R.C. CANTILEVER RETAINING WALL
Input
Data

Enter the file name in which you want to store the design: ret1
Enter height of soil retained(m): 5.5
Enter depth of foundation(m): 2.0
Enter slope of backfill(degrees): 20.0
Types of backfill:
1: Coarse-grained soil without
fines, very permeable, like clean sand or gravel
2: Coarse-grained soil with fines of low permeability
3: Fine silty sand,granular soil with clay, or residual soil with stones
4: Very soft or soft clay, organic silt or silty clay
Enter type of backfill: 2
Enter unit weight of soil(kN/m3): 18.0
Enter (presumptive) allowable soil pressure (kN/m2): 200.0
Enter coefficient of base friction: 0.5
If water table is above G.L., use negative sign
Enter depth of water table from G.L.(m): -2.0
Enter rate of increase of stem width per metre depth(m): 0.04
Enter steps of iteration on B(mm): 100

Output
Design

Height of soil retained(m): 5.50
Depth of foundation: 2.00
Slope of backfill(degrees): 20.00
Type of backfill: 2
Unit weight of soil(kN/m3): 18.00
Allowable soil pressure(kN/m2): 200.00
Coefficient of base friction: 0.50
Depth of water table from G.L.(m): -2.00
Rate of increase of stem width per metre depth(m): 0.040
Steps of iteration on B(mm): 100
Trial breadth of foundation(m)= 7.40
Final breadth of foundation(m): 7.40 No. of iterations: 1
Factor of safety against overturning: 2.43
Maximum soil pressure at the base(kN/m2): 113.56
Minimum soil pressure at the base(kN/m2): 75.20
Factor of safety against sliding: 1.51
Governing aspect: Sliding

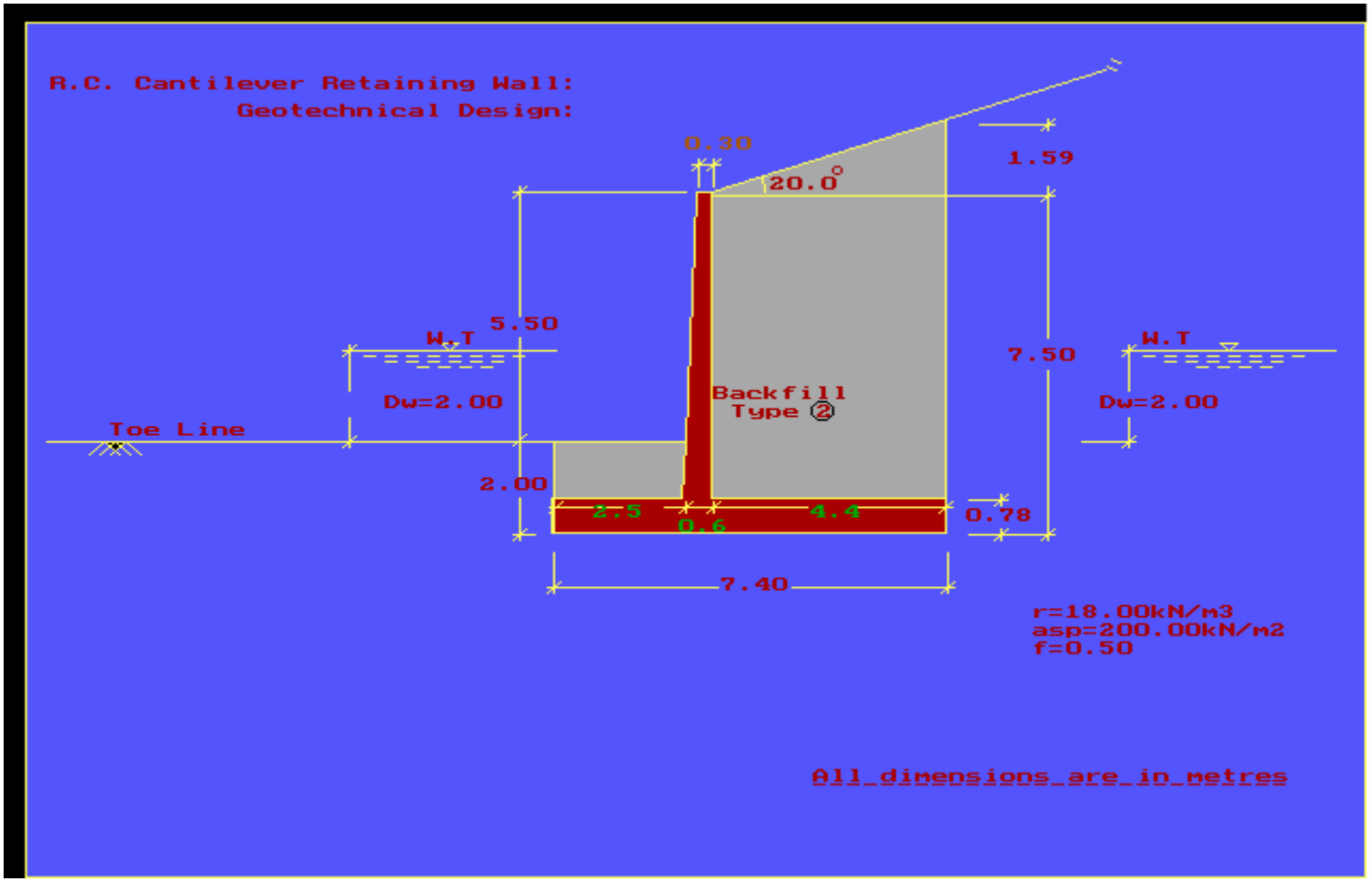
R.C. Cantilever Retaining Wall:
Geotechnical Design:
0.30
1.59
20.0°
5.50
W.T
7.50
W.T
Dw=2.00
Backfill
Type ②
Dw=2.00
Toe Line
2.00
2.5
0.6
4.4
0.78
7.40
r=18.00kN/m3
asp=200.00kN/m2
f=0.50
All dimensions are in metres

