Units: kN,m

**INPUT DATA**

**SOIL PROFILE**

| Stratum no. | Elevation of top of stratum | Soil types Active side | Passive side |
|---|---|---|---|
| 1 | 34.00 | 1 MG Undrained | 1 MG Undrained |
| 2 | 26.00 | 2 London Clay | 2 London Clay |

**SOIL PROPERTIES**

| No. | Soil type / Description (Datum elev.) | Bulk density kN/m3 | Young's Modulus Eh,kN/m2 (dEh/dy) | At rest coeff. Ko (dKo/dy) | Consol state. NC/OC ( Nu ) | Active limit Ka ( Kac ) | Passive limit Kp ( Kpc ) | Cohesion kN/m2 ( dc/dy ) |
|---|---|---|---|---|---|---|---|---|
| 1 | MG Undrai.. | 19.00 | 20000 | 0.530 | NC | 1.000 | 1.000 | 30.00u |
| | ( 34.00 ) | | | | (0.490) | (2.389) | ( 2.390) | ( 2.000) |
| 2 | London Clay | 20.00 | 24000 | 1.000 | OC | 1.000 | 1.000 | 60.00u |
| | ( 26.00 ) | | ( 2000) | | (0.490) | (2.389) | ( 2.390) | ( 5.300) |
| 3 | MG Drained | 19.00 | 14000 | 0.530 | NC | 0.301 | 4.339 | 1.000d |
| | | | | | (0.200) | (1.315) | ( 6.280) | |
| 4 | LC Drained | 20.00 | 19200 | 1.000 | OC | 0.329 | 3.814 | 5.000d |
| | ( 26.00 ) | | ( 1600) | | (0.200) | (1.376) | ( 5.769) | |

**Additional soil parameters associated with Ka and Kp**

| No. | Soil type Description | --- parameters for Ka --- Soil friction angle | Wall adhesion coeff. | Back-fill angle | --- parameters for Kp --- Soil friction angle | Wall adhesion coeff. | Back-fill angle |
|---|---|---|---|---|---|---|---|
| 1 | MG Undrained | 0.00 | 0.500 | 0.00 | 0.00 | 0.500 | 0.00 |
| 2 | London Clay | 0.00 | 0.500 | 0.00 | 0.00 | 0.500 | 0.00 |
| 3 | MG Drained | 28.00 | 0.885 | 0.00 | 28.00 | 0.874 | 0.00 |
| 4 | LC Drained | 26.00 | 0.865 | 0.00 | 26.00 | 0.866 | 0.00 |

**GROUND WATER CONDITIONS**

Density of water = 10.00 kN/m3

| | Active side | Passive side |
|---|---|---|
| Initial water table elevation | 19.00 | 19.00 |

Automatic water pressure balancing at toe of wall : No

**WALL PROPERTIES**

Type of structure = Fully Embedded Wall
Elevation of toe of wall = 5.00
Maximum finite element length = 0.50 m
Youngs modulus of wall E = 2.3800E+08 kN/m2
Moment of inertia of wall I = 0.051900 m4/m run
E.I = 1.2352E+07 kN.m2/m run
Yield Moment of wall = Not defined

**STRUTS and ANCHORS**

| Strut/ anchor no. | Elev. | Strut spacing m | X-section area of strut sq.m | Youngs modulus kN/m2 | Free length m | Inclin -ation (degs) | Pre-stress /strut kN | Tension allowed |
|---|---|---|---|---|---|---|---|---|
| 1 | 31.00 | 5.00 | 0.050000 | 2.000E+08 | 5.00 | 0.00 | 0 | Yes |
| 2 | 28.00 | 1.00 | 0.300000 | 2.800E+07 | 5.00 | 0.00 | 0 | Yes |
| 3 | 24.00 | 1.00 | 0.300000 | 2.800E+07 | 5.00 | 0.00 | 0 | Yes |
| 4 | 34.00 | 1.00 | 0.400000 | 2.800E+07 | 5.00 | 0.00 | 0 | Yes |

**CONSTRUCTION STAGES**

| Construction stage no. | Stage description |
|---|---|
| 1 | Excavate to elevation 30.50 on PASSIVE side |
| 2 | Install strut or anchor no.1 at elevation 31.00 |
| 3 | Excavate to elevation 27.50 on PASSIVE side |
| 4 | Install strut or anchor no.2 at elevation 28.00 |
| 5 | Excavate to elevation 23.70 on PASSIVE side |
| 6 | Install strut or anchor no.3 at elevation 24.00 |
| 7 | Install strut or anchor no.4 at elevation 34.00 |
| 8 | Remove strut or anchor no.1 at elevation 31.00 |
| 9 | Change properties of soil type 1 to soil type 3<br>No analysis at this stage<br>Ko pressures will not be reset |
| 10 | Change properties of soil type 2 to soil type 4<br>Ko pressures will not be reset |
| 11 | Change EI of wall to 882019 kN.m2/m run<br>Yield moment not defined<br>Allow wall to relax with new modulus value |

**FACTORS OF SAFETY and ANALYSIS OPTIONS**

Limit State options: Serviceability Limit State
All loads and soil strengths are unfactored

Stability analysis:
Method of analysis - Strength Factor method
Factor on soil strength for calculating wall depth = 1.00

Parameters for undrained strata:
Minimum equivalent fluid density = 5.00 kN/m3
Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:
Method - Subgrade reaction model using Influence Coefficients
Open Tension Crack analysis? - No
Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:
Length of wall (normal to plane of analysis) = 1000.00 m

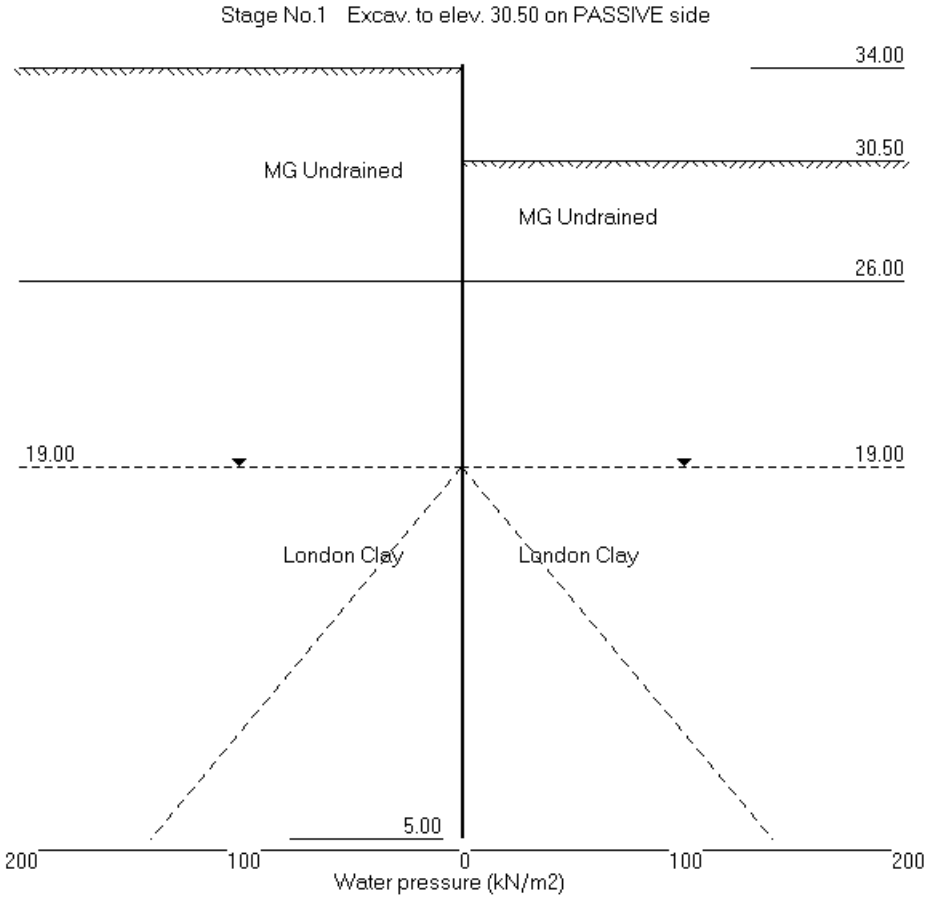
Width of excavation on active side of wall = 20.00 m
Width of excavation on passive side of wall = 50.00 m

Distance to rigid boundary on active side = 20.00 m
Distance to rigid boundary on passive side = 50.00 m

**OUTPUT OPTIONS**

| Stage no. | Stage description | Output options: Displacement, Bending mom., Shear force | Output options: Active, Passive pressures | Graph. output |
|---|---|---|---|---|
| 1 | Excav. to elev. 30.50 on PASSIVE side | Yes | Yes | Yes |
| 2 | Install strut no.1 at elev. 31.00 | No | No | No |
| 3 | Excav. to elev. 27.50 on PASSIVE side | No | No | No |
| 4 | Install strut no.2 at elev. 28.00 | No | No | No |
| 5 | Excav. to elev. 23.70 on PASSIVE side | No | No | No |
| 6 | Install strut no.3 at elev. 24.00 | No | No | No |
| 7 | Install strut no.4 at elev. 34.00 | No | No | No |
| 8 | Remove strut no.1 at elev. 31.00 | No | No | No |
| 9 | Change soil type 1 to soil type 3 | No | No | No |
| 10 | Change soil type 2 to soil type 4 | No | No | No |
| 11 | Change EI of wall to 882019kN.m2/m run | No | No | No |
| * | Summary output | Yes | - | Yes |

Units: kN,m


Stage No.1 Excav. to elev. 30.50 on PASSIVE side
34.00
30.50
MG Undrained
MG Undrained
26.00
19.00
19.00
London Clay
London Clay
5.00
200
100
0
100
200
Water pressure (kN/m2)

Units: kN,m

Stage No. 1 Excavate to elevation 30.50 on PASSIVE side

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**

Factor of safety on soil strength

| Stage No. | --- G.L. --- Act. | Pass. | Strut Elev. | FoS for toe elev. = 5.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation |
|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 30.50 | Cant. | 4.928 | 7.49 | 28.66 | 1.84 |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**

**Analysis options**

Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 50.00 from wall

**Limit State: Serviceability Limit State**

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 0.00 | 0.019 | 7.44E-04 | 0.0 | -0.0 | | 12352200 |
| 2 | 33.50 | 2.50 | 0.019 | 7.44E-04 | 0.6 | 0.1 | | 12352200 |
| 3 | 33.00 | 5.00 | 0.019 | 7.44E-04 | 2.5 | 0.8 | | 12352200 |
| 4 | 32.50 | 7.50 | 0.018 | 7.44E-04 | 5.6 | 2.8 | | 12352200 |
| 5 | 32.00 | 10.00 | 0.018 | 7.44E-04 | 10.0 | 6.7 | | 12352200 |
| 6 | 31.50 | 12.50 | 0.017 | 7.44E-04 | 15.6 | 13.0 | | 12352200 |
| 7 | 31.00 | 15.00 | 0.017 | 7.43E-04 | 22.5 | 22.5 | | 12352200 |
| 8 | 30.50 | 17.50 | 0.017 | 7.42E-04 | 30.6 | 35.7 | | 12352200 |
| | | -8.39 | 0.017 | 7.42E-04 | 30.6 | 35.7 | | |
| 9 | 30.00 | -5.31 | 0.016 | 7.40E-04 | 27.2 | 50.1 | | 12352200 |
| 10 | 29.50 | -2.24 | 0.016 | 7.38E-04 | 25.3 | 63.1 | | 12352200 |
| 11 | 29.00 | 0.83 | 0.016 | 7.35E-04 | 25.0 | 75.6 | | 12352200 |
| 12 | 28.50 | 3.90 | 0.015 | 7.32E-04 | 26.1 | 88.3 | | 12352200 |
| 13 | 28.00 | 6.97 | 0.015 | 7.28E-04 | 28.9 | 102.0 | | 12352200 |
| 14 | 27.50 | 10.03 | 0.014 | 7.23E-04 | 33.1 | 117.4 | | 12352200 |
| 15 | 27.00 | 9.09 | 0.014 | 7.18E-04 | 37.9 | 135.1 | | 12352200 |
| 16 | 26.50 | 8.97 | 0.014 | 7.12E-04 | 42.4 | 156.7 | | 12352200 |
| 17 | 26.00 | 10.45 | 0.013 | 7.06E-04 | 47.3 | 179.0 | | 12352200 |
| | | -3.37 | 0.013 | 7.06E-04 | 47.3 | 179.0 | | |
| 18 | 25.50 | -4.34 | 0.013 | 6.98E-04 | 45.3 | 202.2 | | 12352200 |
| 19 | 25.00 | -5.19 | 0.013 | 6.89E-04 | 43.0 | 224.4 | | 12352200 |
| 20 | 24.50 | -5.93 | 0.012 | 6.80E-04 | 40.2 | 245.2 | | 12352200 |
| 21 | 24.00 | -6.55 | 0.012 | 6.69E-04 | 37.1 | 264.5 | | 12352200 |
| 22 | 23.70 | -6.87 | 0.012 | 6.63E-04 | 35.0 | 275.4 | | 12352200 |
| 23 | 23.35 | -7.20 | 0.012 | 6.55E-04 | 32.6 | 287.2 | | 12352200 |
| 24 | 23.00 | -7.48 | 0.011 | 6.47E-04 | 30.0 | 298.2 | | 12352200 |
| 25 | 22.50 | -7.80 | 0.011 | 6.34E-04 | 26.2 | 312.2 | | 12352200 |
| 26 | 22.00 | -8.03 | 0.011 | 6.21E-04 | 22.2 | 324.4 | | 12352200 |
| 27 | 21.50 | -8.18 | 0.010 | 6.08E-04 | 18.2 | 334.5 | | 12352200 |
| 28 | 21.00 | -8.25 | 0.010 | 5.94E-04 | 14.1 | 342.5 | | 12352200 |

(continued)

Stage No.1 Excavate to elevation 30.50 on PASSIVE side

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 29 | 20.50 | -8.24 | 0.010 | 5.80E-04 | 10.0 | 348.5 | | 12352200 |
| 30 | 20.00 | -8.17 | 0.010 | 5.66E-04 | 5.9 | 352.5 | | 12352200 |
| 31 | 19.50 | -8.04 | 0.009 | 5.52E-04 | 1.8 | 354.4 | | 12352200 |
| 32 | 19.00 | -7.85 | 0.009 | 5.37E-04 | -2.2 | 354.3 | | 12352200 |
| 33 | 18.50 | -7.61 | 0.009 | 5.23E-04 | -6.0 | 352.2 | | 12352200 |
| 34 | 18.00 | -7.31 | 0.008 | 5.09E-04 | -9.8 | 348.2 | | 12352200 |
| 35 | 17.50 | -6.98 | 0.008 | 4.95E-04 | -13.3 | 342.5 | | 12352200 |
| 36 | 17.00 | -6.60 | 0.008 | 4.81E-04 | -16.7 | 334.9 | | 12352200 |
| 37 | 16.50 | -6.19 | 0.008 | 4.68E-04 | -19.9 | 325.7 | | 12352200 |
| 38 | 16.00 | -5.74 | 0.008 | 4.55E-04 | -22.9 | 315.0 | | 12352200 |
| 39 | 15.50 | -5.26 | 0.007 | 4.42E-04 | -25.7 | 302.8 | | 12352200 |
| 40 | 15.00 | -4.74 | 0.007 | 4.30E-04 | -28.2 | 289.3 | | 12352200 |
| 41 | 14.50 | -4.20 | 0.007 | 4.19E-04 | -30.4 | 274.6 | | 12352200 |
| 42 | 14.00 | -3.63 | 0.007 | 4.08E-04 | -32.4 | 258.9 | | 12352200 |
| 43 | 13.50 | -3.02 | 0.006 | 3.98E-04 | -34.0 | 242.3 | | 12352200 |
| 44 | 13.00 | -2.39 | 0.006 | 3.89E-04 | -35.4 | 224.9 | | 12352200 |
| 45 | 12.50 | -1.73 | 0.006 | 3.80E-04 | -36.4 | 206.9 | | 12352200 |
| 46 | 12.00 | -1.03 | 0.006 | 3.72E-04 | -37.1 | 188.5 | | 12352200 |
| 47 | 11.50 | -0.30 | 0.006 | 3.65E-04 | -37.4 | 169.8 | | 12352200 |
| 48 | 11.00 | 0.46 | 0.006 | 3.58E-04 | -37.4 | 151.0 | | 12352200 |
| 49 | 10.50 | 1.26 | 0.005 | 3.52E-04 | -37.0 | 132.4 | | 12352200 |
| 50 | 10.00 | 2.10 | 0.005 | 3.47E-04 | -36.1 | 114.0 | | 12352200 |
| 51 | 9.50 | 2.98 | 0.005 | 3.43E-04 | -34.9 | 96.2 | | 12352200 |
| 52 | 9.00 | 3.90 | 0.005 | 3.40E-04 | -33.1 | 79.2 | | 12352200 |
| 53 | 8.50 | 4.88 | 0.005 | 3.37E-04 | -30.9 | 63.1 | | 12352200 |
| 54 | 8.00 | 5.90 | 0.004 | 3.34E-04 | -28.2 | 48.2 | | 12352200 |
| 55 | 7.50 | 6.98 | 0.004 | 3.33E-04 | -25.0 | 34.8 | | 12352200 |
| 56 | 7.00 | 8.12 | 0.004 | 3.32E-04 | -21.2 | 23.2 | | 12352200 |
| 57 | 6.50 | 9.32 | 0.004 | 3.31E-04 | -16.9 | 13.6 | | 12352200 |
| 58 | 6.00 | 10.58 | 0.004 | 3.30E-04 | -11.9 | 6.3 | | 12352200 |
| 59 | 5.50 | 11.90 | 0.004 | 3.30E-04 | -6.3 | 1.7 | | 12352200 |
| 60 | 5.00 | 13.29 | 0.003 | 3.30E-04 | 0.0 | 0.0 | | --- |

| Node no. | Y coord | ACTIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. kN/m2 | Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | | |
| 1 | 34.00 | Total> | 0.00 | 0.00 | 71.70 | 0.00 | 0.00a | 2627 |
| 2 | 33.50 | Total> | 9.50 | 2.50m | 83.59 | 2.50 | 2.50a | 2627 |
| 3 | 33.00 | Total> | 19.00 | 5.00m | 95.48 | 5.00 | 5.00a | 2627 |
| 4 | 32.50 | Total> | 28.50 | 7.50m | 107.37 | 7.50 | 7.50a | 2627 |
| 5 | 32.00 | Total> | 38.00 | 10.00m | 119.26 | 10.00 | 10.00a | 2627 |
| 6 | 31.50 | Total> | 47.50 | 12.50m | 131.15 | 12.50 | 12.50a | 2627 |
| 7 | 31.00 | Total> | 57.00 | 15.00m | 143.04 | 15.00 | 15.00a | 2627 |
| 8 | 30.50 | Total> | 66.50 | 17.50m | 154.93 | 17.50 | 17.50a | 2627 |
| 9 | 30.00 | Total> | 76.00 | 20.00m | 166.82 | 20.00 | 20.00a | 2627 |
| 10 | 29.50 | Total> | 85.50 | 22.50m | 178.71 | 22.50 | 22.50a | 2627 |
| 11 | 29.00 | Total> | 95.00 | 25.00m | 190.60 | 25.00 | 25.00a | 2627 |
| 12 | 28.50 | Total> | 104.50 | 27.50m | 202.49 | 27.50 | 27.50a | 2627 |
| 13 | 28.00 | Total> | 114.00 | 30.00m | 214.38 | 30.00 | 30.00a | 2627 |
| 14 | 27.50 | Total> | 123.50 | 32.50m | 226.27 | 32.50 | 32.50a | 2627 |
| 15 | 27.00 | Total> | 133.00 | 35.00m | 238.16 | 35.00 | 35.00a | 2627 |
| 16 | 26.50 | Total> | 142.50 | 37.50m | 250.05 | 39.36 | 39.36 | 2627 |
| 17 | 26.00 | Total> | 152.00 | 42.09 | 261.94 | 45.33 | 45.33 | 2627 |
| | | Total> | 152.00 | 40.00m | 295.40 | 109.72 | 109.72 | 3153 |
| 18 | 25.50 | Total> | 162.00 | 42.50m | 311.73 | 119.11 | 119.11 | 3284 |

(continued)

Stage No.1 Excavate to elevation 30.50 on PASSIVE side

| Node no. | Y coord | ACTIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. kN/m2 | Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | kN/m2 | kN/m3 |
| 19 | 25.00 | Total> | 172.00 | 45.00m | 328.07 | 128.58 | 128.58 | 3416 |
| 20 | 24.50 | Total> | 182.00 | 47.50m | 344.40 | 138.13 | 138.13 | 3547 |
| 21 | 24.00 | Total> | 192.00 | 50.00m | 360.73 | 147.74 | 147.74 | 3678 |
| 22 | 23.70 | Total> | 198.00 | 51.50m | 370.53 | 153.55 | 153.55 | 3757 |
| 23 | 23.35 | Total> | 205.00 | 53.25m | 381.97 | 160.35 | 160.35 | 3849 |
| 24 | 23.00 | Total> | 212.00 | 55.00m | 393.40 | 167.18 | 167.18 | 3941 |
| 25 | 22.50 | Total> | 222.00 | 57.50m | 409.73 | 176.99 | 176.99 | 4072 |
| 26 | 22.00 | Total> | 232.00 | 60.00m | 426.07 | 186.86 | 186.86 | 4204 |
| 27 | 21.50 | Total> | 242.00 | 62.50m | 442.40 | 196.78 | 196.78 | 4335 |
| 28 | 21.00 | Total> | 252.00 | 65.00m | 458.74 | 206.75 | 206.75 | 4466 |
| 29 | 20.50 | Total> | 262.00 | 67.50m | 475.07 | 216.78 | 216.78 | 4598 |
| 30 | 20.00 | Total> | 272.00 | 70.00m | 491.40 | 226.84 | 226.84 | 4729 |
| 31 | 19.50 | Total> | 282.00 | 72.50m | 507.74 | 236.94 | 236.94 | 4861 |
| 32 | 19.00 | Total> | 292.00 | 75.00m | 524.07 | 247.09 | 247.09 | 4992 |
| 33 | 18.50 | Total> | 302.00 | 77.50m | 540.40 | 257.27 | 257.27 | 5123 |
| 34 | 18.00 | Total> | 312.00 | 80.00m | 556.74 | 267.48 | 267.48 | 5255 |
| 35 | 17.50 | Total> | 322.00 | 82.50m | 573.07 | 277.72 | 277.72 | 5386 |
| 36 | 17.00 | Total> | 332.00 | 85.00m | 589.40 | 287.98 | 287.98 | 5517 |
| 37 | 16.50 | Total> | 342.00 | 87.50m | 605.74 | 298.28 | 298.28 | 5649 |
| 38 | 16.00 | Total> | 352.00 | 90.00m | 622.07 | 308.59 | 308.59 | 5780 |
| 39 | 15.50 | Total> | 362.00 | 92.50m | 638.40 | 318.94 | 318.94 | 5911 |
| 40 | 15.00 | Total> | 372.00 | 95.00m | 654.74 | 329.30 | 329.30 | 6043 |
| 41 | 14.50 | Total> | 382.00 | 97.50m | 671.07 | 339.68 | 339.68 | 6174 |
| 42 | 14.00 | Total> | 392.00 | 100.00m | 687.40 | 350.09 | 350.09 | 6306 |
| 43 | 13.50 | Total> | 402.00 | 102.50m | 703.74 | 360.51 | 360.51 | 6437 |
| 44 | 13.00 | Total> | 412.00 | 105.00m | 720.07 | 370.96 | 370.96 | 6568 |
| 45 | 12.50 | Total> | 422.00 | 107.73 | 736.40 | 381.43 | 381.43 | 6700 |
| 46 | 12.00 | Total> | 432.00 | 111.40 | 752.74 | 391.92 | 391.92 | 6831 |
| 47 | 11.50 | Total> | 442.00 | 115.07 | 769.07 | 402.43 | 402.43 | 6962 |
| 48 | 11.00 | Total> | 452.00 | 118.73 | 785.41 | 412.97 | 412.97 | 7094 |
| 49 | 10.50 | Total> | 462.00 | 122.40 | 801.74 | 423.53 | 423.53 | 7225 |
| 50 | 10.00 | Total> | 472.00 | 126.07 | 818.07 | 434.12 | 434.12 | 7356 |
| 51 | 9.50 | Total> | 482.00 | 129.74 | 834.41 | 444.74 | 444.74 | 7488 |
| 52 | 9.00 | Total> | 492.00 | 133.41 | 850.74 | 455.39 | 455.39 | 7619 |
| 53 | 8.50 | Total> | 502.00 | 137.08 | 867.07 | 466.07 | 466.07 | 7751 |
| 54 | 8.00 | Total> | 512.00 | 140.75 | 883.41 | 476.78 | 476.78 | 7882 |
| 55 | 7.50 | Total> | 522.00 | 144.42 | 899.74 | 487.53 | 487.53 | 8013 |
| 56 | 7.00 | Total> | 532.00 | 148.09 | 916.07 | 498.32 | 498.32 | 8145 |
| 57 | 6.50 | Total> | 542.00 | 151.76 | 932.41 | 509.15 | 509.15 | 8276 |
| 58 | 6.00 | Total> | 552.00 | 155.43 | 948.74 | 520.02 | 520.02 | 8407 |
| 59 | 5.50 | Total> | 562.00 | 159.10 | 965.07 | 530.94 | 530.94 | 8539 |
| 60 | 5.00 | Total> | 572.00 | 162.76 | 981.41 | 541.89 | 541.89 | 8670 |

