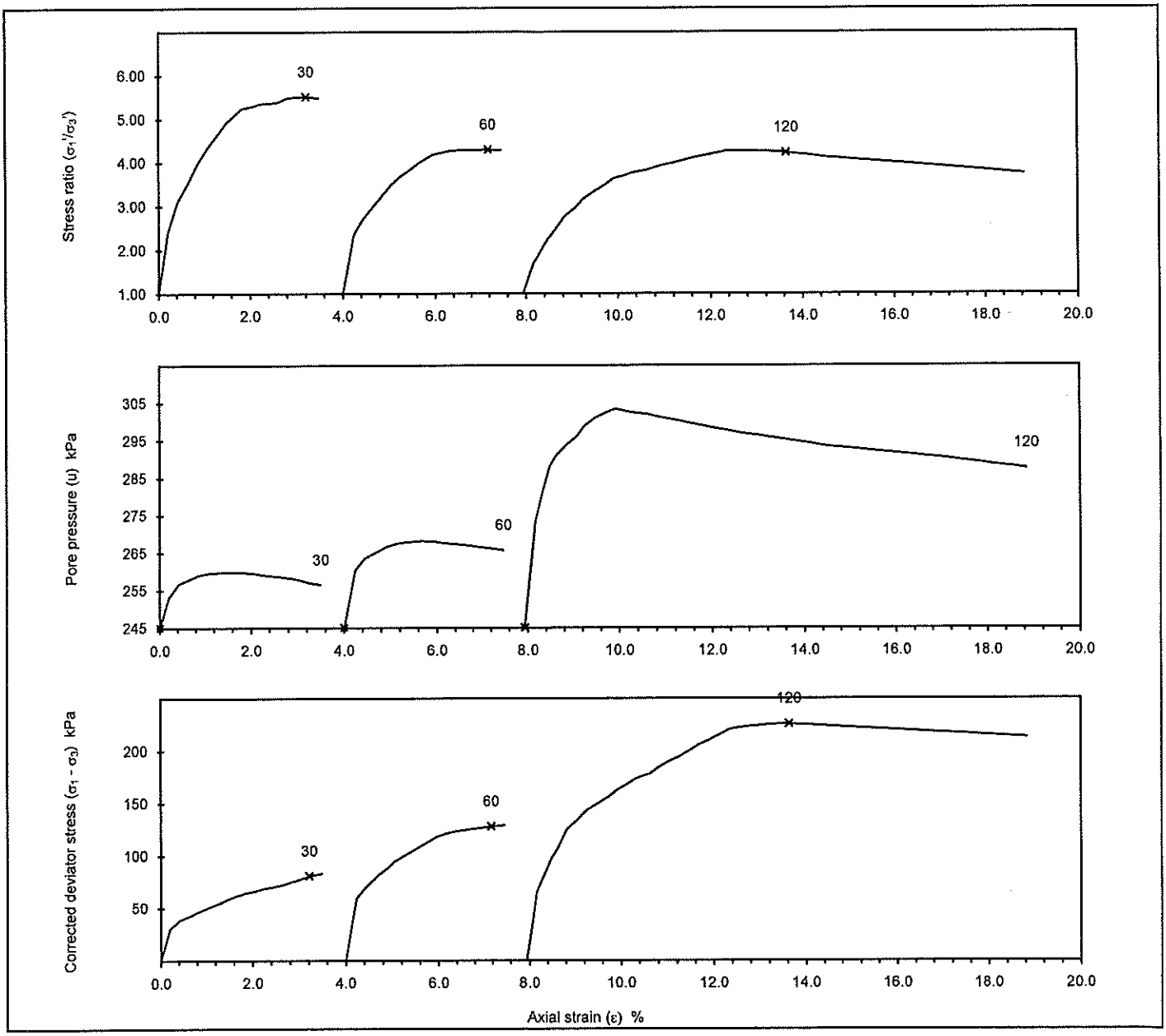
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/4
Specimen ref. : A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/4
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	30	
	Stage 2	kPa	60	
	Stage 3	kPa	120	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			125	120
			150	145
			175	170
			200	195
			225	220
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		0.99
Volume change	cm^3	12.9

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1197.8
Final moisture content	%	28.4
Final bulk density	Mg/m^3	1.93

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 6.00
To : -

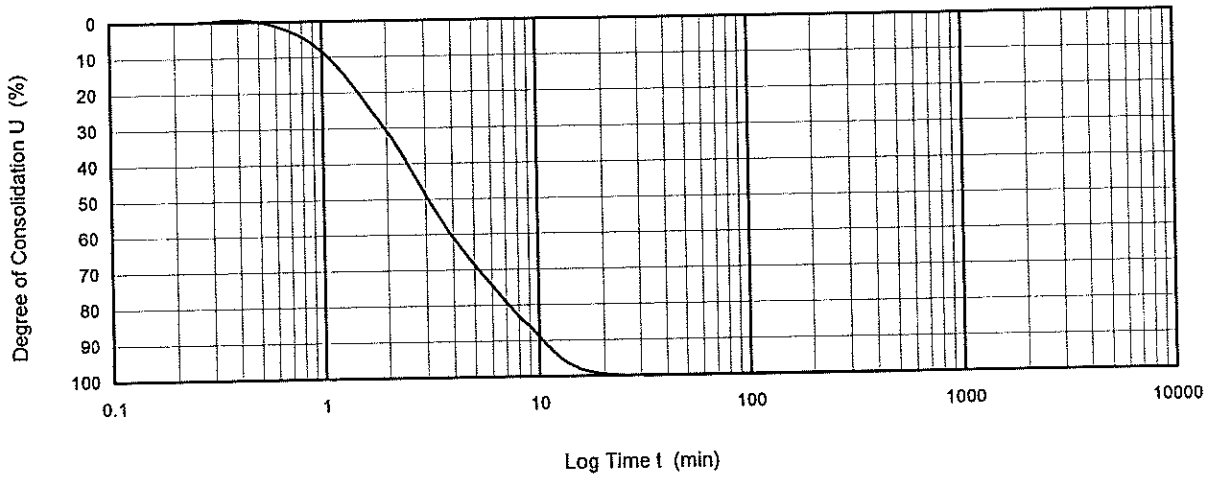
Laboratory Information

Cell pressure : 275 kPa
Back pressure : 245 kPa
Effective pressure : 30 kPa

Lab. sample I.D. : SL100076/4
Specimen ref. : A

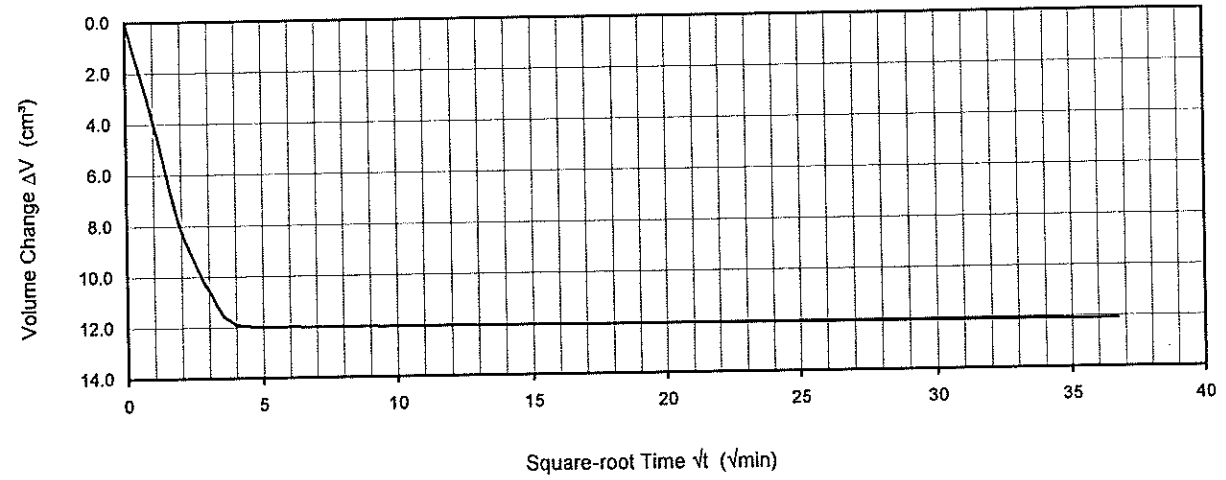
Degree of Consolidation vs. Log Time

t_{50} = 3.10 min ΔV = 12.1 cm^3



Volume Change vs. Square-root Time

t_{100} = 8.41 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

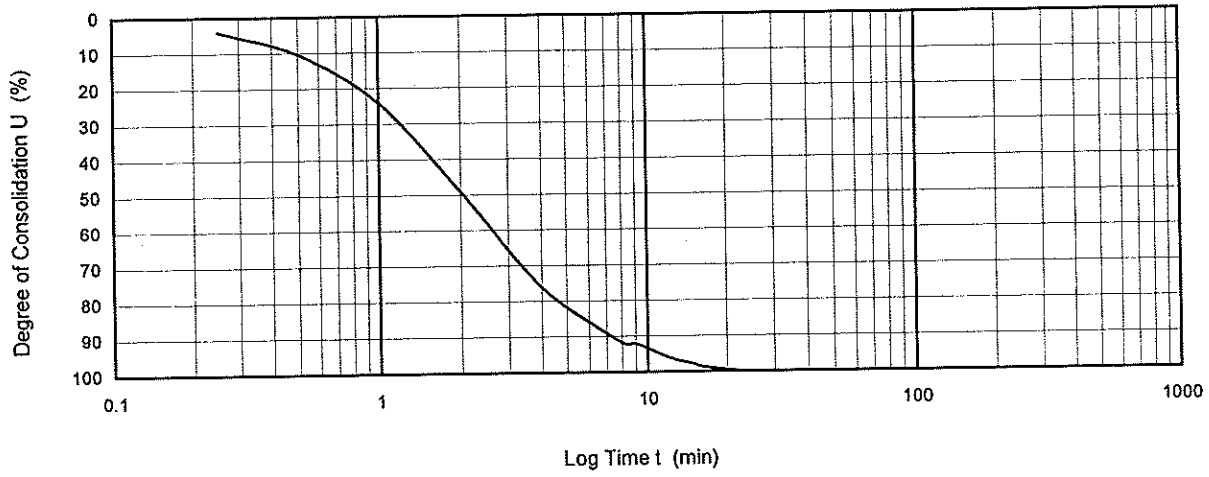
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D225
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	6.00
			To	:	-

Laboratory Information

Cell pressure	:	305 kPa	Lab. sample I.D.	:	SL100076/4
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	60 kPa			

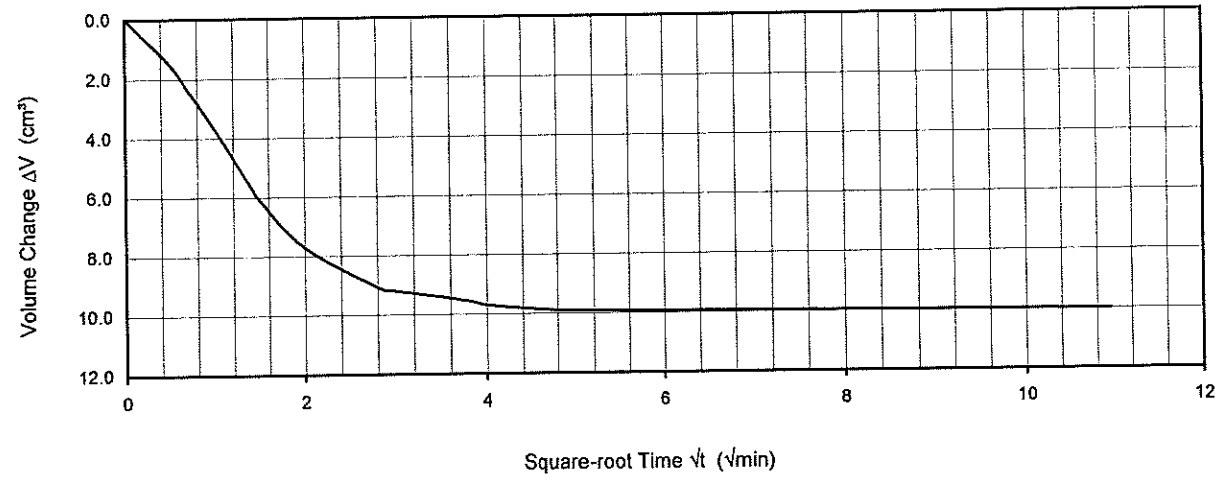
Degree of Consolidation vs. Log Time

t_{50} = 2.10 min ΔV = 10.0 cm³



Volume Change vs. Square-root Time

t_{100} = 5.52 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

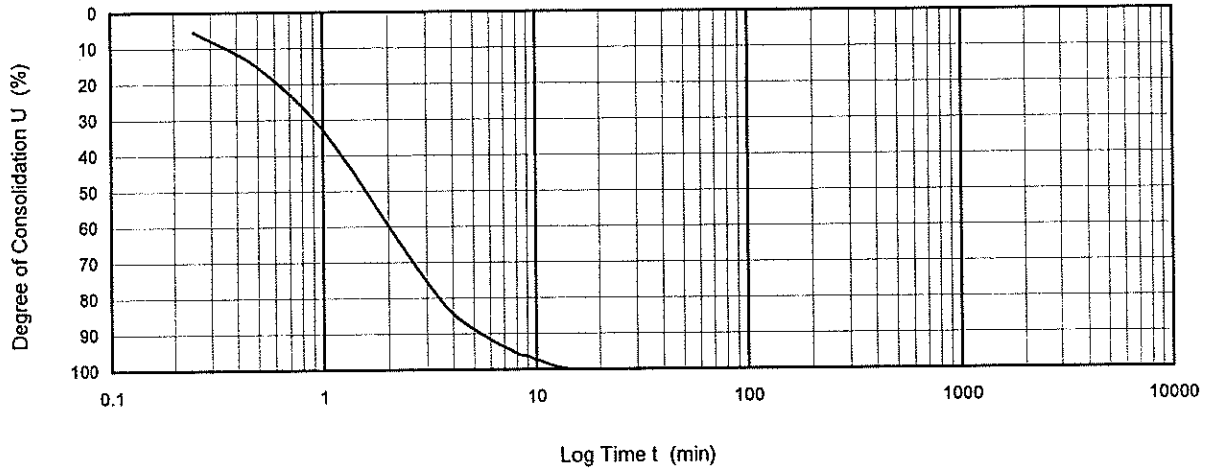
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D225
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	6.00
			To	:	-

Laboratory Information

Cell pressure	:	365 kPa	Lab. sample I.D.	:	SL100076/4
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	120 kPa			

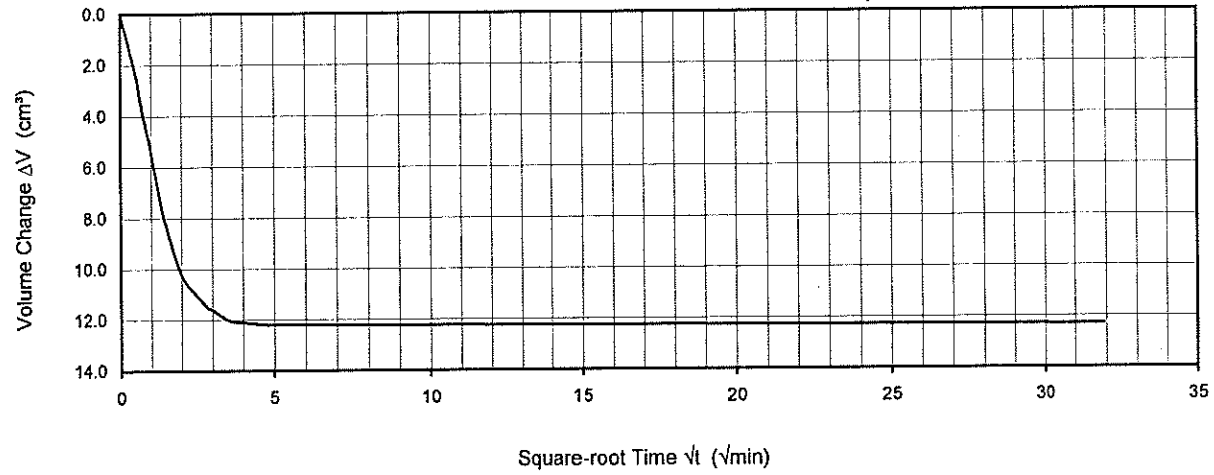
Degree of Consolidation vs. Log Time

t_{50} = 1.65 min ΔV = 12.3 cm³



Volume Change vs. Square-root Time

t_{100} = 4.41 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 6.00
To : -

Laboratory Information

Date shearing commenced : 02/02/2010 Time : 13:30
Date shearing completed : 02/02/2010 Time : 15:25
Proving ring serial No. : 15167
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.17

Lab. sample I.D. : SL100076/4
Specimen ref. : A
Cell pressure : 305 kPa
Back pressure : 245 kPa
Effective pressure : 60 kPa

Dimensions at starting of compression

Volume V_c : 634.40 cm^3
Area A_c : 4427.0 mm^2
Length L_c : 143.3 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.198	133.8	0.0	4.0	0.00	0.97	0.0	60.0	0.0	60.0	0.0	1.00
260.4	35	0.595	402.0	0.2	4.2	0.00	1.02	59.4	74.3	29.7	64.4	59.4	2.33
263.5	63	0.666	450.0	0.4	4.4	0.00	1.06	70.1	76.5	35.0	64.9	70.1	2.69
265.3	102	0.744	502.7	0.7	4.7	0.00	1.12	81.6	80.5	40.8	66.9	81.6	3.06
266.8	136	0.801	541.2	0.9	4.9	0.00	1.17	90.0	83.2	45.0	68.2	90.0	3.36
267.1	150	0.830	560.8	1.0	5.0	0.00	1.19	94.3	85.0	47.1	69.3	94.3	3.49
267.8	180	0.868	586.5	1.3	5.3	0.00	1.23	99.7	87.1	49.9	70.4	99.7	3.68
268.0	210	0.904	610.8	1.5	5.5	0.00	1.27	104.9	89.5	52.5	72.0	104.9	3.84
268.2	240	0.944	637.8	1.7	5.7	0.00	1.31	110.6	92.1	55.3	73.7	110.6	4.01
268.0	283	0.996	673.0	2.0	6.0	0.00	1.37	118.0	96.0	59.0	76.3	118.0	4.19
267.6	306	1.015	685.8	2.1	6.1	0.00	1.40	120.6	97.7	60.3	77.6	120.6	4.23
267.4	335	1.032	697.3	2.3	6.3	0.00	1.44	122.9	99.0	61.4	78.6	122.9	4.27
267.2	362	1.042	704.1	2.5	6.5	0.00	1.48	124.1	99.8	62.0	79.2	124.1	4.28
266.9	392	1.052	710.8	2.7	6.7	0.00	1.51	125.3	100.7	62.6	79.9	125.3	4.29
266.6	420	1.062	717.6	2.9	6.9	0.00	1.55	126.5	101.6	63.2	80.6	126.5	4.29
266.2	456	1.074	725.7	3.2	7.2	0.00	1.60	127.8	102.7	63.9	81.4	127.8	4.30
265.7	498	1.086	733.8	3.5	7.5	0.00	1.65	129.2	103.9	64.6	82.4	129.2	4.29

Final volume (cm^3): 634.40 Final length (mm): 138.3 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 6.00
To : -

Laboratory Information

Date shearing commenced : 03/02/2010 Time : 09:00
Date shearing completed : 03/02/2010 Time : 14:30
Proving ring serial No. : 9689
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.22

Lab. sample I.D. : SL100076/4
Specimen ref. : A
Cell pressure : 365 kPa
Back pressure : 245 kPa
Effective pressure : 120 kPa

Dimensions at starting of compression

Volume V_c : 622.10 cm^3
Area A_c : 4526.9 mm^2
Length L_c : 137.4 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.226	161.0	0.0	7.9	0.00	1.73	0.0	120.0	0.0	120.0	0.0	1.00
273.5	30	0.648	461.8	0.2	8.2	0.00	1.77	64.5	123.8	32.3	113.0	64.5	1.71
288.0	75	0.856	610.0	0.5	8.5	0.00	1.82	96.8	125.4	48.4	109.3	96.8	2.26
290.9	94	0.920	655.6	0.7	8.6	0.00	1.85	106.6	127.4	53.3	109.6	106.6	2.44
293.4	122	1.038	739.7	0.9	8.8	0.00	1.88	124.8	134.0	62.4	113.2	124.8	2.74
296.0	156	1.104	786.7	1.1	9.1	0.00	1.92	134.7	136.4	67.4	113.9	134.7	2.95
298.8	180	1.158	825.2	1.3	9.2	0.00	1.95	142.8	137.6	71.4	113.8	142.8	3.16
300.9	212	1.201	855.8	1.5	9.5	0.00	1.99	149.1	138.7	74.6	113.8	149.1	3.33
302.4	246	1.246	887.9	1.8	9.7	0.00	2.03	155.7	140.4	77.8	114.5	155.7	3.49
303.4	273	1.292	920.7	2.0	9.9	0.00	2.06	162.4	142.8	81.2	115.7	162.4	3.64
302.7	304	1.332	949.2	2.2	10.1	0.00	2.09	168.2	146.4	84.1	118.4	168.2	3.70
302.3	330	1.369	975.5	2.4	10.3	0.00	2.12	173.5	149.4	86.7	120.5	173.5	3.77
301.9	370	1.403	999.8	2.7	10.6	0.00	2.17	178.1	152.2	89.1	122.5	178.1	3.82
301.3	394	1.441	1026.8	2.9	10.8	0.00	2.19	183.6	155.5	91.8	124.9	183.6	3.88
300.8	422	1.479	1053.9	3.1	11.0	0.00	2.22	189.0	158.7	94.5	127.2	189.0	3.94
300.3	456	1.516	1080.3	3.3	11.3	0.00	2.26	194.1	161.7	97.0	129.4	194.1	4.00
299.7	485	1.556	1108.8	3.5	11.5	0.00	2.29	199.7	165.1	99.8	131.9	199.7	4.06
299.2	512	1.593	1135.2	3.7	11.7	0.00	2.32	204.8	168.2	102.4	134.1	204.8	4.11
298.6	547	1.632	1162.9	4.0	11.9	0.00	2.36	210.2	171.5	105.1	136.5	210.2	4.16
298.1	576	1.668	1188.6	4.2	12.1	0.00	2.39	215.1	174.4	107.5	138.6	215.1	4.21
297.6	608	1.706	1215.7	4.4	12.4	0.00	2.42	220.2	177.5	110.1	140.8	220.2	4.27
297.1	633	1.720	1225.7	4.6	12.5	0.00	2.45	221.9	178.8	110.9	141.9	221.9	4.27
296.7	662	1.732	1234.2	4.8	12.8	0.00	2.48	223.2	179.9	111.6	142.7	223.2	4.27
296.3	696	1.740	1239.9	5.1	13.0	0.00	2.51	223.7	180.6	111.9	143.3	223.7	4.26
295.9	722	1.750	1247.0	5.3	13.2	0.00	2.54	224.7	181.5	112.4	144.0	224.7	4.25
295.5	756	1.758	1252.7	5.5	13.4	0.00	2.57	225.3	182.2	112.7	144.6	225.3	4.24
295.1	784	1.763	1256.3	5.7	13.6	0.00	2.60	225.5	182.7	112.8	145.1	225.5	4.23
294.7	812	1.764	1257.0	5.9	13.8	0.00	2.63	225.2	182.9	112.6	145.4	225.2	4.20
294.3	846	1.764	1257.0	6.2	14.1	0.00	2.66	224.5	183.0	112.3	145.5	224.5	4.18
293.8	877	1.764	1257.0	6.4	14.3	0.00	2.70	224.0	183.2	112.0	145.9	224.0	4.15
293.4	900	1.764	1257.0	6.5	14.5	0.00	2.72	223.5	183.4	111.8	146.1	223.5	4.12
293.0	954	1.765	1257.7	6.9	14.9	0.00	2.77	222.7	183.3	111.3	146.2	222.7	4.09
292.5	1008	1.765	1257.7	7.3	15.3	0.00	2.82	221.7	183.3	110.8	146.4	221.7	4.06
292.1	1052	1.765	1257.7	7.7	15.6	0.00	2.87	220.8	183.3	110.4	146.5	220.8	4.03

«

Final volume (cm^3): 622.10 Final length (mm): 122.4 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 6.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/4
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
291.6	1110	1.766	1258.4	8.1	16.0	0.00	2.92	219.9	183.4	110.0	146.7	219.9	4.00
291.2	1157	1.766	1258.4	8.4	16.4	0.00	2.97	219.0	183.3	109.5	146.8	219.0	3.97
290.7	1208	1.766	1258.4	8.8	16.7	0.00	3.01	218.1	183.3	109.0	147.0	218.1	3.94
290.3	1255	1.766	1258.4	9.1	17.1	0.00	3.06	217.2	183.3	108.6	147.1	217.2	3.91
289.7	1304	1.767	1259.1	9.5	17.4	0.00	3.11	216.4	183.5	108.2	147.4	216.4	3.87
289.2	1356	1.767	1259.1	9.9	17.8	0.00	3.16	215.5	183.5	107.7	147.6	215.5	3.84
288.6	1400	1.767	1259.1	10.2	18.1	0.00	3.20	214.7	183.7	107.3	148.0	214.7	3.81
288.1	1454	1.767	1259.1	10.6	18.5	0.00	3.25	213.7	183.7	106.8	148.1	213.7	3.78
287.5	1500	1.768	1259.9	10.9	18.9	0.00	3.29	212.9	184.0	106.5	148.5	212.9	3.75

Final volume (cm^3): 622.10 Final length (mm): 122.4 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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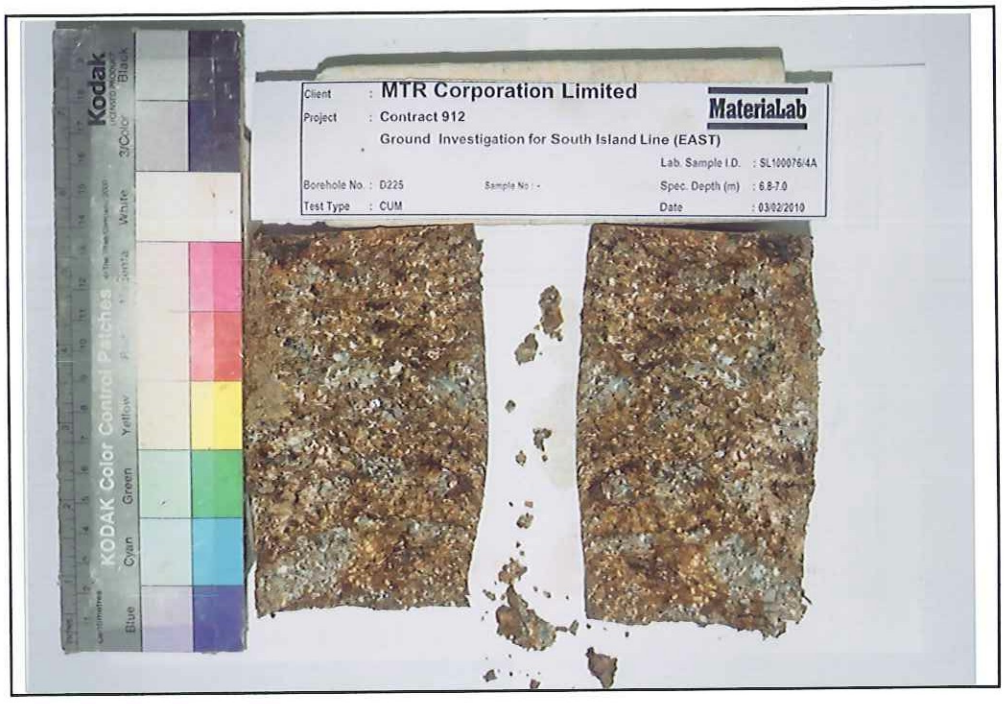
Photographic Records for Triaxial Test



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HKAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

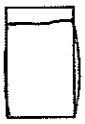
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -
Sample origin : CDM
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 02-02-2010
Date test(s) completed : 08-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 19.5 °C

Lab. sample I.D. : SL100076/5
Sample type : M

Specimen reference			A			B			C	
Specimen depth(m)	From		18.40			18.60			18.80	
	To		18.60			18.80			19.00	
Effective pressure		kPa	90			180			360	
*Measurements and Calculations			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.6	73.4	77.4	74.6	73.0	77.0	74.6	72.8	76.9
Length		mm	150.2	147.7	132.7	150.3	147.1	132.1	150.1	146.5	131.5
Volume		cm³	656.50	624.40	624.40	656.94	615.74	615.74	656.07	610.07	610.07
Wet mass		g	1278.6	1247.7	1247.7	1275.0	1234.4	1234.4	1280.9	1244.5	1244.5
Dry mass		g	997.8	997.8	997.8	994.6	994.6	994.6	1015.9	1015.9	1015.9
Moisture content		%	28.1	25.0	25.0	28.2	24.1	24.1	26.1	22.5	22.5
Bulk density		Mg/m³	1.95	2.00	2.00	1.94	2.00	2.00	1.95	2.04	2.04
Dry density		Mg/m³	1.52	1.60	1.60	1.51	1.62	1.62	1.55	1.67	1.67
Void ratio			0.74	0.66	0.66	0.75	0.64	0.64	0.71	0.59	0.59
Degree of saturation		%	100.3	100.8	100.8	99.6	99.7	99.7	97.2	100.8	100.8
Saturation Stage											
Volume change of water		cm³	1.2			0.6			9.6		
Consolidation Stage											
Side drain used			No			No			No		
Initial pore pressure		kPa	330.0			417.3			597.3		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm³	32.1			41.2			46.0		
m_{vi}		m²/MN	0.58			0.36			0.20		
t_{50}		min	5.30			3.50			3.30		
c_{vi}	(from t_{50})	m²/yr	837.27			1263.44			1332.96		
t_{100}		min	8.41			6.25			4.41		
c_{vi}	(from t_{100})	m²/yr	1059.59			1417.02			2008.35		
Sketch of failed specimen (Failure Mode)			 Plastic			Plastic			Plastic		
Visual description			Moist, brown spotted with white, mottled with dark brown, silty/clayey, gravelly SAND.			Moist, brown spotted with white, mottled with dark brown, silty/clayey, gravelly SAND.			Moist, brown spotted with white, mottled with dark brown, silty/clayey, gravelly SAND.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - GMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

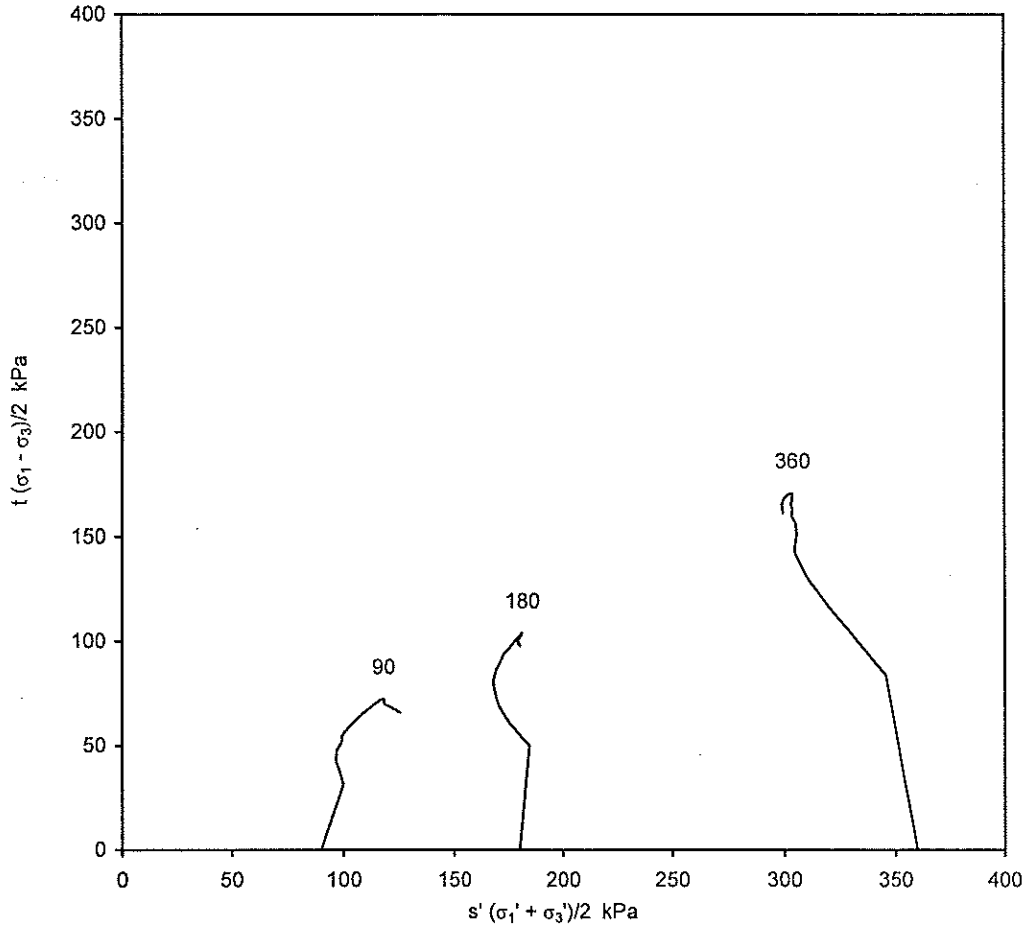
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D225
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.00
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL100076/5
Specimen ref.	:	A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
A	90	4.5	289.3	144.3	117.8	72.1
B	180	3.9	347.7	207.8	181.2	103.9
C	360	3.9	471.8	341.3	303.9	170.7



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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

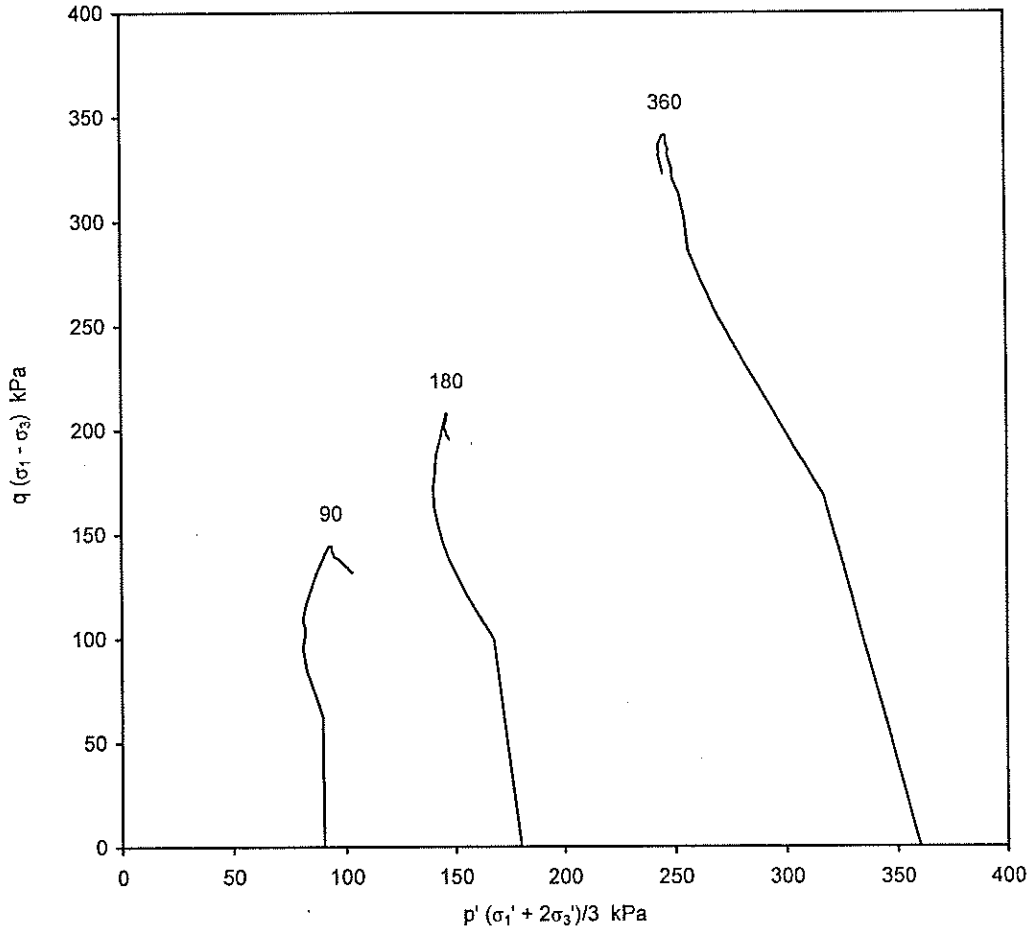
Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/5
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	90	4.5	289.3	144.3	93.8	144.3
B	180	3.9	347.7	207.8	146.6	207.8
C	360	3.9	471.8	341.3	247.0	341.3



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STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

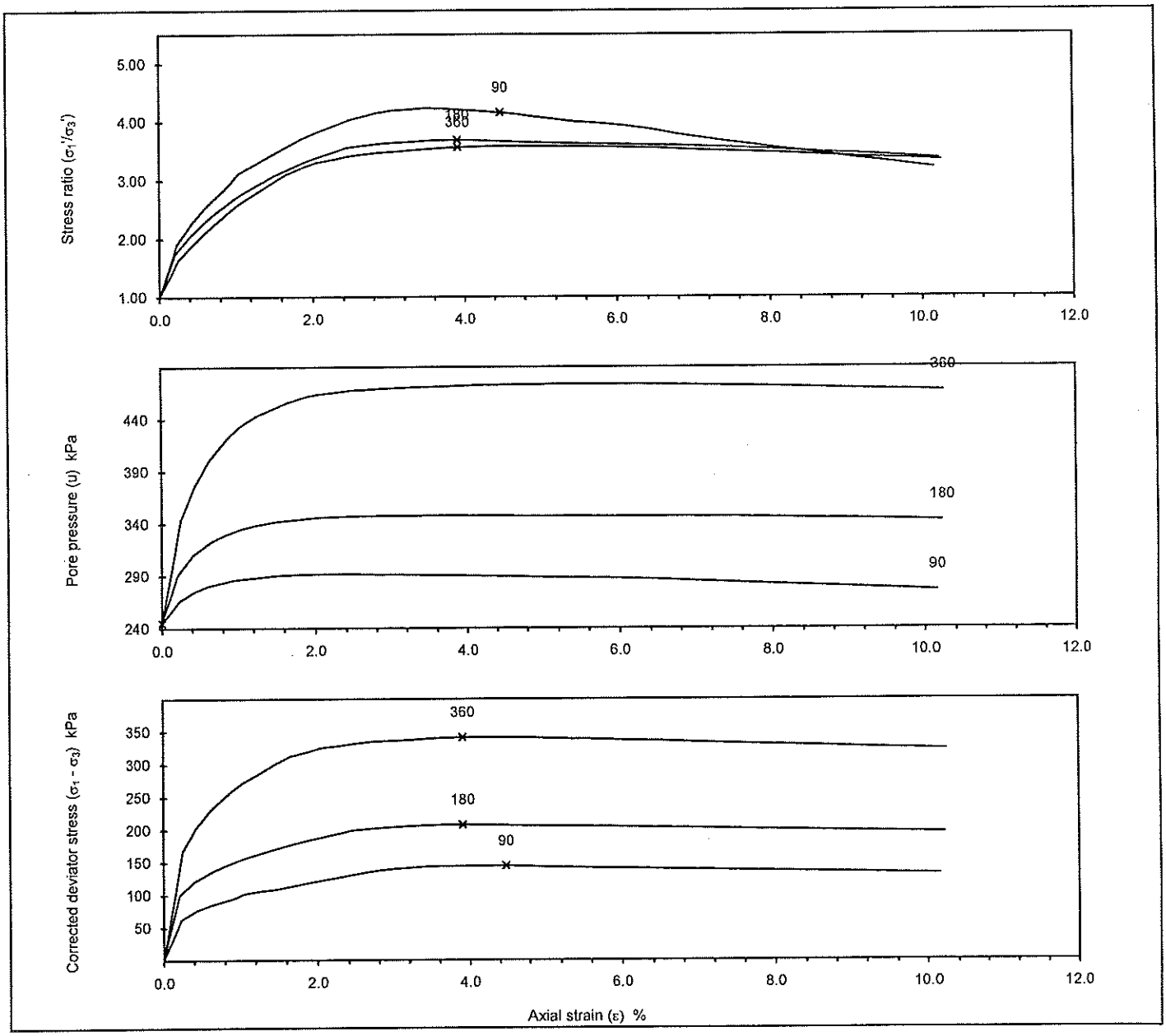
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/5
Specimen ref. : A, B, C



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/5

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	90		180		360	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		25	20	25	20	25	20
		50	45	50	45	50	45
		75	70	75	70	75	70
		100	95	100	95	100	95
		125	120	150	145	125	120
		150	145	200	195	150	145
		200	195	250	245	200	195
		250	245			250	245

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	2450.0	245.0	245.0
B value		1.00	1.00	1.00
Volume change	cm^3	1.2	0.6	9.6

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1245.7	1232.2	1242.2
Final moisture content	%	24.8	23.9	22.3
Final bulk density	Mg/m^3	2.00	2.00	2.04

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

CONSOLIDATION STAGE

Information supplied by Client

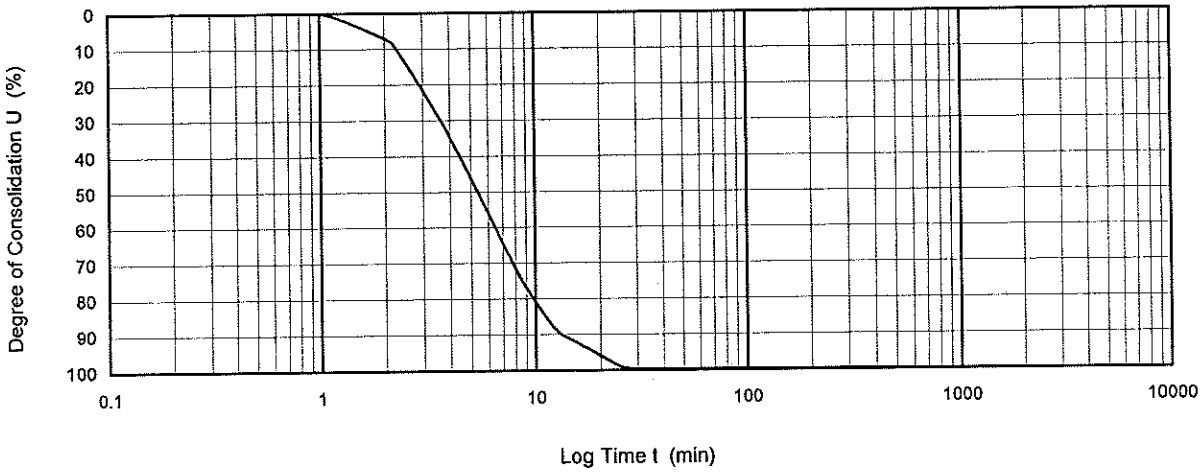
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D225
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.00
			To	:	-

Laboratory information

Cell pressure	:	335 kPa	Lab. sample I.D.	:	SL100076/5
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	90 kPa			

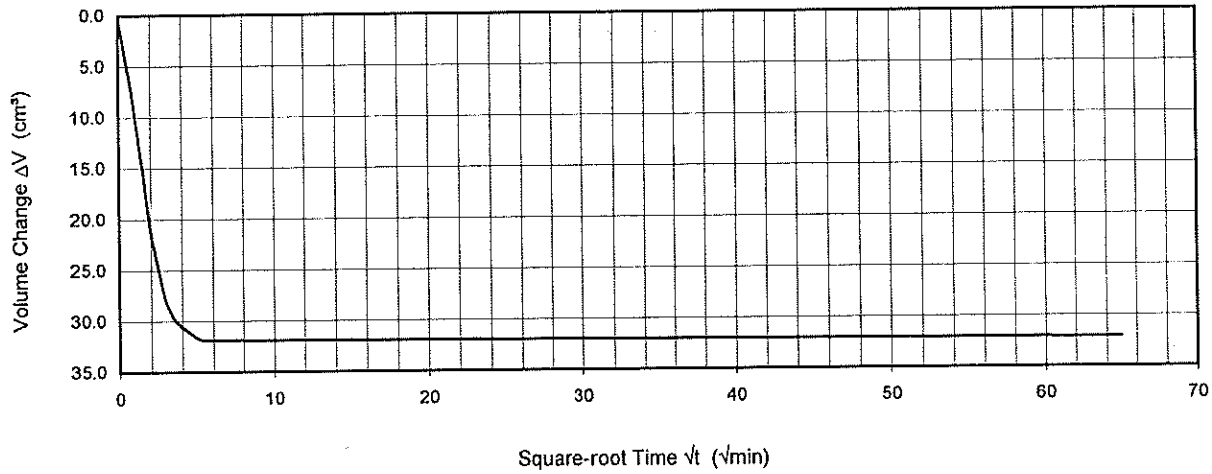
Degree of Consolidation vs. Log Time

t_{50} = 5.30 min ΔV = 32.1 cm³



Volume Change vs. Square-root Time

t_{100} = 8.41 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

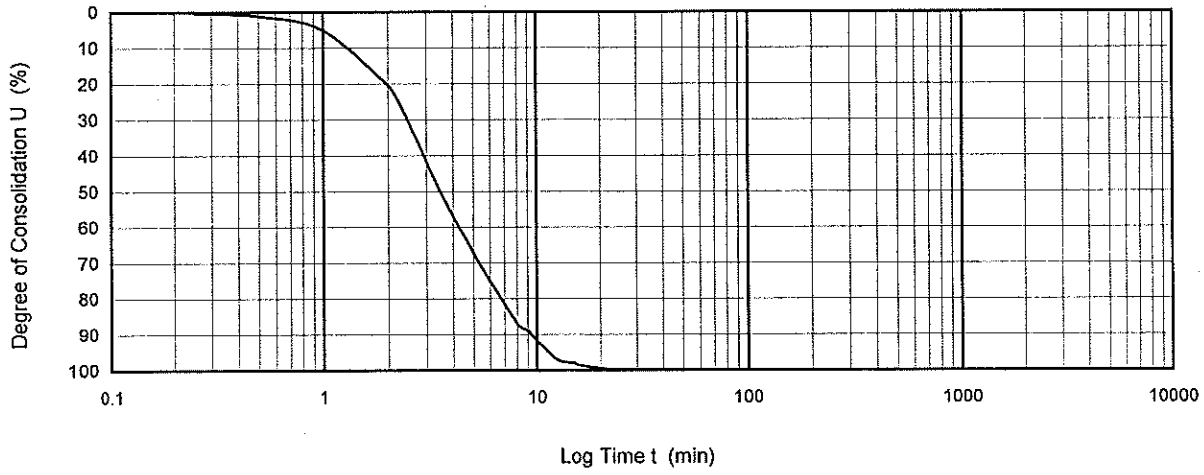
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D225
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.00
			To	:	-

Laboratory Information

Cell pressure	:	425 kPa	Lab. sample I.D.	:	SL100076/5
Back pressure	:	245 kPa	Specimen ref.	:	B
Effective pressure	:	180 kPa			

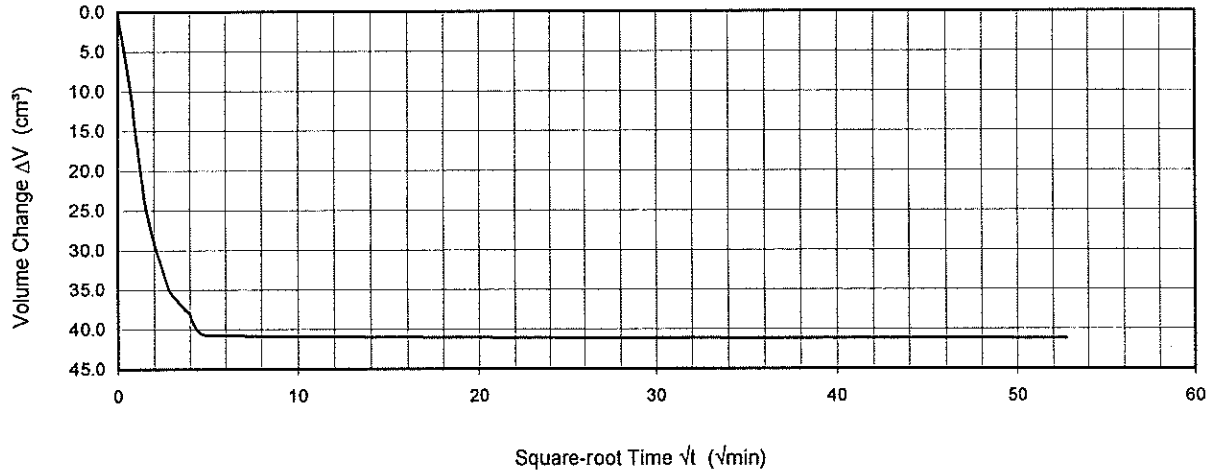
Degree of Consolidation vs. Log Time

t_{50} = 3.50 min ΔV = 41.2 cm³



Volume Change vs. Square-root Time

t_{100} = 6.25 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

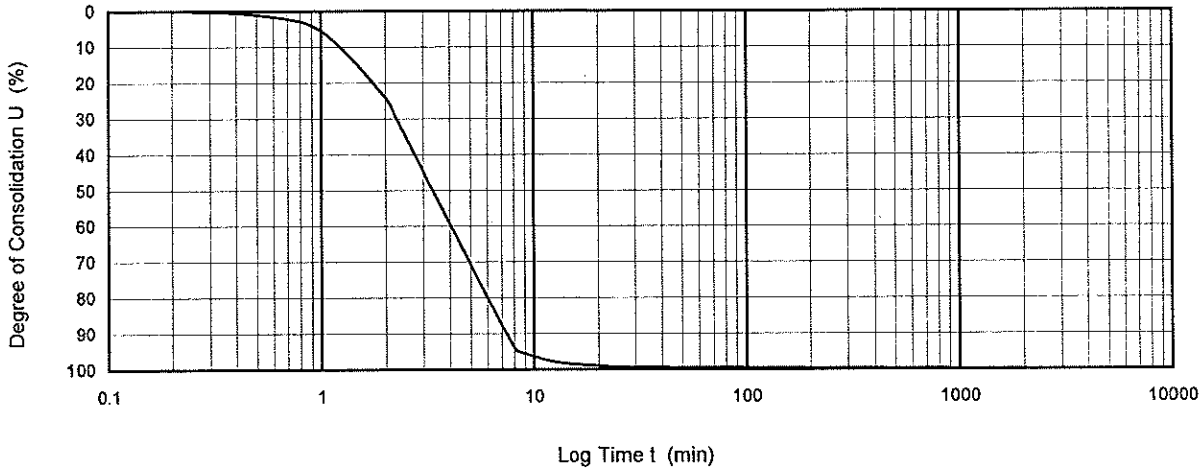
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D225
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	18.00
			To	:	-

Laboratory Information

Cell pressure	:	605 kPa	Lab. sample I.D.	:	SL100076/5
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	360 kPa			

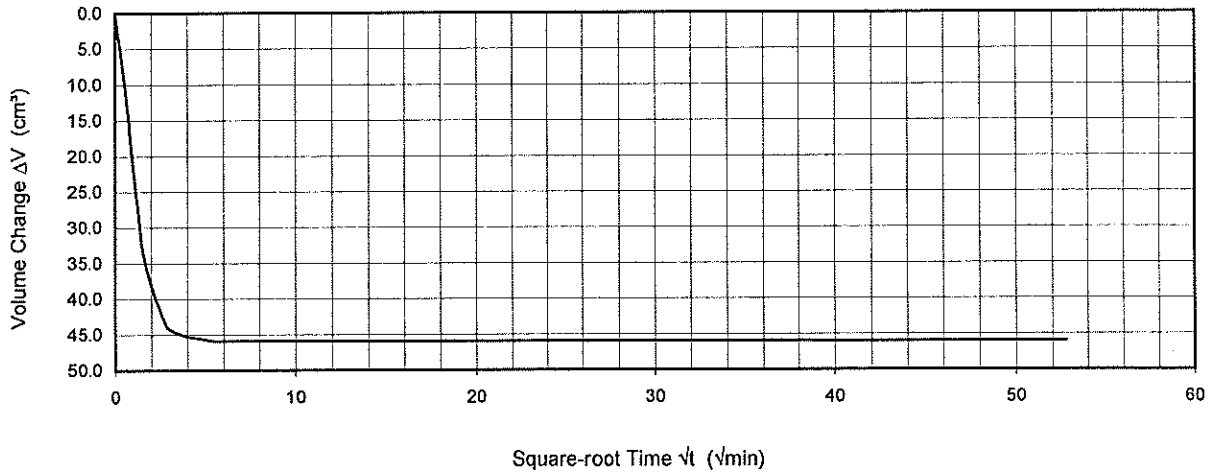
Degree of Consolidation vs. Log Time

t_{50} = 3.30 min ΔV = 46.0 cm³



Volume Change vs. Square-root Time

t_{100} = 4.41 min



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HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -

Laboratory Information

Date shearing commenced : 06/02/2010 Time : 09:00
Date shearing completed : 06/02/2010 Time : 14:07
Proving ring serial No. : 12202
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.31

Lab. sample I.D. : SL100076/5
Specimen ref. : A
Cell pressure : 335 kPa
Back pressure : 245 kPa
Effective pressure : 90 kPa

Dimensions at starting of compression

Volume V_c : 624.40 cm^3
Area A_c : 4227.2 mm^2
Length L_c : 147.7 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.086	149.8	0.0	0.00	0.00	0.0	90.0	0.0	90.0	0.0	1.00	
266.3	34	0.238	414.6	0.2	0.00	0.06	62.4	99.9	31.2	89.5	62.4	1.91	
275.3	64	0.273	475.6	0.4	0.00	0.11	76.6	98.0	38.3	85.2	76.6	2.28	
280.3	90	0.292	508.7	0.6	0.00	0.15	84.2	96.8	42.1	82.8	84.2	2.54	
285.8	136	0.320	557.5	0.9	0.00	0.23	95.3	96.9	47.7	81.0	95.3	2.94	
286.9	154	0.336	585.4	1.0	0.00	0.26	101.7	98.9	50.8	82.0	101.7	3.11	
288.4	186	0.347	604.5	1.3	0.00	0.31	105.9	99.6	53.0	81.9	105.9	3.27	
290.1	214	0.354	616.7	1.4	0.00	0.36	108.5	99.1	54.2	81.1	108.5	3.42	
290.8	240	0.364	634.1	1.6	0.00	0.40	112.3	100.4	56.2	81.6	112.3	3.54	
291.4	272	0.378	658.5	1.8	0.00	0.45	117.7	102.4	58.8	82.8	117.7	3.70	
291.6	300	0.389	677.7	2.0	0.00	0.49	121.8	104.3	60.9	84.0	121.8	3.81	
291.7	330	0.400	696.9	2.2	0.00	0.54	126.0	106.3	63.0	85.3	126.0	3.91	
291.6	367	0.415	723.0	2.5	0.00	0.59	131.6	109.2	65.8	87.3	131.6	4.03	
291.4	393	0.424	738.7	2.7	0.00	0.63	135.0	111.1	67.5	88.6	135.0	4.10	
291.2	422	0.433	754.4	2.9	0.00	0.67	138.3	112.9	69.1	89.9	138.3	4.16	
291.1	451	0.439	764.8	3.1	0.00	0.72	140.3	114.1	70.2	90.7	140.3	4.20	
290.8	483	0.444	773.5	3.3	0.00	0.76	142.0	115.2	71.0	91.5	142.0	4.21	
290.6	510	0.449	782.2	3.5	0.00	0.80	143.6	116.2	71.8	92.3	143.6	4.24	
290.4	546	0.451	785.7	3.7	0.00	0.85	144.0	116.6	72.0	92.6	144.0	4.23	
290.1	574	0.452	787.5	3.9	0.00	0.89	144.1	116.9	72.0	92.9	144.1	4.21	
289.9	601	0.453	789.2	4.1	0.00	0.93	144.2	117.2	72.1	93.2	144.2	4.20	
289.6	631	0.454	790.9	4.3	0.00	0.97	144.2	117.5	72.1	93.5	144.2	4.18	
289.3	662	0.455	792.7	4.5	0.00	1.01	144.3	117.8	72.1	93.8	144.3	4.16	«
289.0	694	0.455	792.7	4.7	0.00	1.05	143.9	117.9	71.9	94.0	143.9	4.13	
288.7	721	0.454	790.9	4.9	0.00	1.09	143.2	117.9	71.6	94.0	143.2	4.09	
288.4	754	0.453	789.2	5.1	0.00	1.13	142.4	117.8	71.2	94.1	142.4	4.06	
287.9	801	0.452	787.5	5.4	0.00	1.19	141.5	117.8	70.7	94.3	141.5	4.00	
287.6	854	0.452	787.5	5.8	0.00	1.26	140.9	117.8	70.4	94.4	140.9	3.97	
287.1	901	0.452	787.5	6.1	0.00	1.31	140.3	118.1	70.2	94.7	140.3	3.93	
286.4	953	0.451	785.7	6.5	0.00	1.38	139.3	118.3	69.7	95.0	139.3	3.87	
285.2	1002	0.451	785.7	6.8	0.00	1.43	138.8	119.2	69.4	96.1	138.8	3.79	
284.2	1050	0.451	785.7	7.1	0.00	1.49	138.2	119.9	69.1	96.9	138.2	3.72	
283.2	1101	0.451	785.7	7.5	0.00	1.55	137.7	120.6	68.8	97.7	137.7	3.66	
282.4	1154	0.450	784.0	7.8	0.00	1.61	136.7	120.9	68.3	98.2	136.7	3.60	
281.4	1202	0.450	784.0	8.1	0.00	1.66	136.1	121.7	68.1	99.0	136.1	3.54	

Final volume (cm^3): 624.40 Final length (mm): 132.7 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/5
Specimen ref. : A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
280.6	1251	0.450	784.0	8.5	0.00	1.71	135.6	122.2	67.8	99.6	135.6	3.49
279.6	1305	0.449	782.2	8.8	0.00	1.77	134.6	122.7	67.3	100.3	134.6	3.43
278.4	1350	0.449	782.2	9.1	0.00	1.82	134.1	123.7	67.1	101.3	134.1	3.37
277.6	1404	0.448	780.5	9.5	0.00	1.87	133.1	124.0	66.6	101.8	133.1	3.32
276.5	1452	0.447	778.7	9.8	0.00	1.92	132.2	124.6	66.1	102.6	132.2	3.26
275.5	1500	0.447	778.7	10.2	0.00	1.97	131.7	125.3	65.8	103.4	131.7	3.21

Final volume (cm^3): 624.40 Final length (mm): 132.7 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -

Laboratory Information

Date shearing commenced : 06/02/2010 Time : 09:00
Date shearing completed : 06/02/2010 Time : 14:11
Proving ring serial No. : 6323
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.67 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.49

Lab. sample I.D. : SL100076/5
Specimen ref. : B
Cell pressure : 425 kPa
Back pressure : 245 kPa
Effective pressure : 180 kPa

Dimensions at starting of compression

Volume V_c : 615.74 cm^3
Area A_c : 4186.2 mm^2
Length L_c : 147.1 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.119	192.6	0.0	0.00	0.00	0.0	180.0	0.0	180.0	0.0	1.00	
290.4	30	0.377	610.0	0.2	0.00	0.05	99.5	184.3	49.7	167.8	99.5	1.74	
310.3	60	0.435	703.9	0.4	0.00	0.11	121.5	175.5	60.8	155.2	121.5	2.06	
323.4	97	0.478	773.5	0.7	0.00	0.17	137.7	170.4	68.8	147.5	137.7	2.36	
329.6	123	0.503	813.9	0.8	0.00	0.22	147.0	168.9	73.5	144.4	147.0	2.54	
334.7	151	0.526	851.1	1.0	0.00	0.27	155.4	168.0	77.7	142.1	155.4	2.72	
338.4	180	0.545	881.9	1.2	0.00	0.32	162.3	167.8	81.2	140.7	162.3	2.87	
342.2	222	0.573	927.2	1.5	0.00	0.39	172.5	169.0	86.2	140.3	172.5	3.08	
343.5	249	0.590	954.7	1.7	0.00	0.43	178.5	170.8	89.3	141.0	178.5	3.19	
345.1	278	0.606	980.6	1.9	0.00	0.48	184.2	172.0	92.1	141.3	184.2	3.31	
346.0	301	0.618	1000.0	2.0	0.00	0.52	188.4	173.2	94.2	141.8	188.4	3.39	
346.4	330	0.633	1024.3	2.2	0.00	0.56	193.7	175.4	96.8	143.2	193.7	3.46	
347.1	360	0.649	1050.2	2.4	0.00	0.61	199.2	177.5	99.6	144.3	199.2	3.56	
347.3	393	0.657	1063.1	2.7	0.00	0.66	201.7	178.6	100.9	144.9	201.7	3.60	
347.5	424	0.663	1072.8	2.9	0.00	0.71	203.5	179.3	101.8	145.3	203.5	3.63	
347.6	452	0.668	1080.9	3.1	0.00	0.75	204.9	179.9	102.5	145.7	204.9	3.65	
347.6	485	0.672	1087.4	3.3	0.00	0.80	205.9	180.4	103.0	146.0	205.9	3.66	
347.7	513	0.676	1093.9	3.5	0.00	0.85	206.9	180.8	103.5	146.3	206.9	3.68	
347.7	541	0.679	1098.7	3.7	0.00	0.89	207.6	181.1	103.8	146.5	207.6	3.69	
347.7	575	0.681	1101.9	3.9	0.00	0.94	207.8	181.2	103.9	146.6	207.8	3.69	«
347.6	601	0.682	1103.6	4.1	0.00	0.97	207.8	181.3	103.9	146.7	207.8	3.68	
347.4	652	0.682	1103.6	4.4	0.00	1.05	206.9	181.1	103.5	146.6	206.9	3.67	
347.2	704	0.682	1103.6	4.8	0.00	1.12	206.1	180.8	103.0	146.5	206.1	3.65	
347.1	751	0.683	1105.2	5.1	0.00	1.18	205.7	180.7	102.8	146.5	205.7	3.64	
346.9	801	0.684	1106.8	5.4	0.00	1.25	205.3	180.7	102.6	146.5	205.3	3.63	
346.8	854	0.685	1108.4	5.8	0.00	1.32	204.8	180.6	102.4	146.5	204.8	3.62	
346.8	903	0.685	1108.4	6.1	0.00	1.38	204.0	180.2	102.0	146.2	204.0	3.61	
346.7	953	0.685	1108.4	6.5	0.00	1.45	203.2	179.9	101.6	146.0	203.2	3.59	
346.7	1000	0.686	1110.0	6.8	0.00	1.50	202.8	179.7	101.4	145.9	202.8	3.59	
346.6	1052	0.686	1110.0	7.2	0.00	1.57	201.9	179.4	101.0	145.7	201.9	3.58	
346.4	1101	0.686	1110.0	7.5	0.00	1.63	201.1	179.2	100.6	145.6	201.1	3.56	
346.1	1156	0.686	1110.0	7.9	0.00	1.69	200.3	179.0	100.1	145.7	200.3	3.54	
345.6	1204	0.687	1111.7	8.2	0.00	1.75	199.8	179.3	99.9	146.0	199.8	3.52	
345.1	1252	0.687	1111.7	8.5	0.00	1.80	199.1	179.4	99.5	146.3	199.1	3.49	
344.7	1300	0.687	1111.7	8.8	0.00	1.85	198.3	179.4	99.1	146.4	198.3	3.47	

Final volume (cm^3): 615.74 Final length (mm): 132.1 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/5
Specimen ref. : B

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
344.3	1355	0.687	1111.7	9.2	0.00	1.92	197.4	179.4	98.7	146.5	197.4	3.45
343.7	1403	0.688	1113.3	9.5	0.00	1.97	197.0	179.8	98.5	147.0	197.0	3.42
343.1	1450	0.688	1113.3	9.9	0.00	2.02	196.2	180.0	98.1	147.3	196.2	3.40
342.4	1503	0.688	1113.3	10.2	0.00	2.07	195.4	180.3	97.7	147.7	195.4	3.37

Final volume (cm^3): 615.741 Final length (mm): 132.1 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -

Laboratory Information

Date shearing commenced : 06/02/2010 Time : 09:00
Date shearing completed : 06/02/2010 Time : 14:10
Proving ring serial No. : 6499
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.67 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.66

Lab. sample I.D. : SL100076/5
Specimen ref. : C
Cell pressure : 605 kPa
Back pressure : 245 kPa
Effective pressure : 360 kPa

Dimensions at starting of compression

Volume V_c : 610.07 cm^3
Area A_c : 4164.1 mm^2
Length L_c : 146.5 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.095	290.5	0.0	0.00	0.00	0.0	360.0	0.0	360.0	0.0	1.00	
343.4	37	0.324	990.8	0.3	0.00	0.07	167.7	345.4	83.8	317.5	167.7	1.64	
375.8	63	0.374	1143.7	0.4	0.00	0.11	203.9	331.2	102.0	297.2	203.9	1.89	
400.7	92	0.413	1263.0	0.6	0.00	0.17	231.9	320.3	116.0	281.6	231.9	2.14	
422.4	127	0.449	1373.1	0.9	0.00	0.23	257.5	311.3	128.7	268.4	257.5	2.41	
433.4	152	0.470	1437.3	1.0	0.00	0.27	272.3	307.7	136.1	262.4	272.3	2.59	
443.4	184	0.490	1498.5	1.3	0.00	0.32	286.1	304.7	143.1	257.0	286.1	2.77	
450.4	216	0.513	1568.8	1.5	0.00	0.38	302.1	305.6	151.0	255.3	302.1	2.95	
456.3	243	0.529	1617.7	1.7	0.00	0.42	313.0	305.2	156.5	253.0	313.0	3.11	
461.7	279	0.540	1651.4	1.9	0.00	0.48	320.1	303.4	160.1	250.0	320.1	3.23	
463.7	300	0.548	1675.8	2.0	0.00	0.52	325.4	304.0	162.7	249.8	325.4	3.30	
465.5	332	0.553	1691.1	2.3	0.00	0.57	328.2	303.6	164.1	248.9	328.2	3.35	
467.7	364	0.559	1709.5	2.5	0.00	0.62	331.7	303.1	165.8	247.9	331.7	3.42	
468.4	393	0.564	1724.8	2.7	0.00	0.67	334.5	303.9	167.3	248.1	334.5	3.45	
469.3	421	0.567	1733.9	2.9	0.00	0.71	336.0	303.7	168.0	247.7	336.0	3.48	
469.9	454	0.569	1740.1	3.1	0.00	0.76	336.6	303.4	168.3	247.3	336.6	3.49	
470.5	483	0.572	1749.2	3.3	0.00	0.80	338.0	303.5	169.0	247.2	338.0	3.51	
470.9	511	0.575	1758.4	3.5	0.00	0.85	339.4	303.8	169.7	247.2	339.4	3.53	
471.4	544	0.578	1767.6	3.7	0.00	0.89	340.6	303.9	170.3	247.1	340.6	3.55	
471.8	573	0.580	1773.7	3.9	0.00	0.94	341.3	303.9	170.7	247.0	341.3	3.56	«
472.3	603	0.581	1776.8	4.1	0.00	0.98	341.2	303.3	170.6	246.4	341.2	3.57	
472.6	632	0.582	1779.8	4.3	0.00	1.02	341.2	303.0	170.6	246.1	341.2	3.58	
472.8	663	0.583	1782.9	4.5	0.00	1.07	341.1	302.8	170.6	245.9	341.1	3.58	
473.0	694	0.584	1785.9	4.7	0.00	1.11	341.0	302.5	170.5	245.7	341.0	3.58	
473.2	721	0.584	1785.9	4.9	0.00	1.15	340.3	302.0	170.2	245.2	340.3	3.58	
473.3	752	0.584	1785.9	5.1	0.00	1.19	339.5	301.4	169.7	244.9	339.5	3.58	
473.4	784	0.584	1785.9	5.4	0.00	1.23	338.7	300.9	169.3	244.5	338.7	3.57	
473.4	815	0.585	1789.0	5.6	0.00	1.27	338.6	300.9	169.3	244.5	338.6	3.57	
473.4	841	0.585	1789.0	5.7	0.00	1.31	337.9	300.5	168.9	244.2	337.9	3.57	
473.5	873	0.585	1789.0	6.0	0.00	1.35	337.1	300.0	168.5	243.9	337.1	3.56	
473.4	901	0.585	1789.0	6.1	0.00	1.38	336.3	299.8	168.2	243.7	336.3	3.56	
473.1	951	0.586	1792.0	6.5	0.00	1.45	335.7	299.8	167.9	243.8	335.7	3.55	
472.6	1003	0.586	1792.0	6.8	0.00	1.51	334.4	299.6	167.2	243.9	334.4	3.53	
472.1	1050	0.586	1792.0	7.2	0.00	1.57	333.2	299.5	166.6	244.0	333.2	3.51	
471.8	1101	0.586	1792.0	7.5	0.00	1.63	331.9	299.1	165.9	243.8	331.9	3.49	

Final volume (cm^3): 610.07 Final length (mm): 131.5 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D225
Depth(m) From : 18.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/5
Specimen ref. : C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
471.3	1154	0.586	1792.0	7.9	0.00	1.69	330.5	298.9	165.2	243.9	330.5	3.47
470.8	1202	0.587	1795.1	8.2	0.00	1.75	329.9	299.2	165.0	244.2	329.9	3.46
470.1	1256	0.587	1795.1	8.6	0.00	1.81	328.5	299.2	164.3	244.4	328.5	3.44
469.4	1300	0.587	1795.1	8.9	0.00	1.86	327.4	299.3	163.7	244.7	327.4	3.41
468.6	1357	0.587	1795.1	9.3	0.00	1.92	325.9	299.4	163.0	245.0	325.9	3.39
468.1	1401	0.587	1795.1	9.6	0.00	1.97	324.8	299.3	162.4	245.2	324.8	3.37
467.5	1453	0.588	1798.2	9.9	0.00	2.03	324.1	299.6	162.1	245.5	324.1	3.36
466.9	1501	0.588	1798.2	10.2	0.00	2.08	322.9	299.5	161.4	245.7	322.9	3.34

Final volume (cm^3): 610.07 Final length (mm): 131.5 Termination criterion : Maximum deviator stress
Remarks:

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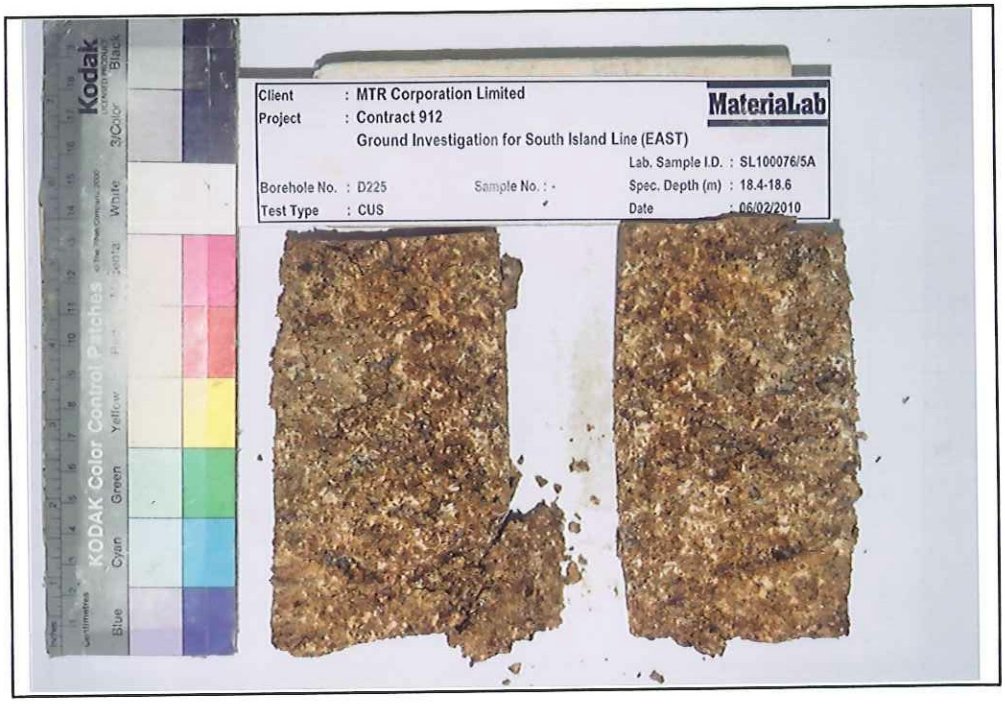
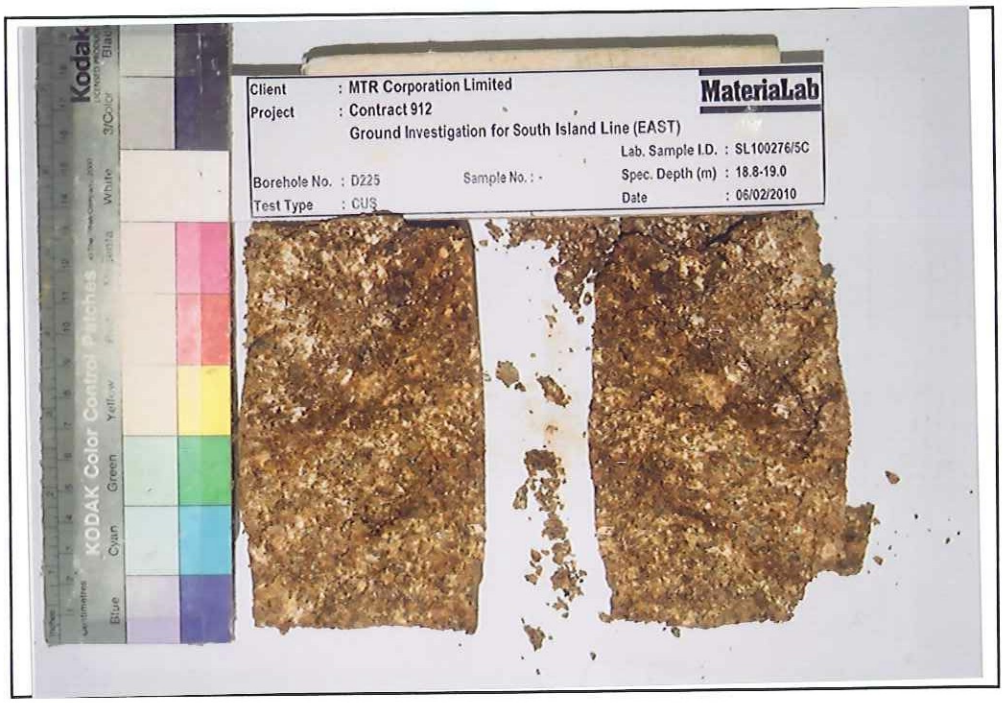
Photographic Records for Triaxial Test



Photographic Records for Triaxial Test

Photographic Records for Triaxial Test



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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D226
Depth(m) From : 5.50
To : -
Sample origin : CDR
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 01-02-2010
Date test(s) completed : 09-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 19.5 °C
Visual description : Moist, brown spotted with white, silty/clayey, gravelly SAND.

Lab. sample I.D. : SL100076/6
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 5.90
To : 6.10
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	30			60			120	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.7	74.3	75.7	75.3	76.5		76.0	79.9
Length	mm	150.3	149.6	144.2	143.4	139.1		138.3	125.3
Volume	cm³	658.70	649.20	649.20	638.80	638.80		627.60	627.60
Wet mass	g	1249.6	1273.7	1273.7	1263.3	1263.3		1252.1	1252.1
Dry mass	g	1003.9	1003.9	1003.9	1003.9	1003.9		1003.9	1003.9
Moisture content	%	24.5	26.9	26.9	25.8	25.8		24.7	24.7
Bulk density	Mg/m³	1.90	1.96	1.96	1.98	1.98		2.00	2.00
Dry density	Mg/m³	1.52	1.55	1.55	1.57	1.57		1.60	1.60
Void ratio		0.74	0.71	0.71	0.69	0.69		0.66	0.66
Degree of saturation	%	87.8	99.8	99.8	99.8	99.8		99.8	99.8
Saturation Stage									
**Volume change of water	cm³	33.6							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	270.0			289.6			329.9	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	9.5			10.4			11.2	
m_{vi}	m²/MN	0.58			0.36			0.21	
t_{50}	min	3.35			2.90			1.90	
c_{vi} (from t_{50})	m²/yr	1342.15			1425.64			2025.05	
t_{100}	min	9.61			7.84			5.76	
c_{vi} (from t_{100})	m²/yr	942.07			1185.91			1645.16	
Sketch of failed specimen (Failure Mode)								Plastic	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D226
Depth(m) From : 5.50
To : -

Laboratory Information

Date shearing commenced : 08/02/2010 Time : 09:00
Date shearing completed : 08/02/2010 Time : 13:49
Proving ring serial No. : 14654
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.62 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.24

Lab. sample I.D. : SL100076/6
Specimen ref. : A
Cell pressure : 365 kPa
Back pressure : 245 kPa
Effective pressure : 120 kPa

Dimensions at starting of compression

Volume V_c : 627.60 cm^3
Area A_c : 4538.2 mm^2
Length L_c : 138.3 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.200	137.4	0.0	7.5	0.00	1.51	0.0	120.0	0.0	120.0	0.0	1.00
270.1	30	0.656	450.5	0.2	7.8	0.00	1.55	67.3	128.6	33.7	117.3	67.3	1.71
282.1	60	0.839	576.2	0.4	8.0	0.00	1.58	94.7	130.3	47.4	114.5	94.7	2.14
288.1	90	0.978	671.7	0.7	8.2	0.00	1.62	115.4	134.6	57.7	115.4	115.4	2.50
292.0	121	1.097	753.4	0.9	8.4	0.00	1.65	132.9	139.5	66.5	117.3	132.9	2.82
294.3	150	1.191	818.0	1.1	8.6	0.00	1.68	146.7	144.0	73.3	119.6	146.7	3.07
296.7	186	1.287	883.9	1.3	8.9	0.00	1.72	160.6	148.6	80.3	121.8	160.6	3.35
297.8	210	1.340	920.3	1.5	9.1	0.00	1.75	168.2	151.3	84.1	123.3	168.2	3.50
298.8	246	1.406	965.7	1.8	9.3	0.00	1.79	177.5	154.9	88.7	125.4	177.5	3.68
299.0	270	1.442	990.4	2.0	9.5	0.00	1.81	182.5	157.2	91.2	126.8	182.5	3.76
299.0	303	1.485	1019.9	2.2	9.7	0.00	1.85	188.4	160.2	94.2	128.8	188.4	3.85
298.6	338	1.531	1051.5	2.4	10.0	0.00	1.88	194.6	163.7	97.3	131.3	194.6	3.93
298.3	364	1.556	1068.7	2.6	10.2	0.00	1.91	197.9	165.7	99.0	132.7	197.9	3.97
297.9	392	1.581	1085.9	2.8	10.4	0.00	1.94	201.1	167.7	100.6	134.1	201.1	4.00
297.1	425	1.608	1104.4	3.1	10.6	0.00	1.97	204.6	170.2	102.3	136.1	204.6	4.01
296.6	453	1.622	1114.0	3.3	10.8	0.00	2.00	206.2	171.5	103.1	137.1	206.2	4.01
296.2	480	1.633	1121.6	3.5	11.0	0.00	2.03	207.3	172.5	103.7	137.9	207.3	4.01
295.7	514	1.642	1127.7	3.7	11.3	0.00	2.06	208.1	173.3	104.0	138.7	208.1	4.00
295.1	542	1.649	1132.6	3.9	11.5	0.00	2.09	208.6	174.2	104.3	139.4	208.6	3.98
294.7	571	1.654	1136.0	4.1	11.7	0.00	2.12	208.8	174.7	104.4	139.9	208.8	3.97
294.1	601	1.658	1138.7	4.3	11.9	0.00	2.14	208.9	175.4	104.5	140.5	208.9	3.95
293.7	634	1.661	1140.8	4.6	12.1	0.00	2.18	208.8	175.7	104.4	140.9	208.8	3.93
293.1	662	1.663	1142.2	4.8	12.3	0.00	2.20	208.6	176.2	104.3	141.4	208.6	3.90
292.7	691	1.665	1143.5	5.0	12.5	0.00	2.23	208.4	176.5	104.2	141.8	208.4	3.88
292.4	721	1.667	1144.9	5.2	12.8	0.00	2.26	208.2	176.7	104.1	142.0	208.2	3.87
292.0	754	1.669	1146.3	5.5	13.0	0.00	2.29	207.9	177.0	104.0	142.3	207.9	3.85
291.7	781	1.670	1147.0	5.6	13.2	0.00	2.31	207.6	177.1	103.8	142.5	207.6	3.83
291.4	814	1.671	1147.7	5.9	13.4	0.00	2.34	207.2	177.2	103.6	142.7	207.2	3.81
291.0	842	1.671	1147.7	6.1	13.6	0.00	2.37	206.7	177.3	103.3	142.9	206.7	3.79
290.7	871	1.671	1147.7	6.3	13.8	0.00	2.39	206.2	177.4	103.1	143.0	206.2	3.78
290.3	904	1.670	1147.0	6.5	14.1	0.00	2.42	205.5	177.5	102.8	143.2	205.5	3.75
289.7	954	1.668	1145.6	6.9	14.4	0.00	2.47	204.4	177.5	102.2	143.4	204.4	3.71
289.2	1000	1.666	1144.2	7.2	14.8	0.00	2.51	203.3	177.5	101.7	143.6	203.3	3.68
288.7	1053	1.664	1142.9	7.6	15.2	0.00	2.56	202.1	177.4	101.1	143.7	202.1	3.65

«

Final volume (cm^3): 627.60 Final length (mm): 125.3 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D226
Depth(m) From : 5.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/6
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
287.4	1104	1.662	1141.5	8.0	15.5	0.00	2.60	201.0	178.1	100.5	144.6	201.0	3.59
286.5	1153	1.660	1140.1	8.3	15.9	0.00	2.64	199.9	178.4	99.9	145.1	199.9	3.55
285.4	1201	1.659	1139.4	8.7	16.2	0.00	2.69	198.9	179.1	99.5	145.9	198.9	3.50
284.3	1254	1.658	1138.7	9.1	16.6	0.00	2.73	197.9	179.7	99.0	146.7	197.9	3.45
283.2	1304	1.657	1138.0	9.4	17.0	0.00	2.77	196.9	180.3	98.5	147.4	196.9	3.41

Final volume (cm^3): 627.60 Final length (mm): 125.3 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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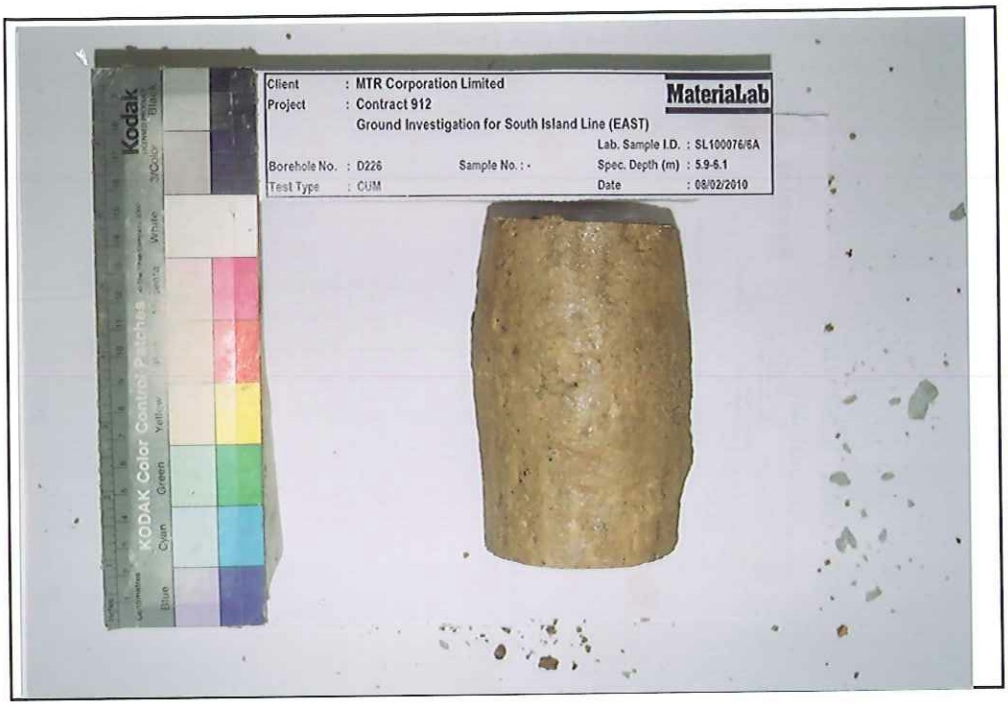
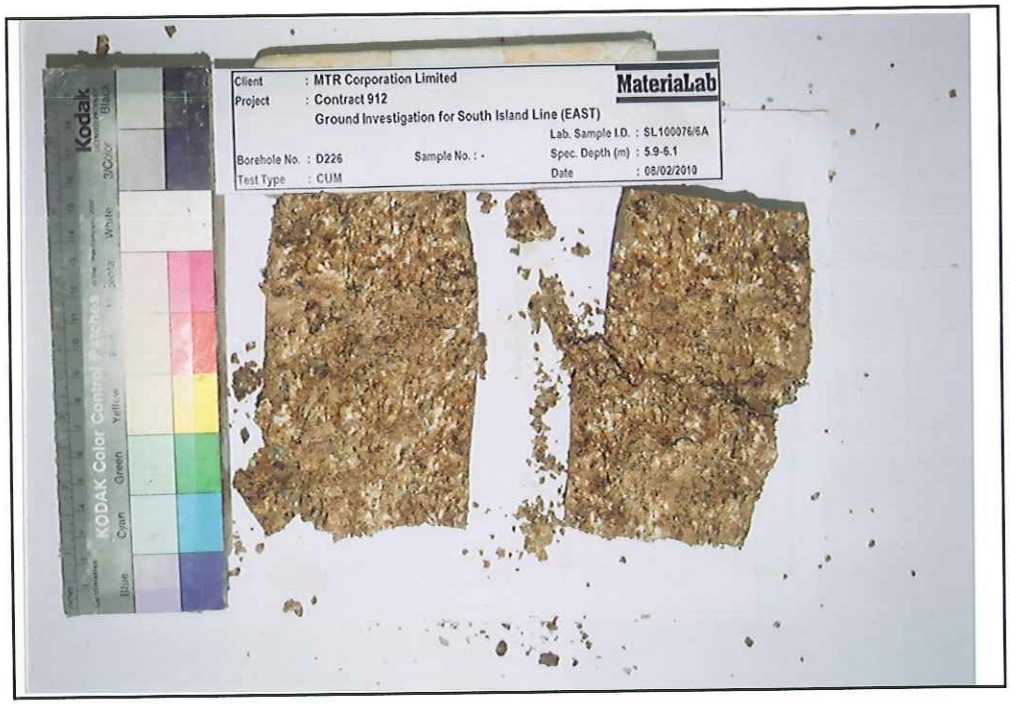
Photographic Records for Triaxial Test





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MateriaLab

Test Report No. : 090562SL100076(62) Page 1 of 13

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D226
Depth(m) From : 19.50
To : -
Sample origin : CDR
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 01-02-2010
Date test(s) completed : 10-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : S.W. Leung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 19.5 °C
Visual description : Moist, light yellowish brown spotted with white, mottled with brown, slightly silty/clayey, gravelly SAND.

Lab. sample I.D. : SL100076/7
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 19.90
To : 20.10
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	100			200			400	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.4	73.1	74.6	74.1	75.1		74.8	79.1
Length	mm	150.0	147.4	141.7	140.8	136.9		136.2	121.7
Volume	cm³	652.12	619.32	619.32	606.82	606.82		598.32	598.32
Wet mass	g	1325.5	1305.0	1305.0	1292.5	1292.5		1284.0	1284.0
Dry mass	g	1093.4	1093.4	1093.4	1093.4	1093.4		1093.4	1093.4
Moisture content	%	21.2	19.4	19.4	18.2	18.2		17.4	17.4
Bulk density	Mg/m³	2.03	2.11	2.11	2.13	2.13		2.15	2.15
Dry density	Mg/m³	1.68	1.77	1.77	1.80	1.80		1.83	1.83
Void ratio		0.58	0.50	0.50	0.47	0.47		0.45	0.45
Degree of saturation	%	96.9	102.4	102.4	102.5	102.5		102.6	102.6
Saturation Stage									
**Volume change of water	cm³	12.3							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	340.0			388.1			428.0	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	32.8			12.5			8.5	
m_{vi}	m²/MN	0.53			0.14			0.08	
t_{50}	min	39.00			17.00			15.00	
c_{vi} (from t_{50})	m²/yr	113.43			234.66			248.54	
t_{100}	min	56.25			36.00			36.00	
c_{vi} (from t_{100})	m²/yr	157.07			249.27			253.45	
Sketch of failed specimen (Failure Mode)								Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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MaterialLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

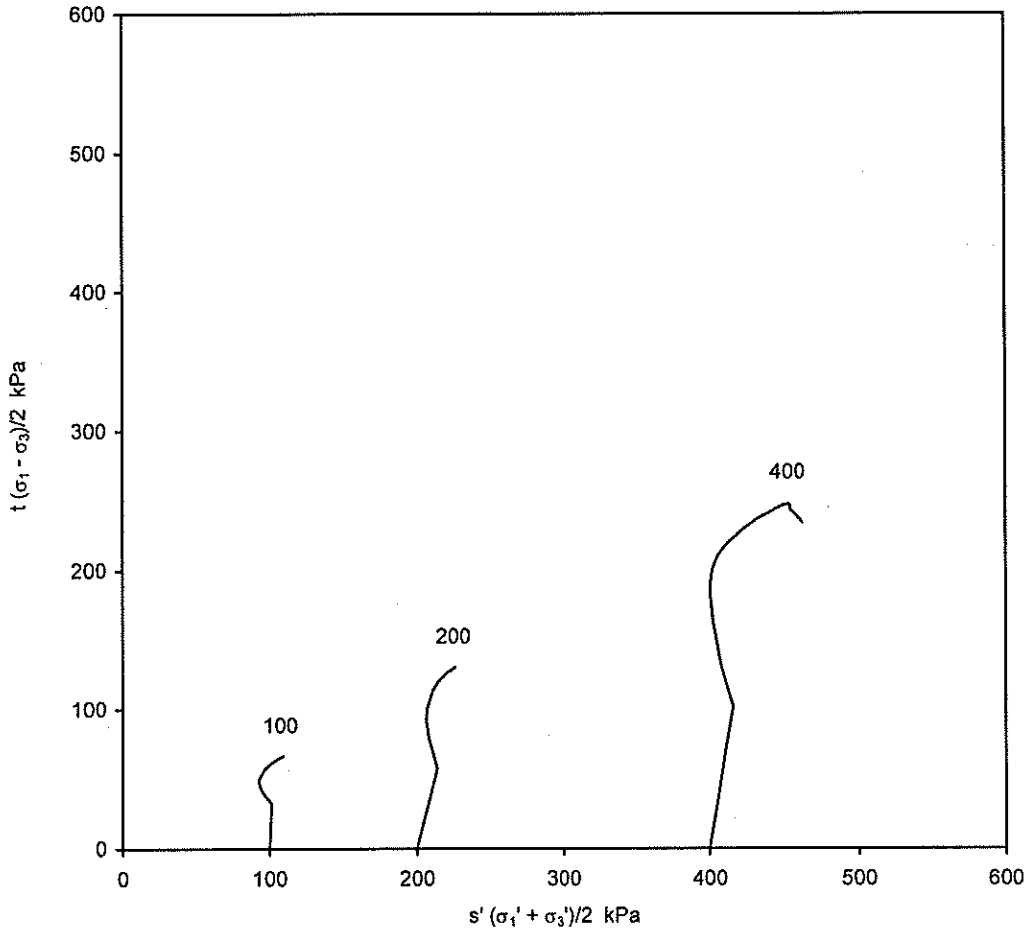
Client sample No. : -
Borehole No. : D226
Depth(m) From : 19.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/7
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	100	3.7	3.7	303.2	130.6	107.1	65.3
2	200	2.6	7.1	349.5	258.4	224.7	129.2
3	400	5.5	13.1	439.6	494.2	452.5	247.1



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

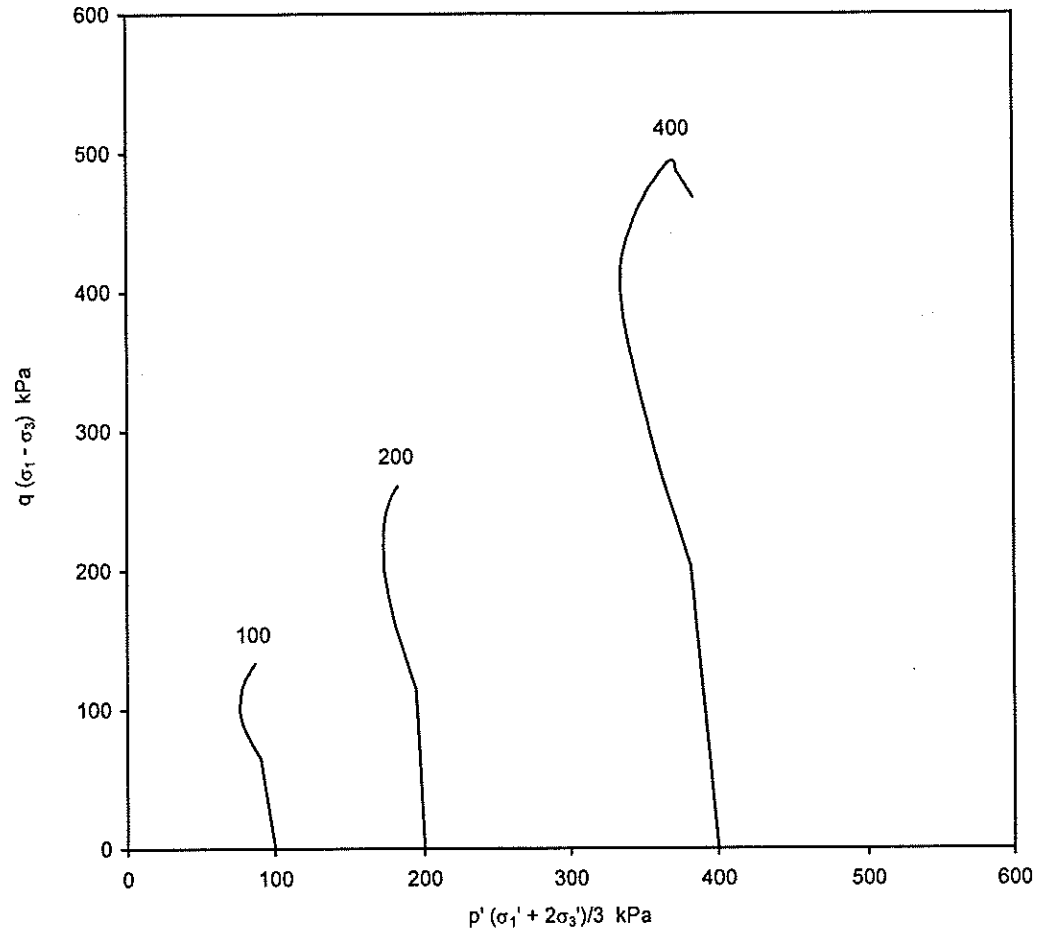
Client sample No. : -
Borehole No. : D226
Depth(m) From : 19.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/7
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	100	3.7	3.7	303.2	130.6	85.3	130.6
2	200	2.6	7.1	349.5	258.4	181.6	258.4
3	400	5.5	13.1	439.6	494.2	370.1	494.2



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

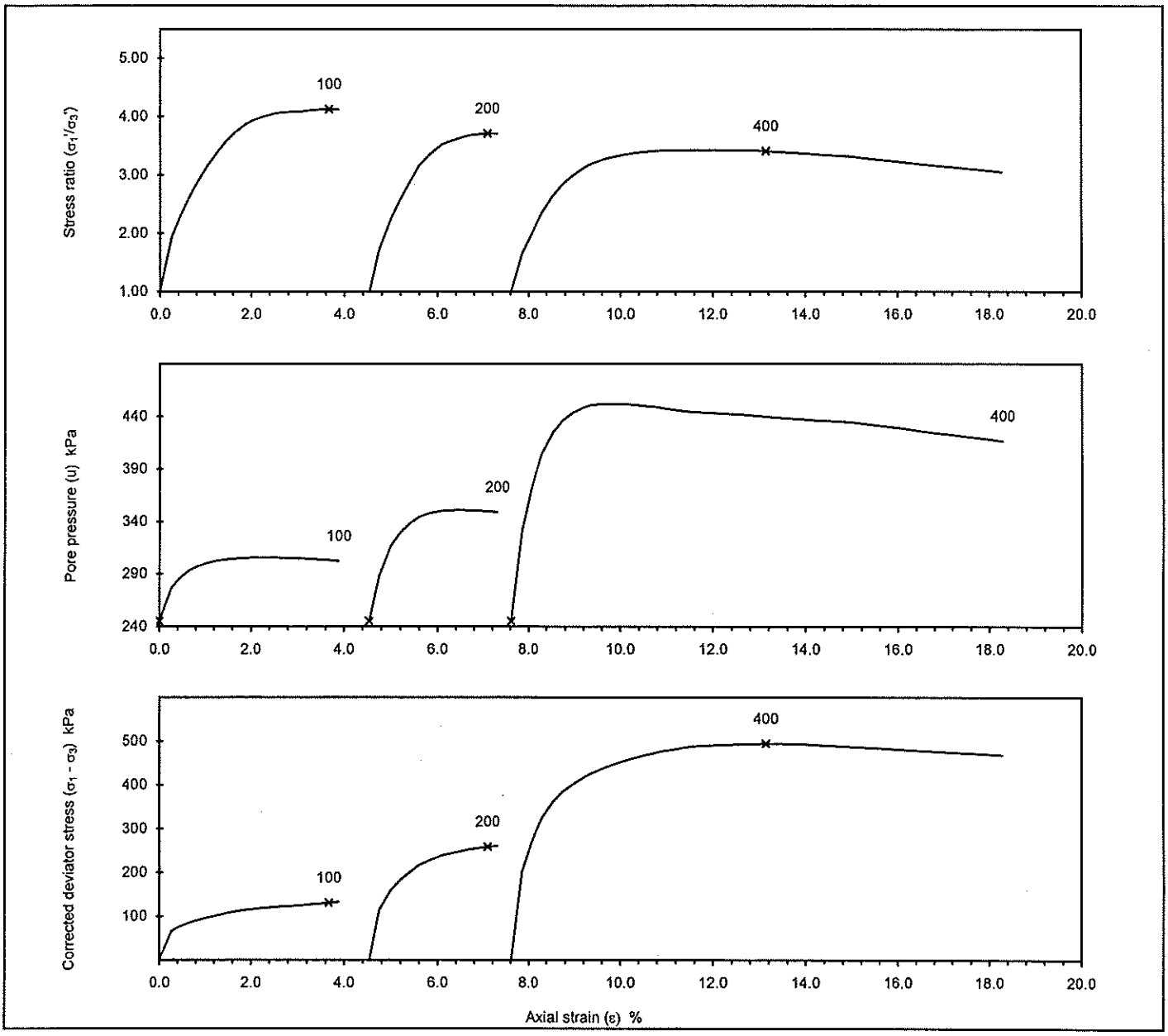
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D226
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	19.50
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL100076/7
Specimen ref.	:	A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D226
Depth(m) From : 19.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/7
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	100	
	Stage 2	kPa	200	
	Stage 3	kPa	400	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			125	120
			150	145
			200	195
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		1.00
Volume change	cm^3	12.3

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1282.0
Final moisture content	%	17.2
Final bulk density	Mg/m^3	2.14

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

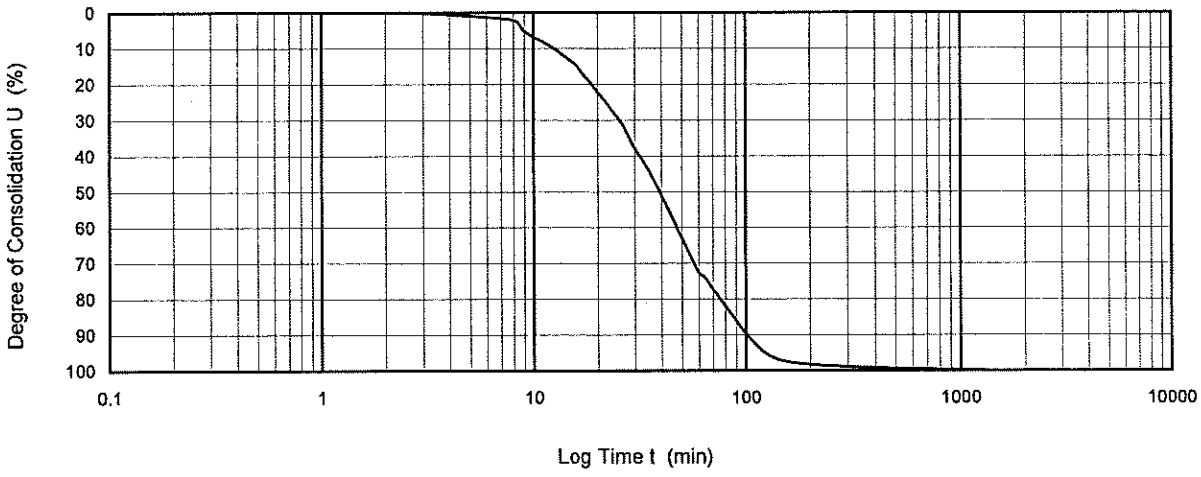
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D226
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	19.50
			To	:	-

Laboratory Information

Cell pressure	:	345 kPa	Lab. sample I.D.	:	SL100076/7
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	100 kPa			

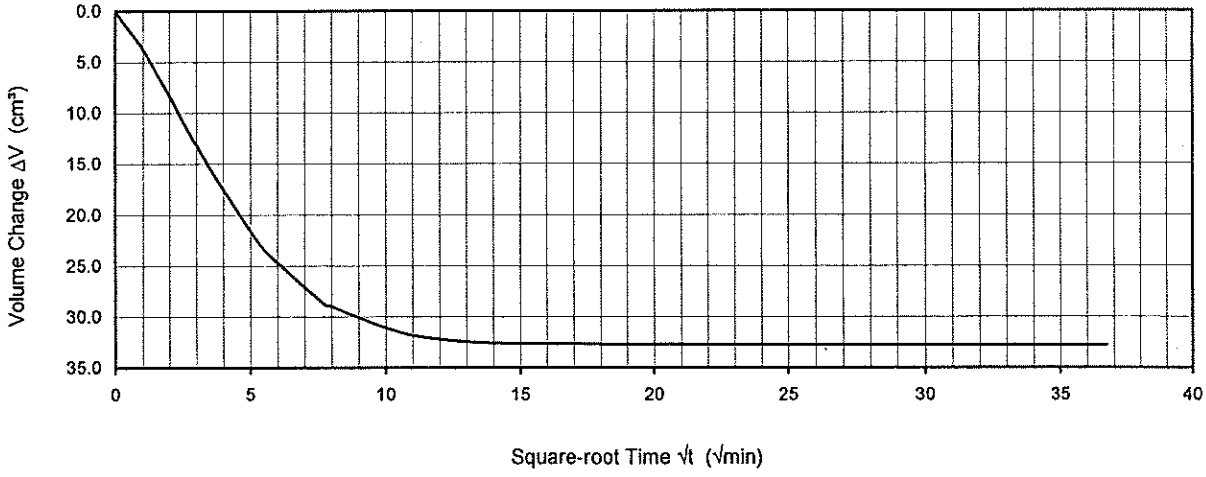
Degree of Consolidation vs. Log Time

t_{50} = 39.00 min ΔV = 32.8 cm³



Volume Change vs. Square-root Time

t_{100} = 56.25 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

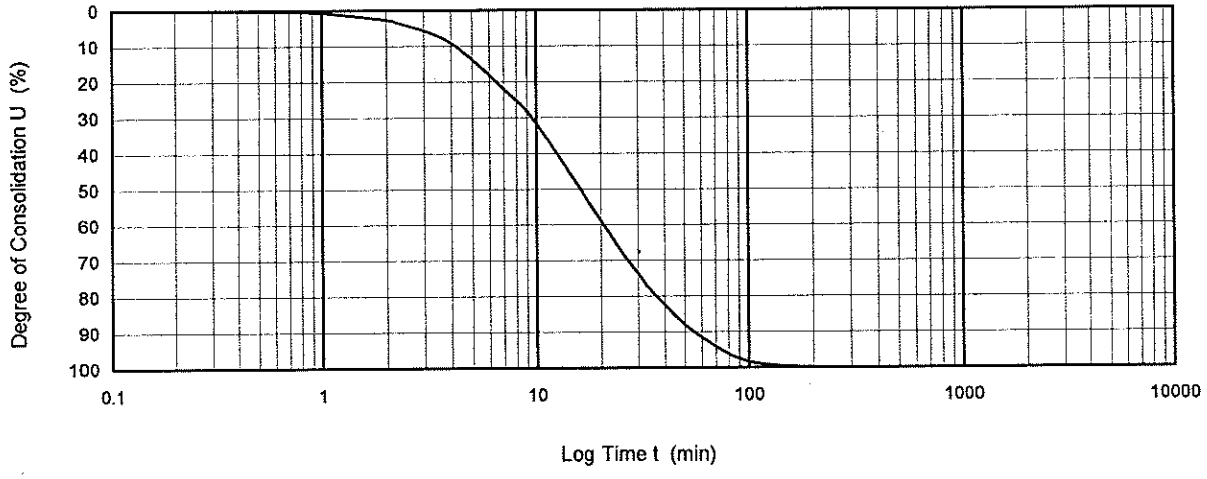
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D226
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	19.50
			To	:	-

Laboratory Information

Cell pressure	:	445 kPa	Lab. sample I.D.	:	SL100076/7
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	200 kPa			

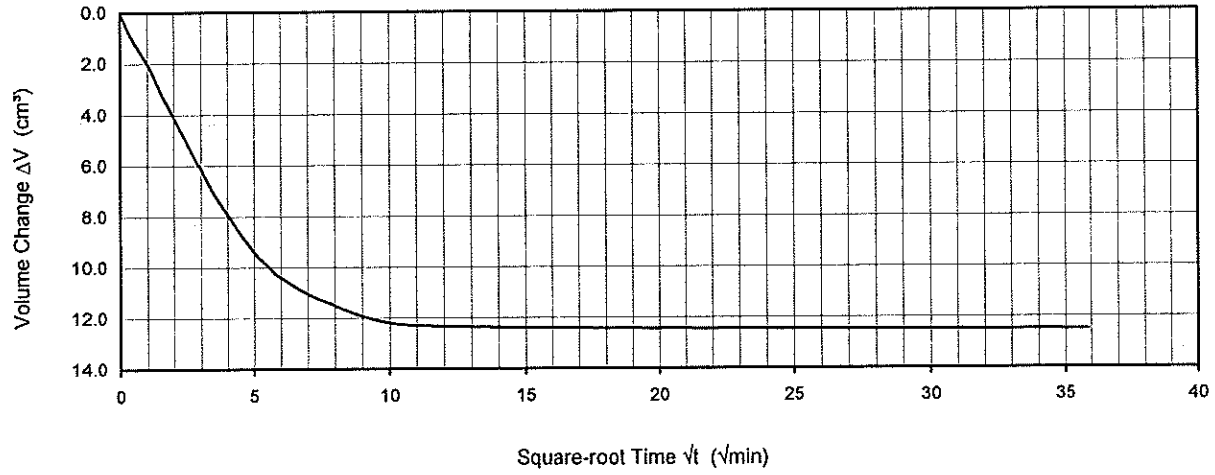
Degree of Consolidation vs. Log Time

t_{50} = 17.00 min ΔV = 12.5 cm³



Volume Change vs. Square-root Time

t_{100} = 36.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

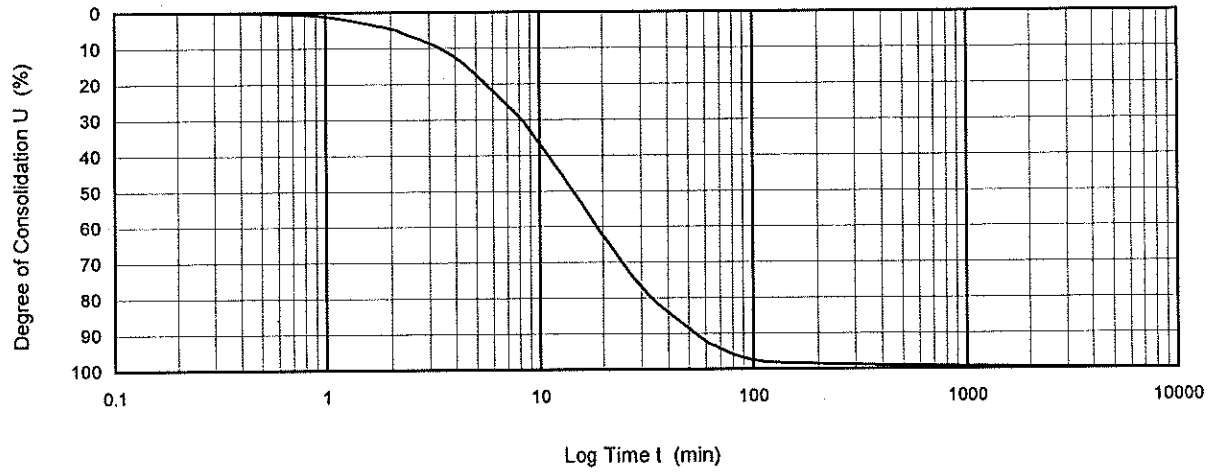
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D226
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	19.50
			To	:	-

Laboratory Information

Cell pressure	:	645 kPa	Lab. sample I.D.	:	SL100076/7
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	400 kPa			

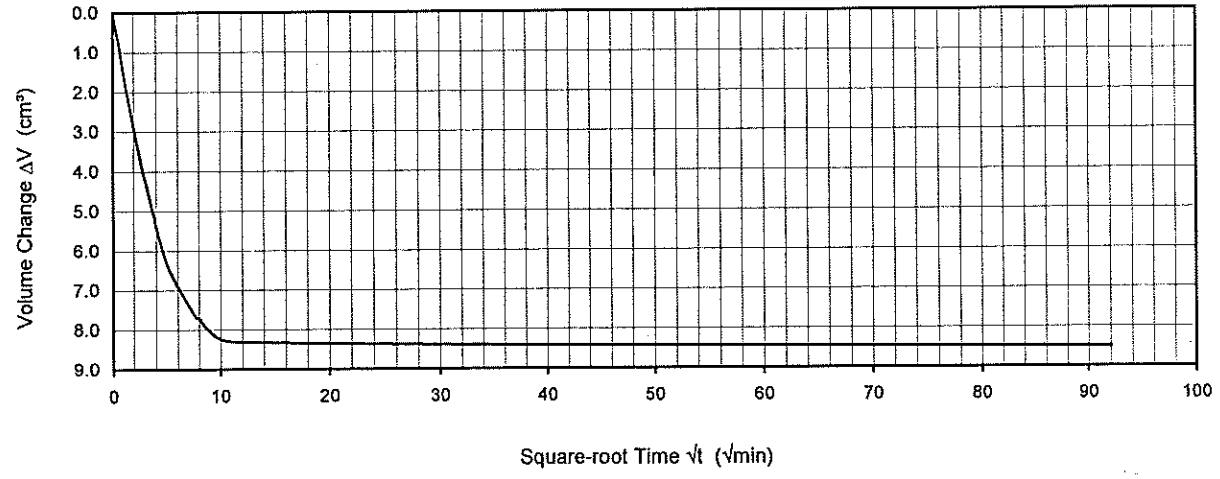
Degree of Consolidation vs. Log Time

t_{50} = 15.00 min ΔV = 8.5 cm³



Volume Change vs. Square-root Time

t_{100} = 36.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D226
Depth(m) From : 19.50
To : -

Laboratory Information

Date shearing commenced : 02/02/2010 Time : 09:00
Date shearing completed : 02/02/2010 Time : 11:01
Proving ring serial No. : 10175
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.45

Lab. sample I.D. : SL100076/7
Specimen ref. : A
Cell pressure : 345 kPa
Back pressure : 245 kPa
Effective pressure : 100 kPa

Dimensions at starting of compression

Volume V_c : 619.32 cm^3
Area A_c : 4200.4 mm^2
Length L_c : 147.4 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.081	146.0	0.0	0.0	0.00	0.00	0.0	100.0	0.0	100.0	0.0	1.00	
276.5	37	0.234	421.8	0.3	0.3	0.00	0.06	65.4	101.2	32.7	90.3	65.4	1.96	
284.9	61	0.256	461.4	0.4	0.4	0.00	0.11	74.7	97.4	37.3	85.0	74.7	2.24	
293.0	95	0.280	504.7	0.6	0.6	0.00	0.16	84.7	94.3	42.3	80.2	84.7	2.63	
296.8	120	0.293	528.1	0.8	0.8	0.00	0.20	90.0	93.2	45.0	78.2	90.0	2.87	
300.2	152	0.308	555.2	1.0	1.0	0.00	0.26	96.1	92.9	48.1	76.8	96.1	3.15	
302.3	181	0.319	575.0	1.2	1.2	0.00	0.30	100.6	93.0	50.3	76.2	100.6	3.36	
303.6	213	0.334	602.0	1.4	1.4	0.00	0.36	106.6	94.7	53.3	76.9	106.6	3.58	
304.5	240	0.343	618.2	1.6	1.6	0.00	0.40	110.2	95.6	55.1	77.2	110.2	3.72	
305.3	279	0.353	636.3	1.9	1.9	0.00	0.46	114.0	96.7	57.0	77.7	114.0	3.87	
305.5	300	0.358	645.3	2.0	2.0	0.00	0.49	116.0	97.5	58.0	78.2	116.0	3.94	
305.5	330	0.364	656.1	2.2	2.2	0.00	0.54	118.2	98.6	59.1	78.9	118.2	3.99	
305.4	375	0.372	670.5	2.5	2.5	0.00	0.61	121.1	100.1	60.5	80.0	121.1	4.06	
305.2	390	0.375	675.9	2.6	2.6	0.00	0.63	122.2	100.9	61.1	80.5	122.2	4.07	
305.0	423	0.378	681.3	2.9	2.9	0.00	0.68	123.1	101.6	61.6	81.0	123.1	4.08	
304.6	458	0.383	690.3	3.1	3.1	0.00	0.73	124.8	102.8	62.4	82.0	124.8	4.09	
304.2	480	0.388	699.4	3.3	3.3	0.00	0.76	126.7	104.1	63.3	83.0	126.7	4.11	
303.7	513	0.394	710.2	3.5	3.5	0.00	0.81	128.8	105.7	64.4	84.2	128.8	4.12	
303.2	541	0.399	719.2	3.7	3.7	0.00	0.85	130.6	107.1	65.3	85.3	130.6	4.12	«
302.3	573	0.406	731.8	3.9	3.9	0.00	0.89	133.1	109.3	66.6	87.1	133.1	4.12	

Final volume (cm^3): 619.32 Final length (mm): 141.7 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D226
Depth(m) From : 19.50
To : -

Laboratory Information

Date shearing commenced : 03/02/2010 Time : 09:00
Date shearing completed : 03/02/2010 Time : 10:30
Proving ring serial No. : 10175
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.40

Lab. sample I.D. : SL100076/7
Specimen ref. : A
Cell pressure : 445 kPa
Back pressure : 245 kPa
Effective pressure : 200 kPa

Dimensions at starting of compression

Volume V_c : 606.82 cm^3
Area A_c : 4311.3 mm^2
Length L_c : 140.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.110	198.3	0.0	4.5	0.00	1.02	0.0	200.0	0.0	200.0	0.0	1.00	
288.5	30	0.387	697.5	0.2	4.8	0.00	1.06	114.5	213.7	57.2	194.7	114.5	1.73	
316.2	64	0.493	888.6	0.5	5.0	0.00	1.11	158.3	207.9	79.1	181.6	158.3	2.23	
329.2	92	0.550	991.3	0.7	5.2	0.00	1.15	181.6	206.6	90.8	176.3	181.6	2.57	
337.9	120	0.594	1070.7	0.9	5.4	0.00	1.19	199.4	206.8	99.7	173.6	199.4	2.86	
344.3	150	0.638	1150.0	1.1	5.6	0.00	1.23	217.2	209.3	108.6	173.1	217.2	3.16	
347.8	180	0.664	1196.8	1.3	5.8	0.00	1.27	227.4	210.9	113.7	173.0	227.4	3.34	
350.1	219	0.693	1249.1	1.6	6.1	0.00	1.32	238.6	214.2	119.3	174.4	238.6	3.51	
350.5	240	0.703	1267.1	1.7	6.2	0.00	1.34	242.4	215.7	121.2	175.3	242.4	3.56	
350.8	274	0.718	1294.2	1.9	6.5	0.00	1.39	247.9	218.1	123.9	176.8	247.9	3.63	
350.6	307	0.732	1319.4	2.2	6.7	0.00	1.43	252.9	220.9	126.5	178.7	252.9	3.68	
350.2	330	0.739	1332.0	2.3	6.9	0.00	1.46	255.4	222.5	127.7	179.9	255.4	3.69	
349.5	360	0.748	1348.2	2.6	7.1	0.00	1.49	258.4	224.7	129.2	181.6	258.4	3.71	«
348.8	390	0.754	1359.0	2.8	7.3	0.00	1.53	260.3	226.3	130.1	183.0	260.3	3.71	

Final volume (cm^3): 606.82 Final length (mm): 136.9 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D226
Depth(m) From : 19.50
To : -

Laboratory Information

Date shearing commenced : 09/02/2010 Time : 09:00
Date shearing completed : 09/02/2010 Time : 14:16
Proving ring serial No. : 10175
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.39

Lab. sample I.D. : SL100076/7
Specimen ref. : A
Cell pressure : 645 kPa
Back pressure : 245 kPa
Effective pressure : 400 kPa

Dimensions at starting of compression

Volume V_c : 598.32 cm^3
Area A_c : 4392.6 mm^2
Length L_c : 136.2 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.169	304.6	0.0	7.6	0.00	1.58	0.0	400.0	0.0	400.0	0.0	1.00	
330.9	33	0.670	1207.6	0.2	7.9	0.00	1.62	203.5	415.8	101.7	381.9	203.5	1.65	
370.7	60	0.825	1487.0	0.4	8.1	0.00	1.65	266.3	407.5	133.2	363.1	266.3	1.97	
404.1	93	0.967	1743.0	0.7	8.3	0.00	1.69	323.5	402.7	161.8	348.7	323.5	2.34	
424.7	125	1.061	1912.4	0.9	8.5	0.00	1.73	360.9	400.8	180.5	340.6	360.9	2.64	
434.9	150	1.113	2006.1	1.1	8.7	0.00	1.76	381.3	400.8	190.7	337.2	381.3	2.82	
443.2	182	1.163	2096.3	1.3	9.0	0.00	1.79	400.6	402.1	200.3	335.3	400.6	2.99	
448.8	219	1.209	2179.2	1.6	9.2	0.00	1.84	418.1	405.2	209.0	335.6	418.1	3.13	
450.6	240	1.232	2220.6	1.8	9.4	0.00	1.86	426.6	407.7	213.3	336.6	426.6	3.19	
451.7	275	1.264	2278.3	2.0	9.6	0.00	1.90	438.3	412.5	219.2	339.4	438.3	3.27	
451.5	300	1.283	2312.5	2.2	9.8	0.00	1.93	445.1	416.1	222.6	341.9	445.1	3.30	
451.4	330	1.305	2352.2	2.4	10.0	0.00	1.96	452.9	420.0	226.4	344.6	452.9	3.34	
450.9	365	1.328	2393.7	2.7	10.3	0.00	2.00	460.8	424.5	230.4	347.7	460.8	3.37	
449.8	394	1.346	2426.1	2.9	10.5	0.00	2.03	467.0	428.7	233.5	350.9	467.0	3.39	
449.0	429	1.364	2458.5	3.1	10.8	0.00	2.07	472.8	432.4	236.4	353.6	472.8	3.41	
447.6	450	1.377	2482.0	3.3	10.9	0.00	2.09	477.2	436.0	238.6	356.5	477.2	3.42	
446.0	483	1.389	2503.6	3.5	11.2	0.00	2.12	480.7	439.4	240.4	359.2	480.7	3.42	
444.7	513	1.403	2528.8	3.8	11.4	0.00	2.15	485.1	442.9	242.6	362.0	485.1	3.42	
443.9	540	1.413	2546.9	4.0	11.6	0.00	2.18	488.0	445.1	244.0	363.8	488.0	3.43	
443.4	573	1.419	2557.7	4.2	11.8	0.00	2.21	489.1	446.2	244.6	364.6	489.1	3.43	
442.8	604	1.426	2570.3	4.4	12.1	0.00	2.24	490.7	447.5	245.3	365.8	490.7	3.43	
442.3	633	1.431	2579.3	4.6	12.3	0.00	2.27	491.5	448.5	245.8	366.5	491.5	3.42	
441.9	664	1.436	2588.3	4.9	12.5	0.00	2.30	492.2	449.2	246.1	367.2	492.2	3.42	
441.5	691	1.441	2597.3	5.1	12.7	0.00	2.33	493.1	450.1	246.6	367.9	493.1	3.42	
440.4	723	1.446	2606.3	5.3	12.9	0.00	2.36	493.8	451.5	246.9	369.2	493.8	3.41	
439.6	752	1.450	2613.6	5.5	13.1	0.00	2.39	494.2	452.5	247.1	370.1	494.2	3.41	«
438.7	786	1.453	2619.0	5.8	13.4	0.00	2.42	494.0	453.3	247.0	371.0	494.0	3.39	
438.1	815	1.455	2622.6	6.0	13.6	0.00	2.45	493.7	453.7	246.8	371.5	493.7	3.39	
437.4	841	1.457	2626.2	6.2	13.8	0.00	2.48	493.4	454.3	246.7	372.1	493.4	3.38	
436.8	873	1.458	2628.0	6.4	14.0	0.00	2.51	492.5	454.5	246.3	372.4	492.5	3.37	
436.1	901	1.458	2628.0	6.6	14.2	0.00	2.53	491.4	454.6	245.7	372.7	491.4	3.35	
435.4	951	1.458	2628.0	7.0	14.6	0.00	2.58	489.4	454.3	244.7	372.7	489.4	3.33	
434.4	1004	1.458	2628.0	7.4	15.0	0.00	2.63	487.3	454.3	243.7	373.0	487.3	3.31	
432.4	1053	1.457	2626.2	7.7	15.3	0.00	2.67	485.0	455.1	242.5	374.3	485.0	3.28	

Final volume (cm^3): 598.32 Final length (mm): 121.7 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D226
Depth(m) From : 19.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/7
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
430.6	1100	1.457	2626.2	8.1	15.7	0.00	2.72	483.1	456.0	241.6	375.4	483.1	3.25
428.7	1151	1.457	2626.2	8.5	16.1	0.00	2.76	481.1	456.8	240.5	376.7	481.1	3.22
426.4	1203	1.456	2624.4	8.8	16.4	0.00	2.81	478.6	457.9	239.3	378.1	478.6	3.19
424.3	1250	1.456	2624.4	9.2	16.8	0.00	2.85	476.8	459.1	238.4	379.6	476.8	3.16
422.6	1305	1.456	2624.4	9.6	17.2	0.00	2.90	474.6	459.7	237.3	380.6	474.6	3.13
420.5	1352	1.456	2624.4	9.9	17.5	0.00	2.95	472.7	460.9	236.4	382.1	472.7	3.11
418.7	1401	1.455	2622.6	10.3	17.9	0.00	2.99	470.4	461.5	235.2	383.1	470.4	3.08
416.4	1453	1.454	2620.8	10.7	18.3	0.00	3.04	468.0	462.6	234.0	384.6	468.0	3.05

Final volume (cm^3): 598.32 Final length (mm): 121.7 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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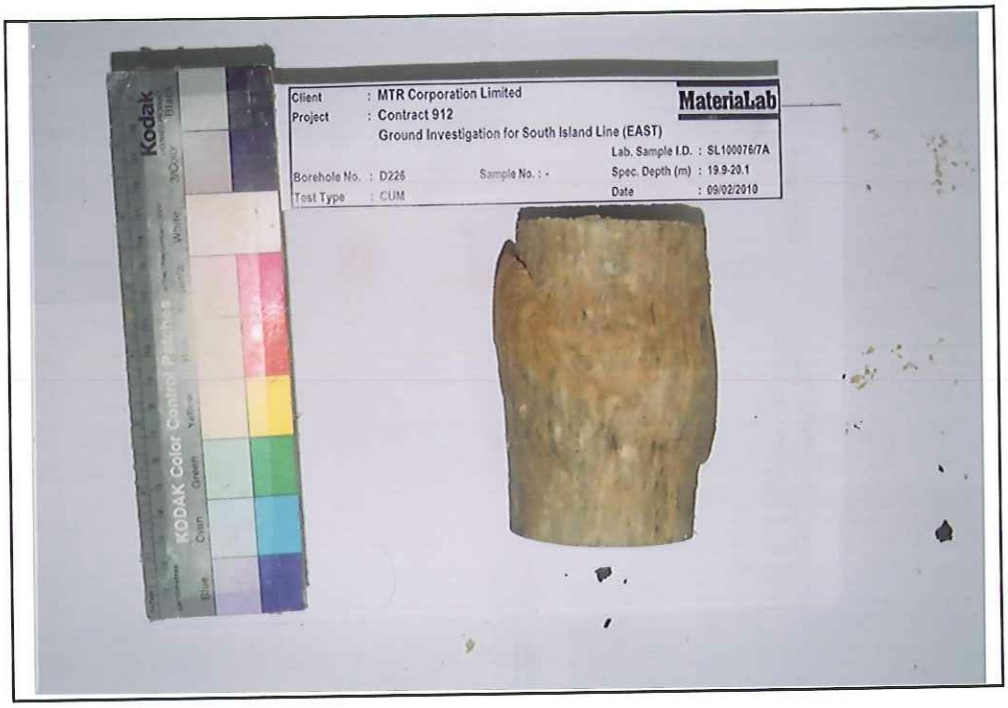
Photographic Records for Triaxial Test



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

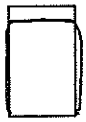
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 2.00
To : -
Sample origin : FILL
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 30-01-2010
Date test(s) completed : 05-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : S.W. Leung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 19.5 °C
Visual description : Moist, yellowish brown mottled with brown, slightly gravelly, sandy SILT/CLAY.

Lab. sample I.D. : SL100076/8
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 2.40
To : 2.60
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	20			30			40	
***Measurements and Calculations**		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.4	74.2	74.8	74.7	75.5		75.3	79.8
Length	mm	150.0	149.5	146.8	146.5	143.5		143.2	127.7
Volume	cm^3	652.12	645.72	645.72	642.12	642.12		638.52	638.52
Wet mass	g	1277.2	1284.7	1284.7	1281.1	1281.1		1277.5	1277.5
Dry mass	g	1022.8	1022.8	1022.8	1022.8	1022.8		1022.8	1022.8
Moisture content	%	24.9	25.6	25.6	25.3	25.3		24.9	24.9
Bulk density	Mg/m^3	1.96	1.99	1.99	2.00	2.00		2.00	2.00
Dry density	Mg/m^3	1.57	1.58	1.58	1.59	1.59		1.60	1.60
Void ratio		0.69	0.67	0.67	0.66	0.66		0.65	0.65
Degree of saturation	%	95.6	100.8	100.8	100.8	100.8		100.8	100.8
Saturation Stage									
****Volume change of water**	cm^3	13.9							
Consolidation Stage									
Side drain used		Yes			-			-	
Initial pore pressure	kPa	260.0			263.1			267.3	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm^3	6.4			3.6			3.6	
m_{vi}	m^2/MN	0.65			0.31			0.25	
t_{50}	min	2.00			7.70			8.70	
c_{vi} (from t_{50})	m^2/yr	NA			NA			NA	
t_{100}	min	25.00			30.25			28.09	
c_{vi} (from t_{100})	m^2/yr	4.49			3.76			4.12	
Sketch of failed specimen (Failure Mode)								 Plastic	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

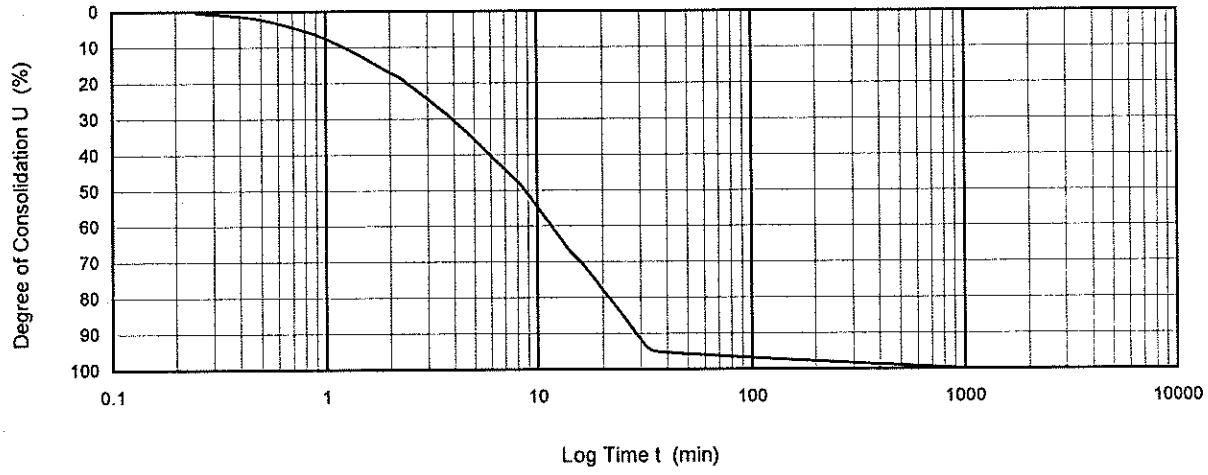
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	-

Laboratory Information

Cell pressure	:	285 kPa	Lab. sample I.D.	:	SL100076/8
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	40 kPa			

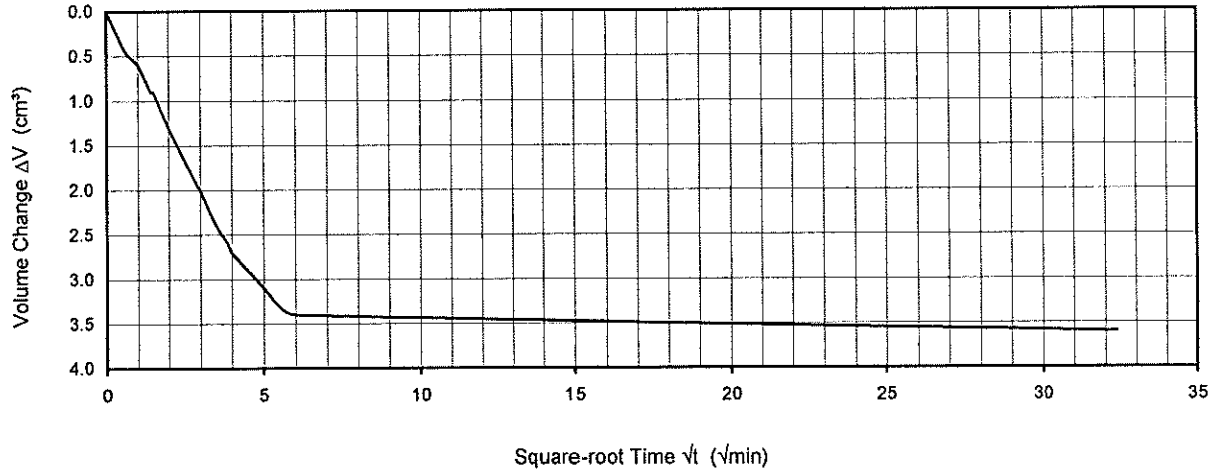
Degree of Consolidation vs. Log Time

t_{50} = 8.70 min ΔV = 3.6 cm³



Volume Change vs. Square-root Time

t_{100} = 28.09 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 2.00
To : -

Laboratory Information

Date shearing commenced : 03/02/2010 Time : 09:00
Date shearing completed : 03/02/2010 Time : 10:02
Proving ring serial No. : 14654
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.780 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.06

Lab. sample I.D. : SL100076/8
Specimen ref. : A
Cell pressure : 265 kPa
Back pressure : 245 kPa
Effective pressure : 20 kPa

Dimensions at starting of compression

Volume V_c : 645.72 cm^3
Area A_c : 4319.0 mm^2
Length L_c : 149.5 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.127	87.2	0.0	0.0	0.00	0.00	0.0	20.0	0.0	20.0	0.0	1.00	
249.9	30	0.332	228.0	0.2	0.2	0.48	0.05	32.0	31.1	16.0	25.8	32.0	3.12	
251.2	66	0.386	265.1	0.4	0.4	1.06	0.11	39.8	33.7	19.9	27.1	39.8	3.89	
251.6	90	0.418	287.1	0.6	0.6	1.44	0.15	44.4	35.6	22.2	28.2	44.4	4.31	
251.5	120	0.452	310.4	0.8	0.8	1.92	0.20	49.1	38.1	24.6	29.9	49.1	4.64	
251.0	155	0.489	335.9	1.0	1.0	2.48	0.26	54.2	41.1	27.1	32.1	54.2	4.87	
250.3	180	0.512	351.6	1.2	1.2	2.88	0.30	57.3	43.4	28.7	33.8	57.3	4.90	
249.4	217	0.542	372.3	1.5	1.5	3.47	0.36	61.2	46.2	30.6	36.0	61.2	4.92	
249.0	240	0.557	382.6	1.6	1.6	3.84	0.39	63.1	47.5	31.5	37.0	63.1	4.94	«
248.3	270	0.575	394.9	1.8	1.8	4.32	0.44	65.2	49.3	32.6	38.4	65.2	4.90	

Final volume (cm^3): 645.72 Final length (mm): 146.8 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	-

Laboratory Information

Date shearing commenced	:	03/02/2010	Time :	13:30				
Date shearing completed	:	03/02/2010	Time :	14:43	Lab. sample I.D.	:	SL100076/8	
Proving ring serial No.	:	14654			Specimen ref.	:	A	
Type of membrane	:	rubber			Cell pressure	:	275	kPa
Corrections					Back pressure	:	245	kPa
*Side drain, σ_{dr}	:	4.780	kPa/%		Effective pressure	:	30	kPa
Membrane thickness, σ_{mb}	:	0.64	mm		Dimensions at starting of compression			
Rate of axial displacement	:	0.050	mm/min		Volume V_c	:	642.12	cm^3
Pore pressure coefficient, A_f	:	0.03			Area A_c	:	4382.0	mm^2
					Length L_c	:	146.5	mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.139	95.5	0.0	2.0	4.75	0.48	0.0	30.0	0.0	30.0	0.0	1.00	
252.8	38	0.411	282.3	0.3	2.2	4.78	0.54	37.2	40.8	18.6	34.6	37.2	2.68	
253.2	62	0.480	329.7	0.4	2.4	4.78	0.58	47.9	45.7	23.9	37.8	47.9	3.20	
252.9	93	0.567	389.4	0.6	2.6	4.78	0.62	61.3	52.7	30.6	42.5	61.3	3.77	
252.4	121	0.631	433.4	0.8	2.8	4.78	0.67	71.0	58.1	35.5	46.3	71.0	4.14	
251.4	159	0.688	472.5	1.1	3.1	4.78	0.72	79.6	63.4	39.8	50.1	79.6	4.37	
250.6	183	0.710	487.6	1.2	3.2	4.78	0.76	82.8	65.8	41.4	52.0	82.8	4.40	
249.9	210	0.734	504.1	1.4	3.4	4.78	0.80	86.3	68.3	43.2	53.9	86.3	4.44	
249.1	243	0.757	519.9	1.7	3.6	4.78	0.84	89.6	70.7	44.8	55.8	89.6	4.46	
248.2	279	0.780	535.7	1.9	3.9	4.78	0.89	92.9	73.2	46.4	57.8	92.9	4.47	«
247.5	302	0.793	544.6	2.1	4.0	4.78	0.93	94.7	74.8	47.3	59.1	94.7	4.44	

Final volume (cm^3): 642.12 Final length (mm): 143.5 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 2.00
To : -

Laboratory Information

Date shearing commenced : 04/02/2010 Time : 09:00
Date shearing completed : 04/02/2010 Time : 14:30
Proving ring serial No. : 14654
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.780 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.11

Lab. sample I.D. : SL100076/8
Specimen ref. : A
Cell pressure : 285 kPa
Back pressure : 245 kPa
Effective pressure : 40 kPa

Dimensions at starting of compression
Volume V_c : 638.52 cm^3
Area A_c : 4457.5 mm^2
Length L_c : 143.2 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.149	102.3	0.0	4.2	4.78	0.95	0.0	40.0	0.0	40.0	0.0	1.00	
253.2	30	0.468	321.4	0.2	4.4	4.78	1.00	43.3	53.4	21.6	46.2	43.3	2.36	
253.6	60	0.583	400.4	0.4	4.6	4.78	1.04	60.8	61.8	30.4	51.7	60.8	2.94	
252.6	90	0.700	480.8	0.6	4.8	4.78	1.08	78.5	71.7	39.3	58.6	78.5	3.42	
251.6	120	0.798	548.1	0.8	5.0	4.78	1.12	93.3	80.0	46.6	64.5	93.3	3.79	
250.7	150	0.863	592.7	1.0	5.2	4.78	1.16	102.9	85.8	51.5	68.6	102.9	4.00	
249.7	180	0.904	620.9	1.3	5.4	4.78	1.20	108.9	89.7	54.4	71.6	108.9	4.08	
248.7	210	0.931	639.4	1.5	5.7	4.78	1.24	112.7	92.7	56.4	73.9	112.7	4.10	
247.2	253	0.954	655.2	1.8	6.0	4.78	1.29	115.8	95.7	57.9	76.4	115.8	4.06	
246.4	278	0.964	662.1	1.9	6.1	4.78	1.32	117.0	97.1	58.5	77.6	117.0	4.03	
246.0	300	0.973	668.3	2.1	6.3	4.78	1.35	118.2	98.1	59.1	78.4	118.2	4.03	
245.0	330	0.984	675.8	2.3	6.5	4.78	1.39	119.5	99.8	59.8	79.8	119.5	3.99	
244.3	360	0.993	682.0	2.5	6.7	4.78	1.42	120.6	101.0	60.3	80.9	120.6	3.96	
243.7	390	1.004	689.6	2.7	6.9	4.78	1.46	121.9	102.3	61.0	81.9	121.9	3.95	
243.0	421	1.017	698.5	2.9	7.1	4.78	1.50	123.5	103.8	61.8	83.2	123.5	3.94	
242.1	451	1.031	708.1	3.1	7.3	4.78	1.53	125.3	105.6	62.7	84.7	125.3	3.92	
241.6	480	1.047	719.1	3.4	7.5	4.78	1.57	127.4	107.1	63.7	85.9	127.4	3.94	
241.1	515	1.058	726.6	3.6	7.8	4.78	1.61	128.6	108.2	64.3	86.8	128.6	3.93	
240.6	540	1.070	734.9	3.8	8.0	4.78	1.64	130.1	109.5	65.1	87.8	130.1	3.93	
239.4	574	1.078	740.4	4.0	8.2	4.78	1.67	130.9	111.1	65.5	89.2	130.9	3.87	
238.5	601	1.085	745.2	4.2	8.4	4.78	1.70	131.7	112.3	65.8	90.4	131.7	3.83	
237.5	632	1.092	750.0	4.4	8.6	4.78	1.74	132.4	113.7	66.2	91.6	132.4	3.79	
236.4	664	1.096	752.7	4.6	8.8	4.78	1.77	132.6	114.9	66.3	92.8	132.6	3.73	
235.3	693	1.101	756.2	4.8	9.0	4.78	1.81	133.0	116.2	66.5	94.0	133.0	3.68	
234.3	722	1.107	760.3	5.0	9.2	4.78	1.84	133.6	117.5	66.8	95.2	133.6	3.63	
233.6	755	1.111	763.0	5.3	9.5	4.78	1.87	133.8	118.3	66.9	96.0	133.8	3.60	
232.5	780	1.115	765.8	5.4	9.6	4.78	1.90	134.1	119.5	67.0	97.2	134.1	3.55	
231.4	813	1.118	767.9	5.7	9.9	4.78	1.93	134.1	120.7	67.1	98.3	134.1	3.50	
230.6	843	1.122	770.6	5.9	10.1	4.78	1.96	134.4	121.6	67.2	99.2	134.4	3.47	«
229.4	873	1.124	772.0	6.1	10.3	4.78	2.00	134.3	122.7	67.1	100.4	134.3	3.42	
228.3	901	1.126	773.4	6.3	10.5	4.78	2.02	134.3	123.8	67.1	101.5	134.3	3.37	
227.6	933	1.127	774.0	6.5	10.7	4.78	2.06	134.0	124.4	67.0	102.1	134.0	3.34	
226.4	964	1.129	775.4	6.7	10.9	4.78	2.09	134.0	125.6	67.0	103.3	134.0	3.29	
225.3	993	1.130	776.1	6.9	11.1	4.78	2.12	133.8	126.6	66.9	104.3	133.8	3.24	

Final volume (cm^3): 638.52 Final length (mm): 127.7 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 2.00
To : -

Laboratory Information

Lab. sample I.D. : SL100076/8
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
224.2	1022	1.130	776.1	7.1	11.3	4.78	2.14	133.4	127.5	66.7	105.3	133.4	3.19
223.4	1051	1.129	775.4	7.3	11.5	4.78	2.17	133.0	128.1	66.5	105.9	133.0	3.16
221.4	1105	1.127	774.0	7.7	11.9	4.78	2.22	132.1	129.6	66.0	107.6	132.1	3.08
218.7	1152	1.124	772.0	8.0	12.2	4.78	2.27	131.1	131.8	65.5	110.0	131.1	2.98
216.4	1206	1.122	770.6	8.4	12.6	4.78	2.32	130.2	133.7	65.1	112.0	130.2	2.90
214.3	1254	1.120	769.2	8.8	12.9	4.78	2.36	129.4	135.4	64.7	113.8	129.4	2.83
212.5	1303	1.118	767.9	9.1	13.3	4.78	2.41	128.5	136.8	64.3	115.3	128.5	2.77
210.6	1350	1.116	766.5	9.4	13.6	4.78	2.45	127.7	138.3	63.9	117.0	127.7	2.72
208.7	1401	1.114	765.1	9.8	14.0	4.78	2.50	126.9	139.7	63.4	118.6	126.9	2.66
206.4	1452	1.111	763.0	10.1	14.3	4.78	2.54	125.9	141.5	62.9	120.6	125.9	2.60
204.3	1505	1.108	761.0	10.5	14.7	4.78	2.59	124.9	143.1	62.4	122.3	124.9	2.55
202.7	1557	1.105	758.9	10.9	15.1	4.78	2.64	123.9	144.2	61.9	123.6	123.9	2.51

Final volume (cm^3): 638.52 Final length (mm): 127.7 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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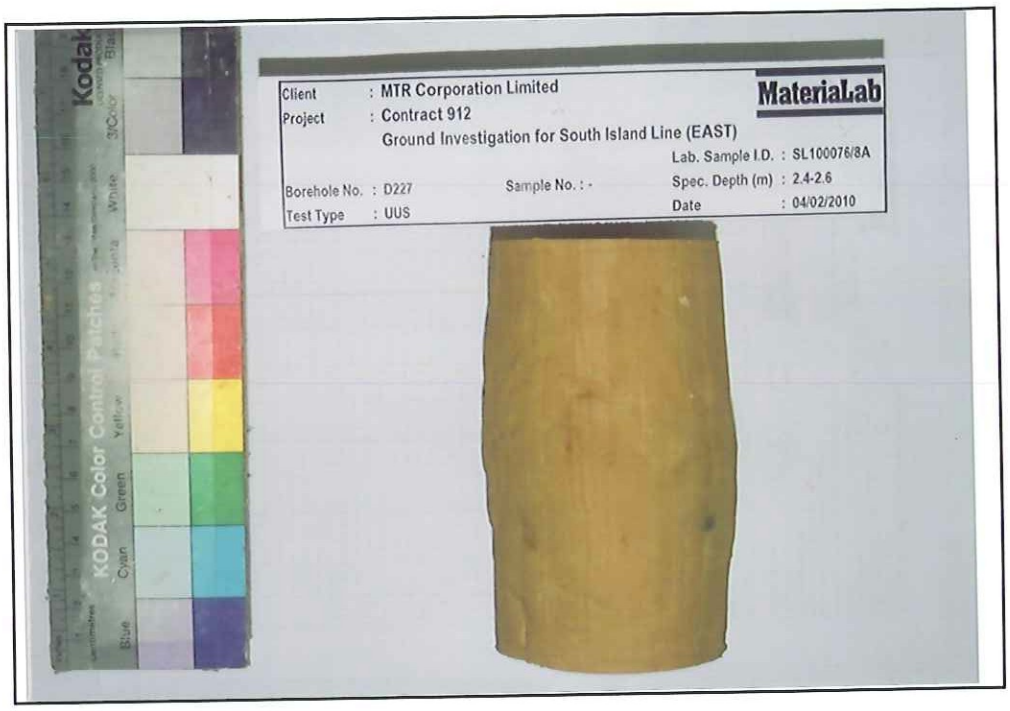
Photographic Records for Triaxial Test



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 6.10
To : -
Sample origin : ALL
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 01-02-2010
Date test(s) completed : 06-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 20.0 °C
Visual description : Moist, light brownish grey mottled with yellow and white, silty/clayey, gravelly SAND.

