A reliable, user-friendly tool, according to Eurocodes

GEOFOND

Shallow and deep foundations design

Calculation of settlements under embankments

A DESIGN ACCORDING TO EUROCODES

> **Shallow foundations**

> **Deep foundations**: piles, pile groups, rigid inclusions and ballast piers

> Simple and complex **embankments**

Foundation : Circular spread footing
Diameter : 5 m
area : 19.6 m²
Embeddment : 1 m
Foundation: 2 m

Soils parameters
Type of soils under the foundation
Clay ans Silts

Soils weight above the foundation :
after travaux = 20 kN/m³
before travaux = 20 kN/m³
Final vertical stress q'0: 20 kPa (calculated)
Initial vertical stress σ'v0: 40 kPa (calculated)
Cohesion under the Foundation: 5 kPa
Angle of friction under the Foundation: 30 °

Depth of the water : 5 m/NS

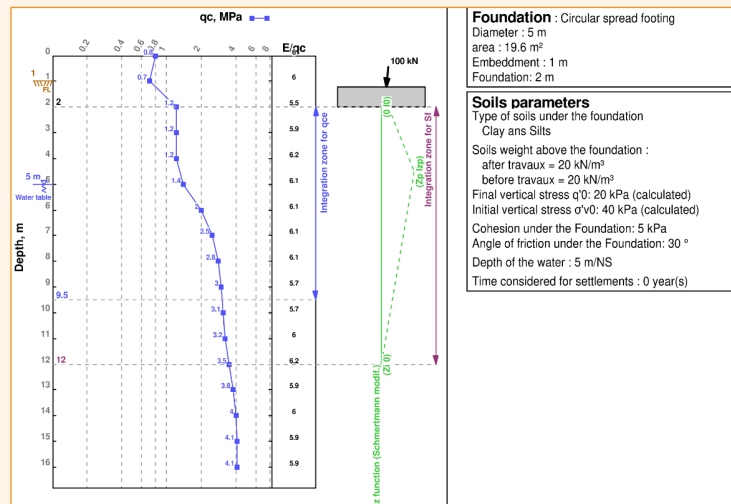Time considered for settlements : 0 year(s)

AN EASY AND RELIABLE ANALYSIS

> **Foundations:** bearing capacities and settlements

> **Embankments: punching failure safety factors** and oedometric and elastic settlements under embankments

Source : Vinci

ADAPTED CALCULATION TOOLS

> **Consideration of a wide range of tests**: pressuremeter, oedometer, penetrometer, laboratory tests

> Various design methods: **Schmertmann, Meyerhof, Burland...**

> Choice of French standards: **NF P 94-261** (shallow foundations) and **NF P 94-262** (deep foundations), **DTU, Fascicule 62-Chapter V**

ADVANCED ANALYSIS OPTIONS

> Piles under **horizontal charges**

> Group of **piles design**, considering torsion in the head of distribution structure

> Calculation of **negative skin friction**: fascicule 62 and norm NF P 94-262

> Verification of concrete efforts

Calculation results: Bearing capacity
With the NF P 94-262 method
Rs = 0.881 MN   Ann. F.5
Ple = 0.522 MPa   Ann. F4.2.3   kpmax = 1.1   Tab. F4.2.1
Def = 5.71 m   kp = 1.1   Ann. F4.2
qb = 0.574 MPa   Ann. F4.2.1   Rb = 0.162 MN   Ann. F4.1

Check on the characteristics of the material conc
k1 = 1.3, k2 = 1, k3 = 1   cmax = 35 MPa
fck* = 7.69 MPa
σavgSLS = k3 * 0.3 * fck* = 2.31 MPa
σmaxSLS =min(0.6*fck*;0.6*fck)= 4.62 MPa
NavgSLS = σavgSLS * A = 0.652 MN
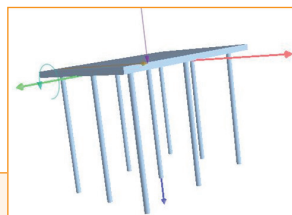
Calculation results : settlements
Under a stress qref = 1.96 MPa

With the Frank & Zhao method.
ql(7.5) = 574 kPa
qp(7.5) = 293 kPa
q'u(7.5) = 82.9 kN