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. kN/m2 | Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | kN/m2 | kN/m3 |
| 1 | 34.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | 33.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | 33.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | 32.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 5 | 32.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 6 | 31.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

(continued)

Stage No.1 Excavate to elevation 30.50 on PASSIVE side

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. kN/m2 | Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | | |
| 7 | 31.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | 30.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | Total> | 0.00 | 0.00 | 88.43 | 25.89 | 25.89 | 1551 |
| 9 | 30.00 | Total> | 9.50 | 2.50m | 100.32 | 25.31 | 25.31 | 1551 |
| 10 | 29.50 | Total> | 19.00 | 5.00m | 112.21 | 24.74 | 24.74 | 1551 |
| 11 | 29.00 | Total> | 28.50 | 7.50m | 124.10 | 24.17 | 24.17 | 1551 |
| 12 | 28.50 | Total> | 38.00 | 10.00m | 135.99 | 23.60 | 23.60 | 1551 |
| 13 | 28.00 | Total> | 47.50 | 12.50m | 147.88 | 23.03 | 23.03 | 1551 |
| 14 | 27.50 | Total> | 57.01 | 15.00m | 159.77 | 22.47 | 22.47 | 1551 |
| 15 | 27.00 | Total> | 66.51 | 17.50m | 171.67 | 25.91 | 25.91 | 1551 |
| 16 | 26.50 | Total> | 76.01 | 20.00m | 183.56 | 30.39 | 30.39 | 1551 |
| 17 | 26.00 | Total> | 85.52 | 22.50m | 195.46 | 34.88 | 34.88 | 1551 |
| | | Total> | 85.52 | 22.50m | 228.92 | 113.09 | 113.09 | 1861 |
| 18 | 25.50 | Total> | 95.53 | 25.00m | 245.26 | 123.46 | 123.46 | 1939 |
| 19 | 25.00 | Total> | 105.54 | 27.50m | 261.60 | 133.78 | 133.78 | 2017 |
| 20 | 24.50 | Total> | 115.55 | 30.00m | 277.95 | 144.06 | 144.06 | 2094 |
| 21 | 24.00 | Total> | 125.56 | 32.50m | 294.29 | 154.30 | 154.30 | 2172 |
| 22 | 23.70 | Total> | 131.57 | 34.00m | 304.10 | 160.42 | 160.42 | 2218 |
| 23 | 23.35 | Total> | 138.58 | 35.75m | 315.55 | 167.55 | 167.55 | 2273 |
| 24 | 23.00 | Total> | 145.59 | 37.50m | 326.99 | 174.66 | 174.66 | 2327 |
| 25 | 22.50 | Total> | 155.61 | 40.00m | 343.35 | 184.79 | 184.79 | 2404 |
| 26 | 22.00 | Total> | 165.63 | 42.50m | 359.70 | 194.89 | 194.89 | 2482 |
| 27 | 21.50 | Total> | 175.66 | 45.00m | 376.06 | 204.96 | 204.96 | 2560 |
| 28 | 21.00 | Total> | 185.69 | 47.50m | 392.42 | 215.00 | 215.00 | 2637 |
| 29 | 20.50 | Total> | 195.72 | 50.00m | 408.78 | 225.02 | 225.02 | 2715 |
| 30 | 20.00 | Total> | 205.75 | 52.50m | 425.15 | 235.01 | 235.01 | 2792 |
| 31 | 19.50 | Total> | 215.78 | 55.00m | 441.52 | 244.98 | 244.98 | 2870 |
| 32 | 19.00 | Total> | 225.82 | 57.50m | 457.89 | 254.94 | 254.94 | 2947 |
| 33 | 18.50 | Total> | 235.86 | 60.00m | 474.27 | 264.87 | 264.87 | 3025 |
| 34 | 18.00 | Total> | 245.91 | 62.50m | 490.65 | 274.79 | 274.79 | 3102 |
| 35 | 17.50 | Total> | 255.96 | 65.00m | 507.03 | 284.69 | 284.69 | 3180 |
| 36 | 17.00 | Total> | 266.01 | 67.50m | 523.41 | 294.59 | 294.59 | 3258 |
| 37 | 16.50 | Total> | 276.07 | 70.00m | 539.80 | 304.47 | 304.47 | 3335 |
| 38 | 16.00 | Total> | 286.12 | 72.50m | 556.19 | 314.34 | 314.34 | 3413 |
| 39 | 15.50 | Total> | 296.19 | 75.00m | 572.59 | 324.19 | 324.19 | 3490 |
| 40 | 15.00 | Total> | 306.25 | 77.50m | 588.99 | 334.04 | 334.04 | 3568 |
| 41 | 14.50 | Total> | 316.32 | 80.00m | 605.39 | 343.88 | 343.88 | 3645 |
| 42 | 14.00 | Total> | 326.40 | 82.50m | 621.80 | 353.71 | 353.71 | 3723 |
| 43 | 13.50 | Total> | 336.47 | 85.00m | 638.21 | 363.54 | 363.54 | 3800 |
| 44 | 13.00 | Total> | 346.55 | 87.50m | 654.62 | 373.35 | 373.35 | 3878 |
| 45 | 12.50 | Total> | 356.64 | 90.00m | 671.04 | 383.15 | 383.15 | 3956 |
| 46 | 12.00 | Total> | 366.72 | 92.50m | 687.46 | 392.95 | 392.95 | 4033 |
| 47 | 11.50 | Total> | 376.82 | 95.00m | 703.89 | 402.74 | 402.74 | 4111 |
| 48 | 11.00 | Total> | 386.91 | 97.50m | 720.32 | 412.51 | 412.51 | 4188 |
| 49 | 10.50 | Total> | 397.01 | 100.00m | 736.75 | 422.27 | 422.27 | 4266 |
| 50 | 10.00 | Total> | 407.11 | 102.50m | 753.18 | 432.02 | 432.02 | 4343 |
| 51 | 9.50 | Total> | 417.22 | 105.00m | 769.62 | 441.76 | 441.76 | 4421 |
| 52 | 9.00 | Total> | 427.33 | 107.50m | 786.07 | 451.48 | 451.48 | 4499 |
| 53 | 8.50 | Total> | 437.44 | 110.00m | 802.51 | 461.19 | 461.19 | 4576 |
| 54 | 8.00 | Total> | 447.56 | 112.50m | 818.96 | 470.88 | 470.88 | 4654 |
| 55 | 7.50 | Total> | 457.68 | 115.00m | 835.42 | 480.55 | 480.55 | 4731 |
| 56 | 7.00 | Total> | 467.80 | 117.50m | 851.88 | 490.20 | 490.20 | 4809 |
| 57 | 6.50 | Total> | 477.93 | 120.00m | 868.34 | 499.84 | 499.84 | 4886 |
| 58 | 6.00 | Total> | 488.06 | 122.50m | 884.80 | 509.45 | 509.45 | 4964 |
| 59 | 5.50 | Total> | 498.19 | 125.00m | 901.27 | 519.04 | 519.04 | 5041 |

(continued)

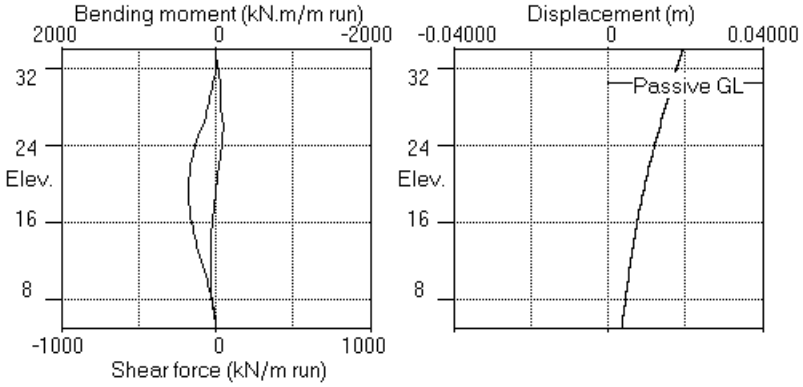
Stage No.1 Excavate to elevation 30.50 on PASSIVE side

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 60 | 5.00 | Total> | 508.33 | 127.50m | 917.74 | 528.60 | 528.60 | 5119 |

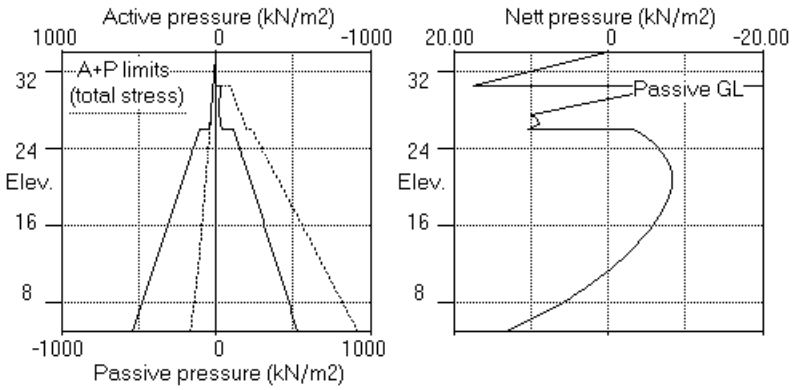
Note: 35.00a Soil pressure at active limit
123.45p Soil pressure at passive limit

Units: kN,m

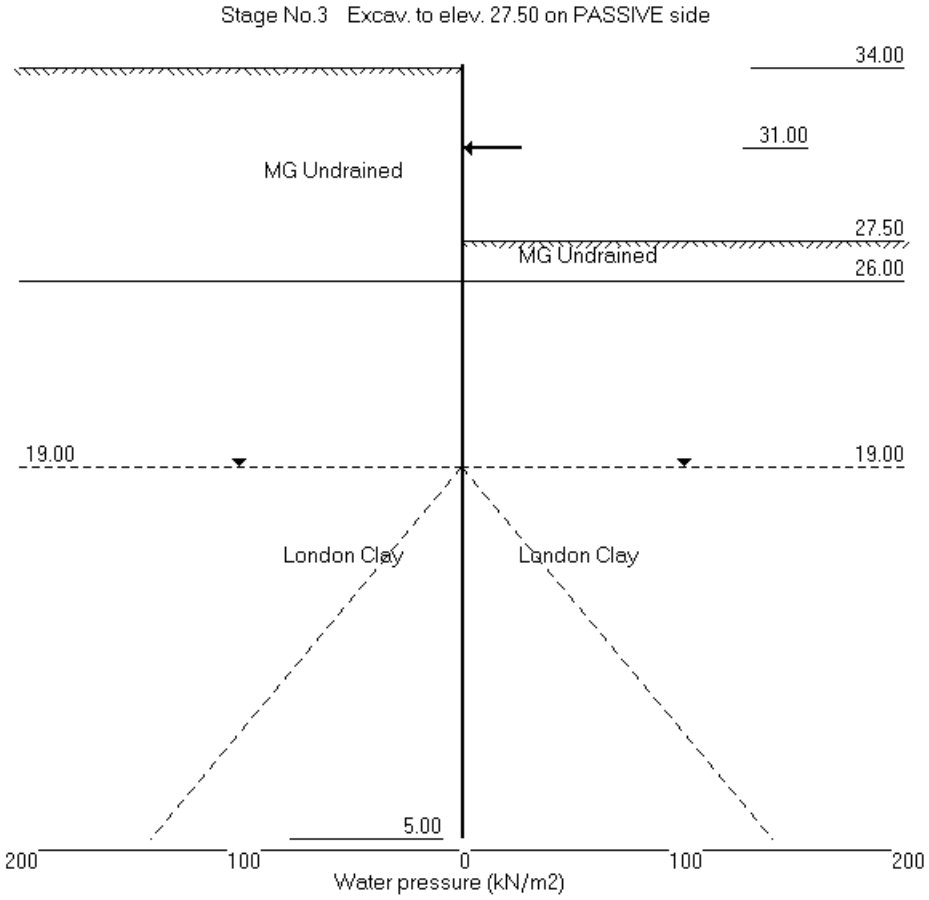
Stage No.1 Excav. to elev. 30.50 on PASSIVE side




Stage No.1 Excav. to elev. 30.50 on PASSIVE side



Units: kN,m


Stage No.3 Excav. to elev. 27.50 on PASSIVE side
34.00
31.00
MG Undrained
27.50
MG Undrained
26.00
19.00
19.00
London Clay
London Clay
5.00
200
100
0
100
200
Water pressure (kN/m2)

Units: kN,m

Stage No. 3 Excavate to elevation 27.50 on PASSIVE side

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**

Factor of safety on soil strength

| Stage No. | --- G.L. --- Act. | Pass. | Strut Elev. | FoS for toe elev. = 5.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation |
|---|---|---|---|---|---|---|---|
| 3 | 34.00 | 27.50 | 31.00 | 4.908 | n/a | 27.00 | 0.50 |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**

**Analysis options**

Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 50.00 from wall

**Limit State: Serviceability Limit State**

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 17.03 | 0.018 | 6.06E-06 | 0.0 | -0.0 | | 12352200 |
| 2 | 33.50 | 15.76 | 0.018 | 6.01E-06 | 8.2 | 2.2 | | 12352200 |
| 3 | 33.00 | 14.49 | 0.018 | 5.80E-06 | 15.8 | 8.4 | | 12352200 |
| 4 | 32.50 | 13.22 | 0.018 | 5.26E-06 | 22.7 | 18.2 | | 12352200 |
| 5 | 32.00 | 11.94 | 0.018 | 4.26E-06 | 29.0 | 31.3 | | 12352200 |
| 6 | 31.50 | 12.50 | 0.018 | 2.66E-06 | 35.1 | 47.4 | | 12352200 |
| 7 | 31.00 | 15.00 | 0.018 | 3.62E-07 | 42.0 | 66.6 | 220.5 | 12352200 |
| | | 15.00 | 0.018 | 3.62E-07 | -178.5 | 66.6 | | |
| 8 | 30.50 | 17.50 | 0.018 | -5.66E-07 | -170.4 | -20.7 | | 12352200 |
| 9 | 30.00 | 20.00 | 0.018 | 1.94E-06 | -161.0 | -103.6 | | 12352200 |
| 10 | 29.50 | 22.50 | 0.018 | 7.72E-06 | -150.4 | -181.6 | | 12352200 |
| 11 | 29.00 | 25.00 | 0.018 | 1.65E-05 | -138.5 | -253.9 | | 12352200 |
| 12 | 28.50 | 27.50 | 0.018 | 2.81E-05 | -125.4 | -319.9 | | 12352200 |
| 13 | 28.00 | 30.00 | 0.018 | 4.22E-05 | -111.0 | -379.1 | | 12352200 |
| 14 | 27.50 | 32.50 | 0.018 | 5.86E-05 | -95.4 | -430.8 | | 12352200 |
| | | 28.81 | 0.018 | 5.86E-05 | -95.4 | -430.8 | | |
| 15 | 27.00 | 30.92 | 0.018 | 7.70E-05 | -80.5 | -474.8 | | 12352200 |
| 16 | 26.50 | 32.50 | 0.017 | 9.69E-05 | -64.6 | -509.8 | | 12352200 |
| 17 | 26.00 | 34.59 | 0.017 | 1.18E-04 | -47.8 | -538.0 | | 12352200 |
| | | 33.55 | 0.017 | 1.18E-04 | -47.8 | -538.0 | | |
| 18 | 25.50 | 30.51 | 0.017 | 1.40E-04 | -31.8 | -557.7 | | 12352200 |
| 19 | 25.00 | 27.55 | 0.017 | 1.63E-04 | -17.3 | -569.8 | | 12352200 |
| 20 | 24.50 | 24.70 | 0.017 | 1.86E-04 | -4.2 | -575.0 | | 12352200 |
| 21 | 24.00 | 21.95 | 0.017 | 2.09E-04 | 7.4 | -574.1 | | 12352200 |
| 22 | 23.70 | 20.35 | 0.017 | 2.23E-04 | 13.8 | -570.9 | | 12352200 |
| 23 | 23.35 | 18.53 | 0.017 | 2.39E-04 | 20.6 | -564.8 | | 12352200 |
| 24 | 23.00 | 16.78 | 0.017 | 2.55E-04 | 26.7 | -556.5 | | 12352200 |
| 25 | 22.50 | 14.37 | 0.017 | 2.77E-04 | 34.5 | -541.0 | | 12352200 |
| 26 | 22.00 | 12.08 | 0.017 | 2.99E-04 | 41.1 | -521.9 | | 12352200 |
| 27 | 21.50 | 9.91 | 0.016 | 3.19E-04 | 46.6 | -499.9 | | 12352200 |

(continued)

Stage No.3 Excavate to elevation 27.50 on PASSIVE side

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 28 | 21.00 | 7.88 | 0.016 | 3.39E-04 | 51.1 | -475.3 | | 12352200 |
| 29 | 20.50 | 5.97 | 0.016 | 3.58E-04 | 54.5 | -448.8 | | 12352200 |
| 30 | 20.00 | 4.19 | 0.016 | 3.75E-04 | 57.1 | -420.8 | | 12352200 |
| 31 | 19.50 | 2.54 | 0.016 | 3.92E-04 | 58.8 | -391.7 | | 12352200 |
| 32 | 19.00 | 1.02 | 0.016 | 4.07E-04 | 59.7 | -362.0 | | 12352200 |
| 33 | 18.50 | -0.37 | 0.015 | 4.21E-04 | 59.8 | -332.1 | | 12352200 |
| 34 | 18.00 | -1.64 | 0.015 | 4.34E-04 | 59.3 | -302.2 | | 12352200 |
| 35 | 17.50 | -2.77 | 0.015 | 4.46E-04 | 58.2 | -272.7 | | 12352200 |
| 36 | 17.00 | -3.78 | 0.015 | 4.56E-04 | 56.6 | -244.0 | | 12352200 |
| 37 | 16.50 | -4.67 | 0.014 | 4.65E-04 | 54.5 | -216.2 | | 12352200 |
| 38 | 16.00 | -5.44 | 0.014 | 4.74E-04 | 51.9 | -189.5 | | 12352200 |
| 39 | 15.50 | -6.09 | 0.014 | 4.81E-04 | 49.0 | -164.2 | | 12352200 |
| 40 | 15.00 | -6.63 | 0.014 | 4.87E-04 | 45.9 | -140.5 | | 12352200 |
| 41 | 14.50 | -7.05 | 0.013 | 4.92E-04 | 42.4 | -118.4 | | 12352200 |
| 42 | 14.00 | -7.37 | 0.013 | 4.97E-04 | 38.8 | -98.1 | | 12352200 |
| 43 | 13.50 | -7.57 | 0.013 | 5.00E-04 | 35.1 | -79.6 | | 12352200 |
| 44 | 13.00 | -7.67 | 0.013 | 5.03E-04 | 31.3 | -63.0 | | 12352200 |
| 45 | 12.50 | -7.67 | 0.012 | 5.05E-04 | 27.5 | -48.3 | | 12352200 |
| 46 | 12.00 | -7.57 | 0.012 | 5.07E-04 | 23.6 | -35.5 | | 12352200 |
| 47 | 11.50 | -7.37 | 0.012 | 5.08E-04 | 19.9 | -24.6 | | 12352200 |
| 48 | 11.00 | -7.07 | 0.012 | 5.09E-04 | 16.3 | -15.6 | | 12352200 |
| 49 | 10.50 | -6.67 | 0.011 | 5.09E-04 | 12.9 | -8.3 | | 12352200 |
| 50 | 10.00 | -6.18 | 0.011 | 5.10E-04 | 9.7 | -2.7 | | 12352200 |
| 51 | 9.50 | -5.60 | 0.011 | 5.10E-04 | 6.7 | 1.3 | | 12352200 |
| 52 | 9.00 | -4.92 | 0.011 | 5.10E-04 | 4.1 | 4.0 | | 12352200 |
| 53 | 8.50 | -4.15 | 0.010 | 5.09E-04 | 1.8 | 5.4 | | 12352200 |
| 54 | 8.00 | -3.29 | 0.010 | 5.09E-04 | -0.0 | 5.8 | | 12352200 |
| 55 | 7.50 | -2.33 | 0.010 | 5.09E-04 | -1.4 | 5.3 | | 12352200 |
| 56 | 7.00 | -1.28 | 0.010 | 5.09E-04 | -2.3 | 4.3 | | 12352200 |
| 57 | 6.50 | -0.14 | 0.009 | 5.09E-04 | -2.7 | 3.0 | | 12352200 |
| 58 | 6.00 | 1.10 | 0.009 | 5.09E-04 | -2.5 | 1.6 | | 12352200 |
| 59 | 5.50 | 2.44 | 0.009 | 5.09E-04 | -1.6 | 0.5 | | 12352200 |
| 60 | 5.00 | 3.87 | 0.009 | 5.09E-04 | 0.0 | 0.0 | | --- |