Lab. sample I.D. : SL100076/9
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 6.50
To : 6.70
Affiliation : FTS Ltd. - MaterialLab Division

Stage No.		1			2			3	
Effective pressure	kPa	30			60			120	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.6	74.4	75.3	75.2	75.9		75.7	79.6
Length	mm	150.2	149.8	146.1	145.8	143.1		142.7	129.2
Volume	cm³	656.50	651.40	651.40	647.00	647.00		642.30	642.30
Wet mass	g	1371.4	1371.3	1371.3	1366.9	1366.9		1362.2	1362.2
Dry mass	g	1154.3	1154.3	1154.3	1154.3	1154.3		1154.3	1154.3
Moisture content	%	18.8	18.8	18.8	18.4	18.4		18.0	18.0
Bulk density	Mg/m³	2.09	2.11	2.11	2.11	2.11		2.12	2.12
Dry density	Mg/m³	1.76	1.77	1.77	1.78	1.78		1.80	1.80
Void ratio		0.51	0.50	0.50	0.49	0.49		0.47	0.47
Degree of saturation	%	98.3	100.5	100.5	100.6	100.6		100.6	100.6
Saturation Stage									
**Volume change of water	cm³	5.0							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	270.0			284.1			318.8	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	5.1			4.4			4.7	
m_{vi}	m²/MN	0.31			0.17			0.10	
t_{50}	min	1.55			0.93			0.58	
c_{vi} (from t_{50})	m²/yr	2903.42			4581.27			7041.19	
t_{100}	min	4.41			2.56			1.69	
c_{vi} (from t_{100})	m²/yr	2049.24			3601.74			5533.60	
Sketch of failed specimen (Failure Mode)								Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

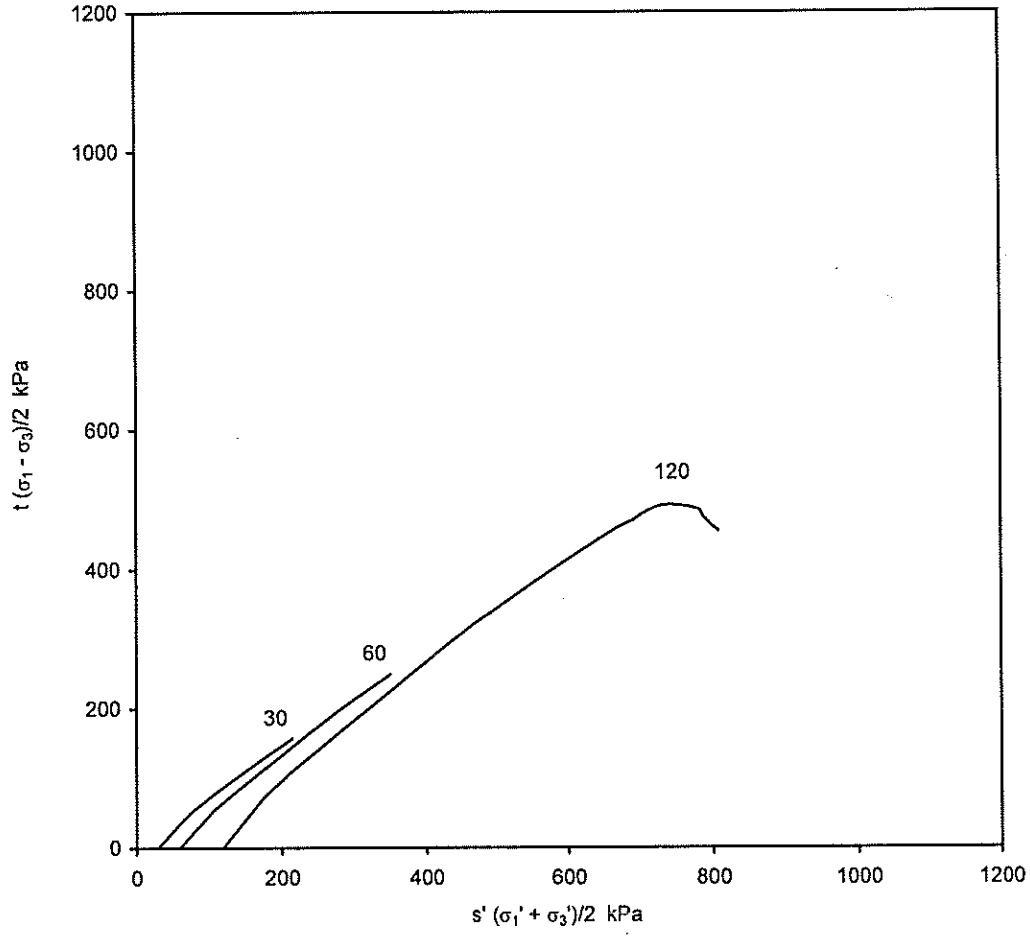
Client sample No. : -
Borehole No. : D227
Depth(m) From : 6.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/9
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	30	2.2	2.2	223.9	280.4	191.3	140.2
2	60	1.7	4.4	210.6	466.2	327.5	233.1
3	120	4.4	9.2	111.4	983.0	745.1	491.5



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

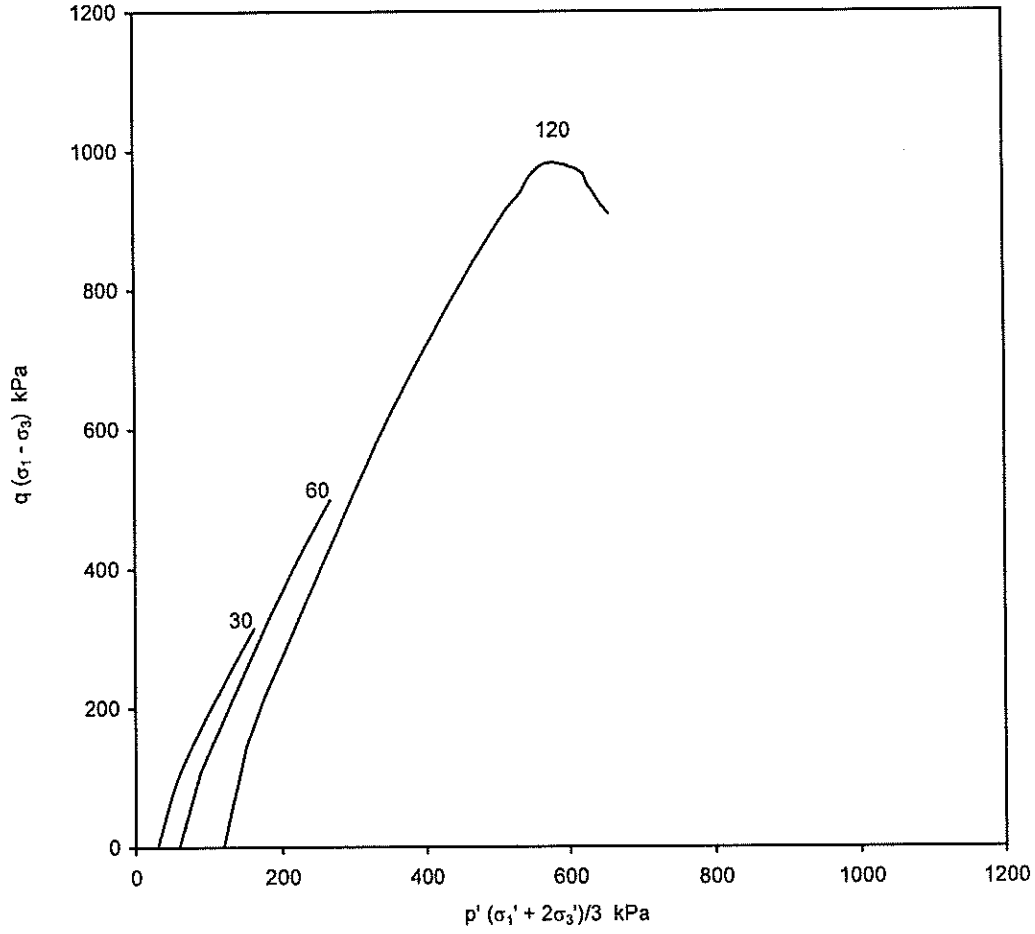
Client sample No. : -
Borehole No. : D227
Depth(m) From : 6.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/9
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	30	2.2	2.2	223.9	280.4	144.6	280.4
2	60	1.7	4.4	210.6	466.2	249.8	466.2
3	120	4.4	9.2	111.4	983.0	581.3	983.0



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

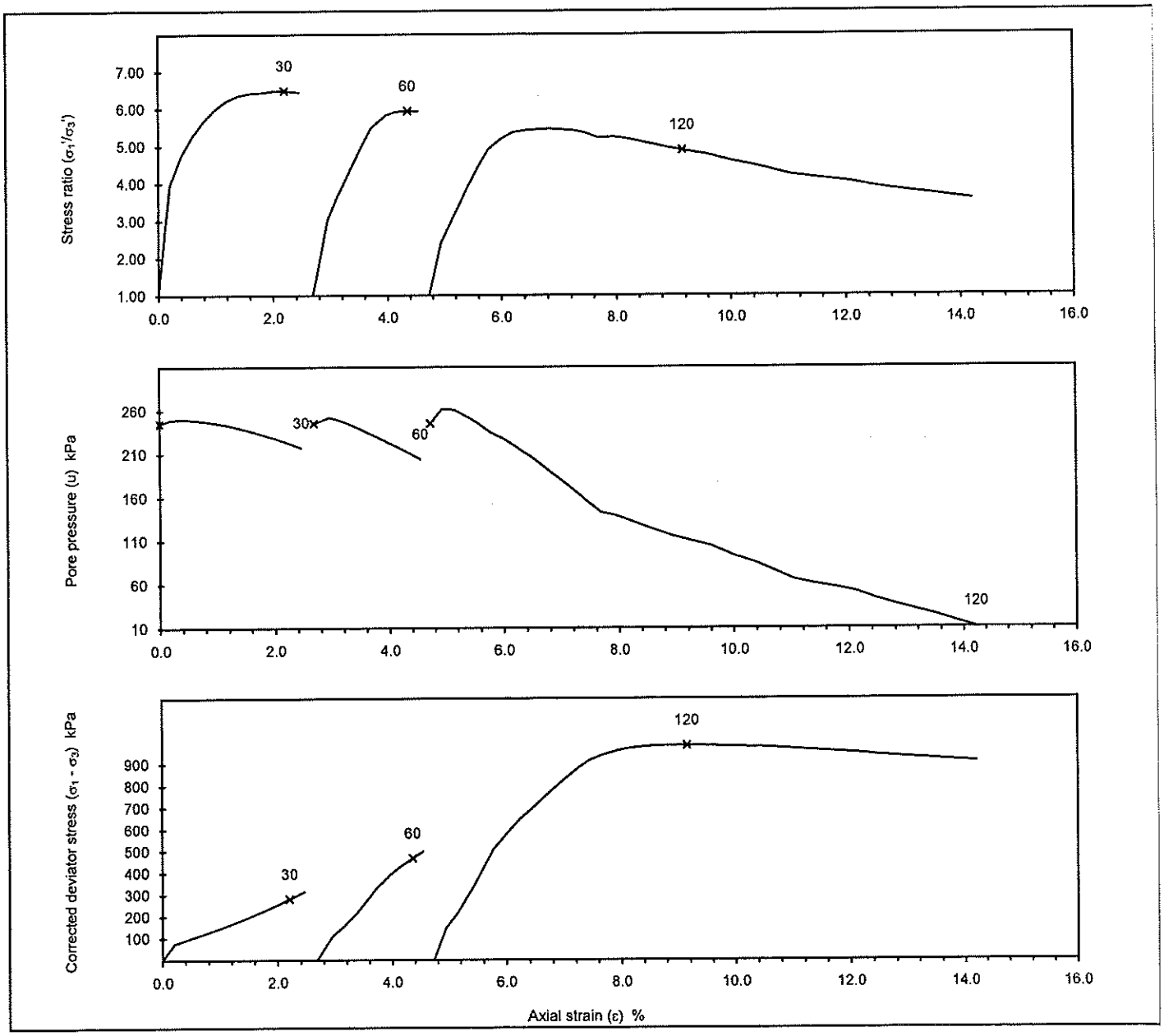
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 6.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/9
Specimen ref. : A



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MateriaLab

HKAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 6.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/9
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	30	
	Stage 2	kPa	60	
	Stage 3	kPa	120	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			125	120
			150	145
			175	170
			200	195
			225	220
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		1.00
Volume change	cm^3	5.0

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1359.7
Final moisture content	%	17.8
Final bulk density	Mg/m^3	2.12

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

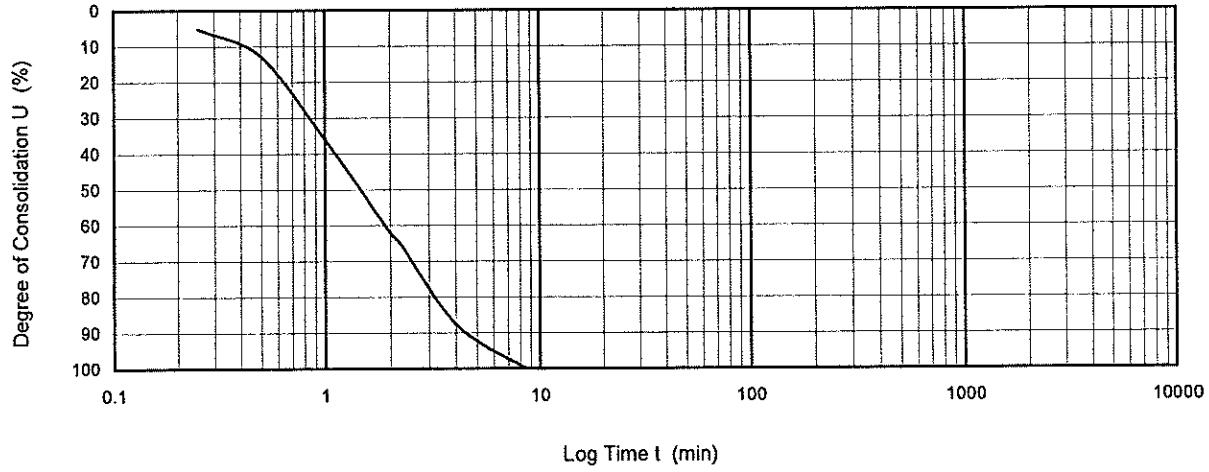
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	6.10
			To	:	-

Laboratory Information

Cell pressure	:	275 kPa	Lab. sample I.D.	:	SL100076/9
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	30 kPa			

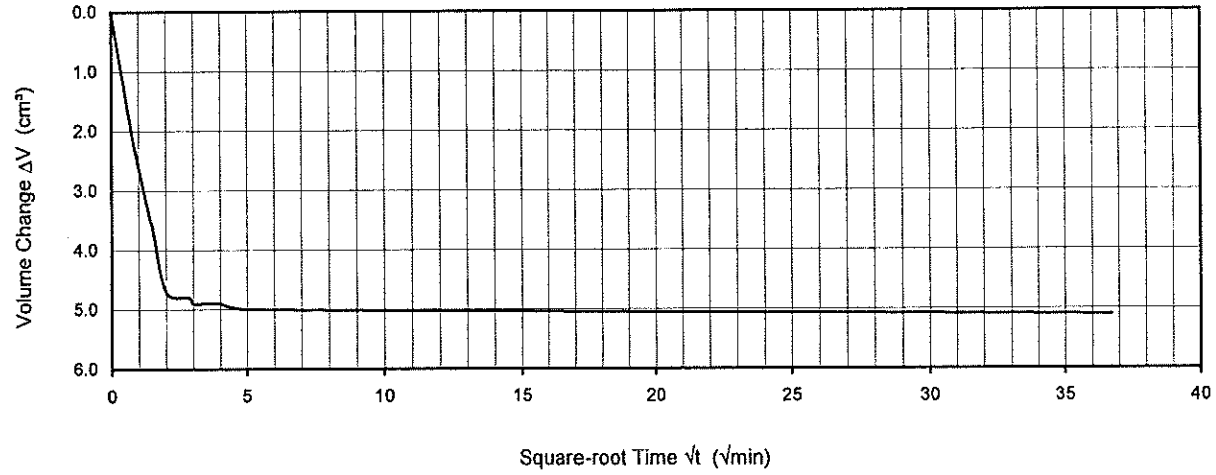
Degree of Consolidation vs. Log Time

t_{50} = 1.55 min ΔV = 5.1 cm³



Volume Change vs. Square-root Time

t_{100} = 4.41 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

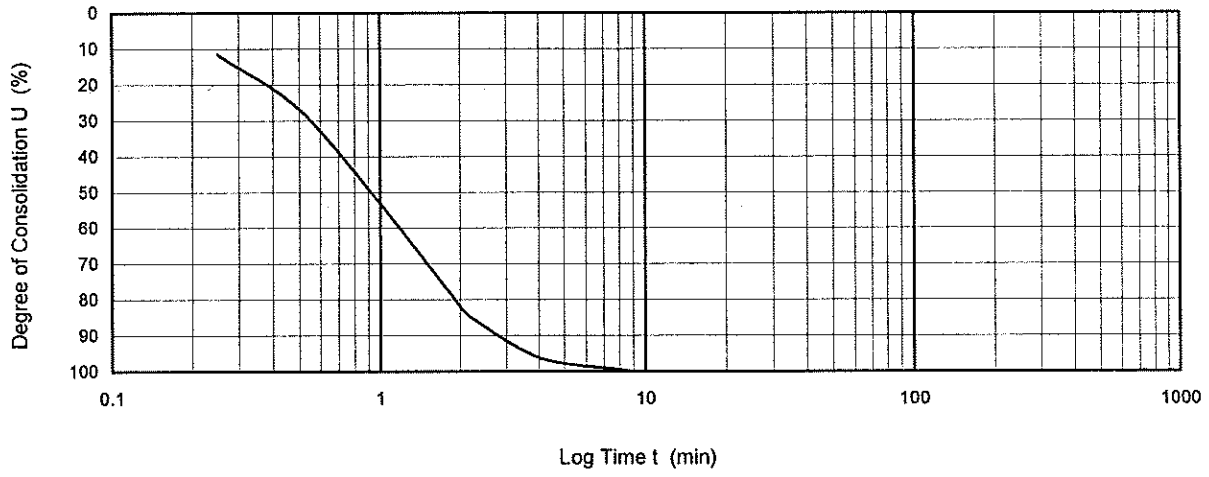
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	6.10
			To	:	-

Laboratory Information

Cell pressure	:	305 kPa	Lab. sample I.D.	:	SL100076/9
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	60 kPa			

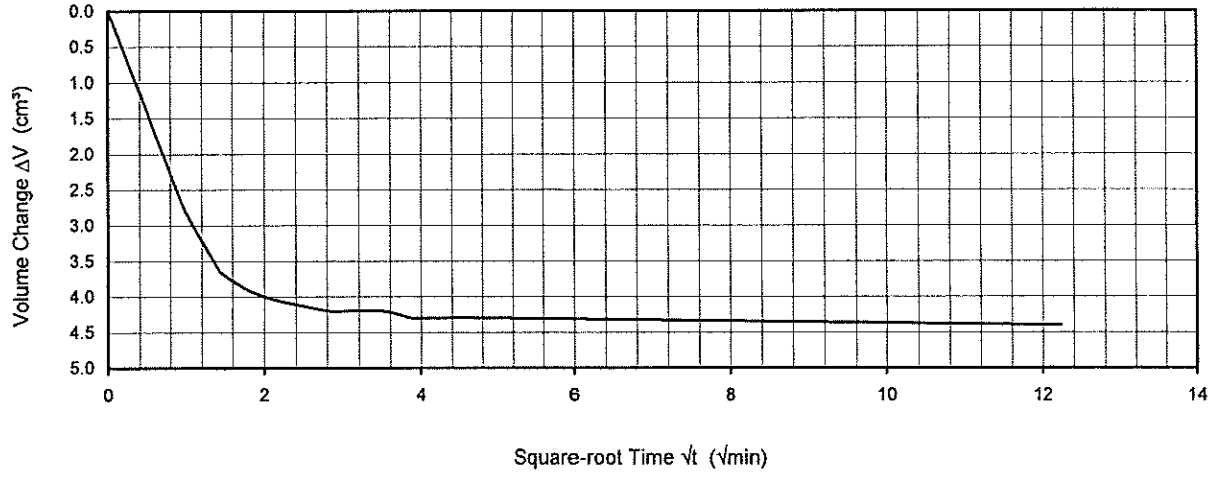
Degree of Consolidation vs. Log Time

t_{50} = 0.93 min ΔV = 4.4 cm³



Volume Change vs. Square-root Time

t_{100} = 2.56 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

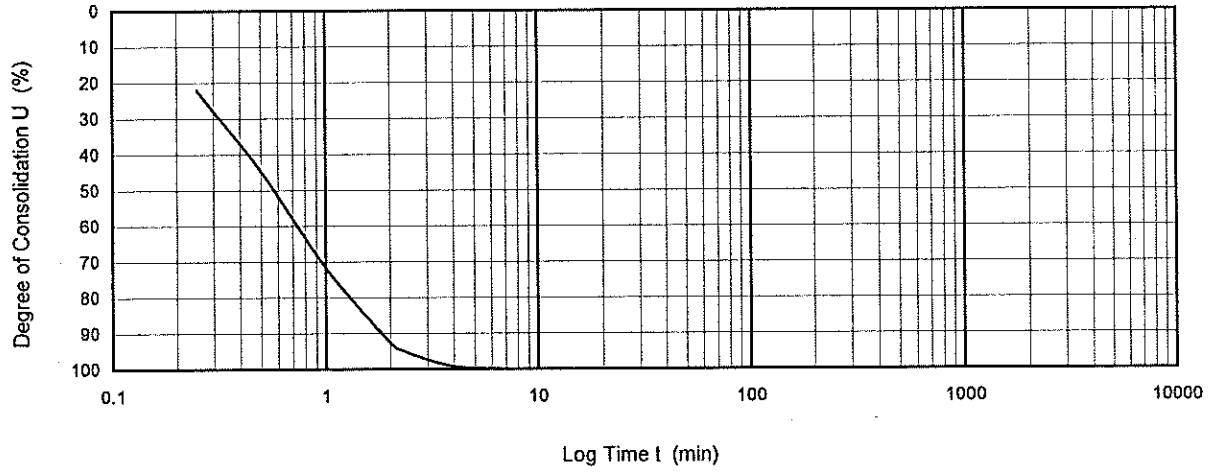
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	6.10
			To	:	-

Laboratory Information

Cell pressure	:	365 kPa	Lab. sample I.D.	:	SL100076/9
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	120 kPa			

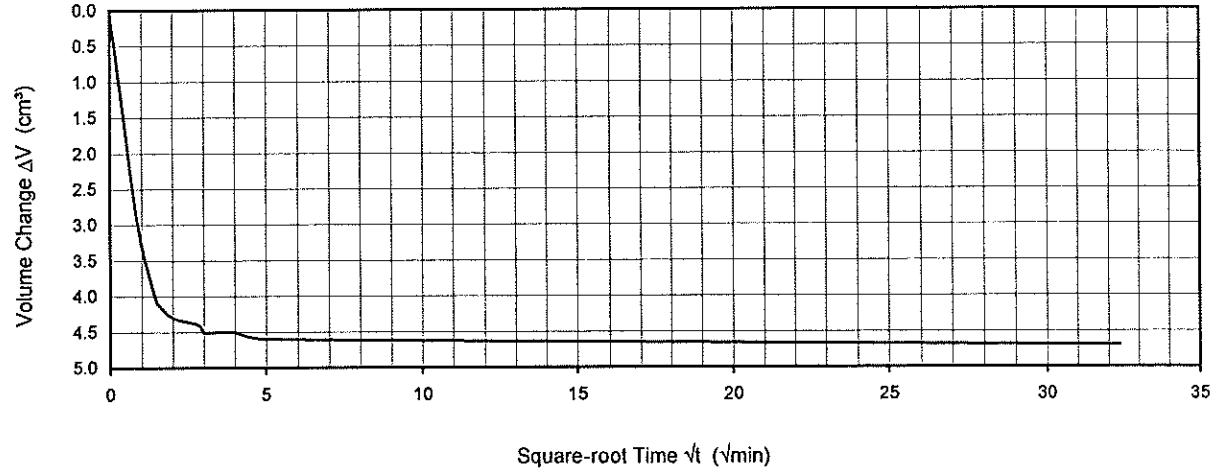
Degree of Consolidation vs. Log Time

t_{50} = 0.58 min ΔV = 4.7 cm³



Volume Change vs. Square-root Time

t_{100} = 1.69 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 6.10
To : -

Laboratory Information

Date shearing commenced : 04/02/2010 Time : 09:00
Date shearing completed : 04/02/2010 Time : 10:29
Proving ring serial No. : 10175
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.08

Lab. sample I.D. : SL100076/9
Specimen ref. : A
Cell pressure : 275 kPa
Back pressure : 245 kPa
Effective pressure : 30 kPa

Dimensions at starting of compression

Volume V_c : 651.40 cm^3
Area A_c : 4348.2 mm^2
Length L_c : 149.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.061	109.9	0.0	0.0	0.00	0.00	0.0	30.0	0.0	30.0	0.0	1.00	
249.7	30	0.243	438.0	0.2	0.2	0.00	0.05	75.2	62.9	37.6	50.4	75.2	3.97	
250.3	61	0.287	517.3	0.4	0.4	0.00	0.11	93.2	71.3	46.6	55.8	93.2	4.77	
249.4	90	0.327	589.4	0.6	0.6	0.00	0.16	109.4	80.3	54.7	62.1	109.4	5.28	
247.7	120	0.373	672.3	0.8	0.8	0.00	0.21	128.1	91.3	64.0	70.0	128.1	5.69	
245.7	150	0.418	753.4	1.0	1.0	0.00	0.26	146.2	102.4	73.1	78.0	146.2	5.99	
243.1	180	0.469	845.3	1.2	1.2	0.00	0.31	166.8	115.3	83.4	87.5	166.8	6.23	
240.0	210	0.521	939.1	1.4	1.4	0.00	0.36	187.7	128.8	93.8	97.6	187.7	6.36	
235.9	244	0.582	1049.0	1.6	1.6	0.00	0.41	212.0	145.1	106.0	109.8	212.0	6.42	
232.5	270	0.630	1135.5	1.8	1.8	0.00	0.45	231.2	158.1	115.6	119.6	231.2	6.44	
228.4	300	0.691	1245.5	2.0	2.0	0.00	0.50	255.4	174.3	127.7	131.7	255.4	6.48	
223.9	330	0.754	1359.0	2.2	2.2	0.00	0.55	280.4	191.3	140.2	144.6	280.4	6.49	«
217.3	369	0.840	1514.1	2.5	2.5	0.00	0.61	314.4	214.9	157.2	162.5	314.4	6.45	

Final volume (cm^3): 651.40 Final length (mm): 146.1 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	6.10
			To	:	-

Laboratory Information

Date shearing commenced	:	04/02/2010	Time :	13:30				
Date shearing completed	:	04/02/2010	Time :	14:49	Lab. sample I.D.	:	SL100076/9	
Proving ring serial No.	:	10175			Specimen ref.	:	A	
Type of membrane	:	rubber			Cell pressure	:	305	kPa
Corrections					Back pressure	:	245	kPa
*Side drain, σ_{dr}	:	0.000	kPa/%		Effective pressure	:	60	kPa
Membrane thickness, σ_{mb}	:	0.66	mm		Dimensions at starting of compression			
Rate of axial displacement	:	0.050	mm/min		Volume V_c	:	647.00	cm^3
Pore pressure coefficient, A_f	:	-0.07			Area A_c	:	4437.9	mm^2
					Length L_c	:	145.8	mm

Pore pressure u	Axial gauge reading	Proving ring reading	Axial force	Axial strain ε	ε_c	Side drain correction σ_{dr}	Membrane correction σ_{mb}	Corr. Dev. stress $\sigma_1-\sigma_3$	s'	t	p'	q	Stress ratio σ_1'/σ_3'	
kPa	div	div	N	%	%	kPa	kPa	kPa	kPa	kPa	kPa	kPa		
245.0	0	0.071	128.0	0.0	2.7	0.00	0.66	0.0	60.0	0.0	60.0	0.0	1.00	
251.9	39	0.340	612.8	0.3	3.0	0.00	0.72	108.2	107.2	54.1	89.2	108.2	3.04	
249.5	62	0.431	776.9	0.4	3.1	0.00	0.75	144.8	127.9	72.4	103.8	144.8	3.61	
244.8	90	0.554	998.6	0.6	3.3	0.00	0.79	194.2	157.3	97.1	124.9	194.2	4.23	
238.5	120	0.713	1285.1	0.8	3.5	0.00	0.84	257.8	195.4	128.9	152.4	257.8	4.88	
231.8	151	0.890	1604.2	1.0	3.7	0.00	0.88	328.3	237.4	164.2	182.6	328.3	5.49	
223.4	189	1.056	1903.4	1.3	4.0	0.00	0.94	393.9	278.6	197.0	212.9	393.9	5.83	
217.8	214	1.145	2063.8	1.5	4.2	0.00	0.97	428.8	301.6	214.4	230.1	428.8	5.92	
210.6	245	1.241	2236.8	1.7	4.4	0.00	1.02	466.2	327.5	233.1	249.8	466.2	5.94	«
204.0	272	1.324	2386.4	1.9	4.5	0.00	1.05	498.4	350.2	249.2	267.1	498.4	5.93	

Final volume (cm^3): 647.00 Final length (mm): 143.1 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 6.10
To : -

Laboratory Information

Date shearing commenced : 05/02/2010 Time : 09:00
Date shearing completed : 05/02/2010 Time : 13:59
Proving ring serial No. : 10106
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.14

Lab. sample I.D. : SL100076/9
Specimen ref. : A
Cell pressure : 365 kPa
Back pressure : 245 kPa
Effective pressure : 120 kPa

Dimensions at starting of compression

Volume V_c : 642.30 cm^3
Area A_c : 4500.4 mm^2
Length L_c : 142.7 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	27	169.9	0.0	4.7	0.00	1.09	0.0	120.0	0.0	120.0	0.0	1.00
261.7	30	132	830.5	0.2	4.9	0.00	1.13	145.4	176.0	72.7	151.8	145.4	2.41
260.9	60	182	1145.1	0.4	5.2	0.00	1.17	214.6	211.4	107.3	175.6	214.6	3.06
251.0	98	267	1679.9	0.7	5.4	0.00	1.23	332.0	280.0	166.0	224.7	332.0	3.91
244.6	120	320	2013.4	0.8	5.6	0.00	1.26	404.9	322.9	202.5	255.4	404.9	4.36
234.7	150	395	2485.3	1.1	5.8	0.00	1.30	507.8	384.2	253.9	299.6	507.8	4.90
226.9	183	448	2818.8	1.3	6.0	0.00	1.34	579.7	428.0	289.9	331.3	579.7	5.20
218.9	211	490	3083.1	1.5	6.2	0.00	1.38	636.4	464.3	318.2	358.2	636.4	5.36
206.7	248	538	3385.1	1.7	6.5	0.00	1.42	700.6	508.6	350.3	391.8	700.6	5.43
197.7	273	570	3586.4	1.9	6.6	0.00	1.45	743.2	538.9	371.6	415.0	743.2	5.44
187.7	300	605	3806.6	2.1	6.8	0.00	1.49	789.6	572.1	394.8	440.5	789.6	5.45
176.7	330	640	4026.8	2.3	7.0	0.00	1.53	835.7	606.1	417.8	466.9	835.7	5.44
164.7	362	676	4253.4	2.5	7.3	0.00	1.56	882.8	641.7	441.4	494.6	882.8	5.41
153.9	390	703	4423.2	2.7	7.5	0.00	1.60	917.7	669.9	458.8	517.0	917.7	5.35
142.5	420	720	4530.2	2.9	7.7	0.00	1.63	938.7	691.9	469.4	535.4	938.7	5.22
138.9	457	736	4630.9	3.2	7.9	0.00	1.68	957.8	705.0	478.9	545.4	957.8	5.24
135.1	481	745	4687.5	3.4	8.1	0.00	1.71	968.3	714.0	484.1	552.7	968.3	5.21
129.6	513	752	4731.5	3.6	8.3	0.00	1.74	975.4	723.1	487.7	560.5	975.4	5.14
124.3	543	757	4763.0	3.8	8.5	0.00	1.78	980.0	730.7	490.0	567.4	980.0	5.07
119.7	572	760	4781.9	4.0	8.7	0.00	1.81	981.9	736.3	491.0	572.6	981.9	5.00
115.2	601	762	4794.5	4.2	8.9	0.00	1.84	982.5	741.0	491.2	577.3	982.5	4.93
111.4	631	764	4807.0	4.4	9.2	0.00	1.88	983.0	745.1	491.5	581.3	983.0	4.88
107.6	664	765	4813.3	4.7	9.4	0.00	1.91	981.9	748.3	490.9	584.7	981.9	4.81
104.3	693	766	4819.6	4.9	9.6	0.00	1.95	981.1	751.2	490.5	587.7	981.1	4.76
98.7	721	767	4825.9	5.1	9.8	0.00	1.98	980.4	756.5	490.2	593.1	980.4	4.68
92.4	753	768	4832.2	5.3	10.0	0.00	2.01	979.3	762.3	489.7	599.0	979.3	4.59
87.6	786	768	4832.2	5.5	10.2	0.00	2.05	976.9	765.8	488.4	603.0	976.9	4.52
83.1	814	769	4838.5	5.7	10.4	0.00	2.07	976.1	770.0	488.1	607.3	976.1	4.46
77.5	843	769	4838.5	5.9	10.6	0.00	2.10	974.0	774.5	487.0	612.2	974.0	4.39
71.4	872	768	4832.2	6.1	10.8	0.00	2.13	970.6	778.9	485.3	617.1	970.6	4.31
65.4	901	767	4825.9	6.3	11.0	0.00	2.16	967.1	783.2	483.6	622.0	967.1	4.23
60.6	951	765	4813.3	6.7	11.4	0.00	2.22	960.8	784.8	480.4	624.7	960.8	4.16
56.3	1003	763	4800.8	7.0	11.8	0.00	2.27	954.4	785.9	477.2	626.8	954.4	4.09
51.4	1054	761	4788.2	7.4	12.1	0.00	2.32	948.1	787.7	474.1	629.6	948.1	4.02

Final volume (cm^3): 642.30 Final length (mm): 129.2 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 6.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/9
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
43.4	1102	758	4769.3	7.7	12.5	0.00	2.36	940.7	792.0	470.4	635.2	940.7	3.93
36.6	1151	755	4750.4	8.1	12.8	0.00	2.41	933.3	795.1	466.7	639.5	933.3	3.84
30.4	1202	753	4737.8	8.4	13.2	0.00	2.46	927.1	798.1	463.5	643.6	927.1	3.77
24.3	1255	751	4725.2	8.8	13.5	0.00	2.51	920.7	801.1	460.4	647.6	920.7	3.70
17.5	1300	749	4712.7	9.1	13.8	0.00	2.55	914.9	805.0	457.5	652.5	914.9	3.63
10.4	1354	747	4700.1	9.5	14.2	0.00	2.60	908.5	808.9	454.3	657.4	908.5	3.56

Final volume (cm^3): 642.30 Final length (mm): 129.2 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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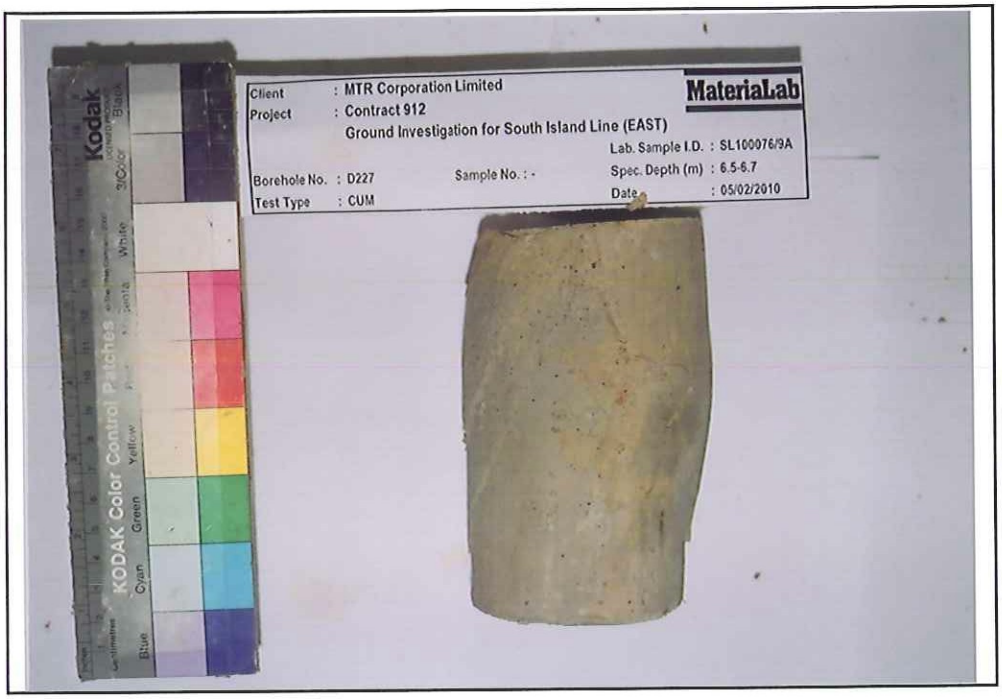
Photographic Records for Triaxial Test



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

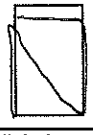
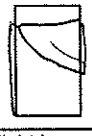
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 8.10
To : -
Sample origin : HDT
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 03-02-2010
Date test(s) completed : 11-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 19.5 °C

Lab. sample I.D. : SL100076/10
Sample type : M

Specimen reference			A			B			C		
Specimen depth(m)	From		8.50			8.70			8.90		
	To		8.70			8.90			9.10		
Effective pressure		kPa	40			80			160		
*Measurements and Calculations			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.6	74.3	79.2	74.6	74.2	79.0	74.6	74.1	78.8
Length		mm	150.2	149.6	131.6	150.3	149.5	132.0	150.2	149.1	131.6
Volume		cm^3	656.50	648.60	648.60	656.94	646.44	646.44	656.50	642.40	642.40
Wet mass		g	1393.0	1395.7	1395.7	1394.2	1400.4	1400.4	1415.6	1418.2	1418.2
Dry mass		g	1202.9	1202.9	1202.9	1211.2	1211.2	1211.2	1249.0	1249.0	1249.0
Moisture content		%	15.8	16.0	16.0	15.1	15.6	15.6	13.3	13.5	13.5
Bulk density		Mg/m^3	2.12	2.15	2.15	2.12	2.17	2.17	2.16	2.21	2.21
Dry density		Mg/m^3	1.83	1.85	1.85	1.84	1.87	1.87	1.90	1.94	1.94
Void ratio			0.45	0.43	0.43	0.44	0.41	0.41	0.39	0.36	0.36
Degree of saturation		%	93.8	99.0	99.0	91.6	99.9	99.9	90.0	98.9	98.9
Saturation Stage											
Volume change of water		cm^3	10.6			16.7			16.7		
Consolidation Stage											
Side drain used			No			No			No		
Initial pore pressure		kPa	280.0			320.0			396.6		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm^3	7.9			10.5			14.1		
m_{vi}		m^2/MN	0.34			0.21			0.14		
t_{50}		min	1.70			1.60			1.70		
c_{vi}	(from t_{50})	m^2/yr	2643.44			2808.66			2635.02		
t_{100}		min	3.61			2.89			3.06		
c_{vi}	(from t_{100})	m^2/yr	2499.78			3114.25			2939.68		
Sketch of failed specimen (Failure Mode)			Brittle			 Brittle			 Brittle		
Visual description			Moist, light brownish grey mottled with orange and dark brown, silty/clayey, gravelly SAND.			Moist, light brownish grey mottled with orange and brown, silty/clayey, gravelly SAND.			Moist, light brownish grey mottled with orange, silty/clayey, gravelly SAND.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

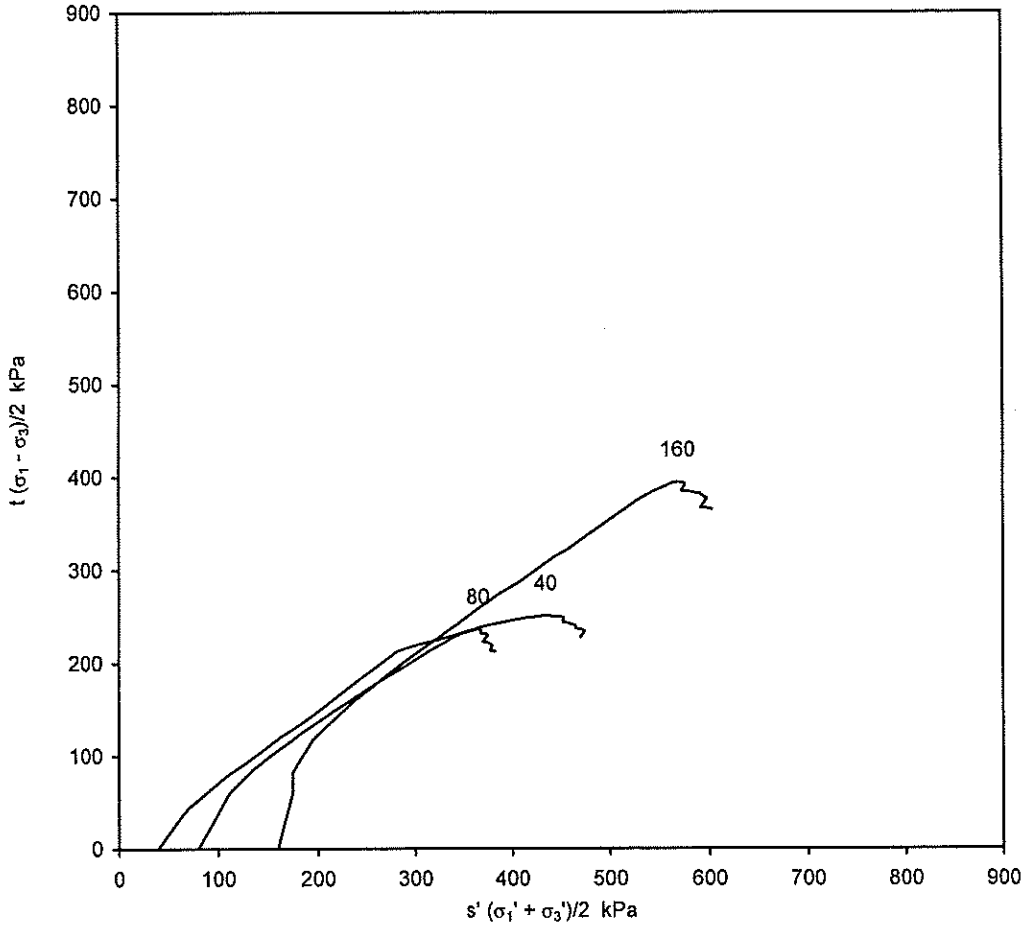
Client sample No. : -
Borehole No. : D227
Depth(m) From : 8.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/10
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
A	40	6.8	101.4	501.6	434.4	250.8
B	80	6.5	196.0	472.5	365.3	236.3
C	160	6.3	230.8	788.7	568.5	394.3



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HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

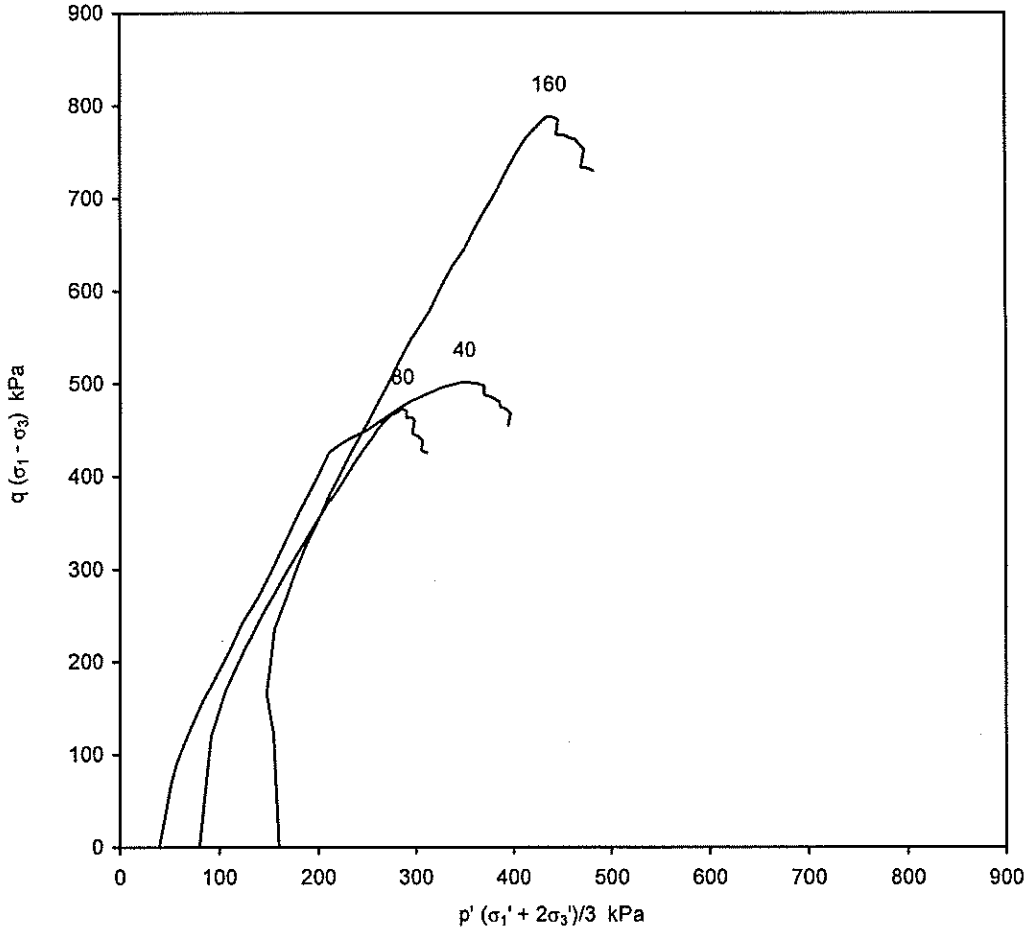
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	8.10
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL100076/10
Specimen ref.	:	A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	40	6.8	101.4	501.6	350.8	501.6
B	80	6.5	196.0	472.5	286.5	472.5
C	160	6.3	230.8	788.7	437.1	788.7



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HOKLAS 015

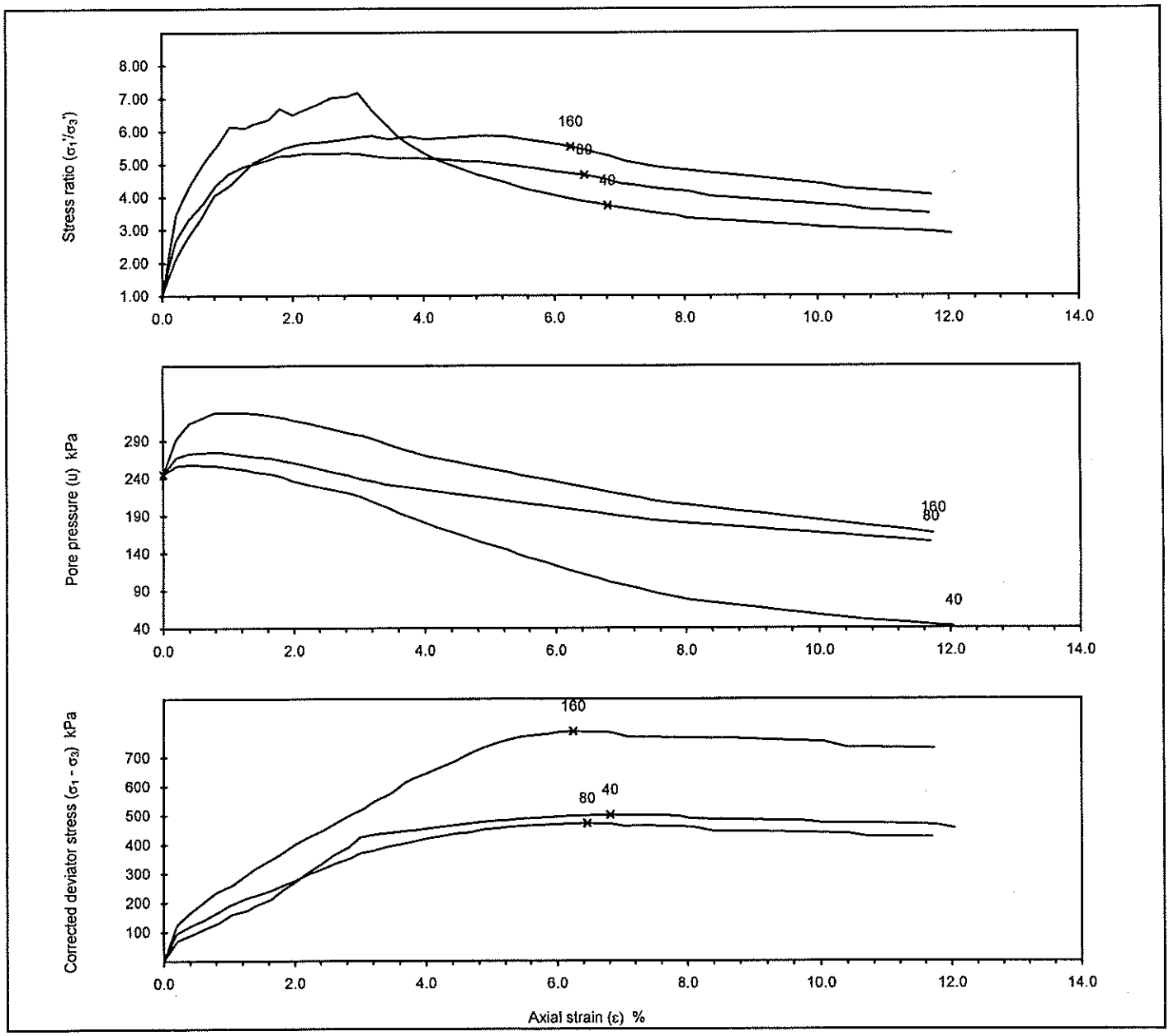
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	8.10
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL100076/10
Specimen ref.	:	A, B, C



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HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 8.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/10

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	40		80		160	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		25	20	25	20	25	20
		50	45	50	45	50	45
		75	70	75	70	75	70
		100	95	100	95	100	95
		125	120	150	145	150	145
		150	145	200	195	200	195
		175	170	250	245	250	245
		200	195				
		225	220				
		250	245				

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	245.0	245.0	245.0
B value		0.99	0.98	0.99
Volume change	cm^3	10.6	16.7	16.7

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1392.9	1398.1	1415.6
Final moisture content	%	15.8	15.4	13.3
Final bulk density	Mg/m^3	2.15	2.16	2.20

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

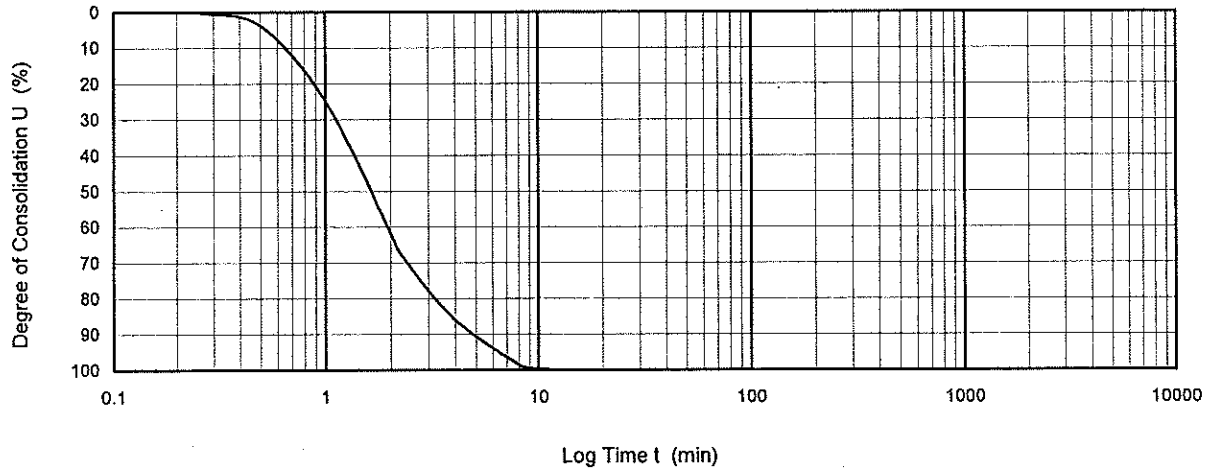
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	8.10
			To	:	-

Laboratory Information

Cell pressure	:	285 kPa	Lab. sample I.D.	:	SL100076/10
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	40 kPa			

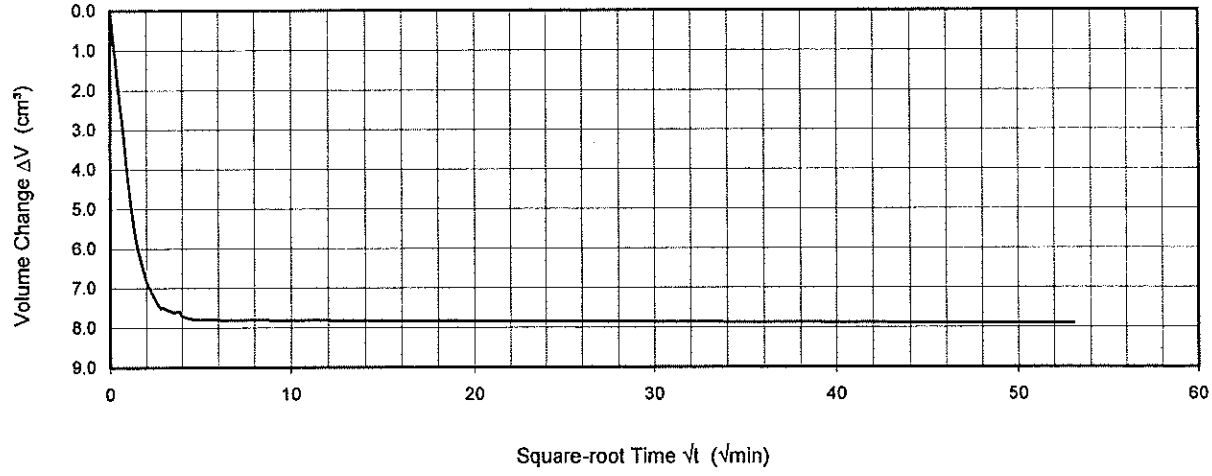
Degree of Consolidation vs. Log Time

t_{50} = 1.70 min ΔV = 7.9 cm³



Volume Change vs. Square-root Time

t_{100} = 3.61 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

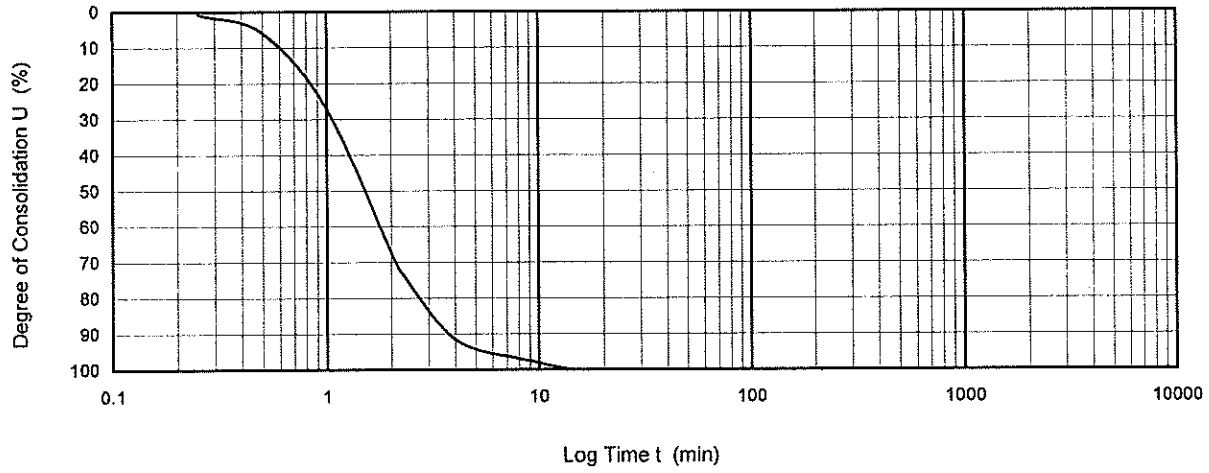
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	8.10
			To	:	-

Laboratory Information

Cell pressure	:	325 kPa	Lab. sample I.D.	:	SL100076/10
Back pressure	:	245 kPa	Specimen ref.	:	B
Effective pressure	:	80 kPa			

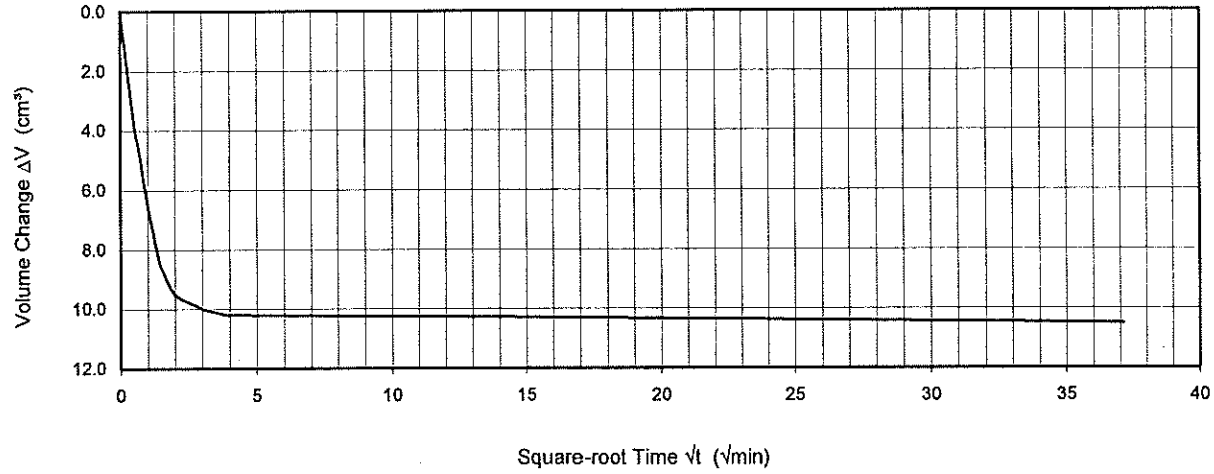
Degree of Consolidation vs. Log Time

t_{50} = 1.60 min ΔV = 10.5 cm³



Volume Change vs. Square-root Time

t_{100} = 2.89 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

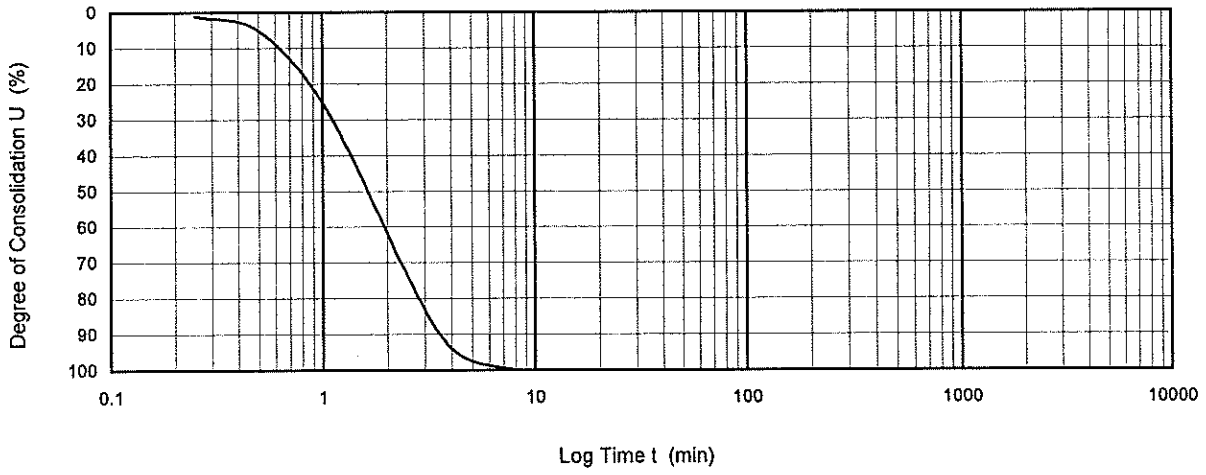
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	8.10
			To	:	-

Laboratory Information

Cell pressure	:	405 kPa	Lab. sample I.D.	:	SL100076/10
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	160 kPa			

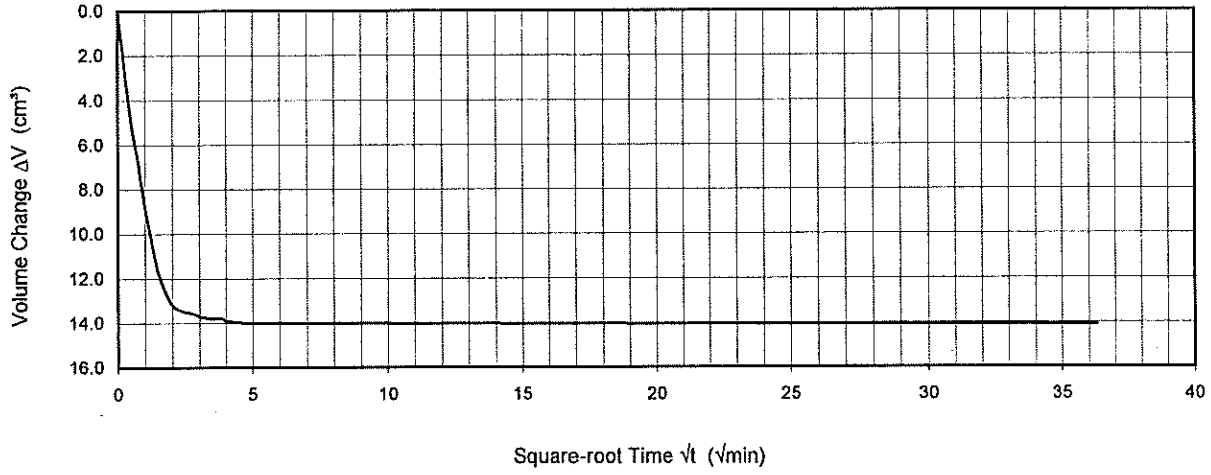
Degree of Consolidation vs. Log Time

t_{50} = 1.70 min ΔV = 14.1 cm³



Volume Change vs. Square-root Time

t_{100} = 3.06 min



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HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 8.10
To : -

Laboratory Information

Date shearing commenced : 10/02/2010 Time : 09:00
Date shearing completed : 10/02/2010 Time : 15:26
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.29

Lab. sample I.D. : SL100076/10
Specimen ref. : A
Cell pressure : 285 kPa
Back pressure : 245 kPa
Effective pressure : 40 kPa

Dimensions at starting of compression

Volume V_c : 648.60 cm^3
Area A_c : 4335.7 mm^2
Length L_c : 149.6 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	32	111.7	0.0	0.00	0.00	0.0	40.0	0.0	40.0	0.0	1.00	
256.5	32	119	415.2	0.2	0.00	0.06	69.8	63.4	34.9	51.8	69.8	3.45	
258.2	63	144	502.4	0.4	0.00	0.11	89.6	71.6	44.8	56.7	89.6	4.34	
257.4	94	170	593.2	0.6	0.00	0.17	110.2	82.7	55.1	64.3	110.2	4.99	
256.2	128	198	690.9	0.9	0.00	0.23	132.2	94.9	66.1	72.9	132.2	5.59	
253.8	156	234	816.5	1.0	0.00	0.28	160.6	111.5	80.3	84.7	160.6	6.15	
251.1	190	250	872.3	1.3	0.00	0.33	172.9	120.3	86.4	91.5	172.9	6.10	
248.6	210	272	949.1	1.4	0.00	0.37	190.1	131.4	95.0	99.8	190.1	6.22	
245.5	246	300	1046.8	1.6	0.00	0.43	211.7	145.3	105.8	110.1	211.7	6.36	
242.6	270	338	1179.3	1.8	0.00	0.47	241.3	163.1	120.7	122.8	241.3	6.69	
235.8	300	376	1311.9	2.0	0.00	0.51	270.8	184.6	135.4	139.5	270.8	6.50	
231.4	330	419	1462.0	2.2	0.00	0.56	304.0	205.6	152.0	154.9	304.0	6.67	
227.8	362	458	1598.0	2.4	0.00	0.61	333.9	224.2	167.0	168.5	333.9	6.84	
224.6	390	497	1734.1	2.6	0.00	0.66	363.8	242.3	181.9	181.7	363.8	7.02	
220.3	424	534	1863.2	2.8	0.00	0.71	391.8	260.6	195.9	195.3	391.8	7.06	
216.0	450	578	2016.7	3.0	0.00	0.75	425.4	281.7	212.7	210.8	425.4	7.17	
208.3	482	590	2058.6	3.2	0.00	0.80	433.8	293.6	216.9	221.3	433.8	6.66	
200.1	516	600	2093.5	3.4	0.00	0.85	440.5	305.1	220.2	231.7	440.5	6.19	
192.4	544	607	2117.9	3.6	0.00	0.89	445.0	315.1	222.5	240.9	445.0	5.81	
185.8	576	614	2142.4	3.9	0.00	0.94	449.4	323.9	224.7	249.0	449.4	5.53	
179.5	603	622	2170.3	4.0	0.00	0.98	454.7	332.8	227.3	257.1	454.7	5.31	
173.2	632	631	2201.7	4.2	0.00	1.02	460.7	342.1	230.3	265.4	460.7	5.12	
167.0	664	640	2233.1	4.4	0.00	1.06	466.5	351.3	233.3	273.5	466.5	4.95	
161.2	694	648	2261.0	4.6	0.00	1.11	471.6	359.6	235.8	281.0	471.6	4.81	
155.4	720	656	2288.9	4.8	0.00	1.14	476.9	368.0	238.4	288.6	476.9	4.68	
149.6	756	664	2316.8	5.1	0.00	1.19	481.7	376.3	240.9	296.0	481.7	4.56	
143.8	788	669	2334.3	5.3	0.00	1.23	484.4	383.4	242.2	302.7	484.4	4.43	
138.0	812	675	2355.2	5.4	0.00	1.27	488.1	391.1	244.1	309.7	488.1	4.32	
132.2	846	680	2372.6	5.7	0.00	1.31	490.7	398.1	245.3	316.4	490.7	4.21	
126.9	877	685	2390.1	5.9	0.00	1.35	493.3	404.8	246.7	322.5	493.3	4.12	
121.6	903	690	2407.5	6.0	0.00	1.38	496.2	411.5	248.1	328.8	496.2	4.04	
116.3	932	694	2421.5	6.2	0.00	1.42	498.1	417.8	249.1	334.7	498.1	3.95	
111.0	964	697	2432.0	6.4	0.00	1.46	499.2	423.6	249.6	340.4	499.2	3.87	
106.2	996	701	2445.9	6.7	0.00	1.50	501.0	429.3	250.5	345.8	501.0	3.80	
101.4	1020	703	2452.9	6.8	0.00	1.53	501.6	434.4	250.8	350.8	501.6	3.73	«

Final volume (cm^3): 648.60 Final length (mm): 131.6 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 8.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/10
Specimen ref. : A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
96.6	1056	704	2456.4	7.1	0.00	1.57	501.0	438.9	250.5	355.4	501.0	3.66
92.4	1088	705	2459.9	7.3	0.00	1.61	500.6	442.9	250.3	359.5	500.6	3.60
88.2	1114	706	2463.4	7.4	0.00	1.64	500.4	447.0	250.2	363.6	500.4	3.54
84.0	1146	706	2463.4	7.7	0.00	1.68	499.2	450.6	249.6	367.4	499.2	3.48
80.6	1178	706	2463.4	7.9	0.00	1.72	498.0	453.4	249.0	370.4	498.0	3.44
77.2	1204	694	2421.5	8.0	0.00	1.75	488.1	451.9	244.1	370.5	488.1	3.35
73.8	1256	695	2425.0	8.4	0.00	1.81	486.9	454.7	243.5	373.5	486.9	3.31
70.4	1308	696	2428.5	8.7	0.00	1.87	485.8	457.5	242.9	376.5	485.8	3.26
67.0	1355	696	2428.5	9.1	0.00	1.92	484.0	460.0	242.0	379.3	484.0	3.22
63.6	1402	696	2428.5	9.4	0.00	1.97	482.3	462.6	241.2	382.2	482.3	3.18
60.2	1457	697	2432.0	9.7	0.00	2.03	481.0	465.3	240.5	385.1	481.0	3.14
56.8	1500	690	2407.5	10.0	0.00	2.07	474.4	465.4	237.2	386.3	474.4	3.08
53.4	1556	692	2414.5	10.4	0.00	2.13	473.8	468.5	236.9	389.5	473.8	3.05
50.7	1600	693	2418.0	10.7	0.00	2.18	472.9	470.7	236.4	391.9	472.9	3.02
48.6	1656	694	2421.5	11.1	0.00	2.23	471.5	472.2	235.8	393.6	471.5	2.99
46.8	1700	694	2421.5	11.4	0.00	2.28	469.9	473.2	235.0	394.8	469.9	2.97
43.9	1757	694	2421.5	11.7	0.00	2.33	467.8	475.0	233.9	397.0	467.8	2.94
42.2	1802	678	2365.7	12.0	0.00	2.38	454.9	470.2	227.4	394.4	454.9	2.87

Final volume (cm³): 648.60 Final length (mm): 131.6 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 8.10
To : -

Laboratory Information

Date shearing commenced : 09/02/2010 Time : 09:00
Date shearing completed : 09/02/2010 Time : 15:14
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.10

Lab. sample I.D. : SL100076/10
Specimen ref. : B
Cell pressure : 325 kPa
Back pressure : 245 kPa
Effective pressure : 80 kPa

Dimensions at starting of compression

Volume V_c : 646.44 cm^3
Area A_c : 4324.2 mm^2
Length L_c : 149.5 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	41	143.1	0.0	0.00	0.00	0.0	80.0	0.0	80.0	0.0	1.00	
267.2	30	158	551.3	0.2	0.00	0.05	94.2	104.9	47.1	89.2	94.2	2.63	
273.2	60	190	662.9	0.4	0.00	0.11	119.6	111.6	59.8	91.7	119.6	3.31	
274.2	96	220	767.6	0.6	0.00	0.17	143.3	122.5	71.7	98.6	143.3	3.82	
275.2	124	251	875.8	0.8	0.00	0.22	167.8	133.7	83.9	105.7	167.8	4.37	
273.0	152	282	983.9	1.0	0.00	0.27	192.2	148.1	96.1	116.1	192.2	4.70	
270.4	186	310	1081.6	1.2	0.00	0.33	214.0	161.6	107.0	125.9	214.0	4.92	
268.2	220	330	1151.4	1.5	0.00	0.38	229.4	171.5	114.7	133.3	229.4	5.04	
266.7	246	346	1207.3	1.6	0.00	0.43	241.6	179.1	120.8	138.8	241.6	5.14	
264.1	270	368	1284.0	1.8	0.00	0.47	258.6	190.2	129.3	147.1	258.6	5.25	
260.5	300	390	1360.8	2.0	0.00	0.52	275.4	202.2	137.7	156.3	275.4	5.27	
256.5	330	418	1458.5	2.2	0.00	0.56	296.9	217.0	148.5	167.5	296.9	5.33	
252.5	360	440	1535.2	2.4	0.00	0.61	313.6	229.3	156.8	177.0	313.6	5.33	
247.7	392	467	1629.4	2.6	0.00	0.66	334.1	244.3	167.0	188.7	334.1	5.32	
243.6	427	492	1716.7	2.9	0.00	0.72	352.8	257.8	176.4	199.0	352.8	5.33	
239.0	450	516	1800.4	3.0	0.00	0.75	371.0	271.5	185.5	209.7	371.0	5.31	
235.7	482	528	1842.3	3.2	0.00	0.80	379.5	279.0	189.7	215.8	379.5	5.25	
231.6	510	546	1905.1	3.4	0.00	0.84	392.7	289.8	196.4	224.3	392.7	5.20	
228.6	550	561	1957.4	3.7	0.00	0.90	403.3	298.0	201.6	230.8	403.3	5.18	
226.2	579	575	2006.3	3.9	0.00	0.94	413.3	305.4	206.6	236.6	413.3	5.18	
224.1	604	586	2044.7	4.0	0.00	0.98	421.0	311.4	210.5	241.2	421.0	5.17	
222.1	630	596	2079.6	4.2	0.00	1.02	427.9	316.9	214.0	245.5	427.9	5.16	
219.1	663	609	2124.9	4.4	0.00	1.06	436.9	324.4	218.5	251.5	436.9	5.13	
216.3	700	618	2156.3	4.7	0.00	1.11	442.7	330.0	221.3	256.3	442.7	5.07	
214.4	728	630	2198.2	4.9	0.00	1.15	451.0	336.1	225.5	260.9	451.0	5.08	
212.1	756	637	2222.6	5.1	0.00	1.19	455.4	340.6	227.7	264.7	455.4	5.03	
209.8	784	644	2247.0	5.2	0.00	1.23	459.8	345.1	229.9	268.5	459.8	4.99	
207.5	812	650	2268.0	5.4	0.00	1.27	463.4	349.2	231.7	272.0	463.4	4.94	
205.2	846	655	2285.4	5.7	0.00	1.31	466.1	352.8	233.0	275.2	466.1	4.89	
202.9	877	658	2295.9	5.9	0.00	1.35	467.3	355.8	233.7	277.9	467.3	4.83	
200.6	904	662	2309.8	6.0	0.00	1.39	469.4	359.1	234.7	280.9	469.4	4.77	
198.3	932	666	2323.8	6.2	0.00	1.42	471.5	362.4	235.7	283.9	471.5	4.72	
196.0	966	669	2334.3	6.5	0.00	1.46	472.5	365.3	236.3	286.5	472.5	4.66	«
193.7	996	669	2334.3	6.7	0.00	1.50	471.5	367.0	235.7	288.5	471.5	4.59	
191.4	1020	669	2334.3	6.8	0.00	1.53	470.6	368.9	235.3	290.5	470.6	4.52	

Final volume (cm^3): 646.44 Final length (mm): 132.0 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 8.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/10
Specimen ref. : B

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
189.1	1050	661	2306.4	7.0	0.00	1.57	463.6	367.7	231.8	290.4	463.6	4.41
186.8	1082	663	2313.3	7.2	0.00	1.61	464.0	370.2	232.0	292.9	464.0	4.36
184.5	1112	664	2316.8	7.4	0.00	1.64	463.7	372.3	231.8	295.1	463.7	4.30
182.1	1150	664	2316.8	7.7	0.00	1.69	462.3	374.1	231.2	297.0	462.3	4.24
179.9	1204	664	2316.8	8.1	0.00	1.75	460.5	375.3	230.2	298.6	460.5	4.17
177.6	1255	647	2257.5	8.4	0.00	1.81	446.1	370.5	223.1	296.1	446.1	4.03
175.3	1306	648	2261.0	8.7	0.00	1.87	445.1	372.3	222.6	298.1	445.1	3.97
173.0	1355	649	2264.5	9.1	0.00	1.92	444.2	374.1	222.1	300.1	444.2	3.92
170.7	1402	650	2268.0	9.4	0.00	1.97	443.3	376.0	221.7	302.1	443.3	3.87
168.4	1456	650	2268.0	9.7	0.00	2.03	441.5	377.4	220.8	303.8	441.5	3.82
166.1	1502	650	2268.0	10.0	0.00	2.08	440.0	378.9	220.0	305.6	440.0	3.77
163.8	1556	650	2268.0	10.4	0.00	2.13	438.1	380.3	219.1	307.2	438.1	3.72
161.5	1600	637	2222.6	10.7	0.00	2.18	427.3	377.1	213.6	305.9	427.3	3.61
159.2	1656	639	2229.6	11.1	0.00	2.24	426.8	379.2	213.4	308.1	426.8	3.57
156.9	1704	640	2233.1	11.4	0.00	2.28	426.0	381.1	213.0	310.1	426.0	3.53
154.6	1750	641	2236.6	11.7	0.00	2.33	425.1	383.0	212.6	312.1	425.1	3.49

Final volume (cm^3): 646.441 Final length (mm): 132.0 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 8.10
To : -

Laboratory Information

Date shearing commenced : 09/02/2010 Time : 09:00
Date shearing completed : 09/02/2010 Time : 15:12
Proving ring serial No. : 10106
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.02

Lab. sample I.D. : SL100076/10
Specimen ref. : C
Cell pressure : 405 kPa
Back pressure : 245 kPa
Effective pressure : 160 kPa

Dimensions at starting of compression

Volume V_c : 642.40 cm^3
Area A_c : 4308.1 mm^2
Length L_c : 149.1 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	30	188.8	0.0	0.00	0.00	0.0	160.0	0.0	160.0	0.0	1.00	
291.3	30	114	717.3	0.2	0.00	0.05	122.4	174.9	61.2	154.5	122.4	2.08	
313.1	60	144	906.0	0.4	0.00	0.11	165.7	174.8	82.9	147.1	165.7	2.80	
320.2	90	168	1057.0	0.6	0.00	0.16	200.2	184.9	100.1	151.5	200.2	3.36	
327.8	120	193	1214.3	0.8	0.00	0.21	235.9	195.2	118.0	155.8	235.9	4.06	
327.6	156	210	1321.3	1.0	0.00	0.27	259.9	207.3	129.9	164.0	259.9	4.36	
327.1	182	230	1447.1	1.2	0.00	0.31	288.2	222.0	144.1	174.0	288.2	4.70	
326.6	210	251	1579.3	1.4	0.00	0.36	317.9	237.3	158.9	184.4	317.9	5.05	
322.4	257	280	1761.7	1.7	0.00	0.43	358.4	261.8	179.2	202.1	358.4	5.34	
320.4	279	295	1856.1	1.9	0.00	0.47	379.3	274.3	189.7	211.0	379.3	5.48	
316.9	300	311	1956.8	2.0	0.00	0.50	401.6	288.9	200.8	222.0	401.6	5.56	
313.5	330	328	2063.8	2.2	0.00	0.55	425.1	304.0	212.5	233.2	425.1	5.65	
308.8	366	346	2177.0	2.5	0.00	0.60	449.6	321.0	224.8	246.1	449.6	5.67	
304.3	396	365	2296.6	2.7	0.00	0.65	475.6	338.5	237.8	259.2	475.6	5.72	
300.2	422	382	2403.5	2.8	0.00	0.69	498.9	354.2	249.4	271.1	498.9	5.76	
296.8	456	400	2516.8	3.1	0.00	0.74	523.1	369.8	261.6	282.6	523.1	5.83	
292.5	480	418	2630.0	3.2	0.00	0.77	547.7	386.3	273.8	295.1	547.7	5.87	
283.7	520	440	2768.5	3.5	0.00	0.83	577.1	409.8	288.5	313.7	577.1	5.76	
278.1	550	466	2932.0	3.7	0.00	0.88	612.4	433.1	306.2	331.0	612.4	5.83	
275.0	570	478	3007.5	3.8	0.00	0.90	628.4	444.2	314.2	339.5	628.4	5.83	
269.4	600	491	3089.3	4.0	0.00	0.95	645.3	458.2	322.6	350.7	645.3	5.76	
265.8	632	507	3190.0	4.2	0.00	0.99	666.1	472.3	333.1	361.2	666.1	5.79	
262.2	664	523	3290.7	4.5	0.00	1.03	686.9	486.3	343.5	371.8	686.9	5.81	
258.6	690	539	3391.4	4.6	0.00	1.07	707.9	500.4	354.0	382.4	707.9	5.84	
255.1	720	555	3492.0	4.8	0.00	1.11	728.6	514.2	364.3	392.8	728.6	5.86	
251.4	756	570	3586.4	5.1	0.00	1.16	747.5	527.4	373.8	402.8	747.5	5.87	
247.8	788	581	3655.6	5.3	0.00	1.20	761.0	537.7	380.5	410.9	761.0	5.84	
244.4	812	588	3699.7	5.4	0.00	1.23	769.4	545.3	384.7	417.1	769.4	5.79	
241.1	843	593	3731.1	5.7	0.00	1.27	774.5	551.2	387.3	422.1	774.5	5.73	
237.6	878	599	3768.9	5.9	0.00	1.32	780.8	557.8	390.4	427.7	780.8	5.66	
234.2	904	605	3806.6	6.1	0.00	1.35	787.5	564.6	393.8	433.3	787.5	5.61	
230.8	932	607	3819.2	6.3	0.00	1.38	788.7	568.5	394.3	437.1	788.7	5.53	«
227.4	966	608	3825.5	6.5	0.00	1.42	788.1	571.6	394.0	440.3	788.1	5.44	
224.0	992	608	3825.5	6.7	0.00	1.46	786.6	574.3	393.3	443.2	786.6	5.35	
220.6	1020	608	3825.5	6.8	0.00	1.49	784.9	576.9	392.5	446.0	784.9	5.26	

Final volume (cm^3): 642.40 Final length (mm): 131.6 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 8.10
To : -

Laboratory Information

Lab. sample I.D. : SL100076/10
Specimen ref. : C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
217.2	1056	598	3762.6	7.1	0.00	1.53	769.3	572.4	384.6	444.2	769.3	5.10
213.8	1088	599	3768.9	7.3	0.00	1.57	768.8	575.6	384.4	447.5	768.8	5.02
210.4	1112	600	3775.2	7.5	0.00	1.60	768.8	579.0	384.4	450.9	768.8	4.95
207.0	1152	601	3781.5	7.7	0.00	1.64	767.9	581.9	383.9	454.0	767.9	4.88
203.6	1208	602	3787.8	8.1	0.00	1.71	766.0	584.4	383.0	456.7	766.0	4.80
200.2	1256	603	3794.0	8.4	0.00	1.76	764.6	587.1	382.3	459.7	764.6	4.73
196.8	1302	605	3806.6	8.7	0.00	1.81	764.7	590.5	382.3	463.1	764.7	4.67
193.4	1355	605	3806.6	9.1	0.00	1.87	761.6	592.4	380.8	465.5	761.6	4.60
190.0	1404	605	3806.6	9.4	0.00	1.92	758.8	594.4	379.4	467.9	758.8	4.53
186.6	1456	605	3806.6	9.8	0.00	1.97	755.8	596.3	377.9	470.3	755.8	4.46
183.2	1500	605	3806.6	10.1	0.00	2.02	753.3	598.4	376.6	472.9	753.3	4.40
179.8	1552	592	3724.8	10.4	0.00	2.07	733.3	591.9	366.7	469.6	733.3	4.26
176.4	1600	594	3737.4	10.7	0.00	2.12	733.2	595.2	366.6	473.0	733.2	4.21
173.0	1656	596	3750.0	11.1	0.00	2.17	732.7	598.3	366.3	476.2	732.7	4.16
169.6	1708	597	3756.3	11.5	0.00	2.22	731.0	600.9	365.5	479.1	731.0	4.11
166.2	1751	598	3762.6	11.7	0.00	2.27	729.9	603.7	364.9	482.1	729.9	4.06

Final volume (cm^3): 642.40 Final length (mm): 131.6 Termination criterion : Maximum deviator stress

Remarks:

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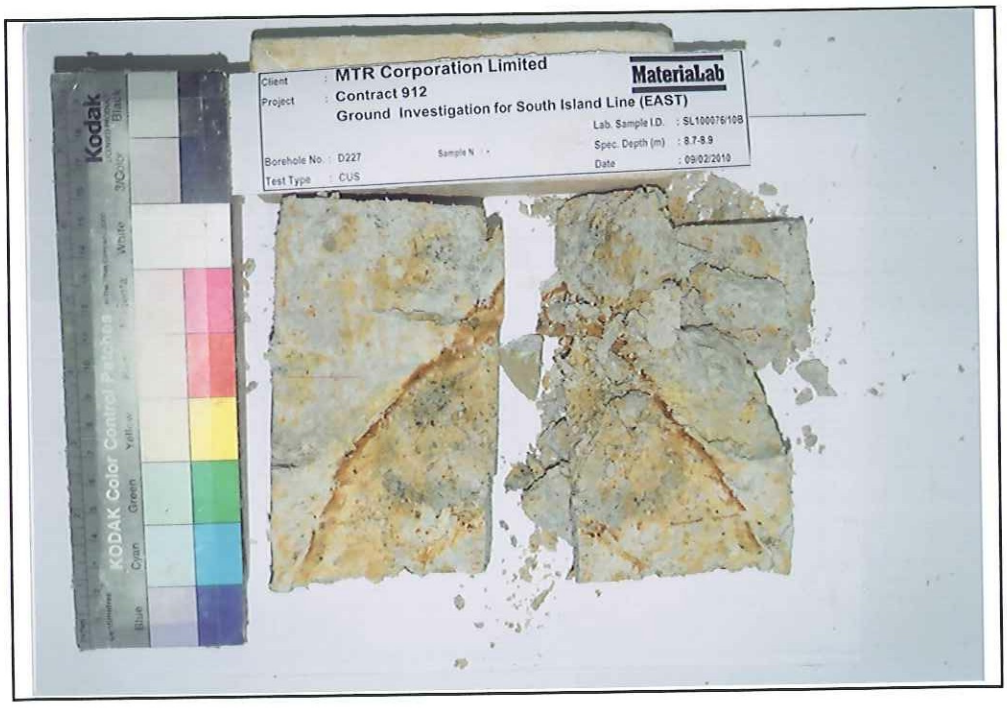
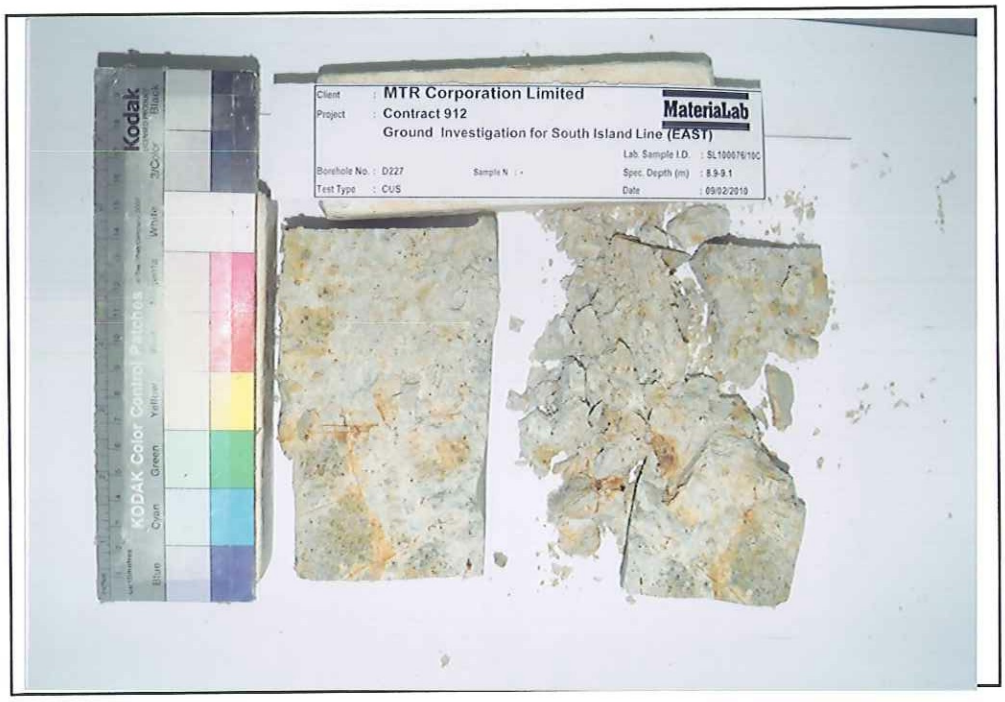
Photographic Records for Triaxial Test

Photographic Records for Triaxial Test



Photographic Records for Triaxial Test



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

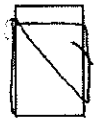
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -
Sample origin : CDT
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 04-02-2010
Date test(s) completed : 10-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 19.5 °C

Lab. sample I.D. : SL100076/11
Sample type : M

Specimen reference			A			B			C	
Specimen depth(m)	From		11.70			11.90			12.10	
	To		11.90			12.10			12.30	
Effective pressure		kPa	55			110			220	
***Measurements and Calculations**			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.5	74.1	78.1	74.8	74.3	78.4	75.1	74.3	78.4
Length		mm	150.2	149.4	134.4	150.1	149.2	134.1	150.2	148.7	133.7
Volume		cm^3	654.75	643.85	643.85	659.59	647.19	647.19	665.33	645.23	645.23
Wet mass		g	1458.8	1480.1	1480.1	1474.4	1493.2	1493.2	1521.1	1521.7	1521.7
Dry mass		g	1339.6	1339.6	1339.6	1357.4	1357.4	1357.4	1406.6	1406.6	1406.6
Moisture content		%	8.9	10.5	10.5	8.6	10.0	10.0	8.1	8.2	8.2
Bulk density		Mg/m^3	2.23	2.30	2.30	2.24	2.31	2.31	2.29	2.36	2.36
Dry density		Mg/m^3	2.05	2.08	2.08	2.06	2.10	2.10	2.11	2.18	2.18
Void ratio			0.30	0.27	0.27	0.29	0.26	0.26	0.25	0.22	0.22
Degree of saturation		%	79.9	101.6	101.6	79.4	100.6	100.6	85.1	100.6	100.6
Saturation Stage											
Volume change of water		cm^3	32.2			31.2			20.7		
Consolidation Stage											
Side drain used			No			No			No		
Initial pore pressure		kPa	295.0			349.9			458.2		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm^3	10.9			12.4			20.1		
m_{vi}		m^2/MN	0.33			0.18			0.14		
t_{50}		min	0.18			0.47			0.95		
c_{vi}	(from t_{50})	m^2/yr	24927.03			9526.87			4701.29		
t_{100}		min	0.49			1.21			4.41		
c_{vi}	(from t_{100})	m^2/yr	18289.68			7531.14			2088.79		
Sketch of failed specimen (Failure Mode)			 Brittle			Brittle			Brittle		
Visual description			Moist, light grey spotted with brown, silty/clayey, gravelly SAND.			Moist, light grey spotted with brown, silty/clayey, gravelly SAND.			Moist, light grey mottled with white, silty/clayey, gravelly SAND.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

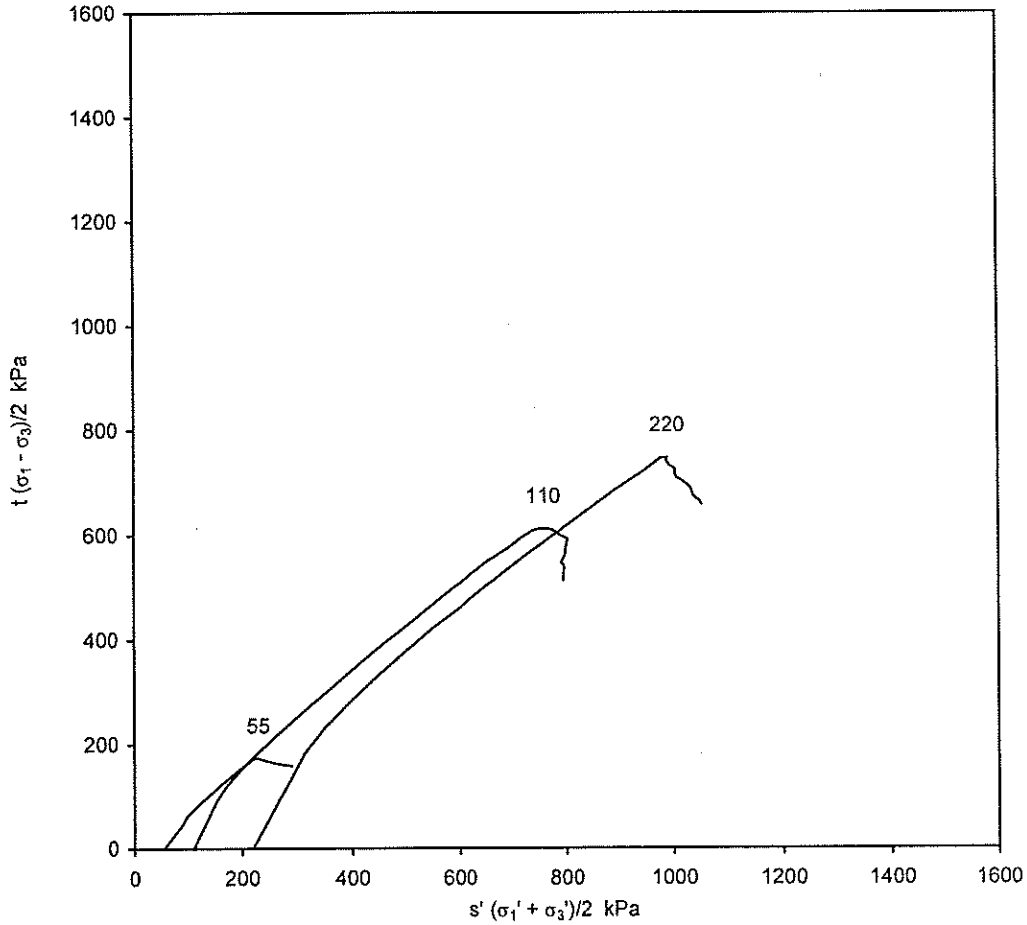
Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -

Laboratory Information

Lab. sample I.D. : SL100076/11
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
A	55	3.8	243.4	347.0	230.1	173.5
B	110	4.8	209.6	1224.3	757.6	612.2
C	220	3.5	223.2	1494.9	989.3	747.5



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

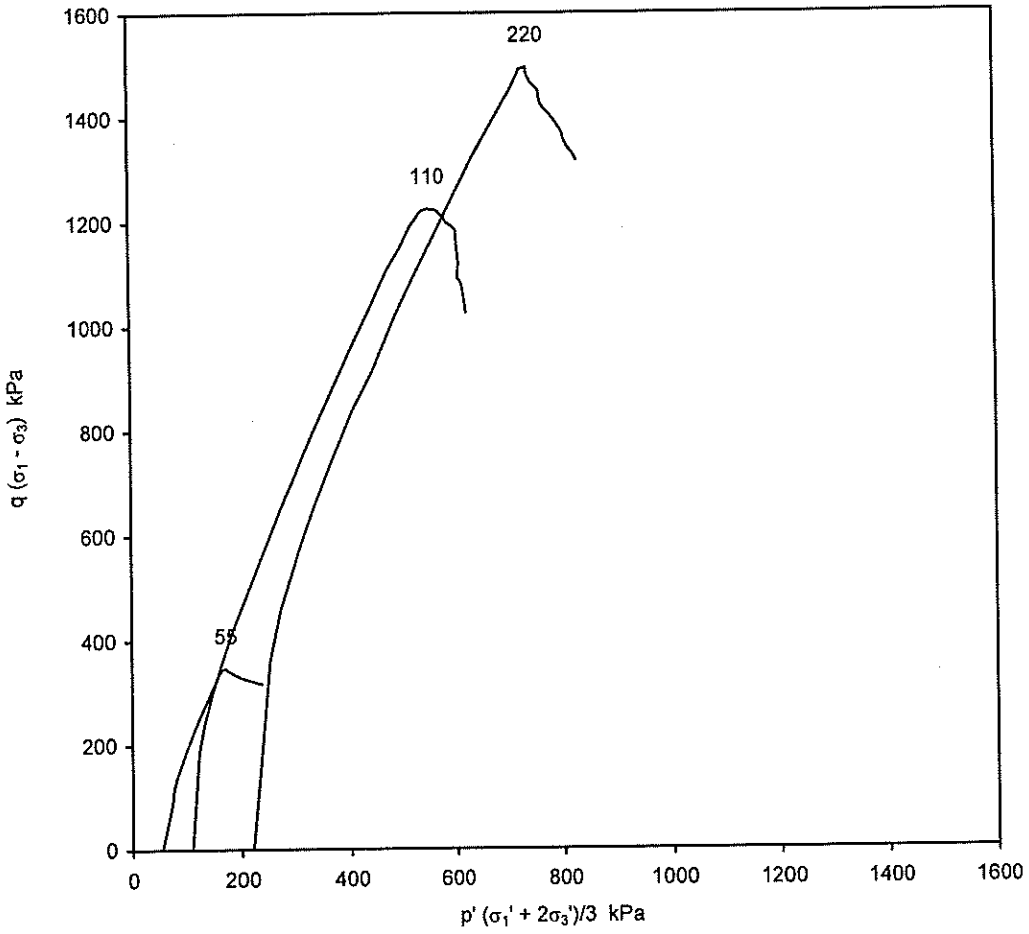
Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -

Laboratory Information

Lab. sample I.D. : SL100076/11
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	55	3.8	243.4	347.0	172.3	347.0
B	110	4.8	209.6	1224.3	553.5	1224.3
C	220	3.5	223.2	1494.9	740.1	1494.9



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -

Laboratory Information

Lab. sample I.D. : SL100076/11

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	55		110		220	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		25	20	25	20	25	20
		50	45	50	45	50	45
		75	70	75	70	75	70
		100	95	100	95	100	95
		125	120	125	120	125	120
		150	145	150	145	150	145
		200	195	200	195	200	195
		250	245	250	245	250	245

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	245.0	245.0	245.0
B value		1.00	1.00	1.00
Volume change	cm^3	32.2	31.2	20.7

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1477.0	1490.2	1518.8
Final moisture content	%	10.3	9.8	8.0
Final bulk density	Mg/m^3	2.29	2.30	2.35

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

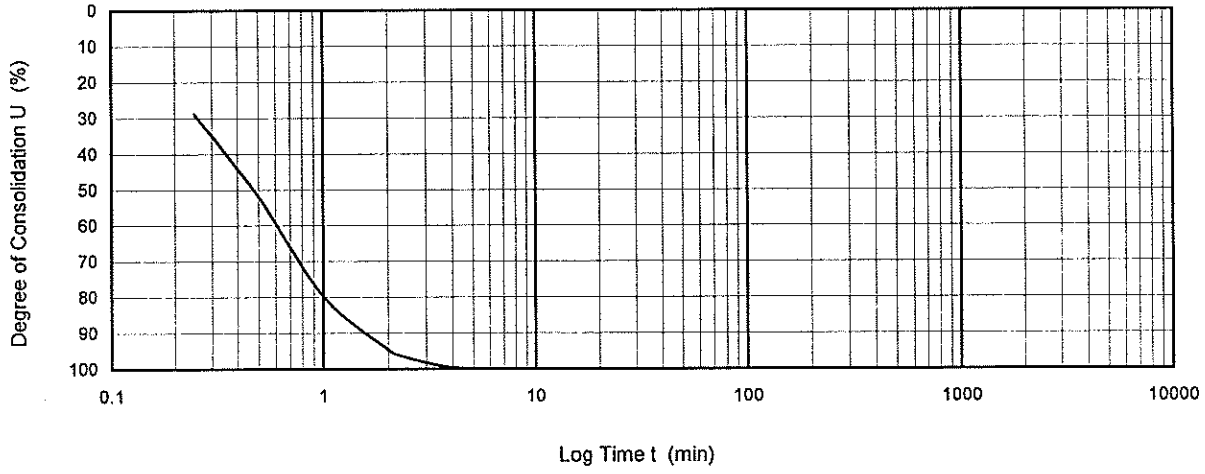
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	11.30
			To	:	-

Laboratory Information

Cell pressure	:	-	355	kPa	Lab. sample I.D.	:	SL100076/11
Back pressure	:		245	kPa	Specimen ref.	:	B
Effective pressure	:		110	kPa			

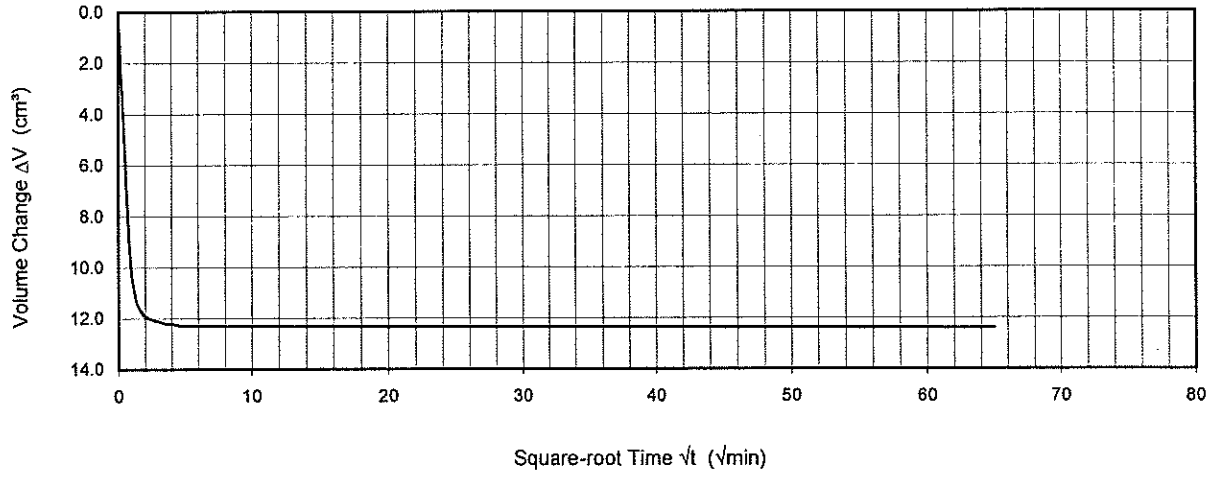
Degree of Consolidation vs. Log Time

t_{50} = 0.47 min ΔV = 12.4 cm³



Volume Change vs. Square-root Time

t_{100} = 1.21 min



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MateriaLab

HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

CONSOLIDATION STAGE

Information supplied by Client

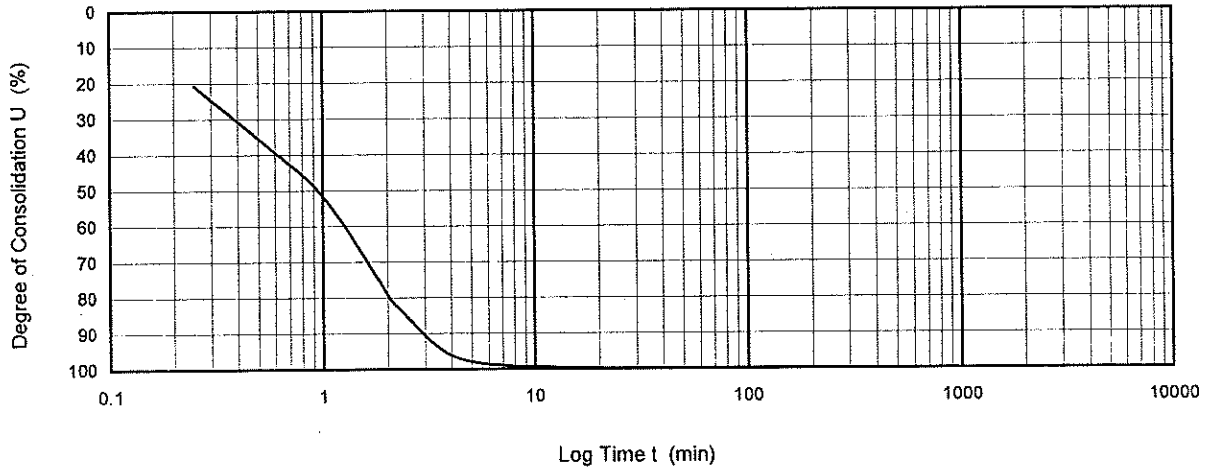
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D227
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	11.30
			To	:	-

Laboratory Information

Cell pressure	:	465 kPa	Lab. sample I.D.	:	SL100076/11
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	220 kPa			

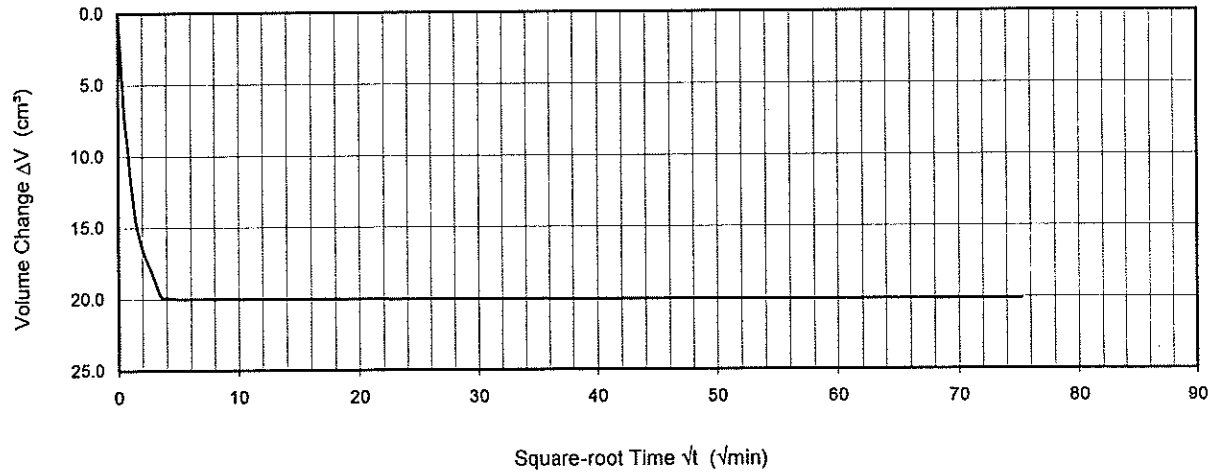
Degree of Consolidation vs. Log Time

t_{50} = 0.95 min ΔV = 20.1 cm³



Volume Change vs. Square-root Time

t_{100} = 4.41 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -

Laboratory Information

Date shearing commenced : 09/02/2010 Time : 09:00
Date shearing completed : 09/02/2010 Time : 14:10
Proving ring serial No. : 6499
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.00

Lab. sample I.D. : SL100076/11
Specimen ref. : A
Cell pressure : 300 kPa
Back pressure : 245 kPa
Effective pressure : 55 kPa

Dimensions at starting of compression
Volume V_c : 643.85 cm^3
Area A_c : 4310.6 mm^2
Length L_c : 149.4 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.046	140.7	0.0	0.00	0.00	0.0	55.0	0.0	55.0	0.0	1.00	
256.1	33	0.173	529.1	0.2	0.00	0.06	89.8	88.8	44.9	73.8	89.8	3.05	
262.5	66	0.211	645.3	0.4	0.00	0.11	116.4	95.7	58.2	76.3	116.4	4.10	
263.4	90	0.232	709.5	0.6	0.00	0.15	131.0	102.1	65.5	80.3	131.0	4.58	
264.1	127	0.265	810.4	0.9	0.00	0.21	153.8	112.8	76.9	87.2	153.8	5.29	
264.1	151	0.285	871.6	1.0	0.00	0.25	167.6	119.7	83.8	91.8	167.6	5.67	
263.7	185	0.312	954.1	1.2	0.00	0.31	186.1	129.3	93.0	98.3	186.1	6.13	
263.0	213	0.332	1015.3	1.4	0.00	0.35	199.7	136.8	99.8	103.6	199.7	6.40	
262.1	247	0.356	1088.7	1.7	0.00	0.40	215.9	145.8	107.9	109.9	215.9	6.70	
261.2	275	0.377	1152.9	1.8	0.00	0.45	230.1	153.8	115.0	115.5	230.1	6.93	
260.1	307	0.406	1241.6	2.1	0.00	0.50	249.6	164.7	124.8	123.1	249.6	7.26	
258.7	335	0.429	1311.9	2.2	0.00	0.54	265.1	173.8	132.5	129.7	265.1	7.42	
257.0	368	0.459	1403.7	2.5	0.00	0.59	285.2	185.6	142.6	138.1	285.2	7.63	
255.5	395	0.486	1486.2	2.6	0.00	0.63	303.3	196.1	151.6	145.6	303.3	7.81	
253.0	429	0.519	1587.2	2.9	0.00	0.68	325.2	209.6	162.6	155.4	325.2	7.92	
252.0	450	0.532	1626.9	3.0	0.00	0.71	333.7	214.8	166.8	159.2	333.7	7.95	
249.7	481	0.548	1675.8	3.2	0.00	0.75	343.9	222.3	172.0	164.9	343.9	7.84	
247.6	514	0.551	1685.0	3.4	0.00	0.80	345.1	225.0	172.6	167.4	345.1	7.59	
245.3	542	0.554	1694.2	3.6	0.00	0.84	346.5	227.9	173.2	170.2	346.5	7.33	
243.4	573	0.556	1700.3	3.8	0.00	0.88	347.0	230.1	173.5	172.3	347.0	7.13	«
241.6	603	0.555	1697.2	4.0	0.00	0.92	345.6	231.2	172.8	173.6	345.6	6.92	
239.6	651	0.554	1694.2	4.4	0.00	0.99	343.7	232.2	171.8	175.0	343.7	6.69	
236.4	704	0.554	1694.2	4.7	0.00	1.06	342.3	234.8	171.2	177.7	342.3	6.38	
233.4	756	0.554	1694.2	5.1	0.00	1.12	341.0	237.1	170.5	180.3	341.0	6.12	
230.1	803	0.553	1691.1	5.4	0.00	1.18	339.2	239.5	169.6	183.0	339.2	5.85	
226.4	851	0.552	1688.1	5.7	0.00	1.24	337.3	242.2	168.6	186.0	337.3	5.58	
222.4	904	0.551	1685.0	6.1	0.00	1.31	335.3	245.2	167.6	189.4	335.3	5.32	
218.7	956	0.551	1685.0	6.4	0.00	1.37	334.0	248.3	167.0	192.6	334.0	5.11	
215.4	1002	0.551	1685.0	6.7	0.00	1.42	332.8	251.0	166.4	195.5	332.8	4.93	
212.3	1057	0.550	1682.0	7.1	0.00	1.49	330.8	253.1	165.4	198.0	330.8	4.77	
208.4	1100	0.549	1678.9	7.4	0.00	1.54	329.0	256.1	164.5	201.3	329.0	4.59	
204.3	1151	0.549	1678.9	7.7	0.00	1.59	327.8	259.6	163.9	205.0	327.8	4.42	
199.4	1202	0.548	1675.8	8.0	0.00	1.65	325.8	263.5	162.9	209.2	325.8	4.24	
194.3	1254	0.548	1675.8	8.4	0.00	1.70	324.5	268.0	162.3	213.9	324.5	4.07	
189.6	1303	0.548	1675.8	8.7	0.00	1.76	323.3	272.1	161.7	218.2	323.3	3.93	

Final volume (cm^3): 643.85 Final length (mm): 134.4 Termination criterion : Maximum deviator stress

Remarks:

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HKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -

Laboratory Information

Lab. sample I.D. : SL100076/11
Specimen ref. : A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
184.3	1355	0.547	1672.8	9.1	0.00	1.81	321.4	276.4	160.7	222.8	321.4	3.78
179.4	1400	0.547	1672.8	9.4	0.00	1.86	320.3	280.7	160.1	227.4	320.3	3.66
173.6	1451	0.546	1669.7	9.7	0.00	1.91	318.3	285.6	159.2	232.5	318.3	3.52
167.4	1500	0.546	1669.7	10.0	0.00	1.96	317.1	291.2	158.6	238.3	317.1	3.39

Final volume (cm^3): 643.85 Final length (mm): 134.4 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -

Laboratory Information

Date shearing commenced : 08/02/2010 Time : 09:00
Date shearing completed : 08/02/2010 Time : 14:33
Proving ring serial No. : 6499
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.03

Lab. sample I.D. : SL100076/11
Specimen ref. : B
Cell pressure : 355 kPa
Back pressure : 245 kPa
Effective pressure : 110 kPa

Dimensions at starting of compression

Volume V_c : 647.19 cm^3
Area A_c : 4339.1 mm^2
Length L_c : 149.2 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.053	162.1	0.0	0.00	0.00	0.0	110.0	0.0	110.0	0.0	1.00	
280.5	33	0.244	746.2	0.2	0.00	0.06	134.3	141.6	67.1	119.3	134.3	2.80	
293.7	60	0.317	969.4	0.4	0.00	0.10	185.2	153.9	92.6	123.0	185.2	4.02	
302.4	90	0.397	1214.1	0.6	0.00	0.15	240.8	173.0	120.4	132.9	240.8	5.58	
307.1	120	0.482	1474.0	0.8	0.00	0.20	299.7	197.8	149.9	147.8	299.7	7.26	
308.9	150	0.564	1724.8	1.0	0.00	0.25	356.3	224.2	178.1	164.9	356.3	8.73	
308.5	183	0.661	2021.4	1.2	0.00	0.30	422.9	258.0	211.5	187.5	422.9	10.10	
306.8	211	0.737	2253.8	1.4	0.00	0.35	474.9	285.7	237.5	206.5	474.9	10.85	
303.4	240	0.856	2617.7	1.6	0.00	0.39	556.4	329.8	278.2	237.1	556.4	11.78	
300.5	278	0.920	2813.5	1.9	0.00	0.45	599.2	354.1	299.6	254.2	599.2	11.99	
297.9	301	1.001	3061.2	2.0	0.00	0.49	654.2	384.2	327.1	275.2	654.2	12.46	
292.9	330	1.100	3363.9	2.2	0.00	0.53	721.0	422.6	360.5	302.4	721.0	12.61	
287.1	365	1.206	3688.1	2.4	0.00	0.58	792.1	464.0	396.1	331.9	792.1	12.67	
278.4	399	1.321	4039.8	2.7	0.00	0.63	869.1	511.2	434.6	366.3	869.1	12.35	
273.7	423	1.389	4247.7	2.8	0.00	0.67	914.2	538.4	457.1	386.0	914.2	12.24	
267.4	453	1.473	4504.6	3.0	0.00	0.71	969.7	572.4	484.8	410.8	969.7	12.07	
258.6	480	1.566	4789.0	3.2	0.00	0.75	1031.3	612.0	515.6	440.2	1031.3	11.70	
249.4	512	1.679	5134.6	3.4	0.00	0.79	1105.8	658.5	552.9	474.2	1105.8	11.47	
238.0	541	1.747	5342.5	3.6	0.00	0.83	1149.8	691.9	574.9	500.3	1149.8	10.83	
232.4	570	1.811	5538.2	3.8	0.00	0.87	1190.8	718.0	595.4	519.5	1190.8	10.71	
227.6	602	1.833	5605.5	4.0	0.00	0.92	1203.0	728.9	601.5	528.4	1203.0	10.44	
223.2	631	1.856	5675.8	4.2	0.00	0.96	1216.0	739.8	608.0	537.1	1216.0	10.23	
219.6	664	1.867	5709.5	4.5	0.00	1.00	1220.6	745.7	610.3	542.3	1220.6	10.01	
215.3	693	1.874	5730.9	4.6	0.00	1.04	1222.7	751.1	611.4	547.3	1222.7	9.75	
209.6	721	1.880	5749.2	4.8	0.00	1.08	1224.3	757.6	612.2	553.5	1224.3	9.42	«
205.3	753	1.883	5758.4	5.0	0.00	1.12	1223.5	761.5	611.8	557.5	1223.5	9.17	
199.6	781	1.886	5767.6	5.2	0.00	1.15	1223.1	766.9	611.5	563.1	1223.1	8.87	
191.4	815	1.887	5770.6	5.5	0.00	1.19	1220.7	774.0	610.4	570.5	1220.7	8.46	
186.3	843	1.885	5764.5	5.7	0.00	1.23	1217.0	777.2	608.5	574.4	1217.0	8.21	
180.5	872	1.882	5755.4	5.8	0.00	1.26	1212.4	780.7	606.2	578.6	1212.4	7.95	
173.4	901	1.879	5746.2	6.0	0.00	1.30	1207.9	785.5	603.9	584.2	1207.9	7.65	
167.4	951	1.873	5727.8	6.4	0.00	1.36	1199.6	787.4	599.8	587.5	1199.6	7.39	
154.3	1003	1.868	5712.5	6.7	0.00	1.42	1191.7	796.6	595.9	597.9	1191.7	6.94	
142.3	1052	1.861	5691.1	7.1	0.00	1.48	1182.9	804.1	591.4	607.0	1182.9	6.56	
136.4	1105	1.843	5636.1	7.4	0.00	1.54	1166.6	801.9	583.3	607.5	1166.6	6.34	

Final volume (cm^3): 647.19 Final length (mm): 134.1 Termination criterion : Maximum deviator stress

Remarks:

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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -

Laboratory Information

Lab. sample I.D. : SL100076/11
Specimen ref. : B

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
129.4	1153	1.822	5571.9	7.7	0.00	1.59	1148.8	800.0	574.4	608.5	1148.8	6.09
122.1	1200	1.804	5516.8	8.0	0.00	1.64	1133.1	799.5	566.6	610.6	1133.1	5.87
116.4	1251	1.788	5467.9	8.4	0.00	1.70	1118.5	797.9	559.3	611.4	1118.5	5.69
109.6	1305	1.753	5360.9	8.7	0.00	1.75	1091.5	791.2	545.8	609.2	1091.5	5.45
102.3	1353	1.751	5354.7	9.1	0.00	1.80	1086.4	795.9	543.2	614.8	1086.4	5.30
94.3	1402	1.736	5308.9	9.4	0.00	1.85	1072.8	797.1	536.4	618.3	1072.8	5.12
83.1	1451	1.704	5211.0	9.7	0.00	1.90	1048.5	796.1	524.2	621.4	1048.5	4.86
72.4	1504	1.674	5119.3	10.1	0.00	1.96	1025.3	795.2	512.6	624.4	1025.3	4.63

Final volume (cm^3): 647.190 Final length (mm): 134.1 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HKAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -

Laboratory Information

Date shearing commenced : 09/02/2010 Time : 09:00
Date shearing completed : 09/02/2010 Time : 14:23
Proving ring serial No. : 15862
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.01

Lab. sample I.D. : SL100076/11
Specimen ref. : C
Cell pressure : 465 kPa
Back pressure : 245 kPa
Effective pressure : 220 kPa

Dimensions at starting of compression

Volume V_c : 645.23 cm^3
Area A_c : 4340.0 mm^2
Length L_c : 148.7 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.032	174.9	0.0	0.00	0.00	0.0	220.0	0.0	220.0	0.0	1.00	
309.6	33	0.246	1344.3	0.2	0.00	0.06	268.8	289.8	134.4	245.0	268.8	2.73	
332.3	60	0.320	1748.6	0.4	0.00	0.10	361.1	313.2	180.5	253.1	361.1	3.72	
345.0	90	0.399	2177.4	0.6	0.00	0.16	458.5	349.2	229.2	272.8	458.5	4.82	
348.7	124	0.484	2634.4	0.8	0.00	0.21	561.8	397.2	280.9	303.6	561.8	5.83	
347.6	151	0.556	3021.5	1.0	0.00	0.26	649.0	441.9	324.5	333.7	649.0	6.53	
343.8	180	0.629	3414.0	1.2	0.00	0.31	737.0	489.7	368.5	366.9	737.0	7.08	
337.1	210	0.717	3887.1	1.4	0.00	0.36	842.9	549.4	421.5	408.9	842.9	7.59	
324.8	243	0.789	4196.8	1.6	0.00	0.41	911.2	595.8	455.6	443.9	911.2	7.50	
316.0	275	0.877	4664.9	1.8	0.00	0.46	1015.0	656.5	507.5	487.3	1015.0	7.81	
304.1	303	0.950	5053.2	2.0	0.00	0.50	1100.6	711.2	550.3	527.8	1100.6	7.84	
291.2	331	1.016	5404.3	2.2	0.00	0.55	1177.6	762.6	588.8	566.3	1177.6	7.78	
276.4	361	1.091	5803.2	2.4	0.00	0.59	1264.8	821.0	632.4	610.2	1264.8	7.71	
258.7	393	1.176	6255.3	2.6	0.00	0.64	1363.4	888.0	681.7	660.8	1363.4	7.61	
239.2	422	1.252	6659.6	2.8	0.00	0.69	1451.1	951.3	725.5	709.5	1451.1	7.43	
234.2	452	1.289	6856.4	3.0	0.00	0.73	1492.0	976.8	746.0	728.1	1492.0	7.46	
227.5	485	1.293	6877.7	3.3	0.00	0.78	1493.3	984.1	746.6	735.3	1493.3	7.29	
223.2	514	1.297	6898.9	3.5	0.00	0.82	1494.9	989.3	747.5	740.1	1494.9	7.18	«
219.7	543	1.291	6867.0	3.7	0.00	0.86	1484.8	987.7	742.4	740.2	1484.8	7.05	
214.2	572	1.286	6840.4	3.8	0.00	0.90	1475.9	988.7	737.9	742.8	1475.9	6.88	
208.7	601	1.284	6829.8	4.0	0.00	0.94	1470.5	991.5	735.2	746.5	1470.5	6.74	
204.1	634	1.282	6819.1	4.3	0.00	0.99	1464.7	993.2	732.3	749.1	1464.7	6.61	
198.6	662	1.281	6813.8	4.5	0.00	1.03	1460.6	996.7	730.3	753.3	1460.6	6.48	
192.4	691	1.280	6808.5	4.6	0.00	1.07	1456.4	1000.8	728.2	758.1	1456.4	6.34	
185.7	721	1.278	6797.9	4.8	0.00	1.11	1450.9	1004.8	725.5	762.9	1450.9	6.19	
182.3	751	1.274	6776.6	5.1	0.00	1.15	1443.2	1004.3	721.6	763.8	1443.2	6.10	
178.4	801	1.271	6760.6	5.4	0.00	1.21	1434.5	1003.8	717.2	764.8	1434.5	6.01	
172.6	853	1.267	6739.4	5.7	0.00	1.28	1424.5	1004.7	712.3	767.2	1424.5	5.87	
164.3	900	1.264	6723.4	6.1	0.00	1.34	1416.2	1008.8	708.1	772.8	1416.2	5.71	
152.5	956	1.262	6712.8	6.4	0.00	1.41	1408.2	1016.6	704.1	781.9	1408.2	5.51	
144.3	1004	1.259	6696.8	6.8	0.00	1.46	1399.8	1020.6	699.9	787.3	1399.8	5.36	
134.6	1052	1.256	6680.9	7.1	0.00	1.52	1391.5	1026.1	695.7	794.2	1391.5	5.21	
126.7	1101	1.253	6664.9	7.4	0.00	1.58	1383.1	1029.8	691.5	799.3	1383.1	5.09	
119.4	1153	1.251	6654.3	7.8	0.00	1.64	1375.5	1033.4	687.8	804.1	1375.5	4.98	
113.2	1200	1.248	6638.3	8.1	0.00	1.69	1367.4	1035.5	683.7	807.6	1367.4	4.89	

Final volume (cm^3): 645.23 Final length (mm): 133.7 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D227
Depth(m) From : 11.30
To : -

Laboratory Information

Lab. sample I.D. : SL100076/11
Specimen ref. : C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
108.1	1254	1.244	6617.0	8.4	0.00	1.75	1357.4	1035.6	678.7	809.4	1357.4	4.80
101.2	1303	1.241	6601.1	8.8	0.00	1.80	1349.1	1038.4	674.6	813.5	1349.1	4.71
94.3	1351	1.238	6585.1	9.1	0.00	1.85	1340.9	1041.2	670.5	817.7	1340.9	4.62
85.6	1402	1.236	6574.5	9.4	0.00	1.91	1333.6	1046.2	666.8	823.9	1333.6	4.52
78.4	1451	1.234	6563.8	9.8	0.00	1.96	1326.5	1049.8	663.2	828.8	1326.5	4.43
70.9	1500	1.230	6542.6	10.1	0.00	2.01	1317.2	1052.7	658.6	833.2	1317.2	4.34

Final volume (cm^3): 645.23 Final length (mm): 133.7 Termination criterion : Maximum deviator stress

Remarks:

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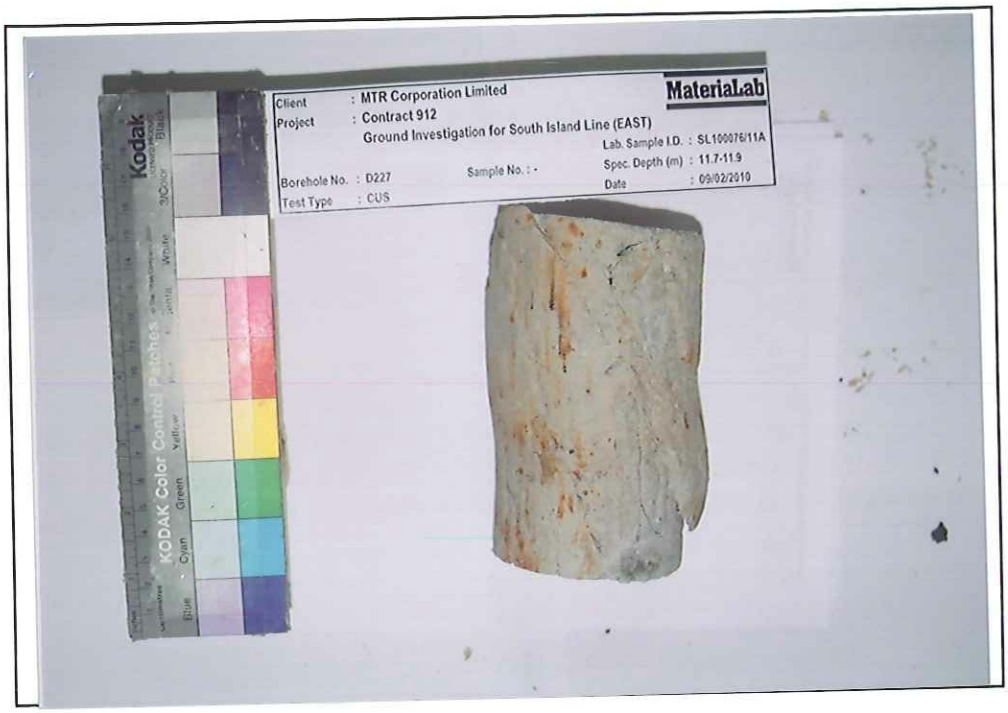
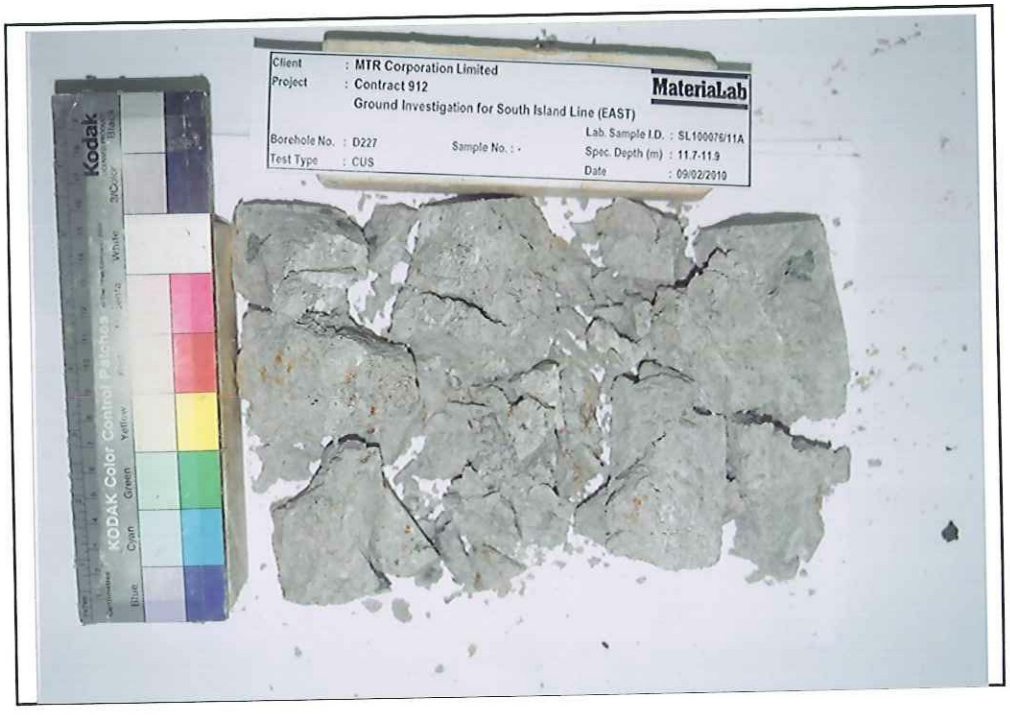
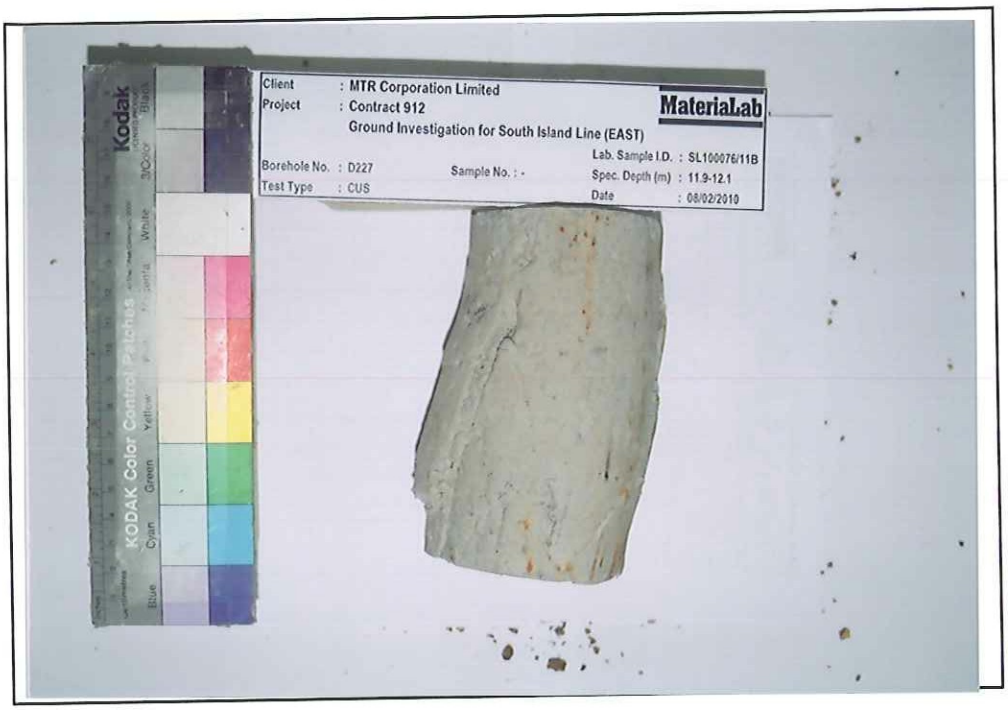
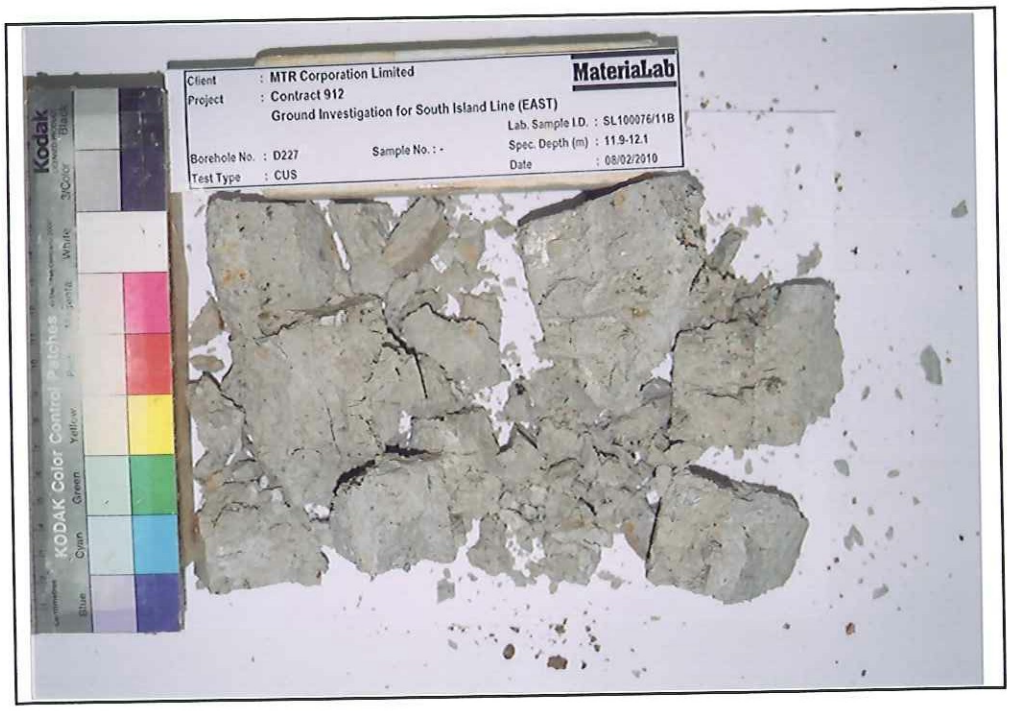
Photographic Records for Triaxial Test



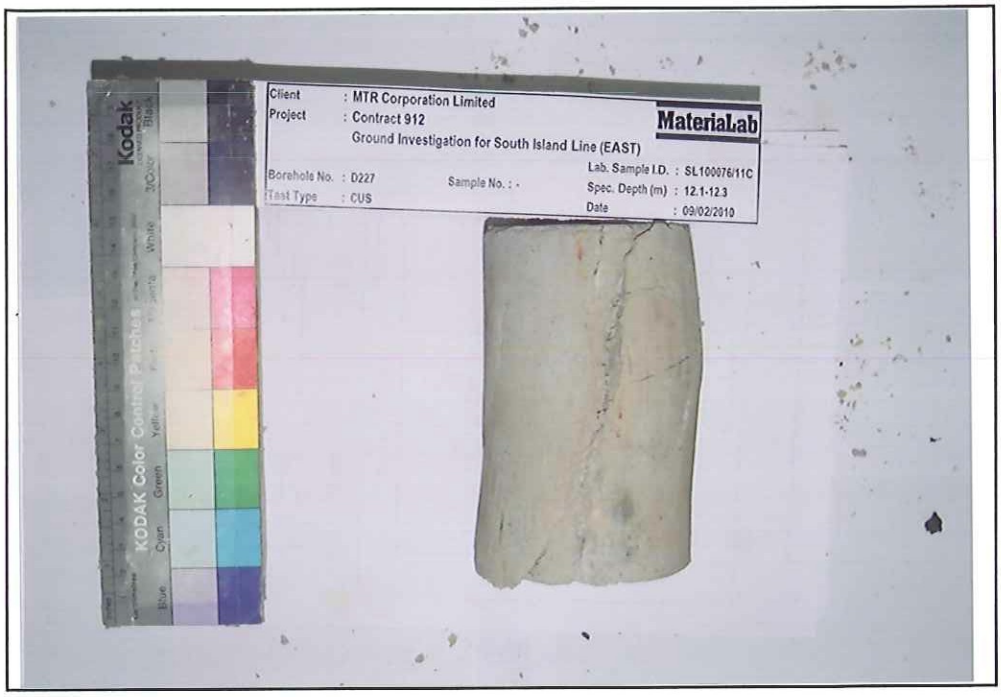


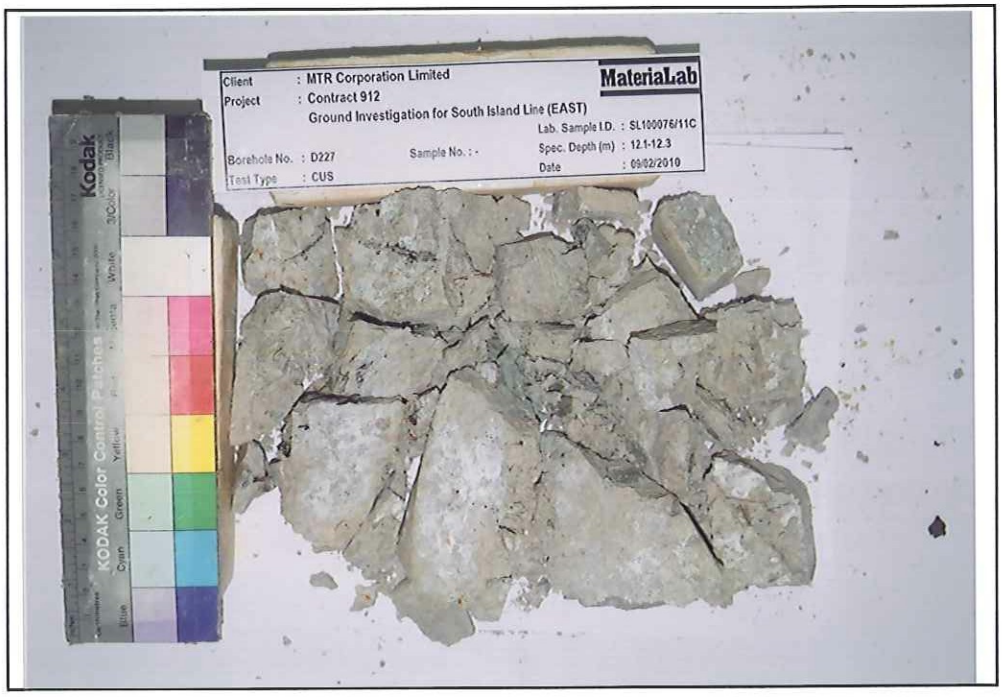
Photographic Records for Triaxial Test





Photographic Records for Triaxial Test





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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

