European Commission

Worked example – characteristic values

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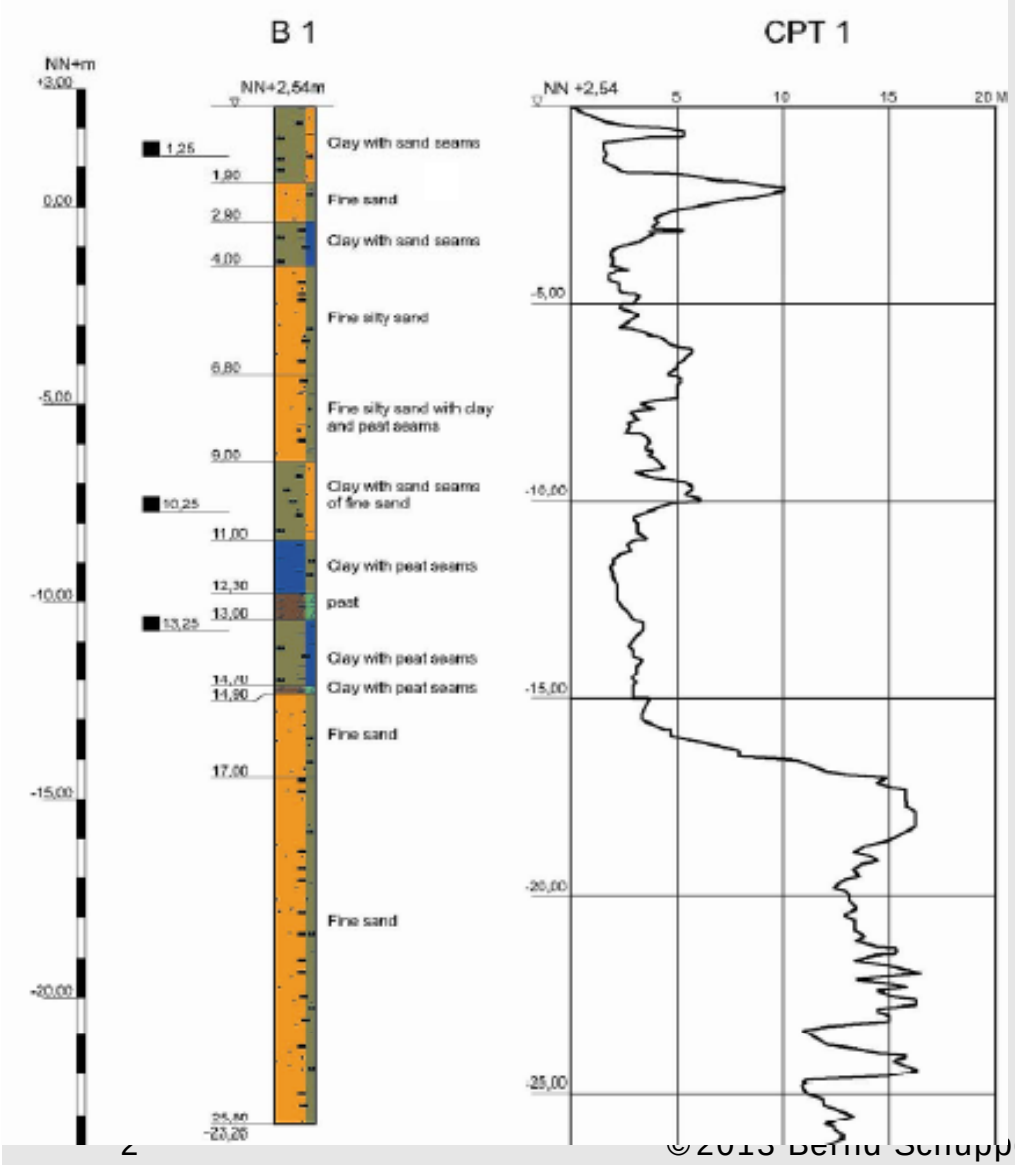


Example: pile foundation in sand

Boring and CPT-profile for the selection of characteristic values of ground parameter

7.6.2.3 Ultimate compressive resistance from ground test results

(8) The characteristic values may be obtained by calculating:

$$R_{b;k} = A_b\, q_{b;k} \quad \text{and} \quad R_{s;k} = \sum_i A_{s;i} \cdot q_{s;i;k} \qquad (7.9)$$

where $q_{b;k}$ and $q_{s;i;k}$ are characteristic values of base resistance and shaft friction in the various strata, obtained from values of ground parameters.

NOTE If this alternative procedure is applied, the values of the partial factors γ_b and γ_s recommended in Annex A may need to be corrected by a model factor larger than 1,0. The value of the model factor may be set by the National annex.