At elev. 31.00 Strut force = 1102.4 kN/strut = 220.5 kN/m run

| Node no. | Y coord | ACTIVE side: Water press. kN/m2 | Vertic -al kN/m2 | Effective stresses: Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | Total earth pressure kN/m2 | Coeff. of subgrade reaction kN/m3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | Total> | 0.00 | 0.00 | 71.70 | 17.03 | 17.03 | 10204 |
| 2 | 33.50 | Total> | 9.50 | 2.50m | 83.59 | 15.76 | 15.76 | 10204 |
| 3 | 33.00 | Total> | 19.00 | 5.00m | 95.48 | 14.49 | 14.49 | 10204 |
| 4 | 32.50 | Total> | 28.50 | 7.50m | 107.37 | 13.22 | 13.22 | 10204 |
| 5 | 32.00 | Total> | 38.00 | 10.00m | 119.26 | 11.94 | 11.94 | 10204 |
| 6 | 31.50 | Total> | 47.50 | 12.50m | 131.15 | 12.50 | 12.50a | 2512 |
| 7 | 31.00 | Total> | 57.00 | 15.00m | 143.04 | 15.00 | 15.00a | 2512 |
| 8 | 30.50 | Total> | 66.50 | 17.50m | 154.93 | 17.50 | 17.50a | 2512 |
| 9 | 30.00 | Total> | 76.00 | 20.00m | 166.82 | 20.00 | 20.00a | 2512 |
| 10 | 29.50 | Total> | 85.50 | 22.50m | 178.71 | 22.50 | 22.50a | 2512 |
| 11 | 29.00 | Total> | 95.00 | 25.00m | 190.60 | 25.00 | 25.00a | 2512 |
| 12 | 28.50 | Total> | 104.50 | 27.50m | 202.49 | 27.50 | 27.50a | 2512 |
| 13 | 28.00 | Total> | 114.00 | 30.00m | 214.38 | 30.00 | 30.00a | 2512 |
| 14 | 27.50 | Total> | 123.50 | 32.50m | 226.27 | 32.50 | 32.50a | 2512 |
| 15 | 27.00 | Total> | 133.00 | 35.00m | 238.16 | 35.00 | 35.00a | 2512 |
| 16 | 26.50 | Total> | 142.50 | 37.50m | 250.05 | 37.50 | 37.50a | 2512 |
| 17 | 26.00 | Total> | 152.00 | 42.09 | 261.94 | 42.09 | 42.09a | 2512 |
| | | Total> | 152.00 | 40.00m | 295.40 | 97.64 | 97.64 | 3014 |

(continued)

Stage No.3 Excavate to elevation 27.50 on PASSIVE side

| Node no. | Y coord | ACTIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. kN/m2 | Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | kN/m2 | kN/m3 |
| 18 | 25.50 | Total> 162.00 | 42.50m | 311.73 | 105.63 | 105.63 | | 3140 |
| 19 | 25.00 | Total> 172.00 | 45.00m | 328.07 | 113.68 | 113.68 | | 3265 |
| 20 | 24.50 | Total> 182.00 | 47.50m | 344.40 | 121.79 | 121.79 | | 3391 |
| 21 | 24.00 | Total> 192.00 | 50.00m | 360.73 | 129.96 | 129.96 | | 3516 |
| 22 | 23.70 | Total> 198.00 | 51.50m | 370.53 | 134.89 | 134.89 | | 3592 |
| 23 | 23.35 | Total> 205.00 | 53.25m | 381.97 | 140.69 | 140.69 | | 3680 |
| 24 | 23.00 | Total> 212.00 | 55.00m | 393.40 | 146.52 | 146.52 | | 3767 |
| 25 | 22.50 | Total> 222.00 | 57.50m | 409.73 | 154.91 | 154.91 | | 3893 |
| 26 | 22.00 | Total> 232.00 | 60.00m | 426.07 | 163.38 | 163.38 | | 4019 |
| 27 | 21.50 | Total> 242.00 | 62.50m | 442.40 | 171.94 | 171.94 | | 4144 |
| 28 | 21.00 | Total> 252.00 | 65.00m | 458.74 | 180.58 | 180.58 | | 4270 |
| 29 | 20.50 | Total> 262.00 | 67.50m | 475.07 | 189.31 | 189.31 | | 4395 |
| 30 | 20.00 | Total> 272.00 | 70.00m | 491.40 | 198.12 | 198.12 | | 4521 |
| 31 | 19.50 | Total> 282.00 | 72.50m | 507.74 | 207.02 | 207.02 | | 4646 |
| 32 | 19.00 | Total> 292.00 | 75.00m | 524.07 | 216.01 | 216.01 | | 4772 |
| 33 | 18.50 | Total> 302.00 | 77.50m | 540.40 | 225.08 | 225.08 | | 4898 |
| 34 | 18.00 | Total> 312.00 | 80.00m | 556.74 | 234.25 | 234.25 | | 5023 |
| 35 | 17.50 | Total> 322.00 | 82.50m | 573.07 | 243.50 | 243.50 | | 5149 |
| 36 | 17.00 | Total> 332.00 | 85.00m | 589.40 | 252.83 | 252.83 | | 5274 |
| 37 | 16.50 | Total> 342.00 | 87.50m | 605.74 | 262.25 | 262.25 | | 5400 |
| 38 | 16.00 | Total> 352.00 | 90.00m | 622.07 | 271.75 | 271.75 | | 5526 |
| 39 | 15.50 | Total> 362.00 | 92.50m | 638.40 | 281.34 | 281.34 | | 5651 |
| 40 | 15.00 | Total> 372.00 | 95.00m | 654.74 | 291.00 | 291.00 | | 5777 |
| 41 | 14.50 | Total> 382.00 | 97.50m | 671.07 | 300.75 | 300.75 | | 5902 |
| 42 | 14.00 | Total> 392.00 | 100.00m | 687.40 | 310.57 | 310.57 | | 6028 |
| 43 | 13.50 | Total> 402.00 | 102.50m | 703.74 | 320.46 | 320.46 | | 6153 |
| 44 | 13.00 | Total> 412.00 | 105.00m | 720.07 | 330.43 | 330.43 | | 6279 |
| 45 | 12.50 | Total> 422.00 | 107.73 | 736.40 | 340.47 | 340.47 | | 6405 |
| 46 | 12.00 | Total> 432.00 | 111.40 | 752.74 | 350.59 | 350.59 | | 6530 |
| 47 | 11.50 | Total> 442.00 | 115.07 | 769.07 | 360.77 | 360.77 | | 6656 |
| 48 | 11.00 | Total> 452.00 | 118.73 | 785.41 | 371.02 | 371.02 | | 6781 |
| 49 | 10.50 | Total> 462.00 | 122.40 | 801.74 | 381.34 | 381.34 | | 6907 |
| 50 | 10.00 | Total> 472.00 | 126.07 | 818.07 | 391.72 | 391.72 | | 7033 |
| 51 | 9.50 | Total> 482.00 | 129.74 | 834.41 | 402.17 | 402.17 | | 7158 |
| 52 | 9.00 | Total> 492.00 | 133.41 | 850.74 | 412.68 | 412.68 | | 7284 |
| 53 | 8.50 | Total> 502.00 | 137.08 | 867.07 | 423.26 | 423.26 | | 7409 |
| 54 | 8.00 | Total> 512.00 | 140.75 | 883.41 | 433.91 | 433.91 | | 7535 |
| 55 | 7.50 | Total> 522.00 | 144.42 | 899.74 | 444.62 | 444.62 | | 7660 |
| 56 | 7.00 | Total> 532.00 | 148.09 | 916.07 | 455.39 | 455.39 | | 7786 |
| 57 | 6.50 | Total> 542.00 | 151.76 | 932.41 | 466.23 | 466.23 | | 7912 |
| 58 | 6.00 | Total> 552.00 | 155.43 | 948.74 | 477.13 | 477.13 | | 8037 |
| 59 | 5.50 | Total> 562.00 | 159.10 | 965.07 | 488.10 | 488.10 | | 8163 |
| 60 | 5.00 | Total> 572.00 | 162.76 | 981.41 | 499.14 | 499.14 | | 8288 |

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. kN/m2 | Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | kN/m2 | kN/m3 |
| 1 | 34.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | 33.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | 33.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | 32.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 5 | 32.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |

(continued)

Stage No.3 Excavate to elevation 27.50 on PASSIVE side

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. kN/m2 | Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | | |
| 6 | 31.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | 31.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | 30.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 9 | 30.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 10 | 29.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 11 | 29.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 12 | 28.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 13 | 28.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 14 | 27.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | Total> 0.00 | 0.00 | 102.77 | 3.69 | 3.69 | | 1203 |
| 15 | 27.00 | Total> 9.50 | 2.50m | 114.66 | 4.08 | 4.08 | | 1203 |
| 16 | 26.50 | Total> 19.00 | 5.00m | 126.55 | 5.00 | 5.00a | | 1203 |
| 17 | 26.00 | Total> 28.50 | 7.50m | 138.44 | 7.50 | 7.50a | | 1203 |
| | | Total> 28.50 | 7.50m | 171.90 | 64.09 | 64.09 | | 1444 |
| 18 | 25.50 | Total> 38.50 | 10.00m | 188.24 | 75.13 | 75.13 | | 1504 |
| 19 | 25.00 | Total> 48.51 | 12.50m | 204.57 | 86.12 | 86.12 | | 1564 |
| 20 | 24.50 | Total> 58.51 | 15.00m | 220.91 | 97.09 | 97.09 | | 1624 |
| 21 | 24.00 | Total> 68.52 | 17.50m | 237.25 | 108.01 | 108.01 | | 1685 |
| 22 | 23.70 | Total> 74.52 | 19.00m | 247.06 | 114.55 | 114.55 | | 1721 |
| 23 | 23.35 | Total> 81.53 | 20.75m | 258.50 | 122.15 | 122.15 | | 1763 |
| 24 | 23.00 | Total> 88.54 | 22.50m | 269.94 | 129.74 | 129.74 | | 1805 |
| 25 | 22.50 | Total> 98.55 | 25.00m | 286.29 | 140.55 | 140.55 | | 1865 |
| 26 | 22.00 | Total> 108.57 | 27.50m | 302.64 | 151.31 | 151.31 | | 1925 |
| 27 | 21.50 | Total> 118.59 | 30.00m | 318.99 | 162.03 | 162.03 | | 1985 |
| 28 | 21.00 | Total> 128.61 | 32.50m | 335.35 | 172.70 | 172.70 | | 2046 |
| 29 | 20.50 | Total> 138.64 | 35.00m | 351.71 | 183.34 | 183.34 | | 2106 |
| 30 | 20.00 | Total> 148.67 | 37.50m | 368.07 | 193.93 | 193.93 | | 2166 |
| 31 | 19.50 | Total> 158.71 | 40.00m | 384.44 | 204.48 | 204.48 | | 2226 |
| 32 | 19.00 | Total> 168.75 | 42.50m | 400.82 | 214.99 | 214.99 | | 2286 |
| 33 | 18.50 | Total> 178.79 | 45.00m | 417.20 | 225.46 | 225.46 | | 2346 |
| 34 | 18.00 | Total> 188.84 | 47.50m | 433.58 | 235.88 | 235.88 | | 2406 |
| 35 | 17.50 | Total> 198.90 | 50.00m | 449.97 | 246.27 | 246.27 | | 2467 |
| 36 | 17.00 | Total> 208.96 | 52.50m | 466.36 | 256.61 | 256.61 | | 2527 |
| 37 | 16.50 | Total> 219.03 | 55.00m | 482.76 | 266.92 | 266.92 | | 2587 |
| 38 | 16.00 | Total> 229.10 | 57.50m | 499.17 | 277.20 | 277.20 | | 2647 |
| 39 | 15.50 | Total> 239.18 | 60.00m | 515.58 | 287.43 | 287.43 | | 2707 |
| 40 | 15.00 | Total> 249.26 | 62.50m | 532.00 | 297.63 | 297.63 | | 2767 |
| 41 | 14.50 | Total> 259.35 | 65.00m | 548.42 | 307.80 | 307.80 | | 2828 |
| 42 | 14.00 | Total> 269.45 | 67.50m | 564.85 | 317.93 | 317.93 | | 2888 |
| 43 | 13.50 | Total> 279.55 | 70.00m | 581.29 | 328.03 | 328.03 | | 2948 |
| 44 | 13.00 | Total> 289.66 | 72.50m | 597.73 | 338.10 | 338.10 | | 3008 |
| 45 | 12.50 | Total> 299.78 | 75.00m | 614.18 | 348.14 | 348.14 | | 3068 |
| 46 | 12.00 | Total> 309.90 | 77.50m | 630.64 | 358.15 | 358.15 | | 3128 |
| 47 | 11.50 | Total> 320.03 | 80.00m | 647.10 | 368.13 | 368.13 | | 3189 |
| 48 | 11.00 | Total> 330.16 | 82.50m | 663.57 | 378.08 | 378.08 | | 3249 |
| 49 | 10.50 | Total> 340.31 | 85.00m | 680.04 | 388.01 | 388.01 | | 3309 |
| 50 | 10.00 | Total> 350.46 | 87.50m | 696.53 | 397.90 | 397.90 | | 3369 |
| 51 | 9.50 | Total> 360.61 | 90.00m | 713.02 | 407.77 | 407.77 | | 3429 |
| 52 | 9.00 | Total> 370.77 | 92.50m | 729.51 | 417.60 | 417.60 | | 3489 |
| 53 | 8.50 | Total> 380.94 | 95.00m | 746.02 | 427.41 | 427.41 | | 3550 |
| 54 | 8.00 | Total> 391.12 | 97.50m | 762.53 | 437.20 | 437.20 | | 3610 |
| 55 | 7.50 | Total> 401.31 | 100.00m | 779.04 | 446.95 | 446.95 | | 3670 |
| 56 | 7.00 | Total> 411.50 | 102.50m | 795.57 | 456.67 | 456.67 | | 3730 |
| 57 | 6.50 | Total> 421.69 | 105.00m | 812.10 | 466.37 | 466.37 | | 3790 |
| 58 | 6.00 | Total> 431.90 | 107.50m | 828.64 | 476.03 | 476.03 | | 3850 |

(continued)

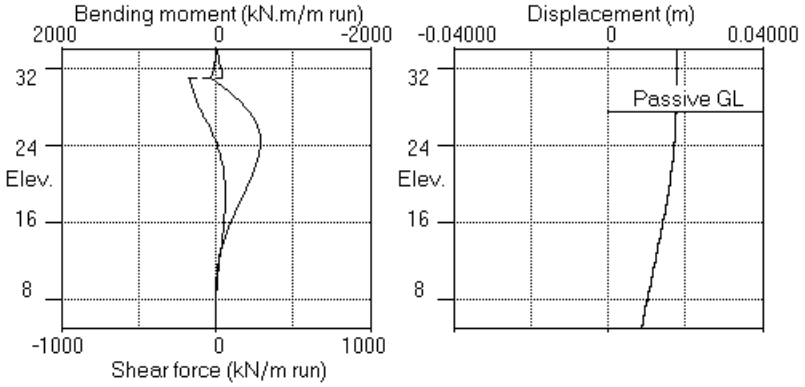
Stage No.3 Excavate to elevation 27.50 on PASSIVE side

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 59 | 5.50 | Total> | 442.11 | 110.00m | 845.18 | 485.67 | 485.67 | 3911 |
| 60 | 5.00 | Total> | 452.32 | 112.50m | 861.73 | 495.27 | 495.27 | 3971 |

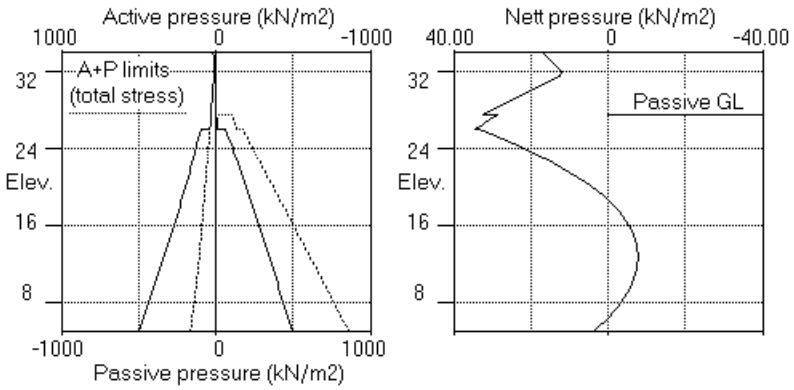
Note: 7.50a Soil pressure at active limit
123.45p Soil pressure at passive limit

Units: kN,m

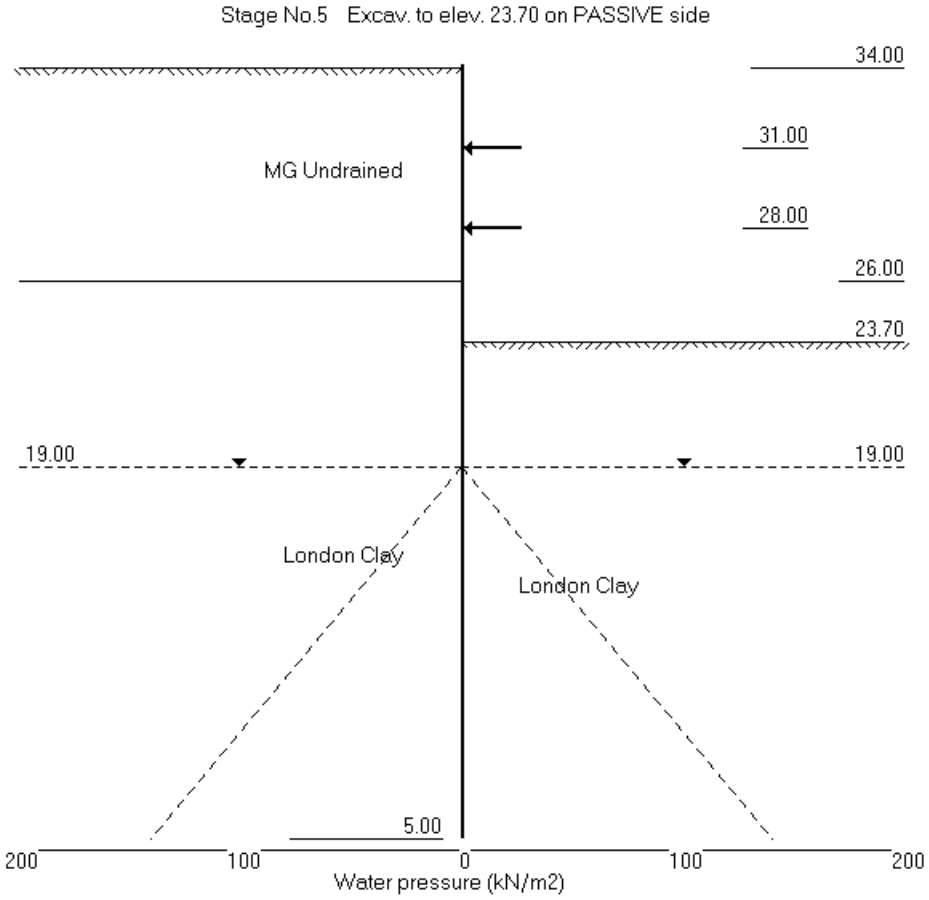
Stage No.3 Excav. to elev. 27.50 on PASSIVE side




Stage No.3 Excav. to elev. 27.50 on PASSIVE side



Units: kN,m


Stage No.5 Excav. to elev. 23.70 on PASSIVE side
34.00
31.00
28.00
26.00
23.70
MG Undrained
19.00
19.00
London Clay
London Clay
5.00
200
100
0
100
200
Water pressure (kN/m2)

Units: kN,m

Stage No. 5 Excavate to elevation 23.70 on PASSIVE side

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**

Factor of safety on soil strength

| Stage No. | --- G.L. --- Act. | Pass. | Strut Elev. | FoS for toe elev. = 5.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation |
|---|---|---|---|---|---|---|---|
| 5 | 34.00 | 23.70 | | More than one strut. No FoS calc. | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**

**Analysis options**

Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 50.00 from wall

**Limit State: Serviceability Limit State**

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 28.65 | 0.016 | -3.79E-04 | 0.0 | -0.0 | | 12352200 |
| 2 | 33.50 | 26.27 | 0.016 | -3.79E-04 | 13.7 | 3.7 | | 12352200 |
| 3 | 33.00 | 23.89 | 0.016 | -3.80E-04 | 26.3 | 13.9 | | 12352200 |
| 4 | 32.50 | 21.51 | 0.016 | -3.80E-04 | 37.6 | 30.2 | | 12352200 |
| 5 | 32.00 | 19.12 | 0.016 | -3.82E-04 | 47.8 | 51.8 | | 12352200 |
| 6 | 31.50 | 18.56 | 0.017 | -3.85E-04 | 57.2 | 78.1 | | 12352200 |
| 7 | 31.00 | 19.95 | 0.017 | -3.89E-04 | 66.8 | 109.2 | -123.5 | 12352200 |
| | | 19.95 | 0.017 | -3.89E-04 | 190.4 | 109.2 | | |
| 8 | 30.50 | 21.32 | 0.017 | -3.95E-04 | 200.7 | 206.9 | | 12352200 |
| 9 | 30.00 | 22.67 | 0.017 | -4.05E-04 | 211.7 | 310.0 | | 12352200 |
| 10 | 29.50 | 23.97 | 0.017 | -4.20E-04 | 223.3 | 418.8 | | 12352200 |
| 11 | 29.00 | 25.20 | 0.018 | -4.39E-04 | 235.6 | 533.5 | | 12352200 |
| 12 | 28.50 | 27.50 | 0.018 | -4.64E-04 | 248.8 | 654.6 | | 12352200 |
| 13 | 28.00 | 30.00 | 0.018 | -4.93E-04 | 263.2 | 782.5 | 771.4 | 12352200 |
| | | 30.00 | 0.018 | -4.93E-04 | -508.2 | 782.5 | | |
| 14 | 27.50 | 32.50 | 0.018 | -5.19E-04 | -492.6 | 532.2 | | 12352200 |
| 15 | 27.00 | 35.00 | 0.019 | -5.36E-04 | -475.7 | 290.1 | | 12352200 |
| 16 | 26.50 | 37.50 | 0.019 | -5.43E-04 | -457.6 | 58.0 | | 12352200 |
| 17 | 26.00 | 42.09 | 0.019 | -5.41E-04 | -437.7 | -165.9 | | 12352200 |
| | | 92.57 | 0.019 | -5.41E-04 | -437.7 | -165.9 | | |
| 18 | 25.50 | 99.29 | 0.019 | -5.30E-04 | -389.7 | -372.7 | | 12352200 |
| 19 | 25.00 | 105.98 | 0.020 | -5.11E-04 | -338.4 | -554.7 | | 12352200 |
| 20 | 24.50 | 112.64 | 0.020 | -4.85E-04 | -283.7 | -710.2 | | 12352200 |
| 21 | 24.00 | 119.29 | 0.020 | -4.54E-04 | -225.8 | -837.6 | | 12352200 |
| 22 | 23.70 | 123.28 | 0.020 | -4.33E-04 | -189.4 | -899.8 | | 12352200 |
| | | 74.30 | 0.020 | -4.33E-04 | -189.4 | -899.8 | | |
| 23 | 23.35 | 70.78 | 0.020 | -4.07E-04 | -164.0 | -961.6 | | 12352200 |
| 24 | 23.00 | 67.28 | 0.021 | -3.79E-04 | -139.8 | -1014.6 | | 12352200 |
| 25 | 22.50 | 62.31 | 0.021 | -3.36E-04 | -107.4 | -1076.1 | | 12352200 |
| 26 | 22.00 | 57.42 | 0.021 | -2.92E-04 | -77.5 | -1122.0 | | 12352200 |

(continued)

