Technical Justification: Settlement Analysis of Transmission Towers

Rizal Purnawan

Civil Engineer, Independent Researcher, Jakarta, Indonesia Corresponding author. E-mail: rizalpurnawan23@gmail.com; ORCID: 0000-0001-8858-4036

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Abstract

This document covers a presentation related to a technical justification in determining the total settlements of transmission towers in Smelter Ferronickel Kolaka, a project handled by PT. PP (Persero) Tbk. This document will not present a detail data used in the project, but rather demonstrates the methodology and framework for the task. A key innovation employed by the author is the use of machine learning (ML) algorithm for interpolating the depth factor for immediate settlements. In addition, this document is intended as a portfolio that demonstrates the competency and experience of the author in the corresponding problem solving.

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1 Introduction

In project Smelter Ferronickel Kolaka held by PT. PP, there are transmission towers which distribute powers for the Smelter from its source a few kilometers apart. The engineering design of the transmission towers were conducted by a engineering consulting company hired by PT. PP. However, after the engineering team in the internal body of PT. PP performed a review on the calculation, there were missing technical components to be analysed. These components are the consolidation settlements. Hence, I was tasked on producing a technical justification for evaluating the total settlements of the transmission towers.

In this document, we will only highlight the methodology used for evaluating the settlements as well as the result. We do not disclose sensitive data related to the project such as the soil investigation data, etc. It is also worth noted that this document only serves as a portfolio of the author in demonstrating the depth of the knowledge in the corresponding problem as well as the approach offered by the author to solve such cases.

2 Methodology and Theoretical Framework

In geotechnical engineering, settlements of soils can be defined as the change in the thickness of soil layers due to compressions to the soil surfaces by applied loads such as existence of buildings, infrastructures or any civil engineering constructions (Das and Sobhan, 2012a). In practices, settlements shall be controlled in order to maintain the integrity of the buildings above the ground since uncontrolled settlements could damage the buildings.

Settlements of shallow foundations are basically divided into three components (Das and Sobhan, 2012a), namely immediate settlement (or elastic settlement), consolidation settlement (or primary settlement) and secondary consolidation settlement. Immediate settlement of foundations is the settlement which occurs directly after the application of a load without a change in the moisture content of the soil (Das and Sobhan, 2012b). Consolidation settlement refers to the vertical deformation or settlement that occurs in a soil layer when it undergoes consolidation under applied loads (Das and Sobhan, 2012a). While Secondary consolidation settlement is the settlement which occurs at the end of the primary settlement due to the plastic adjustment of soil fabrics (Das and Sobhan, 2012c). And the total settlement is defined as the sums of these three settlements (Das and Sobhan, 2012a). In a formal expression, the total settlement can be given by

$$S := S_i + S_c + S_s \,, \tag{1}$$

where S_i is the immediate settlement, S_c is the consolidation settlement and S_s is the secondary consolidation settlement. Note that all the values in the expression above are magnitudes, hence $S, S_i, S_c, S_s \in [0, \infty)$.

Throughout this section, we will use a shallow foundation as the geotechnical object associated with settlements. In addition, the units to be used throughout the discussion are meters (m) for length and distance measures, kilo Newtons (kN) for forces and loads and the combinations of these two initial units for other soil mechanical properties such as kN/m² for stresses as well as Young's modulus, kN/m³ for unit weights, etc., unless otherwise stated. Then let us suppose a rectangular shallow foundation with horizontal dimensions $B \times L$ such that $B, L \in (0, \infty)$ with $B \leq L$.

2.1 Immediate Settlement

For a foundation that is perfectly flexible in theory, the immediate settlement of the foundation (Das and Sobhan, 2012d) is given by

$$S_i = \Delta \sigma(\alpha B') \frac{1 - \mu_s^2}{E_s} I_s I_f.$$
 (2)

The components of equation 2 above are presented as follows:

I. $\Delta\sigma$ is the applied pressure on the foundation. Suppose P is the gravitational applied load on the foundation, then

$$\Delta \sigma = \frac{P}{BL} \,. \tag{3}$$

II. α is a factor regarding the position of the settlement to be considered, and is given by

$$\alpha := \begin{cases} 4 & : \text{ for centre of foundation} \\ 1 & : \text{ for corner of foundation} \end{cases}$$
 (4)

III. B' is the effective width of the foundation (Das and Sobhan, 2012d), defined by

$$B' := \begin{cases} B/2 & : \text{ for centre of foundation} \\ B & : \text{ for corner of foundation} \end{cases}$$
 (5)

IV. μ_s is the Poisson's ratio of soil (Das and Sobhan, 2012d).

V. E_s is the Young's modulus of soil (Das and Sobhan, 2012d).

VI. I_s is the shape factor (Steinbrenner, 1934), given by

$$I_s = F_1 + \frac{1 - 2\mu_s}{1 - \mu_s} F_2 \,. \tag{6}$$

And the components in the expression above is given by

$$F_1 = \frac{1}{\pi} (A_0 + A_1) \tag{7}$$

$$F_2 = \frac{n'}{2\pi} \tan^{-1} A_2 \tag{8}$$

$$A_0 = m' \ln \frac{1 + \sqrt{m'^2 + n'^2 + 1}}{m'(1 + \sqrt{m'^2 + n'^2 + 1}}$$
(9)

$$A_1 = \ln \frac{\left(m' + \sqrt{m'^2 + 1}\right)\sqrt{1 + n'^2}}{m' + \sqrt{m'^2 + n'^2 + 1}}$$
(10)

$$A_2 = \frac{m'}{n'\sqrt{m'^2 + n'^2 + 1}},\tag{11}$$

with

$$m' := \frac{L}{B} \quad \text{, and } n' := \begin{cases} 2H/B & : \text{ for centre of foundation} \\ H/B & : \text{ for corner of foundation} \end{cases}.$$