Fig.7.1

CANTILEVER SHEETPILE WALL

Input

Data

Enter the file name in which you want to store the design: she1
Enter height of soil retained(m): 6.0
If water table is above dredgeline use negative sign
Enter depth of water table(m): 10.0
If water table is within a layer,consider the thicknesses above and below as two layers
How many layers are there above dredgeline: 2
Enter factor of safety for passive resistance: 2.0
Enter thickness of layer 1(m): 3.0
Enter cohesion(kN/m2) and angle of internal friction(degrees) of layer 1: 0.0 30.0
Enter submerged unit weight of soil, if soil is below water table
Enter unit weight of soil in layer 1 (kN/m3): 17.5
Enter thickness of layer 2(m): 3.0
Enter cohesion(kN/m2) and angle of internal friction(degrees) of layer 2: 10.0 30.0
Enter submerged unit weight of soil, if soil is below water table
Enter unit weight of soil in layer 2 (kN/m3): 16.5
Enter thickness of soil layer below dredgeline(m): 10.0
Enter submerged unit weight of soil, if soil is below water table
Enter unit weight of soil below dredgeline(kN/m3): 18.0
Enter cohesion(kN/m2) and angle of internal friction(degrees) below dedgeline: 0.0 30.0
Your results are stored in the file 'she1'

Output

Design

Height of soil retained(m): 6.00
Depth of water table(m): 10.00
Number of layers above dredgeline: 2
Factor of safety for passive resistance: 2.00
Data for layer 1:
    Thickness of layer(m): 3.00
    Cohesion(kN/m2) : 0.00
    Angle of internal friction(degrees): 30.00
    Submerged unit weight of soil, if soil is below water table
    Unit weight of soil in layer 1 (kN/m3): 17.50
Data for layer 2:
    Thickness of layer(m): 3.00
    Cohesion(kN/m2) : 10.00
    Angle of internal friction(degrees): 30.00
    Submerged unit weight of soil, if soil is below water table
    Unit weight of soil in layer 2 (kN/m3): 16.50
Data of soil layer below dredgeline:
    Thickness(m): 10.00
    Unit weight(kN/m3): 18.00

Cohesion(kN/m2): 0.00

Angle of internal friction(degrees): 30.00
Value of n(m): 1.62
Value of f(m): 3.35
Value of d(m): 7.86
Total depth of penetration(m): 9.48
Total length of sheetpile(m): 15.48

ANCHORED BULKHEAD – FREE EARTH SUPPORT
Input
Data

Enter the file name in which you want to store the design: anc2
Enter height of soil retained(m): 5.5
If water table is above dredgeline use negative sign
Enter depth of water table(m): 10.0
If water table is within a layer, consider the thicknesses above and below as two layers
How many layers are there above dredgeline: 1
Enter factor of safety against passive resistance: 2.0
Enter depth of anchor from G.L(m): 1.2
Enter thickness of layer 1(m): 5.5
Enter cohesion(kN/m2) and angle of internal friction(degrees) of layer 1: 0.0 30.0
Enter submerged unit weight of soil, if soil is below water table
Enter unit weight of soil of layer 1(kN/m3): 16.5
How many layers are there below dredgeline: 2
Enter thickness of layer 1 below dredgeline(m): 1.5
Enter cohesion(kN/m2) and angle of internal friction(degrees) of layer 1: 0.0 30.0
Enter submerged unit weight of soil, if soil is below water table
Enter unit weight of soil of layer 1(kN/m3): 18.0
Enter thickness of layer 2 below dredgeline(m): 8.5
Enter cohesion(kN/m2) and angle of internal friction(degrees) of layer 2: 4.0 12.0
Enter submerged unit weight of soil, if soil is below water table
Enter unit weight of soil of layer 2(kN/m3): 15.0
Data stored in the file 'anc2'

Output
Design

Height of soil retained above dredgeline(m): 5.50
Depth of water table(m): 10.00
Number of layers above dredgeline: 1
Factor of safety against passive resistance: 2.00
Depth of anchor from G.L(m): 1.20
Data of layer 1:
Thickness of layer(m): 5.50
Cohesion(kN/m2): 0.00
Angle of internal friction(degrees): 30.00