Stage No.5 Excavate to elevation 23.70 on PASSIVE side

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 27 | 21.50 | 52.62 | 0.021 | -2.46E-04 | -50.0 | -1153.6 | | 12352200 |
| 28 | 21.00 | 47.92 | 0.021 | -1.99E-04 | -24.8 | -1172.0 | | 12352200 |
| 29 | 20.50 | 43.34 | 0.021 | -1.51E-04 | -2.0 | -1178.5 | | 12352200 |
| 30 | 20.00 | 38.89 | 0.021 | -1.04E-04 | 18.5 | -1174.1 | | 12352200 |
| 31 | 19.50 | 34.58 | 0.021 | -5.67E-05 | 36.9 | -1159.9 | | 12352200 |
| 32 | 19.00 | 30.42 | 0.021 | -1.02E-05 | 53.1 | -1137.2 | | 12352200 |
| 33 | 18.50 | 26.43 | 0.021 | 3.51E-05 | 67.4 | -1106.8 | | 12352200 |
| 34 | 18.00 | 22.61 | 0.021 | 7.91E-05 | 79.6 | -1069.8 | | 12352200 |
| 35 | 17.50 | 18.97 | 0.021 | 1.21E-04 | 90.0 | -1027.2 | | 12352200 |
| 36 | 17.00 | 15.51 | 0.021 | 1.62E-04 | 98.6 | -979.8 | | 12352200 |
| 37 | 16.50 | 12.24 | 0.021 | 2.00E-04 | 105.6 | -928.5 | | 12352200 |
| 38 | 16.00 | 9.15 | 0.021 | 2.37E-04 | 110.9 | -874.2 | | 12352200 |
| 39 | 15.50 | 6.25 | 0.021 | 2.71E-04 | 114.8 | -817.6 | | 12352200 |
| 40 | 15.00 | 3.53 | 0.021 | 3.03E-04 | 117.2 | -759.5 | | 12352200 |
| 41 | 14.50 | 1.01 | 0.021 | 3.33E-04 | 118.3 | -700.4 | | 12352200 |
| 42 | 14.00 | -1.33 | 0.020 | 3.60E-04 | 118.3 | -641.1 | | 12352200 |
| 43 | 13.50 | -3.49 | 0.020 | 3.84E-04 | 117.1 | -582.2 | | 12352200 |
| 44 | 13.00 | -5.48 | 0.020 | 4.07E-04 | 114.8 | -524.1 | | 12352200 |
| 45 | 12.50 | -7.29 | 0.020 | 4.27E-04 | 111.6 | -467.4 | | 12352200 |
| 46 | 12.00 | -8.94 | 0.020 | 4.45E-04 | 107.6 | -412.5 | | 12352200 |
| 47 | 11.50 | -10.43 | 0.019 | 4.60E-04 | 102.7 | -359.8 | | 12352200 |
| 48 | 11.00 | -11.76 | 0.019 | 4.74E-04 | 97.2 | -309.8 | | 12352200 |
| 49 | 10.50 | -12.95 | 0.019 | 4.86E-04 | 91.0 | -262.7 | | 12352200 |
| 50 | 10.00 | -13.99 | 0.019 | 4.95E-04 | 84.3 | -218.8 | | 12352200 |
| 51 | 9.50 | -14.90 | 0.018 | 5.03E-04 | 77.0 | -178.4 | | 12352200 |
| 52 | 9.00 | -15.68 | 0.018 | 5.10E-04 | 69.4 | -141.8 | | 12352200 |
| 53 | 8.50 | -16.34 | 0.018 | 5.15E-04 | 61.4 | -109.0 | | 12352200 |
| 54 | 8.00 | -16.88 | 0.018 | 5.19E-04 | 53.1 | -80.4 | | 12352200 |
| 55 | 7.50 | -17.31 | 0.017 | 5.21E-04 | 44.5 | -56.0 | | 12352200 |
| 56 | 7.00 | -17.63 | 0.017 | 5.23E-04 | 35.8 | -35.9 | | 12352200 |
| 57 | 6.50 | -17.85 | 0.017 | 5.24E-04 | 26.9 | -20.2 | | 12352200 |
| 58 | 6.00 | -17.97 | 0.017 | 5.25E-04 | 18.0 | -9.0 | | 12352200 |
| 59 | 5.50 | -18.00 | 0.016 | 5.25E-04 | 9.0 | -2.2 | | 12352200 |
| 60 | 5.00 | -17.93 | 0.016 | 5.25E-04 | 0.0 | -0.0 | | --- |

At elev. 31.00 Strut force = -617.7 kN/strut = -123.5 kN/m run
At elev. 28.00 Strut force = 771.4 kN/strut = 771.4 kN/m run

| Node no. | Y coord | ACTIVE side: Water press. kN/m2 | Vertic -al kN/m2 | Effective stresses: Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | Total earth pressure kN/m2 | Coeff. of subgrade reaction kN/m3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | Total> | 0.00 | 0.00 | 71.70 | 28.65 | 28.65 | 5751 |
| 2 | 33.50 | Total> | 9.50 | 2.50m | 83.59 | 26.27 | 26.27 | 5751 |
| 3 | 33.00 | Total> | 19.00 | 5.00m | 95.48 | 23.89 | 23.89 | 5751 |
| 4 | 32.50 | Total> | 28.50 | 7.50m | 107.37 | 21.51 | 21.51 | 5751 |
| 5 | 32.00 | Total> | 38.00 | 10.00m | 119.26 | 19.12 | 19.12 | 5751 |
| 6 | 31.50 | Total> | 47.50 | 12.50m | 131.15 | 18.56 | 18.56 | 5751 |
| 7 | 31.00 | Total> | 57.00 | 15.00m | 143.04 | 19.95 | 19.95 | 5751 |
| 8 | 30.50 | Total> | 66.50 | 17.50m | 154.93 | 21.32 | 21.32 | 5751 |
| 9 | 30.00 | Total> | 76.00 | 20.00m | 166.82 | 22.67 | 22.67 | 5751 |
| 10 | 29.50 | Total> | 85.50 | 22.50m | 178.71 | 23.97 | 23.97 | 5751 |
| 11 | 29.00 | Total> | 95.00 | 25.00m | 190.60 | 25.20 | 25.20 | 5751 |
| 12 | 28.50 | Total> | 104.50 | 27.50m | 202.49 | 27.50 | 27.50a | 2526 |
| 13 | 28.00 | Total> | 114.00 | 30.00m | 214.38 | 30.00 | 30.00a | 2526 |
| 14 | 27.50 | Total> | 123.50 | 32.50m | 226.27 | 32.50 | 32.50a | 2526 |
| 15 | 27.00 | Total> | 133.00 | 35.00m | 238.16 | 35.00 | 35.00a | 2526 |

(continued)

Stage No.5 Excavate to elevation 23.70 on PASSIVE side

| Node no. | Y coord | ACTIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 16 | 26.50 | Total> | 142.50 | 37.50m | 250.05 | 37.50 | 37.50a | 2526 |
| 17 | 26.00 | Total> | 152.00 | 42.09 | 261.94 | 42.09 | 42.09a | 2526 |
| | | Total> | 152.00 | 40.00m | 295.40 | 92.57 | 92.57 | 3031 |
| 18 | 25.50 | Total> | 162.00 | 42.50m | 311.73 | 99.29 | 99.29 | 3158 |
| 19 | 25.00 | Total> | 172.00 | 45.00m | 328.07 | 105.98 | 105.98 | 3284 |
| 20 | 24.50 | Total> | 182.00 | 47.50m | 344.40 | 112.64 | 112.64 | 3410 |
| 21 | 24.00 | Total> | 192.00 | 50.00m | 360.73 | 119.29 | 119.29 | 3537 |
| 22 | 23.70 | Total> | 198.00 | 51.50m | 370.53 | 123.28 | 123.28 | 3612 |
| 23 | 23.35 | Total> | 205.00 | 53.25m | 381.97 | 127.95 | 127.95 | 3701 |
| 24 | 23.00 | Total> | 212.00 | 55.00m | 393.40 | 132.62 | 132.62 | 3789 |
| 25 | 22.50 | Total> | 222.00 | 57.50m | 409.73 | 139.33 | 139.33 | 3916 |
| 26 | 22.00 | Total> | 232.00 | 60.00m | 426.07 | 146.08 | 146.08 | 4042 |
| 27 | 21.50 | Total> | 242.00 | 62.50m | 442.40 | 152.89 | 152.89 | 4168 |
| 28 | 21.00 | Total> | 252.00 | 65.00m | 458.74 | 159.77 | 159.77 | 4294 |
| 29 | 20.50 | Total> | 262.00 | 67.50m | 475.07 | 166.72 | 166.72 | 4421 |
| 30 | 20.00 | Total> | 272.00 | 70.00m | 491.40 | 173.76 | 173.76 | 4547 |
| 31 | 19.50 | Total> | 282.00 | 72.50m | 507.74 | 180.90 | 180.90 | 4673 |
| 32 | 19.00 | Total> | 292.00 | 75.00m | 524.07 | 188.14 | 188.14 | 4800 |
| 33 | 18.50 | Total> | 302.00 | 77.50m | 540.40 | 195.50 | 195.50 | 4926 |
| 34 | 18.00 | Total> | 312.00 | 80.00m | 556.74 | 202.96 | 202.96 | 5052 |
| 35 | 17.50 | Total> | 322.00 | 82.50m | 573.07 | 210.55 | 210.55 | 5179 |
| 36 | 17.00 | Total> | 332.00 | 85.00m | 589.40 | 218.26 | 218.26 | 5305 |
| 37 | 16.50 | Total> | 342.00 | 87.50m | 605.74 | 226.10 | 226.10 | 5431 |
| 38 | 16.00 | Total> | 352.00 | 90.00m | 622.07 | 234.06 | 234.06 | 5558 |
| 39 | 15.50 | Total> | 362.00 | 92.50m | 638.40 | 242.16 | 242.16 | 5684 |
| 40 | 15.00 | Total> | 372.00 | 95.00m | 654.74 | 250.38 | 250.38 | 5810 |
| 41 | 14.50 | Total> | 382.00 | 97.50m | 671.07 | 258.73 | 258.73 | 5936 |
| 42 | 14.00 | Total> | 392.00 | 100.00m | 687.40 | 267.21 | 267.21 | 6063 |
| 43 | 13.50 | Total> | 402.00 | 102.50m | 703.74 | 275.81 | 275.81 | 6189 |
| 44 | 13.00 | Total> | 412.00 | 105.00m | 720.07 | 284.54 | 284.54 | 6315 |
| 45 | 12.50 | Total> | 422.00 | 107.73 | 736.40 | 293.38 | 293.38 | 6442 |
| 46 | 12.00 | Total> | 432.00 | 111.40 | 752.74 | 302.34 | 302.34 | 6568 |
| 47 | 11.50 | Total> | 442.00 | 115.07 | 769.07 | 311.41 | 311.41 | 6694 |
| 48 | 11.00 | Total> | 452.00 | 118.73 | 785.41 | 320.59 | 320.59 | 6821 |
| 49 | 10.50 | Total> | 462.00 | 122.40 | 801.74 | 329.87 | 329.87 | 6947 |
| 50 | 10.00 | Total> | 472.00 | 126.07 | 818.07 | 339.25 | 339.25 | 7073 |
| 51 | 9.50 | Total> | 482.00 | 129.74 | 834.41 | 348.72 | 348.72 | 7200 |
| 52 | 9.00 | Total> | 492.00 | 133.41 | 850.74 | 358.29 | 358.29 | 7326 |
| 53 | 8.50 | Total> | 502.00 | 137.08 | 867.07 | 367.94 | 367.94 | 7452 |
| 54 | 8.00 | Total> | 512.00 | 140.75 | 883.41 | 377.68 | 377.68 | 7578 |
| 55 | 7.50 | Total> | 522.00 | 144.42 | 899.74 | 387.49 | 387.49 | 7705 |
| 56 | 7.00 | Total> | 532.00 | 148.09 | 916.07 | 397.38 | 397.38 | 7831 |
| 57 | 6.50 | Total> | 542.00 | 151.76 | 932.41 | 407.35 | 407.35 | 7957 |
| 58 | 6.00 | Total> | 552.00 | 155.43 | 948.74 | 417.38 | 417.38 | 8084 |
| 59 | 5.50 | Total> | 562.00 | 159.10 | 965.07 | 427.49 | 427.49 | 8210 |
| 60 | 5.00 | Total> | 572.00 | 162.76 | 981.41 | 437.66 | 437.66 | 8336 |

(continued)

Stage No.5 Excavate to elevation 23.70 on PASSIVE side

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 34.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | 33.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | 33.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | 32.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 5 | 32.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 6 | 31.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | 31.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | 30.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 9 | 30.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 10 | 29.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 11 | 29.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 12 | 28.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 13 | 28.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 14 | 27.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 15 | 27.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 16 | 26.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 17 | 26.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 18 | 25.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 19 | 25.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 20 | 24.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 21 | 24.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 22 | 23.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | Total> | 0.00 | 0.00 | 172.53 | 48.98 | 48.98 | 1878 |
| 23 | 23.35 | Total> | 7.00 | 1.75m | 183.97 | 57.17 | 57.17 | 1923 |
| 24 | 23.00 | Total> | 14.00 | 3.50m | 195.40 | 65.35 | 65.35 | 1969 |
| 25 | 22.50 | Total> | 24.00 | 6.00m | 211.74 | 77.02 | 77.02 | 2035 |
| 26 | 22.00 | Total> | 34.00 | 8.50m | 228.07 | 88.66 | 88.66 | 2101 |
| 27 | 21.50 | Total> | 44.01 | 11.00m | 244.41 | 100.27 | 100.27 | 2166 |
| 28 | 21.00 | Total> | 54.01 | 13.50m | 260.75 | 111.85 | 111.85 | 2232 |
| 29 | 20.50 | Total> | 64.02 | 16.00m | 277.09 | 123.39 | 123.39 | 2298 |
| 30 | 20.00 | Total> | 74.03 | 18.50m | 293.44 | 134.88 | 134.88 | 2363 |
| 31 | 19.50 | Total> | 84.05 | 21.00m | 309.78 | 146.32 | 146.32 | 2429 |
| 32 | 19.00 | Total> | 94.07 | 23.50m | 326.14 | 157.72 | 157.72 | 2495 |
| 33 | 18.50 | Total> | 104.09 | 26.00m | 342.50 | 169.06 | 169.06 | 2560 |
| 34 | 18.00 | Total> | 114.12 | 28.50m | 358.86 | 180.35 | 180.35 | 2626 |
| 35 | 17.50 | Total> | 124.16 | 31.00m | 375.23 | 191.58 | 191.58 | 2692 |
| 36 | 17.00 | Total> | 134.20 | 33.50m | 391.60 | 202.75 | 202.75 | 2757 |
| 37 | 16.50 | Total> | 144.24 | 36.00m | 407.98 | 213.86 | 213.86 | 2823 |
| 38 | 16.00 | Total> | 154.30 | 38.50m | 424.37 | 224.92 | 224.92 | 2889 |
| 39 | 15.50 | Total> | 164.36 | 41.00m | 440.76 | 235.91 | 235.91 | 2954 |
| 40 | 15.00 | Total> | 174.43 | 43.50m | 457.16 | 246.85 | 246.85 | 3020 |
| 41 | 14.50 | Total> | 184.50 | 46.00m | 473.57 | 257.72 | 257.72 | 3085 |
| 42 | 14.00 | Total> | 194.59 | 48.50m | 489.99 | 268.54 | 268.54 | 3151 |
| 43 | 13.50 | Total> | 204.68 | 51.00m | 506.42 | 279.31 | 279.31 | 3217 |
| 44 | 13.00 | Total> | 214.78 | 53.50m | 522.85 | 290.02 | 290.02 | 3282 |
| 45 | 12.50 | Total> | 224.89 | 56.00m | 539.30 | 300.67 | 300.67 | 3348 |
| 46 | 12.00 | Total> | 235.01 | 58.50m | 555.75 | 311.28 | 311.28 | 3414 |
| 47 | 11.50 | Total> | 245.14 | 61.00m | 572.21 | 321.84 | 321.84 | 3479 |
| 48 | 11.00 | Total> | 255.28 | 63.50m | 588.68 | 332.35 | 332.35 | 3545 |
| 49 | 10.50 | Total> | 265.43 | 66.00m | 605.16 | 342.81 | 342.81 | 3611 |
| 50 | 10.00 | Total> | 275.58 | 68.50m | 621.66 | 353.24 | 353.24 | 3676 |
| 51 | 9.50 | Total> | 285.75 | 71.00m | 638.16 | 363.62 | 363.62 | 3742 |
| 52 | 9.00 | Total> | 295.93 | 73.50m | 654.67 | 373.97 | 373.97 | 3808 |
| 53 | 8.50 | Total> | 306.12 | 76.00m | 671.20 | 384.28 | 384.28 | 3873 |
| 54 | 8.00 | Total> | 316.32 | 78.50m | 687.73 | 394.56 | 394.56 | 3939 |

(continued)

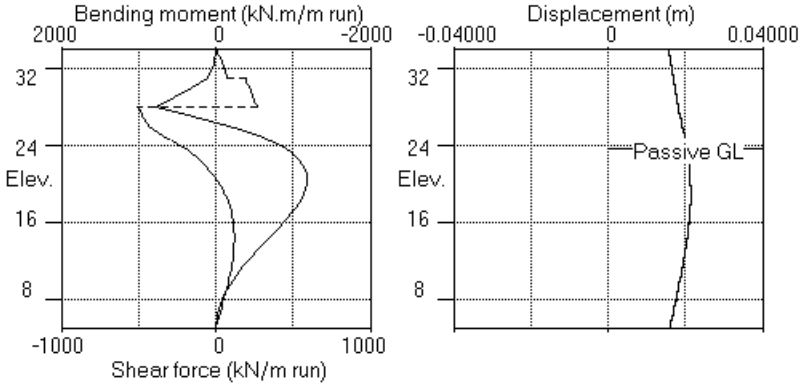
Stage No.5 Excavate to elevation 23.70 on PASSIVE side

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 55 | 7.50 | Total> | 326.53 | 81.00m | 704.27 | 404.80 | 404.80 | 4005 |
| 56 | 7.00 | Total> | 336.76 | 83.50m | 720.83 | 415.01 | 415.01 | 4070 |
| 57 | 6.50 | Total> | 346.99 | 86.00m | 737.40 | 425.20 | 425.20 | 4136 |
| 58 | 6.00 | Total> | 357.23 | 88.50m | 753.97 | 435.35 | 435.35 | 4201 |
| 59 | 5.50 | Total> | 367.49 | 91.00m | 770.56 | 445.48 | 445.48 | 4267 |
| 60 | 5.00 | Total> | 377.75 | 93.50m | 787.16 | 455.58 | 455.58 | 4333 |

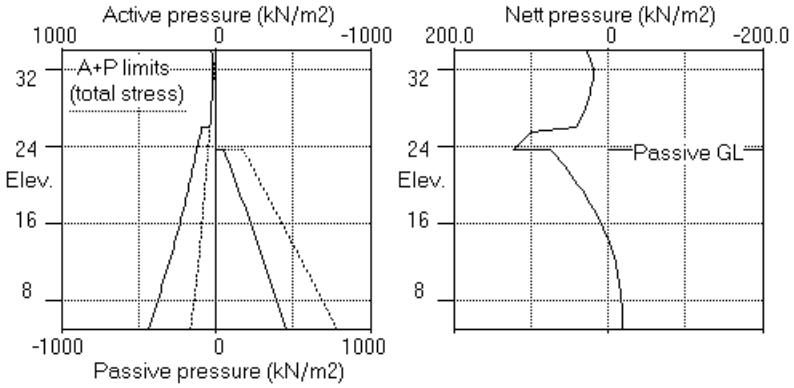
Note: 42.09a Soil pressure at active limit
123.45p Soil pressure at passive limit

Units: kN,m

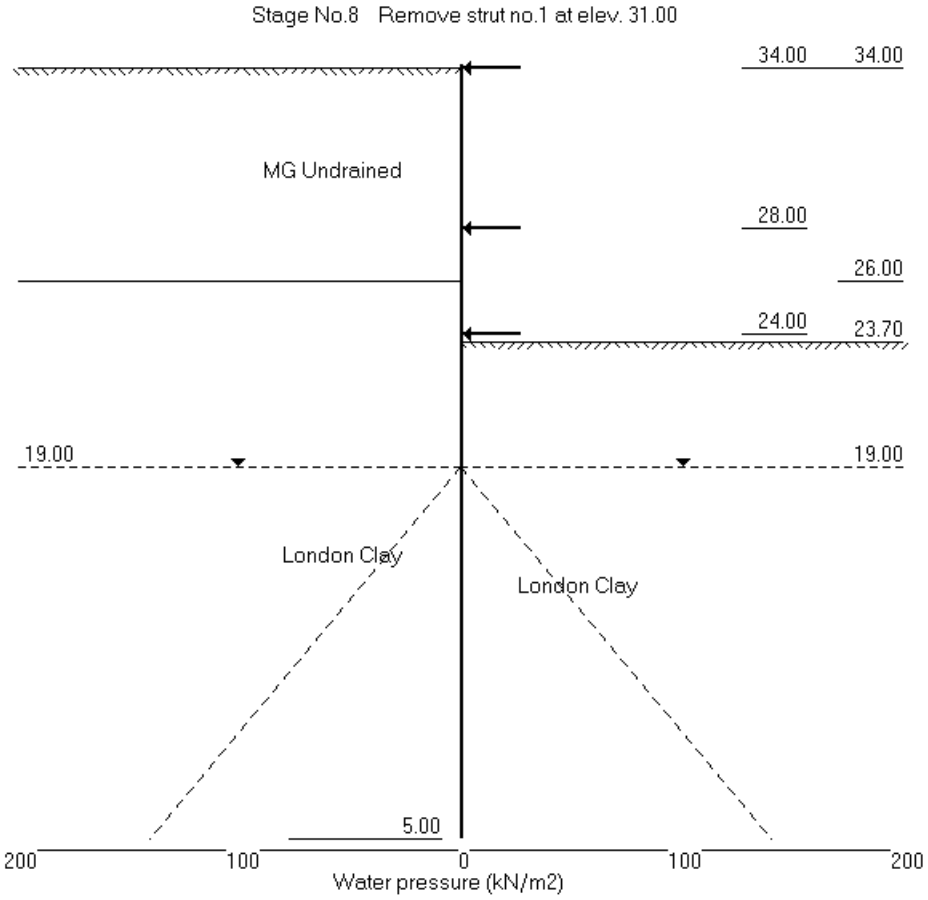
Stage No.5 Excav. to elev. 23.70 on PASSIVE side




Stage No.5 Excav. to elev. 23.70 on PASSIVE side



Units: kN,m


Stage No.8 Remove strut no.1 at elev. 31.00
34.00
34.00
MG Undrained
28.00
26.00
24.00
23.70
19.00
19.00
London Clay
London Clay
5.00
200
100
0
100
200
Water pressure (kN/m2)

Units: kN,m

Stage No. 8 Remove strut or anchor no.1 at elevation 31.00

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**

Factor of safety on soil strength

| Stage No. | --- G.L. --- Act. | Pass. | Strut Elev. | FoS for toe elev. = 5.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation |
|---|---|---|---|---|---|---|---|
| 8 | 34.00 | 23.70 | | More than one strut. No FoS calc. | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**