VII. I_f is the depth factor. And several values of depth factors are given in table 1 (Das and Sobhan, 2012e). In case the values of parameters for I_f do not present in table 1, I_f is determined by

Table 1: Parameters for depth factor (Das and Sobhan, 2012e)

		I_f		
L/B	D_f/B	$\mu_s = 0.3$	$\mu_s = 0.4$	$\mu_s = 0.5$
1	0.50	0.77	0.82	0.85
	0.75	0.69	0.74	0.77
	1.00	0.65	0.69	0.72
2	0.50	0.82	0.86	0.89
	0.75	0.75	0.79	0.83
	1.00	0.71	0.75	0.79
5	0.50	0.87	0.91	0.93
	0.75	0.81	0.86	0.89
	1.00	0.78	0.82	0.85

linear interpolations on the nearby parameters. However, for multidimensional hyper parameters such as those of table 1, it will be very difficult to conduct a accurate linear interpolation. In exchange, we developed a Machine Learning (ML) model to execute this task by making use of LinearRegression() from the Python (van Rossum, 2018) library sklearn (Pedregosa et al., 2011). From the ML model, we obtain the following equation for I_f ;

$$I_f = \sum_{k=0}^{3} \beta_k x_k \,, \tag{12}$$

with the additional pararmeters given on table 2. The detail development of the ML model and the model itself can be accessed on (Purnawan, 2024).

The rigidity of foundations also affects the settlement profile (Das and Sobhan, 2012f). For rigid foundations, the settlement can be estimated in accordance with (Das and Sobhan, 2012g) by

$$S_{i,r} \approx 0.93S_i \,, \tag{13}$$

where $S_i \in (0, \infty)$ is the settlement for perfectly flexible foundations.

Table 2: A function from ML model for I_f

k	x_k	β_k
0		0.739085
1	L/B	0.025799
2	D_f/B	-0.198381
3	μ_s	0.353371

2.2 Consolidation Settlement

Consolidation settlement is a time-dependent process that happens in saturated or nearly saturated soils. The formula for consolidation settlement is given by

$$S_c = \begin{cases} \frac{C_c H}{1 + e_0} \log \left(\frac{\sigma_0' + \Delta \sigma'}{\sigma_0'} \right) & : \text{ for normally consolidated clays} \\ \frac{C_s H}{1 + e_0} \log \left(\frac{\sigma_0' + \Delta \sigma'}{\sigma_0'} \right) & : \text{ for overconsolidated clays with } \sigma_0' + \Delta \sigma' \leq \sigma_c' \\ \frac{C_s H}{1 + e_0} \log \left(\frac{\sigma_c'}{\sigma_0'} \right) + \frac{C_c H}{1 + e_0} \log \left(\frac{\sigma_0' + \Delta \sigma'}{\sigma_0'} \right) & : \text{ for overconsolidated clays with } \sigma_0' + \Delta \sigma' > \sigma_c' \end{cases}$$

$$\tag{14}$$

The components in equation 14 above is descrived as follows:

I. C_c is the compression index, given in accordance with (Rendond-Herrero, 1983) by

$$C_c = 0.141G_s^{1.2} \left(\frac{1+e_0}{G_s}\right)^{2.38},\tag{15}$$

where G_s is the specific gravity of soils.

II. C_s is the swell index, taken as (Das and Sobhan, 2012h)

$$C_s = \frac{C_c}{r} \tag{16}$$

with $r \in [5, 10]$.

III. σ_0' is the maximum effective initial pressure of soil before the current settlement occurs, and is given by

$$\sigma_0' = \frac{\gamma' H}{2} \,, \tag{17}$$

where γ' is the effective unit weight of soil. In case the soil is normally consolidated, then $\sigma'_0 = \sigma'_c$, where σ'_c is the effective precosolidation pressure. Otherwise, σ'_c is given in accordance with (Mayne, 1988) by

$$\sigma_c' = 0.243 q_c^{0.96} \,, \tag{18}$$

where q_c is the tip resistance of cone penetration test (CPT) at the depth of interest.

IV. $\Delta\sigma'$ is the net applied pressure, given as the pressure experienced at the depth of interest due to the load on the foundation. Follows from (Fang, 1975), using the method proposed by (Harr, 1977), it is given by

$$\Delta \sigma' = q \psi \left(\frac{B}{\kappa z \sqrt{K}} \right) \psi \left(\frac{L}{\kappa z \sqrt{K}} \right) , \tag{19}$$

where q is the pressure from the foundation, and κ is given by

 $\kappa := \begin{cases} 1 & : \text{ for consolidation at the edge of foundation} \\ 2 & : \text{ for consolidation at the centre of foundation} \end{cases},$

and K is coefficient of lateral earth pressure, and $\psi: \mathbb{R} \to \mathbb{R}$ is the probability density function proposed by (Harr, 1977) and is given by

$$\forall z \in \mathbb{R}, \ \psi(z) := \frac{1}{\sqrt{2\pi}} \int_0^z \frac{\mathrm{d}U}{\sqrt{e^{U^2}}}.$$

We can approximate $\psi : \mathbb{R} \to \mathbb{R}$ by estimating the error function (Andrews, 1998). We will show that ψ can be expressed in terms of error function as follows:

