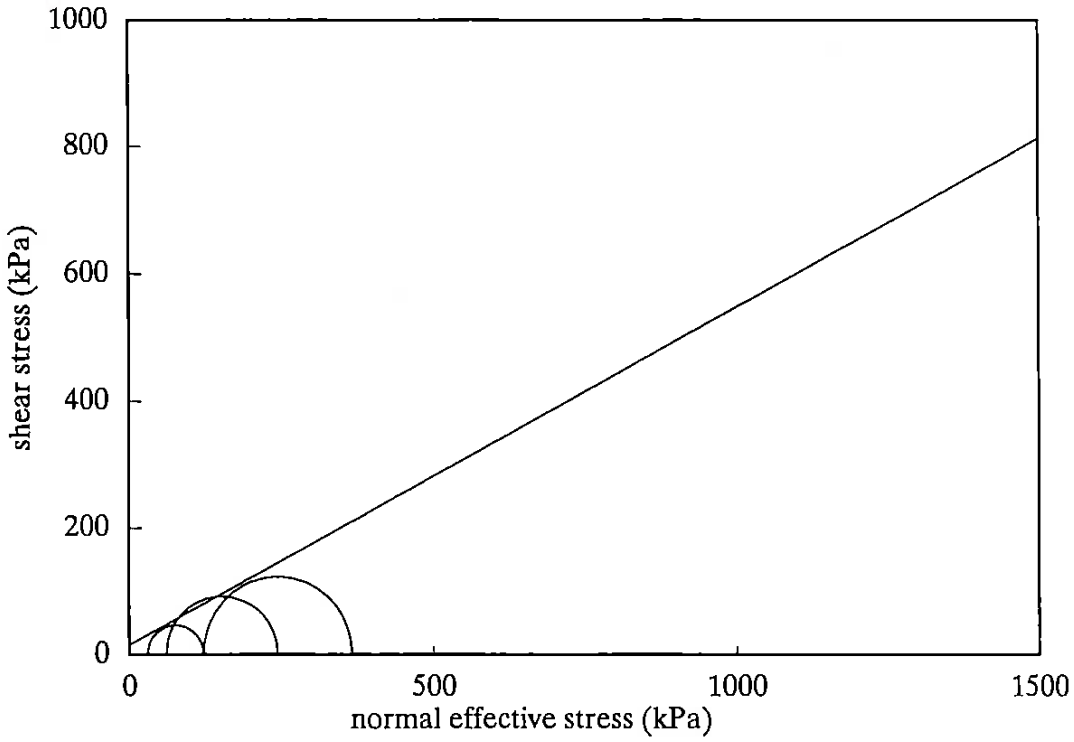
Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 1 Depth (m): 3.00




SUMMARY
At maximum principal stress difference:

| | #1 | #2 | #3 |
|---|---|---|---|
| cell pressure (kPa) | 330 | 360 | 420 |
| deviator stress (kPa) | 91 | 183 | 244 |
| pore pressure (kPa) | 300 | 300 | 299 |

Effective strength parameters:

| | |
|---|---|
| effective cohesion intercept (kPa) | 15.0 |
| effective angle of friction (degrees) | 28.0 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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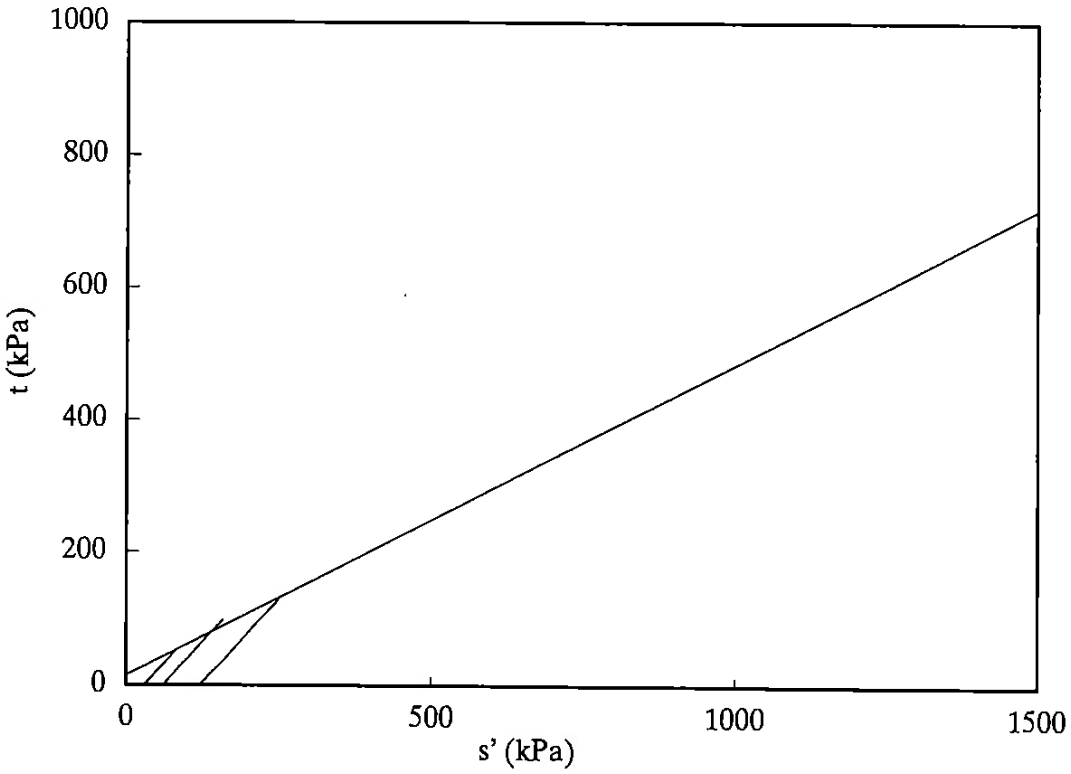
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE
BH Number: 1

Sample No.: U1
Depth (m): 3.00




NOTES ON STRESS PATH PLOTS

1. No membrane or filter drain corrections made to stress path plots

2. Effective stress paths assume full pore water pressure equalization at all times after the start of shear. This assumption is incorrect. The rate of shearing has been estimated to give 95% equalization only at failure.

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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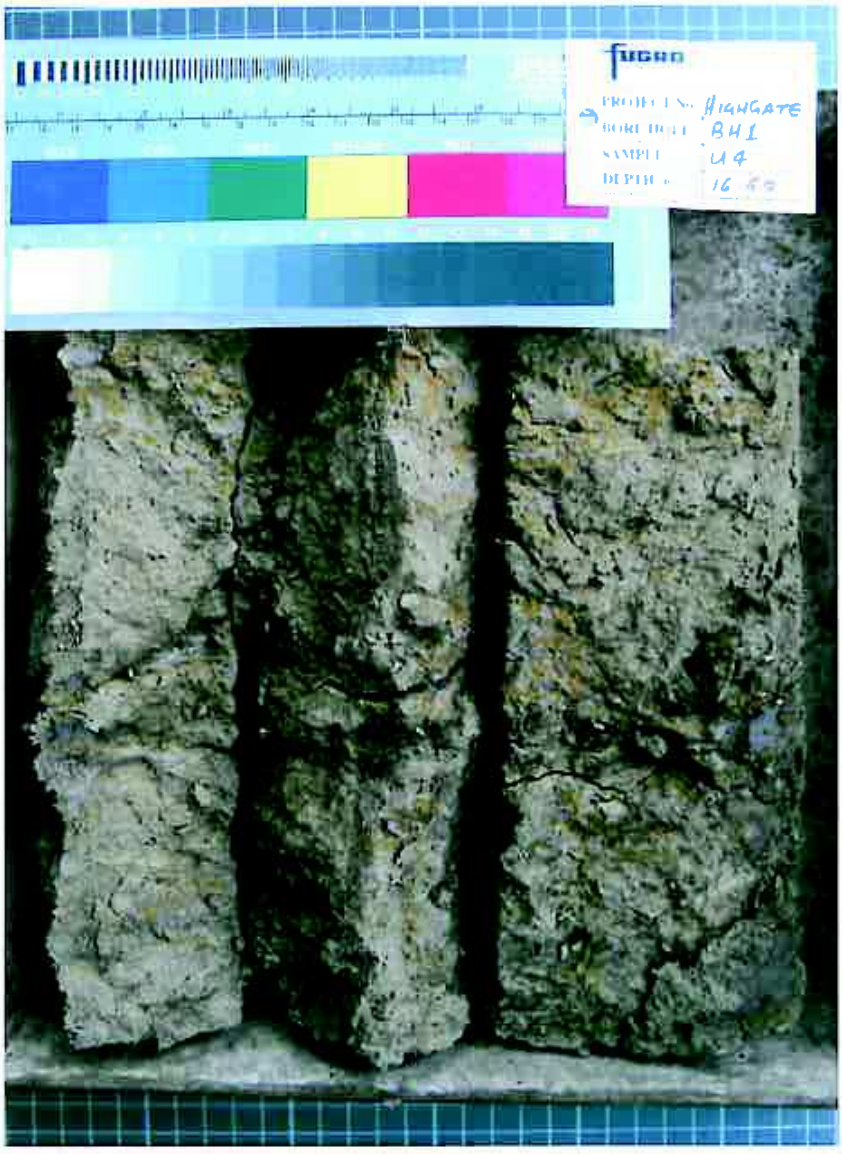
**GROUND ENGINEERING**
**HIGHGATE**

| VISUAL DESCRIPTION |
| --- |
| Firm grey CLAY with thinly interlaminated orange brown fine SAND and few pockets of silt |

SPECIMEN PHOTOGRAPHS




| | |
| --- | --- |
| Borehole | BH1 |
| Sample | U4 |
| Depth (m) | 16.60 |



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| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No: | U4 |
| BH Number: | 1 | Depth (m): | 16.60 |

SPECIMEN DETAILS (TEST #1)

| | |
|---|---|
| description: (visual) | Firm orange brown & grey fine SAND with silt & pockets of clay |
| preparation: | Undisturbed |
| orientation within original sample: | Vertical |
| test started: | 04/03/2009 |

| | | TEST 1 |
|---|---|---|
| **INITIAL STAGE** | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density (Mg/m³): | assumed | 2.67 |
| voids ratio: | | 0.69 |
| degree of saturation (%): | | 100.6 |

**SATURATION STAGE**

| | |
|---|---|
| method: | increments of cell pressure only |
| final pore water pressure (kPa): | 384 |
| final degree of saturation (%): | 99.0 |

**CONSOLIDATION STAGE**

| | |
|---|---|
| effective stress (kPa): | 135 |
| initial pore water pressure (kPa): | 423 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

**SHEAR STAGE**

| | |
|---|---|
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 435 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.012 |
| strain at failure (%): | 8.37 |
| volumetric strain (%): | 1.31 |
| eff. major principal stress (kPa): | 510 |
| eff. minor principal stress (kPa): | 135 |
| time to peak dev. stress (min): | 526 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job name: 41 HIGHGATE Sample No.:U4
BH Number: 1 Depth : 16.60 (m)

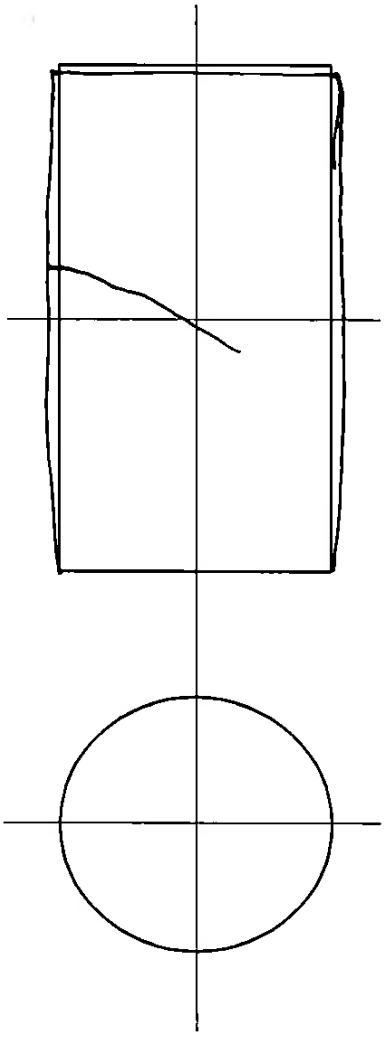
SPECIMEN DETAILS

Description : Firm orange brown & grey
(visual) fine SAND with silt & pockets of clay
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 1 Depth (m): 16.60

SPECIMEN DETAILS (TEST #1)

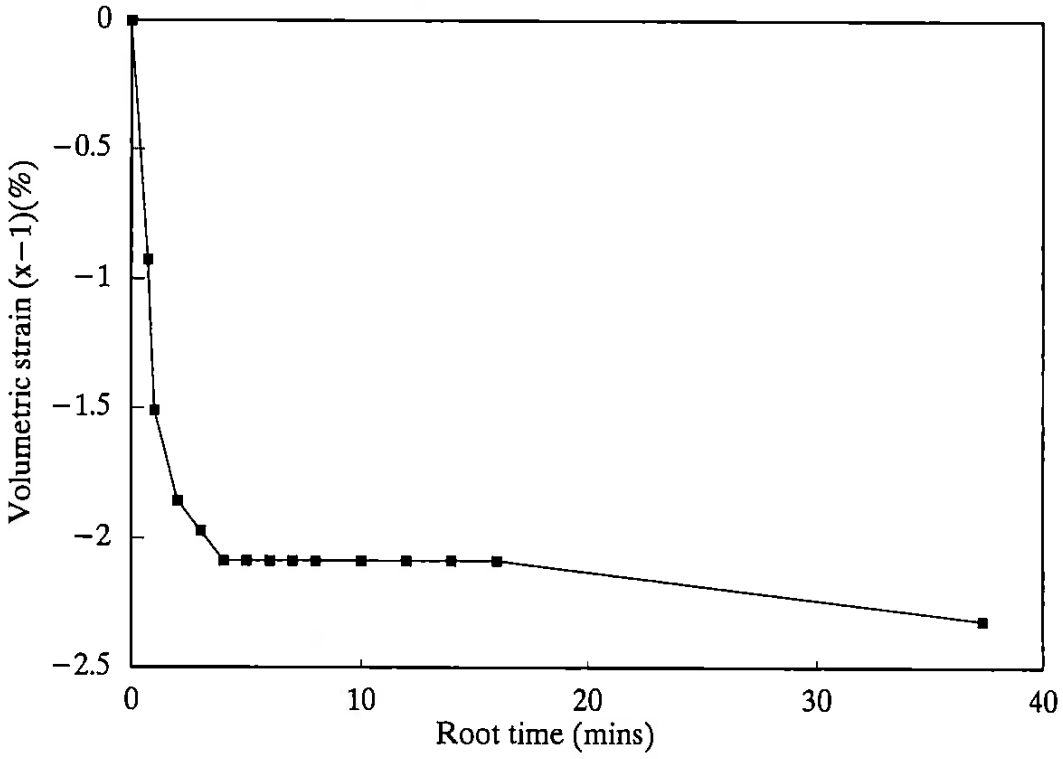
| | | |
|---|---|---|
| description: | Firm orange brown & grey | |
| (visual) | fine SAND with silt & pockets of clay | |
| initial and final m/c (%): | 26 | 25 |
| initial bulk density (Mg/cu.m): | 1.99 | |
| initial dry density (Mg/cu.m): | 1.58 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | | |
| B value: | 0.99 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 435 | 300 |
| effective consolidation pressure (kPa): | | 135 |
| base, side, top drainage | y y y | |

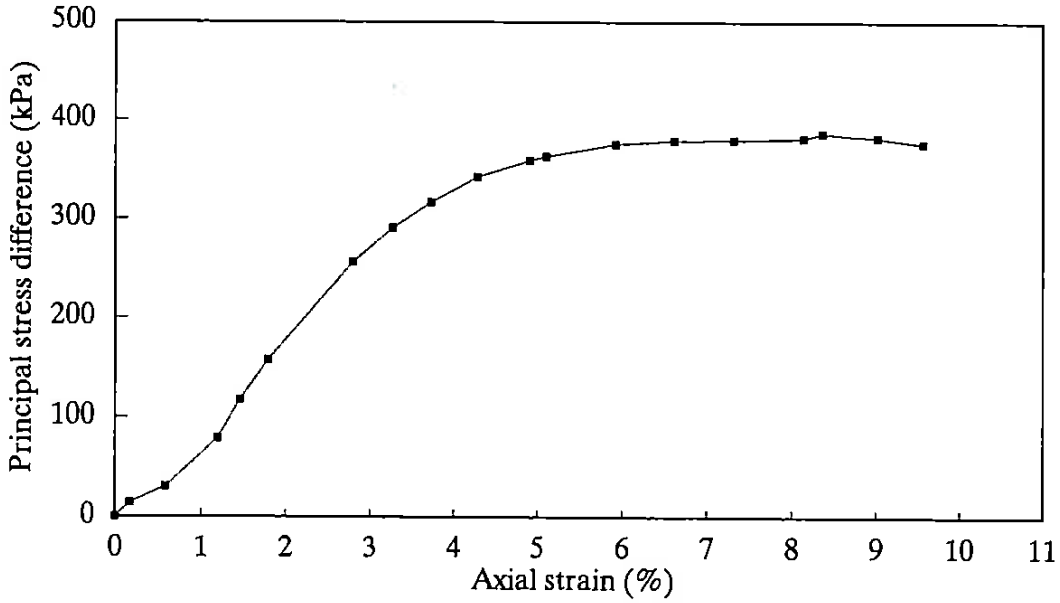


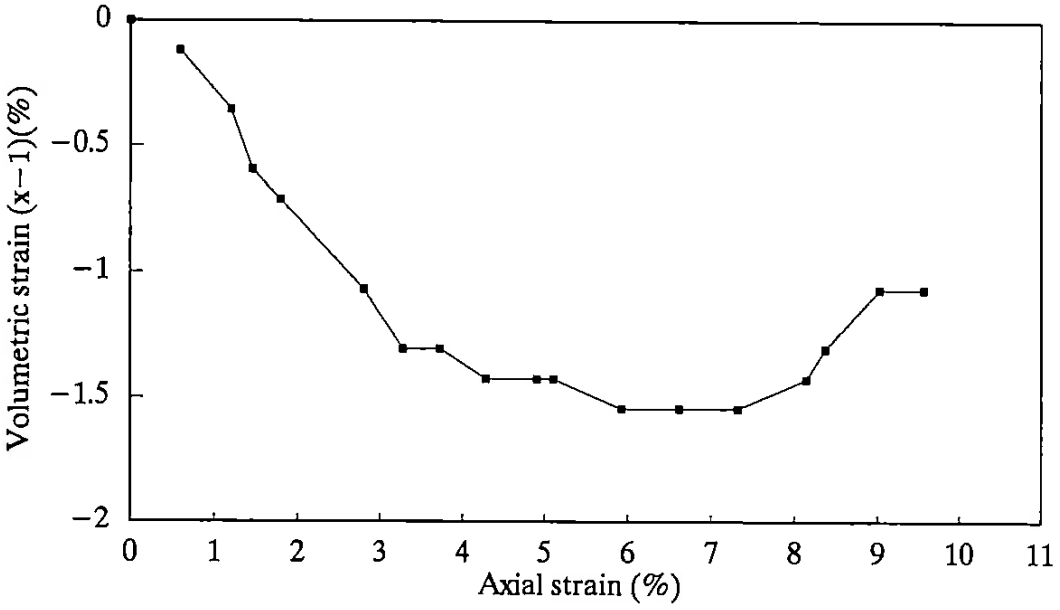

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 1 Depth (m): 16.60

SHEAR STAGE (TEST #1)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.95 |
| cell pressure (kPa): | 435 |
| measured max. deviator stress (kPa): | 387 |
| membrane + filter drain correction (kPa): | 11.8 |
| corrected max. deviator stress (kPa): | 375 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No:U4 | |
| BH Number: | 1 | Depth (m):16.60 | |

SPECIMEN DETAILS (TEST #2)

| | | |
|---|---|---|
| description: | Firm orange brown & grey | |
| (visual) | fine SAND with silt & pockets of clay | |
| preparation: | Undisturbed | |
| orientation within original sample: | | Vertical |
| test started: | 04/03/2009 | |

| | | TEST 2 |
|---|---|---|
| INITIAL STAGE | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density ($Mg/m^3$): | assumed | 2.67 |
| voids ratio: | | 0.73 |
| degree of saturation (%): | | 93.1 |

SATURATION STAGE

| | | |
|---|---|---|
| method: | increments of cell pressure only | |
| final pore water pressure (kPa): | | 397 |
| final degree of saturation (%): | | 100.0 |

CONSOLIDATION STAGE

| | |
|---|---|
| effective stress (kPa): | 235 |
| initial pore water pressure (kPa): | 537 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

SHEAR STAGE

| | | |
|---|---|---|
| failure criterion: | maximum deviator stress (kPa) | |
| cell pressure (kPa): | | 535 |
| initial pore water pressure (kPa): | | 300 |
| rate of strain (mm/min): | | 0.012 |
| strain at failure (%): | | 7.78 |
| volumetric strain at failure (%): | | 3.66 |
| eff. major principal stress (kPa): | | 891 |
| eff. minor principal stress (kPa): | | 235 |
| time to peak dev. stress (min): | | 474 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job name: 41 HIGHGATE Sample No.:U4
BH Number: 1 Depth : 16.60 (m)

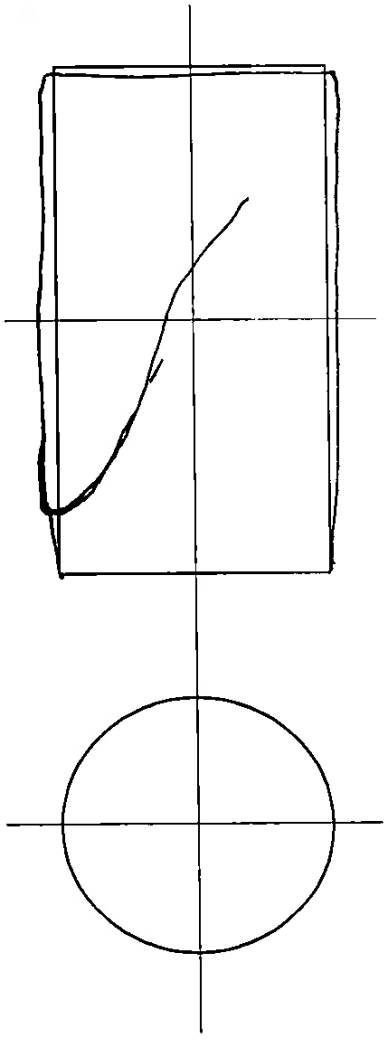
SPECIMEN DETAILS

Description : Firm orange brown & grey
(visual) fine SAND with silt & pockets of clay
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 1 Depth (m): 16.60

SPECIMEN DETAILS (TEST #2)