German NA has applied a model factor and gives γ_b = 1.40 and γ_s =1.40

Annex D (Informative) **Cone and piezocone penetration tests**

Table D.3 — Unit base resistance q_b of cast in-situ piles in coarse soil with little or no fines

Normalised settlement s/D_s; s/D_b	Unit base resistance q_b in MPa, at average cone penetration resistance q_c (CPT) in MPa			
	$q_c = 10$	$q_c = 15$	$q_c = 20$	$q_c = 25$
0,02	0,70	1,05	1,40	1,75
0,03	0,90	1,35	1,80	2,25
0,10 (= s_g)	2,00	3,00	3,50	4,00

NOTE Intermediate values may be interpolated linearly.
In the case of cast in-situ piles with pile base enlargement, the values shall be multiplied by 0,75.

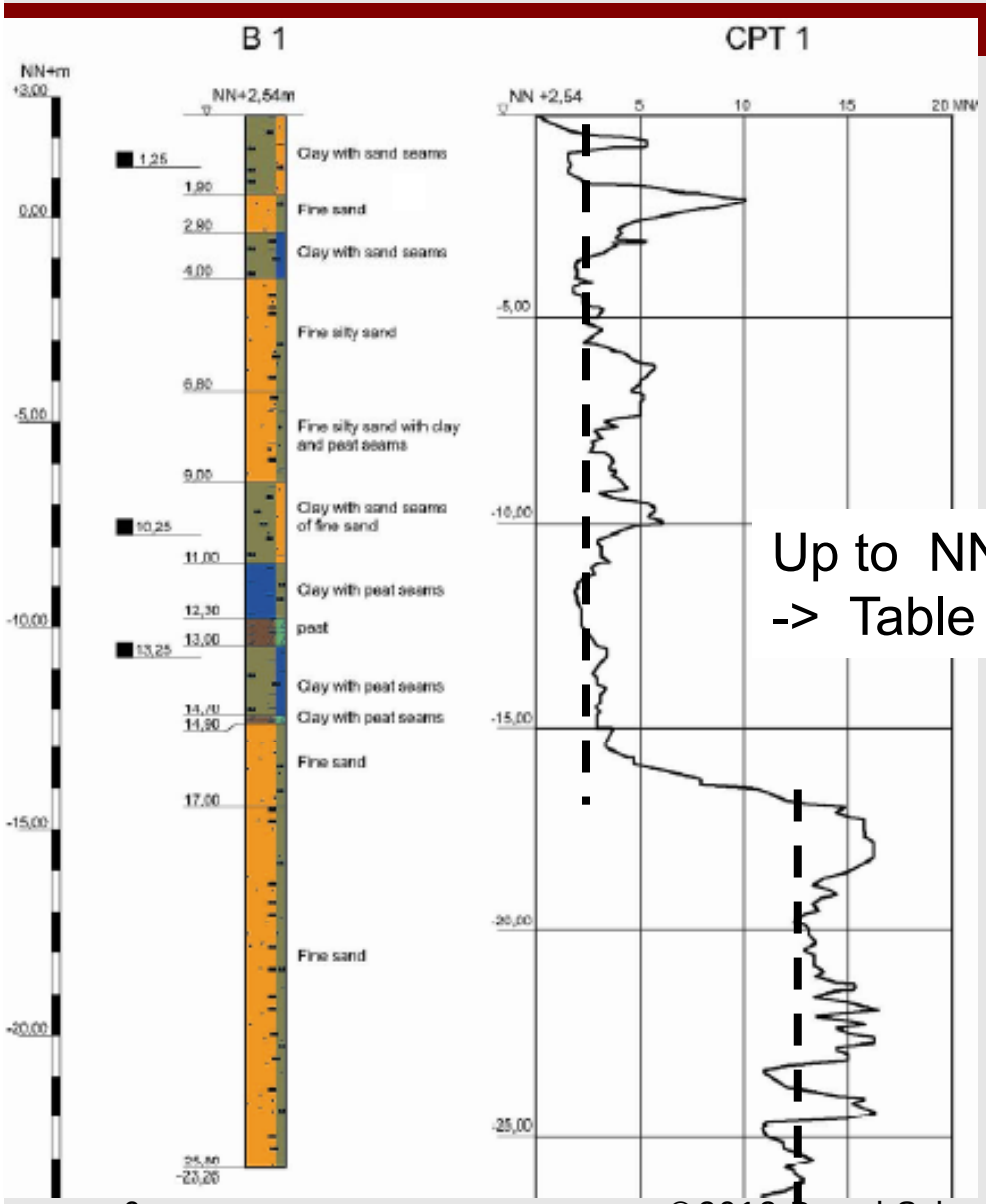
s is the normalised pile head settlement
D_s is the diameter of the pile shaft
D_b is the diameter of the pile base
s_g is the ultimate settlement of pile head