Note that

$$\psi(z) = \frac{1}{\sqrt{2\pi}} \int_0^z \frac{dU}{\sqrt{e^{U^2}}} = \frac{1}{\sqrt{2\pi}} \int_0^z e^{-U^2/2} dU.$$

Assuming $t:=\frac{U}{\sqrt{2}}$, thus $\mathrm{d} U=\sqrt{2}\mathrm{d} t$. Thus we have

$$\psi\left(z\sqrt{2}\right) = \frac{1}{\sqrt{2\pi}} \int_0^z \sqrt{2}e^{-t^2} dt = \frac{1}{\sqrt{\pi}} \int_0^z e^{-t^2} dt = \frac{\text{erf } z}{2},$$

which shows that

$$\psi(z) = \frac{\operatorname{erf}\left(\frac{z}{\sqrt{2}}\right)}{2} \,.$$

We can use an approximation to erf given in the form of Bürmann's series (Schöp and Supancic, 2014), as given by

$$\begin{split} \psi(z) &\approx \frac{1}{2} \left(\frac{2}{\sqrt{\pi}} \mathrm{sgn} \left(\frac{z}{\sqrt{2}} \right) \sqrt{1 - e^{-\frac{z^2}{2}}} \left(\frac{\sqrt{\pi}}{2} + \frac{31}{200} e^{-\frac{z^2}{2}} - \frac{341}{8000} e^{-\frac{2z^2}{2}} \right) \right) \\ &= \frac{1}{\sqrt{\pi}} \mathrm{sgn} \left(\frac{z}{\sqrt{2}} \right) \sqrt{1 - e^{-\frac{z^2}{2}}} \left(\frac{\sqrt{\pi}}{2} + \frac{31}{200} e^{-\frac{z^2}{2}} - \frac{341}{8000} e^{-z^2} \right) \,. \end{split}$$

Since z > 0, then $\operatorname{sgn}(z/\sqrt{2}) = 1$, thus

$$\psi(z) \approx \frac{1}{\sqrt{\pi}} \sqrt{1 - e^{-\frac{z^2}{2}}} \left(\frac{\sqrt{\pi}}{2} + \frac{31}{200} e^{-\frac{z^2}{2}} - \frac{341}{8000} e^{-z^2} \right). \tag{20}$$

Coefficient of lateral earth pressure K is allowed to be taken as the coefficient of active earth pressure (Fang, 1975). Thus,

$$K := \tan^2\left(45 - \frac{\phi'}{2}\right),\tag{21}$$

where ϕ' is the effective friction angle.

2.3 Time-Rate Consolidation Settlement

In the time-rate consolidation settlement, consolidation can be described as a function of time. Obtaining information about the time when the primary consolidation ends is crucial for computing secondary consolidation settlement. The first theory describing time-rate consolidation settlement was proposed by Terzaghi (Das and Sobhan, 2012i). Terzaghi modelled the problem into a partial differential equation (PDE) (Kreyszig, 2011)

$$\frac{\partial u}{\partial t} = c_v \frac{\partial^2 u}{\partial z^2} \,,$$

where u(t, x, y, z) is the function of pore water pressure and c_v is the coefficient of consolidation. A set of boundary conditions is given;

$$z = 0 \implies u = 0$$

$$z = 2H_{dr} \implies u = 0$$

$$t = 0 \implies u = u_0.$$

The solution is given in a form of Fourier series

$$u = \sum_{m=0}^{\infty} \frac{2u_0}{M} \sin\left(\frac{Mz}{H_{dr}}\right) e^{-M^2 T_v} , \qquad (22)$$

where

 u_0 is the initial excess pore water pressure,

 $M = \frac{\pi(2m+1)}{2}, \ T_v = \frac{c_v t}{H_{dr}^2} \ (\mbox{time factor}),$

 H_{dr} is the maximum vertical drainage path.

The degree of consolidation is given by

$$U = 1 - \frac{1}{u_0 2H_{dr}} \int_0^{2H_{dr}} u \, dz = 1 - \sum_{m=0}^{\infty} \frac{2}{M^2} e^{-M^2 T_v} \,. \tag{23}$$

If we can find the invers of U from equation 23 above, we can treat T_v as a function $T_v: U \mapsto T_v(U)$. However, posing the question whether the equation above is invertible is another serious question in mathematics. Moreover, the equation above does not seem to have a closed form solution. Thus, it is very inconvenience for computing T_v from the equation above. An approximation to the function is given in accordance with (Das and Sobhan, 2012j) by

$$T_v = \begin{cases} \frac{\pi U^2}{4} & : U \le 0.6\\ 1.781 - 0.933 \log (100(1 - U)) & : U > 0.6 \end{cases}$$
 (24)

Note that $U \in [0,1]$ along this discussion.