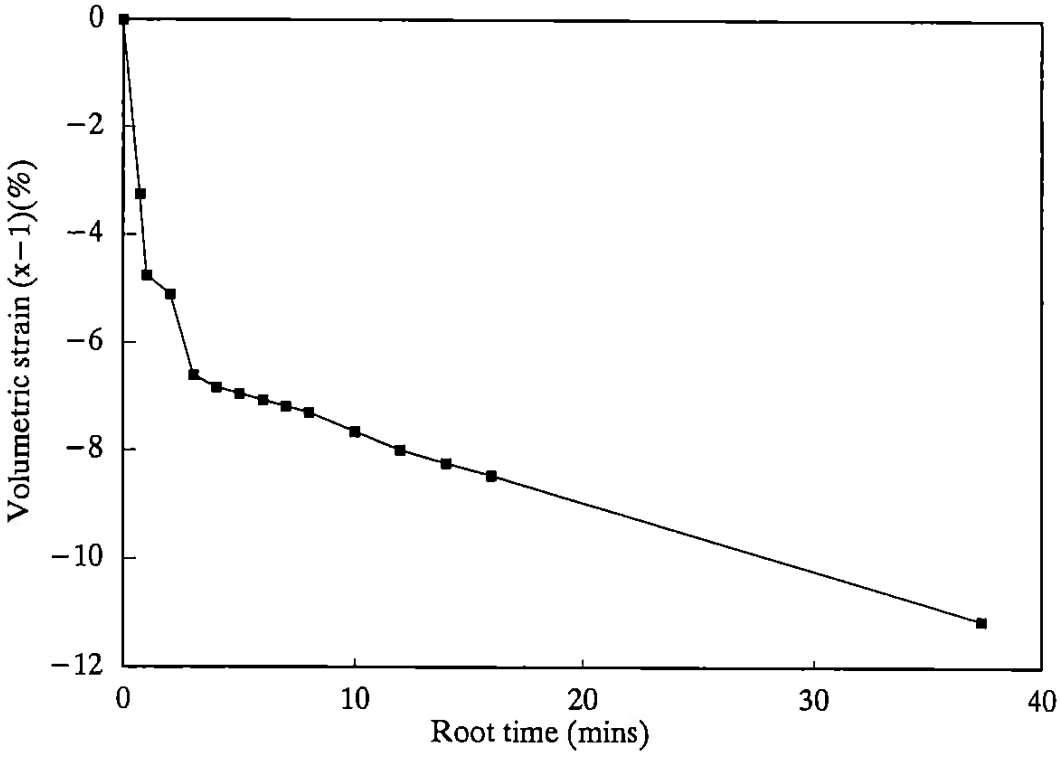
| | | |
|---|---|---|
| description: | Firm orange brown & grey | |
| (visual) | fine SAND with silt & pockets of clay | |
| initial and final m/c (%): | 26 | 24 |
| initial bulk density (Mg/cu.m): | 1.94 | |
| initial dry density (Mg/cu.m): | 1.54 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | |
|---|---|
| cell and back pressure (kPa): | |
| B value: | 1 |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 535 | 300 |
| effective consolidation pressure (kPa): | | 235 |
| base, side, top drainage | y y y | |



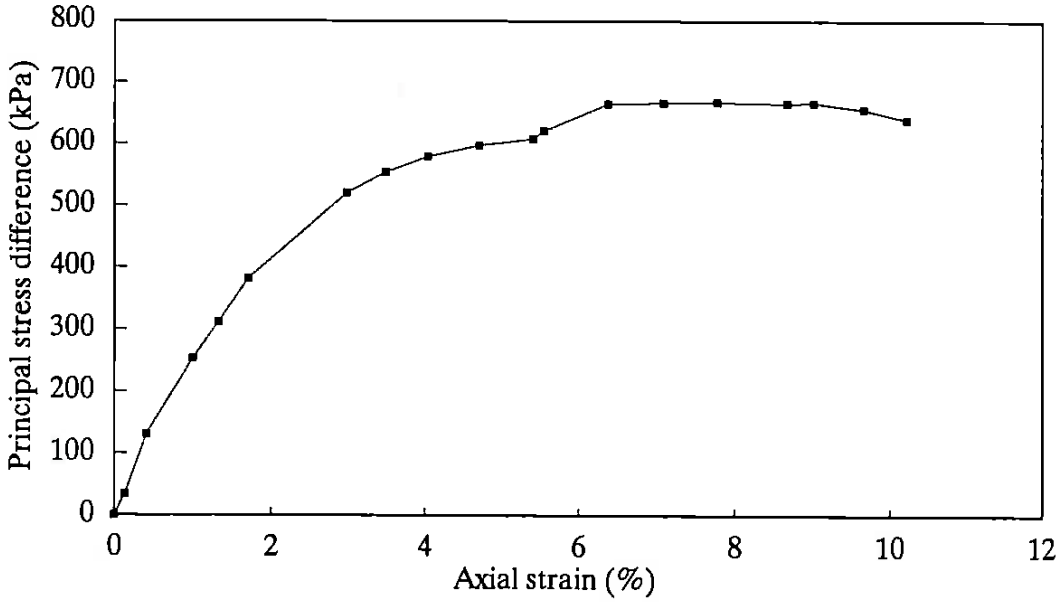

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

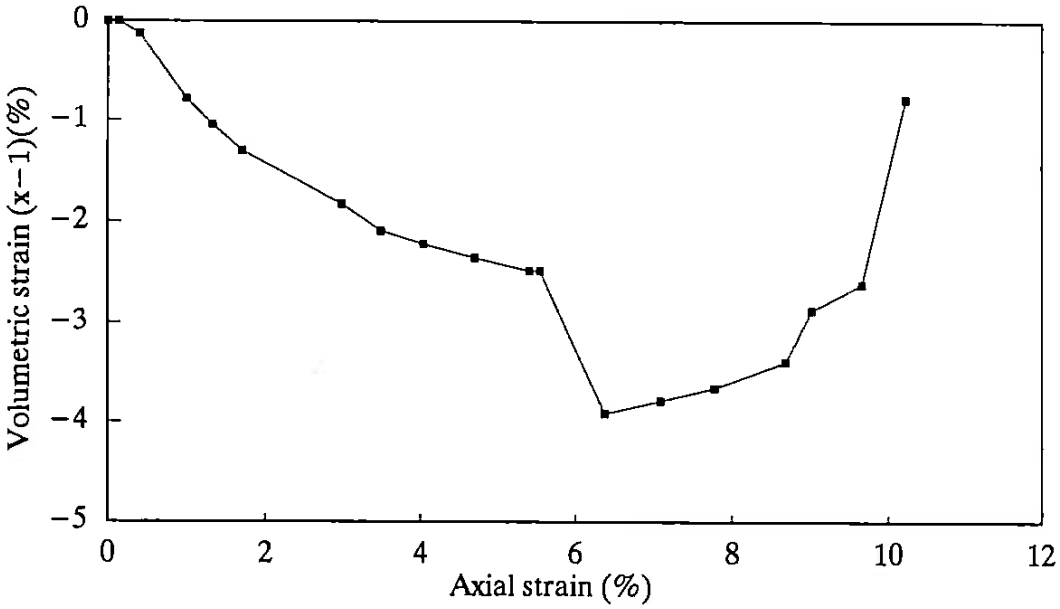
S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE  Sample No.: U4
BH Number: 1  Depth (m): 16.60

SHEAR STAGE (TEST #2)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.95 |
| cell pressure (kPa): | 535 |
| measured max. deviator stress (kPa): | 668 |
| membrane + filter drain correction (kPa) | 11.7 |
| corrected max. deviator stress (kPa): | 656 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No:U4
BH Number: 1 Depth (m):16.60

SPECIMEN DETAILS (TEST #3)
description: Firm orange brown & grey
(visual) fine SAND with silt & pockets of clay
preparation: Undisturbed
orientation within original sample: Vertical
test started: 04/03/2009

| | | TEST 3 |
|---|---|---|
| INITIAL STAGE | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density (Mg/m³): | assumed | 2.67 |
| voids ratio: | | 0.70 |
| degree of saturation (%): | | 99.0 |

SATURATION STAGE
method: increments of cell pressure only

| | |
|---|---|
| final pore water pressure (kPa): | 381 |
| final degree of saturation (%): | 99.0 |

CONSOLIDATION STAGE

| | |
|---|---|
| effective stress (kPa): | 335 |
| initial pore water pressure (kPa): | 615 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

SHEAR STAGE
failure criterion: maximum deviator stress (kPa)

| | |
|---|---|
| cell pressure (kPa): | 635 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.012 |
| strain at failure (%): | 7.40 |
| volumetric strain at failure (%): | 2.23 |
| eff. major principal stress (kPa): | 1060 |
| eff. minor principal stress (kPa): | 335 |
| time to peak dev. stress (min): | 458 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job name: 41 HIGHGATE Sample No.:U4
BH Number: 1 Depth : 16.60 (m)

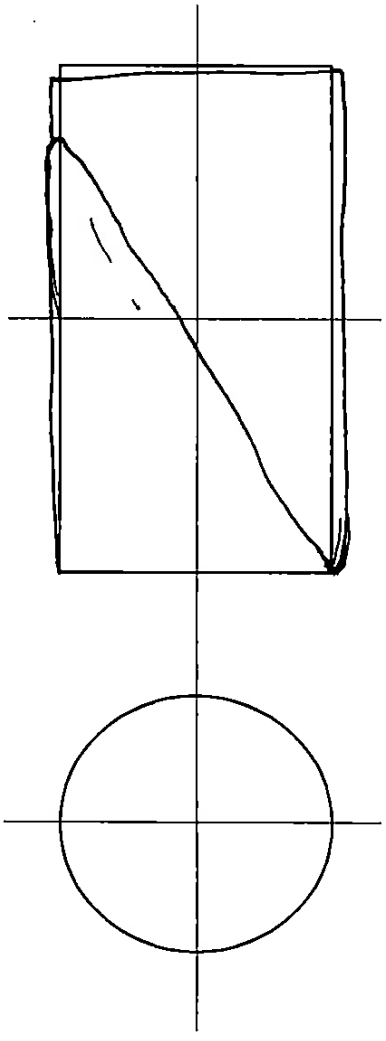
SPECIMEN DETAILS

Description : Firm orange brown & grey
(visual) fine SAND with silt & pockets of clay
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 1 Depth (m): 16.60

SPECIMEN DETAILS (TEST #3)

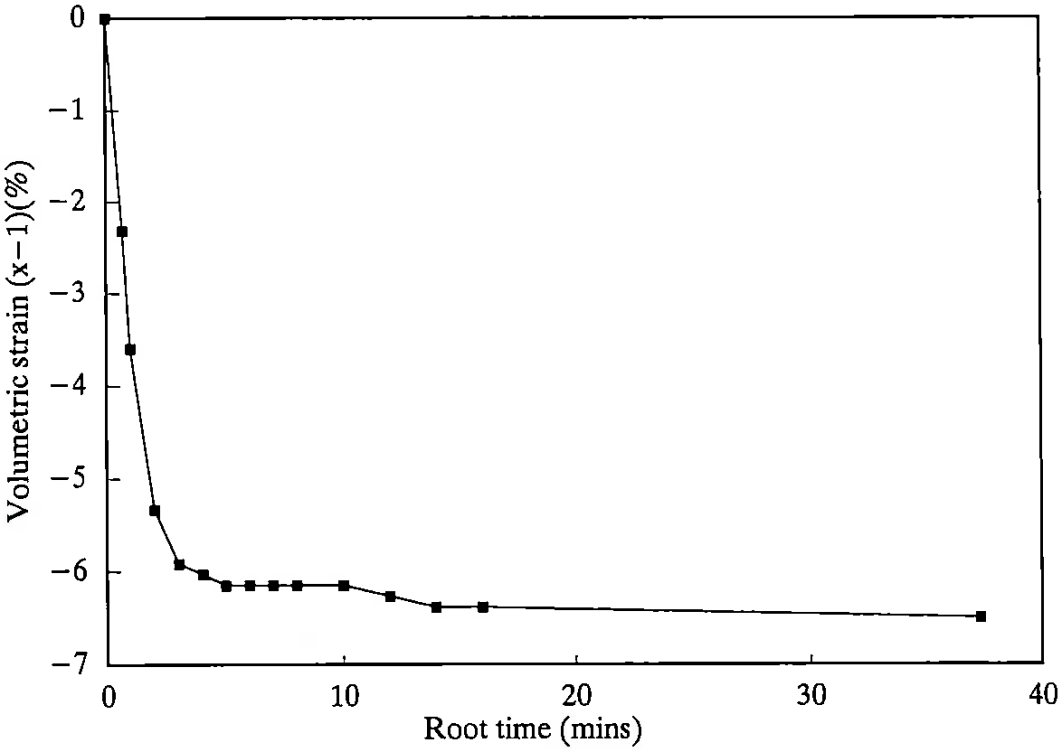
| | | |
|---|---|---|
| description: | Firm orange brown & grey | |
| (visual) | fine SAND with silt & pockets of clay | |
| initial and final m/c (%): | 26 | 23 |
| initial bulk density (Mg/cu.m): | 1.98 | |
| initial dry density (Mg/cu.m): | 1.57 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | | |
| B value: | 0.99 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 635 | 300 |
| effective consolidation pressure (kPa): | | 335 |
| base, side, top drainage | y y y | |



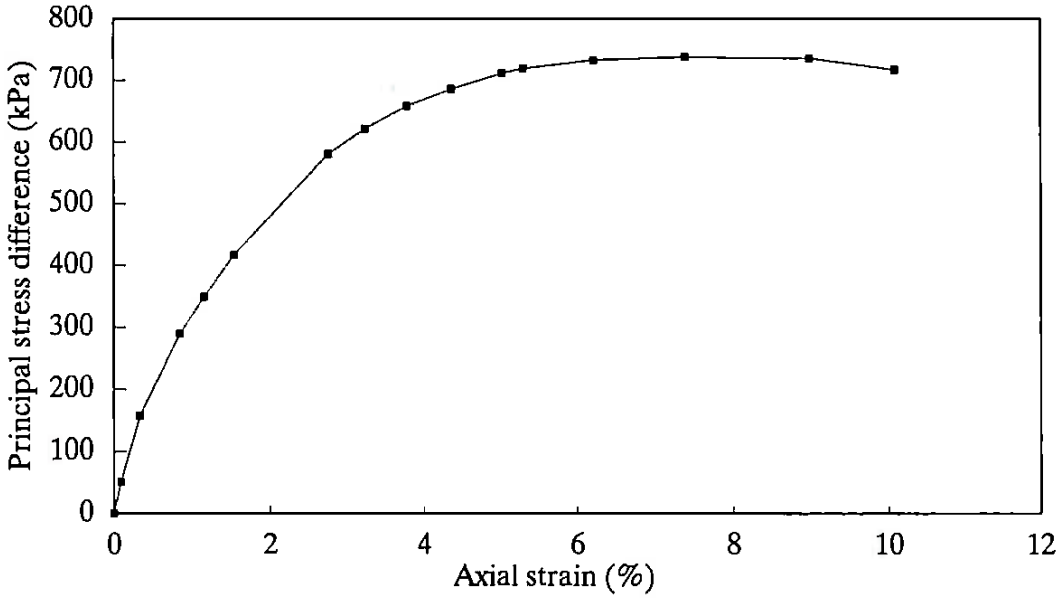

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

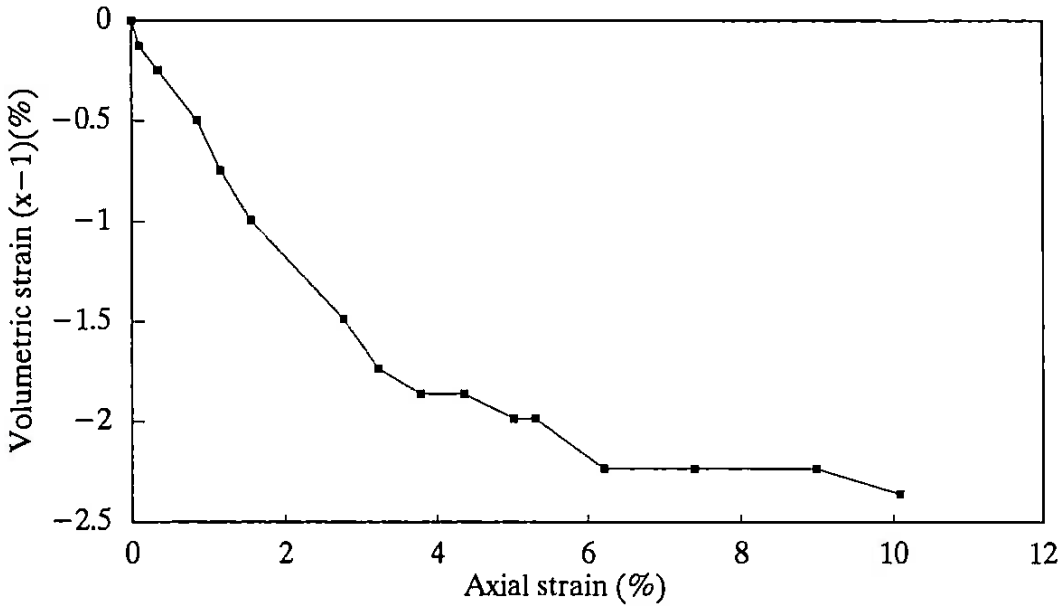
S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 1 Depth (m): 16.60

SHEAR STAGE (TEST #3)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.95 |
| cell pressure (kPa): | 635 |
| measured max. deviator stress (kPa): | 737 |
| membrane + filter drain correction (kPa) | 11.6 |
| corrected max. deviator stress (kPa): | 725 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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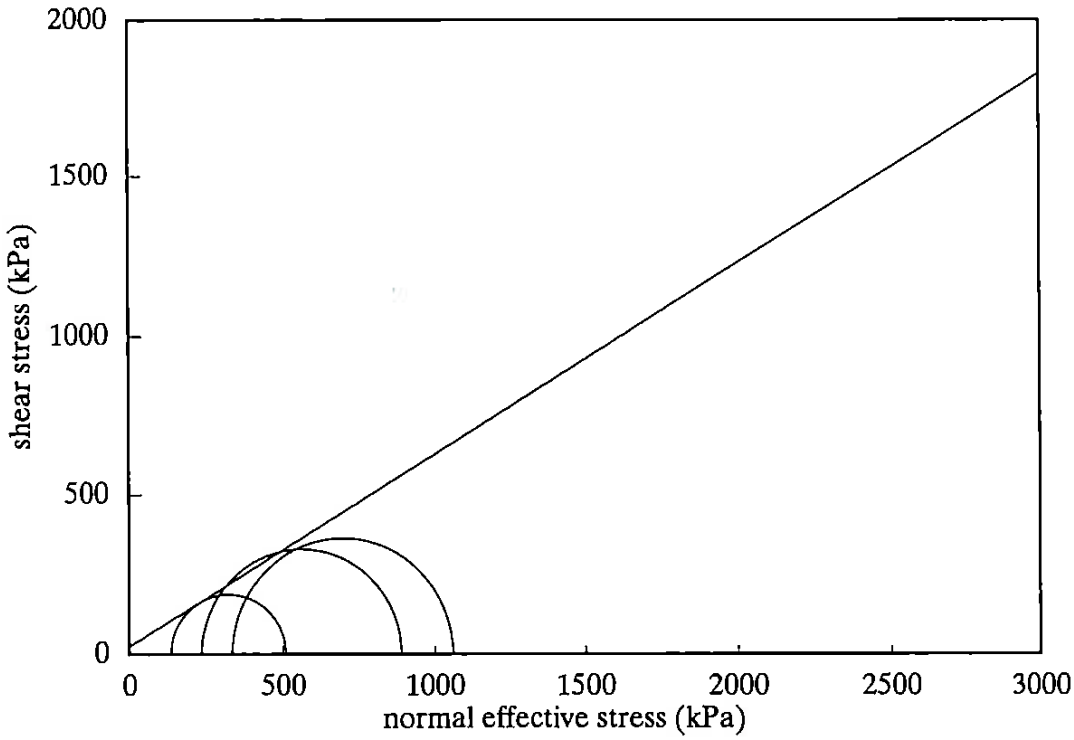
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 1 Depth (m): 16.60




SUMMARY
At maximum principal stress difference:

| | #1 | #2 | #3 |
|---|---|---|---|
| cell pressure (kPa) | 435 | 535 | 635 |
| deviator stress (kPa) | 375 | 656 | 725 |
| pore pressure (kPa) | 300 | 300 | 300 |

Effective strength parameters:

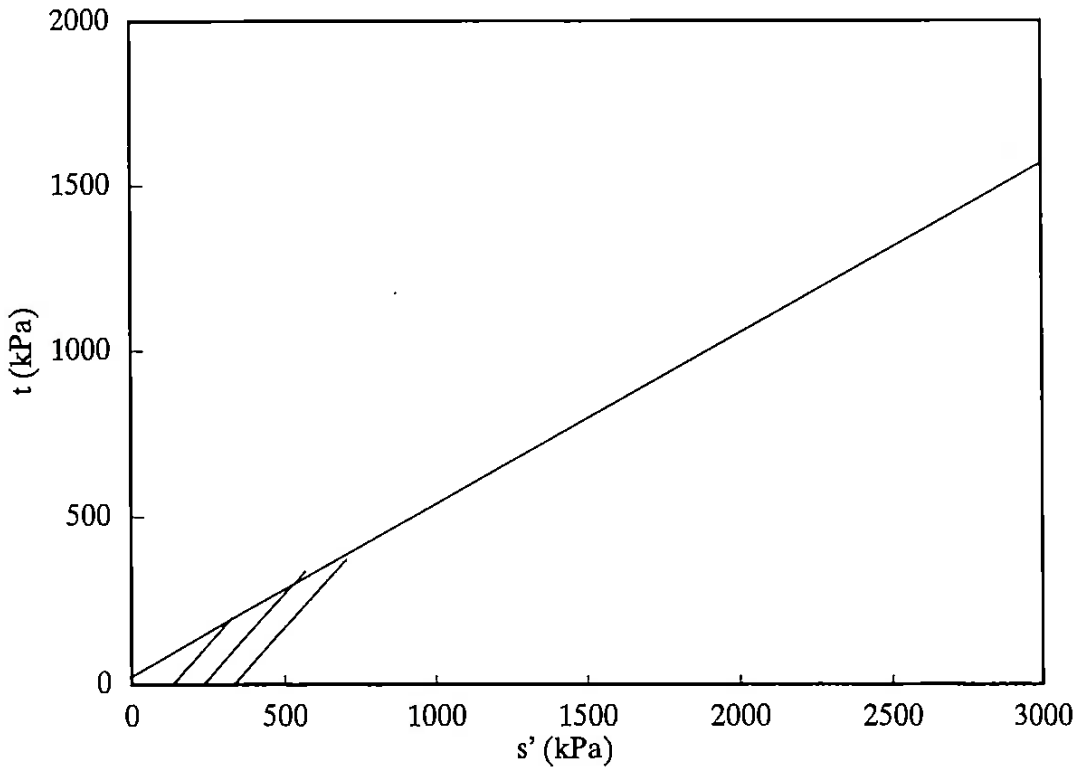
| | |
|---|---|
| effective cohesion intercept (kPa) | 25.0 |
| effective angle of friction (degrees) | 31.0 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE
BH Number: 1

Sample No.: U4
Depth (m): 16.60




NOTES ON STRESS PATH PLOTS

1. No membrane or filter drain corrections made to stress path plots

2. Effective stress paths assume full pore water pressure equalization at all times after the start of shear. This assumption is incorrect. The rate of shearing has been estimated to give 95% equalization only at failure.