Submerged unit weight of soil, if soil is below water table
Unit weight of soil of layer 1(kN/m3): 16.50
Number of layers below dredgeline: 2
Data of soil below dredgeline:
Number of layers:2
Data of layer 1:
Thickness of layer(m): 1.50
Cohesion(kN/m2): 0.00
Angle of internal friction(degrees): 30.00
Submerged unit weight of soil, if soil is below water table
Unit weight of soil(kN/m3): 18.00
Data of layer 2:
Thickness of layer(m): 8.50
Cohesion(kN/m2): 4.00
Angle of internal friction(degrees): 12.00
Submerged unit weight of soil, if soil is below water table
Unit weight of soil(kN/m3): 15.00
Value of n(m): 1.44
Value of d(m): 3.35
Total depth of penetration(m): 4.79
Total length of sheetpile(m): 10.29
Tension in the anchor(kN/m): 57.11

ANCHORED BULKHEAD – FIXED EARTH SUPPORT – *Equivalent Beam Method*
Input
Data

Enter the file name in which you want to store the design: anc6
Enter height of soil retained(m): 5.5
If water table is above dredgeline use negative sign
Enter depth of water table(m): 4.0
Enter depth of anchor from G.L(m): 1.0
If water table is within a layer, consider the thicknesses above and below as two layers
How many layers are there above dredgeline: 1
Enter thickness of layer 1(m): 5.5
Enter cohesion(kN/m2) and angle of internal friction(degrees) of layer 1: 0.0 30.0
Enter submerged unit weight of soil, if soil is below ground water table
Enter unit weight of soil in layer 1 (kN/m3): 16.5
How many layers are there below dredgeline: 2
Enter thickness of layer 1 below dredgeline(m): 4.0
Enter cohesion(kN/m2) and angle of internal friction(degrees) of layer 1: 0.0 30.0
Enter submerged unit weight of soil, if soil is below ground water table
Enter unit weight of soil in layer 1 (kN/m3): 17.0
Enter thickness of layer 2 below dredgeline(m): 15.0
Enter cohesion(kN/m2) and angle of internal friction(degrees) of layer 2: 4.0 24.5
Enter submerged unit weight of soil, if soil is below ground water table
Enter unit weight of soil in layer 2 (kN/m3): 8.8
Data stored in the file 'anc6'

Output
Design

Height of soil retained(m): 5.50
Depth of anchor from G.L(m): 1.00
Number of layers: 1
Data of layer 1:
Thickness of layer(m): 5.50
Cohesion(kN/m2) : 0.00
Angle of internal friction(degrees): 30.00
Submerged unit weight of soil, if soil is below ground water table
Unit weight of soil of layer 1(kN/m3): 16.50
Data of soil below dredgeline:
Number of layers:2
Data of layer 1:
Thickness of layer(m): 4.00
Cohesion(kN/m2): 0.00
Angle of internal friction(degrees): 30.00
Submerged unit weight of soil, if soil is below water table
Unit weight of soil(kN/m3): 17.00
Data of layer 2:
Thickness of layer(m): 15.00
Cohesion(kN/m2): 4.00
Angle of internal friction(degrees): 24.50
Submerged unit weight of soil, if soil is below water table
Unit weight of soil(kN/m3): 8.80
Value of n(m): 1.52
Value of d(m): 4.11
Total depth of penetration(m): 8.92
Total length of sheetpile(m): 14.42
Tension in the anchor(kN/m): 50.29