The time in which the primary consolidation is considered ending is the time in which the consolidation has reached 95% (Fang, 1975). Thus, the time in which the primary consolidation ends is given by

$$t_1 := \frac{T_v(0.95)H_{dr}^2}{c_v} \,. \tag{25}$$

2.4 Secondary Consolidation Settlement

The secondary consolidation settlement is given by (Das and Sobhan, 2012c)

$$S_s = \frac{C_{\alpha}H}{1 + e_p} \log\left(\frac{t_2}{t_1}\right),\tag{26}$$

where t_1 is the time in which the primary consolidation ends (given by equation 25), t_2 is the time in which the secondary consolidation is expected to occur –thus, $t_1 < t_2$ necessarily hold, e_p is the void ratio right after the primary consolidation settlement, given by

$$e_p = e_0 - \Delta e \,, \tag{27}$$

and C_{lpha} is the secondary compression index, given by (Das and Sobhan, 2012c)

$$C_{\alpha} = \frac{\Delta e}{\log\left(t_2/t_1\right)} \,. \tag{28}$$

And Δe is the change in void ratio, which is given by (Das and Sobhan, 2012k)

$$\Delta e = C \log \left(\frac{\sigma_0' + \Delta \sigma'}{\sigma_0'} \right), \tag{29}$$

where

 $C := \begin{cases} C_c &: \text{ for normally consolidated clays} \\ C_s &: \text{ for overconsolidated clays} \end{cases}.$

3 Settlements of Transmission Towers Foundations

The detail calculation sheets for the settlements of the transmission towers are given in the attachment. The summary of the analysis result is given in table 3.

Table 3: Summary of the computation results

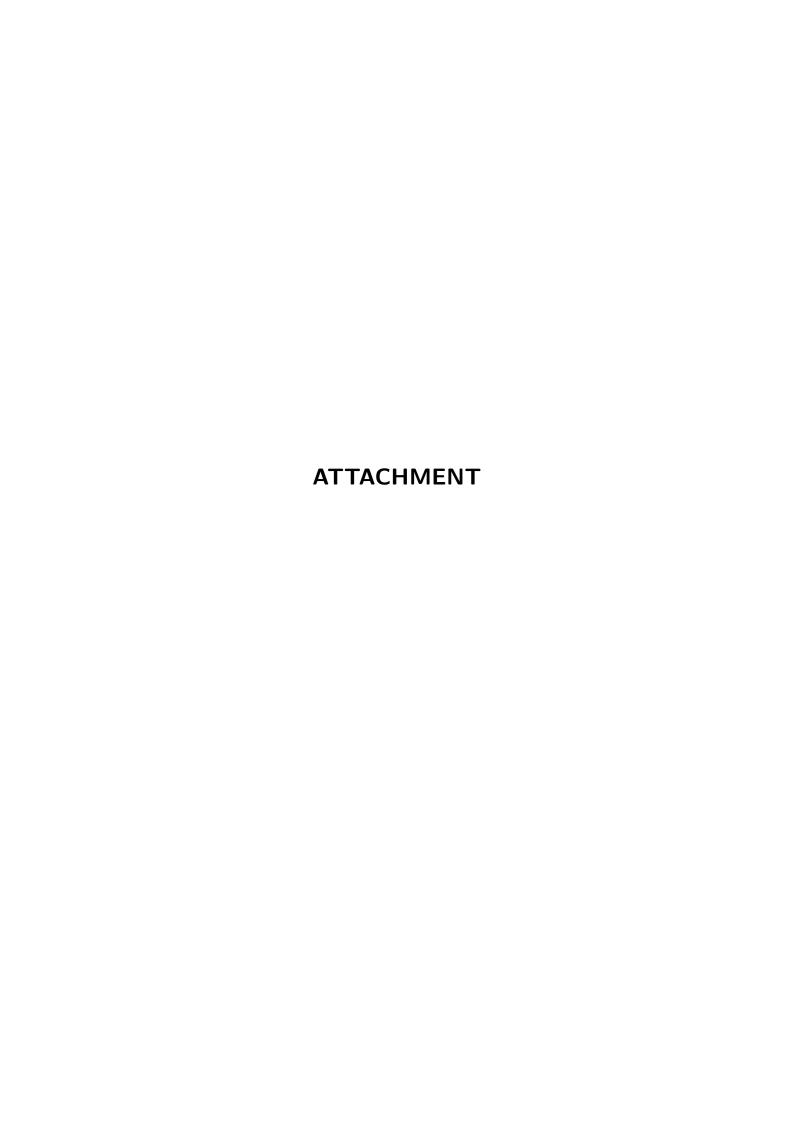
Tower	S_i	S_c	S_s	\overline{S}
	(mm)	(mm)	(mm)	(mm)
T01	6.822	5.231	3.179	15.232
T02	3.774	6.530	3.724	14.028
T03	9.580	5.777	4.318	19.675
T04	10.233	4.973	4.619	19.825
T05	8.560	8.194	8.455	25.208
T06	18.941	7.401	5.682	32.025
T07	12.886	4.518	3.981	21.385
T08	6.288	4.826	5.274	16.388
T09	7.226	4.360	5.104	16.691
T10	7.567	4.088	5.264	16.918
T11	7.153	4.358	4.723	16.233
T12	12.829	5.955	5.194	23.978
T13	12.694	5.277	4.670	22.640
T14	12.963	4.761	4.034	21.758

4 Conclusion

We have presented the theoretical framework for evaluating settlements of shallow foundations, and in this case, the foundations of transmission towers in Smelter Ferronickel Kolaka. From the computation as presentd in table 3, the largest settlement occurs at tower T06 with a total settlement of 32.025 mm. And most towers have total settlements below 25 mm.