Settlement D = 3.91 mm

Calculation results : skin friction
On an isolated element
Gsn(inf) = 2827 kN
h1 = 7.5 m et h2 = 7.5 m (defined in tha data) /NS

On an element within a group
Gsn(b) = 99.95 kN with b=0.564 m² et Gsn(b) bounded = 150 k
h1 = 0.8 m et h2 = 7.5 m (defined in tha data) /NS
skin friction on the angle elements
Gsna = 7/12 * Gsn(b) + 5/12 * Gsn(inf) = 1236 kN
skin friction on the elements at the border of the group
Gsne = 5/6 * Gsn(b) + 1/6 * Gsn(inf) = 554.5 kN
skin friction on the elements within the group
Gsni = Gsn(b) = 99.95 kN

Geos

OPTIMIZATION MODULES

❯ **Deterministic calculation** with an analysis variable choice: Influence of foundation dimensions on bearing capacities, or influence of charges on settlements

❯ **Probabilistic calculation** with consideration of incertitude

COMPLEX EMBANKMENT DESIGN

❯ **Finite or infinite embankments**

❯ Elastic and oedometric settlements on different time lapses

❯ Consideration of **non-symmetric geometries and berms**

❯ Graphic display of settlements **isovalues**

❯ **Stresses and settlements variation** curves, depending on the depth
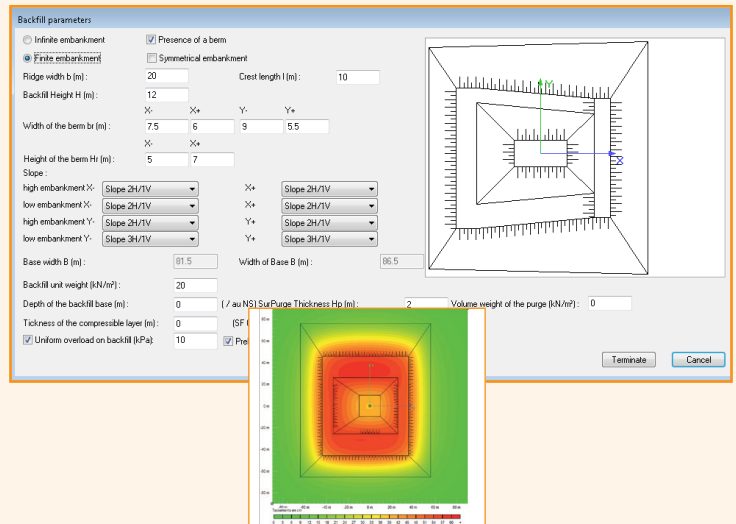
BALLAST PIERS AND RIGID INCLUSIONS DESIGN

❯ Determination of the bearing capacity according to **COPREC-SOFFONS** recommendations

❯ Stresses verificarion according to **PRIEBE** and **FHWA** methods (Federal Highway Administration - USA)
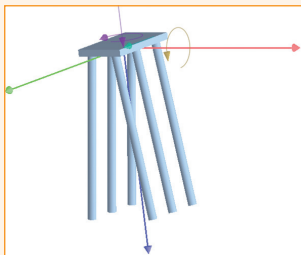
PILE GROUP MODULE

❯ Pile and footing **displacements**

❯ **Efforts, moments and maximal displacements in each pile**

❯ **Tridimensional** display of pile groups
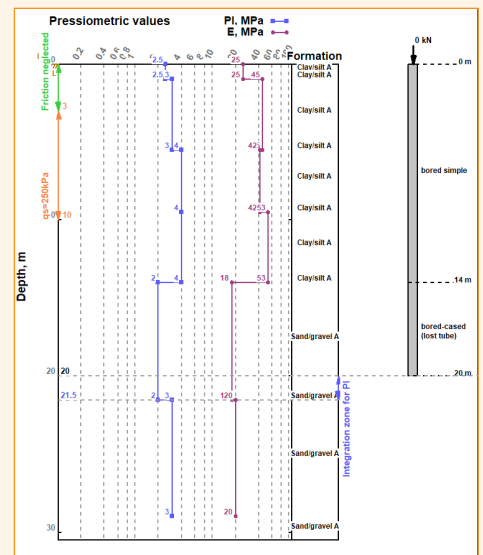
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