Annex D (Informative)
Cone and piezocone penetration tests

Table D.4 — Unit shaft resistance q_s of cast in-situ piles in coarse soil with little or no fines

Average cone penetration resistance q_c (CPT) MPa	Unit shaft resistance q_s MPa
0	0
5	0,040
10	0,080
≥ 15	0,120
NOTE Intermediate values may be interpolated linearly	

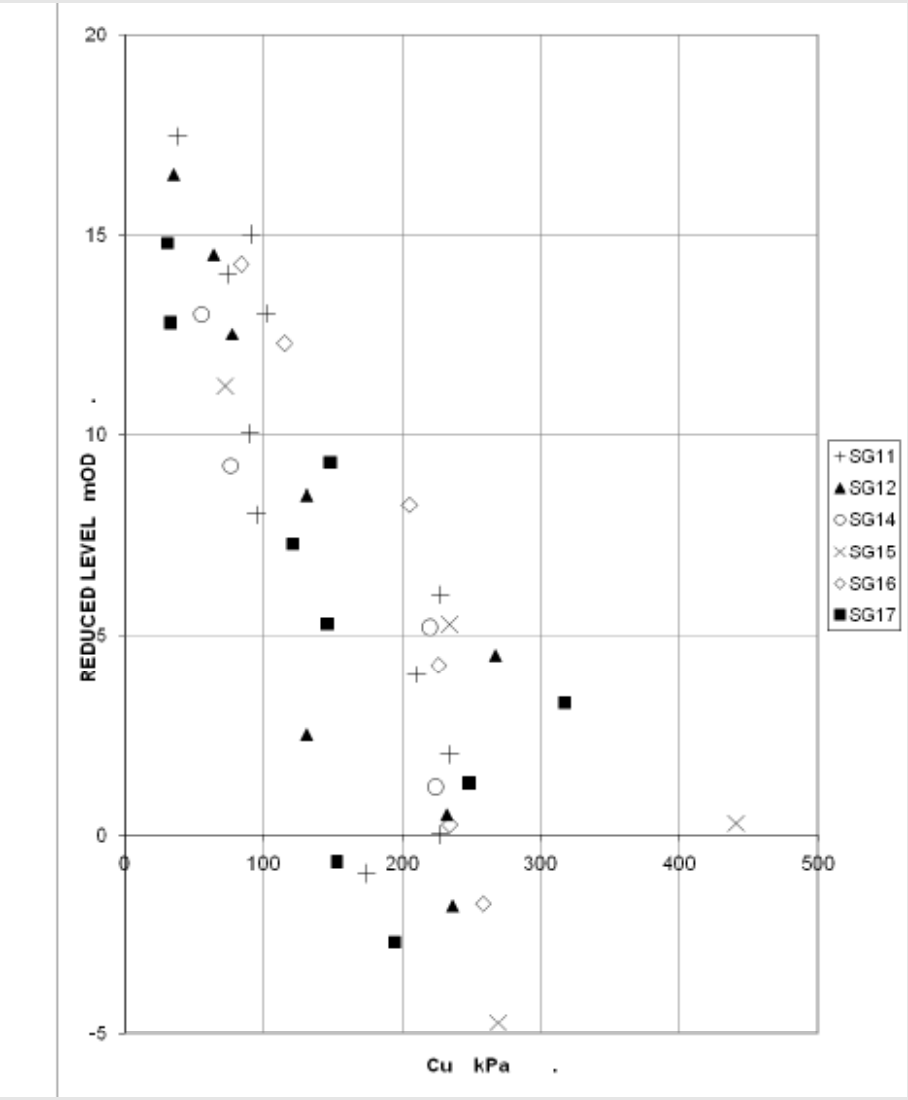
Example: pile foundation in sand



Boring and CPT-profile for the selection of characte-ristic values of ground parameter

Up to NN – 16.5m: q_c = 2.5 MN/m²
-> Table D.4: $q_{s,k}$ = 0.02 MPa

From NN –16.5m: q_c = 12.5 MN/m²
-> Table D.3: $q_{b,k}$ (s_g)= 2.5 MPa



Example: pile foundation in clay

Undrained shear strength c_u as results of UU triaxial tests with specimen from samples of 6 borings

DIN 1054:2002 - Annex B (informativ)
Characteristic values of pile resistance of axially loaded piles