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GENERAL SOIL MECHANICAL PROPERTIES				
Young's modulus		E _s =	35,561.300	kN/m ²
Poisson's ratio		μ_s =	0.300	
Unit Weight		γ =	16.300	kN/m ³
Existence of water			TRUE	
Effective unit weight		γ' =	6.490	kN/m ³
Water content		w =	0.069	
Dry unit weight		$\gamma_d =$	15.251	kN/m ³
Specific gravity		G _s =	2.530	
FOUNDATION PROPERTIES				
Length of the foundation		L =	22.000	m
Breadth of the foundation		B =	22.000	m
Depth of foundation		D _f =	3.400	m
Thickness of soil layer		H =	4.000	m
Maximum dranage path		H _{dr} =	2.000	m
COMPUTING NET APPLIED PRESSURE				
Applied pressure		Δσ =	21.386	kN/m ²
Internal angle of friction		φ' =	0.000	
Coefficient of lateral earth pressure	(Eq. 21)	K =	1.000	
Depth of interest		z =	2.000	
Density input-1		Z1 =	5.500	
Density input-2		Z2 =	5.500	
Probability density-1 (Harr, 1977)	(Eq. 20)	ψ(Z1) =	0.484	
Probability density-2 (Harr, 1977)	(Eq. 20)	ψ(Z2) =	0.484	
Net applied pressure	(Eq. 19)	Δσ' =	5.005	kN/m ²
SETTLEMENT				
Immediate Settlement				
A. At the Center				
Effective width	(Eq. 5)	B' =	11.000	m
Location factor	(Eq. 4)	α =	4.000	
Computing shape factor				
		m' =	1.000	

		n' =	0.364	
	(Eq. 9)	A ₀ =	0.466	
	(Eq. 10)	A ₁ =	0.540	
	(Eq. 11)	A ₂ =	1.372	
	(Eq. 7)	F ₁ =	0.320	
	(Eq. 8)	F ₂ =	0.070	
Shape factor	(Eq. 6)	I _s =	0.360	
Depth factor	(Eq. 12)	I _f =	0.846	
Immediate settlement	(Eq. 2)	S _i =	6.822	mm
B. At the Corner				
Effective width	(Eq. 5)	B' =	22.000	m
Location factor	(Eq. 4)	α =	1.000	
Computing shape factor				
		m' =	1.000	
		n' =	0.182	
	(Eq. 9)	A ₀ =	0.462	
	(Eq. 10)	A ₁ =	0.536	
	(Eq. 11)	A ₂ =	1.964	
	(Eq. 7)	F ₁ =	0.318	
	(Eq. 8)	F ₂ =	0.081	
Shape factor	(Eq. 6)	I _s =	0.364	
Depth factor	(Eq. 12)	I _f =	0.846	
Immediate settlement	(Eq. 2)	S _i =	3.450	mm
Primary Consolidation Settlement				
Pressure of initial state	(Eq. 17)	σ ₀ ' =	12.980	kN/m²
Void ratio of initial state		e ₀ =	0.627	
Compression index	(Eq. 15)	C _c =	0.150	
Swell index	(Eq. 16)	C _s =	0.030	
Corresponding cone tip resistance		q _c =	1,078.732	kN/m ²
Preconsolidation pressure	(Eq. 18)	σ _c ' =	198.245	kN/m ²
Consolidation status		Ove	erconsolidated	
Change of void ratio	(Eq. 29)	Δe =	0.004	
Consolidation settlement	(Eq. 14)	S _c =	5.231	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.623	

Computing the time in which the primary consolidation ends (assumed to be 95% consolidation):

Total Settlement		(Eq. 1)	S =	15.232	mm
Secondary consoli	dation settlement	(Eq. 26)	S _s =	3.179	mm
Secondary compre	ession index		$C_{\alpha} =$	0.006	
Empirical value for	$r C_{\alpha}/C_{c}$		$C_{\alpha}/C_{c} =$	0.040	
			$t_1 + t_2' =: t_2 =$	5.129	years
The time consider	ed for secondary consolidation		t ₂ ' =	2.000	years
Time a	t the end of primary consolidation	(Eq. 25)	t ₁ =	3.129	years
Draina	ge path		H _{dr} =	2.000	m
Coeffic	cient of consolidation		c _v =	2.78E-06	m²/min
Time f	actor	(Eq. 24)	$T_v =$	1.129	

Young's modulus		E _s =	41,414.190	kN/m ²
Poisson's ratio		μ _s =	0.500	
Unit Weight		γ =	15.600	kN/m³
Existence of water			FALSE	
Effective unit weight		γ' =	15.600	kN/m³
Water content		w =	0.257	
Dry unit weight		$\gamma_d =$	12.413	kN/m³
Specific gravity		G _s =	2.560	
FOUNDATION PROPERTIES				
Length of the foundation		L =	7.200	m
Breadth of the foundation		B =	7.200	m
Depth of foundation		D _f =	3.400	m
Thickness of soil layer		H =	4.900	m
Maximum dranage path		H _{dr} =	2.450	m
COMPUTING NET APPLIED PRESSURE				
Weight of pedestal		W _p =	4.320	Ton
Weight of footing		W _f =	87.091	Ton
Force on the foundation		F =	195.870	Ton
Total force		P =	2,818.229	kN
Applied pressure		Δσ =	54.364	kN/m²
Internal angle of friction		ф' =	40.280	
Coefficient of lateral earth pressure	(Eq. 21)	K =	0.215	
Depth of interest		z =	2.450	
Density input-1		Z1 =	3.171	
Density input-2		Z2 =	3.171	
Probability density-1 (Harr, 1977)	(Eq. 20)	ψ(Z1) =	0.446	
Probability density-2 (Harr, 1977)	(Eq. 20)	ψ(Z2) =	0.446	
Net applied pressure	(Eq. 19)	Δσ' =	10.832	kN/m ²