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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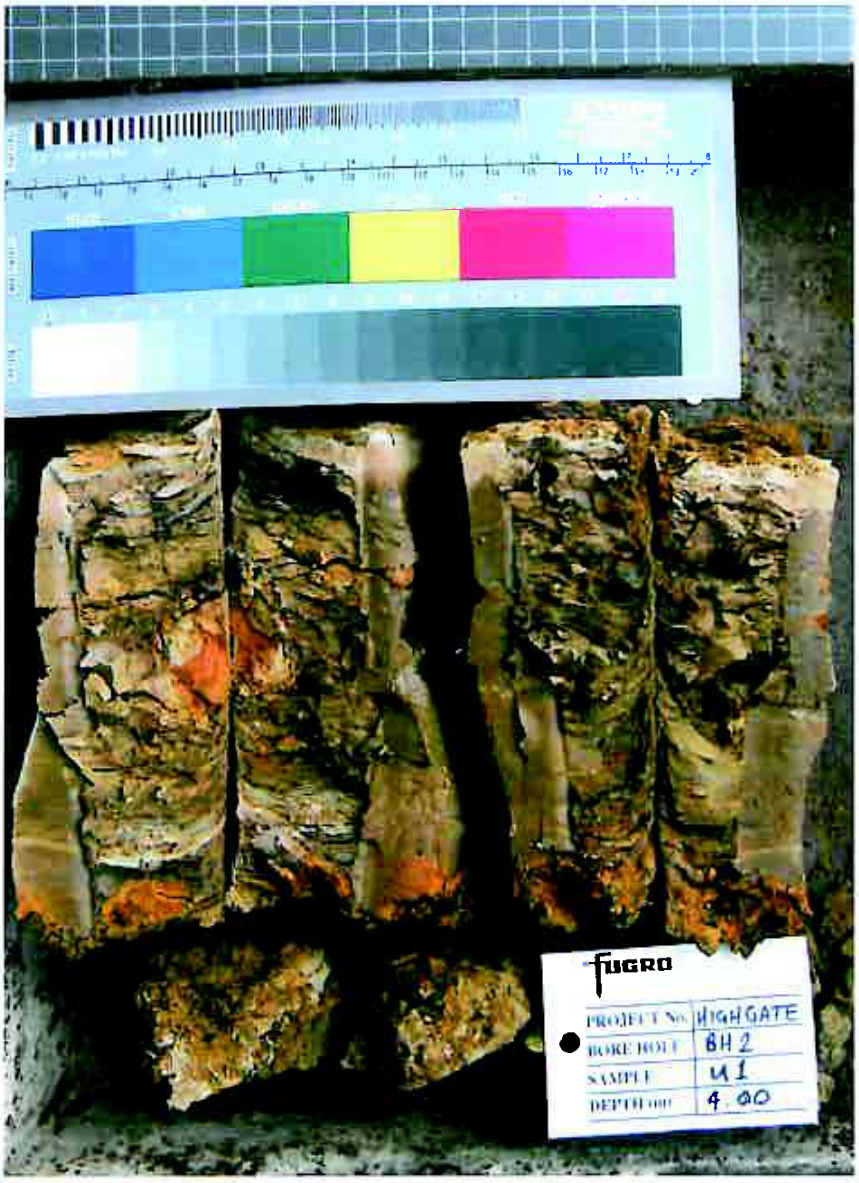
Surrey Geotechnical Consultants Limited

**GROUND ENGINEERING**
**HIGHGATE**

| VISUAL DESCRIPTION |
| --- |
| Firm very closely fissured light grey CLAY with think laminae of brown sand and pockets of silty sand |

SPECIMEN PHOTOGRAPHS




| | |
| --- | --- |
| Borehole | BH2 |
| Sample | U1 |
| Depth (m) | 4.00 |

Report No: 20921005

S·G·C
Surrey Geotechnical Consultants Limited

| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No: | U1 |
| BH Number: | 2 | Depth (m): | 4.00 |

SPECIMEN DETAILS (TEST #1)

| | |
|---|---|
| description: (visual) | Firm brown sand with pockets of light grey clay |
| preparation: | Undisturbed |
| orientation within original sample: | Vertical |
| test started: | 17/03/2009 |

| | | TEST 1 |
|---|---|---|
| **INITIAL STAGE** | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density ($Mg/m^3$): | assumed | 2.69 |
| voids ratio: | | 0.63 |
| degree of saturation (%): | | 95.9 |

**SATURATION STAGE**

| | |
|---|---|
| method: | increments of cell and back pressure |
| final pore water pressure (kPa): | 393 |
| final degree of saturation (%): | 98.0 |

**CONSOLIDATION STAGE**

| | |
|---|---|
| effective stress (kPa): | 40 |
| initial pore water pressure (kPa): | 329 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

**SHEAR STAGE**

| | |
|---|---|
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 340 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.012 |
| strain at failure (%): | 5.41 |
| volumetric strain (%): | -0.58 |
| eff. major principal stress (kPa): | 195 |
| eff. minor principal stress (kPa): | 40 |
| time to peak dev. stress (min): | 342 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job name: 41 HIGHGATE Sample No.:U1
BH Number: 2 Depth : 4.00 (m)

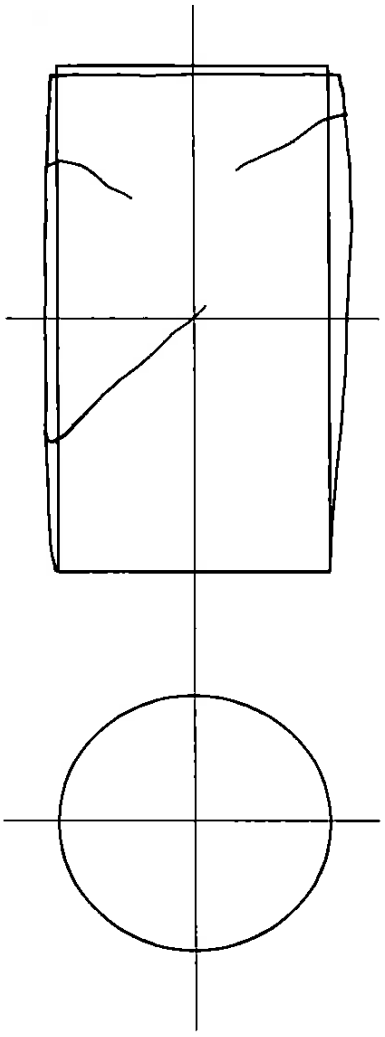
SPECIMEN DETAILS

Description : Firm brown sand with
(visual) pockets of light grey clay
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

| | | | |
|---|---|---|---|
| Job Name: 41 HIGHGATE | | Sample No.: | U1 |
| BH Number: 2 | | Depth (m): | 4.00 |

SPECIMEN DETAILS (TEST #1)

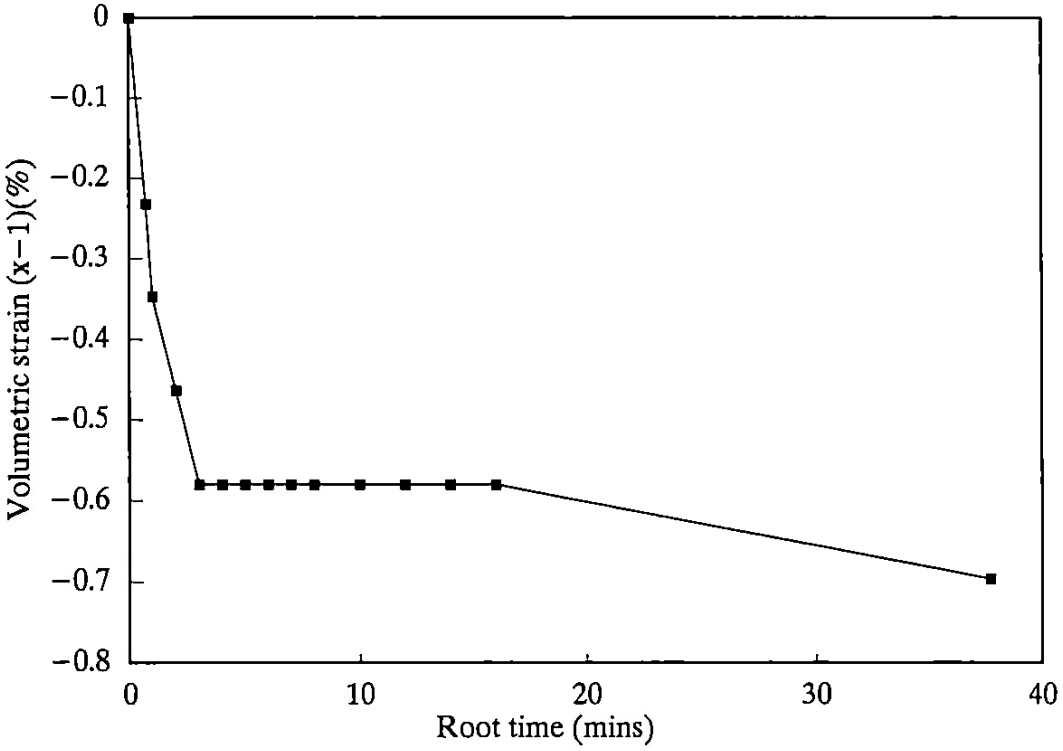
| | | |
|---|---|---|
| description: | Firm brown sand with | |
| (visual) | pockets of light grey clay | |
| initial and final m/c (%): | 23 | 24 |
| initial bulk density (Mg/cu.m): | 2.02 | |
| initial dry density (Mg/cu.m): | 1.65 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 310 | 300 |
| B value: | 0.98 | |

CONSOLIDATION STAGE

| | | | |
|---|---|---|---|
| cell and back pressure (kPa): | 340 | | 300 |
| effective consolidation pressure (kPa): | | | 40 |
| base, side, top drainage | y | y | y |

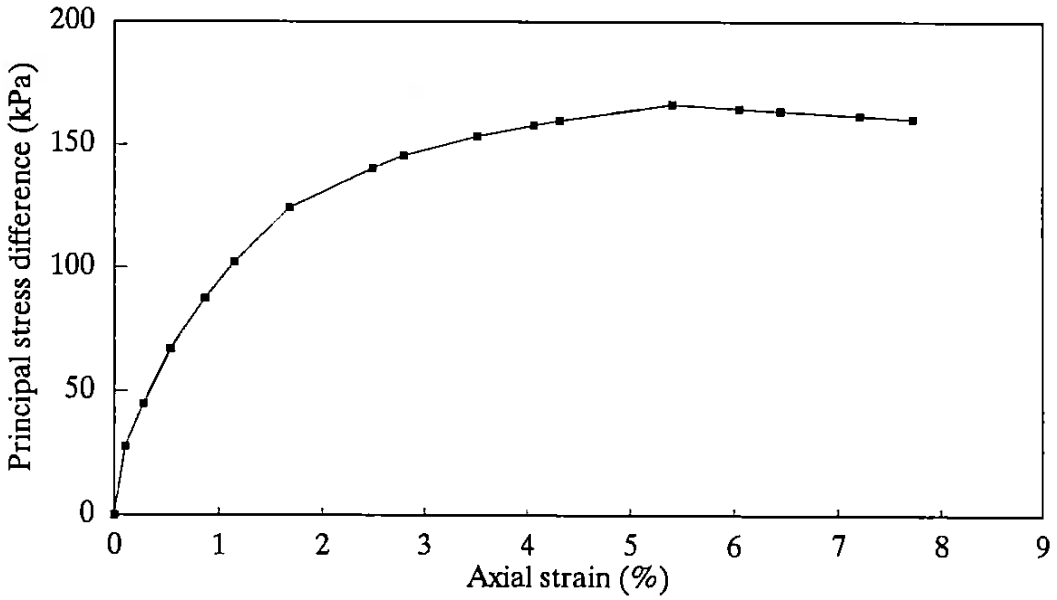


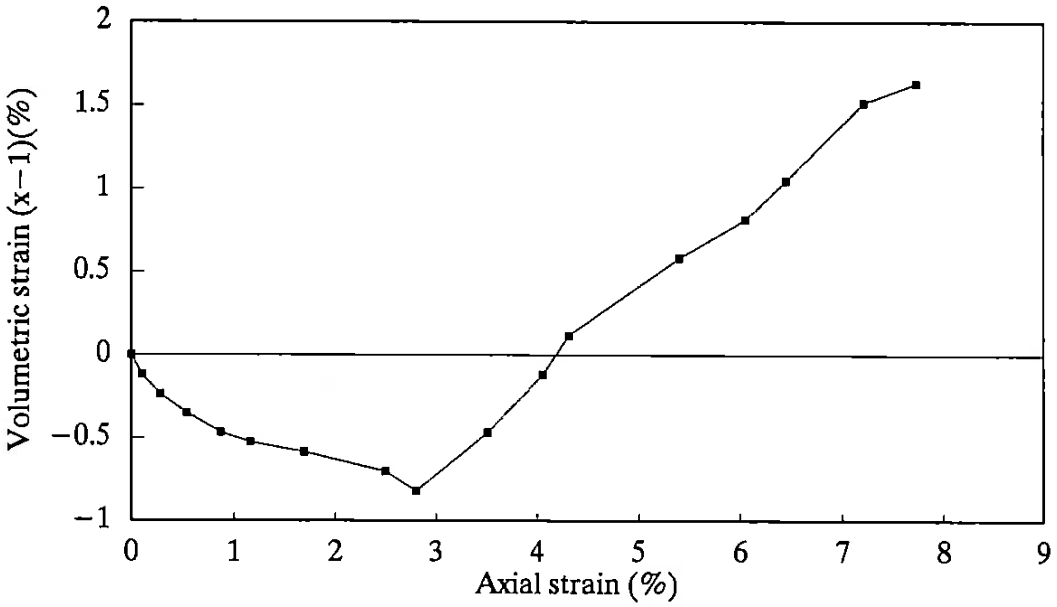

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 2 Depth (m): 4.00

SHEAR STAGE (TEST #1)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.95 |
| cell pressure (kPa): | 340 |
| measured max. deviator stress (kPa): | 166 |
| membrane + filter drain correction (kPa): | 11.1 |
| corrected max. deviator stress (kPa): | 155 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No: | U1 |
| BH Number: | 2 | Depth (m): | 4.00 |

SPECIMEN DETAILS (TEST #2)

| | | | |
|---|---|---|---|
| description: (visual) | Firm brown sand with pockets of light grey clay | | |
| preparation: | Undisturbed | | |
| orientation within original sample: | | | Vertical |
| test started: | 17/03/2009 | | |

| | | TEST 2 |
|---|---|---|
| **INITIAL STAGE** | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density (Mg/m³): | assumed | 2.69 |
| voids ratio: | | 0.66 |
| degree of saturation (%): | | 93.9 |

| | |
|---|---|
| **SATURATION STAGE** | |
| method: | increments of cell and back pressure |
| final pore water pressure (kPa): | 396 |
| final degree of saturation (%): | 100.0 |

| | |
|---|---|
| **CONSOLIDATION STAGE** | |
| effective stress (kPa): | 80 |
| initial pore water pressure (kPa): | 369 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

| | |
|---|---|
| **SHEAR STAGE** | |
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 380 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.012 |
| strain at failure (%): | 5.67 |
| volumetric strain at failure (%): | 2.16 |
| eff. major principal stress (kPa): | 323 |
| eff. minor principal stress (kPa): | 80 |
| time to peak dev. stress (min): | 355 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job name: 41 HIGHGATE Sample No.:U1
BH Number: 2 Depth : 4.00 (m)

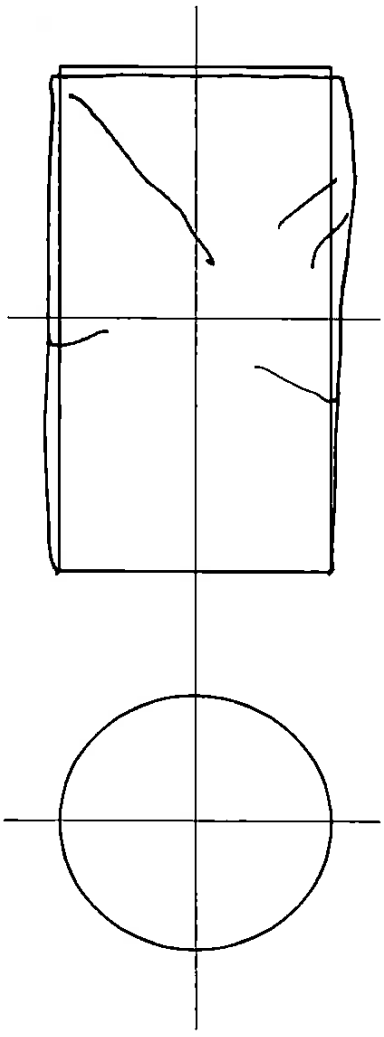
SPECIMEN DETAILS

Description : Firm brown sand with
(visual) pockets of light grey clay
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 2 Depth (m): 4.00

SPECIMEN DETAILS (TEST #2)

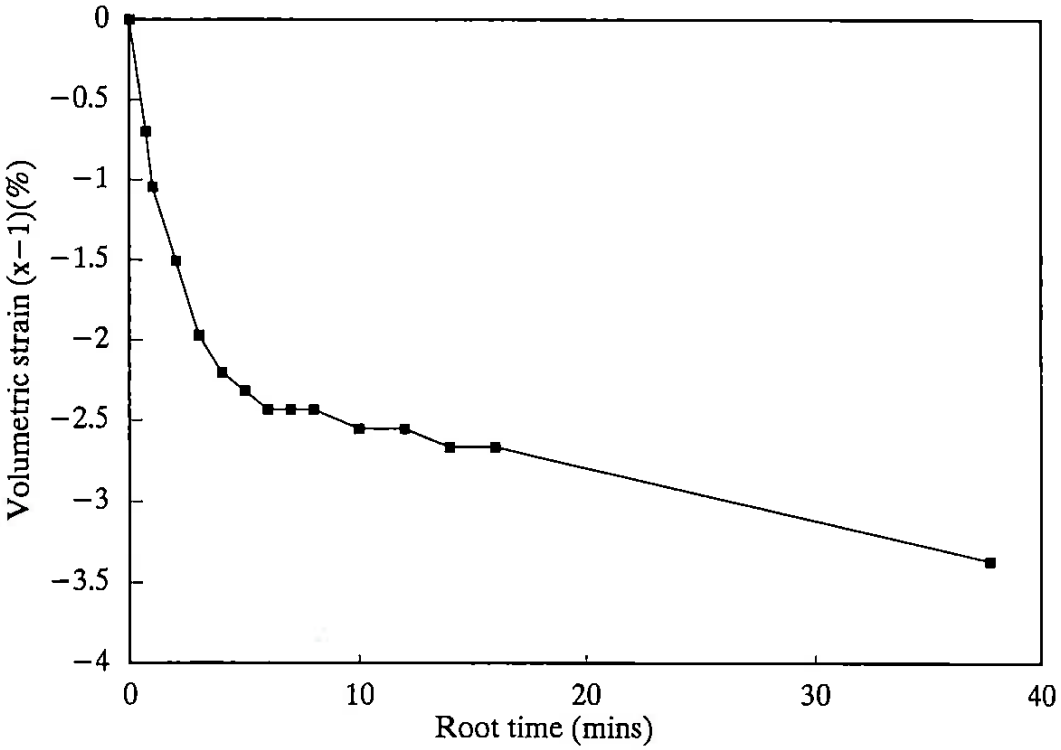
| | | |
|---|---|---|
| description: (visual) | Firm brown sand with pockets of light grey clay | |
| initial and final m/c (%): | 23 | 23 |
| initial bulk density (Mg/cu.m): | 1.99 | |
| initial dry density (Mg/cu.m): | 1.62 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 310 | 300 |
| B value: | 1 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 380 | 300 |
| effective consolidation pressure (kPa): | | 80 |
| base, side, top drainage | y y y | |

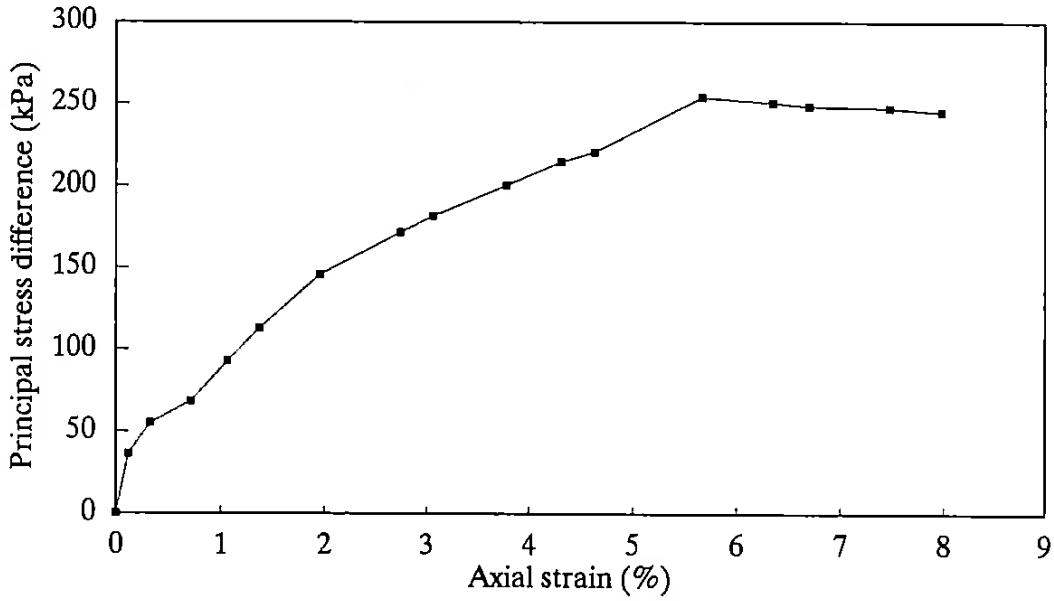


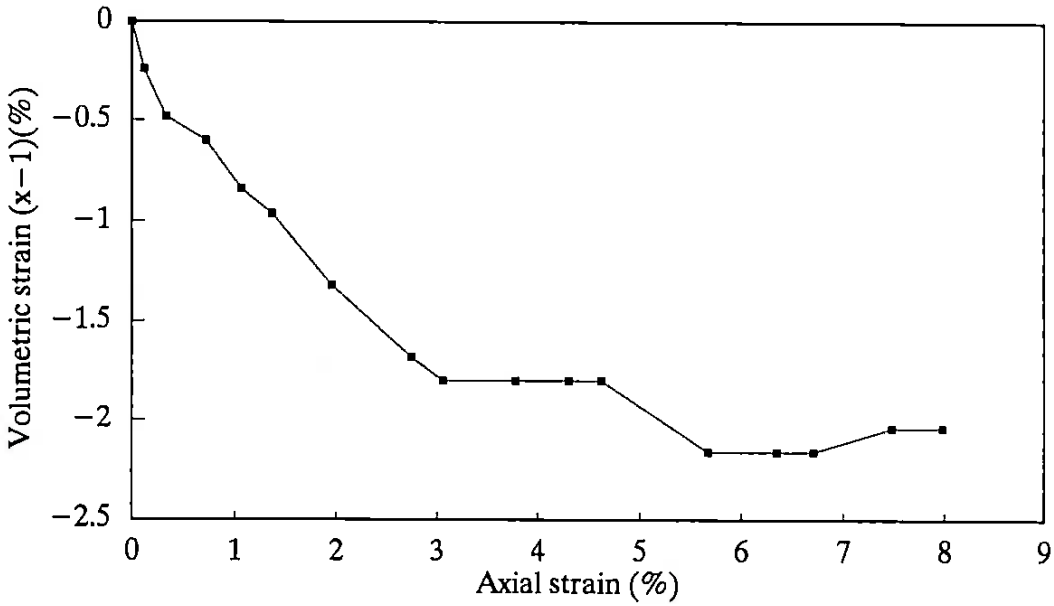

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 2 Depth (m): 4.00

SHEAR STAGE (TEST #2)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.95 |
| cell pressure (kPa): | 380 |
| measured max. deviator stress (kPa): | 254 |
| membrane + filter drain correction (kPa) | 11.1 |
| corrected max. deviator stress (kPa): | 243 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No: | U1 |
| BH Number: | 2 | Depth (m): | 4.00 |

SPECIMEN DETAILS (TEST #3)

| | | |
|---|---|---|
| description: (visual) | Firm brown sand with pockets of light grey clay | |
| preparation: | Undisturbed | |
| orientation within original sample: | | Vertical |
| test started: | 17/03/2009 | |

| | | TEST 3 |
|---|---|---|
| **INITIAL STAGE** | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density (Mg/m³): | assumed | 2.69 |
| voids ratio: | | 0.64 |
| degree of saturation (%): | | 96.9 |

**SATURATION STAGE**

| | |
|---|---|
| method: | increments of cell and back pressure |
| final pore water pressure (kPa): | 399 |
| final degree of saturation (%): | 99.0 |

**CONSOLIDATION STAGE**

| | |
|---|---|
| effective stress (kPa): | 160 |
| initial pore water pressure (kPa): | 449 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

**SHEAR STAGE**

| | |
|---|---|
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 460 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.012 |
| strain at failure (%): | 9.65 |
| volumetric strain at failure (%): | 1.45 |
| eff. major principal stress (kPa): | 583 |
| eff. minor principal stress (kPa): | 160 |
| time to peak dev. stress (min): | 603 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Job name: 41 HIGHGATE Sample No.:U1
BH Number: 2 Depth : 4.00 (m)