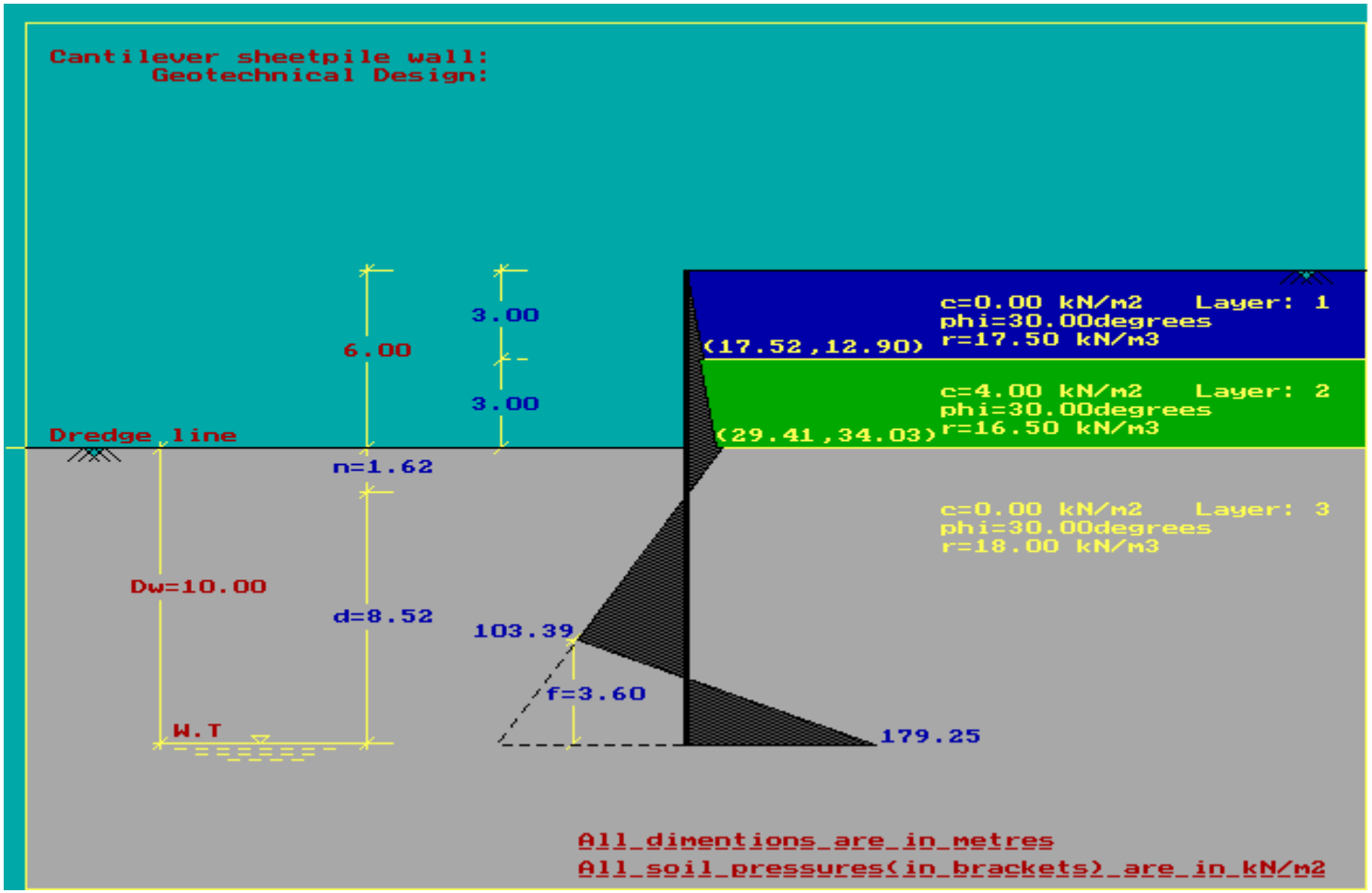
Cantilever sheetpile wall:
Geotechnical Design:
6.00
3.00
3.00
Dredge line
n=1.62
Dw=10.00
d=8.52
W.T
103.39
f=3.60
179.25
(17.52,12.90)
(29.41,34.03)
c=0.00 kN/m2 Layer: 1
phi=30.00degrees
r=17.50 kN/m3
c=4.00 kN/m2 Layer: 2
phi=30.00degrees
r=16.50 kN/m3
c=0.00 kN/m2 Layer: 3
phi=30.00degrees
r=18.00 kN/m3
All dimentions are in metres
All soil pressures(in brackets) are in kN/m2

Fig.7.2

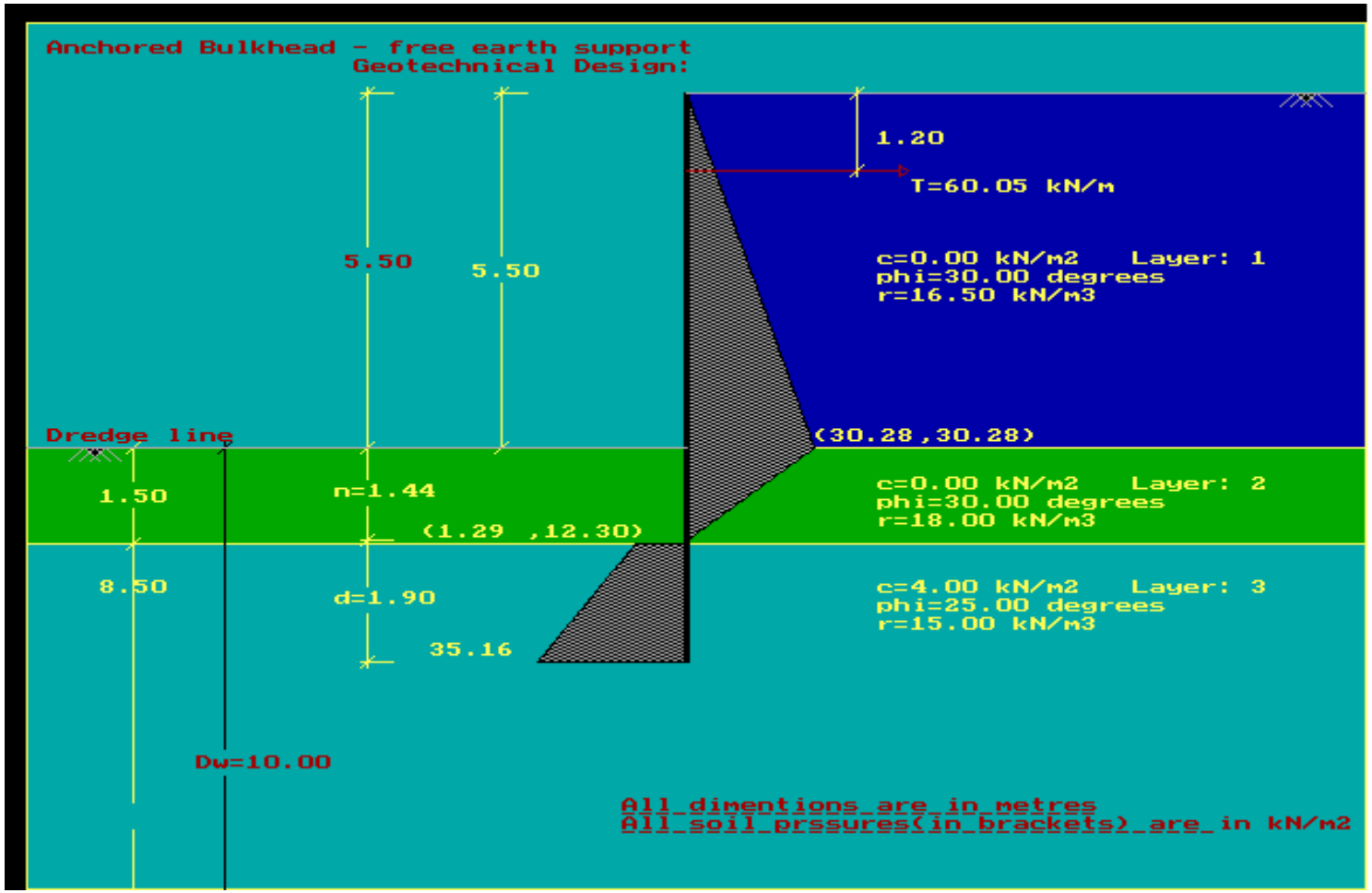
Anchored Bulkhead - free earth support
Geotechnical Design:
1.20
T=60.05 kN/m
5.50
5.50
c=0.00 kN/m2 Layer: 1
phi=30.00 degrees
r=16.50 kN/m3
Dredge line
(30.28 ,30.28)
1.50
n=1.44
(1.29 ,12.30)
c=0.00 kN/m2 Layer: 2
phi=30.00 degrees
r=18.00 kN/m3
8.50
d=1.90
35.16
c=4.00 kN/m2 Layer: 3
phi=25.00 degrees
r=15.00 kN/m3
Dw=10.00
All dimentions are in metres
All soil prssures(in brackets) are in kN/m2