SETTLEMENT

Immediate Settlement

M' = 1.000	Effective width	(Eq. 5)	B' =	3.600	m
m' = 1.000 n' = 1.361 1.361 (Eq. 9) A ₀ = 0.508 (Eq. 10) A ₁ = 0.546 (Eq. 11) A ₂ = 0.612 (Eq. 11) A ₂ = 0.612 (Eq. 11) A ₂ = 0.612 (Eq. 8) F ₂ = 0.044 (Eq. 8) F ₂ = 0.044 (Eq. 12) I ₁ = 0.853 (Eq. 8) F ₂ = 0.044 (Eq. 12) I ₁ = 0.853 (Eq. 8) Eq. 1000 (Eq. 12) I ₂ = 0.853 (Eq. 9) Eq. 1000 (Eq. 12) I ₃ = 0.853 (Eq. 9) Eq. 1000 (Eq. 12)	Location factor	(Eq. 4)	α =	4.000	
N	Computing shape factor				
(Eq. 9) A ₀ = 0.508 (Eq. 10) A ₁ = 0.546 (Eq. 11) A ₂ = 0.612 (Eq. 7) F ₁ = 0.336 (Eq. 8) F ₂ = 0.044 Shape factor (Eq. 6) I ₁ = 0.853 Immediate settlement (Eq. 12) I ₇ = 0.853 Immediate settlement (Eq. 12) I ₇ = 0.853 Immediate settlement (Eq. 12) I ₇ = 0.853 Immediate settlement (Eq. 2) S ₁ = 3.774 mm B. At the Corner (Eq. 14) α = 1.000 Computing shape factor (Eq. 4) α = 1.000 Computing shape factor (Eq. 4) α = 1.000 Image: Arrival shape factor (Eq. 4) A ₁ = 0.546 (Eq. 9) A ₂ = 0.477 (Eq. 10) A ₁ = 0.546 (Eq. 11) A ₂ = 0.968 (Eq. 7) F ₁ = 0.326 (Eq. 11) A ₂ = 0.968 (Eq. 7) F ₁ = 0.326 (Eq. 8) F ₂ = 0.058 (Eq. 12) I ₇ = 0.853 Immediate settlement (Eq. 2) S ₁ = 1.831 mm Primary Consolidation Settlement (Eq. 12) I ₇ = 0.853 Immediate settlement (Eq. 12) I ₇ = 0.853 Immediate settlement (Eq. 15) C ₇ = 0.249 Swell index (Eq. 16) C ₇ = 0.050 Immediate settlement (Eq. 15) C ₇ = 0.050 Immediate settlement (Eq. 16) C ₇ = 0.050 Immediate settlement (Eq. 18) (Eq. 18) (Eq. 18) (Eq. 18) Immediate settlement (Eq. 18) (Eq. 18			m' =	1.000	
(Eq. 10) A1 = 0.546 (Eq. 11) A2 = 0.612 (Eq. 7) F1 = 0.336 (Eq. 8) F2 = 0.044 (Eq. 8) F3 = 0.044 (Eq. 8) F3 = 0.044 (Eq. 6) I3 = 0.853 (Eq. 12) I4 = 0.854 (Eq. 12) I4 = 0.854 (Eq. 13) (Eq. 14) I4 = 0.681 (Eq. 14) I4 = 0.546 (Eq. 11) I4 = 0.326 (Eq. 8) F2 = 0.058 (Eq. 7) F3 = 0.326 (Eq. 8) F4 = 0.326 (Eq. 8) F4 = 0.326 (Eq. 8) I4 = 0.326 (Eq. 8) I4 = 0.326 (Eq. 8) I4 = 0.326 (Eq. 12) I4 = 0.853 (Eq. 12) (Eq. 12) I4 = 0.853 (Eq. 12) (Eq. 12) (Eq. 12) (Eq. 12) (Eq. 13) (Eq. 12) (Eq. 13) (Eq. 14) (Eq. 14) (Eq. 15) (Eq.			n' =	1.361	
(Eq. 11) A₂ = 0.612 (Eq. 7)		(Eq. 9)	A ₀ =	0.508	
(Eq. 7) F ₁ = 0.336 (Eq. 8) F ₂ = 0.044 Shape factor (Eq. 6) I ₁ = 0.336 Depth factor (Eq. 12) I ₁ = 0.853 Immediate settlement (Eq. 2) S ₁ = 3.774 mm B. At the Corner		(Eq. 10)	A ₁ =	0.546	
(Eq. 8) F ₂ 0.044		(Eq. 11)	A ₂ =	0.612	
Shape factor (Eq. 6) I ₁ = 0.336 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0.853 0		(Eq. 7)	F ₁ =	0.336	
Depth factor (Eq. 12) I ₁ = 0.853 (Eq. 2) S ₁ = 3.774 mm (Eq. 5) S ₁ = 3.774 mm (Eq. 5) S ₁ = 3.774 mm (Eq. 5) S ₂ = 3.774 mm (Eq. 5) S ₃ = 3.774 mm (Eq. 5) S ₄ = 3.700 m (Eq. 4) α = 1.000 (Eq. 9) α α = 0.477 (Eq. 10) α α = 0.477 (Eq. 10) α α = 0.477 (Eq. 11) α α = 0.968 (Eq. 11) α α = 0.968 (Eq. 11) α α = 0.968 (Eq. 11) α α = 0.326 (Eq. 8) E α = 0.058 (Eq. 8) E α = 0.058 (Eq. 8) E α = 0.326 (Eq. 8) E α = 0.326 (Eq. 16) (Eq. 12) I ₁ = 0.853 (Eq. 12) I ₂ = 0.853 (Eq. 12) (Eq. 12) I ₃ = 0.853 (Eq. 12) (Eq. 12) (Eq. 12) (Eq. 12) (Eq. 13) (Eq. 12) (Eq. 13) (Eq. 13) (Eq. 15) (Eq. 1		(Eq. 8)	F ₂ =	0.044	
Section Fig. 2 Section Sect	Shape factor	(Eq. 6)	I _s =	0.336	
B. At the Corner Effective width (Eq. 5) B' = 7.200 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.681 (Eq. 9) A ₀ = 0.477 (Eq. 10) A ₁ = 0.546 (Eq. 11) A ₂ = 0.968 (Eq. 7) F ₁ = 0.326 (Eq. 8) F ₂ = 0.058 Shape factor (Eq. 6) I ₅ = 0.326 Depth factor (Eq. 12) I ₇ = 0.853 Immediate settlement (Eq. 2) S ₁ = 1.831 mm Primary Consolidation Settlement Pressure of initial state (Eq. 17) σ ₀ ' = 38.220 kN/m² Void ratio of initial state (Eq. 15) C _c = 0.249 Swell index (Eq. 16) C ₅ = 0.050 Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) σ _c ' = 351.929 kN/m² Consolidation status	Depth factor	(Eq. 12)	I _f =	0.853	
Effective width (Eq. 5) B' = 7.200 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.681 (Eq. 9) A₀ = 0.477 (Eq. 10) A₁ = 0.546 (Eq. 11) A₂ = 0.968 (Eq. 7) F₁ = 0.326 (Eq. 8) F₂ = 0.058 Shape factor (Eq. 8) F₂ = 0.058 Shape factor (Eq. 12) I₁ = 0.853 Immediate settlement (Eq. 2) S₁ = 1.831 mm Primary Consolidation Settlement Pressure of initial state (Eq. 17) σ₀' = 38.220 kN/m² Void ratio of initial state (Eq. 15) C₂ = 0.249 Swell index (Eq. 16) C₃ = 0.050 Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) σ₂' = 351.929 kN/m² Preconsolidation status Overconsolidated	Immediate settlement	(Eq. 2)	S _i =	3.774	mm
Effective width (Eq. 5) B' = 7.200 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.681 (Eq. 9) A₀ = 0.477 (Eq. 10) A₁ = 0.546 (Eq. 11) A₂ = 0.968 (Eq. 7) F₁ = 0.326 (Eq. 8) F₂ = 0.058 Shape factor (Eq. 8) F₂ = 0.058 Shape factor (Eq. 12) I₁ = 0.853 Immediate settlement (Eq. 2) S₁ = 1.831 mm Primary Consolidation Settlement Pressure of initial state (Eq. 17) σ₀' = 38.220 kN/m² Void ratio of initial state (Eq. 15) C₂ = 0.249 Swell index (Eq. 16) C₃ = 0.050 Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) σ₂' = 351.929 kN/m² Preconsolidation status Overconsolidated					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		(5 5)	D.	7 200	