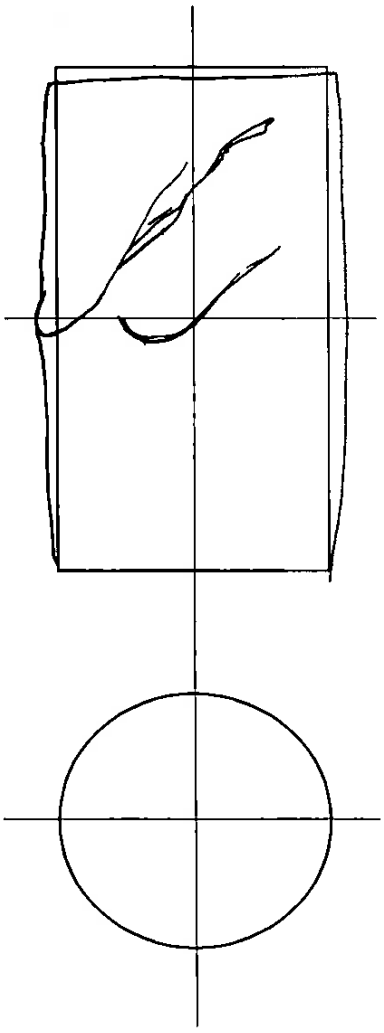
SPECIMEN DETAILS

Description : Firm brown sand with
(visual) pockets of light grey clay
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 2 Depth (m): 4.00

SPECIMEN DETAILS (TEST #3)

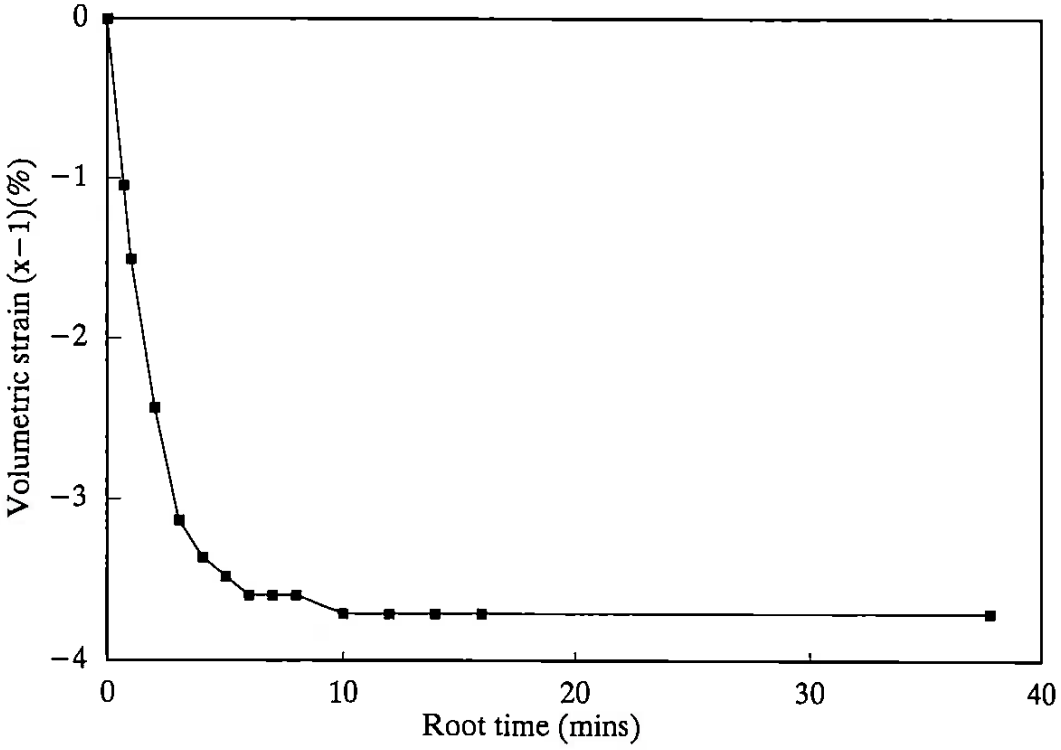
| | | |
|---|---|---|
| description: (visual) | Firm brown sand with pockets of light grey clay | |
| initial and final m/c (%): | 23 | 22 |
| initial bulk density (Mg/cu.m): | 2.02 | |
| initial dry density (Mg/cu.m): | 1.64 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 310 | 300 |
| B value: | 0.99 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 460 | 300 |
| effective consolidation pressure (kPa): | | 160 |
| base, side, top drainage | y y | y |

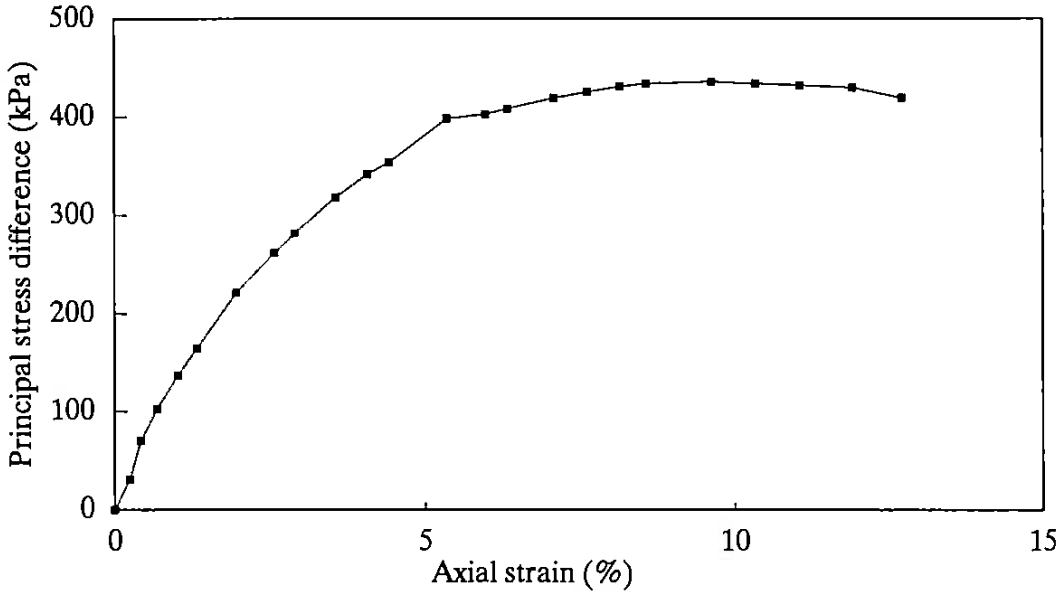


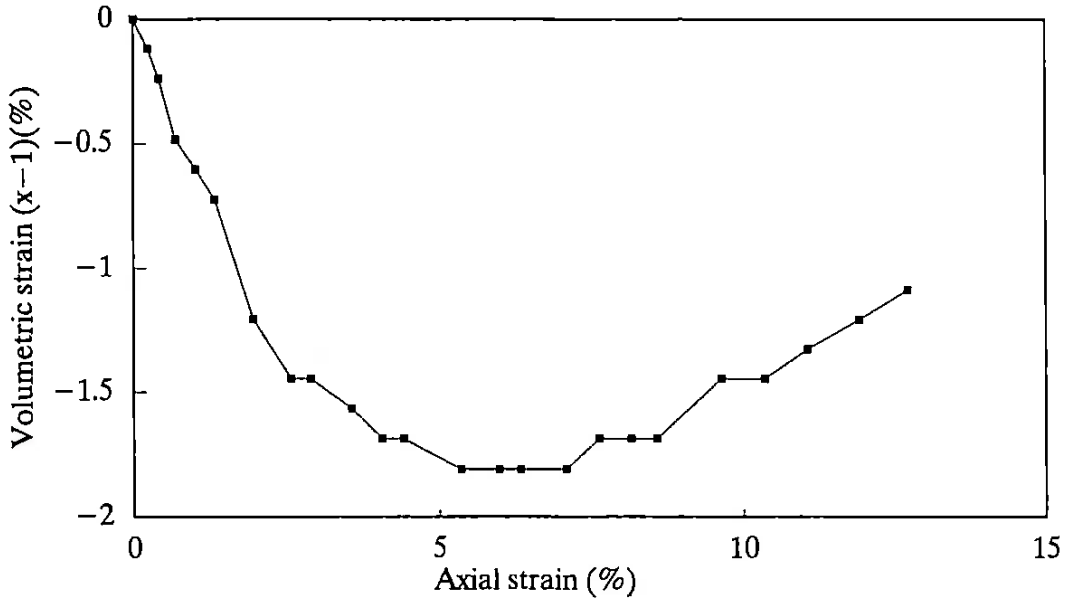

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 2 Depth (m): 4.00

SHEAR STAGE (TEST #3)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.95 |
| cell pressure (kPa): | 460 |
| measured max. deviator stress (kPa): | 436 |
| membrane + filter drain correction (kPa) | 12.2 |
| corrected max. deviator stress (kPa): | 423 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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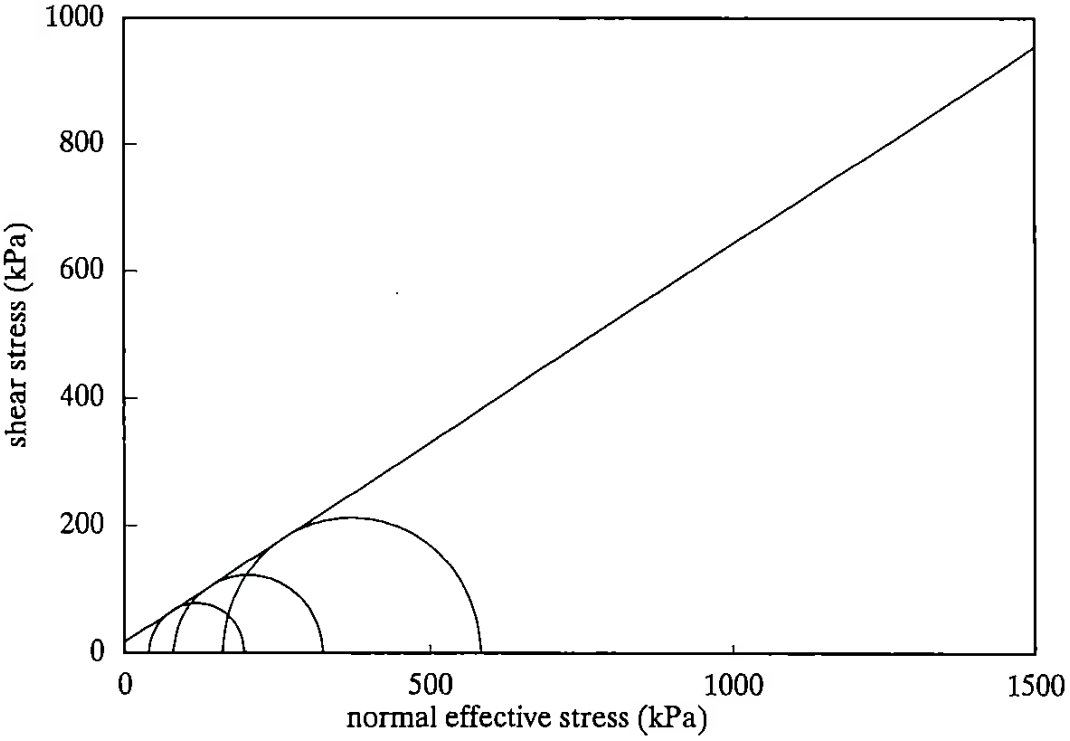
Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 2 Depth (m): 4.00




SUMMARY
At maximum principal stress difference:

| | #1 | #2 | #3 |
|---|---|---|---|
| cell pressure (kPa) | 340 | 380 | 460 |
| deviator stress (kPa) | 155 | 243 | 423 |
| pore pressure (kPa) | 300 | 300 | 300 |

Effective strength parameters:

| | |
|---|---|
| effective cohesion intercept (kPa) | 17.0 |
| effective angle of friction (degrees) | 32.0 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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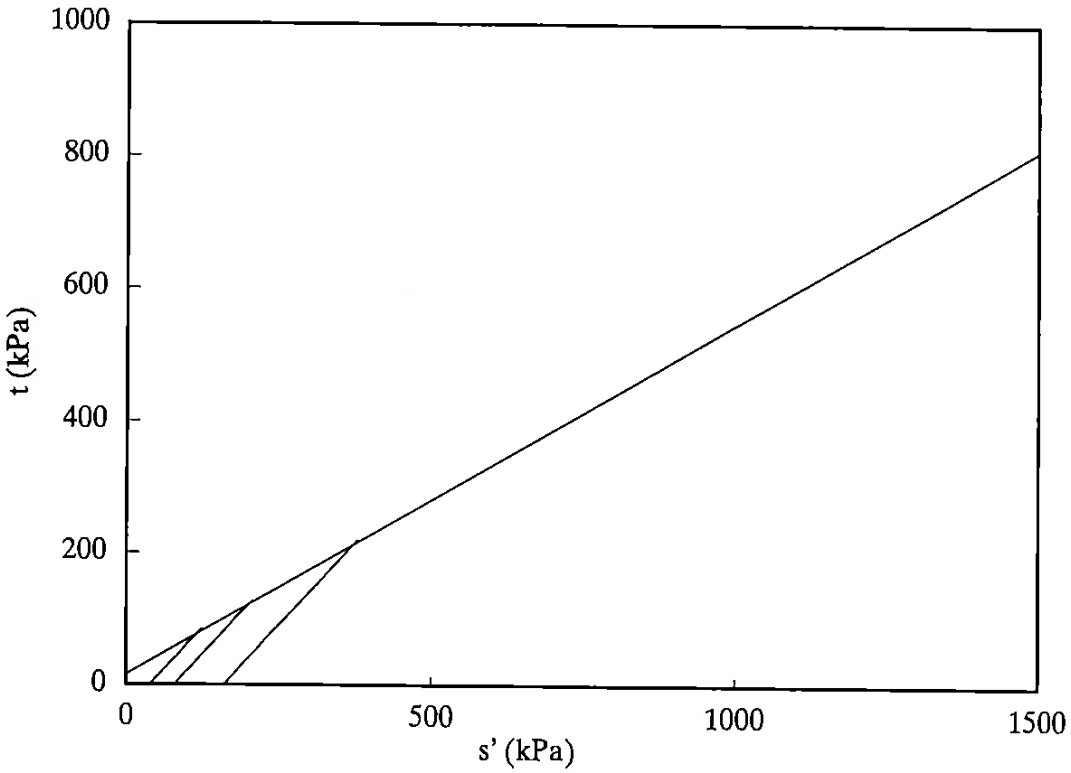
Job Name: 41 HIGHGATE
BH Number: 2

Sample No.: U1
Depth (m): 4.00




NOTES ON STRESS PATH PLOTS

1. No membrane or filter drain corrections made to stress path plots

2. Effective stress paths assume full pore water pressure equalization at all times after the start of shear. This assumption is incorrect. The rate of shearing has been estimated to give 95% equalization only at failure.

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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**GROUND ENGINEERING**
**HIGHGATE**

| VISUAL DESCRIPTION |
| --- |
| Compact thinly bedded brown and light brown fine silty SAND with clay |

SPECIMEN PHOTOGRAPHS


| | |
| --- | --- |
| Borehole | BH3 |
| Sample | U1 |
| Depth (m) | 2.90 |



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| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No:U1 | |
| BH Number: | 3 | Depth (m):2.90 | |

SPECIMEN DETAILS (TEST #1)

| | | |
|---|---|---|
| description: (visual) | Firm brown sand with clay | |
| preparation: | Undisturbed | |
| orientation within original sample: | | Vertical |
| test started: | 24/03/2009 | |

| | | TEST 1 |
|---|---|---|
| INITIAL STAGE | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density ($Mg/m^3$): | assumed | 2.69 |
| voids ratio: | | 0.61 |
| degree of saturation (%): | | 107.0 |

| | |
|---|---|
| SATURATION STAGE | |
| method: | increments of cell pressure only |
| final pore water pressure (kPa): | 293 |
| final degree of saturation (%): | 99.0 |

| | |
|---|---|
| CONSOLIDATION STAGE | |
| effective stress (kPa): | 30 |
| initial pore water pressure (kPa): | 326 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

| | |
|---|---|
| SHEAR STAGE | |
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 330 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.006 |
| strain at failure (%): | 7.04 |
| volumetric strain (%): | 0.12 |
| eff. major principal stress (kPa): | 136 |
| eff. minor principal stress (kPa): | 30 |
| time to peak dev. stress (min): | 885 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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| | | | | |
|---|---|---|---|---|
| Job name: | 41 HIGHGATE | Sample No.: | U1 | |
| BH Number: | 3 | Depth : | 2.90 | (m) |

SPECIMEN DETAILS

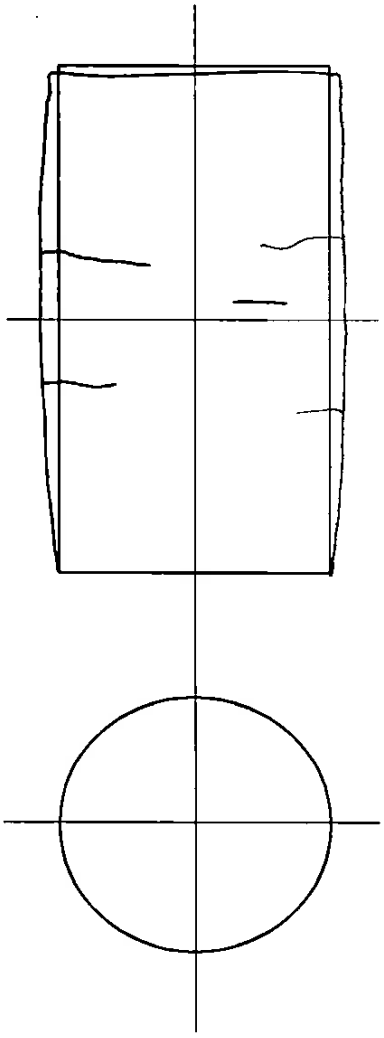
Description : Firm brown sand with clay (visual)

Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Job Name: 41 HIGHGATE
BH Number: 3

Sample No.: U1
Depth (m): 2.90

SPECIMEN DETAILS (TEST #1)

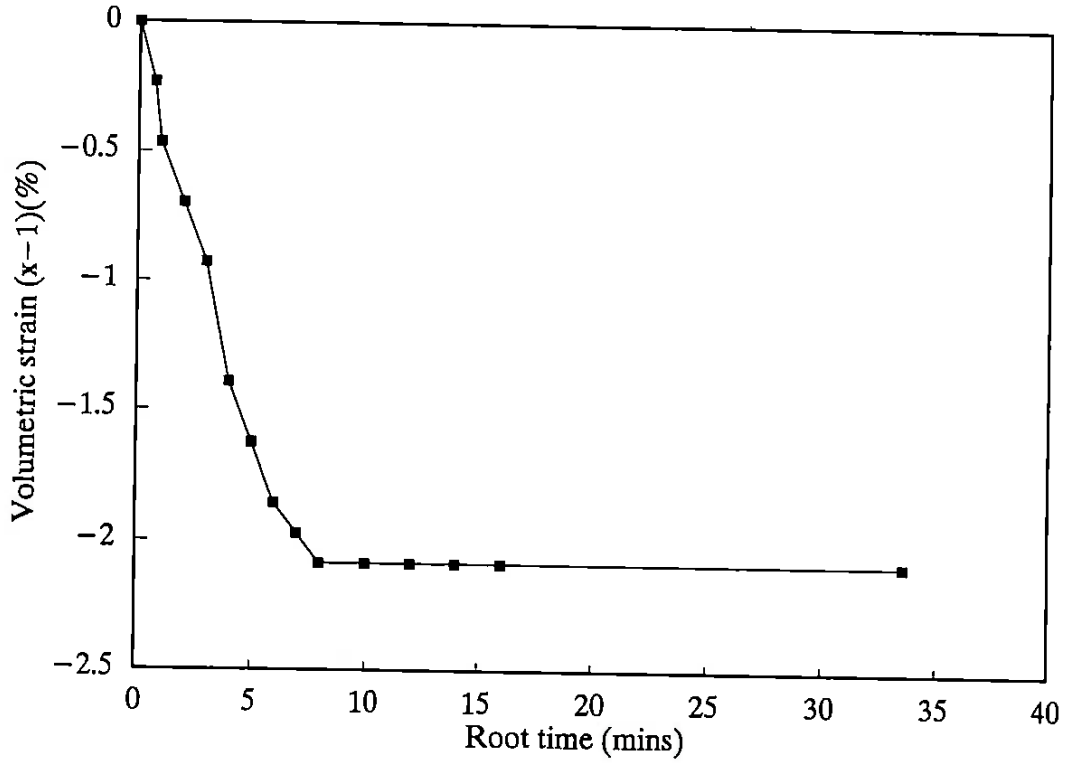
| | | |
|---|---|---|
| description: Firm brown sand with clay (visual) | | |
| initial and final m/c (%): | 24 | 24 |
| initial bulk density (Mg/cu.m): | 2.08 | |
| initial dry density (Mg/cu.m): | 1.67 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | | |
| B value: | 0.99 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 330 | 300 |
| effective consolidation pressure (kPa): | | 30 |
| base, side, top drainage | y y y | |

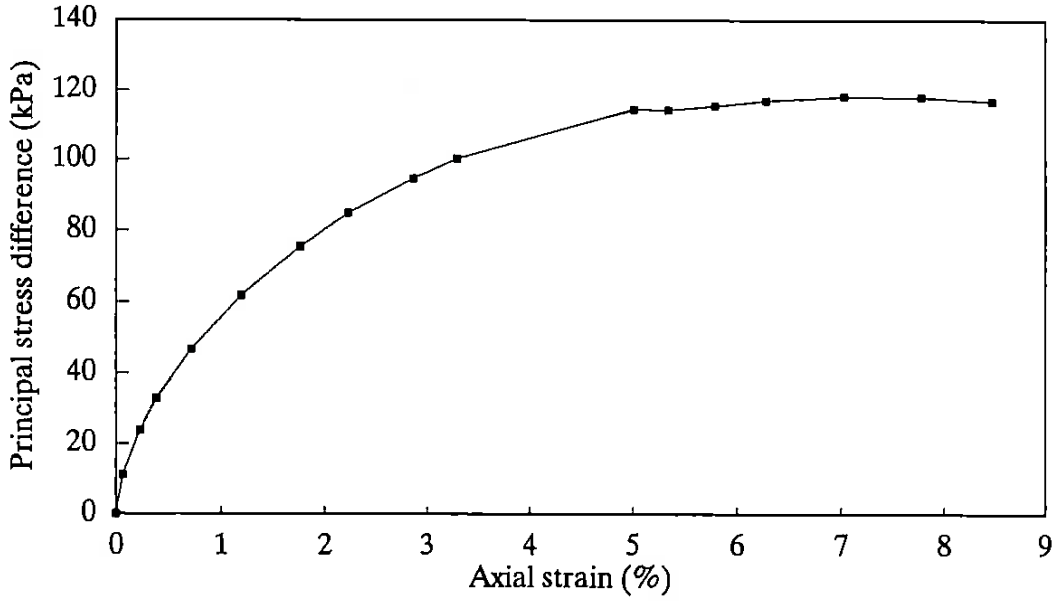


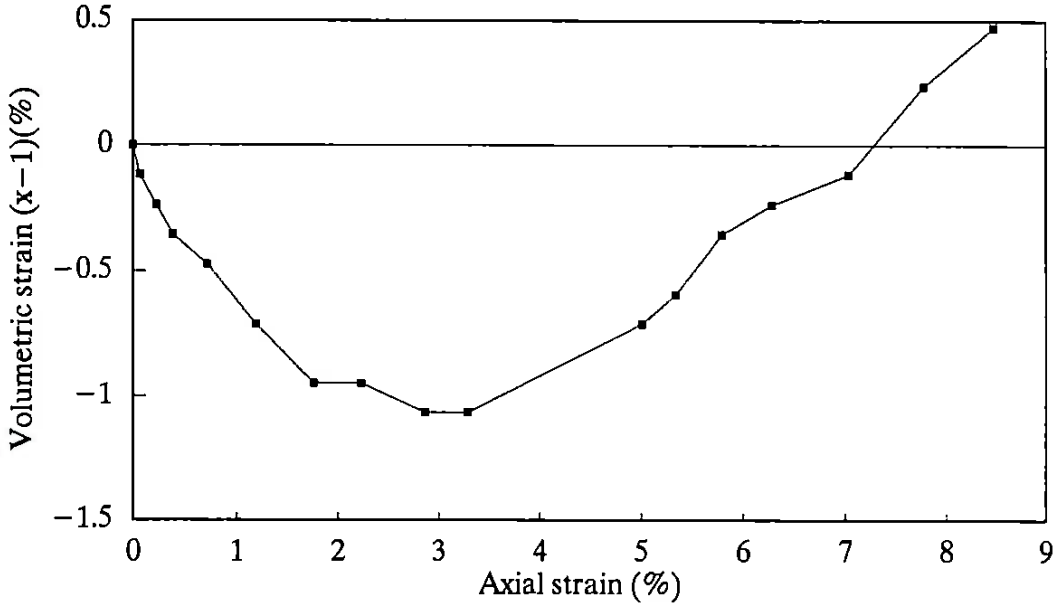

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 3 Depth (m): 2.90

SHEAR STAGE (TEST #1)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.47 |
| cell pressure (kPa): | 330 |
| measured max. deviator stress (kPa): | 118 |
| membrane + filter drain correction (kPa): | 11.8 |
| corrected max. deviator stress (kPa): | 106 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No: | U1 |
| BH Number: | 3 | Depth (m): | 2.90 |