**Analysis options**

Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 50.00 from wall

**Limit State: Serviceability Limit State**

Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 28.74 | 0.016 | -3.57E-04 | 56.1 | -0.0 | -56.1 | 12352200 |
| 2 | 33.50 | 26.40 | 0.016 | -3.57E-04 | 69.9 | 31.7 | | 12352200 |
| 3 | 33.00 | 24.06 | 0.016 | -3.59E-04 | 82.5 | 70.1 | | 12352200 |
| 4 | 32.50 | 21.71 | 0.016 | -3.63E-04 | 93.9 | 114.4 | | 12352200 |
| 5 | 32.00 | 19.35 | 0.016 | -3.69E-04 | 104.2 | 164.2 | | 12352200 |
| 6 | 31.50 | 18.82 | 0.016 | -3.76E-04 | 113.7 | 218.8 | | 12352200 |
| 7 | 31.00 | 20.21 | 0.017 | -3.87E-04 | 123.5 | 278.1 | | 12352200 |
| 8 | 30.50 | 21.58 | 0.017 | -3.99E-04 | 133.9 | 342.5 | | 12352200 |
| 9 | 30.00 | 22.91 | 0.017 | -4.14E-04 | 145.1 | 412.3 | | 12352200 |
| 10 | 29.50 | 24.19 | 0.017 | -4.33E-04 | 156.8 | 487.7 | | 12352200 |
| 11 | 29.00 | 25.40 | 0.018 | -4.54E-04 | 169.2 | 569.3 | | 12352200 |
| 12 | 28.50 | 27.68 | 0.018 | -4.79E-04 | 182.5 | 657.1 | | 12352200 |
| 13 | 28.00 | 30.15 | 0.018 | -5.07E-04 | 197.0 | 751.9 | 702.5 | 12352200 |
| | | 30.15 | 0.018 | -5.07E-04 | -505.5 | 751.9 | | |
| 14 | 27.50 | 32.62 | 0.018 | -5.33E-04 | -489.8 | 503.0 | | 12352200 |
| 15 | 27.00 | 35.10 | 0.019 | -5.48E-04 | -472.9 | 262.3 | | 12352200 |
| 16 | 26.50 | 37.58 | 0.019 | -5.54E-04 | -454.7 | 31.6 | | 12352200 |
| 17 | 26.00 | 42.15 | 0.019 | -5.51E-04 | -434.8 | -190.9 | | 12352200 |
| | | 92.64 | 0.019 | -5.51E-04 | -434.8 | -190.9 | | |
| 18 | 25.50 | 99.34 | 0.019 | -5.39E-04 | -386.8 | -396.3 | | 12352200 |
| 19 | 25.00 | 106.01 | 0.020 | -5.19E-04 | -335.5 | -576.8 | | 12352200 |
| 20 | 24.50 | 112.65 | 0.020 | -4.93E-04 | -280.8 | -730.8 | | 12352200 |
| 21 | 24.00 | 119.29 | 0.020 | -4.61E-04 | -222.8 | -856.7 | 0.8 | 12352200 |
| | | 119.29 | 0.020 | -4.61E-04 | -223.6 | -856.7 | | |
| 22 | 23.70 | 123.27 | 0.020 | -4.39E-04 | -187.3 | -918.3 | | 12352200 |
| | | 74.29 | 0.020 | -4.39E-04 | -187.3 | -918.3 | | |
| 23 | 23.35 | 70.75 | 0.020 | -4.12E-04 | -161.9 | -979.3 | | 12352200 |
| 24 | 23.00 | 67.23 | 0.021 | -3.84E-04 | -137.7 | -1031.6 | | 12352200 |
| 25 | 22.50 | 62.26 | 0.021 | -3.41E-04 | -105.4 | -1092.1 | | 12352200 |
| 26 | 22.00 | 57.35 | 0.021 | -2.96E-04 | -75.5 | -1137.0 | | 12352200 |

(continued)

Stage No.8 Remove strut or anchor no.1 at elevation 31.00

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 27 | 21.50 | 52.53 | 0.021 | -2.49E-04 | -48.0 | -1167.5 | | 12352200 |
| 28 | 21.00 | 47.82 | 0.021 | -2.01E-04 | -22.9 | -1184.9 | | 12352200 |
| 29 | 20.50 | 43.22 | 0.021 | -1.53E-04 | -0.1 | -1190.4 | | 12352200 |
| 30 | 20.00 | 38.76 | 0.021 | -1.05E-04 | 20.4 | -1185.1 | | 12352200 |
| 31 | 19.50 | 34.44 | 0.021 | -5.81E-05 | 38.7 | -1170.1 | | 12352200 |
| 32 | 19.00 | 30.28 | 0.021 | -1.12E-05 | 54.8 | -1146.4 | | 12352200 |
| 33 | 18.50 | 26.28 | 0.021 | 3.44E-05 | 69.0 | -1115.2 | | 12352200 |
| 34 | 18.00 | 22.46 | 0.021 | 7.88E-05 | 81.2 | -1077.5 | | 12352200 |
| 35 | 17.50 | 18.81 | 0.021 | 1.21E-04 | 91.5 | -1034.1 | | 12352200 |
| 36 | 17.00 | 15.34 | 0.021 | 1.62E-04 | 100.0 | -986.0 | | 12352200 |
| 37 | 16.50 | 12.07 | 0.021 | 2.01E-04 | 106.9 | -934.1 | | 12352200 |
| 38 | 16.00 | 8.98 | 0.021 | 2.38E-04 | 112.1 | -879.1 | | 12352200 |
| 39 | 15.50 | 6.08 | 0.021 | 2.72E-04 | 115.9 | -822.0 | | 12352200 |
| 40 | 15.00 | 3.37 | 0.021 | 3.04E-04 | 118.2 | -763.3 | | 12352200 |
| 41 | 14.50 | 0.84 | 0.021 | 3.34E-04 | 119.3 | -703.7 | | 12352200 |
| 42 | 14.00 | -1.50 | 0.020 | 3.61E-04 | 119.1 | -644.0 | | 12352200 |
| 43 | 13.50 | -3.65 | 0.020 | 3.86E-04 | 117.9 | -584.6 | | 12352200 |
| 44 | 13.00 | -5.64 | 0.020 | 4.08E-04 | 115.5 | -526.1 | | 12352200 |
| 45 | 12.50 | -7.44 | 0.020 | 4.29E-04 | 112.3 | -469.1 | | 12352200 |
| 46 | 12.00 | -9.08 | 0.020 | 4.46E-04 | 108.1 | -413.9 | | 12352200 |
| 47 | 11.50 | -10.57 | 0.019 | 4.62E-04 | 103.2 | -361.0 | | 12352200 |
| 48 | 11.00 | -11.89 | 0.019 | 4.76E-04 | 97.6 | -310.7 | | 12352200 |
| 49 | 10.50 | -13.07 | 0.019 | 4.87E-04 | 91.4 | -263.4 | | 12352200 |
| 50 | 10.00 | -14.10 | 0.019 | 4.97E-04 | 84.6 | -219.3 | | 12352200 |
| 51 | 9.50 | -15.00 | 0.018 | 5.05E-04 | 77.3 | -178.8 | | 12352200 |
| 52 | 9.00 | -15.77 | 0.018 | 5.12E-04 | 69.6 | -142.0 | | 12352200 |
| 53 | 8.50 | -16.42 | 0.018 | 5.17E-04 | 61.5 | -109.2 | | 12352200 |
| 54 | 8.00 | -16.95 | 0.018 | 5.21E-04 | 53.2 | -80.5 | | 12352200 |
| 55 | 7.50 | -17.37 | 0.017 | 5.23E-04 | 44.6 | -56.0 | | 12352200 |
| 56 | 7.00 | -17.68 | 0.017 | 5.25E-04 | 35.9 | -35.9 | | 12352200 |
| 57 | 6.50 | -17.89 | 0.017 | 5.26E-04 | 27.0 | -20.2 | | 12352200 |
| 58 | 6.00 | -18.00 | 0.017 | 5.27E-04 | 18.0 | -9.0 | | 12352200 |
| 59 | 5.50 | -18.01 | 0.016 | 5.27E-04 | 9.0 | -2.2 | | 12352200 |
| 60 | 5.00 | -17.93 | 0.016 | 5.27E-04 | 0.0 | -0.0 | | --- |

At elev. 34.00 Strut force = -56.1 kN/strut = -56.1 kN/m run
At elev. 28.00 Strut force = 702.5 kN/strut = 702.5 kN/m run
At elev. 24.00 Strut force = 0.8 kN/strut = 0.8 kN/m run

| Node no. | Y coord | ACTIVE side: Water press. kN/m2 | Vertic -al kN/m2 | Effective stresses: Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | Total earth pressure kN/m2 | Coeff. of subgrade reaction kN/m3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | Total> | 0.00 | 0.00 | 71.70 | 28.74 | 28.74 | 3617 |
| 2 | 33.50 | Total> | 9.50 | 2.50m | 83.59 | 26.40 | 26.40 | 3617 |
| 3 | 33.00 | Total> | 19.00 | 5.00m | 95.48 | 24.06 | 24.06 | 3617 |
| 4 | 32.50 | Total> | 28.50 | 7.50m | 107.37 | 21.71 | 21.71 | 3617 |
| 5 | 32.00 | Total> | 38.00 | 10.00m | 119.26 | 19.35 | 19.35 | 3617 |
| 6 | 31.50 | Total> | 47.50 | 12.50m | 131.15 | 18.82 | 18.82 | 3617 |
| 7 | 31.00 | Total> | 57.00 | 15.00m | 143.04 | 20.21 | 20.21 | 3617 |
| 8 | 30.50 | Total> | 66.50 | 17.50m | 154.93 | 21.58 | 21.58 | 3617 |
| 9 | 30.00 | Total> | 76.00 | 20.00m | 166.82 | 22.91 | 22.91 | 3617 |
| 10 | 29.50 | Total> | 85.50 | 22.50m | 178.71 | 24.19 | 24.19 | 3617 |
| 11 | 29.00 | Total> | 95.00 | 25.00m | 190.60 | 25.40 | 25.40 | 3617 |
| 12 | 28.50 | Total> | 104.50 | 27.50m | 202.49 | 27.68 | 27.68 | 3617 |
| 13 | 28.00 | Total> | 114.00 | 30.00m | 214.38 | 30.15 | 30.15 | 3617 |
| 14 | 27.50 | Total> | 123.50 | 32.50m | 226.27 | 32.62 | 32.62 | 3617 |

(continued)

Stage No.8 Remove strut or anchor no.1 at elevation 31.00

| Node no. | Y coord | ACTIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 15 | 27.00 | Total> | 133.00 | 35.00m | 238.16 | 35.10 | 35.10 | 3617 |
| 16 | 26.50 | Total> | 142.50 | 37.50m | 250.05 | 37.58 | 37.58 | 3617 |
| 17 | 26.00 | Total> | 152.00 | 42.09 | 261.94 | 42.15 | 42.15 | 3617 |
| | | Total> | 152.00 | 40.00m | 295.40 | 92.64 | 92.64 | 4340 |
| 18 | 25.50 | Total> | 162.00 | 42.50m | 311.73 | 99.34 | 99.34 | 4521 |
| 19 | 25.00 | Total> | 172.00 | 45.00m | 328.07 | 106.01 | 106.01 | 4702 |
| 20 | 24.50 | Total> | 182.00 | 47.50m | 344.40 | 112.65 | 112.65 | 4883 |
| 21 | 24.00 | Total> | 192.00 | 50.00m | 360.73 | 119.29 | 119.29 | 3768 |
| 22 | 23.70 | Total> | 198.00 | 51.50m | 370.53 | 123.27 | 123.27 | 3849 |
| 23 | 23.35 | Total> | 205.00 | 53.25m | 381.97 | 127.93 | 127.93 | 3943 |
| 24 | 23.00 | Total> | 212.00 | 55.00m | 393.40 | 132.60 | 132.60 | 4037 |
| 25 | 22.50 | Total> | 222.00 | 57.50m | 409.73 | 139.29 | 139.29 | 4172 |
| 26 | 22.00 | Total> | 232.00 | 60.00m | 426.07 | 146.04 | 146.04 | 4306 |
| 27 | 21.50 | Total> | 242.00 | 62.50m | 442.40 | 152.83 | 152.83 | 4441 |
| 28 | 21.00 | Total> | 252.00 | 65.00m | 458.74 | 159.70 | 159.70 | 4575 |
| 29 | 20.50 | Total> | 262.00 | 67.50m | 475.07 | 166.65 | 166.65 | 4710 |
| 30 | 20.00 | Total> | 272.00 | 70.00m | 491.40 | 173.68 | 173.68 | 4845 |
| 31 | 19.50 | Total> | 282.00 | 72.50m | 507.74 | 180.82 | 180.82 | 4979 |
| 32 | 19.00 | Total> | 292.00 | 75.00m | 524.07 | 188.05 | 188.05 | 5114 |
| 33 | 18.50 | Total> | 302.00 | 77.50m | 540.40 | 195.40 | 195.40 | 5248 |
| 34 | 18.00 | Total> | 312.00 | 80.00m | 556.74 | 202.86 | 202.86 | 5383 |
| 35 | 17.50 | Total> | 322.00 | 82.50m | 573.07 | 210.45 | 210.45 | 5517 |
| 36 | 17.00 | Total> | 332.00 | 85.00m | 589.40 | 218.16 | 218.16 | 5652 |
| 37 | 16.50 | Total> | 342.00 | 87.50m | 605.74 | 225.99 | 225.99 | 5787 |
| 38 | 16.00 | Total> | 352.00 | 90.00m | 622.07 | 233.96 | 233.96 | 5921 |
| 39 | 15.50 | Total> | 362.00 | 92.50m | 638.40 | 242.05 | 242.05 | 6056 |
| 40 | 15.00 | Total> | 372.00 | 95.00m | 654.74 | 250.27 | 250.27 | 6190 |
| 41 | 14.50 | Total> | 382.00 | 97.50m | 671.07 | 258.63 | 258.63 | 6325 |
| 42 | 14.00 | Total> | 392.00 | 100.00m | 687.40 | 267.11 | 267.11 | 6459 |
| 43 | 13.50 | Total> | 402.00 | 102.50m | 703.74 | 275.71 | 275.71 | 6594 |
| 44 | 13.00 | Total> | 412.00 | 105.00m | 720.07 | 284.44 | 284.44 | 6728 |
| 45 | 12.50 | Total> | 422.00 | 107.73 | 736.40 | 293.28 | 293.28 | 6863 |
| 46 | 12.00 | Total> | 432.00 | 111.40 | 752.74 | 302.25 | 302.25 | 6998 |
| 47 | 11.50 | Total> | 442.00 | 115.07 | 769.07 | 311.32 | 311.32 | 7132 |
| 48 | 11.00 | Total> | 452.00 | 118.73 | 785.41 | 320.50 | 320.50 | 7267 |
| 49 | 10.50 | Total> | 462.00 | 122.40 | 801.74 | 329.79 | 329.79 | 7401 |
| 50 | 10.00 | Total> | 472.00 | 126.07 | 818.07 | 339.18 | 339.18 | 7536 |
| 51 | 9.50 | Total> | 482.00 | 129.74 | 834.41 | 348.66 | 348.66 | 7670 |
| 52 | 9.00 | Total> | 492.00 | 133.41 | 850.74 | 358.23 | 358.23 | 7805 |
| 53 | 8.50 | Total> | 502.00 | 137.08 | 867.07 | 367.89 | 367.89 | 7940 |
| 54 | 8.00 | Total> | 512.00 | 140.75 | 883.41 | 377.63 | 377.63 | 8074 |
| 55 | 7.50 | Total> | 522.00 | 144.42 | 899.74 | 387.45 | 387.45 | 8209 |
| 56 | 7.00 | Total> | 532.00 | 148.09 | 916.07 | 397.35 | 397.35 | 8343 |
| 57 | 6.50 | Total> | 542.00 | 151.76 | 932.41 | 407.32 | 407.32 | 8478 |
| 58 | 6.00 | Total> | 552.00 | 155.43 | 948.74 | 417.36 | 417.36 | 8612 |
| 59 | 5.50 | Total> | 562.00 | 159.10 | 965.07 | 427.48 | 427.48 | 8747 |
| 60 | 5.00 | Total> | 572.00 | 162.76 | 981.41 | 437.66 | 437.66 | 8882 |

(continued)

Stage No.8 Remove strut or anchor no.1 at elevation 31.00

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 34.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | 33.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | 33.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | 32.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 5 | 32.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 6 | 31.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | 31.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | 30.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 9 | 30.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 10 | 29.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 11 | 29.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 12 | 28.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 13 | 28.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 14 | 27.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 15 | 27.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 16 | 26.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 17 | 26.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 18 | 25.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 19 | 25.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 20 | 24.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 21 | 24.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 22 | 23.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | Total> 0.00 | 0.00 | 172.53 | 48.99 | 48.99 | | 2243 |
| 23 | 23.35 | Total> 7.00 | 1.75m | 183.97 | 57.18 | 57.18 | | 2298 |
| 24 | 23.00 | Total> 14.00 | 3.50m | 195.40 | 65.36 | 65.36 | | 2353 |
| 25 | 22.50 | Total> 24.00 | 6.00m | 211.74 | 77.04 | 77.04 | | 2432 |
| 26 | 22.00 | Total> 34.00 | 8.50m | 228.07 | 88.69 | 88.69 | | 2510 |
| 27 | 21.50 | Total> 44.01 | 11.00m | 244.41 | 100.30 | 100.30 | | 2589 |
| 28 | 21.00 | Total> 54.01 | 13.50m | 260.75 | 111.89 | 111.89 | | 2667 |
| 29 | 20.50 | Total> 64.02 | 16.00m | 277.09 | 123.43 | 123.43 | | 2745 |
| 30 | 20.00 | Total> 74.03 | 18.50m | 293.44 | 134.93 | 134.93 | | 2824 |
| 31 | 19.50 | Total> 84.05 | 21.00m | 309.78 | 146.37 | 146.37 | | 2902 |
| 32 | 19.00 | Total> 94.07 | 23.50m | 326.14 | 157.77 | 157.77 | | 2981 |
| 33 | 18.50 | Total> 104.09 | 26.00m | 342.50 | 169.12 | 169.12 | | 3059 |
| 34 | 18.00 | Total> 114.12 | 28.50m | 358.86 | 180.41 | 180.41 | | 3138 |
| 35 | 17.50 | Total> 124.16 | 31.00m | 375.23 | 191.64 | 191.64 | | 3216 |
| 36 | 17.00 | Total> 134.20 | 33.50m | 391.60 | 202.81 | 202.81 | | 3295 |
| 37 | 16.50 | Total> 144.24 | 36.00m | 407.98 | 213.93 | 213.93 | | 3373 |
| 38 | 16.00 | Total> 154.30 | 38.50m | 424.37 | 224.98 | 224.98 | | 3451 |
| 39 | 15.50 | Total> 164.36 | 41.00m | 440.76 | 235.97 | 235.97 | | 3530 |
| 40 | 15.00 | Total> 174.43 | 43.50m | 457.16 | 246.91 | 246.91 | | 3608 |
| 41 | 14.50 | Total> 184.50 | 46.00m | 473.57 | 257.78 | 257.78 | | 3687 |
| 42 | 14.00 | Total> 194.59 | 48.50m | 489.99 | 268.60 | 268.60 | | 3765 |
| 43 | 13.50 | Total> 204.68 | 51.00m | 506.42 | 279.37 | 279.37 | | 3844 |
| 44 | 13.00 | Total> 214.78 | 53.50m | 522.85 | 290.07 | 290.07 | | 3922 |
| 45 | 12.50 | Total> 224.89 | 56.00m | 539.30 | 300.73 | 300.73 | | 4001 |
| 46 | 12.00 | Total> 235.01 | 58.50m | 555.75 | 311.33 | 311.33 | | 4079 |
| 47 | 11.50 | Total> 245.14 | 61.00m | 572.21 | 321.89 | 321.89 | | 4157 |
| 48 | 11.00 | Total> 255.28 | 63.50m | 588.68 | 332.39 | 332.39 | | 4236 |
| 49 | 10.50 | Total> 265.43 | 66.00m | 605.16 | 342.86 | 342.86 | | 4314 |
| 50 | 10.00 | Total> 275.58 | 68.50m | 621.66 | 353.28 | 353.28 | | 4393 |
| 51 | 9.50 | Total> 285.75 | 71.00m | 638.16 | 363.66 | 363.66 | | 4471 |
| 52 | 9.00 | Total> 295.93 | 73.50m | 654.67 | 374.00 | 374.00 | | 4550 |
| 53 | 8.50 | Total> 306.12 | 76.00m | 671.20 | 384.31 | 384.31 | | 4628 |
| 54 | 8.00 | Total> 316.32 | 78.50m | 687.73 | 394.58 | 394.58 | | 4707 |

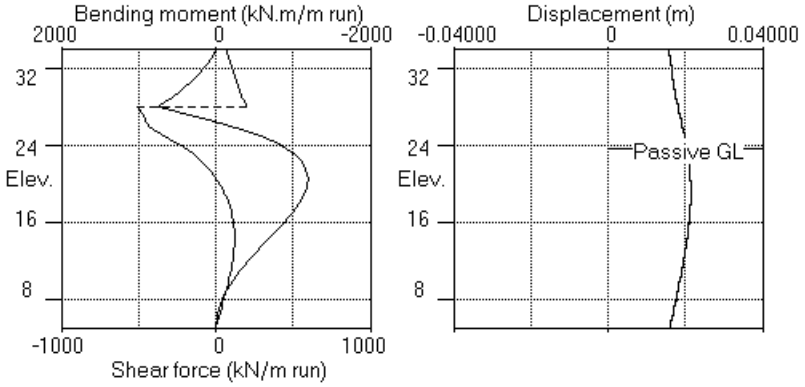
(continued)

Stage No.8 Remove strut or anchor no.1 at elevation 31.00

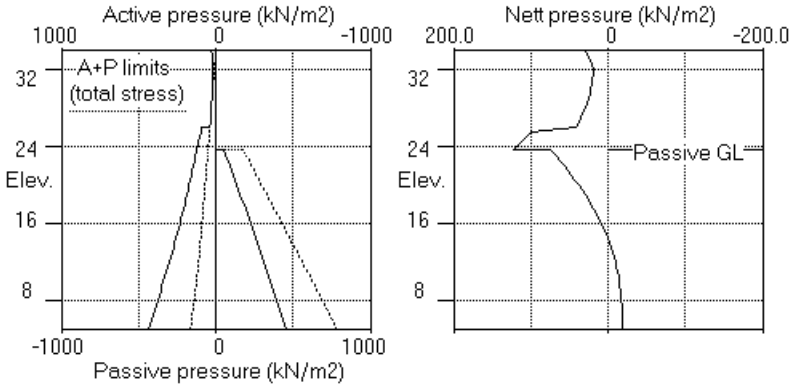
| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 55 | 7.50 | Total> | 326.53 | 81.00m | 704.27 | 404.82 | 404.82 | 4785 |
| 56 | 7.00 | Total> | 336.76 | 83.50m | 720.83 | 415.03 | 415.03 | 4863 |
| 57 | 6.50 | Total> | 346.99 | 86.00m | 737.40 | 425.21 | 425.21 | 4942 |
| 58 | 6.00 | Total> | 357.23 | 88.50m | 753.97 | 435.37 | 435.37 | 5020 |
| 59 | 5.50 | Total> | 367.49 | 91.00m | 770.56 | 445.49 | 445.49 | 5099 |
| 60 | 5.00 | Total> | 377.75 | 93.50m | 787.16 | 455.59 | 455.59 | 5177 |