Fig.7.3

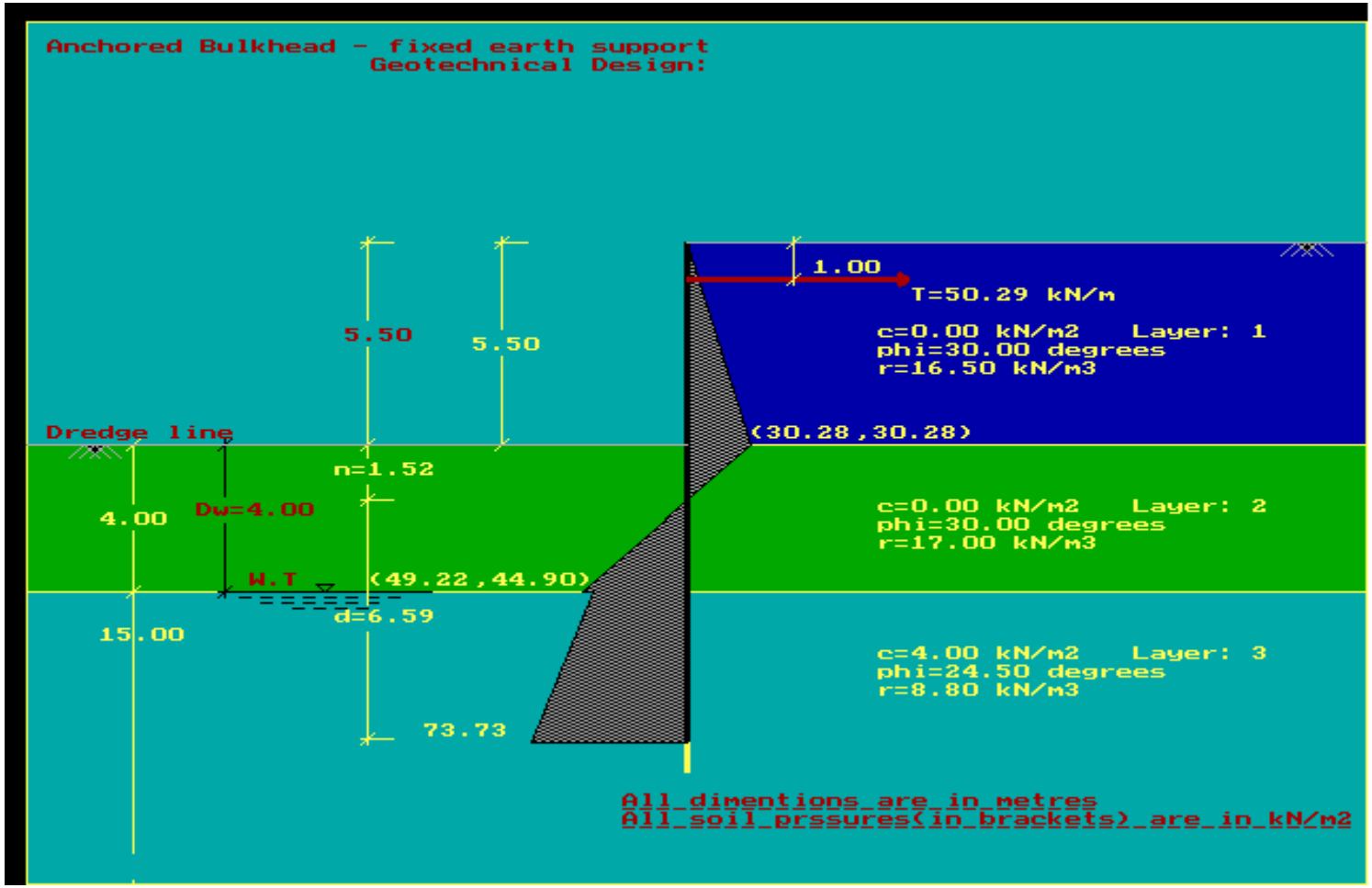
Anchored Bulkhead - fixed earth support
Geotechnical Design:
1.00
T=50.29 kN/m
5.50
5.50
c=0.00 kN/m2 Layer: 1
phi=30.00 degrees
r=16.50 kN/m3
Dredge line
(30.28,30.28)
n=1.52
4.00
Dw=4.00
c=0.00 kN/m2 Layer: 2
phi=30.00 degrees
r=17.00 kN/m3
W.T
(49.22,44.90)
d=6.59
15.00
c=4.00 kN/m2 Layer: 3
phi=24.50 degrees
r=8.80 kN/m3
73.73
All dimentions are in metres
All soil prssures(in brackets) are in kN/m2