SPECIMEN DETAILS (TEST #2)

| | |
|---|---|
| description: (visual) | Firm brown sand with clay |
| preparation: | Undisturbed |
| orientation within original sample: | Vertical |
| test started: | 24/03/2009 |

| | | TEST 2 |
|---|---|---|
| **INITIAL STAGE** | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density ($Mg/m^3$): | assumed | 2.69 |
| voids ratio: | | 0.64 |
| degree of saturation (%): | | 104.8 |

**SATURATION STAGE**

| | |
|---|---|
| method: | increments of cell pressure only |
| final pore water pressure (kPa): | 296 |
| final degree of saturation (%): | 100.0 |

**CONSOLIDATION STAGE**

| | |
|---|---|
| effective stress (kPa): | 60 |
| initial pore water pressure (kPa): | 360 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

**SHEAR STAGE**

| | |
|---|---|
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 360 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.006 |
| strain at failure (%): | 10.50 |
| volumetric strain at failure (%): | 0.25 |
| eff. major principal stress (kPa): | 291 |
| eff. minor principal stress (kPa): | 60 |
| time to peak dev. stress (min): | 1303 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job name: 41 HIGHGATE Sample No.:U1
BH Number: 3 Depth : 2.90 (m)

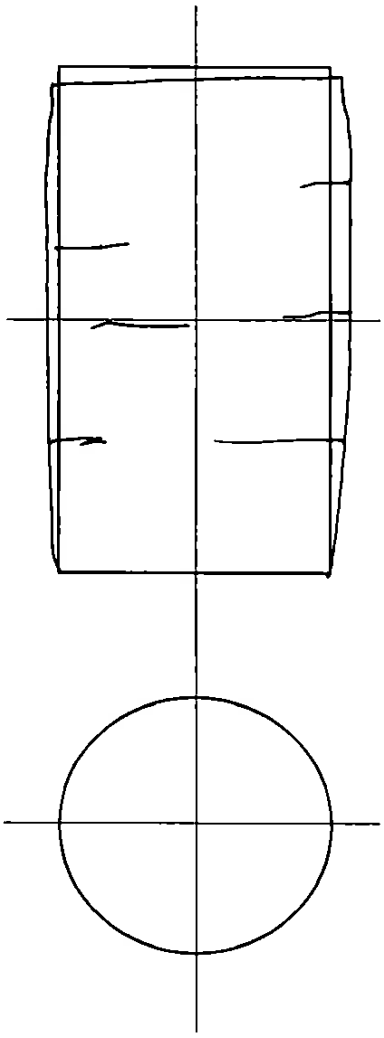
SPECIMEN DETAILS

Description : Firm brown sand with clay
(visual)
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 3 Depth (m): 2.90

SPECIMEN DETAILS (TEST #2)

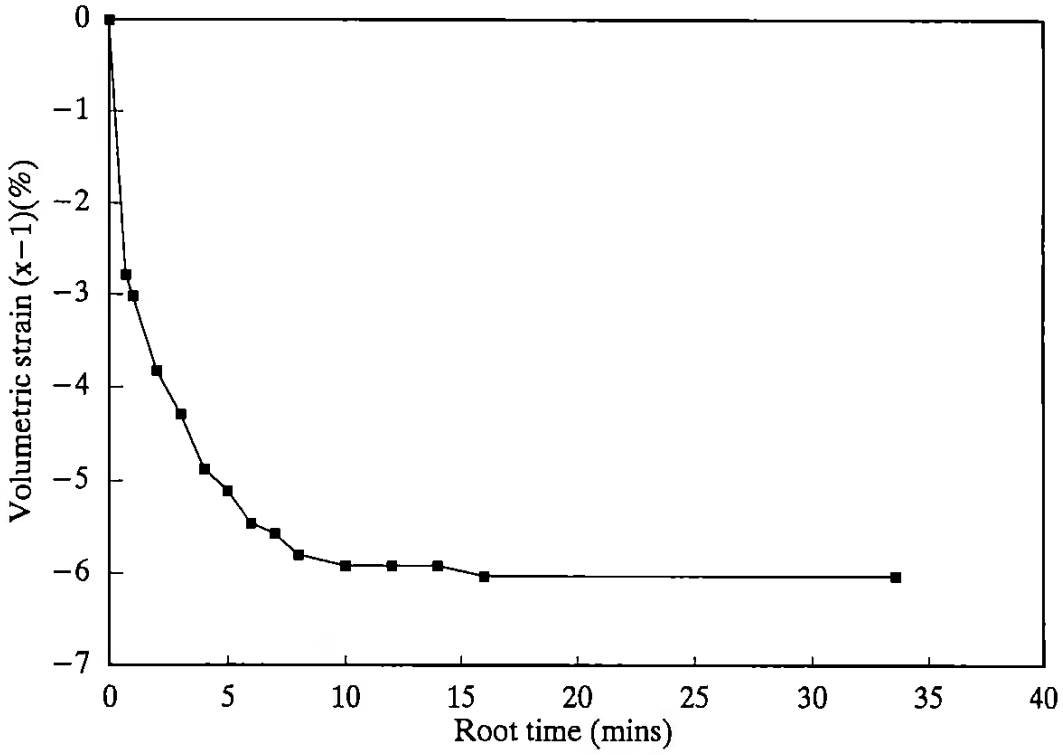
| | | |
|---|---|---|
| description: Firm brown sand with clay (visual) | | |
| initial and final m/c (%): | 25 | 23 |
| initial bulk density (Mg/cu.m): | 2.05 | |
| initial dry density (Mg/cu.m): | 1.64 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | | |
| B value: | 1 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 360 | 300 |
| effective consolidation pressure (kPa): | | 60 |
| base, side, top drainage | y y | y |

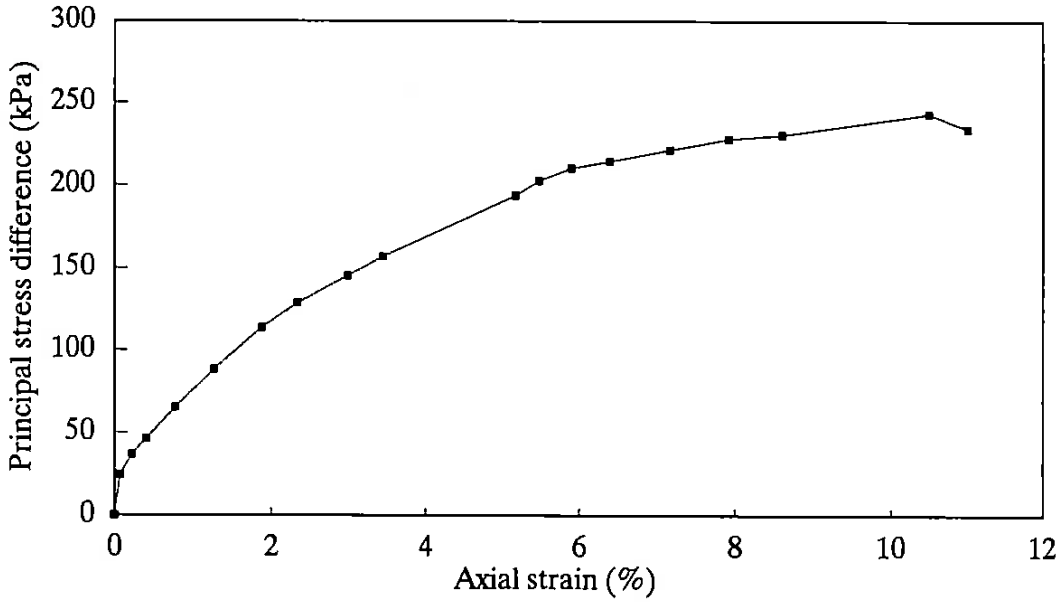


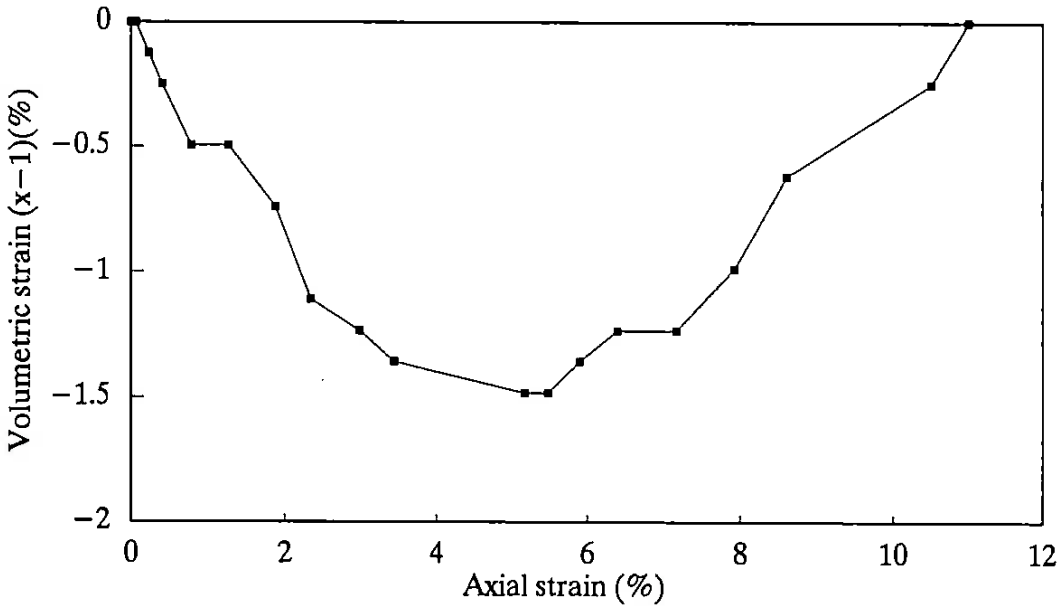

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 3 Depth (m): 2.90

SHEAR STAGE (TEST #2)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.47 |
| cell pressure (kPa): | 360 |
| measured max. deviator stress (kPa): | 243 |
| membrane + filter drain correction (kPa) | 12.4 |
| corrected max. deviator stress (kPa): | 231 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No: | U1 |
| BH Number: | 3 | Depth (m): | 2.90 |

SPECIMEN DETAILS (TEST #3)

| | |
|---|---|
| description: (visual) | Firm brown sand with clay |
| preparation: | Undisturbed |
| orientation within original sample: | Vertical |
| test started: | 24/03/2009 |

| | | TEST 3 |
|---|---|---|
| **INITIAL STAGE** | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density ($Mg/m^3$): | assumed | 2.69 |
| voids ratio: | | 0.65 |
| degree of saturation (%): | | 104.1 |

**SATURATION STAGE**

| | |
|---|---|
| method: | increments of cell pressure only |
| final pore water pressure (kPa): | 419 |
| final degree of saturation (%): | 99.0 |

**CONSOLIDATION STAGE**

| | |
|---|---|
| effective stress (kPa): | 120 |
| initial pore water pressure (kPa): | 419 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

**SHEAR STAGE**

| | |
|---|---|
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 420 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.006 |
| strain at failure (%): | 10.07 |
| volumetric strain at failure (%): | 1.23 |
| eff. major principal stress (kPa): | 490 |
| eff. minor principal stress (kPa): | 120 |
| time to peak dev. stress (min): | 1253 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

| | | | | |
|---|---|---|---|---|
| Job name: | 41 HIGHGATE | Sample No.: | U1 | |
| BH Number: | 3 | Depth : | 2.90 | (m) |

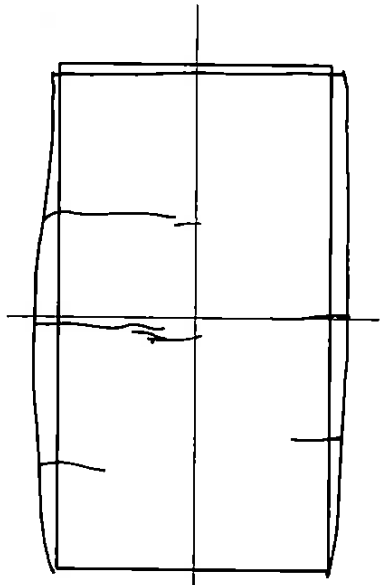
SPECIMEN DETAILS

Description : Firm brown sand with clay (visual)

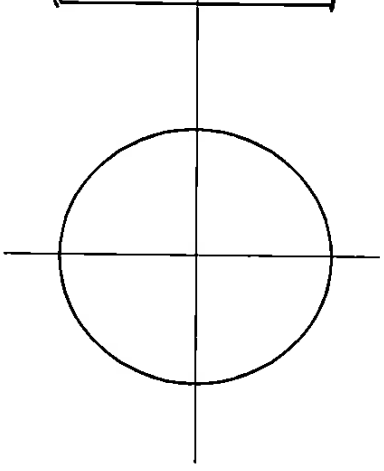
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation



Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 3 Depth (m): 2.90

SPECIMEN DETAILS (TEST #3)
description: Firm brown sand with clay (visual)

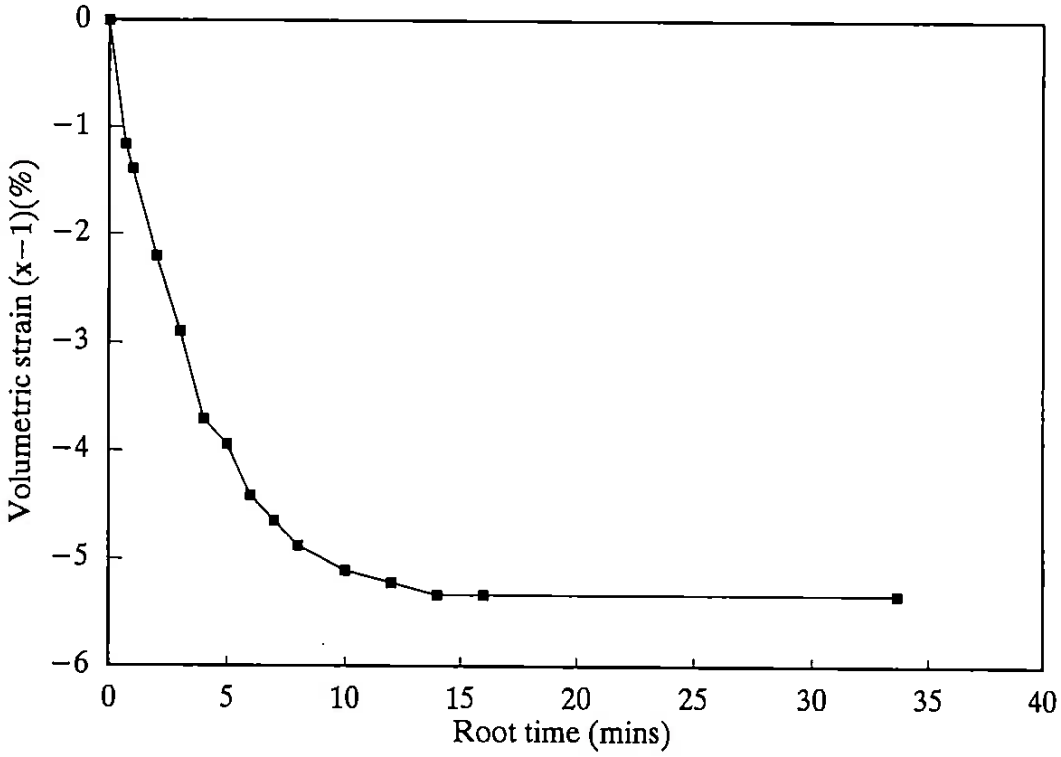
| | | |
|---|---|---|
| initial and final m/c (%): | 25 | 22 |
| initial bulk density (Mg/cu.m): | 2.04 | |
| initial dry density (Mg/cu.m): | 1.63 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | | |
| B value: | 0.99 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 420 | 300 |
| effective consolidation pressure (kPa): | | 120 |
| base, side, top drainage | y y | y |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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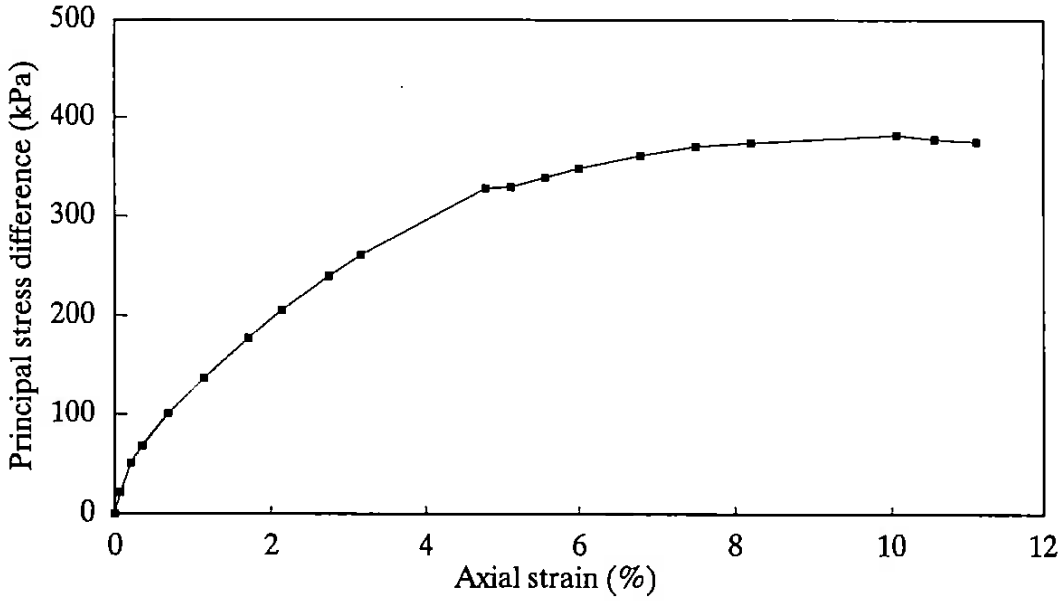
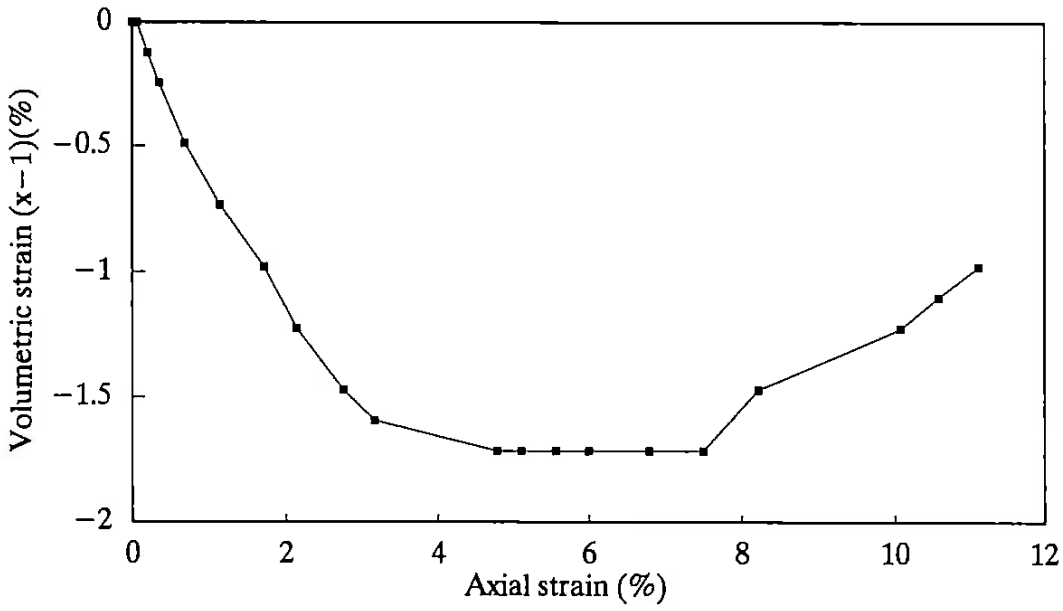
Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 3 Depth (m): 2.90

SHEAR STAGE (TEST #3)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.47 |
| cell pressure (kPa): | 420 |
| measured max. deviator stress (kPa): | 382 |
| membrane + filter drain correction (kPa) | 12.4 |
| corrected max. deviator stress (kPa): | 370 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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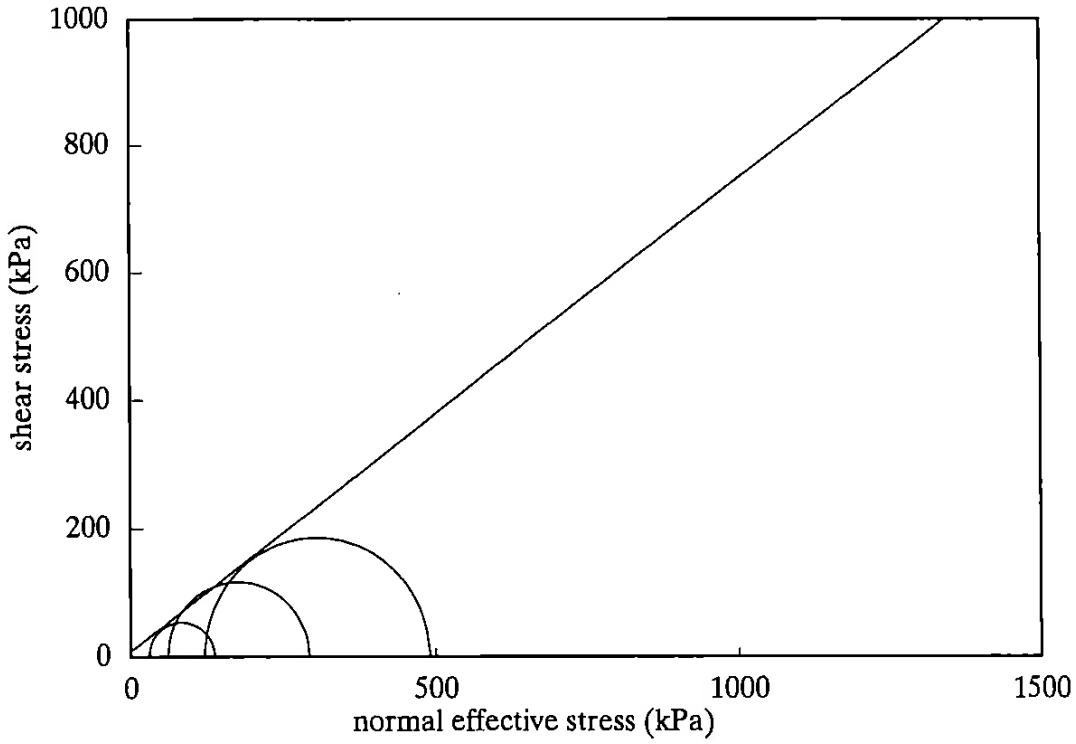
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U1
BH Number: 3 Depth (m): 2.90




SUMMARY
At maximum principal stress difference:

| | #1 | #2 | #3 |
|---|---|---|---|
| cell pressure (kPa) | 330 | 360 | 420 |
| deviator stress (kPa) | 106 | 231 | 370 |
| pore pressure (kPa) | 300 | 300 | 300 |

Effective strength parameters:

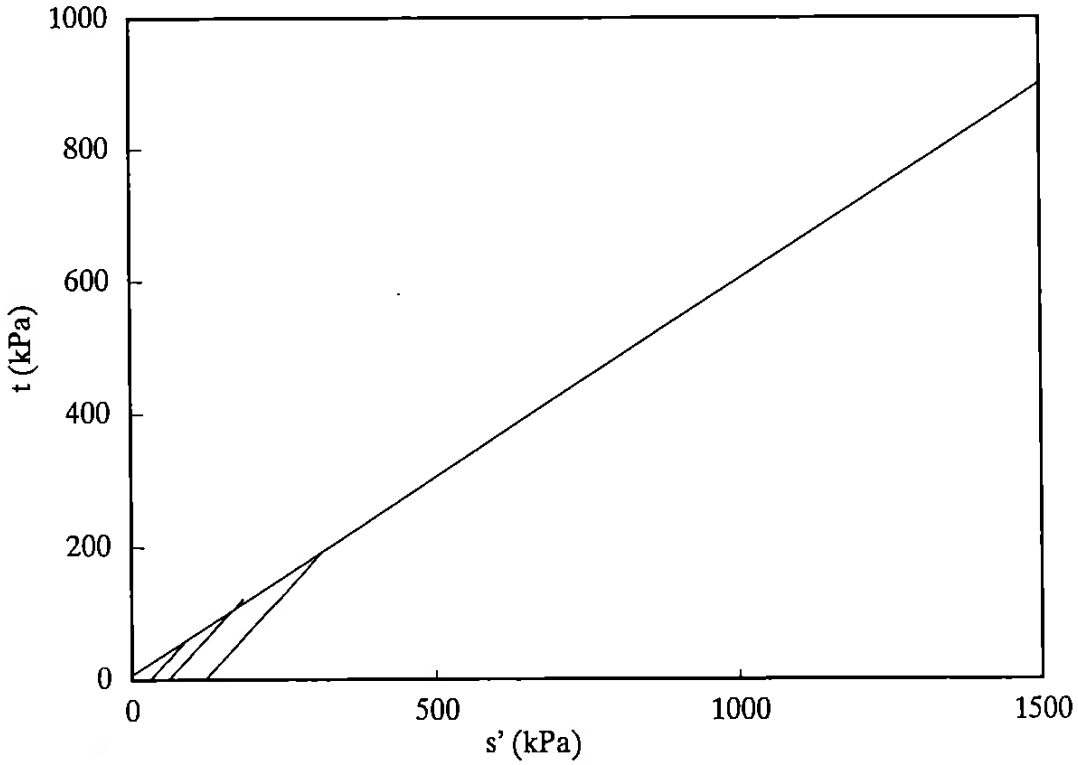
| | |
|---|---|
| effective cohesion intercept (kPa) | 8.0 |
| effective angle of friction (degrees) | 36.5 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE
BH Number: 3

Sample No.: U1
Depth (m): 2.90




NOTES ON STRESS PATH PLOTS

1. No membrane or filter drain corrections made to stress path plots

2. Effective stress paths assume full pore water pressure equalization at all times after the start of shear. This assumption is incorrect. The rate of shearing has been estimated to give 95% equalization only at failure.