Units: kN,m

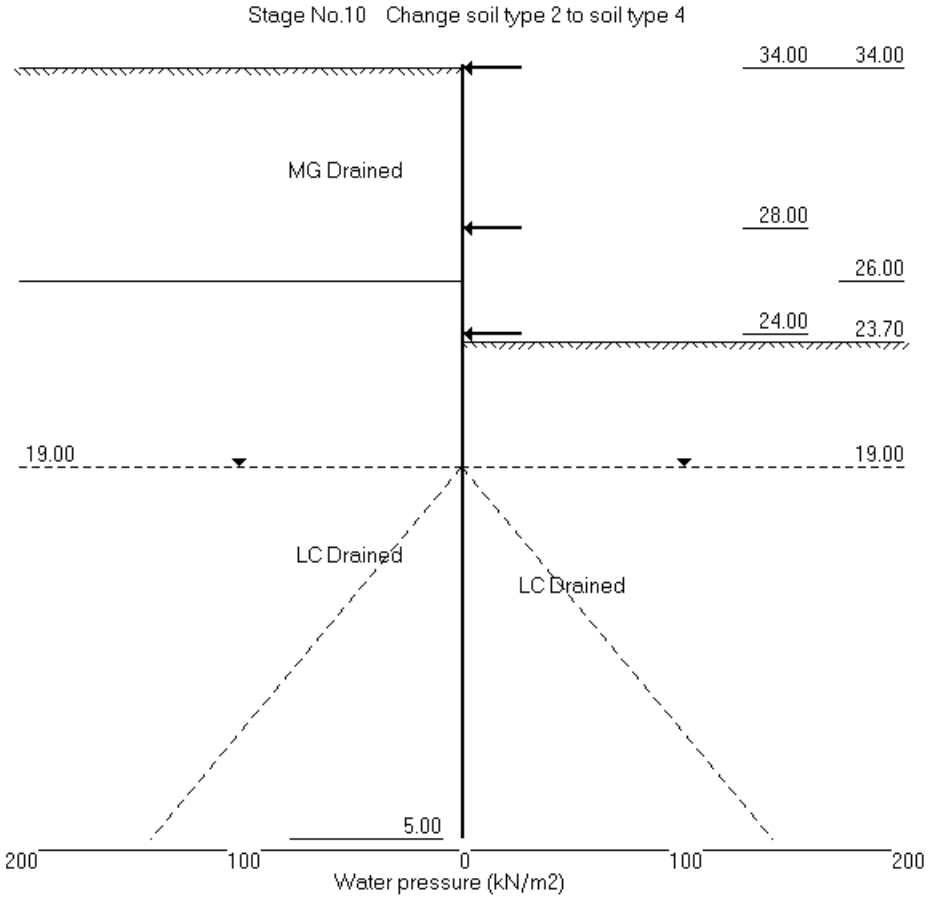
Stage No.8 Remove strut no.1 at elev. 31.00




Stage No.8 Remove strut no.1 at elev. 31.00



Units: kN,m


Stage No.10 Change soil type 2 to soil type 4
34.00
34.00
MG Drained
28.00
26.00
24.00
23.70
19.00
19.00
LC Drained
LC Drained
5.00
200
100
0
100
200
Water pressure (kN/m2)

Units: kN,m

Stage No. 10 Change properties of soil type 2 to soil type 4
Ko pressures will not be reset

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | --- G.L. --- Act. | Pass. | Strut Elev. | FoS for toe elev. = 5.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation |
|---|---|---|---|---|---|---|---|
| 10 | 34.00 | 23.70 | | More than one strut. No FoS calc. | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**
**Analysis options**
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 50.00 from wall
**Limit State: Serviceability Limit State**
Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 6.28 | 0.016 | -3.58E-04 | 60.9 | -0.0 | -60.9 | 12352200 |
| 2 | 33.50 | 26.41 | 0.016 | -3.58E-04 | 69.1 | 32.3 | | 12352200 |
| 3 | 33.00 | 24.06 | 0.016 | -3.61E-04 | 81.7 | 70.2 | | 12352200 |
| 4 | 32.50 | 21.71 | 0.016 | -3.64E-04 | 93.2 | 114.2 | | 12352200 |
| 5 | 32.00 | 19.35 | 0.016 | -3.70E-04 | 103.4 | 163.6 | | 12352200 |
| 6 | 31.50 | 18.81 | 0.016 | -3.78E-04 | 113.0 | 217.9 | | 12352200 |
| 7 | 31.00 | 20.21 | 0.017 | -3.88E-04 | 122.7 | 276.8 | | 12352200 |
| 8 | 30.50 | 21.58 | 0.017 | -4.00E-04 | 133.2 | 340.8 | | 12352200 |
| 9 | 30.00 | 22.91 | 0.017 | -4.15E-04 | 144.3 | 410.2 | | 12352200 |
| 10 | 29.50 | 24.39 | 0.017 | -4.33E-04 | 156.1 | 485.3 | | 12352200 |
| 11 | 29.00 | 27.25 | 0.018 | -4.55E-04 | 169.0 | 566.5 | | 12352200 |
| 12 | 28.50 | 30.11 | 0.018 | -4.79E-04 | 183.4 | 654.6 | | 12352200 |
| 13 | 28.00 | 32.96 | 0.018 | -5.08E-04 | 199.1 | 750.1 | 708.8 | 12352200 |
| | | 32.96 | 0.018 | -5.08E-04 | -509.7 | 750.1 | | |
| 14 | 27.50 | 35.82 | 0.018 | -5.33E-04 | -492.5 | 499.5 | | 12352200 |
| 15 | 27.00 | 38.68 | 0.019 | -5.48E-04 | -473.8 | 257.9 | | 12352200 |
| 16 | 26.50 | 41.53 | 0.019 | -5.54E-04 | -453.8 | 27.2 | | 12352200 |
| 17 | 26.00 | 44.39 | 0.019 | -5.51E-04 | -432.3 | -194.4 | | 12352200 |
| | | 92.63 | 0.019 | -5.51E-04 | -432.3 | -194.4 | | |
| 18 | 25.50 | 99.34 | 0.019 | -5.39E-04 | -384.3 | -398.6 | | 12352200 |
| 19 | 25.00 | 106.00 | 0.020 | -5.19E-04 | -333.0 | -577.8 | | 12352200 |
| 20 | 24.50 | 112.65 | 0.020 | -4.93E-04 | -278.3 | -730.6 | | 12352200 |
| 21 | 24.00 | 119.28 | 0.020 | -4.61E-04 | -220.3 | -855.2 | 7.3 | 12352200 |
| | | 119.28 | 0.020 | -4.61E-04 | -227.6 | -855.2 | | |
| 22 | 23.70 | 123.27 | 0.020 | -4.39E-04 | -191.2 | -918.1 | | 12352200 |
| | | 94.42 | 0.020 | -4.39E-04 | -191.2 | -918.1 | | |
| 23 | 23.35 | 72.38 | 0.020 | -4.12E-04 | -162.1 | -979.6 | | 12352200 |
| 24 | 23.00 | 67.22 | 0.021 | -3.84E-04 | -137.6 | -1031.9 | | 12352200 |
| 25 | 22.50 | 62.24 | 0.021 | -3.41E-04 | -105.3 | -1092.3 | | 12352200 |

(continued)

Stage No.10 Change properties of soil type 2 to soil type 4
Ko pressures will not be reset

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 26 | 22.00 | 57.34 | 0.021 | -2.95E-04 | -75.4 | -1137.2 | | 12352200 |
| 27 | 21.50 | 52.52 | 0.021 | -2.49E-04 | -47.9 | -1167.7 | | 12352200 |
| 28 | 21.00 | 47.80 | 0.021 | -2.01E-04 | -22.8 | -1185.1 | | 12352200 |
| 29 | 20.50 | 43.21 | 0.021 | -1.53E-04 | -0.1 | -1190.5 | | 12352200 |
| 30 | 20.00 | 38.75 | 0.021 | -1.05E-04 | 20.4 | -1185.2 | | 12352200 |
| 31 | 19.50 | 34.43 | 0.021 | -5.78E-05 | 38.7 | -1170.1 | | 12352200 |
| 32 | 19.00 | 30.27 | 0.021 | -1.10E-05 | 54.9 | -1146.4 | | 12352200 |
| 33 | 18.50 | 26.27 | 0.021 | 3.47E-05 | 69.0 | -1115.2 | | 12352200 |
| 34 | 18.00 | 22.44 | 0.021 | 7.91E-05 | 81.2 | -1077.4 | | 12352200 |
| 35 | 17.50 | 18.80 | 0.021 | 1.21E-04 | 91.5 | -1034.0 | | 12352200 |
| 36 | 17.00 | 15.33 | 0.021 | 1.62E-04 | 100.0 | -985.9 | | 12352200 |
| 37 | 16.50 | 12.06 | 0.021 | 2.01E-04 | 106.9 | -934.0 | | 12352200 |
| 38 | 16.00 | 8.97 | 0.021 | 2.38E-04 | 112.1 | -879.0 | | 12352200 |
| 39 | 15.50 | 6.07 | 0.021 | 2.72E-04 | 115.9 | -821.8 | | 12352200 |
| 40 | 15.00 | 3.36 | 0.021 | 3.04E-04 | 118.3 | -763.1 | | 12352200 |
| 41 | 14.50 | 0.83 | 0.021 | 3.34E-04 | 119.3 | -703.6 | | 12352200 |
| 42 | 14.00 | -1.50 | 0.020 | 3.61E-04 | 119.1 | -643.8 | | 12352200 |
| 43 | 13.50 | -3.66 | 0.020 | 3.86E-04 | 117.8 | -584.5 | | 12352200 |
| 44 | 13.00 | -5.64 | 0.020 | 4.09E-04 | 115.5 | -526.0 | | 12352200 |
| 45 | 12.50 | -7.45 | 0.020 | 4.29E-04 | 112.3 | -468.9 | | 12352200 |
| 46 | 12.00 | -9.09 | 0.020 | 4.47E-04 | 108.1 | -413.8 | | 12352200 |
| 47 | 11.50 | -10.57 | 0.019 | 4.62E-04 | 103.2 | -360.8 | | 12352200 |
| 48 | 11.00 | -11.89 | 0.019 | 4.76E-04 | 97.6 | -310.6 | | 12352200 |
| 49 | 10.50 | -13.07 | 0.019 | 4.87E-04 | 91.3 | -263.3 | | 12352200 |
| 50 | 10.00 | -14.11 | 0.019 | 4.97E-04 | 84.5 | -219.2 | | 12352200 |
| 51 | 9.50 | -15.01 | 0.018 | 5.05E-04 | 77.3 | -178.7 | | 12352200 |
| 52 | 9.00 | -15.78 | 0.018 | 5.12E-04 | 69.6 | -142.0 | | 12352200 |
| 53 | 8.50 | -16.42 | 0.018 | 5.17E-04 | 61.5 | -109.2 | | 12352200 |
| 54 | 8.00 | -16.95 | 0.018 | 5.21E-04 | 53.2 | -80.5 | | 12352200 |
| 55 | 7.50 | -17.37 | 0.017 | 5.23E-04 | 44.6 | -56.0 | | 12352200 |
| 56 | 7.00 | -17.68 | 0.017 | 5.25E-04 | 35.8 | -35.9 | | 12352200 |
| 57 | 6.50 | -17.89 | 0.017 | 5.26E-04 | 26.9 | -20.2 | | 12352200 |
| 58 | 6.00 | -17.99 | 0.017 | 5.27E-04 | 18.0 | -9.0 | | 12352200 |
| 59 | 5.50 | -18.00 | 0.016 | 5.27E-04 | 9.0 | -2.2 | | 12352200 |
| 60 | 5.00 | -17.91 | 0.016 | 5.27E-04 | 0.0 | -0.0 | | --- |

At elev. 34.00 Strut force = -60.9 kN/strut = -60.9 kN/m run
At elev. 28.00 Strut force = 708.8 kN/strut = 708.8 kN/m run
At elev. 24.00 Strut force = 7.3 kN/strut = 7.3 kN/m run

| Node no. | Y coord | ACTIVE side: Water press. kN/m2 | Effective stresses: Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | Total earth pressure kN/m2 | Coeff. of subgrade reaction kN/m3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 0.00 | 0.00 | 0.00 | 6.28 | 6.28 | 6.28p | 5920 |
| 2 | 33.50 | 0.00 | 9.50 | 1.54 | 47.50 | 26.41 | 26.41 | 5920 |
| 3 | 33.00 | 0.00 | 19.00 | 4.40 | 88.72 | 24.06 | 24.06 | 5920 |
| 4 | 32.50 | 0.00 | 28.50 | 7.25 | 129.95 | 21.71 | 21.71 | 5920 |
| 5 | 32.00 | 0.00 | 38.00 | 10.11 | 171.17 | 19.35 | 19.35 | 1159 |
| 6 | 31.50 | 0.00 | 47.50 | 12.97 | 212.39 | 18.81 | 18.81 | 1159 |
| 7 | 31.00 | 0.00 | 57.00 | 15.82 | 253.61 | 20.21 | 20.21 | 1159 |
| 8 | 30.50 | 0.00 | 66.50 | 18.68 | 294.83 | 21.58 | 21.58 | 1159 |
| 9 | 30.00 | 0.00 | 76.00 | 21.54 | 336.06 | 22.91 | 22.91 | 1159 |
| 10 | 29.50 | 0.00 | 85.50 | 24.39 | 377.28 | 24.39 | 24.39a | 1159 |
| 11 | 29.00 | 0.00 | 95.00 | 27.25 | 418.50 | 27.25 | 27.25a | 1159 |
| 12 | 28.50 | 0.00 | 104.50 | 30.11 | 459.72 | 30.11 | 30.11a | 1159 |

(continued)

Stage No.10 Change properties of soil type 2 to soil type 4
Ko pressures will not be reset

| Node no. | Y coord | ACTIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 13 | 28.00 | 0.00 | 114.00 | 32.96 | 500.94 | 32.96 | 32.96a | 1159 |
| 14 | 27.50 | 0.00 | 123.50 | 35.82 | 542.17 | 35.82 | 35.82a | 1159 |
| 15 | 27.00 | 0.00 | 133.00 | 38.68 | 583.39 | 38.68 | 38.68a | 1159 |
| 16 | 26.50 | 0.00 | 142.50 | 41.53 | 624.61 | 41.53 | 41.53a | 1159 |
| 17 | 26.00 | 0.00 | 152.00 | 44.39 | 665.83 | 44.39 | 44.39a | 1159 |
| | | 0.00 | 152.00 | 43.07 | 608.52 | 92.63 | 92.63 | 1589 |
| 18 | 25.50 | 0.00 | 162.00 | 46.36 | 646.65 | 99.34 | 99.34 | 1656 |
| 19 | 25.00 | 0.00 | 172.00 | 49.65 | 684.79 | 106.00 | 106.00 | 1722 |
| 20 | 24.50 | 0.00 | 182.00 | 52.93 | 722.93 | 112.65 | 112.65 | 1788 |
| 21 | 24.00 | 0.00 | 192.00 | 56.22 | 761.06 | 119.28 | 119.28 | 1854 |
| 22 | 23.70 | 0.00 | 198.00 | 58.19 | 783.94 | 123.27 | 123.27 | 1894 |
| 23 | 23.35 | 0.00 | 205.00 | 60.49 | 810.64 | 127.92 | 127.92 | 1940 |
| 24 | 23.00 | 0.00 | 212.00 | 62.79 | 837.34 | 132.59 | 132.59 | 1987 |
| 25 | 22.50 | 0.00 | 222.00 | 66.08 | 875.47 | 139.29 | 139.29 | 2053 |
| 26 | 22.00 | 0.00 | 232.00 | 69.36 | 913.61 | 146.03 | 146.03 | 2119 |
| 27 | 21.50 | 0.00 | 242.00 | 72.65 | 951.74 | 152.83 | 152.83 | 2185 |
| 28 | 21.00 | 0.00 | 252.00 | 75.94 | 989.88 | 159.70 | 159.70 | 2252 |
| 29 | 20.50 | 0.00 | 262.00 | 79.22 | 1028.02 | 166.64 | 166.64 | 2318 |
| 30 | 20.00 | 0.00 | 272.00 | 82.51 | 1066.15 | 173.68 | 173.68 | 2384 |
| 31 | 19.50 | 0.00 | 282.00 | 85.80 | 1104.29 | 180.81 | 180.81 | 2450 |
| 32 | 19.00 | 0.00 | 292.00 | 89.08 | 1142.43 | 188.05 | 188.05 | 2516 |
| 33 | 18.50 | 5.00 | 297.00 | 90.73 | 1161.49 | 190.39 | 195.39 | 2583 |
| 34 | 18.00 | 10.00 | 302.00 | 92.37 | 1180.56 | 192.86 | 202.86 | 2649 |
| 35 | 17.50 | 15.00 | 307.00 | 94.01 | 1199.63 | 195.44 | 210.44 | 2715 |
| 36 | 17.00 | 20.00 | 312.00 | 95.66 | 1218.70 | 198.15 | 218.15 | 2781 |
| 37 | 16.50 | 25.00 | 317.00 | 97.30 | 1237.77 | 200.99 | 225.99 | 2848 |
| 38 | 16.00 | 30.00 | 322.00 | 98.94 | 1256.84 | 203.95 | 233.95 | 2914 |
| 39 | 15.50 | 35.00 | 327.00 | 100.59 | 1275.90 | 207.05 | 242.05 | 2980 |
| 40 | 15.00 | 40.00 | 332.00 | 102.23 | 1294.97 | 210.27 | 250.27 | 3046 |
| 41 | 14.50 | 45.00 | 337.00 | 103.87 | 1314.04 | 213.62 | 258.62 | 3112 |
| 42 | 14.00 | 50.00 | 342.00 | 105.52 | 1333.11 | 217.10 | 267.10 | 3179 |
| 43 | 13.50 | 55.00 | 347.00 | 107.16 | 1352.18 | 220.71 | 275.71 | 3245 |
| 44 | 13.00 | 60.00 | 352.00 | 108.80 | 1371.24 | 224.43 | 284.43 | 3311 |
| 45 | 12.50 | 65.00 | 357.00 | 110.45 | 1390.31 | 228.28 | 293.28 | 3377 |
| 46 | 12.00 | 70.00 | 362.00 | 112.09 | 1409.38 | 232.24 | 302.24 | 3444 |
| 47 | 11.50 | 75.00 | 367.00 | 113.73 | 1428.45 | 236.32 | 311.32 | 3510 |
| 48 | 11.00 | 80.00 | 372.00 | 115.38 | 1447.52 | 240.50 | 320.50 | 3576 |
| 49 | 10.50 | 85.00 | 377.00 | 117.02 | 1466.59 | 244.79 | 329.79 | 3642 |
| 50 | 10.00 | 90.00 | 382.00 | 118.66 | 1485.65 | 249.17 | 339.17 | 3708 |
| 51 | 9.50 | 95.00 | 387.00 | 120.31 | 1504.72 | 253.66 | 348.66 | 3775 |
| 52 | 9.00 | 100.00 | 392.00 | 121.95 | 1523.79 | 258.23 | 358.23 | 3841 |
| 53 | 8.50 | 105.00 | 397.00 | 123.59 | 1542.86 | 262.89 | 367.89 | 11969 |
| 54 | 8.00 | 110.00 | 402.00 | 125.23 | 1561.93 | 267.63 | 377.63 | 12172 |
| 55 | 7.50 | 115.00 | 407.00 | 126.88 | 1580.99 | 272.45 | 387.45 | 12375 |
| 56 | 7.00 | 120.00 | 412.00 | 128.52 | 1600.06 | 277.35 | 397.35 | 12578 |
| 57 | 6.50 | 125.00 | 417.00 | 130.16 | 1619.13 | 282.32 | 407.32 | 12781 |
| 58 | 6.00 | 130.00 | 422.00 | 131.81 | 1638.20 | 287.37 | 417.37 | 12983 |
| 59 | 5.50 | 135.00 | 427.00 | 133.45 | 1657.27 | 292.48 | 427.48 | 13186 |
| 60 | 5.00 | 140.00 | 432.00 | 135.09 | 1676.34 | 297.67 | 437.67 | 13389 |

(continued)

Stage No.10 Change properties of soil type 2 to soil type 4
Ko pressures will not be reset

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Effective stresses | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. kN/m2 | Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | | |
| 1 | 34.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | 33.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | 33.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | 32.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 5 | 32.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 6 | 31.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | 31.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | 30.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 9 | 30.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 10 | 29.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 11 | 29.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 12 | 28.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 13 | 28.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 14 | 27.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 15 | 27.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 16 | 26.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 17 | 26.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 18 | 25.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 19 | 25.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 20 | 24.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 21 | 24.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 22 | 23.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 28.84 | 28.84 | 28.84p | 1738 |
| 23 | 23.35 | 0.00 | 7.00 | 0.00 | 55.54 | 55.54 | 55.54p | 1781 |
| 24 | 23.00 | 0.00 | 14.00 | 0.00 | 82.24 | 65.37 | 65.37 | 1823 |
| 25 | 22.50 | 0.00 | 24.00 | 1.01 | 120.38 | 77.04 | 77.04 | 1884 |
| 26 | 22.00 | 0.00 | 34.00 | 4.29 | 158.52 | 88.69 | 88.69 | 1945 |
| 27 | 21.50 | 0.00 | 44.01 | 7.58 | 196.67 | 100.31 | 100.31 | 2006 |
| 28 | 21.00 | 0.00 | 54.01 | 10.87 | 234.83 | 111.89 | 111.89 | 2066 |
| 29 | 20.50 | 0.00 | 64.02 | 14.16 | 273.00 | 123.43 | 123.43 | 2127 |
| 30 | 20.00 | 0.00 | 74.03 | 17.45 | 311.18 | 134.93 | 134.93 | 2188 |
| 31 | 19.50 | 0.00 | 84.05 | 20.74 | 349.38 | 146.38 | 146.38 | 2249 |
| 32 | 19.00 | 0.00 | 94.07 | 24.03 | 387.59 | 157.78 | 157.78 | 2310 |
| 33 | 18.50 | 5.00 | 99.09 | 25.68 | 406.75 | 164.12 | 169.12 | 2370 |
| 34 | 18.00 | 10.00 | 104.12 | 27.34 | 425.93 | 170.41 | 180.41 | 2431 |
| 35 | 17.50 | 15.00 | 109.16 | 28.99 | 445.13 | 176.64 | 191.64 | 2492 |
| 36 | 17.00 | 20.00 | 114.20 | 30.65 | 464.35 | 182.82 | 202.82 | 2553 |
| 37 | 16.50 | 25.00 | 119.24 | 32.31 | 483.60 | 188.93 | 213.93 | 2613 |
| 38 | 16.00 | 30.00 | 124.30 | 33.97 | 502.87 | 194.98 | 224.98 | 2674 |
| 39 | 15.50 | 35.00 | 129.36 | 35.63 | 522.17 | 200.98 | 235.98 | 2735 |
| 40 | 15.00 | 40.00 | 134.43 | 37.30 | 541.50 | 206.91 | 246.91 | 2796 |
| 41 | 14.50 | 45.00 | 139.50 | 38.97 | 560.86 | 212.79 | 257.79 | 2857 |
| 42 | 14.00 | 50.00 | 144.59 | 40.64 | 580.25 | 218.61 | 268.61 | 2917 |
| 43 | 13.50 | 55.00 | 149.68 | 42.31 | 599.67 | 224.37 | 279.37 | 2978 |
| 44 | 13.00 | 60.00 | 154.78 | 43.99 | 619.12 | 230.08 | 290.08 | 3039 |
| 45 | 12.50 | 65.00 | 159.89 | 45.67 | 638.61 | 235.73 | 300.73 | 3100 |
| 46 | 12.00 | 70.00 | 165.01 | 47.35 | 658.13 | 241.33 | 311.33 | 3160 |
| 47 | 11.50 | 75.00 | 170.14 | 49.03 | 677.69 | 246.89 | 321.89 | 3221 |
| 48 | 11.00 | 80.00 | 175.28 | 50.72 | 697.29 | 252.40 | 332.40 | 3282 |
| 49 | 10.50 | 85.00 | 180.43 | 52.41 | 716.92 | 257.86 | 342.86 | 3343 |
| 50 | 10.00 | 90.00 | 185.58 | 54.11 | 736.60 | 263.28 | 353.28 | 3404 |
| 51 | 9.50 | 95.00 | 190.75 | 55.81 | 756.31 | 268.66 | 363.66 | 3464 |
| 52 | 9.00 | 100.00 | 195.93 | 57.51 | 776.06 | 274.00 | 374.00 | 3525 |
| 53 | 8.50 | 105.00 | 201.12 | 59.22 | 795.85 | 279.31 | 384.31 | 9011 |