Fig.7.4

CELLULAR COFFERDAM

Input1

Data

Enter the file name in which you want to store the design: cell
Enter height of cellular cofferdam(m): 18.3
Enter height of soil retained(m): 6.0
Enter submerged unit weight of soil retained(kN/m3): 8.8
Enter angle of internal friction of soil retained(degrees): 25.0
Enter height of berm(m): 1.5
Enter water height ratio in the cofferdam(n): 0.4
Enter unit weight of berm soil(kN/m3): 14.4
Enter angle of internal friction of berm soil(degrees): 28.0
Enter unit weight of gravel fill(kN/m3): 16.0
Enter angle of internal friction of gravel fill(degrees): 30.0
Enter coefficient of lock friction of sheet piles: 0.3
Enter allowable tension in the sheetpile interlock(kN/mm): 1.43
Your results are stored in th file 'cell'

Output1

Design

Height of cellular cofferdam(m): 18.30
Height of soil reatained(m): 6.00
Submerged unit weight of soil retained(kN/m3): 8.80
Angle of internal friction of soil retained(degrees): 25.00
Water height ratio in the cofferdam(n): 0.40
Height of berm(m): 1.50
Unit weight of berm soil(kN/m3): 14.40
Angle of internal friction of berm soil(degrees): 28.00
Unit weight of gravel fill(kN/m3): 16.00
Angle of internal friction of gravel fill(degrees): 30.00
Coefficient of lock friction of sheet piles: 0.30
Allowable tension in the sheetpile interlock(kN/mm): 1.43

Circular type is possible
r(m)= 13.00

Short diaphragm type is possible
A(m)= 13.20
r(m)= 19.60

Input2

Data

Enter the file name in which you want to store the design: cel2
Enter height of cellular cofferdam(m): 18.3
Enter height of soil retained(m): 6.0

Enter submerged unit weight of soil retained(kN/m3): 8.8
Enter angle of internal friction of soil retained(degrees): 25.0
Enter height of berm(m): 1.5
Enter water height ratio in the cofferdam(n): 0.4
Enter unit weight of berm soil(kN/m3): 14.4
Enter angle of internal friction of berm soil(degrees): 28.0
Enter unit weight of gravel fill(kN/m3): 16.0
Enter angle of internal friction of gravel fill(degrees): 30.0
Enter coefficient of lock friction of sheet piles: 0.3
Enter allowable tension in the sheetpile interlock(kN/mm): 0.65
Your results are stored in th file 'cel2'

Output2
Design

Height of cellular cofferdam(m): 18.30
Height of soil reatained(m): 6.00
Submerged unit weight of soil retained(kN/m3): 8.80
Angle of internal friction of soil retained(degrees): 25.00
Water height ratio in the cofferdam(n): 0.40
Height of berm(m): 1.50
Unit weight of berm soil(kN/m3): 14.40
Angle of internal friction of berm soil(degrees): 28.00
Unit weight of gravel fill(kN/m3): 16.00
Angle of internal friction of gravel fill(degrees): 30.00
Coefficient of lock friction of sheet piles: 0.30
Allowable tension in the sheetpile interlock(kN/mm): 0.65