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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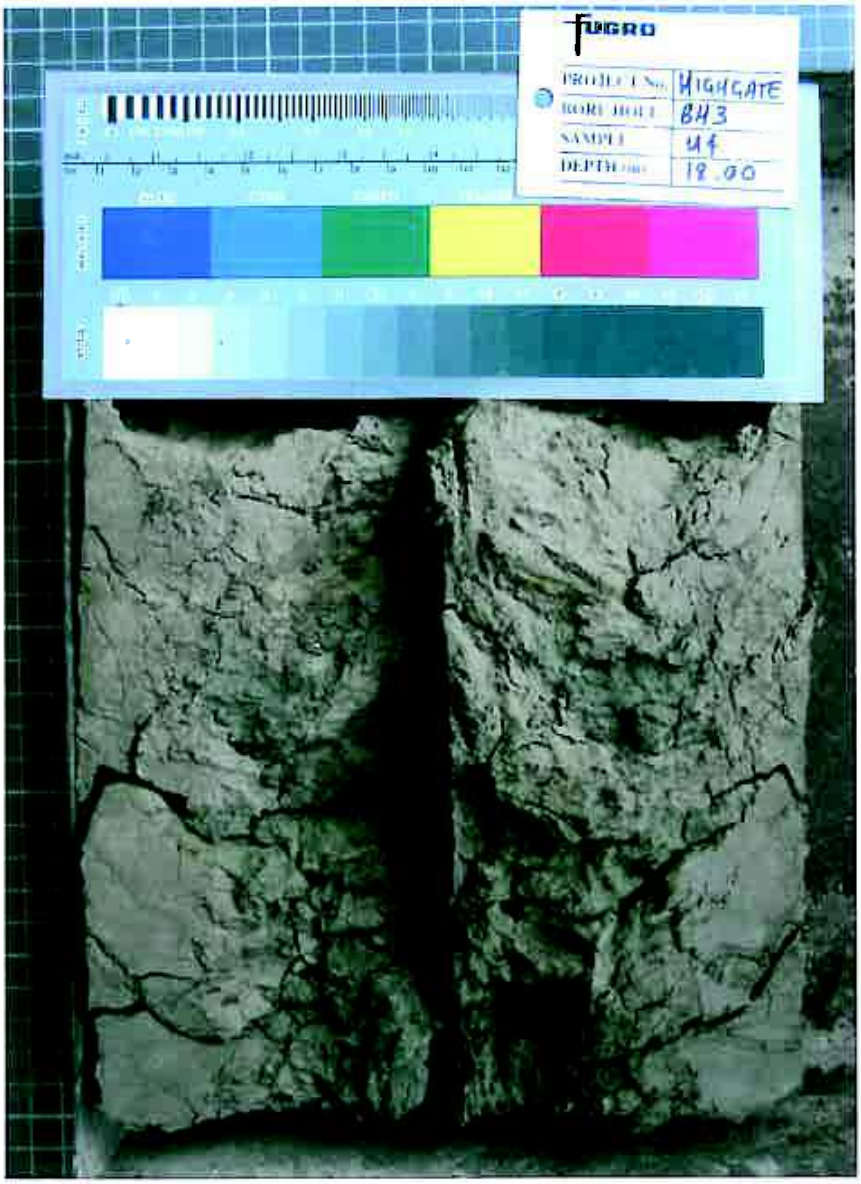
Surrey Geotechnical Consultants Limited

**GROUND ENGINEERING**
**HIGHGATE**

| VISUAL DESCRIPTION |
| --- |
| Firm closely fissured grey brown CLAY with thin laminae of grey brown silty sand and occasional pockets of sand |

SPECIMEN PHOTOGRAPHS




| | |
| --- | --- |
| Borehole | BH3 |
| Sample | U4 |
| Depth (m) | 18.00 |



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| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No: | U4 |
| BH Number: | 3 | Depth (m): | 18.0 |

SPECIMEN DETAILS (TEST #1)

| | | |
|---|---|---|
| description: | Firm grey brown clay | |
| (visual) | with pockets of brown sand | |
| preparation: | Undisturbed | |
| orientation within original sample: | | Vertical |
| test started: | 27/03/2009 | |

| | | TEST 1 |
|---|---|---|
| **INITIAL STAGE** | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density (Mg/m³): | assumed | 2.7 |
| voids ratio: | | 0.82 |
| degree of saturation (%): | | 97.3 |

**SATURATION STAGE**

| | |
|---|---|
| method: | increments of cell and back pressure |
| final pore water pressure (kPa): | 393 |
| final degree of saturation (%): | 96.0 |

**CONSOLIDATION STAGE**

| | |
|---|---|
| effective stress (kPa): | 150 |
| initial pore water pressure (kPa): | 438 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

**SHEAR STAGE**

| | |
|---|---|
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 450 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.006 |
| strain at failure (%): | 10.11 |
| volumetric strain (%): | 3.57 |
| eff. major principal stress (kPa): | 428 |
| eff. minor principal stress (kPa): | 151 |
| time to peak dev. stress (min): | 1257 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Job name: 41 HIGHGATE Sample No.:U4
BH Number: 3 Depth : 18.0 (m)

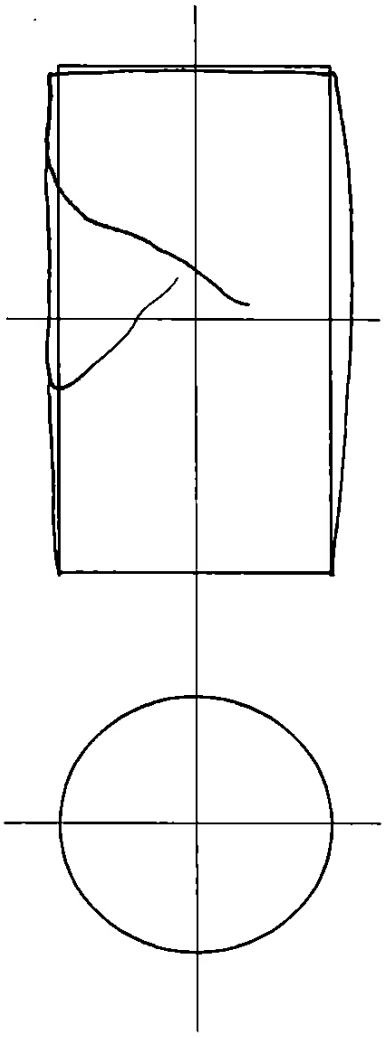
SPECIMEN DETAILS

Description : Firm grey brown clay
(visual) with pockets of brown sand
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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| | | | |
|---|---|---|---|
| Job Name: 41 HIGHGATE | | Sample No.: | U4 |
| BH Number: 3 | | Depth (m): | 18.0 |

SPECIMEN DETAILS (TEST #1)

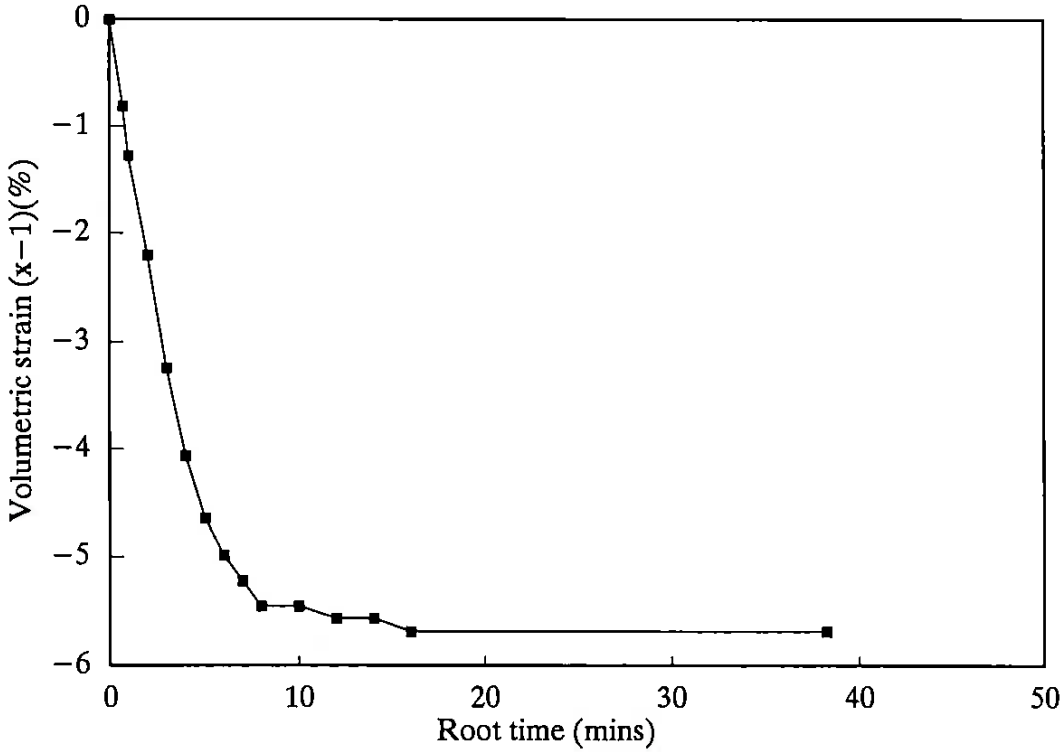
| | | |
|---|---|---|
| description: (visual) | Firm grey brown clay with pockets of brown sand | |
| initial and final m/c (%): | 29 | 27 |
| initial bulk density (Mg/cu.m): | 1.92 | |
| initial dry density (Mg/cu.m): | 1.48 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 310 | 300 |
| B value: | 0.96 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 450 | 300 |
| effective consolidation pressure (kPa): | | 150 |
| base, side, top drainage | y y y | |

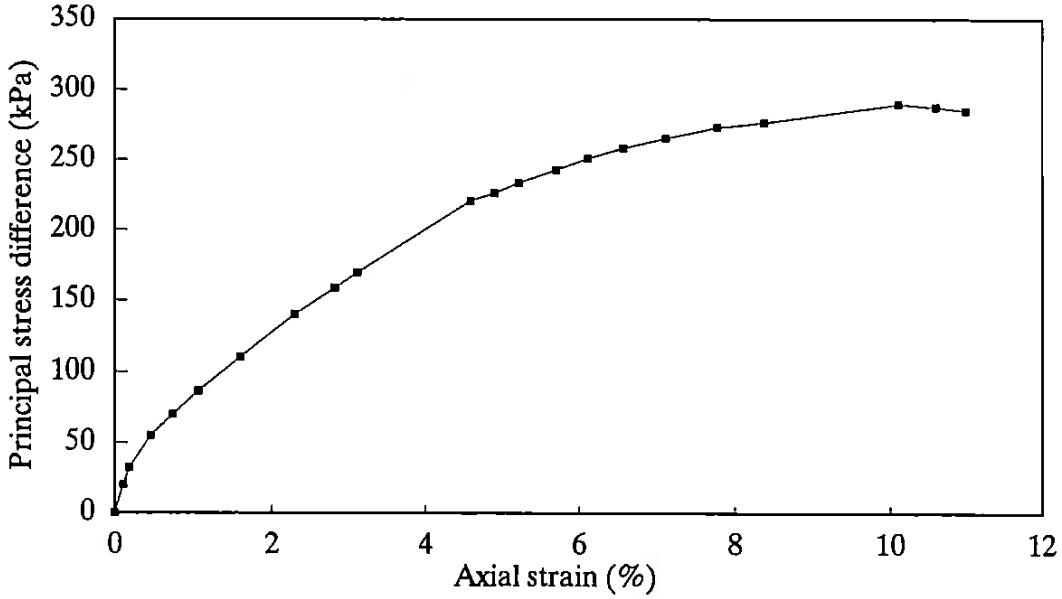


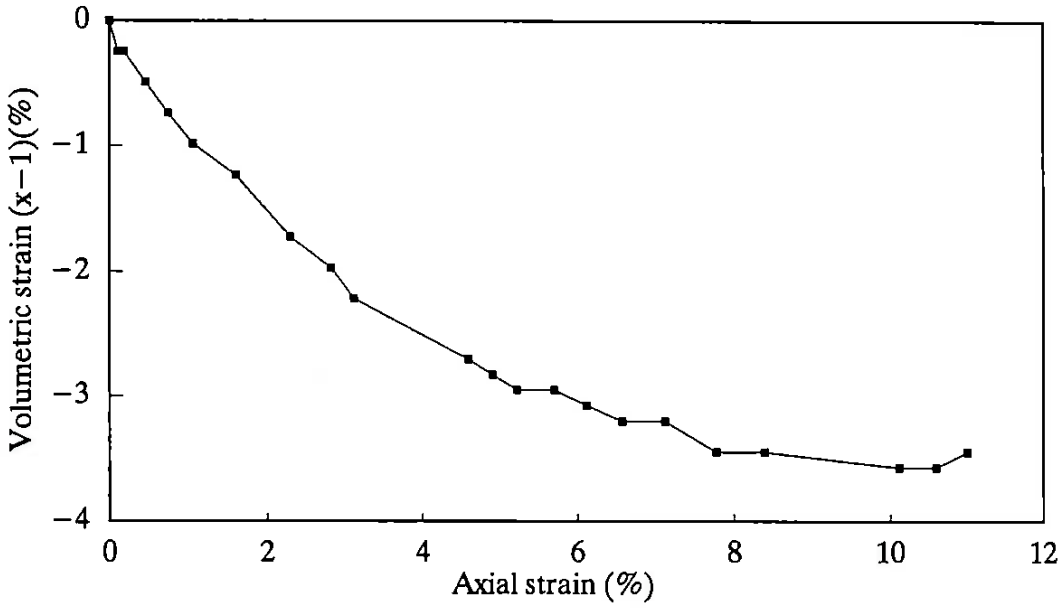

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 3 Depth (m): 18.0

SHEAR STAGE (TEST #1)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.47 |
| cell pressure (kPa): | 450 |
| measured max. deviator stress (kPa): | 289 |
| membrane + filter drain correction (kPa): | 12.4 |
| corrected max. deviator stress (kPa): | 277 |
| pore pressure at failure (kPa): | 299 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No: | U4 |
| BH Number: | 3 | Depth (m): | 18.0 |

SPECIMEN DETAILS (TEST #2)

| | | |
|---|---|---|
| description: | Firm grey brown clay | |
| (visual) | with pockets of brown sand | |
| preparation: | Undisturbed | |
| orientation within original sample: | | Vertical |
| test started: | 27/03/2009 | |

| | | TEST 2 |
|---|---|---|
| INITIAL STAGE | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density (Mg/m³): | assumed | 2.7 |
| voids ratio: | | 0.85 |
| degree of saturation (%): | | 99.2 |

SATURATION STAGE

| | |
|---|---|
| method: | increments of cell and back pressure |
| final pore water pressure (kPa): | 397 |
| final degree of saturation (%): | 100.0 |

CONSOLIDATION STAGE

| | |
|---|---|
| effective stress (kPa): | 250 |
| initial pore water pressure (kPa): | 543 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

SHEAR STAGE

| | |
|---|---|
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 550 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.006 |
| strain at failure (%): | 10.72 |
| volumetric strain at failure (%): | 5.72 |
| eff. major principal stress (kPa): | 722 |
| eff. minor principal stress (kPa): | 250 |
| time to peak dev. stress (min): | 1300 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

Job name: 41 HIGHGATE Sample No.:U4
BH Number: 3 Depth : 18.0 (m)

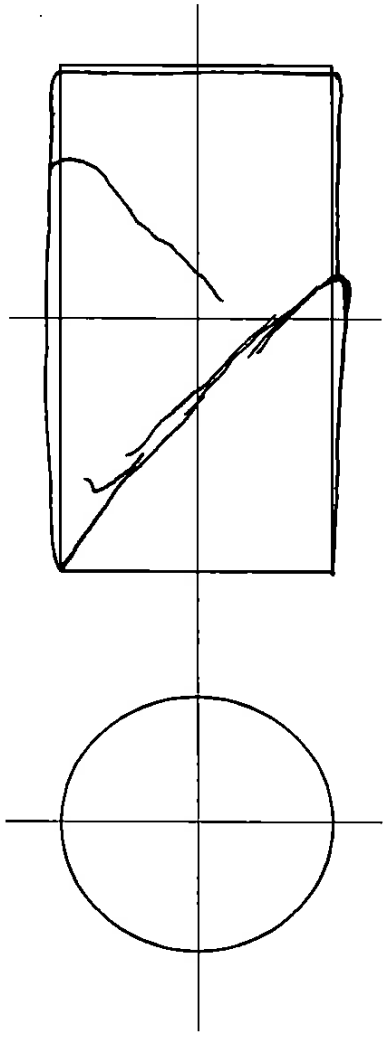
SPECIMEN DETAILS

Description : Firm grey brown clay
(visual) with pockets of brown sand
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 3 Depth (m): 18.0

SPECIMEN DETAILS (TEST #2)

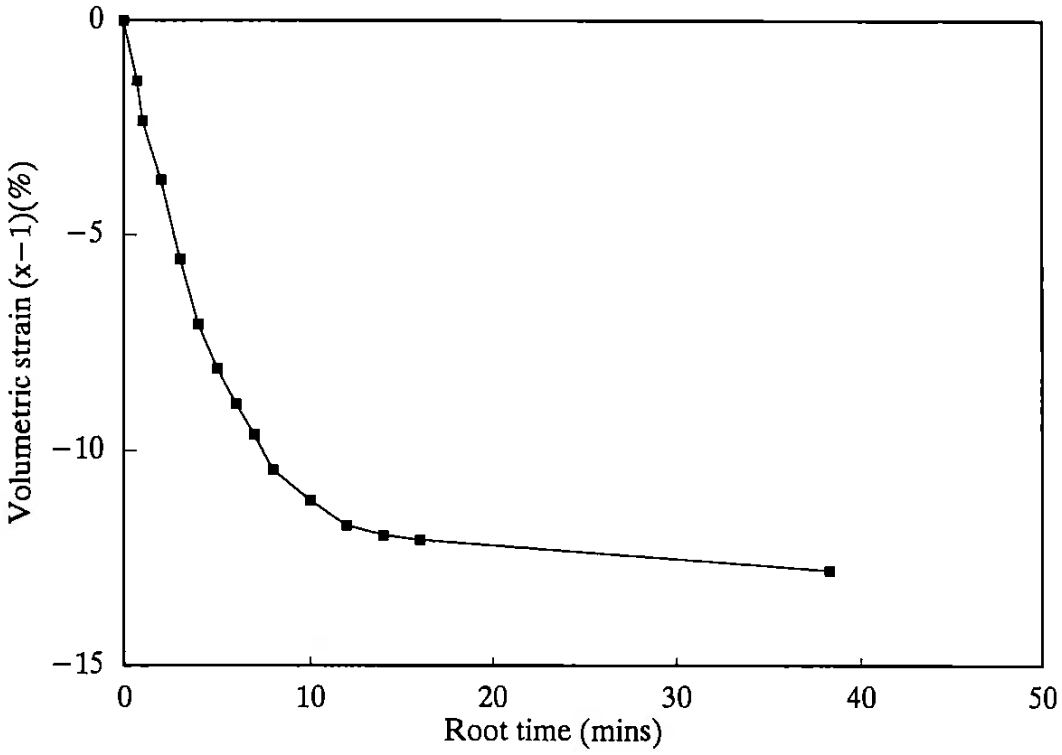
| | | |
|---|---|---|
| description: (visual) | Firm grey brown clay with pockets of brown sand | |
| initial and final m/c (%): | 31 | 28 |
| initial bulk density (Mg/cu.m): | 1.92 | |
| initial dry density (Mg/cu.m): | 1.46 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 310 | 300 |
| B value: | 1 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 550 | 300 |
| effective consolidation pressure (kPa): | | 250 |
| base, side, top drainage | y y y | |