M' = 1.000					m
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(Eq. 4)	α =	1.000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Computing snape factor			1 000	
$ (Eq. 9) \qquad A_0 = \qquad 0.477 \\ (Eq. 10) \qquad A_1 = \qquad 0.546 \\ (Eq. 11) \qquad A_2 = \qquad 0.968 \\ (Eq. 7) \qquad F_1 = \qquad 0.326 \\ (Eq. 8) \qquad F_2 = \qquad 0.058 \\ (Eq. 8) \qquad F_2 = \qquad 0.058 \\ (Eq. 6) \qquad I_5 = \qquad 0.326 \\ (Eq. 12) \qquad I_f = \qquad 0.853 \\ (Eq. 13) \qquad I_f = \qquad 0.853 \\ (Eq. 15) \qquad I_f = \qquad 0.853 \\ (Eq. 16) \qquad I_f = \qquad 0.853 \\ (Eq. 18) \qquad I_f = \qquad 0.85$					
		(5 0)			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					
Shape factor $(Eq. 8)$ $F_2 = 0.058$ Shape factor $(Eq. 6)$ $I_s = 0.326$ Depth factor $(Eq. 12)$ $I_f = 0.853$ Immediate settlement $(Eq. 2)$ $S_i = 1.831$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 38.220$ kN/m^2 Void ratio of initial state $(Eq. 15)$ $C_c = 0.249$ Swell index $(Eq. 16)$ $C_s = 0.050$ Corresponding cone tip resistance $q_c = 1.961.330$ kN/m^2 Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 351.929$ kN/m^2 Consolidation status					
Shape factor $(Eq. 6)$ $I_s = 0.326$ Depth factor $(Eq. 12)$ $I_f = 0.853$ Immediate settlement $(Eq. 2)$ $S_i = 1.831$ mm					
Depth factor(Eq. 12) I_f = 0.853Immediate settlement(Eq. 2) S_i = 1.831 mmPrimary Consolidation SettlementPressure of initial state(Eq. 17) σ_0' = 38.220 kN/m²Void ratio of initial state e_0 = 1.023Compression index(Eq. 15) C_c = 0.249Swell index(Eq. 16) C_s = 0.050Corresponding cone tip resistance q_c = 1,961.330 kN/m²Preconsolidation pressure(Eq. 18) σ_c' = 351.929 kN/m²Consolidation statusOverconsolidated					
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Compression index Corresponding cone tip resistance Preconsolidation status (Eq. 17) $\sigma_0' = 38.220 \text{ kN/m}^2$ $\sigma_0' = 38.220 \text{ kN/m}^2$ $\sigma_0' = 1.023$ $\sigma_0' = 0.249$ σ					
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Compression index Compression index (Eq. 15) Co = 0.249 Swell index (Eq. 16) Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) $\sigma_{c}' = 351.929 \text{ kN/m}^2$ Consolidation status Overconsolidated	·				
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = \qquad 38.220 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 1.023 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.249 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.050 $ Corresponding cone tip resistance $ q_c = \qquad 1,961.330 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 351.929 kN/m^2 $ Consolidation status $ Overconsolidated $	Immediate settlement	(Eq. 2)	S _i =	1.831	mm
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = \qquad 38.220 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 1.023 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.249 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.050 $ Corresponding cone tip resistance $ q_c = \qquad 1,961.330 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 351.929 kN/m^2 $ Consolidation status $ Overconsolidated $	Primary Consolidation Settlement				
Void ratio of initial state $e_0 = 1.023$ Compression index $(Eq. 15) \qquad C_c = 0.249$ Swell index $(Eq. 16) \qquad C_s = 0.050$ Corresponding cone tip resistance $q_c = 1,961.330 kN/m^2$ Preconsolidation pressure $(Eq. 18) \qquad \sigma_{c}' = 351.929 kN/m^2$ Consolidation status $Overconsolidated$	Pressure of initial state	(Eq. 17)	σ ₀ ' =	38.220	kN/m ²
Swell index (Eq. 16) $C_s = 0.050$ Corresponding cone tip resistance $q_c = 1,961.330 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 351.929 \text{ kN/m}^2$ Consolidation status	Void ratio of initial state		e ₀ =	1.023	
Corresponding cone tip resistance $q_c = 1,961.330 kN/m^2$ Preconsolidation pressure $(Eq.\ 18) \qquad \sigma_c' = 351.929 kN/m^2$ Consolidation status $Overconsolidated$	Compression index	(Eq. 15)	C _c =	0.249	
Preconsolidation pressure (Eq. 18) $\sigma_c' = 351.929 \text{ kN/m}^2$ Consolidation status Overconsolidated	Swell index	(Eq. 16)	C _s =	0.050	
Consolidation status Overconsolidated	Corresponding cone tip resistance		q _c =	1,961.330	kN/m ²
	Preconsolidation pressure	(Eq. 18)	σ _c ' =	351.929	kN/m²
Change of void ratio (Eq. 29) $\Delta e = 0.005$	Consolidation status		Ove	rconsolidated	
	Change of void ratio	(Eq. 29)	Δe =	0.005	