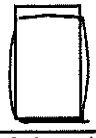
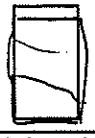
Project : Contract 912
Ground Investigation for South Island Line
(EAST)

Client sample No. : 17
Borehole No. : D230
Depth(m) From : 10.90
To : -
Sample origin : CDT
Soil description : -

Laboratory Information

Date sample received : 21-08-2009
Date test(s) commenced : 09-09-2009
Date test(s) completed : 15-09-2009
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum 24.5 °C Minimum : 20.0 °C

Lab. sample I.D. : SL90169/3
Sample type : M

Specimen reference			A			B			C		
Specimen depth(m)	From		11.30			11.50			11.70		
	To		11.50			11.70			11.90		
Effective pressure		kPa	50			100			150		
*Measurements and Calculations			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.6	74.0	78.7	74.5	73.8	77.8	74.6	73.7	78.8
Length		mm	150.2	149.0	132.0	150.3	148.9	133.9	150.3	148.4	129.9
Volume		cm^3	656.50	641.30	641.30	655.18	637.48	637.48	656.94	632.84	632.84
Wet mass		g	1254.3	1246.1	1246.1	1290.8	1277.9	1277.9	1274.3	1263.7	1263.7
Dry mass		g	974.1	974.1	974.1	1026.4	1026.4	1026.4	1011.5	1011.5	1011.5
Moisture content		%	28.8	27.9	27.9	25.8	24.5	24.5	26.0	24.9	24.9
Bulk density		Mg/m^3	1.91	1.94	1.94	1.97	2.00	2.00	1.94	2.00	2.00
Dry density		Mg/m^3	1.48	1.52	1.52	1.57	1.61	1.61	1.54	1.60	1.60
Void ratio			0.79	0.74	0.74	0.69	0.65	0.65	0.72	0.66	0.66
Degree of saturation		%	97.0	99.4	99.4	98.7	100.5	100.5	95.5	100.4	100.4
Saturation Stage											
Volume change of water		cm^3	7.0			4.8			13.5		
Consolidation Stage											
Side drain used			No			No.			No.		
Initial pore pressure		kPa	290.0			340.0			389.5		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm^3	15.2			17.7			24.1		
m_{vi}		m^2/MN	0.51			0.28			0.25		
t_{50}		min	6.60			2.80			3.00		
c_{vi}	(from t_{50})	m^2/yr	678.33			1598.95			1487.42		
t_{100}		min	10.89			4.84			6.25		
c_{vi}	(from t_{100})	m^2/yr	825.56			1842.68			1429.91		
Sketch of failed specimen (Failure Mode)			 Plastic			Brittle			 Brittle		
Visual description			Moist, dark greyish brown spotted with white, black and dark brown, very silty/clayey, gravelly SAND.			Moist, dark greyish brown spotted with white, black and dark brown, very silty/clayey, gravelly SAND.			Moist, dark greyish brown spotted with white, black and dark brown, very silty/clayey, gravelly SAND.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)
Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : K.M. Fung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 OCT 2009

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

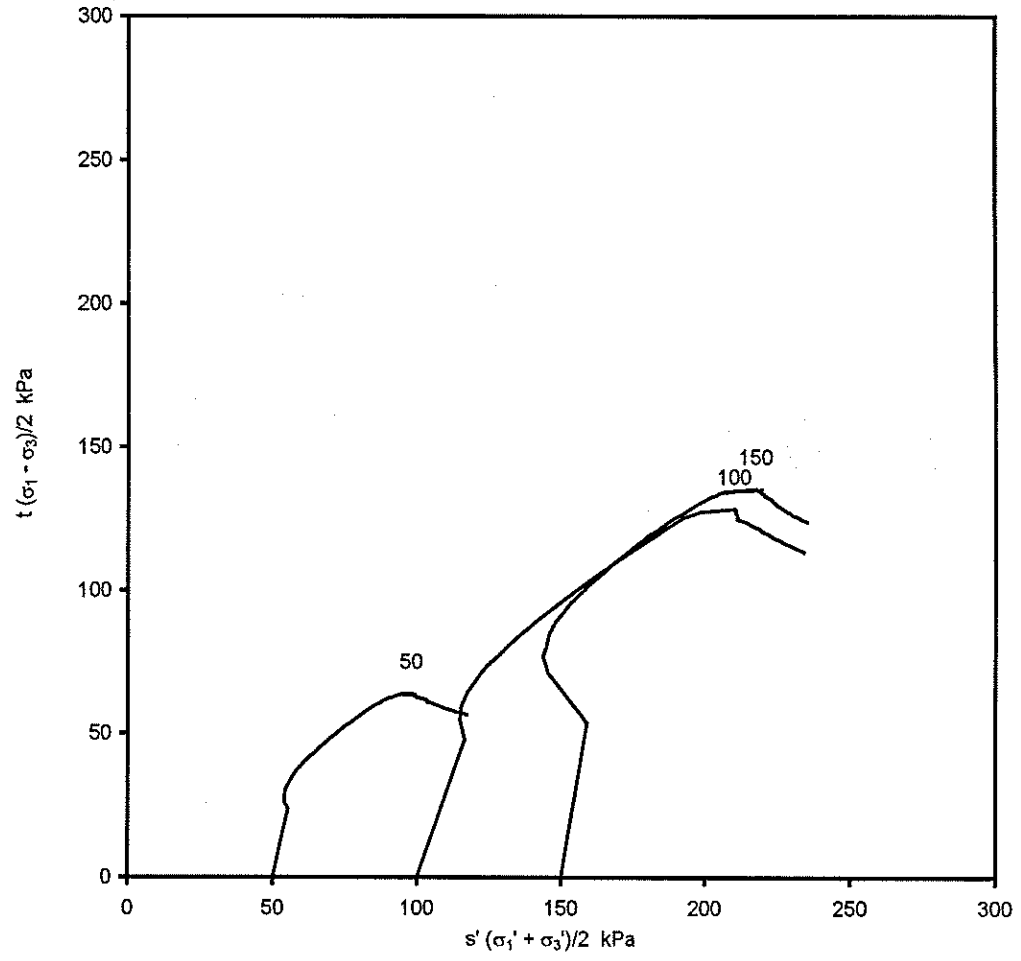
Client	:	MTR Corporation Limited	Client sample No.	:	17
Project	:	Contract 912	Borehole No.	:	D230
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.90
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/3
Specimen ref.	:	A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
A	50	6.5	260.7	127.5	98.0	63.7
B	100	5.0	263.4	256.8	210.0	128.4
C	150	7.5	312.5	270.3	217.7	135.2



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

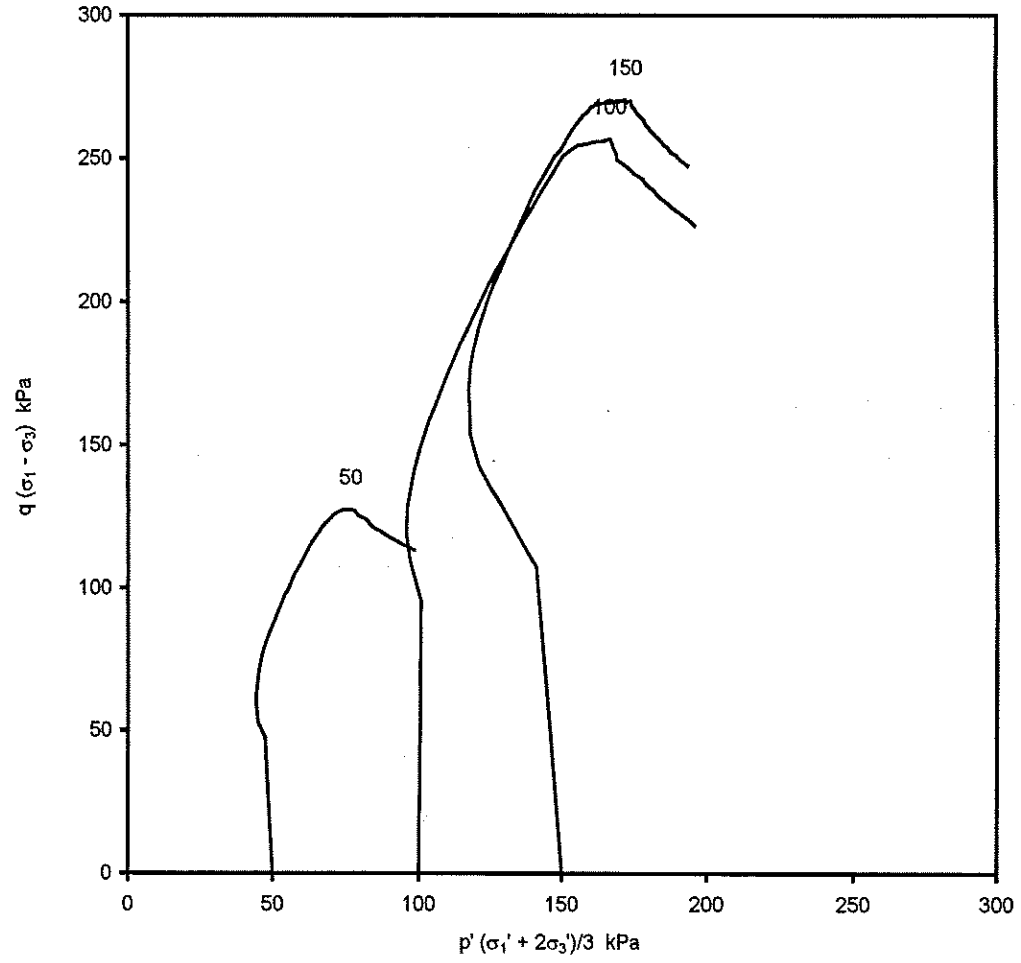
Client	:	MTR Corporation Limited	Client sample No.	:	17
Project	:	Contract 912	Borehole No.	:	D230
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.90
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/3
Specimen ref.	:	A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	50	6.5	260.7	127.5	76.8	127.5
B	100	5.0	263.4	256.8	167.2	256.8
C	150	7.5	312.5	270.3	172.6	270.3



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

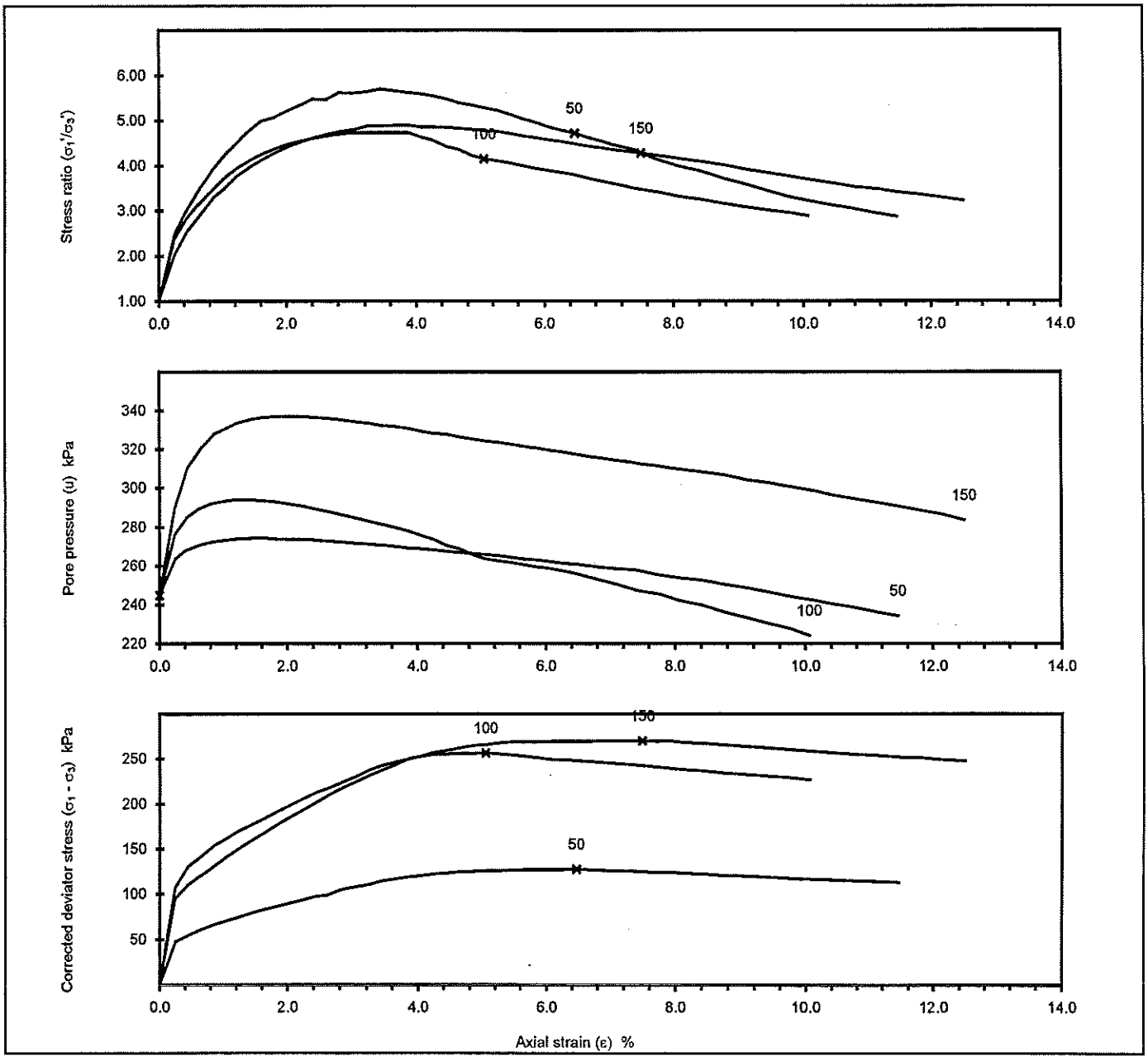
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	17
Project	:	Contract 912	Borehole No.	:	D230
		Ground Investigation for South Island Line	Depth(m) From	:	10.90
		(EAST)	To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/3
Specimen ref.	:	A, B, C



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 17
Borehole No. : D230
Depth(m) From : 10.90
To : -

Laboratory Information

Lab. sample I.D. : SL90169/3

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	50		100		150	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		25	20	25	20	25	20
		50	45	50	45	50	45
		75	70	75	70	75	70
		100	95	100	95	100	95
		125	120	150	145	150	145
		150	145	200	195	200	195
		200	195	250	245	250	245
		250	245				

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	245.0	245.0	245.0
B value		1.00	1.00	1.00
Volume change	cm^3	7.0	4.8	13.5

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1243.4	1275.0	1260.9
Final moisture content	%	27.6	24.2	24.7
Final bulk density	Mg/m^3	1.94	2.00	1.99

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

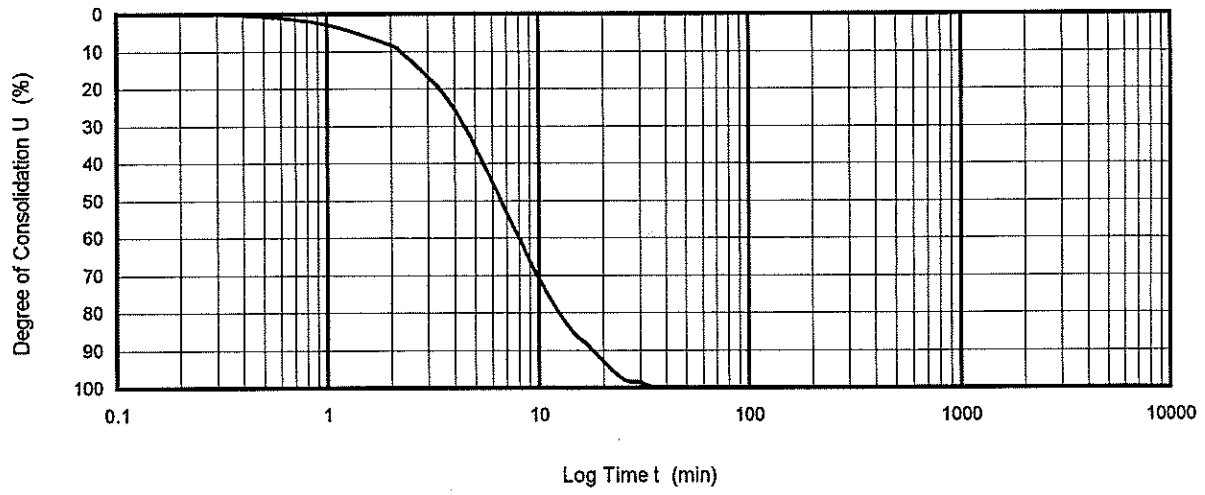
Client	:	MTR Corporation Limited	Client sample No.	:	17
Project	:	Contract 912	Borehole No.	:	D230
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.90
			To	:	-

Laboratory Information

Cell pressure	:	295 kPa	Lab. sample I.D.	:	SL90169/3
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	50 kPa			

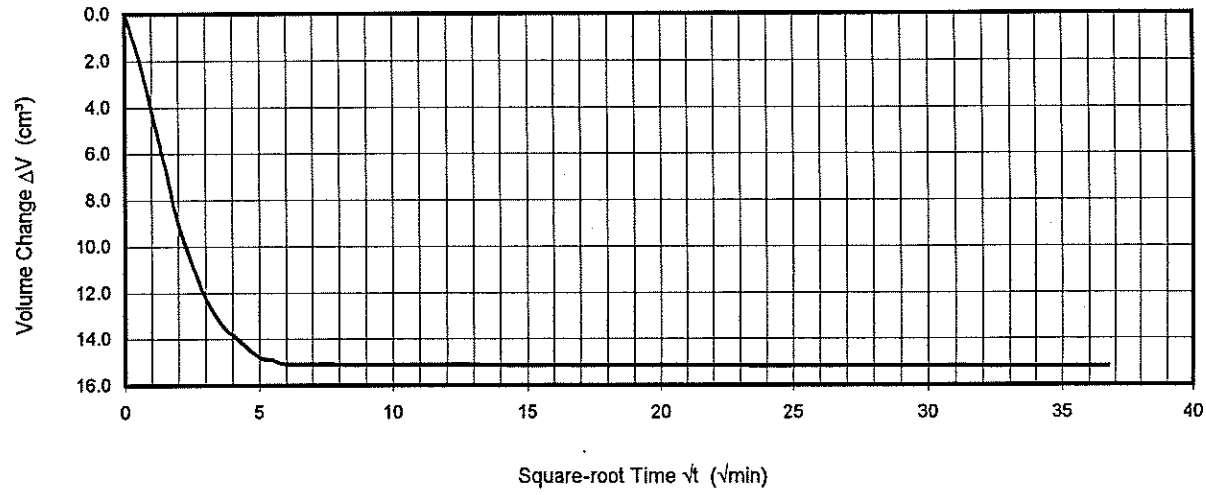
Degree of Consolidation vs. Log Time

t_{50} = 6.60 min ΔV = 15.2 cm^3



Volume Change vs. Square-root Time

t_{100} = 10.89 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

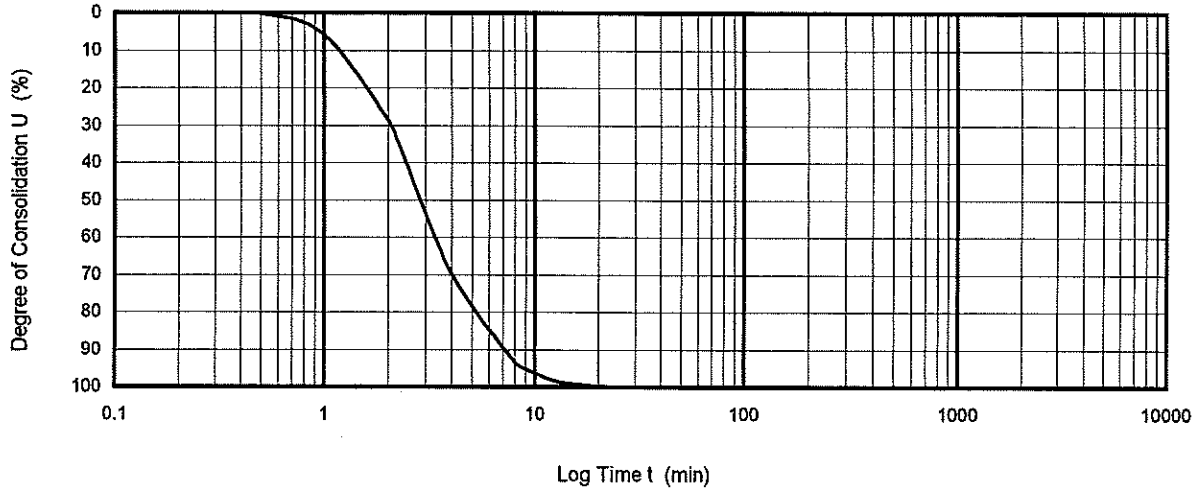
Client	:	MTR Corporation Limited	Client sample No.	:	17
Project	:	Contract 912	Borehole No.	:	D230
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.90
			To	:	-

Laboratory Information

Cell pressure	:	345 kPa	Lab. sample I.D.	:	SL90169/3
Back pressure	:	245 kPa	Specimen ref.	:	B
Effective pressure	:	100 kPa			

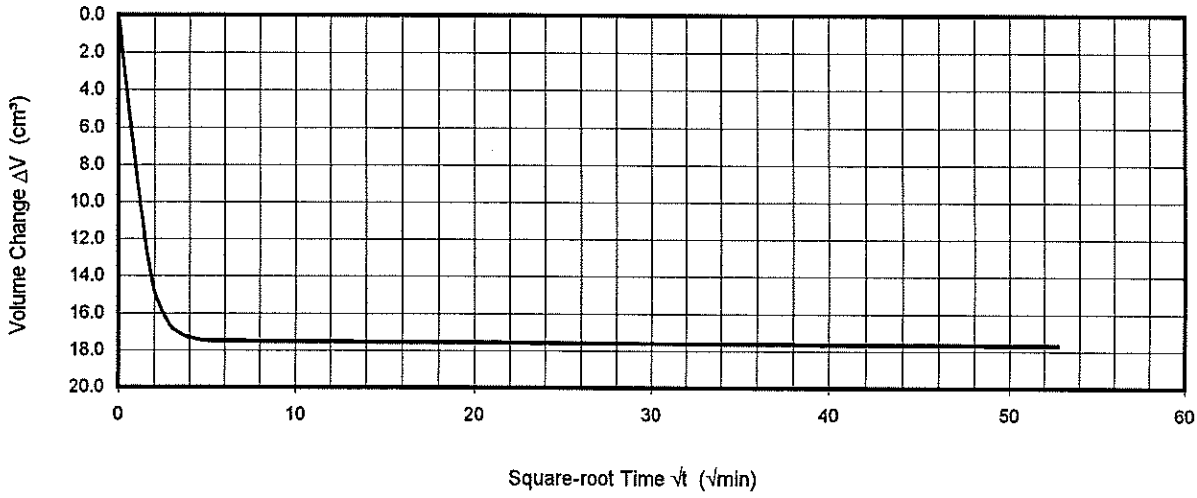
Degree of Consolidation vs. Log Time

t_{50} = 2.80 min ΔV = 17.7 cm³



Volume Change vs. Square-root Time

t_{100} = 4.84 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

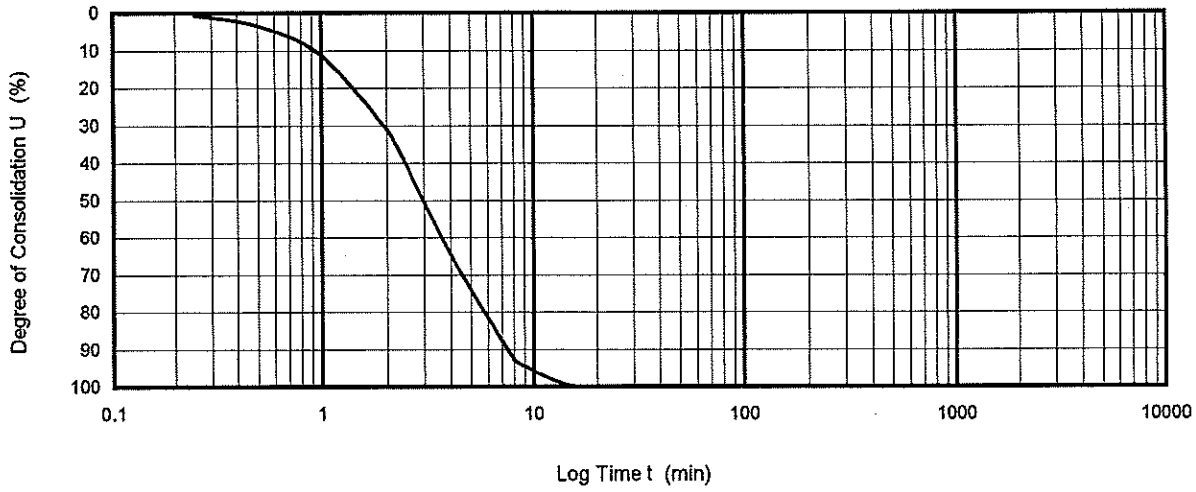
Client	:	MTR Corporation Limited	Client sample No.	:	17
Project	:	Contract 912	Borehole No.	:	D230
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.90
			To	:	-

Laboratory Information

Cell pressure	:	395 kPa	Lab. sample I.D.	:	SL90169/3
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	150 kPa			

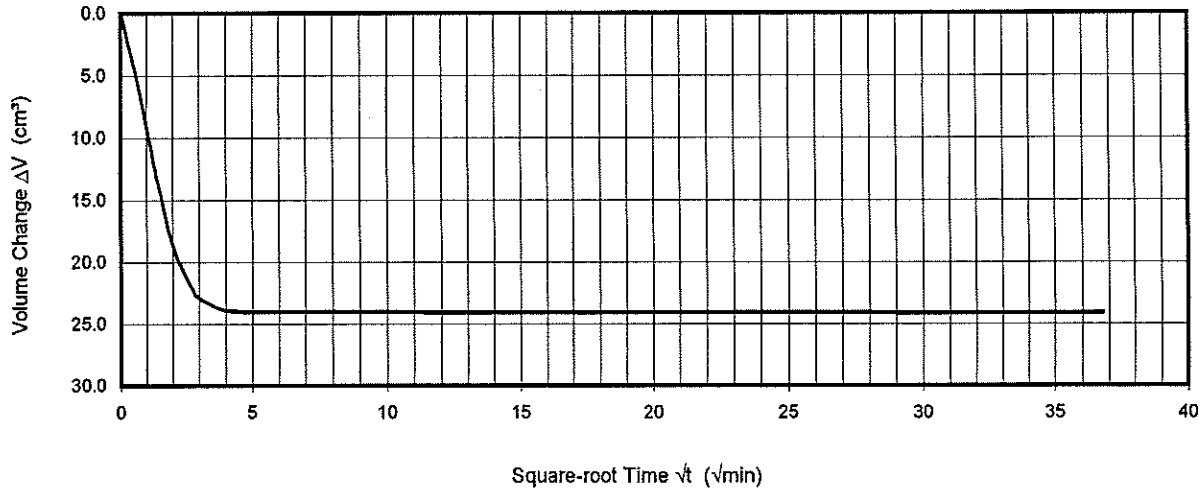
Degree of Consolidation vs. Log Time

t_{50} = 3.00 min ΔV = 24.1 cm³



Volume Change vs. Square-root Time

t_{100} = 6.25 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	17
Project	:	Contract 912	Borehole No.	:	D230
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.90
			To	:	-

Laboratory Information

Date shearing commenced	:	11/09/2009	Time :	09:00	Lab. sample I.D.	:	SL90169/3	
Date shearing completed	:	11/09/2009	Time :	14:47	Specimen ref.	:	A	
Proving ring serial No.	:	12202			Cell pressure	:	295	kPa
Type of membrane	:	rubber			Back pressure	:	245	kPa
Corrections					Effective pressure	:	50	kPa
Side drain, σ_{dr}	:	0.000	kPa/%		Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.68	mm		Volume V_c	:	641.30	cm^3
Rate of axial displacement	:	0.050	mm/min		Area A_c	:	4303.1	mm^2
Pore pressure coefficient, A_f	:	0.12			Length L_c	:	149.0	mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.071	123.9	0.0	0.00	0.00	0.0	50.0	0.0	50.0	0.0	1.00	
263.4	37	0.188	328.0	0.2	0.00	0.07	47.2	55.2	23.6	47.3	47.2	2.50	
267.5	60	0.202	352.4	0.4	0.00	0.11	52.8	53.9	26.4	45.1	52.8	2.92	
270.9	96	0.222	387.3	0.6	0.00	0.17	60.7	54.4	30.3	44.3	60.7	3.52	
272.2	124	0.235	410.0	0.8	0.00	0.22	65.7	55.7	32.9	44.7	65.7	3.88	
273.1	151	0.246	429.2	1.0	0.00	0.27	70.0	56.9	35.0	45.2	70.0	4.19	
273.8	180	0.256	446.6	1.2	0.00	0.32	73.8	58.1	36.9	45.8	73.8	4.48	
274.2	211	0.268	467.6	1.4	0.00	0.37	78.4	60.0	39.2	46.9	78.4	4.77	
274.3	240	0.279	486.7	1.6	0.00	0.42	82.6	62.0	41.3	48.2	82.6	4.99	
273.9	270	0.288	502.4	1.8	0.00	0.47	85.9	64.1	43.0	49.7	85.9	5.07	
273.7	300	0.298	519.9	2.0	0.00	0.52	89.7	66.1	44.8	51.2	89.7	5.21	
273.5	330	0.308	537.3	2.2	0.00	0.57	93.4	68.2	46.7	52.6	93.4	5.34	
273.3	361	0.318	554.8	2.4	0.00	0.61	97.1	70.2	48.5	54.1	97.1	5.47	
272.8	390	0.324	565.2	2.6	0.00	0.66	99.2	71.8	49.6	55.3	99.2	5.47	
272.3	420	0.339	591.4	2.8	0.00	0.71	104.9	75.1	52.4	57.7	104.9	5.62	
271.6	450	0.347	605.4	3.0	0.00	0.75	107.8	77.3	53.9	59.3	107.8	5.61	
271.1	483	0.356	621.1	3.2	0.00	0.80	111.0	79.4	55.5	60.9	111.0	5.64	
270.6	514	0.366	638.5	3.4	0.00	0.85	114.6	81.7	57.3	62.6	114.6	5.70	
270.0	541	0.372	649.0	3.6	0.00	0.89	116.7	83.4	58.4	63.9	116.7	5.67	
269.3	570	0.379	661.2	3.8	0.00	0.93	119.2	85.3	59.6	65.4	119.2	5.64	
268.7	605	0.384	669.9	4.1	0.00	0.98	120.8	86.7	60.4	66.6	120.8	5.59	
268.1	634	0.389	678.6	4.3	0.00	1.02	122.4	88.1	61.2	67.7	122.4	5.55	
267.4	667	0.393	685.6	4.5	0.00	1.07	123.6	89.4	61.8	68.8	123.6	5.48	
266.7	693	0.396	690.9	4.7	0.00	1.11	124.5	90.6	62.3	69.8	124.5	5.40	
266.1	725	0.399	696.1	4.9	0.00	1.15	125.4	91.6	62.7	70.7	125.4	5.34	
265.6	754	0.401	699.6	5.1	0.00	1.19	125.8	92.3	62.9	71.3	125.8	5.28	
265.1	786	0.403	703.1	5.3	0.00	1.23	126.3	93.0	63.1	72.0	126.3	5.22	
264.4	813	0.405	706.6	5.5	0.00	1.27	126.8	94.0	63.4	72.9	126.8	5.14	
263.6	842	0.407	710.0	5.6	0.00	1.31	127.2	95.0	63.6	73.8	127.2	5.05	
262.9	871	0.408	711.8	5.8	0.00	1.35	127.3	95.7	63.6	74.5	127.3	4.97	
262.0	903	0.409	713.5	6.1	0.00	1.39	127.3	96.7	63.7	75.4	127.3	4.86	
261.4	931	0.410	715.3	6.2	0.00	1.42	127.4	97.3	63.7	76.1	127.4	4.79	
260.7	964	0.411	717.0	6.5	0.00	1.47	127.5	98.0	63.7	76.8	127.5	4.72	«
259.9	993	0.411	717.0	6.7	0.00	1.50	127.2	98.7	63.6	77.5	127.2	4.62	
259.2	1026	0.411	717.0	6.9	0.00	1.54	126.8	99.2	63.4	78.1	126.8	4.54	

Final volume (cm^3): 641.30 Final length (mm): 132.0 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	17
Project	:	Contract 912	Borehole No.	:	D230
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.90
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/3
Specimen ref.	:	A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
258.6	1052	0.410	715.3	7.1	0.00	1.57	126.2	99.5	63.1	78.5	126.2	4.47
257.6	1104	0.409	713.5	7.4	0.00	1.64	125.2	100.0	62.6	79.1	125.2	4.35
255.3	1153	0.408	711.8	7.7	0.00	1.70	124.4	101.9	62.2	81.2	124.4	4.13
253.6	1206	0.407	710.0	8.1	0.00	1.76	123.4	103.1	61.7	82.5	123.4	3.98
252.5	1253	0.405	706.6	8.4	0.00	1.81	122.2	103.6	61.1	83.2	122.2	3.88
250.4	1305	0.403	703.1	8.8	0.00	1.87	120.9	105.1	60.5	84.9	120.9	3.71
248.7	1352	0.402	701.3	9.1	0.00	1.92	120.1	106.3	60.0	86.3	120.1	3.59
246.4	1404	0.400	697.8	9.4	0.00	1.98	118.8	108.0	59.4	88.2	118.8	3.45
244.3	1453	0.398	694.3	9.7	0.00	2.03	117.6	109.5	58.8	89.9	117.6	3.32
242.3	1506	0.397	692.6	10.1	0.00	2.09	116.7	111.1	58.4	91.6	116.7	3.21
240.6	1551	0.396	690.9	10.4	0.00	2.13	115.9	112.4	58.0	93.0	115.9	3.13
238.7	1603	0.395	689.1	10.8	0.00	2.19	115.0	113.8	57.5	94.6	115.0	3.04
236.4	1652	0.394	687.4	11.1	0.00	2.24	114.2	115.7	57.1	96.7	114.2	2.95
234.3	1707	0.393	685.6	11.5	0.00	2.29	113.3	117.4	56.7	98.5	113.3	2.87

Final volume (cm³): 641.30 Final length (mm): 132.0 Termination criterion : Maximum deviator stress

Remarks:

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MaterialLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 17
Borehole No. : D230
Depth(m) From : 10.90
To : -

Laboratory Information

Date shearing commenced : 14/09/2009 Time : 09:00
Date shearing completed : 14/09/2009 Time : 14:12
Proving ring serial No. : 10175
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.07

Lab. sample I.D. : SL90169/3
Specimen ref. : B
Cell pressure : 345 kPa
Back pressure : 245 kPa
Effective pressure : 100 kPa

Dimensions at starting of compression

Volume V_c : 637.48 cm^3
Area A_c : 4280.3 mm^2
Length L_c : 148.9 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.094	169.4	0.0	0.00	0.00	0.0	100.0	0.0	100.0	0.0	1.00	
276.0	35	0.321	578.6	0.2	0.00	0.06	95.3	116.7	47.7	100.8	95.3	2.38	
284.8	64	0.356	641.7	0.4	0.00	0.11	109.7	115.1	54.9	96.8	109.7	2.82	
289.1	90	0.379	683.1	0.6	0.00	0.15	119.1	115.5	59.6	95.6	119.1	3.13	
291.8	120	0.402	724.6	0.8	0.00	0.20	128.5	117.4	64.2	96.0	128.5	3.41	
293.6	158	0.435	784.1	1.1	0.00	0.26	141.8	122.3	70.9	98.7	141.8	3.76	
294.0	180	0.453	816.5	1.2	0.00	0.30	149.1	125.5	74.5	100.7	149.1	3.92	
294.0	211	0.476	858.0	1.4	0.00	0.35	158.2	130.1	79.1	103.7	158.2	4.10	
293.6	244	0.500	901.2	1.6	0.00	0.40	167.8	135.3	83.9	107.3	167.8	4.26	
292.9	270	0.520	937.3	1.8	0.00	0.44	175.7	139.9	87.8	110.7	175.7	4.37	
291.8	302	0.543	978.7	2.0	0.00	0.49	184.8	145.6	92.4	114.8	184.8	4.47	
290.7	332	0.563	1014.8	2.2	0.00	0.54	192.6	150.6	96.3	118.5	192.6	4.55	
289.4	360	0.583	1050.8	2.4	0.00	0.58	200.4	155.8	100.2	122.4	200.4	4.60	
287.7	394	0.608	1095.9	2.6	0.00	0.63	210.1	162.3	105.0	127.3	210.1	4.67	
286.4	420	0.625	1126.5	2.8	0.00	0.67	216.6	166.9	108.3	130.8	216.6	4.70	
284.6	456	0.647	1166.2	3.1	0.00	0.72	225.0	172.9	112.5	135.4	225.0	4.73	
282.6	489	0.667	1202.2	3.3	0.00	0.77	232.6	178.7	116.3	139.9	232.6	4.73	
281.6	510	0.678	1222.1	3.4	0.00	0.80	236.7	181.8	118.4	142.3	236.7	4.73	
280.0	540	0.694	1250.9	3.6	0.00	0.84	242.7	186.3	121.3	145.9	242.7	4.73	
277.8	578	0.716	1290.6	3.9	0.00	0.89	250.9	192.6	125.4	150.8	250.9	4.73	
275.3	609	0.723	1303.2	4.1	0.00	0.93	253.1	196.3	126.6	154.1	253.1	4.63	
273.6	633	0.728	1312.2	4.3	0.00	0.96	254.7	198.7	127.3	156.3	254.7	4.57	
270.4	665	0.731	1317.6	4.5	0.00	1.01	255.3	202.2	127.6	159.7	255.3	4.42	
268.7	694	0.734	1323.0	4.7	0.00	1.05	255.9	204.3	128.0	161.6	255.9	4.35	
265.3	725	0.736	1326.6	4.9	0.00	1.09	256.1	207.8	128.1	165.1	256.1	4.21	
263.4	752	0.739	1332.0	5.0	0.00	1.12	256.8	210.0	128.4	167.2	256.8	4.15	«
262.4	786	0.738	1330.2	5.3	0.00	1.16	255.7	210.5	127.9	167.8	255.7	4.10	
261.6	814	0.736	1326.6	5.5	0.00	1.20	254.4	210.6	127.2	168.2	254.4	4.05	
260.5	843	0.734	1323.0	5.7	0.00	1.24	253.0	211.0	126.5	168.8	253.0	3.99	
259.4	872	0.731	1317.6	5.9	0.00	1.27	251.3	211.2	125.6	169.4	251.3	3.94	
258.6	903	0.728	1312.2	6.1	0.00	1.31	249.5	211.1	124.7	169.6	249.5	3.89	
256.4	956	0.728	1312.2	6.4	0.00	1.37	248.5	212.8	124.2	171.4	248.5	3.80	
253.4	1007	0.726	1308.6	6.8	0.00	1.43	246.7	215.0	123.4	173.8	246.7	3.69	
250.6	1054	0.723	1303.2	7.1	0.00	1.49	244.6	216.7	122.3	175.9	244.6	3.59	
247.4	1103	0.721	1299.6	7.4	0.00	1.54	242.9	219.1	121.5	178.6	242.9	3.49	

Final volume (cm^3): 637.48 Final length (mm): 133.9 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 17
Borehole No. : D230
Depth(m) From : 10.90
To : -

Laboratory Information

Lab. sample I.D. : SL90169/3
Specimen ref. : B

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.3	1155	0.718	1294.2	7.8	0.00	1.60	240.8	220.1	120.4	180.0	240.8	3.42
242.1	1202	0.715	1288.8	8.1	0.00	1.65	238.7	222.3	119.4	182.5	238.7	3.32
239.6	1255	0.712	1283.3	8.4	0.00	1.71	236.6	223.7	118.3	184.3	236.6	3.24
236.4	1300	0.709	1277.9	8.7	0.00	1.76	234.6	225.9	117.3	186.8	234.6	3.16
233.4	1354	0.706	1272.5	9.1	0.00	1.81	232.5	227.8	116.2	189.1	232.5	3.08
230.5	1403	0.704	1268.9	9.4	0.00	1.86	230.8	229.9	115.4	191.4	230.8	3.02
227.6	1457	0.702	1265.3	9.8	0.00	1.92	229.1	231.9	114.5	193.8	229.1	2.95
224.2	1500	0.698	1258.1	10.1	0.00	1.96	226.8	234.2	113.4	196.4	226.8	2.88

Final volume (cm³): 637.48 Final length (mm): 133.9 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	17
Project	:	Contract 912	Borehole No.	:	D230
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.90
			To	:	-

Laboratory Information

Date shearing commenced	:	11/09/2009	Time : 09:00	Lab. sample I.D.	:	SL90169/3	
Date shearing completed	:	11/09/2009	Time : 15:24	Specimen ref.	:	C	
Proving ring serial No.	:	12412		Cell pressure	:	395	kPa
Type of membrane	:	rubber		Back pressure	:	245	kPa
Corrections				Effective pressure	:	150	kPa
Side drain, σ_{dr}	:	0.000	kPa/%	Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.65	mm	Volume V_c	:	632.84	cm^3
Rate of axial displacement	:	0.050	mm/min	Area A_c	:	4263.3	mm^2
Pore pressure coefficient, A_f	:	0.25		Length L_c	:	148.4	mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	50	179.0	0.0	0.00	0.00	0.0	150.0	0.0	150.0	0.0	1.00
289.6	35	178	637.4	0.2	0.00	0.06	107.2	159.0	53.6	141.1	107.2	2.02
310.1	66	206	737.6	0.4	0.00	0.11	130.3	150.1	65.2	128.3	130.3	2.54
321.0	97	221	791.4	0.7	0.00	0.17	142.5	145.3	71.3	121.5	142.5	2.93
328.0	129	235	841.5	0.9	0.00	0.22	153.8	143.9	76.9	118.3	153.8	3.30
330.1	150	243	870.1	1.0	0.00	0.26	160.2	145.0	80.1	118.3	160.2	3.47
333.6	180	254	909.5	1.2	0.00	0.30	169.0	145.9	84.5	117.7	169.0	3.75
335.7	217	265	948.9	1.5	0.00	0.36	177.6	148.1	88.8	118.5	177.6	3.99
336.4	240	272	974.0	1.6	0.00	0.40	183.0	150.1	91.5	119.6	183.0	4.12
337.0	272	282	1009.8	1.8	0.00	0.45	190.8	153.4	95.4	121.6	190.8	4.29
337.1	305	292	1045.6	2.1	0.00	0.50	198.6	157.2	99.3	124.1	198.6	4.43
336.9	334	301	1077.8	2.3	0.00	0.55	205.5	160.9	102.8	126.6	205.5	4.54
336.4	364	310	1110.0	2.5	0.00	0.59	212.4	164.8	106.2	129.4	212.4	4.63
336.0	397	318	1138.7	2.7	0.00	0.64	218.4	168.2	109.2	131.8	218.4	4.70
335.2	427	327	1170.9	2.9	0.00	0.69	225.3	172.4	112.6	134.9	225.3	4.77
334.4	453	334	1196.0	3.1	0.00	0.73	230.5	175.9	115.3	137.4	230.5	4.80
333.6	484	344	1231.8	3.3	0.00	0.77	238.1	180.5	119.1	140.8	238.1	4.88
332.5	511	350	1253.3	3.4	0.00	0.81	242.5	183.7	121.2	143.3	242.5	4.88
331.7	545	356	1274.8	3.7	0.00	0.86	246.7	186.7	123.4	145.5	246.7	4.90
330.8	576	361	1292.7	3.9	0.00	0.90	250.2	189.3	125.1	147.6	250.2	4.90
329.4	603	365	1307.0	4.1	0.00	0.94	252.9	192.0	126.4	149.9	252.9	4.85
328.4	632	371	1328.5	4.3	0.00	0.98	257.2	195.2	128.6	152.3	257.2	4.86
327.6	665	375	1342.8	4.5	0.00	1.02	259.7	197.3	129.9	154.0	259.7	4.85
326.4	694	379	1357.1	4.7	0.00	1.06	262.3	199.8	131.2	156.0	262.3	4.82
325.4	723	383	1371.4	4.9	0.00	1.10	265.0	202.1	132.5	157.9	265.0	4.81
324.3	756	385	1378.6	5.1	0.00	1.15	265.9	203.6	132.9	159.3	265.9	4.76
323.6	783	388	1389.4	5.3	0.00	1.18	267.7	205.3	133.9	160.6	267.7	4.75
322.5	814	390	1396.5	5.5	0.00	1.22	268.7	206.8	134.3	162.1	268.7	4.71
321.4	845	391	1400.1	5.7	0.00	1.26	268.8	208.0	134.4	163.2	268.8	4.65
320.6	872	392	1403.7	5.9	0.00	1.29	269.1	208.9	134.5	164.1	269.1	4.62
319.6	901	393	1407.3	6.1	0.00	1.33	269.3	210.0	134.6	165.2	269.3	4.57
318.7	931	394	1410.8	6.3	0.00	1.37	269.4	211.0	134.7	166.1	269.4	4.53
317.4	965	395	1414.4	6.5	0.00	1.41	269.5	212.4	134.8	167.4	269.5	4.47
316.3	994	396	1418.0	6.7	0.00	1.44	269.7	213.6	134.9	168.6	269.7	4.43
315.4	1023	397	1421.6	6.9	0.00	1.48	269.9	214.5	134.9	169.6	269.9	4.39

Final volume (cm^3): 632.84 Final length (mm): 129.9 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line
(EAST)

Client sample No. : 17
Borehole No. : D230
Depth(m) From : 10.90
To : -

Laboratory Information

Lab. sample I.D. : SL90169/3
Specimen ref. : C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
314.2	1054	398	1425.2	7.1	0.00	1.51	270.0	215.8	135.0	170.8	270.0	4.34	
313.4	1084	399	1428.7	7.3	0.00	1.55	270.2	216.7	135.1	171.7	270.2	4.31	
312.5	1113	400	1432.3	7.5	0.00	1.58	270.3	217.7	135.2	172.6	270.3	4.28	«
311.6	1146	400	1432.3	7.7	0.00	1.62	269.7	218.2	134.8	173.3	269.7	4.23	
310.4	1173	401	1435.9	7.9	0.00	1.65	269.9	219.5	134.9	174.6	269.9	4.19	
309.6	1205	400	1432.3	8.1	0.00	1.68	268.4	219.6	134.2	174.9	268.4	4.14	
308.4	1251	400	1432.3	8.4	0.00	1.73	267.5	220.3	133.7	175.8	267.5	4.09	
306.6	1304	399	1428.7	8.8	0.00	1.79	265.6	221.2	132.8	176.9	265.6	4.00	
304.3	1353	398	1425.2	9.1	0.00	1.84	263.8	222.6	131.9	178.6	263.8	3.91	
302.5	1406	397	1421.6	9.5	0.00	1.90	261.9	223.5	131.0	179.8	261.9	3.83	
300.6	1454	396	1418.0	9.8	0.00	1.95	260.2	224.5	130.1	181.1	260.2	3.76	
298.7	1503	395	1414.4	10.1	0.00	2.00	258.4	225.5	129.2	182.4	258.4	3.68	
296.4	1552	394	1410.8	10.5	0.00	2.05	256.7	226.9	128.3	184.2	256.7	3.60	
294.3	1601	393	1407.3	10.8	0.00	2.09	254.9	228.2	127.5	185.7	254.9	3.53	
292.5	1655	393	1407.3	11.1	0.00	2.15	253.8	229.4	126.9	187.1	253.8	3.48	
290.6	1702	392	1403.7	11.5	0.00	2.19	252.1	230.5	126.1	188.4	252.1	3.41	
288.7	1750	392	1403.7	11.8	0.00	2.24	251.1	231.9	125.6	190.0	251.1	3.36	
286.4	1804	391	1400.1	12.2	0.00	2.29	249.3	233.3	124.7	191.7	249.3	3.30	
283.4	1854	390	1396.5	12.5	0.00	2.33	247.6	235.4	123.8	194.1	247.6	3.22	

Final volume (cm³): 632.84 Final length (mm): 129.9 Termination criterion : Maximum deviator stress

Remarks:

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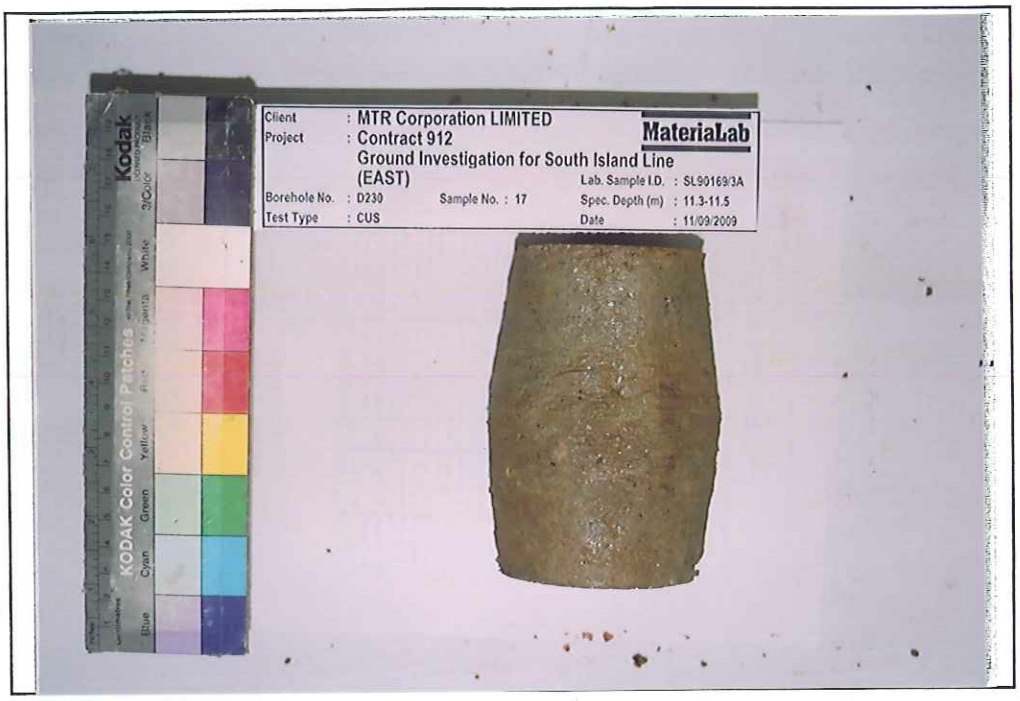
Photographic Records for Triaxial Test



Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

REPORT ON SOIL AND ROCK TESTS

CLIENT : MTR Corporation Limited

PROJECT : Contract No.912-Ground Investigation
for South Island Line East

SIL REPORT NO. : VOLUME 1 - PART 3 OF 4

MTR SCHEDULE NOS. : C902-1, C902-3, C903-1, C903-2,
C903-3

MTR CORPORATION LIMITED

CONTRACT NO. 912- GROUND INVESTIGATION FOR SOUTH ISLAND LINE EAST

LABORATORY TEST REPORT SUMMARY CONTENTS LIST

VOLUME NUMBER	REPORTED SCHEDULES	PART NOS.	CONTENTS	REMARKS
VOLUME 1	C902-1	1 OF 4	Soil Summary Tables, Classification Tests, Chemical Tests	Results from 5 Nos. schedules collated in one report presented in Drillhole/ trial pit order
	C902-3	2 OF 4	Triaxial Tests	
	C903-1	3 OF 4	Triaxial Tests	
	C903-2	4 OF 4	Consolidation Tests and Rock Tests	
	C903-3			
VOLUME 2	C903-4	1 OF 1	Soil Summary Tables, Classification Tests, Chemical Tests,Triaxial Test & Rock Test Results	Results from 1 No. schedule collated in one report presented
VOLUME 3	C902-5	1 OF 2	Soil Summary Tables, Classification Tests, Chemical Tests, Triaxial Tests and Consolidation Tests	Results from 2 Nos. schedule collated in one report presented in Drillhole/ trial pit order
	C902-6	2 OF 2	Rock Test Results	
VOLUME 4	C902-7	1 OF 3	Soil Summary Tables, Classification Tests, Chemical Tests	Results from 2 No. schedules collated in one report presented in Drillhole/ trial pit order
	C904-1	2 OF 3	Compaction Test Results and Triaxial Test & Rock Test Results	
		3 OF 3	Rock Test Results	

PROJECT : CONTRACT NO.912 - GROUND INVESTIGATION FOR SOUTH ISLAND LINE EAST

CLIENT : MTR CORPORATION LIMITED

SOIL AND ROCK LABORATORY TEST REPORT

VOLUME 1

CONTENTS

PART 1	APPENDIX A.	Summary of Soil and Rock Test Results
	APPENDIX B.	Moisture Content
	APPENDIX C.	Bulk Density
	APPENDIX D.	Particle Density
	APPENDIX E.	Liquid and Plastic Limits
	APPENDIX F.	Particle Size Distribution
	APPENDIX G.	Compaction Tests
	APPENDIX H.	Chemical Tests
PART 2	APPENDIX I.	1 Triaxial Compression tests (Drillhole 912/SIL/D222 to D230)
PART 3	APPENDIX I.	2 Triaxial Compression tests (Drillhole 912/SIL/D231 to D265)
PART 4	APPENDIX I.	3 Triaxial Compression tests (Drillhole 912/SIL/D272(P) to D275(P))
	APPENDIX J.	One Dimensional Consolidation Test
	APPENDIX K.	Porosity / Density Determination of Rock Speciment Using Saturation and Buoyancy Techniques
	APPENDIX L.	Point Load Test
	APPENDIX M.	Unconfined Compressive Strength of Rock Core
	APPENDIX N.	Determination of the Elastic Moduli of Rock Core
	APPENDIX O.	Direct Shear Test
	APPENDIX P.	Dimensional and Shape Tolerances for UCS Test on Rock Core

APPENDIX I.2 TRIAXIAL COMPRESSION TEST (DRILLHOLE 912/SIL/D231 TO D265)

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

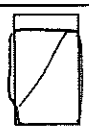
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 5.50
To : -
Sample origin : CDM
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 01-02-2010
Date test(s) completed : 09-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 19.5 °C
Visual description : Moist, brown spotted with orange, mottled with white, silty/clayey, gravelly SAND.

Lab. sample I.D. : SL100076/12
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 5.90
To : 6.10
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	30			60			120	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.7	74.5	75.4	75.2	76.1		75.8	79.9
Length	mm	150.3	149.9	146.3	145.9	142.3		141.7	127.7
Volume	cm³	658.70	653.80	653.80	647.90	647.90		640.20	640.20
Wet mass	g	1172.5	1216.3	1216.3	1210.4	1210.4		1202.7	1202.7
Dry mass	g	901.1	901.1	901.1	901.1	901.1		901.1	901.1
Moisture content	%	30.1	35.0	35.0	34.3	34.3		33.5	33.5
Bulk density	Mg/m³	1.78	1.86	1.86	1.87	1.87		1.88	1.88
Dry density	Mg/m³	1.37	1.38	1.38	1.39	1.39		1.41	1.41
Void ratio		0.94	0.92	0.92	0.91	0.91		0.88	0.88
Degree of saturation	%	85.2	100.5	100.5	100.5	100.5		100.5	100.5
Saturation Stage									
**Volume change of water	cm³	48.7							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	270.0			289.6			333.2	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	4.9			5.9			7.7	
m_{vl}	m²/MN	0.30			0.20			0.13	
t_{50}	min	0.16			0.17			0.15	
c_{vi} (from t_{50})	m²/yr	28167.46			25110.52			26882.30	
t_{100}	min	0.49			0.49			0.49	
c_{vi} (from t_{100})	m²/yr	18519.62			18872.28			19214.73	
Sketch of failed specimen (Failure Mode)								 Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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MateriaLab

HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

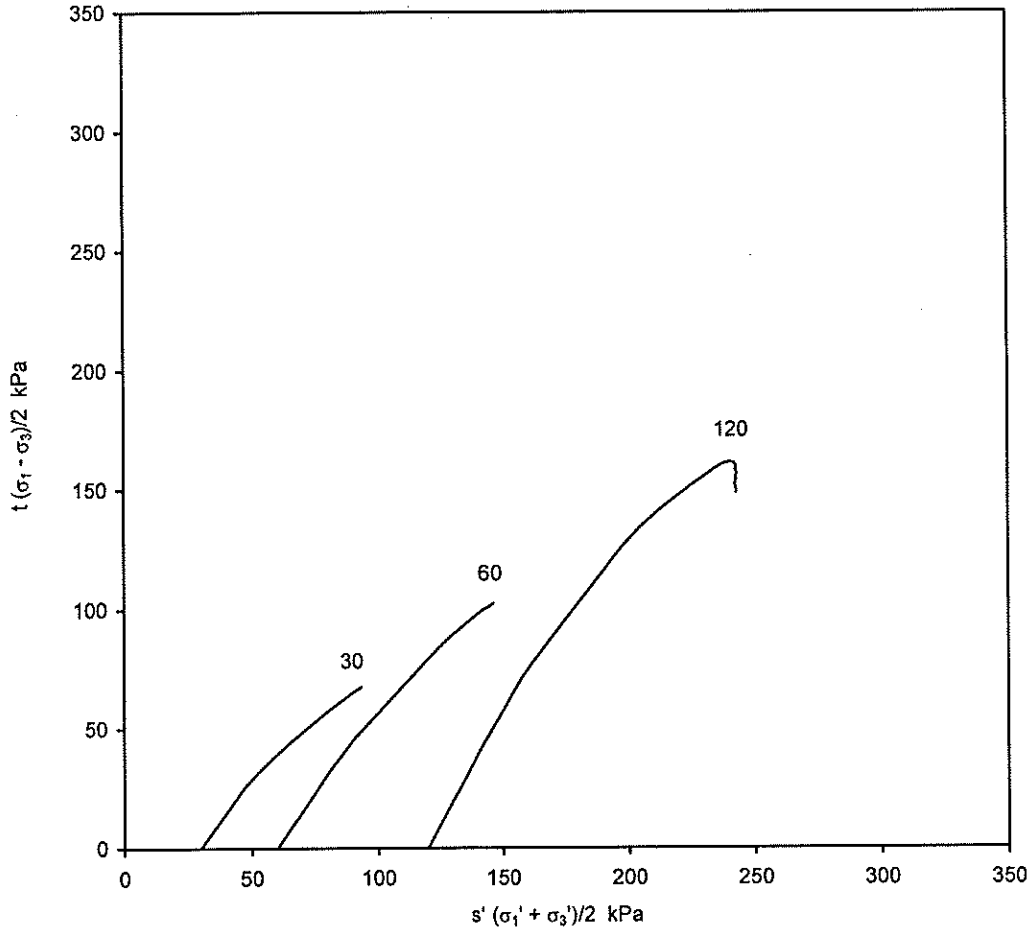
Client sample No. : -
Borehole No. : D231
Depth(m) From : 5.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/12
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	30	2.2	2.2	250.2	129.7	89.6	64.8
2	60	2.4	5.1	261.4	203.0	145.1	101.5
3	120	4.9	10.4	285.7	322.6	240.6	161.3



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

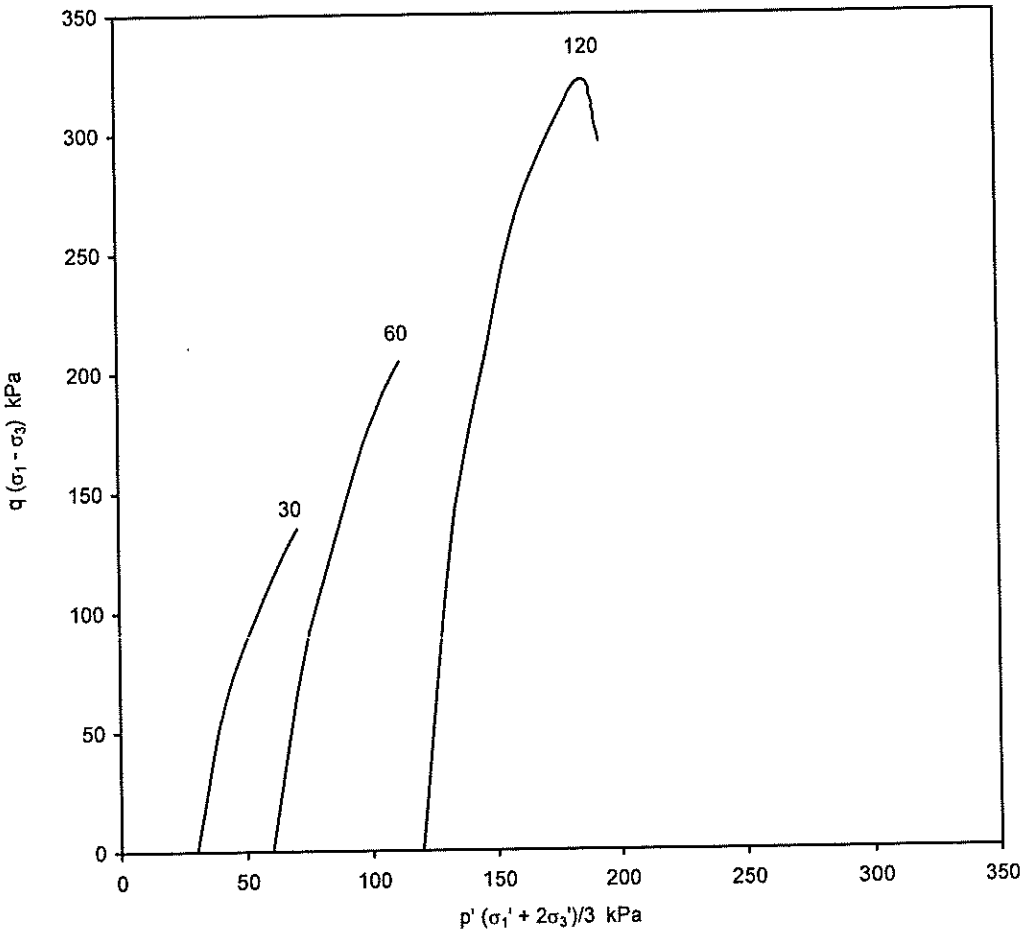
Client sample No. : -
Borehole No. : D231
Depth(m) From : 5.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/12
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	30	2.2	2.2	250.2	129.7	68.0	129.7
2	60	2.4	5.1	261.4	203.0	111.3	203.0
3	120	4.9	10.4	285.7	322.6	186.8	322.6



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

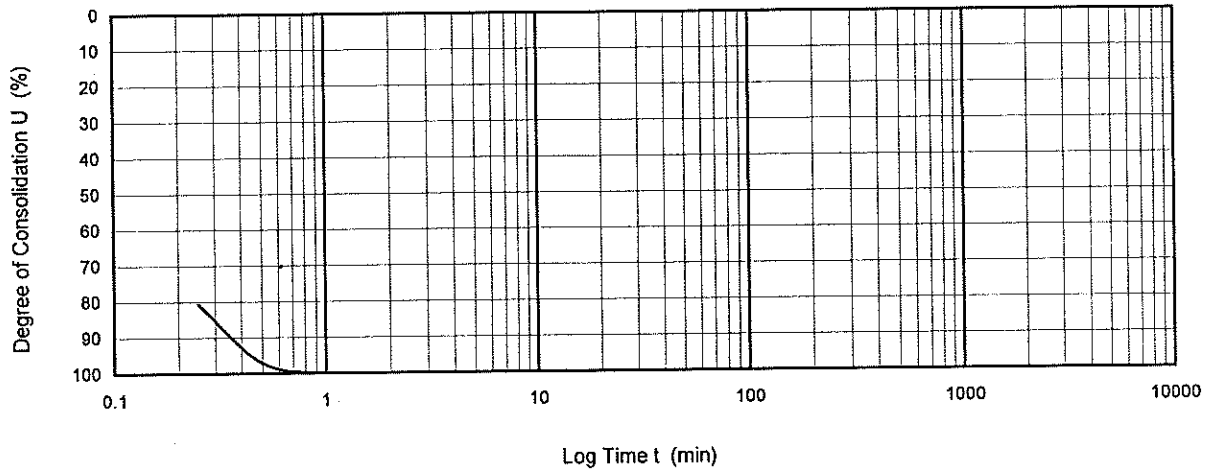
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D231
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	5.50
			To	:	-

Laboratory Information

Cell pressure	:	365 kPa	Lab. sample I.D.	:	SL100076/12
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	120 kPa			

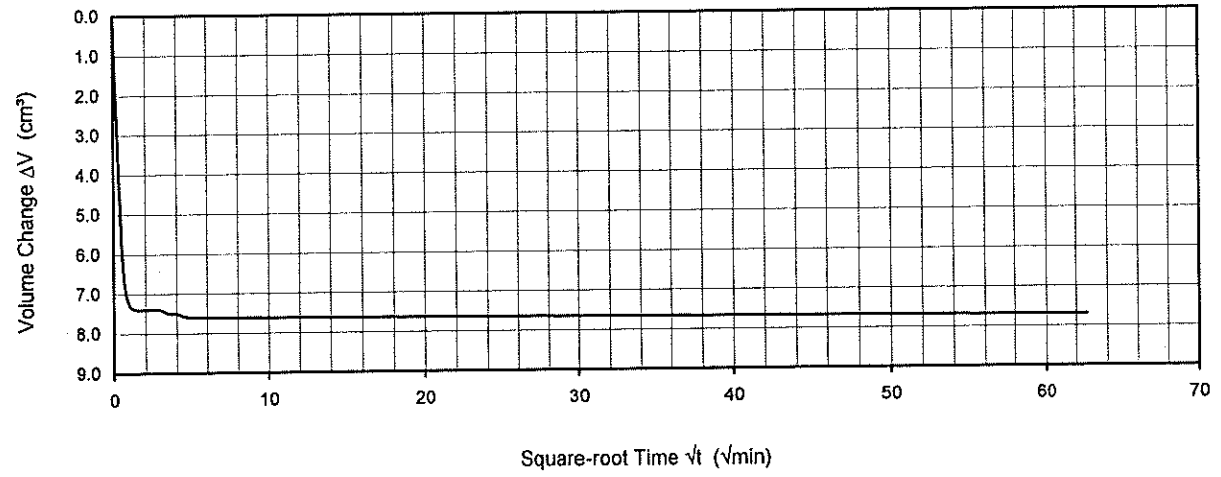
Degree of Consolidation vs. Log Time

t_{50} = 0.15 min ΔV = 7.7 cm³



Volume Change vs. Square-root Time

t_{100} = 0.49 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 5.50
To : -

Laboratory Information

Date shearing commenced : 05/02/2010 Time : 13:30
Date shearing completed : 05/02/2010 Time : 14:52
Proving ring serial No. : 10175
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.62 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.08

Lab. sample I.D. : SL100076/12
Specimen ref. : A
Cell pressure : 305 kPa
Back pressure : 245 kPa
Effective pressure : 60 kPa
Dimensions at starting of compression
Volume V_c : 647.90 cm^3
Area A_c : 4441.5 mm^2
Length L_c : 145.9 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.070	126.2	0.0	2.7	0.00	0.62	0.0	60.0	0.0	60.0	0.0	1.00	
256.8	32	0.235	423.6	0.2	2.9	0.00	0.67	66.1	81.3	33.1	70.2	66.1	2.37	
260.3	63	0.299	538.9	0.4	3.1	0.00	0.71	91.8	90.6	45.9	75.3	91.8	3.05	
261.6	91	0.357	643.5	0.6	3.3	0.00	0.75	115.0	100.9	57.5	81.7	115.0	3.65	
263.1	127	0.425	766.0	0.9	3.6	0.00	0.80	142.0	112.9	71.0	89.2	142.0	4.39	
264.0	155	0.463	834.5	1.1	3.8	0.00	0.84	157.0	119.5	78.5	93.3	157.0	4.83	
264.4	184	0.493	888.6	1.3	4.0	0.00	0.88	168.6	124.9	84.3	96.8	168.6	5.15	
264.3	212	0.516	930.1	1.5	4.2	0.00	0.91	177.5	129.4	88.7	99.9	177.5	5.36	
263.9	240	0.534	962.5	1.6	4.3	0.00	0.95	184.3	133.2	92.1	102.5	184.3	5.48	
263.3	270	0.553	996.8	1.9	4.6	0.00	0.99	191.4	137.4	95.7	105.5	191.4	5.59	
262.2	314	0.574	1034.6	2.2	4.9	0.00	1.05	199.1	142.3	99.5	109.2	199.1	5.65	
261.4	344	0.585	1054.4	2.4	5.1	0.00	1.08	203.0	145.1	101.5	111.3	203.0	5.66	«
260.9	360	0.590	1063.4	2.5	5.2	0.00	1.11	204.7	146.5	102.4	112.3	204.7	5.64	

Final volume (cm^3): 647.90 Final length (mm): 142.3 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 5.50
To : -

Laboratory Information

Lab. sample I.D. : SL100076/12
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
277.6	1104	0.937	1688.9	7.8	13.3	0.00	2.32	310.0	242.4	155.0	190.7	310.0	4.55
276.4	1150	0.936	1687.1	8.1	13.6	0.00	2.36	308.5	242.9	154.3	191.4	308.5	4.48
275.3	1205	0.931	1678.1	8.5	14.0	0.00	2.41	305.3	242.4	152.7	191.5	305.3	4.40
274.2	1252	0.928	1672.7	8.8	14.3	0.00	2.45	303.1	242.3	151.5	191.8	303.1	4.34
272.5	1303	0.924	1665.5	9.2	14.7	0.00	2.50	300.4	242.7	150.2	192.6	300.4	4.25
271.4	1350	0.922	1661.9	9.5	15.0	0.00	2.54	298.5	242.9	149.3	193.1	298.5	4.19
270.6	1402	0.921	1660.1	9.9	15.4	0.00	2.58	296.9	242.8	148.4	193.4	296.9	4.14

Final volume (cm^3): 640.20 Final length (mm): 127.7 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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Photographic Records for Triaxial Test

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

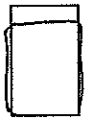
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50
Sample origin : CDM
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 05-02-2010
Date test(s) completed : 11-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : W.Y. Lo Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 19.5 °C

Lab. sample I.D. : SL100076/13
Sample type : M

Specimen reference			A			B			C		
Specimen depth(m)	From		9.90			10.10			10.30		
	To		10.10			10.30			10.50		
Effective pressure		kPa	50			100			200		
*Measurements and Calculations			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.3	73.7	77.7	74.4	73.5	77.5	74.4	73.1	77.2
Length		mm	150.0	148.8	133.8	150.2	148.4	133.4	150.2	147.7	132.7
Volume		cm³	650.37	635.47	635.47	652.99	629.59	629.59	652.99	620.49	620.49
Wet mass		g	1181.9	1192.9	1192.9	1229.8	1218.0	1218.0	1245.9	1226.2	1226.2
Dry mass		g	896.8	896.8	896.8	942.7	942.7	942.7	961.5	961.5	961.5
Moisture content		%	31.8	33.0	33.0	30.5	29.2	29.2	29.6	27.5	27.5
Bulk density		Mg/m³	1.82	1.88	1.88	1.88	1.93	1.93	1.91	1.98	1.98
Dry density		Mg/m³	1.38	1.41	1.41	1.44	1.50	1.50	1.47	1.55	1.55
Void ratio			0.92	0.88	0.88	0.84	0.77	0.77	0.80	0.71	0.71
Degree of saturation		%	91.4	99.7	99.7	96.6	100.5	100.5	98.0	102.7	102.7
Saturation Stage											
Volume change of water		cm³	25.9			11.6			12.8		
Consolidation Stage											
Side drain used			No			No			No		
Initial pore pressure		kPa	290.0			339.2			438.9		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm³	14.9			23.4			32.5		
m_{vi}		m²/MN	0.51			0.38			0.26		
t_{50}		min	1.80			2.95			3.00		
c_{vi}	(from t_{50})	m²/yr	2480.80			1511.06			1478.73		
t_{100}		min	4.41			6.25			4.00		
c_{vi}	(from t_{100})	m²/yr	2011.54			1416.93			2203.32		
Sketch of failed specimen (Failure Mode)			 Plastic			Brittle			Brittle		
Visual description			Moist, brown spotted with black, mottled with white and dark brown, slightly gravelly, sandy SILT/CLAY.			Moist, brown mottled with white and dark brown, slightly gravelly, sandy SILT/CLAY.			Moist, brown mottled with white and dark brown, slightly gravelly, sandy SILT/CLAY.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HKAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

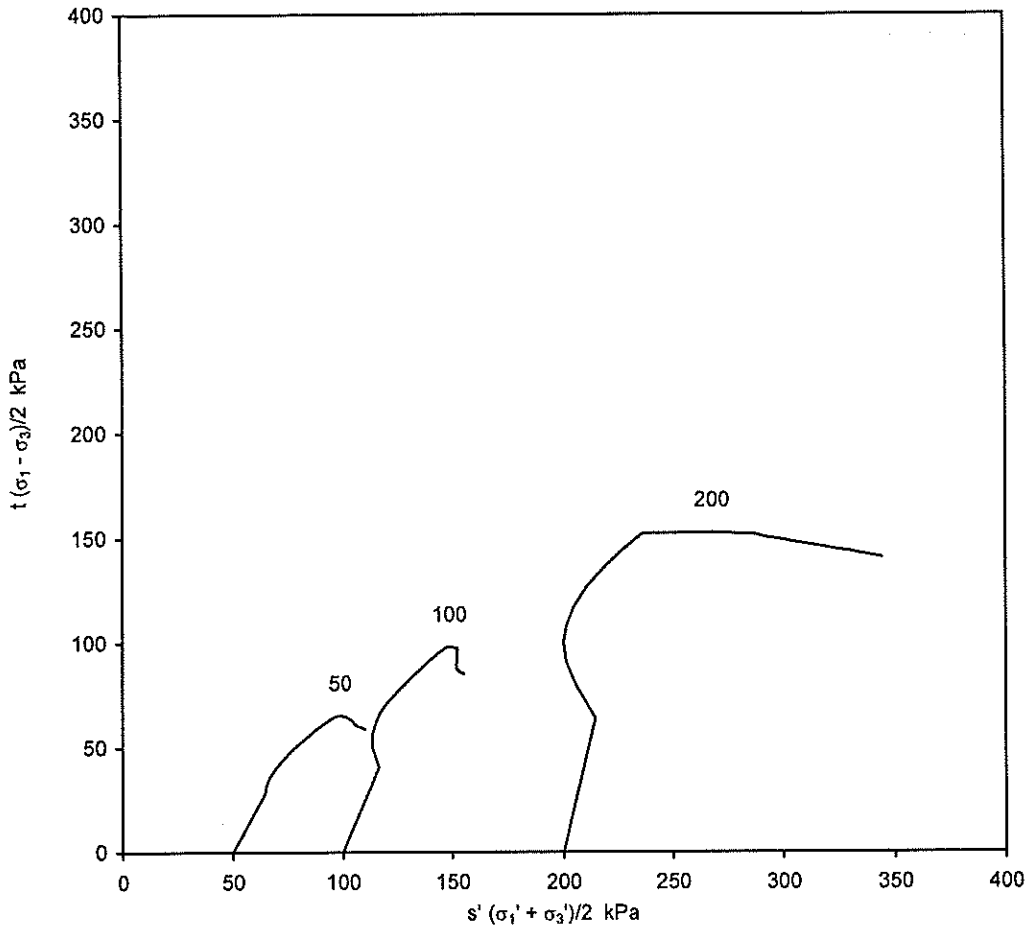
Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50

Laboratory Information

Lab. sample I.D. : SL100076/13
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
A	50	4.3	261.1	130.3	99.1	65.2
B	100	3.8	294.2	196.0	148.8	98.0
C	200	5.3	329.6	305.0	267.9	152.5



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

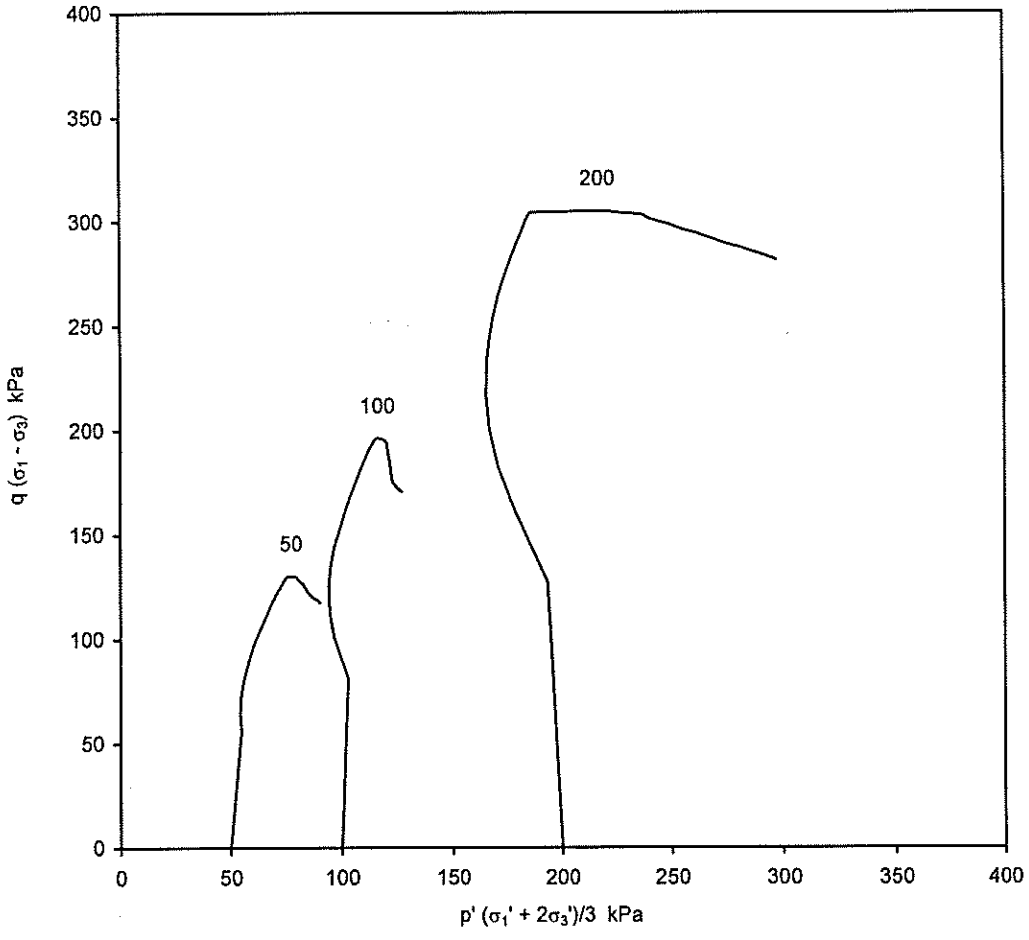
Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50

Laboratory Information

Lab. sample I.D. : SL100076/13
Specimen ref. : A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	50	4.3	261.1	130.3	77.3	130.3
B	100	3.8	294.2	196.0	116.1	196.0
C	200	5.3	329.6	305.0	217.1	305.0



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

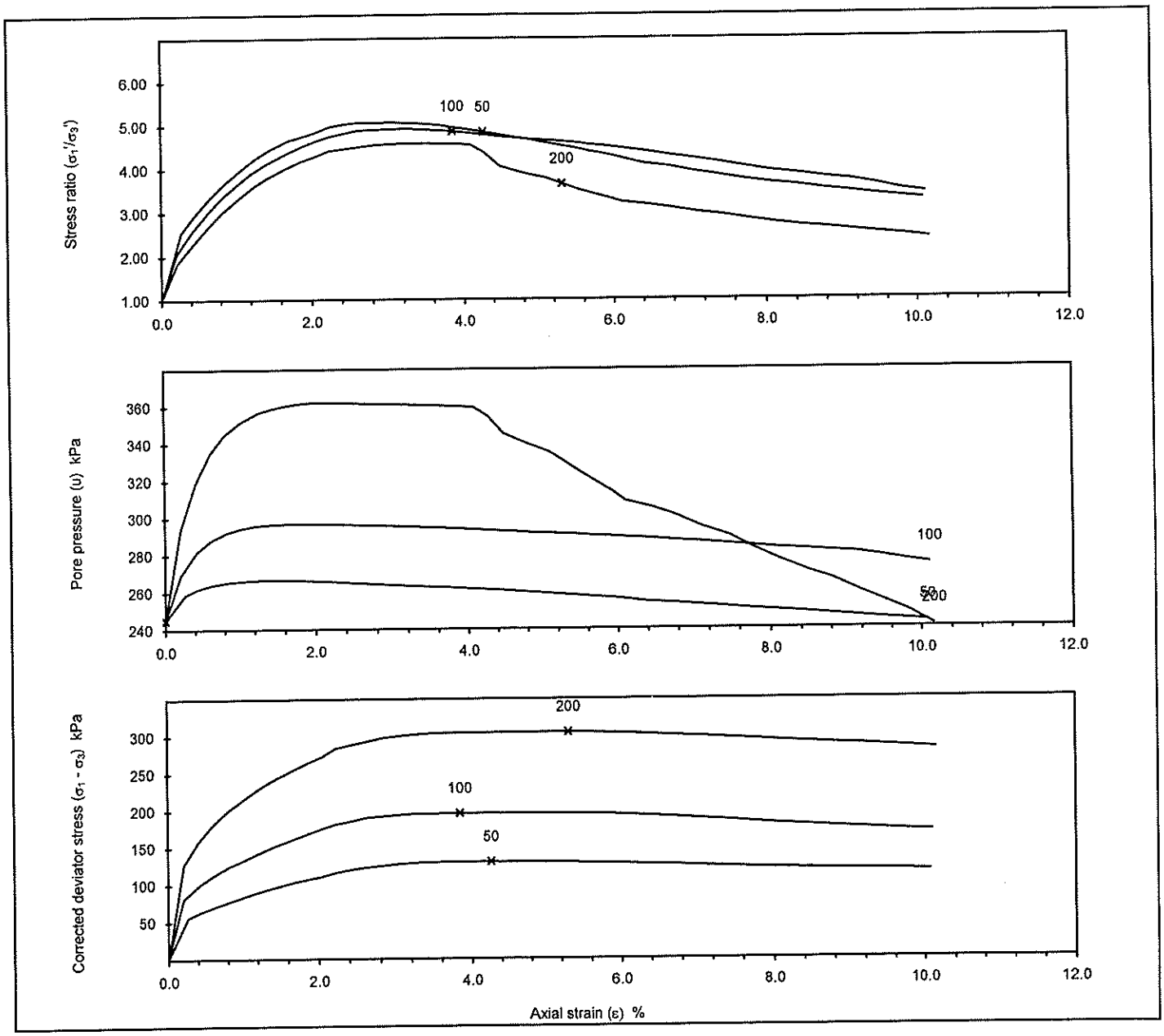
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50

Laboratory Information

Lab. sample I.D. : SL100076/13
Specimen ref. : A, B, C



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50

Laboratory Information

Lab. sample I.D. : SL100076/13

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	50		100		200	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		25	20	25	20	25	20
		50	45	50	45	50	45
		75	70	75	70	75	70
		100	95	100	95	100	95
		125	120	125	120	125	120
		150	145	150	145	150	145
		200	195	200	195	200	195
		250	245	250	245	250	245

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	245.0	245.0	245.0
B value		1.00	1.00	1.00
Volume change	cm^3	25.9	11.6	12.8

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1189.3	1215.6	1222.6
Final moisture content	%	32.6	28.9	27.2
Final bulk density	Mg/m^3	1.87	1.93	1.97

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

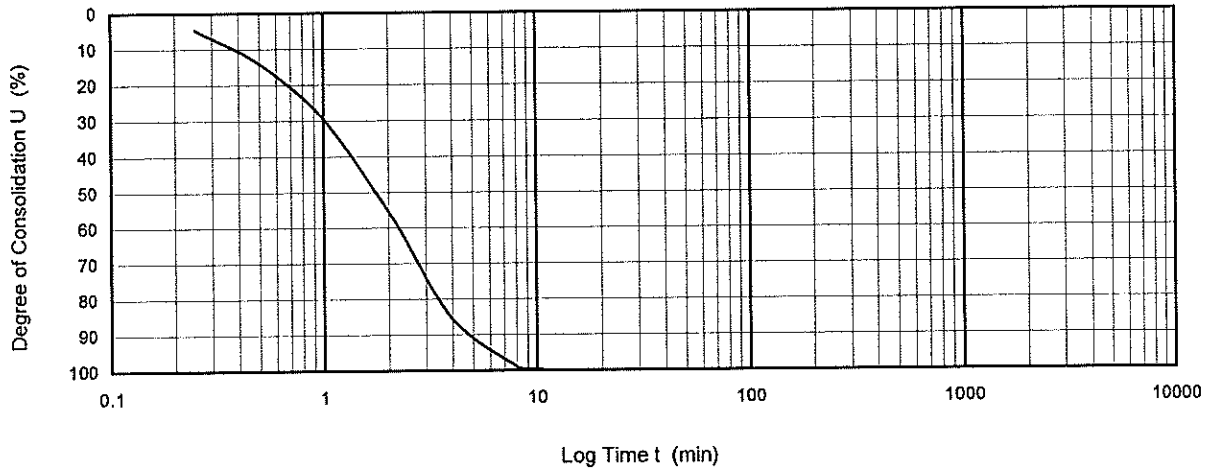
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D231
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	9.50
			To	:	10.50

Laboratory Information

Cell pressure	:	295 kPa	Lab. sample I.D.	:	SL100076/13
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	50 kPa			

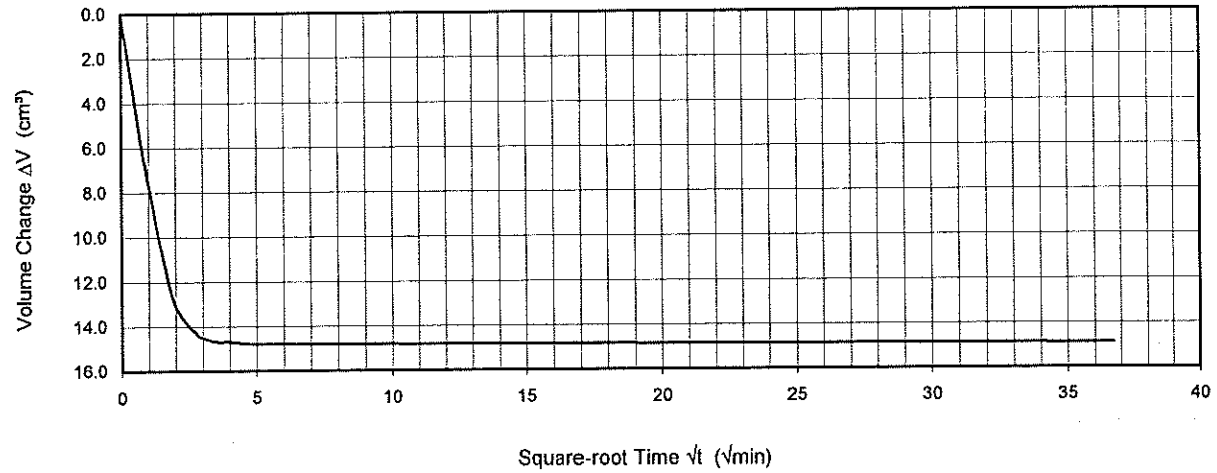
Degree of Consolidation vs. Log Time

t_{50} = 1.80 min ΔV = 14.9 cm³



Volume Change vs. Square-root Time

t_{100} = 4.41 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

CONSOLIDATION STAGE

Information supplied by Client

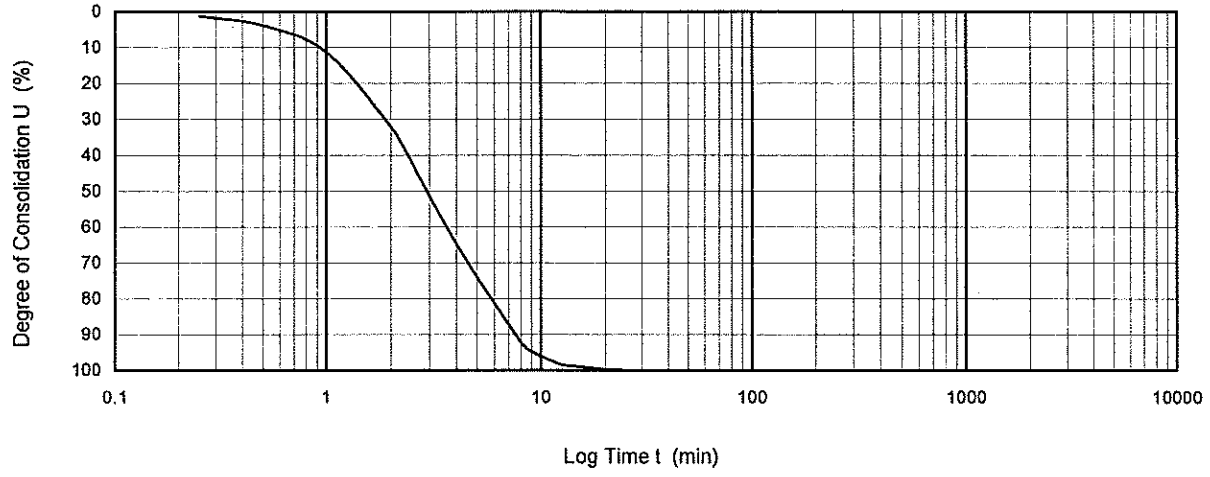
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D231
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	9.50
			To	:	10.50

Laboratory Information

Cell pressure	:	345 kPa	Lab. sample I.D.	:	SL100076/13
Back pressure	:	245 kPa	Specimen ref.	:	B
Effective pressure	:	100 kPa			

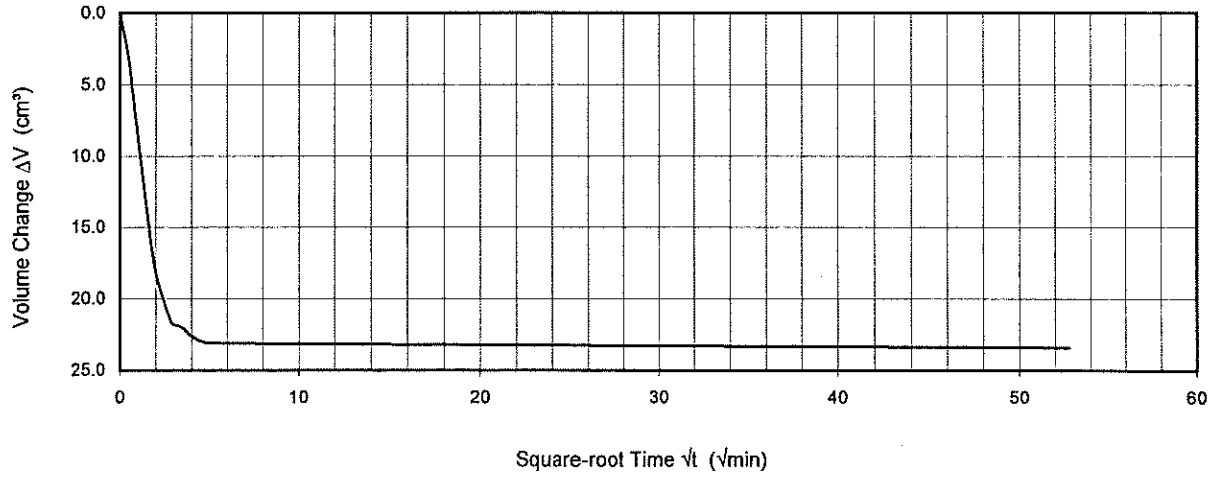
Degree of Consolidation vs. Log Time

t_{50} = 2.95 min ΔV = 23.4 cm³



Volume Change vs. Square-root Time

t_{100} = 6.25 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

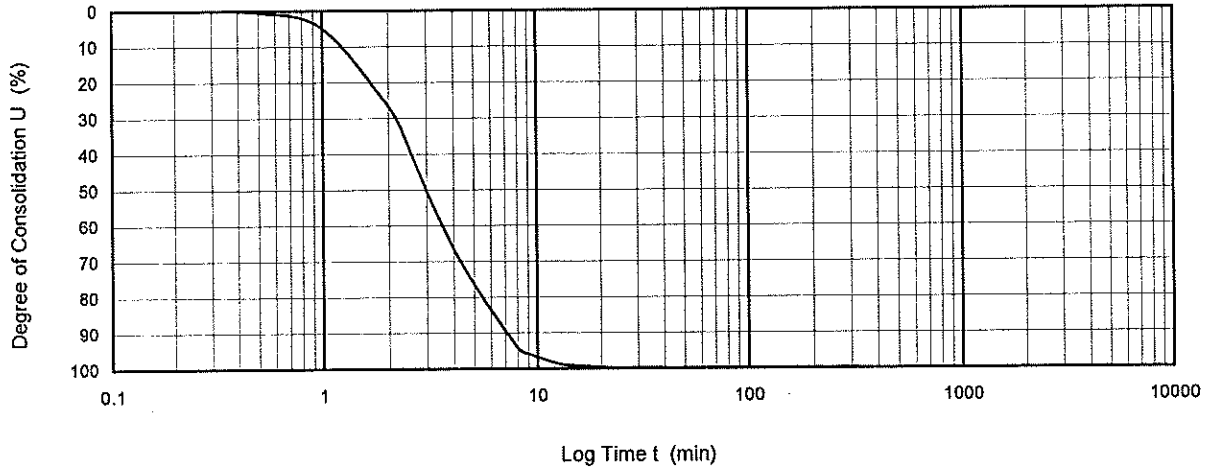
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D231
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	9.50
			To	:	10.50

Laboratory Information

Cell pressure	:	445 kPa	Lab. sample I.D.	:	SL100076/13
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	200 kPa			

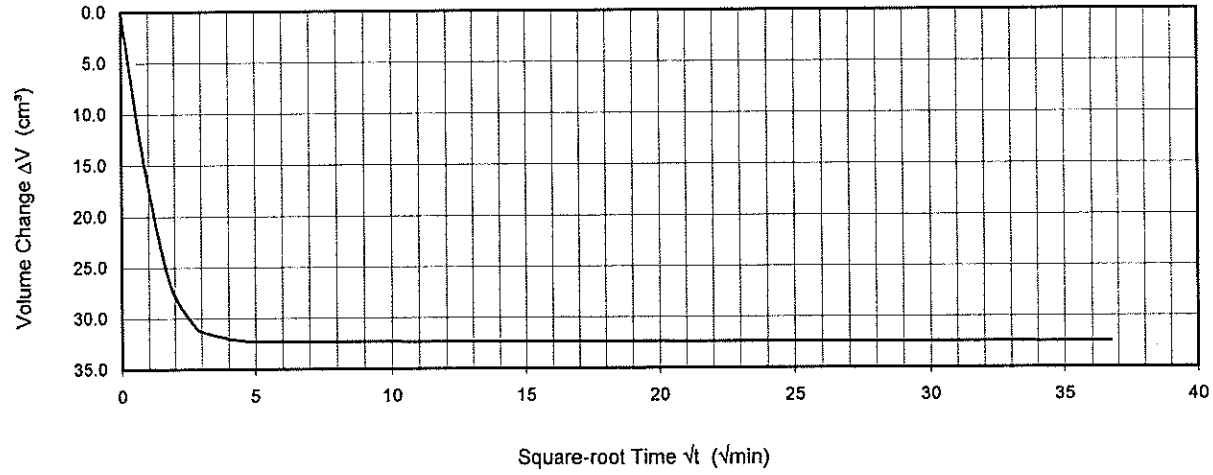
Degree of Consolidation vs. Log Time

t_{50} = 3.00 min ΔV = 32.5 cm³



Volume Change vs. Square-root Time

t_{100} = 4.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D231
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	9.50
			To	:	10.50

Laboratory Information

Date shearing commenced	:	09/02/2010	Time :	09:00	Lab. sample I.D.	:	SL100076/13	
Date shearing completed	:	09/02/2010	Time :	14:07	Specimen ref.	:	A	
Proving ring serial No.	:	6323			Cell pressure	:	295	kPa
Type of membrane	:	rubber			Back pressure	:	245	kPa
Corrections					Effective pressure	:	50	kPa
Side drain, σ_{dr}	:	0.000	kPa/%		Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.68	mm		Volume V_c	:	635.47	cm^3
Rate of axial displacement	:	0.050	mm/min		Area A_c	:	4269.3	mm^2
Pore pressure coefficient, A_f	:	0.12			Length L_c	:	148.8	mm

Pore pressure u	Axial strain reading	Proving ring reading	Axial force	Axial strain ε	Side drain correction σ_{dr}	Membrane correction σ_{mb}	Corr. Dev. stress σ_1-σ_3	s'	t	p'	q	Stress ratio σ_1'/σ_3'	
kPa	div	div	N	%	kPa	kPa	kPa	kPa	kPa	kPa	kPa		
245.0	0	0.080	129.4	0.0	0.00	0.00	0.0	50.0	0.0	50.0	0.0	1.00	
258.6	39	0.228	368.9	0.3	0.00	0.07	55.9	64.3	27.9	55.0	55.9	2.54	
261.8	64	0.249	402.9	0.4	0.00	0.12	63.7	65.0	31.8	54.4	63.7	2.92	
264.0	91	0.268	433.7	0.6	0.00	0.16	70.7	66.3	35.3	54.6	70.7	3.28	
265.6	129	0.292	472.5	0.9	0.00	0.23	79.4	69.1	39.7	55.9	79.4	3.70	
266.2	157	0.309	500.0	1.1	0.00	0.28	85.6	71.6	42.8	57.3	85.6	3.97	
266.6	189	0.328	530.7	1.3	0.00	0.33	92.5	74.6	46.2	59.2	92.5	4.26	
266.8	219	0.343	555.0	1.5	0.00	0.39	97.8	77.1	48.9	60.8	97.8	4.47	
266.6	255	0.361	584.1	1.7	0.00	0.45	104.2	80.5	52.1	63.1	104.2	4.67	
266.4	270	0.367	593.9	1.8	0.00	0.47	106.3	81.8	53.2	64.0	106.3	4.72	
266.1	302	0.379	613.3	2.0	0.00	0.52	110.5	84.2	55.3	65.7	110.5	4.82	
265.7	334	0.396	640.8	2.2	0.00	0.57	116.5	87.6	58.3	68.1	116.5	4.98	
265.1	364	0.408	660.2	2.4	0.00	0.62	120.7	90.2	60.3	70.1	120.7	5.04	
264.7	392	0.416	673.1	2.6	0.00	0.67	123.3	92.0	61.7	71.4	123.3	5.07	
264.1	424	0.423	684.5	2.8	0.00	0.72	125.6	93.7	62.8	72.8	125.6	5.06	
263.7	454	0.429	694.2	3.1	0.00	0.76	127.5	95.0	63.7	73.8	127.5	5.07	
263.2	481	0.434	702.3	3.2	0.00	0.80	129.0	96.3	64.5	74.8	129.0	5.06	
262.9	512	0.437	707.1	3.4	0.00	0.85	129.8	97.0	64.9	75.4	129.8	5.04	
262.5	546	0.439	710.4	3.7	0.00	0.90	130.2	97.6	65.1	75.9	130.2	5.01	
262.1	571	0.440	712.0	3.8	0.00	0.94	130.3	98.0	65.1	76.3	130.3	4.96	
261.6	603	0.441	713.6	4.1	0.00	0.99	130.3	98.5	65.1	76.8	130.3	4.90	
261.1	634	0.442	715.2	4.3	0.00	1.03	130.3	99.1	65.2	77.3	130.3	4.84	«
260.7	662	0.442	715.2	4.4	0.00	1.07	130.0	99.3	65.0	77.6	130.0	4.79	
260.1	691	0.443	716.8	4.6	0.00	1.11	130.1	99.9	65.0	78.3	130.1	4.73	
259.6	722	0.444	718.4	4.9	0.00	1.15	130.1	100.5	65.1	78.8	130.1	4.68	
258.9	755	0.444	718.4	5.1	0.00	1.20	129.8	101.0	64.9	79.4	129.8	4.59	
258.3	783	0.445	720.1	5.3	0.00	1.24	129.8	101.6	64.9	80.0	129.8	4.54	
257.8	816	0.444	718.4	5.5	0.00	1.28	129.1	101.8	64.6	80.2	129.1	4.47	
257.1	844	0.443	716.8	5.7	0.00	1.32	128.5	102.1	64.2	80.7	128.5	4.39	
256.6	872	0.443	716.8	5.9	0.00	1.35	128.2	102.5	64.1	81.1	128.2	4.34	
255.9	901	0.442	715.2	6.1	0.00	1.39	127.5	102.9	63.8	81.6	127.5	4.26	
254.3	951	0.441	713.6	6.4	0.00	1.46	126.6	104.0	63.3	82.9	126.6	4.11	
253.6	1003	0.440	712.0	6.7	0.00	1.52	125.7	104.3	62.9	83.3	125.7	4.04	
252.5	1050	0.438	708.7	7.1	0.00	1.58	124.5	104.8	62.3	84.0	124.5	3.93	
251.4	1104	0.436	705.5	7.4	0.00	1.65	123.3	105.2	61.6	84.7	123.3	3.83	

Final volume (cm^3): 635.47 Final length (mm): 133.8 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50

Laboratory Information

Lab. sample I.D. : SL100076/13
Specimen ref. : A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
250.3	1152	0.434	702.3	7.7	0.00	1.70	122.1	105.7	61.0	85.4	122.1	3.73
249.4	1201	0.433	700.6	8.1	0.00	1.76	121.2	106.2	60.6	86.0	121.2	3.66
248.6	1252	0.433	700.6	8.4	0.00	1.82	120.7	106.8	60.4	86.6	120.7	3.60
247.3	1305	0.432	699.0	8.8	0.00	1.88	119.8	107.6	59.9	87.6	119.8	3.51
246.4	1350	0.432	699.0	9.1	0.00	1.93	119.4	108.3	59.7	88.4	119.4	3.46
245.2	1401	0.432	699.0	9.4	0.00	1.98	118.9	109.2	59.4	89.4	118.9	3.39
244.3	1454	0.431	697.4	9.8	0.00	2.04	118.0	109.7	59.0	90.0	118.0	3.33
243.4	1500	0.431	697.4	10.1	0.00	2.09	117.5	110.4	58.8	90.8	117.5	3.28

Final volume (cm^3): 635.47 Final length (mm): 133.8 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50

Laboratory Information

Date shearing commenced : 10/02/2010 Time : 09:00
Date shearing completed : 10/02/2010 Time : 14:10
Proving ring serial No. : 6323
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.25

Lab. sample I.D. : SL100076/13
Specimen ref. : B
Cell pressure : 345 kPa
Back pressure : 245 kPa
Effective pressure : 100 kPa

Dimensions at starting of compression

Volume V_c : 629.59 cm^3
Area A_c : 4243.0 mm^2
Length L_c : 148.4 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.093	150.5	0.0	0.00	0.00	0.0	100.0	0.0	100.0	0.0	1.00	
269.0	30	0.306	495.1	0.2	0.00	0.05	81.0	116.5	40.5	103.0	81.0	2.07	
281.7	62	0.358	579.3	0.4	0.00	0.11	100.5	113.6	50.3	96.8	100.5	2.59	
287.8	90	0.391	632.7	0.6	0.00	0.15	112.8	113.6	56.4	94.8	112.8	2.97	
292.1	122	0.424	686.1	0.8	0.00	0.21	125.0	115.4	62.5	94.6	125.0	3.36	
294.4	150	0.447	723.3	1.0	0.00	0.25	133.4	117.3	66.7	95.1	133.4	3.64	
296.0	181	0.474	767.0	1.2	0.00	0.30	143.2	120.6	71.6	96.7	143.2	3.92	
296.5	210	0.498	805.8	1.4	0.00	0.35	151.9	124.5	76.0	99.1	151.9	4.13	
296.9	244	0.522	844.7	1.6	0.00	0.40	160.5	128.4	80.3	101.6	160.5	4.34	
297.0	274	0.543	878.6	1.8	0.00	0.45	168.0	132.0	84.0	104.0	168.0	4.50	
296.8	301	0.562	909.4	2.0	0.00	0.49	174.7	135.6	87.4	106.4	174.7	4.63	
296.6	331	0.581	940.1	2.2	0.00	0.54	181.4	139.1	90.7	108.9	181.4	4.75	
296.4	363	0.594	961.2	2.4	0.00	0.59	185.8	141.5	92.9	110.5	185.8	4.82	
296.1	390	0.607	982.2	2.6	0.00	0.63	190.2	144.0	95.1	112.3	190.2	4.89	
295.8	421	0.613	991.9	2.8	0.00	0.67	192.0	145.2	96.0	113.2	192.0	4.90	
295.5	454	0.619	1001.6	3.1	0.00	0.72	193.7	146.4	96.9	114.1	193.7	4.91	
295.3	482	0.624	1009.7	3.2	0.00	0.76	195.2	147.3	97.6	114.8	195.2	4.93	
294.9	514	0.626	1012.9	3.5	0.00	0.80	195.4	147.8	97.7	115.2	195.4	4.90	
294.6	542	0.628	1016.2	3.7	0.00	0.84	195.7	148.3	97.9	115.6	195.7	4.88	
294.2	571	0.630	1019.4	3.8	0.00	0.88	196.0	148.8	98.0	116.1	196.0	4.86	«
293.7	603	0.631	1021.0	4.1	0.00	0.93	195.9	149.3	98.0	116.6	195.9	4.82	
293.2	632	0.632	1022.7	4.3	0.00	0.97	195.8	149.7	97.9	117.1	195.8	4.78	
292.7	663	0.633	1024.3	4.5	0.00	1.01	195.7	150.2	97.9	117.5	195.7	4.74	
292.3	694	0.634	1025.9	4.7	0.00	1.05	195.6	150.5	97.8	117.9	195.6	4.71	
291.8	721	0.635	1027.5	4.9	0.00	1.09	195.6	151.0	97.8	118.4	195.6	4.68	
291.5	753	0.636	1029.1	5.1	0.00	1.13	195.4	151.2	97.7	118.6	195.4	4.65	
291.1	782	0.637	1030.7	5.3	0.00	1.16	195.4	151.6	97.7	119.0	195.4	4.62	
290.7	816	0.637	1030.7	5.5	0.00	1.21	194.8	151.7	97.4	119.2	194.8	4.59	
290.1	841	0.638	1032.4	5.7	0.00	1.24	194.8	152.3	97.4	119.8	194.8	4.55	
289.7	873	0.638	1032.4	5.9	0.00	1.28	194.3	152.5	97.2	120.1	194.3	4.51	
289.2	901	0.637	1030.7	6.1	0.00	1.31	193.6	152.6	96.8	120.3	193.6	4.47	
288.5	951	0.634	1025.9	6.4	0.00	1.37	191.7	152.4	95.9	120.4	191.7	4.39	
287.4	1003	0.631	1021.0	6.8	0.00	1.43	189.9	152.5	94.9	120.9	189.9	4.30	
286.5	1056	0.627	1014.6	7.1	0.00	1.50	187.7	152.3	93.8	121.1	187.7	4.21	
285.4	1104	0.624	1009.7	7.4	0.00	1.55	185.9	152.5	92.9	121.6	185.9	4.12	

Final volume (cm^3): 629.59 Final length (mm): 133.4 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50

Laboratory Information

Lab. sample I.D. : SL100076/13
Specimen ref. : B

Pore pressure u	Axial strain reading	Proving ring reading	Axial force	Axial strain ε	Side drain correction σ_{dr}	Membrane correction σ_{mb}	Corr. Dev. stress $\sigma_1-\sigma_3$	s'	t	p'	q	Stress ratio σ_1'/σ_3'
kPa	div	div	N	%	kPa	kPa	kPa	kPa	kPa	kPa	kPa	
284.3	1152	0.618	1000.0	7.8	0.00	1.60	183.1	152.2	91.5	121.7	183.1	4.02
283.2	1200	0.614	993.5	8.1	0.00	1.66	181.0	152.3	90.5	122.1	181.0	3.93
282.5	1250	0.611	988.7	8.4	0.00	1.71	179.2	152.1	89.6	122.2	179.2	3.87
281.4	1301	0.607	982.2	8.8	0.00	1.77	177.1	152.1	88.5	122.6	177.1	3.78
280.6	1352	0.604	977.3	9.1	0.00	1.82	175.3	152.1	87.7	122.8	175.3	3.72
278.7	1403	0.601	972.5	9.5	0.00	1.87	173.5	153.1	86.8	124.1	173.5	3.62
276.4	1451	0.597	966.0	9.8	0.00	1.92	171.5	154.3	85.7	125.8	171.5	3.50
274.6	1500	0.596	964.4	10.1	0.00	1.97	170.5	155.6	85.2	127.2	170.5	3.42

Final volume (cm^3): 629.589 Final length (mm): 133.4 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50

Laboratory Information

Date shearing commenced : 10/02/2010 Time : 09:00
Date shearing completed : 10/02/2010 Time : 14:14
Proving ring serial No. : 10175
Type of membrane : rubber

Corrections

Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.28

Lab. sample I.D. : SL100076/13
Specimen ref. : C
Cell pressure : 445 kPa
Back pressure : 245 kPa
Effective pressure : 200 kPa

Dimensions at starting of compression

Volume V_c : 620.49 cm^3
Area A_c : 4202.0 mm^2
Length L_c : 147.7 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.109	196.5	0.0	0.00	0.00	0.0	200.0	0.0	200.0	0.0	1.00	
294.1	31	0.407	733.6	0.2	0.00	0.06	127.5	214.7	63.8	193.4	127.5	1.84	
318.7	61	0.482	868.8	0.4	0.00	0.11	159.2	205.9	79.6	179.4	159.2	2.26	
334.6	90	0.536	966.1	0.6	0.00	0.16	181.9	201.3	90.9	171.0	181.9	2.65	
344.9	120	0.580	1045.4	0.8	0.00	0.21	200.2	200.2	100.1	166.8	200.2	3.00	
351.5	151	0.618	1113.9	1.0	0.00	0.26	215.8	201.4	107.9	165.4	215.8	3.31	
356.7	187	0.659	1187.8	1.3	0.00	0.32	232.6	204.6	116.3	165.8	232.6	3.63	
358.9	212	0.684	1232.9	1.4	0.00	0.36	242.7	207.5	121.4	167.0	242.7	3.82	
360.6	240	0.708	1276.1	1.6	0.00	0.41	252.4	210.6	126.2	168.5	252.4	3.99	
361.8	274	0.737	1328.4	1.9	0.00	0.47	263.9	215.2	132.0	171.2	263.9	4.17	
362.2	302	0.758	1366.3	2.0	0.00	0.51	272.2	218.9	136.1	173.5	272.2	4.29	
362.0	330	0.787	1418.5	2.2	0.00	0.55	283.8	224.9	141.9	177.6	283.8	4.42	
361.8	361	0.800	1442.0	2.4	0.00	0.60	288.6	227.5	144.3	179.4	288.6	4.47	
361.6	391	0.813	1465.4	2.6	0.00	0.65	293.3	230.1	146.7	181.2	293.3	4.52	
361.3	423	0.826	1488.8	2.9	0.00	0.70	298.1	232.7	149.0	183.1	298.1	4.56	
361.1	453	0.833	1501.4	3.1	0.00	0.74	300.3	234.0	150.1	184.0	300.3	4.58	
360.8	484	0.840	1514.1	3.3	0.00	0.79	302.5	235.4	151.2	185.0	302.5	4.59	
360.5	512	0.844	1521.3	3.5	0.00	0.83	303.5	236.3	151.8	185.7	303.5	4.59	
360.2	541	0.847	1526.7	3.7	0.00	0.87	304.1	236.8	152.0	186.2	304.1	4.59	
359.8	573	0.849	1530.3	3.9	0.00	0.92	304.2	237.3	152.1	186.6	304.2	4.57	
359.4	603	0.851	1533.9	4.1	0.00	0.96	304.3	237.8	152.2	187.0	304.3	4.56	
354.4	632	0.853	1537.5	4.3	0.00	1.00	304.5	242.8	152.2	192.1	304.5	4.36	
345.0	663	0.855	1541.1	4.5	0.00	1.05	304.6	252.3	152.3	201.5	304.6	4.05	
341.4	694	0.857	1544.7	4.7	0.00	1.09	304.7	255.9	152.3	205.2	304.7	3.94	
338.1	723	0.859	1548.3	4.9	0.00	1.13	304.8	259.3	152.4	208.5	304.8	3.85	
335.3	751	0.861	1551.9	5.1	0.00	1.16	305.0	262.2	152.5	211.4	305.0	3.78	
329.6	784	0.863	1555.5	5.3	0.00	1.21	305.0	267.9	152.5	217.1	305.0	3.64	«
324.3	813	0.864	1557.3	5.5	0.00	1.25	304.8	273.1	152.4	222.3	304.8	3.53	
319.6	841	0.864	1557.3	5.7	0.00	1.28	304.1	277.5	152.1	226.8	304.1	3.43	
314.3	874	0.865	1559.1	5.9	0.00	1.32	303.8	282.6	151.9	232.0	303.8	3.32	
308.6	901	0.865	1559.1	6.1	0.00	1.36	303.1	288.0	151.6	237.4	303.1	3.22	
305.2	953	0.864	1557.3	6.5	0.00	1.42	301.5	290.6	150.8	240.3	301.5	3.16	
300.6	1002	0.863	1555.5	6.8	0.00	1.48	300.0	294.4	150.0	244.4	300.0	3.08	
294.6	1051	0.862	1553.7	7.1	0.00	1.54	298.5	299.6	149.2	249.9	298.5	2.98	
289.6	1104	0.860	1550.1	7.5	0.00	1.61	296.5	303.6	148.2	254.2	296.5	2.91	

Final volume (cm^3): 620.49 Final length (mm): 132.7 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D231
Depth(m) From : 9.50
To : 10.50

Laboratory Information

Lab. sample I.D. : SL100076/13
Specimen ref. : C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
282.4	1153	0.858	1546.5	7.8	0.00	1.66	294.5	309.9	147.3	260.8	294.5	2.81
276.4	1202	0.856	1542.9	8.1	0.00	1.72	292.6	314.9	146.3	266.1	292.6	2.74
270.4	1255	0.854	1539.3	8.5	0.00	1.78	290.6	319.9	145.3	271.5	290.6	2.66
266.4	1301	0.853	1537.5	8.8	0.00	1.83	289.2	323.2	144.6	275.0	289.2	2.62
259.6	1354	0.852	1535.7	9.2	0.00	1.89	287.6	329.2	143.8	281.3	287.6	2.55
254.3	1402	0.850	1532.1	9.5	0.00	1.94	285.7	333.6	142.9	285.9	285.7	2.50
248.3	1453	0.848	1528.5	9.8	0.00	1.99	283.8	338.6	141.9	291.3	283.8	2.44
241.3	1501	0.845	1523.1	10.2	0.00	2.04	281.6	344.5	140.8	297.6	281.6	2.38

Final volume (cm^3): 620.49 Final length (mm): 132.7 Termination criterion : Maximum deviator stress

Remarks:

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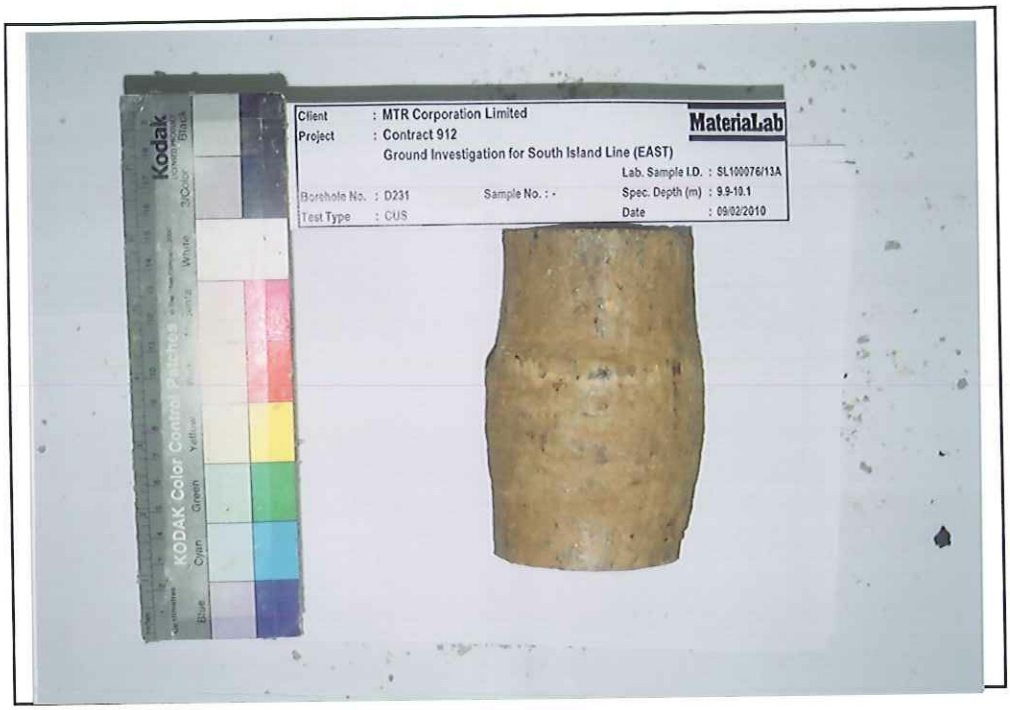
Photographic Records for Triaxial Test



Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HKAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

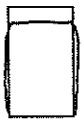
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth(m) From : 9.60
To : -
Sample origin : MD
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 30-01-2010
Date test(s) completed : 05-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 19.5 °C
Visual description : Moist, dark grey, slightly gravelly, sandy SILT/CLAY with shell fragments.

Lab. sample I.D. : SL100076/15
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 10.00
To : 10.20
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	50			100			200	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	73.9	72.9	74.7	74.1	75.8		75.1	79.0
Length	mm	150.0	148.0	141.1	140.0	133.7		132.4	119.9
Volume	cm^3	643.38	617.78	617.78	603.48	603.48		586.98	586.98
Wet mass	g	1203.5	1182.4	1182.4	1168.1	1168.1		1151.6	1151.6
Dry mass	g	906.3	906.3	906.3	906.3	906.3		906.3	906.3
Moisture content	%	32.8	30.5	30.5	28.9	28.9		27.1	27.1
Bulk density	Mg/m^3	1.87	1.91	1.91	1.94	1.94		1.96	1.96
Dry density	Mg/m^3	1.41	1.47	1.47	1.50	1.50		1.54	1.54
Void ratio		0.88	0.81	0.81	0.76	0.76		0.72	0.72
Degree of saturation	%	98.6	100.1	100.1	100.1	100.1		100.1	100.1
Saturation Stage									
**Volume change of water	cm^3	4.5							
Consolidation Stage									
Side drain used		Yes			-			-	
Initial pore pressure	kPa	290.0			329.5			413.1	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm^3	25.6			14.3			16.5	
m_{vi}	m^2/MN	0.88			0.27			0.16	
t_{50}	min	50.00			45.00			57.50	
c_{vi} (from t_{50})	m^2/yr	NA			NA			NA	
t_{100}	min	81.00			110.25			132.25	
c_{vi} (from t_{100})	m^2/yr	1.34			1.01			0.87	
Sketch of failed specimen (Failure Mode)								 Plastic	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

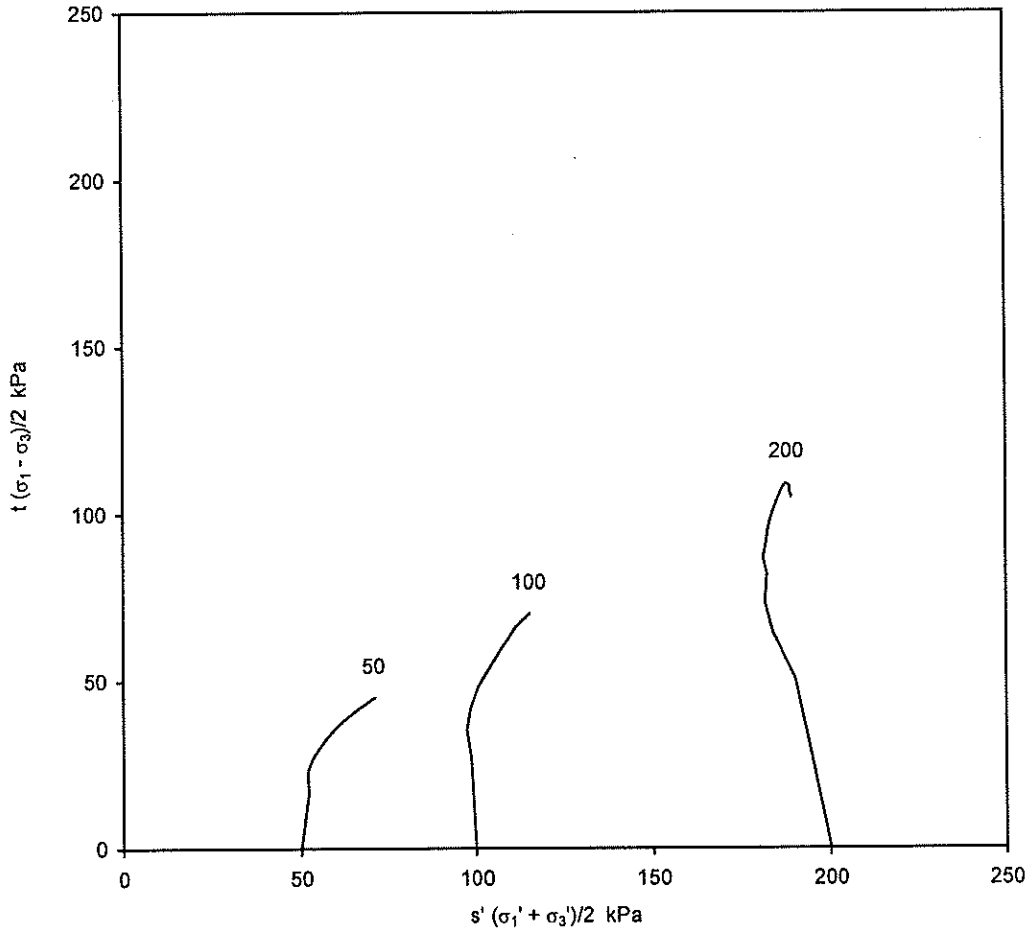
Client sample No. : -
Borehole No. : D232
Depth(m) From : 9.60
To : -

Laboratory Information

Lab. sample I.D. : SL100076/15
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	50	4.5	4.5	269.4	89.8	70.5	44.9
2	100	4.3	9.7	300.0	139.7	114.8	69.8
3	200	5.0	15.5	365.9	217.6	187.9	108.8



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

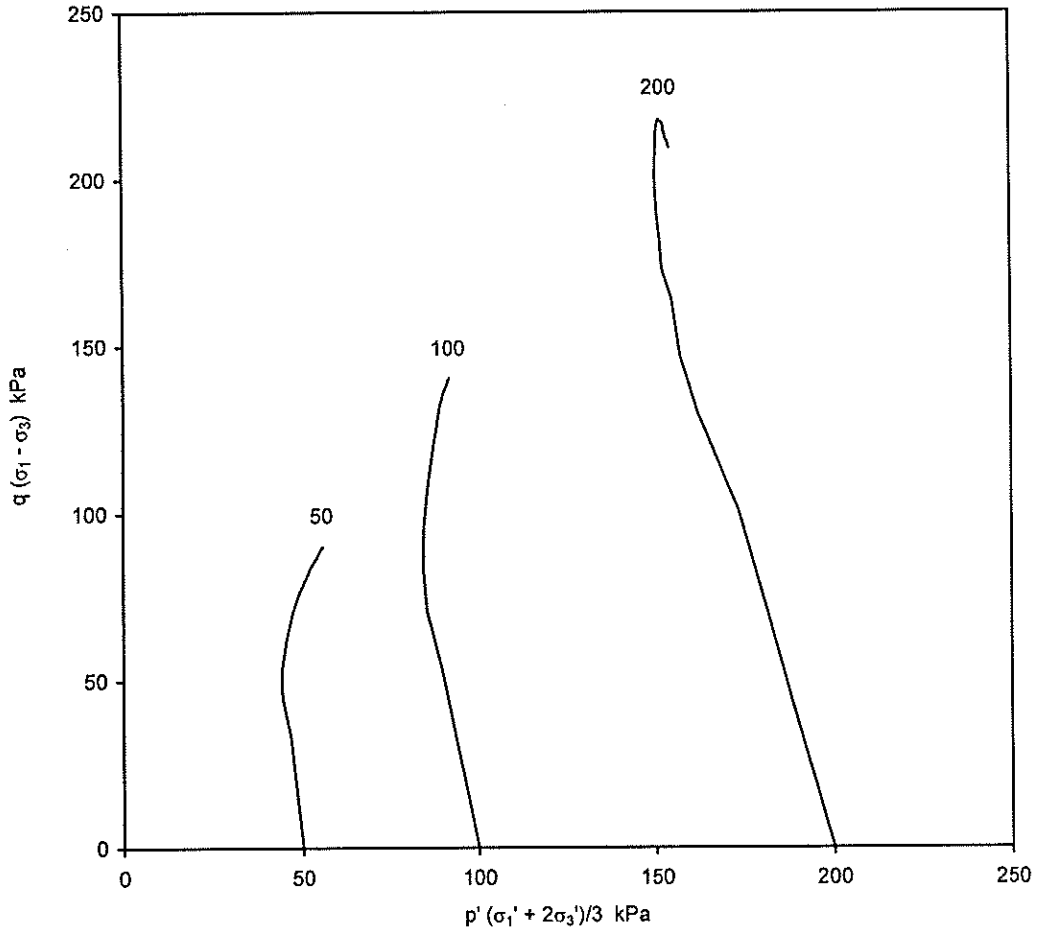
Client sample No. : -
Borehole No. : D232
Depth(m) From : 9.60
To : -

Laboratory Information

Lab. sample I.D. : SL100076/15
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	50	4.5	4.5	269.4	89.8	55.5	89.8
2	100	4.3	9.7	300.0	139.7	91.6	139.7
3	200	5.0	15.5	365.9	217.6	151.6	217.6



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

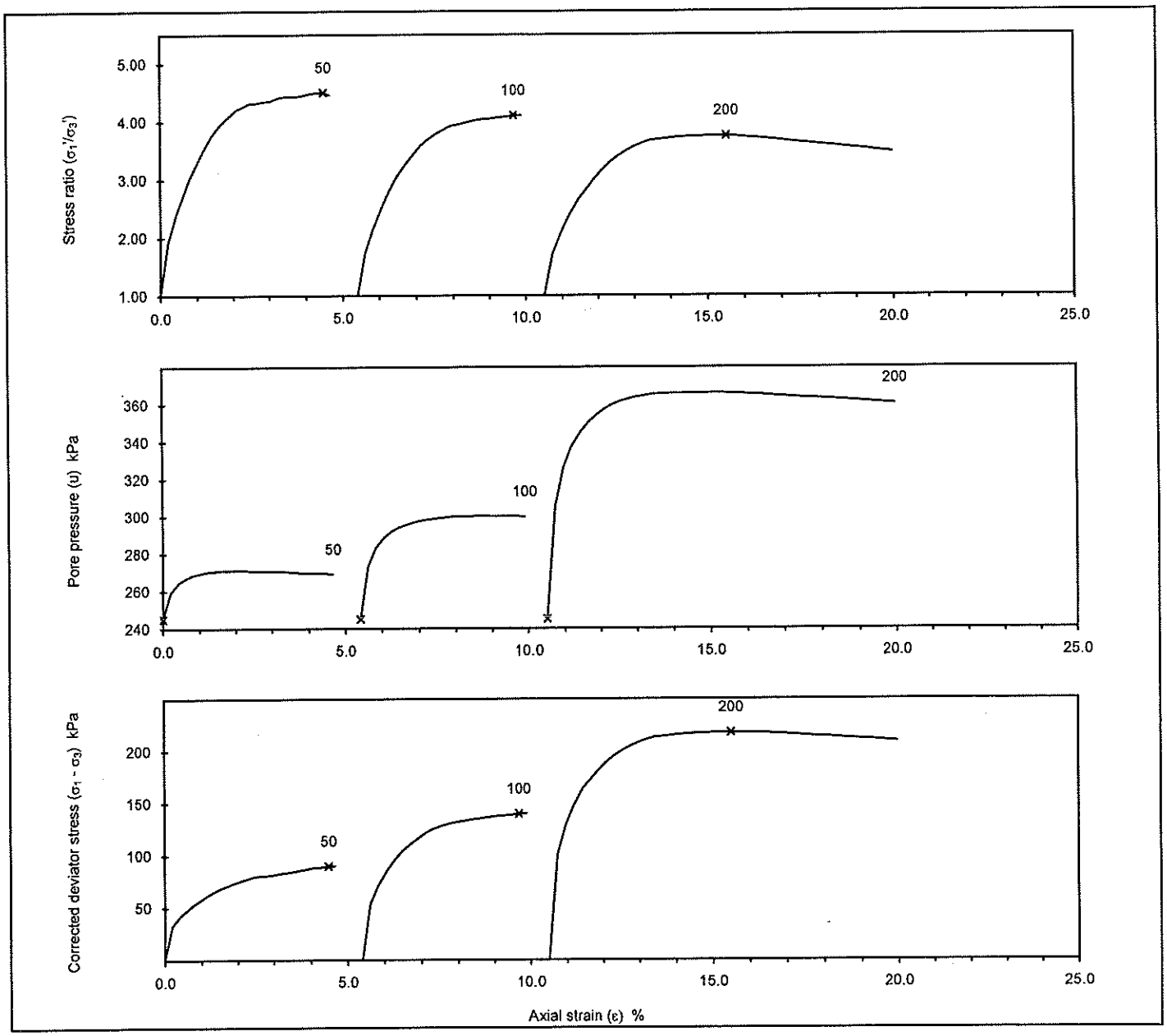
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth(m) From : 9.60
To : -

Laboratory Information

Lab. sample I.D. : SL100076/15
Specimen ref. : A



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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth(m) From : 9.60
To : -

Laboratory Information

Lab. sample I.D. : SL100076/15
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	50	
	Stage 2	kPa	100	
	Stage 3	kPa	200	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			150	145
			200	195
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		1.00
Volume change	cm^3	4.5

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1149.3
Final moisture content	%	26.8
Final bulk density	Mg/m^3	1.96

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

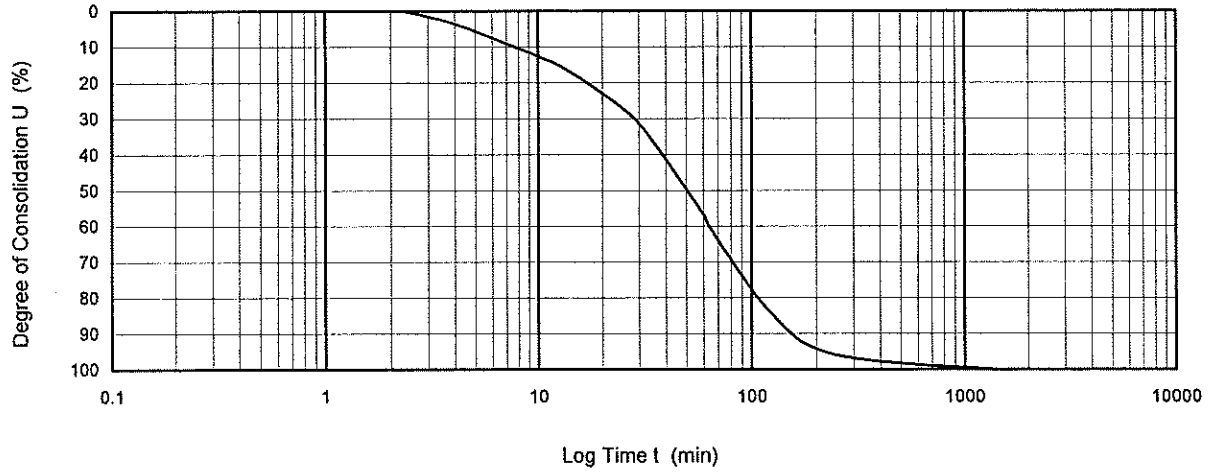
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D232
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	9.60
			To	:	-

Laboratory Information

Cell pressure	:	295	kPa	Lab. sample I.D.	:	SL100076/15
Back pressure	:	245	kPa	Specimen ref.	:	A
Effective pressure	:	50	kPa			

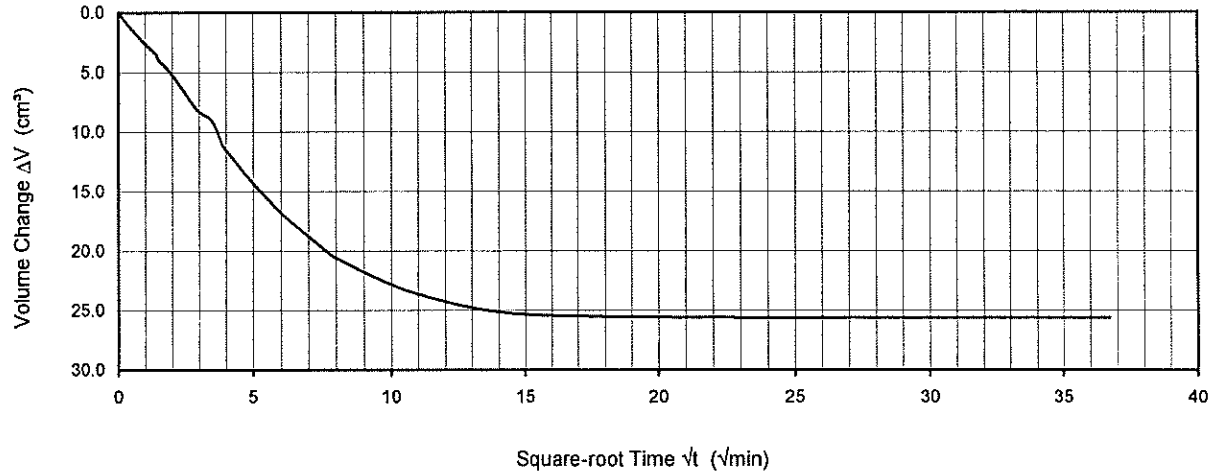
Degree of Consolidation vs. Log Time

t_{50} = 50.00 min ΔV = 25.6 cm³



Volume Change vs. Square-root Time

t_{100} = 81.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

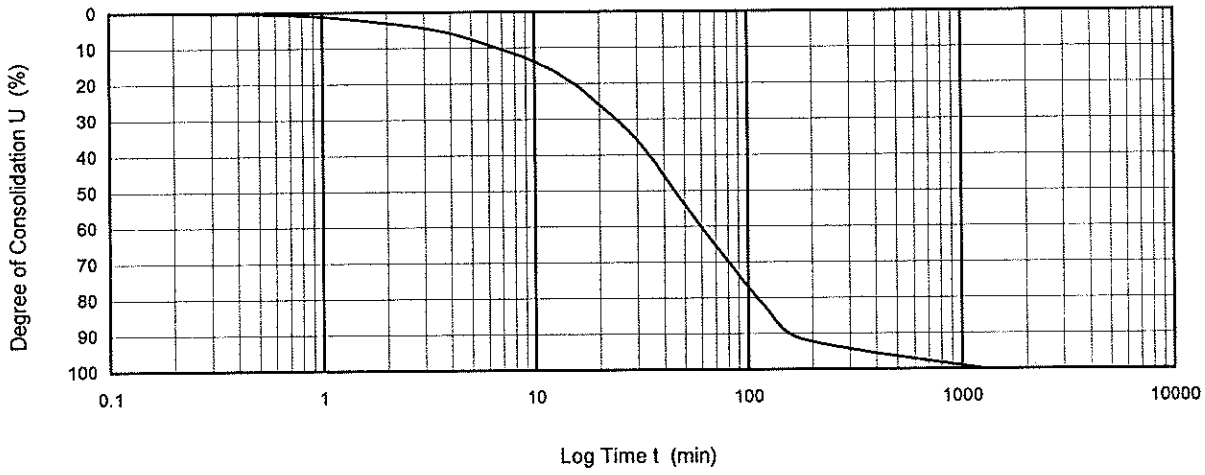
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D232
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	9.60
			To	:	-

Laboratory Information

Cell pressure	:	345 kPa	Lab. sample I.D.	:	SL100076/15
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	100 kPa			

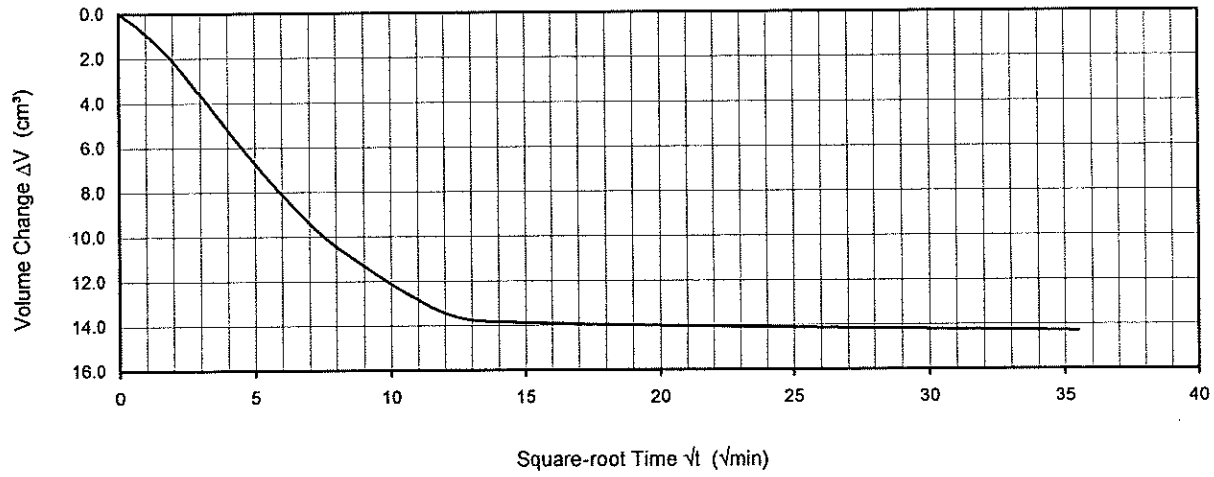
Degree of Consolidation vs. Log Time

t_{50} = 45.00 min ΔV = 14.3 cm^3



Volume Change vs. Square-root Time

t_{100} = 110.25 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

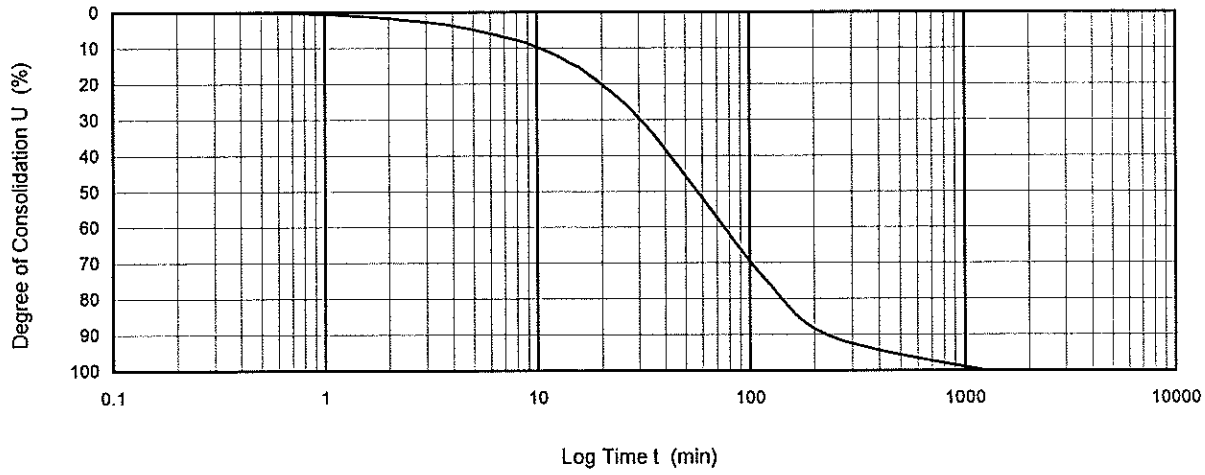
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D232
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	9.60
			To	:	-

Laboratory Information

Cell pressure	:	445 kPa	Lab. sample I.D.	:	SL100076/15
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	200 kPa			

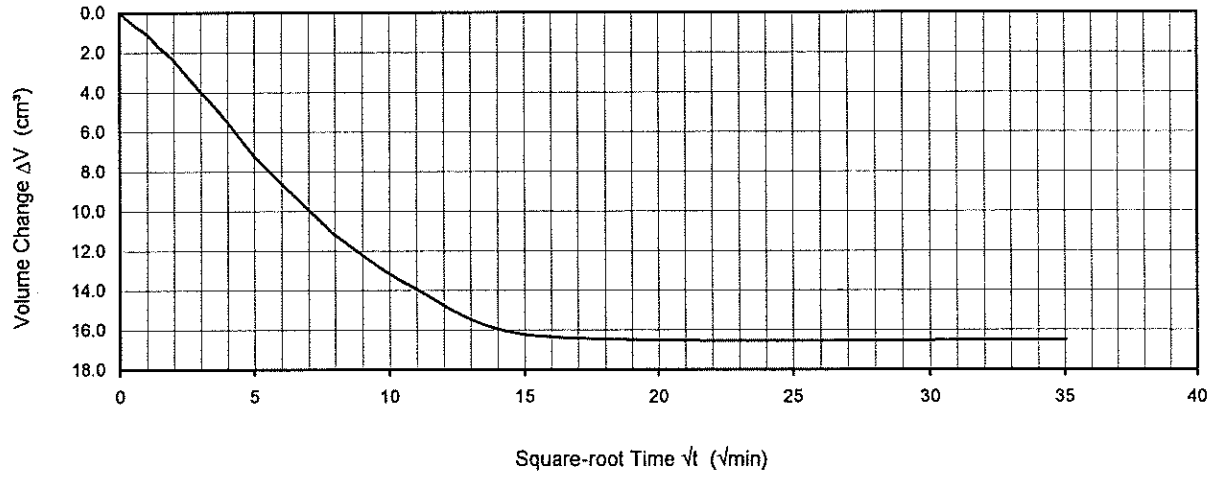
Degree of Consolidation vs. Log Time

t_{50} = 57.50 min ΔV = 16.5 cm³



Volume Change vs. Square-root Time

t_{100} = 132.25 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth(m) From : 9.60
To : -

Laboratory Information

Date shearing commenced : 02/02/2010 Time : 09:00
Date shearing completed : 02/02/2010 Time : 11:20
Proving ring serial No. : 5345
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.805 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.27

Lab. sample I.D. : SL100076/15
Specimen ref. : A
Cell pressure : 295 kPa
Back pressure : 245 kPa
Effective pressure : 50 kPa

Dimensions at starting of compression

Volume V_c : 617.78 cm^3
Area A_c : 4174.7 mm^2
Length L_c : 148.0 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.348	129.8	0.0	0.0	0.00	0.00	0.0	50.0	0.0	50.0	0.0	1.00	
259.3	31	0.724	270.0	0.2	0.2	0.50	0.05	33.0	52.2	16.5	46.7	33.0	1.92	
264.8	68	0.849	316.7	0.5	0.5	1.10	0.12	43.3	51.9	21.7	44.6	43.3	2.43	
266.7	90	0.901	336.1	0.6	0.6	1.46	0.15	47.5	52.0	23.7	44.1	47.5	2.68	
268.6	120	0.977	364.4	0.8	0.8	1.95	0.20	53.6	53.2	26.8	44.3	53.6	3.03	
269.6	151	1.042	388.7	1.0	1.0	2.45	0.26	58.7	54.7	29.3	45.0	58.7	3.31	
270.4	186	1.107	412.9	1.3	1.3	3.02	0.31	63.6	56.4	31.8	45.8	63.6	3.59	
270.8	210	1.149	428.6	1.4	1.4	3.41	0.35	66.8	57.6	33.4	46.5	66.8	3.76	
271.1	240	1.193	445.0	1.6	1.6	3.90	0.40	70.0	58.9	35.0	47.2	70.0	3.93	
271.2	271	1.232	459.5	1.8	1.8	4.40	0.45	72.7	60.1	36.3	48.0	72.7	4.05	
271.3	309	1.277	476.3	2.1	2.1	4.81	0.51	76.0	61.7	38.0	49.0	76.0	4.20	
271.1	336	1.300	484.9	2.3	2.3	4.81	0.55	77.8	62.8	38.9	49.8	77.8	4.25	
270.9	367	1.329	495.7	2.5	2.5	4.81	0.60	80.1	64.1	40.0	50.8	80.1	4.32	
270.8	393	1.336	498.3	2.7	2.7	4.81	0.64	80.5	64.4	40.2	51.0	80.5	4.33	
270.8	423	1.346	502.1	2.9	2.9	4.81	0.68	81.1	64.8	40.6	51.2	81.1	4.35	
270.6	450	1.358	506.5	3.0	3.0	4.81	0.72	82.0	65.4	41.0	51.7	82.0	4.36	
270.6	481	1.376	513.2	3.3	3.3	4.81	0.77	83.3	66.0	41.6	52.2	83.3	4.41	
270.5	510	1.389	518.1	3.4	3.4	4.81	0.81	84.2	66.6	42.1	52.6	84.2	4.44	
270.1	541	1.408	525.2	3.7	3.7	4.81	0.85	85.6	67.7	42.8	53.4	85.6	4.44	
269.8	573	1.426	531.9	3.9	3.9	4.81	0.90	86.9	68.6	43.4	54.2	86.9	4.45	
269.6	601	1.446	539.4	4.1	4.1	4.81	0.93	88.4	69.6	44.2	54.9	88.4	4.48	
269.6	632	1.455	542.7	4.3	4.3	4.81	0.98	88.9	69.9	44.5	55.0	88.9	4.50	
269.4	664	1.468	547.6	4.5	4.5	4.81	1.02	89.8	70.5	44.9	55.5	89.8	4.51	«
269.0	690	1.475	550.2	4.7	4.7	4.81	1.05	90.1	71.1	45.1	56.0	90.1	4.47	

Final volume (cm^3): 617.78 Final length (mm): 141.1 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MaterialLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth(m) From : 9.60
To : -

Laboratory Information

Date shearing commenced : 03/02/2010 Time : 09:00
Date shearing completed : 03/02/2010 Time : 11:42
Proving ring serial No. : 5345
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.805 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.39

Lab. sample I.D. : SL100076/15
Specimen ref. : A
Cell pressure : 345 kPa
Back pressure : 245 kPa
Effective pressure : 100 kPa

Dimensions at starting of compression

Volume V_c : 603.48 cm^3
Area A_c : 4311.0 mm^2
Length L_c : 140.0 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.404	150.7	0.0	5.4	4.81	1.20	0.0	100.0	0.0	100.0	0.0	1.00	
273.2	30	1.092	407.3	0.2	5.6	4.81	1.24	53.4	98.5	26.7	89.6	53.4	1.74	
283.2	60	1.297	483.8	0.4	5.8	4.81	1.28	70.9	97.2	35.4	85.4	70.9	2.15	
288.4	90	1.447	539.7	0.6	6.0	4.81	1.32	83.5	98.4	41.8	84.4	83.5	2.48	
292.2	123	1.589	592.7	0.9	6.3	4.81	1.36	95.5	100.5	47.7	84.6	95.5	2.81	
294.1	150	1.685	628.5	1.1	6.5	4.81	1.39	103.4	102.6	51.7	85.4	103.4	3.03	
295.7	180	1.768	659.5	1.3	6.7	4.81	1.43	110.3	104.4	55.1	86.1	110.3	3.24	
296.9	210	1.838	685.6	1.5	6.9	4.81	1.47	115.9	106.1	58.0	86.7	115.9	3.41	
298.0	241	1.907	711.3	1.7	7.1	4.81	1.51	121.5	107.7	60.7	87.5	121.5	3.58	
298.5	270	1.955	729.2	1.9	7.3	4.81	1.54	125.3	109.1	62.6	88.3	125.3	3.69	
299.1	300	1.992	743.0	2.1	7.5	4.81	1.58	128.1	109.9	64.0	88.6	128.1	3.79	
299.6	338	2.030	757.2	2.4	7.8	4.81	1.62	130.9	110.8	65.4	89.0	130.9	3.88	
299.9	360	2.047	763.5	2.6	8.0	4.81	1.65	132.0	111.1	66.0	89.1	132.0	3.93	
299.9	392	2.066	770.6	2.8	8.2	4.81	1.69	133.3	111.7	66.6	89.5	133.3	3.96	
300.0	420	2.085	777.7	3.0	8.4	4.81	1.72	134.6	112.3	67.3	89.9	134.6	3.99	
300.2	450	2.101	783.7	3.2	8.6	4.81	1.75	135.5	112.6	67.8	90.0	135.5	4.03	
300.2	480	2.115	788.9	3.4	8.8	4.81	1.79	136.4	113.0	68.2	90.3	136.4	4.04	
300.0	510	2.131	794.9	3.6	9.0	4.81	1.82	137.4	113.7	68.7	90.8	137.4	4.05	
300.0	540	2.144	799.7	3.9	9.3	4.81	1.85	138.1	114.0	69.0	91.0	138.1	4.07	
300.0	570	2.156	804.2	4.1	9.5	4.81	1.89	138.7	114.4	69.4	91.2	138.7	4.08	
300.0	600	2.172	810.1	4.3	9.7	4.81	1.92	139.7	114.8	69.8	91.6	139.7	4.10	«
299.8	632	2.184	814.6	4.5	9.9	4.81	1.95	140.3	115.3	70.1	92.0	140.3	4.10	

Final volume (cm^3): 603.48 Final length (mm): 133.7 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth(m) From : 9.60
To : -

Laboratory Information

Date shearing commenced : 04/03/2010 Time : 09:00
Date shearing completed : 04/03/2010 Time : 13:23
Proving ring serial No. : 12202
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.805 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.56

Lab. sample I.D. : SL100076/15
Specimen ref. : A
Cell pressure : 445 kPa
Back pressure : 245 kPa
Effective pressure : 200 kPa
Dimensions at starting of compression
Volume V_c : 586.98 cm^3
Area A_c : 4432.2 mm^2
Length L_c : 132.4 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.117	203.8	0.0	10.5	4.81	2.04	0.0	200.0	0.0	200.0	0.0	1.00	
305.1	30	0.392	682.9	0.2	10.7	4.81	2.07	101.0	190.4	50.5	173.6	101.0	1.72	
325.8	61	0.465	810.1	0.5	11.0	4.81	2.11	129.2	183.8	64.6	162.3	129.2	2.08	
336.7	90	0.511	890.2	0.7	11.2	4.81	2.14	146.9	181.7	73.4	157.3	146.9	2.36	
344.7	123	0.556	968.6	0.9	11.4	4.81	2.17	164.0	182.3	82.0	155.0	164.0	2.63	
350.4	155	0.581	1012.2	1.2	11.7	4.81	2.21	173.2	181.2	86.6	152.3	173.2	2.83	
353.7	181	0.603	1050.5	1.4	11.9	4.81	2.24	181.4	182.0	90.7	151.8	181.4	2.99	
357.1	213	0.625	1088.9	1.6	12.1	4.81	2.27	189.4	182.6	94.7	151.0	189.4	3.15	
359.4	240	0.641	1116.7	1.8	12.3	4.81	2.30	195.1	183.2	97.6	150.6	195.1	3.28	
361.4	270	0.656	1142.9	2.0	12.5	4.81	2.33	200.4	183.8	100.2	150.4	200.4	3.40	
362.6	300	0.668	1163.8	2.3	12.8	4.81	2.36	204.5	184.7	102.3	150.6	204.5	3.48	
363.8	331	0.679	1182.9	2.5	13.0	4.81	2.39	208.2	185.3	104.1	150.6	208.2	3.56	
364.7	366	0.689	1200.3	2.8	13.3	4.81	2.42	211.4	186.0	105.7	150.8	211.4	3.63	
365.3	390	0.695	1210.8	2.9	13.5	4.81	2.45	213.3	186.3	106.6	150.8	213.3	3.68	
365.5	421	0.698	1216.0	3.2	13.7	4.81	2.48	213.8	186.4	106.9	150.8	213.8	3.69	
365.7	453	0.702	1223.0	3.4	13.9	4.81	2.51	214.8	186.7	107.4	150.9	214.8	3.71	
365.8	483	0.706	1230.0	3.6	14.2	4.81	2.54	215.7	187.1	107.9	151.1	215.7	3.72	
365.9	512	0.709	1235.2	3.9	14.4	4.81	2.57	216.3	187.3	108.2	151.2	216.3	3.73	
365.9	544	0.712	1240.4	4.1	14.6	4.81	2.60	216.9	187.5	108.4	151.4	216.9	3.74	
365.9	573	0.714	1243.9	4.3	14.8	4.81	2.63	217.1	187.6	108.5	151.5	217.1	3.74	
366.0	603	0.716	1247.4	4.6	15.1	4.81	2.66	217.3	187.6	108.6	151.4	217.3	3.75	
366.0	632	0.718	1250.9	4.8	15.3	4.81	2.68	217.5	187.7	108.7	151.5	217.5	3.75	
365.9	663	0.720	1254.4	5.0	15.5	4.81	2.71	217.6	187.9	108.8	151.6	217.6	3.75	«
365.8	694	0.721	1256.1	5.2	15.7	4.81	2.74	217.4	187.9	108.7	151.7	217.4	3.75	
365.5	723	0.722	1257.8	5.5	16.0	4.81	2.77	217.3	188.1	108.6	151.9	217.3	3.73	
365.2	751	0.723	1259.6	5.7	16.2	4.81	2.80	217.1	188.3	108.5	152.2	217.1	3.72	
365.0	781	0.724	1261.3	5.9	16.4	4.81	2.82	216.9	188.4	108.4	152.3	216.9	3.71	
364.7	813	0.725	1263.1	6.1	16.6	4.81	2.85	216.7	188.6	108.3	152.5	216.7	3.70	
364.3	842	0.726	1264.8	6.4	16.9	4.81	2.88	216.5	188.9	108.2	152.9	216.5	3.68	
364.0	874	0.726	1264.8	6.6	17.1	4.81	2.91	215.9	188.9	107.9	153.0	215.9	3.67	
363.7	905	0.726	1264.8	6.8	17.3	4.81	2.94	215.3	188.9	107.6	153.1	215.3	3.65	
363.4	954	0.726	1264.8	7.2	17.7	4.81	2.99	214.3	188.8	107.2	153.0	214.3	3.63	
362.9	1003	0.727	1266.6	7.6	18.1	4.81	3.03	213.8	189.0	106.9	153.4	213.8	3.60	
362.5	1053	0.727	1266.6	8.0	18.5	4.81	3.08	212.8	188.9	106.4	153.4	212.8	3.58	

Final volume (cm^3): 586.98 Final length (mm): 119.9 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth(m) From : 9.60
To : -

Laboratory Information

Lab. sample I.D. : SL100076/15
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
361.9	1106	0.727	1266.6	8.4	18.9	4.81	3.13	211.8	189.0	105.9	153.7	211.8	3.55
361.4	1154	0.728	1268.3	8.7	19.2	4.81	3.17	211.3	189.2	105.6	154.0	211.3	3.53
360.8	1202	0.728	1268.3	9.1	19.6	4.81	3.22	210.3	189.4	105.2	154.3	210.3	3.50
360.3	1256	0.728	1268.3	9.5	20.0	4.81	3.27	209.3	189.4	104.7	154.5	209.3	3.47

Final volume (cm^3): 586.98 Final length (mm): 119.9 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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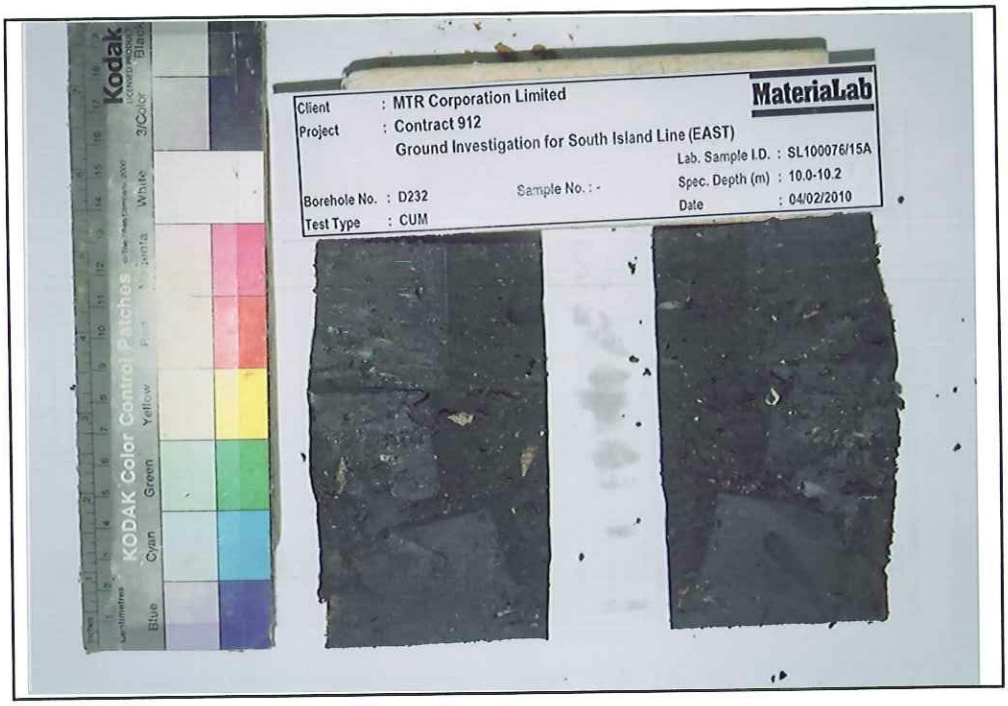
Photographic Records for Triaxial Test



Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

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MaterialLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

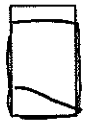
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D228
Depth(m) From : 3.00
To : -
Sample origin : FILL
Soil description : -

Laboratory Information

Date sample received : 27-01-2010
Date test(s) commenced : 30-01-2010
Date test(s) completed : 10-02-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : W.Y. Lo Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.5 °C Minimum : 19.5 °C
Visual description : Moist, grey, silty/clayey, slightly gravelly SAND.