(continued)

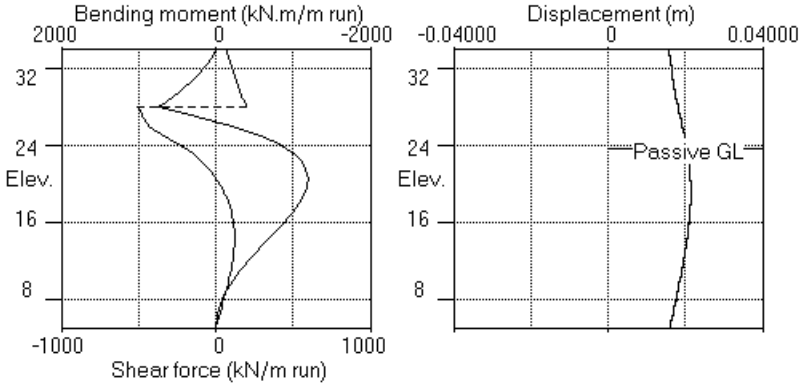
Stage No.10 Change properties of soil type 2 to soil type 4
Ko pressures will not be reset

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 54 | 8.00 | 110.00 | 206.32 | 60.93 | 815.69 | 284.58 | 394.58 | 9163 |
| 55 | 7.50 | 115.00 | 211.53 | 62.64 | 835.56 | 289.82 | 404.82 | 9316 |
| 56 | 7.00 | 120.00 | 216.76 | 64.35 | 855.48 | 295.03 | 415.03 | 9469 |
| 57 | 6.50 | 125.00 | 221.99 | 66.07 | 875.43 | 300.21 | 425.21 | 9621 |
| 58 | 6.00 | 130.00 | 227.23 | 67.80 | 895.43 | 305.36 | 435.36 | 9774 |
| 59 | 5.50 | 135.00 | 232.49 | 69.53 | 915.47 | 310.48 | 445.48 | 9927 |
| 60 | 5.00 | 140.00 | 237.75 | 71.26 | 935.55 | 315.58 | 455.58 | 10080 |

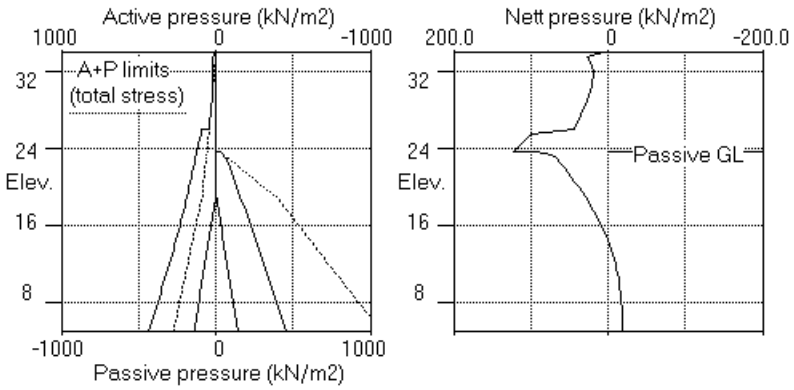
Note: 44.39a Soil pressure at active limit
55.54p Soil pressure at passive limit

Units: kN,m

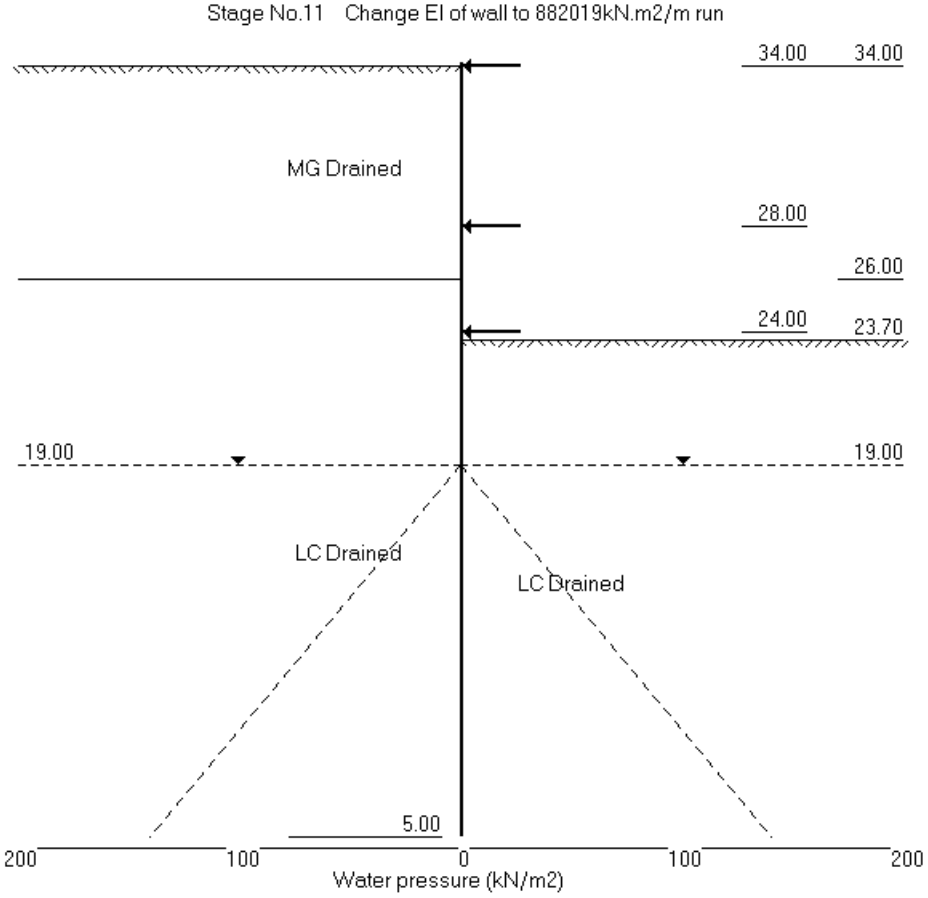
Stage No.10 Change soil type 2 to soil type 4




Stage No.10 Change soil type 2 to soil type 4



Units: kN,m


Stage No.11 Change EI of wall to 882019kN.m2/m run
34.00
34.00
MG Drained
28.00
26.00
24.00
23.70
19.00
19.00
LC Drained
LC Drained
5.00
200
100
0
100
200
Water pressure (kN/m2)

Units: kN,m

Stage No. 11 Change EI of wall to 882019 kN.m2/m run
Yield moment not defined
Allow wall to relax with new modulus value

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**
Factor of safety on soil strength

| Stage No. | --- G.L. --- Act. | Pass. | Strut Elev. | FoS for toe elev. = 5.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation |
|---|---|---|---|---|---|---|---|
| 11 | 34.00 | 23.70 | | More than one strut. No FoS calc. | | | |

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**
**Analysis options**
Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 50.00 from wall
**Limit State: Serviceability Limit State**
Calculated Bending Moments and Strut Forces are to be multiplied by a factor of 1.35 to obtain values for structural design. See summary for factored values.

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 6.14 | 0.016 | -3.81E-04 | -36.3 | -0.0 | 36.3 | 882019 |
| 2 | 33.50 | 26.24 | 0.016 | -3.77E-04 | -28.3 | 7.1 | | 882019 |
| 3 | 33.00 | 23.88 | 0.016 | -3.64E-04 | -15.7 | 19.8 | | 882019 |
| 4 | 32.50 | 21.53 | 0.016 | -3.48E-04 | -4.4 | 38.5 | | 882019 |
| 5 | 32.00 | 19.22 | 0.016 | -3.30E-04 | 5.8 | 62.6 | | 882019 |
| 6 | 31.50 | 18.76 | 0.017 | -3.14E-04 | 15.3 | 91.5 | | 882019 |
| 7 | 31.00 | 20.25 | 0.017 | -3.02E-04 | 25.1 | 125.1 | | 882019 |
| 8 | 30.50 | 21.73 | 0.017 | -2.97E-04 | 35.6 | 163.8 | | 882019 |
| 9 | 30.00 | 23.18 | 0.017 | -3.03E-04 | 46.8 | 207.9 | | 882019 |
| 10 | 29.50 | 24.79 | 0.017 | -3.21E-04 | 58.8 | 257.7 | | 882019 |
| 11 | 29.00 | 27.76 | 0.017 | -3.57E-04 | 71.9 | 313.7 | | 882019 |
| 12 | 28.50 | 30.71 | 0.017 | -4.13E-04 | 86.5 | 376.6 | | 882019 |
| 13 | 28.00 | 33.61 | 0.018 | -4.94E-04 | 102.6 | 447.1 | 213.6 | 882019 |
| | | 33.61 | 0.018 | -4.94E-04 | -111.0 | 447.1 | | |
| 14 | 27.50 | 36.45 | 0.018 | -5.73E-04 | -93.5 | 299.9 | | 882019 |
| 15 | 27.00 | 39.24 | 0.018 | -6.26E-04 | -74.6 | 161.7 | | 882019 |
| 16 | 26.50 | 42.00 | 0.019 | -6.58E-04 | -54.2 | 34.6 | | 882019 |
| 17 | 26.00 | 44.73 | 0.019 | -6.76E-04 | -32.6 | -83.4 | | 882019 |
| | | 93.10 | 0.019 | -6.76E-04 | -32.6 | -83.4 | | |
| 18 | 25.50 | 99.61 | 0.019 | -6.86E-04 | 15.6 | -183.8 | | 882019 |
| 19 | 25.00 | 106.02 | 0.020 | -7.00E-04 | 67.0 | -259.4 | | 882019 |
| 20 | 24.50 | 112.42 | 0.020 | -7.34E-04 | 121.6 | -308.5 | | 882019 |
| 21 | 24.00 | 118.71 | 0.020 | -8.03E-04 | 179.4 | -329.4 | 415.5 | 882019 |
| | | 118.71 | 0.020 | -8.03E-04 | -236.0 | -329.4 | | |
| 22 | 23.70 | 122.42 | 0.021 | -8.46E-04 | -199.9 | -393.6 | | 882019 |
| | | 93.57 | 0.021 | -8.46E-04 | -199.9 | -393.6 | | |
| 23 | 23.35 | 71.14 | 0.021 | -8.70E-04 | -171.0 | -456.7 | | 882019 |
| 24 | 23.00 | 64.36 | 0.021 | -8.71E-04 | -147.3 | -510.7 | | 882019 |

(continued)

Stage No.11 Change EI of wall to 882019 kN.m2/m run
Yield moment not defined
Allow wall to relax with new modulus value

| Node no. | Y coord | Nett pressure kN/m2 | Wall disp. m | Wall rotation rad. | Shear force kN/m | Bending moment kN.m/m | Strut forces kN/m | EI of wall kN.m2/m |
|---|---|---|---|---|---|---|---|---|
| 25 | 22.50 | 58.20 | 0.022 | -8.37E-04 | -116.7 | -573.8 | | 882019 |
| 26 | 22.00 | 52.06 | 0.022 | -7.70E-04 | -89.1 | -621.9 | | 882019 |
| 27 | 21.50 | 46.02 | 0.022 | -6.78E-04 | -64.6 | -656.3 | | 882019 |
| 28 | 21.00 | 40.15 | 0.023 | -5.68E-04 | -43.1 | -678.5 | | 882019 |
| 29 | 20.50 | 34.51 | 0.023 | -4.45E-04 | -24.4 | -689.6 | | 882019 |
| 30 | 20.00 | 29.16 | 0.023 | -3.15E-04 | -8.5 | -691.1 | | 882019 |
| 31 | 19.50 | 24.14 | 0.023 | -1.84E-04 | 4.8 | -684.2 | | 882019 |
| 32 | 19.00 | 19.47 | 0.023 | -5.34E-05 | 15.7 | -670.0 | | 882019 |
| 33 | 18.50 | 15.18 | 0.023 | 7.26E-05 | 24.4 | -649.6 | | 882019 |
| 34 | 18.00 | 11.29 | 0.023 | 1.91E-04 | 31.0 | -624.1 | | 882019 |
| 35 | 17.50 | 7.79 | 0.023 | 3.02E-04 | 35.8 | -594.4 | | 882019 |
| 36 | 17.00 | 4.68 | 0.023 | 4.02E-04 | 38.9 | -561.5 | | 882019 |
| 37 | 16.50 | 1.96 | 0.023 | 4.91E-04 | 40.6 | -526.1 | | 882019 |
| 38 | 16.00 | -0.39 | 0.022 | 5.69E-04 | 41.0 | -489.0 | | 882019 |
| 39 | 15.50 | -2.40 | 0.022 | 6.35E-04 | 40.3 | -450.9 | | 882019 |
| 40 | 15.00 | -4.08 | 0.022 | 6.89E-04 | 38.7 | -412.3 | | 882019 |
| 41 | 14.50 | -5.46 | 0.021 | 7.33E-04 | 36.3 | -373.9 | | 882019 |
| 42 | 14.00 | -6.56 | 0.021 | 7.67E-04 | 33.3 | -336.1 | | 882019 |
| 43 | 13.50 | -7.42 | 0.021 | 7.91E-04 | 29.8 | -299.3 | | 882019 |
| 44 | 13.00 | -8.06 | 0.020 | 8.06E-04 | 25.9 | -263.9 | | 882019 |
| 45 | 12.50 | -8.50 | 0.020 | 8.14E-04 | 21.8 | -230.2 | | 882019 |
| 46 | 12.00 | -8.63 | 0.020 | 8.16E-04 | 17.5 | -198.6 | | 882019 |
| 47 | 11.50 | -8.14 | 0.019 | 8.14E-04 | 13.3 | -169.1 | | 882019 |
| 48 | 11.00 | -7.54 | 0.019 | 8.07E-04 | 9.4 | -142.0 | | 882019 |
| 49 | 10.50 | -6.83 | 0.018 | 7.98E-04 | 5.8 | -117.3 | | 882019 |
| 50 | 10.00 | -6.04 | 0.018 | 7.87E-04 | 2.6 | -95.0 | | 882019 |
| 51 | 9.50 | -5.16 | 0.018 | 7.75E-04 | -0.2 | -75.3 | | 882019 |
| 52 | 9.00 | -4.21 | 0.017 | 7.64E-04 | -2.6 | -58.0 | | 882019 |
| 53 | 8.50 | -3.19 | 0.017 | 7.53E-04 | -4.4 | -43.1 | | 882019 |
| 54 | 8.00 | -2.09 | 0.016 | 7.43E-04 | -5.8 | -30.7 | | 882019 |
| 55 | 7.50 | -0.91 | 0.016 | 7.35E-04 | -6.5 | -20.5 | | 882019 |
| 56 | 7.00 | 0.36 | 0.016 | 7.29E-04 | -6.7 | -12.6 | | 882019 |
| 57 | 6.50 | 1.74 | 0.015 | 7.25E-04 | -6.1 | -6.7 | | 882019 |
| 58 | 6.00 | 3.23 | 0.015 | 7.23E-04 | -4.9 | -2.8 | | 882019 |
| 59 | 5.50 | 4.85 | 0.015 | 7.21E-04 | -2.9 | -0.6 | | 882019 |
| 60 | 5.00 | 6.60 | 0.014 | 7.21E-04 | 0.0 | -0.0 | | --- |

At elev. 34.00 Strut force = 36.3 kN/strut = 36.3 kN/m run
At elev. 28.00 Strut force = 213.6 kN/strut = 213.6 kN/m run
At elev. 24.00 Strut force = 415.5 kN/strut = 415.5 kN/m run

| Node no. | Y coord | ACTIVE side: Water press. kN/m2 | Effective stresses: Vertic -al kN/m2 | Active limit kN/m2 | Passive limit kN/m2 | Earth pressure kN/m2 | Total earth pressure kN/m2 | Coeff. of subgrade reaction kN/m3 |
|---|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 0.00 | 0.00 | 0.00 | 6.28 | 6.14 | 6.14 | 3128 |
| 2 | 33.50 | 0.00 | 9.50 | 1.54 | 47.50 | 26.24 | 26.24 | 3128 |
| 3 | 33.00 | 0.00 | 19.00 | 4.40 | 88.72 | 23.88 | 23.88 | 3128 |
| 4 | 32.50 | 0.00 | 28.50 | 7.25 | 129.95 | 21.53 | 21.53 | 3128 |
| 5 | 32.00 | 0.00 | 38.00 | 10.11 | 171.17 | 19.22 | 19.22 | 3128 |
| 6 | 31.50 | 0.00 | 47.50 | 12.97 | 212.39 | 18.76 | 18.76 | 3128 |
| 7 | 31.00 | 0.00 | 57.00 | 15.82 | 253.61 | 20.25 | 20.25 | 2195 |
| 8 | 30.50 | 0.00 | 66.50 | 18.68 | 294.83 | 21.73 | 21.73 | 2195 |
| 9 | 30.00 | 0.00 | 76.00 | 21.54 | 336.06 | 23.18 | 23.18 | 2195 |
| 10 | 29.50 | 0.00 | 85.50 | 24.39 | 377.28 | 24.79 | 24.79 | 2195 |

(continued)

Stage No.11 Change EI of wall to 882019 kN.m2/m run
Yield moment not defined
Allow wall to relax with new modulus value

| Node no. | Y coord | ACTIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 11 | 29.00 | 0.00 | 95.00 | 27.25 | 418.50 | 27.76 | 27.76 | 2195 |
| 12 | 28.50 | 0.00 | 104.50 | 30.11 | 459.72 | 30.71 | 30.71 | 2195 |
| 13 | 28.00 | 0.00 | 114.00 | 32.96 | 500.94 | 33.61 | 33.61 | 2195 |
| 14 | 27.50 | 0.00 | 123.50 | 35.82 | 542.17 | 36.45 | 36.45 | 2195 |
| 15 | 27.00 | 0.00 | 133.00 | 38.68 | 583.39 | 39.24 | 39.24 | 2195 |
| 16 | 26.50 | 0.00 | 142.50 | 41.53 | 624.61 | 42.00 | 42.00 | 2195 |
| 17 | 26.00 | 0.00 | 152.00 | 44.39 | 665.83 | 44.73 | 44.73 | 2195 |
| | | 0.00 | 152.00 | 43.07 | 608.52 | 93.10 | 93.10 | 3011 |
| 18 | 25.50 | 0.00 | 162.00 | 46.36 | 646.65 | 99.61 | 99.61 | 3136 |
| 19 | 25.00 | 0.00 | 172.00 | 49.65 | 684.79 | 106.02 | 106.02 | 3262 |
| 20 | 24.50 | 0.00 | 182.00 | 52.93 | 722.93 | 112.42 | 112.42 | 2257 |
| 21 | 24.00 | 0.00 | 192.00 | 56.22 | 761.06 | 118.71 | 118.71 | 2341 |
| 22 | 23.70 | 0.00 | 198.00 | 58.19 | 783.94 | 122.42 | 122.42 | 2391 |
| 23 | 23.35 | 0.00 | 205.00 | 60.49 | 810.64 | 126.68 | 126.68 | 2449 |
| 24 | 23.00 | 0.00 | 212.00 | 62.79 | 837.34 | 130.90 | 130.90 | 2508 |
| 25 | 22.50 | 0.00 | 222.00 | 66.08 | 875.47 | 136.90 | 136.90 | 2591 |
| 26 | 22.00 | 0.00 | 232.00 | 69.36 | 913.61 | 142.91 | 142.91 | 2675 |
| 27 | 21.50 | 0.00 | 242.00 | 72.65 | 951.74 | 148.99 | 148.99 | 2758 |
| 28 | 21.00 | 0.00 | 252.00 | 75.94 | 989.88 | 155.17 | 155.17 | 2842 |
| 29 | 20.50 | 0.00 | 262.00 | 79.22 | 1028.02 | 161.50 | 161.50 | 2926 |
| 30 | 20.00 | 0.00 | 272.00 | 82.51 | 1066.15 | 168.01 | 168.01 | 3009 |
| 31 | 19.50 | 0.00 | 282.00 | 85.80 | 1104.29 | 174.73 | 174.73 | 3093 |
| 32 | 19.00 | 0.00 | 292.00 | 89.08 | 1142.43 | 181.67 | 181.67 | 3176 |
| 33 | 18.50 | 5.00 | 297.00 | 90.73 | 1161.49 | 183.84 | 188.84 | 3260 |
| 34 | 18.00 | 10.00 | 302.00 | 92.37 | 1180.56 | 186.27 | 196.27 | 3344 |
| 35 | 17.50 | 15.00 | 307.00 | 94.01 | 1199.63 | 188.94 | 203.94 | 3427 |
| 36 | 17.00 | 20.00 | 312.00 | 95.66 | 1218.70 | 191.86 | 211.86 | 3511 |
| 37 | 16.50 | 25.00 | 317.00 | 97.30 | 1237.77 | 195.02 | 220.02 | 3594 |
| 38 | 16.00 | 30.00 | 322.00 | 98.94 | 1256.84 | 198.42 | 228.42 | 3678 |
| 39 | 15.50 | 35.00 | 327.00 | 100.59 | 1275.90 | 202.04 | 237.04 | 3762 |
| 40 | 15.00 | 40.00 | 332.00 | 102.23 | 1294.97 | 205.88 | 245.88 | 3845 |
| 41 | 14.50 | 45.00 | 337.00 | 103.87 | 1314.04 | 209.90 | 254.90 | 3929 |
| 42 | 14.00 | 50.00 | 342.00 | 105.52 | 1333.11 | 214.11 | 264.11 | 4012 |
| 43 | 13.50 | 55.00 | 347.00 | 107.16 | 1352.18 | 218.49 | 273.49 | 4096 |
| 44 | 13.00 | 60.00 | 352.00 | 108.80 | 1371.24 | 223.01 | 283.01 | 4180 |
| 45 | 12.50 | 65.00 | 357.00 | 110.45 | 1390.31 | 227.66 | 292.66 | 4263 |
| 46 | 12.00 | 70.00 | 362.00 | 112.09 | 1409.38 | 232.51 | 302.51 | 6105 |
| 47 | 11.50 | 75.00 | 367.00 | 113.73 | 1428.45 | 237.71 | 312.71 | 6223 |
| 48 | 11.00 | 80.00 | 372.00 | 115.38 | 1447.52 | 243.00 | 323.00 | 6340 |
| 49 | 10.50 | 85.00 | 377.00 | 117.02 | 1466.59 | 248.37 | 333.37 | 6458 |
| 50 | 10.00 | 90.00 | 382.00 | 118.66 | 1485.65 | 253.81 | 343.81 | 6575 |
| 51 | 9.50 | 95.00 | 387.00 | 120.31 | 1504.72 | 259.31 | 354.31 | 6692 |
| 52 | 9.00 | 100.00 | 392.00 | 121.95 | 1523.79 | 264.87 | 364.87 | 6810 |
| 53 | 8.50 | 105.00 | 397.00 | 123.59 | 1542.86 | 270.48 | 375.48 | 6927 |
| 54 | 8.00 | 110.00 | 402.00 | 125.23 | 1561.93 | 276.16 | 386.16 | 7045 |
| 55 | 7.50 | 115.00 | 407.00 | 126.88 | 1580.99 | 281.90 | 396.90 | 7162 |
| 56 | 7.00 | 120.00 | 412.00 | 128.52 | 1600.06 | 287.71 | 407.71 | 7280 |
| 57 | 6.50 | 125.00 | 417.00 | 130.16 | 1619.13 | 293.60 | 418.60 | 7397 |
| 58 | 6.00 | 130.00 | 422.00 | 131.81 | 1638.20 | 299.56 | 429.56 | 7514 |
| 59 | 5.50 | 135.00 | 427.00 | 133.45 | 1657.27 | 305.60 | 440.60 | 7632 |
| 60 | 5.00 | 140.00 | 432.00 | 135.09 | 1676.34 | 311.74 | 451.74 | 7749 |