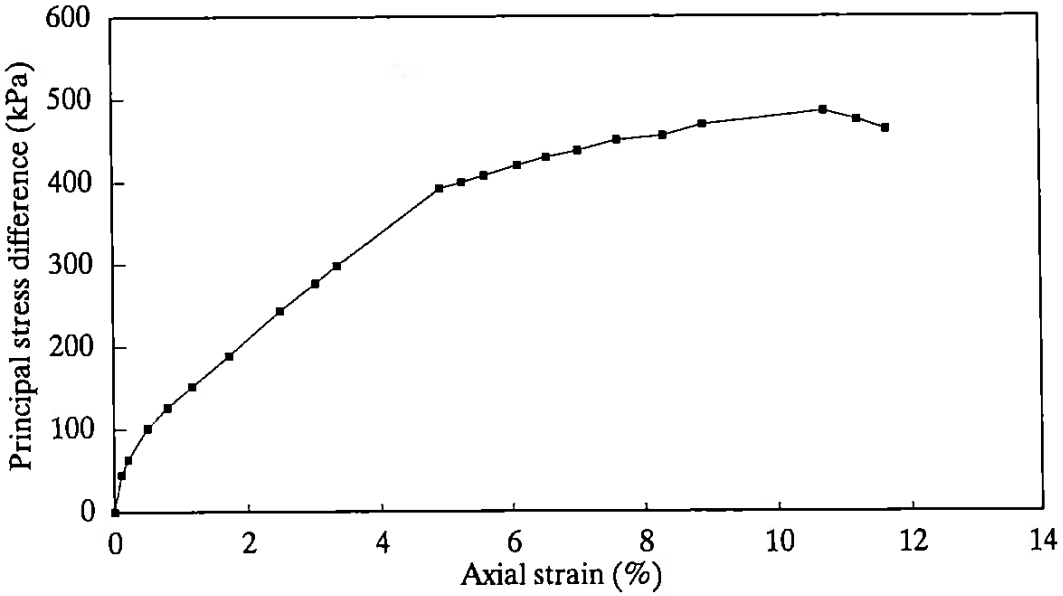


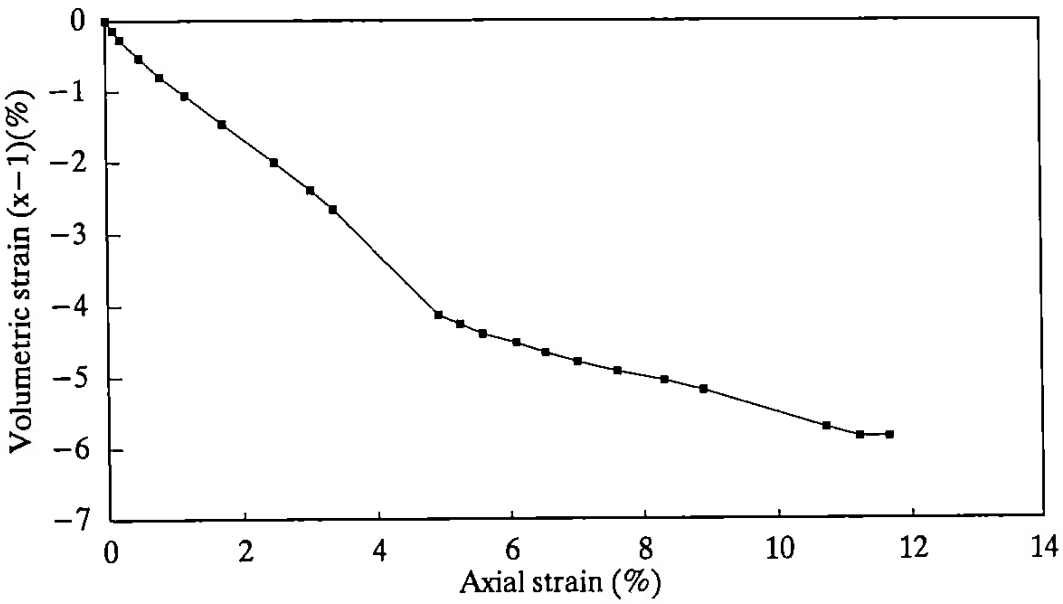

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 3 Depth (m): 18.0

SHEAR STAGE (TEST #2)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.47 |
| cell pressure (kPa): | 550 |
| measured max. deviator stress (kPa): | 485 |
| membrane + filter drain correction (kPa) | 12.5 |
| corrected max. deviator stress (kPa): | 472 |
| pore pressure at failure (kPa): | 300 |




CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

| | | | |
|---|---|---|---|
| Job Name: | 41 HIGHGATE | Sample No: | U4 |
| BH Number: | 3 | Depth (m): | 18.0 |

SPECIMEN DETAILS (TEST #3)

| | | |
|---|---|---|
| description: | Firm grey brown clay | |
| (visual) | with pockets of brown sand | |
| preparation: | Undisturbed | |
| orientation within original sample: | | Vertical |
| test started: | 27/03/2009 | |

| | | TEST 3 |
|---|---|---|
| **INITIAL STAGE** | | |
| type of side drains: | | Vertical |
| membrane thickness (mm): | | 0.3 |
| particle density (Mg/m³): | assumed | 2.7 |
| voids ratio: | | 0.82 |
| degree of saturation (%): | | 98.1 |

| | |
|---|---|
| **SATURATION STAGE** | |
| method: | increments of cell and back pressure |
| final pore water pressure (kPa): | 398 |
| final degree of saturation (%): | 97.0 |

| | |
|---|---|
| **CONSOLIDATION STAGE** | |
| effective stress (kPa): | 350 |
| initial pore water pressure (kPa): | 635 |
| final pore water pressure (kPa): | 300 |
| pore pressure dissipation (%): | 100.0 |

| | |
|---|---|
| **SHEAR STAGE** | |
| failure criterion: | maximum deviator stress (kPa) |
| cell pressure (kPa): | 650 |
| initial pore water pressure (kPa): | 300 |
| rate of strain (mm/min): | 0.006 |
| strain at failure (%): | 10.51 |
| volumetric strain at failure (%): | 2.93 |
| eff. major principal stress (kPa): | 810 |
| eff. minor principal stress (kPa): | 350 |
| time to peak dev. stress (min): | 1292 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job name: 41 HIGHGATE Sample No.:U4
BH Number: 3 Depth : 18.0 (m)

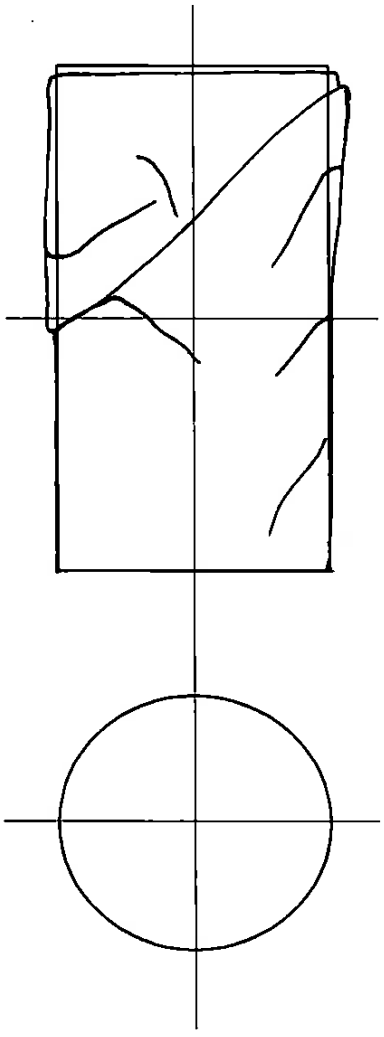
SPECIMEN DETAILS

Description : Firm grey brown clay
(visual) with pockets of brown sand
Specimen size: 76 mm high
38 mm diameter

Test No:

Elevation

Plan



FAILURE SKETCH

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 3 Depth (m): 18.0

SPECIMEN DETAILS (TEST #3)

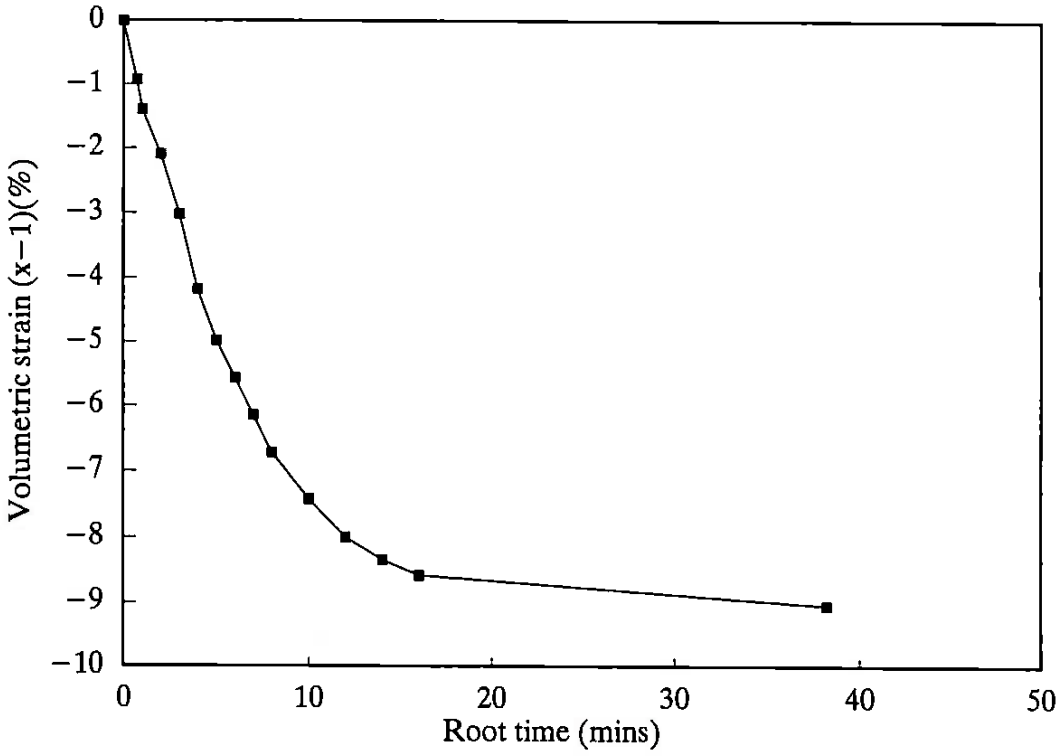
| | | |
|---|---|---|
| description: (visual) | Firm grey brown clay with pockets of brown sand | |
| initial and final m/c (%): | 30 | 26 |
| initial bulk density (Mg/cu.m): | 1.92 | |
| initial dry density (Mg/cu.m): | 1.48 | |
| height and diameter (mm): | 76 | 38 |

SATURATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 310 | 300 |
| B value: | 0.97 | |

CONSOLIDATION STAGE

| | | |
|---|---|---|
| cell and back pressure (kPa): | 650 | 300 |
| effective consolidation pressure (kPa): | | 350 |
| base, side, top drainage | y y y | |

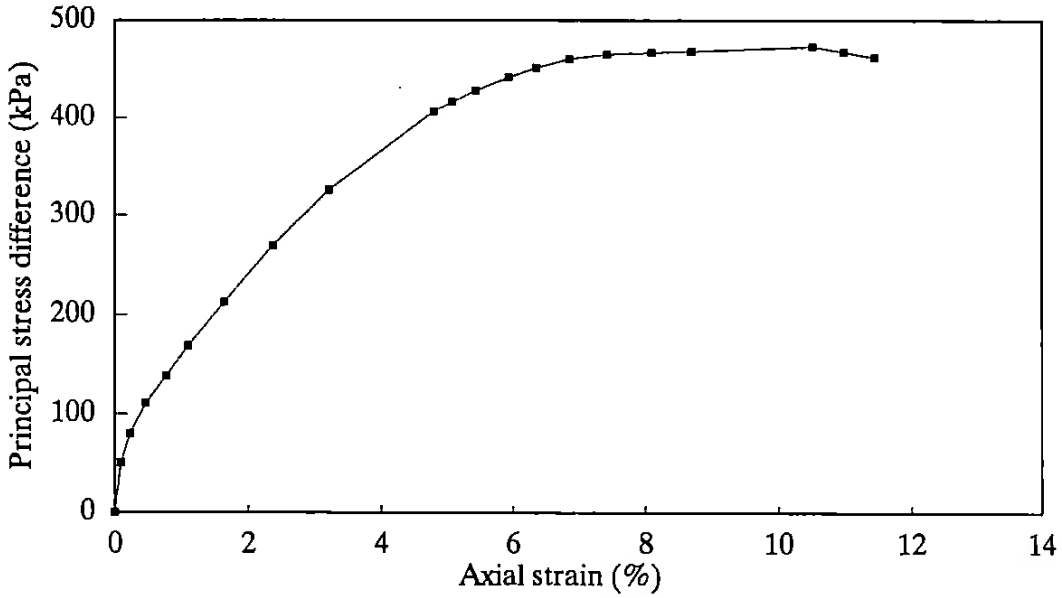


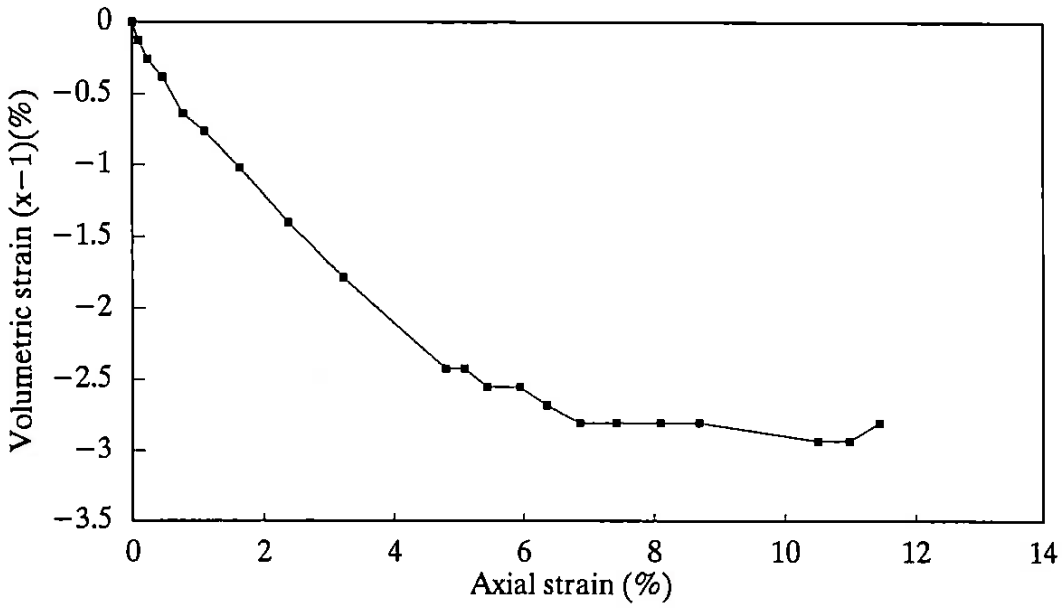

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 3 Depth (m): 18.0

SHEAR STAGE (TEST #3)

| | |
|---|---|
| machine rate of strain (%/hr): | 0.47 |
| cell pressure (kPa): | 650 |
| measured max. deviator stress (kPa): | 473 |
| membrane + filter drain correction (kPa) | 12.5 |
| corrected max. deviator stress (kPa): | 460 |
| pore pressure at failure (kPa): | 300 |

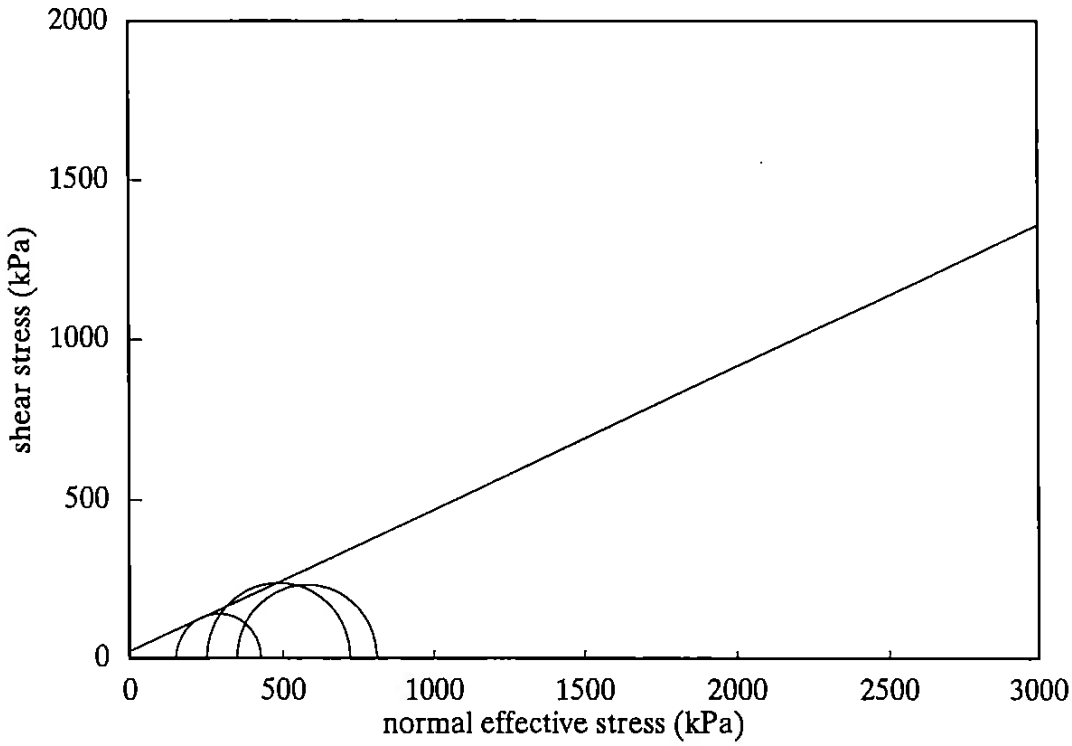



CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE Sample No.: U4
BH Number: 3 Depth (m): 18.0




SUMMARY
At maximum principal stress difference:

| | #1 | #2 | #3 |
|---|---|---|---|
| cell pressure (kPa) | 450 | 550 | 650 |
| deviator stress (kPa) | 277 | 472 | 460 |
| pore pressure (kPa) | 299 | 300 | 300 |

Effective strength parameters:

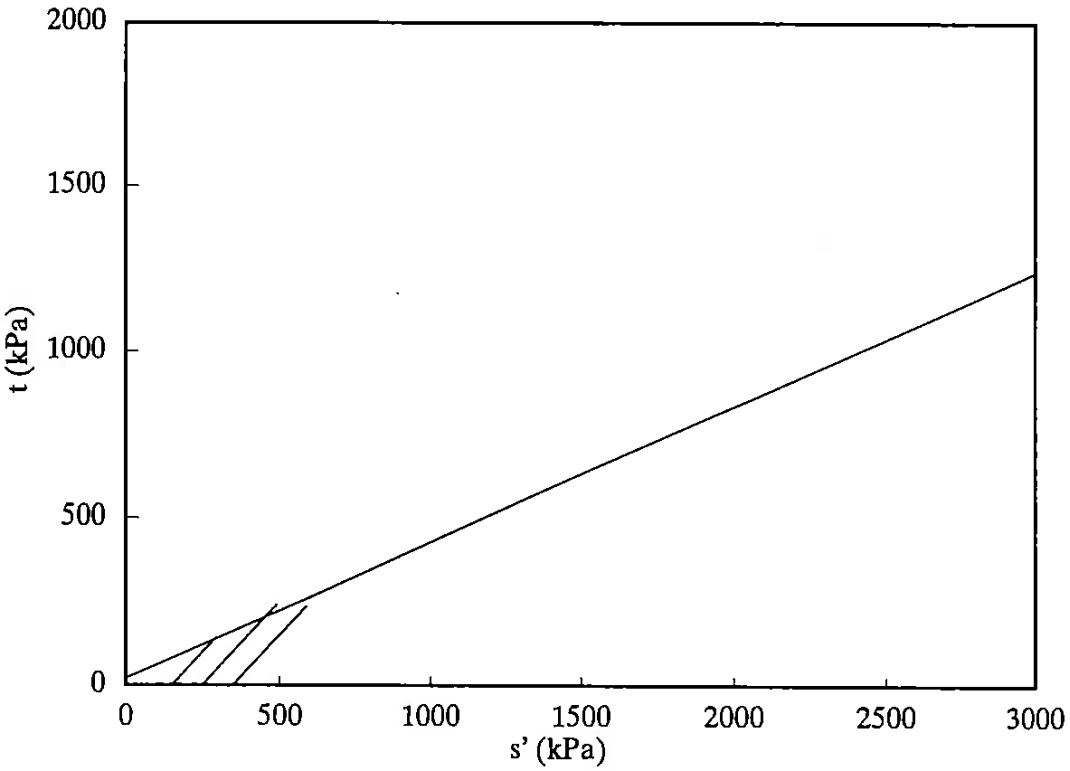
| | |
|---|---|
| effective cohesion intercept (kPa) | 22.0 |
| effective angle of friction (degrees) | 24.0 |

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

S·G·C
Surrey Geotechnical Consultants Limited

Job Name: 41 HIGHGATE
BH Number: 3

Sample No.: U4
Depth (m): 18.0




NOTES ON STRESS PATH PLOTS

1. No membrane or filter drain corrections made to stress path plots

2. Effective stress paths assume full pore water pressure equalization at all times after the start of shear. This assumption is incorrect. The rate of shearing has been estimated to give 95% equalization only at failure.

CONSOLIDATED DRAINED TRIAXIAL TEST
WITH VOLUME CHANGE MEASUREMENT

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Surrey Geotechnical Consultants Limited

# APPENDIX 6

# CHEMICAL LABORATORY TEST RESULTS

Chemtest

Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

Ground Engineering
Newark Road
Peterborough

PE1 5UA

FAO Steve Fleming
26 February 2009

Dear Steve Fleming

**Test Report Number** **75534**
**Your Project Reference** **Witanhurst, 41 Highgate West Hill, London N6**

Please find enclosed the results of analysis for the samples received 18 February 2009.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely

KTJones

Authorised Signatory

| | |
|---|---|
| ☐ Darrell Hall | Laboratory Manager |
| ☐ Phil Hellier | Operations Director |
| ☑ Keith Jones | Technical Development Manager |
| ☐ John Crawford | Quality Manager |
| ☐ Malcolm Avis | Technical Director |

UKAS TESTING
2183

*Notes to accompany report:*

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/e means 'not evaluated'*
- *i/s means 'insufficient sample'*
- *u/s means 'unsuitable sample'*
- *Comments or interpretations are beyond the scope of UKAS accreditation*
- *The results relate only to the items tested*

Ground Engineering
Newark Road
Peterborough

PE1 5UA

FAO Steve Fleming

# LABORATORY TEST REPORT

**Results of analysis of 6 samples**
**received 18 February 2009**

**Witanhurst, 41 Highgate West Hill, London N6**

Chemtest

**Report Date**
**26 February 2009**

| Login Batch No | | | | | 75534 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Chemtest LIMS ID | | | | | AD82361 | AD82362 | AD82363 | AD82364 | AD82365 | AD82366 |
| Sample ID | | | | | BH1 | BH2 | BH3 | BH3 | TP1 | TP2 |
| Sample No | | | | | D1 | D1 | B1 | B2 | D1 | D1 |
| Depth | | | | | 0.1m | 0.1m | 0m - 0.7m | 0.7m - 1.2m | 0.2m | 0.2m |
| *Matrix* | | | | | *SOIL* | *SOIL* | *SOIL* | *SOIL* | *SOIL* | *SOIL* |
| SOP↓ | Determinand↓ | CAS No↓ | Units↓ | * | | | | | | |
| 2120 | Boron (hot water soluble) | 7440428 | mg kg$^{-1}$ | U | 1.2 | 0.5 | 1.1 | 0.6 | 0.5 | 1 |
| | Sulfate (2:1 water soluble) | 14808798 | g l$^{-1}$ | M | 0.14 | 0.05 | 0.02 | 0.01 | 0.18 | 0.44 |
| 2300 | Cyanide (free) | 57125 | mg kg$^{-1}$ | M | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| | Cyanide (total) | 57125 | mg kg$^{-1}$ | M | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 2325 | Sulfide | 18496258 | mg kg$^{-1}$ | N | 6.9 | 270.0 | 5.4 | 110.0 | < 0.5 | 230.0 |
| 2450 | Arsenic | 7440382 | mg kg$^{-1}$ | M | 13 | 15 | 28 | 11 | 18 | 19 |
| | Cadmium | 7440439 | mg kg$^{-1}$ | M | 0.15 | 0.19 | 0.42 | <0.1 | 0.20 | 0.18 |
| | Chromium | 7440473 | mg kg$^{-1}$ | M | 30 | 28 | 27 | 26 | 26 | 32 |
| | Copper | 7440508 | mg kg$^{-1}$ | M | 25 | 35 | 94 | 32 | 26 | 31 |
| | Mercury | 7439976 | mg kg$^{-1}$ | M | 0.84 | 0.32 | 3.4 | 1.9 | <0.1 | 0.15 |
| | Nickel | 7440020 | mg kg$^{-1}$ | M | 19 | 26 | 23 | 11 | 22 | 31 |
| | Lead | 7439921 | mg kg$^{-1}$ | M | 170 | 220 | 1200 | 210 | 70 | 290 |
| | Selenium | 7782492 | mg kg$^{-1}$ | M | <0.2 | <0.2 | 0.27 | <0.2 | 0.27 | <0.2 |
| | Zinc | 7440666 | mg kg$^{-1}$ | M | 70 | 100 | 230 | 59 | 42 | 91 |
| 2490 | Chromium (hexavalent) | 18540299 | mg kg$^{-1}$ | N | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 |
| 2625 | Organic matter | | % | M | 3.8 | 8.4 | 9.0 | 1.5 | 15 | 10 |
| 2700 | Naphthalene | 91203 | mg kg$^{-1}$ | M | 0.4 | 0.6 | 0.3 | 0.1 | 0.1 | 0.3 |
| | Acenaphthylene | 208968 | mg kg$^{-1}$ | M | 0.4 | 0.5 | <0.1 | 0.1 | 3.4 | 0.4 |
| | Acenaphthene | 83329 | mg kg$^{-1}$ | M | 0.4 | 0.3 | 0.1 | 0.4 | 0.4 | 0.9 |
| | Fluorene | 86737 | mg kg$^{-1}$ | M | 0.5 | 0.3 | <0.1 | <0.1 | 0.4 | 0.4 |
| | Phenanthrene | 85018 | mg kg$^{-1}$ | M | 15 | 7.8 | 0.5 | 0.2 | 5.9 | 15 |
| | Anthracene | 120127 | mg kg$^{-1}$ | M | 1.8 | 1.9 | <0.1 | <0.1 | 5.7 | 3.6 |
| | Fluoranthene | 206440 | mg kg$^{-1}$ | M | 25 | 13 | 0.9 | 0.3 | 33 | 26 |
| | Pyrene | 129000 | mg kg$^{-1}$ | M | 17 | 12 | 0.7 | <0.1 | 35 | 22 |
| | Benzo[a]anthracene | 56553 | mg kg$^{-1}$ | M | 9.2 | 7.5 | 0.4 | 0.1 | 18 | 11 |
| | Chrysene | 218019 | mg kg$^{-1}$ | M | 11 | 9.6 | 0.6 | 0.1 | 20 | 13 |
| | Benzo[b]fluoranthene | 205992 | mg kg$^{-1}$ | M | 13 | 12 | 0.7 | 0.1 | 39 | 17 |
| | Benzo[k]fluoranthene | 207089 | mg kg$^{-1}$ | M | 7.2 | 8.1 | 0.4 | <0.1 | 32 | 8.3 |
| | Benzo[a]pyrene | 50328 | mg kg$^{-1}$ | M | 9.8 | 12 | 0.6 | <0.1 | 49 | 14 |
| | Dibenzo[a,h]anthracene | 53703 | mg kg$^{-1}$ | M | <0.1 | 2.7 | 0.3 | <0.1 | 11 | 2.5 |
| | Indeno[1,2,3-cd]pyrene | 193395 | mg kg$^{-1}$ | M | 8.5 | 9.6 | 0.4 | <0.1 | 42 | 10 |