Lab. sample I.D. : SL100076/17
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 3.40
To : 3.60
Affiliation : FTS Ltd. - MaterialLab Division

Stage No.		1			2			3	
Effective pressure	kPa	20			40			60	
***Measurements and Calculations**		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.6	74.4	75.5	75.2	76.4		76.1	80.7
Length	mm	150.4	150.0	145.8	145.2	140.7		140.3	124.8
Volume	cm³	657.38	652.38	652.38	644.78	644.78		638.58	638.58
Wet mass	g	1334.7	1348.9	1348.9	1341.3	1341.3		1335.1	1335.1
Dry mass	g	1114.3	1114.3	1114.3	1114.3	1114.3		1114.3	1114.3
Moisture content	%	19.8	21.1	21.1	20.4	20.4		19.8	19.8
Bulk density	Mg/m³	2.03	2.07	2.07	2.08	2.08		2.09	2.09
Dry density	Mg/m³	1.70	1.71	1.71	1.73	1.73		1.74	1.74
Void ratio		0.56	0.55	0.55	0.53	0.53		0.52	0.52
Degree of saturation	%	93.0	101.2	101.2	101.2	101.2		101.2	101.2
Saturation Stage									
****Volume change of water**	cm³	19.2							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	259.8			279.8			289.8	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	5.0			7.6			6.2	
m_{vi}	m²/MN	0.51			0.33			0.21	
t_{50}	min	22.00			60.00			42.00	
c_{vi} (from t_{50})	m²/yr	205.12			70.60			94.03	
t_{100}	min	108.16			100.00			96.00	
c_{vi} (from t_{100})	m²/yr	83.34			92.14			98.34	
Sketch of failed specimen (Failure Mode)								 Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 25 FEB 2010

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

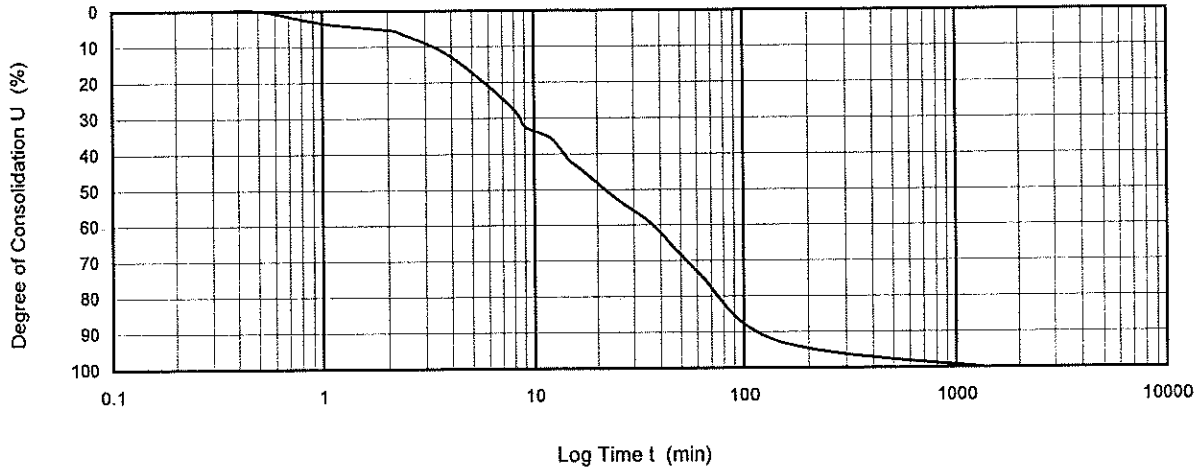
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D228
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Cell pressure	:	265 kPa	Lab. sample I.D.	:	SL100076/17
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	20 kPa			

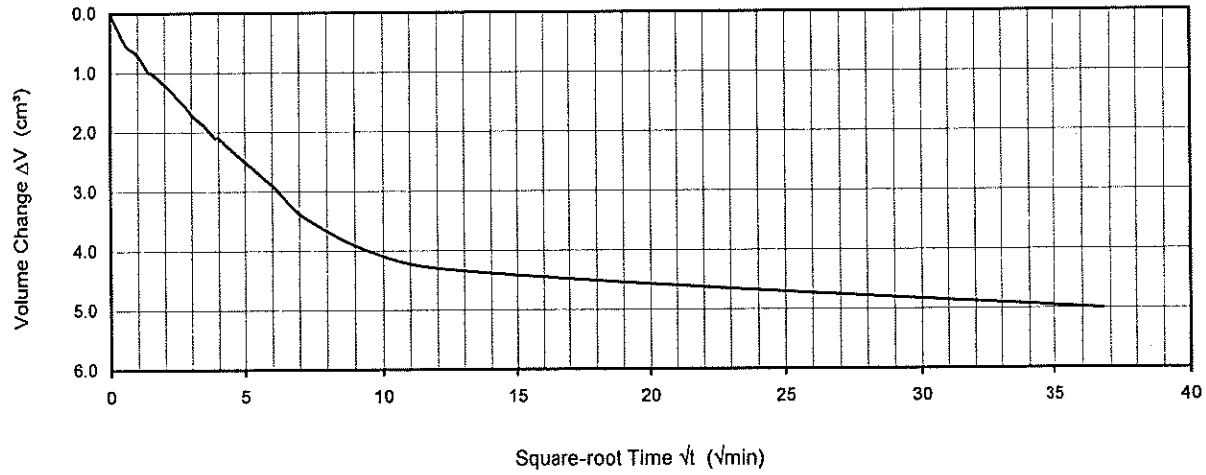
Degree of Consolidation vs. Log Time

t_{50} = 22.00 min ΔV = 5.0 cm³



Volume Change vs. Square-root Time

t_{100} = 108.16 min



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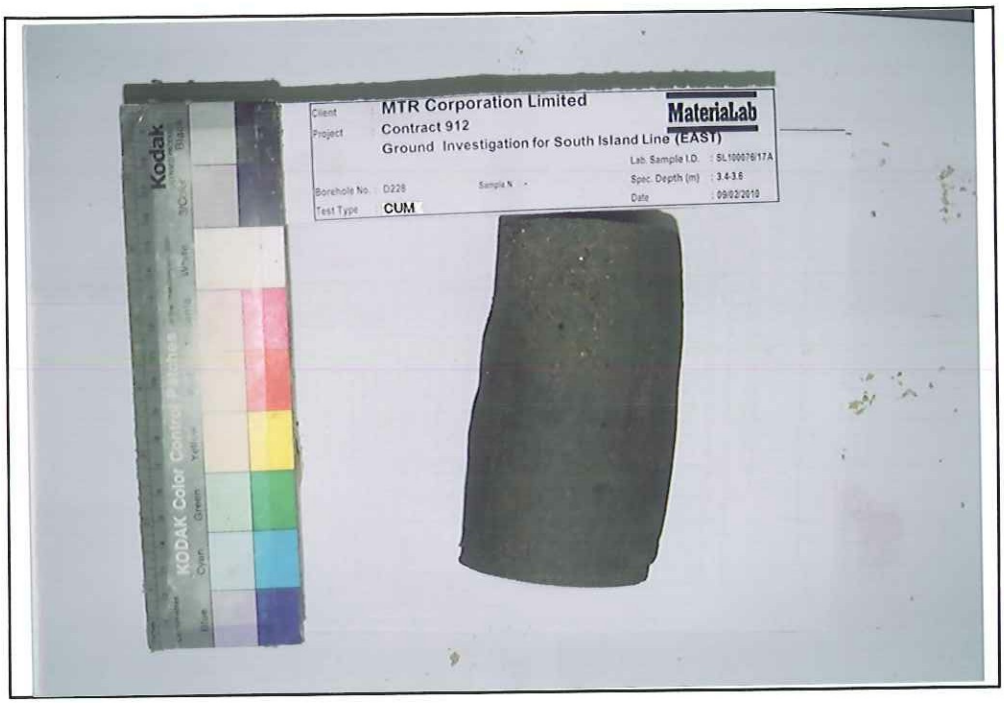
Photographic Records for Triaxial Test



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MateriaLab

HKAS 015

Test Report No. : 090562SL90169(7) Page 1 of 17

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line
(EAST)

Client sample No. : 7
Borehole No. : D237
Depth(m) From : 3.00
To : -
Sample origin : ALL
Soil description : -

Laboratory Information

Date sample received : 21-08-2009
Date test(s) commenced : 09-09-2009
Date test(s) completed : 14-09-2009
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum 24.5 °C Minimum : 20.0 °C

Lab. sample I.D. : SL90169/4
Sample type : M

Specimen reference			A			B			C	
Specimen depth(m)	From		3.40			3.60			3.80	
	To		3.60			3.80			4.00	
Effective pressure		kPa	20			40			80	
*Measurements and Calculations			Initial	End of consolidation	Final	Initial	End of consolidation	Final	Initial	End of consolidation	Final
Diameter		mm	74.8	74.6	80.5	74.7	74.4	79.4	74.6	74.2	80.4
Length		mm	150.4	150.1	129.0	150.2	149.6	131.4	150.2	149.4	127.3
Volume		cm^3	660.91	656.61	656.61	658.27	650.07	650.07	656.50	646.30	646.30
Wet mass		g	1327.5	1340.0	1340.0	1279.5	1289.4	1289.4	1288.5	1301.1	1301.1
Dry mass		g	1082.5	1082.5	1082.5	1033.0	1033.0	1033.0	1055.2	1055.2	1055.2
Moisture content		%	22.6	23.8	23.8	23.9	24.8	24.8	22.1	23.3	23.3
Bulk density		Mg/m^3	2.01	2.04	2.04	1.94	1.98	1.98	1.96	2.01	2.01
Dry density		Mg/m^3	1.64	1.65	1.65	1.57	1.59	1.59	1.61	1.63	1.63
Void ratio			0.62	0.61	0.61	0.69	0.67	0.67	0.65	0.62	0.62
Degree of saturation		%	97.1	103.8	103.8	91.8	98.5	98.5	90.3	99.1	99.1
Saturation Stage											
Volume change of water		cm^3	16.8			18.1			22.8		
Consolidation Stage											
Side drain used			No			No.			No.		
Initial pore pressure		kPa	260.0			280.0			320.0		
Final pore pressure		kPa	245.0			245.0			245.0		
Volume of water drained out		cm^3	4.3			8.2			10.2		
m_{vi}		m^2/MN	0.43			0.36			0.21		
t_{50}		min	25.00			15.00			19.50		
c_{vi}	(from t_{50})	m^2/yr	180.57			299.55			230.18		
t_{100}		min	67.24			33.64			43.56		
c_{vi}	(from t_{100})	m^2/yr	135.54			269.66			206.92		
Sketch of failed specimen (Failure Mode)			Brittle			Brittle			Brittle		
Visual description			Moist, brownish grey spotted with white and black, slightly gravelly, slightly sandy SILT/CLAY.			Moist, brownish grey spotted with white and black, slightly gravelly, slightly sandy SILT/CLAY.			Moist, brownish grey spotted with white and black, slightly gravelly, sandy SILT/CLAY.		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)
Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo Certified by : ~~Paul Richard Cooper (Operations Manager—CMT)~~ / Lai Mei Ting (Assistant Manager - Soil) Date : 27 OCT 2009

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

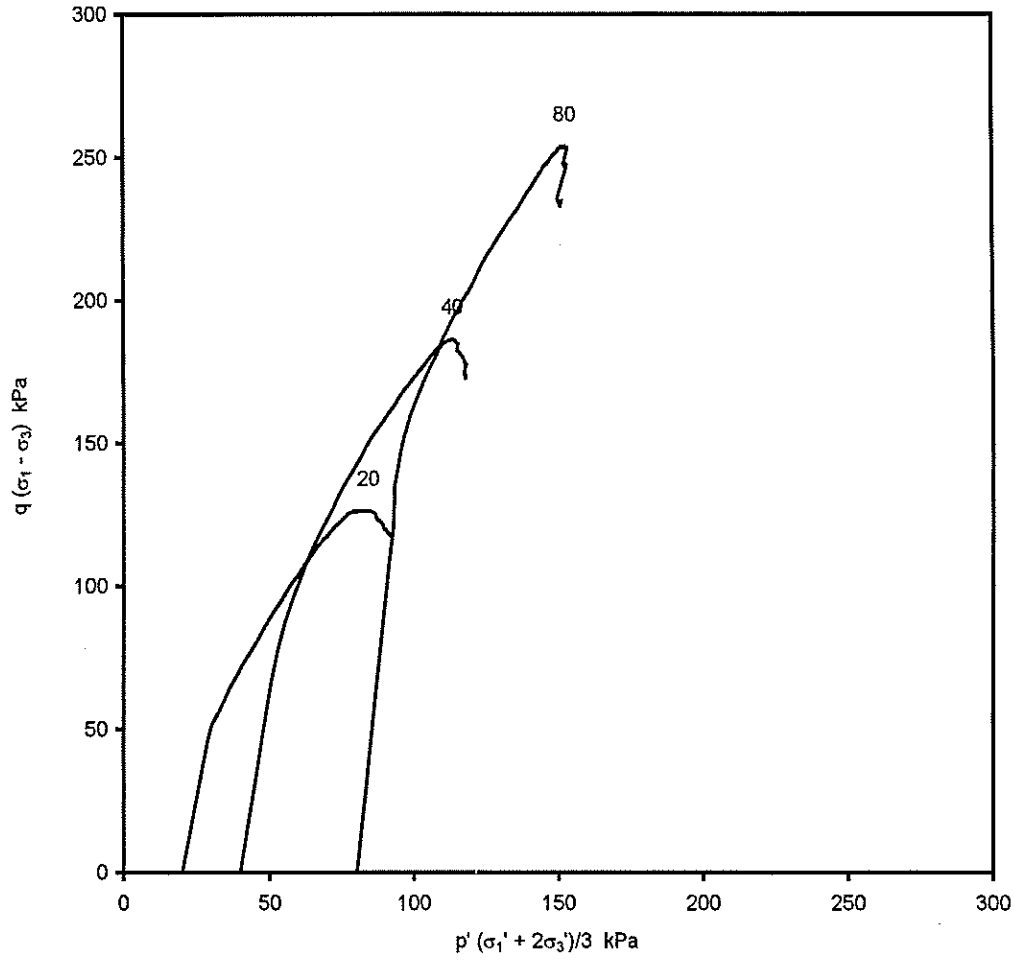
Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/4
Specimen ref.	:	A, B, C

Test Results at Failure

Specimen reference	Effective stress kPa	Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
A	20	8.8	223.1	126.2	84.0	126.2
B	40	7.1	233.4	186.3	113.7	186.3
C	80	9.7	257.2	253.8	152.4	253.8



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

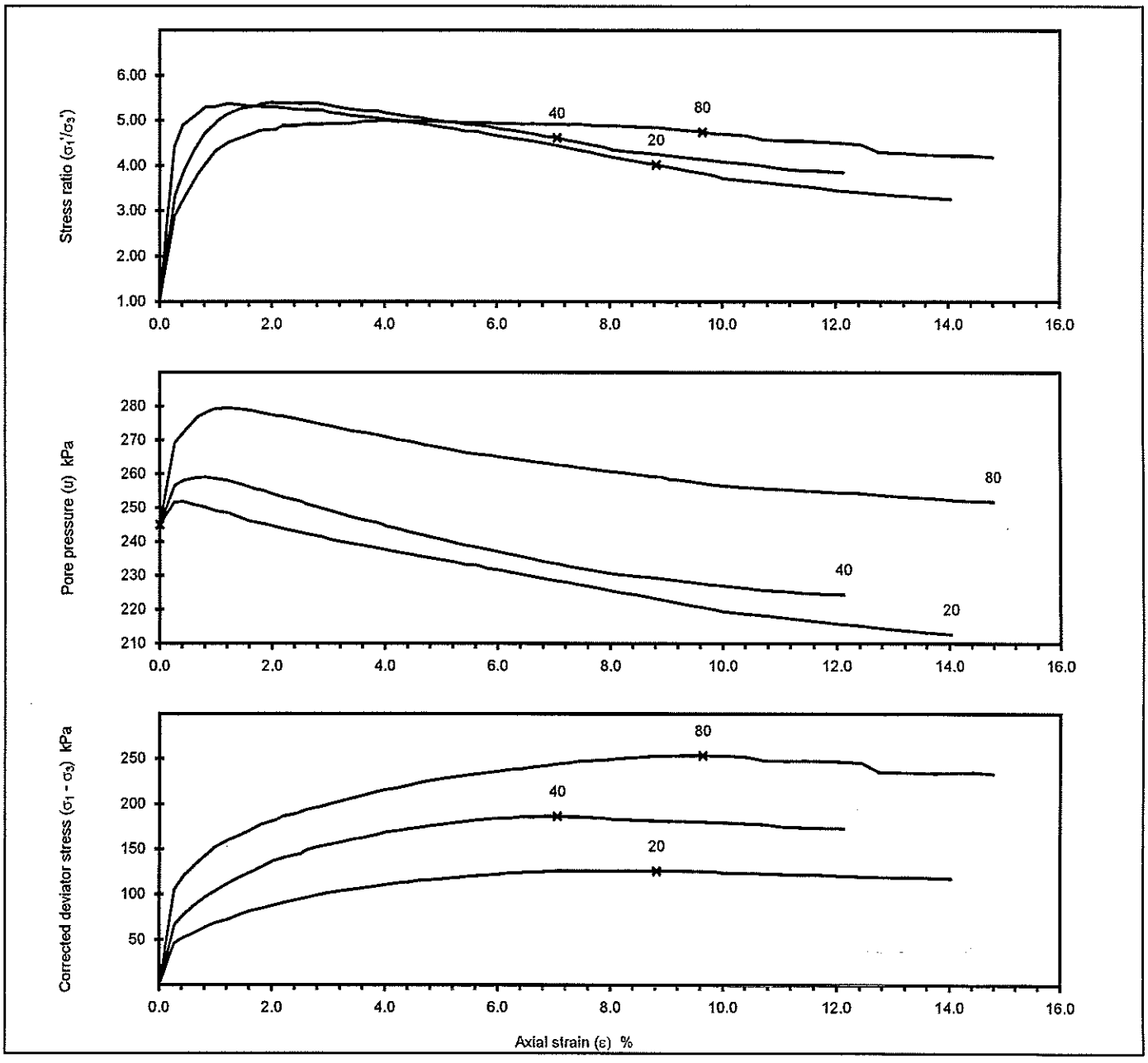
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/4
Specimen ref.	:	A, B, C



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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 7
Borehole No. : D237
Depth(m) From : 3.00
To : -

Laboratory Information

Lab. sample I.D. : SL90169/4

Sequence of pressure increment

Specimen reference		A		B		C	
Effective pressure	kPa	20		40		80	
Applied pressure		Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa	Cell pressure kPa	Back pressure kPa
		20	15	25	20	25	20
		40	35	50	45	50	45
		60	55	75	70	75	70
		80	75	100	95	100	95
		100	95	125	120	150	145
		120	115	150	145	200	195
		140	135	175	170	250	245
		160	155	200	195		
		180	175	225	220		
		200	195	250	245		
		220	215				
		240	235				
		250	245				

End of Saturation

Cell pressure	kPa	250	250	250
Back pressure	kPa	245	245	245
Pore pressure	kPa	245.0	245.0	245.0
B value		0.99	0.99	0.98
Volume change	cm^3	16.8	18.1	22.8

For remoulded specimen(s)

Specimen reference				
Method of drying				
Drying temperature				
Method of remoulding				
Target dry density	Mg/m^3			
Target moisture content	%			

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Specimen reference		A			B			C		
Retained on sieve of size	mm	-			-			-		
Mass of particles	g	-			-			-		
Percentage retained	%	-			-			-		

Final wet mass of the specimen	g	1337.6	1285.7	1298.8
Final moisture content	%	23.6	24.5	23.1
Final bulk density	Mg/m^3	2.04	1.98	2.01

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HKAS HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

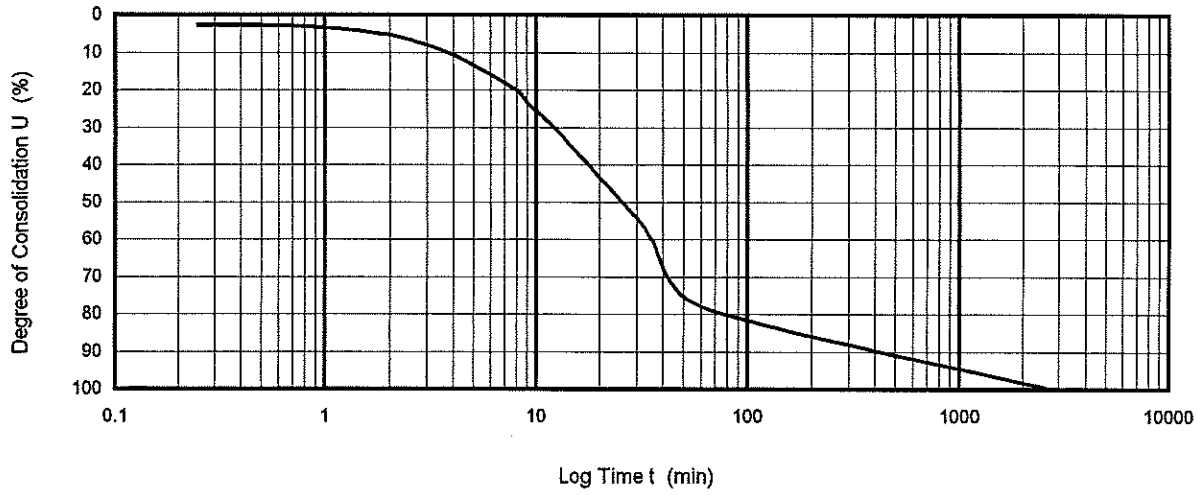
Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Cell pressure	:	265 kPa	Lab. sample I.D.	:	SL90169/4
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	20 kPa			

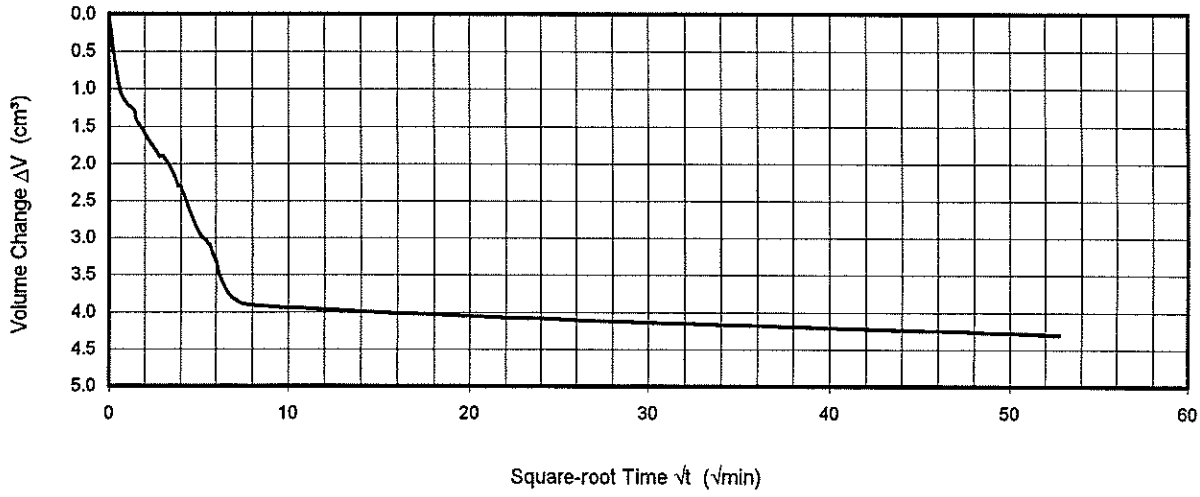
Degree of Consolidation vs. Log Time

t_{50} = 25.00 min ΔV = 4.3 cm³



Volume Change vs. Square-root Time

t_{100} = 67.24 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

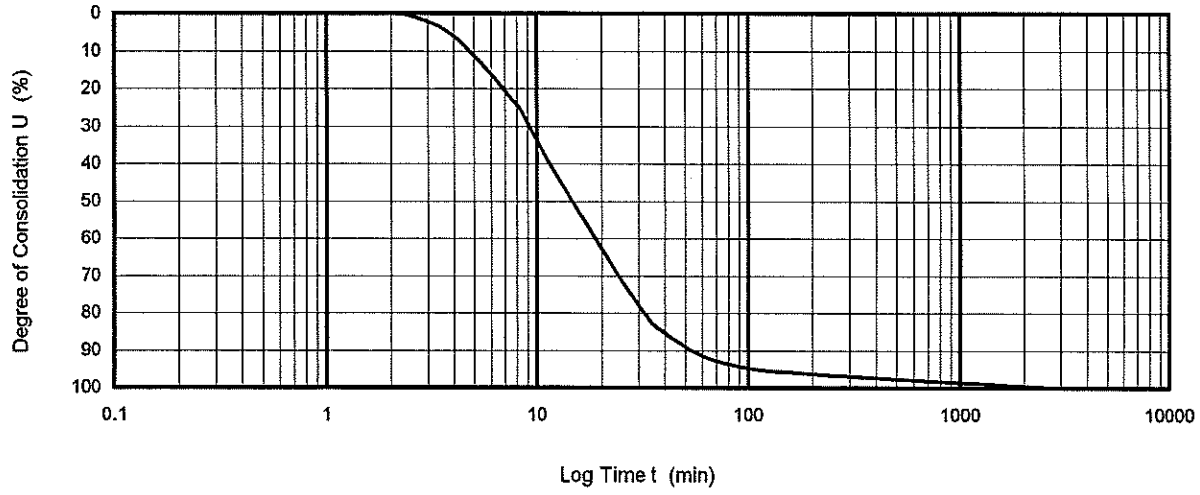
Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Cell pressure	:	285 kPa	Lab. sample I.D.	:	SL90169/4
Back pressure	:	245 kPa	Specimen ref.	:	B
Effective pressure	:	40 kPa			

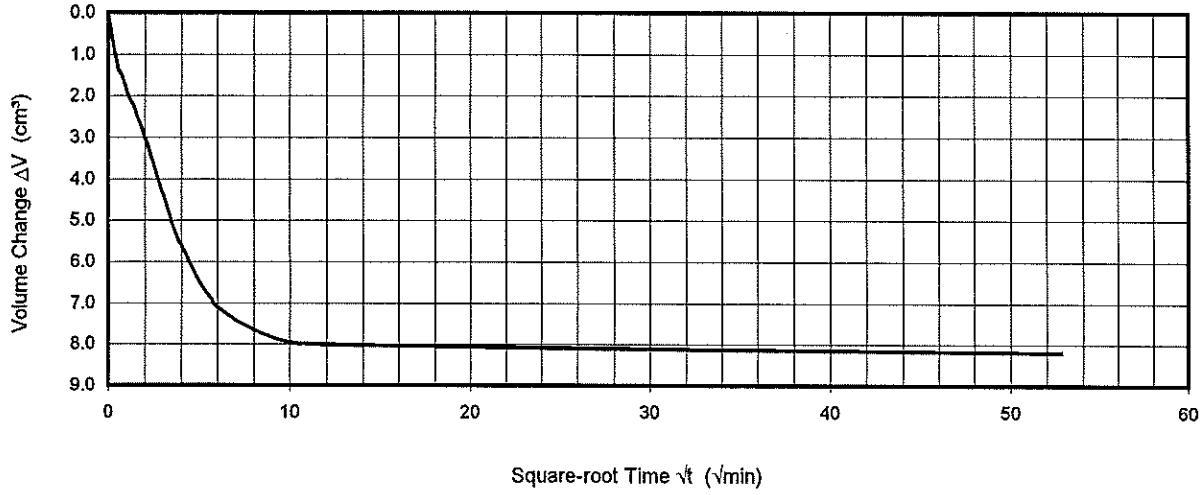
Degree of Consolidation vs. Log Time

t_{50} = 15.00 min ΔV = 8.2 cm³



Volume Change vs. Square-root Time

t_{100} = 33.64 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

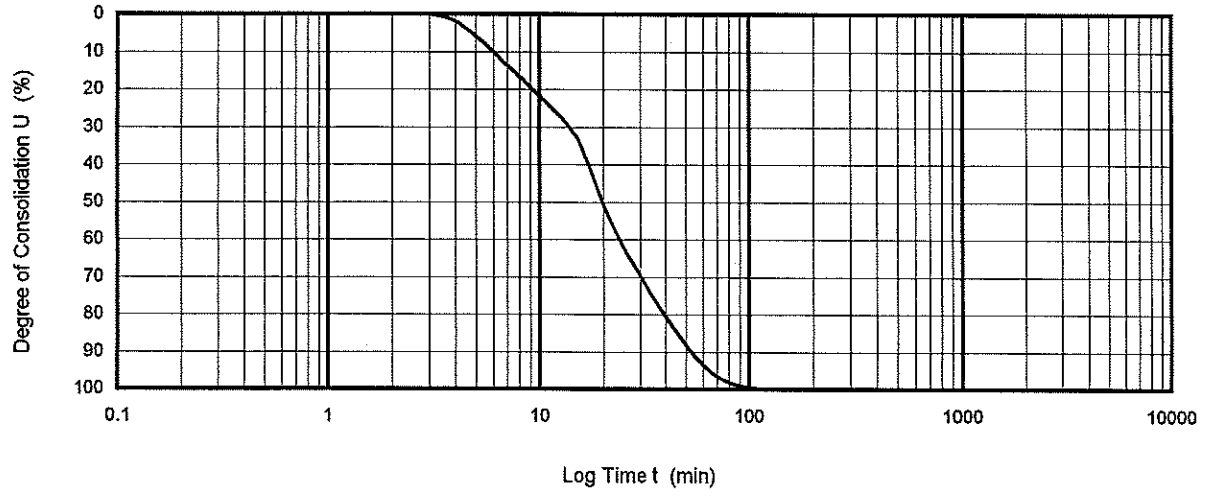
Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Cell pressure	:	325 kPa	Lab. sample I.D.	:	SL90169/4
Back pressure	:	245 kPa	Specimen ref.	:	C
Effective pressure	:	80 kPa			

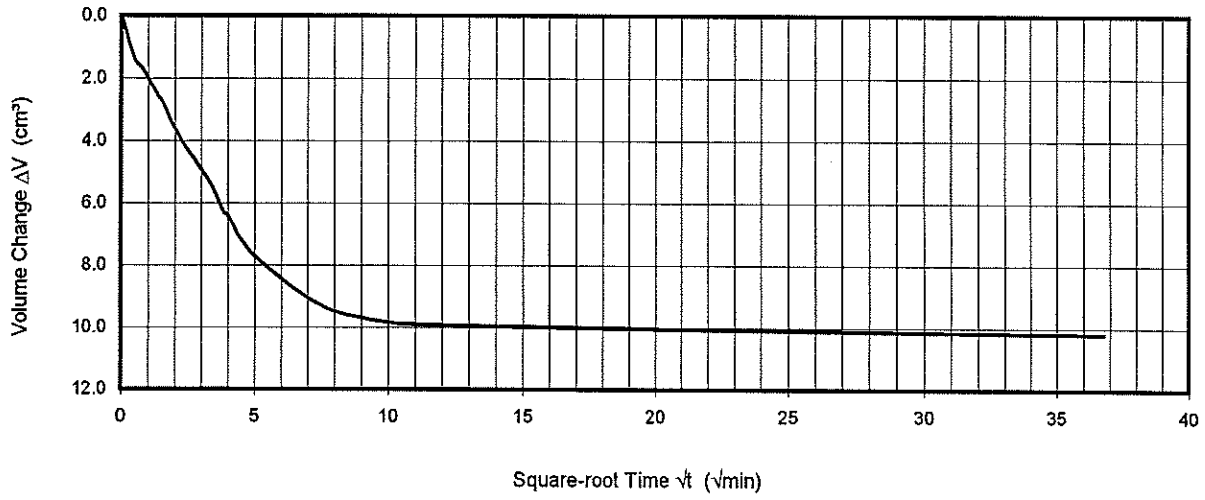
Degree of Consolidation vs. Log Time

t_{50} = 19.50 min ΔV = 10.2 cm^3



Volume Change vs. Square-root Time

t_{100} = 43.56 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Date shearing commenced	:	12/09/2009	Time :	09:00	Lab. sample I.D.	:	SL90169/4
Date shearing completed	:	12/09/2009	Time :	16:34	Specimen ref.	:	A
Proving ring serial No.	:	5345			Cell pressure	:	265 kPa
Type of membrane	:	rubber			Back pressure	:	245 kPa
Corrections					Effective pressure	:	20 kPa
Side drain, σ_{dr}	:	0.000 kPa/%			Dimensions at starting of compression		
Membrane thickness, σ_{mb}	:	0.68 mm			Volume V_c	:	656.61 cm³
Rate of axial displacement	:	0.050 mm/min			Area A_c	:	4375.3 mm²
Pore pressure coefficient, A_f	:	-0.17			Length L_c	:	150.1 mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.290	108.2	0.0	0.00	0.00	0.0	20.0	0.0	20.0	0.0	1.00
251.5	39	0.831	310.0	0.3	0.00	0.07	45.9	36.5	23.0	28.8	45.9	4.40
251.8	61	0.896	334.2	0.4	0.00	0.11	51.3	38.9	25.7	30.3	51.3	4.89
251.0	90	0.964	359.6	0.6	0.00	0.16	57.0	42.5	28.5	33.0	57.0	5.07
250.1	123	1.049	391.3	0.8	0.00	0.22	64.0	46.9	32.0	36.2	64.0	5.29
249.1	150	1.103	411.4	1.0	0.00	0.26	68.4	50.1	34.2	38.7	68.4	5.30
248.4	186	1.157	431.6	1.2	0.00	0.32	72.7	52.9	36.3	40.8	72.7	5.38
247.3	210	1.210	451.3	1.4	0.00	0.36	77.0	56.2	38.5	43.4	77.0	5.35
246.1	240	1.266	472.2	1.6	0.00	0.41	81.5	59.6	40.7	46.1	81.5	5.31
245.3	278	1.308	487.9	1.9	0.00	0.48	84.7	62.1	42.4	47.9	84.7	5.30
244.6	304	1.348	502.8	2.0	0.00	0.52	87.9	64.3	43.9	49.7	87.9	5.31
243.8	332	1.386	517.0	2.2	0.00	0.56	90.8	66.6	45.4	51.5	90.8	5.28
243.0	364	1.421	530.0	2.4	0.00	0.61	93.5	68.7	46.7	53.2	93.5	5.25
242.3	390	1.456	543.1	2.6	0.00	0.65	96.2	70.8	48.1	54.8	96.2	5.24
241.4	433	1.507	562.1	2.9	0.00	0.72	100.0	73.6	50.0	56.9	100.0	5.24
240.6	454	1.530	570.7	3.0	0.00	0.75	101.8	75.3	50.9	58.3	101.8	5.17
240.0	482	1.556	580.4	3.2	0.00	0.79	103.7	76.8	51.8	59.6	103.7	5.15
239.3	514	1.582	590.1	3.4	0.00	0.84	105.5	78.5	52.8	60.9	105.5	5.11
238.7	546	1.608	599.8	3.6	0.00	0.89	107.4	80.0	53.7	62.1	107.4	5.08
238.1	578	1.632	608.7	3.9	0.00	0.94	109.1	81.4	54.5	63.3	109.1	5.05
237.5	604	1.655	617.3	4.0	0.00	0.97	110.7	82.9	55.4	64.4	110.7	5.03
236.9	633	1.678	625.9	4.2	0.00	1.01	112.3	84.3	56.2	65.5	112.3	5.00
236.3	666	1.701	634.5	4.4	0.00	1.06	113.9	85.6	56.9	66.7	113.9	4.97
235.7	694	1.720	641.6	4.6	0.00	1.10	115.2	86.9	57.6	67.7	115.2	4.93
235.1	722	1.737	647.9	4.8	0.00	1.14	116.3	88.0	58.1	68.7	116.3	4.89
234.5	756	1.754	654.2	5.0	0.00	1.18	117.3	89.2	58.7	69.6	117.3	4.85
233.9	788	1.771	660.6	5.3	0.00	1.23	118.4	90.3	59.2	70.6	118.4	4.81
233.3	812	1.788	666.9	5.4	0.00	1.26	119.5	91.5	59.8	71.5	119.5	4.77
232.9	846	1.805	673.3	5.6	0.00	1.30	120.6	92.4	60.3	72.3	120.6	4.76
232.1	873	1.820	678.9	5.8	0.00	1.34	121.5	93.7	60.8	73.4	121.5	4.69
231.5	907	1.835	684.4	6.0	0.00	1.38	122.4	94.7	61.2	74.3	122.4	4.65
230.9	932	1.851	690.4	6.2	0.00	1.41	123.4	95.8	61.7	75.2	123.4	4.62
230.3	964	1.865	695.6	6.4	0.00	1.45	124.2	96.8	62.1	76.1	124.2	4.58
229.7	993	1.880	701.2	6.6	0.00	1.49	125.1	97.8	62.5	77.0	125.1	4.54
229.1	1024	1.889	704.6	6.8	0.00	1.53	125.5	98.6	62.7	77.7	125.5	4.50

Final volume (cm³): 656.61 Final length (mm): 129.0 Termination criterion : Maximum deviator stress

Remarks:

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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/4
Specimen ref.	:	A

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
228.5	1056	1.897	707.6	7.0	0.00	1.57	125.8	99.4	62.9	78.4	125.8	4.45	
227.9	1088	1.903	709.8	7.2	0.00	1.60	125.9	100.1	63.0	79.1	125.9	4.39	
227.3	1114	1.908	711.7	7.4	0.00	1.64	126.1	100.7	63.0	79.7	126.1	4.34	
226.7	1148	1.913	713.5	7.6	0.00	1.68	126.1	101.4	63.1	80.3	126.1	4.29	
226.1	1176	1.917	715.0	7.8	0.00	1.71	126.1	102.0	63.1	80.9	126.1	4.24	
225.5	1203	1.921	716.5	8.0	0.00	1.74	126.2	102.6	63.1	81.6	126.2	4.19	
224.9	1234	1.925	718.0	8.2	0.00	1.77	126.1	103.2	63.1	82.1	126.1	4.15	
224.3	1266	1.929	719.5	8.4	0.00	1.81	126.1	103.8	63.1	82.7	126.1	4.10	
223.7	1298	1.934	721.4	8.6	0.00	1.85	126.2	104.4	63.1	83.4	126.2	4.06	
223.1	1324	1.938	722.9	8.8	0.00	1.88	126.2	105.0	63.1	84.0	126.2	4.01	«
222.5	1356	1.941	724.0	9.0	0.00	1.91	126.1	105.6	63.1	84.5	126.1	3.97	
221.9	1384	1.944	725.1	9.2	0.00	1.94	126.1	106.1	63.0	85.1	126.1	3.92	
221.3	1412	1.945	725.5	9.4	0.00	1.97	125.8	106.6	62.9	85.6	125.8	3.88	
220.7	1446	1.945	725.5	9.6	0.00	2.01	125.5	107.0	62.7	86.1	125.5	3.83	
220.0	1478	1.945	725.5	9.8	0.00	2.04	125.2	107.6	62.6	86.7	125.2	3.78	
219.4	1503	1.930	719.9	10.0	0.00	2.07	123.7	107.5	61.9	86.8	123.7	3.71	
218.8	1556	1.933	721.0	10.4	0.00	2.12	123.4	107.9	61.7	87.3	123.4	3.67	
218.3	1604	1.934	721.4	10.7	0.00	2.17	123.0	108.2	61.5	87.7	123.0	3.63	
217.6	1656	1.935	721.7	11.0	0.00	2.22	122.5	108.7	61.3	88.2	122.5	3.59	
217.0	1704	1.936	722.1	11.4	0.00	2.27	122.1	109.1	61.1	88.7	122.1	3.54	
216.4	1755	1.936	722.1	11.7	0.00	2.32	121.6	109.4	60.8	89.1	121.6	3.50	
215.8	1802	1.927	718.8	12.0	0.00	2.37	120.4	109.4	60.2	89.3	120.4	3.45	
215.3	1856	1.928	719.1	12.4	0.00	2.42	120.0	109.7	60.0	89.7	120.0	3.41	
214.7	1903	1.930	719.9	12.7	0.00	2.46	119.6	110.1	59.8	90.2	119.6	3.38	
214.1	1955	1.931	720.3	13.0	0.00	2.51	119.2	110.5	59.6	90.6	119.2	3.34	
213.6	2004	1.932	720.6	13.4	0.00	2.56	118.7	110.8	59.4	91.0	118.7	3.31	
213.2	2052	1.933	721.0	13.7	0.00	2.60	118.3	111.0	59.2	91.2	118.3	3.28	
212.7	2106	1.933	721.0	14.0	0.00	2.65	117.8	111.2	58.9	91.6	117.8	3.25	

Final volume (cm³): 656.61 Final length (mm): 129.0 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Date shearing commenced	:	12/09/2009	Time :	09:00	Lab. sample I.D.	:	SL90169/4	
Date shearing completed	:	12/09/2009	Time :	15:27	Specimen ref.	:	B	
Proving ring serial No.	:	9689			Cell pressure	:	285	kPa
Type of membrane	:	rubber			Back pressure	:	245	kPa
Corrections					Effective pressure	:	40	kPa
Side drain, σ_{dr}	:	0.000	kPa/%		Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.66	mm		Volume V_c	:	650.07	cm^3
Rate of axial displacement	:	0.050	mm/min		Area A_c	:	4346.1	mm^2
Pore pressure coefficient, A_f	:	-0.06			Length L_c	:	149.6	mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.177	126.5	0.0	0.00	0.00	0.0	40.0	0.0	40.0	0.0	1.00
256.5	40	0.580	414.5	0.3	0.00	0.07	66.0	61.5	33.0	50.5	66.0	3.32
258.2	65	0.655	468.1	0.4	0.00	0.11	78.1	65.9	39.1	52.8	78.1	3.92
258.8	91	0.711	508.1	0.6	0.00	0.16	87.1	69.8	43.6	55.2	87.1	4.32
259.0	122	0.771	551.0	0.8	0.00	0.21	96.7	74.3	48.3	58.2	96.7	4.72
258.4	161	0.836	597.4	1.1	0.00	0.28	106.9	80.1	53.5	62.2	106.9	5.02
258.1	180	0.863	616.7	1.2	0.00	0.31	111.1	82.5	55.6	63.9	111.1	5.13
257.1	215	0.912	651.7	1.4	0.00	0.36	118.8	87.3	59.4	67.5	118.8	5.26
255.5	257	0.967	691.0	1.7	0.00	0.43	127.2	93.1	63.6	71.9	127.2	5.31
255.1	275	0.990	707.5	1.8	0.00	0.46	130.8	95.3	65.4	73.5	130.8	5.37
254.0	300	1.027	733.9	2.0	0.00	0.50	136.5	99.2	68.2	76.5	136.5	5.40
252.9	332	1.055	753.9	2.2	0.00	0.55	140.6	102.4	70.3	79.0	140.6	5.38
251.9	376	1.085	775.4	2.5	0.00	0.62	144.9	105.6	72.5	81.4	144.9	5.38
251.1	390	1.110	793.2	2.6	0.00	0.64	148.8	108.3	74.4	83.5	148.8	5.39
250.2	420	1.136	811.8	2.8	0.00	0.68	152.6	111.1	76.3	85.7	152.6	5.38
249.1	456	1.155	825.4	3.0	0.00	0.74	155.2	113.5	77.6	87.6	155.2	5.32
248.1	483	1.174	839.0	3.2	0.00	0.78	157.9	115.8	78.9	89.5	157.9	5.28
247.2	512	1.193	852.5	3.4	0.00	0.82	160.5	118.1	80.3	91.3	160.5	5.25
246.3	546	1.212	866.1	3.7	0.00	0.87	163.1	120.3	81.6	93.1	163.1	5.21
245.6	578	1.231	879.7	3.9	0.00	0.91	165.7	122.2	82.8	94.6	165.7	5.21
244.5	602	1.251	894.0	4.0	0.00	0.95	168.5	124.8	84.3	96.7	168.5	5.16
243.6	639	1.266	904.7	4.3	0.00	1.00	170.4	126.6	85.2	98.2	170.4	5.12
242.8	662	1.280	914.7	4.4	0.00	1.03	172.3	128.4	86.2	99.6	172.3	5.08
242.1	694	1.294	924.7	4.6	0.00	1.07	174.1	129.9	87.0	100.9	174.1	5.06
241.2	722	1.308	934.7	4.8	0.00	1.11	175.9	131.7	87.9	102.4	175.9	5.02
240.4	756	1.322	944.7	5.1	0.00	1.15	177.6	133.4	88.8	103.8	177.6	4.98
239.6	786	1.336	954.7	5.3	0.00	1.19	179.4	135.1	89.7	105.2	179.4	4.95
238.9	812	1.347	962.6	5.4	0.00	1.23	180.7	136.5	90.4	106.3	180.7	4.92
238.3	844	1.358	970.5	5.6	0.00	1.27	182.0	137.7	91.0	107.4	182.0	4.90
237.5	878	1.369	978.3	5.9	0.00	1.31	183.2	139.1	91.6	108.6	183.2	4.86
236.8	902	1.376	983.3	6.0	0.00	1.34	183.9	140.2	92.0	109.5	183.9	4.82
236.1	936	1.384	989.0	6.3	0.00	1.38	184.7	141.2	92.3	110.5	184.7	4.78
235.4	964	1.392	994.8	6.4	0.00	1.42	185.5	142.3	92.7	111.4	185.5	4.74
234.7	996	1.397	998.3	6.7	0.00	1.45	185.8	143.2	92.9	112.2	185.8	4.69
234.0	1020	1.402	1001.9	6.8	0.00	1.48	186.2	144.1	93.1	113.1	186.2	4.65

Final volume (cm^3): 650.07 Final length (mm): 131.4 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Lab. sample I.D.	:	SL90169/4
Specimen ref.	:	B

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
233.4	1056	1.406	1004.8	7.1	0.00	1.53	186.3	144.7	93.1	113.7	186.3	4.61	«
232.7	1087	1.407	1005.5	7.3	0.00	1.56	186.0	145.3	93.0	114.3	186.0	4.56	
232.2	1112	1.407	1005.5	7.4	0.00	1.59	185.6	145.6	92.8	114.7	185.6	4.52	
231.6	1146	1.407	1005.5	7.7	0.00	1.63	185.1	146.0	92.6	115.1	185.1	4.47	
231.0	1178	1.407	1005.5	7.9	0.00	1.67	184.7	146.3	92.3	115.6	184.7	4.42	
230.4	1204	1.396	997.6	8.0	0.00	1.70	182.6	145.9	91.3	115.5	182.6	4.34	
229.8	1256	1.398	999.0	8.4	0.00	1.75	182.2	146.3	91.1	115.9	182.2	4.30	
229.3	1308	1.399	999.8	8.7	0.00	1.81	181.6	146.5	90.8	116.2	181.6	4.26	
228.7	1356	1.400	1000.5	9.1	0.00	1.86	181.0	146.8	90.5	116.6	181.0	4.21	
228.1	1404	1.401	1001.2	9.4	0.00	1.91	180.5	147.1	90.2	117.1	180.5	4.17	
227.4	1457	1.401	1001.2	9.7	0.00	1.97	179.7	147.4	89.8	117.5	179.7	4.12	
226.9	1502	1.401	1001.2	10.0	0.00	2.01	179.0	147.6	89.5	117.8	179.0	4.08	
226.3	1556	1.401	1001.2	10.4	0.00	2.07	178.3	147.8	89.1	118.1	178.3	4.04	
225.7	1600	1.402	1001.9	10.7	0.00	2.11	177.8	148.2	88.9	118.6	177.8	4.00	
225.3	1656	1.384	989.0	11.1	0.00	2.17	174.3	146.9	87.2	117.8	174.3	3.92	
224.9	1702	1.386	990.5	11.4	0.00	2.21	174.0	147.1	87.0	118.1	174.0	3.89	
224.6	1755	1.388	991.9	11.7	0.00	2.26	173.5	147.1	86.7	118.2	173.5	3.87	
224.3	1814	1.389	992.6	12.1	0.00	2.32	172.8	147.1	86.4	118.3	172.8	3.85	

Final volume (cm³): 650.07 Final length (mm): 131.4 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	7
Project	:	Contract 912	Borehole No.	:	D237
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	-

Laboratory Information

Date shearing commenced	:	11/09/2009	Time :	09:00	Lab. sample I.D.	:	SL90169/4	
Date shearing completed	:	11/09/2009	Time :	16:35	Specimen ref.	:	C	
Proving ring serial No.	:	9769			Cell pressure	:	325	kPa
Type of membrane	:	rubber			Back pressure	:	245	kPa
Corrections					Effective pressure	:	80	kPa
Side drain, σ_{dr}	:	0.000	kPa/%		Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.68	mm		Volume V_c	:	646.30	cm^3
Rate of axial displacement	:	0.050	mm/min		Area A_c	:	4325.5	mm^2
Pore pressure coefficient, A_f	:	0.05			Length L_c	:	149.4	mm

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	39	136.1	0.0	0.00	0.00	0.0	80.0	0.0	80.0	0.0	1.00
269.0	40	170	593.2	0.3	0.00	0.07	105.3	108.7	52.7	91.1	105.3	2.88
272.6	67	190	662.9	0.4	0.00	0.12	121.1	113.0	60.6	92.8	121.1	3.31
276.8	102	208	725.8	0.7	0.00	0.18	135.2	115.8	67.6	93.3	135.2	3.81
278.8	137	224	781.6	0.9	0.00	0.24	147.6	120.0	73.8	95.4	147.6	4.20
279.2	150	230	802.5	1.0	0.00	0.27	152.3	121.9	76.1	96.6	152.3	4.32
279.5	184	240	837.4	1.2	0.00	0.32	159.8	125.4	79.9	98.8	159.8	4.51
279.2	210	246	858.3	1.4	0.00	0.37	164.3	127.9	82.1	100.6	164.3	4.59
278.7	244	255	889.7	1.6	0.00	0.42	171.0	131.8	85.5	103.3	171.0	4.69
278.2	270	263	917.7	1.8	0.00	0.47	177.0	135.3	88.5	105.8	177.0	4.78
277.2	310	270	942.1	2.1	0.00	0.53	181.9	138.8	91.0	108.4	181.9	4.81
277.0	330	276	963.0	2.2	0.00	0.56	186.4	141.2	93.2	110.1	186.4	4.88
276.3	364	280	977.0	2.4	0.00	0.62	189.1	143.2	94.5	111.7	189.1	4.88
275.7	390	286	997.9	2.6	0.00	0.66	193.4	146.0	96.7	113.8	193.4	4.92
274.6	434	292	1018.8	2.9	0.00	0.73	197.4	149.1	98.7	116.2	197.4	4.92
274.1	458	296	1032.8	3.1	0.00	0.76	200.2	151.0	100.1	117.6	200.2	4.93
273.4	480	300	1046.8	3.2	0.00	0.80	203.0	153.1	101.5	119.3	203.0	4.93
272.7	512	305	1064.2	3.4	0.00	0.84	206.4	155.5	103.2	121.1	206.4	4.95
272.2	546	310	1081.6	3.7	0.00	0.89	209.7	157.7	104.9	122.7	209.7	4.97
271.6	577	315	1099.1	3.9	0.00	0.94	213.1	160.0	106.6	124.4	213.1	4.99
271.0	600	319	1113.0	4.0	0.00	0.97	215.8	161.9	107.9	125.9	215.8	5.00
270.2	631	322	1123.5	4.2	0.00	1.02	217.6	163.6	108.8	127.3	217.6	4.97
269.6	667	327	1141.0	4.5	0.00	1.07	220.9	165.8	110.4	129.0	220.9	4.99
268.6	702	332	1158.4	4.7	0.00	1.12	224.1	168.5	112.1	131.1	224.1	4.97
268.1	727	335	1168.9	4.9	0.00	1.15	226.0	169.9	113.0	132.2	226.0	4.97
267.7	751	338	1179.3	5.0	0.00	1.18	227.9	171.2	113.9	133.3	227.9	4.98
267.0	780	341	1189.8	5.2	0.00	1.22	229.7	172.8	114.8	134.6	229.7	4.96
266.3	812	344	1200.3	5.4	0.00	1.27	231.4	174.4	115.7	135.8	231.4	4.94
265.8	846	347	1210.7	5.7	0.00	1.31	233.1	175.7	116.5	136.9	233.1	4.94
265.4	877	350	1221.2	5.9	0.00	1.35	234.8	177.0	117.4	137.9	234.8	4.94
265.0	900	352	1228.2	6.0	0.00	1.38	235.9	177.9	117.9	138.6	235.9	4.93
264.5	930	355	1238.7	6.2	0.00	1.42	237.6	179.3	118.8	139.7	237.6	4.93
264.0	964	358	1249.1	6.5	0.00	1.46	239.3	180.6	119.6	140.8	239.3	4.92
263.6	990	361	1259.6	6.6	0.00	1.49	241.0	181.9	120.5	141.7	241.0	4.93
263.1	1028	364	1270.1	6.9	0.00	1.54	242.6	183.2	121.3	142.8	242.6	4.92

Final volume (cm^3): 646.30 Final length (mm): 127.3 Termination criterion : Maximum deviator stress

Remarks:

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - SINGLE STAGE (CUS)

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 7
Borehole No. : D237
Depth(m) From : 3.00
To : -

Laboratory Information

Lab. sample I.D. : SL90169/4
Specimen ref. : C

Pore pressure u kPa	Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
262.7	1056	367	1280.5	7.1	0.00	1.58	244.3	184.5	122.2	143.7	244.3	4.92	
262.3	1087	369	1287.5	7.3	0.00	1.61	245.2	185.3	122.6	144.4	245.2	4.91	
261.9	1112	372	1298.0	7.4	0.00	1.64	247.0	186.6	123.5	145.4	247.0	4.91	
261.4	1146	374	1305.0	7.7	0.00	1.68	247.8	187.5	123.9	146.2	247.8	4.90	
261.0	1178	376	1311.9	7.9	0.00	1.72	248.7	188.3	124.3	146.9	248.7	4.89	
260.7	1204	378	1318.9	8.1	0.00	1.75	249.7	189.1	124.8	147.5	249.7	4.88	
260.3	1232	380	1325.9	8.2	0.00	1.78	250.6	190.0	125.3	148.2	250.6	4.87	
259.8	1264	382	1332.9	8.5	0.00	1.82	251.5	190.9	125.7	149.0	251.5	4.86	
259.4	1297	384	1339.8	8.7	0.00	1.86	252.3	191.7	126.1	149.7	252.3	4.85	
259.0	1333	386	1346.8	8.9	0.00	1.90	253.0	192.5	126.5	150.3	253.0	4.83	
258.5	1352	387	1350.3	9.0	0.00	1.92	253.4	193.2	126.7	151.0	253.4	4.81	
258.1	1384	388	1353.8	9.3	0.00	1.95	253.5	193.6	126.7	151.4	253.5	4.79	
257.6	1416	389	1357.3	9.5	0.00	1.99	253.6	194.2	126.8	151.9	253.6	4.76	
257.2	1442	390	1360.8	9.7	0.00	2.01	253.8	194.7	126.9	152.4	253.8	4.74	«
256.7	1473	390	1360.8	9.9	0.00	2.05	253.2	194.9	126.6	152.7	253.2	4.71	
256.4	1500	391	1364.3	10.0	0.00	2.08	253.4	195.3	126.7	153.1	253.4	4.69	
256.0	1557	391	1364.3	10.4	0.00	2.14	252.2	195.1	126.1	153.1	252.2	4.66	
255.6	1604	386	1346.8	10.7	0.00	2.18	247.7	193.2	123.8	152.0	247.7	4.57	
255.3	1664	387	1350.3	11.1	0.00	2.24	247.2	193.3	123.6	152.1	247.2	4.55	
255.0	1708	389	1357.3	11.4	0.00	2.29	247.8	193.9	123.9	152.6	247.8	4.54	
254.7	1756	390	1360.8	11.8	0.00	2.34	247.5	194.1	123.8	152.8	247.5	4.52	
254.4	1802	390	1360.8	12.1	0.00	2.38	246.6	193.9	123.3	152.8	246.6	4.49	
254.2	1858	390	1360.8	12.4	0.00	2.43	245.5	193.5	122.7	152.6	245.5	4.47	
253.7	1903	377	1315.4	12.7	0.00	2.48	235.4	189.0	117.7	149.8	235.4	4.30	
253.3	1957	378	1318.9	13.1	0.00	2.53	235.1	189.3	117.6	150.1	235.1	4.28	
252.9	2004	378	1318.9	13.4	0.00	2.57	234.2	189.2	117.1	150.2	234.2	4.25	
252.6	2056	379	1322.4	13.8	0.00	2.62	233.9	189.4	117.0	150.4	233.9	4.23	
252.2	2101	381	1329.4	14.1	0.00	2.66	234.4	190.0	117.2	150.9	234.4	4.22	
251.9	2155	383	1336.4	14.4	0.00	2.71	234.8	190.5	117.4	151.4	234.8	4.21	
251.7	2210	382	1332.9	14.8	0.00	2.76	233.0	189.8	116.5	151.0	233.0	4.18	

Final volume (cm³): 646.30 Final length (mm): 127.3 Termination criterion : Maximum deviator stress

Remarks:

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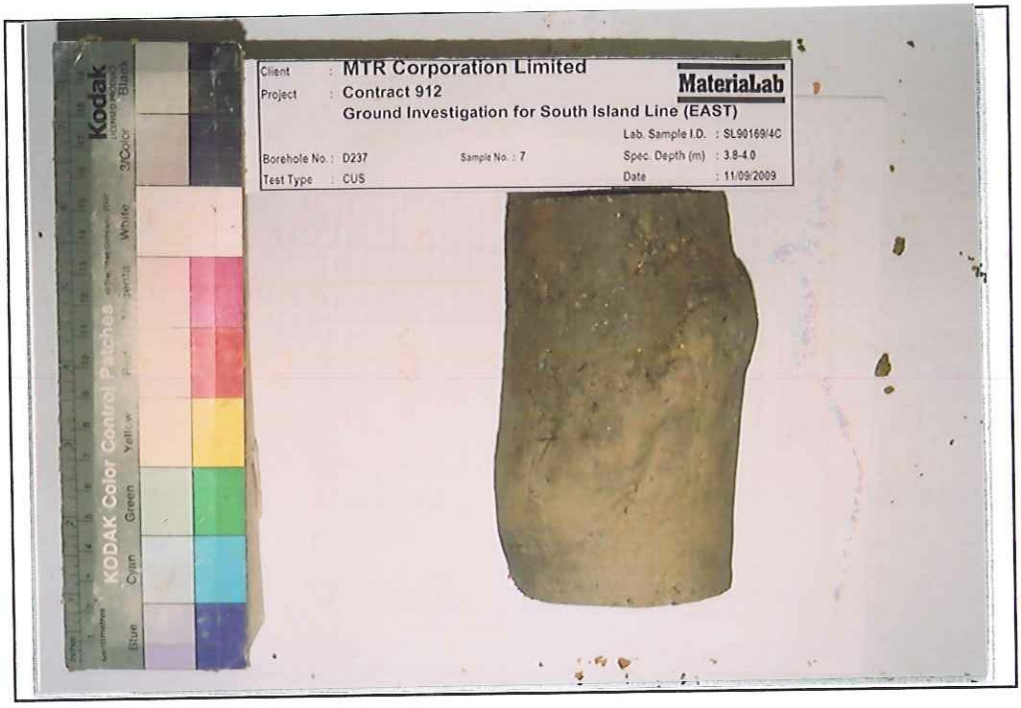
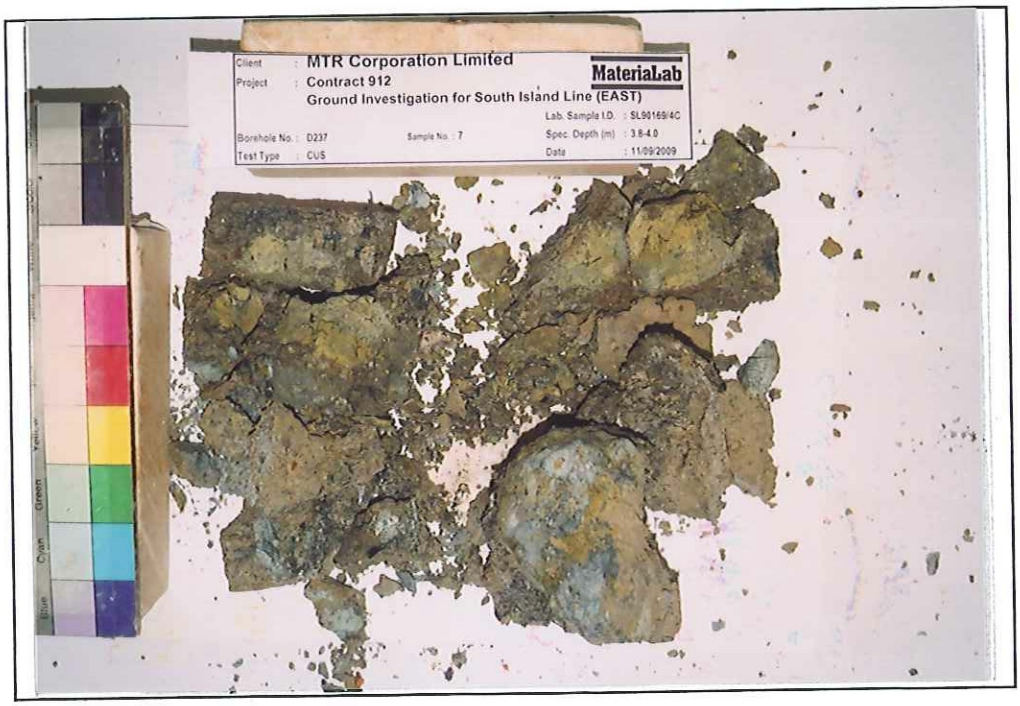
Photographic Records for Triaxial Test

Photographic Records for Triaxial Test

Photographic Records for Triaxial Test





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MateriaLab

Test Report No. : 090562SL90277(37) Page 1 of 13

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

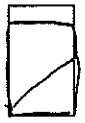
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 2.00
To : 3.00
Sample origin : FILL
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 08-01-2010
Date test(s) completed : 15-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 17.5 °C
Visual description : Moist, orangish brown mottled with yellow, slightly gravelly, sandy SILT/CLAY.

Lab. sample I.D. : SL90277/1
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 2.40
To : 2.60
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	25			50			100	
***Measurements and Calculations**		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.4	74.0	75.8	75.4	76.8		76.3	80.5
Length	mm	150.3	149.5	142.5	141.8	136.7		135.9	122.4
Volume	cm^3	653.42	642.52	642.52	632.92	632.92		622.22	622.22
Wet mass	g	1235.2	1233.7	1233.7	1224.1	1224.1		1213.4	1213.4
Dry mass	g	946.5	946.5	946.5	946.5	946.5		946.5	946.5
Moisture content	%	30.5	30.3	30.3	29.3	29.3		28.2	28.2
Bulk density	Mg/m^3	1.89	1.92	1.92	1.93	1.93		1.95	1.95
Dry density	Mg/m^3	1.45	1.47	1.47	1.50	1.50		1.52	1.52
Void ratio		0.83	0.80	0.80	0.77	0.77		0.74	0.74
Degree of saturation	%	97.5	100.6	100.6	100.7	100.7		100.7	100.7
Saturation Stage									
**Volume change of water	cm^3	9.4							
Consolidation Stage									
Side drain used		Yes			-			-	
Initial pore pressure	kPa	265.0			282.5			319.9	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm^3	10.9			9.6			10.7	
m_{vi}	m^2/MN	0.83			0.40			0.23	
t_{50}	min	1.40			9.00			17.50	
c_{vi} (from t_{50})	m^2/yr	NA			NA			NA	
t_{100}	min	10.89			29.16			38.44	
c_{vi} (from t_{100})	m^2/yr	10.26			3.98			3.10	
Sketch of failed specimen (Failure Mode)								 Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

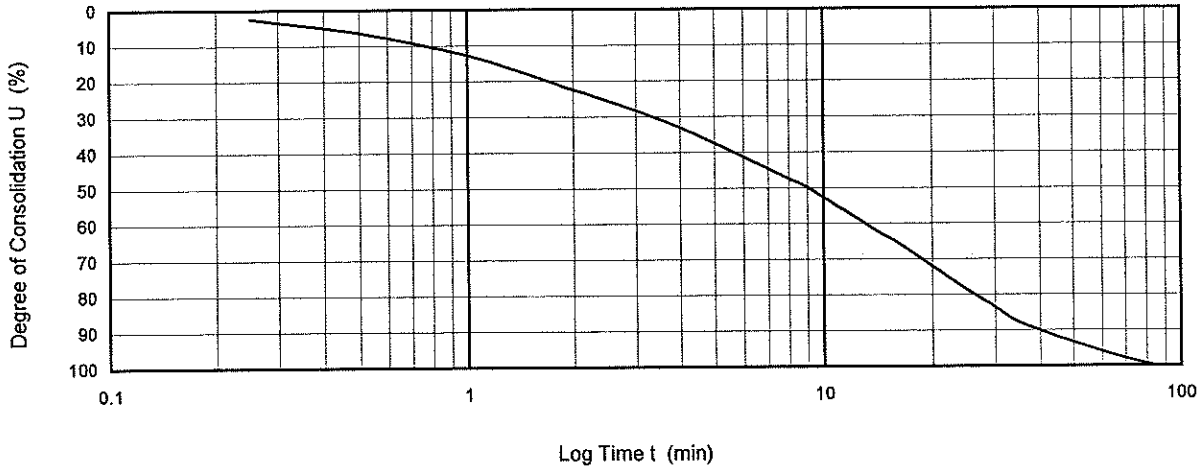
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D243
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Cell pressure	:	295 kPa	Lab. sample I.D.	:	SL90277/1
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	50 kPa			

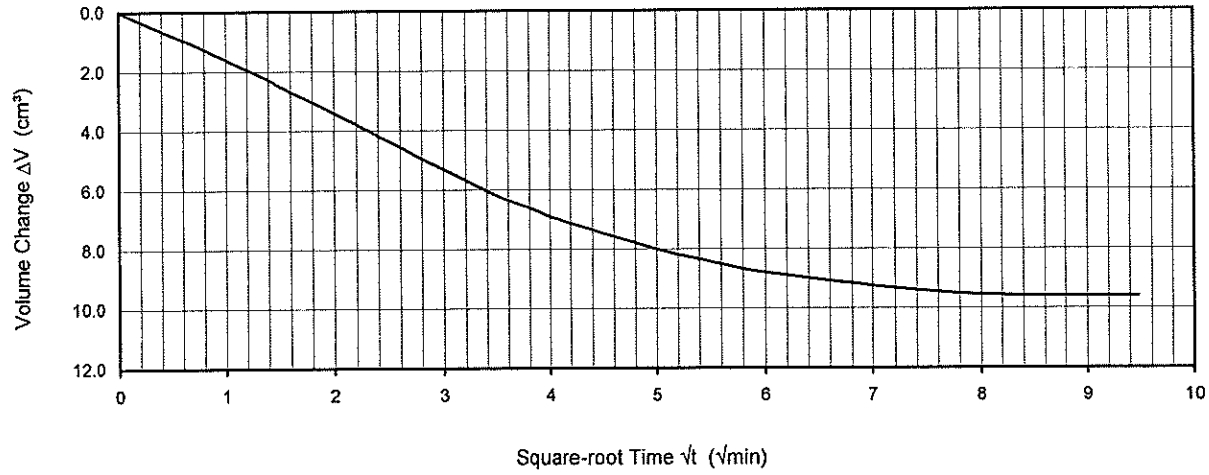
Degree of Consolidation vs. Log Time

t_{50} = 9.00 min ΔV = 9.6 cm³



Volume Change vs. Square-root Time

t_{100} = 29.16 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Date shearing commenced : 13/01/2010 Time : 01:30
Date shearing completed : 13/01/2010 Time : 03:26
Proving ring serial No. : 14571
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.780 kPa/%
Membrane thickness, σ_{mb} : 0.67 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.18

Lab. sample I.D. : SL90277/1
Specimen ref. : A
Cell pressure : 295 kPa
Back pressure : 245 kPa
Effective pressure : 50 kPa

Dimensions at starting of compression

Volume V_c : 632.92 cm^3
Area A_c : 4463.0 mm^2
Length L_c : 141.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.189	130.7	0.0	5.1	4.78	1.19	0.0	50.0	0.0	50.0	0.0	1.00	
257.3	31	0.454	314.0	0.2	5.3	4.78	1.23	35.0	55.2	17.5	49.4	35.0	1.93	
261.5	68	0.541	374.1	0.5	5.6	4.78	1.28	48.2	57.6	24.1	49.6	48.2	2.44	
262.7	90	0.583	403.2	0.6	5.7	4.78	1.31	54.6	59.6	27.3	50.5	54.6	2.69	
263.7	121	0.638	441.2	0.9	6.0	4.78	1.35	62.8	62.7	31.4	52.2	62.8	3.01	
264.1	150	0.683	472.3	1.1	6.2	4.78	1.39	69.6	65.7	34.8	54.1	69.6	3.25	
264.5	180	0.718	496.5	1.3	6.4	4.78	1.43	74.7	67.9	37.4	55.4	74.7	3.45	
264.7	210	0.746	515.9	1.5	6.6	4.78	1.47	78.8	69.7	39.4	56.6	78.8	3.60	
264.7	240	0.771	533.2	1.7	6.8	4.78	1.51	82.4	71.5	41.2	57.8	82.4	3.72	
264.5	275	0.793	548.4	1.9	7.1	4.78	1.55	85.4	73.2	42.7	59.0	85.4	3.80	
264.3	303	0.806	557.4	2.1	7.3	4.78	1.59	87.2	74.3	43.6	59.8	87.2	3.84	
264.0	335	0.819	566.4	2.4	7.5	4.78	1.63	88.9	75.5	44.5	60.6	88.9	3.87	
263.7	361	0.827	571.9	2.5	7.7	4.78	1.66	89.9	76.3	45.0	61.3	89.9	3.87	
263.4	392	0.837	578.8	2.8	7.9	4.78	1.70	91.2	77.2	45.6	62.0	91.2	3.88	
263.0	420	0.847	585.8	3.0	8.1	4.78	1.73	92.4	78.2	46.2	62.8	92.4	3.89	
262.7	450	0.858	593.4	3.2	8.3	4.78	1.77	93.8	79.2	46.9	63.6	93.8	3.90	
262.2	489	0.872	603.0	3.4	8.6	4.78	1.81	95.6	80.6	47.8	64.7	95.6	3.91	«
261.9	512	0.877	606.5	3.6	8.7	4.78	1.84	96.1	81.2	48.1	65.1	96.1	3.90	

Final volume (cm^3): 632.92 Final length (mm): 136.7 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Date shearing commenced : 14/01/2010 Time : 09:00
Date shearing completed : 14/01/2010 Time : 13:53
Proving ring serial No. : 14571
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.780 kPa/%
Membrane thickness, σ_{mb} : 0.67 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.25

Lab. sample I.D. : SL90277/1
Specimen ref. : A
Cell pressure : 345 kPa
Back pressure : 245 kPa
Effective pressure : 100 kPa

Dimensions at starting of compression
Volume V_c : 622.22 cm^3
Area A_c : 4577.8 mm^2
Length L_c : 135.9 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.228	157.7	0.0	9.1	4.78	1.90	0.0	100.0	0.0	100.0	0.0	1.00
268.8	36	0.737	509.7	0.3	9.3	4.78	1.94	70.0	111.2	35.0	99.5	70.0	1.92
275.4	62	0.837	578.8	0.5	9.5	4.78	1.97	84.8	112.0	42.4	97.9	84.8	2.22
279.6	91	0.924	639.0	0.7	9.7	4.78	2.00	97.7	114.2	48.8	98.0	97.7	2.49
282.3	120	0.994	687.4	0.9	9.9	4.78	2.04	107.9	116.6	53.9	98.7	107.9	2.72
284.5	154	1.069	739.3	1.1	10.2	4.78	2.07	118.8	119.9	59.4	100.1	118.8	2.96
285.7	184	1.119	773.9	1.4	10.4	4.78	2.11	125.9	122.2	62.9	101.3	125.9	3.12
286.7	219	1.173	811.2	1.6	10.7	4.78	2.15	133.5	125.1	66.8	102.8	133.5	3.29
287.0	240	1.195	826.4	1.8	10.8	4.78	2.17	136.6	126.3	68.3	103.5	136.6	3.35
287.2	273	1.229	849.9	2.0	11.1	4.78	2.21	141.2	128.4	70.6	104.9	141.2	3.44
287.3	305	1.258	870.0	2.2	11.3	4.78	2.24	145.1	130.2	72.5	106.1	145.1	3.51
287.4	330	1.276	882.4	2.4	11.5	4.78	2.27	147.4	131.3	73.7	106.7	147.4	3.56
287.0	366	1.286	889.3	2.7	11.8	4.78	2.31	148.4	132.2	74.2	107.5	148.4	3.56
286.6	390	1.306	903.2	2.9	11.9	4.78	2.33	151.1	133.9	75.5	108.8	151.1	3.59
286.3	422	1.323	914.9	3.1	12.2	4.78	2.37	153.1	135.3	76.6	109.7	153.1	3.61
286.1	454	1.338	925.3	3.3	12.4	4.78	2.40	154.9	136.4	77.5	110.5	154.9	3.63
285.8	483	1.346	930.8	3.6	12.6	4.78	2.43	155.7	137.0	77.8	111.1	155.7	3.63
285.4	515	1.353	935.7	3.8	12.8	4.78	2.46	156.3	137.7	78.1	111.7	156.3	3.62
285.1	541	1.361	941.2	4.0	13.0	4.78	2.49	157.1	138.4	78.5	112.3	157.1	3.62
284.7	573	1.365	944.0	4.2	13.3	4.78	2.52	157.2	138.9	78.6	112.7	157.2	3.61
284.4	603	1.368	946.1	4.4	13.5	4.78	2.55	157.2	139.2	78.6	113.0	157.2	3.59
284.1	633	1.371	948.1	4.7	13.7	4.78	2.58	157.3	139.5	78.6	113.3	157.3	3.58
283.8	661	1.374	950.2	4.9	13.9	4.78	2.61	157.3	139.9	78.7	113.6	157.3	3.57
283.4	694	1.377	952.3	5.1	14.2	4.78	2.64	157.3	140.2	78.6	114.0	157.3	3.55
283.0	722	1.379	953.7	5.3	14.4	4.78	2.67	157.2	140.6	78.6	114.4	157.2	3.54
282.7	755	1.382	955.7	5.6	14.6	4.78	2.70	157.2	140.9	78.6	114.7	157.2	3.52
282.2	783	1.384	957.1	5.8	14.8	4.78	2.73	157.1	141.3	78.5	115.2	157.1	3.50
281.8	810	1.386	958.5	6.0	15.0	4.78	2.76	157.0	141.7	78.5	115.5	157.0	3.48
281.3	841	1.387	959.2	6.2	15.2	4.78	2.79	156.7	142.0	78.3	115.9	156.7	3.46
280.9	874	1.387	959.2	6.4	15.5	4.78	2.82	156.2	142.2	78.1	116.2	156.2	3.44
280.5	901	1.386	958.5	6.6	15.7	4.78	2.84	155.7	142.4	77.9	116.4	155.7	3.41
280.0	952	1.386	958.5	7.0	16.1	4.78	2.89	155.0	142.5	77.5	116.7	155.0	3.38
279.4	1003	1.385	957.8	7.4	16.4	4.78	2.94	154.2	142.7	77.1	117.0	154.2	3.35
278.7	1056	1.384	957.1	7.8	16.8	4.78	2.99	153.3	142.9	76.6	117.4	153.3	3.31

Final volume (cm^3): 622.22 Final length (mm): 122.4 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90277/1
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
277.5	1101	1.382	955.7	8.1	17.2	4.78	3.03	152.4	143.7	76.2	118.3	152.4	3.26
276.4	1152	1.381	955.0	8.5	17.5	4.78	3.08	151.6	144.4	75.8	119.1	151.6	3.21
275.3	1200	1.381	955.0	8.8	17.9	4.78	3.13	150.9	145.1	75.4	120.0	150.9	3.16
274.2	1255	1.381	955.0	9.2	18.3	4.78	3.18	150.1	145.9	75.1	120.8	150.1	3.12
273.4	1303	1.381	955.0	9.6	18.6	4.78	3.23	149.5	146.3	74.7	121.4	149.5	3.09
272.5	1354	1.380	954.4	10.0	19.0	4.78	3.27	148.6	146.8	74.3	122.0	148.6	3.05

Final volume (cm^3): 622.22 Final length (mm): 122.4 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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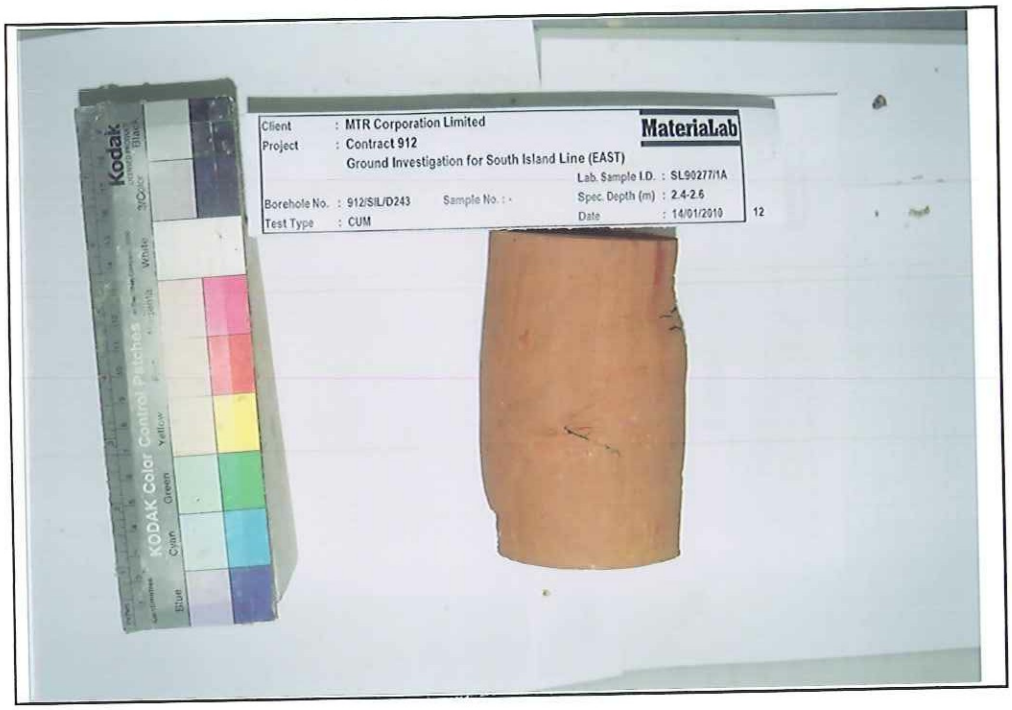
Photographic Records for Triaxial Test



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MateriaLab

HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 4.50
To : 5.50
Sample origin : CDT
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 09-01-2010
Date test(s) completed : 14-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 18.0 °C
Visual description : Moist, orangish brown mottled with white and yellow, slightly gravelly, sandy SILT/CLAY with some tree roots.

Lab. sample I.D. : SL90277/2
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 4.90
To : 5.10
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	50			100			200	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.6	74.1	75.2	74.9	76.4		76.0	80.2
Length	mm	150.3	149.3	144.7	143.9	138.2		137.6	123.5
Volume	cm³	656.94	643.44	643.44	633.44	633.44		623.94	623.94
Wet mass	g	1221.5	1227.4	1227.4	1217.4	1217.4		1207.9	1207.9
Dry mass	g	933.8	933.8	933.8	933.8	933.8		933.8	933.8
Moisture content	%	30.8	31.4	31.4	30.4	30.4		29.4	29.4
Bulk density	Mg/m³	1.86	1.91	1.91	1.92	1.92		1.94	1.94
Dry density	Mg/m³	1.42	1.45	1.45	1.47	1.47		1.50	1.50
Void ratio		0.86	0.83	0.83	0.80	0.80		0.77	0.77
Degree of saturation	%	94.5	100.9	100.9	100.9	100.9		100.9	100.9
Saturation Stage									
**Volume change of water	cm³	19.4							
Consolidation Stage									
Side drain used		Yes			-			-	
Initial pore pressure	kPa	289.9			311.9			375.7	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	13.5			10.0			9.5	
m_{vi}	m²/MN	0.46			0.23			0.11	
t_{50}	min	3.10			13.00			17.00	
c_{vi} (from t_{50})	m²/yr	NA			NA			NA	
t_{100}	min	17.64			36.00			49.00	
c_{vi} (from t_{100})	m²/yr	6.39			3.19			2.41	
Sketch of failed specimen (Failure Mode)								Plastic	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : Y.K. Chan

Certified by : ~~Paul Richard Cooper (Operations Manager—CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

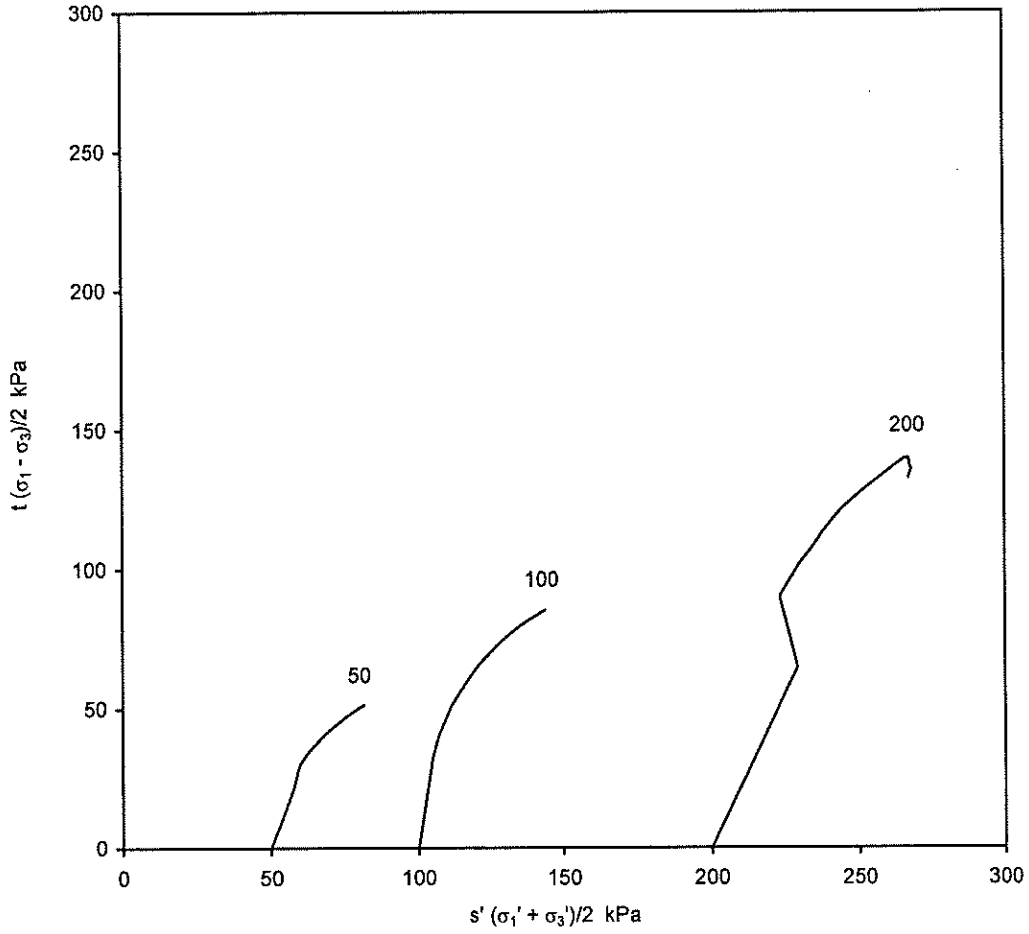
Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 4.50
To : 5.50

Laboratory Information

Lab. sample I.D. : SL90277/2
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	50	2.8	2.8	265.5	100.9	79.9	50.4
2	100	3.8	7.3	286.9	169.0	142.6	84.5
3	200	4.9	12.7	317.8	279.0	266.7	139.5



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

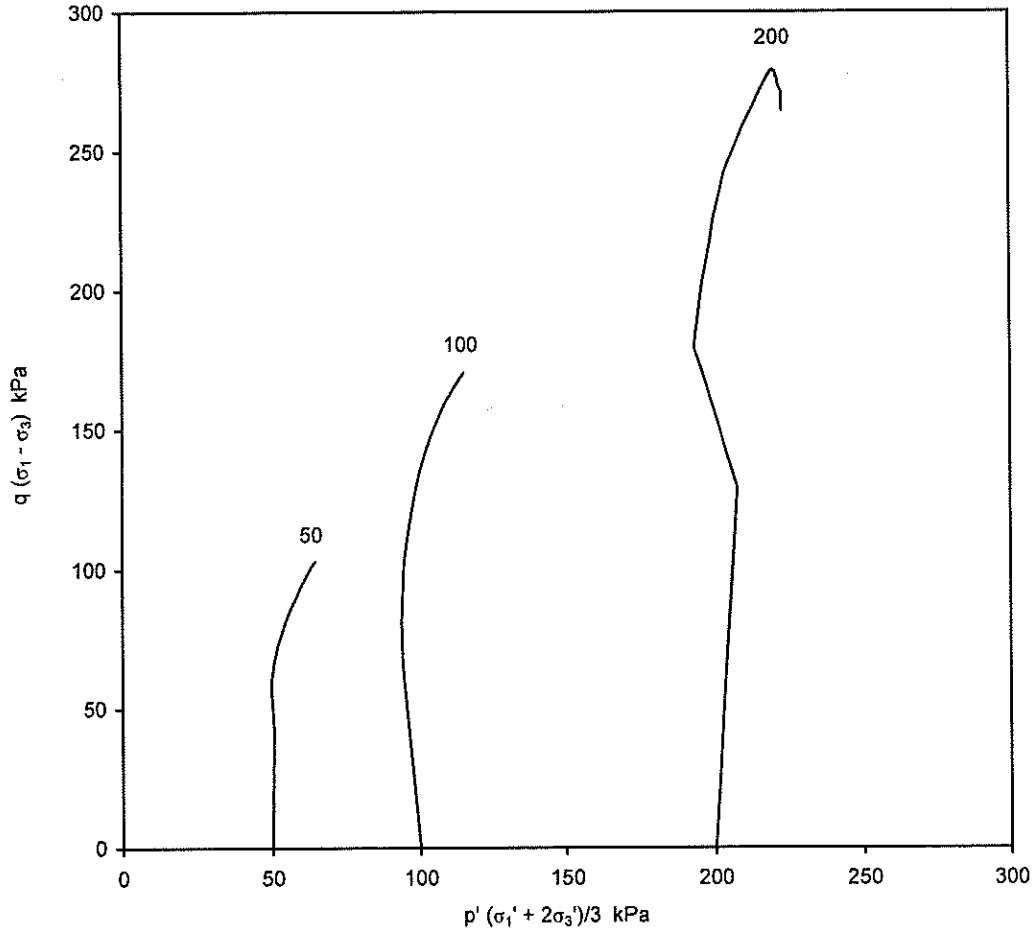
Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 4.50
To : 5.50

Laboratory Information

Lab. sample I.D. : SL90277/2
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	50	2.8	2.8	265.5	100.9	63.1	100.9
2	100	3.8	7.3	286.9	169.0	114.4	169.0
3	200	4.9	12.7	317.8	279.0	220.2	279.0



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

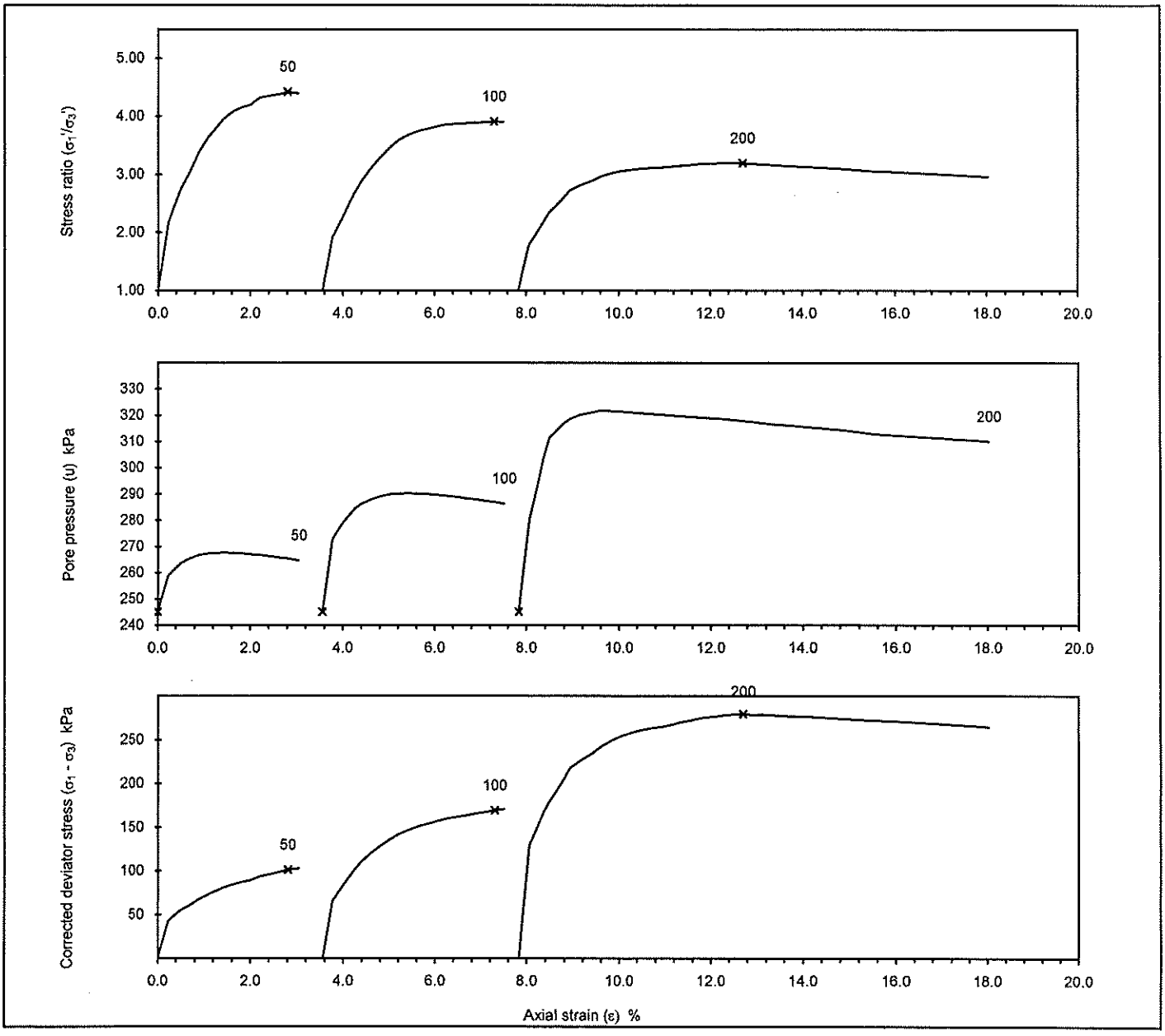
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D243
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	4.50
			To	:	5.50

Laboratory Information

Lab. sample I.D.	:	SL90277/2
Specimen ref.	:	A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 4.50
To : 5.50

Laboratory Information

Lab. sample I.D. : SL90277/2
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	50	
	Stage 2	kPa	100	
	Stage 3	kPa	200	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			125	120
			150	145
			175	170
			200	195
			225	220
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		1.00
Volume change	cm^3	19.4

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1205.3
Final moisture content	%	29.1
Final bulk density	Mg/m^3	1.93

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

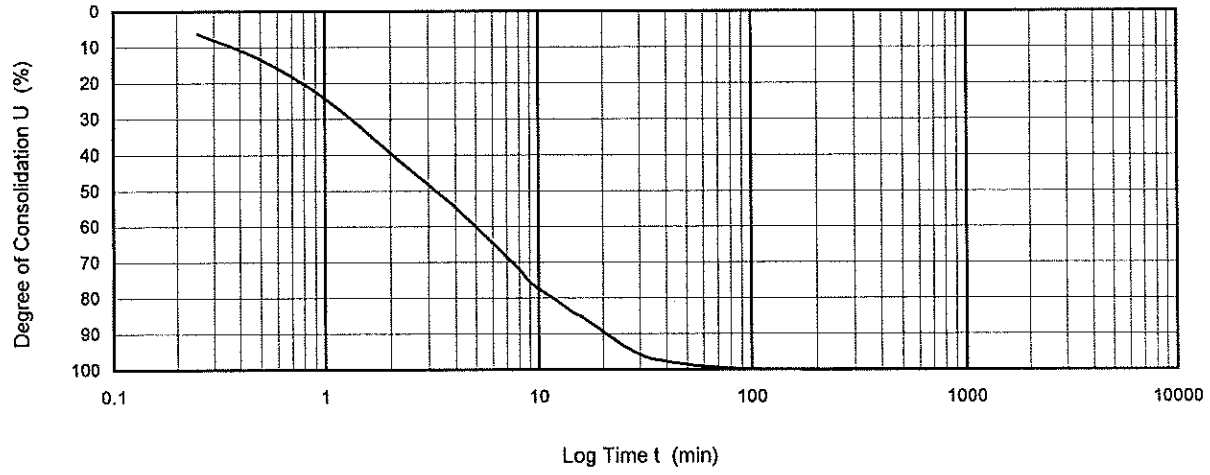
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912 Ground Investigation for South Island Line (EAST)	Borehole No.	:	912/SIL/D243
			Depth(m) From	:	4.50
			To	:	5.50

Laboratory Information

Cell pressure	:	295 kPa	Lab. sample I.D.	:	SL90277/2
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	50 kPa			

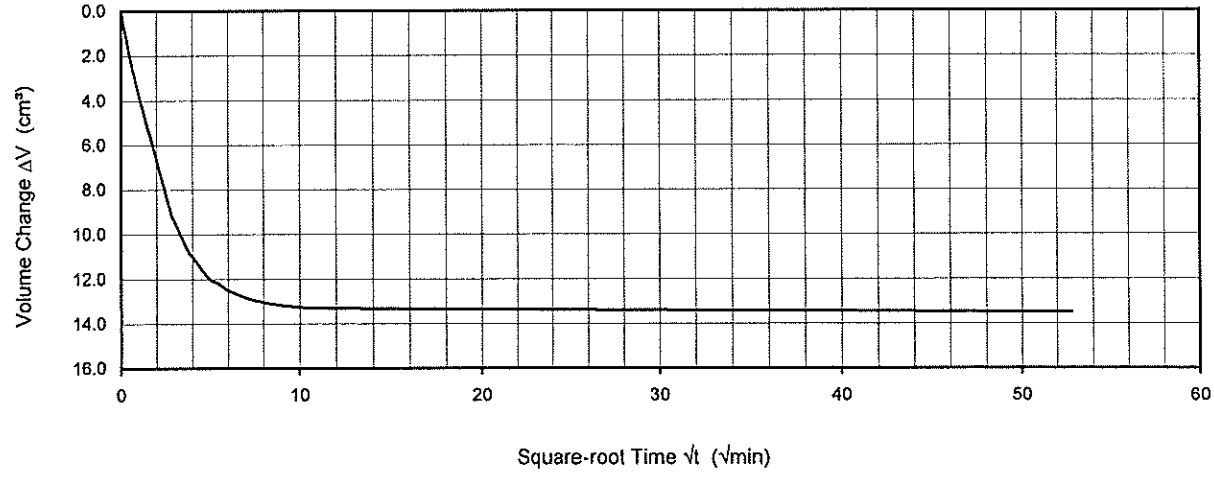
Degree of Consolidation vs. Log Time

t_{50} = 3.10 min ΔV = 13.5 cm³



Volume Change vs. Square-root Time

t_{100} = 17.64 min



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CONSOLIDATION STAGE

Information supplied by Client

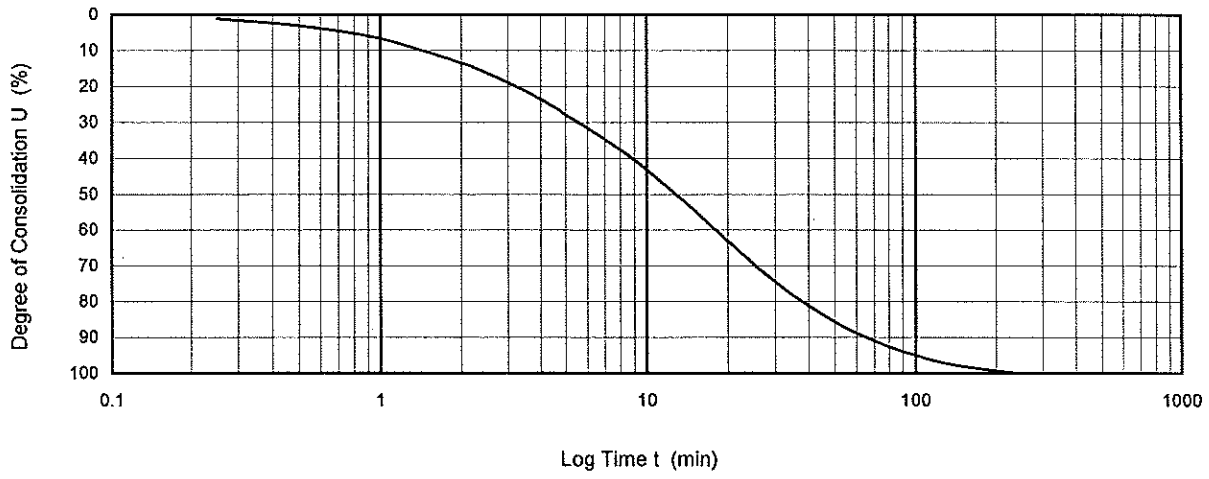
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D243
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	4.50
			To	:	5.50

Laboratory Information

Cell pressure	:	345 kPa	Lab. sample I.D.	:	SL90277/2
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	100 kPa			

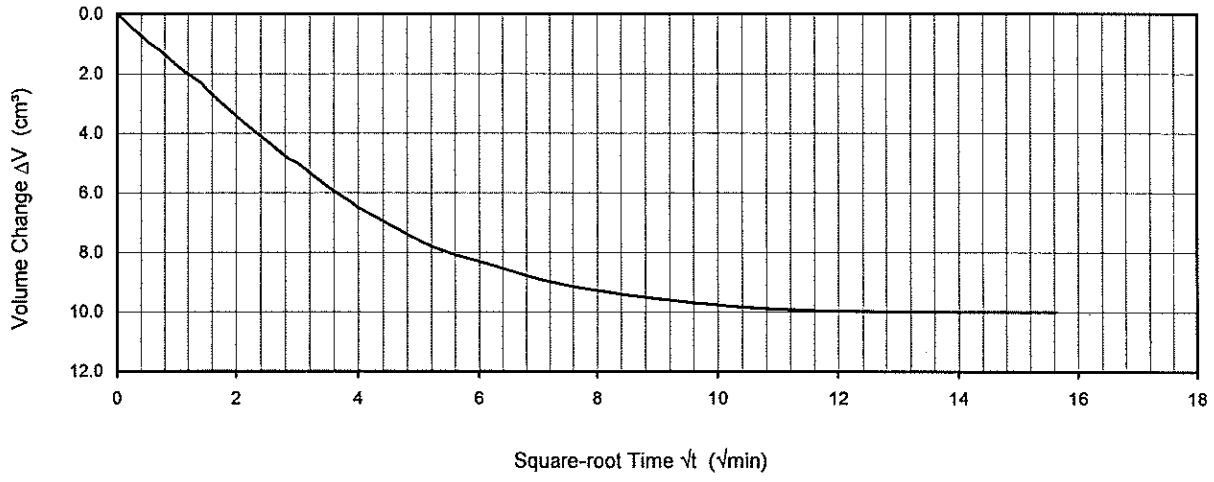
Degree of Consolidation vs. Log Time

t_{50} = 13.00 min ΔV = 10.0 cm³



Volume Change vs. Square-root Time

t_{100} = 36.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

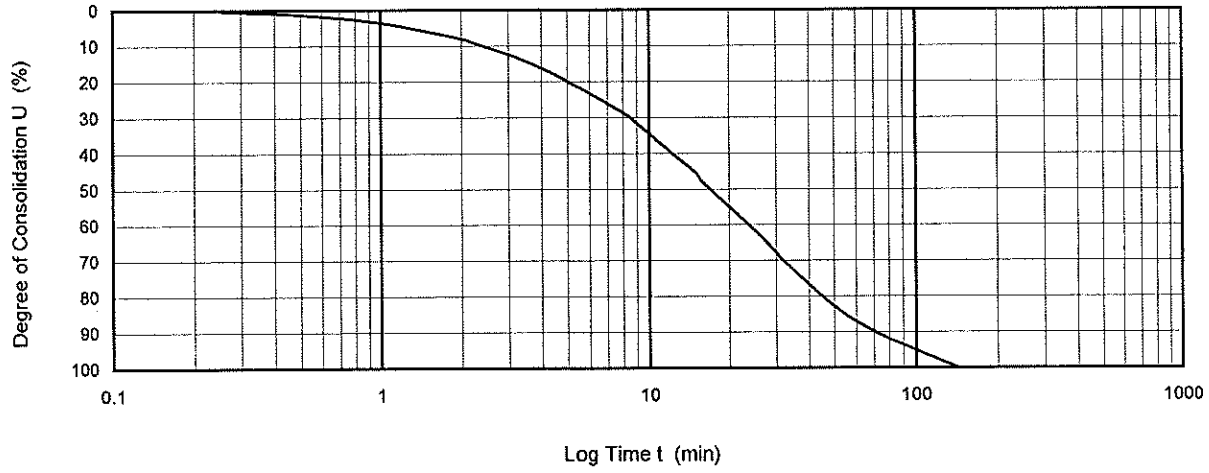
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D243
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	4.50
			To	:	5.50

Laboratory Information

Cell pressure	:	445 kPa	Lab. sample I.D.	:	SL90277/2
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	200 kPa			

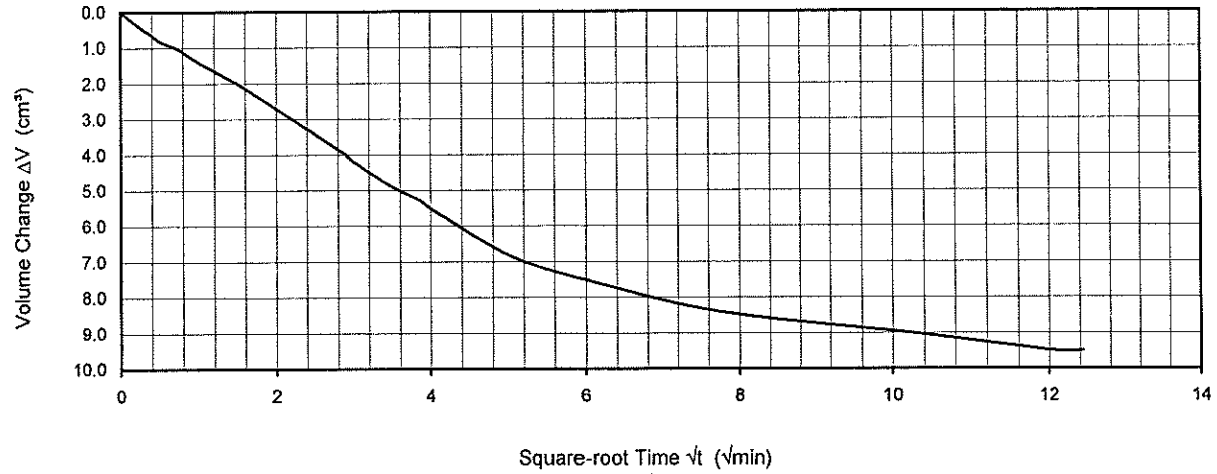
Degree of Consolidation vs. Log Time

t_{50} = 17.00 min ΔV = 9.5 cm³



Volume Change vs. Square-root Time

t_{100} = 49.00 min



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MateriaLab

HKAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 4.50
To : 5.50

Laboratory Information

Date shearing commenced : 11/01/2010 Time : 09:00
Date shearing completed : 11/01/2010 Time : 22:58
Proving ring serial No. : 12540
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.770 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.20

Lab. sample I.D. : SL90277/2
Specimen ref. : A
Cell pressure : 295 kPa
Back pressure : 245 kPa
Effective pressure : 50 kPa

Dimensions at starting of compression

Volume V_c : 643.44 cm^3
Area A_c : 4310.8 mm^2
Length L_c : 149.3 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	183	132.8	0.0	0.0	0.00	0.00	0.0	50.0	0.0	50.0	0.0	1.00	
258.7	34	443	318.9	0.2	0.2	0.54	0.06	42.5	57.5	21.2	50.5	42.5	2.17	
263.6	74	524	376.4	0.5	0.5	1.18	0.13	54.9	58.9	27.5	49.7	54.9	2.75	
265.3	100	562	399.6	0.7	0.7	1.60	0.17	59.7	59.5	29.8	49.6	59.7	3.01	
266.7	131	612	435.1	0.9	0.9	2.09	0.22	67.2	61.9	33.6	50.7	67.2	3.37	
267.4	164	653	464.3	1.1	1.1	2.62	0.27	73.1	64.2	36.6	52.0	73.1	3.65	
267.5	187	678	482.0	1.3	1.3	2.99	0.31	76.7	65.8	38.3	53.1	76.7	3.79	
267.7	210	703	499.8	1.4	1.4	3.36	0.35	80.2	67.4	40.1	54.0	80.2	3.94	
267.6	245	735	522.6	1.6	1.6	3.91	0.40	84.6	69.7	42.3	55.6	84.6	4.09	
267.4	270	753	535.4	1.8	1.8	4.31	0.44	86.9	71.1	43.5	56.6	86.9	4.15	
267.1	300	771	548.2	2.0	2.0	4.77	0.49	89.2	72.5	44.6	57.6	89.2	4.20	
266.8	330	800	568.8	2.2	2.2	4.77	0.53	93.6	75.0	46.8	59.4	93.6	4.32	
266.2	371	822	584.4	2.5	2.5	4.77	0.59	96.8	77.2	48.4	61.1	96.8	4.36	
265.8	394	835	593.7	2.6	2.6	4.77	0.63	98.7	78.5	49.3	62.1	98.7	4.38	
265.5	420	850	604.3	2.8	2.8	4.77	0.66	100.9	79.9	50.4	63.1	100.9	4.42	«
264.7	456	864	614.3	3.1	3.1	4.77	0.72	102.8	81.7	51.4	64.6	102.8	4.39	

Final volume (cm^3): 643.44 Final length (mm): 144.7 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 4.50
To : 5.50

Laboratory Information

Date shearing commenced : 12/01/2010 Time : 03:30
Date shearing completed : 12/01/2010 Time : 06:09
Proving ring serial No. : 12540
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.770 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.25

Lab. sample I.D. : SL90277/2
Specimen ref. : A
Cell pressure : 345 kPa
Back pressure : 245 kPa
Effective pressure : 100 kPa

Dimensions at starting of compression

Volume V_c : 633.44 cm^3
Area A_c : 4400.4 mm^2
Length L_c : 143.9 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	217	157.5	0.0	3.6	4.77	0.82	0.0	100.0	0.0	100.0	0.0	1.00	
272.7	30	662	470.7	0.2	3.8	4.77	0.87	65.4	105.0	32.7	94.1	65.4	1.90	
278.5	60	764	543.2	0.4	4.0	4.77	0.91	81.6	107.3	40.8	93.7	81.6	2.23	
284.5	101	896	637.0	0.7	4.3	4.77	0.97	102.5	111.7	51.2	94.7	102.5	2.69	
286.1	120	946	672.6	0.8	4.4	4.77	0.99	110.3	114.1	55.2	95.7	110.3	2.87	
287.8	150	1008	716.7	1.0	4.6	4.77	1.03	119.9	117.2	60.0	97.2	119.9	3.10	
289.0	180	1062	755.1	1.3	4.8	4.77	1.07	128.2	120.1	64.1	98.7	128.2	3.29	
289.8	210	1110	789.2	1.5	5.0	4.77	1.11	135.6	123.0	67.8	100.4	135.6	3.46	
290.2	240	1153	819.8	1.7	5.2	4.77	1.15	142.1	125.8	71.0	102.2	142.1	3.59	
290.3	270	1184	841.8	1.9	5.4	4.77	1.19	146.6	128.0	73.3	103.6	146.6	3.68	
290.1	305	1214	863.1	2.1	5.7	4.77	1.24	150.9	130.4	75.5	105.2	150.9	3.75	
289.8	340	1239	880.9	2.4	5.9	4.77	1.28	154.5	132.4	77.2	106.7	154.5	3.80	
289.6	360	1253	890.9	2.5	6.1	4.77	1.31	156.4	133.6	78.2	107.5	156.4	3.82	
289.2	390	1276	907.2	2.7	6.3	4.77	1.34	159.6	135.6	79.8	109.0	159.6	3.86	
288.8	420	1289	916.5	2.9	6.5	4.77	1.38	161.3	136.8	80.6	110.0	161.3	3.87	
288.3	450	1304	927.1	3.1	6.7	4.77	1.42	163.2	138.3	81.6	111.1	163.2	3.88	
287.9	480	1319	937.8	3.3	6.9	4.77	1.45	165.2	139.7	82.6	112.2	165.2	3.89	
287.3	510	1334	948.5	3.5	7.1	4.77	1.49	167.1	141.3	83.6	113.4	167.1	3.90	
286.9	540	1349	959.1	3.8	7.3	4.77	1.52	169.0	142.6	84.5	114.4	169.0	3.91	«
286.3	570	1361	967.7	4.0	7.5	4.77	1.56	170.5	143.9	85.2	115.5	170.5	3.90	

Final volume (cm^3): 633.44 Final length (mm): 138.2 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 4.50
To : 5.50

Laboratory Information

Date shearing commenced : 13/01/2010 Time : 09:00
Date shearing completed : 13/01/2010 Time : 13:54
Proving ring serial No. : 12412
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.770 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.26

Lab. sample I.D. : SL90277/2
Specimen ref. : A
Cell pressure : 445 kPa
Back pressure : 245 kPa
Effective pressure : 200 kPa
Dimensions at starting of compression
Volume V_c : 623.94 cm^3
Area A_c : 4535.9 mm^2
Length L_c : 137.6 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	49	175.5	0.0	7.8	4.77	1.61	0.0	200.0	0.0	200.0	0.0	1.00	
280.3	30	221	791.4	0.2	8.1	4.77	1.65	129.1	229.2	64.5	207.7	129.1	1.78	
303.6	73	270	966.8	0.5	8.4	4.77	1.70	167.1	224.9	83.5	197.1	167.1	2.18	
311.4	90	286	1024.1	0.7	8.5	4.77	1.72	179.4	223.3	89.7	193.4	179.4	2.34	
316.4	128	316	1131.5	0.9	8.8	4.77	1.76	202.3	229.7	101.1	196.0	202.3	2.57	
318.6	150	336	1203.2	1.1	8.9	4.77	1.79	217.5	235.2	108.8	198.9	217.5	2.72	
320.2	180	347	1242.5	1.3	9.2	4.77	1.82	225.6	237.6	112.8	200.0	225.6	2.81	
321.0	214	358	1281.9	1.6	9.4	4.77	1.86	233.5	240.8	116.8	201.8	233.5	2.88	
321.9	244	370	1324.9	1.8	9.6	4.77	1.89	242.3	244.2	121.1	203.9	242.3	2.97	
321.6	276	380	1360.7	2.0	9.9	4.77	1.93	249.4	248.1	124.7	206.5	249.4	3.02	
321.4	304	387	1385.8	2.2	10.1	4.77	1.96	254.2	250.7	127.1	208.3	254.2	3.06	
321.1	332	392	1403.7	2.4	10.3	4.77	1.99	257.5	252.6	128.7	209.7	257.5	3.08	
320.8	364	397	1421.6	2.6	10.5	4.77	2.02	260.7	254.5	130.3	211.1	260.7	3.10	
320.5	396	401	1435.9	2.9	10.7	4.77	2.05	263.1	256.0	131.5	212.2	263.1	3.11	
320.2	428	404	1446.6	3.1	11.0	4.77	2.09	264.7	257.1	132.3	213.0	264.7	3.12	
319.9	457	408	1461.0	3.3	11.2	4.77	2.12	267.1	258.7	133.6	214.1	267.1	3.14	
319.7	480	412	1475.3	3.5	11.3	4.77	2.14	269.7	260.1	134.8	215.2	269.7	3.15	
319.4	512	416	1489.6	3.7	11.6	4.77	2.17	272.0	261.6	136.0	216.3	272.0	3.17	
319.1	546	421	1507.5	4.0	11.8	4.77	2.21	275.0	263.4	137.5	217.6	275.0	3.18	
318.8	588	424	1518.3	4.3	12.1	4.77	2.25	276.4	264.4	138.2	218.3	276.4	3.19	
318.5	612	427	1529.0	4.4	12.3	4.77	2.27	278.1	265.5	139.0	219.2	278.1	3.20	
318.1	644	429	1536.2	4.7	12.5	4.77	2.30	278.9	266.3	139.4	219.9	278.9	3.20	
317.8	670	430	1539.7	4.9	12.7	4.77	2.33	279.0	266.7	139.5	220.2	279.0	3.19	«
317.4	698	430	1539.7	5.1	12.9	4.77	2.35	278.4	266.8	139.2	220.4	278.4	3.18	
317.0	720	431	1543.3	5.2	13.1	4.77	2.38	278.6	267.3	139.3	220.9	278.6	3.18	
316.5	756	431	1543.3	5.5	13.3	4.77	2.41	277.8	267.4	138.9	221.1	277.8	3.16	
316.1	804	431	1543.3	5.8	13.7	4.77	2.46	276.7	267.3	138.4	221.1	276.7	3.15	
315.5	853	432	1546.9	6.2	14.0	4.77	2.50	276.3	267.7	138.2	221.6	276.3	3.13	
315.0	902	432	1546.9	6.6	14.4	4.77	2.55	275.2	267.6	137.6	221.7	275.2	3.12	
314.4	956	432	1546.9	6.9	14.8	4.77	2.60	274.0	267.6	137.0	221.9	274.0	3.10	
313.6	1008	432	1546.9	7.3	15.2	4.77	2.64	272.8	267.8	136.4	222.3	272.8	3.08	
312.8	1055	432	1546.9	7.7	15.5	4.77	2.69	271.7	268.1	135.9	222.8	271.7	3.06	
312.4	1102	433	1550.5	8.0	15.9	4.77	2.73	271.4	268.3	135.7	223.1	271.4	3.05	
312.0	1156	433	1550.5	8.4	16.2	4.77	2.78	270.1	268.1	135.1	223.0	270.1	3.03	

Final volume (cm^3): 623.94 Final length (mm): 123.5 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D243
Depth(m) From : 4.50
To : 5.50

Laboratory Information

Lab. sample I.D. : SL90277/2
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
311.6	1203	433	1550.5	8.7	16.6	4.77	2.82	269.0	267.9	134.5	223.1	269.0	3.02
311.3	1255	433	1550.5	9.1	17.0	4.77	2.87	267.8	267.6	133.9	223.0	267.8	3.00
310.8	1300	433	1550.5	9.5	17.3	4.77	2.91	266.8	267.6	133.4	223.1	266.8	2.99
310.5	1357	433	1550.5	9.9	17.7	4.77	2.96	265.5	267.3	132.8	223.0	265.5	2.97
310.0	1402	433	1550.5	10.2	18.0	4.77	3.00	264.5	267.2	132.2	223.2	264.5	2.96

Final volume (cm^3): 623.94 Final length (mm): 123.5 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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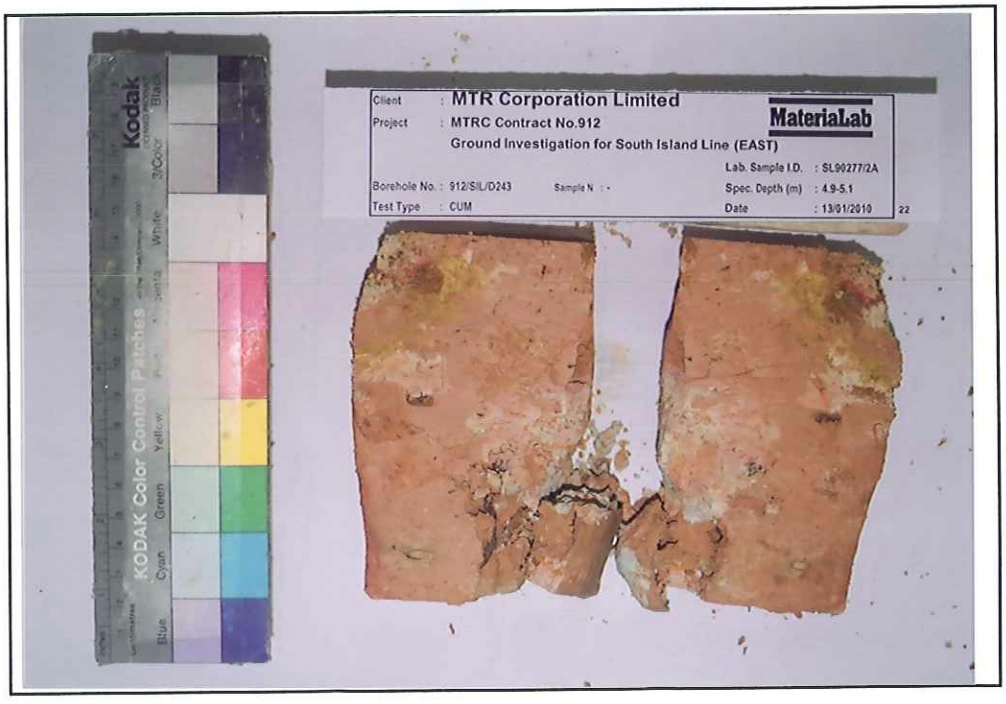
Photographic Records for Triaxial Test



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SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D244
Depth(m) From : 2.00
To : 2.90
Sample origin : HDT
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 09-01-2010
Date test(s) completed : 12-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 23.5 °C Minimum : 18.0 °C
Visual description : Moist, dark brownish grey, mottled with brown, slightly gravelly, sandy SILT/CLAY.