(continued)

Stage No.11 Change EI of wall to 882019 kN.m2/m run
Yield moment not defined
Allow wall to relax with new modulus value

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 1 | 34.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 2 | 33.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 3 | 33.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 4 | 32.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 5 | 32.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 6 | 31.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 7 | 31.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 8 | 30.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 9 | 30.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 10 | 29.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 11 | 29.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 12 | 28.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 13 | 28.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 14 | 27.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 15 | 27.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 16 | 26.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 17 | 26.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 18 | 25.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 19 | 25.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 20 | 24.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 21 | 24.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| 22 | 23.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | 0.00 | 0.00 | 0.00 | 28.84 | 28.84 | 28.84p | 1656 |
| 23 | 23.35 | 0.00 | 7.00 | 0.00 | 55.54 | 55.54 | 55.54p | 1696 |
| 24 | 23.00 | 0.00 | 14.00 | 0.00 | 82.24 | 66.54 | 66.54 | 1737 |
| 25 | 22.50 | 0.00 | 24.00 | 1.01 | 120.38 | 78.70 | 78.70 | 1794 |
| 26 | 22.00 | 0.00 | 34.00 | 4.29 | 158.52 | 90.85 | 90.85 | 1852 |
| 27 | 21.50 | 0.00 | 44.01 | 7.58 | 196.67 | 102.97 | 102.97 | 1910 |
| 28 | 21.00 | 0.00 | 54.01 | 10.87 | 234.83 | 115.02 | 115.02 | 1968 |
| 29 | 20.50 | 0.00 | 64.02 | 14.16 | 273.00 | 126.99 | 126.99 | 2026 |
| 30 | 20.00 | 0.00 | 74.03 | 17.45 | 311.18 | 138.85 | 138.85 | 2084 |
| 31 | 19.50 | 0.00 | 84.05 | 20.74 | 349.38 | 150.59 | 150.59 | 2142 |
| 32 | 19.00 | 0.00 | 94.07 | 24.03 | 387.59 | 162.20 | 162.20 | 2200 |
| 33 | 18.50 | 5.00 | 99.09 | 25.68 | 406.75 | 168.66 | 173.66 | 2258 |
| 34 | 18.00 | 10.00 | 104.12 | 27.34 | 425.93 | 174.98 | 184.98 | 2315 |
| 35 | 17.50 | 15.00 | 109.16 | 28.99 | 445.13 | 181.15 | 196.15 | 2373 |
| 36 | 17.00 | 20.00 | 114.20 | 30.65 | 464.35 | 187.17 | 207.17 | 2431 |
| 37 | 16.50 | 25.00 | 119.24 | 32.31 | 483.60 | 193.06 | 218.06 | 2489 |
| 38 | 16.00 | 30.00 | 124.30 | 33.97 | 502.87 | 198.81 | 228.81 | 2547 |
| 39 | 15.50 | 35.00 | 129.36 | 35.63 | 522.17 | 204.44 | 239.44 | 2605 |
| 40 | 15.00 | 40.00 | 134.43 | 37.30 | 541.50 | 209.96 | 249.96 | 2663 |
| 41 | 14.50 | 45.00 | 139.50 | 38.97 | 560.86 | 215.36 | 260.36 | 2721 |
| 42 | 14.00 | 50.00 | 144.59 | 40.64 | 580.25 | 220.68 | 270.68 | 2778 |
| 43 | 13.50 | 55.00 | 149.68 | 42.31 | 599.67 | 225.91 | 280.91 | 2836 |
| 44 | 13.00 | 60.00 | 154.78 | 43.99 | 619.12 | 231.06 | 291.06 | 2894 |
| 45 | 12.50 | 65.00 | 159.89 | 45.67 | 638.61 | 236.16 | 301.16 | 2952 |
| 46 | 12.00 | 70.00 | 165.01 | 47.35 | 658.13 | 241.14 | 311.14 | 4527 |
| 47 | 11.50 | 75.00 | 170.14 | 49.03 | 677.69 | 245.86 | 320.86 | 4614 |
| 48 | 11.00 | 80.00 | 175.28 | 50.72 | 697.29 | 250.54 | 330.54 | 4701 |
| 49 | 10.50 | 85.00 | 180.43 | 52.41 | 716.92 | 255.20 | 340.20 | 4789 |
| 50 | 10.00 | 90.00 | 185.58 | 54.11 | 736.60 | 259.84 | 349.84 | 4876 |
| 51 | 9.50 | 95.00 | 190.75 | 55.81 | 756.31 | 264.47 | 359.47 | 4963 |
| 52 | 9.00 | 100.00 | 195.93 | 57.51 | 776.06 | 269.08 | 369.08 | 5050 |

(continued)

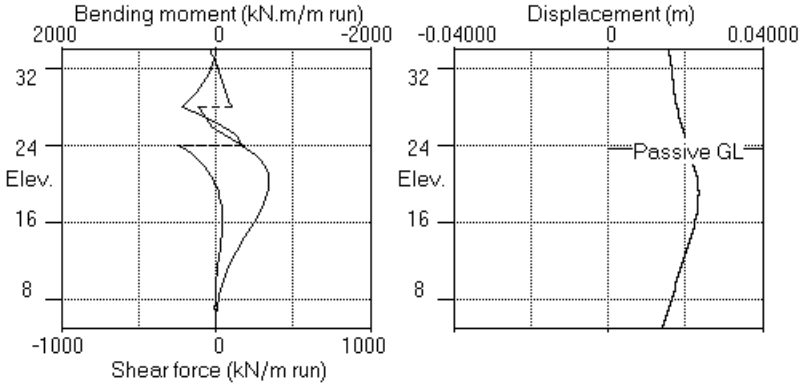
Stage No.11 Change EI of wall to 882019 kN.m2/m run
Yield moment not defined
Allow wall to relax with new modulus value

| Node no. | Y coord | PASSIVE side | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Effective stresses | | | | | Total earth pressure | Coeff. of subgrade reaction |
| | | Water press. | Vertic -al | Active limit | Passive limit | Earth pressure | | |
| | | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m2 | kN/m3 |
| 53 | 8.50 | 105.00 | 201.12 | 59.22 | 795.85 | 273.68 | 378.68 | 5137 |
| 54 | 8.00 | 110.00 | 206.32 | 60.93 | 815.69 | 278.26 | 388.26 | 5224 |
| 55 | 7.50 | 115.00 | 211.53 | 62.64 | 835.56 | 282.82 | 397.82 | 5311 |
| 56 | 7.00 | 120.00 | 216.76 | 64.35 | 855.48 | 287.35 | 407.35 | 5398 |
| 57 | 6.50 | 125.00 | 221.99 | 66.07 | 875.43 | 291.85 | 416.85 | 5485 |
| 58 | 6.00 | 130.00 | 227.23 | 67.80 | 895.43 | 296.32 | 426.32 | 5572 |
| 59 | 5.50 | 135.00 | 232.49 | 69.53 | 915.47 | 300.75 | 435.75 | 5659 |
| 60 | 5.00 | 140.00 | 237.75 | 71.26 | 935.55 | 305.14 | 445.14 | 5746 |

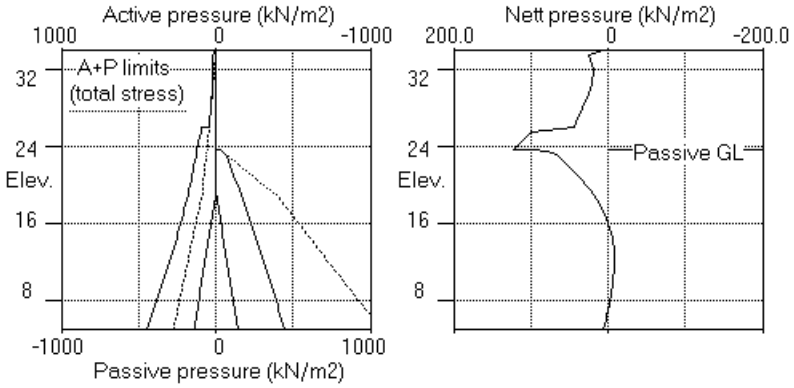
Note: 12.34a Soil pressure at active limit
55.54p Soil pressure at passive limit

Units: kN,m

Stage No.11 Change EI of wall to 882019kN.m2/m run




Stage No.11 Change EI of wall to 882019kN.m2/m run



Units: kN,m

**Summary of results**

**LIMIT STATE PARAMETERS**

Limit State: Serviceability Limit State
All loads and soil strengths are unfactored

**STABILITY ANALYSIS of Fully Embedded Wall according to Strength Factor method**

Factor of safety on soil strength

| Stage No. | --- G.L. --- Act. | Pass. | Strut Elev. | FoS for toe elev. = 5.00 Factor of Safety | Moment equilib. at elev. | Toe elev. for FoS = 1.000 Toe elev. | Wall Penetr -ation |
|---|---|---|---|---|---|---|---|
| 1 | 34.00 | 30.50 | Cant. | 4.928 | 7.49 | 28.66 | 1.84 |
| 2 | 34.00 | 30.50 | | No analysis at this stage | | | |
| 3 | 34.00 | 27.50 | 31.00 | 4.908 | n/a | 27.00 | 0.50 |
| 4 | 34.00 | 27.50 | | No analysis at this stage | | | |

All remaining stages have more than one strut - FoS calculation n/a

Units: kN,m

**Summary of results**

**BENDING MOMENT and DISPLACEMENT ANALYSIS of Fully Embedded Wall**

**Analysis options**

Length of wall perpendicular to section = 1000.00m
Subgrade reaction model - Boussinesq Influence coefficients
Soil deformations are elastic until the active or passive limit is reached
Open Tension Crack analysis - No

Rigid boundaries: Active side 20.00 from wall
Passive side 50.00 from wall

**Limit State: Serviceability Limit State**

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

**Bending moment, shear force and displacement envelopes**

| Node no. | Y coord | Displacement | | Bending moment Calculated | | Bending moment Factored | | Shear force Calculated | | Shear force Factored | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. |
| | | m | m | kN.m/m | | kN.m/m | | kN/m | kN/m | kN/m | kN/m |
| 1 | 34.00 | 0.019 | 0.000 | 0 | -0 | 0 | -0 | 61 | -36 | 82 | -49 |
| 2 | 33.50 | 0.019 | 0.000 | 32 | 0 | 44 | 0 | 70 | -28 | 94 | -38 |
| 3 | 33.00 | 0.019 | 0.000 | 70 | 0 | 95 | 0 | 82 | -16 | 111 | -21 |
| 4 | 32.50 | 0.018 | 0.000 | 114 | 0 | 154 | 0 | 94 | -4 | 127 | -6 |
| 5 | 32.00 | 0.018 | 0.000 | 164 | 0 | 222 | 0 | 104 | 0 | 141 | 0 |
| 6 | 31.50 | 0.018 | 0.000 | 219 | 0 | 295 | 0 | 114 | 0 | 154 | 0 |
| 7 | 31.00 | 0.018 | 0.000 | 278 | 0 | 376 | 0 | 190 | -179 | 257 | -241 |
| 8 | 30.50 | 0.018 | 0.000 | 343 | -21 | 462 | -28 | 201 | -170 | 271 | -230 |
| 9 | 30.00 | 0.018 | 0.000 | 412 | -104 | 557 | -140 | 212 | -161 | 286 | -217 |
| 10 | 29.50 | 0.018 | 0.000 | 488 | -182 | 658 | -245 | 223 | -150 | 302 | -203 |
| 11 | 29.00 | 0.018 | 0.000 | 569 | -254 | 769 | -343 | 236 | -139 | 318 | -187 |
| 12 | 28.50 | 0.018 | 0.000 | 657 | -320 | 887 | -432 | 249 | -125 | 336 | -169 |
| 13 | 28.00 | 0.018 | 0.000 | 783 | -379 | 1056 | -512 | 263 | -510 | 355 | -688 |
| 14 | 27.50 | 0.018 | 0.000 | 532 | -431 | 719 | -582 | 33 | -493 | 45 | -665 |
| 15 | 27.00 | 0.019 | 0.000 | 290 | -475 | 392 | -641 | 38 | -476 | 51 | -642 |
| 16 | 26.50 | 0.019 | 0.000 | 157 | -510 | 212 | -688 | 42 | -458 | 57 | -618 |
| 17 | 26.00 | 0.019 | 0.000 | 179 | -538 | 242 | -726 | 47 | -438 | 64 | -591 |
| 18 | 25.50 | 0.019 | 0.000 | 202 | -558 | 273 | -753 | 45 | -390 | 61 | -526 |
| 19 | 25.00 | 0.020 | 0.000 | 224 | -578 | 303 | -780 | 67 | -338 | 90 | -457 |
| 20 | 24.50 | 0.020 | 0.000 | 245 | -731 | 331 | -987 | 122 | -284 | 164 | -383 |
| 21 | 24.00 | 0.020 | 0.000 | 265 | -857 | 357 | -1156 | 179 | -236 | 242 | -319 |
| 22 | 23.70 | 0.021 | 0.000 | 275 | -918 | 372 | -1240 | 35 | -200 | 47 | -270 |
| 23 | 23.35 | 0.021 | 0.000 | 287 | -980 | 388 | -1322 | 33 | -171 | 44 | -231 |
| 24 | 23.00 | 0.021 | 0.000 | 298 | -1032 | 403 | -1393 | 30 | -147 | 41 | -199 |
| 25 | 22.50 | 0.022 | 0.000 | 312 | -1092 | 422 | -1475 | 35 | -117 | 47 | -158 |
| 26 | 22.00 | 0.022 | 0.000 | 324 | -1137 | 438 | -1535 | 41 | -89 | 56 | -120 |
| 27 | 21.50 | 0.022 | 0.000 | 334 | -1168 | 452 | -1576 | 47 | -65 | 63 | -87 |
| 28 | 21.00 | 0.023 | 0.000 | 343 | -1185 | 462 | -1600 | 51 | -43 | 69 | -58 |
| 29 | 20.50 | 0.023 | 0.000 | 349 | -1191 | 471 | -1607 | 55 | -24 | 74 | -33 |
| 30 | 20.00 | 0.023 | 0.000 | 352 | -1185 | 476 | -1600 | 57 | -8 | 77 | -11 |
| 31 | 19.50 | 0.023 | 0.000 | 354 | -1170 | 478 | -1580 | 59 | 0 | 79 | 0 |
| 32 | 19.00 | 0.023 | 0.000 | 354 | -1146 | 478 | -1548 | 60 | -2 | 81 | -3 |
| 33 | 18.50 | 0.023 | 0.000 | 352 | -1115 | 475 | -1506 | 69 | -6 | 93 | -8 |
| 34 | 18.00 | 0.023 | 0.000 | 348 | -1077 | 470 | -1455 | 81 | -10 | 110 | -13 |
| 35 | 17.50 | 0.023 | 0.000 | 342 | -1034 | 462 | -1396 | 92 | -13 | 124 | -18 |
| 36 | 17.00 | 0.023 | 0.000 | 335 | -986 | 452 | -1331 | 100 | -17 | 135 | -23 |
| 37 | 16.50 | 0.023 | 0.000 | 326 | -934 | 440 | -1261 | 107 | -20 | 144 | -27 |
| 38 | 16.00 | 0.022 | 0.000 | 315 | -879 | 425 | -1187 | 112 | -23 | 151 | -31 |
| 39 | 15.50 | 0.022 | 0.000 | 303 | -822 | 409 | -1110 | 116 | -26 | 156 | -35 |
| 40 | 15.00 | 0.022 | 0.000 | 289 | -763 | 391 | -1030 | 118 | -28 | 160 | -38 |

**Bending moment, shear force and displacement envelopes**

| Node no. | Y coord | Displacement | | Bending moment Calculated | | Bending moment Factored | | Shear force Calculated | | Shear force Factored | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | max. | min. | max. | min. | max. | min. | max. | min. | max. | min. |
| | | m | m | kN.m/m | | kN.m/m | | kN/m | kN/m | kN/m | kN/m |
| 41 | 14.50 | 0.021 | 0.000 | 275 | -704 | 371 | -950 | 119 | -30 | 161 | -41 |
| 42 | 14.00 | 0.021 | 0.000 | 259 | -644 | 349 | -869 | 119 | -32 | 161 | -44 |
| 43 | 13.50 | 0.021 | 0.000 | 242 | -585 | 327 | -789 | 118 | -34 | 159 | -46 |
| 44 | 13.00 | 0.020 | 0.000 | 225 | -526 | 304 | -710 | 116 | -35 | 156 | -48 |
| 45 | 12.50 | 0.020 | 0.000 | 207 | -469 | 279 | -633 | 112 | -36 | 152 | -49 |
| 46 | 12.00 | 0.020 | 0.000 | 188 | -414 | 254 | -559 | 108 | -37 | 146 | -50 |
| 47 | 11.50 | 0.019 | 0.000 | 170 | -361 | 229 | -487 | 103 | -37 | 139 | -51 |
| 48 | 11.00 | 0.019 | 0.000 | 151 | -311 | 204 | -419 | 98 | -37 | 132 | -50 |
| 49 | 10.50 | 0.019 | 0.000 | 132 | -263 | 179 | -356 | 91 | -37 | 123 | -50 |
| 50 | 10.00 | 0.019 | 0.000 | 114 | -219 | 154 | -296 | 85 | -36 | 114 | -49 |
| 51 | 9.50 | 0.018 | 0.000 | 96 | -179 | 130 | -241 | 77 | -35 | 104 | -47 |
| 52 | 9.00 | 0.018 | 0.000 | 79 | -142 | 107 | -192 | 70 | -33 | 94 | -45 |
| 53 | 8.50 | 0.018 | 0.000 | 63 | -109 | 85 | -147 | 62 | -31 | 83 | -42 |
| 54 | 8.00 | 0.018 | 0.000 | 48 | -81 | 65 | -109 | 53 | -28 | 72 | -38 |
| 55 | 7.50 | 0.017 | 0.000 | 35 | -56 | 47 | -76 | 45 | -25 | 60 | -34 |
| 56 | 7.00 | 0.017 | 0.000 | 23 | -36 | 31 | -48 | 36 | -21 | 48 | -29 |
| 57 | 6.50 | 0.017 | 0.000 | 14 | -20 | 18 | -27 | 27 | -17 | 36 | -23 |
| 58 | 6.00 | 0.017 | 0.000 | 6 | -9 | 9 | -12 | 18 | -12 | 24 | -16 |
| 59 | 5.50 | 0.016 | 0.000 | 2 | -2 | 2 | -3 | 9 | -6 | 12 | -9 |
| 60 | 5.00 | 0.016 | 0.000 | 0 | -0 | 0 | -0 | 0 | 0 | 0 | 0 |

**Maximum and minimum bending moment and shear force at each stage**

| Stage no. | Bending moment Calculated max. | elev. | min. | elev. | Bending moment Factored max. | min. | Shear force Calculated max. | elev. | min. | elev. | Shear force Factored max. | min. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | kN.m/m | | kN.m/m | | kN.m/m | | kN/m | | kN/m | | kN/m | kN/m |
| 1 | 354 | 19.50 | -0 | 34.00 | 478 | -0 | 47 | 26.00 | -37 | 11.50 | 64 | -51 |
| 2 | No calculation at this stage | | | | | | | | | | | |
| 3 | 67 | 31.00 | -575 | 24.50 | 90 | -776 | 60 | 18.50 | -179 | 31.00 | 81 | -241 |
| 4 | No calculation at this stage | | | | | | | | | | | |
| 5 | 783 | 28.00 | -1178 | 20.50 | 1056 | -1591 | 263 | 28.00 | -508 | 28.00 | 355 | -686 |
| 6 | No calculation at this stage | | | | | | | | | | | |
| 7 | No calculation at this stage | | | | | | | | | | | |
| 8 | 752 | 28.00 | -1190 | 20.50 | 1015 | -1607 | 197 | 28.00 | -506 | 28.00 | 266 | -682 |
| 9 | No calculation at this stage | | | | | | | | | | | |
| 10 | 750 | 28.00 | -1191 | 20.50 | 1013 | -1607 | 199 | 28.00 | -510 | 28.00 | 269 | -688 |
| 11 | 447 | 28.00 | -691 | 20.00 | 604 | -933 | 179 | 24.00 | -236 | 24.00 | 242 | -319 |

**Maximum and minimum displacement at each stage**

| Stage no. | Displacement maximum | elev. | minimum | elev. | Stage description |
|---|---|---|---|---|---|
| | m | | m | | |
| 1 | 0.019 | 34.00 | 0.000 | 34.00 | Excav. to elev. 30.50 on PASSIVE side |
| 2 | No calculation at this stage | | | | Install strut no.1 at elev. 31.00 |
| 3 | 0.018 | 34.00 | 0.000 | 34.00 | Excav. to elev. 27.50 on PASSIVE side |
| 4 | No calculation at this stage | | | | Install strut no.2 at elev. 28.00 |
| 5 | 0.021 | 19.00 | 0.000 | 34.00 | Excav. to elev. 23.70 on PASSIVE side |
| 6 | No calculation at this stage | | | | Install strut no.3 at elev. 24.00 |
| 7 | No calculation at this stage | | | | Install strut no.4 at elev. 34.00 |
| 8 | 0.021 | 19.00 | 0.000 | 34.00 | Remove strut no.1 at elev. 31.00 |
| 9 | No calculation at this stage | | | | Change soil type 1 to soil type 3 |
| 10 | 0.021 | 19.00 | 0.000 | 34.00 | Change soil type 2 to soil type 4 |
| 11 | 0.023 | 19.00 | 0.000 | 34.00 | Change EI of wall to 882019kN.m2/m run |

**Summary of results (continued)**

Calculated Bending Moments and Strut Forces have been multiplied by a factor of 1.35 to obtain values for structural design.

**Strut forces at each stage (horizontal components)**

| Stage no. | Strut no. 1 at elev. 31.00 | | | Strut no. 2 at elev. 28.00 | | | Strut no. 3 at elev. 24.00 | | |
|---|---|---|---|---|---|---|---|---|---|
| | --Calculated-- kN per m run | kN per strut | Factored kN per strut | --Calculated-- kN per m run | kN per strut | Factored kN per strut | --Calculated-- kN per m run | kN per strut | Factored kN per strut |
| 3 | 220 | 1102 | 1488 | --- | --- | --- | --- | --- | --- |
| 5 | -124 | -618 | -834 | 771 | 771 | 1041 | --- | --- | --- |
| 8 | --- | --- | --- | 702 | 702 | 948 | 1 | 1 | 1 |
| 10 | --- | --- | --- | 709 | 709 | 957 | 7 | 7 | 10 |
| 11 | --- | --- | --- | 214 | 214 | 288 | 415 | 415 | 561 |

| Stage no. | Strut no. 4 at elev. 34.00 | | |
|---|---|---|---|
| | --Calculated-- kN per m run | kN per strut | Factored kN per strut |
| 8 | -56 | -56 | -76 |
| 10 | -61 | -61 | -82 |
| 11 | 36 | 36 | 49 |

Units: kN,m

Bending moment, shear force, displacement envelopes