Circular type is not possible

Long diaphragm type is possible

A(m)= 6.00
r(m)= 8.90

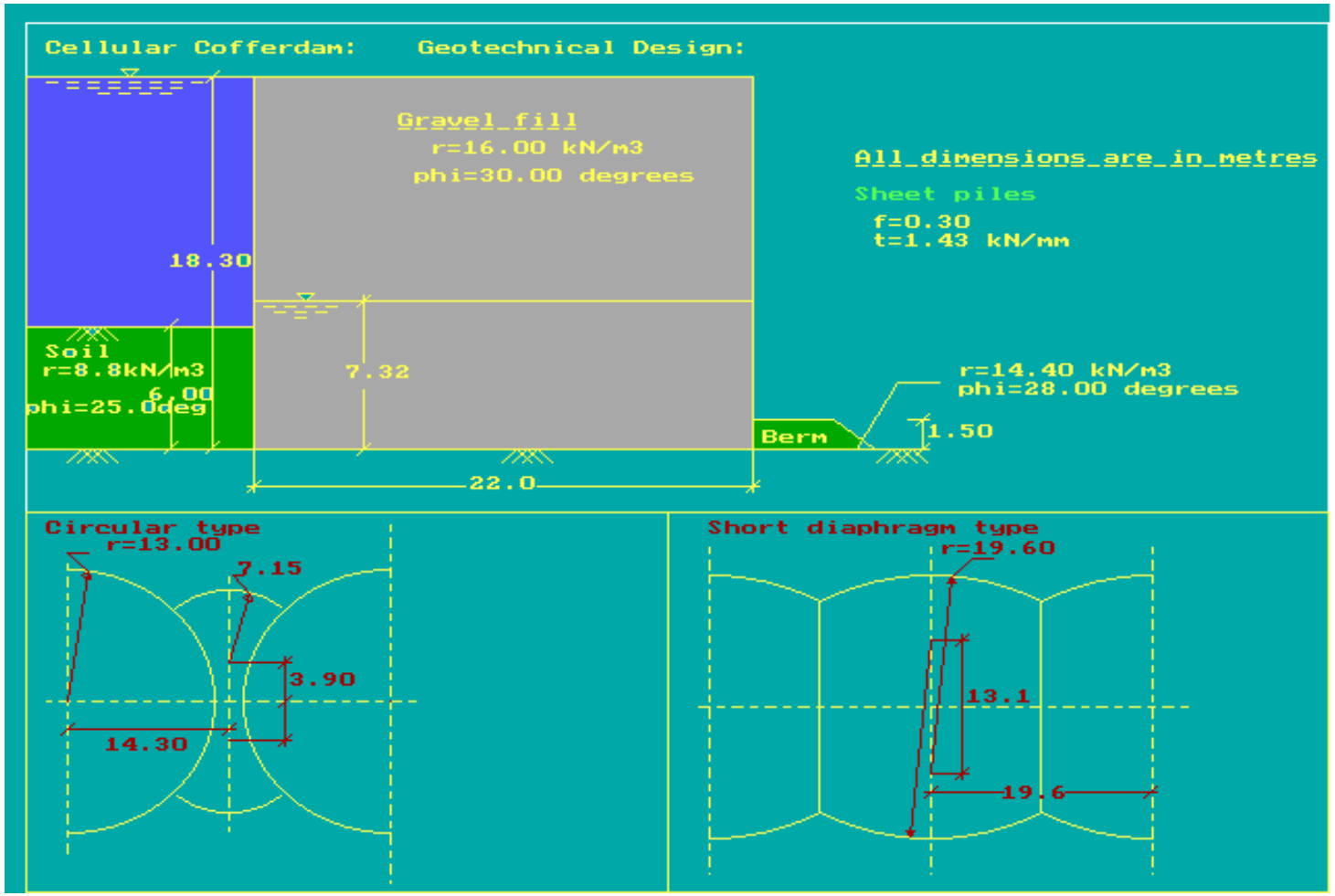
Cellular Cofferdam: Geotechnical Design:
Gravel fill
r=16.00 kN/m3
phi=30.00 degrees
All dimensions are in metres
Sheet piles
f=0.30
t=1.43 kN/mm
18.30
Soil
r=8.8kN/m3
6.00
phi=25.0deg
7.32
r=14.40 kN/m3
phi=28.00 degrees
Berm
1.50
22.0
Circular type
r=13.00
7.15
3.90
14.30
Short diaphragm type
r=19.60
13.1
19.6