Lab. sample I.D. : SL90277/4
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 2.40
To : 2.60
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	20			40			80	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.8	74.7	75.0	74.9	75.3		75.2	80.2
Length	mm	150.2	150.0	148.8	148.7	147.1		147.0	129.5
Volume	cm³	660.03	657.73	657.73	655.53	655.53		653.43	653.43
Wet mass	g	1252.1	1280.8	1280.8	1278.6	1278.6		1276.5	1276.5
Dry mass	g	1002.1	1002.1	1002.1	1002.1	1002.1		1002.1	1002.1
Moisture content	%	24.9	27.8	27.8	27.6	27.6		27.4	27.4
Bulk density	Mg/m³	1.90	1.95	1.95	1.95	1.95		1.95	1.95
Dry density	Mg/m³	1.52	1.52	1.52	1.53	1.53		1.53	1.53
Void ratio		0.75	0.74	0.74	0.73	0.73		0.73	0.73
Degree of saturation	%	88.7	99.7	99.7	99.7	99.7		99.7	99.7
Saturation Stage									
**Volume change of water	cm³	31.0							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	260.0			270.8			283.6	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	2.3			2.2			2.1	
m_{vi}	m²/MN	0.23			0.13			0.08	
t_{50}	min	1.70			1.30			1.00	
c_{vi} (from t_{50})	m²/yr	2651.04			3403.73			4324.77	
t_{100}	min	4.84			4.33			4.20	
c_{vi} (from t_{100})	m²/yr	1889.99			2124.78			2208.50	
Sketch of failed specimen (Failure Mode)								Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : Y.K. Chan

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HKAS HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

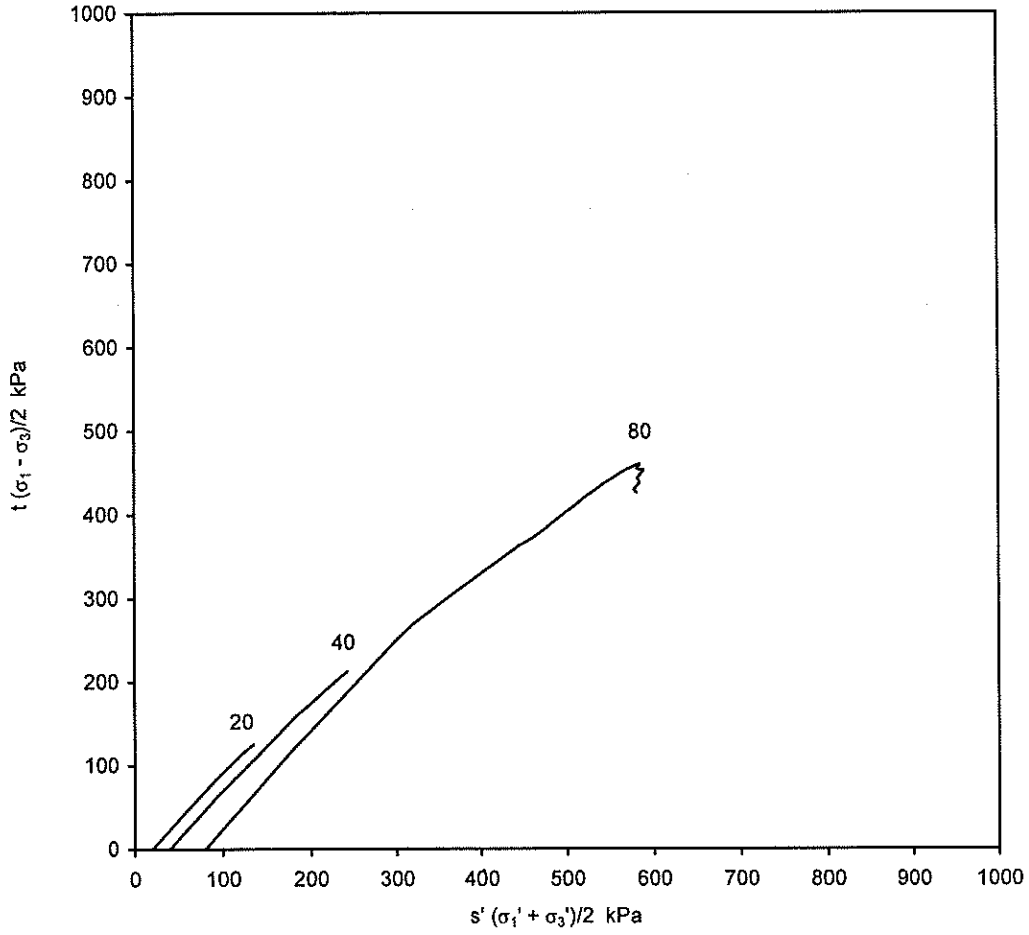
Client sample No. : -
Borehole No. : 912/SIL/D244
Depth(m) From : 2.00
To : 2.90

Laboratory Information

Lab. sample I.D. : SL90277/4
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	20	0.6	0.6	257.1	226.8	121.3	113.4
2	40	1.0	1.9	255.5	417.0	238.0	208.5
3	80	6.8	8.8	199.8	919.2	584.8	459.6



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

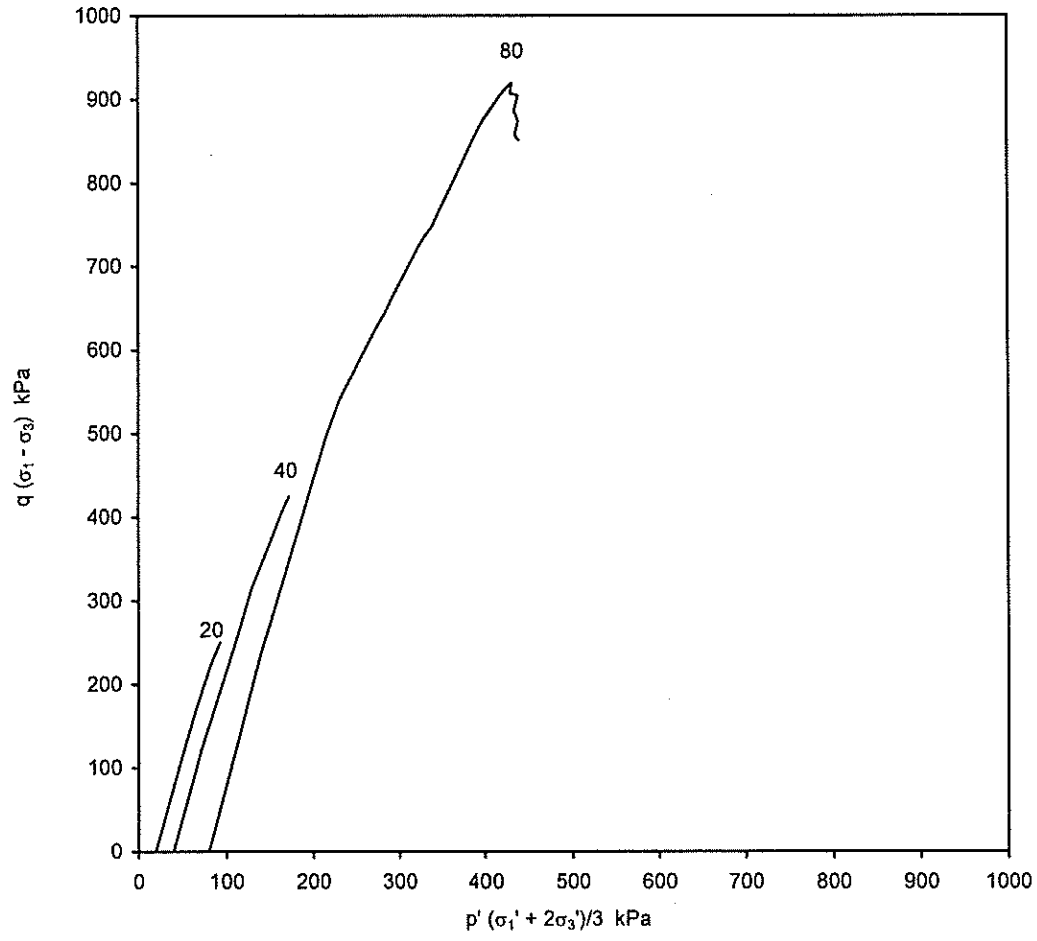
Client sample No. : -
Borehole No. : 912/SIL/D244
Depth(m) From : 2.00
To : 2.90

Laboratory Information

Lab. sample I.D. : SL90277/4
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	20	0.6	0.6	257.1	226.8	83.5	226.8
2	40	1.0	1.9	255.5	417.0	168.5	417.0
3	80	6.8	8.8	199.8	919.2	431.6	919.2



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

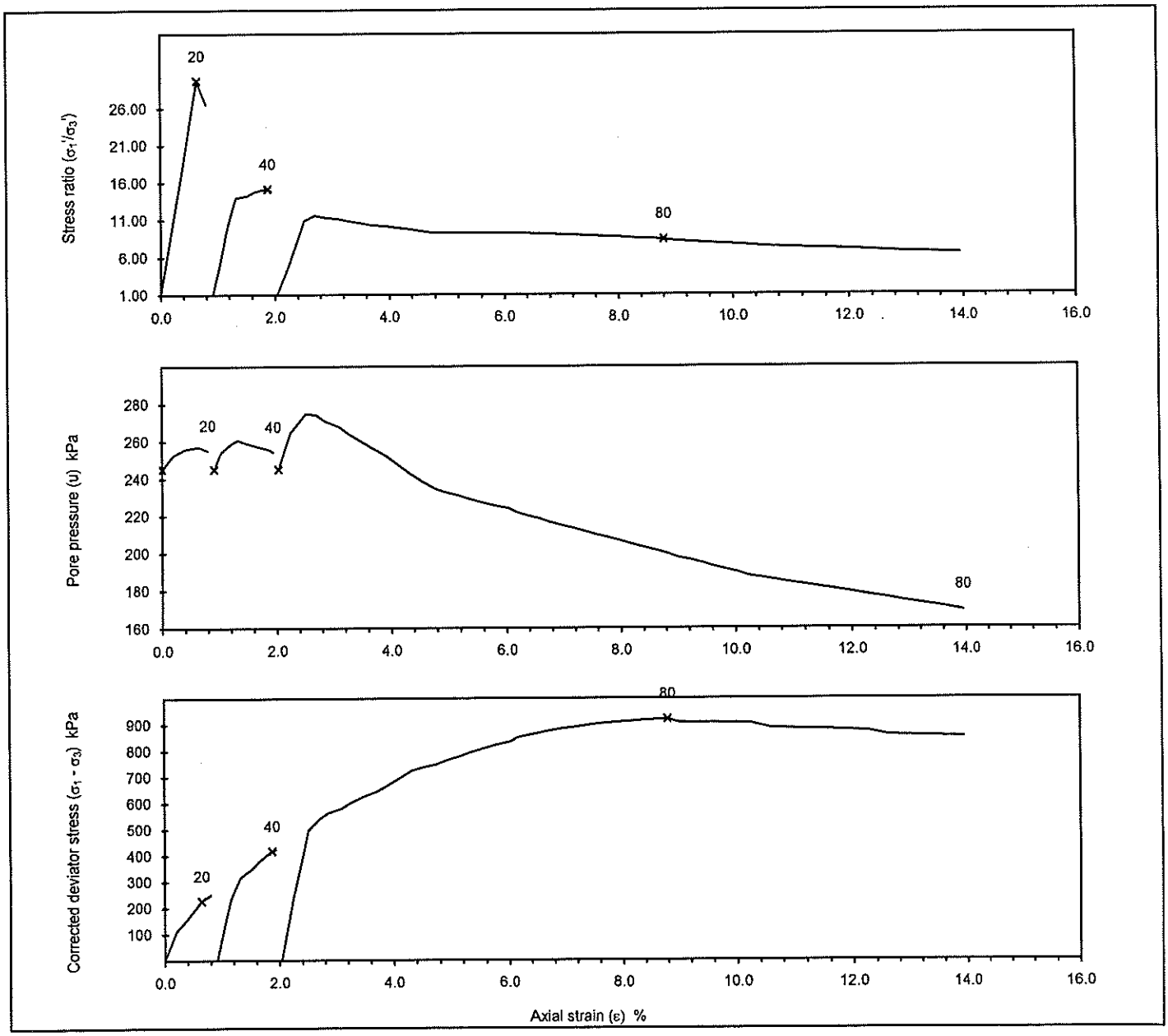
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D244
Depth(m) From : 2.00
To : 2.90

Laboratory Information

Lab. sample I.D. : SL90277/4
Specimen ref. : A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D244
Depth(m) From : 2.00
To : 2.90

Laboratory Information

Lab. sample I.D. : SL90277/4
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	20	
	Stage 2	kPa	40	
	Stage 3	kPa	80	
Applied pressure			Cell pressure kPa	Back pressure kPa
			20	15
			40	35
			60	55
			80	75
			100	95
			120	115
			140	135
			160	155
			180	175
			200	195
			220	215
			240	235
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		0.99
Volume change	cm^3	31.0

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1273.5
Final moisture content	%	27.1
Final bulk density	Mg/m^3	1.95

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D244
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	2.90

Laboratory Information

Date shearing commenced	:	10/01/2010	Time :	01:30				
Date shearing completed	:	10/01/2010	Time :	02:23	Lab. sample I.D.	:	SL90277/4	
Proving ring serial No.	:	6323			Specimen ref.	:	A	
Type of membrane	:	rubber			Cell pressure	:	285	kPa
Corrections					Back pressure	:	245	kPa
*Side drain, σ_{dr}	:	0.000	kPa/%		Effective pressure	:	40	kPa
Membrane thickness, σ_{mb}	:	0.64	mm		Dimensions at starting of compression			
Rate of axial displacement	:	0.050	mm/min		Volume V_c	:	655.53	cm^3
Pore pressure coefficient, A_f	:	0.03			Area A_c	:	4409.6	mm^2
					Length L_c	:	148.7	mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.075	121.8	0.0	0.9	0.00	0.23	0.0	40.0	0.0	40.0	0.0	1.00	
254.0	18	0.409	664.0	0.1	1.0	0.00	0.26	122.6	92.3	61.3	71.9	122.6	4.95	
257.2	36	0.709	1151.0	0.2	1.2	0.00	0.28	232.6	144.1	116.3	105.3	232.6	9.37	
259.1	48	0.837	1358.8	0.3	1.2	0.00	0.30	279.3	165.6	139.7	119.0	279.3	11.78	
260.7	60	0.934	1516.2	0.4	1.3	0.00	0.32	314.6	181.6	157.3	129.2	314.6	13.95	
259.7	75	0.982	1594.2	0.5	1.4	0.00	0.35	331.9	191.2	165.9	135.9	331.9	14.12	
258.7	90	1.029	1670.5	0.6	1.5	0.00	0.37	348.7	200.7	174.4	142.5	348.7	14.26	
257.6	108	1.108	1798.7	0.7	1.6	0.00	0.40	377.1	216.0	188.6	153.1	377.1	14.76	
256.4	129	1.179	1914.0	0.9	1.8	0.00	0.43	402.5	229.8	201.2	162.8	402.5	15.07	
255.5	143	1.220	1980.5	1.0	1.9	0.00	0.45	417.0	238.0	208.5	168.5	417.0	15.14	«
254.3	153	1.240	2013.0	1.0	1.9	0.00	0.47	424.0	242.7	212.0	172.0	424.0	14.81	

Final volume (cm^3): 655.53 Final length (mm): 147.1 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D244
Depth(m) From : 2.00
To : 2.90

Laboratory Information

Date shearing commenced : 11/01/2010 Time : 09:00
Date shearing completed : 11/01/2010 Time : 15:18
Proving ring serial No. : 6499
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.05

Lab. sample I.D. : SL90277/4
Specimen ref. : A
Cell pressure : 325 kPa
Back pressure : 245 kPa
Effective pressure : 80 kPa

Dimensions at starting of compression

Volume V_c : 653.43 cm^3
Area A_c : 4445.9 mm^2
Length L_c : 147.0 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.047	143.7	0.0	2.0	0.00	0.49	0.0	80.0	0.0	80.0	0.0	1.00
264.2	30	0.393	1201.8	0.2	2.2	0.00	0.54	237.0	179.3	118.5	139.8	237.0	4.90
274.8	70	0.771	2357.8	0.5	2.5	0.00	0.60	495.0	297.7	247.5	215.2	495.0	10.86
274.2	98	0.837	2559.6	0.7	2.7	0.00	0.64	539.1	320.4	269.6	230.5	539.1	11.61
270.8	120	0.872	2666.7	0.8	2.9	0.00	0.67	562.2	335.3	281.1	241.6	562.2	11.37
267.8	156	0.900	2752.3	1.1	3.1	0.00	0.72	579.8	347.1	289.9	250.5	579.8	11.14
264.1	180	0.934	2856.3	1.2	3.3	0.00	0.76	601.9	361.8	300.9	261.5	601.9	10.88
259.6	215	0.974	2978.6	1.5	3.5	0.00	0.81	627.5	379.1	313.7	274.6	627.5	10.59
256.0	244	0.998	3052.0	1.7	3.7	0.00	0.85	642.4	390.2	321.2	283.1	642.4	10.31
252.1	277	1.040	3180.4	1.9	3.9	0.00	0.89	669.3	407.5	334.6	296.0	669.3	10.18
247.0	310	1.086	3321.1	2.1	4.1	0.00	0.94	698.7	427.3	349.3	310.9	698.7	9.96
242.9	336	1.124	3437.3	2.3	4.3	0.00	0.97	722.9	443.5	361.4	323.1	722.9	9.81
238.4	368	1.148	3510.7	2.5	4.5	0.00	1.02	737.3	455.3	368.7	332.4	737.3	9.51
234.6	400	1.166	3565.7	2.7	4.8	0.00	1.06	747.7	464.2	373.8	339.6	747.7	9.27
232.8	424	1.190	3639.1	2.9	4.9	0.00	1.09	762.4	473.4	381.2	346.3	762.4	9.27
231.0	456	1.214	3712.5	3.1	5.1	0.00	1.13	776.7	482.3	388.3	352.9	776.7	9.26
229.2	483	1.239	3789.0	3.3	5.3	0.00	1.17	791.8	491.7	395.9	359.7	791.8	9.27
227.4	512	1.261	3856.3	3.5	5.5	0.00	1.20	804.7	500.0	402.4	365.8	804.7	9.25
225.6	546	1.286	3932.7	3.7	5.8	0.00	1.25	819.3	509.1	409.7	372.5	819.3	9.24
223.8	588	1.312	4012.2	4.0	6.0	0.00	1.30	834.0	518.2	417.0	379.2	834.0	9.24
222.0	604	1.334	4079.5	4.1	6.1	0.00	1.32	847.6	526.8	423.8	385.5	847.6	9.23
220.2	633	1.352	4134.6	4.3	6.3	0.00	1.35	857.6	533.6	428.8	390.7	857.6	9.18
218.4	666	1.371	4192.7	4.5	6.6	0.00	1.39	868.0	540.6	434.0	395.9	868.0	9.14
216.6	692	1.386	4238.5	4.7	6.7	0.00	1.42	876.2	546.5	438.1	400.5	876.2	9.08
214.9	722	1.399	4278.3	4.9	6.9	0.00	1.46	882.8	551.5	441.4	404.4	882.8	9.02
213.2	756	1.412	4318.0	5.1	7.2	0.00	1.50	889.1	556.4	444.6	408.2	889.1	8.95
211.5	784	1.425	4357.8	5.3	7.4	0.00	1.53	895.8	561.4	447.9	412.1	895.8	8.89
209.7	812	1.436	4391.4	5.5	7.6	0.00	1.56	901.1	565.8	450.5	415.7	901.1	8.81
208.1	846	1.446	4422.0	5.8	7.8	0.00	1.60	905.3	569.5	452.6	418.7	905.3	8.74
206.3	878	1.456	4452.6	6.0	8.0	0.00	1.64	909.6	573.5	454.8	421.9	909.6	8.66
204.7	903	1.462	4470.9	6.1	8.2	0.00	1.66	911.8	576.2	455.9	424.2	911.8	8.58
203.1	932	1.470	4495.4	6.3	8.4	0.00	1.69	915.0	579.4	457.5	426.9	915.0	8.51
201.3	966	1.478	4519.9	6.6	8.6	0.00	1.73	917.9	582.6	458.9	429.7	917.9	8.42
199.8	994	1.483	4535.2	6.8	8.8	0.00	1.76	919.2	584.8	459.6	431.6	919.2	8.34 «

Final volume (cm^3): 653.43 Final length (mm): 129.5 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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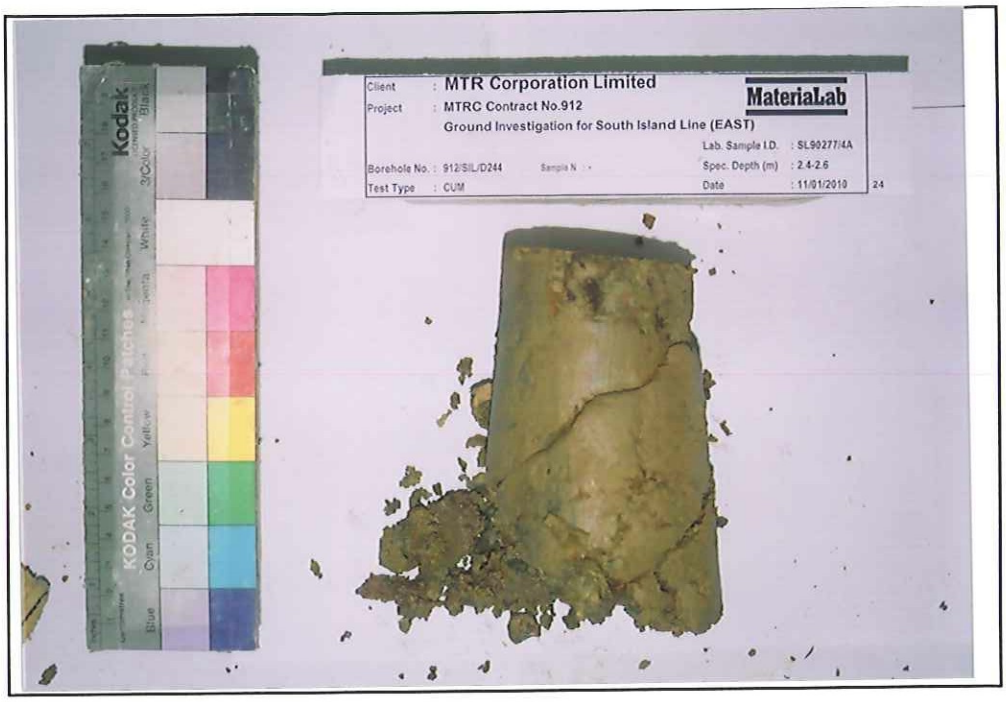
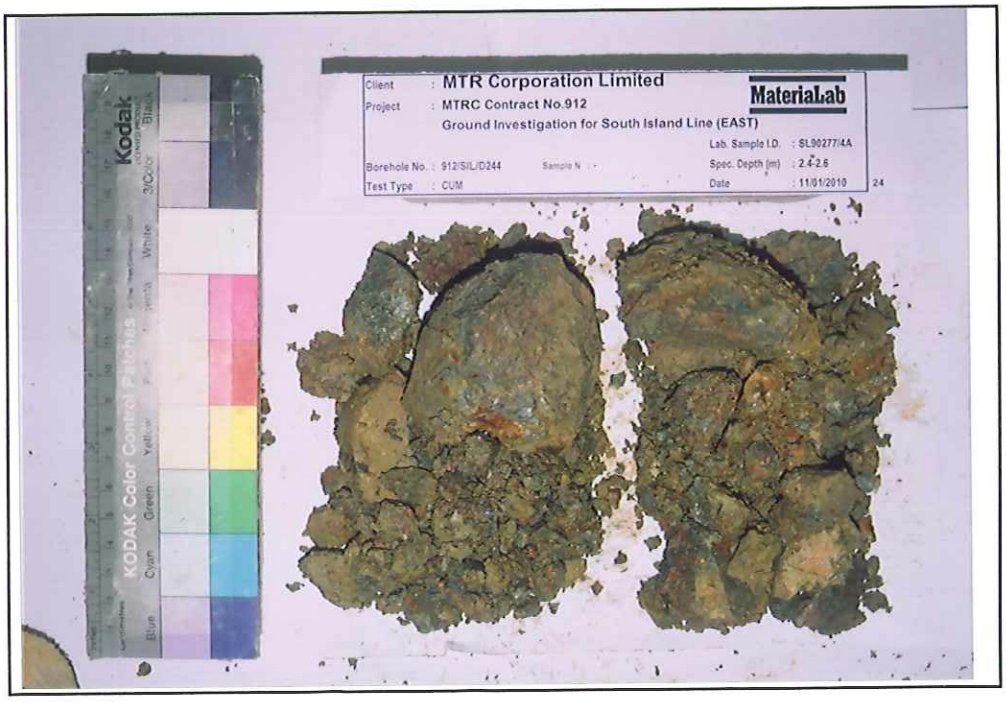
Photographic Records for Triaxial Test





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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

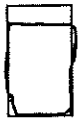
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 3.00
To : 4.00
Sample origin : COLL
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 15-01-2010
Date test(s) completed : 22-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : W.Y. Lo Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.67 (Measured)
Temperature range at test(s) : Maximum : 23.5 °C Minimum : 17.5 °C
Visual description : Moist, orangish brown mottled with red and yellow, slightly gravelly, sandy SILT/CLAY.

Lab. sample I.D. : SL90277/6
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 3.40
To : 3.60
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	35			70			140	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.7	74.5	75.0	74.9	75.6		75.3	80.4
Length	mm	150.2	149.8	148.0	147.8	145.0		144.6	127.1
Volume	cm³	658.27	653.67	653.67	650.37	650.37		644.67	644.67
Wet mass	g	1225.6	1259.7	1259.7	1256.4	1256.4		1250.7	1250.7
Dry mass	g	969.3	969.3	969.3	969.3	969.3		969.3	969.3
Moisture content	%	26.4	30.0	30.0	29.6	29.6		29.0	29.0
Bulk density	Mg/m³	1.86	1.93	1.93	1.93	1.93		1.94	1.94
Dry density	Mg/m³	1.47	1.48	1.48	1.49	1.49		1.50	1.50
Void ratio		0.81	0.80	0.80	0.79	0.79		0.78	0.78
Degree of saturation	%	86.8	99.9	99.9	99.9	99.9		99.9	99.9
Saturation Stage									
**Volume change of water	cm³	38.7							
Consolidation Stage									
Side drain used		Yes			-			-	
Initial pore pressure	kPa	275.0			283.9			334.0	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	4.6			3.3			5.7	
m_{vi}	m²/MN	0.23			0.13			0.10	
t_{50}	min	0.60			2.10			4.20	
c_{vi} (from t_{50})	m²/yr	NA			NA			NA	
t_{100}	min	4.84			9.00			14.44	
c_{vi} (from t_{100})	m²/yr	23.52			12.76			8.06	
Sketch of failed specimen (Failure Mode)								 Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

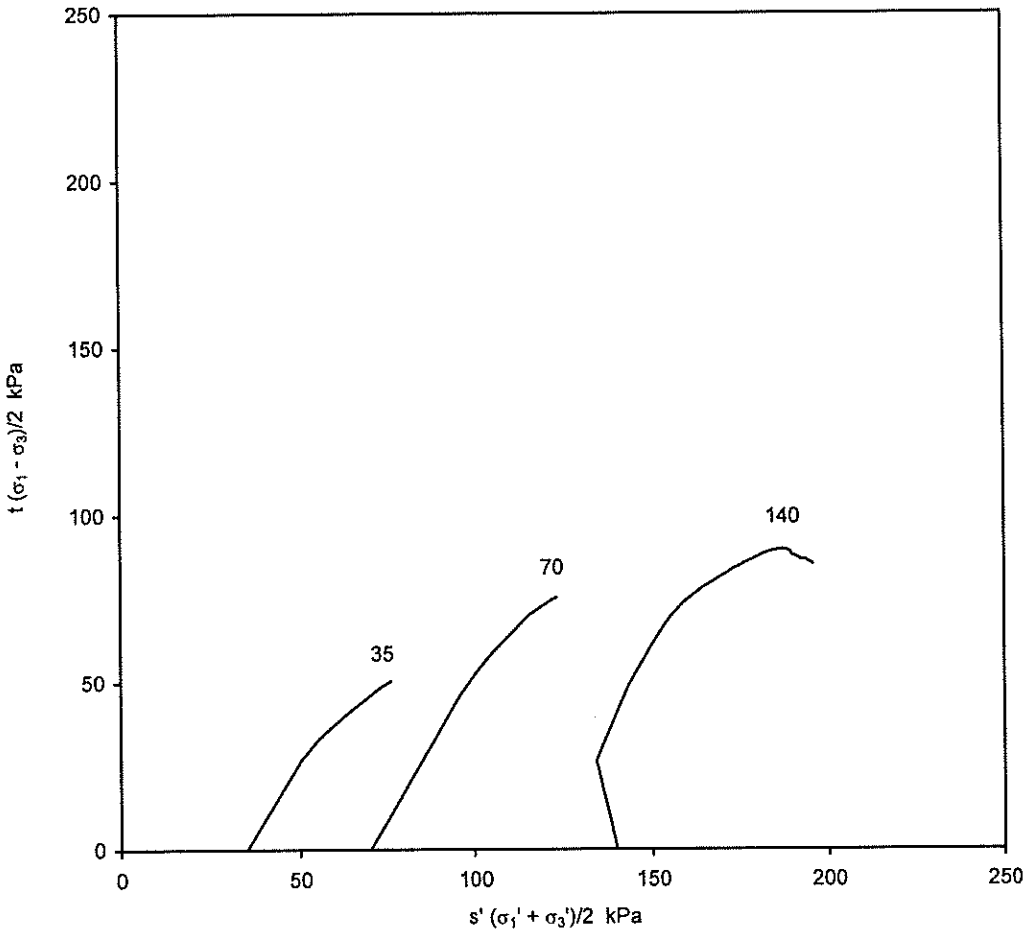
Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 3.00
To : 4.00

Laboratory Information

Lab. sample I.D. : SL90277/6
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	35	1.0	1.0	255.4	97.8	73.5	48.9
2	70	1.7	3.1	267.7	149.3	122.0	74.7
3	140	6.7	10.2	287.6	179.4	187.1	89.7



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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

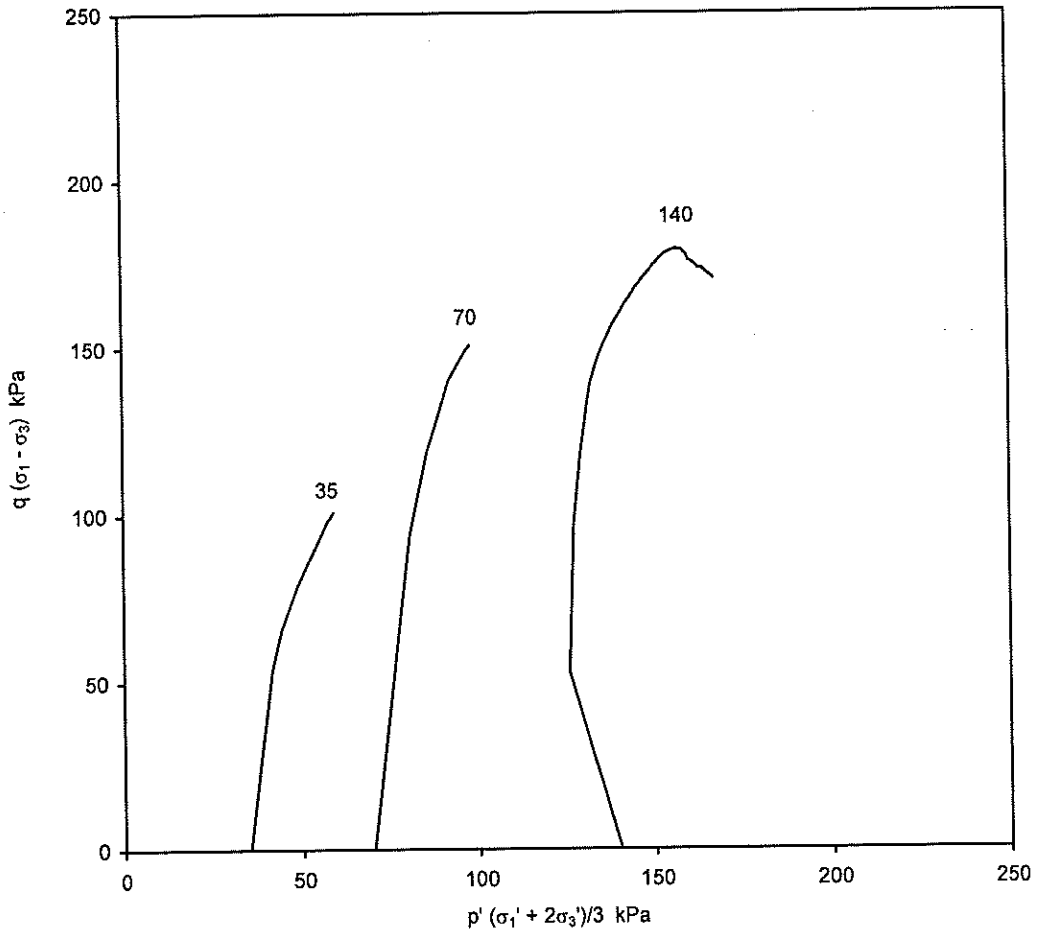
Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 3.00
To : 4.00

Laboratory Information

Lab. sample I.D. : SL90277/6
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	35	1.0	1.0	255.4	97.8	57.2	97.8
2	70	1.7	3.1	267.7	149.3	97.1	149.3
3	140	6.7	10.2	287.6	179.4	157.2	179.4



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

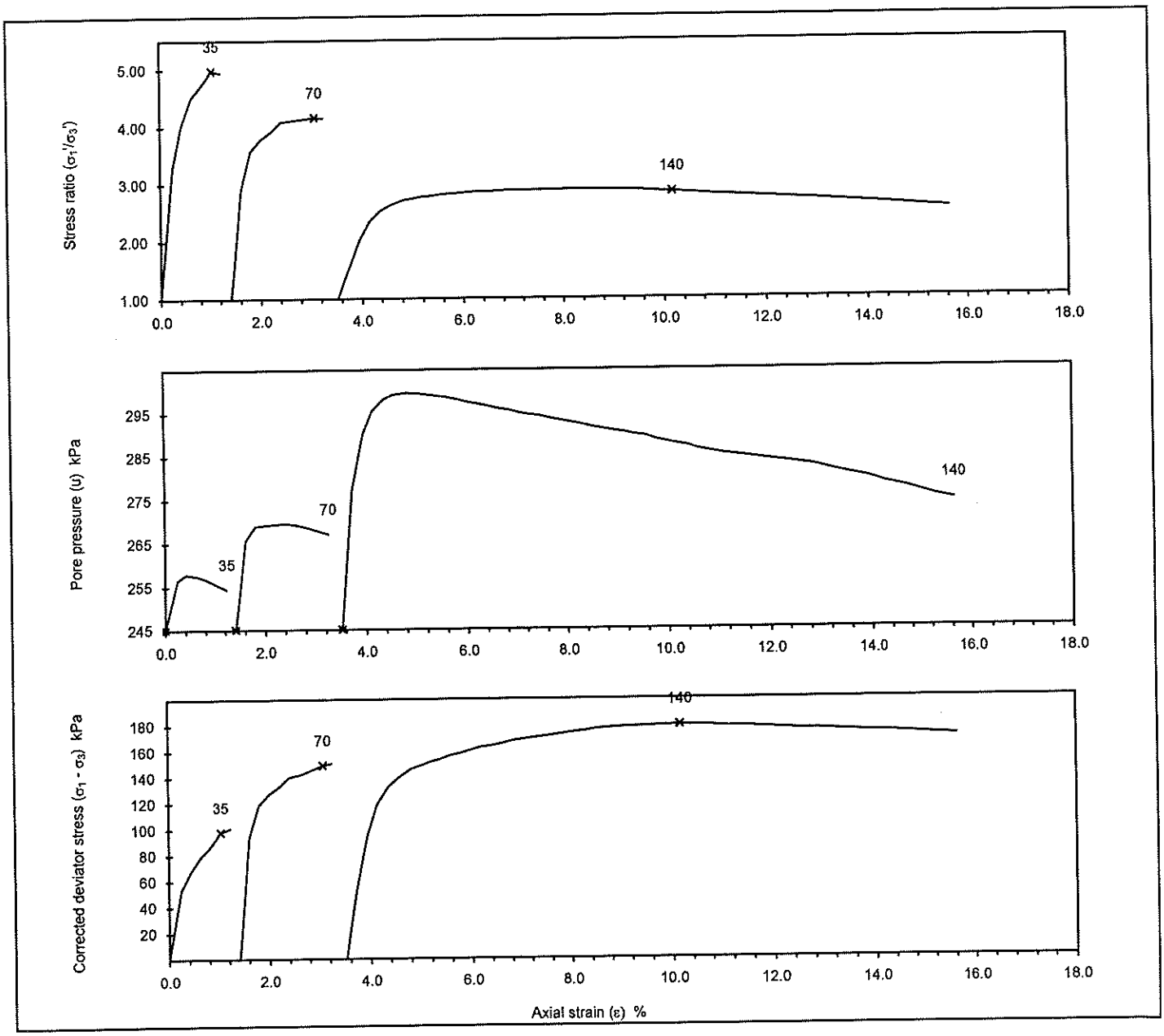
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 3.00
To : 4.00

Laboratory Information

Lab. sample I.D. : SL90277/6
Specimen ref. : A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 3.00
To : 4.00

Laboratory Information

Lab. sample I.D. : SL90277/6
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	35	
	Stage 2	kPa	70	
	Stage 3	kPa	140	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			125	120
			150	145
			175	170
			200	195
			225	220
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		1.00
Volume change	cm^3	38.7

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1247.8
Final moisture content	%	28.7
Final bulk density	Mg/m^3	1.94

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

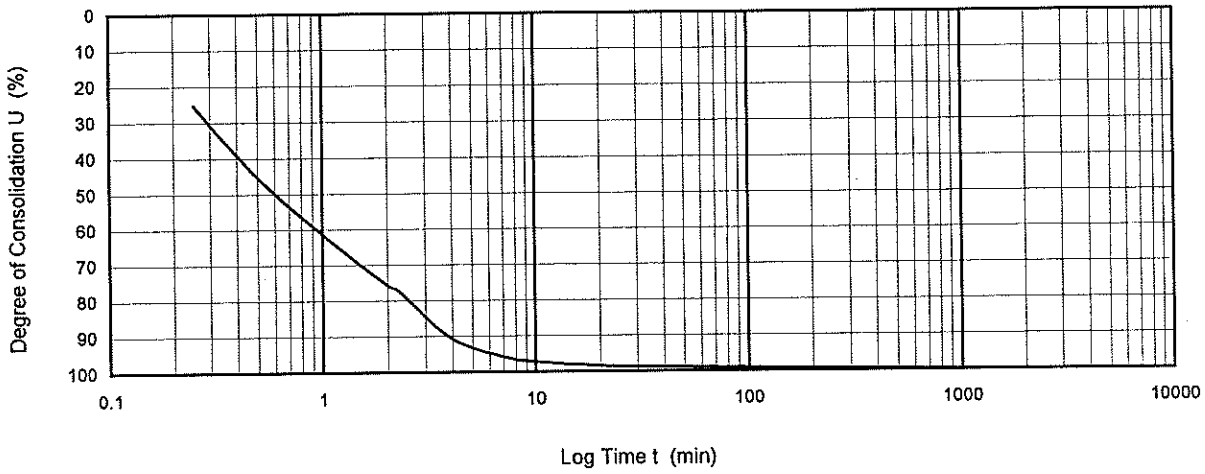
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	4.00

Laboratory Information

Cell pressure	:	280 kPa	Lab. sample I.D.	:	SL90277/6
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	35 kPa			

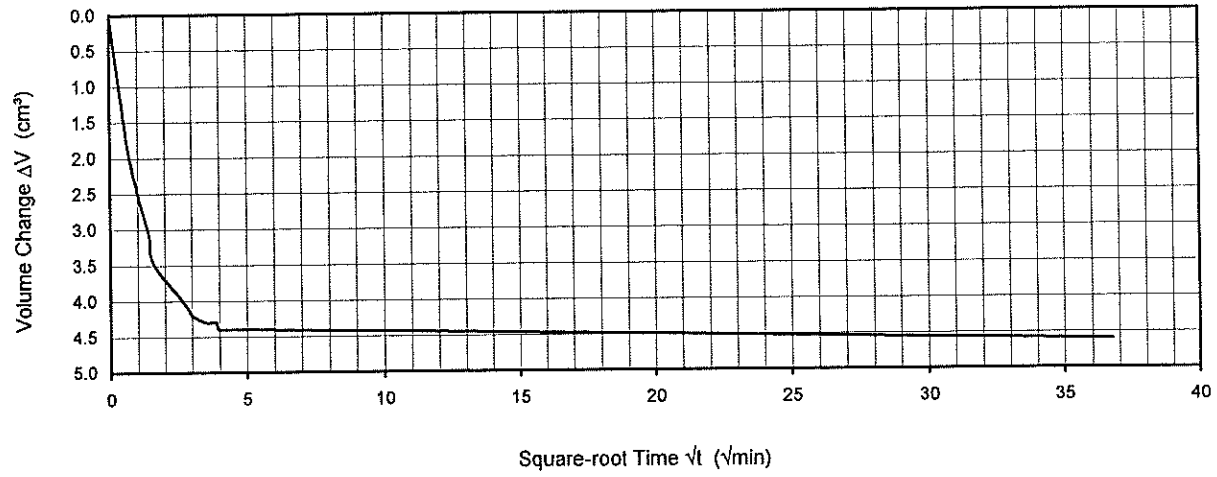
Degree of Consolidation vs. Log Time

t_{50} = 0.60 min ΔV = 4.6 cm^3



Volume Change vs. Square-root Time

t_{100} = 4.84 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

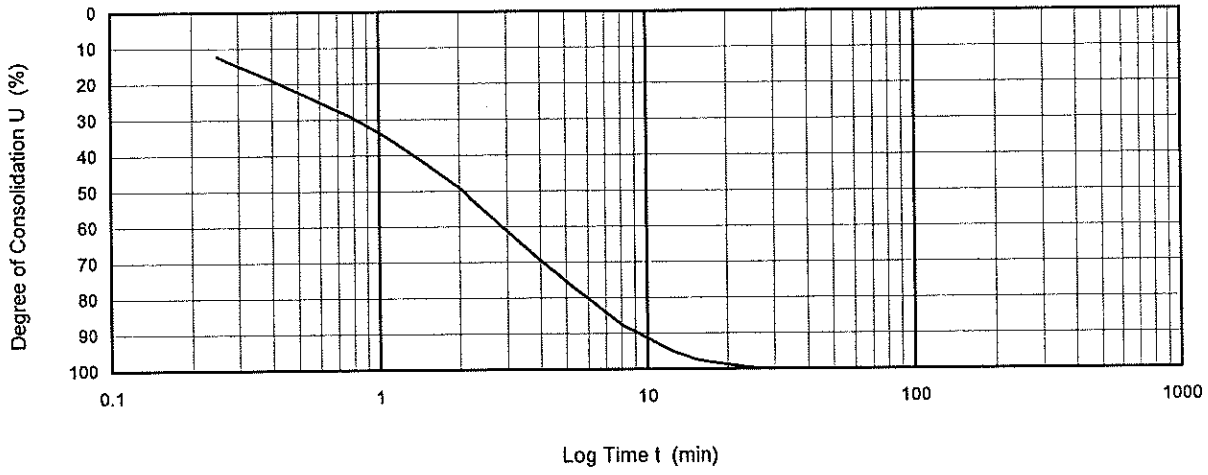
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	4.00

Laboratory Information

Cell pressure	:	315 kPa	Lab. sample I.D.	:	SL90277/6
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	70 kPa			

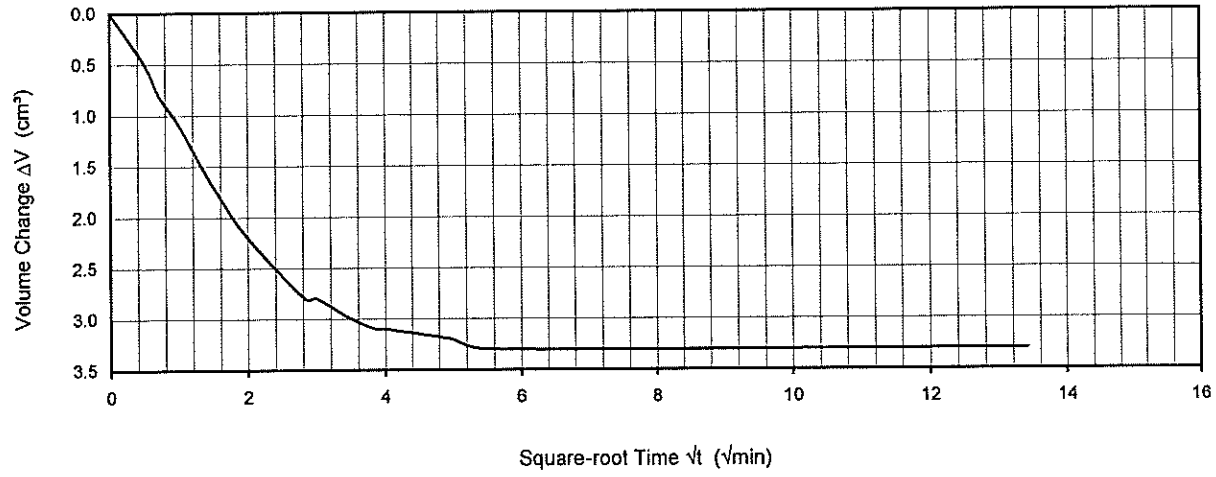
Degree of Consolidation vs. Log Time

t_{50} = 2.10 min ΔV = 3.3 cm^3



Volume Change vs. Square-root Time

t_{100} = 9.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

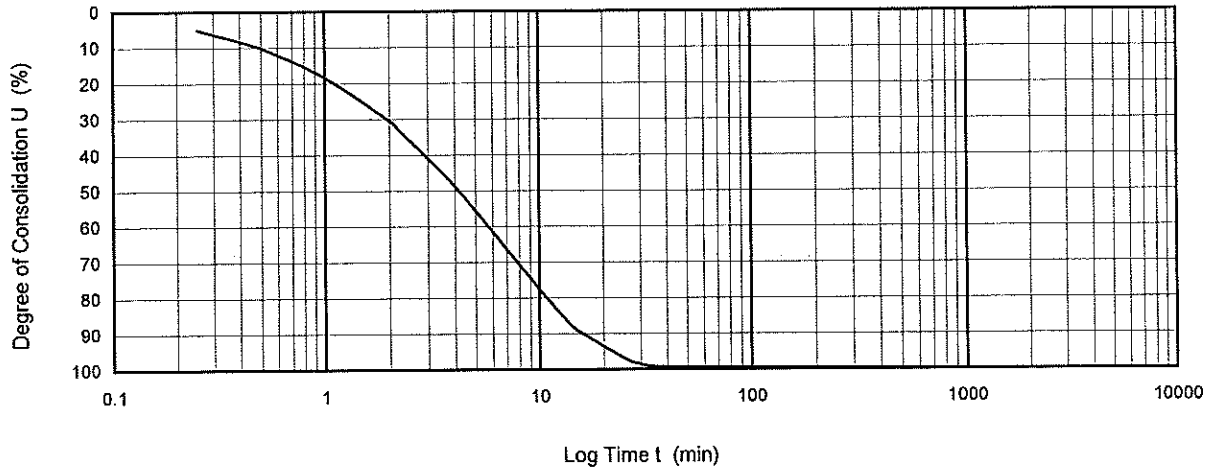
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	4.00

Laboratory Information

Cell pressure	:	385 kPa	Lab. sample I.D.	:	SL90277/6
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	140 kPa			

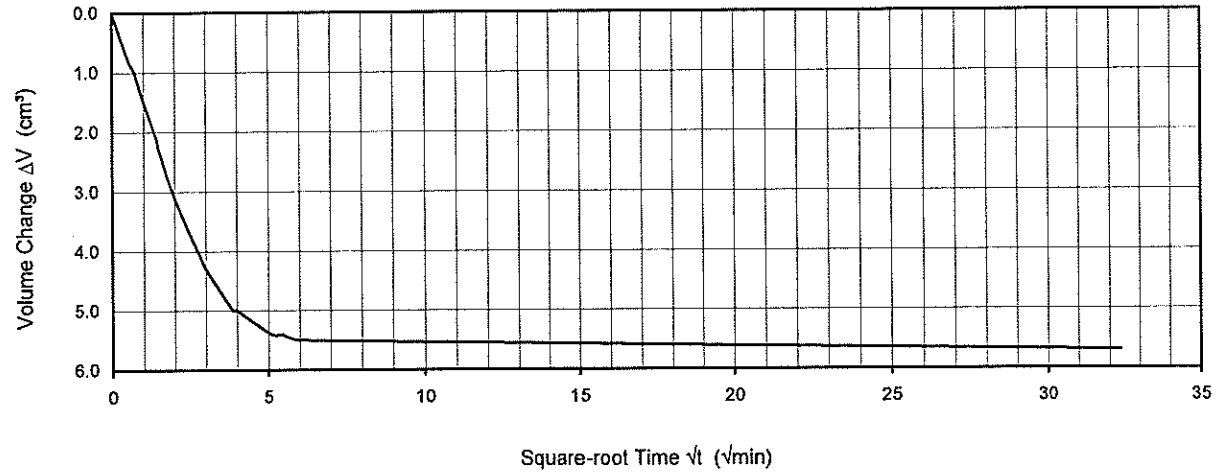
Degree of Consolidation vs. Log Time

t_{50} = 4.20 min ΔV = 5.7 cm³



Volume Change vs. Square-root Time

t_{100} = 14.44 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 3.00
To : 4.00

Laboratory Information

Date shearing commenced : 20/01/2010 Time : 09:00
Date shearing completed : 20/01/2010 Time : 10:02
Proving ring serial No. : 12540
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.765 kPa/%
Membrane thickness, σ_{mb} : 0.67 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.11

Lab. sample I.D. : SL90277/6
Specimen ref. : A
Cell pressure : 280 kPa
Back pressure : 245 kPa
Effective pressure : 35 kPa
Dimensions at starting of compression
Volume V_c : 653.67 cm^3
Area A_c : 4362.2 mm^2
Length L_c : 149.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	170	123.4	0.0	0.0	0.00	0.00	0.0	35.0	0.0	35.0	0.0	1.00	
256.5	36	502	360.8	0.2	0.2	0.57	0.06	53.7	50.3	26.8	41.4	53.7	3.28	
257.9	62	588	418.1	0.4	0.4	0.99	0.11	66.2	55.2	33.1	44.2	66.2	3.99	
257.5	95	672	477.8	0.6	0.6	1.51	0.17	79.0	62.0	39.5	48.8	79.0	4.51	
256.8	120	717	509.8	0.8	0.8	1.91	0.21	85.7	66.1	42.9	51.8	85.7	4.70	
255.4	156	797	566.7	1.0	1.0	2.48	0.27	97.8	73.5	48.9	57.2	97.8	4.98	«
254.4	184	820	583.0	1.2	1.2	2.93	0.32	100.8	76.0	50.4	59.2	100.8	4.94	

Final volume (cm^3): 653.67 Final length (mm): 148.0 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	3.00
			To	:	4.00

Laboratory Information

Date shearing commenced	:	20/01/2010	Time	:	13:30			
Date shearing completed	:	20/01/2010	Time	:	15:04	Lab. sample I.D.	:	SL90277/6
Proving ring serial No.	:	12540				Specimen ref.	:	A
Type of membrane	:	rubber				Cell pressure	:	315 kPa
Corrections						Back pressure	:	245 kPa
*Side drain, σ_{dr}	:	4.765	kPa/%			Effective pressure	:	70 kPa
Membrane thickness, σ_{mb}	:	0.67	mm			Dimensions at starting of compression		
Rate of axial displacement	:	0.050	mm/min			Volume V_c	:	650.37 cm^3
Pore pressure coefficient, A_f	:	0.15				Area A_c	:	4401.5 mm^2
						Length L_c	:	147.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	195	141.6	0.0	1.4	3.32	0.36	0.0	70.0	0.0	70.0	0.0	1.00	
265.6	32	807	573.8	0.2	1.6	3.84	0.41	93.7	96.3	46.9	80.6	93.7	2.90	
268.9	61	966	686.8	0.4	1.8	4.31	0.46	118.6	105.4	59.3	85.6	118.6	3.57	
269.2	90	1024	728.0	0.6	2.0	4.77	0.51	127.2	109.4	63.6	88.2	127.2	3.78	
269.4	122	1063	755.8	0.8	2.2	4.77	0.56	133.1	112.1	66.5	90.0	133.1	3.92	
269.6	151	1109	788.5	1.0	2.4	4.77	0.60	140.1	115.5	70.1	92.1	140.1	4.09	
269.2	183	1125	799.9	1.2	2.6	4.77	0.65	142.3	116.9	71.1	93.2	142.3	4.11	
268.6	213	1146	814.8	1.4	2.8	4.77	0.70	145.3	119.0	72.6	94.8	145.3	4.13	
267.7	249	1174	834.7	1.7	3.1	4.77	0.75	149.3	122.0	74.7	97.1	149.3	4.16	«
267.1	275	1185	842.5	1.9	3.3	4.77	0.79	150.7	123.3	75.4	98.1	150.7	4.15	

Final volume (cm^3): 650.37 Final length (mm): 145.0 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 3.00
To : 4.00

Laboratory Information

Date shearing commenced : 21/01/2010 Time : 09:00
Date shearing completed : 21/01/2010 Time : 15:00
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.765 kPa/%
Membrane thickness, σ_{mb} : 0.67 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.24

Lab. sample I.D. : SL90277/6
Specimen ref. : A
Cell pressure : 385 kPa
Back pressure : 245 kPa
Effective pressure : 140 kPa
Dimensions at starting of compression
Volume V_c : 644.67 cm^3
Area A_c : 4458.7 mm^2
Length L_c : 144.6 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	48	167.5	0.0	3.5	4.77	0.85	0.0	140.0	0.0	140.0	0.0	1.00	
277.2	30	123	429.2	0.2	3.7	4.77	0.89	52.9	134.3	26.5	125.4	52.9	1.49	
290.4	64	180	628.1	0.4	4.0	4.77	0.95	97.1	143.2	48.6	127.0	97.1	2.03	
295.4	91	208	725.8	0.6	4.1	4.77	0.98	118.7	148.9	59.3	129.2	118.7	2.32	
298.1	123	226	788.6	0.9	4.4	4.77	1.03	132.3	153.1	66.2	131.0	132.3	2.52	
299.2	150	235	820.0	1.0	4.6	4.77	1.07	139.0	155.3	69.5	132.1	139.0	2.62	
299.6	189	245	854.9	1.3	4.8	4.77	1.12	146.3	158.5	73.1	134.2	146.3	2.71	
299.5	219	249	868.8	1.5	5.0	4.77	1.17	149.0	160.0	74.5	135.2	149.0	2.74	
299.2	244	253	882.8	1.7	5.2	4.77	1.20	151.8	161.7	75.9	136.4	151.8	2.77	
298.9	272	256	893.2	1.9	5.4	4.77	1.24	153.7	163.0	76.9	137.3	153.7	2.79	
298.6	300	260	907.2	2.1	5.6	4.77	1.28	156.4	164.6	78.2	138.5	156.4	2.81	
298.1	330	263	917.7	2.3	5.8	4.77	1.32	158.3	166.1	79.2	139.7	158.3	2.82	
297.4	364	267	931.6	2.5	6.0	4.77	1.36	160.9	168.1	80.5	141.2	160.9	2.84	
297.0	390	270	942.1	2.7	6.2	4.77	1.39	162.9	169.4	81.4	142.3	162.9	2.85	
296.5	420	272	949.1	2.9	6.4	4.77	1.43	164.0	170.5	82.0	143.2	164.0	2.85	
295.9	454	275	959.5	3.1	6.7	4.77	1.48	165.8	172.0	82.9	144.4	165.8	2.86	
295.5	482	278	970.0	3.3	6.8	4.77	1.51	167.7	173.4	83.9	145.4	167.7	2.87	
294.9	511	280	977.0	3.5	7.0	4.77	1.55	168.8	174.5	84.4	146.4	168.8	2.87	
294.5	542	282	983.9	3.7	7.3	4.77	1.59	169.9	175.5	85.0	147.1	169.9	2.88	
294.1	575	284	990.9	4.0	7.5	4.77	1.63	170.9	176.4	85.5	147.9	170.9	2.88	
293.6	601	286	997.9	4.2	7.7	4.77	1.66	172.1	177.4	86.0	148.8	172.1	2.88	
293.1	632	288	1004.9	4.4	7.9	4.77	1.69	173.1	178.5	86.6	149.6	173.1	2.88	
292.7	661	290	1011.9	4.6	8.1	4.77	1.73	174.2	179.4	87.1	150.4	174.2	2.89	
292.1	694	292	1018.8	4.8	8.3	4.77	1.77	175.2	180.5	87.6	151.3	175.2	2.89	
291.6	721	294	1025.8	5.0	8.5	4.77	1.80	176.3	181.6	88.2	152.2	176.3	2.89	
291.1	755	296	1032.8	5.2	8.7	4.77	1.84	177.3	182.6	88.7	153.0	177.3	2.89	
290.7	783	297	1036.3	5.4	8.9	4.77	1.87	177.7	183.1	88.8	153.5	177.7	2.88	
290.4	810	298	1039.8	5.6	9.1	4.77	1.90	178.0	183.6	89.0	153.9	178.0	2.88	
289.8	844	299	1043.3	5.8	9.4	4.77	1.94	178.3	184.3	89.1	154.6	178.3	2.87	
289.5	874	300	1046.8	6.0	9.6	4.77	1.97	178.5	184.8	89.3	155.0	178.5	2.87	
288.7	901	301	1050.2	6.2	9.7	4.77	2.00	178.9	185.7	89.4	155.9	178.9	2.86	
288.1	933	302	1053.7	6.5	10.0	4.77	2.03	179.1	186.5	89.6	156.6	179.1	2.85	
287.6	962	303	1057.2	6.7	10.2	4.77	2.06	179.4	187.1	89.7	157.2	179.4	2.84	«
287.1	995	303	1057.2	6.9	10.4	4.77	2.10	179.0	187.4	89.5	157.6	179.0	2.83	

Final volume (cm^3): 644.67 Final length (mm): 127.1 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 3.00
To : 4.00

Laboratory Information

Lab. sample I.D. : SL90277/6
Specimen ref. : A

Pore pressure u	Axial gauge reading	Proving ring reading	Axial force	Axial strain ε	ε_c	Side drain correction σ_{dr}	Membrane correction σ_{mb}	Corr. Dev. stress $\sigma_1-\sigma_3$	s'	t	p'	q	Stress ratio σ_1'/σ_3'
kPa	div	div	N	%	%	kPa	kPa	kPa	kPa	kPa	kPa	kPa	
286.4	1021	304	1060.7	7.1	10.6	4.77	2.12	179.3	188.2	89.6	158.4	179.3	2.82
285.9	1054	304	1060.7	7.3	10.8	4.77	2.16	178.8	188.5	89.4	158.7	178.8	2.80
285.2	1101	304	1060.7	7.6	11.1	4.77	2.21	178.1	188.9	89.1	159.2	178.1	2.78
284.7	1153	305	1064.2	8.0	11.5	4.77	2.26	178.1	189.3	89.0	159.7	178.1	2.78
284.1	1204	305	1064.2	8.3	11.8	4.77	2.31	177.3	189.5	88.6	160.0	177.3	2.76
283.6	1252	305	1064.2	8.7	12.2	4.77	2.36	176.6	189.7	88.3	160.3	176.6	2.74
283.1	1301	305	1064.2	9.0	12.5	4.77	2.41	175.8	189.8	87.9	160.5	175.8	2.73
282.5	1352	306	1067.7	9.4	12.9	4.77	2.45	175.8	190.4	87.9	161.1	175.8	2.72
281.4	1406	306	1067.7	9.7	13.2	4.77	2.51	175.0	191.1	87.5	161.9	175.0	2.69
280.5	1450	306	1067.7	10.0	13.5	4.77	2.55	174.3	191.7	87.2	162.6	174.3	2.67
279.6	1505	306	1067.7	10.4	13.9	4.77	2.60	173.5	192.2	86.8	163.2	173.5	2.65
278.4	1553	307	1071.2	10.7	14.3	4.77	2.64	173.5	193.4	86.8	164.4	173.5	2.63
277.5	1603	307	1071.2	11.1	14.6	4.77	2.69	172.8	193.9	86.4	165.1	172.8	2.61
276.4	1654	307	1071.2	11.4	15.0	4.77	2.74	172.0	194.6	86.0	165.9	172.0	2.58
275.3	1702	307	1071.2	11.8	15.3	4.77	2.78	171.3	195.3	85.6	166.8	171.3	2.56
274.4	1752	307	1071.2	12.1	15.6	4.77	2.82	170.5	195.9	85.3	167.4	170.5	2.54

Final volume (cm^3): 644.67 Final length (mm): 127.1 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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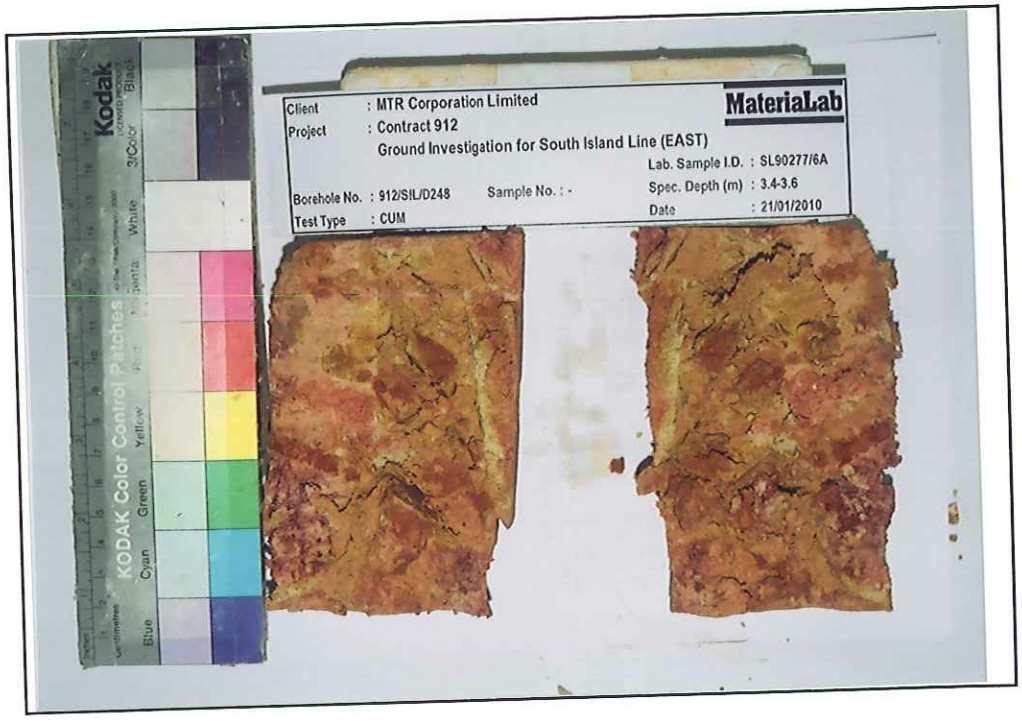
Photographic Records for Triaxial Test



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MateriaLab

HKAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

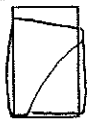
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 5.50
To : 6.50
Sample origin : COLL
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 09-01-2010
Date test(s) completed : 13-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 18.0 °C
Visual description : Moist, reddish brown mottled with white and dark grey, slightly gravelly, sandy SILT/CLAY.

Lab. sample I.D. : SL90277/7
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 5.90
To : 6.10
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	60			120			240	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.7	74.4	75.2	75.0	75.5		75.3	80.8
Length	mm	150.3	149.7	146.4	145.9	143.8		143.3	124.3
Volume	cm³	658.70	650.50	650.50	644.30	644.30		637.40	637.40
Wet mass	g	1202.0	1223.6	1223.6	1217.4	1217.4		1210.5	1210.5
Dry mass	g	920.6	920.6	920.6	920.6	920.6		920.6	920.6
Moisture content	%	30.6	32.9	32.9	32.2	32.2		31.5	31.5
Bulk density	Mg/m³	1.82	1.88	1.88	1.89	1.89		1.90	1.90
Dry density	Mg/m³	1.40	1.42	1.42	1.43	1.43		1.44	1.44
Void ratio		0.90	0.87	0.87	0.85	0.85		0.83	0.83
Degree of saturation	%	90.4	100.0	100.0	100.0	100.0		100.0	100.0
Saturation Stage									
**Volume change of water	cm³	29.8							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	298.4			335.1			417.1	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	8.2			6.2			6.9	
m_{vl}	m²/MN	0.23			0.11			0.06	
t_{50}	min	10.00			9.50			7.00	
c_{vl} (from t_{50})	m²/yr	449.92			449.62			588.76	
t_{100}	min	23.04			21.16			18.32	
c_{vl} (from t_{100})	m²/yr	393.20			434.57			505.83	
Sketch of failed specimen (Failure Mode)								 Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung, K.M. Fung

Certified by :

~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

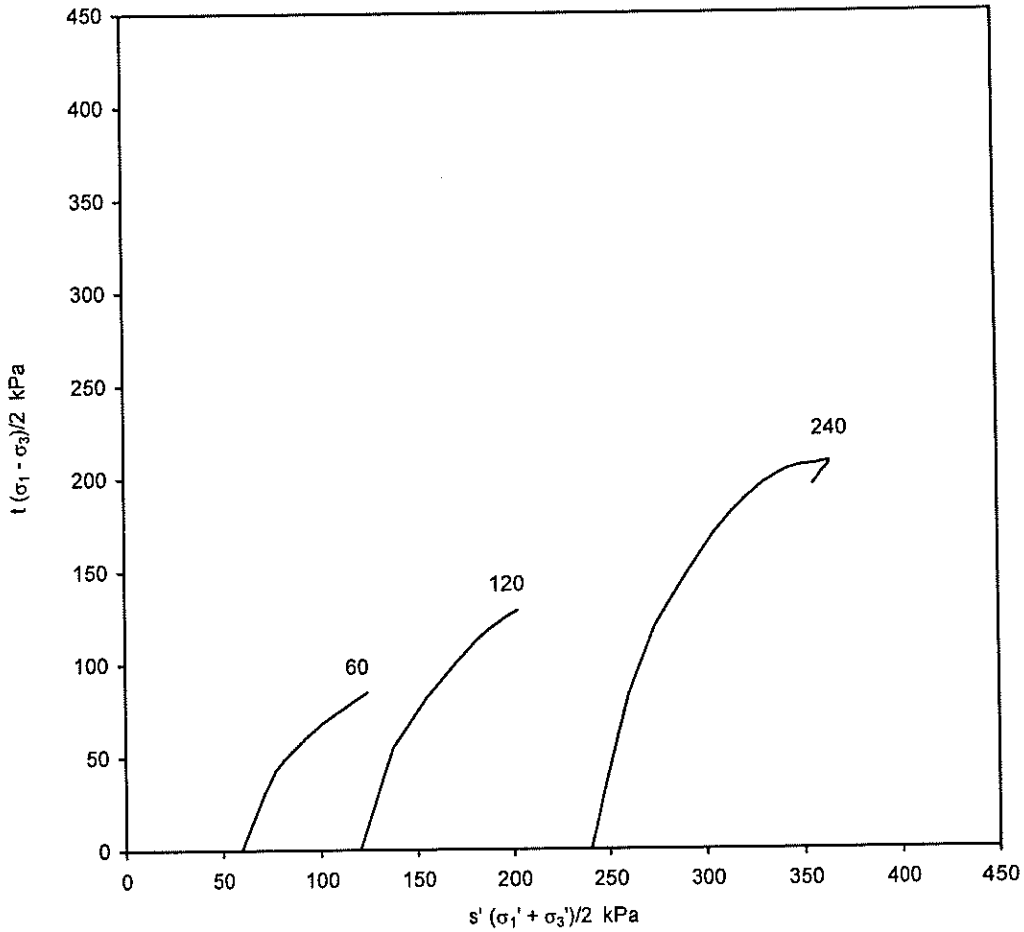
Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 5.50
To : 6.50

Laboratory Information

Lab. sample I.D. : SL90277/7
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	60	2.0	2.0	267.1	162.3	119.0	81.1
2	120	1.2	3.8	293.1	250.4	197.1	125.2
3	240	8.2	12.4	329.0	415.9	363.9	207.9



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 5.50
To : 6.50

Laboratory Information

Date shearing commenced : 12/01/2010 Time : 01:30
Date shearing completed : 12/01/2010 Time : 02:25
Proving ring serial No. : 12202
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.67 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.19

Lab. sample I.D. : SL90277/7
Specimen ref. : A
Cell pressure : 365 kPa
Back pressure : 245 kPa
Effective pressure : 120 kPa

Dimensions at starting of compression

Volume V_c : 644.30 cm^3
Area A_c : 4415.8 mm^2
Length L_c : 145.9 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.092	160.3	0.0	2.5	0.00	0.63	0.0	120.0	0.0	120.0	0.0	1.00	
282.6	37	0.374	651.6	0.3	2.8	0.00	0.68	110.3	137.5	55.1	119.2	110.3	2.34	
291.6	69	0.510	888.5	0.5	3.0	0.00	0.73	163.4	155.1	81.7	127.9	163.4	3.23	
294.6	99	0.608	1059.2	0.7	3.2	0.00	0.78	201.4	171.1	100.7	137.5	201.4	3.86	
295.3	127	0.665	1158.5	0.9	3.4	0.00	0.82	223.3	181.3	111.6	144.1	223.3	4.20	
294.8	150	0.703	1224.7	1.0	3.5	0.00	0.86	237.7	189.1	118.9	149.4	237.7	4.39	
293.1	180	0.737	1284.0	1.2	3.8	0.00	0.90	250.4	197.1	125.2	155.4	250.4	4.48	«
291.0	210	0.756	1317.1	1.4	4.0	0.00	0.95	257.2	202.6	128.6	159.7	257.2	4.48	

Final volume (cm^3): 644.30 Final length (mm): 143.8 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 5.50
To : 6.50

Laboratory Information

Date shearing commenced : 12/01/2010 Time : 09:00
Date shearing completed : 12/01/2010 Time : 15:44
Proving ring serial No. : 12202
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.67 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.20

Lab. sample I.D. : SL90277/7
Specimen ref. : A
Cell pressure : 485 kPa
Back pressure : 245 kPa
Effective pressure : 240 kPa

Dimensions at starting of compression

Volume V_c : 637.40 cm^3
Area A_c : 4448.3 mm^2
Length L_c : 143.3 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.122	212.5	0.0	4.3	0.00	1.01	0.0	240.0	0.0	240.0	0.0	1.00
307.7	31	0.546	951.2	0.2	4.5	0.00	1.05	164.6	259.6	82.3	232.2	164.6	1.93
330.8	63	0.740	1289.2	0.4	4.7	0.00	1.10	239.9	274.1	119.9	234.2	239.9	2.56
343.2	97	0.894	1557.5	0.7	4.9	0.00	1.15	299.2	291.4	149.6	241.5	299.2	3.11
349.3	126	0.992	1728.2	0.9	5.1	0.00	1.19	336.5	304.0	168.3	247.9	336.5	3.48
351.8	154	1.054	1836.2	1.1	5.3	0.00	1.23	359.9	313.1	179.9	253.2	359.9	3.70
352.4	181	1.093	1904.2	1.3	5.5	0.00	1.26	374.2	319.7	187.1	257.3	374.2	3.82
351.6	213	1.121	1953.0	1.5	5.8	0.00	1.31	384.1	325.5	192.1	261.4	384.1	3.88
350.9	240	1.147	1998.3	1.7	5.9	0.00	1.34	393.4	330.8	196.7	265.2	393.4	3.93
349.6	271	1.159	2019.2	1.9	6.2	0.00	1.38	397.1	333.9	198.5	267.8	397.1	3.93
348.1	302	1.175	2047.0	2.1	6.4	0.00	1.42	402.3	338.0	201.1	271.0	402.3	3.94
346.6	338	1.190	2073.2	2.4	6.6	0.00	1.47	406.9	341.9	203.5	274.0	406.9	3.94
345.3	369	1.196	2083.6	2.6	6.8	0.00	1.51	408.3	343.8	204.1	275.8	408.3	3.92
344.6	392	1.199	2088.9	2.7	7.0	0.00	1.54	408.7	344.8	204.4	276.6	408.7	3.91
344.0	425	1.204	2097.6	3.0	7.2	0.00	1.58	409.6	345.8	204.8	277.5	409.6	3.91
343.3	451	1.208	2104.5	3.1	7.4	0.00	1.61	410.3	346.9	205.2	278.5	410.3	3.90
342.6	482	1.212	2111.5	3.4	7.6	0.00	1.65	410.9	347.8	205.4	279.4	410.9	3.89
341.3	513	1.216	2118.5	3.6	7.8	0.00	1.69	411.4	349.4	205.7	280.8	411.4	3.86
340.5	545	1.219	2123.7	3.8	8.1	0.00	1.72	411.6	350.3	205.8	281.7	411.6	3.85
339.7	576	1.222	2128.9	4.0	8.3	0.00	1.76	411.7	351.2	205.9	282.5	411.7	3.83
338.8	601	1.225	2134.1	4.2	8.5	0.00	1.79	412.1	352.2	206.0	283.6	412.1	3.82
337.9	632	1.228	2139.4	4.4	8.7	0.00	1.83	412.2	353.2	206.1	284.5	412.2	3.80
337.0	663	1.231	2144.6	4.6	8.9	0.00	1.86	412.4	354.2	206.2	285.5	412.4	3.79
336.2	694	1.234	2149.8	4.8	9.1	0.00	1.90	412.5	355.1	206.3	286.3	412.5	3.77
335.4	721	1.237	2155.1	5.0	9.3	0.00	1.93	412.8	356.0	206.4	287.2	412.8	3.76
334.9	752	1.240	2160.3	5.2	9.5	0.00	1.96	412.9	356.6	206.5	287.7	412.9	3.75
334.2	783	1.243	2165.5	5.5	9.7	0.00	1.99	413.1	357.3	206.5	288.5	413.1	3.74
333.7	810	1.246	2170.7	5.7	9.9	0.00	2.02	413.3	358.0	206.7	289.1	413.3	3.73
332.9	845	1.251	2179.4	5.9	10.2	0.00	2.06	414.0	359.1	207.0	290.1	414.0	3.72
332.4	871	1.254	2184.7	6.1	10.3	0.00	2.09	414.3	359.8	207.2	290.7	414.3	3.71
332.0	902	1.257	2189.9	6.3	10.6	0.00	2.12	414.4	360.2	207.2	291.1	414.4	3.71
331.5	931	1.261	2196.9	6.5	10.8	0.00	2.15	415.0	361.0	207.5	291.8	415.0	3.70
331.1	962	1.264	2202.1	6.7	11.0	0.00	2.18	415.0	361.4	207.5	292.2	415.0	3.70
330.8	994	1.267	2207.3	6.9	11.2	0.00	2.22	415.1	361.8	207.6	292.6	415.1	3.69

Final volume (cm^3): 637.40 Final length (mm): 124.3 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 5.50
To : 6.50

Laboratory Information

Lab. sample I.D. : SL90277/7
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
330.5	1023	1.27	2212.5	7.1	11.4	0.00	2.25	415.3	362.1	207.6	292.9	415.3	3.69
330.2	1056	1.273	2217.8	7.4	11.6	0.00	2.28	415.3	362.4	207.6	293.2	415.3	3.68
329.9	1081	1.276	2223.0	7.5	11.8	0.00	2.31	415.6	362.9	207.8	293.6	415.6	3.68
329.6	1114	1.279	2228.2	7.8	12.0	0.00	2.34	415.6	363.2	207.8	293.9	415.6	3.67
329.3	1143	1.282	2233.4	8.0	12.2	0.00	2.37	415.7	363.6	207.9	294.3	415.7	3.67
329.0	1171	1.285	2238.7	8.2	12.4	0.00	2.39	415.9	363.9	207.9	294.6	415.9	3.67
328.7	1202	1.286	2240.4	8.4	12.7	0.00	2.43	415.2	363.9	207.6	294.7	415.2	3.66
328.4	1235	1.286	2240.4	8.6	12.9	0.00	2.46	414.1	363.7	207.1	294.6	414.1	3.64
328.1	1261	1.286	2240.4	8.8	13.1	0.00	2.48	413.3	363.5	206.6	294.7	413.3	3.63
327.8	1292	1.286	2240.4	9.0	13.3	0.00	2.51	412.3	363.3	206.1	294.6	412.3	3.62
327.4	1320	1.286	2240.4	9.2	13.5	0.00	2.54	411.3	363.3	205.7	294.7	411.3	3.61
327.2	1351	1.286	2240.4	9.4	13.7	0.00	2.57	410.3	363.0	205.2	294.6	410.3	3.60
327.0	1402	1.285	2238.7	9.8	14.0	0.00	2.62	408.3	362.2	204.2	294.1	408.3	3.58
327.0	1455	1.285	2238.7	10.2	14.4	0.00	2.67	406.6	361.3	203.3	293.5	406.6	3.57
327.0	1504	1.285	2238.7	10.5	14.8	0.00	2.71	405.0	360.5	202.5	293.0	405.0	3.56
326.8	1552	1.285	2238.7	10.8	15.1	0.00	2.75	403.4	359.9	201.7	292.7	403.4	3.55
326.6	1603	1.285	2238.7	11.2	15.5	0.00	2.80	401.7	359.3	200.9	292.3	401.7	3.54
326.3	1657	1.284	2236.9	11.6	15.8	0.00	2.85	399.6	358.5	199.8	291.9	399.6	3.52
326.1	1702	1.284	2236.9	11.9	16.1	0.00	2.89	398.1	358.0	199.1	291.6	398.1	3.51
325.7	1752	1.284	2236.9	12.2	16.5	0.00	2.94	396.5	357.6	198.3	291.5	396.5	3.49
325.5	1803	1.283	2235.2	12.6	16.8	0.00	2.98	394.5	356.8	197.3	291.0	394.5	3.47
325.2	1851	1.282	2233.4	12.9	17.2	0.00	3.02	392.6	356.1	196.3	290.7	392.6	3.46
324.9	1904	1.282	2233.4	13.3	17.6	0.00	3.07	390.9	355.5	195.4	290.4	390.9	3.44

Final volume (cm^3): 637.40 Final length (mm): 124.3 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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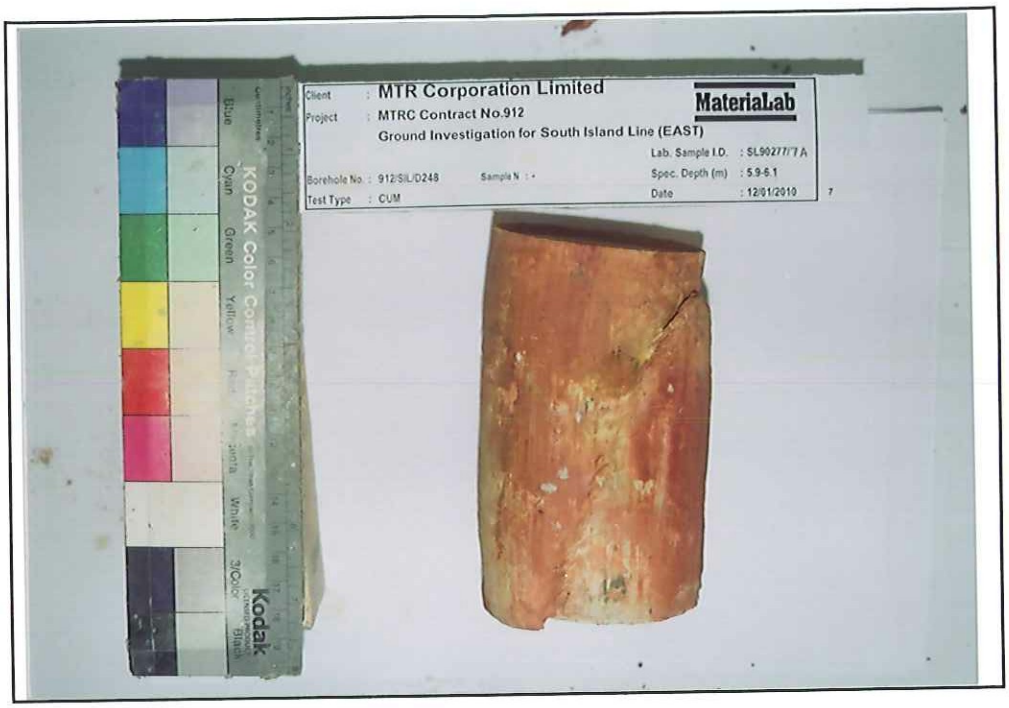
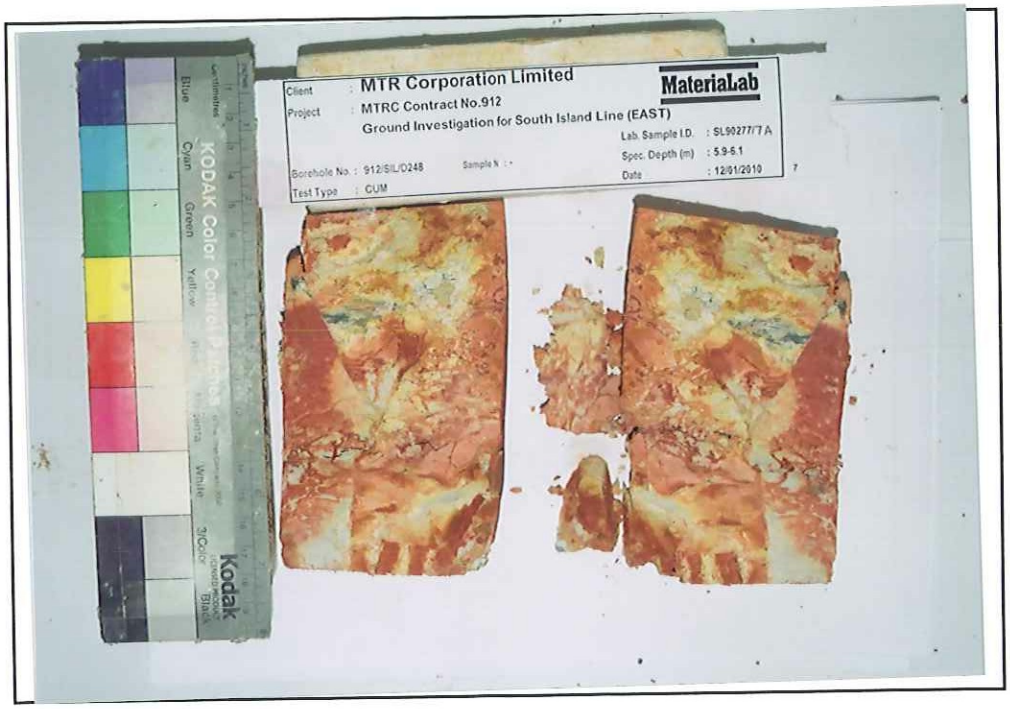
Photographic Records for Triaxial Test





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Test Report No. : 090562SL90277(42) Page 1 of 13

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

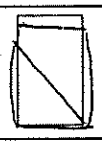
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 10.50
To : 11.50
Sample origin : CDT
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 09-01-2010
Date test(s) completed : 13-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.69 (Measured)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 18.0 °C
Visual description : Moist, purplish red streaked with white, slightly gravelly, slightly sandy SILT/CLAY.

Lab. sample I.D. : SL90277/8
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 10.90
To : 11.10
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	110			220			440	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.7	73.8	74.5	74.2	74.8		74.3	77.2
Length	mm	150.2	148.5	145.8	145.2	142.8		141.8	131.6
Volume	cm^3	658.27	635.87	635.87	627.77	627.77		615.67	615.67
Wet mass	g	1161.6	1152.4	1152.4	1144.3	1144.3		1132.2	1132.2
Dry mass	g	829.0	829.0	829.0	829.0	829.0		829.0	829.0
Moisture content	%	40.1	39.0	39.0	38.0	38.0		36.6	36.6
Bulk density	Mg/m^3	1.76	1.81	1.81	1.82	1.82		1.84	1.84
Dry density	Mg/m^3	1.26	1.30	1.30	1.32	1.32		1.35	1.35
Void ratio		1.14	1.06	1.06	1.04	1.04		1.00	1.00
Degree of saturation	%	95.0	98.7	98.7	98.7	98.7		98.6	98.6
Saturation Stage									
**Volume change of water	cm^3	13.2							
Consolidation Stage									
Side drain used		Yes			-			-	
Initial pore pressure	kPa	350.0			386.6			532.7	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm^3	22.4			8.1			12.1	
m_{vi}	m^2/MN	0.32			0.09			0.07	
t_{50}	min	23.00			8.90			7.20	
c_{vi} (from t_{50})	m^2/yr	NA			NA			NA	
t_{100}	min	36.00			23.04			20.43	
c_{vi} (from t_{100})	m^2/yr	3.13			4.91			5.57	
Sketch of failed specimen (Failure Mode)								 Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung, K.M. Fung Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil) Date : - 5 MAR 2010

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

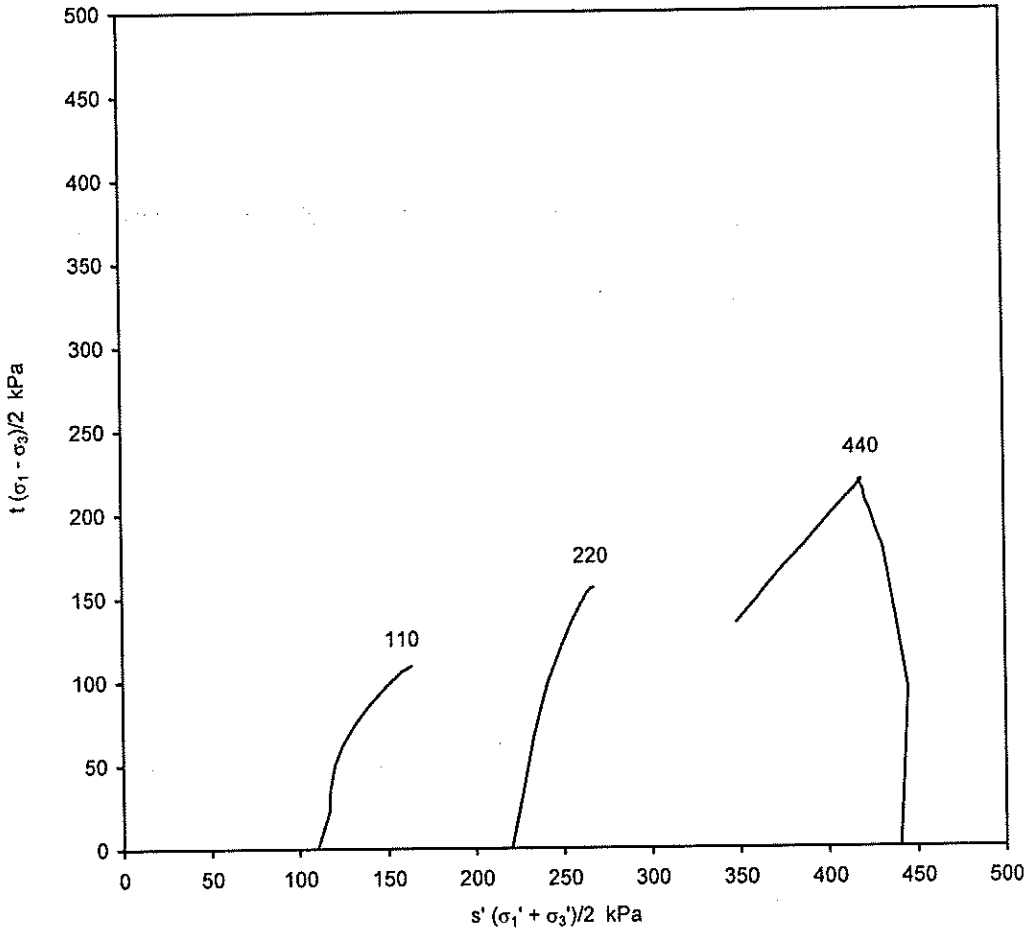
Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 10.50
To : 11.50

Laboratory Information

Lab. sample I.D. : SL90277/8
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	110	1.6	1.6	302.6	211.9	158.3	105.9
2	220	1.4	3.7	353.9	310.0	266.1	155.0
3	440	2.8	7.2	484.9	438.4	419.3	219.2



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

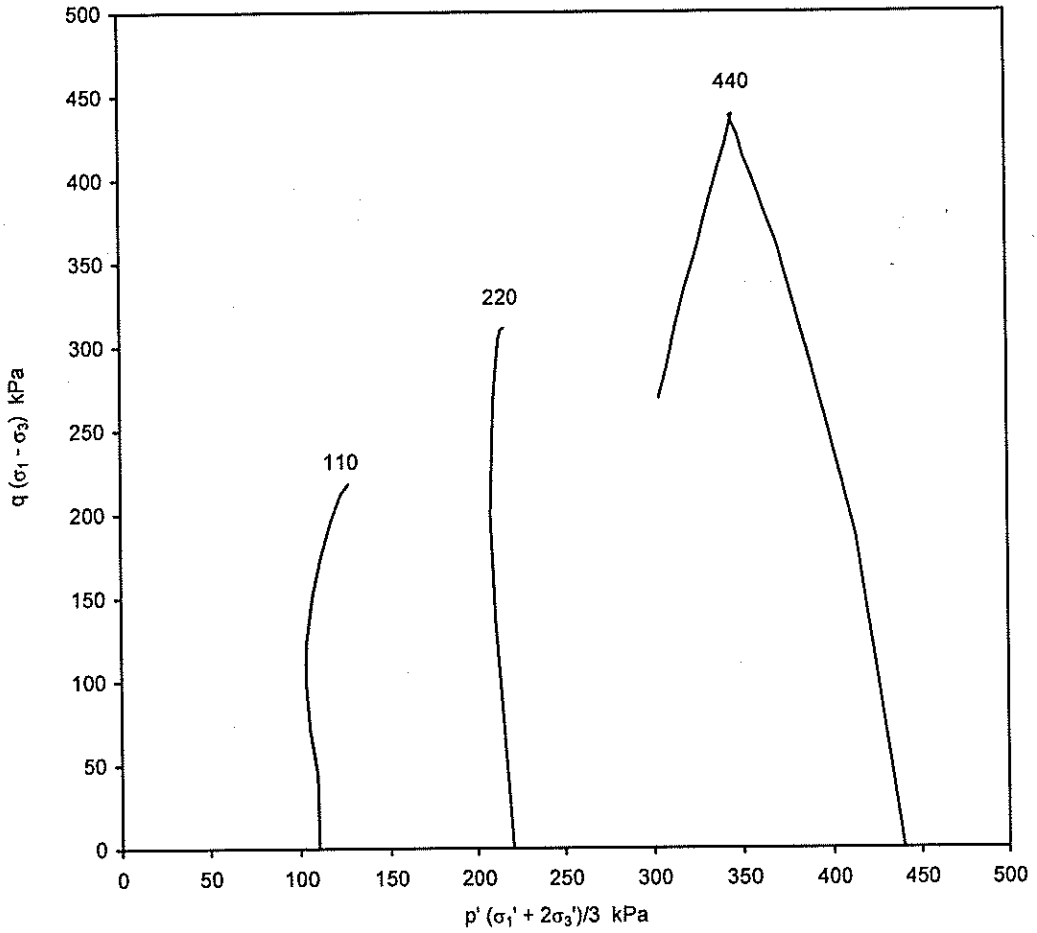
Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 10.50
To : 11.50

Laboratory Information

Lab. sample I.D. : SL90277/8
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	110	1.6	1.6	302.6	211.9	123.0	211.9
2	220	1.4	3.7	353.9	310.0	214.4	310.0
3	440	2.8	7.2	484.9	438.4	346.2	438.4



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

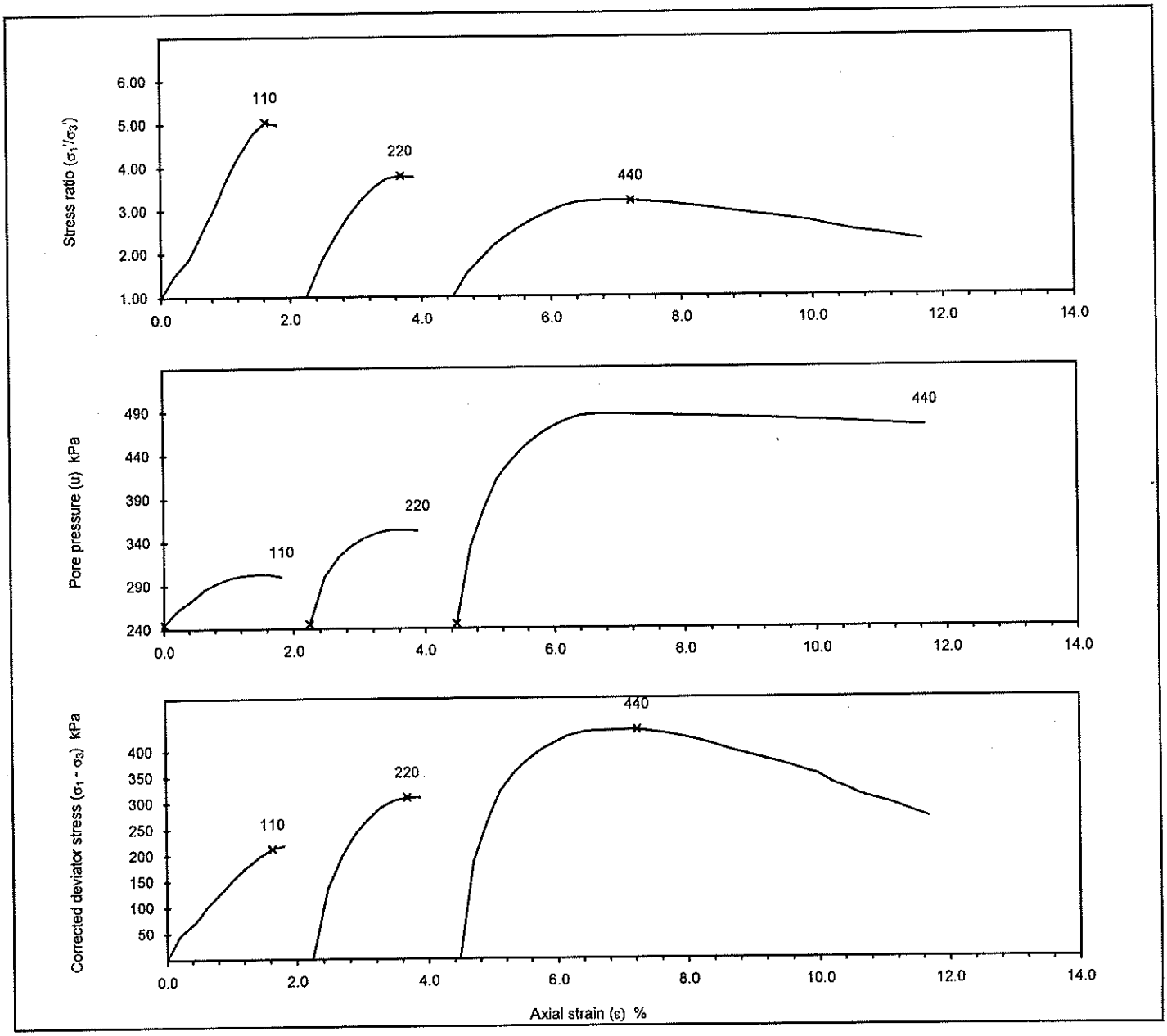
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 10.50
To : 11.50

Laboratory Information

Lab. sample I.D. : SL90277/8
Specimen ref. : A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 10.50
To : 11.50

Laboratory Information

Lab. sample I.D. : SL90277/8
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	110	
	Stage 2	kPa	220	
	Stage 3	kPa	440	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			150	145
			200	195
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		1.00
Volume change	cm^3	13.2

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1130.0
Final moisture content	%	36.3
Final bulk density	Mg/m^3	1.84

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

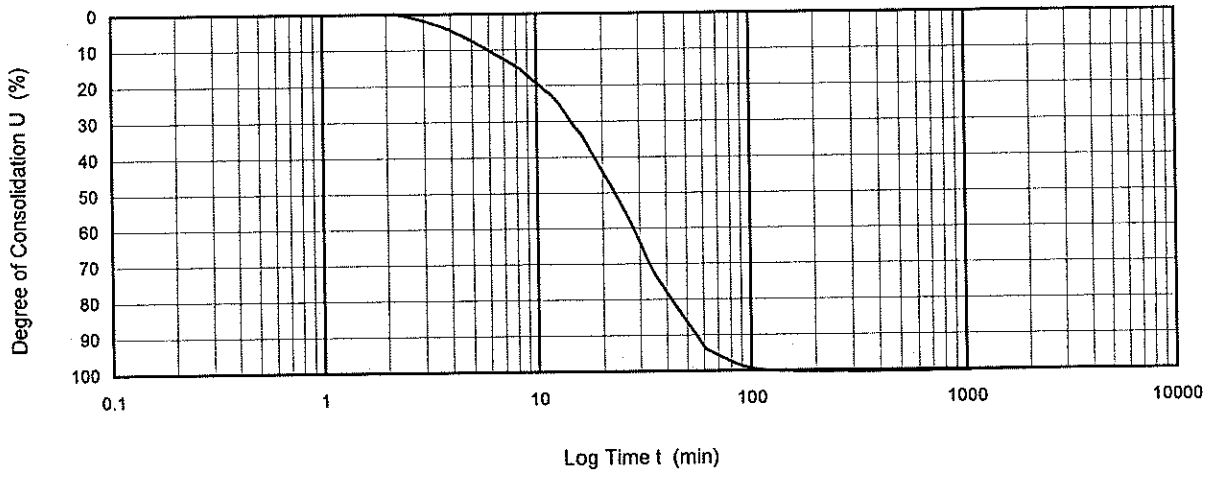
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.50
			To	:	11.50

Laboratory Information

Cell pressure	:	355 kPa	Lab. sample I.D.	:	SL90277/8
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	110 kPa			

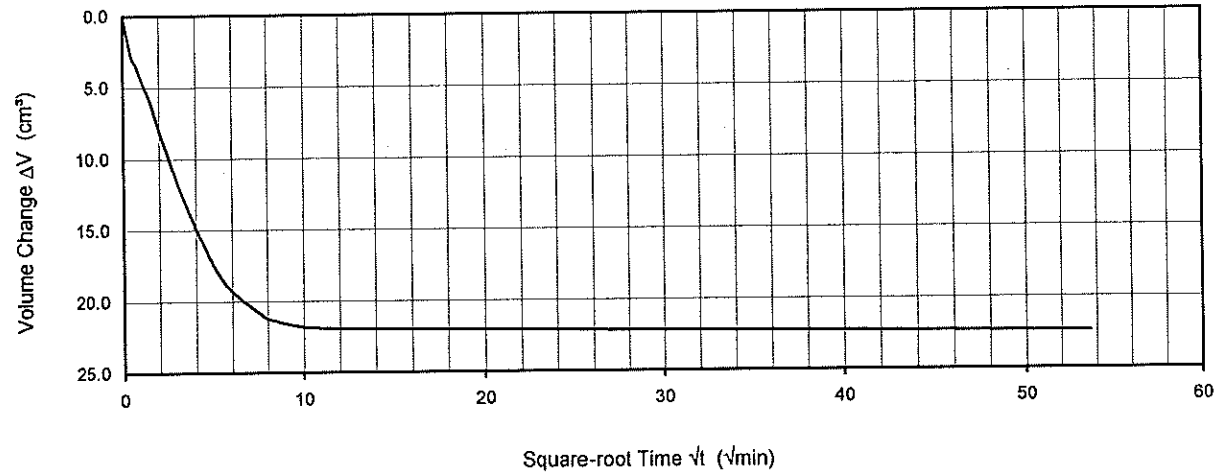
Degree of Consolidation vs. Log Time

t_{50} = 23.00 min ΔV = 22.4 cm³



Volume Change vs. Square-root Time

t_{100} = 36.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

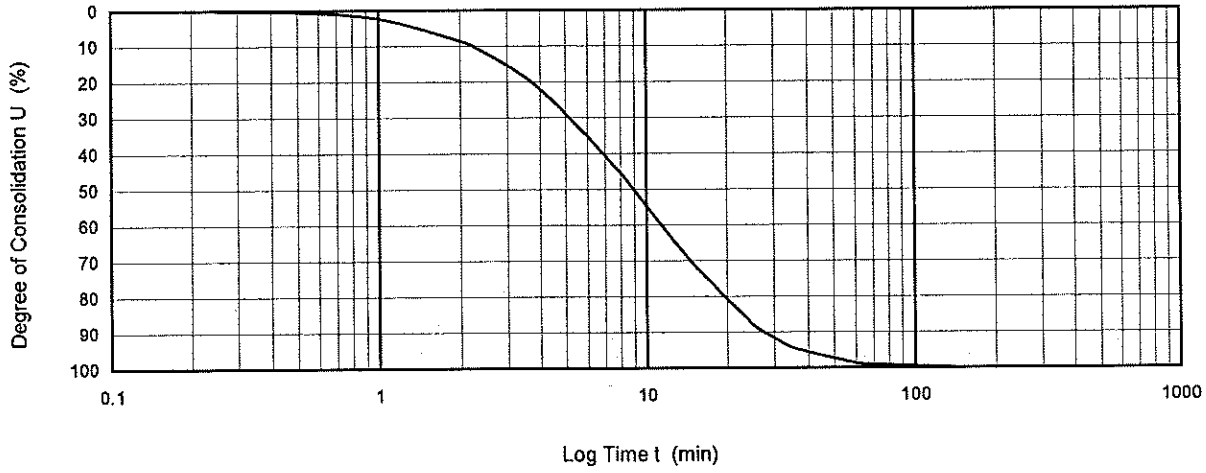
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.50
			To	:	11.50

Laboratory Information

Cell pressure	:	465 kPa	Lab. sample I.D.	:	SL90277/8
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	220 kPa			

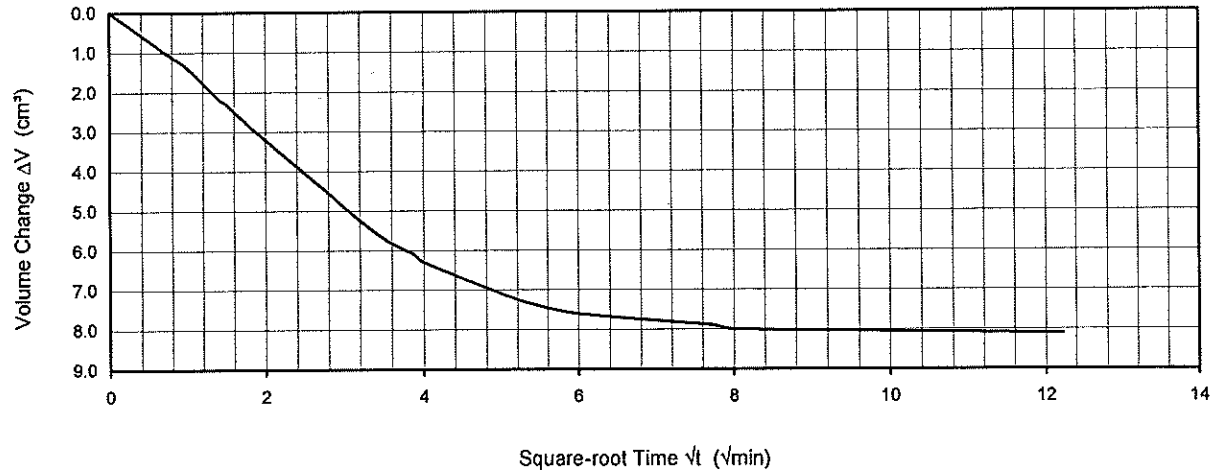
Degree of Consolidation vs. Log Time

t_{50} = 8.90 min ΔV = 8.1 cm³



Volume Change vs. Square-root Time

t_{100} = 23.04 min



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MaterialLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

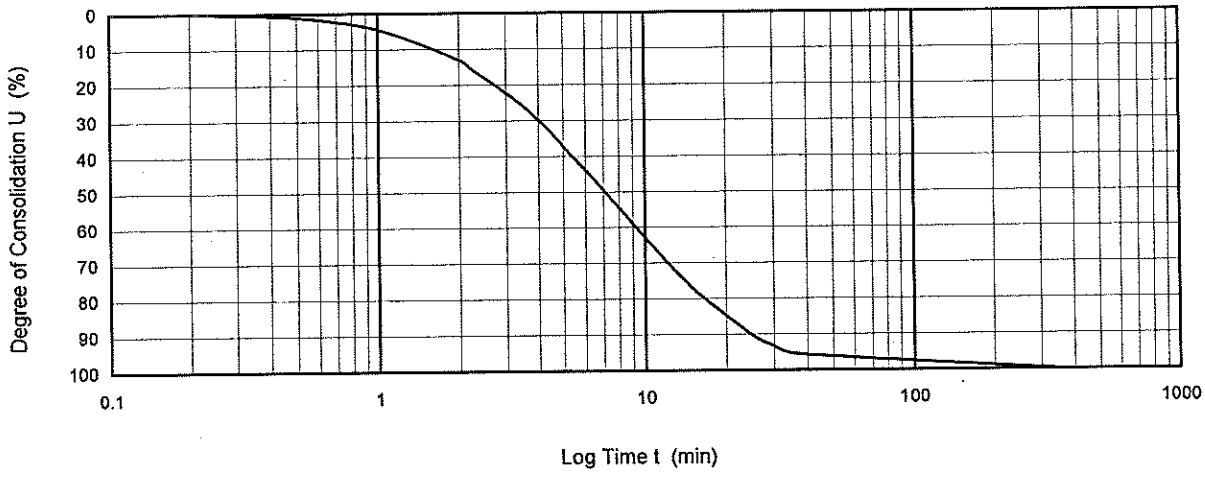
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.50
			To	:	11.50

Laboratory Information

Cell pressure	:	685 kPa	Lab. sample I.D.	:	SL90277/8
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	440 kPa			

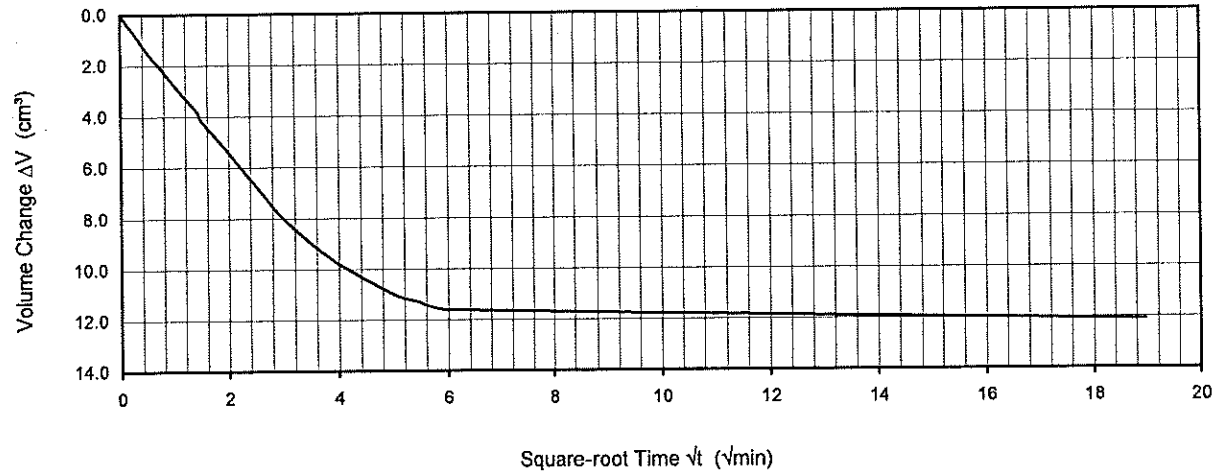
Degree of Consolidation vs. Log Time

t_{50} = 7.20 min ΔV = 12.1 cm³



Volume Change vs. Square-root Time

t_{100} = 20.43 min



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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 10.50
To : 11.50

Laboratory Information

Date shearing commenced : 11/01/2010 Time : 21:00
Date shearing completed : 11/01/2010 Time : 22:21
Proving ring serial No. : 9689
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.765 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.27

Lab. sample I.D. : SL90277/8
Specimen ref. : A
Cell pressure : 355 kPa
Back pressure : 245 kPa
Effective pressure : 110 kPa
Dimensions at starting of compression
Volume V_c : 635.87 cm^3
Area A_c : 4282.6 mm^2
Length L_c : 148.5 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.229	163.6	0.0	0.0	0.00	0.00	0.0	110.0	0.0	110.0	0.0	1.00	
260.4	30	0.499	356.6	0.2	0.2	0.48	0.05	44.4	116.8	22.2	109.4	44.4	1.47	
272.9	65	0.661	472.4	0.4	0.4	1.04	0.11	70.6	117.4	35.3	105.6	70.6	1.86	
285.2	93	0.848	606.0	0.6	0.6	1.49	0.16	101.0	120.3	50.5	103.5	101.0	2.45	
292.1	120	0.987	705.3	0.8	0.8	1.93	0.21	123.3	124.6	61.7	104.0	123.3	2.96	
298.0	151	1.158	827.5	1.0	1.0	2.42	0.26	150.8	132.4	75.4	107.3	150.8	3.64	
301.2	180	1.302	930.4	1.2	1.2	2.89	0.31	173.7	140.6	86.8	111.7	173.7	4.23	
302.8	215	1.450	1036.2	1.4	1.4	3.45	0.37	197.0	150.7	98.5	117.9	197.0	4.77	
302.6	243	1.546	1104.8	1.6	1.6	3.90	0.41	211.9	158.3	105.9	123.0	211.9	5.04	«
300.2	270	1.590	1136.3	1.8	1.8	4.33	0.46	218.2	163.9	109.1	127.5	218.2	4.98	

Final volume (cm^3): 635.87 Final length (mm): 145.8 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	10.50
			To	:	11.50

Laboratory Information

Date shearing commenced	:	12/01/2010	Time :	01:30			
Date shearing completed	:	12/01/2010	Time :	02:33	Lab. sample I.D.	:	SL90277/8
Proving ring serial No.	:	9769			Specimen ref.	:	A
Type of membrane	:	rubber			Cell pressure	:	465 kPa
Corrections					Back pressure	:	245 kPa
*Side drain, σ_{dr}	:	4.765	kPa/%		Effective pressure	:	220 kPa
Membrane thickness, σ_{mb}	:	0.66	mm		Dimensions at starting of compression		
Rate of axial displacement	:	0.050	mm/min		Volume V_c	:	627.77 cm^3
Pore pressure coefficient, A_f	:	0.35			Area A_c	:	4324.8 mm^2
					Length L_c	:	145.2 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	60	209.4	0.0	2.2	4.77	0.55	0.0	220.0	0.0	220.0	0.0	1.00	
299.8	34	235	820.0	0.2	2.5	4.77	0.61	135.5	232.9	67.7	210.4	135.5	1.82	
323.5	66	315	1099.1	0.5	2.7	4.77	0.66	199.4	241.2	99.7	208.0	199.4	2.41	
336.8	96	369	1287.5	0.7	2.9	4.77	0.70	242.2	249.3	121.1	208.9	242.2	2.89	
344.2	120	400	1395.7	0.8	3.1	4.77	0.74	266.5	254.1	133.3	209.6	266.5	3.21	
350.2	150	430	1500.3	1.0	3.3	4.77	0.78	289.9	259.7	144.9	211.4	289.9	3.53	
353.5	180	449	1566.6	1.2	3.5	4.77	0.83	304.4	263.7	152.2	213.0	304.4	3.73	
353.9	210	457	1594.6	1.4	3.7	4.77	0.87	310.0	266.1	155.0	214.4	310.0	3.79	«
352.6	240	459	1601.5	1.7	3.9	4.77	0.92	310.9	267.9	155.5	216.0	310.9	3.77	

Final volume (cm^3): 627.77 Final length (mm): 142.8 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 10.50
To : 11.50

Laboratory Information

Date shearing commenced : 12/01/2010 Time : 09:00
Date shearing completed : 12/01/2010 Time : 12:39
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.765 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.55

Lab. sample I.D. : SL90277/8
Specimen ref. : A
Cell pressure : 685 kPa
Back pressure : 245 kPa
Effective pressure : 440 kPa
Dimensions at starting of compression
Volume V_c : 615.67 cm^3
Area A_c : 4340.8 mm^2
Length L_c : 141.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	88	307.0	0.0	4.5	4.77	1.04	0.0	440.0	0.0	440.0	0.0	1.00	
334.7	32	330	1151.4	0.2	4.7	4.77	1.08	188.2	444.4	94.1	413.0	188.2	1.54	
381.4	65	432	1507.3	0.5	4.9	4.77	1.13	269.3	438.3	134.7	393.4	269.3	1.89	
411.3	91	497	1734.1	0.6	5.1	4.77	1.17	320.7	434.1	160.4	380.6	320.7	2.17	
433.2	124	545	1901.6	0.9	5.3	4.77	1.21	358.2	430.9	179.1	371.2	358.2	2.42	
447.3	151	572	1995.8	1.1	5.5	4.77	1.25	378.9	427.1	189.4	364.0	378.9	2.59	
461.6	183	601	2097.0	1.3	5.8	4.77	1.29	401.0	423.9	200.5	357.1	401.0	2.79	
471.1	212	619	2159.8	1.5	6.0	4.77	1.33	414.3	421.1	207.2	352.0	414.3	2.94	
478.4	241	636	2219.1	1.7	6.2	4.77	1.37	426.9	420.0	213.4	348.9	426.9	3.07	
484.3	277	647	2257.5	2.0	6.4	4.77	1.41	434.4	417.9	217.2	345.5	434.4	3.16	
485.2	301	651	2271.5	2.1	6.6	4.77	1.44	436.7	418.2	218.4	345.4	436.7	3.19	
486.1	332	653	2278.4	2.3	6.8	4.77	1.48	437.3	417.5	218.6	344.7	437.3	3.20	
485.7	360	655	2285.4	2.5	7.0	4.77	1.52	437.9	418.3	219.0	345.3	437.9	3.20	
484.9	391	657	2292.4	2.8	7.2	4.77	1.56	438.4	419.3	219.2	346.2	438.4	3.19	«
484.5	420	654	2281.9	3.0	7.4	4.77	1.59	435.1	418.1	217.6	345.5	435.1	3.17	
484.1	458	650	2268.0	3.2	7.7	4.77	1.64	430.8	416.3	215.4	344.5	430.8	3.14	
483.6	483	645	2250.5	3.4	7.9	4.77	1.67	426.0	414.4	213.0	343.4	426.0	3.12	
483.1	512	639	2229.6	3.6	8.1	4.77	1.70	420.4	412.1	210.2	342.0	420.4	3.08	
482.7	543	631	2201.7	3.8	8.3	4.77	1.74	413.3	408.9	206.6	340.1	413.3	3.04	
482.2	571	622	2170.3	4.0	8.5	4.77	1.77	405.4	405.5	202.7	337.9	405.4	3.00	
481.6	602	613	2138.9	4.2	8.7	4.77	1.81	397.5	402.2	198.8	335.9	397.5	2.95	
481.1	630	605	2111.0	4.4	8.9	4.77	1.84	390.5	399.2	195.3	334.1	390.5	2.92	
480.5	663	596	2079.6	4.7	9.1	4.77	1.87	382.6	395.8	191.3	332.0	382.6	2.87	
479.9	695	588	2051.6	4.9	9.4	4.77	1.91	375.5	392.9	187.8	330.3	375.5	2.83	
479.2	723	579	2020.2	5.1	9.6	4.77	1.94	367.8	389.7	183.9	328.4	367.8	2.79	
478.5	750	570	1988.8	5.3	9.8	4.77	1.97	360.2	386.6	180.1	326.6	360.2	2.74	
477.9	781	560	1953.9	5.5	10.0	4.77	2.00	351.7	383.0	175.9	324.3	351.7	2.70	
477.2	814	539	1880.7	5.7	10.2	4.77	2.04	334.9	375.3	167.5	319.4	334.9	2.61	
476.4	843	527	1838.8	5.9	10.4	4.77	2.07	325.1	371.1	162.5	317.0	325.1	2.56	
475.3	871	512	1786.5	6.1	10.6	4.77	2.10	313.0	366.2	156.5	314.0	313.0	2.49	
474.2	905	501	1748.1	6.4	10.9	4.77	2.13	303.9	362.7	151.9	312.1	303.9	2.44	
473.1	937	492	1716.7	6.6	11.1	4.77	2.17	296.4	360.1	148.2	310.7	296.4	2.40	
472.2	965	481	1678.3	6.8	11.3	4.77	2.20	287.4	356.5	143.7	308.6	287.4	2.35	
471.5	992	469	1636.4	7.0	11.5	4.77	2.22	277.8	352.4	138.9	306.1	277.8	2.30	

Final volume (cm^3): 615.67 Final length (mm): 131.6 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 10.50
To : 11.50

Laboratory Information

Lab. sample I.D. : SL90277/8
Specimen ref. : A

Pore pressure u	Axial gauge reading	Proving ring reading	Axial force	Axial strain	ε_c	Side drain correction σ_{dr}	Membrane correction σ_{mb}	Corr. Dev. stress σ_1-σ_3	s'	t	p'	q	Stress ratio σ_1'/σ_3'
kPa	div	div	N	%	%	kPa	kPa	kPa	kPa	kPa	kPa	kPa	
470.7	1023	458	1598.0	7.2	11.7	4.77	2.25	268.9	348.8	134.5	303.9	268.9	2.25

Final volume (cm^3): 615.67 Final length (mm): 131.6 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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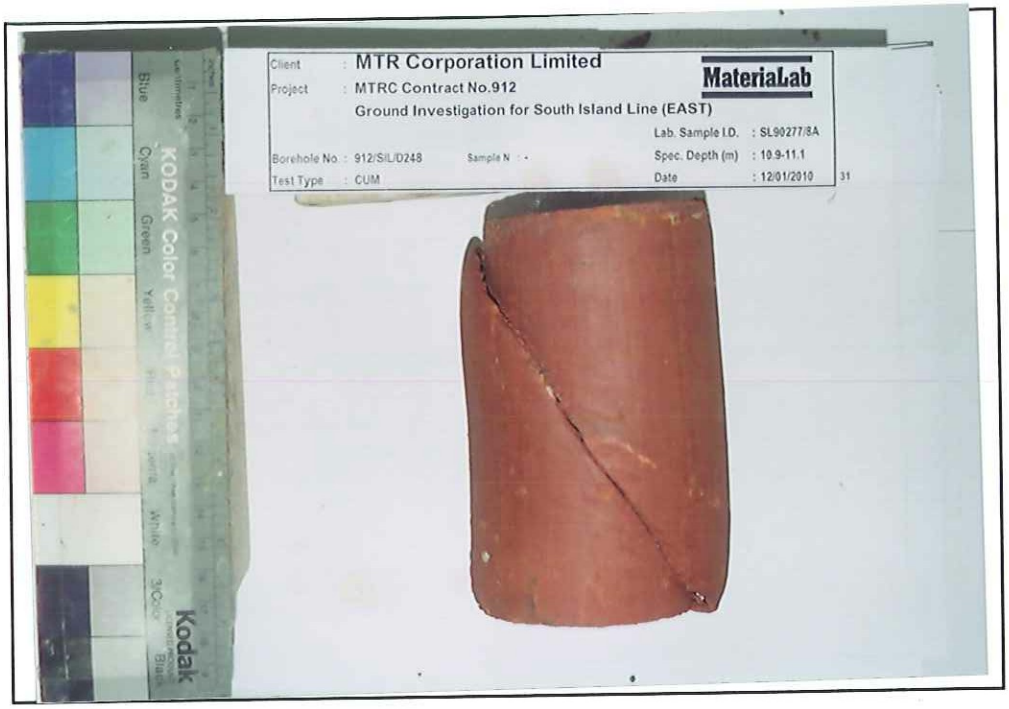
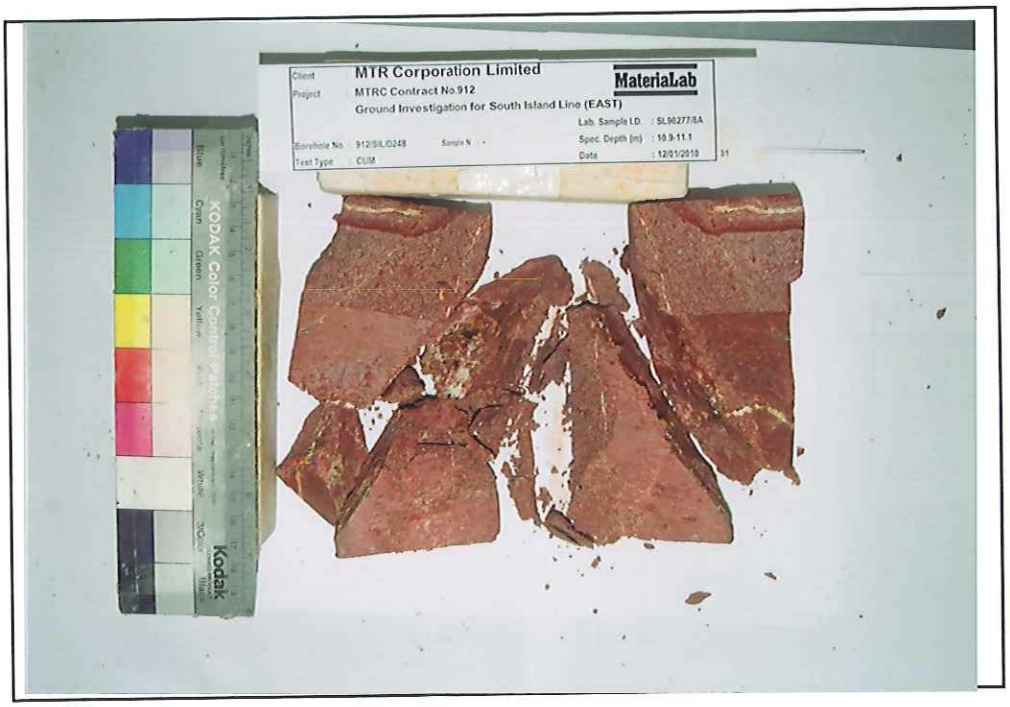
Photographic Records for Triaxial Test





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MateriaLab

HOKLAS 015

Test Report No. : 090562SL90277(43) Page 1 of 13

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

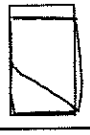
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 13.00
To : 14.00
Sample origin : CDT
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 11-01-2010
Date test(s) completed : 14-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : W.Y. Lo Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 18.0 °C
Visual description : Moist, reddish brown streaked with black and white, slightly gravelly, slightly sandy SILT/CLAY.

Lab. sample I.D. : SL90277/9
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 13.40
To : 13.60
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	135			270			540	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.8	74.2	75.0	74.6	76.1		75.5	79.4
Length	mm	150.4	149.2	146.1	145.4	139.7		138.5	125.0
Volume	cm³	660.91	644.91	644.91	635.81	635.81		619.71	619.71
Wet mass	g	1162.7	1163.8	1163.8	1154.7	1154.7		1138.6	1138.6
Dry mass	g	828.7	828.7	828.7	828.7	828.7		828.7	828.7
Moisture content	%	40.3	40.4	40.4	39.3	39.3		37.4	37.4
Bulk density	Mg/m³	1.76	1.80	1.80	1.82	1.82		1.84	1.84
Dry density	Mg/m³	1.25	1.28	1.28	1.30	1.30		1.34	1.34
Void ratio		1.11	1.06	1.06	1.03	1.03		0.98	0.98
Degree of saturation	%	95.9	100.9	100.9	100.9	100.9		100.9	100.9
Saturation Stage									
**Volume change of water	cm³	17.1							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	374.9			424.9			622.3	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	16.0			9.1			16.1	
m_{vi}	m²/MN	0.19			0.08			0.07	
t_{50}	min	6.00			3.50			3.50	
c_{vi} (from t_{50})	m²/yr	747.88			1214.08			1105.98	
t_{100}	min	10.24			7.84			9.00	
c_{vi} (from t_{100})	m²/yr	884.74			1164.71			1042.06	
Sketch of failed specimen (Failure Mode)								 Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo, Y.K. Chan

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : - 5 MAR 2010

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

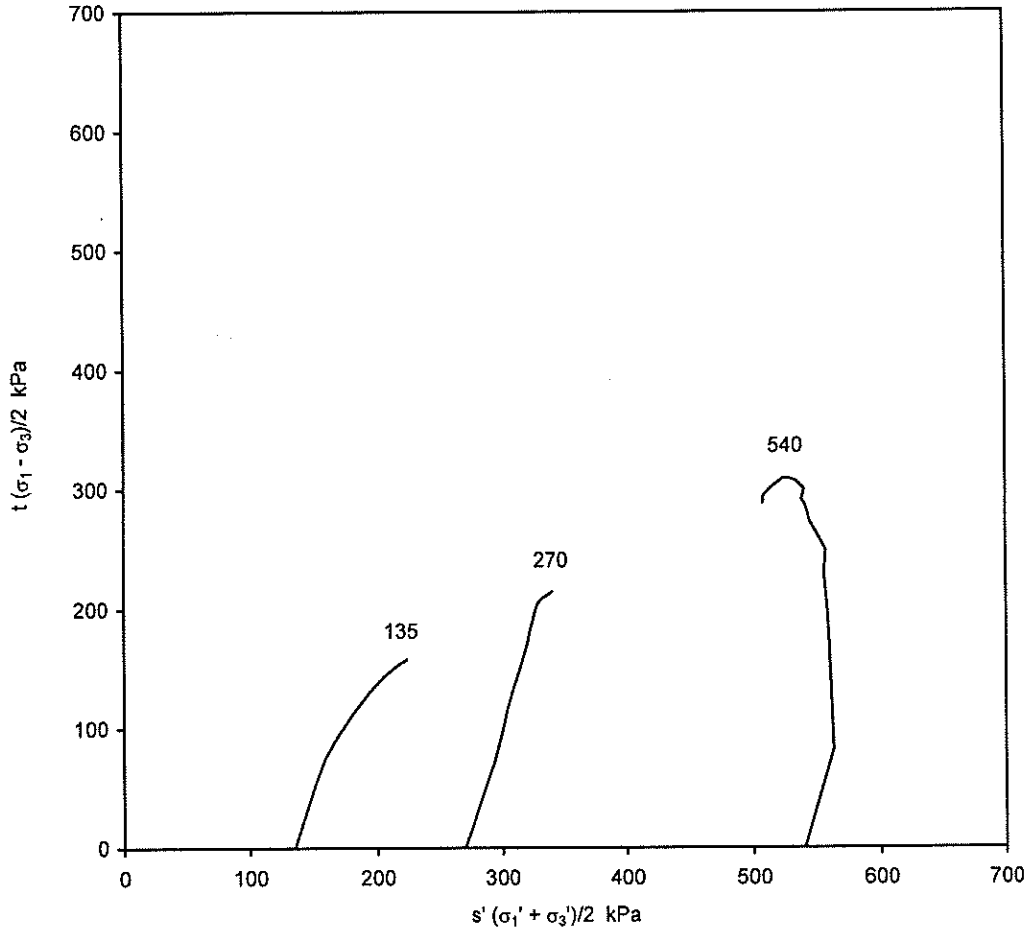
Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 13.00
To : 14.00

Laboratory Information

Lab. sample I.D. : SL90277/9
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	135	1.8	1.8	315.5	309.0	219.0	154.5
2	270	3.7	6.2	389.7	427.7	339.1	213.8
3	540	4.1	11.3	568.3	617.8	525.6	308.9



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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

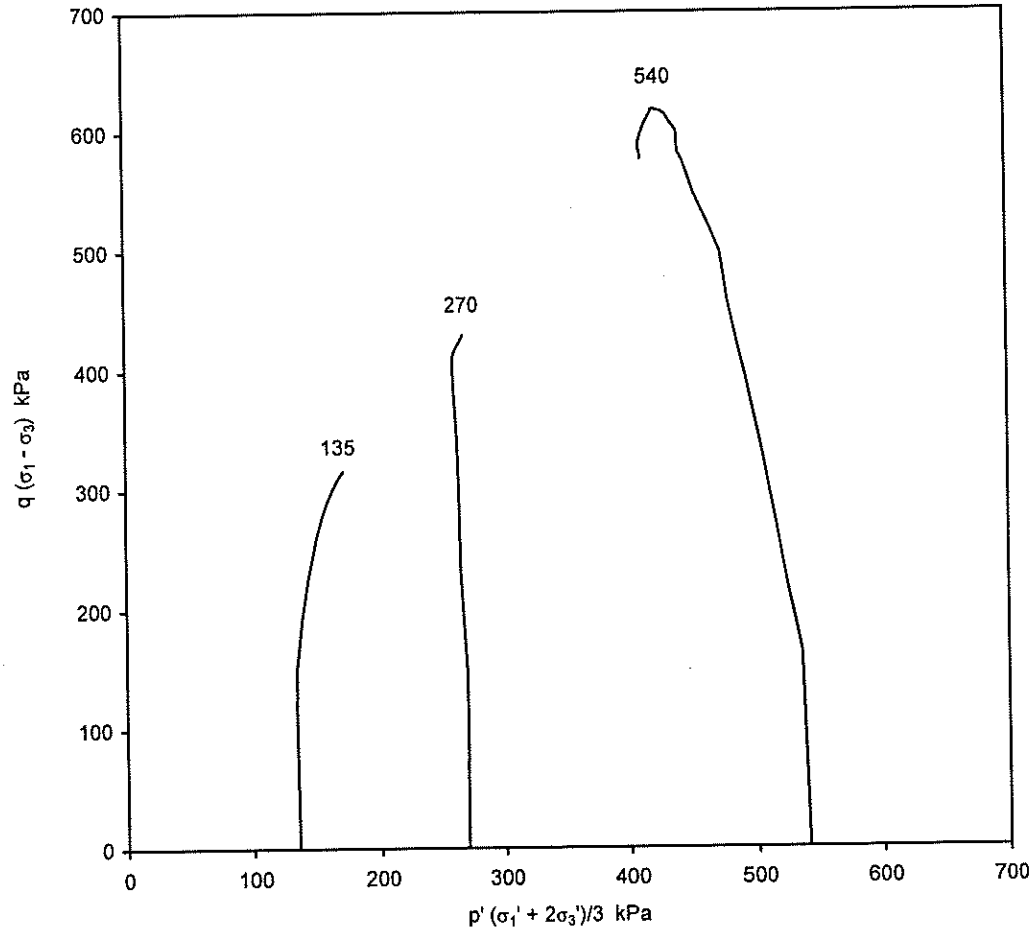
Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 13.00
To : 14.00

Laboratory Information

Lab. sample I.D. : SL90277/9
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	135	1.8	1.8	315.5	309.0	167.5	309.0
2	270	3.7	6.2	389.7	427.7	267.9	427.7
3	540	4.1	11.3	568.3	617.8	422.6	617.8



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HKAS HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

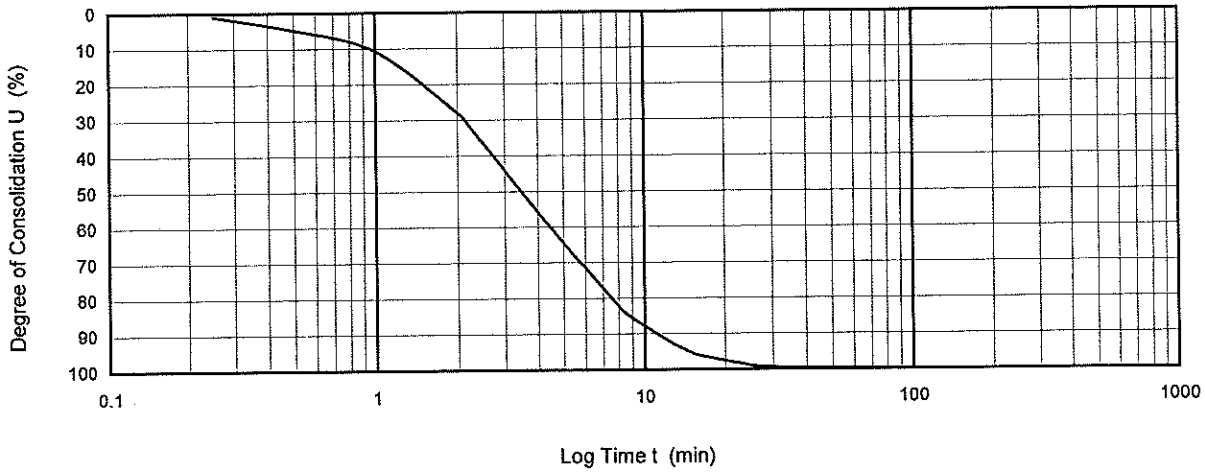
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912 Ground Investigation for South Island Line (EAST)	Borehole No.	:	912/SIL/D248
			Depth(m) From	:	13.00
			To	:	14.00

Laboratory Information

Cell pressure	:	515 kPa	Lab. sample I.D.	:	SL90277/9
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	270 kPa			

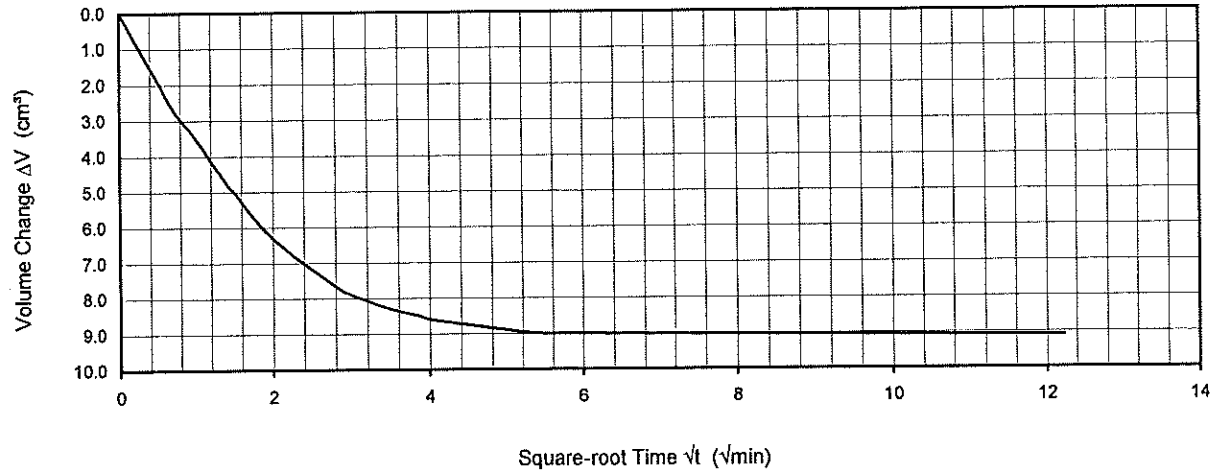
Degree of Consolidation vs. Log Time

t_{50} = 3.50 min ΔV = 9.1 cm³



Volume Change vs. Square-root Time

t_{100} = 7.84 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

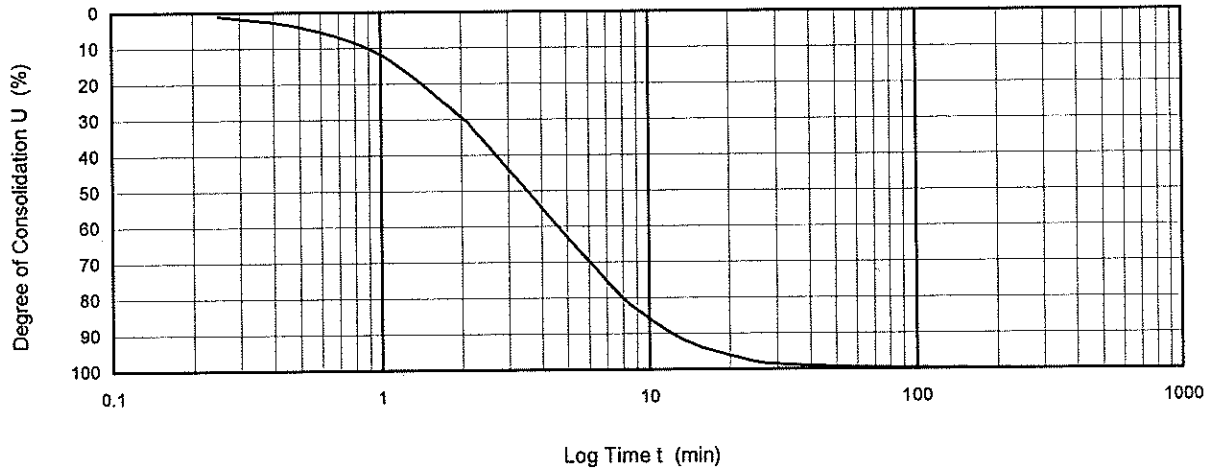
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	13.00
			To	:	14.00

Laboratory Information

Cell pressure	:	785 kPa	Lab. sample I.D.	:	SL90277/9
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	540 kPa			

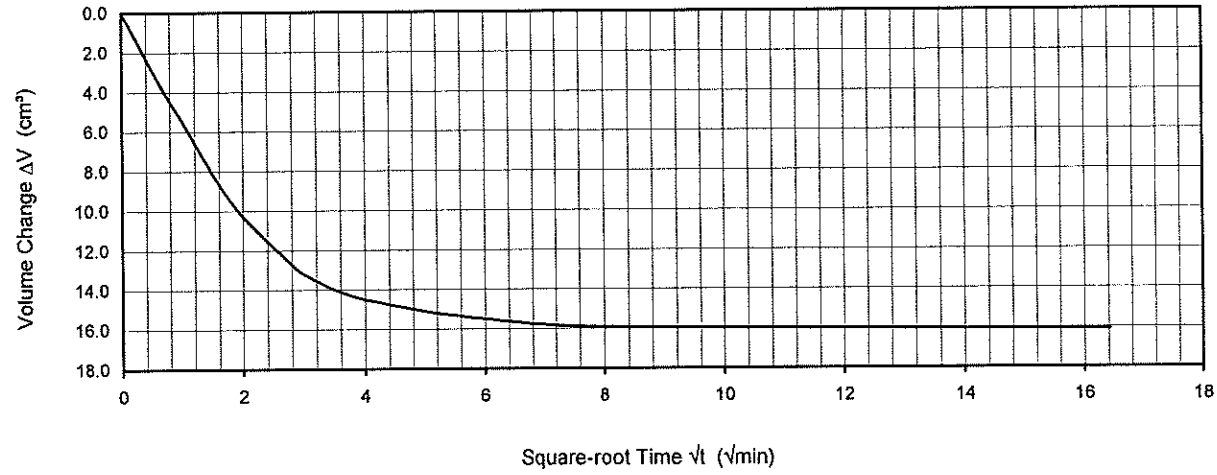
Degree of Consolidation vs. Log Time

t_{50} = 3.50 min ΔV = 16.1 cm^3



Volume Change vs. Square-root Time

t_{100} = 9.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	13.00
			To	:	14.00

Laboratory Information

Date shearing commenced	:	12/01/2010	Time : 21:00				
Date shearing completed	:	12/01/2010	Time : 22:16	Lab. sample I.D.	:	SL90277/9	
Proving ring serial No.	:	10175		Specimen ref.	:	A	
Type of membrane	:	rubber		Cell pressure	:	380	kPa
Corrections				Back pressure	:	245	kPa
*Side drain, σ_{dr}	:	0.000	kPa/%	Effective pressure	:	135	kPa
Membrane thickness, σ_{mb}	:	0.68	mm	Dimensions at starting of compression			
Rate of axial displacement	:	0.050	mm/min	Volume V_c	:	644.91	cm^3
Pore pressure coefficient, A_f	:	0.23		Area A_c	:	4323.1	mm^2
				Length L_c	:	149.2	mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.094	169.4	0.0	0.0	0.00	0.00	0.0	135.0	0.0	135.0	0.0	1.00	
279.5	30	0.333	600.2	0.2	0.2	0.00	0.05	99.4	150.2	49.7	133.6	99.4	1.99	
296.0	60	0.456	821.9	0.4	0.4	0.00	0.11	150.2	159.1	75.1	134.1	150.2	2.79	
305.6	90	0.557	1004.0	0.6	0.6	0.00	0.16	191.7	170.3	95.9	138.3	191.7	3.58	
311.9	120	0.644	1160.8	0.8	0.8	0.00	0.21	227.3	181.7	113.6	143.9	227.3	4.34	
316.4	158	0.725	1306.8	1.1	1.1	0.00	0.28	260.0	193.6	130.0	150.3	260.0	5.09	
317.7	185	0.769	1386.1	1.2	1.2	0.00	0.32	277.6	201.1	138.8	154.8	277.6	5.46	
317.8	210	0.797	1436.6	1.4	1.4	0.00	0.37	288.6	206.5	144.3	158.4	288.6	5.64	
317.0	240	0.827	1490.6	1.6	1.6	0.00	0.42	300.3	213.1	150.1	163.1	300.3	5.77	
315.5	270	0.850	1532.1	1.8	1.8	0.00	0.47	309.0	219.0	154.5	167.5	309.0	5.79	«
313.5	307	0.868	1564.5	2.1	2.1	0.00	0.53	315.5	224.3	157.8	171.7	315.5	5.74	

Final volume (cm^3): 644.91 Final length (mm): 146.1 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	13.00
			To	:	14.00

Laboratory Information

Date shearing commenced	:	13/01/2010	Time :	01:30	Lab. sample I.D.	:	SL90277/9
Date shearing completed	:	13/01/2010	Time :	03:45	Specimen ref.	:	A
Proving ring serial No.	:	10175			Cell pressure	:	515 kPa
Type of membrane	:	rubber			Back pressure	:	245 kPa
Corrections					Effective pressure	:	270 kPa
*Side drain, σ_{dr}	:	0.000	kPa/%		Dimensions at starting of compression		
Membrane thickness, σ_{mb}	:	0.68	mm		Volume V_c	:	635.81 cm^3
Rate of axial displacement	:	0.050	mm/min		Area A_c	:	4372.3 mm^2
Pore pressure coefficient, A_f	:	0.34			Length L_c	:	145.4 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.134	241.5	0.0	2.5	0.00	0.64	0.0	270.0	0.0	270.0	0.0	1.00	
293.1	30	0.487	877.8	0.2	2.7	0.00	0.68	144.5	294.2	72.3	270.1	144.5	1.65	
326.9	60	0.700	1261.7	0.4	2.9	0.00	0.73	231.6	303.9	115.8	265.3	231.6	2.23	
349.8	95	0.863	1555.5	0.7	3.2	0.00	0.79	297.8	314.1	148.9	264.5	297.8	2.80	
365.9	130	0.974	1755.6	0.9	3.4	0.00	0.84	342.3	320.3	171.2	263.2	342.3	3.30	
376.4	162	1.041	1876.4	1.1	3.6	0.00	0.89	368.8	323.0	184.4	261.5	368.8	3.66	
381.4	189	1.075	1937.6	1.3	3.8	0.00	0.93	381.9	324.6	191.0	260.9	381.9	3.86	
385.2	210	1.101	1984.5	1.4	4.0	0.00	0.96	391.9	325.8	196.0	260.4	391.9	4.02	
388.1	240	1.122	2022.4	1.7	4.2	0.00	1.00	399.6	326.7	199.8	260.1	399.6	4.15	
390.0	270	1.138	2051.2	1.9	4.4	0.00	1.05	405.2	327.6	202.6	260.1	405.2	4.24	
391.3	300	1.151	2074.6	2.1	4.6	0.00	1.09	409.5	328.5	204.8	260.2	409.5	4.31	
391.6	330	1.159	2089.0	2.3	4.8	0.00	1.13	411.8	329.3	205.9	260.7	411.8	4.34	
391.8	369	1.169	2107.1	2.5	5.1	0.00	1.19	414.7	330.5	207.3	261.4	414.7	4.37	
391.7	395	1.176	2119.7	2.7	5.2	0.00	1.22	416.7	331.6	208.3	262.2	416.7	4.38	
391.5	423	1.182	2130.5	2.9	5.4	0.00	1.26	418.2	332.6	209.1	262.9	418.2	4.39	
391.1	450	1.189	2143.1	3.1	5.6	0.00	1.30	420.2	334.0	210.1	264.0	420.2	4.39	
390.7	480	1.196	2155.7	3.3	5.8	0.00	1.34	422.0	335.3	211.0	265.0	422.0	4.40	
389.8	523	1.209	2179.2	3.6	6.1	0.00	1.40	425.8	338.1	212.9	267.1	425.8	4.40	
389.7	540	1.215	2190.0	3.7	6.2	0.00	1.42	427.7	339.1	213.8	267.9	427.7	4.41	«
389.0	570	1.221	2200.8	3.9	6.4	0.00	1.46	429.1	340.5	214.5	269.0	429.1	4.41	

Final volume (cm^3): 635.81 Final length (mm): 139.7 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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MaterialLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 13.00
To : 14.00

Laboratory Information

Date shearing commenced : 13/01/2010 Time : 09:00
Date shearing completed : 13/01/2010 Time : 13:49
Proving ring serial No. : 6499
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.52

Lab. sample I.D. : SL90277/9
Specimen ref. : A
Cell pressure : 785 kPa
Back pressure : 245 kPa
Effective pressure : 540 kPa
Dimensions at starting of compression
Volume V_c : 619.71 cm^3
Area A_c : 4473.6 mm^2
Length L_c : 138.5 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.121	370.0	0.0	7.1	0.00	1.58	0.0	540.0	0.0	540.0	0.0	1.00	
304.1	30	0.363	1110.1	0.2	7.4	0.00	1.62	163.4	562.6	81.7	535.4	163.4	1.34	
390.2	71	0.609	1862.4	0.5	7.7	0.00	1.68	330.2	559.9	165.1	504.9	330.2	1.84	
423.7	95	0.704	2152.9	0.7	7.8	0.00	1.71	394.1	558.3	197.0	492.7	394.1	2.09	
458.4	128	0.800	2446.5	0.9	8.1	0.00	1.75	458.1	555.7	229.1	479.3	458.1	2.40	
476.7	156	0.860	2630.0	1.1	8.3	0.00	1.78	497.7	557.2	248.9	474.2	497.7	2.61	
498.3	180	0.905	2767.6	1.3	8.4	0.00	1.81	527.2	550.3	263.6	462.4	527.2	2.84	
514.4	216	0.938	2868.5	1.6	8.7	0.00	1.85	547.9	544.6	274.0	453.2	547.9	3.02	
522.8	244	0.960	2935.8	1.8	8.9	0.00	1.89	561.5	543.0	280.8	449.4	561.5	3.14	
531.5	270	0.982	3003.1	1.9	9.1	0.00	1.92	575.2	541.1	287.6	445.2	575.2	3.27	
537.8	300	0.995	3042.8	2.2	9.3	0.00	1.95	582.6	538.5	291.3	441.4	582.6	3.36	
540.4	332	1.008	3082.6	2.4	9.5	0.00	1.99	589.8	539.5	294.9	441.2	589.8	3.41	
544.2	364	1.025	3134.6	2.6	9.8	0.00	2.03	599.7	540.7	299.9	440.7	599.7	3.49	
548.7	396	1.034	3162.1	2.9	10.0	0.00	2.06	604.2	538.4	302.1	437.7	604.2	3.56	
551.6	422	1.040	3180.4	3.0	10.2	0.00	2.09	607.0	536.9	303.5	435.7	607.0	3.60	
554.9	456	1.048	3204.9	3.3	10.4	0.00	2.13	610.7	535.5	305.4	433.7	610.7	3.65	
558.3	483	1.055	3226.3	3.5	10.6	0.00	2.16	614.1	533.7	307.0	431.4	614.1	3.71	
561.7	512	1.060	3241.6	3.7	10.8	0.00	2.19	616.0	531.3	308.0	428.6	616.0	3.76	
565.2	544	1.064	3253.8	3.9	11.1	0.00	2.23	617.1	528.3	308.5	425.5	617.1	3.81	
568.3	570	1.067	3263.0	4.1	11.3	0.00	2.26	617.8	525.6	308.9	422.6	617.8	3.85	«
569.4	600	1.069	3269.1	4.3	11.5	0.00	2.29	617.7	524.4	308.8	421.5	617.7	3.86	
569.9	633	1.071	3275.2	4.6	11.7	0.00	2.32	617.4	523.8	308.7	420.9	617.4	3.87	
570.0	664	1.066	3259.9	4.8	11.9	0.00	2.36	612.7	521.3	306.3	419.2	612.7	3.85	
570.0	692	1.067	3263.0	5.0	12.1	0.00	2.38	612.0	521.0	306.0	419.0	612.0	3.85	
570.3	722	1.068	3266.1	5.2	12.4	0.00	2.42	611.2	520.3	305.6	418.4	611.2	3.85	
570.5	756	1.068	3266.1	5.5	12.6	0.00	2.45	609.6	519.3	304.8	417.7	609.6	3.84	
570.8	788	1.068	3266.1	5.7	12.8	0.00	2.48	608.1	518.2	304.0	416.9	608.1	3.84	
571.0	812	1.068	3266.1	5.9	13.0	0.00	2.51	606.9	517.5	303.5	416.3	606.9	3.84	
571.2	845	1.068	3266.1	6.1	13.2	0.00	2.54	605.3	516.5	302.7	415.6	605.3	3.83	
571.4	873	1.066	3259.9	6.3	13.4	0.00	2.57	602.7	515.0	301.4	414.5	602.7	3.82	
571.4	904	1.064	3253.8	6.5	13.7	0.00	2.60	600.0	513.6	300.0	413.6	600.0	3.81	
571.4	955	1.064	3253.8	6.9	14.0	0.00	2.65	597.5	512.4	298.8	412.8	597.5	3.80	
571.1	1006	1.061	3244.6	7.3	14.4	0.00	2.70	593.2	510.5	296.6	411.6	593.2	3.77	
570.7	1057	1.058	3235.5	7.6	14.8	0.00	2.75	588.9	508.8	294.5	410.6	588.9	3.75	

Final volume (cm^3): 619.71 Final length (mm): 125.0 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 13.00
To : 14.00

Laboratory Information

Lab. sample I.D. : SL90277/9
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
570.0	1104	1.058	3235.5	8.0	15.1	0.00	2.79	586.7	508.3	293.3	410.6	586.7	3.73
569.1	1156	1.058	3235.5	8.3	15.5	0.00	2.84	584.2	508.0	292.1	410.6	584.2	3.71
567.7	1200	1.059	3238.5	8.7	15.8	0.00	2.89	582.8	508.7	291.4	411.6	582.8	3.68
566.8	1257	1.060	3241.6	9.1	16.2	0.00	2.94	580.7	508.6	290.4	411.8	580.7	3.66
566.0	1300	1.060	3241.6	9.4	16.5	0.00	2.98	578.7	508.3	289.3	411.9	578.7	3.64
565.1	1352	1.060	3241.6	9.8	16.9	0.00	3.03	576.2	508.0	288.1	412.0	576.2	3.62

Final volume (cm^3): 619.71 Final length (mm): 125.0 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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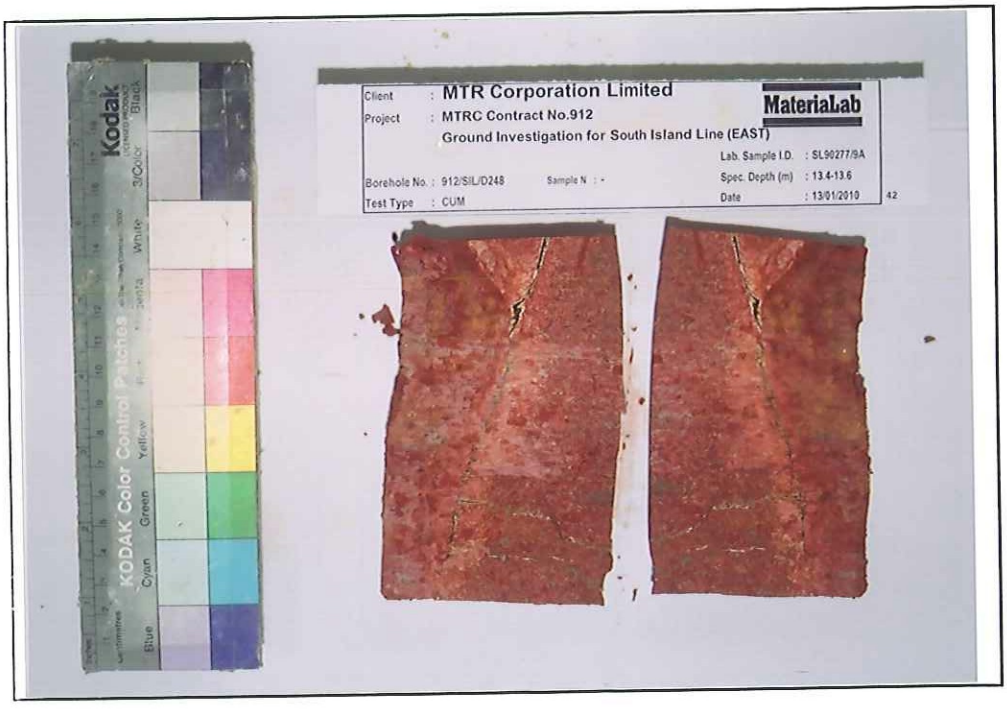
Photographic Records for Triaxial Test



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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Client's Address	:	Not requested to be reported	Borehole No.	:	912/SIL/D248
			Depth(m) From	:	16.60
			To	:	17.60
Project	:	Contract 912	Sample origin	:	CDT
		Ground Investigation for South Island Line (EAST)	Soil description	:	-

Laboratory Information

Date sample received	:	30-12-2009	Lab. sample I.D.	:	SL90277/10
Date test(s) commenced	:	11-01-2010	Sample type	:	M
Date test(s) completed	:	14-01-2010	Specimen reference	:	A
Test method used	:	Geospec 3 (November 2001) Test Method 15.2	Specimen depth (m)		
Method of preparation	:	Cylindrical specimen from sample tube of the same internal diameter as the required specimen	From	:	17.00
			To	:	17.20
Selection of specimen by	:	W.Y. Lo Designation : Technician II	Affiliation :		FTS Ltd. - MateriaLab Division
Moisture content test method	:	Geospec 3 (November 2001) Test Method 5.1			
Particle density Mg/m³	:	2.69 (Measured)			
Temperature range at test(s)	:	Maximum : 24.0 °C Minimum : 18.0 °C			
Visual description	:	Moist, brown spotted and streaked with white, slightly gravelly, slightly sandy SILT/CLAY.			