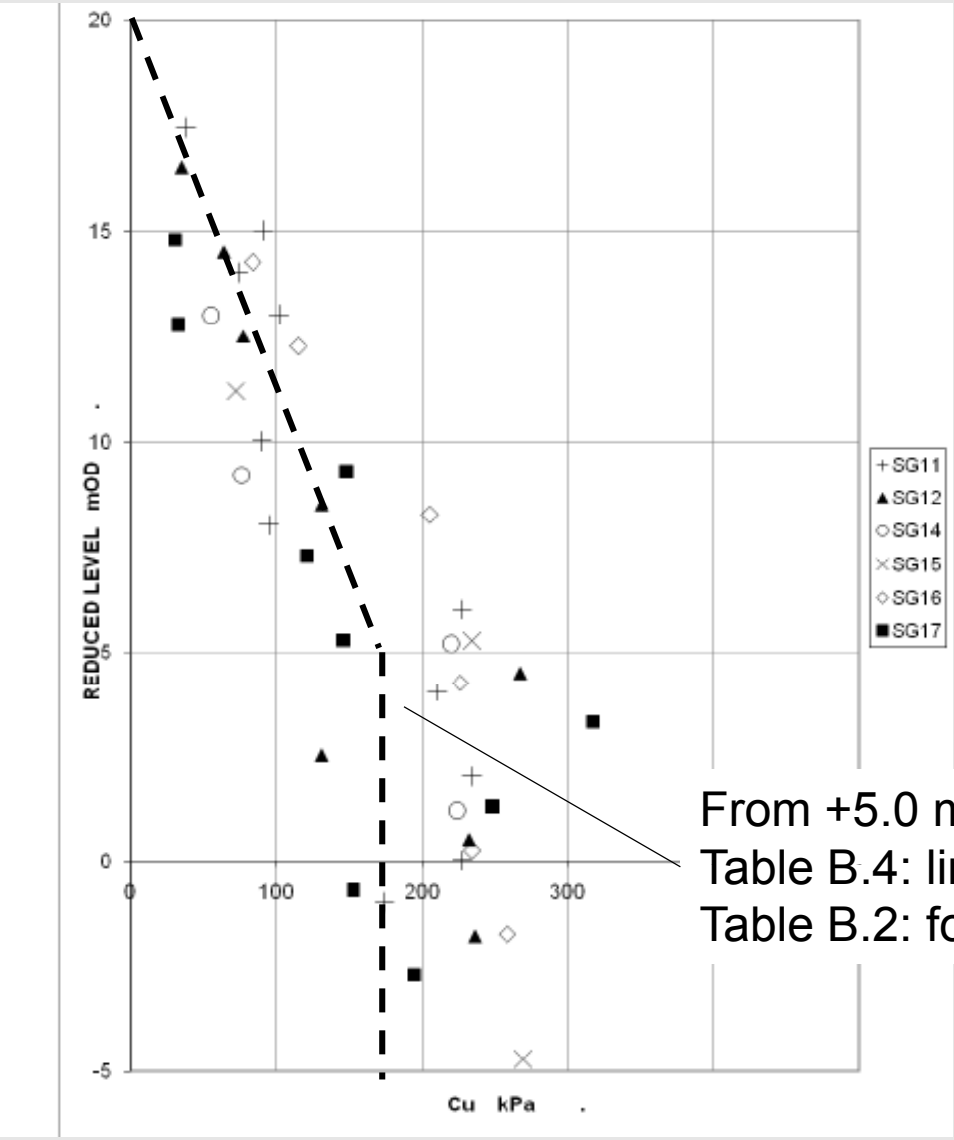
Table B.4 —Unit shaft resistance $q_{s,k}$ of cast in situ piles in clay

Undrained shear strength $c_{u,k}$ MN/m²	Unit shaft resistance $q_{s,k}$ MN/m²
0,025	0,025
0,10	0,040
≥ 0,20	0,060
Intermediate values may be interpolated linearly	

DIN 1054:2002 - Annex B (informativ)
Characteristic values of pile resistance of axially loaded piles

Table B.2 — Unit base resistance $q_{b,k}$ of cast in-situ piles in clay

Normalized pile settlement s / D_s bzw. s / D_b	Unit base resistance $q_{b,k}$ MN/m²	
	Undrained shear strength $c_{u,k}$ MN/m²	
	0,10	0,20
0,02	0,35	0,90
0,03	0,45	1,10
0,10 (s_g)	0,80	1,50
Intermediate values may be interpolated linearly		



Example: Pile foundation in clay

Undrained shear strength c_u as results of UU triaxial tests with specimen from samples of 6 borings

From +5.0 mOD: $q_{c,k}$ = 180 kPa
Table B.4: linear increase to $q_{s,k}$ = 0.056 MN/m²
Table B.2: for s=20mm≈0.03xD_{pile}:$q_{b,k}$ = 0.97 MN/m²

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Geotechnical design with worked examples

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