Fig.7.5

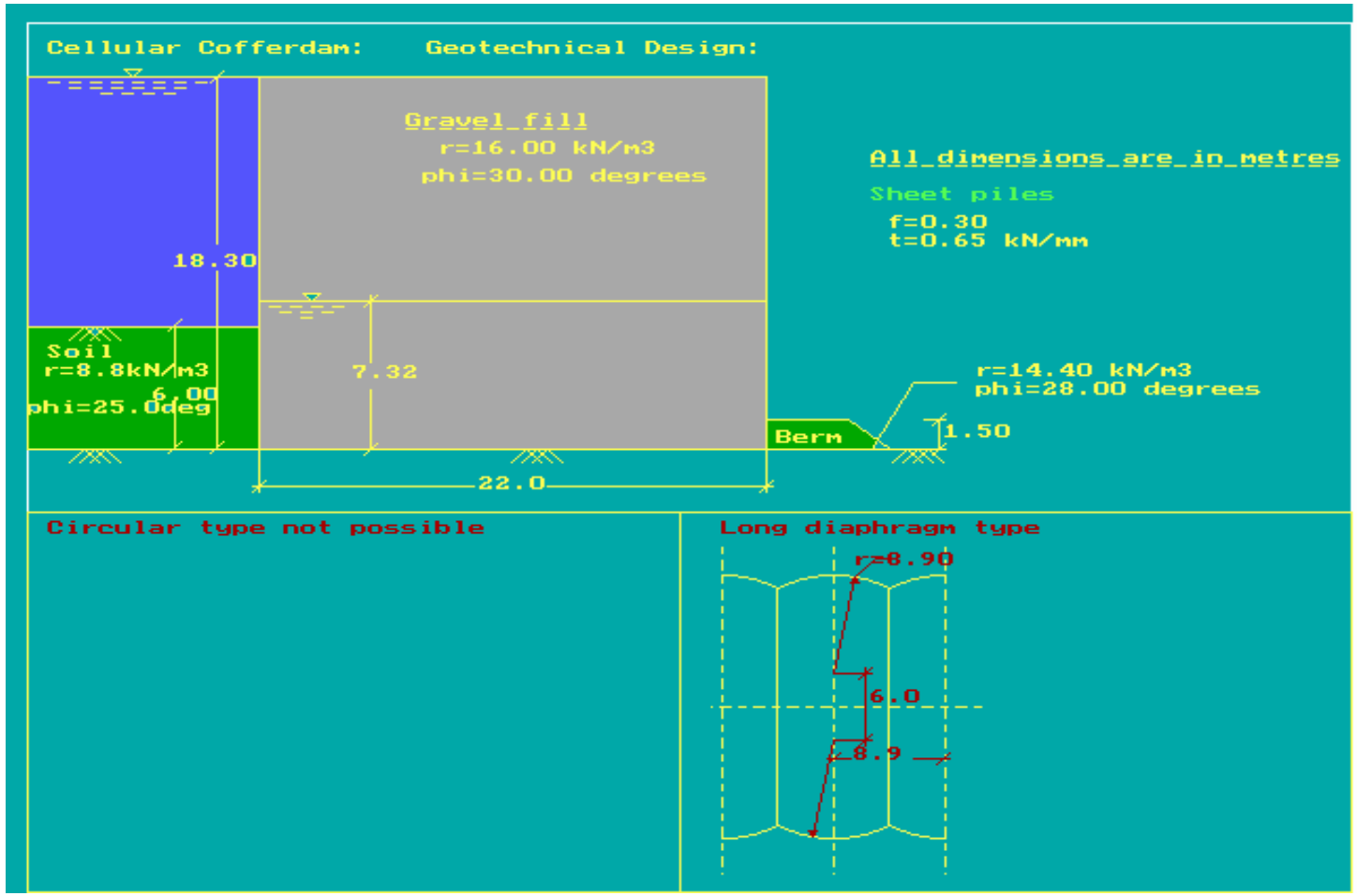
Cellular Cofferdam: Geotechnical Design:
Gravel_fill
r=16.00 kN/m3
phi=30.00 degrees
All_dimensions_are_in_metres
Sheet piles
f=0.30
t=0.65 kN/mm
18.30
Soil
r=8.8kN/m3
6.00
phi=25.0deg
7.32
r=14.40 kN/m3
phi=28.00 degrees
Berm
1.50
22.0
Circular type not possible
Long diaphragm type
r=8.90
6.0
8.9

Fig.7.6

CUT SUPPORT
Type: *H–Pile and Lagging*
Input
Data

Enter the file name in which you want to store the design: cel1
Enter the depth and width of the cut(m): 14.6 5.0
Enter 1 for clay, 2 for sand: 1
Enter unit weight of soil(kN/m3): 19.2
Enter cohesive strength of the clay(kN/m2): 74.3
Enter the Young's modulus of the timber of the supporting system(kN/mm2): 12.6
Enter allowable stress in direct compression(N/mm2): 6.0
Enter allowable stress in bending(N/mm2): 18.2
Enter allowable stress in shear - beam(N/mm2): 1.2
Enter allowable stress in shear - others(N/mm2): 1.7
Enter span of lagging(m): 2.0
Enter vertical spacing of struts(m): 4.6
Enter horizontal spacing of struts(m): 4.0
Enter factor of safety against buckling: 2.0
Your results are stored in file 'cel1'

Output
Design

Soil type: clay
Unit weight of soil(kN/m3): 19.20
Cohesive strength of the clay(kN/m2):74.30
Young's modulus of the timber of the supporting system(kN/mm2): 12.60
Alowable stress in direct compression(N/mm2): 6.00
Allowable stress in bending(N/mm2): 18.20
Allowable stress in shear - beam(N/mm2): 1.20
Allowable stress in shear - others(N/mm2): 1.70
Span of lagging(m): 2.00
Vertical spacing of struts(m): 4.60
Horizontal spacing of struts(m): 4.00
Design of lagging:
Assume simply supported span:
Thickness of lagging(mm): 120.00
Design of strut:
Factor of safety against buckling: 2.00
Governing aspect: Compression
Section of the square strut(mm): 510.00
Design of wale beam:
Assume simply supported span:
Section of the square wale beam(mm): 650.00