Stage No.		1			2			3		
Effective pressure	kPa	170			340			680		
***Measurements and Calculations**		Initial	End of consolidation	Final		End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.8	73.8	74.8		74.4	75.1		74.7	77.6
Length	mm	150.3	148.4	144.7		144.0	141.3		140.5	130.0
Volume	cm³	660.47	635.57	635.57		626.47	626.47		615.57	615.57
Wet mass	g	1295.8	1288.7	1288.7		1279.6	1279.6		1268.7	1268.7
Dry mass	g	1045.8	1045.8	1045.8		1045.8	1045.8		1045.8	1045.8
Moisture content	%	23.9	23.2	23.2		22.4	22.4		21.3	21.3
Bulk density	Mg/m³	1.96	2.03	2.03		2.04	2.04		2.06	2.06
Dry density	Mg/m³	1.58	1.65	1.65		1.67	1.67		1.70	1.70
Void ratio		0.70	0.63	0.63		0.61	0.61		0.58	0.58
Degree of saturation	%	92.0	98.4	98.4		98.4	98.4		98.3	98.3
Saturation Stage										
**Volume change of water	cm³	17.8								
Consolidation Stage										
Side drain used		No			-			-		
Initial pore pressure	kPa	364.5			399.9			589.9		
Final pore pressure	kPa	200.0			200.0			200.0		
Volume of water drained out	cm³	24.9			9.1			10.9		
m_{vi}	m²/MN	0.23			0.07			0.04		
t_{50}	min	19.00			6.50			4.50		
c_{vi} (from t_{50})	m²/yr	234.77			641.49			882.73		
t_{100}	min	33.64			18.49			14.44		
c_{vi} (from t_{100})	m²/yr	268.43			491.93			635.13		
Sketch of failed specimen (Failure Mode)								Brittle		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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MateriaLab

HKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

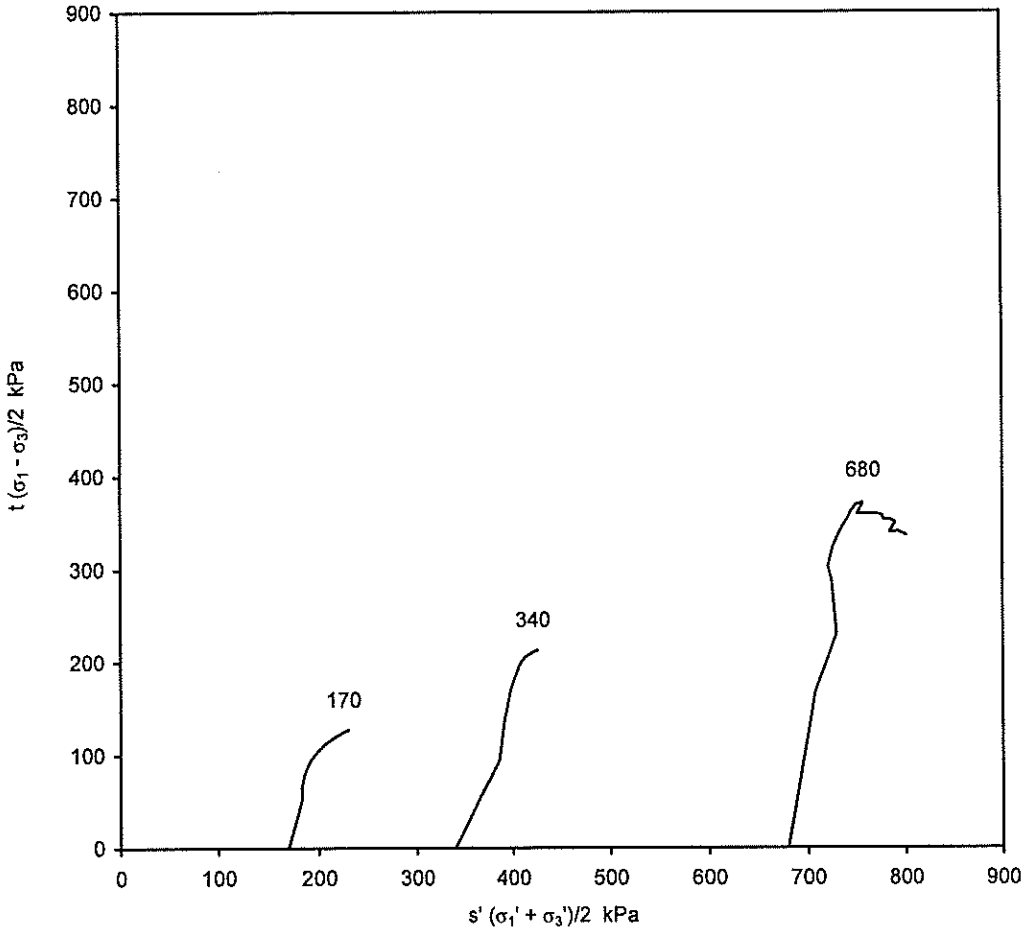
Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 16.60
To : 17.60

Laboratory Information

Lab. sample I.D. : SL90277/10
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	170	2.2	2.2	269.9	249.6	224.9	124.8
2	340	1.7	4.6	329.8	421.0	420.7	210.5
3	680	2.4	7.7	493.4	741.0	757.1	370.5



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

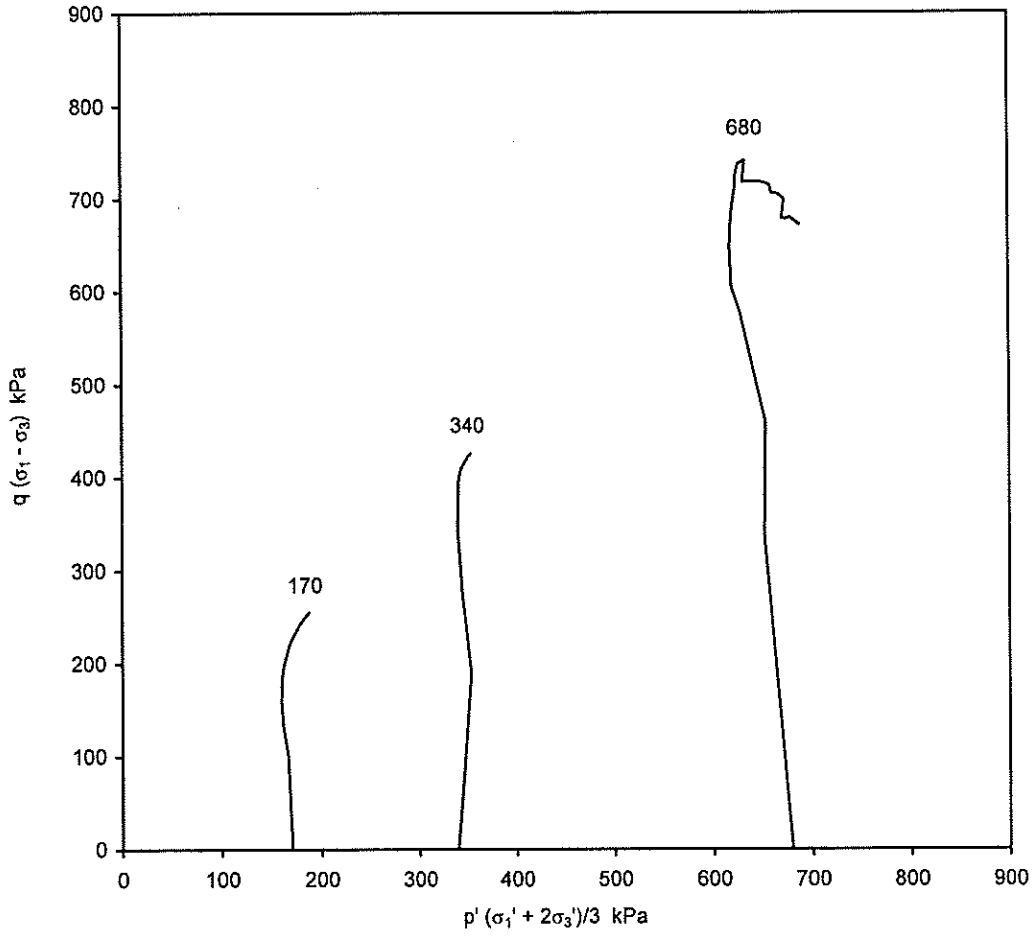
Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 16.60
To : 17.60

Laboratory Information

Lab. sample I.D. : SL90277/10
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	170	2.2	2.2	269.9	249.6	183.3	249.6
2	340	1.7	4.6	329.8	421.0	350.5	421.0
3	680	2.4	7.7	493.4	741.0	633.6	741.0



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

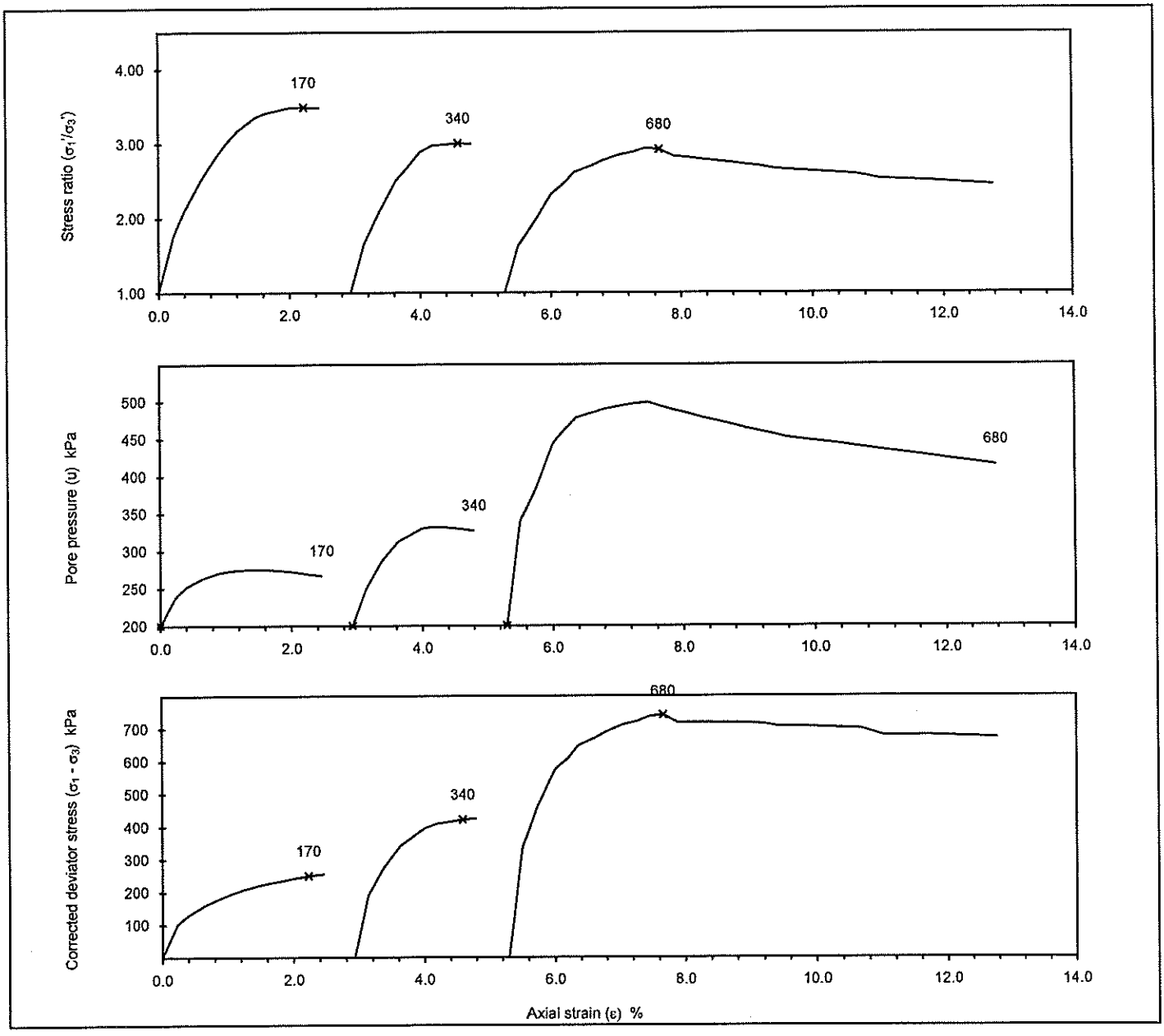
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	16.60
			To	:	17.60

Laboratory Information

Lab. sample I.D.	:	SL90277/10
Specimen ref.	:	A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 16.60
To : 17.60

Laboratory Information

Lab. sample I.D. : SL90277/10
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	170	
	Stage 2	kPa	340	
	Stage 3	kPa	680	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			150	145
			200	195
			205	200

End of Saturation

Cell pressure	kPa	205
Back pressure	kPa	200
Pore pressure	kPa	200.0
B value		0.98
Volume change	cm^3	17.8

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1266.6
Final moisture content	%	21.1
Final bulk density	Mg/m^3	2.06

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HKAS HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

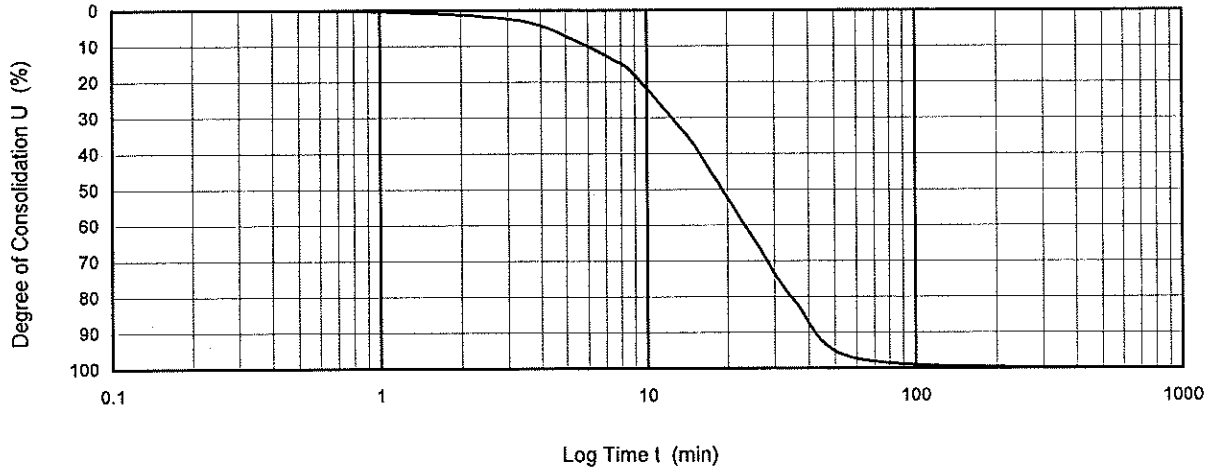
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912 Ground Investigation for South Island Line (EAST)	Borehole No.	:	912/SIL/D248
			Depth(m) From	:	16.60
			To	:	17.60

Laboratory Information

Cell pressure	:	370 kPa	Lab. sample I.D.	:	SL90277/10
Back pressure	:	200 kPa	Specimen ref.	:	A
Effective pressure	:	170 kPa			

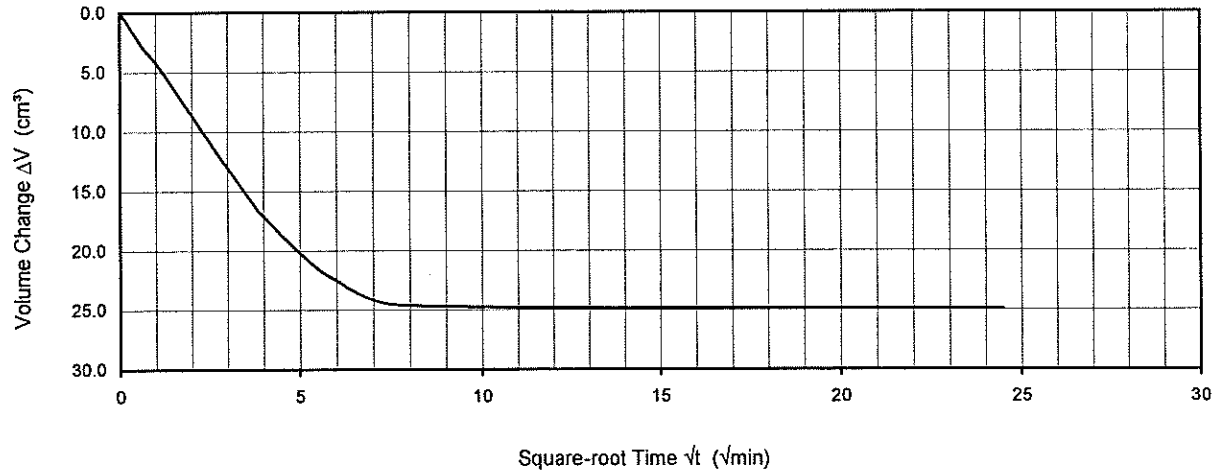
Degree of Consolidation vs. Log Time

t_{50} = 19.00 min ΔV = 24.9 cm³



Volume Change vs. Square-root Time

t_{100} = 33.64 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

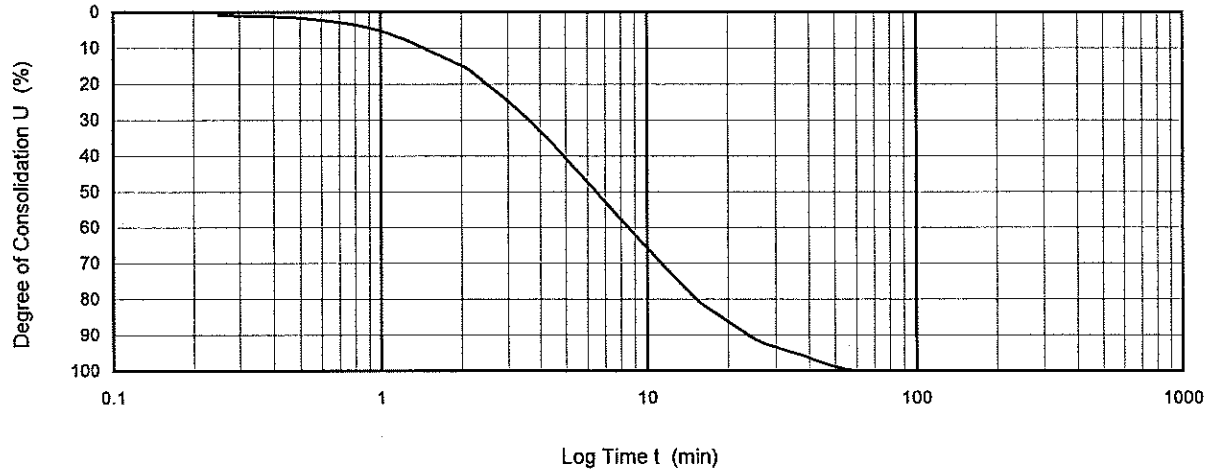
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912 Ground Investigation for South Island Line (EAST)	Borehole No.	:	912/SIL/D248
			Depth(m) From	:	16.60
			To	:	17.60

Laboratory Information

Cell pressure	:	540 kPa	Lab. sample I.D.	:	SL90277/10
Back pressure	:	200 kPa	Specimen ref.	:	A
Effective pressure	:	340 kPa			

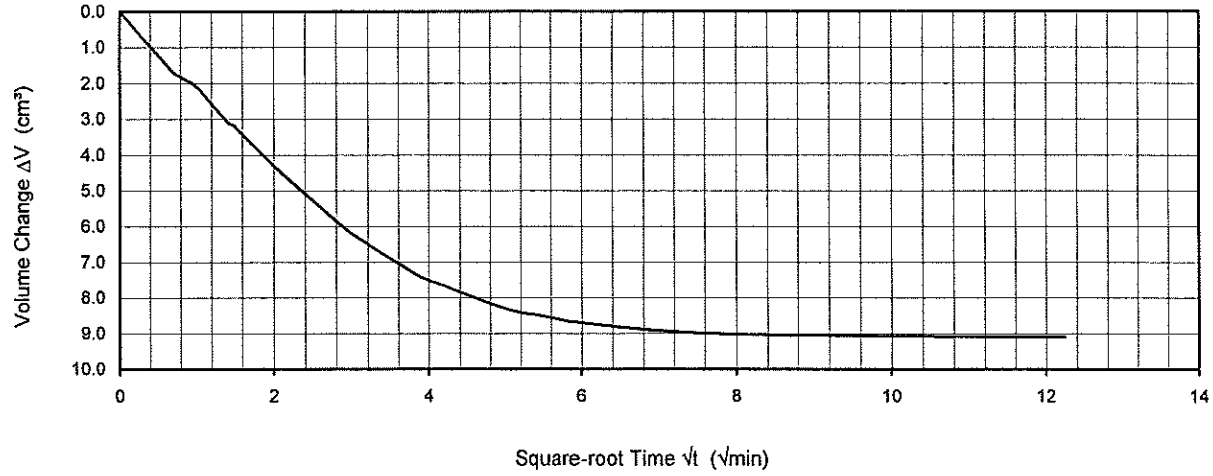
Degree of Consolidation vs. Log Time

t_{50} = 6.50 min ΔV = 9.1 cm³



Volume Change vs. Square-root Time

t_{100} = 18.49 min



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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

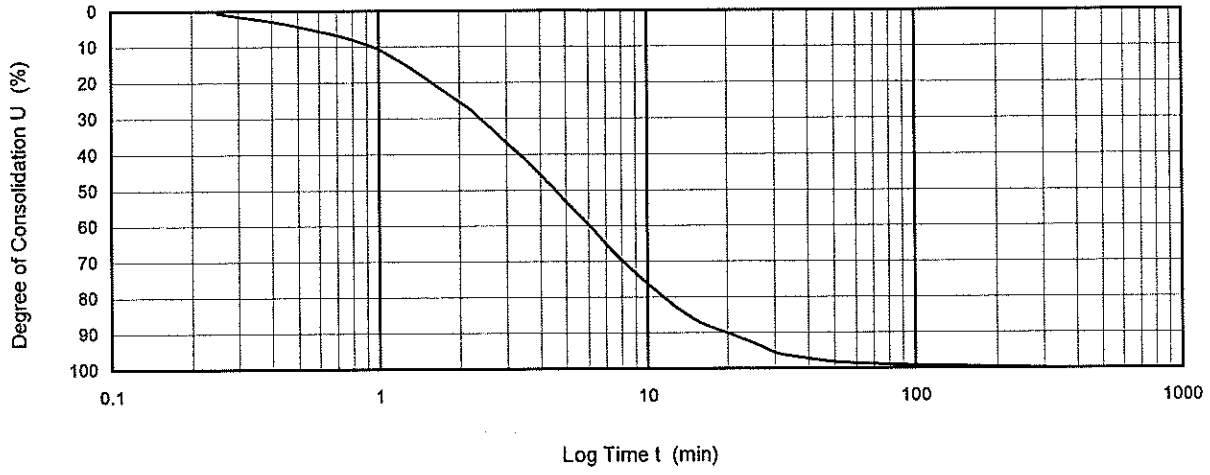
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D248
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	16.60
			To	:	17.60

Laboratory Information

Cell pressure	:	880 kPa	Lab. sample I.D.	:	SL90277/10
Back pressure	:	200 kPa	Specimen ref.	:	A
Effective pressure	:	680 kPa			

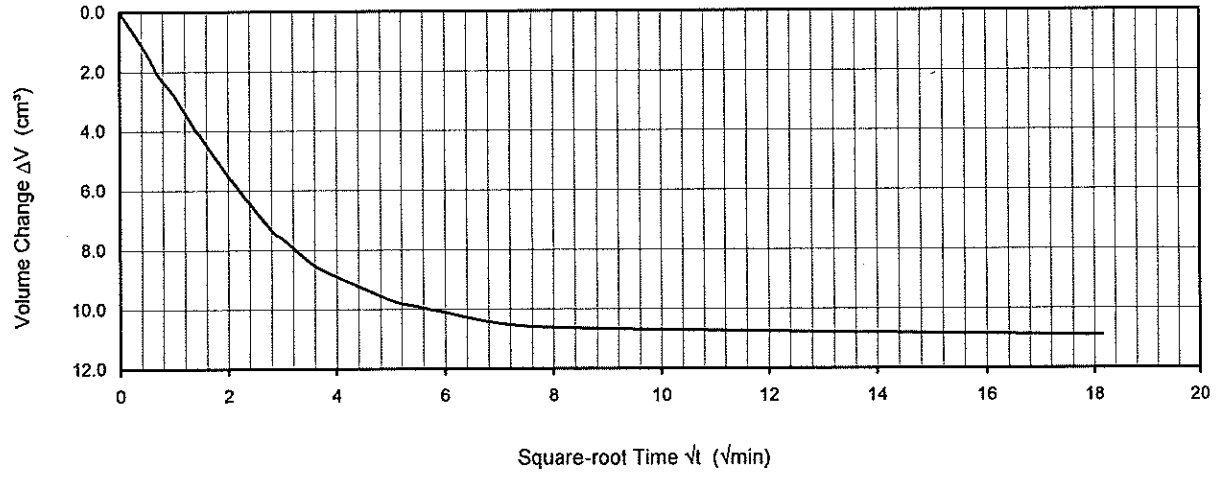
Degree of Consolidation vs. Log Time

t_{50} = 4.50 min ΔV = 10.9 cm³



Volume Change vs. Square-root Time

t_{100} = 14.44 min



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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 16.60
To : 17.60

Laboratory Information

Date shearing commenced : 12/01/2010 Time : 21:00
Date shearing completed : 12/01/2010 Time : 22:25
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.28

Lab. sample I.D. : SL90277/10
Specimen ref. : A
Cell pressure : 370 kPa
Back pressure : 200 kPa
Effective pressure : 170 kPa

Dimensions at starting of compression
Volume V_c : 635.57 cm^3
Area A_c : 4283.2 mm^2
Length L_c : 148.4 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
200.0	0	44	153.5	0.0	0.0	0.00	0.00	0.0	170.0	0.0	170.0	0.0	1.00	
238.0	34	169	589.7	0.2	0.2	0.00	0.06	101.5	182.8	50.8	165.8	101.5	1.77	
252.4	60	205	715.3	0.4	0.4	0.00	0.11	130.5	182.9	65.3	161.1	130.5	2.11	
263.5	94	240	837.4	0.6	0.6	0.00	0.16	158.5	185.7	79.2	159.3	158.5	2.49	
270.7	131	269	938.6	0.9	0.9	0.00	0.23	181.4	190.0	90.7	159.8	181.4	2.83	
273.4	154	284	990.9	1.0	1.0	0.00	0.27	193.2	193.2	96.6	161.0	193.2	3.00	
275.0	180	301	1050.2	1.2	1.2	0.00	0.31	206.5	198.3	103.3	163.8	206.5	3.17	
275.9	219	320	1116.5	1.5	1.5	0.00	0.37	221.1	204.7	110.6	167.8	221.1	3.35	
275.6	240	328	1144.5	1.6	1.6	0.00	0.41	227.2	208.0	113.6	170.1	227.2	3.41	
274.2	270	338	1179.3	1.8	1.8	0.00	0.45	234.7	213.1	117.3	174.0	234.7	3.45	
272.7	300	348	1214.2	2.0	2.0	0.00	0.50	242.1	218.4	121.1	178.0	242.1	3.49	
269.9	330	358	1249.1	2.2	2.2	0.00	0.55	249.6	224.9	124.8	183.3	249.6	3.49	«
267.3	365	366	1277.0	2.5	2.5	0.00	0.60	255.3	230.3	127.6	187.8	255.3	3.49	

Final volume (cm^3): 635.57 Final length (mm): 144.7 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 16.60
To : 17.60

Laboratory Information

Date shearing commenced : 13/01/2010 Time : 01:30
Date shearing completed : 13/01/2010 Time : 02:55
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.31

Lab. sample I.D. : SL90277/10
Specimen ref. : A
Cell pressure : 540 kPa
Back pressure : 200 kPa
Effective pressure : 340 kPa
Dimensions at starting of compression
Volume V_c : 626.47 cm^3
Area A_c : 4349.2 mm^2
Length L_c : 144.0 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
200.0	0	69	240.8	0.0	2.9	0.00	0.71	0.0	340.0	0.0	340.0	0.0	1.00	
248.9	30	306	1067.7	0.2	3.1	0.00	0.75	189.0	385.6	94.5	354.1	189.0	1.65	
287.0	65	415	1448.0	0.5	3.4	0.00	0.81	275.5	390.8	137.8	344.8	275.5	2.09	
312.9	101	498	1737.6	0.7	3.6	0.00	0.86	340.9	397.5	170.4	340.7	340.9	2.50	
321.0	126	530	1849.3	0.9	3.8	0.00	0.90	365.7	401.9	182.9	340.9	365.7	2.67	
330.5	155	568	1981.9	1.1	4.0	0.00	0.94	395.1	407.0	197.5	341.2	395.1	2.89	
332.7	183	587	2048.2	1.3	4.2	0.00	0.98	409.3	412.0	204.7	343.7	409.3	2.97	
331.3	210	595	2076.1	1.5	4.4	0.00	1.02	414.8	416.1	207.4	347.0	414.8	2.99	
329.8	240	604	2107.5	1.7	4.6	0.00	1.06	421.0	420.7	210.5	350.5	421.0	3.00	«
327.2	270	611	2131.9	1.9	4.8	0.00	1.10	425.6	425.6	212.8	354.7	425.6	3.00	

Final volume (cm^3): 626.47 Final length (mm): 141.3 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D248
Depth(m) From : 16.60
To : 17.60

Laboratory Information

Date shearing commenced : 13/01/2010 Time : 09:00
Date shearing completed : 13/01/2010 Time : 12:51
Proving ring serial No. : 9890
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.40

Lab. sample I.D. : SL90277/10
Specimen ref. : A
Cell pressure : 880 kPa
Back pressure : 200 kPa
Effective pressure : 680 kPa
Dimensions at starting of compression
Volume V_c : 615.57 cm^3
Area A_c : 4380.7 mm^2
Length L_c : 140.5 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
200.0	0	56	340.5	0.0	5.3	0.00	1.20	0.0	680.0	0.0	680.0	0.0	1.00	
340.4	30	299	1818.0	0.2	5.5	0.00	1.24	335.3	707.3	167.7	651.4	335.3	1.62	
380.4	60	389	2365.2	0.4	5.7	0.00	1.28	458.9	729.1	229.5	652.6	458.9	1.92	
443.8	100	475	2888.1	0.7	6.0	0.00	1.34	576.1	724.2	288.0	628.2	576.1	2.32	
461.6	124	496	3015.8	0.9	6.2	0.00	1.37	603.9	720.4	302.0	619.7	603.9	2.44	
478.0	150	529	3216.5	1.1	6.4	0.00	1.40	648.1	726.0	324.0	618.0	648.1	2.61	
484.4	184	546	3319.8	1.3	6.6	0.00	1.44	669.8	730.5	334.9	618.9	669.8	2.69	
489.5	210	561	3411.0	1.5	6.8	0.00	1.48	689.0	735.0	344.5	620.2	689.0	2.76	
493.8	246	579	3520.5	1.8	7.1	0.00	1.52	711.7	742.0	355.8	623.4	711.7	2.84	
497.1	278	588	3575.2	2.0	7.3	0.00	1.56	722.2	744.0	361.1	623.6	722.2	2.89	
499.0	304	600	3648.2	2.2	7.5	0.00	1.59	737.1	749.6	368.6	626.7	737.1	2.93	
493.4	332	604	3672.5	2.4	7.7	0.00	1.63	741.0	757.1	370.5	633.6	741.0	2.92	«
487.9	364	588	3575.2	2.6	7.9	0.00	1.67	717.6	750.9	358.8	631.3	717.6	2.83	
483.1	395	590	3587.4	2.8	8.1	0.00	1.70	718.6	756.2	359.3	636.4	718.6	2.81	
478.3	420	591	3593.4	3.0	8.3	0.00	1.73	718.6	761.0	359.3	641.2	718.6	2.79	
473.5	456	592	3599.5	3.2	8.5	0.00	1.78	718.0	765.5	359.0	645.8	718.0	2.77	
468.7	488	593	3605.6	3.5	8.8	0.00	1.81	717.6	770.1	358.8	650.5	717.6	2.74	
463.9	516	593	3605.6	3.7	9.0	0.00	1.84	716.1	774.2	358.1	654.8	716.1	2.72	
459.8	546	593	3605.6	3.9	9.2	0.00	1.88	714.5	777.4	357.2	658.4	714.5	2.70	
455.7	577	588	3575.2	4.1	9.4	0.00	1.91	706.2	777.4	353.1	659.7	706.2	2.66	
451.6	602	589	3581.3	4.3	9.6	0.00	1.94	706.2	781.5	353.1	663.8	706.2	2.65	
447.5	656	590	3587.4	4.7	10.0	0.00	2.00	704.6	784.8	352.3	667.4	704.6	2.63	
443.4	708	590	3587.4	5.0	10.3	0.00	2.06	701.8	787.5	350.9	670.5	701.8	2.61	
439.4	755	590	3587.4	5.4	10.7	0.00	2.10	699.2	790.2	349.6	673.7	699.2	2.59	
435.2	803	576	3502.2	5.7	11.0	0.00	2.15	678.3	784.0	339.2	670.9	678.3	2.53	
431.0	856	578	3514.4	6.1	11.4	0.00	2.21	678.2	788.1	339.1	675.1	678.2	2.51	
427.0	904	581	3532.6	6.4	11.7	0.00	2.26	679.5	792.8	339.8	679.5	679.5	2.50	
422.9	950	581	3532.6	6.8	12.1	0.00	2.30	677.1	795.7	338.6	682.8	677.1	2.48	
418.8	1002	581	3532.6	7.1	12.4	0.00	2.36	674.4	798.4	337.2	686.0	674.4	2.46	
414.7	1050	581	3532.6	7.5	12.8	0.00	2.40	671.8	801.2	335.9	689.2	671.8	2.44	

Final volume (cm^3): 615.57 Final length (mm): 130.0 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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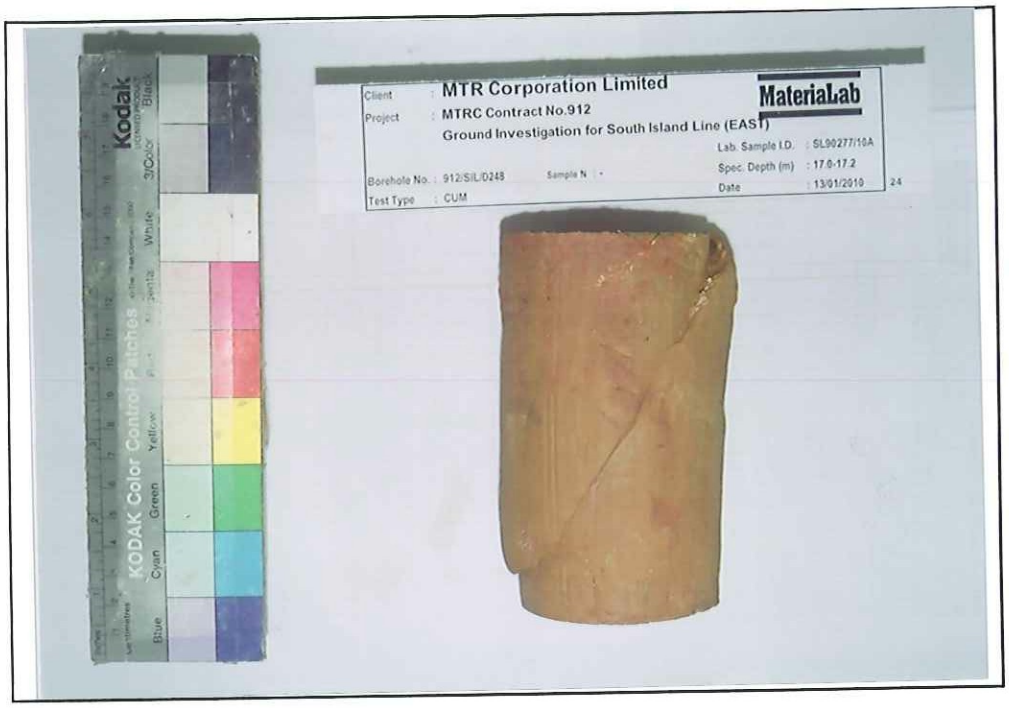
Photographic Records for Triaxial Test



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

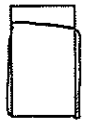
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 22.1
To : 23.1
Sample origin : MD
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 09-01-2010
Date test(s) completed : 13-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.68 (Measured)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 18.0 °C
Visual description : Moist, dark grey, slightly gravelly, sandy SILT/CLAY with shell fragments.

Lab. sample I.D. : SL90277/12
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 22.50
To : 22.70
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	225			450			600	
***Measurements and Calculations**		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.8	72.9	75.0	74.1	75.4		74.9	78.7
Length	mm	150.3	146.5	138.3	136.7	131.9		130.9	118.6
Volume	cm³	660.47	611.17	611.17	589.57	589.57		576.27	576.27
Wet mass	g	1218.8	1182.7	1182.7	1161.1	1161.1		1147.8	1147.8
Dry mass	g	916.5	916.5	916.5	916.5	916.5		916.5	916.5
Moisture content	%	33.0	29.0	29.0	26.7	26.7		25.2	25.2
Bulk density	Mg/m³	1.85	1.94	1.94	1.97	1.97		1.99	1.99
Dry density	Mg/m³	1.39	1.50	1.50	1.55	1.55		1.59	1.59
Void ratio		0.93	0.79	0.79	0.72	0.72		0.69	0.69
Degree of saturation	%	94.9	98.9	98.9	98.8	98.8		98.7	98.7
Saturation Stage									
**Volume change of water	cm³	13.2							
Consolidation Stage									
Side drain used		Yes			-			-	
Initial pore pressure	kPa	463.3			618.7			689.8	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	49.3			21.6			13.3	
m_{vi}	m²/MN	0.34			0.09			0.05	
t_{50}	min	51.00			61.00			51.00	
c_{vi} (from t_{50})	m²/yr	NA			NA			NA	
t_{100}	min	98.01			144.00			158.76	
c_{vi} (from t_{100})	m²/yr	1.14			0.79			0.73	
Sketch of failed specimen (Failure Mode)								 Plastic	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : Y.K. Chan, W.Y. Lo

Certified by :

~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

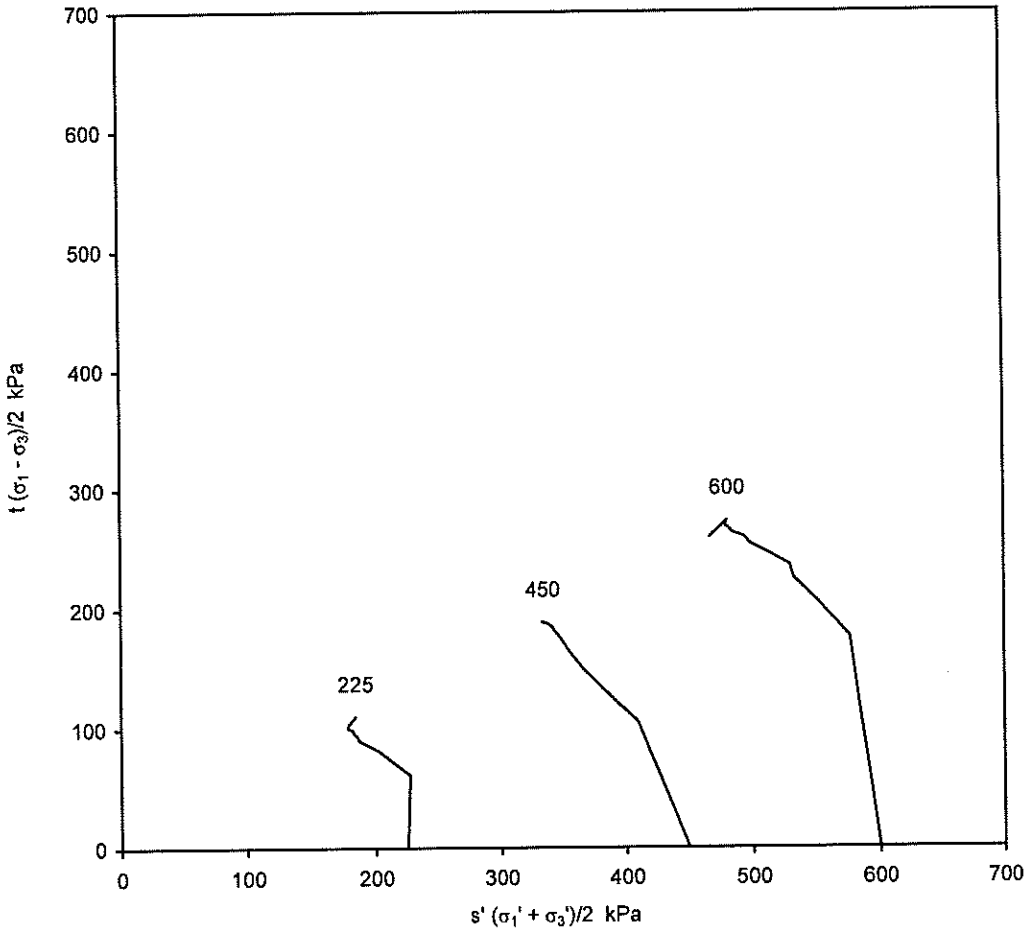
Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 22.1
To : 23.1

Laboratory Information

Lab. sample I.D. : SL90277/12
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	225	5.3	5.3	395.8	220.6	184.5	110.3
2	450	3.3	10.0	549.1	377.5	334.7	188.8
3	600	6.5	17.1	636.9	546.4	481.3	273.2



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

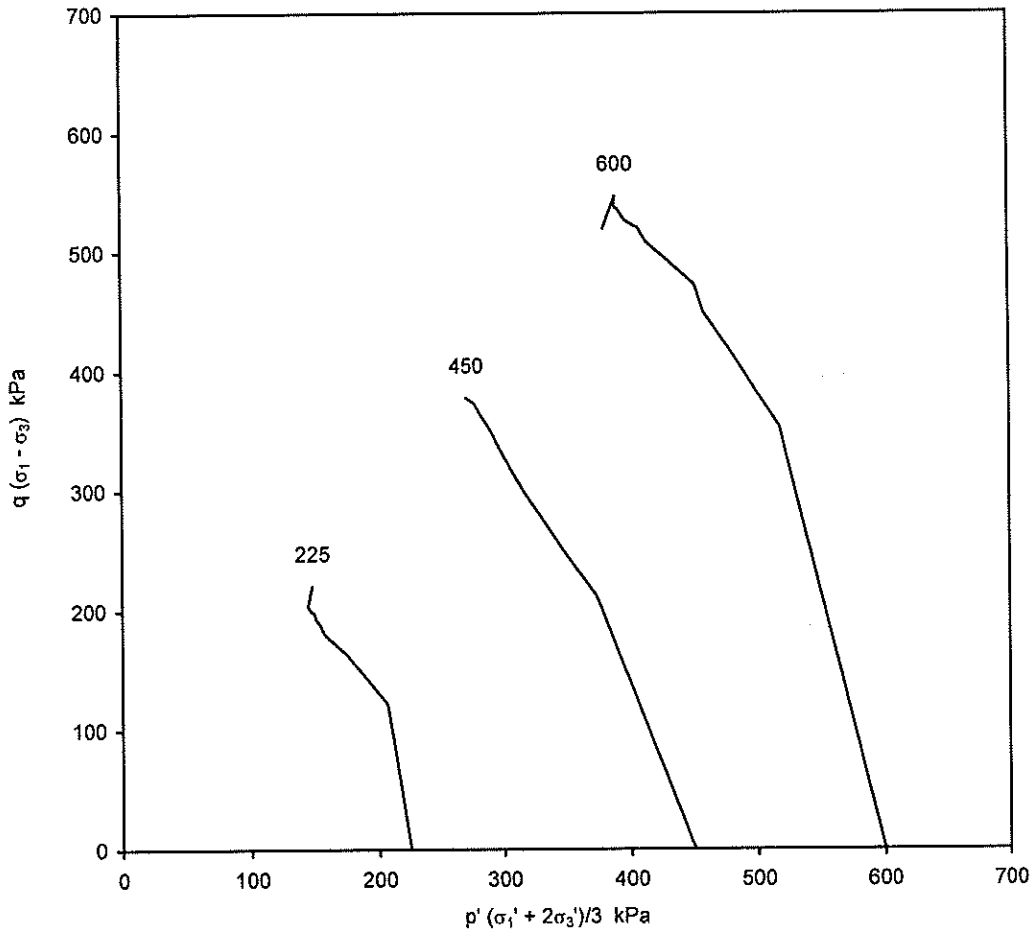
Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 22.1
To : 23.1

Laboratory Information

Lab. sample I.D. : SL90277/12
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	225	5.3	5.3	395.8	220.6	147.7	220.6
2	450	3.3	10.0	549.1	377.5	271.7	377.5
3	600	6.5	17.1	636.9	546.4	390.2	546.4



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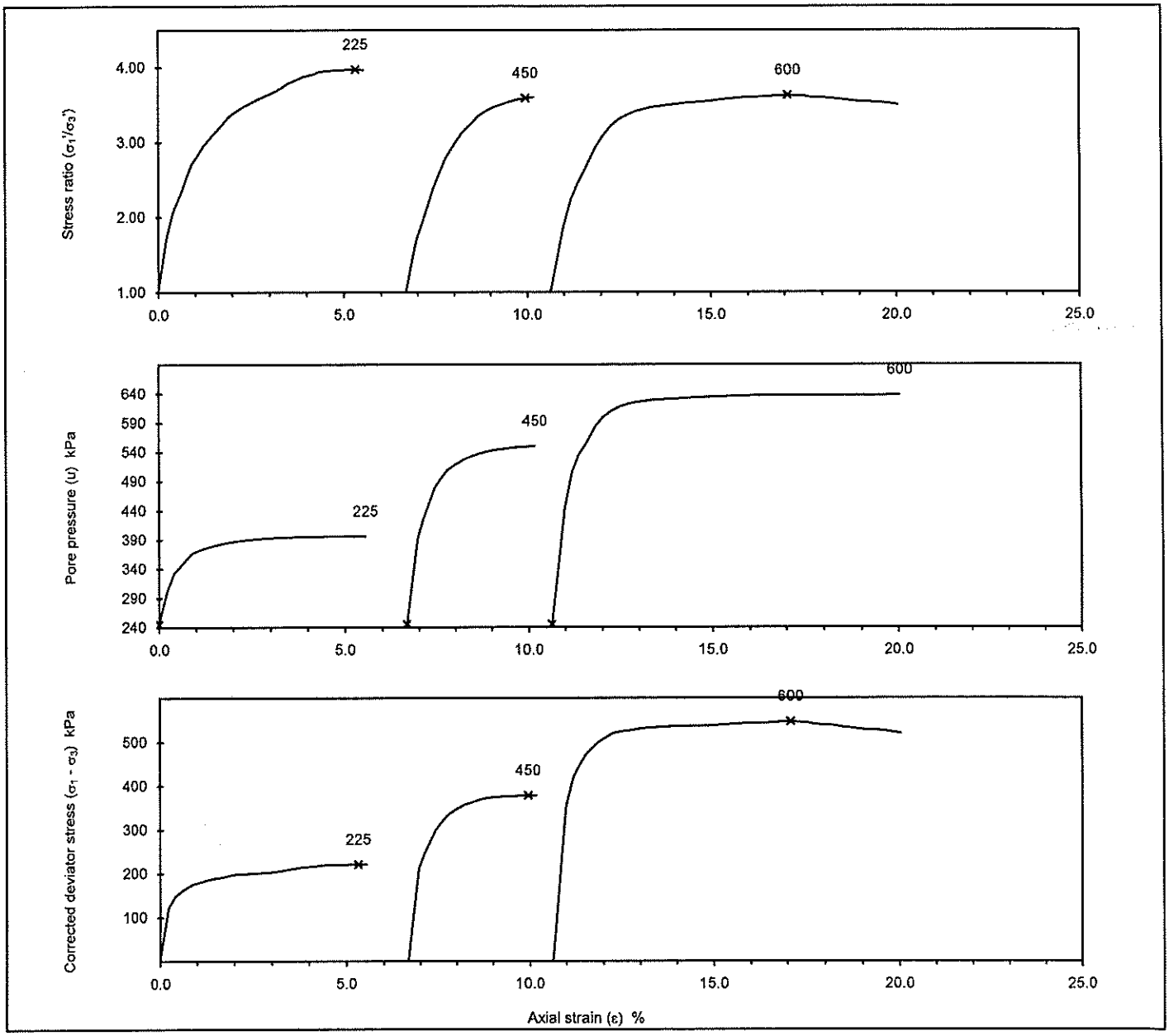
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D265
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	22.1
			To	:	23.1

Laboratory Information

Lab. sample I.D.	:	SL90277/12
Specimen ref.	:	A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 22.1
To : 23.1

Laboratory Information

Lab. sample I.D. : SL90277/12
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	225	
	Stage 2	kPa	450	
	Stage 3	kPa	600	
Applied pressure			Cell pressure kPa	Back pressure kPa
			20	20
			50	45
			75	70
			100	95
			125	120
			150	145
			175	170
			200	195
			225	220
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		1.00
Volume change	cm^3	13.2

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1145.0
Final moisture content	%	24.9
Final bulk density	Mg/m^3	1.99

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

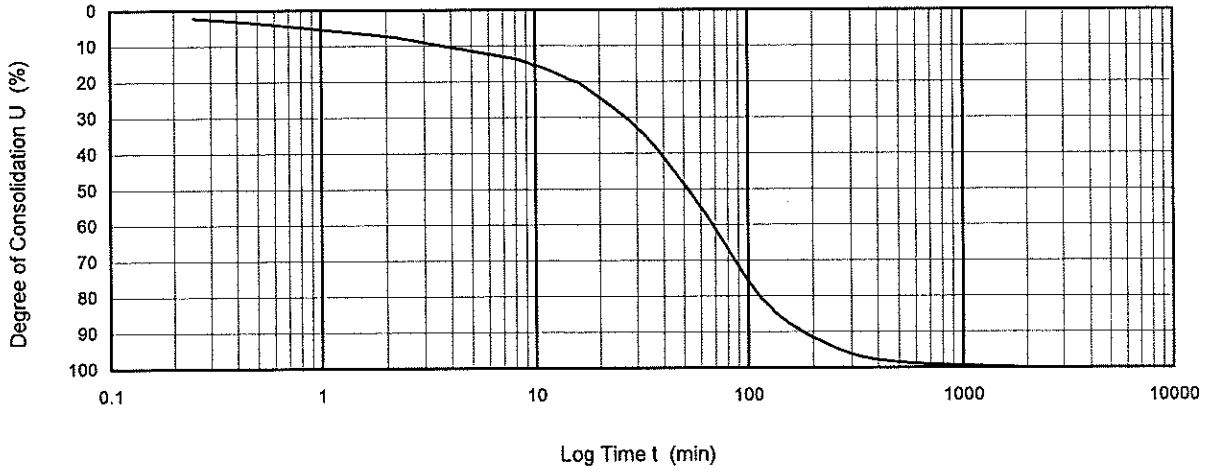
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D265
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	22.1
			To	:	23.1

Laboratory Information

Cell pressure	:	470 kPa	Lab. sample I.D.	:	SL90277/12
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	225 kPa			

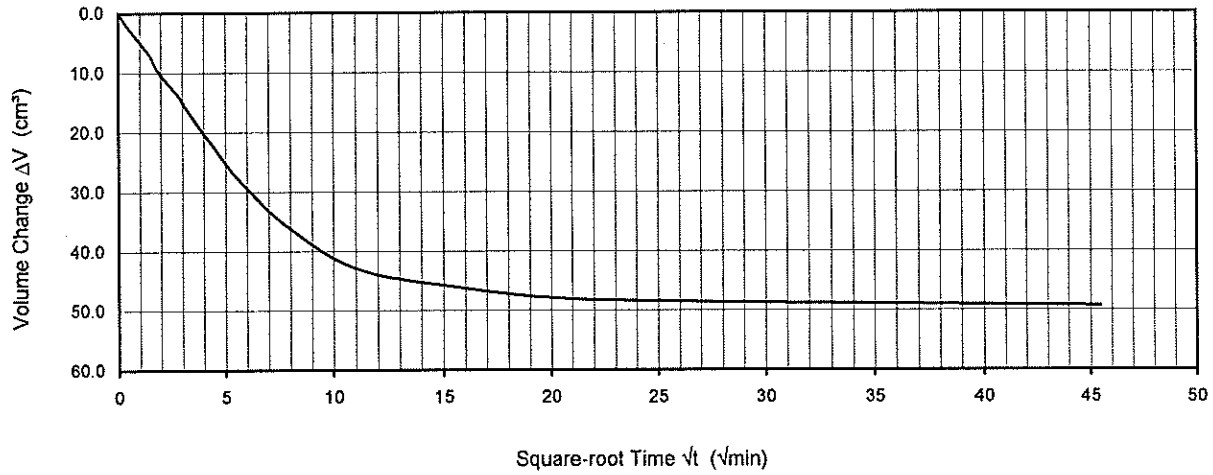
Degree of Consolidation vs. Log Time

t_{50} = 51.00 min ΔV = 49.3 cm³



Volume Change vs. Square-root Time

t_{100} = 98.01 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

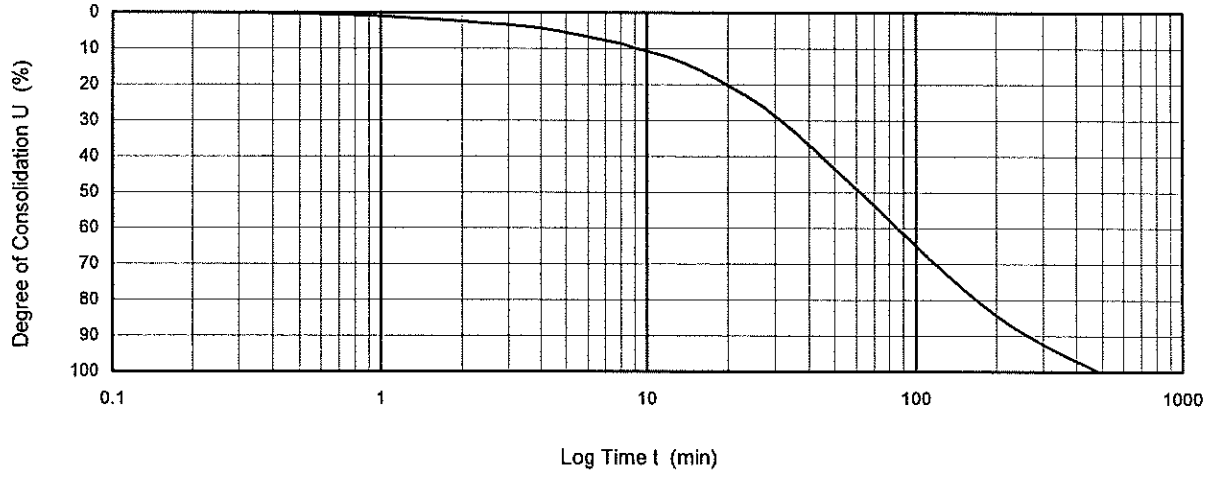
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D265
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	22.1
			To	:	23.1

Laboratory Information

Cell pressure	:	695 kPa	Lab. sample I.D.	:	SL90277/12
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	450 kPa			

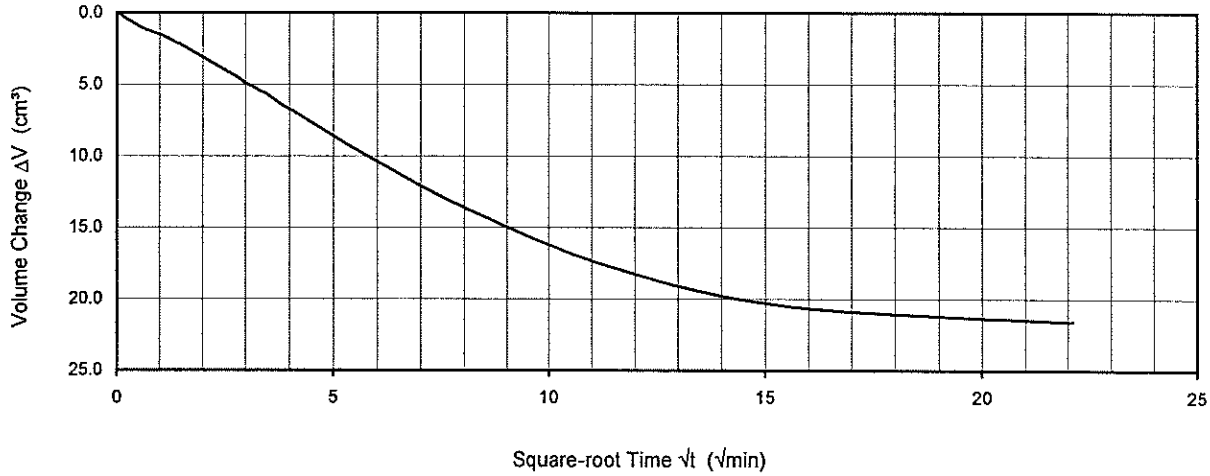
Degree of Consolidation vs. Log Time

t_{50} = 61.00 min ΔV = 21.6 cm³



Volume Change vs. Square-root Time

t_{100} = 144.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

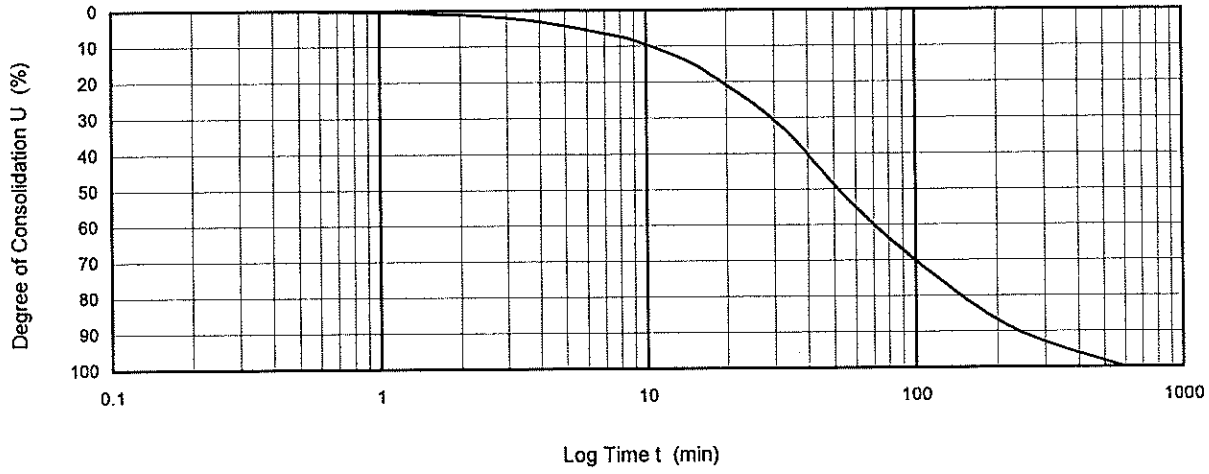
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D265
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	22.1
			To	:	23.1

Laboratory Information

Cell pressure	:	845 kPa	Lab. sample I.D.	:	SL90277/12
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	600 kPa			

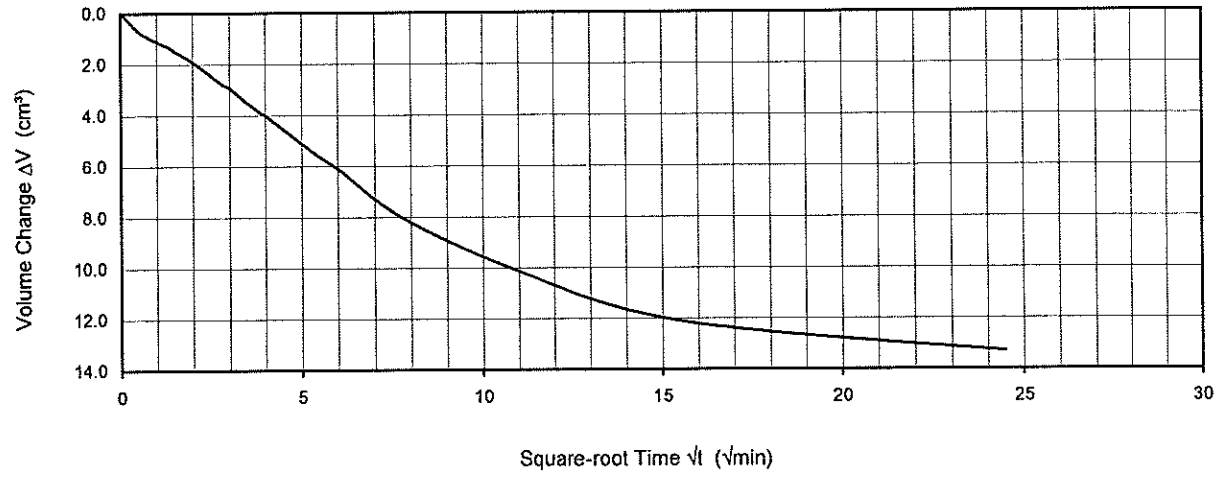
Degree of Consolidation vs. Log Time

t_{50} = 51.00 min ΔV = 13.3 cm³



Volume Change vs. Square-root Time

t_{100} = 158.76 min



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 22.1
To : 23.1

Laboratory information

Date shearing commenced : 11/01/2010 Time : 09:00
Date shearing completed : 11/01/2010 Time : 11:53
Proving ring serial No. : 10175
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.760 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.68

Lab. sample I.D. : SL90277/12
Specimen ref. : A
Cell pressure : 470 kPa
Back pressure : 245 kPa
Effective pressure : 225 kPa

Dimensions at starting of compression

Volume V_c : 611.17 cm^3
Area A_c : 4172.8 mm^2
Length L_c : 146.5 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.120	216.3	0.0	0.0	0.00	0.00	0.0	225.0	0.0	225.0	0.0	1.00	
304.1	33	0.405	730.0	0.2	0.2	0.54	0.06	122.2	227.0	61.1	206.6	122.2	1.74	
332.6	60	0.467	841.7	0.4	0.4	0.97	0.11	148.2	211.5	74.1	186.8	148.2	2.08	
349.4	94	0.504	908.4	0.6	0.6	1.53	0.17	163.1	202.2	81.6	175.0	163.1	2.35	
366.7	132	0.536	966.1	0.9	0.9	2.14	0.24	175.7	191.1	87.8	161.9	175.7	2.70	
372.8	161	0.549	989.5	1.1	1.1	2.62	0.29	180.4	187.4	90.2	157.3	180.4	2.86	
375.7	180	0.559	1007.6	1.2	1.2	2.92	0.32	184.0	186.3	92.0	155.6	184.0	2.95	
379.1	210	0.572	1031.0	1.4	1.4	3.41	0.37	188.7	185.2	94.3	153.8	188.7	3.08	
383.0	246	0.582	1049.0	1.7	1.7	4.00	0.43	191.8	182.9	95.9	150.9	191.8	3.20	
385.9	280	0.596	1074.3	1.9	1.9	4.55	0.49	196.6	182.4	98.3	149.6	196.6	3.34	
387.1	300	0.601	1083.3	2.0	2.0	4.76	0.52	198.2	182.0	99.1	149.0	198.2	3.39	
389.5	340	0.605	1090.5	2.3	2.3	4.76	0.59	199.3	180.1	99.6	146.9	199.3	3.48	
390.8	372	0.609	1097.7	2.5	2.5	4.76	0.64	200.5	179.4	100.2	146.0	200.5	3.53	
391.7	395	0.612	1103.1	2.7	2.7	4.76	0.68	201.3	179.0	100.7	145.4	201.3	3.57	
392.9	429	0.616	1110.3	2.9	2.9	4.76	0.73	202.5	178.3	101.2	144.6	202.5	3.63	
393.5	457	0.621	1119.3	3.1	3.1	4.76	0.77	204.1	178.6	102.1	144.5	204.1	3.67	
394.0	486	0.628	1131.9	3.3	3.3	4.76	0.82	206.6	179.3	103.3	144.9	206.6	3.72	
394.5	512	0.637	1148.2	3.5	3.5	4.76	0.86	209.9	180.4	104.9	145.5	209.9	3.78	
395.0	550	0.646	1164.4	3.8	3.8	4.76	0.91	213.0	181.5	106.5	146.0	213.0	3.84	
395.3	576	0.652	1175.2	3.9	3.9	4.76	0.95	215.0	182.2	107.5	146.4	215.0	3.88	
395.5	617	0.658	1186.0	4.2	4.2	4.76	1.01	216.8	182.9	108.4	146.8	216.8	3.91	
395.6	634	0.663	1195.0	4.3	4.3	4.76	1.04	218.6	183.7	109.3	147.3	218.6	3.94	
395.7	662	0.666	1200.4	4.5	4.5	4.76	1.08	219.3	184.0	109.7	147.4	219.3	3.95	
395.8	692	0.668	1204.0	4.7	4.7	4.76	1.12	219.6	184.0	109.8	147.4	219.6	3.96	
395.8	722	0.670	1207.6	4.9	4.9	4.76	1.16	219.9	184.2	110.0	147.5	219.9	3.96	
395.8	750	0.672	1211.2	5.1	5.1	4.76	1.20	220.3	184.3	110.1	147.6	220.3	3.97	
395.8	780	0.674	1214.9	5.3	5.3	4.76	1.24	220.6	184.5	110.3	147.7	220.6	3.97	«
395.7	812	0.675	1216.7	5.5	5.5	4.76	1.28	220.4	184.5	110.2	147.8	220.4	3.97	

Final volume (cm^3): 611.17 Final length (mm): 138.3 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 22.1
To : 23.1

Laboratory Information

Date shearing commenced : 11/01/2010 Time : 21:00
Date shearing completed : 11/01/2010 Time : 22:55
Proving ring serial No. : 10175
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.760 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.81

Lab. sample I.D. : SL90277/12
Specimen ref. : A
Cell pressure : 695 kPa
Back pressure : 245 kPa
Effective pressure : 450 kPa

Dimensions at starting of compression

Volume V_c : 589.57 cm^3
Area A_c : 4313.1 mm^2
Length L_c : 136.7 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.178	320.8	0.0	6.7	4.76	1.50	0.0	450.0	0.0	450.0	0.0	1.00
391.8	40	0.702	1265.3	0.3	7.0	4.76	1.55	212.0	409.2	106.0	373.9	212.0	1.70
424.6	60	0.780	1405.9	0.4	7.1	4.76	1.58	244.1	392.5	122.1	351.8	244.1	1.90
477.9	103	0.915	1649.2	0.8	7.4	4.76	1.64	299.3	366.7	149.6	316.9	299.3	2.38
494.9	128	0.963	1735.8	0.9	7.6	4.76	1.67	318.6	359.4	159.3	306.3	318.6	2.59
507.6	150	1.000	1802.5	1.1	7.8	4.76	1.70	333.3	354.0	166.6	298.5	333.3	2.78
517.7	180	1.033	1861.9	1.3	8.0	4.76	1.73	346.1	350.4	173.1	292.7	346.1	2.95
526.5	210	1.060	1910.6	1.5	8.2	4.76	1.77	356.4	346.7	178.2	287.3	356.4	3.12
531.8	240	1.076	1939.4	1.8	8.4	4.76	1.81	362.1	344.3	181.1	283.9	362.1	3.22
537.5	274	1.096	1975.5	2.0	8.7	4.76	1.85	369.3	342.2	184.7	280.6	369.3	3.34
540.5	300	1.105	1991.7	2.2	8.9	4.76	1.88	372.3	340.6	186.1	278.6	372.3	3.41
543.4	334	1.113	2006.1	2.4	9.1	4.76	1.92	374.5	338.9	187.3	276.4	374.5	3.47
545.1	364	1.117	2013.3	2.7	9.3	4.76	1.96	375.2	337.5	187.6	275.0	375.2	3.50
546.7	390	1.121	2020.5	2.9	9.5	4.76	1.99	376.1	336.3	188.0	273.7	376.1	3.54
548.0	420	1.126	2029.6	3.1	9.7	4.76	2.02	377.2	335.6	188.6	272.7	377.2	3.57
549.1	450	1.129	2035.0	3.3	10.0	4.76	2.06	377.5	334.7	188.8	271.7	377.5	3.59
549.8	480	1.131	2038.6	3.5	10.2	4.76	2.09	377.4	333.9	188.7	271.0	377.4	3.60

Final volume (cm^3): 589.57 Final length (mm): 131.9 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MaterialLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 22.1
To : 23.1

Laboratory Information

Date shearing commenced : 12/01/2010 Time : 09:30
Date shearing completed : 12/01/2010 Time : 13:53
Proving ring serial No. : 6499
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.760 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.72

Lab. sample I.D. : SL90277/12
Specimen ref. : A
Cell pressure : 845 kPa
Back pressure : 245 kPa
Effective pressure : 600 kPa

Dimensions at starting of compression

Volume V_c : 576.27 cm^3
Area A_c : 4402.5 mm^2
Length L_c : 130.9 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.127	388.4	0.0	10.6	4.76	2.16	0.0	600.0	0.0	600.0	0.0	1.00	
444.5	48	0.647	1978.6	0.4	11.0	4.76	2.22	352.9	577.0	176.5	518.1	352.9	1.88	
506.9	75	0.745	2278.3	0.6	11.2	4.76	2.25	419.8	548.0	209.9	478.0	419.8	2.24	
535.9	98	0.789	2412.8	0.7	11.4	4.76	2.27	449.4	533.8	224.7	458.9	449.4	2.45	
550.9	120	0.824	2519.9	0.9	11.5	4.76	2.30	472.7	530.4	236.3	451.7	472.7	2.61	
584.7	158	0.862	2636.1	1.2	11.8	4.76	2.34	497.3	508.9	248.6	426.1	497.3	2.91	
600.4	186	0.880	2691.1	1.4	12.1	4.76	2.37	508.5	498.8	254.2	414.1	508.5	3.08	
610.5	217	0.899	2749.2	1.7	12.3	4.76	2.41	520.2	494.6	260.1	407.9	520.2	3.22	
618.0	246	0.906	2770.6	1.9	12.5	4.76	2.44	523.7	488.9	261.9	401.6	523.7	3.31	
622.7	278	0.912	2789.0	2.1	12.8	4.76	2.47	526.5	485.5	263.2	397.8	526.5	3.37	
625.4	304	0.918	2807.3	2.3	13.0	4.76	2.50	529.4	484.3	264.7	396.1	529.4	3.41	
627.1	333	0.923	2822.6	2.5	13.2	4.76	2.53	531.6	483.7	265.8	395.1	531.6	3.44	
628.8	362	0.927	2834.9	2.8	13.4	4.76	2.56	533.0	482.7	266.5	393.9	533.0	3.47	
629.7	396	0.931	2847.1	3.0	13.7	4.76	2.60	534.2	482.4	267.1	393.4	534.2	3.48	
630.6	427	0.935	2859.3	3.3	13.9	4.76	2.63	535.6	482.2	267.8	392.9	535.6	3.50	
631.7	464	0.938	2868.5	3.5	14.2	4.76	2.67	535.9	481.3	268.0	391.9	535.9	3.51	
632.3	485	0.940	2874.6	3.7	14.3	4.76	2.69	536.4	480.9	268.2	391.5	536.4	3.52	
633.0	515	0.942	2880.7	3.9	14.6	4.76	2.72	536.4	480.2	268.2	390.8	536.4	3.53	
633.7	550	0.945	2889.9	4.2	14.8	4.76	2.76	536.8	479.7	268.4	390.2	536.8	3.54	
634.3	579	0.948	2899.1	4.4	15.1	4.76	2.79	537.5	479.5	268.8	389.9	537.5	3.55	
634.8	604	0.952	2911.3	4.6	15.2	4.76	2.81	539.0	479.7	269.5	389.9	539.0	3.56	
635.3	633	0.956	2923.5	4.8	15.5	4.76	2.84	540.4	479.9	270.2	389.8	540.4	3.58	
635.7	666	0.960	2935.8	5.1	15.7	4.76	2.87	541.5	480.1	270.8	389.8	541.5	3.59	
636.1	692	0.963	2945.0	5.3	15.9	4.76	2.90	542.3	480.1	271.2	389.7	542.3	3.60	
636.3	720	0.966	2954.1	5.5	16.1	4.76	2.93	543.0	480.2	271.5	389.7	543.0	3.60	
636.5	756	0.969	2963.3	5.8	16.4	4.76	2.96	543.4	480.2	271.7	389.6	543.4	3.61	
636.7	783	0.972	2972.5	6.0	16.6	4.76	2.99	544.1	480.3	272.0	389.7	544.1	3.61	
636.8	812	0.976	2984.7	6.2	16.8	4.76	3.02	545.4	480.9	272.7	390.0	545.4	3.62	
636.9	846	0.980	2996.9	6.5	17.1	4.76	3.05	546.4	481.3	273.2	390.2	546.4	3.63	«
636.9	872	0.980	2996.9	6.7	17.3	4.76	3.08	545.2	480.7	272.6	389.8	545.2	3.62	
637.0	904	0.980	2996.9	6.9	17.5	4.76	3.11	543.7	479.9	271.9	389.2	543.7	3.61	
637.0	933	0.976	2984.7	7.1	17.8	4.76	3.14	539.8	477.9	269.9	387.9	539.8	3.60	
637.1	962	0.977	2987.8	7.3	18.0	4.76	3.17	539.1	477.5	269.6	387.6	539.1	3.59	
637.1	998	0.977	2987.8	7.6	18.3	4.76	3.21	537.4	476.6	268.7	387.0	537.4	3.59	

Final volume (cm^3): 576.27 Final length (mm): 118.6 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 22.1
To : 23.1

Laboratory Information

Lab. sample I.D. : SL90277/12
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
637.2	1023	0.974	2978.6	7.8	18.4	4.76	3.23	534.4	475.0	267.2	385.9	534.4	3.57
637.2	1056	0.972	2972.5	8.1	18.7	4.76	3.26	531.6	473.6	265.8	385.0	531.6	3.56
637.2	1088	0.970	2966.4	8.3	18.9	4.76	3.30	528.8	472.2	264.4	384.1	528.8	3.54
637.2	1112	0.970	2966.4	8.5	19.1	4.76	3.32	527.7	471.7	263.9	383.7	527.7	3.54
637.2	1146	0.971	2969.4	8.8	19.4	4.76	3.35	526.8	471.2	263.4	383.4	526.8	3.54
637.2	1178	0.971	2969.4	9.0	19.6	4.76	3.39	525.4	470.5	262.7	382.9	525.4	3.53
637.3	1204	0.968	2960.2	9.2	19.8	4.76	3.41	522.3	468.8	261.1	381.8	522.3	3.51
637.3	1234	0.965	2951.1	9.4	20.1	4.76	3.44	519.0	467.2	259.5	380.7	519.0	3.50

Final volume (cm^3): 576.27 Final length (mm): 118.6 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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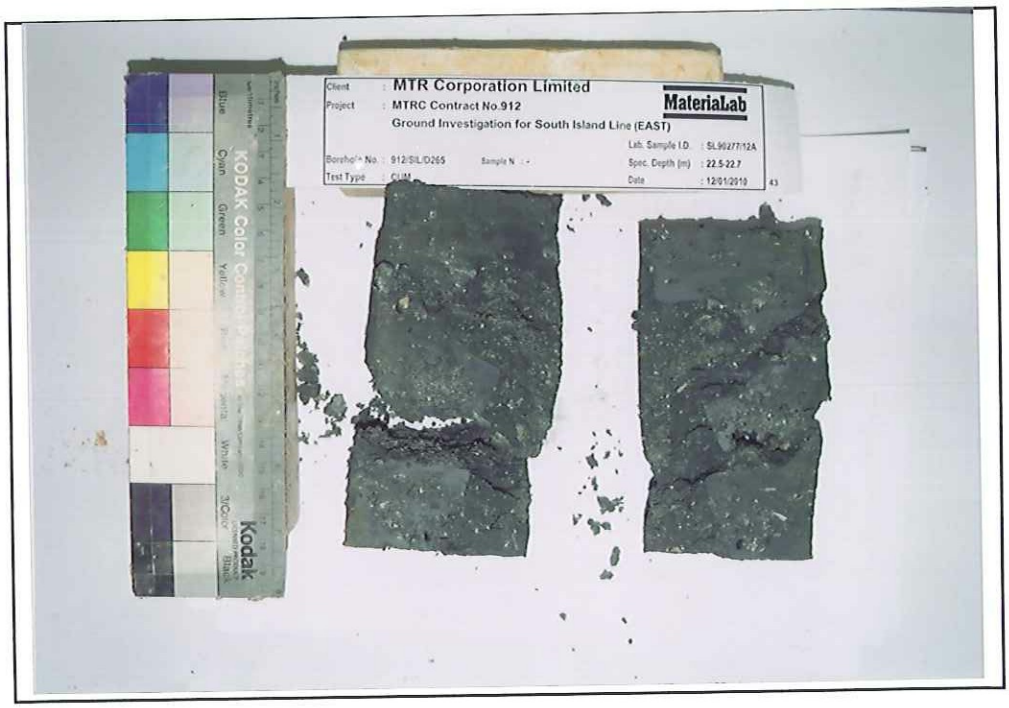
Photographic Records for Triaxial Test



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MateriaLab

Test Report No. : 090562SL90277(46)

TEST REPORT ON THE UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITHOUT PORE PRESSURE MEASUREMENT - (UU)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

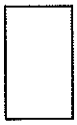
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 27.10
To : 28.10
Sample origin : MD
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 20-01-2010
Date test(s) completed : 21-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.1
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : K.M. Fung Designation : Technical Assistant Affiliation : FTS Ltd. - MateriaLab Division
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.60 (Measured)
Temperature range at test(s) : Maximum : 23.5 °C Minimum : 18.5 °C

Lab. sample I.D. : SL90277/14
Sample type : M

Specimen reference		A								
Specimen depth(m)	From	27.9								
	To	28.1								
Cell pressure	kPa	550								
Measurements and Calculations		Initial	Final							
Diameter	mm	74.7	83.6							
Length	mm	150.4	120.1							
Volume	cm³	659.14	659.14							
Wet mass	g	1156.1	1156.1							
Dry mass	g	848.3	848.3							
Moisture content	%	36.3	36.3							
Bulk density	Mg/m³	1.75	1.75							
Dry density	Mg/m³	1.29	1.29							
Void ratio		1.02	1.02							
Degree of saturation	%	92.5	92.5							
Sketch of failed specimen (Failure Mode)		Brittle								
Visual description		Moist, dark grey, slightly sandy SILT/CLAY with shell fragments.								

Test Results (at Failure)

Cell Pressure	kPa	550								
Corr. Max. Deviator Stress	kPa	110.8								
Strain	%	4.4								
Undrained Shear Strength	kPa	55.4								

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-			-			-		
Mass of particle	g	-			-			-		
Percentage retained	%	-			-			-		

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks:

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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MateriaLab

TEST REPORT ON THE UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITHOUT PORE PRESSURE MEASUREMENT - (UU)

HOKLAS 015

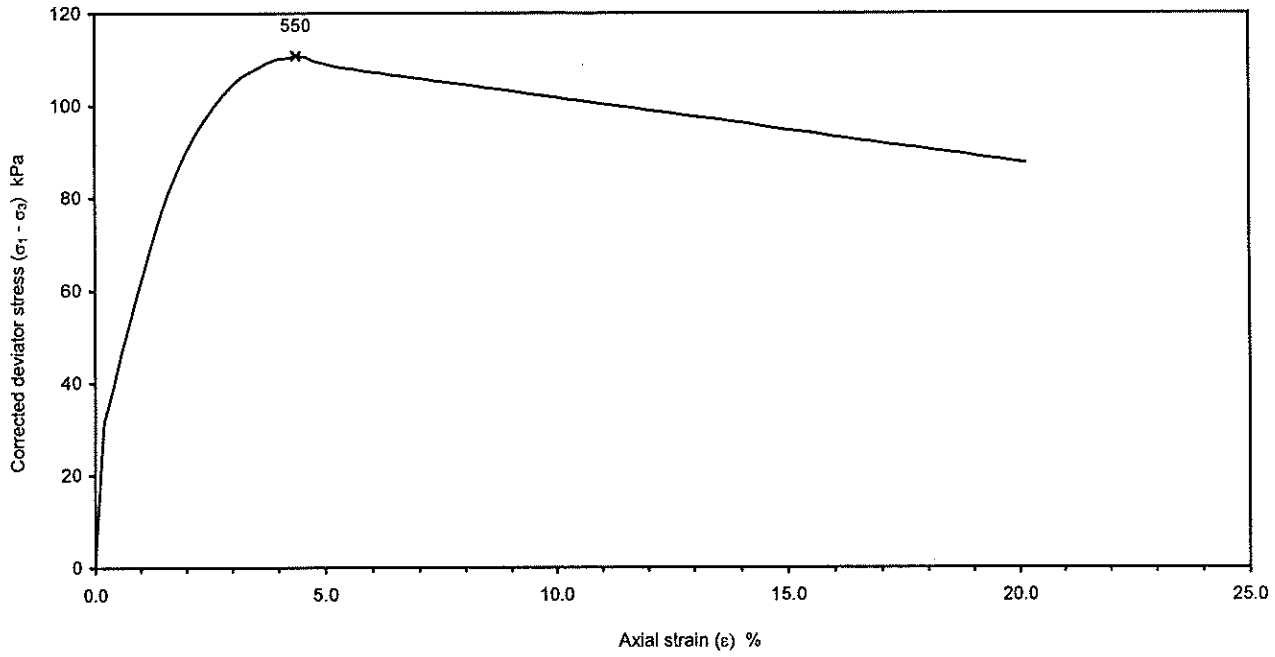
CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOT

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D265
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	27.10
			To	:	28.10

Laboratory Information

Lab. sample I.D.	:	SL90277/14
Specimen ref.	:	A



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TEST REPORT ON THE UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITHOUT PORE PRESSURE MEASUREMENT - (UU)

HOKLAS 015

COMPRESSION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 27.10
To : 28.10

Laboratory Information

Date shearing commenced : 20/01/2010 Time : 10:00
Date shearing completed : 20/01/2010 Time : 10:15
Proving ring serial No. : 15167
Type of membrane : rubber

Lab. sample I.D. : SL90277/14
Specimen ref. : A
Cell pressure : 550 kPa

Corrections

Membrane thickness, σ_{mb} : 0.33 mm
Rate of axial displacement : 2.00 mm/min

Dimensions at starting of compression

Volume V_c : 659.14 cm^3
Area A_c : 4382.6 mm^2
Length L_c : 150.4 mm

Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	Undrained shear strength S_u kPa	
0	0.383	258.8	0.0	0.00	0.0		
30	0.587	396.6	0.2	0.03	31.4		
60	0.637	430.4	0.4	0.05	39.0		
90	0.691	466.9	0.6	0.08	47.1		
120	0.738	498.6	0.8	0.10	54.2		
150	0.785	530.4	1.0	0.13	61.2		
180	0.832	562.2	1.2	0.15	68.2		
210	0.875	591.2	1.4	0.18	74.6		
240	0.916	618.9	1.6	0.20	80.7		
270	0.950	641.9	1.8	0.22	85.6		
300	0.978	660.8	2.0	0.25	89.7		
330	1.004	678.4	2.2	0.27	93.4		
360	1.027	693.9	2.4	0.29	96.6		
390	1.048	708.1	2.6	0.32	99.5		
420	1.066	720.3	2.8	0.34	102.0		
450	1.081	730.4	3.0	0.36	104.0		
480	1.095	739.9	3.2	0.38	105.9		
510	1.105	746.6	3.4	0.41	107.1		
540	1.114	752.7	3.6	0.43	108.2		
570	1.123	758.8	3.8	0.45	109.3		
600	1.130	763.5	4.0	0.47	110.1		
630	1.133	765.5	4.2	0.49	110.3		
660	1.138	768.9	4.4	0.51	110.8	55.4	«
690	1.138	768.9	4.6	0.53	110.5		
720	1.134	766.2	4.8	0.55	109.7		
750	1.132	764.9	5.0	0.57	109.1		
780	1.130	763.5	5.2	0.59	108.6		
810	1.129	762.8	5.4	0.61	108.2		
840	1.129	762.8	5.6	0.63	108.0		
870	1.128	762.2	5.8	0.65	107.6		
900	1.128	762.2	6.0	0.67	107.3		
930	1.128	762.2	6.2	0.68	107.1		
960	1.127	761.5	6.4	0.70	106.7		
990	1.127	761.5	6.6	0.72	106.4		
1020	1.127	761.5	6.8	0.74	106.2		

Final volume (cm^3): 659.14 Final length (mm): 120.1 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITHOUT PORE PRESSURE MEASUREMENT - (UU)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 27.10
To : 28.10

Laboratory Information

Lab. sample I.D. : SL90277/14
Specimen ref. : A

Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	Undrained shear strength S_u kPa
1050	1.127	761.5	7.0	0.76	105.9	
1080	1.127	761.5	7.2	0.77	105.7	
1110	1.126	760.8	7.4	0.79	105.3	
1140	1.126	760.8	7.6	0.81	105.1	
1170	1.126	760.8	7.8	0.83	104.8	
1200	1.126	760.8	8.0	0.84	104.6	
1230	1.126	760.8	8.2	0.86	104.3	
1260	1.125	760.1	8.4	0.88	103.9	
1290	1.125	760.1	8.6	0.89	103.7	
1320	1.125	760.1	8.8	0.91	103.4	
1350	1.125	760.1	9.0	0.92	103.2	
1380	1.125	760.1	9.2	0.94	103.0	
1410	1.124	759.5	9.4	0.95	102.6	
1440	1.124	759.5	9.6	0.97	102.3	
1470	1.124	759.5	9.8	0.99	102.1	
1500	1.124	759.5	10.0	1.00	101.8	
1530	1.123	758.8	10.2	1.02	101.5	
1560	1.123	758.8	10.4	1.03	101.2	
1590	1.123	758.8	10.6	1.05	101.0	
1620	1.123	758.8	10.8	1.06	100.7	
1650	1.122	758.1	11.0	1.08	100.4	
1680	1.122	758.1	11.2	1.09	100.1	
1710	1.122	758.1	11.4	1.10	99.9	
1740	1.122	758.1	11.6	1.12	99.6	
1770	1.122	758.1	11.8	1.13	99.4	
1800	1.121	757.4	12.0	1.15	99.0	
1830	1.121	757.4	12.2	1.16	98.8	
1860	1.121	757.4	12.4	1.17	98.5	
1890	1.121	757.4	12.6	1.19	98.3	
1920	1.120	756.8	12.8	1.20	97.9	
1950	1.120	756.8	13.0	1.22	97.7	
1980	1.120	756.8	13.2	1.23	97.4	
2010	1.120	756.8	13.4	1.24	97.2	
2040	1.120	756.8	13.6	1.26	97.0	
2070	1.119	756.1	13.8	1.27	96.6	
2100	1.119	756.1	14.0	1.28	96.3	
2130	1.119	756.1	14.2	1.30	96.1	
2160	1.118	755.4	14.4	1.31	95.7	
2190	1.117	754.7	14.6	1.32	95.4	
2220	1.116	754.1	14.8	1.34	95.0	
2250	1.116	754.1	15.0	1.35	94.8	
2280	1.116	754.1	15.2	1.36	94.5	

Final volume (cm^3): 659.14 Final length (mm): 120.1 Termination criterion : Maximum deviator stress

Remarks:

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MateriaLab

TEST REPORT ON THE UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITHOUT PORE PRESSURE MEASUREMENT - (UU)

HOKLAS 015

COMPRESSION STAGE (Continued)

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 27.10
To : 28.10

Laboratory Information

Lab. sample I.D. : SL90277/14
Specimen ref. : A

Axial strain reading div	Proving ring reading div	Axial force N	Axial strain ε %	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	Undrained shear strength S_u kPa
2310	1.116	754.1	15.4	1.37	94.3	
2340	1.116	754.1	15.6	1.39	94.0	
2370	1.115	753.4	15.8	1.40	93.7	
2400	1.114	752.7	16.0	1.41	93.3	
2430	1.114	752.7	16.2	1.42	93.1	
2460	1.113	752.0	16.4	1.44	92.7	
2490	1.113	752.0	16.6	1.45	92.5	
2520	1.113	752.0	16.8	1.46	92.2	
2550	1.113	752.0	17.0	1.48	92.0	
2580	1.112	751.4	17.2	1.49	91.6	
2610	1.112	751.4	17.4	1.50	91.4	
2640	1.112	751.4	17.6	1.51	91.2	
2670	1.112	751.4	17.8	1.53	90.9	
2700	1.112	751.4	18.0	1.54	90.7	
2730	1.111	750.7	18.2	1.55	90.3	
2760	1.111	750.7	18.4	1.56	90.1	
2790	1.111	750.7	18.6	1.58	89.8	
2820	1.111	750.7	18.8	1.59	89.6	
2850	1.110	750.0	18.9	1.60	89.2	
2880	1.109	749.3	19.1	1.61	88.9	
2910	1.109	749.3	19.3	1.63	88.6	
2940	1.109	749.3	19.5	1.64	88.4	
2970	1.109	749.3	19.7	1.65	88.2	
3000	1.108	748.6	19.9	1.67	87.8	
3030	1.108	748.6	20.1	1.68	87.6	

Final volume (cm^3): 659.14 Final length (mm): 120.1 Termination criterion : Maximum deviator stress
Remarks:

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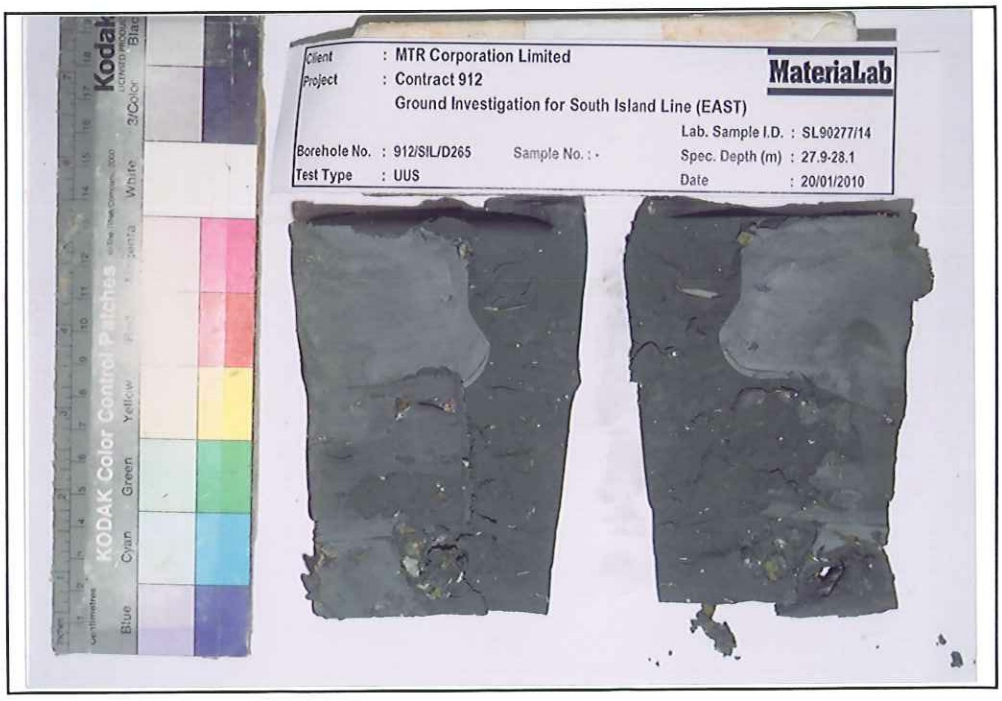
Photographic Records for Triaxial Test



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MateriaLab

HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 31.00
To : 32.00
Sample origin : CDT
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 11-01-2010
Date test(s) completed : 19-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : W.Y. Lo Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.62 (Measured)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 17.5 °C
Visual description : Moist, yellowish and greyish brown mottled with white, slightly gravelly, slightly sandy SILT/CLAY.

Lab. sample I.D. : SL90277/15
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 31.40
To : 31.60
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	170			340			680	
***Measurements and Calculations**		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.6	73.8	74.8	74.6	76.0		75.7	80.0
Length	mm	150.4	148.7	144.5	144.1	139.0		138.5	124.0
Volume	cm^3	657.38	635.58	635.58	630.28	630.28		623.88	623.88
Wet mass	g	1289.4	1287.9	1287.9	1282.6	1282.6		1276.2	1276.2
Dry mass	g	1053.1	1053.1	1053.1	1053.1	1053.1		1053.1	1053.1
Moisture content	%	22.4	22.3	22.3	21.8	21.8		21.2	21.2
Bulk density	Mg/m^3	1.96	2.03	2.03	2.03	2.03		2.05	2.05
Dry density	Mg/m^3	1.60	1.66	1.66	1.67	1.67		1.69	1.69
Void ratio		0.64	0.58	0.58	0.57	0.57		0.55	0.55
Degree of saturation	%	92.5	100.5	100.5	100.5	100.5		100.5	100.5
Saturation Stage									
****Volume change of water**	cm^3	20.3							
Consolidation Stage									
Side drain used		Yes			-			-	
Initial pore pressure	kPa	365.0			357.2			490.0	
Final pore pressure	kPa	200.0			200.0			200.0	
Volume of water drained out	cm^3	21.8			5.3			6.4	
m_{vi}	m^2/MN	0.20			0.05			0.04	
t_{50}	min	29.00			26.50			39.00	
c_{vi} (from t_{50})	m^2/yr	NA			NA			NA	
t_{100}	min	40.96			70.56			100.00	
c_{vi} (from t_{100})	m^2/yr	2.74			1.61			1.17	
Sketch of failed specimen (Failure Mode)								Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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MateriaLab

HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

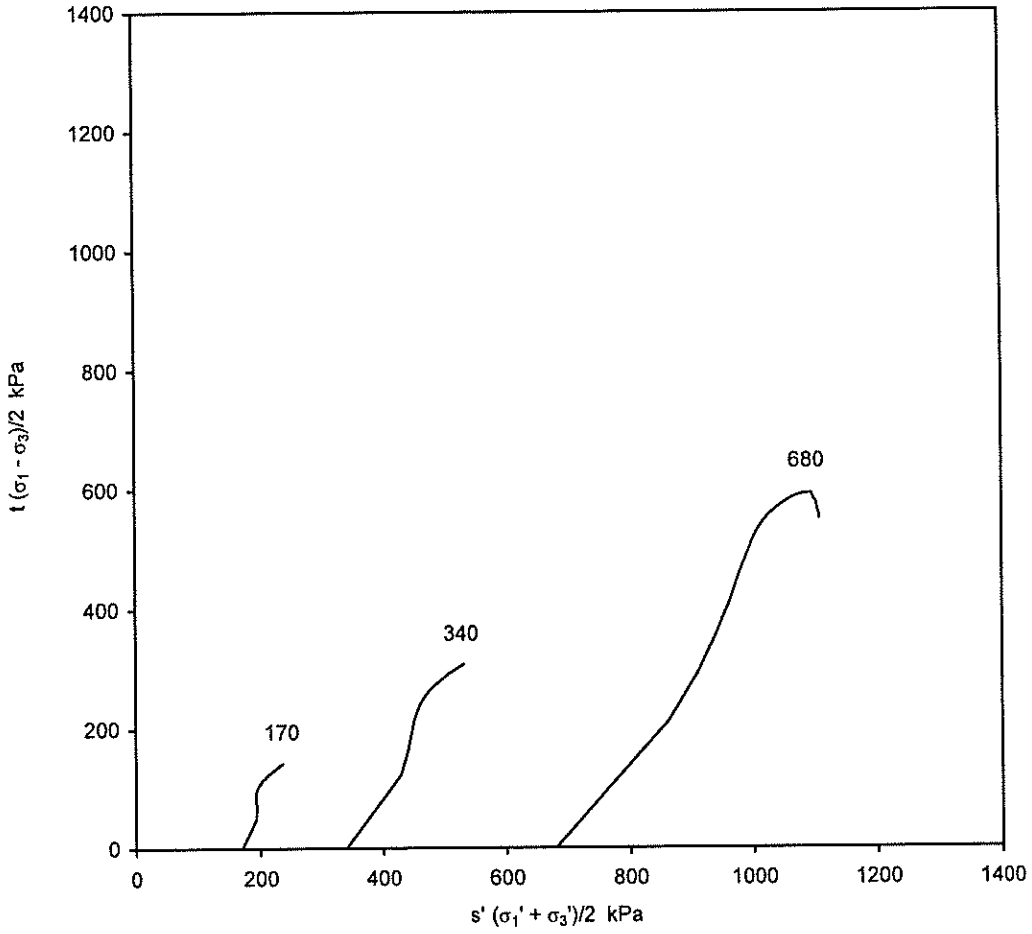
Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 31.00
To : 32.00

Laboratory Information

Lab. sample I.D. : SL90277/15
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	170	2.6	2.6	276.4	281.3	234.3	140.7
2	340	3.3	6.4	316.6	609.8	528.3	304.9
3	680	5.4	12.3	384.3	1183.0	1087.2	591.5



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

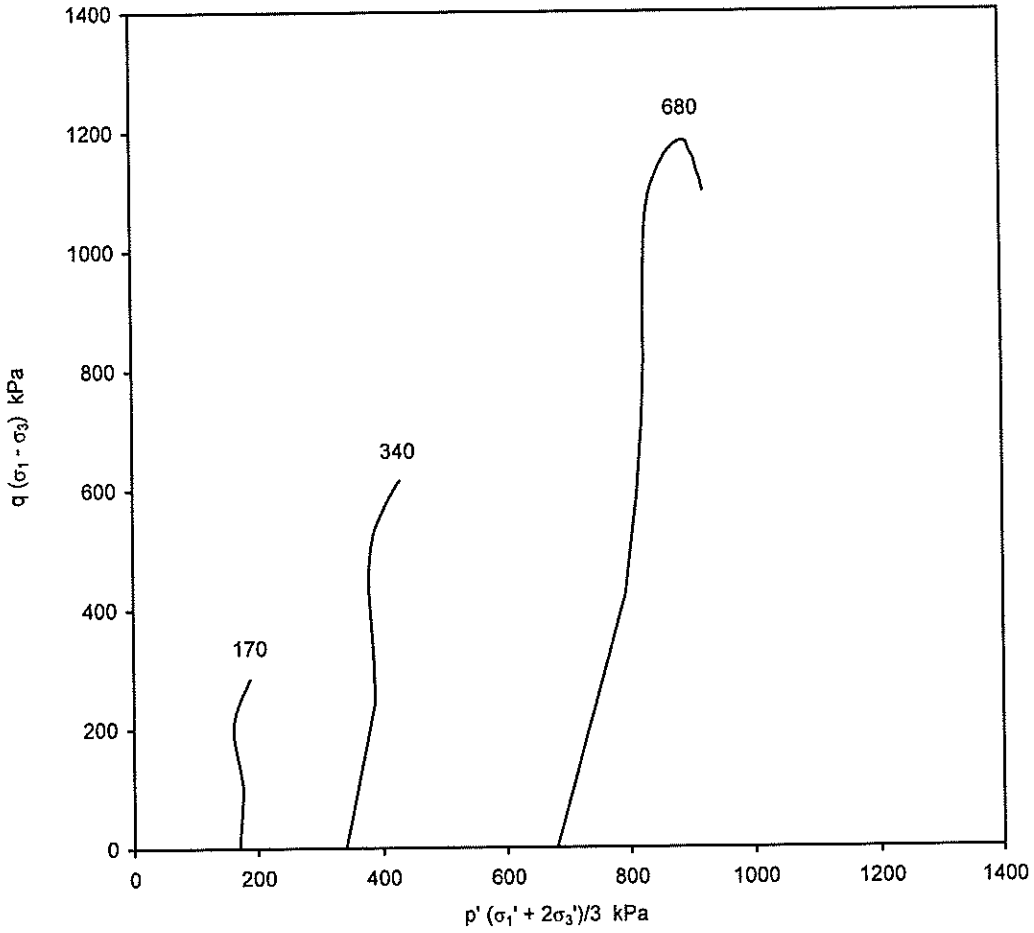
Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 31.00
To : 32.00

Laboratory Information

Lab. sample I.D. : SL90277/15
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	170	2.6	2.6	276.4	281.3	187.4	281.3
2	340	3.3	6.4	316.6	609.8	426.7	609.8
3	680	5.4	12.3	384.3	1183.0	890.0	1183.0



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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

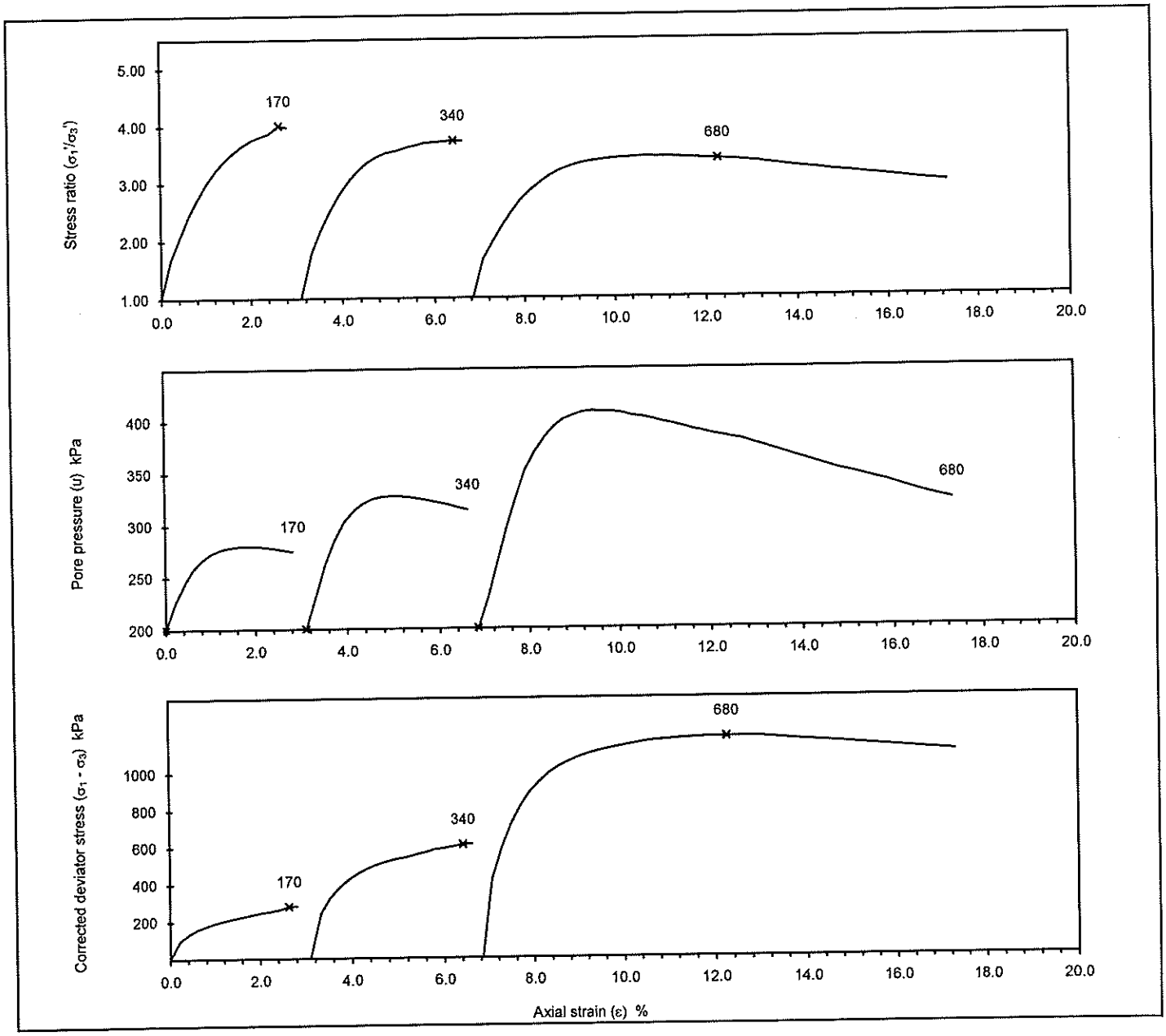
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 31.00
To : 32.00

Laboratory Information

Lab. sample I.D. : SL90277/15
Specimen ref. : A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 31.00
To : 32.00

Laboratory Information

Lab. sample I.D. : SL90277/15
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	170	
	Stage 2	kPa	340	
	Stage 3	kPa	680	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			150	145
			200	195
			205	200

End of Saturation

Cell pressure	kPa	205
Back pressure	kPa	200
Pore pressure	kPa	200.0
B value		0.98
Volume change	cm^3	20.3

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1273.8
Final moisture content	%	21.0
Final bulk density	Mg/m^3	2.04

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

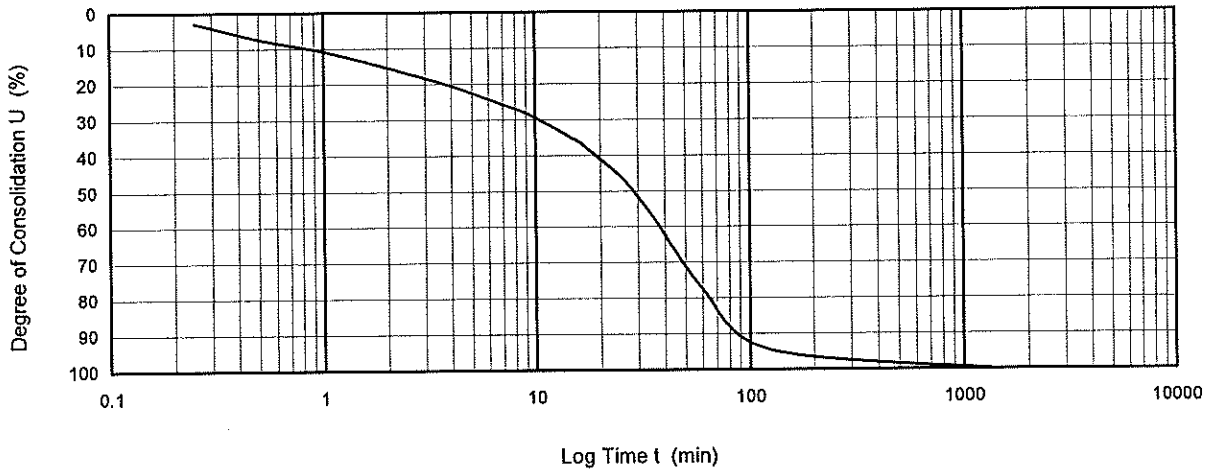
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D265
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	31.00
			To	:	32.00

Laboratory Information

Cell pressure	:	370 kPa	Lab. sample I.D.	:	SL90277/15
Back pressure	:	200 kPa	Specimen ref.	:	A
Effective pressure	:	170 kPa			

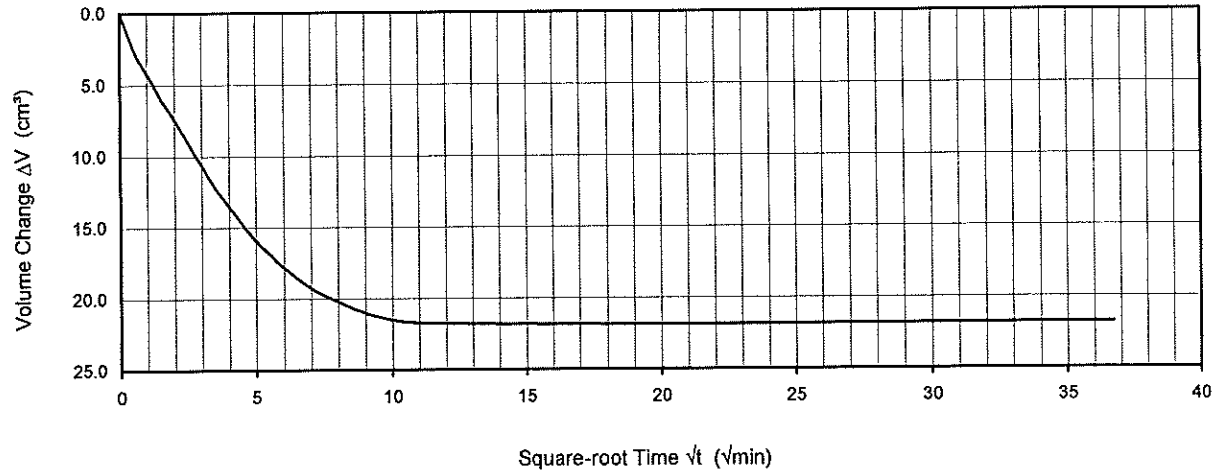
Degree of Consolidation vs. Log Time

t_{50} = 29.00 min ΔV = 21.8 cm^3



Volume Change vs. Square-root Time

t_{100} = 40.96 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

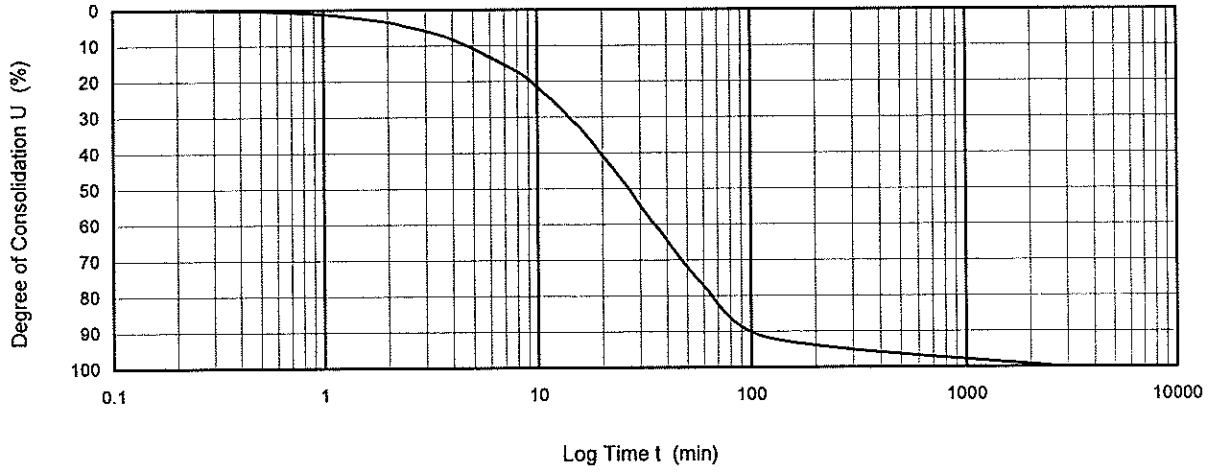
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D265
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	31.00
			To	:	32.00

Laboratory Information

Cell pressure	:	540 kPa	Lab. sample I.D.	:	SL90277/15
Back pressure	:	200 kPa	Specimen ref.	:	A
Effective pressure	:	340 kPa			

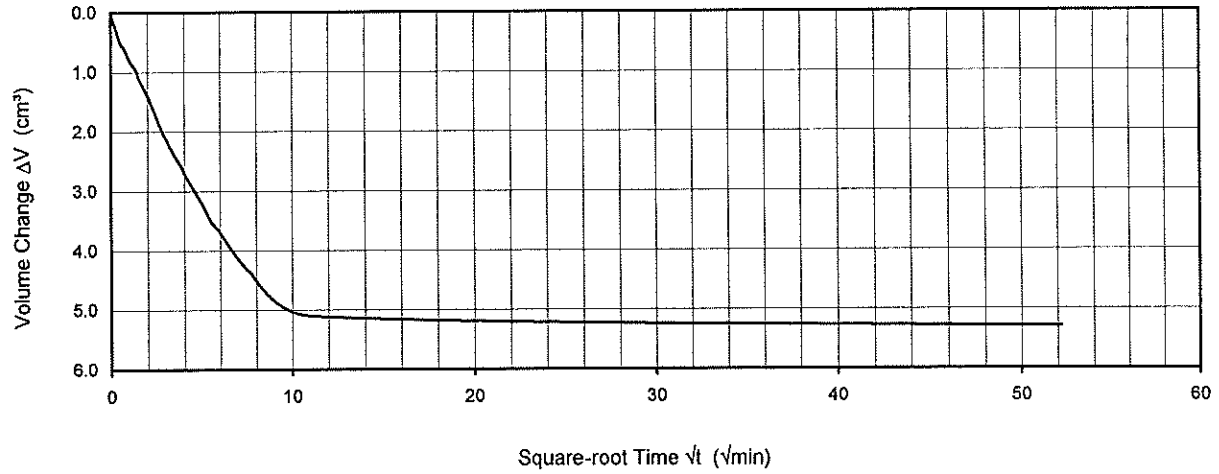
Degree of Consolidation vs. Log Time

t_{50} = 26.50 min ΔV = 5.3 cm^3



Volume Change vs. Square-root Time

t_{100} = 70.56 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

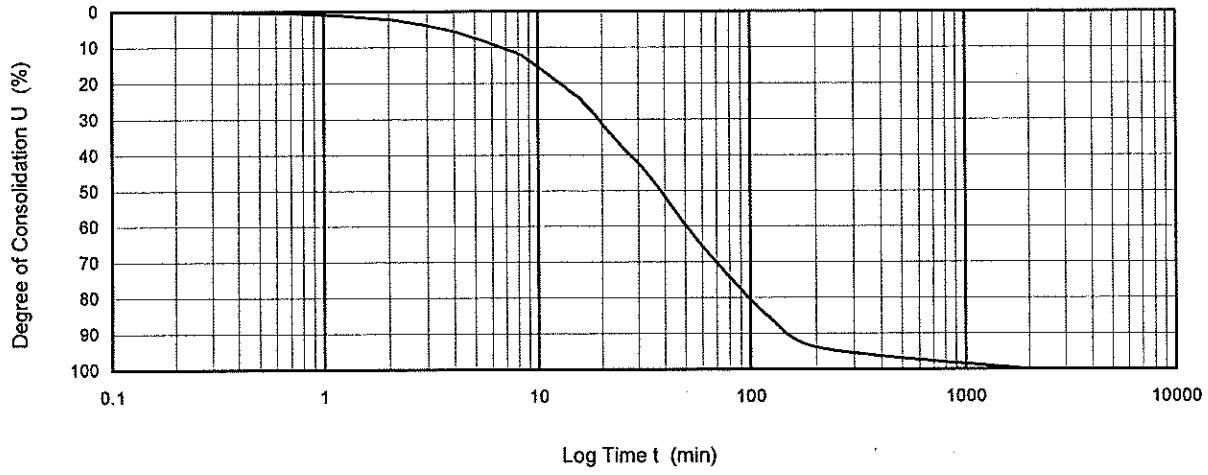
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D265
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	31.00
			To	:	32.00

Laboratory Information

Cell pressure	:	880 kPa	Lab. sample I.D.	:	SL90277/15
Back pressure	:	200 kPa	Specimen ref.	:	A
Effective pressure	:	680 kPa			

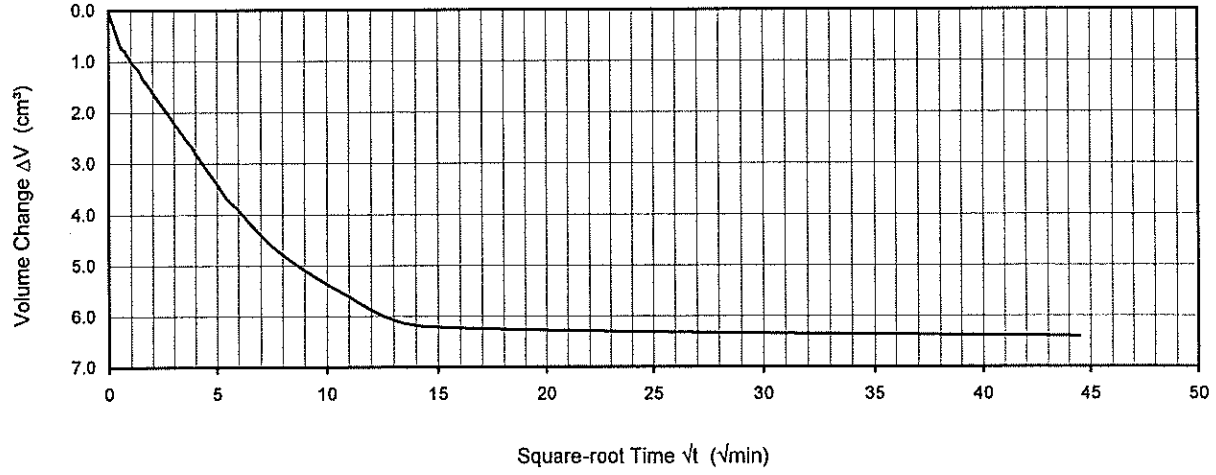
Degree of Consolidation vs. Log Time

t_{50} = 39.00 min ΔV = 6.4 cm³



Volume Change vs. Square-root Time

t_{100} = 100.00 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 31.00
To : 32.00

Laboratory Information

Date shearing commenced : 14/01/2010 Time : 09:00
Date shearing completed : 14/01/2010 Time : 10:48
Proving ring serial No. : 15193
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.770 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.27

Lab. sample I.D. : SL90277/15
Specimen ref. : A
Cell pressure : 370 kPa
Back pressure : 200 kPa
Effective pressure : 170 kPa
Dimensions at starting of compression
Volume V_c : 635.58 cm^3
Area A_c : 4273.7 mm^2
Length L_c : 148.7 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
200.0	0	0.161	166.7	0.0	0.0	0.00	0.00	0.0	170.0	0.0	170.0	0.0	1.00	
226.2	32	0.573	593.2	0.2	0.2	0.51	0.06	99.0	193.3	49.5	176.8	99.0	1.69	
246.5	67	0.747	773.3	0.5	0.5	1.07	0.12	140.1	193.6	70.1	170.2	140.1	2.13	
257.3	90	0.832	861.3	0.6	0.6	1.44	0.16	159.9	192.7	80.0	166.0	159.9	2.42	
266.6	120	0.910	942.0	0.8	0.8	1.92	0.21	177.8	192.3	88.9	162.7	177.8	2.72	
272.9	150	0.978	1012.4	1.0	1.0	2.41	0.26	193.2	193.7	96.6	161.5	193.2	2.99	
277.1	184	1.041	1077.6	1.2	1.2	2.95	0.32	207.3	196.5	103.6	162.0	207.3	3.23	
278.9	210	1.087	1125.3	1.4	1.4	3.37	0.36	217.4	199.8	108.7	163.6	217.4	3.39	
280.1	243	1.139	1179.1	1.6	1.6	3.90	0.41	228.7	204.3	114.4	166.1	228.7	3.54	
280.3	272	1.183	1224.6	1.8	1.8	4.36	0.46	238.2	208.8	119.1	169.1	238.2	3.66	
280.0	302	1.228	1271.2	2.0	2.0	4.77	0.51	247.9	214.0	124.0	172.6	247.9	3.75	
279.2	330	1.262	1306.4	2.2	2.2	4.77	0.55	255.5	218.5	127.7	176.0	255.5	3.81	
278.0	360	1.299	1344.7	2.4	2.4	4.77	0.60	263.6	223.8	131.8	179.9	263.6	3.87	
276.4	393	1.377	1425.5	2.6	2.6	4.77	0.65	281.3	234.3	140.7	187.4	281.3	4.01	«
275.0	420	1.387	1435.8	2.8	2.8	4.77	0.69	283.1	236.6	141.6	189.4	283.1	3.98	

Final volume (cm^3): 635.58 Final length (mm): 144.5 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 31.00
To : 32.00

Laboratory Information

Date shearing commenced : 16/01/2010 Time : 09:00
Date shearing completed : 16/01/2010 Time : 11:00
Proving ring serial No. : 12376
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 4.770 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.19

Lab. sample I.D. : SL90277/15
Specimen ref. : A
Cell pressure : 540 kPa
Back pressure : 200 kPa
Effective pressure : 340 kPa

Dimensions at starting of compression

Volume V_c : 630.28 cm^3
Area A_c : 4373.4 mm^2
Length L_c : 144.1 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
200.0	0	27	171.8	0.0	3.1	4.77	0.75	0.0	340.0	0.0	340.0	0.0	1.00	
233.3	34	201	1267.8	0.2	3.3	4.77	0.80	244.4	428.9	122.2	388.2	244.4	1.80	
261.9	62	259	1618.8	0.4	3.5	4.77	0.84	323.8	440.0	161.9	386.0	323.8	2.16	
284.1	90	300	1866.9	0.6	3.7	4.77	0.88	379.5	445.7	189.8	382.4	379.5	2.48	
303.1	123	336	2079.6	0.9	3.9	4.77	0.93	426.8	450.3	213.4	379.2	426.8	2.80	
315.0	157	363	2246.8	1.1	4.2	4.77	0.98	463.5	456.8	231.8	379.5	463.5	3.06	
320.4	180	378	2339.6	1.2	4.3	4.77	1.01	483.7	461.4	241.8	380.8	483.7	3.20	
325.0	210	394	2438.6	1.5	4.6	4.77	1.06	504.9	467.5	252.5	383.3	504.9	3.35	
327.4	244	408	2525.3	1.7	4.8	4.77	1.10	523.1	474.2	261.6	387.0	523.1	3.46	
328.0	270	417	2581.0	1.9	5.0	4.77	1.14	534.6	479.3	267.3	390.2	534.6	3.52	
327.7	300	424	2624.3	2.1	5.2	4.77	1.18	543.1	483.9	271.6	393.3	543.1	3.56	
326.5	335	436	2698.6	2.3	5.4	4.77	1.23	558.3	492.7	279.2	399.6	558.3	3.62	
324.6	369	447	2766.7	2.6	5.7	4.77	1.27	572.1	501.4	286.0	406.1	572.1	3.66	
323.0	392	457	2828.6	2.7	5.8	4.77	1.30	584.9	509.4	292.4	412.0	584.9	3.70	
321.0	423	463	2865.7	2.9	6.0	4.77	1.34	591.8	514.9	295.9	416.3	591.8	3.70	
319.0	451	470	2909.0	3.1	6.2	4.77	1.38	600.1	521.1	300.1	421.0	600.1	3.72	
316.6	480	478	2958.5	3.3	6.4	4.77	1.41	609.8	528.3	304.9	426.7	609.8	3.73	«
314.4	510	483	2989.5	3.5	6.6	4.77	1.45	615.2	533.2	307.6	430.7	615.2	3.73	

Final volume (cm^3): 630.28 Final length (mm): 139.0 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	912/SIL/D265
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	31.00
			To	:	32.00

Laboratory Information

Date shearing commenced	:	18/01/2010	Time : 09:00	Lab. sample I.D.	:	SL90277/15	
Date shearing completed	:	18/01/2010	Time : 14:26	Specimen ref.	:	A	
Proving ring serial No.	:	12376		Cell pressure	:	880	kPa
Type of membrane	:	rubber		Back pressure	:	200	kPa
Corrections				Effective pressure	:	680	kPa
*Side drain, σ_{dr}	:	4.770	kPa/%	Dimensions at starting of compression			
Membrane thickness, σ_{mb}	:	0.66	mm	Volume V_c	:	623.88	cm^3
Rate of axial displacement	:	0.050	mm/min	Area A_c	:	4503.1	mm^2
Pore pressure coefficient, A_f	:	0.16		Length L_c	:	138.5	mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
200.0	0	50	318.2	0.0	6.8	4.77	1.49	0.0	680.0	0.0	680.0	0.0	1.00	
227.9	30	365	2259.1	0.2	7.1	4.77	1.53	423.8	864.0	211.9	793.4	423.8	1.65	
261.9	60	484	2995.7	0.4	7.3	4.77	1.57	585.7	910.9	292.8	813.3	585.7	1.95	
296.0	90	578	3577.5	0.6	7.5	4.77	1.60	712.7	940.4	356.4	821.6	712.7	2.22	
325.8	120	653	4041.7	0.9	7.7	4.77	1.64	813.3	960.8	406.6	825.3	813.3	2.47	
352.6	152	714	4419.2	1.1	7.9	4.77	1.68	894.3	974.5	447.1	825.5	894.3	2.70	
369.9	181	756	4679.2	1.3	8.1	4.77	1.71	949.3	984.8	474.7	826.5	949.3	2.86	
383.3	210	790	4889.6	1.5	8.4	4.77	1.75	993.3	993.3	496.6	827.8	993.3	3.00	
394.1	241	818	5062.9	1.7	8.6	4.77	1.79	1028.8	1000.3	514.4	828.8	1028.8	3.12	
400.7	270	839	5192.9	1.9	8.8	4.77	1.82	1054.8	1006.7	527.4	830.9	1054.8	3.20	
404.5	301	857	5304.3	2.2	9.0	4.77	1.86	1076.6	1013.8	538.3	834.4	1076.6	3.26	
407.4	330	872	5397.2	2.4	9.2	4.77	1.89	1094.4	1019.8	547.2	837.4	1094.4	3.32	
408.5	360	884	5471.4	2.6	9.4	4.77	1.92	1107.9	1025.5	554.0	840.8	1107.9	3.35	
407.8	393	896	5545.7	2.8	9.7	4.77	1.96	1121.2	1032.8	560.6	845.9	1121.2	3.37	
407.6	421	905	5601.4	3.0	9.9	4.77	1.99	1130.8	1037.8	565.4	849.3	1130.8	3.39	
406.1	455	916	5669.5	3.3	10.1	4.77	2.03	1142.5	1045.2	571.3	854.7	1142.5	3.41	
403.8	482	924	5719.0	3.5	10.3	4.77	2.06	1150.8	1051.6	575.4	859.8	1150.8	3.42	
402.7	510	932	5768.5	3.7	10.5	4.77	2.09	1158.9	1056.8	579.5	863.6	1158.9	3.43	
400.4	543	939	5811.8	3.9	10.8	4.77	2.12	1165.3	1062.2	582.6	868.0	1165.3	3.43	
398.0	570	944	5842.8	4.1	11.0	4.77	2.15	1169.4	1066.7	584.7	871.8	1169.4	3.43	
395.9	601	949	5873.7	4.3	11.2	4.77	2.18	1173.2	1070.7	586.6	875.2	1173.2	3.42	
393.4	632	954	5904.7	4.6	11.4	4.77	2.22	1177.0	1075.1	588.5	878.9	1177.0	3.42	
389.8	669	958	5929.4	4.8	11.7	4.77	2.25	1178.9	1079.6	589.4	883.2	1178.9	3.40	
388.7	690	961	5948.0	5.0	11.8	4.77	2.28	1180.9	1081.7	590.4	884.9	1180.9	3.40	
386.0	722	964	5966.6	5.2	12.1	4.77	2.31	1181.9	1084.9	590.9	888.0	1181.9	3.39	
384.3	752	967	5985.1	5.4	12.3	4.77	2.34	1183.0	1087.2	591.5	890.0	1183.0	3.39	«
382.1	785	969	5997.5	5.7	12.5	4.77	2.37	1182.6	1089.2	591.3	892.1	1182.6	3.38	
380.6	813	971	6009.9	5.9	12.7	4.77	2.40	1182.6	1090.7	591.3	893.6	1182.6	3.37	
377.4	840	973	6022.3	6.1	12.9	4.77	2.43	1182.7	1094.0	591.4	896.8	1182.7	3.35	
374.3	876	974	6028.5	6.3	13.2	4.77	2.46	1180.7	1096.0	590.3	899.3	1180.7	3.33	
371.5	901	972	6016.1	6.5	13.3	4.77	2.49	1175.8	1096.4	587.9	900.4	1175.8	3.31	
366.4	952	970	6003.7	6.9	13.7	4.77	2.54	1168.5	1097.9	584.3	903.1	1168.5	3.28	
361.2	1006	969	5997.5	7.3	14.1	4.77	2.59	1162.3	1099.9	581.1	906.2	1162.3	3.24	
356.4	1053	968	5991.3	7.6	14.4	4.77	2.63	1156.7	1101.9	578.3	909.2	1156.7	3.21	

Final volume (cm^3): 623.88 Final length (mm): 124.0 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth(m) From : 31.00
To : 32.00

Laboratory Information

Lab. sample I.D. : SL90277/15
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
351.6	1100	966	5979.0	7.9	14.8	4.77	2.68	1149.8	1103.3	574.9	911.7	1149.8	3.18
347.6	1155	964	5966.6	8.3	15.2	4.77	2.73	1142.3	1103.5	571.1	913.2	1142.3	3.15
343.4	1202	962	5954.2	8.7	15.5	4.77	2.77	1135.5	1104.3	567.7	915.1	1135.5	3.12
339.5	1254	960	5941.8	9.1	15.9	4.77	2.82	1128.2	1104.6	564.1	916.6	1128.2	3.09
334.3	1303	958	5929.4	9.4	16.2	4.77	2.86	1121.3	1106.3	560.6	919.5	1121.3	3.05
329.6	1351	955	5910.9	9.8	16.6	4.77	2.91	1113.2	1107.0	556.6	921.5	1113.2	3.02
325.4	1402	953	5898.5	10.1	17.0	4.77	2.96	1106.1	1107.6	553.0	923.3	1106.1	2.99
321.6	1451	951	5886.1	10.5	17.3	4.77	3.00	1099.2	1108.0	549.6	924.8	1099.2	2.97

Final volume (cm^3): 623.88 Final length (mm): 124.0 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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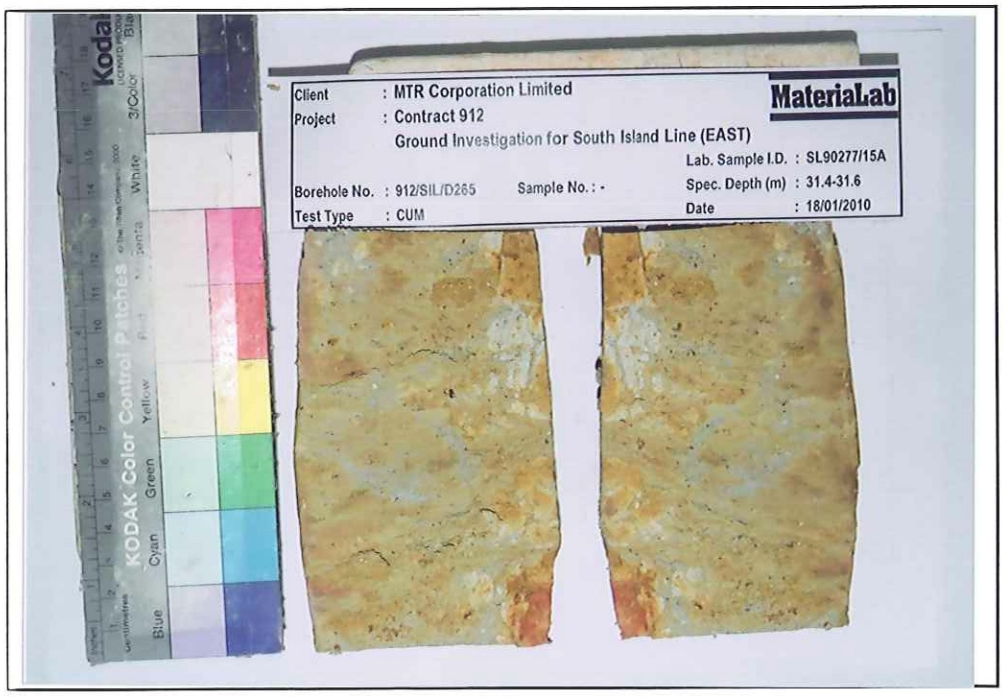
Photographic Records for Triaxial Test



REPORT ON SOIL AND ROCK TESTS

CLIENT : MTR Corporation Limited

PROJECT : Contract No.912-Ground Investigation
for South Island Line East

SIL REPORT NO. : VOLUME 1 - PART 4 OF 4

MTR SCHEDULE NOS. : C902-1, C902-3, C903-1, C903-2,
C903-3

MTR CORPORATION LIMITED

CONTRACT NO. 912- GROUND INVESTIGATION FOR SOUTH ISLAND LINE EAST

LABORATORY TEST REPORT SUMMARY CONTENTS LIST

VOLUME NUMBER	REPORTED SCHEDULES	PART NOS.	CONTENTS	REMARKS
VOLUME 1	C902-1	1 OF 4	Soil Summary Tables, Classification Tests, Chemical Tests	Results from 5 Nos. schedules collated in one report presented in Drillhole/ trial pit order
	C902-3	2 OF 4	Triaxial Tests	
	C903-1	3 OF 4	Triaxial Tests	
	C903-2	4 OF 4	Consolidation Tests and Rock Tests	
	C903-3			
VOLUME 2	C903-4	1 OF 1	Soil Summary Tables, Classification Tests, Chemical Tests,Triaxial Test & Rock Test Results	Results from 1 No. schedule collated in one report presented
VOLUME 3	C902-5	1 OF 2	Soil Summary Tables, Classification Tests, Chemical Tests, Triaxial Tests and Consolidation Tests	Results from 2 Nos. schedule collated in one report presented in Drillhole/ trial pit order
	C902-6	2 OF 2	Rock Test Results	
VOLUME 4	C902-7	1 OF 3	Soil Summary Tables, Classification Tests, Chemical Tests	Results from 2 No. schedules collated in one report presented in Drillhole/ trial pit order
	C904-1	2 OF 3	Compaction Test Results and Triaxial Test & Rock Test Results	
		3 OF 3	Rock Test Results	

PROJECT : CONTRACT NO.912 - GROUND INVESTIGATION FOR SOUTH ISLAND LINE EAST

CLIENT : MTR CORPORATION LIMITED

SOIL AND ROCK LABORATORY TEST REPORT

VOLUME 1

CONTENTS

PART 1	APPENDIX A.	Summary of Soil and Rock Test Results
	APPENDIX B.	Moisture Content
	APPENDIX C.	Bulk Density
	APPENDIX D.	Particle Density
	APPENDIX E.	Liquid and Plastic Limits
	APPENDIX F.	Particle Size Distribution
	APPENDIX G.	Compaction Tests
	APPENDIX H.	Chemical Tests
PART 2	APPENDIX I.	1 Triaxial Compression tests (Drillhole 912/SIL/D222 to D230)
PART 3	APPENDIX I.	2 Triaxial Compression tests (Drillhole 912/SIL/D231 to D265)
PART 4	APPENDIX I.	3 Triaxial Compression tests (Drillhole 912/SIL/D272(P) to D275(P))
	APPENDIX J.	One Dimensional Consolidation Test
	APPENDIX K.	Porosity / Density Determination of Rock Speciment Using Saturation and Buoyancy Techniques
	APPENDIX L.	Point Load Test
	APPENDIX M.	Unconfined Compressive Strength of Rock Core
	APPENDIX N.	Determination of the Elastic Moduli of Rock Core
	APPENDIX O.	Direct Shear Test
	APPENDIX P.	Dimensional and Shape Tolerances for UCS Test on Rock Core

APPENDIX I.3 TRIAXIAL COMPRESSION TEST (DRILLHOLE 912/SIL/D272(P) TO D275(P))

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 4
Borehole No. : D272(P)
Depth(m) From : 1.50
To : 2.50
Sample origin : CDG
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 14-01-2010
Date test(s) completed : 20-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : S.W. Leung Designation : Technical Assistant
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 24.0 °C Minimum : 17.5 °C
Visual description : Moist, orangish brown spotted with white, slightly silty/clayey, gravelly SAND.