All tests undertaken between 19-Feb-2009 and 23-Feb-2009

* Accreditation status

***This report should be interpreted in conjunction with the notes on the accompanying cover page***

Ground Engineering
Newark Road
Peterborough

PE1 5UA

FAO Steve Fleming

# LABORATORY TEST REPORT

**Results of analysis of 6 samples**
**received 18 February 2009**

**Witanhurst, 41 Highgate West Hill, London N6**

Chemtest

**Report Date**
**26 February 2009**

| | | | | | 75534 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AD82361 | AD82362 | AD82363 | AD82364 | AD82365 | AD82366 |
| | | | | | BH1 | BH2 | BH3 | BH3 | TP1 | TP2 |
| | | | | | D1 | D1 | B1 | B2 | D1 | D1 |
| | | | | | 0.1m | 0.1m | 0m - 0.7m | 0.7m - 1.2m | 0.2m | 0.2m |
| | | | | | *SOIL* | *SOIL* | *SOIL* | *SOIL* | *SOIL* | *SOIL* |
| 2700 | Benzo[g,h,i]perylene | 191242 | mg kg-1 | M | 6.8 | 8.7 | 0.4 | <0.1 | 41 | 9.1 |
| | Total (of 16) PAHs | | mg kg-1 | M | 130 | 110 | 6.2 | <2 | 340 | 150 |
| 2920 | Phenols (total) | | mg kg-1 | N | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| 2010 | pH | | - | M | 8.4 | 10.2 | 7.4 | 7.6 | 10.4 | 10.8 |

All tests undertaken between 19-Feb-2009 and 23-Feb-2009

* Accreditation status

***This report should be interpreted in conjunction with the notes on the accompanying cover page***

Chemtest

Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

Ground Engineering
Newark Road
Peterborough

PE1 5UA

FAO Steve Fleming
03 March 2009

Dear Steve Fleming

**Test Report Number** **75535**
**Your Project Reference** **Witanhurst, 41 Highgate West Hill, London N6**

Please find enclosed the results of analysis for the samples received 18 February 2009.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely

Authorised Signatory

| | |
|---|---|
| ☑ Darrell Hall | Laboratory Manager |
| ☐ Phil Hellier | Operations Director |
| ☐ Keith Jones | Technical Development Manager |
| ☐ John Crawford | Quality Manager |
| ☐ Malcolm Avis | Technical Director |

UKAS TESTING
2183

*Notes to accompany report:*

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/e means 'not evaluated'*
- *i/s means 'insufficient sample'*
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- *Comments or interpretations are beyond the scope of UKAS accreditation*
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# Chemtest

# LABORATORY TEST REPORT

**Waste Acceptance Criteria BS EN 12457 Part 3 2 Stage**

Ground Engineering
Newark Road
Peterborough

PE1 5UA
FAO Steve Fleming

**Results of analysis of 1 sample**
**received 18 February 2009**
**Witanhurst, 41 Highgate West Hill, London N6**

Report Date
03 March 2009

| Login Batch No | | | | | | | | 75535 |
|---|---|---|---|---|---|---|---|---|
| Chemtest LIMS ID | | | | | Limit values | | | AD82368 |
| Sample ID | | | | | Inert waste landfill | Stable non-reactive hazardous waste in non-hazardous landfill | Hazardous waste landfill | TP3 |
| Sample No | | | | | | | | D1 |
| Depth | | | | | | | | 0.3 |
| *Matrix* | | | | | | | | *LEACHATE* |
| Determinand↓ | SOP↓ | * | CAS No↓ | Units↓ | | | | |
| As (arsenic) L/S=2 | 1450 | N | 7440382 | mg kg-1 | | | | <0.05 |
| Ba (barium) L/S=2 | 1450 | N | 7440393 | mg kg-1 | | | | <0 5 |
| Cd (cadmium) L/S=2 | 1450 | N | 7440439 | mg kg-1 | | | | <0.01 |
| Cr (chromium) L/S=2 | 1450 | N | 7440473 | mg kg-1 | | | | <0.05 |
| Cu (copper) L/S=2 | 1450 | N | 7440508 | mg kg-1 | | | | <0.05 |
| Hg (mercury) L/S=2 | 1450 | N | 7439976 | mg kg-1 | | | | <0.005 |
| Mo (molybdenum) L/S=2 | 1450 | N | 7439987 | mg kg-1 | | | | <0.05 |
| Ni (nickel) L/S=2 | 1450 | N | 7440020 | mg kg-1 | | | | <0.05 |
| Pb (lead) L/S=2 | 1450 | N | 7439921 | mg kg-1 | | | | <0.05 |
| Sb (antimony) L/S=2 | 1450 | N | 7440360 | mg kg-1 | | | | <0.01 |
| Se (selenium) L/S=2 | 1450 | N | 7782492 | mg kg-1 | | | | <0.01 |
| Zn (zinc) L/S=2 | 1450 | N | 7440666 | mg kg-1 | | | | <0.5 |
| Cl (chloride) L/S=2 | 1220 | U | 16887006 | mg kg-1 | | | | 8.6 |
| F (fluoride) L/S=2 | 1220 | U | 16984488 | mg kg-1 | | | | <1 |
| SO4 (sulfate) L/S=2 | 1220 | U | 14808798 | mg kg-1 | | | | 26 |
| Total Dissolved Solids L/S=2 | 1610 | N | TDS | mg kg-1 | | | | 360 |
| Phenol index L/S=2 | 1920 | N | 108952 | mg kg-1 | | | | <0.5 |
| Dissolved Organic Carbon L/S=2 | 1610 | N | DOC | mg kg-1 | | | | <50 |
| As (arsenic) L/S=10 | 1450 | N | 7440382 | mg kg-1 | 0 5 | 2 | 25 | <0.05 |
| Ba (barium) L/S=10 | 1450 | N | 7440393 | mg kg-1 | 20 | 100 | 300 | <0.5 |
| Cd (cadmium) L/S=10 | 1450 | N | 7440439 | mg kg-1 | 0.04 | 1 | 5 | <0.01 |
| Cr (chromium) L/S=10 | 1450 | N | 7440473 | mg kg-1 | 0.5 | 10 | 70 | 0.1 |
| Cu (copper) L/S=10 | 1450 | N | 7440508 | mg kg-1 | 2 | 50 | 100 | <0.05 |
| Hg (mercury) L/S=10 | 1450 | N | 7439976 | mg kg-1 | 0.01 | 0.2 | 2 | <0.005 |
| Mo (molybdenum) L/S=10 | 1450 | N | 7439987 | mg kg-1 | 0.5 | 10 | 30 | <0.05 |
| Ni (nickel) L/S=10 | 1450 | N | 7440020 | mg kg-1 | 0.4 | 10 | 40 | 0.05 |
| Pb (lead) L/S=10 | 1450 | N | 7439921 | mg kg-1 | 0.5 | 10 | 50 | 0.16 |
| Sb (antimony) L/S=10 | 1450 | N | 7440360 | mg kg-1 | 0.06 | 0.7 | 5 | <0.01 |
| Se (selenium) L/S=10 | 1450 | N | 7782492 | mg kg-1 | 0 1 | 0.5 | 7 | <0.01 |
| Zn (zinc) L/S=10 | 1450 | N | 7440666 | mg kg-1 | 4 | 50 | 200 | <0 5 |
| Cl (chloride) L/S=10 | 1220 | U | 16887006 | mg kg-1 | 800 | 15000 | 25000 | 10.1 |
| F (fluoride) L/S=10 | 1220 | U | 16984488 | mg kg-1 | 10 | 150 | 500 | 2.99 |
| SO4 (sulfate) L/S=10 | 1220 | U | 14808798 | mg kg-1 | 1000 | 20000 | 50000 | 17.1 |
| Total Dissolved Solids L/S=10 | 1610 | N | TDS | mg kg-1 | 4000 | 60000 | 100000 | 946 |
| Phenol index L/S=10 | 1920 | N | 108952 | mg kg-1 | 1 | | | <0.5 |
| Dissolved Organic Carbon L/S=10 | 1610 | N | DOC | mg kg-1 | 500 | 800 | 1000 | 154 |

All tests undertaken between 20-Feb-2009 and 3-Mar-2009

* Accreditation status



Report sample ID range AD82367 to AD82368

*This report should be interpreted in conjunction with the notes on the accompanying cover page*

# Chemtest

# LABORATORY TEST REPORT

**Waste Acceptance Criteria Waste Parameters**

Ground Engineering
Newark Road
Peterborough

PE1 5UA
FAO Steve Fleming

**Results of analysis of 1 sample**
**received 18 February 2009**
**Witanhurst, 41 Highgate West Hill, London N6**

Report Date
03 March 2009

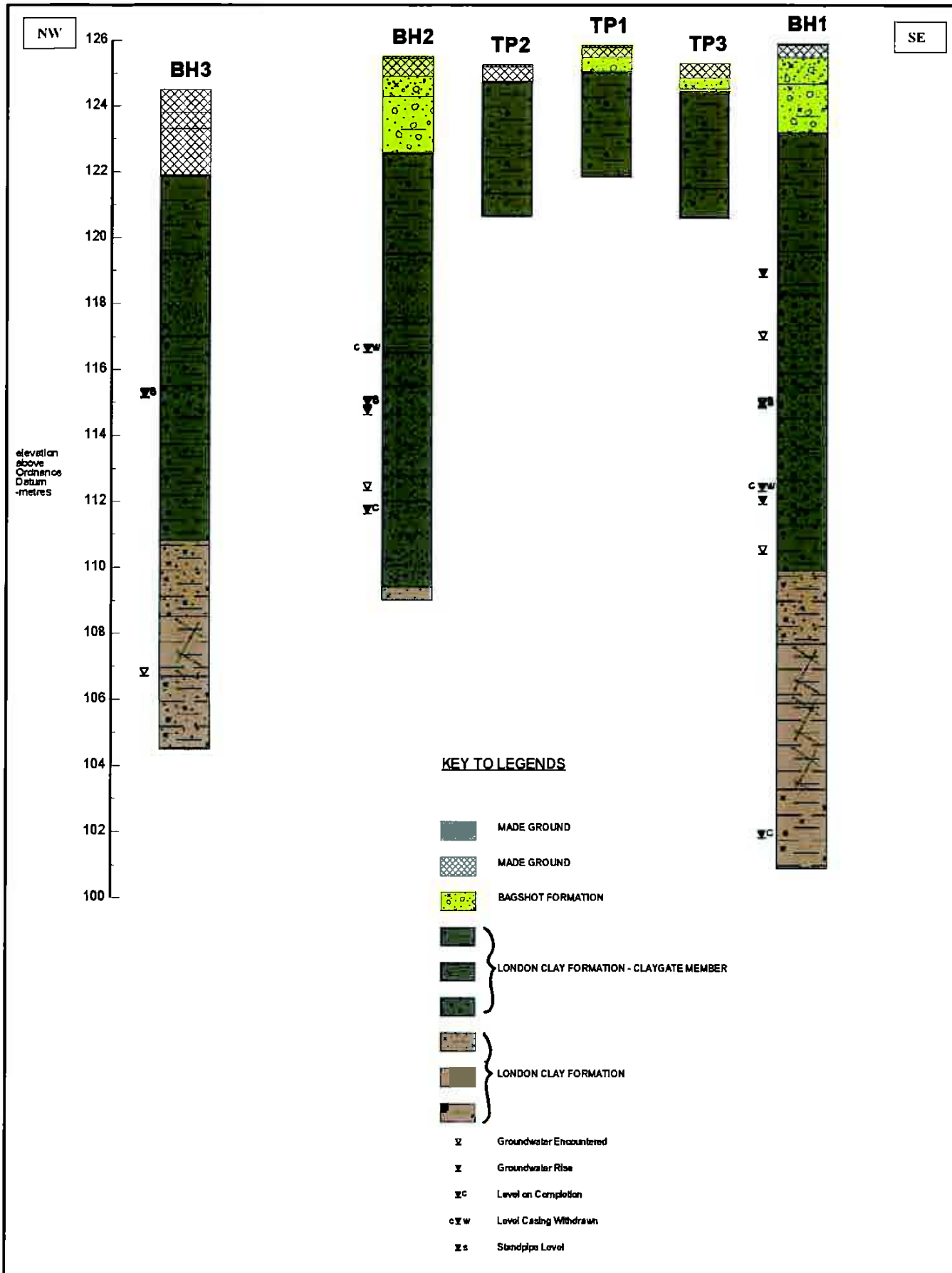
| Login Batch No | | | | | | | | 75535 |
|---|---|---|---|---|---|---|---|---|
| Chemtest LIMS ID | | | | | Limit values | | | AD82367 |
| Sample ID | | | | | Inert waste landfill | Stable non-reactive hazardous waste in non-hazardous landfill | Hazardous waste landfill | TP3 |
| Sample No | | | | | | | | D1 |
| Depth | | | | | | | | 0.3 |
| *Matrix* | | | | | | | | *SOIL* |
| Determinand↓ | SOP↓ | * | CAS No↓ | Units↓ | | | | |
| Total Organic Carbon | 2625 | M | | % | 3 | 5 | 6 | 4.6 |
| Loss on ignition | 2610 | N | | % | | | 10 | 6.25 |
| Benzene | 2760 | M | 71432 | µg kg$^{-1}$ | | | | <1 |
| Toluene | 2760 | M | 108883 | µg kg$^{-1}$ | | | | <1 |
| Ethyl benzene | 2760 | M | 100414 | µg kg$^{-1}$ | | | | <1 |
| m- & p-Xylene | 2760 | M | 1330207 | µg kg$^{-1}$ | | | | <1 |
| o-Xylene | 2760 | M | 95476 | µg kg$^{-1}$ | | | | <1 |
| Total BTEX | 2761 | M | | mg kg$^{-1}$ | 6 | | | <0.005 |
| PCB 28 | 2810 | N | 7012375 | mg kg$^{-1}$ | | | | <0.1 |
| PCB 52 | 2810 | N | 35693993 | mg kg$^{-1}$ | | | | <0.1 |
| PCB 101 | 2810 | N | 37680732 | mg kg$^{-1}$ | | | | <0.1 |
| PCB 118 | 2810 | N | 31508006 | mg kg$^{-1}$ | | | | <0.1 |
| PCB 138 | 2810 | N | 35065282 | mg kg$^{-1}$ | | | | <0.1 |
| PCB 153 | 2810 | N | 35065271 | mg kg$^{-1}$ | | | | <0.1 |
| PCB 180 | 2810 | N | 35065293 | mg kg$^{-1}$ | | | | <0.1 |
| Total PCBs (7 congeners) | 2811 | N | | mg kg$^{-1}$ | 1 | | | <1 |
| Naphthalene | 2700 | M | 91203 | mg kg$^{-1}$ | | | | 0.6 |
| Acenaphthylene | 2700 | M | 208968 | mg kg$^{-1}$ | | | | 0.1 |
| Acenaphthene | 2700 | M | 83329 | mg kg$^{-1}$ | | | | 0.2 |
| Fluorene | 2700 | M | 86737 | mg kg$^{-1}$ | | | | 0.1 |
| Phenanthrene | 2700 | M | 85018 | mg kg$^{-1}$ | | | | 0.8 |
| Anthracene | 2700 | M | 120127 | mg kg$^{-1}$ | | | | 0.2 |
| Fluoranthene | 2700 | M | 206440 | mg kg$^{-1}$ | | | | 1.7 |
| Pyrene | 2700 | M | 129000 | mg kg$^{-1}$ | | | | 1.4 |
| Benzo[a]anthracene | 2700 | M | 56553 | mg kg$^{-1}$ | | | | 0.8 |
| Chrysene | 2700 | M | 218019 | mg kg$^{-1}$ | | | | 1 |
| Benzo[b]fluoranthene | 2700 | M | 205992 | mg kg$^{-1}$ | | | | 0.5 |
| Benzo[k]fluoranthene | 2700 | M | 207089 | mg kg$^{-1}$ | | | | <0.1 |
| Benzo[a]pyrene | 2700 | M | 50328 | mg kg$^{-1}$ | | | | 0.7 |
| Dibenzo[a,h]anthracene | 2700 | M | 53703 | mg kg$^{-1}$ | | | | 0.2 |
| Indeno[1,2,3-cd]pyrene | 2700 | M | 193395 | mg kg$^{-1}$ | | | | <0.1 |
| Benzo[g,h,i]perylene | 2700 | M | 191242 | mg kg$^{-1}$ | | | | <0.1 |
| Coronene | 2700 | N | 191071 | mg kg$^{-1}$ | | | | <0.1 |
| Total (of 17) PAHs | 2700 | N | | mg kg$^{-1}$ | 100 | | | 8.3 |
| pH | 2010 | M | | - | | >6 | | 7.5 |
| Acid Neutralisation Capacity | 1015 | N | ANC | mol kg$^{-1}$ | | To evaluate | To evaluate | 0.014 |
| TPH Total WAC | 2670 | N | | mg kg$^{-1}$ | 500 | | | 28 |

All tests undertaken between 20-Feb-2009 and 3-Mar-2009

* Accreditation status

# APPENDIX 7

# FIGURES




| | | | |
|---|---|---|---|
| SITE | WITANHURST, 41 HIGHGATE WEST HILL, LONDON N6 | | Contract No. 11681 |
| CLIENT | DEWRACE MANAGEMENT SERVICES | Soil Profile | Vertical Scale 1:150 |
| GROUND ENGINEERING, NEWARK ROAD, PETERBOROUGH. | | Date 30/04/09 | Fig. No 1 |

# APPENDIX 8

## CLASSIFICATION OF AGGRESSIVE CHEMICAL ENVIRONMENT FOR BURIED CONCRETE

# TABLE C2 – AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE

# (ACEC) CLASSIFICATION FOR BROWNFIELD LOCATIONS[a]

**Table C2 Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations[a]**

| Sulfate and magnesium | | | | | | Groundwater | | ACEC |
|---|---|---|---|---|---|---|---|---|
| Design Sulfate Class for location | 2:1 water/soil extract[b] | | Groundwater | | Total potential sulfate[c] | Static water | Mobile water | Class for location |
| 1 | 2 ($SO_4$ mg/l) | 3 (Mg mg/l) | 4 ($SO_4$ mg/l) | 5 (Mg mg/l) | 6 ($SO_4$ %) | 7 (pH)[d] | 8 (pH)[d] | 9 |
| DS-1 | < 500 | | < 400 | | < 0.24 | ≥ 2.5 | | AC-1s |
| | | | | | | | > 6.5[d] | AC-1 |
| | | | | | | | 5.5–6.5 | AC-2z |
| | | | | | | | 4.5–5.5 | AC-3z |
| | | | | | | | 2.5–4.5 | AC-4z |
| DS-2 | 500–1500 | | 400–1400 | | 0.24–0.6 | > 5.5 | | AC-1s |
| | | | | | | | > 6.5 | AC-2 |
| | | | | | | 2.5–5.5 | | AC-2s |
| | | | | | | | 5.5–6.5 | AC-3z |
| | | | | | | | 4.5–5.5 | AC-4z |
| | | | | | | | 2.5–5.5 | AC-5z |
| DS-3 | 1600–3000 | | 1500–3000 | | 0.7–1.2 | > 5.5 | | AC-2s |
| | | | | | | | > 6.5 | AC-3 |
| | | | | | | 2.5–5.5 | | AC-3s |
| | | | | | | | 5.5–6.5 | AC-4 |
| | | | | | | | 2.5–5.5 | AC-5 |
| DS-4 | 3100–6000 | ≤ 1200 | 3100–6000 | ≤ 1000 | 1.3–2.4 | > 5.5 | | AC-3s |
| | | | | | | | > 6.5 | AC-4 |
| | | | | | | 2.5–5.5 | | AC-4s |
| | | | | | | | 2.5–6.5 | AC-5 |
| DS-4m | 3100–6000 | > 1200[e] | 3100–6000 | > 1000[e] | 1.3–2.4 | > 5.5 | | AC-3s |
| | | | | | | | > 6.5 | AC-4m |
| | | | | | | 2.5–5.5 | | AC-4ms |
| | | | | | | | 2.5–6.5 | AC-5m |
| DS-5 | > 6000 | ≤ 1200 | > 6000 | ≤ 1000 | > 2.4 | > 5.5 | | AC-4s |
| | | | | | | 2.5–5.5 | ≥ 2.5 | AC-5 |
| DS-5m | > 6000 | > 1200[e] | > 6000 | > 1000[e] | > 2.4 | > 5.5 | | AC-4ms |
| | | | | | | 2.5–5.5 | ≥ 2.5 | AC-5m |

**Notes**

a Brownfield locations are those sites, or parts of sites, that might contain chemical residues produced by or associated with industrial production (Section C5.1.3).

b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered from previous Digests (Box C7).

c Applies only to locations where concrete will be exposed to sulfate ions ($SO_4$), which may result from the oxidation of sulfides such as pyrite, following ground disturbance (Appendix A1 and Box C8).

d An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content (Section C5.1.3).

e The limit on water-soluble magnesium does not apply to brackish groundwater (chloride content between 12 000 mg/l and 17 000 mg/l). This allows 'm' to be omitted from the relevant ACEC classification. Seawater (chloride content about 18 000 mg/l) and stronger brines are not covered by this table.

**Explanation of suffix symbols to ACEC Class**

- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that include the suffix 'z' have primarily to resist acid conditions and may be made with any of the cements in Table D2 on page 42.
- Suffix 'm' relates to the higher levels of magnesium in Design Sulfate Classes 4 and 5.