Lab. sample I.D. : SL90276/1
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 2.30
To : 2.50
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	20			40			60	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.5	74.4	75.1	74.9	75.6		75.4	79.1
Length	mm	150.0	149.8	147.1	146.8	144.4		144.1	131.0
Volume	cm³	653.87	650.97	650.97	647.27	647.27		643.97	643.97
Wet mass	g	1323.0	1346.4	1346.4	1342.7	1342.7		1339.4	1339.4
Dry mass	g	1117.1	1117.1	1117.1	1117.1	1117.1		1117.1	1117.1
Moisture content	%	18.4	20.5	20.5	20.2	20.2		19.9	19.9
Bulk density	Mg/m³	2.02	2.07	2.07	2.07	2.07		2.08	2.08
Dry density	Mg/m³	1.71	1.72	1.72	1.73	1.73		1.73	1.73
Void ratio		0.55	0.54	0.54	0.54	0.54		0.53	0.53
Degree of saturation	%	88.6	99.9	99.9	99.9	99.9		99.9	99.9
Saturation Stage									
**Volume change of water	cm³	26.3							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	260.0			272.0			281.4	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	2.9			3.7			3.3	
m_{vi}	m²/MN	0.30			0.21			0.14	
t_{50}	min	3.90			2.80			2.15	
c_{vi} (from t_{50})	m²/yr	1152.14			1542.21			1935.79	
t_{100}	min	12.25			10.24			7.84	
c_{vi} (from t_{100})	m²/yr	736.56			894.28			1183.35	
Sketch of failed specimen (Failure Mode)								Plastic	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by :

~~Paul Richard Cooper (Operations Manager - CMT)~~ /
Lai Mei Ting (Assistant Manager - Soil)

Date : 03 FEB 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

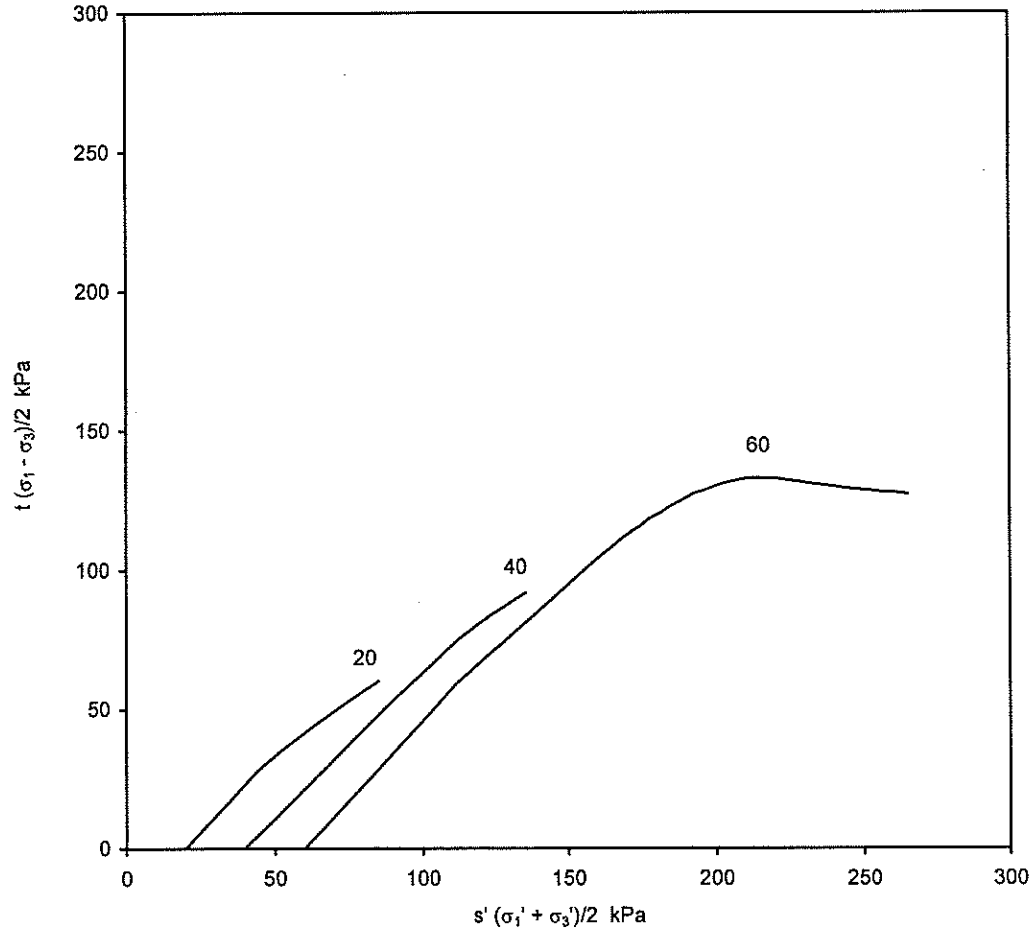
Client sample No. : 4
Borehole No. : D272(P)
Depth(m) From : 1.50
To : 2.50

Laboratory Information

Lab. sample I.D. : SL90276/1
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	20	1.6	1.6	241.6	113.9	80.4	57.0
2	40	1.4	3.4	242.4	179.2	132.2	89.6
3	60	4.2	7.9	223.4	265.8	214.5	132.9



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HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

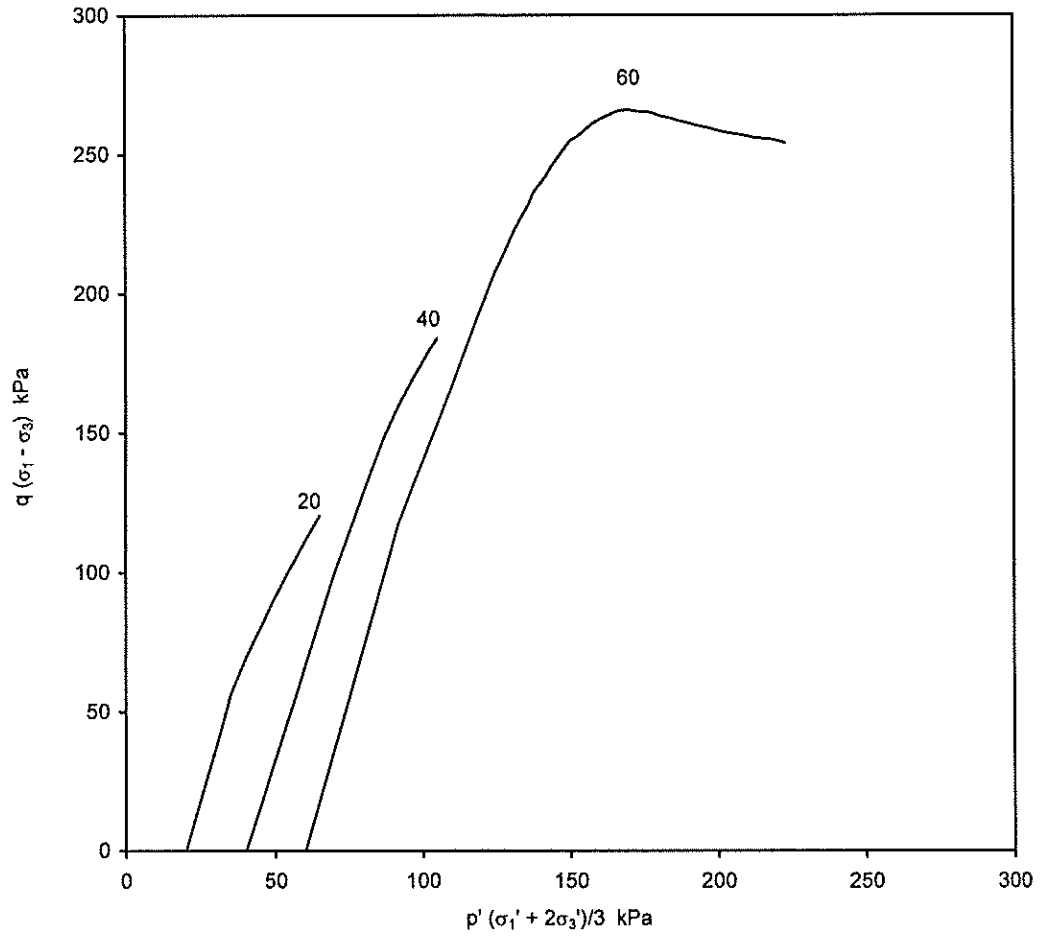
Client sample No. : 4
Borehole No. : D272(P)
Depth(m) From : 1.50
To : 2.50

Laboratory Information

Lab. sample I.D. : SL90276/1
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	20	1.6	1.6	241.6	113.9	61.4	113.9
2	40	1.4	3.4	242.4	179.2	102.3	179.2
3	60	4.2	7.9	223.4	265.8	170.2	265.8



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HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

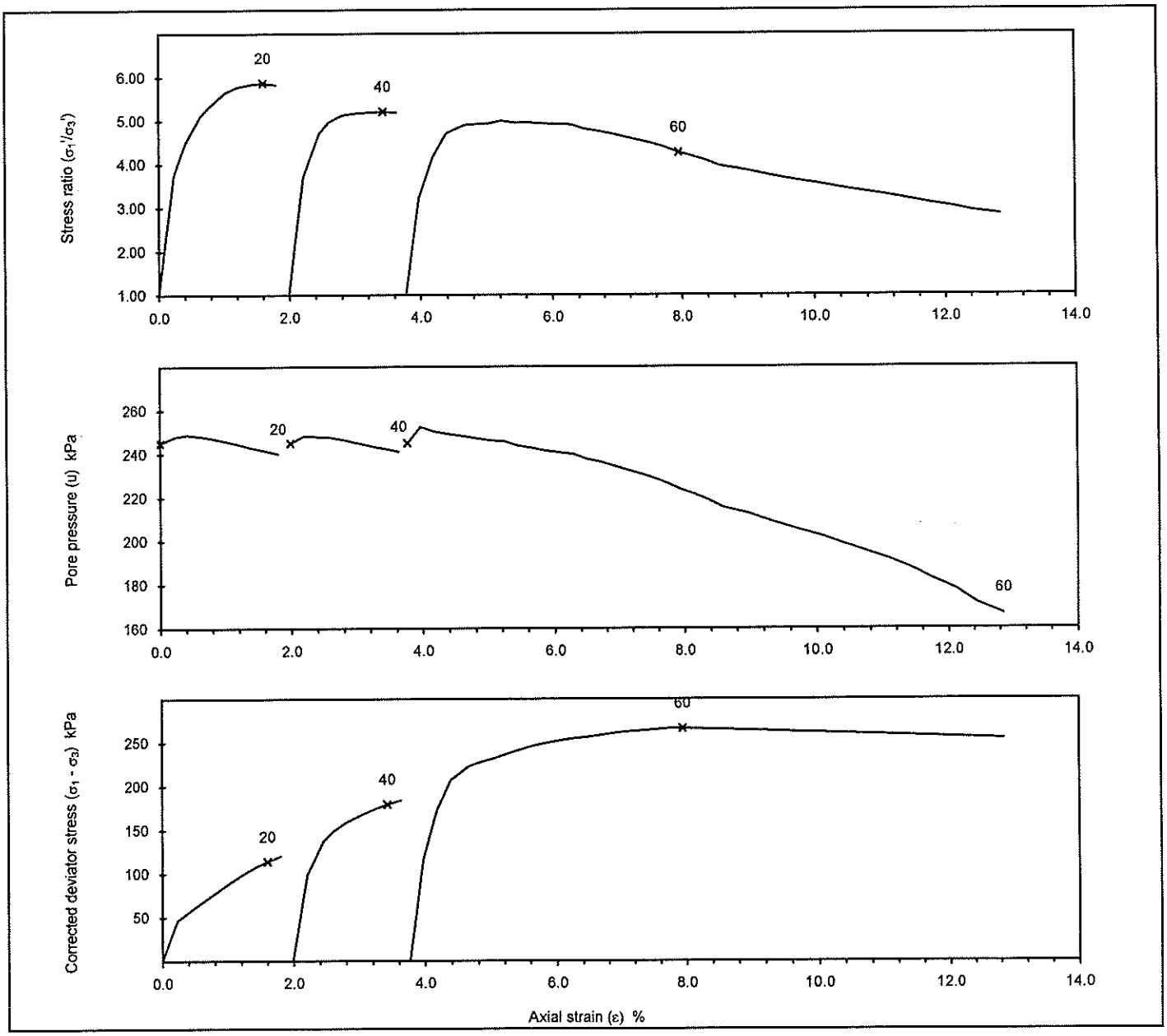
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 4
Borehole No. : D272(P)
Depth(m) From : 1.50
To : 2.50

Laboratory Information

Lab. sample I.D. : SL90276/1
Specimen ref. : A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 4
Borehole No. : D272(P)
Depth(m) From : 1.50
To : 2.50

Laboratory Information

Lab. sample I.D. : SL90276/1
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	20
	Stage 2	kPa	40
	Stage 3	kPa	60

Applied pressure	Cell pressure kPa	Back pressure kPa
	20	15
	40	35
	60	55
	80	75
	100	95
	120	115
	140	135
	160	155
	180	175
	200	195
	220	215
	240	235
	250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		0.99
Volume change	cm^3	26.3

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1336.7
Final moisture content	%	19.7
Final bulk density	Mg/m^3	2.08

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

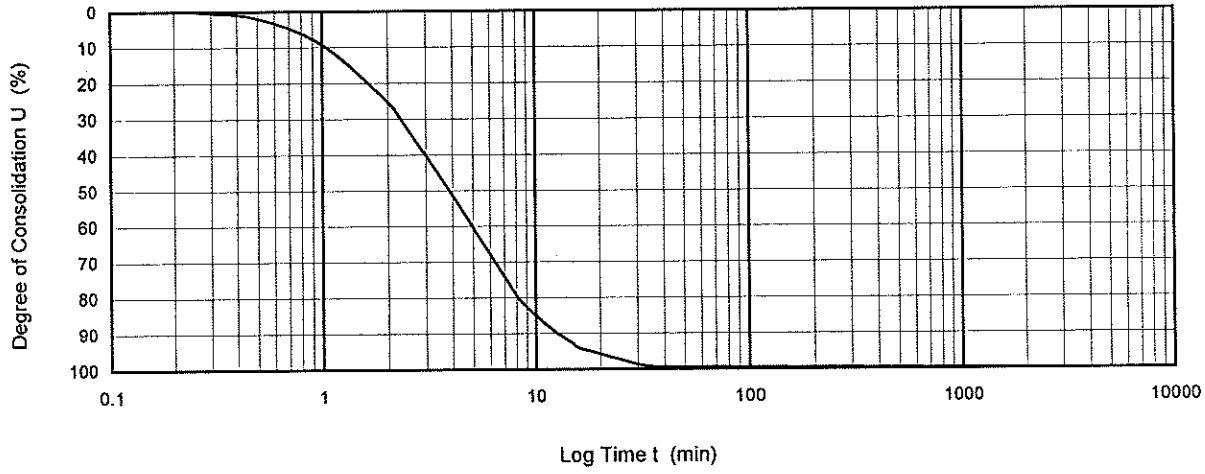
Client	:	MTR Corporation Limited	Client sample No.	:	4
Project	:	Contract 912	Borehole No.	:	D272(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	1.50
			To	:	2.50

Laboratory Information

Cell pressure	:	265 kPa	Lab. sample I.D.	:	SL90276/1
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	20 kPa			

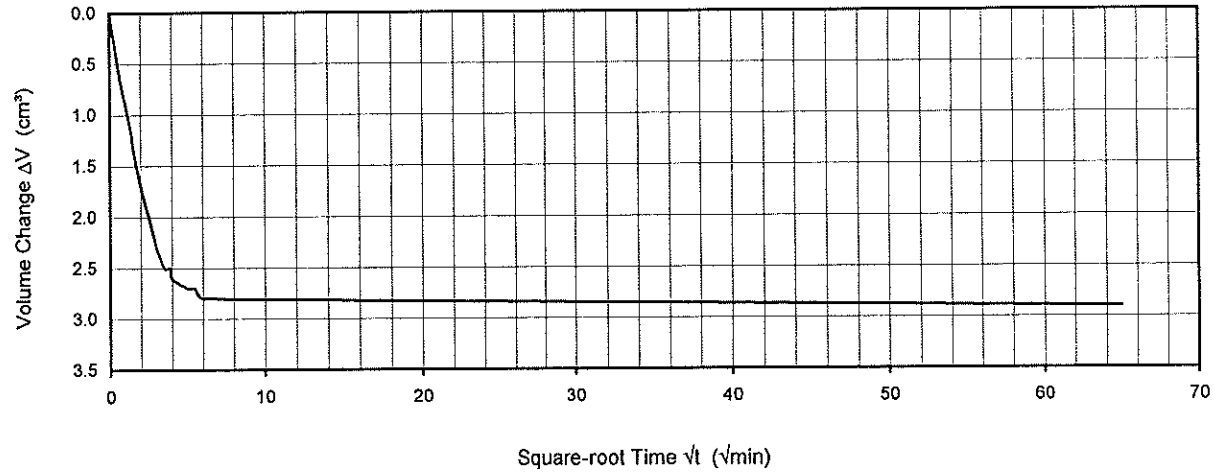
Degree of Consolidation vs. Log Time

t_{50} = 3.90 min ΔV = 2.9 cm^3



Volume Change vs. Square-root Time

t_{100} = 12.25 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

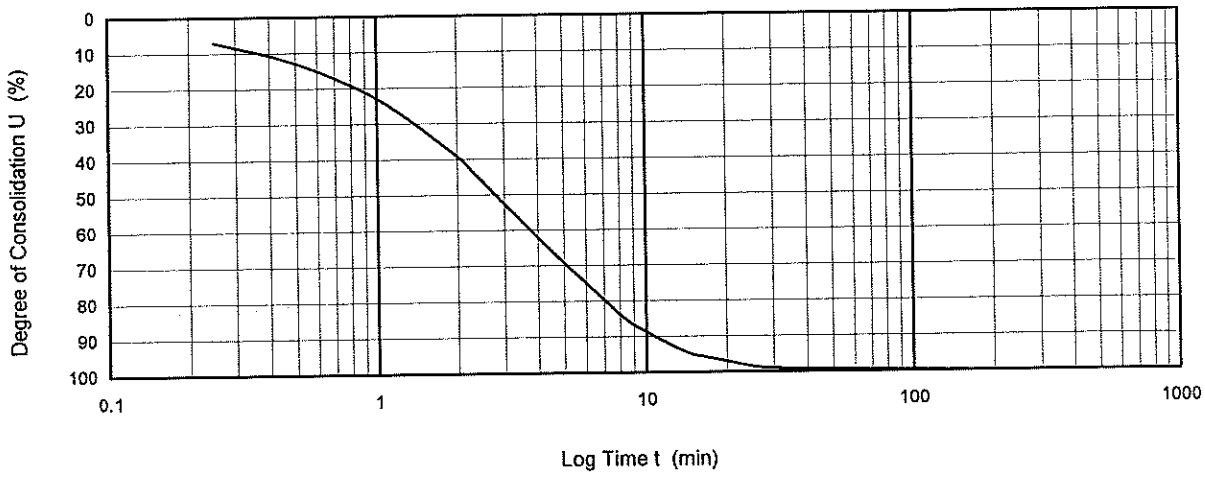
Client	:	MTR Corporation Limited	Client sample No.	: 4
Project	:	Contract 912	Borehole No.	: D272(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	: 1.50
			To	: 2.50

Laboratory Information

Cell pressure	:	285 kPa	Lab. sample I.D.	: SL90276/1
Back pressure	:	245 kPa	Specimen ref.	: A
Effective pressure	:	40 kPa		

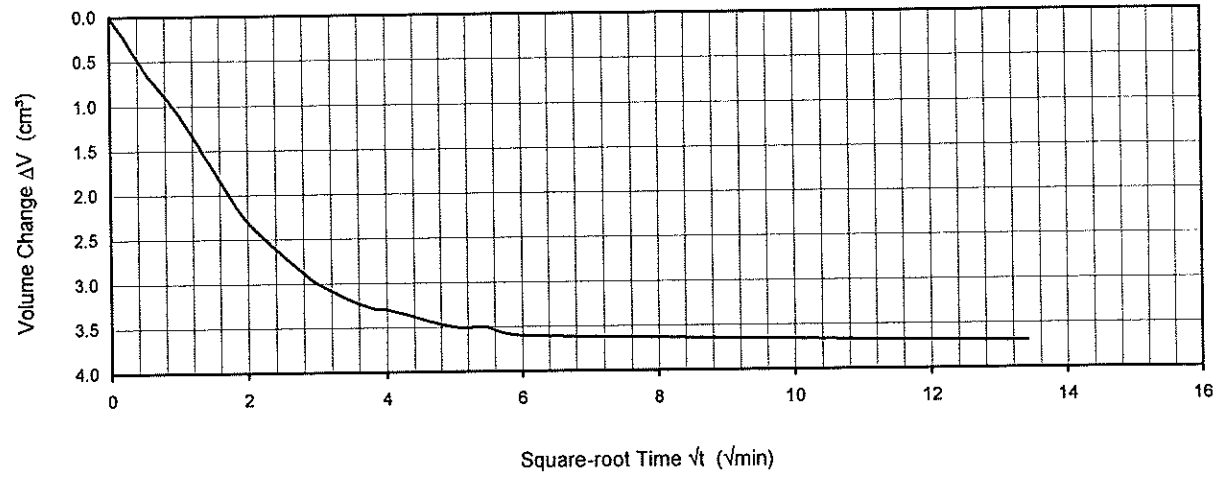
Degree of Consolidation vs. Log Time

t_{50} = 2.80 min ΔV = 3.7 cm³



Volume Change vs. Square-root Time

t_{100} = 10.24 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

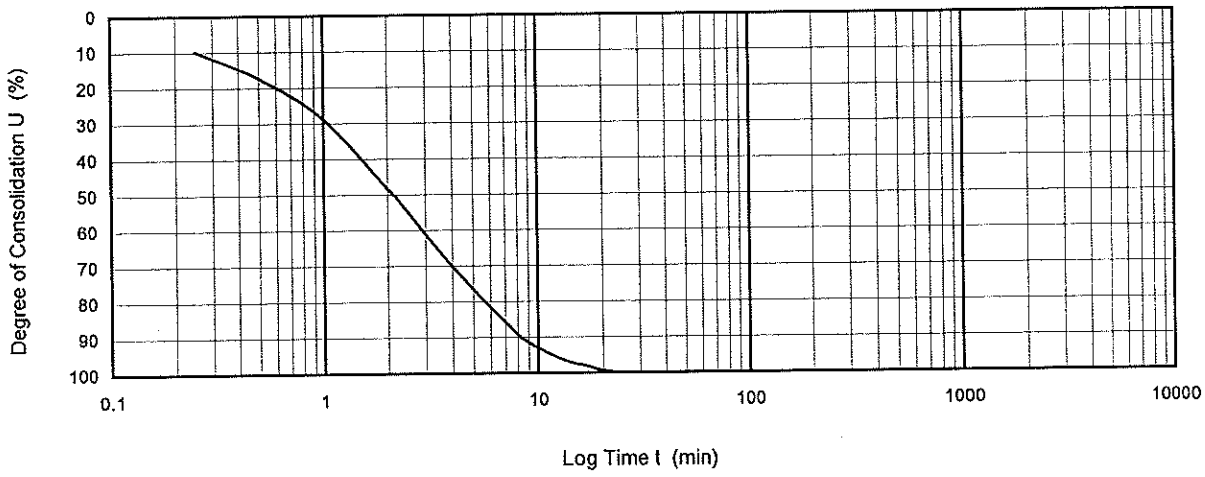
Client	:	MTR Corporation Limited	Client sample No.	:	4
Project	:	Contract 912	Borehole No.	:	D272(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	1.50
			To	:	2.50

Laboratory Information

Cell pressure	:	305 kPa	Lab. sample I.D.	:	SL90276/1
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	60 kPa			

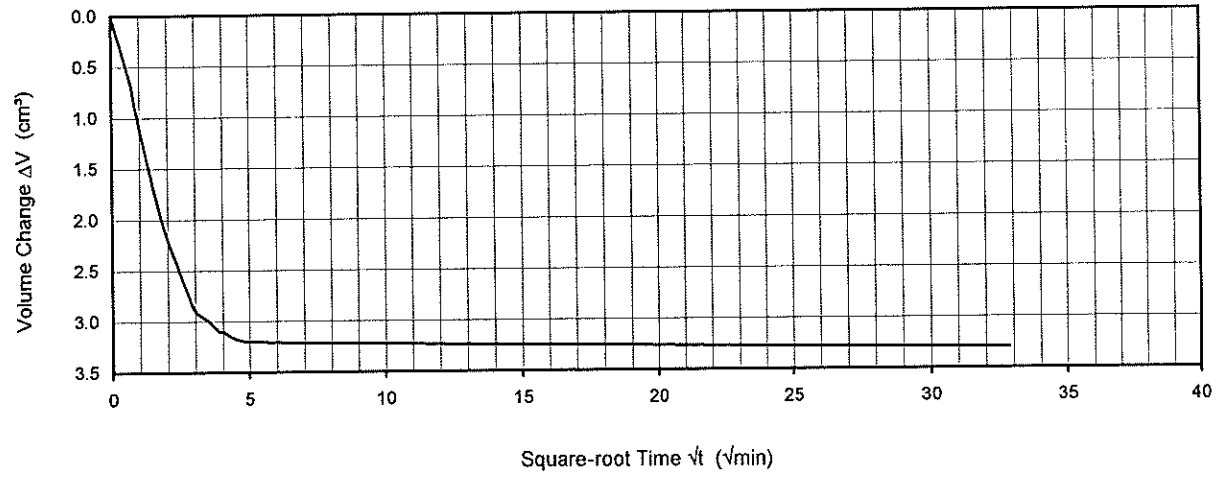
Degree of Consolidation vs. Log Time

t_{50} = 2.15 min ΔV = 3.3 cm^3



Volume Change vs. Square-root Time

t_{100} = 7.84 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	4
Project	:	Contract 912	Borehole No.	:	D272(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	1.50
			To	:	2.50

Laboratory Information

Date shearing commenced	:	18/01/2010	Time :	09:00				
Date shearing completed	:	18/01/2010	Time :	10:00	Lab. sample I.D.	:	SL90276/1	
Proving ring serial No.	:	6323			Specimen ref.	:	A	
Type of membrane	:	rubber			Cell pressure	:	265	kPa
Corrections					Back pressure	:	245	kPa
*Side drain, σ_{dr}	:	0.000	kPa/%		Effective pressure	:	20	kPa
Membrane thickness, σ_{mb}	:	0.63	mm		Dimensions at starting of compression			
Rate of axial displacement	:	0.050	mm/min		Volume V_c	:	650.97	cm^3
Pore pressure coefficient, A_f	:	-0.03			Area A_c	:	4346.3	mm^2
					Length L_c	:	149.8	mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.068	110.4	0.0	0.0	0.00	0.00	0.0	20.0	0.0	20.0	0.0	1.00	
248.0	34	0.193	313.3	0.2	0.2	0.00	0.06	46.5	40.3	23.3	32.5	46.5	3.74	
248.8	61	0.220	357.1	0.4	0.4	0.00	0.10	56.4	44.4	28.2	35.0	56.4	4.48	
248.1	96	0.256	415.6	0.6	0.6	0.00	0.16	69.6	51.7	34.8	40.1	69.6	5.12	
247.2	120	0.278	451.3	0.8	0.8	0.00	0.20	77.6	56.6	38.8	43.7	77.6	5.36	
245.8	152	0.310	503.2	1.0	1.0	0.00	0.25	89.2	63.8	44.6	48.9	89.2	5.65	
244.3	182	0.337	547.1	1.2	1.2	0.00	0.30	99.0	70.2	49.5	53.7	99.0	5.78	
242.8	212	0.361	586.0	1.4	1.4	0.00	0.34	107.5	76.0	53.8	58.0	107.5	5.84	
241.6	240	0.379	615.3	1.6	1.6	0.00	0.39	113.9	80.4	57.0	61.4	113.9	5.87	«
240.1	270	0.397	644.5	1.8	1.8	0.00	0.43	120.2	85.0	60.1	65.0	120.2	5.83	

Final volume (cm^3): 650.97 Final length (mm): 147.1 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	4
Project	:	Contract 912	Borehole No.	:	D272(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	1.50
			To	:	2.50

Laboratory Information

Date shearing commenced	:	18/01/2010	Time :	13:30	Lab. sample I.D.	:	SL90276/1
Date shearing completed	:	18/01/2010	Time :	14:28	Specimen ref.	:	A
Proving ring serial No.	:	6323			Cell pressure	:	285 kPa
Type of membrane	:	rubber			Back pressure	:	245 kPa
Corrections					Effective pressure	:	40 kPa
*Side drain, σ_{dr}	:	0.000 kPa/%			Dimensions at starting of compression		
Membrane thickness, σ_{mb}	:	0.63 mm			Volume V_c	:	647.27 cm^3
Rate of axial displacement	:	0.050 mm/min			Area A_c	:	4409.3 mm^2
Pore pressure coefficient, A_f	:	-0.01			Length L_c	:	146.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.073	118.5	0.0	2.0	0.00	0.47	0.0	40.0	0.0	40.0	0.0	1.00	
248.3	32	0.345	560.1	0.2	2.2	0.00	0.52	99.4	86.4	49.7	69.8	99.4	3.71	
247.9	68	0.449	728.9	0.5	2.5	0.00	0.58	137.2	105.7	68.6	82.8	137.2	4.70	
247.6	90	0.480	779.2	0.6	2.6	0.00	0.61	148.3	111.6	74.2	86.8	148.3	4.97	
246.4	121	0.511	829.5	0.8	2.8	0.00	0.65	159.3	118.2	79.6	91.7	159.3	5.13	
244.7	157	0.537	871.8	1.1	3.1	0.00	0.71	168.3	124.4	84.1	96.4	168.3	5.18	
243.3	188	0.556	902.6	1.3	3.3	0.00	0.75	174.8	129.1	87.4	100.0	174.8	5.19	
242.4	211	0.569	923.7	1.4	3.4	0.00	0.78	179.2	132.2	89.6	102.3	179.2	5.21	«
241.1	242	0.583	946.4	1.6	3.6	0.00	0.83	183.8	135.8	91.9	105.2	183.8	5.19	

Final volume (cm^3): 647.27 Final length (mm): 144.4 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 4
Borehole No. : D272(P)
Depth(m) From : 1.50
To : 2.50

Laboratory Information

Date shearing commenced : 19/01/2010 Time : 09:00
Date shearing completed : 19/01/2010 Time : 13:37
Proving ring serial No. : 6323
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.63 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.08

Lab. sample I.D. : SL90276/1
Specimen ref. : A
Cell pressure : 305 kPa
Back pressure : 245 kPa
Effective pressure : 60 kPa
Dimensions at starting of compression
Volume V_c : 643.97 cm^3
Area A_c : 4467.9 mm^2
Length L_c : 144.1 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.080	129.9	0.0	3.8	0.00	0.85	0.0	60.0	0.0	60.0	0.0	1.00	
252.3	30	0.406	659.1	0.2	4.0	0.00	0.90	117.3	111.4	58.7	91.8	117.3	3.23	
250.1	60	0.563	914.0	0.4	4.2	0.00	0.94	173.8	141.8	86.9	112.8	173.8	4.17	
249.1	90	0.656	1064.9	0.6	4.4	0.00	0.98	207.0	159.4	103.5	124.9	207.0	4.70	
247.8	129	0.701	1138.0	0.9	4.7	0.00	1.03	222.6	168.5	111.3	131.4	222.6	4.89	
247.0	153	0.715	1160.7	1.1	4.8	0.00	1.06	227.2	171.6	113.6	133.7	227.2	4.92	
246.1	182	0.728	1181.8	1.3	5.0	0.00	1.10	231.4	174.6	115.7	136.0	231.4	4.93	
245.8	210	0.743	1206.2	1.5	5.2	0.00	1.14	236.2	177.3	118.1	137.9	236.2	4.99	
243.8	241	0.759	1232.1	1.7	5.4	0.00	1.18	241.4	181.9	120.7	141.7	241.4	4.94	
242.8	270	0.773	1254.9	1.9	5.6	0.00	1.21	245.9	185.1	122.9	144.2	245.9	4.95	
241.5	300	0.784	1272.7	2.1	5.9	0.00	1.25	249.2	188.1	124.6	146.6	249.2	4.92	
240.5	334	0.795	1290.6	2.3	6.1	0.00	1.29	252.5	190.7	126.2	148.7	252.5	4.91	
239.7	363	0.803	1303.6	2.5	6.3	0.00	1.33	254.8	192.7	127.4	150.2	254.8	4.90	
237.6	391	0.809	1313.3	2.7	6.5	0.00	1.36	256.3	195.6	128.2	152.8	256.3	4.80	
236.2	423	0.816	1324.7	2.9	6.7	0.00	1.40	258.2	197.9	129.1	154.9	258.2	4.75	
234.3	453	0.825	1339.3	3.1	6.9	0.00	1.44	260.7	201.1	130.4	157.6	260.7	4.69	
232.5	481	0.831	1349.0	3.3	7.1	0.00	1.47	262.3	203.6	131.1	159.9	262.3	4.62	
230.6	514	0.836	1357.1	3.6	7.3	0.00	1.51	263.4	206.1	131.7	162.2	263.4	4.54	
228.7	543	0.841	1365.3	3.8	7.5	0.00	1.54	264.5	208.6	132.3	164.5	264.5	4.47	
226.4	571	0.846	1373.4	4.0	7.7	0.00	1.57	265.7	211.5	132.9	167.2	265.7	4.38	
223.4	602	0.848	1376.6	4.2	7.9	0.00	1.61	265.8	214.5	132.9	170.2	265.8	4.26	«
221.4	631	0.849	1378.2	4.4	8.1	0.00	1.64	265.5	216.4	132.8	172.1	265.5	4.18	
218.6	663	0.850	1379.9	4.6	8.4	0.00	1.67	265.2	219.0	132.6	174.8	265.2	4.07	
215.3	694	0.851	1381.5	4.8	8.6	0.00	1.71	264.9	222.2	132.5	178.0	264.9	3.95	
212.4	750	0.851	1381.5	5.2	9.0	0.00	1.77	263.8	224.5	131.9	180.5	263.8	3.85	
208.7	801	0.852	1383.1	5.6	9.3	0.00	1.82	263.1	227.8	131.5	184.0	263.1	3.73	
205.2	856	0.852	1383.1	5.9	9.7	0.00	1.88	262.0	230.8	131.0	187.1	262.0	3.62	
202.3	904	0.853	1384.7	6.3	10.0	0.00	1.93	261.3	233.4	130.7	189.8	261.3	3.54	
198.7	953	0.853	1384.7	6.6	10.4	0.00	1.98	260.3	236.5	130.2	193.1	260.3	3.45	
195.2	1002	0.854	1386.4	7.0	10.7	0.00	2.02	259.7	239.6	129.8	196.4	259.7	3.36	
191.4	1055	0.854	1386.4	7.3	11.1	0.00	2.08	258.6	242.9	129.3	199.8	258.6	3.28	
187.4	1101	0.854	1386.4	7.6	11.4	0.00	2.12	257.6	246.4	128.8	203.5	257.6	3.19	
182.3	1152	0.855	1388.0	8.0	11.8	0.00	2.17	256.9	251.2	128.5	208.3	256.9	3.09	
177.5	1203	0.855	1388.0	8.3	12.1	0.00	2.22	255.9	255.4	127.9	212.8	255.9	3.01	

Final volume (cm^3): 643.97 Final length (mm): 131.0 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 4
Borehole No. : D272(P)
Depth(m) From : 1.50
To : 2.50

Laboratory Information

Lab. sample I.D. : SL90276/1
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
171.4	1250	0.856	1389.6	8.7	12.4	0.00	2.26	255.2	261.2	127.6	218.7	255.2	2.91
166.5	1309	0.856	1389.6	9.1	12.9	0.00	2.31	254.0	265.5	127.0	223.2	254.0	2.83

Final volume (cm^3): 643.97 Final length (mm): 131.0 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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Photographic Records for Triaxial Test

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MateriaLab

HKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

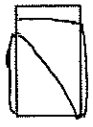
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 8
Borehole No. : D272(P)
Depth(m) From : 4.00
To : 4.45
Sample origin : CDG
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 14-01-2010
Date test(s) completed : 22-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : S.W. Leung Designation : Technical Assistant
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 23.5 °C Minimum : 17.5 °C
Visual description : Moist, orangish brown spotted with grey, mottled with white and red, slightly SILT/CLAY gravelly SAND.

Lab. sample I.D. : SL90276/2
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 4.10
To : 4.30
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	60			120			180	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.5	74.3	75.0	74.8	75.4		75.3	80.6
Length	mm	150.0	149.6	146.9	146.5	144.1		143.8	125.3
Volume	cm^3	653.87	648.57	648.57	643.67	643.67		639.87	639.87
Wet mass	g	1333.0	1351.2	1351.2	1346.3	1346.3		1342.5	1342.5
Dry mass	g	1134.1	1134.1	1134.1	1134.1	1134.1		1134.1	1134.1
Moisture content	%	17.5	19.1	19.1	18.7	18.7		18.4	18.4
Bulk density	Mg/m^3	2.04	2.08	2.08	2.09	2.09		2.10	2.10
Dry density	Mg/m^3	1.73	1.75	1.75	1.76	1.76		1.77	1.77
Void ratio		0.53	0.52	0.52	0.50	0.50		0.50	0.50
Degree of saturation	%	88.0	98.4	98.4	98.4	98.4		98.3	98.3
Saturation Stage									
**Volume change of water	cm^3	23.5							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	300.0			329.4			349.1	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm^3	5.3			4.9			3.8	
m_{vi}	m^2/MN	0.15			0.09			0.06	
t_{50}	min	3.90			3.10			2.70	
c_{vi} (from t_{50})	m^2/yr	1150.72			1388.60			1535.59	
t_{100}	min	8.41			8.41			8.41	
c_{vi} (from t_{100})	m^2/yr	1071.55			1085.54			1098.66	
Sketch of failed specimen (Failure Mode)								 Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : S.W. Leung

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 03 FEB 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

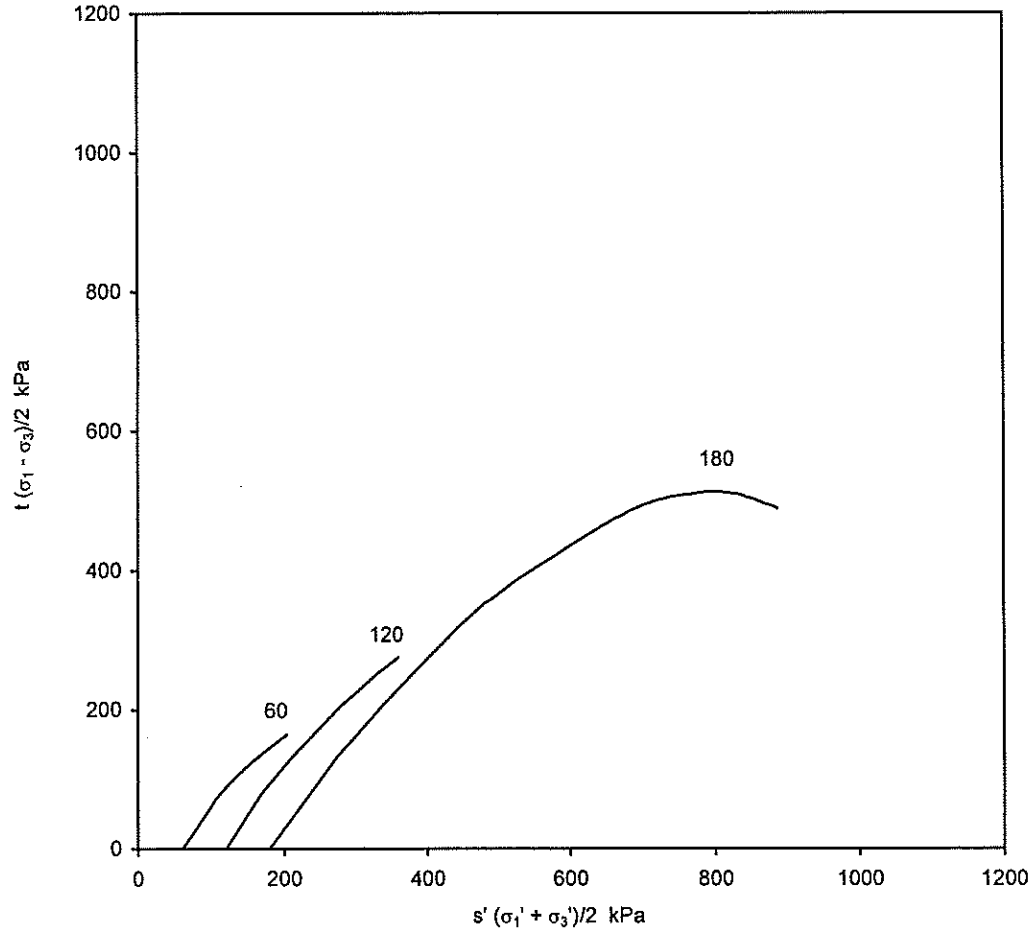
Client sample No. : 8
Borehole No. : D272(P)
Depth(m) From : 4.00
To : 4.45

Laboratory Information

Lab. sample I.D. : SL90276/2
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	60	1.6	1.6	268.2	304.5	189.0	152.2
2	120	1.4	3.5	285.0	522.9	341.4	261.4
3	180	7.7	11.6	135.3	1025.1	802.2	512.5



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

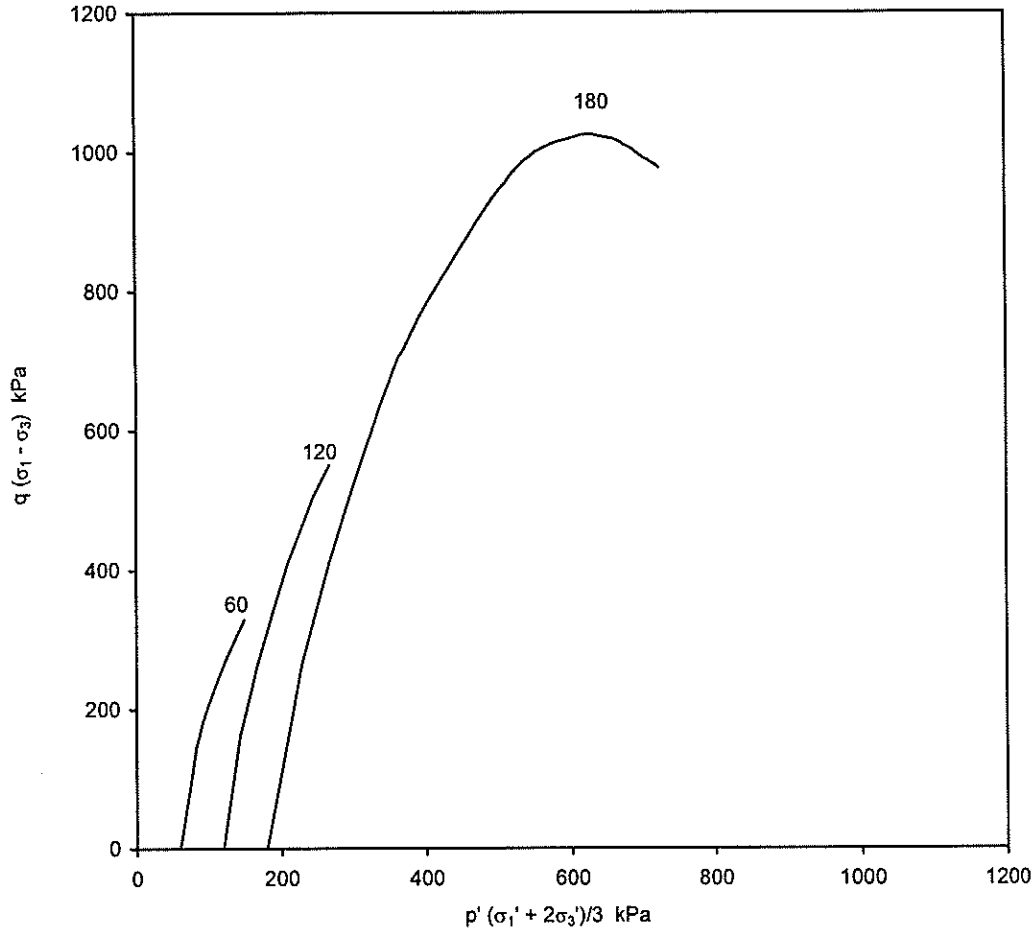
Client sample No. : 8
Borehole No. : D272(P)
Depth(m) From : 4.00
To : 4.45

Laboratory Information

Lab. sample I.D. : SL90276/2
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	60	1.6	1.6	268.2	304.5	138.3	304.5
2	120	1.4	3.5	285.0	522.9	254.3	522.9
3	180	7.7	11.6	135.3	1025.1	631.4	1025.1



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

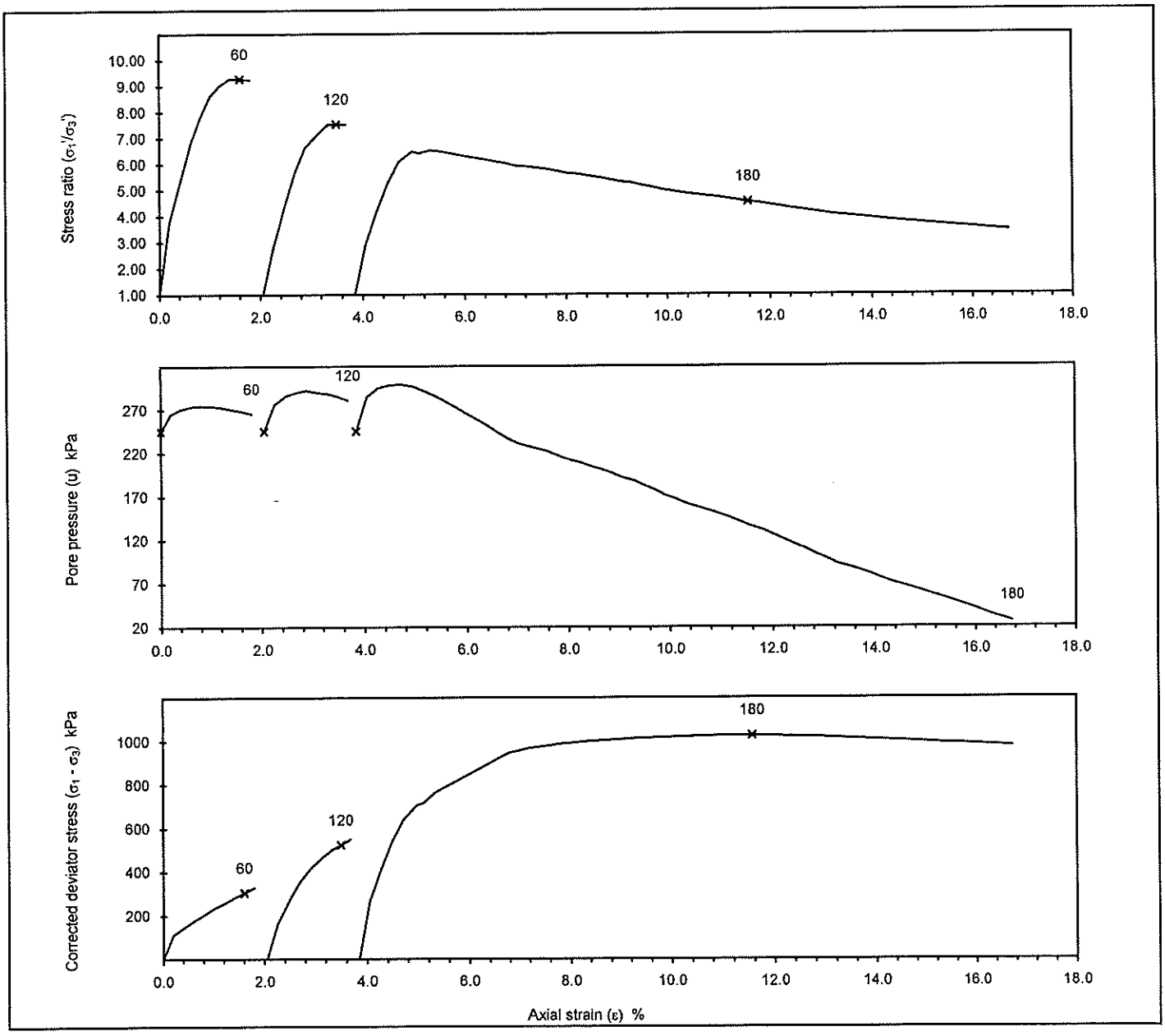
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	8
Project	:	Contract 912	Borehole No.	:	D272(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	4.00
			To	:	4.45

Laboratory Information

Lab. sample I.D.	:	SL90276/2
Specimen ref.	:	A



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MateriaLab

HKAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 8
Borehole No. : D272(P)
Depth(m) From : 4.00
To : 4.45

Laboratory Information

Lab. sample I.D. : SL90276/2
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	60	
	Stage 2	kPa	120	
	Stage 3	kPa	180	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			150	145
			200	195
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		1.00
Volume change	cm^3	23.5

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1340.5
Final moisture content	%	18.2
Final bulk density	Mg/m^3	2.09

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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MateriaLab

HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

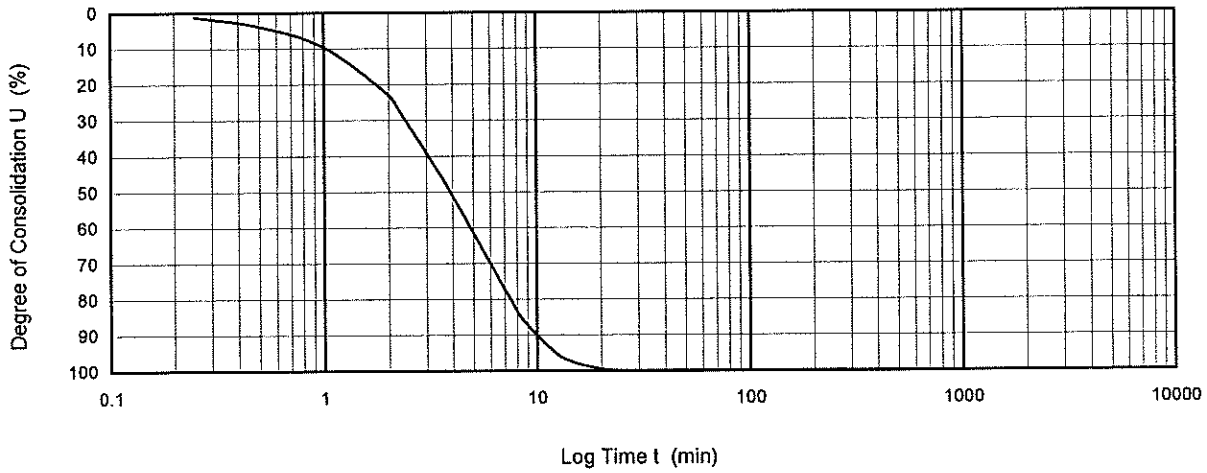
Client	:	MTR Corporation Limited	Client sample No.	:	8
Project	:	Contract 912	Borehole No.	:	D272(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	4.00
			To	:	4.45

Laboratory Information

Cell pressure	:	305 kPa	Lab. sample I.D.	:	SL90276/2
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	60 kPa			

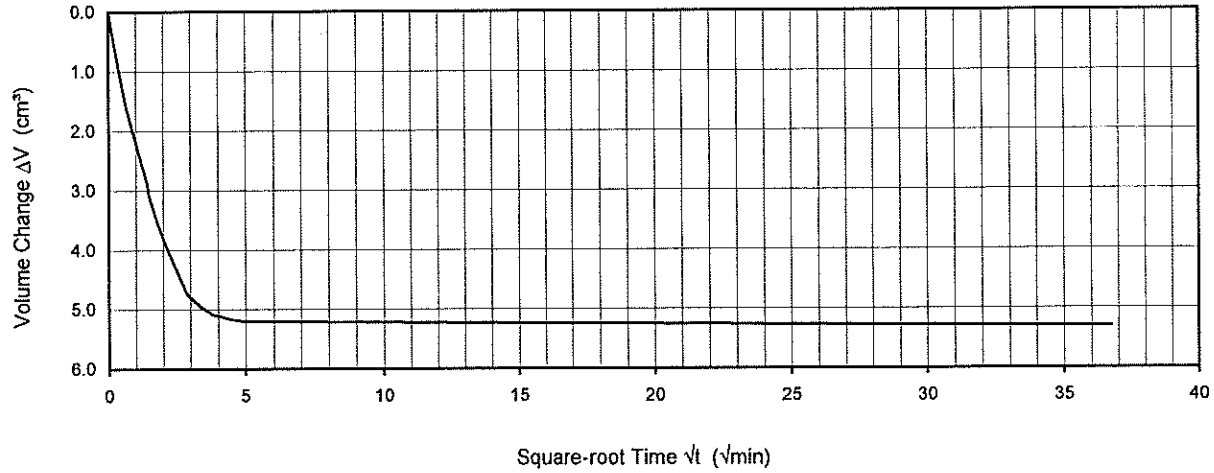
Degree of Consolidation vs. Log Time

t_{50} = 3.90 min ΔV = 5.3 cm³



Volume Change vs. Square-root Time

t_{100} = 8.41 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

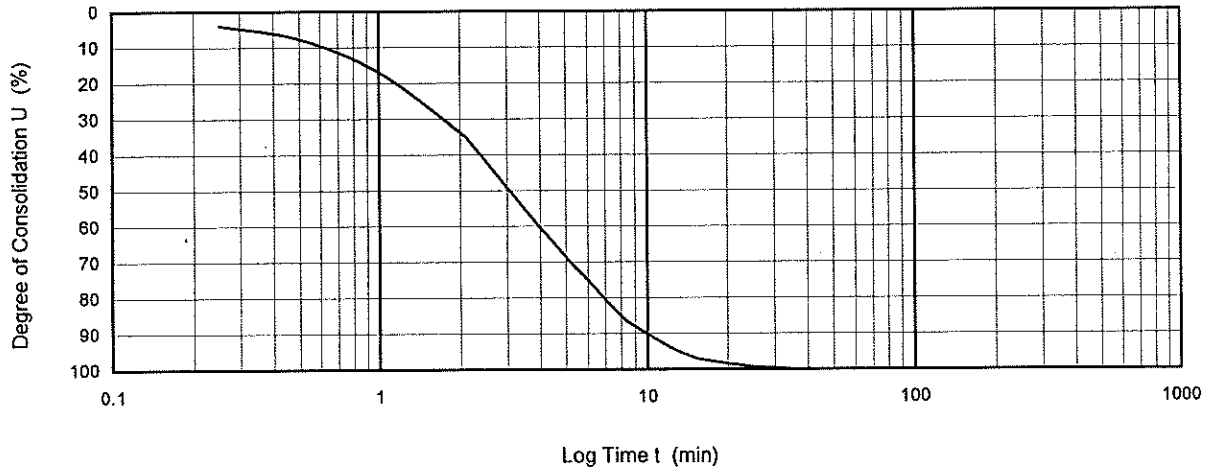
Client	:	MTR Corporation Limited	Client sample No.	:	8
Project	:	Contract 912	Borehole No.	:	D272(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	4.00
			To	:	4.45

Laboratory Information

Cell pressure	:	365 kPa	Lab. sample I.D.	:	SL90276/2
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	120 kPa			

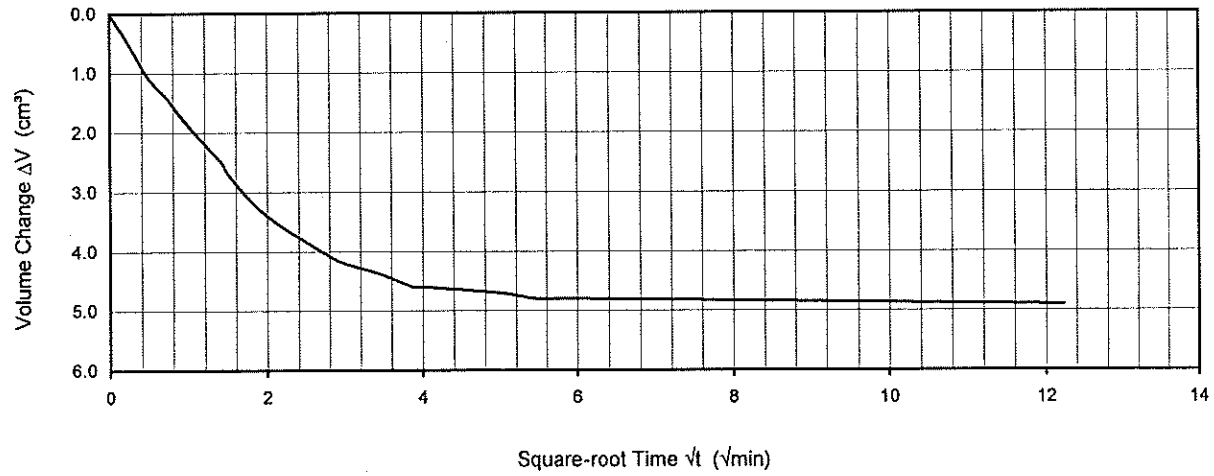
Degree of Consolidation vs. Log Time

t_{50} = 3.10 min ΔV = 4.9 cm³



Volume Change vs. Square-root Time

t_{100} = 8.41 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

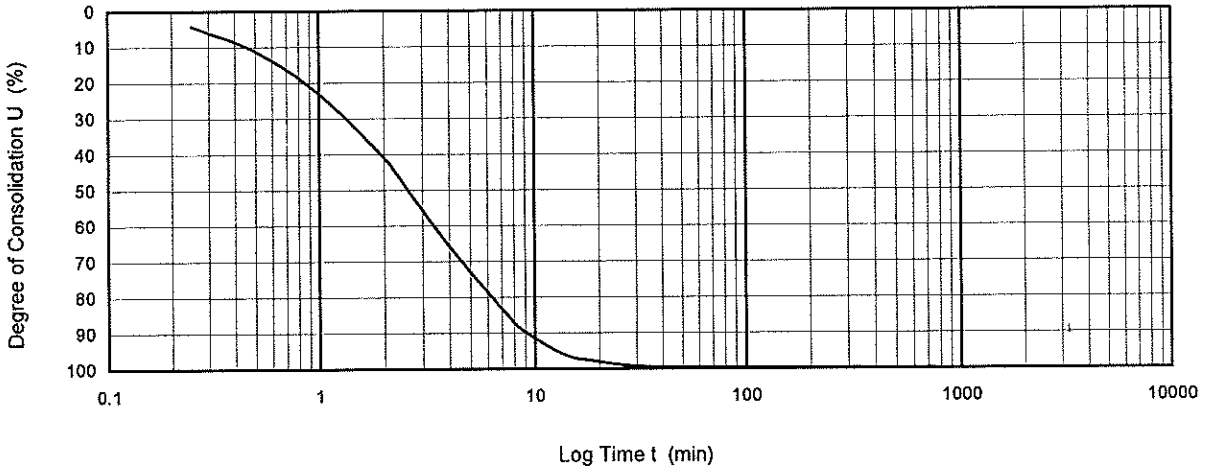
Client	:	MTR Corporation Limited	Client sample No.	:	8
Project	:	Contract 912	Borehole No.	:	D272(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	4.00
			To	:	4.45

Laboratory Information

Cell pressure	:	425 kPa	Lab. sample I.D.	:	SL90276/2
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	180 kPa			

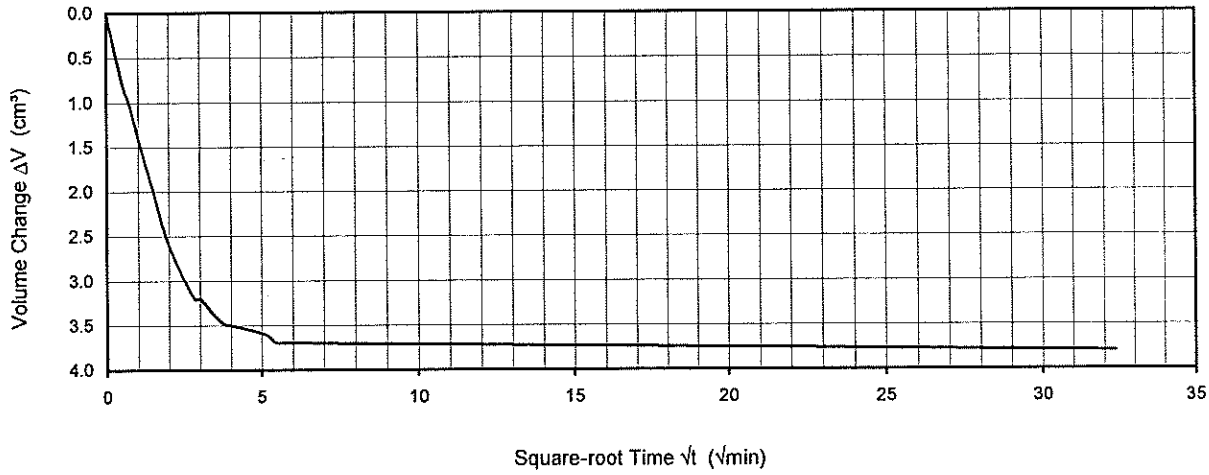
Degree of Consolidation vs. Log Time

t_{50} = 2.70 min ΔV = 3.8 cm^3



Volume Change vs. Square-root Time

t_{100} = 8.41 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 8
Borehole No. : D272(P)
Depth(m) From : 4.00
To : 4.45

Laboratory Information

Date shearing commenced : 20/01/2010 Time : 09:00
Date shearing completed : 20/01/2010 Time : 10:10
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.08

Lab. sample I.D. : SL90276/2
Specimen ref. : A
Cell pressure : 305 kPa
Back pressure : 245 kPa
Effective pressure : 60 kPa
Dimensions at starting of compression
Volume V_c : 648.57 cm^3
Area A_c : 4335.6 mm^2
Length L_c : 149.6 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	38	132.6	0.0	0.0	0.00	0.00	0.0	60.0	0.0	60.0	0.0	1.00	
264.8	30	177	617.6	0.2	0.2	0.00	0.05	111.6	96.0	55.8	77.4	111.6	3.78	
270.9	60	217	757.2	0.4	0.4	0.00	0.10	143.4	105.8	71.7	81.9	143.4	5.20	
274.2	95	263	917.7	0.6	0.6	0.00	0.16	179.8	120.7	89.9	90.7	179.8	6.84	
274.7	120	293	1022.3	0.8	0.8	0.00	0.20	203.4	132.0	101.7	98.1	203.4	7.71	
274.3	152	332	1158.4	1.0	1.0	0.00	0.25	233.9	147.7	117.0	108.7	233.9	8.62	
273.0	180	361	1259.6	1.2	1.2	0.00	0.30	256.5	160.3	128.3	117.5	256.5	9.02	
270.9	210	394	1374.7	1.4	1.4	0.00	0.35	282.1	175.2	141.1	128.1	282.1	9.27	
268.2	240	423	1475.9	1.6	1.6	0.00	0.39	304.5	189.0	152.2	138.3	304.5	9.27	«
265.2	270	454	1584.1	1.8	1.8	0.00	0.44	328.3	204.0	164.2	149.2	328.3	9.25	

Final volume (cm^3): 648.57 Final length (mm): 146.9 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 8
Borehole No. : D272(P)
Depth(m) From : 4.00
To : 4.45

Laboratory Information

Date shearing commenced : 20/01/2010 Time : 13:30
Date shearing completed : 20/01/2010 Time : 14:46
Proving ring serial No. : 9769
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.08

Lab. sample I.D. : SL90276/2
Specimen ref. : A
Cell pressure : 365 kPa
Back pressure : 245 kPa
Effective pressure : 120 kPa

Dimensions at starting of compression

Volume V_c : 643.67 cm^3
Area A_c : 4393.0 mm^2
Length L_c : 146.5 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	47	164.0	0.0	2.1	0.00	0.50	0.0	120.0	0.0	120.0	0.0	1.00	
276.0	30	252	879.3	0.2	2.3	0.00	0.54	161.9	170.0	81.0	143.0	161.9	2.82	
285.6	62	380	1325.9	0.4	2.5	0.00	0.59	262.8	210.8	131.4	167.0	262.8	4.31	
289.8	92	490	1709.7	0.6	2.7	0.00	0.64	349.0	249.7	174.5	191.5	349.0	5.64	
292.1	121	569	1985.3	0.8	2.9	0.00	0.68	410.5	278.2	205.3	209.7	410.5	6.63	
289.9	150	624	2177.3	1.0	3.1	0.00	0.72	452.9	301.5	226.4	226.1	452.9	7.03	
287.9	189	690	2407.5	1.3	3.3	0.00	0.78	503.3	328.8	251.7	244.9	503.3	7.53	
285.0	212	716	2498.3	1.4	3.5	0.00	0.81	522.9	341.4	261.4	254.3	522.9	7.54	«
280.7	240	752	2623.9	1.6	3.7	0.00	0.85	549.9	359.3	275.0	267.6	549.9	7.52	

Final volume (cm^3): 643.67 Final length (mm): 144.1 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 8
Borehole No. : D272(P)
Depth(m) From : 4.00
To : 4.45

Laboratory Information

Date shearing commenced : 21/01/2010 Time : 09:00
Date shearing completed : 21/01/2010 Time : 15:43
Proving ring serial No. : 8775
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.11

Lab. sample I.D. : SL90276/2
Specimen ref. : A
Cell pressure : 425 kPa
Back pressure : 245 kPa
Effective pressure : 180 kPa

Dimensions at starting of compression
Volume V_c : 639.87 cm^3
Area A_c : 4448.6 mm^2
Length L_c : 143.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	29	180.2	0.0	3.8	0.00	0.88	0.0	180.0	0.0	180.0	0.0	1.00
284.3	30	220	1367.0	0.2	4.1	0.00	0.93	265.3	273.4	132.7	229.1	265.3	2.89
294.6	61	323	2007.0	0.4	4.3	0.00	0.97	407.9	334.4	204.0	266.4	407.9	4.13
297.8	90	412	2560.1	0.6	4.5	0.00	1.01	530.6	392.5	265.3	304.1	530.6	5.17
299.3	124	490	3044.7	0.9	4.7	0.00	1.06	637.3	444.4	318.7	338.1	637.3	6.07
296.3	162	540	3355.4	1.1	5.0	0.00	1.11	704.6	481.0	352.3	363.6	704.6	6.47
292.8	182	549	3411.3	1.3	5.1	0.00	1.13	716.0	490.2	358.0	370.9	716.0	6.42
287.1	213	584	3628.8	1.5	5.3	0.00	1.17	762.6	519.2	381.3	392.1	762.6	6.53
281.5	240	603	3746.9	1.7	5.5	0.00	1.21	787.2	537.1	393.6	405.9	787.2	6.49
273.9	274	625	3883.6	1.9	5.8	0.00	1.25	815.4	558.8	407.7	422.9	815.4	6.40
265.4	309	649	4032.7	2.1	6.0	0.00	1.30	846.1	582.7	423.1	441.6	846.1	6.30
258.3	339	670	4163.2	2.4	6.2	0.00	1.33	872.9	603.2	436.5	457.7	872.9	6.24
251.7	366	689	4281.3	2.5	6.4	0.00	1.37	897.1	621.8	448.5	472.3	897.1	6.18
243.7	397	710	4411.8	2.8	6.6	0.00	1.41	923.6	643.1	461.8	489.2	923.6	6.09
236.8	424	728	4523.6	2.9	6.8	0.00	1.44	946.1	661.3	473.1	503.6	946.1	6.03
231.4	451	736	4573.3	3.1	7.0	0.00	1.47	955.1	671.2	477.6	512.0	955.1	5.93
227.6	483	747	4641.7	3.4	7.2	0.00	1.51	967.7	681.3	483.9	520.0	967.7	5.90
224.3	514	753	4679.0	3.6	7.4	0.00	1.55	973.6	687.5	486.8	525.2	973.6	5.85
221.0	543	759	4716.2	3.8	7.6	0.00	1.58	979.6	693.8	489.8	530.5	979.6	5.80
216.4	570	766	4759.7	4.0	7.8	0.00	1.61	987.0	702.1	493.5	537.6	987.0	5.73
211.4	602	771	4790.8	4.2	8.0	0.00	1.65	991.4	709.3	495.7	544.1	991.4	5.64
208.6	632	776	4821.9	4.4	8.2	0.00	1.68	995.9	714.3	497.9	548.4	995.9	5.60
204.3	661	781	4852.9	4.6	8.4	0.00	1.71	1000.4	720.9	500.2	554.2	1000.4	5.53
200.5	694	784	4871.6	4.8	8.7	0.00	1.75	1002.0	725.5	501.0	558.5	1002.0	5.46
196.4	721	788	4896.4	5.0	8.9	0.00	1.78	1005.3	731.2	502.6	563.7	1005.3	5.40
191.3	751	792	4921.3	5.2	9.1	0.00	1.81	1008.3	737.9	504.2	569.8	1008.3	5.31
187.6	785	796	4946.1	5.5	9.3	0.00	1.85	1011.0	742.9	505.5	574.4	1011.0	5.26
182.3	812	799	4964.8	5.6	9.5	0.00	1.87	1012.9	749.2	506.5	580.3	1012.9	5.17
177.6	840	802	4983.4	5.8	9.7	0.00	1.90	1014.8	754.8	507.4	585.7	1014.8	5.10
171.2	871	805	5002.1	6.1	9.9	0.00	1.94	1016.3	762.0	508.2	592.6	1016.3	5.00
166.7	901	808	5020.7	6.3	10.1	0.00	1.97	1018.0	767.3	509.0	597.6	1018.0	4.94
161.4	932	811	5039.4	6.5	10.3	0.00	2.00	1019.5	773.4	509.8	603.4	1019.5	4.87
157.6	963	814	5058.0	6.7	10.5	0.00	2.03	1021.1	777.9	510.5	607.8	1021.1	4.82
153.2	996	817	5076.6	6.9	10.8	0.00	2.06	1022.4	783.0	511.2	612.6	1022.4	4.76

Final volume (cm^3): 639.87 Final length (mm): 125.3 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : 8
Borehole No. : D272(P)
Depth(m) From : 4.00
To : 4.45

Laboratory Information

Lab. sample I.D. : SL90276/2
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
149.8	1021	820	5095.3	7.1	10.9	0.00	2.09	1024.4	787.4	512.2	616.7	1024.4	4.72	
145.2	1054	822	5107.7	7.3	11.2	0.00	2.12	1024.4	792.0	512.2	621.3	1024.4	4.66	
139.7	1086	824	5120.1	7.6	11.4	0.00	2.15	1024.5	797.5	512.2	626.8	1024.5	4.59	
135.3	1111	826	5132.6	7.7	11.6	0.00	2.18	1025.1	802.2	512.5	631.4	1025.1	4.54	«
131.2	1143	827	5138.8	7.9	11.8	0.00	2.21	1023.9	805.7	511.9	635.1	1023.9	4.48	
126.4	1170	828	5145.0	8.1	12.0	0.00	2.23	1023.0	810.1	511.5	639.6	1023.0	4.43	
120.1	1205	829	5151.2	8.4	12.2	0.00	2.27	1021.6	815.7	510.8	645.4	1021.6	4.35	
114.3	1234	830	5157.4	8.6	12.4	0.00	2.29	1020.6	821.0	510.3	650.9	1020.6	4.28	
109.7	1263	831	5163.6	8.8	12.6	0.00	2.32	1019.6	825.1	509.8	655.2	1019.6	4.23	
103.4	1293	832	5169.8	9.0	12.8	0.00	2.35	1018.5	830.8	509.2	661.1	1018.5	4.17	
98.7	1321	832	5169.8	9.2	13.0	0.00	2.37	1016.3	834.4	508.1	665.1	1016.3	4.11	
92.5	1350	832	5169.8	9.4	13.2	0.00	2.40	1014.0	839.5	507.0	670.5	1014.0	4.05	
86.7	1401	832	5169.8	9.7	13.6	0.00	2.45	1009.9	843.3	505.0	674.9	1009.9	3.99	
79.4	1452	833	5176.1	10.1	13.9	0.00	2.49	1007.2	849.2	503.6	681.3	1007.2	3.91	
71.2	1506	833	5176.1	10.5	14.3	0.00	2.54	1002.9	855.3	501.5	688.1	1002.9	3.83	
65.6	1553	833	5176.1	10.8	14.6	0.00	2.58	999.2	859.0	499.6	692.5	999.2	3.78	
59.8	1600	833	5176.1	11.1	15.0	0.00	2.62	995.5	862.9	497.7	697.0	995.5	3.73	
53.1	1651	833	5176.1	11.5	15.3	0.00	2.67	991.5	867.6	495.7	702.4	991.5	3.67	
46.3	1704	834	5182.3	11.8	15.7	0.00	2.71	988.5	873.0	494.3	708.2	988.5	3.61	
39.6	1752	834	5182.3	12.2	16.0	0.00	2.75	984.7	877.8	492.4	713.6	984.7	3.56	
32.4	1801	834	5182.3	12.5	16.4	0.00	2.80	980.8	883.0	490.4	719.5	980.8	3.50	
26.1	1854	834	5182.3	12.9	16.7	0.00	2.84	976.7	887.2	488.3	724.5	976.7	3.45	

Final volume (cm^3): 639.87 Final length (mm): 125.3 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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Photographic Records for Triaxial Test

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MateriaLab

Test Report No. : 090562SL90276(84) Page 1 of 13

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D273
Depth(m) From : 1.30
To : 2.20
Sample origin : CDG
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 15-01-2010
Date test(s) completed : 21-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : W.Y. Lo Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 23.5 °C Minimum : 17.5 °C
Visual description : Moist, brown, very silty/clayey, slightly gravelly SAND.

Lab. sample I.D. : SL90276/3
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 2.00
To : 2.20
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	20			30			40	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.6	74.5	75.4	75.3	76.4		76.3	80.3
Length	mm	150.4	150.2	146.5	146.2	142.0		141.7	127.7
Volume	cm³	657.38	654.88	654.88	651.08	651.08		646.98	646.98
Wet mass	g	1195.9	1236.4	1236.4	1232.6	1232.6		1228.5	1228.5
Dry mass	g	949.0	949.0	949.0	949.0	949.0		949.0	949.0
Moisture content	%	26.0	30.3	30.3	29.9	29.9		29.5	29.5
Bulk density	Mg/m³	1.82	1.89	1.89	1.89	1.89		1.90	1.90
Dry density	Mg/m³	1.44	1.45	1.45	1.46	1.46		1.47	1.47
Void ratio		0.84	0.83	0.83	0.82	0.82		0.81	0.81
Degree of saturation	%	82.5	96.8	96.8	96.8	96.8		96.8	96.8
Saturation Stage									
**Volume change of water	cm³	43.0							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	259.8			264.9			273.0	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	2.5			3.8			4.1	
m_{vi}	m²/MN	0.26			0.29			0.22	
t_{50}	min	1.80			5.10			5.75	
c_{vi} (from t_{50})	m²/yr	2510.16			840.36			699.44	
t_{100}	min	6.76			16.81			20.25	
c_{vi} (from t_{100})	m²/yr	1335.07			548.61			467.28	
Sketch of failed specimen (Failure Mode)								Brittle	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by : ~~Paul Richard Cooper (Operations Manager—GMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 03 FEB 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

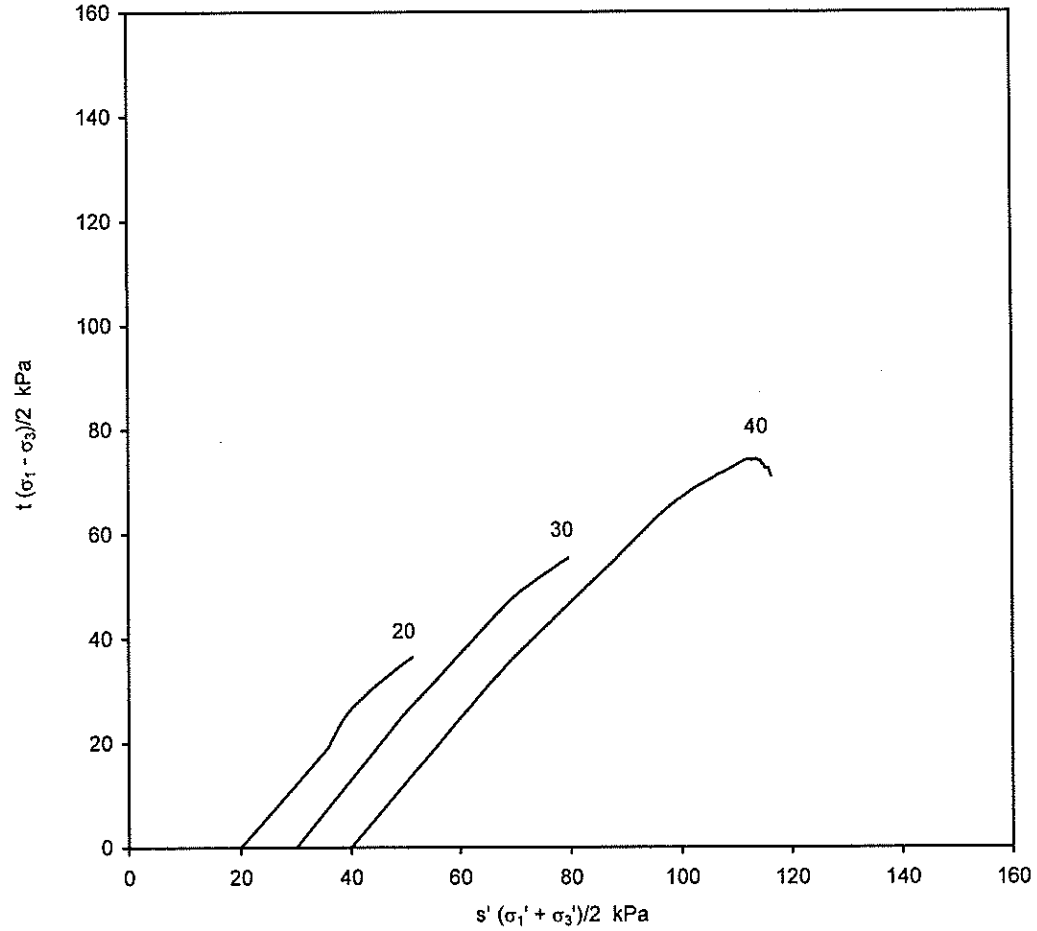
Client sample No. : -
Borehole No. : D273
Depth(m) From : 1.30
To : 2.20

Laboratory Information

Lab. sample I.D. : SL90276/3
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	20	2.2	2.2	250.5	70.4	49.7	35.2
2	30	2.7	5.3	251.1	109.1	78.5	54.6
3	40	4.9	10.6	245.5	148.5	113.7	74.2



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

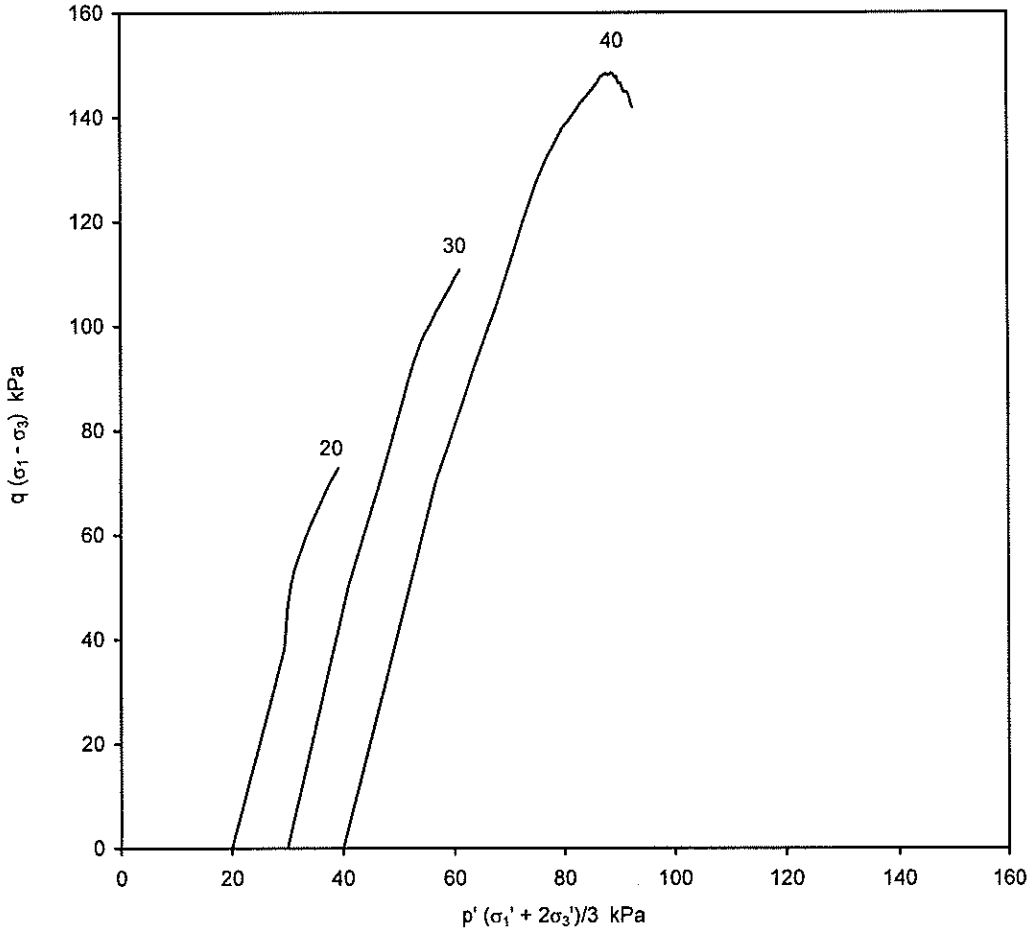
Client sample No. : -
Borehole No. : D273
Depth(m) From : 1.30
To : 2.20

Laboratory Information

Lab. sample I.D. : SL90276/3
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	20	2.2	2.2	250.5	70.4	38.0	70.4
2	30	2.7	5.3	251.1	109.1	60.3	109.1
3	40	4.9	10.6	245.5	148.5	89.0	148.5



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HKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

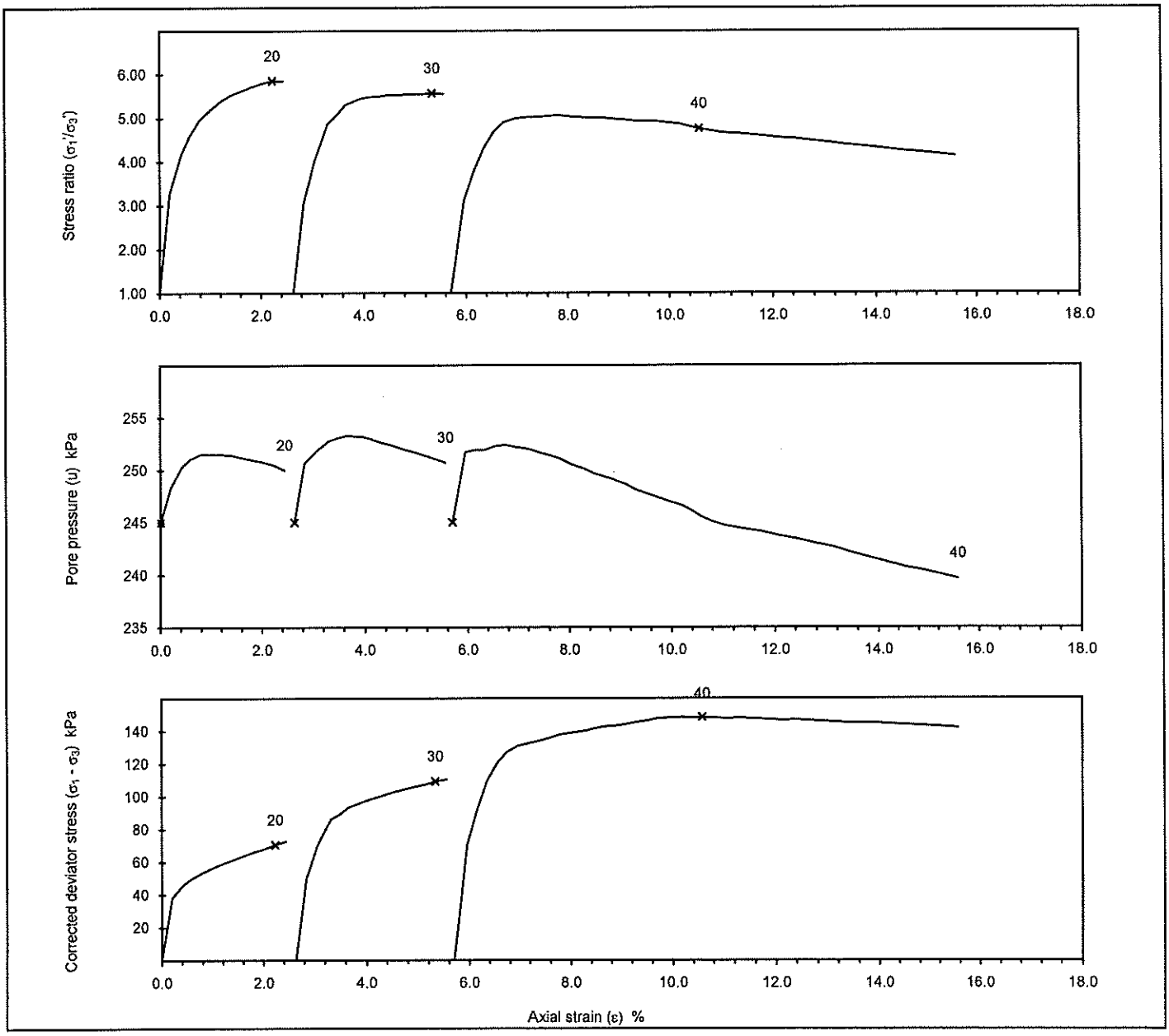
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D273
Depth(m) From : 1.30
To : 2.20

Laboratory Information

Lab. sample I.D. : SL90276/3
Specimen ref. : A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D273
Depth(m) From : 1.30
To : 2.20

Laboratory Information

Lab. sample I.D. : SL90276/3
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	20	
	Stage 2	kPa	30	
	Stage 3	kPa	40	
Applied pressure			Cell pressure kPa	Back pressure kPa
			20	15
			40	35
			60	55
			80	75
			100	95
			120	115
			140	135
			160	155
			180	175
			200	195
			220	215
			240	235
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		0.98
Volume change	cm^3	43.0

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1226.0
Final moisture content	%	29.2
Final bulk density	Mg/m^3	1.89

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

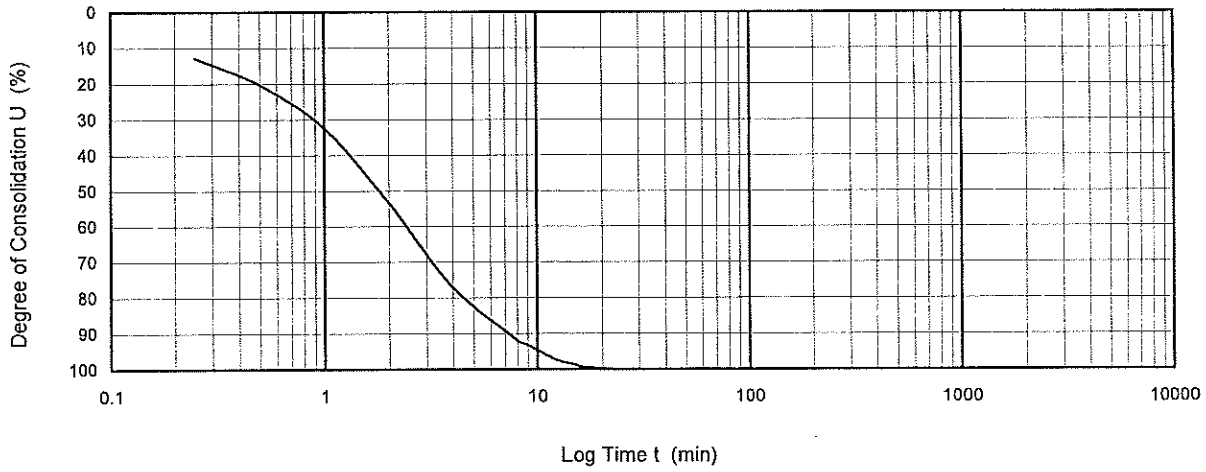
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D273
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	1.30
			To	:	2.20

Laboratory Information

Cell pressure	:	265 kPa	Lab. sample I.D.	:	SL90276/3
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	20 kPa			

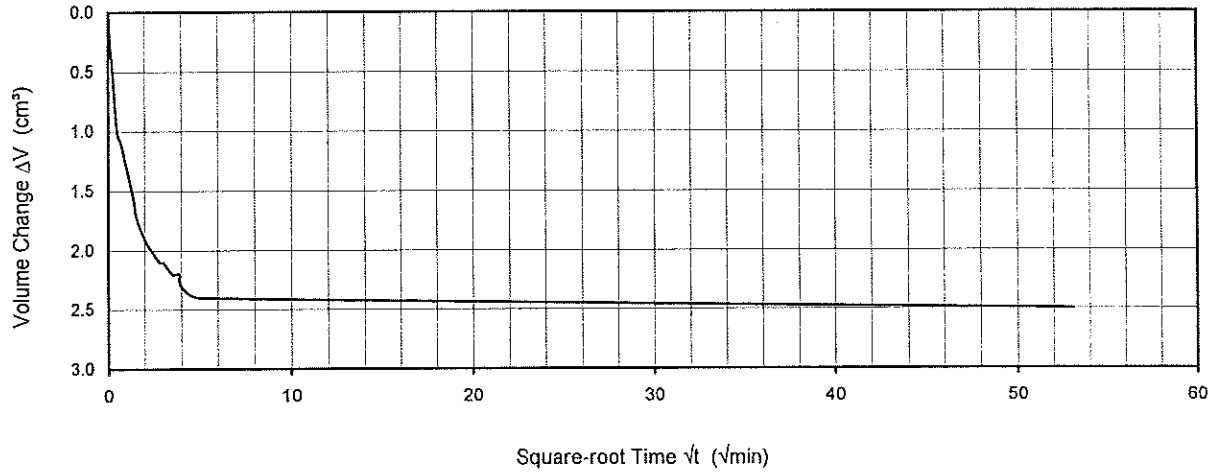
Degree of Consolidation vs. Log Time

t_{50} = 1.80 min ΔV = 2.5 cm³



Volume Change vs. Square-root Time

t_{100} = 6.76 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

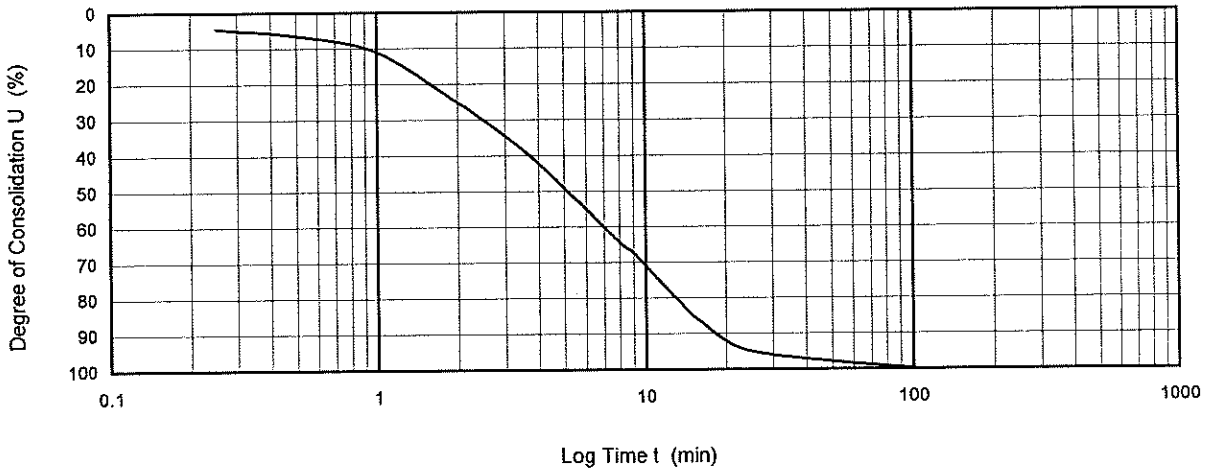
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D273
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	1.30
			To	:	2.20

Laboratory Information

Cell pressure	:	275 kPa	Lab. sample I.D.	:	SL90276/3
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	30 kPa			

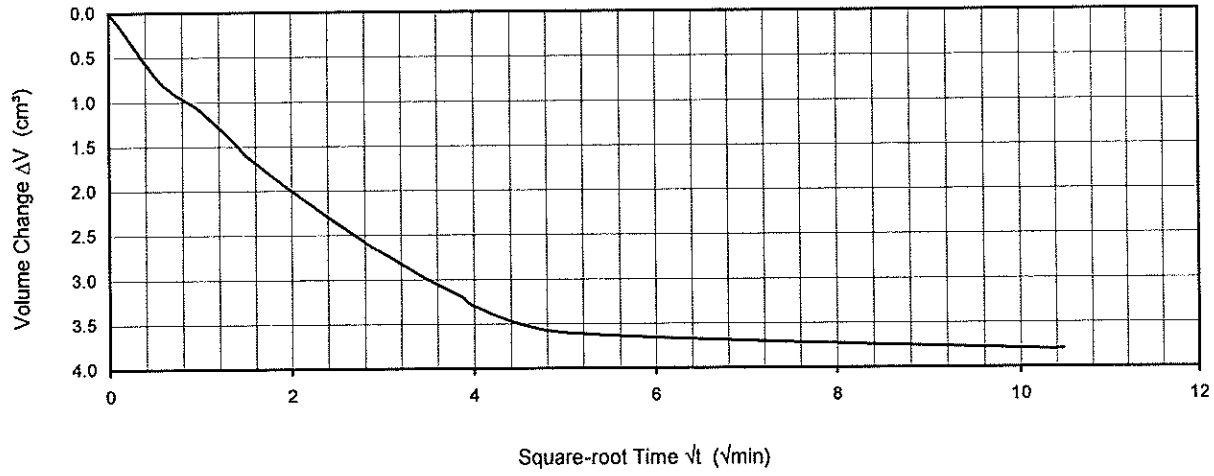
Degree of Consolidation vs. Log Time

t_{50} = 5.10 min ΔV = 3.8 cm^3



Volume Change vs. Square-root Time

t_{100} = 16.81 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

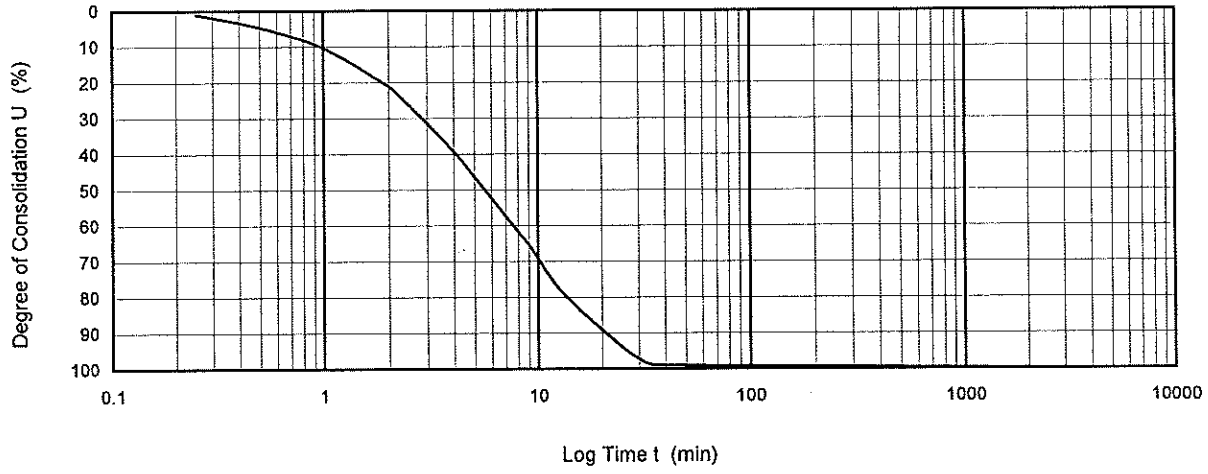
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D273
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	1.30
			To	:	2.20

Laboratory Information

Cell pressure	:	285 kPa	Lab. sample I.D.	:	SL90276/3
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	40 kPa			

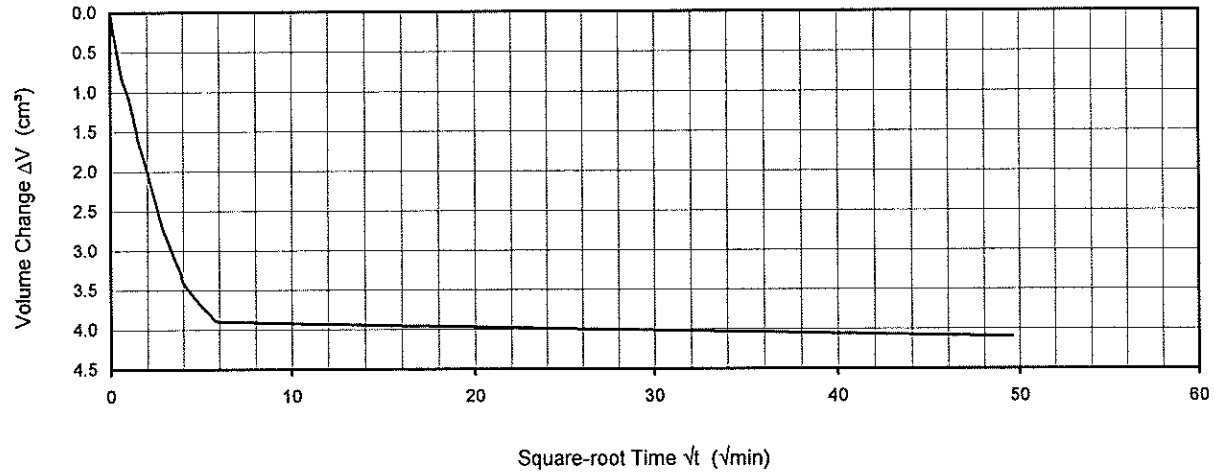
Degree of Consolidation vs. Log Time

t_{50} = 5.75 min ΔV = 4.1 cm^3



Volume Change vs. Square-root Time

t_{100} = 20.25 min



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MateriaLab

HKAS HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D273
Depth(m) From : 1.30
To : 2.20

Laboratory Information

Date shearing commenced : 18/01/2010 Time : 09:30
Date shearing completed : 18/01/2010 Time : 11:04
Proving ring serial No. : 5345
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.08

Lab. sample I.D. : SL90276/3
Specimen ref. : A
Cell pressure : 265 kPa
Back pressure : 245 kPa
Effective pressure : 20 kPa
Dimensions at starting of compression
Volume V_c : 654.88 cm^3
Area A_c : 4359.8 mm^2
Length L_c : 150.2 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.289	107.8	0.0	0.0	0.00	0.00	0.0	20.0	0.0	20.0	0.0	1.00	
248.3	30	0.738	275.3	0.2	0.2	0.00	0.05	38.3	35.8	19.1	29.5	38.3	3.29	
250.3	63	0.831	310.0	0.4	0.4	0.00	0.11	46.1	37.7	23.0	30.1	46.1	4.13	
251.1	90	0.880	328.2	0.6	0.6	0.00	0.16	50.1	38.9	25.0	30.6	50.1	4.60	
251.5	120	0.923	344.3	0.8	0.8	0.00	0.21	53.6	40.3	26.8	31.4	53.6	4.97	
251.5	154	0.962	358.8	1.0	1.0	0.00	0.27	56.7	41.9	28.4	32.4	56.7	5.20	
251.5	183	0.995	371.1	1.2	1.2	0.00	0.32	59.3	43.2	29.7	33.3	59.3	5.40	
251.4	216	1.026	382.7	1.4	1.4	0.00	0.38	61.8	44.5	30.9	34.2	61.8	5.54	
251.2	240	1.050	391.6	1.6	1.6	0.00	0.42	63.7	45.6	31.8	35.0	63.7	5.61	
251.0	270	1.079	402.5	1.8	1.8	0.00	0.46	65.9	47.0	33.0	36.0	65.9	5.71	
250.8	301	1.106	412.5	2.0	2.0	0.00	0.51	68.0	48.2	34.0	36.9	68.0	5.79	
250.5	335	1.138	424.5	2.2	2.2	0.00	0.57	70.4	49.7	35.2	38.0	70.4	5.86	«
250.0	368	1.168	435.7	2.4	2.4	0.00	0.62	72.7	51.4	36.4	39.2	72.7	5.85	

Final volume (cm^3): 654.88 Final length (mm): 146.5 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D273
Depth(m) From : 1.30
To : 2.20

Laboratory Information

Date shearing commenced : 18/01/2010 Time : 13:30
Date shearing completed : 18/01/2010 Time : 15:23
Proving ring serial No. : 5345
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.06

Lab. sample I.D. : SL90276/3
Specimen ref. : A
Cell pressure : 275 kPa
Back pressure : 245 kPa
Effective pressure : 30 kPa

Dimensions at starting of compression
Volume V_c : 651.08 cm^3
Area A_c : 4452.0 mm^2
Length L_c : 146.2 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.302	112.6	0.0	2.6	0.00	0.67	0.0	30.0	0.0	30.0	0.0	1.00	
250.7	30	0.912	340.2	0.2	2.8	0.00	0.71	50.3	49.4	25.1	41.1	50.3	3.07	
251.7	60	1.146	427.5	0.4	3.0	0.00	0.76	69.7	58.1	34.8	46.5	69.7	3.99	
252.8	99	1.346	502.1	0.7	3.3	0.00	0.82	86.1	65.2	43.0	50.9	86.1	4.88	
253.1	126	1.388	517.7	0.9	3.5	0.00	0.86	89.3	66.6	44.7	51.7	89.3	5.08	
253.3	150	1.439	536.7	1.0	3.7	0.00	0.90	93.4	68.4	46.7	52.8	93.4	5.30	
253.2	193	1.488	555.0	1.3	4.0	0.00	0.96	97.1	70.3	48.5	54.2	97.1	5.45	
253.0	216	1.510	563.2	1.5	4.1	0.00	0.99	98.7	71.4	49.4	54.9	98.7	5.49	
252.7	240	1.530	570.7	1.6	4.3	0.00	1.03	100.2	72.4	50.1	55.7	100.2	5.49	
252.4	273	1.562	582.6	1.9	4.5	0.00	1.08	102.5	73.9	51.3	56.8	102.5	5.54	
252.0	307	1.588	592.3	2.1	4.7	0.00	1.13	104.4	75.2	52.2	57.8	104.4	5.54	
251.7	340	1.613	601.6	2.3	5.0	0.00	1.17	106.1	76.4	53.1	58.7	106.1	5.55	
251.4	368	1.633	609.1	2.5	5.2	0.00	1.21	107.5	77.3	53.7	59.4	107.5	5.55	
251.1	395	1.656	617.7	2.7	5.3	0.00	1.25	109.1	78.5	54.6	60.3	109.1	5.57	«
250.7	429	1.679	626.3	2.9	5.6	0.00	1.29	110.7	79.6	55.3	61.2	110.7	5.56	

Final volume (cm^3): 651.08 Final length (mm): 142.0 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D273
Depth(m) From : 1.30
To : 2.20

Laboratory Information

Date shearing commenced : 20/01/2010 Time : 09:00
Date shearing completed : 20/01/2010 Time : 13:52
Proving ring serial No. : 12412
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.68 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.00

Lab. sample I.D. : SL90276/3
Specimen ref. : A
Cell pressure : 285 kPa
Back pressure : 245 kPa
Effective pressure : 40 kPa
Dimensions at starting of compression
Volume V_c : 646.98 cm^3
Area A_c : 4567.2 mm^2
Length L_c : 141.7 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	36	128.9	0.0	5.7	0.00	1.32	0.0	40.0	0.0	40.0	0.0	1.00	
251.7	37	128	458.3	0.3	6.0	0.00	1.37	70.6	68.6	35.3	56.8	70.6	3.12	
251.9	65	155	555.0	0.5	6.2	0.00	1.41	91.5	78.8	45.7	63.6	91.5	3.76	
251.9	93	178	637.4	0.7	6.4	0.00	1.44	109.2	87.7	54.6	69.5	109.2	4.30	
252.3	122	193	691.1	0.9	6.6	0.00	1.48	120.5	93.0	60.3	72.9	120.5	4.69	
252.4	150	202	723.3	1.1	6.8	0.00	1.52	127.3	96.2	63.6	75.0	127.3	4.90	
252.2	180	207	741.2	1.3	7.0	0.00	1.56	130.8	98.2	65.4	76.4	130.8	4.99	
252.0	216	210	752.0	1.5	7.2	0.00	1.60	132.7	99.4	66.4	77.2	132.7	5.02	
251.7	240	212	759.1	1.7	7.4	0.00	1.63	134.0	100.3	67.0	78.0	134.0	5.02	
251.4	272	215	769.9	1.9	7.6	0.00	1.67	136.0	101.6	68.0	78.9	136.0	5.05	
251.1	300	218	780.6	2.1	7.8	0.00	1.71	138.0	102.9	69.0	79.9	138.0	5.07	
250.5	335	220	787.8	2.4	8.1	0.00	1.75	139.1	104.0	69.5	80.9	139.1	5.03	
250.1	370	222	794.9	2.6	8.3	0.00	1.79	140.2	105.0	70.1	81.6	140.2	5.02	
249.7	394	224	802.1	2.8	8.5	0.00	1.82	141.5	106.0	70.7	82.5	141.5	5.01	
249.4	422	226	809.3	3.0	8.7	0.00	1.86	142.7	106.9	71.3	83.2	142.7	5.01	
249.1	450	227	812.8	3.2	8.9	0.00	1.89	143.1	107.5	71.6	83.6	143.1	4.99	
248.6	485	229	820.0	3.4	9.1	0.00	1.93	144.2	108.5	72.1	84.5	144.2	4.96	
248.1	512	231	827.2	3.6	9.3	0.00	1.96	145.4	109.6	72.7	85.4	145.4	4.94	
247.7	546	233	834.3	3.9	9.5	0.00	2.00	146.5	110.6	73.3	86.1	146.5	4.93	
247.4	570	235	841.5	4.0	9.7	0.00	2.03	147.7	111.5	73.9	86.8	147.7	4.93	
247.0	604	236	845.1	4.3	10.0	0.00	2.06	148.1	112.0	74.0	87.4	148.1	4.90	
246.6	640	237	848.7	4.5	10.2	0.00	2.10	148.4	112.6	74.2	87.9	148.4	4.86	
246.1	668	237	848.7	4.7	10.4	0.00	2.13	148.0	112.9	74.0	88.2	148.0	4.81	
245.5	693	238	852.2	4.9	10.6	0.00	2.16	148.5	113.7	74.2	89.0	148.5	4.76	«
245.1	722	238	852.2	5.1	10.8	0.00	2.19	148.1	114.0	74.1	89.3	148.1	4.71	
244.7	756	238	852.2	5.3	11.0	0.00	2.23	147.7	114.1	73.8	89.5	147.7	4.66	
244.4	804	239	855.8	5.7	11.4	0.00	2.28	147.8	114.5	73.9	89.9	147.8	4.64	
244.1	857	239	855.8	6.0	11.7	0.00	2.33	147.2	114.5	73.6	90.0	147.2	4.60	
243.7	908	239	855.8	6.4	12.1	0.00	2.39	146.6	114.6	73.3	90.2	146.6	4.55	
243.4	956	240	859.4	6.7	12.4	0.00	2.43	146.7	115.0	73.4	90.5	146.7	4.53	
243.0	1004	240	859.4	7.1	12.8	0.00	2.48	146.1	115.1	73.1	90.7	146.1	4.48	
242.6	1057	240	859.4	7.5	13.2	0.00	2.54	145.5	115.1	72.7	90.9	145.5	4.43	
242.1	1102	240	859.4	7.8	13.5	0.00	2.58	144.9	115.4	72.5	91.2	144.9	4.38	
241.6	1155	241	863.0	8.2	13.8	0.00	2.63	145.0	115.9	72.5	91.7	145.0	4.34	

Final volume (cm^3): 646.98 Final length (mm): 127.7 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D273
Depth(m) From : 1.30
To : 2.20

Laboratory Information

Lab. sample I.D. : SL90276/3
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
241.2	1200	241	863.0	8.5	14.2	0.00	2.67	144.4	116.0	72.2	91.9	144.4	4.30
240.7	1256	241	863.0	8.9	14.6	0.00	2.73	143.7	116.2	71.9	92.2	143.7	4.24
240.4	1304	241	863.0	9.2	14.9	0.00	2.77	143.2	116.2	71.6	92.3	143.2	4.21
240.0	1356	241	863.0	9.6	15.3	0.00	2.82	142.5	116.3	71.3	92.5	142.5	4.17
239.6	1400	241	863.0	9.9	15.6	0.00	2.86	142.0	116.4	71.0	92.7	142.0	4.13

Final volume (cm^3): 646.98 Final length (mm): 127.7 Termination criterion : Maximum deviator stress
Remarks: ε_c - cumulative axial strain

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Photographic Records for Triaxial Test

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MaterialLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

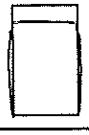
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D274
Depth(m) From : 2.00
To : 3.00
Sample origin : HDG
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 15-01-2010
Date test(s) completed : 21-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : W.Y. Lo Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 23.5 °C Minimum : 17.5 °C
Visual description : Moist, orangish brown spotted with grey and white, slightly silty/clayey, slightly gravelly SAND.

Lab. sample I.D. : SL90276/4
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 2.40
To : 2.60
Affiliation : FTS Ltd. - MaterialLab Division

Stage No.		1			2			3	
Effective pressure	kPa	25			50			100	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.3	74.2	74.8	74.7	75.6		75.4	79.7
Length	mm	150.4	150.1	147.4	147.1	143.5		143.1	128.0
Volume	cm³	652.10	648.30	648.30	644.40	644.40		638.60	638.60
Wet mass	g	1166.1	1239.0	1239.0	1235.1	1235.1		1229.3	1229.3
Dry mass	g	956.1	956.1	956.1	956.1	956.1		956.1	956.1
Moisture content	%	22.0	29.6	29.6	29.2	29.2		28.6	28.6
Bulk density	Mg/m³	1.79	1.91	1.91	1.92	1.92		1.92	1.92
Dry density	Mg/m³	1.47	1.47	1.47	1.48	1.48		1.50	1.50
Void ratio		0.81	0.80	0.80	0.79	0.79		0.77	0.77
Degree of saturation	%	72.1	98.4	98.4	98.4	98.4		98.3	98.3
Saturation Stage									
**Volume change of water	cm³	76.7							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	264.4			274.4			306.5	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	3.8			3.9			5.8	
m_{vi}	m²/MN	0.30			0.20			0.15	
t_{50}	min	0.15			0.19			0.21	
c_{vi} (from t_{50})	m²/yr	30101.54			22826.60			19550.27	
t_{100}	min	0.49			0.49			0.49	
c_{vi} (from t_{100})	m²/yr	18111.81			18370.67			18739.75	
Sketch of failed specimen (Failure Mode)								 Plastic	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by :

~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 03 FEB 2010

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HOKLAS 015

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

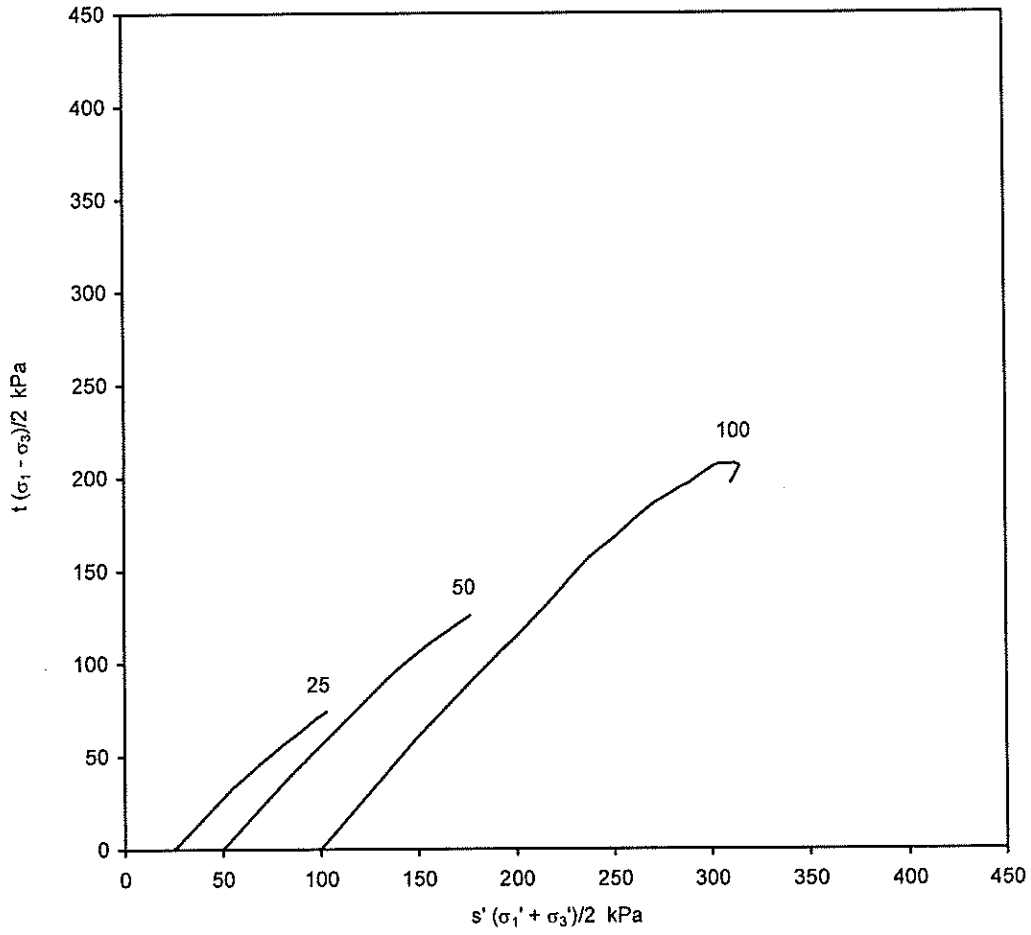
Client sample No. : -
Borehole No. : D274
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90276/4
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	25	1.6	1.6	242.2	142.1	98.9	71.1
2	50	2.3	4.3	245.0	246.7	173.4	123.4
3	100	5.5	10.2	240.5	414.1	311.5	207.0



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

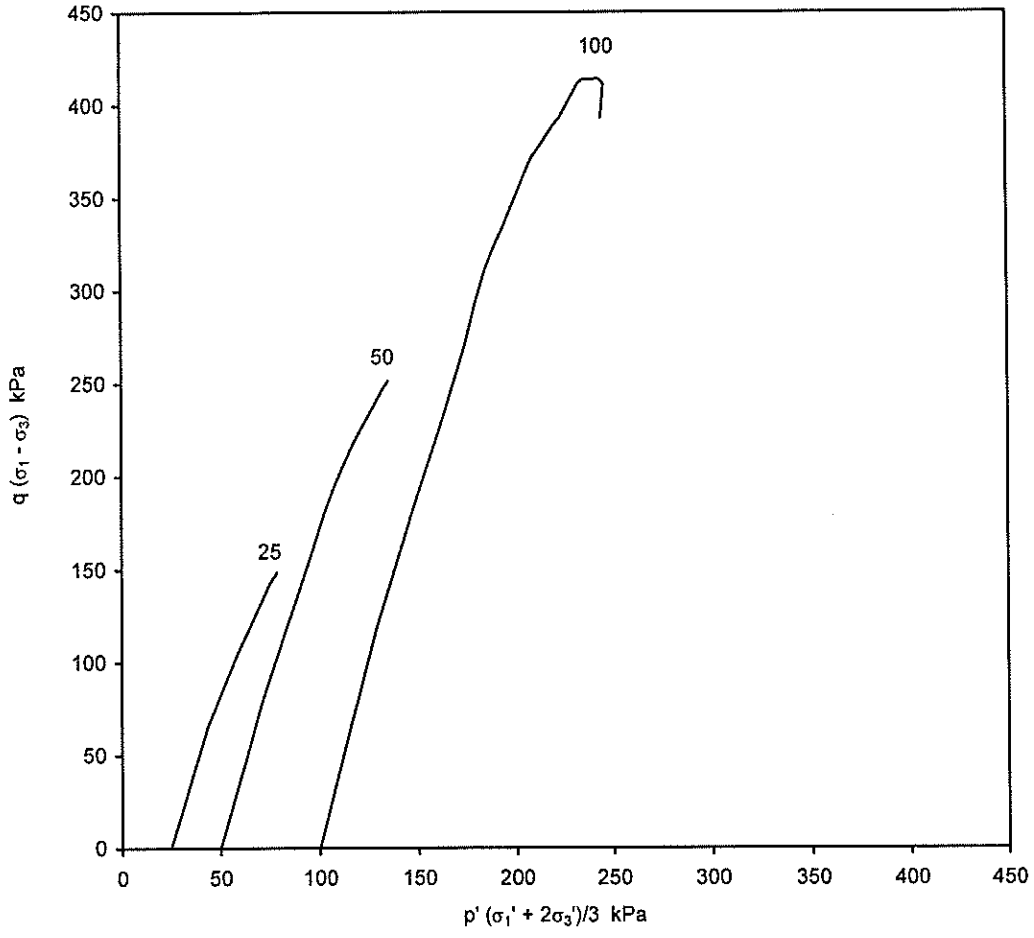
Client sample No. : -
Borehole No. : D274
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90276/4
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	25	1.6	1.6	242.2	142.1	75.2	142.1
2	50	2.3	4.3	245.0	246.7	132.2	246.7
3	100	5.5	10.2	240.5	414.1	242.5	414.1



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HOKLAS 015

STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

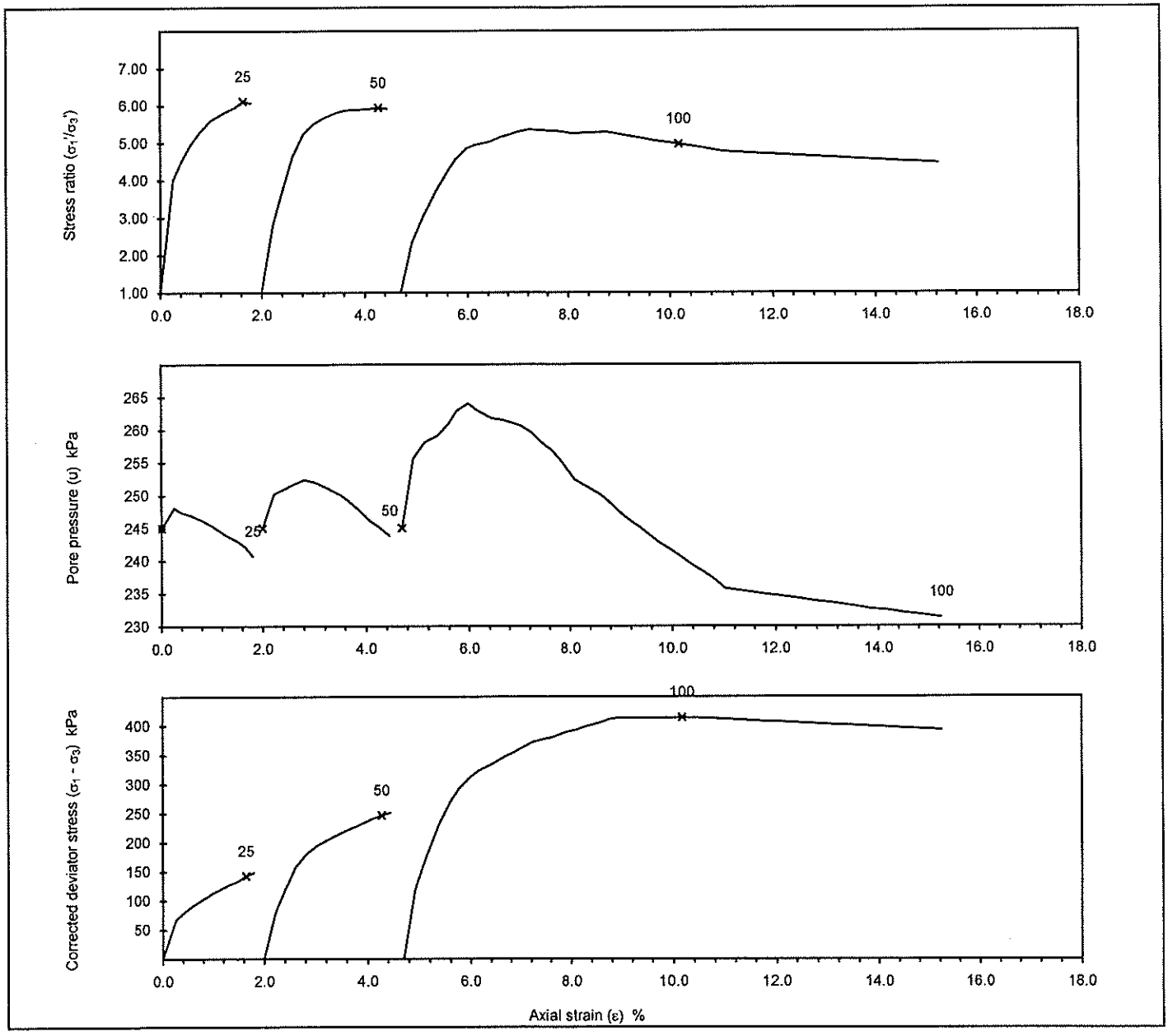
Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D274
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90276/4
Specimen ref. : A



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HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D274
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90276/4
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	25	
	Stage 2	kPa	50	
	Stage 3	kPa	100	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			125	120
			150	145
			175	170
			200	195
			225	220
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		0.98
Volume change	cm^3	76.7

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1226.8
Final moisture content	%	28.3
Final bulk density	Mg/m^3	1.92

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

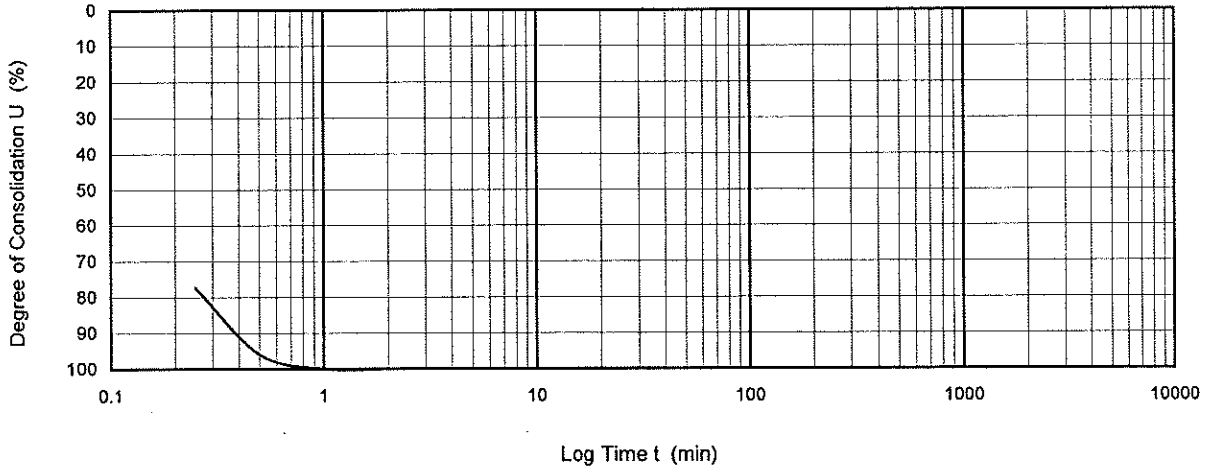
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D274
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Cell pressure	:	270 kPa	Lab. sample I.D.	:	SL90276/4
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	25 kPa			

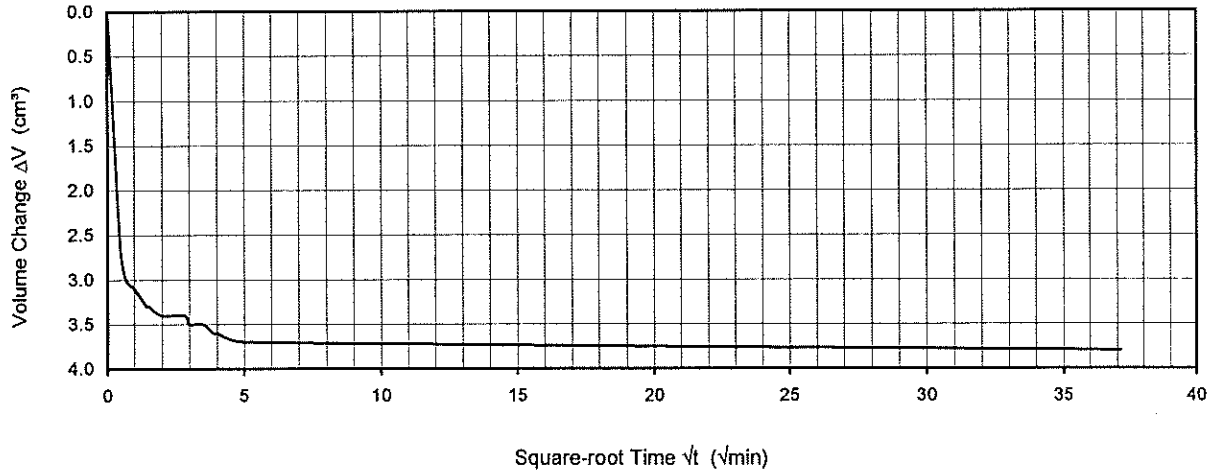
Degree of Consolidation vs. Log Time

t_{50} = 0.15 min ΔV = 3.8 cm³



Volume Change vs. Square-root Time

t_{100} = 0.49 min



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HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

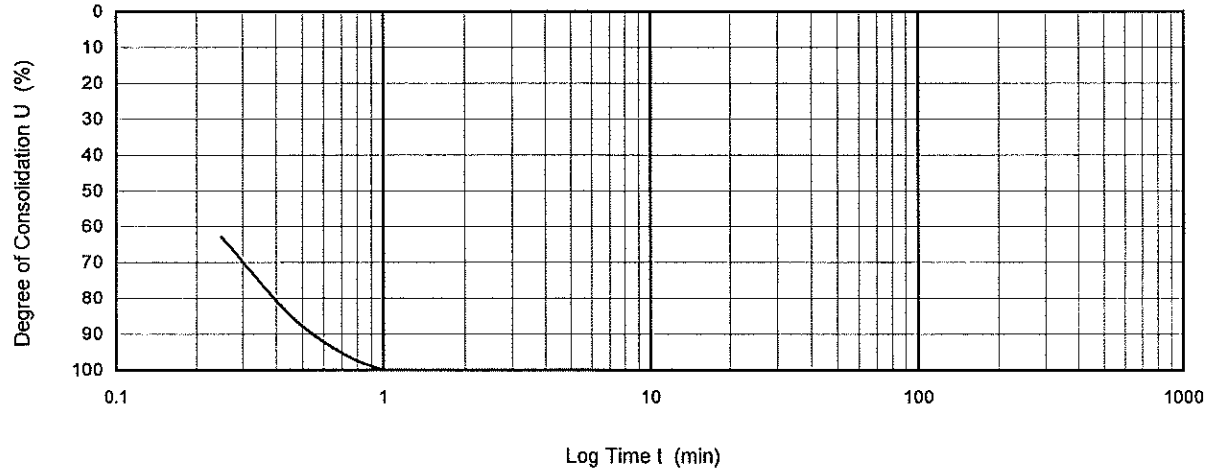
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D274
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Cell pressure	:	295 kPa	Lab. sample I.D.	:	SL90276/4
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	50 kPa			

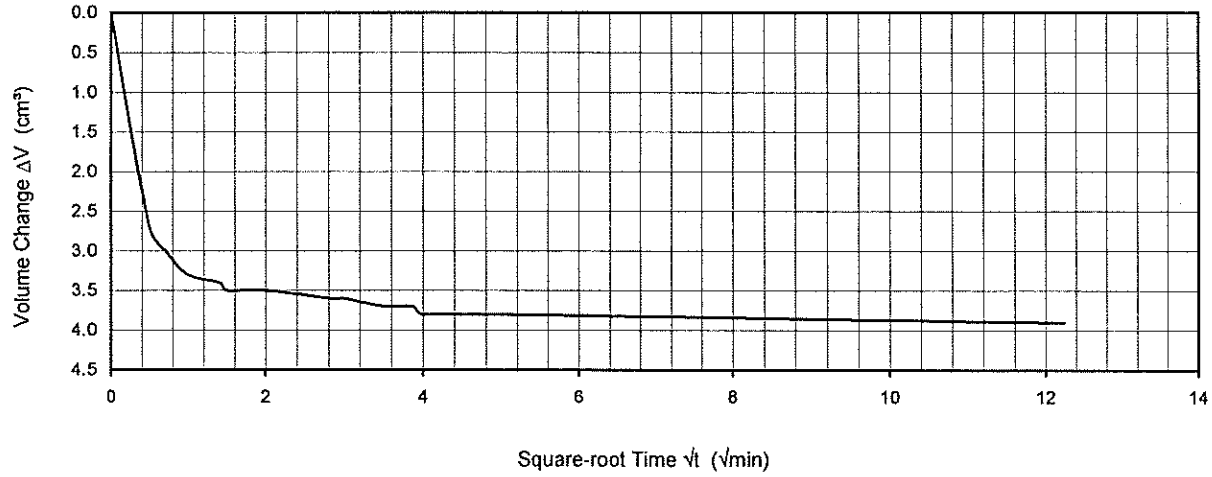
Degree of Consolidation vs. Log Time

t_{50} = 0.19 min ΔV = 3.9 cm³



Volume Change vs. Square-root Time

t_{100} = 0.49 min



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HOKLAS 015

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

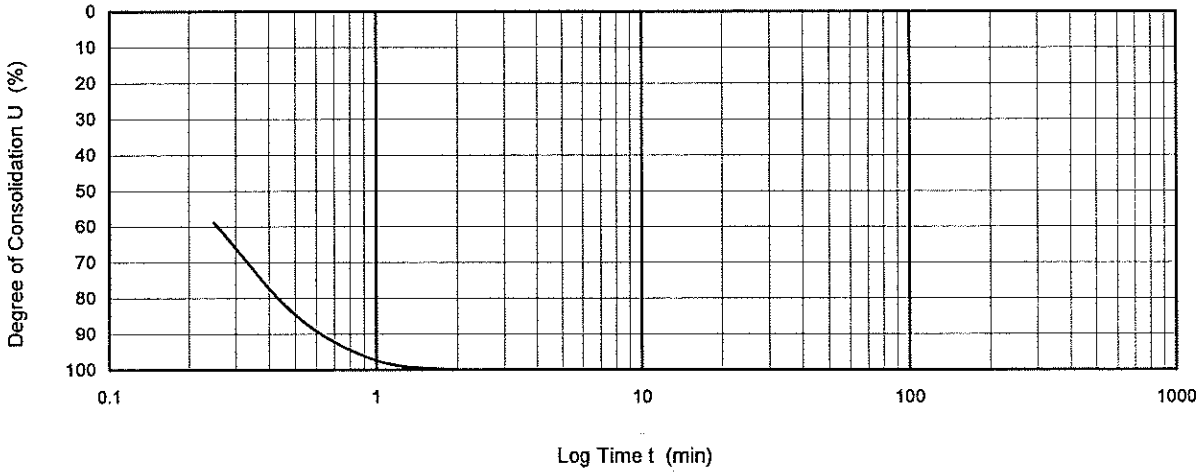
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D274
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Cell pressure	:	345 kPa	Lab. sample I.D.	:	SL90276/4
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	100 kPa			

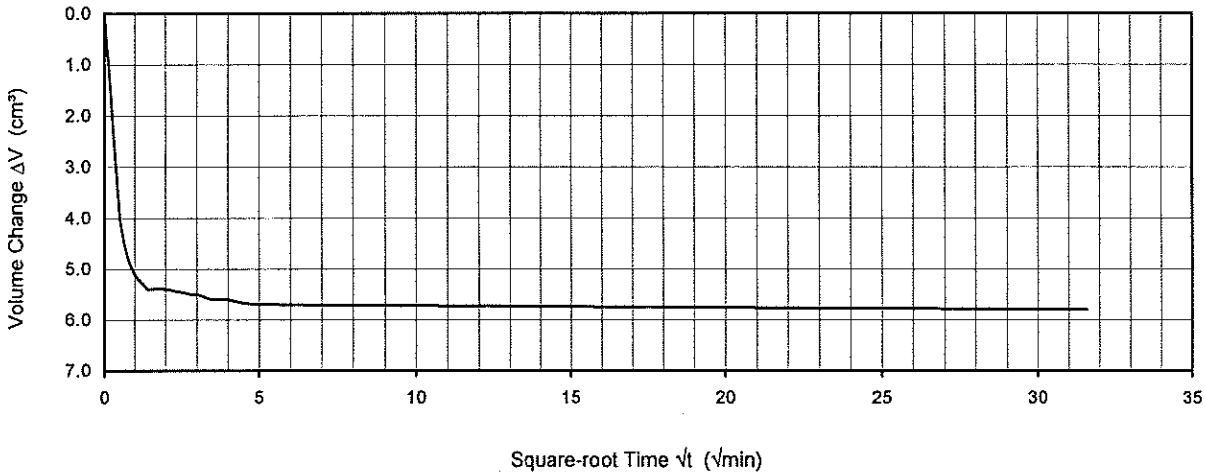
Degree of Consolidation vs. Log Time

t_{50} = 0.21 min ΔV = 5.8 cm³



Volume Change vs. Square-root Time

t_{100} = 0.49 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D274
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Date shearing commenced	:	19/01/2010	Time :	09:00				
Date shearing completed	:	19/01/2010	Time :	10:29	Lab. sample I.D.	:	SL90276/4	
Proving ring serial No.	:	5345			Specimen ref.	:	A	
Type of membrane	:	rubber			Cell pressure	:	270	kPa
Corrections					Back pressure	:	245	kPa
*Side drain, σ_{dr}	:	0.000	kPa/%		Effective pressure	:	25	kPa
Membrane thickness, σ_{mb}	:	0.66	mm		Dimensions at starting of compression			
Rate of axial displacement	:	0.050	mm/min		Volume V_c	:	648.30	cm^3
Pore pressure coefficient, A_f	:	-0.02			Area A_c	:	4318.9	mm^2
					Length L_c	:	150.1	mm

Pore pressure u	Axial gauge reading	Proving ring reading	Axial force	Axial strain ε	ε_c	Side drain correction σ_{dr}	Membrane correction σ_{mb}	Corr. Dev. stress σ_1-σ_3	s'	t	p'	q	Stress ratio σ_1'/σ_3'	
kPa	div	div	N	%	%	kPa	kPa	kPa	kPa	kPa	kPa	kPa		
245.0	0	0.308	114.9	0.0	0.0	0.00	0.00	0.0	25.0	0.0	25.0	0.0	1.00	
248.1	37	1.075	401.0	0.2	0.2	0.00	0.06	66.0	54.9	33.0	43.9	66.0	4.01	
247.4	60	1.221	455.4	0.4	0.4	0.00	0.10	78.4	61.8	39.2	48.7	78.4	4.47	
246.9	90	1.374	512.5	0.6	0.6	0.00	0.16	91.4	68.8	45.7	53.6	91.4	4.95	
246.2	120	1.508	562.5	0.8	0.8	0.00	0.21	102.6	75.1	51.3	58.0	102.6	5.31	
245.4	150	1.635	609.8	1.0	1.0	0.00	0.26	113.2	81.2	56.6	62.3	113.2	5.60	
243.9	192	1.787	666.5	1.3	1.3	0.00	0.33	125.8	89.0	62.9	68.0	125.8	5.82	
243.0	224	1.886	703.5	1.5	1.5	0.00	0.38	133.9	93.9	66.9	71.6	133.9	5.96	
242.2	246	1.986	740.8	1.6	1.6	0.00	0.41	142.1	98.9	71.1	75.2	142.1	6.11	«
240.7	270	2.064	769.9	1.8	1.8	0.00	0.45	148.5	103.5	74.2	78.8	148.5	6.07	

Final volume (cm^3): 648.30 Final length (mm): 147.4 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D274
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Date shearing commenced : 19/01/2010 Time : 13:30
Date shearing completed : 19/01/2010 Time : 15:43
Proving ring serial No. : 5345
Type of membrane : rubber
Corrections
*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : 0.00

Lab. sample I.D. : SL90276/4
Specimen ref. : A
Cell pressure : 295 kPa
Back pressure : 245 kPa
Effective pressure : 50 kPa
Dimensions at starting of compression
Volume V_c : 644.40 cm^3
Area A_c : 4380.4 mm^2
Length L_c : 147.1 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.330	123.1	0.0	2.0	0.00	0.50	0.0	50.0	0.0	50.0	0.0	1.00	
250.2	33	1.279	477.1	0.2	2.2	0.00	0.55	80.1	84.8	40.0	71.5	80.1	2.79	
250.9	60	1.736	647.5	0.4	2.4	0.00	0.59	118.6	103.4	59.3	83.6	118.6	3.69	
251.7	90	2.206	822.8	0.6	2.6	0.00	0.64	158.1	122.4	79.1	96.0	158.1	4.65	
252.4	120	2.469	920.9	0.8	2.8	0.00	0.69	180.0	132.6	90.0	102.6	180.0	5.22	
252.0	150	2.638	984.0	1.0	3.0	0.00	0.73	193.8	139.9	96.9	107.6	193.8	5.51	
251.2	182	2.776	1035.4	1.2	3.2	0.00	0.78	204.9	146.3	102.5	112.1	204.9	5.68	
250.1	221	2.922	1089.9	1.5	3.5	0.00	0.84	216.6	153.2	108.3	117.1	216.6	5.82	
249.2	244	3.005	1120.9	1.7	3.7	0.00	0.87	223.1	157.4	111.6	120.2	223.1	5.87	
247.6	277	3.115	1161.9	1.9	3.9	0.00	0.92	231.8	163.3	115.9	124.7	231.8	5.89	
246.0	308	3.229	1204.4	2.1	4.1	0.00	0.96	240.7	169.4	120.4	129.2	240.7	5.91	
245.0	335	3.307	1233.5	2.3	4.3	0.00	1.00	246.7	173.4	123.4	132.2	246.7	5.93	«
243.8	362	3.368	1256.2	2.5	4.5	0.00	1.04	251.3	176.8	125.6	135.0	251.3	5.91	

Final volume (cm^3): 644.40 Final length (mm): 143.5 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D274
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Date shearing commenced : 20/01/2010 Time : 09:00
Date shearing completed : 20/01/2010 Time : 14:24
Proving ring serial No. : 12202
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.66 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.01

Lab. sample I.D. : SL90276/4
Specimen ref. : A
Cell pressure : 345 kPa
Back pressure : 245 kPa
Effective pressure : 100 kPa

Dimensions at starting of compression

Volume V_c : 638.60 cm^3
Area A_c : 4463.9 mm^2
Length L_c : 143.1 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
245.0	0	0.086	149.8	0.0	4.7	0.00	1.09	0.0	100.0	0.0	100.0	0.0	1.00
255.6	32	0.394	686.4	0.2	4.9	0.00	1.13	118.8	148.8	59.4	129.0	118.8	2.33
258.1	65	0.549	956.4	0.5	5.1	0.00	1.18	178.7	176.2	89.3	146.5	178.7	3.06
259.1	99	0.689	1200.3	0.7	5.4	0.00	1.22	232.5	202.1	116.2	163.4	232.5	3.71
260.9	129	0.787	1371.1	0.9	5.6	0.00	1.27	269.9	219.0	134.9	174.1	269.9	4.21
262.9	153	0.845	1472.1	1.1	5.8	0.00	1.30	291.8	228.0	145.9	179.4	291.8	4.55
264.0	185	0.899	1566.2	1.3	6.0	0.00	1.34	311.9	236.9	155.9	185.0	311.9	4.85
263.0	210	0.930	1620.2	1.5	6.2	0.00	1.37	323.2	243.6	161.6	189.7	323.2	4.94
261.8	250	0.964	1679.4	1.7	6.4	0.00	1.42	335.3	250.8	167.6	195.0	335.3	5.03
261.5	282	0.996	1735.2	2.0	6.7	0.00	1.46	346.7	256.8	173.3	199.1	346.7	5.15
261.1	309	1.018	1773.5	2.2	6.9	0.00	1.50	354.4	261.1	177.2	202.0	354.4	5.22
260.7	332	1.040	1811.8	2.3	7.0	0.00	1.53	362.2	265.4	181.1	205.0	362.2	5.30
259.6	364	1.068	1860.6	2.5	7.2	0.00	1.57	371.9	271.4	186.0	209.4	371.9	5.36
258.3	390	1.081	1883.3	2.7	7.4	0.00	1.60	376.1	274.8	188.1	212.1	376.1	5.34
257.0	420	1.094	1905.9	2.9	7.6	0.00	1.63	380.2	278.1	190.1	214.7	380.2	5.32
254.8	454	1.118	1947.7	3.2	7.9	0.00	1.67	388.3	284.4	194.2	219.6	388.3	5.30
252.4	486	1.133	1973.9	3.4	8.1	0.00	1.71	393.0	289.1	196.5	223.6	393.0	5.24
251.3	520	1.154	2010.5	3.6	8.3	0.00	1.75	399.9	293.7	200.0	227.0	399.9	5.27
250.2	556	1.172	2041.8	3.9	8.6	0.00	1.79	405.6	297.6	202.8	230.0	405.6	5.28
249.0	582	1.190	2073.2	4.1	8.8	0.00	1.82	411.5	301.8	205.8	233.2	411.5	5.29
247.8	604	1.196	2083.6	4.2	8.9	0.00	1.85	413.1	303.7	206.5	234.9	413.1	5.25
246.5	632	1.200	2090.6	4.4	9.1	0.00	1.88	413.7	305.3	206.8	236.4	413.7	5.20
245.2	666	1.203	2095.8	4.7	9.4	0.00	1.92	413.7	306.7	206.9	237.7	413.7	5.15
244.0	694	1.205	2099.3	4.9	9.5	0.00	1.95	413.6	307.8	206.8	238.9	413.6	5.09
242.8	722	1.208	2104.5	5.0	9.7	0.00	1.98	413.8	309.1	206.9	240.1	413.8	5.05
241.6	756	1.211	2109.8	5.3	10.0	0.00	2.01	413.8	310.3	206.9	241.3	413.8	5.00
240.5	784	1.214	2115.0	5.5	10.2	0.00	2.04	414.1	311.5	207.0	242.5	414.1	4.96
239.4	812	1.216	2118.5	5.7	10.4	0.00	2.07	413.9	312.6	207.0	243.6	413.9	4.92
238.2	846	1.217	2120.2	5.9	10.6	0.00	2.11	413.2	313.4	206.6	244.5	413.2	4.87
237.0	877	1.217	2120.2	6.1	10.8	0.00	2.14	412.2	314.1	206.1	245.4	412.2	4.82
235.7	904	1.217	2120.2	6.3	11.0	0.00	2.17	411.3	315.0	205.7	246.4	411.3	4.76
235.3	956	1.217	2120.2	6.7	11.4	0.00	2.22	409.7	314.5	204.8	246.3	409.7	4.73
234.9	1008	1.217	2120.2	7.0	11.7	0.00	2.27	408.0	314.1	204.0	246.1	408.0	4.71
234.6	1056	1.218	2122.0	7.4	12.1	0.00	2.32	406.9	313.8	203.4	246.0	406.9	4.69

Final volume (cm^3): 638.60 Final length (mm): 128.0 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D274
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90276/4
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
234.2	1112	1.218	2122.0	7.8	12.5	0.00	2.38	405.1	313.3	202.5	245.8	405.1	4.66
233.8	1156	1.218	2122.0	8.1	12.8	0.00	2.42	403.7	313.0	201.8	245.8	403.7	4.63
233.5	1204	1.218	2122.0	8.4	13.1	0.00	2.46	402.1	312.6	201.1	245.5	402.1	4.61
233.1	1255	1.219	2123.7	8.8	13.5	0.00	2.51	400.9	312.3	200.4	245.5	400.9	4.58
232.6	1308	1.219	2123.7	9.1	13.8	0.00	2.56	399.2	312.0	199.6	245.5	399.2	4.55
232.4	1356	1.219	2123.7	9.5	14.2	0.00	2.61	397.7	311.4	198.8	245.2	397.7	4.53
232.0	1402	1.219	2123.7	9.8	14.5	0.00	2.65	396.2	311.1	198.1	245.1	396.2	4.51
231.7	1454	1.219	2123.7	10.2	14.9	0.00	2.70	394.5	310.6	197.3	244.8	394.5	4.48
231.3	1510	1.220	2125.4	10.6	15.3	0.00	2.75	393.1	310.3	196.6	244.7	393.1	4.46

Final volume (cm^3): 638.60 Final length (mm): 128.0 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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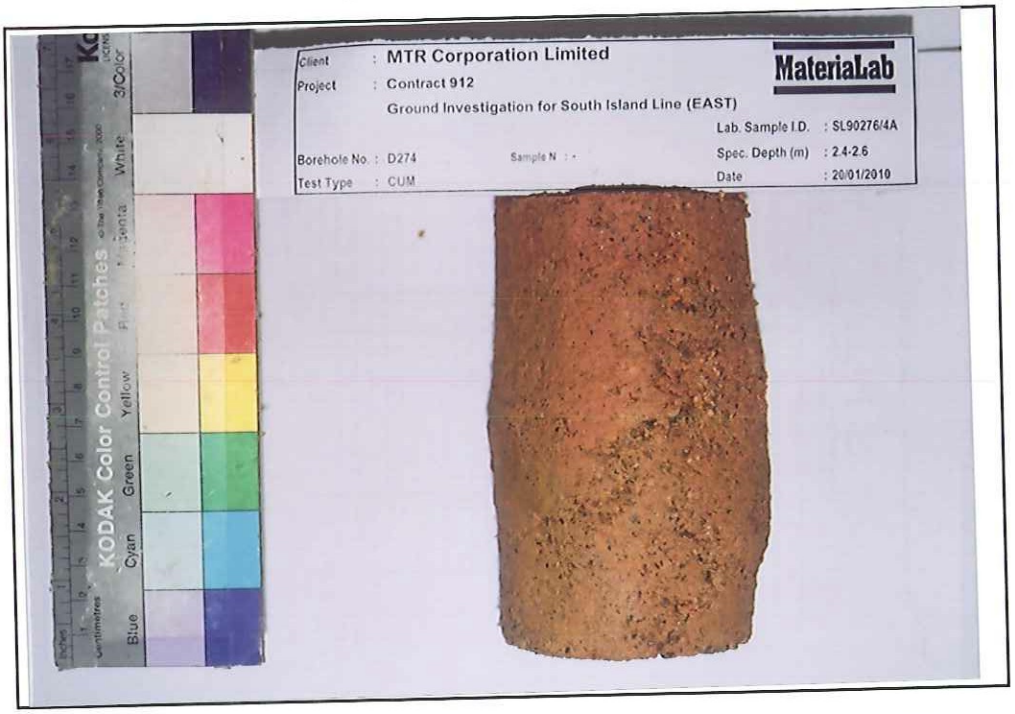
Photographic Records for Triaxial Test



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SUMMARY OF TEST

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D275(P)
Depth(m) From : 2.00
To : 3.00
Sample origin : FILL
Soil description : -

Laboratory Information

Date sample received : 30-12-2009
Date test(s) commenced : 15-01-2010
Date test(s) completed : 21-01-2010
Test method used : Geospec 3 (November 2001) Test Method 15.2
Method of preparation : Cylindrical specimen from sample tube of the same internal diameter as the required specimen
Selection of specimen by : W.Y. Lo Designation : Technician II
Moisture content test method : Geospec 3 (November 2001) Test Method 5.1
Particle density Mg/m³ : 2.65 (Assumed)
Temperature range at test(s) : Maximum : 23.5 °C Minimum : 17.5 °C
Visual description : Moist, dark brown spotted with orangish, mottled with dark grey, very silty/clayey, slightly gravelly SAND.

Lab. sample I.D. : SL90276/5
Sample type : M
Specimen reference : A
Specimen depth (m)
From : 2.40
To : 2.60
Affiliation : FTS Ltd. - MateriaLab Division

Stage No.		1			2			3	
Effective pressure	kPa	25			50			100	
*Measurements and Calculations		Initial	End of consolidation	Final	End of consolidation	Final		End of consolidation	Final
Diameter	mm	74.4	74.2	75.2	75.0	75.8		75.6	80.6
Length	mm	150.4	150.1	146.2	145.7	142.3		141.8	124.8
Volume	cm³	653.86	649.66	649.66	642.76	642.76		636.96	636.96
Wet mass	g	1326.8	1338.9	1338.9	1332.0	1332.0		1326.2	1326.2
Dry mass	g	1115.1	1115.1	1115.1	1115.1	1115.1		1115.1	1115.1
Moisture content	%	19.0	20.1	20.1	19.5	19.5		18.9	18.9
Bulk density	Mg/m³	2.03	2.06	2.06	2.07	2.07		2.08	2.08
Dry density	Mg/m³	1.71	1.72	1.72	1.73	1.73		1.75	1.75
Void ratio		0.55	0.54	0.54	0.53	0.53		0.51	0.51
Degree of saturation	%	90.8	97.8	97.8	97.7	97.7		97.7	97.7
Saturation Stage									
**Volume change of water	cm³	16.3							
Consolidation Stage									
Side drain used		No			-			-	
Initial pore pressure	kPa	264.6			285.9			321.9	
Final pore pressure	kPa	245.0			245.0			245.0	
Volume of water drained out	cm³	4.2			6.9			5.8	
m_{vi}	m²/MN	0.33			0.26			0.12	
t_{50}	min	39.00			49.00			39.00	
c_{vi} (from t_{50})	m²/yr	115.75			86.91			103.50	
t_{100}	min	90.25			156.25			90.25	
c_{vi} (from t_{100})	m²/yr	98.85			58.28			102.63	
Sketch of failed specimen (Failure Mode)								Plastic	

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)

Remarks: * - The calculations are deduced from the initial wet mass of the specimen and the measured volume changes.
** - Positive means water taken in by the specimen whereas negative means water draining out from it.
NA - The calculation was omitted as side drain was used.

Tested by : W.Y. Lo

Certified by :

~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 03 FEB 2010

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

s' - t STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

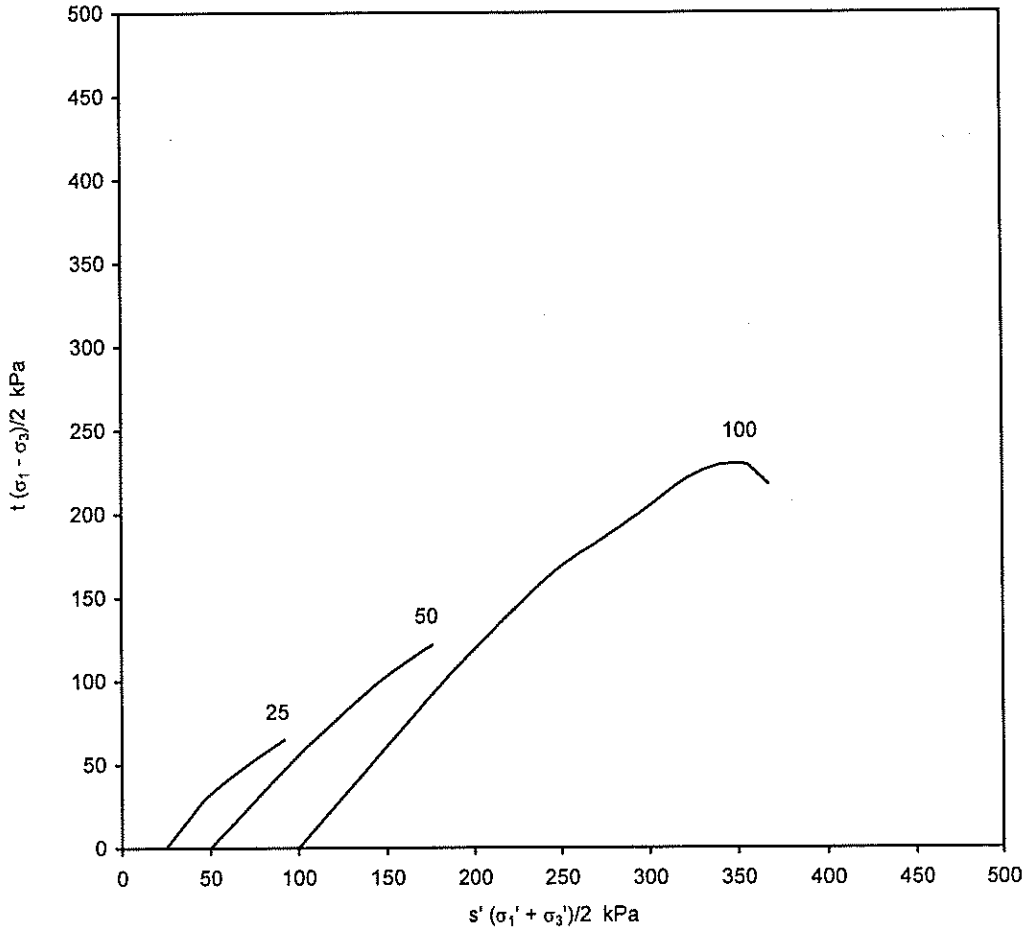
Client sample No. : -
Borehole No. : D275(P)
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90276/5
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	s' kPa	t kPa
1	25	2.4	2.4	243.8	124.4	88.4	62.2
2	50	2.1	5.1	241.9	238.6	172.4	119.3
3	100	6.6	12.1	223.7	459.8	351.2	229.9



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

p' - q STRESS PATH PLOT

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

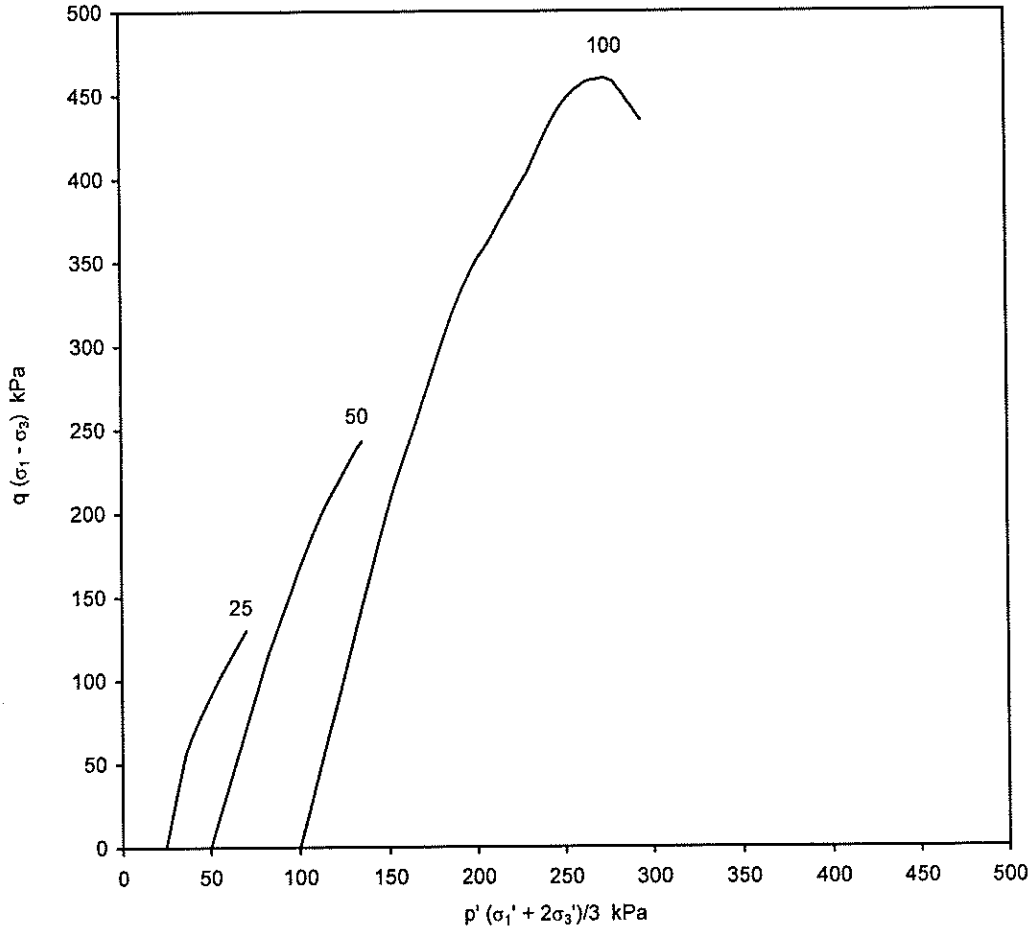
Client sample No. : -
Borehole No. : D275(P)
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90276/5
Specimen ref. : A

Test Results at Failure

Stage No.	Effective stress kPa	Axial strain %	Cum. Axial strain %	Pore pressure kPa	Corr. Dev. stress kPa	p' kPa	q kPa
1	25	2.4	2.4	243.8	124.4	67.7	124.4
2	50	2.1	5.1	241.9	238.6	132.6	238.6
3	100	6.6	12.1	223.7	459.8	274.6	459.8



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

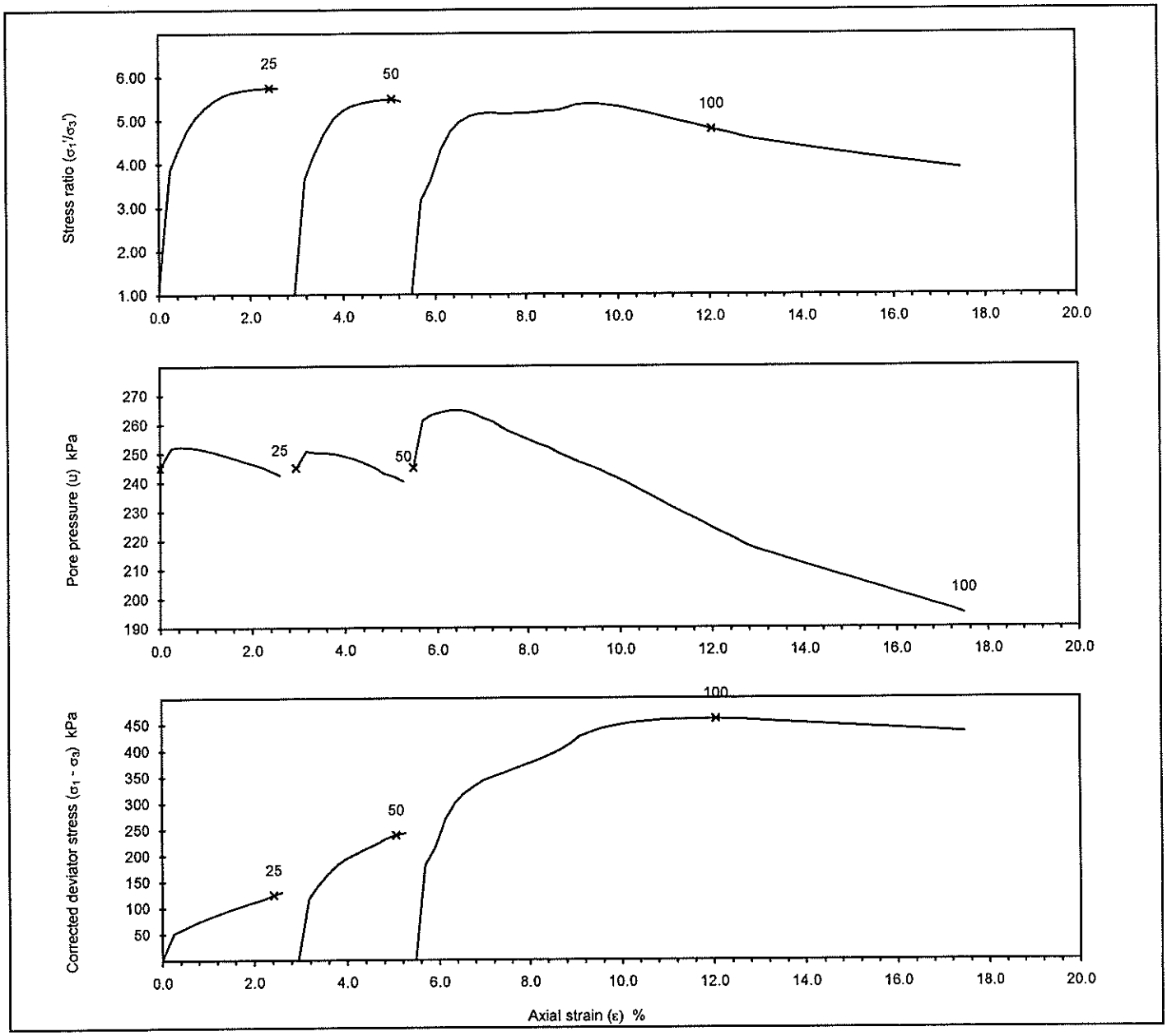
STRESS RATIO, PORE PRESSURE AND CORRECTED DEVIATOR STRESS VS. AXIAL STRAIN PLOTS

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D275(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Lab. sample I.D.	:	SL90276/5
Specimen ref.	:	A



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

SATURATION STAGE

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D275(P)
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90276/5
Specimen ref. : A

Sequence of pressure increment

Effective pressure	Stage 1	kPa	25	
	Stage 2	kPa	50	
	Stage 3	kPa	100	
Applied pressure			Cell pressure kPa	Back pressure kPa
			25	20
			50	45
			75	70
			100	95
			125	120
			150	145
			175	170
			200	195
			225	220
			250	245

End of Saturation

Cell pressure	kPa	250
Back pressure	kPa	245
Pore pressure	kPa	245.0
B value		0.98
Volume change	cm^3	16.3

For remoulded specimen(s)

Method of drying		
Drying temperature		
Method of remoulding		
Target dry density	Mg/m^3	
Target moisture content	%	

After completion of test(s)

The percentage by mass of particles of sizes larger than Diameter/5 (If found within the test specimen(s))

Retained on sieve of size	mm	-		
Mass of particles	g	-		
Percentage retained	%	-		

Final wet mass of the specimen	g	1324.2
Final moisture content	%	18.8
Final bulk density	Mg/m^3	2.08

Remarks: Final moisture content and final bulk density are deduced from the final wet mass of the specimen.

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

CONSOLIDATION STAGE

Information supplied by Client

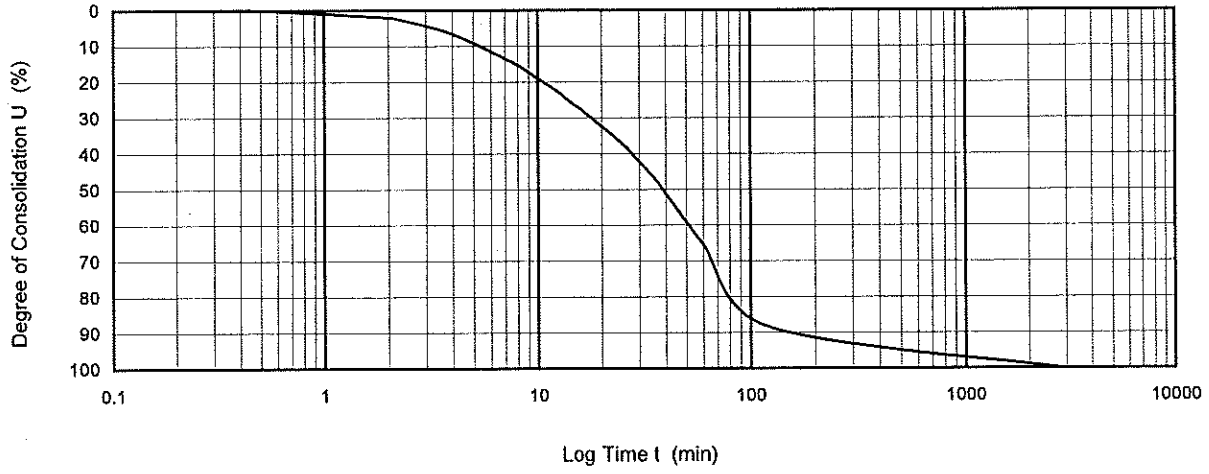
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D275(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Cell pressure	:	270 kPa	Lab. sample I.D.	:	SL90276/5
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	25 kPa			

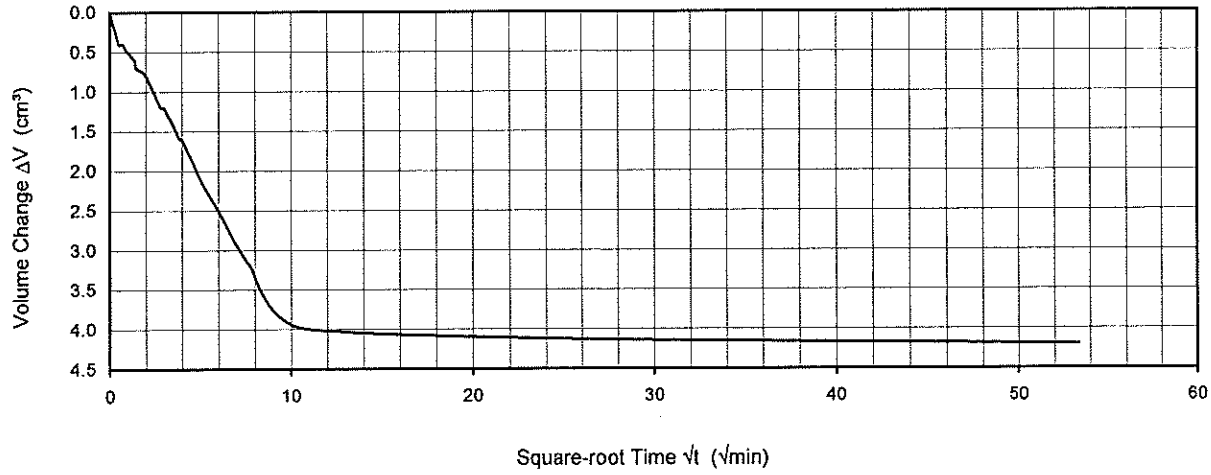
Degree of Consolidation vs. Log Time

t_{50} = 39.00 min ΔV = 4.2 cm³



Volume Change vs. Square-root Time

t_{100} = 90.25 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

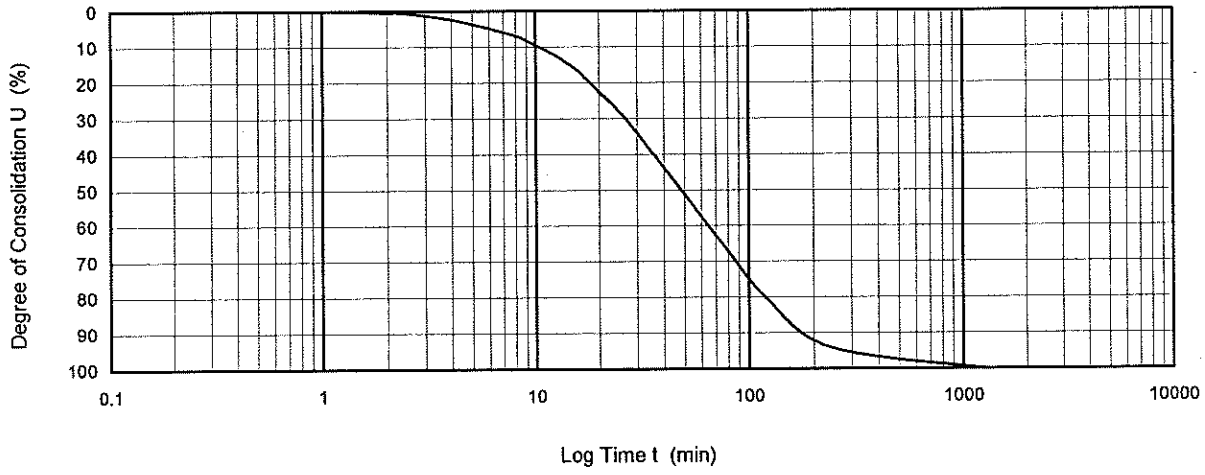
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D275(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Cell pressure	:	295 kPa	Lab. sample I.D.	:	SL90276/5
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	50 kPa			

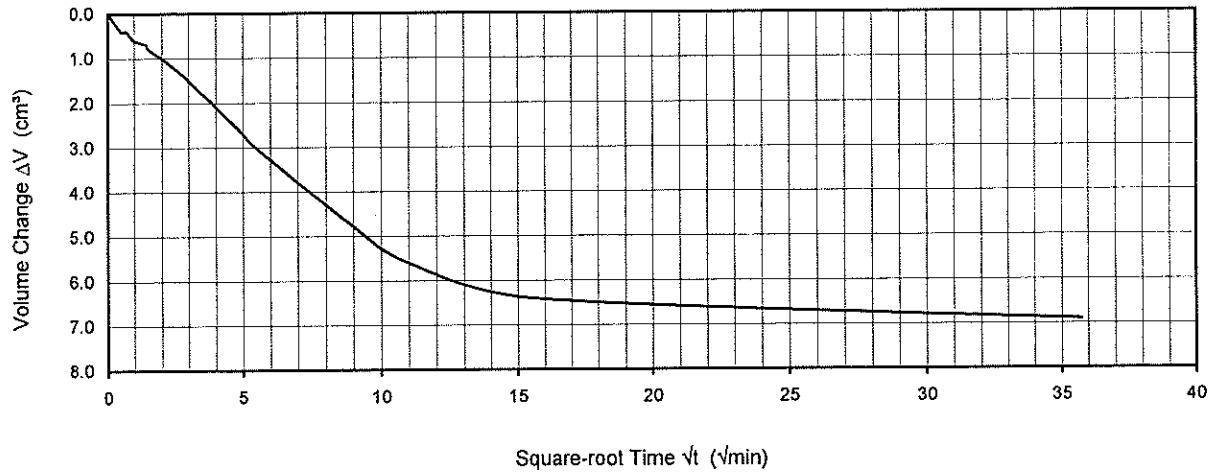
Degree of Consolidation vs. Log Time

t_{50} = 49.00 min ΔV = 6.9 cm³



Volume Change vs. Square-root Time

t_{100} = 156.25 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

CONSOLIDATION STAGE

Information supplied by Client

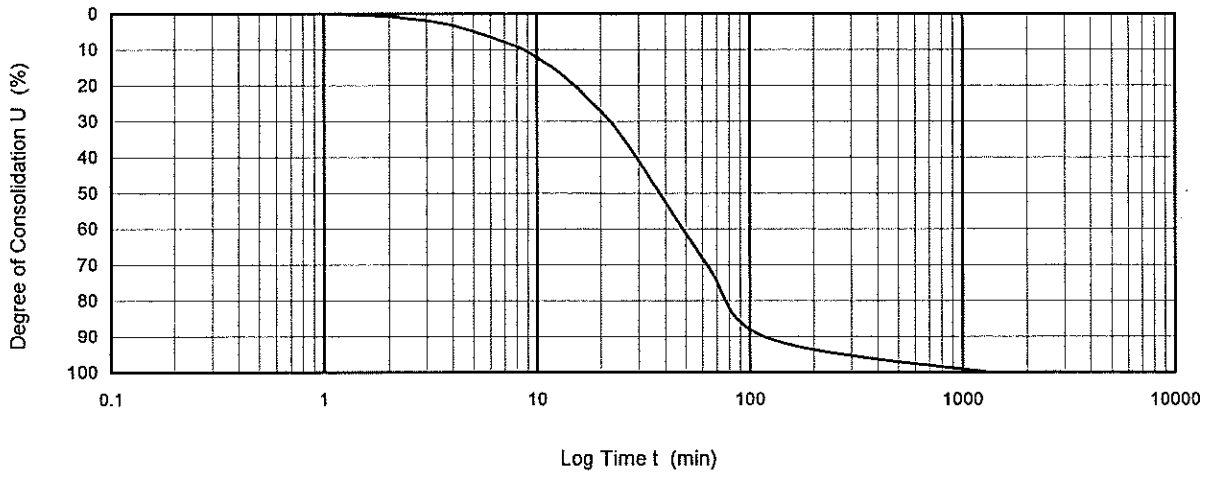
Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D275(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Cell pressure	:	345 kPa	Lab. sample I.D.	:	SL90276/5
Back pressure	:	245 kPa	Specimen ref.	:	A
Effective pressure	:	100 kPa			

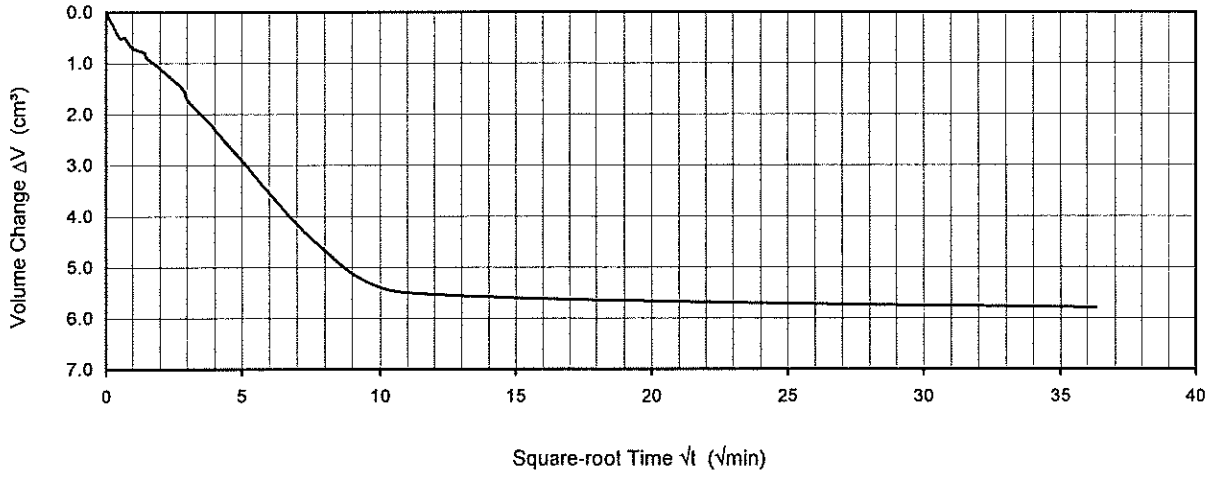
Degree of Consolidation vs. Log Time

t_{50} = 39.00 min ΔV = 5.8 cm³



Volume Change vs. Square-root Time

t_{100} = 90.25 min



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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE **STAGE NO. 1**

Information supplied by Client

Client	:	MTR Corporation Limited	Client sample No.	:	-
Project	:	Contract 912	Borehole No.	:	D275(P)
		Ground Investigation for South Island Line (EAST)	Depth(m) From	:	2.00
			To	:	3.00

Laboratory Information

Date shearing commenced	:	18/01/2010	Time :	09:30				
Date shearing completed	:	18/01/2010	Time :	11:04	Lab. sample I.D.	:	SL90276/5	
Proving ring serial No.	:	14654			Specimen ref.	:	A	
Type of membrane	:	rubber			Cell pressure	:	270	kPa
Corrections					Back pressure	:	245	kPa
*Side drain, σ_{dr}	:	0.000	kPa/%		Effective pressure	:	25	kPa
Membrane thickness, σ_{mb}	:	0.64	mm		Dimensions at starting of compression			
Rate of axial displacement	:	0.050	mm/min		Volume V_c	:	649.66	cm^3
Pore pressure coefficient, A_f	:	-0.01			Area A_c	:	4328.8	mm^2
					Length L_c	:	150.1	mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.174	119.5	0.0	0.0	0.00	0.00	0.0	25.0	0.0	25.0	0.0	1.00	
251.9	38	0.503	345.5	0.3	0.3	0.00	0.06	52.0	44.1	26.0	35.4	52.0	3.87	
252.4	61	0.541	371.6	0.4	0.4	0.00	0.10	57.9	46.5	28.9	36.9	57.9	4.29	
252.3	92	0.596	409.3	0.6	0.6	0.00	0.15	66.4	50.9	33.2	39.8	66.4	4.75	
251.8	121	0.644	442.3	0.8	0.8	0.00	0.20	73.8	55.1	36.9	42.8	73.8	5.05	
251.1	153	0.691	474.6	1.0	1.0	0.00	0.25	80.9	59.4	40.5	45.9	80.9	5.28	
250.3	183	0.735	504.8	1.2	1.2	0.00	0.30	87.6	63.5	43.8	48.9	87.6	5.45	
249.3	215	0.782	537.1	1.4	1.4	0.00	0.35	94.7	68.1	47.4	52.3	94.7	5.58	
248.5	240	0.815	559.8	1.6	1.6	0.00	0.39	99.7	71.3	49.8	54.7	99.7	5.64	
247.3	274	0.860	590.7	1.8	1.8	0.00	0.44	106.4	75.9	53.2	58.2	106.4	5.69	
246.4	303	0.893	613.3	2.0	2.0	0.00	0.49	111.3	79.2	55.6	60.7	111.3	5.72	
245.4	332	0.929	638.0	2.2	2.2	0.00	0.53	116.6	82.9	58.3	63.5	116.6	5.74	
243.8	363	0.981	673.8	2.4	2.4	0.00	0.58	124.4	88.4	62.2	67.7	124.4	5.75	«
242.6	390	1.019	699.9	2.6	2.6	0.00	0.62	130.0	92.4	65.0	70.7	130.0	5.74	

Final volume (cm^3): 649.66 Final length (mm): 146.2 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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MateriaLab

TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 2**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D275(P)
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Date shearing commenced : 19/01/2010 Time : 09:00
Date shearing completed : 19/01/2010 Time : 10:20
Proving ring serial No. : 12604
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.01

Lab. sample I.D. : SL90276/5
Specimen ref. : A
Cell pressure : 295 kPa
Back pressure : 245 kPa
Effective pressure : 50 kPa

Dimensions at starting of compression

Volume V_c : 642.76 cm^3
Area A_c : 4412.8 mm^2
Length L_c : 145.7 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.077	134.4	0.0	2.9	0.00	0.69	0.0	50.0	0.0	50.0	0.0	1.00	
250.7	33	0.376	656.4	0.2	3.2	0.00	0.74	117.3	102.9	58.6	83.4	117.3	3.65	
250.3	60	0.437	762.9	0.4	3.4	0.00	0.78	141.1	115.2	70.5	91.7	141.1	4.16	
250.2	93	0.498	869.4	0.6	3.6	0.00	0.83	164.7	127.1	82.3	99.7	164.7	4.68	
249.7	125	0.545	951.5	0.9	3.8	0.00	0.88	182.7	136.6	91.3	106.2	182.7	5.03	
249.0	152	0.574	1002.1	1.0	4.0	0.00	0.91	193.7	142.8	96.8	110.6	193.7	5.21	
248.2	180	0.597	1042.2	1.2	4.2	0.00	0.95	202.2	147.9	101.1	114.2	202.2	5.32	
246.7	213	0.624	1089.4	1.5	4.4	0.00	1.00	212.2	154.4	106.1	119.0	212.2	5.39	
244.6	256	0.657	1147.0	1.8	4.7	0.00	1.06	224.4	162.6	112.2	125.2	224.4	5.45	
243.0	276	0.678	1183.7	1.9	4.8	0.00	1.08	232.2	168.1	116.1	129.4	232.2	5.47	
241.9	308	0.696	1215.1	2.1	5.1	0.00	1.12	238.6	172.4	119.3	132.6	238.6	5.49	«
240.3	338	0.708	1236.0	2.3	5.3	0.00	1.16	242.7	176.0	121.3	135.6	242.7	5.44	

Final volume (cm^3): 642.76 Final length (mm): 142.3 Termination criterion : Maximum stress ratio

Remarks: * - for axial strain ≥ 2%
ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

HOKLAS 015

COMPRESSION STAGE **STAGE NO. 3**

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D275(P)
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Date shearing commenced : 20/01/2010 Time : 09:00
Date shearing completed : 20/01/2010 Time : 15:05
Proving ring serial No. : 12604
Type of membrane : rubber

Corrections

*Side drain, σ_{dr} : 0.000 kPa/%
Membrane thickness, σ_{mb} : 0.64 mm
Rate of axial displacement : 0.050 mm/min
Pore pressure coefficient, A_f : -0.05

Lab. sample I.D. : SL90276/5
Specimen ref. : A
Cell pressure : 345 kPa
Back pressure : 245 kPa
Effective pressure : 100 kPa
Dimensions at starting of compression
Volume V_c : 636.96 cm^3
Area A_c : 4490.4 mm^2
Length L_c : 141.8 mm

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress $\sigma_1-\sigma_3$ kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'	
245.0	0	0.090	157.1	0.0	5.5	0.00	1.20	0.0	100.0	0.0	100.0	0.0	1.00	
261.2	30	0.560	977.7	0.2	5.7	0.00	1.24	181.1	174.3	90.5	144.2	181.1	3.16	
263.2	60	0.643	1122.6	0.4	5.9	0.00	1.28	212.8	188.2	106.4	152.7	212.8	3.60	
264.2	92	0.790	1379.2	0.6	6.1	0.00	1.32	269.1	215.3	134.5	170.5	269.1	4.33	
264.9	124	0.875	1527.6	0.9	6.4	0.00	1.36	301.2	230.7	150.6	180.5	301.2	4.76	
264.8	150	0.918	1602.7	1.1	6.5	0.00	1.40	317.1	238.8	158.6	185.9	317.1	4.95	
263.8	186	0.961	1677.7	1.3	6.8	0.00	1.44	332.8	247.6	166.4	192.1	332.8	5.10	
262.2	214	0.990	1728.4	1.5	7.0	0.00	1.47	343.2	254.4	171.6	197.2	343.2	5.14	
260.7	250	1.016	1773.7	1.8	7.2	0.00	1.52	352.2	260.4	176.1	201.7	352.2	5.18	
258.8	276	1.032	1801.7	1.9	7.4	0.00	1.55	357.6	265.0	178.8	205.4	357.6	5.15	
257.3	300	1.048	1829.6	2.1	7.6	0.00	1.58	363.0	269.2	181.5	208.7	363.0	5.14	
256.1	330	1.068	1864.5	2.3	7.8	0.00	1.61	369.8	273.8	184.9	212.2	369.8	5.16	
254.4	364	1.090	1902.9	2.6	8.0	0.00	1.65	377.2	279.2	188.6	216.3	377.2	5.16	
253.1	392	1.109	1936.1	2.8	8.2	0.00	1.68	383.5	283.7	191.8	219.7	383.5	5.17	
251.8	425	1.135	1981.5	3.0	8.5	0.00	1.72	392.4	289.4	196.2	224.0	392.4	5.21	
249.7	456	1.164	2032.1	3.2	8.7	0.00	1.75	402.4	296.5	201.2	229.4	402.4	5.22	
248.3	488	1.198	2091.5	3.4	8.9	0.00	1.79	414.2	303.8	207.1	234.8	414.2	5.28	
246.9	512	1.234	2154.3	3.6	9.1	0.00	1.82	426.9	311.6	213.5	240.4	426.9	5.35	
245.6	546	1.257	2194.5	3.8	9.3	0.00	1.85	434.4	316.6	217.2	244.2	434.4	5.37	
244.1	578	1.278	2231.1	4.1	9.6	0.00	1.89	441.2	321.5	220.6	248.0	441.2	5.37	
242.7	604	1.290	2252.1	4.3	9.7	0.00	1.91	444.8	324.7	222.4	250.6	444.8	5.35	
241.3	633	1.302	2273.0	4.5	9.9	0.00	1.95	448.2	327.8	224.1	253.1	448.2	5.32	
239.5	666	1.314	2294.2	4.7	10.2	0.00	1.98	451.6	331.3	225.8	256.0	451.6	5.28	
237.7	694	1.322	2308.0	4.9	10.4	0.00	2.01	453.5	334.1	226.8	258.5	453.5	5.23	
235.9	726	1.330	2321.9	5.1	10.6	0.00	2.04	455.4	336.8	227.7	260.9	455.4	5.17	
234.1	755	1.338	2335.9	5.3	10.8	0.00	2.07	457.3	339.6	228.7	263.3	457.3	5.12	
232.3	783	1.343	2344.6	5.5	11.0	0.00	2.10	458.2	341.8	229.1	265.4	458.2	5.07	
230.5	815	1.347	2351.6	5.7	11.2	0.00	2.13	458.5	343.7	229.2	267.3	458.5	5.00	
228.8	846	1.351	2358.6	6.0	11.4	0.00	2.16	458.9	345.6	229.4	269.2	458.9	4.95	
227.1	878	1.355	2365.6	6.2	11.7	0.00	2.19	459.2	347.5	229.6	271.0	459.2	4.89	
225.4	904	1.359	2372.6	6.4	11.9	0.00	2.22	459.7	349.5	229.9	272.8	459.7	4.84	
223.7	932	1.362	2377.8	6.6	12.1	0.00	2.24	459.8	351.2	229.9	274.6	459.8	4.79	«
222.0	964	1.364	2381.3	6.8	12.3	0.00	2.28	459.4	352.7	229.7	276.1	459.4	4.73	
220.3	996	1.365	2383.0	7.0	12.5	0.00	2.31	458.6	354.0	229.3	277.6	458.6	4.68	

Final volume (cm^3): 636.96 Final length (mm): 124.8 Termination criterion : Maximum deviator stress

Remarks: * - for axial strain ≥ 2%

ε_c - cumulative axial strain

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TEST REPORT ON THE ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST WITH PORE PRESSURE MEASUREMENT - MULTI STAGE (CUM)

COMPRESSION STAGE (Continued) STAGE NO. 3

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D275(P)
Depth(m) From : 2.00
To : 3.00

Laboratory Information

Lab. sample I.D. : SL90276/5
Specimen ref. : A

Pore pressure u kPa	Axial gauge reading div	Proving ring reading div	Axial force N	Axial strain ε %	ε_c %	Side drain correction σ_{dr} kPa	Membrane correction σ_{mb} kPa	Corr. Dev. stress σ_1-σ_3 kPa	s' kPa	t kPa	p' kPa	q kPa	Stress ratio σ_1'/σ_3'
218.6	1020	1.366	2384.8	7.2	12.7	0.00	2.33	458.1	355.4	229.0	279.1	458.1	4.62
216.9	1056	1.366	2384.8	7.4	12.9	0.00	2.36	456.8	356.5	228.4	280.4	456.8	4.57
215.2	1108	1.366	2384.8	7.8	13.3	0.00	2.41	454.9	357.3	227.5	281.4	454.9	4.50
213.5	1156	1.366	2384.8	8.1	13.6	0.00	2.45	453.2	358.1	226.6	282.6	453.2	4.45
211.8	1204	1.367	2386.5	8.5	14.0	0.00	2.50	451.8	359.1	225.9	283.8	451.8	4.39
210.1	1253	1.367	2386.5	8.8	14.3	0.00	2.54	450.1	359.9	225.0	284.9	450.1	4.34
208.4	1302	1.367	2386.5	9.2	14.7	0.00	2.59	448.3	360.8	224.2	286.0	448.3	4.28
206.7	1356	1.367	2386.5	9.6	15.0	0.00	2.64	446.4	361.5	223.2	287.1	446.4	4.23
205.0	1404	1.367	2386.5	9.9	15.4	0.00	2.68	444.7	362.3	222.3	288.2	444.7	4.18
203.3	1455	1.368	2388.3	10.3	15.7	0.00	2.72	443.2	363.3	221.6	289.4	443.2	4.13
201.6	1500	1.368	2388.3	10.6	16.1	0.00	2.76	441.6	364.2	220.8	290.6	441.6	4.08
199.9	1556	1.368	2388.3	11.0	16.5	0.00	2.81	439.6	364.9	219.8	291.6	439.6	4.03
198.2	1603	1.368	2388.3	11.3	16.8	0.00	2.85	437.9	365.7	218.9	292.8	437.9	3.98
196.5	1654	1.368	2388.3	11.7	17.1	0.00	2.90	436.0	366.5	218.0	293.8	436.0	3.94
194.7	1700	1.369	2390.0	12.0	17.5	0.00	2.94	434.7	367.7	217.4	295.2	434.7	3.89

Final volume (cm^3): 636.96 Final length (mm): 124.8 Termination criterion : Maximum deviator stress

Remarks: ε_c - cumulative axial strain

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Photographic Records for Triaxial Test

APPENDIX J. ONE DIMENSIONAL CONSOLIDATION TEST

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MateriaLab

TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -

Borehole No. : D232
Depth(m) From : 7.60
To : -
Sample origin : MD
Description : -

Laboratory Information

Date sample received : 27-01-2010
Date test commenced : 28-01-2010
Date test completed : 05-02-2010
Test method used : Geospec 3 (November 2001) Test Method 14.1
Test method for moisture content : Geospec 3 (November 2001) Test Method 5.2
Condition of porous plates : Saturated
Method of specimen preparation : Circular disc specimen from sampling tube
Selection of specimen by Name : K.M. Fung Designation : Technician II
Affiliation : Fugro Technical Services Limited - MateriaLab Division
Room temperature range : 24.5 °C Maximum 19.5 °C Minimum
Particle density : 2.65 (Assumed)
Visual description : Moist, dark grey, slightly sandy SILT/CLAY with shell fragments.

Lab. sample I.D. : SL100076/14
Specimen ref. : A
Sample type : M
Specimen depth (m)
From : 8.50
To : 8.60

			Initial	Final
Diameter of ring/sample	mm	:	69.90	69.90
Height of ring/sample	mm	:	19.12	18.07
Mass of ring	g	:	81.53	81.53
Mass of ring + wet sample	g	:	226.92	222.44
Mass of dry sample	g	:	111.51	111.51
Moisture content	%	:	30.4	26.4
Bulk density	Mg/m^3	:	1.98	2.03
Dry density	Mg/m^3	:	1.52	1.61
Void ratio		:	0.74	0.65
Degree of saturation	%	:	108.3	107.8
Equivalent Height of solid particles, H_s	mm	:	10.97	

Soaking

Gauge reading at started	mm	:	0.000
Gauge reading on completion	mm	:	-0.020
The actual seating pressure	kPa	:	2.13
The actual soaking time	hr	:	15
Compression/ Swelling after soaking	mm	:	-0.020

(Compression is positive whereas swelling is negative)

Applied load	Final gauge reading	Correction of Deform.	Time fitting: Log time		Time fitting: Square-root time		Second. compress -ion	Height of specimen	Void ratio	Vertical strain	Coeff. of volume compress.	Coeff. Of consolid. Log time	Coeff. Of consolid. Sq-root time	Coeff. of sec. compress -ion
p	d_f	y	t_{50}	d_{100}	t_{90}	d_{100}	δH_{sec}	H	e	ε	m_v	c_v	c_v	
kPa	mm	mm	min	mm	min	mm	mm	mm		%	m^2/MN	m^2/year	m^2/year	
0	-0.020	-	-	-	-	-	-	19.14	0.75	-0.10	-	-	-	-
6	0.084	0.008	2.9	0.072	13.69	0.074	-	19.05	0.74	0.35	0.75	3.27	2.96	-
12	0.196	0.026	3.0	0.176	9.00	0.166	-	18.97	0.73	0.78	0.73	3.13	4.46	-
25	0.348	0.040	1.3	0.312	4.41	0.305	-	18.85	0.72	1.42	0.49	7.15	9.00	-
50	0.544	0.048	*	0.510	2.25	0.476	-	18.66	0.70	2.42	0.40	*	17.35	-
100	0.796	0.076	*	0.750	2.56	0.717	-	18.45	0.68	3.53	0.23	*	14.92	-
200	1.136	0.102	*	1.1	2.6	1.150	-	18.07	0.65	5.48	0.20	*	14.46	-

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)
Remark : * - Cannot be determined.

Tested by : K.M. Fung

Certified by :

~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date :

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

Information supplied by Client

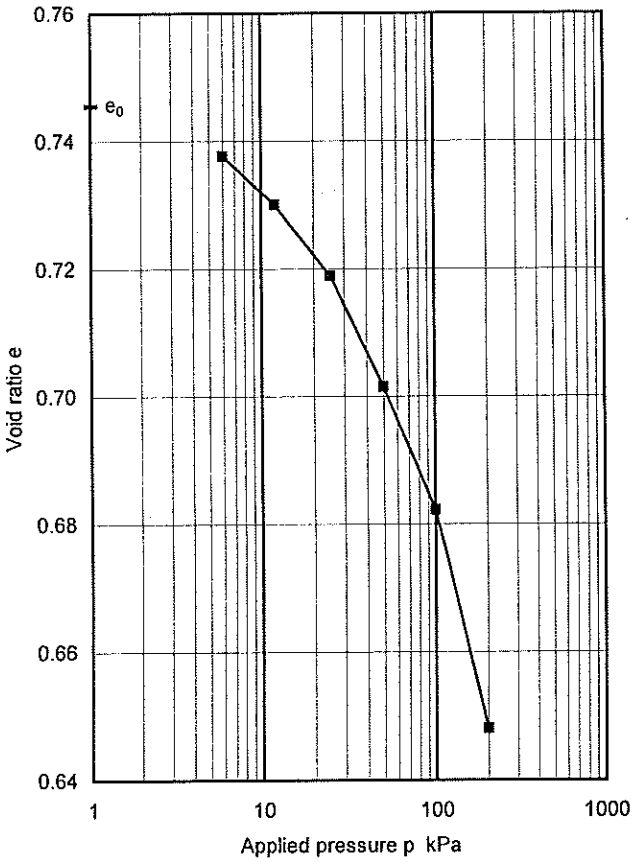
Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth(m) From : 7.60
To : -
Sample origin : MD

Laboratory Information

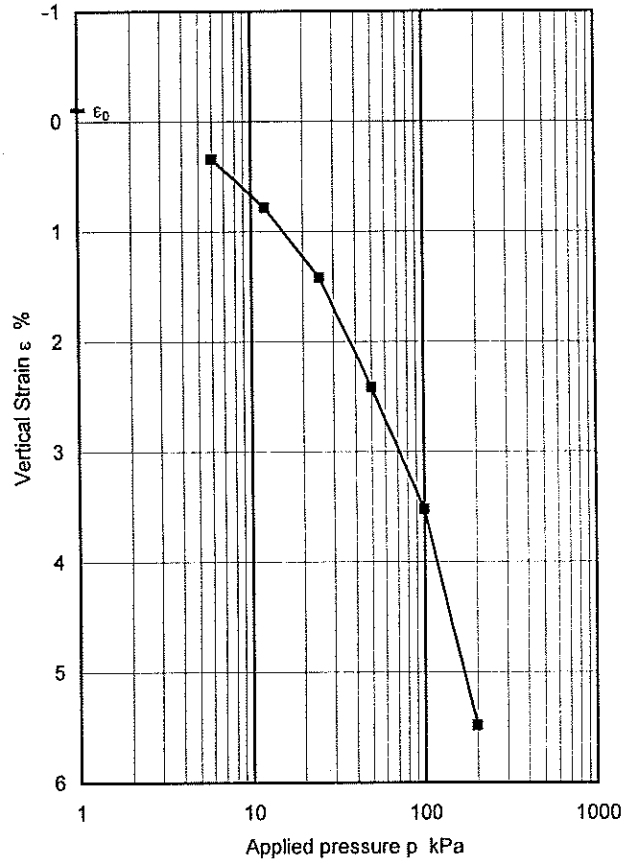
Lab. sample I.D. : SL100076/14
Specimen ref. : A

Void Ratio vs. Logarithm of Applied Pressure



× Secondary Compression

Vertial Strain vs. Logarithm of Applied Pressure



× Secondary Compression

Remark : The percentage by mass of particles of sizes larger than 1/5 of height of consolidation ring, if found

Sieve size mm	-	-	-	-
Percentage %	-	-	-	-

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MateriaLab

TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

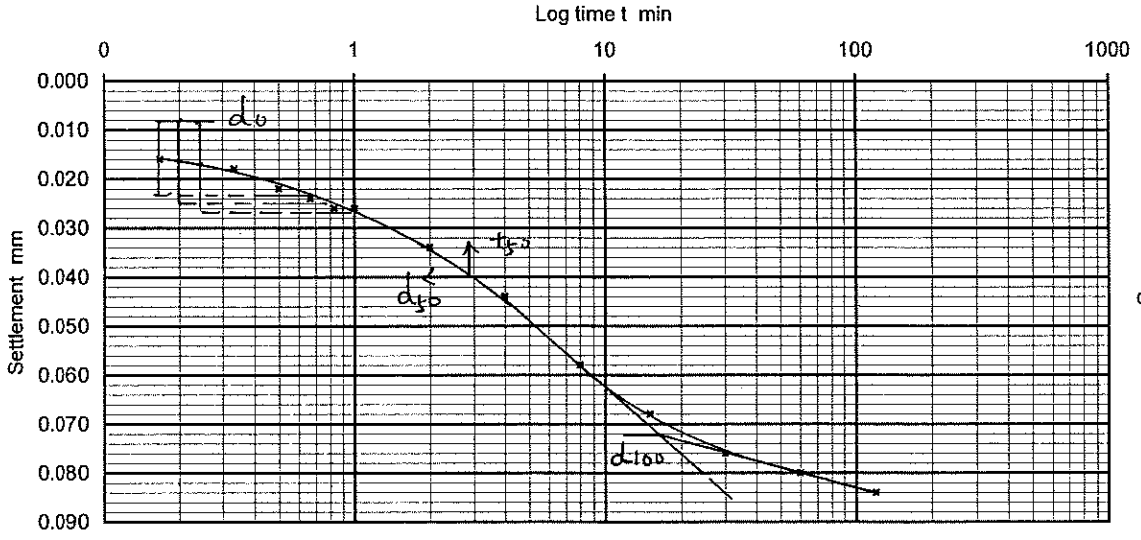
Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth (m) From : 7.60
To : -

Laboratory Information

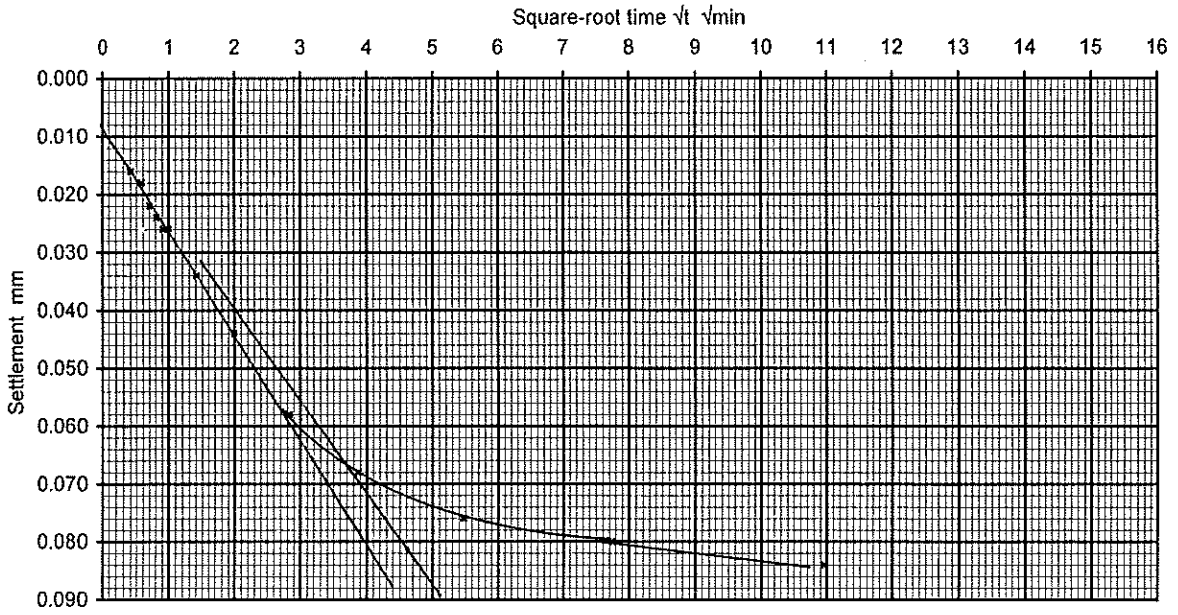
Stage No. : 1
Applied pressure : 6 kPa

Laboratory sample I.D. : SL100076/14
Specimen reference : A



d_i = -0.020 mm
d_f = 0.084 mm
d_0 = 0.008 mm
d_{50} = 0.040 mm
d_{100} = 0.072 mm
t_{50} = 2.9 min

Remark :



d_0 = 0.008 mm
d_{90} = 0.067 mm
d_{100} = 0.074 mm
t_{90} = 13.69 min

Remark :

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

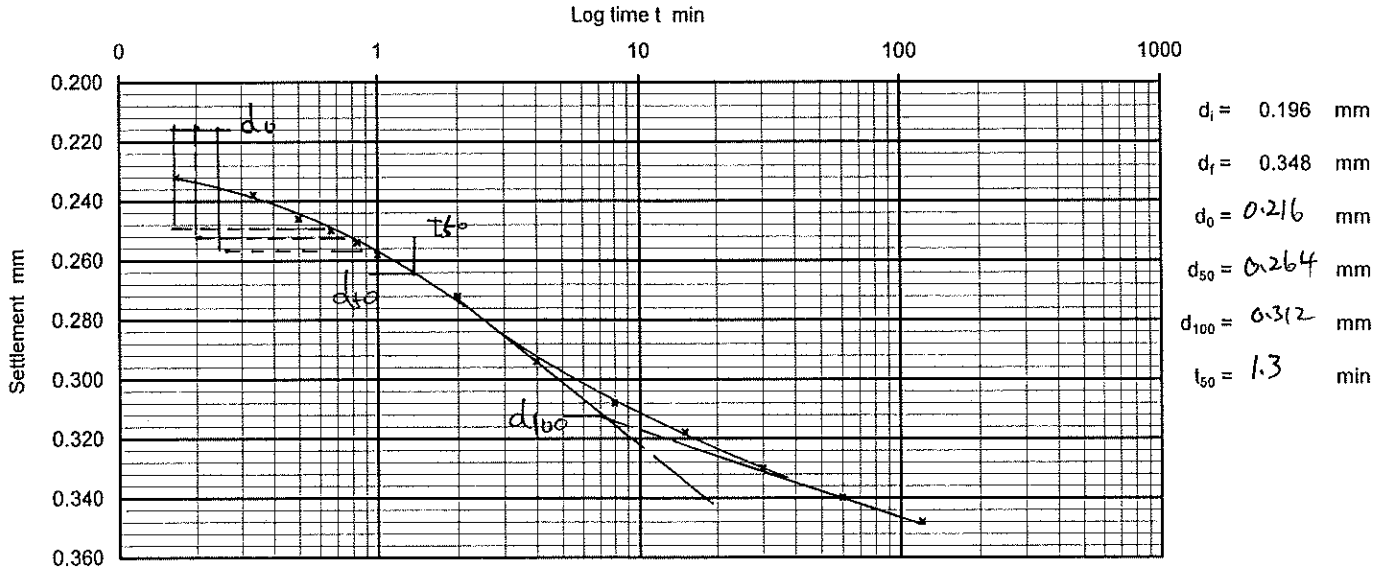
Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth (m) From : 7.60
To : -

Laboratory Information

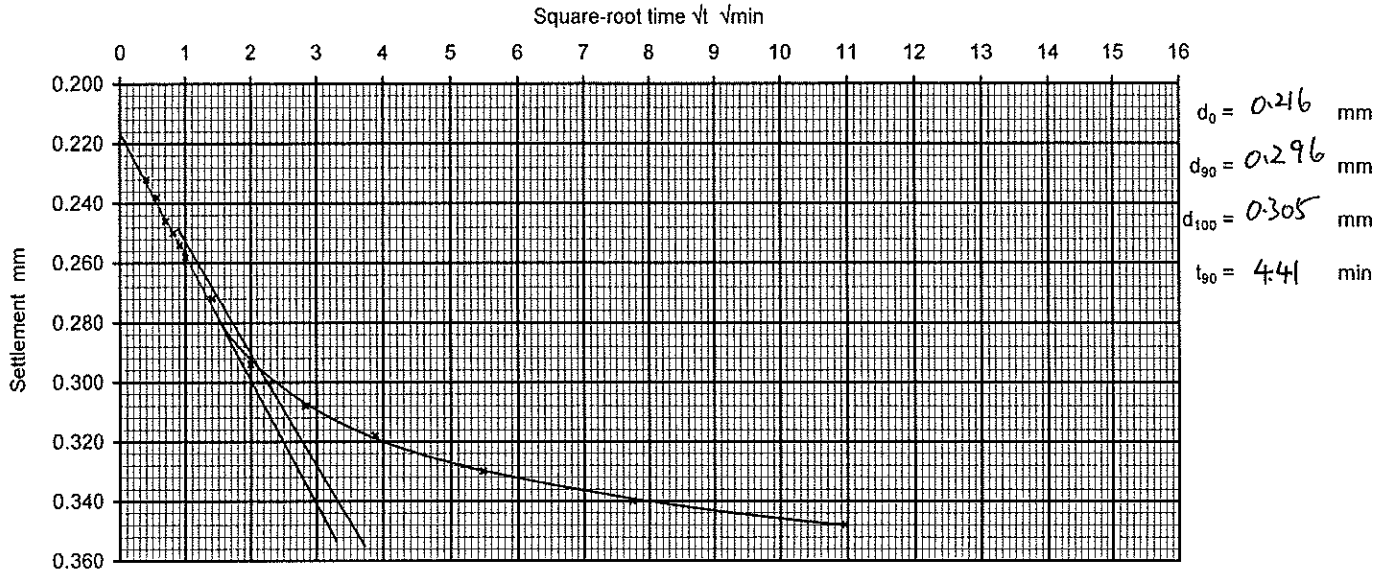
Stage No. : 3
Applied pressure : 25 kPa

Laboratory sample I.D. : SL100076/14
Specimen reference : A



d_i = 0.196 mm
d_f = 0.348 mm
d_0 = 0.216 mm
d_{50} = 0.264 mm
d_{100} = 0.312 mm
t_{50} = 1.3 min

Remark :



d_0 = 0.216 mm
d_{90} = 0.296 mm
d_{100} = 0.305 mm
t_{90} = 4.41 min

Remark :

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

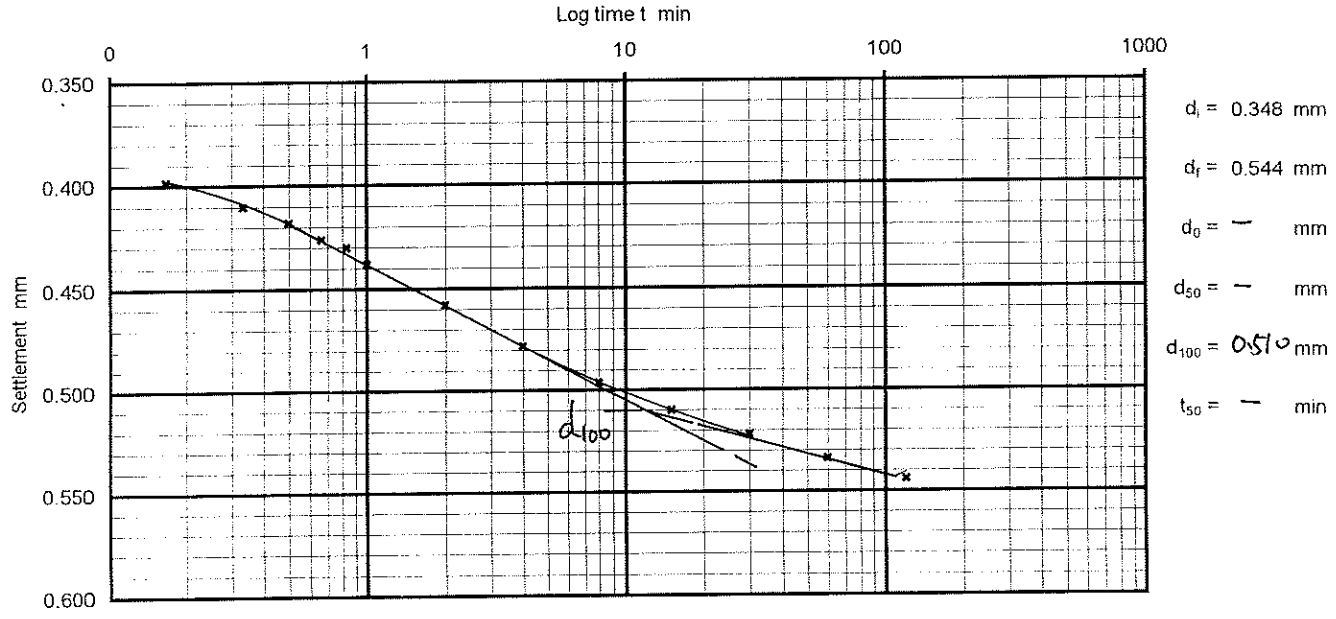
Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth (m) From : 7.60
To : -

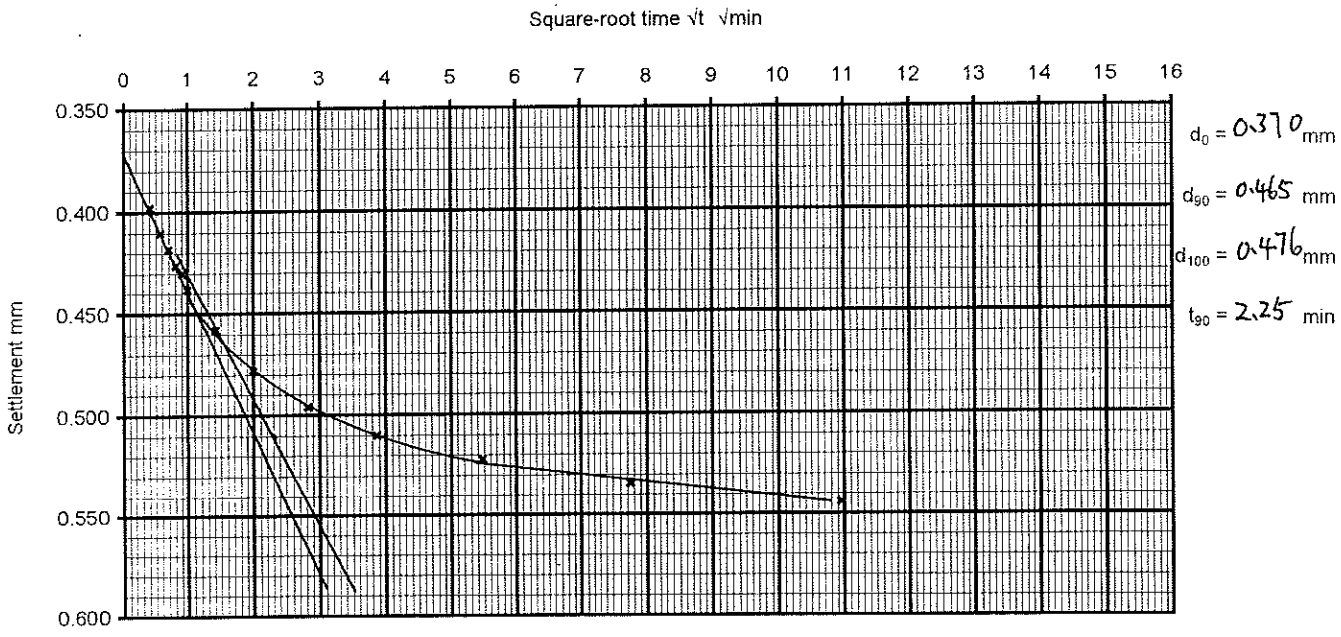
Laboratory Information

Stage No. : 4
Applied pressure : 50 kPa

Laboratory sample I.D. : SL100076/14
Specimen refererence : A



Remark : t50 is indeterminate.



Remark :

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

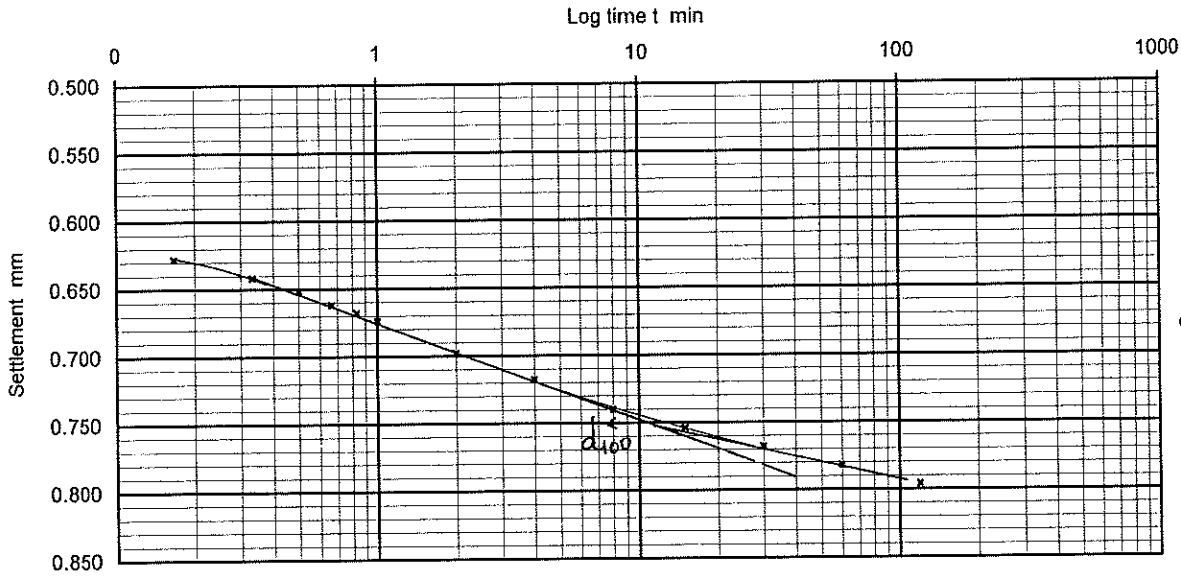
Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth (m) From : 7.60
To : -

Laboratory Information

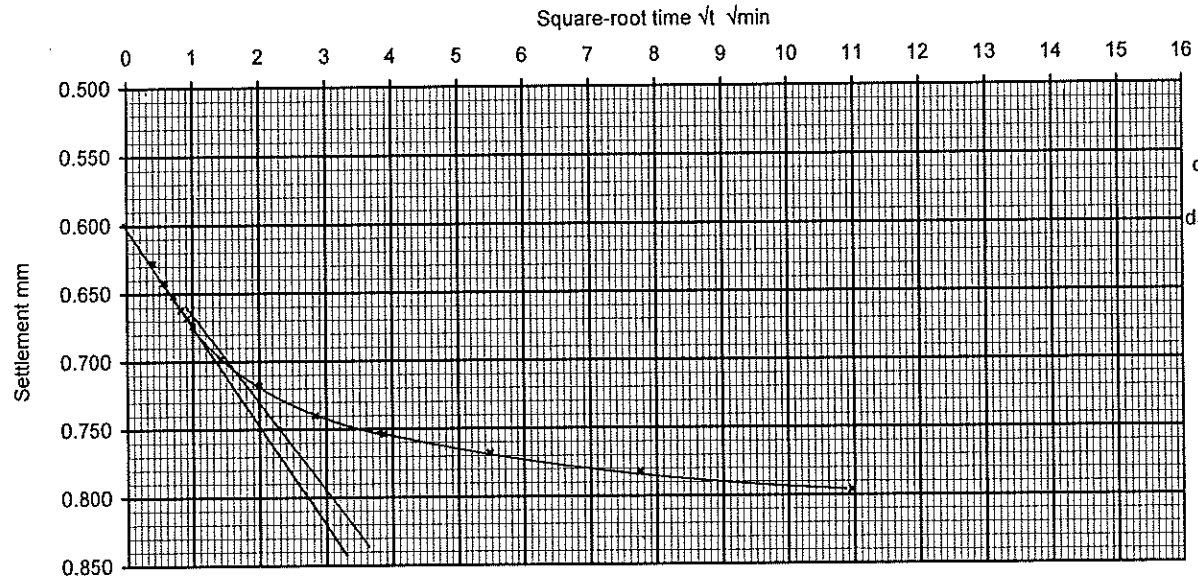
Stage No. : 5
Applied pressure : 100 kPa

Laboratory sample I.D. : SL100076/14
Specimen reference : A



d_i = 0.544 mm
d_f = 0.796 mm
d_0 = — mm
d_{50} = — mm
d_{100} = 0.750 mm
t_{50} = — min

Remark : t50 is indeterminate.



d_0 = 0.600 mm
d_{90} = 0.705 mm
d_{100} = 0.717 mm
t_{90} = 2.56 min

Remark :

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

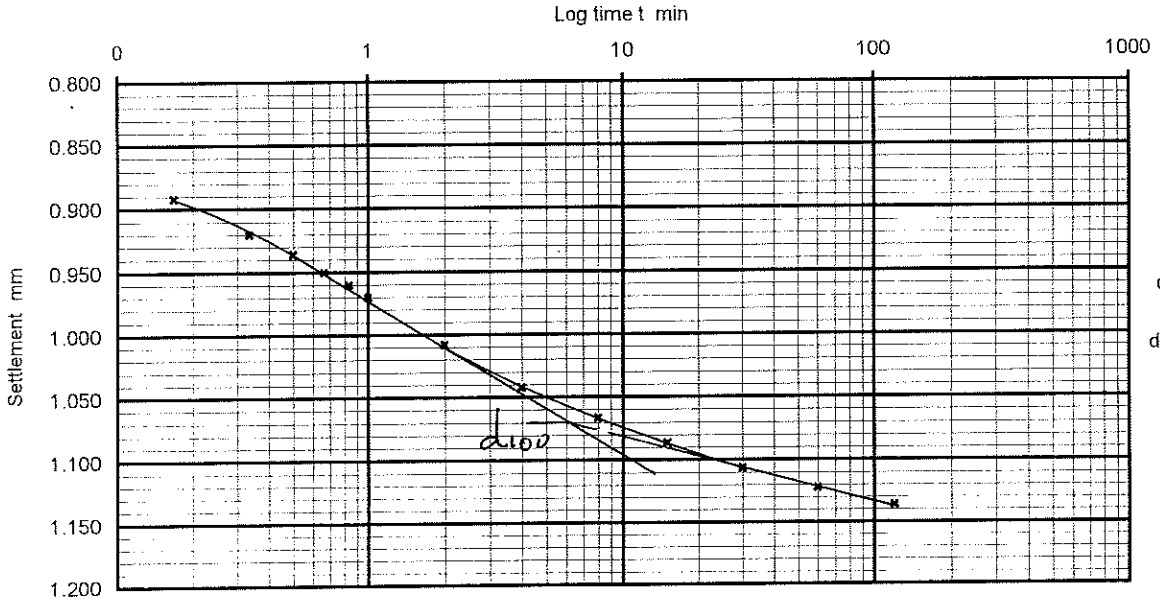
Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : D232
Depth (m) From : 7.60
To : -

Laboratory Information

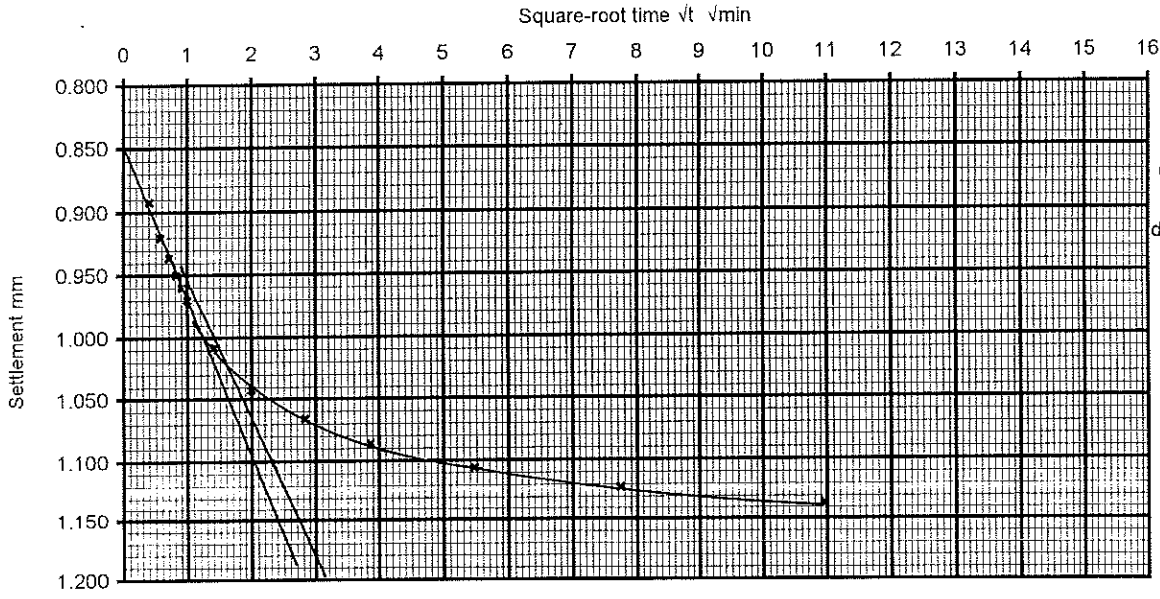
Stage No. : 6
Applied pressure : 200 kPa

Laboratory sample I.D : SL100076/14
Specimen reference : A



d_i = 0.796 mm
d_f = 1.136 mm
d_0 = — mm
d_{50} = — mm
d_{100} = 1.070 mm
t_{50} = — min

Remark : t50 is indeterminate.



d_0 = 0.850 mm
d_{90} = 1.120 mm
d_{100} = 1.150 mm
t_{90} = 2.56 min

Remark :

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

Client : MTR Corporation Limited
Client's Address : Not requested to be reported

Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No. : -

Borehole No. : 912/SIL/D265
Depth(m) From : 24.60
To : 25.60
Sample origin : MD
Description : -

Laboratory Information

Date sample received : 30-12-2009
Date test commenced : 07-01-2010
Date test completed : 19-01-2010
Test method used : Geospec 3 (November 2001) Test Method 14.1
Test method for moisture content : Geospec 3 (November 2001) Test Method 5.2
Condition of porous plates : Saturated
Method of specimen preparation : Circular disc specimen from sampling tube
Selection of specimen by Name : K.M. Fung Designation : Technician II
Affiliation : Fugro Technical Services Limited - MateriaLab Division
Room temperature range : 24.0 °C Maximum 17.5 °C Minimum
Particle density : 2.65 (Assumed)
Visual description : Moist, dark grey, slightly sandy SILT/CLAY with shell fragments.

Lab. sample I.D. : SL90277/13
Specimen ref. : A
Sample type : M
Specimen depth (m)
From : 24.5
To : 25.6

			Initial	Final
Diameter of ring/sample	mm	:	69.90	69.90
Height of ring/sample	mm	:	19.06	15.90
Mass of ring	g	:	82.86	82.86
Mass of ring + wet sample	g	:	211.12	201.46
Mass of dry sample	g	:	88.68	88.68
Moisture content	%	:	44.6	33.7
Bulk density	Mg/m^3	:	1.75	1.94
Dry density	Mg/m^3	:	1.21	1.45
Void ratio		:	1.19	0.82
Degree of saturation	%	:	99.8	108.6
Equivalent Height of solid particles, H_s	mm	:	8.72	

Soaking

Gauge reading at started	mm	:	0.000
Gauge reading on completion	mm	:	-0.020
The actual seating pressure	kPa	:	2.24
The actual soaking time	hr	:	14
Compression/ Swelling after soaking	mm	:	-0.020

(Compression is positive whereas swelling is negative)

Applied load p kPa	Final gauge reading d_f mm	Correction of Deform. y mm	Time fitting Log time t_{50} min	Log time d_{100} mm	Square-root time t_{90} min	Square-root time d_{100} mm	Second. compress -ion δH_{sec} mm	Height of specimen H mm	Void ratio e	Vertical strain ε %	Coeff. of volume compress. m_v m^2/MN	Coeff. Of consolid. Log time c_v $m^2/year$	Coeff. Of consolid. Sq-root time c_v $m^2/year$	Coeff. of sec. compress -ion
0	-0.020	-	-	-	-	-	-	19.08	1.19	-0.10	-	-	-	-
50	0.528	0.018	*	0.490	1.69	0.443	-	18.59	1.13	2.48	0.52	*	23.30	-
100	0.832	0.024	*	0.780	1.96	0.752	-	18.30	1.10	3.97	0.31	*	19.27	-
200	1.368	0.036	*	1.260	1.96	1.209	-	17.84	1.05	6.42	0.26	*	18.49	-
400	2.338	0.050	*	2.120	2.89	2.056	-	16.99	0.95	10.86	0.24	*	11.65	-
800	3.502	0.074	*	3.340	3.24	3.196	-	15.79	0.81	17.14	0.18	*	9.21	-
200	3.472	0.048	-	-	-	-	-	15.64	0.79	17.96	-0.02	-	-	-
50	3.190	0.030	-	-	-	-	-	15.90	0.82	16.58	0.11	-	-	-

Abbreviations used : Sample type : U = U76 or U100, P = piston, M = mazier, BLK = block, D = disturbed (bulk)
Remark : * - Cannot be determined.

Tested by : K.M. Fung

Certified by :

~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil)

Date : 27 JAN 2010

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

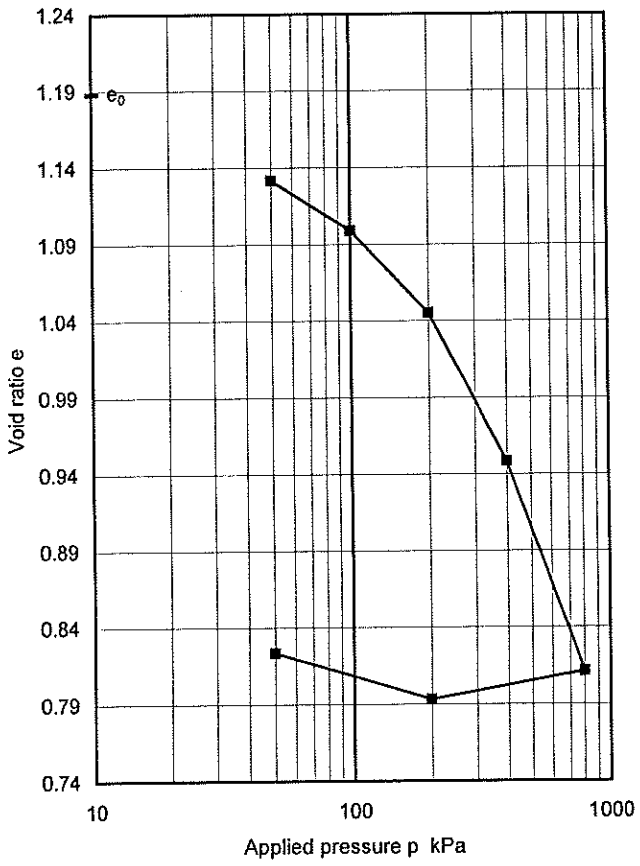
Client sample No. : -

Borehole No. : 912/SIL/D265
Depth(m) From : 24.60
To : 25.60
Sample origin : MD

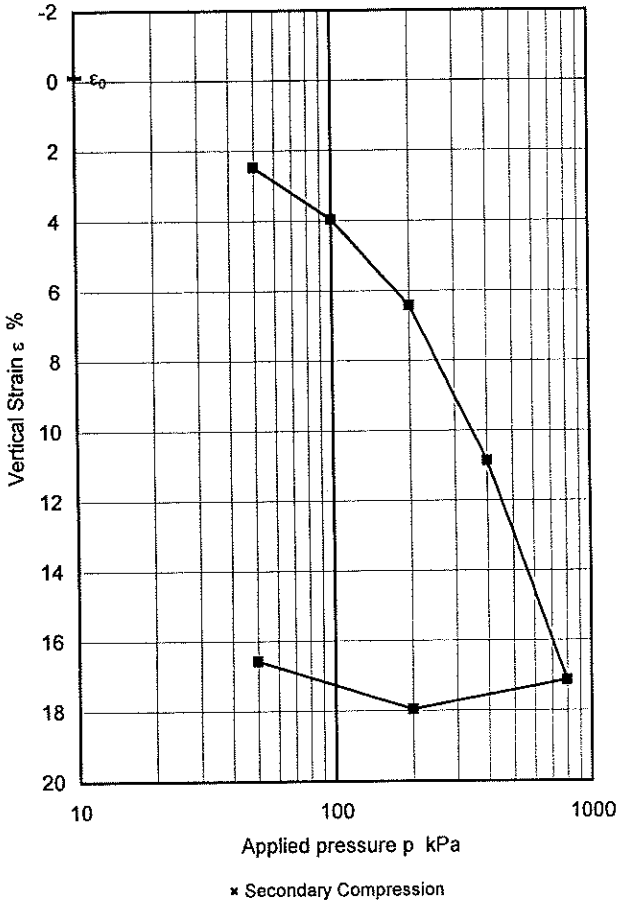
Laboratory Information

Lab. sample I.D. : SL90277/13
Specimen ref. : A

Void Ratio vs. Logarithm of Applied Pressure



Vertial Strain vs. Logarithm of Applied Pressure



Remark : The percentage by mass of particles of sizes larger than 1/5 of height of consolidation ring, if found

Sieve size mm	-	-	-	-
Percentage %	-	-	-	-

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

Client : MTR Corporation Limited
Project : Ground Investigation for South Island Line (EAST)

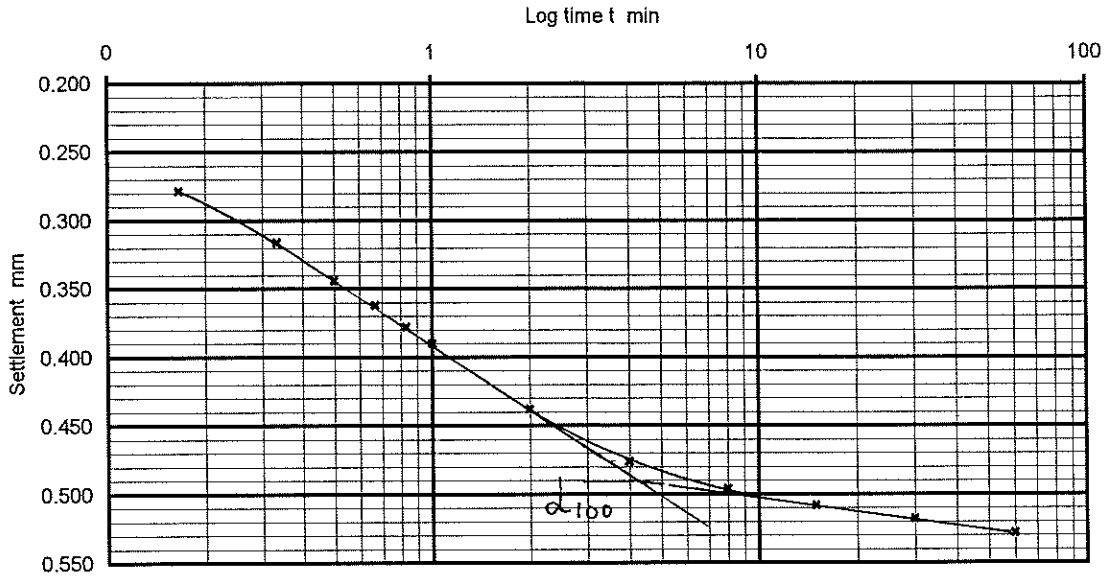
Client sample No. : -

Borehole No. : 912/SIL/D265
Depth (m) From : 24.60
To : 25.60

Laboratory Information

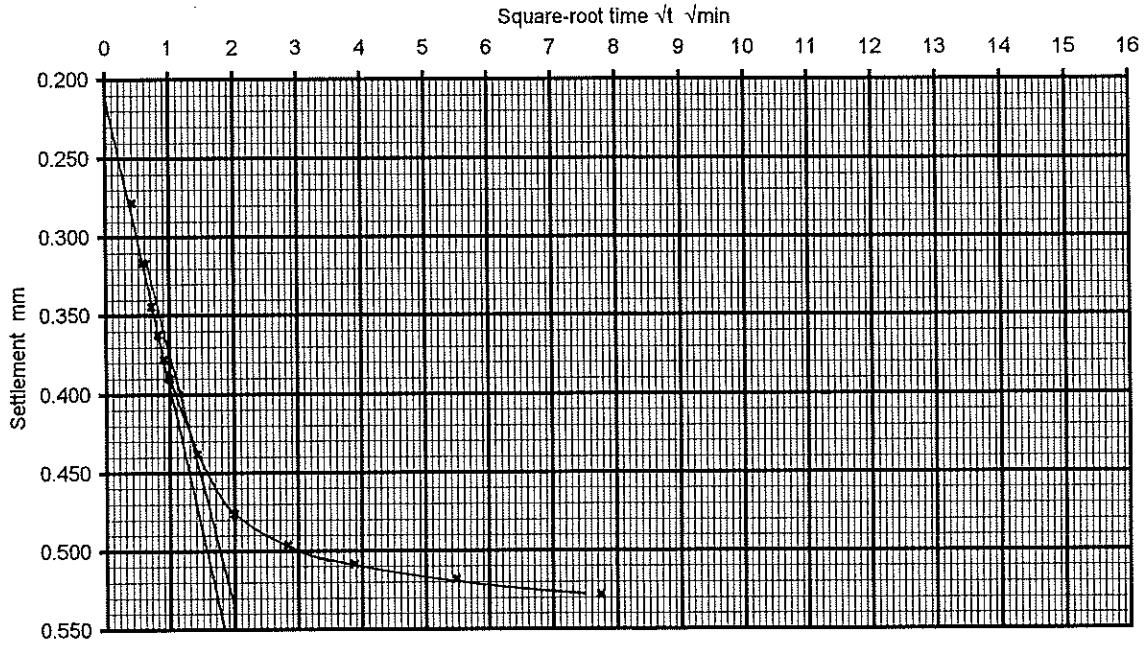
Stage No. : 1
Applied pressure : 50 kPa

Laboratory sample I.D : SL90277/13
Specimen reference : A



d_i = -0.020 mm
d_f = 0.528 mm
d_0 = — mm
d_{50} = — mm
d_{100} = 0.490 mm
t_{50} = — min

Remark : t50 is indeterminate.



d_0 = 0.210 mm
d_{90} = 0.420 mm
d_{100} = 0.443 mm
t_{90} = 1.69 min

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

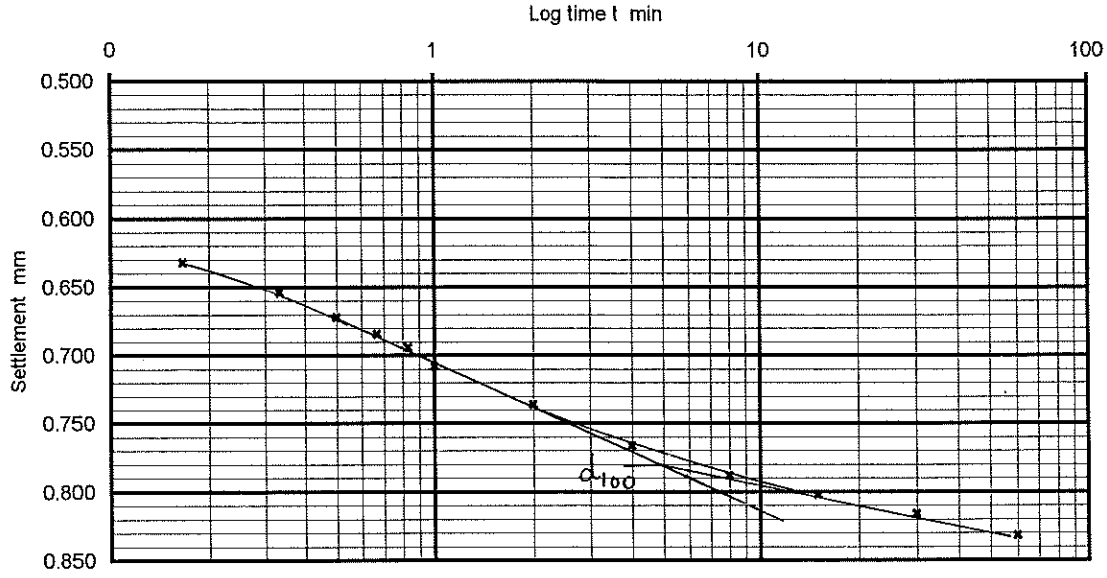
Information supplied by Client

Client : MTR Corporation Limited
Project : Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth (m) From : 24.60
To : 25.60

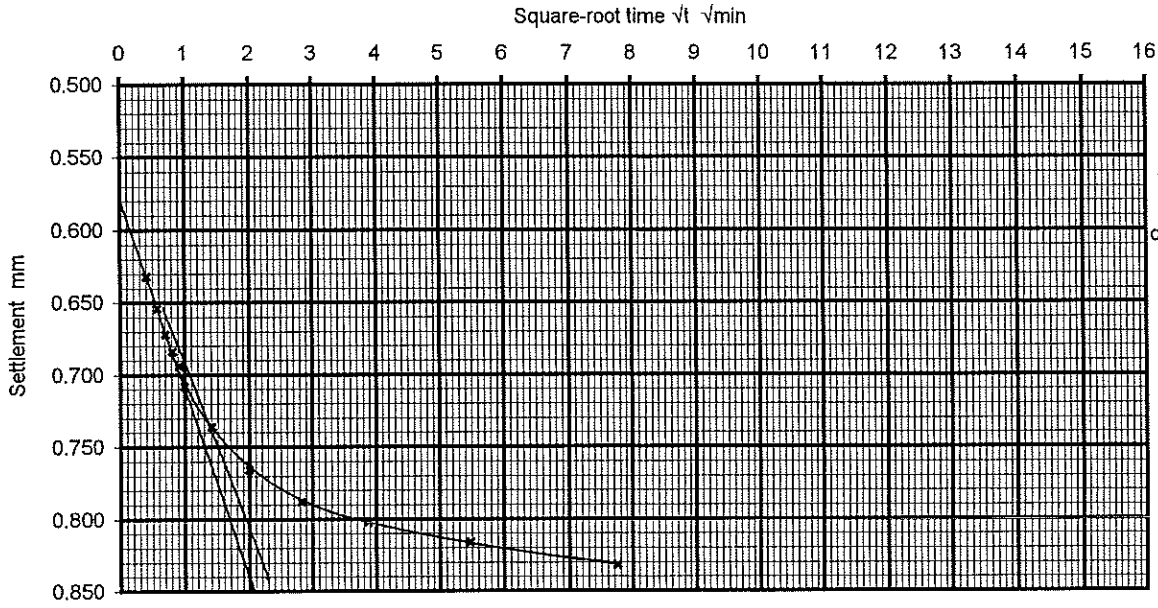
Laboratory Information

Stage No. : 2
Applied pressure : 100 kPa
Laboratory sample I.D : SL90277/13
Specimen reference : A



d_i = 0.528 mm
d_f = 0.832 mm
d_0 = — mm
d_{50} = — mm
d_{100} = 0.780 mm
t_{50} = — min

Remark : t50 is indeterminate.



d_0 = 0.580 mm
d_{90} = 0.735 mm
d_{100} = 0.752 mm
t_{90} = 1.96 min

Remark :

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

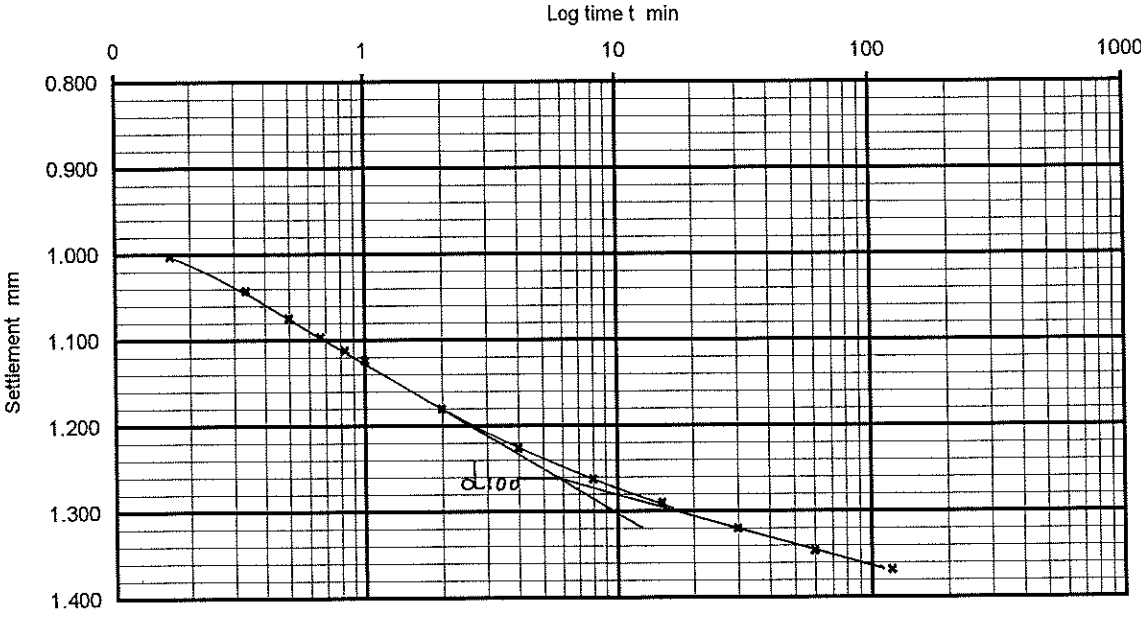
Client : MTR Corporation Limited
Project : Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth (m) From : 24.60
To : 25.60

Laboratory Information

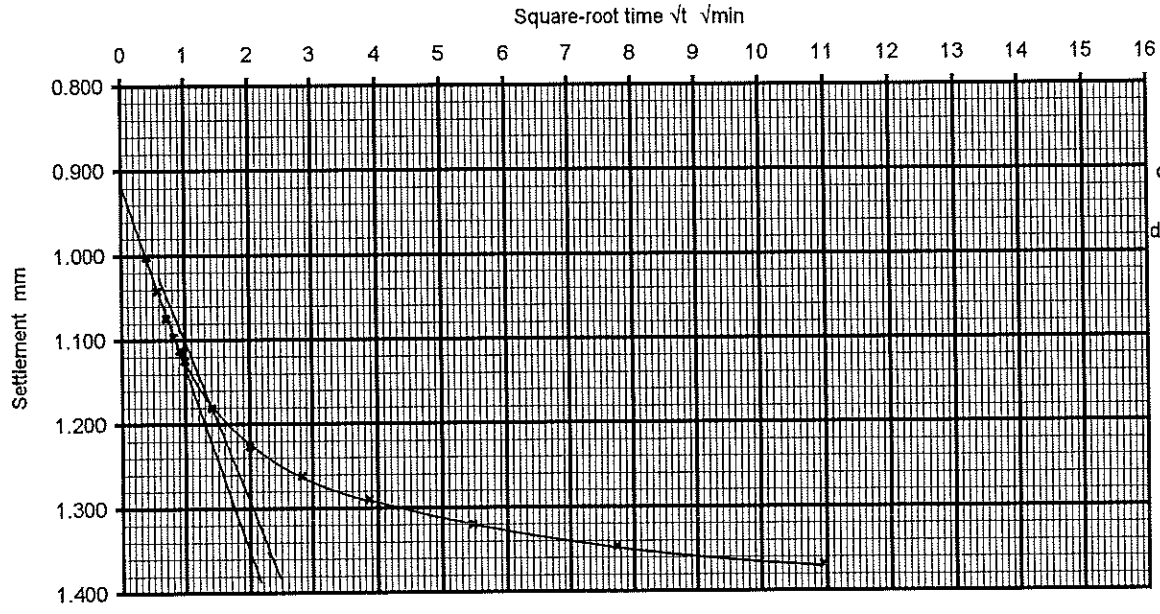
Stage No. : 3
Applied pressure : 200 kPa

Laboratory sample I.D : SL90277/13
Specimen reference : A



d_i = 0.832 mm
d_f = 1.368 mm
d_0 = — mm
d_{50} = — mm
d_{100} = 1.260 mm
t_{50} = — min

Remark : t50 is indeterminate.



d_0 = 0.920 mm
d_{90} = 1.180 mm
d_{100} = 1.209 mm
t_{90} = 1.96 min

Remark :

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

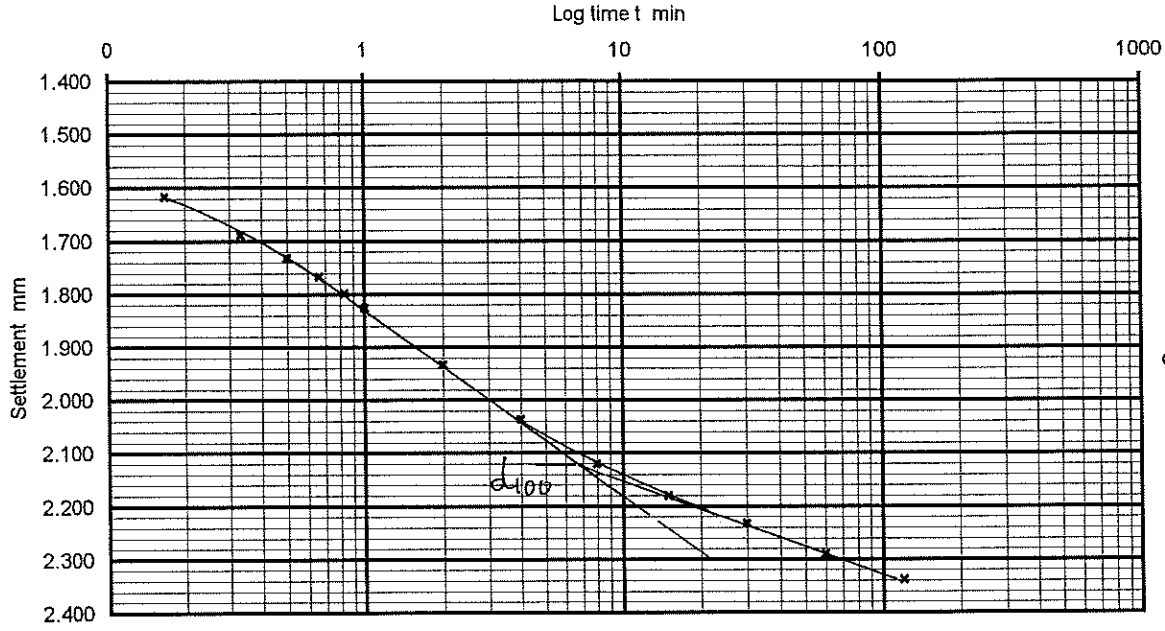
Client : MTR Corporation Limited
Project : Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth (m) From : 24.60
To : 25.60

Laboratory Information

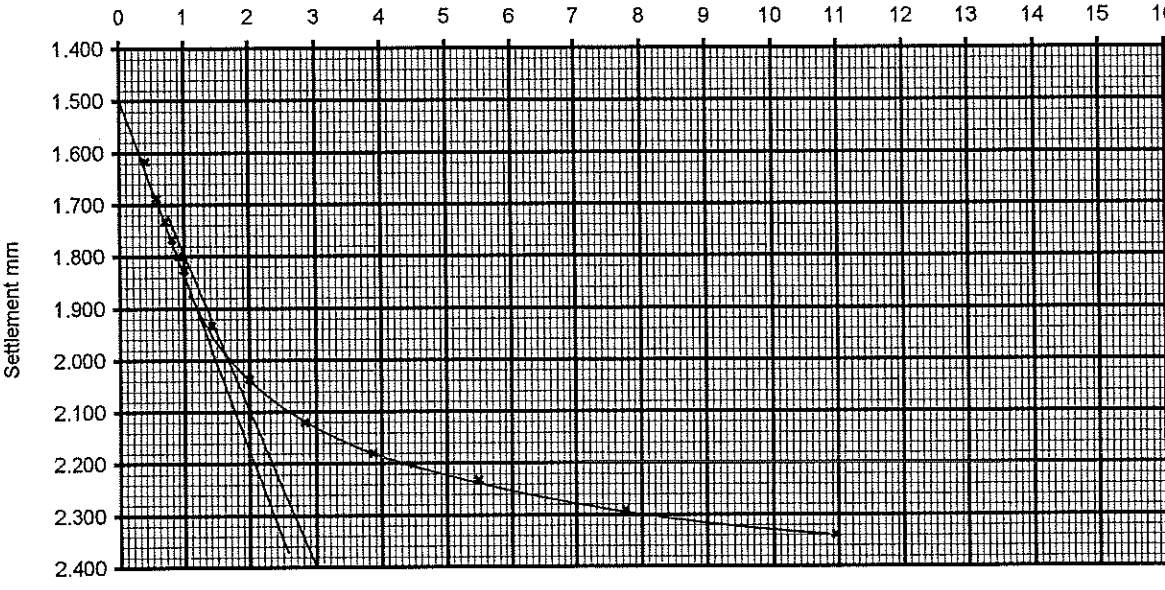
Stage No. : 4
Applied pressure : 400 kPa

Laboratory sample I.D. : SL90277/13
Specimen reference : A



d_i = 1.368 mm
d_f = 2.338 mm
d_0 = — mm
d_{50} = — mm
d_{100} = 2.120 mm
t_{50} = — min

Remark : t50 is indeterminate.



d_0 = 1.500 mm
d_{90} = 2.000 mm
d_{100} = 2.056 mm
t_{90} = 2.89 min

Remark :

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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

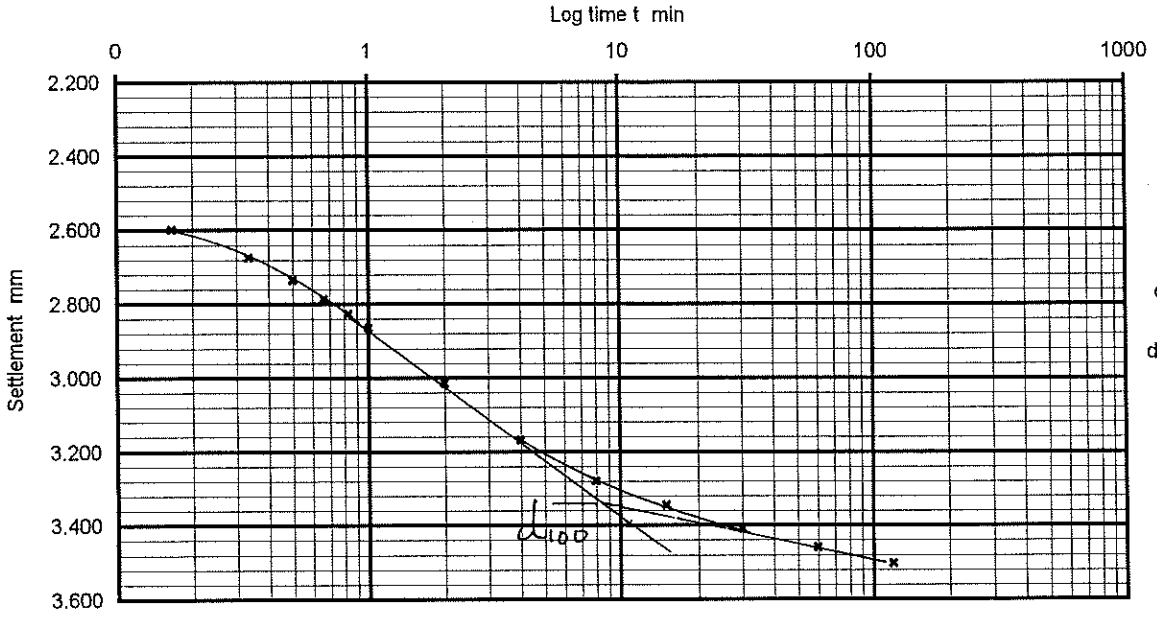
Client : MTR Corporation Limited
Project : Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth (m) From : 24.60
To : 25.60

Laboratory Information

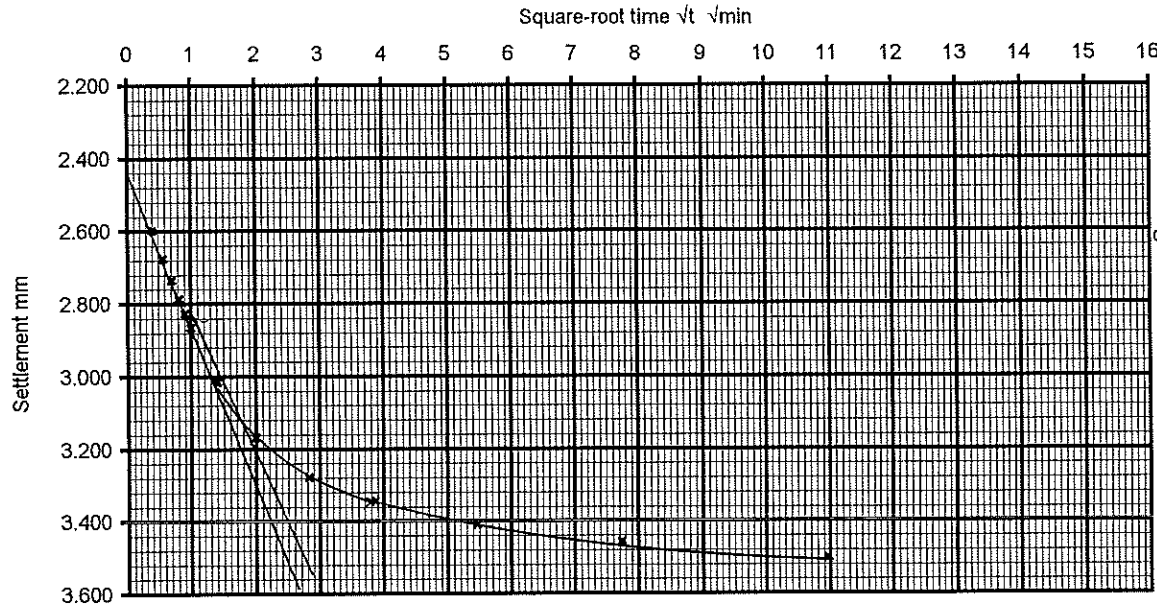
Stage No. : 5
Applied pressure : 800 kPa

Laboratory sample I.D : SL90277/13
Specimen reference : A



d_i = 2.338 mm
d_f = 3.502 mm
d_0 = — mm
d_{50} = — mm
d_{100} = 3340 mm
t_{50} = — min

Remark : t50 is indeterminate.



d_0 = 2.440 mm
d_{90} = 3.120 mm
d_{100} = 3.196 mm
t_{90} = 3.24 min

Remark :

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HOKLAS 015

5 TEST REPORT ON THE ONE-DIAENSION L CONSOLID TION TEST

Information supplied by Client

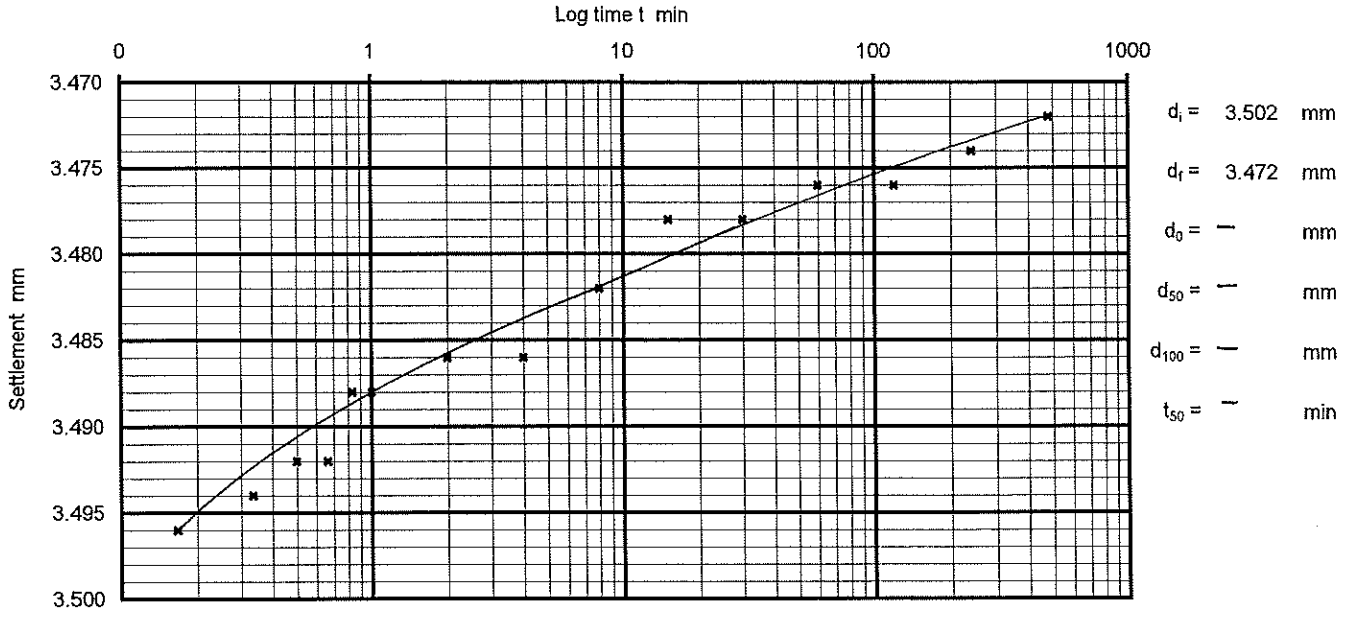
Client : MTR Corporation Limited
Project : Ground Investigation for South Island Line (EAST)

Client sample No. : -
Borehole No. : 912/SIL/D265
Depth (m) From : 24.60
To : 25.60

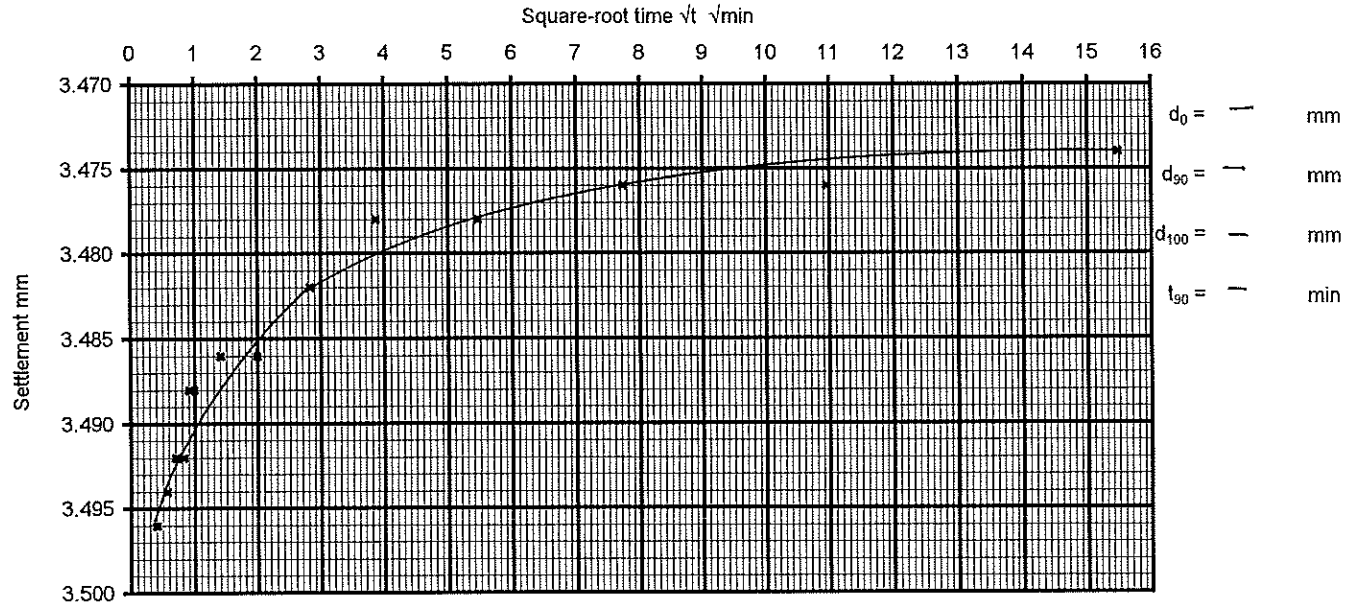
Laboratory Information

Stage No. : 6
Applied pressure : 200 kPa

Laboratory sample I.D : SL90277/13
Specimen reference : A



Remark :



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TEST REPORT ON THE ONE-DIMENSIONAL CONSOLIDATION TEST

HOKLAS 015

Information supplied by Client

Client : MTR Corporation Limited
Project : Ground Investigation for South Island Line (EAST)

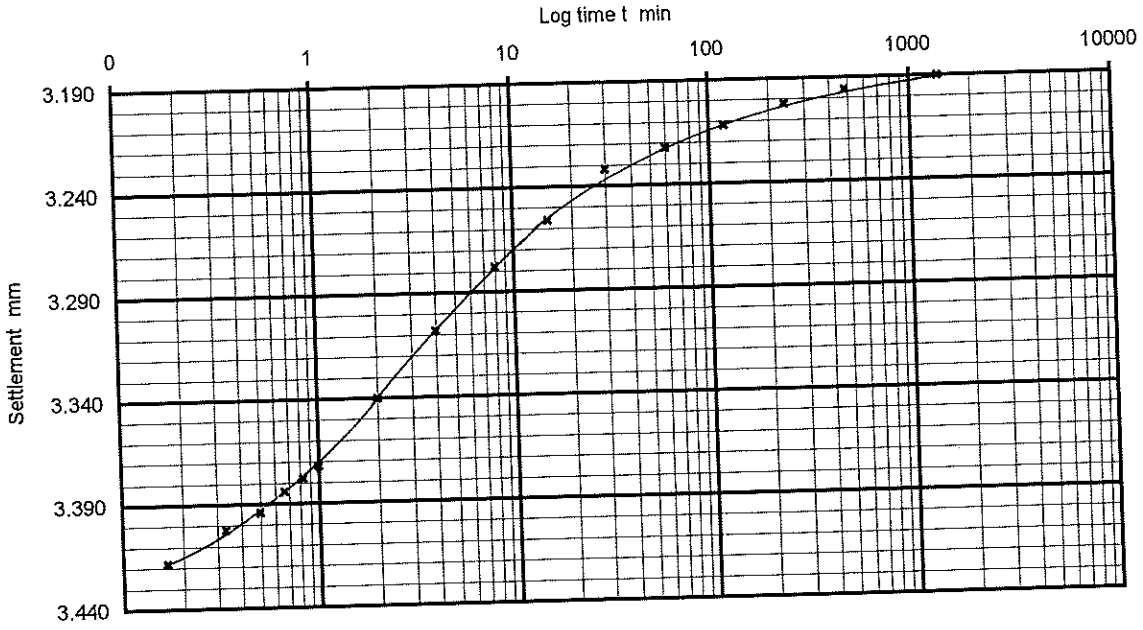
Client sample No. : -

Borehole No. : 912/SIL/D265
Depth (m) From : 24.60
To : 25.60

Laboratory Information

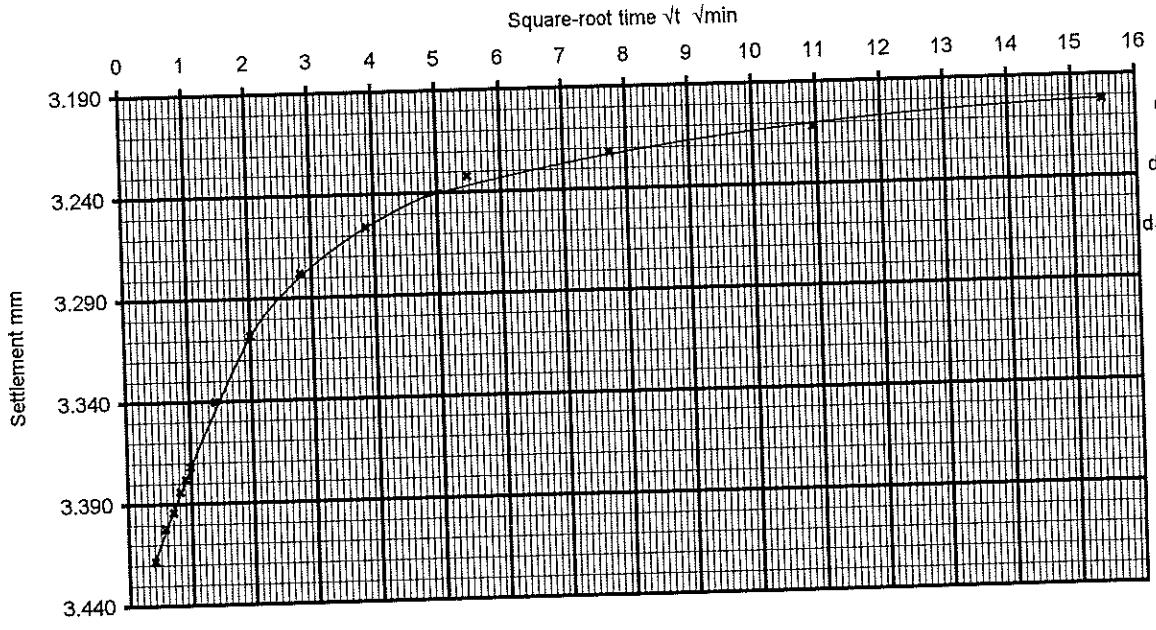
Stage No. : 7
Applied pressure : 50 kPa

Laboratory sample I.D : SL90277/13
Specimen reference : A



d_i = 3.472 mm
d_f = 3.190 mm
d_0 = — mm
d_{50} = — mm
d_{100} = — mm
t_{50} = — min

Remark :



d_0 = — mm
d_{90} = — mm
d_{100} = — mm
t_{90} = — min

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MateriaLab

Test Report No. : 090562SL90189 Page 1 of 1

TEST REPORT ON SUGGESTED METHOD FOR POROSITY/DENSITY DETERMINATION ROCK SPECIMEN USING SATURATION AND BUOYANCY TECHNIQUES

Information supplied by Client

Client : MTR Corporation Limited
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Client sample No.		-	-	-	-	-
Borehole No.		D230	D234	D235	D228	D237
Depth (m)	From	22.30	9.60	6.40	8.00	13.60
	To	23.50	11.00	8.30	11.10	15.10
Rock type		SDT	SDT	SDT	MDT	SDT

Laboratory Information

Date sample received : 08-09-2009
Date test commenced : 28-09-2009
Date test completed : 06-10-2009
Test method used : International Society for Rock Mechanics, Part 1, Method 3

Laboratory sample I.D.			SL90189/3	SL90189/4	SL90189/7	SL90189/11	SL90189/13
Sample reference			B	B	B	B	A
Sample type			-	-	-	-	-
Specimen depth (m)	From		22.45	10.22	6.40	10.24	13.70
	To		22.52	10.30	6.51	10.35	13.77
Geometry of specimen			Irregular	Irregular	Irregular	Irregular	Irregular
Initial mass of specimen		I g	1144.81	1011.64	1371.65	1700.15	1183.81
Mass of saturated-submerged		M_{sub} g	713.60	631.10	850.10	1056.32	739.30
Mass of container		A g	89.97	94.20	94.42	89.79	89.88
Mass of saturated-surface-dry + container		B g	1234.70	1105.98	1480.35	1810.33	1274.59
Mass of oven-dried + container		C g	1232.92	1104.91	1458.34	1785.74	1272.13

Test Result

Proposity	(n)	%	0.4	0.3	4.1	3.7	0.6
Bulk density	(ρ)	kg/m³	2660	2660	2560	2560	2660
Dry density	(ρ_d)	kg/m³	2650	2660	2550	2550	2650

Remarks : -

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil) Date : 27 OCT 2009

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MaterialLab

HKAS HOKLAS 015

REPORT ON DETERMINATION OF THE POINT LOAD STRENGTH OF ROCK

Information supplied by Client

Client : MTR Corporation Limited
Client's address : Not requested to be reported
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Laboratory Information

Date sample received : 25-08-2009
Date test commenced : 06-09-2009
Date test completed : 21-10-2009
Test method referred : ASTM D5731-95

Additional Information supplied by Client

Client sample No.		-	-	-	-	-	-
Borehole No.		D80	D80	D80	D80	D80	D80
Sample depth (m)	From	18.00	22.00	25.00	30.00	34.00	45.00
	To	-	-	-	-	-	-
Rock type		Tuff	Tuff	Tuff	Tuff	Tuff	Tuff

Additional Laboratory Information

Laboratory sample I.D.		SL90202/1	SL90171/2	SL90171/3	SL90171/4	SL90171/5	SL90202/19
Specimen depth (m)	From	18.30	22.40	25.08	29.80	34.08	46.70
	To	18.52	22.73	25.23	30.20	34.23	46.86
Specimen depth at loading point (m)		18.44	22.55	25.14	29.99	34.17	46.77
Test type		D	D	D	D	D	D
Direction (if any)		r	r	r	r	r	⊥
Moisture condition		S	S	S	S	S	S
Specimen width	W (mm)	-	-	-	-	-	-
Specimen width (for test type I only)	W_1 (mm)	-	-	-	-	-	-
	W_2 (mm)	-	-	-	-	-	-
	W (mm)	-	-	-	-	-	-
Contact length	L (mm)	49.00	106.44	44.86	119.26	72.38	75.52
Platen contact distance	D (mm)	83.38	83.36	83.24	83.20	83.48	83.34
L/D ratio (for test type D and I only)		0.59	1.28	0.54	1.43	0.87	0.91
D/W ratio (for test type A, B and I)		-	-	-	-	-	-
Failure load	P (kN)	>50	18.5	8.5	>50	23.5	44.5
Equivalent diameter	D_e (mm^2)	83.38	83.36	83.24	83.20	83.48	83.34
Uncorrected point load strength index	I_s (MPa)	>7.19	2.66	1.22	>7.22	3.36	6.40
Size correction factor		1.26	1.26	1.26	1.26	1.26	1.26
Corrected point load strength index	$I_{s(50)}$ (MPa)	>9.05	3.34	1.53	>9.08	4.24	8.05
Failure Mode		NF	J/M	J	NF	J/M	M

The following is an opinion of the Company and is not covered under the HOKLAS accreditation.
The description of the weathering grade of rock is not a requirement of the point load test and the following weathering grade is an opinion of the laboratory

Weathering grade		II	II	II	II	II	II

Remarks : 1. Rock type : -
2. Weathering grade : Grade I - Fresh, Grade II - Slightly decomposed, Grade III - Medium decomposed, Grade IV - Highly decomposed.
3. Test type : A - Axial test, D - Diametral test, B - Block test, I - Irregular lump test.
4. Direction : ⊥ - perpendicular, // - parallel , r - random or unknown directions w.r.t. the plane of weakness.
5. Moisture condition : S - water saturated, N - natural water content as received, A - laboratory air dry, O - oven dry.
6. Failure mode : J - Joint failure, M - material failure, NF - Not failure (Failure load exceeds load gauge limit (50 kN)).

Certified by : Paul Richard Cooper (Operations Manager - CMT) / Lai Mei Ting (Assistant Manager - Soil) Date : 23 OCT 2009

The Hong Kong Accreditation Service (HKAS) has accredited Fugro Technical Services Limited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific laboratory activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this report were determined by this laboratory in accordance with its terms of accreditation. The copyright of this report is owned by Fugro Technical Services Limited. It may not be reproduced except with prior written approval from the issuing laboratory.

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Test Report No. : 090562SL90171(1) Page 1 of 1

HKAS 015

REPORT ON DETERMINATION OF THE POINT LOAD STRENGTH OF ROCK

Information supplied by Client

Client : MTR Corporation Limited
Client's address : Not requested to be reported
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Laboratory Information

Date sample received : 25-08-2009
Date test commenced : 06-09-2009
Date test completed : 06-09-2009
Test method referred : ASTM D5731-95

Additional Information supplied by Client

Client sample No.		-
Borehole No.		D80
Sample depth (m)	From	48.00
	To	-
Rock type		Tuff

Additional Laboratory Information

Laboratory sample I.D.			SL90171/8
Specimen depth (m)	From		48.23
	To		48.55
Specimen depth at loading point		(m)	48.48
Test type			D
Direction (if any)			r
Moisture condition			S
Specimen width	W	(mm)	-
Specimen width (for test type I only)	W_1	(mm)	-
	W_2	(mm)	-
	W	(mm)	-
Contact length	L	(mm)	68.64
Platen contact distance	D	(mm)	83.22
L/D ratio (for test type D and I only)			0.82
D/W ratio (for test type A, B and I)			-
Failure load	P	(kN)	23.7
Equivalent diameter	D_e	(mm^2)	83.22
Uncorrected point load strength index	I_s	(MPa)	3.41
Size correction factor			1.26
Corrected point load strength index	$I_{s(50)}$	(MPa)	4.29
Failure Mode			J/M

The following is an opinion of the Company and is not covered under the HOKLAS accreditation.
The description of the weathering grade of rock is not a requirement of the point load test and the following weathering grade is an opinion of the laboratory

Weathering grade	II

Remarks : 1. Rock type : -
2. Weathering grade : Grade I - Fresh, Grade II - Slightly decomposed, Grade III - Medium decomposed, Grade IV - Highly decomposed.
3. Test type : A - Axial test, D - Diametral test, B - Block test, I - Irregular lump test.
4. Direction : ⊥ - perpendicular, // - parallel , r - random or unknown directions w.r.t. the plane of weakness.
5. Moisture condition : S - water saturated, N - natural water content as received, A - laboratory air dry, O - oven dry.
6. Failure mode : J - Joint failure, M - material failure, NF - Not failure (Failure load exceeds load gauge limit (50 kN)).

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil) Date : 13 OCT 2009

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MateriaLab

Test Report No. : 090562SL90171(2) Page 1 of 1

HOKLAS 015

REPORT ON DETERMINATION OF THE POINT LOAD STRENGTH OF ROCK

Information supplied by Client

Client : MTR Corporation Limited
Client's address : Not requested to be reported
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Laboratory Information

Date sample received : 25-08-2009
Date test commenced : 06-09-2009
Date test completed : 21-10-2009
Test method referred : ASTM D5731-95

Additional Information supplied by Client

Client sample No.		-	-	-	-	-	-
Borehole No.		D81	D81	D81	D81	D81	D81
Sample depth (m)	From	17.00	22.00	28.00	33.00	40.00	46.00
	To	-	-	-	-	-	-
Rock type		Tuff	Tuff	Tuff	Tuff	Tuff	Tuff

Additional Laboratory Information

Laboratory sample I.D.			SL90202/18	SL90171/9	SL90171/10	SL90171/11	SL90171/13	SL90171/14
Specimen depth (m)	From		16.54	21.87	28.04	33.04	40.00	45.97
	To		16.77	22.23	28.15	33.23	40.38	46.18
Specimen depth at loading point		(m)	16.67	22.05	28.09	33.13	40.23	46.07
Test type			D	D	D	D	D	D
Direction (if any)			r	r	r	r	⊥	r
Moisture condition			S	S	S	S	S	S
Specimen width	W	(mm)	-	-	-	-	-	-
Specimen width (for test type I only)	W_1	(mm)	-	-	-	-	-	-
	W_2	(mm)	-	-	-	-	-	-
	W	(mm)	-	-	-	-	-	-
Contact length	L	(mm)	101.94	175.88	43.26	77.44	203.70	90.84
Platen contact distance	D	(mm)	83.14	83.04	83.10	78.40	83.44	83.38
L/D ratio (for test type D and I only)			1.23	2.12	0.52	0.99	2.44	1.09
D/W ratio (for test type A, B and I)			-	-	-	-	-	-
Failure load	P	(kN)	43.1	39.6	24.7	>50	>50	>50
Equivalent diameter	D_e	(mm^2)	83.14	83.04	83.10	78.40	83.44	83.38
Uncorrected point load strength index	I_s	(MPa)	6.23	5.74	3.57	>8.13	>7.18	>7.19
Size correction factor			1.26	1.26	1.26	1.22	1.26	1.26
Corrected point load strength index	$I_{s(50)}$	(MPa)	7.83	7.22	4.49	>9.96	>9.04	>9.05
Failure Mode			M	M	J/M	NF	NF	NF

The following is an opinion of the Company and is not covered under the HOKLAS accreditation.
The description of the weathering grade of rock is not a requirement of the point load test and the following weathering grade is an opinion of the laboratory

Weathering grade	II	II	II	II	II	II

Remarks : 1. Rock type : -
2. Weathering grade : Grade I - Fresh, Grade II - Slightly decomposed, Grade III - Medium decomposed, Grade IV - Highly decomposed.
3. Test type : A - Axial test, D - Diametral test, B - Block test, I - Irregular lump test.
4. Direction : ⊥ - perpendicular, // - parallel , r - random or unknown directions w.r.t. the plane of weakness.
5. Moisture condition : S - water saturated, N - natural water content as received, A - laboratory air dry, O - oven dry.
6. Failure mode : J - Joint failure, M - material failure, NF - Not failure (Failure load exceeds load gauge limit (50 kN)).

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil) Date : 23 OCT 2009

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HOKLAS 015

REPORT ON DETERMINATION OF THE POINT LOAD STRENGTH OF ROCK

Information supplied by Client

Client : MTR Corporation Limited
Client's address : Not requested to be reported
Project : Contract 912
Ground Investigation for South Island Line (EAST)

Laboratory Information

Date sample received : 25-08-2009
Date test commenced : 06-09-2009
Date test completed : 06-09-2009
Test method referred : ASTM D5731-95

Additional Information supplied by Client

Client sample No.		-	-				
Borehole No.		D82	D82				
Sample depth (m)	From	43.00	45.00				
	To	-	-				
Rock type		Tuff	Tuff				

Additional Laboratory Information

Laboratory sample I.D.		SL90171/22	SL90171/23				
Specimen depth (m)	From	43.37	44.85				
	To	43.75	45.20				
Specimen depth at loading point (m)		43.54	45.15				
Test type		D	D				
Direction (if any)		⊥	r				
Moisture condition		S	S				
Specimen width	W (mm)	-	-				
Specimen width (for test type I only)	W_1 (mm)	-	-				
	W_2 (mm)	-	-				
	W (mm)	-	-				
Contact length	L (mm)	167.44	46.54				
Platen contact distance	D (mm)	83.70	83.44				
L/D ratio (for test type D and I only)		2.00	0.56				
D/W ratio (for test type A, B and I)		-	-				
Failure load	P (kN)	38.5	>50				
Equivalent diameter	D_e (mm^2)	83.70	83.44				
Uncorrected point load strength index	I_s (MPa)	5.50	>7.18				
Size correction factor		1.26	1.26				
Corrected point load strength index	$I_{s(50)}$ (MPa)	6.93	>9.04				
Failure Mode		M	NF				

The following is an opinion of the Company and is not covered under the HOKLAS accreditation.
The description of the weathering grade of rock is not a requirement of the point load test and the following weathering grade is an opinion of the laboratory

Weathering grade		II	II				

Remarks :
1. Rock type : -
2. Weathering grade : Grade I - Fresh, Grade II - Slightly decomposed, Grade III - Medium decomposed, Grade IV - Highly decomposed.
3. Test type : A - Axial test, D - Diametral test, B - Block test, I - Irregular lump test.
4. Direction : ⊥ - perpendicular, // - parallel , r - random or unknown directions w.r.t. the plane of weakness.
5. Moisture condition : S - water saturated, N - natural water content as received, A - laboratory air dry, O - oven dry.
6. Failure mode : J - Joint failure, M - material failure, NF - Not failure (Failure load exceeds load gauge limit (50 kN)).

Certified by : ~~Paul Richard Cooper (Operations Manager - CMT)~~ / Lai Mei Ting (Assistant Manager - Soil) Date : 23 OCT 2009

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