Consolidation settlement	(Eq. 14)	S _c =	6.530	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	1.018	
Computing the time in which the primary consolidation ends (as	ssumed to be 95%	6 consolidation):		
Time factor	(Eq. 24)	$T_v =$	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	2.450	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	4.695	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t	$t_1 + t_2' =: t_2 =$	6.695	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.010	
Secondary consolidation settlement	(Eq. 26)	S _s =	3.724	mm
Total Settlement	(Eq. 1)	S =	14.028	mm

Young's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		μ _s =	0.300	
Unit Weight		γ =	14.800	kN/m³
Existence of water			FALSE	
Effective unit weight		γ' =	14.800	kN/m³
Water content		w =	0.336	
Dry unit weight		$\gamma_d =$	11.080	kN/m³
Specific gravity		G _s =	2.450	
FOUNDATION PROPERTIES				
Length of the foundation		L =	7.400	m
Breadth of the foundation		B =	7.400	m
Depth of foundation		D _f =	3.400	m
Thickness of soil layer		H =	4.900	m
Maximum dranage path		H _{dr} =	2.450	m
COMPUTING NET APPLIED PRESSURE				
Weight of pedestal		W _p =	2.535	Ton
Weight of footing		W _f =	65.712	Ton
Force on the foundation		F =	154.530	Ton
Total force		P =	2,185.442	kN
Applied pressure		Δσ =	39.909	kN/m ²
Internal angle of friction		φ' =	33.870	
Coefficient of lateral earth pressure	(Eq. 21)	K =	0.284	
Depth of interest		z =	2.450	
Density input-1		Z1 =	2.833	
Density input-2		Z2 =	2.833	
	(5 20)	ψ(Z1) =	0.437	
Probability density-1 (Harr, 1977)	(Eq. 20)	,		
Probability density-1 (Harr, 1977) Probability density-2 (Harr, 1977)	(Eq. 20) (Eq. 20)	ψ(Z2) =	0.437	

SETTLEMENT

Immediate Settlement

March 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.324 1.000 1.325 1.00	Effective width	(Eq. 5)	B' =	3.700	m
m' = 1.000 n' = 1.324 (Eq. 9) A ₉ = 0.507 (Eq. 10) A ₁ = 0.547 (Eq. 11) A ₂ = 0.624 (Eq. 7) F ₁ = 0.335 (Eq. 8) F ₂ = 0.045 Shape factor (Eq. 6) I ₁ = 0.361 Depth factor (Eq. 6) I ₂ = 0.781 Immediate settlement (Eq. 2) S ₁ = 9.580 mm B. At the Corner Effective width (Eq. 2) S ₁ = 9.580 mm B. At the Corner Effective width (Eq. 5) B' = 7.400 m Location factor (Eq. 4) α = 1.000 Computing shape factor Eq. 9 A ₉ = 0.476 (Eq. 10) A ₁ = 0.662 (Eq. 9) A ₉ = 0.476 (Eq. 11) A ₂ = 0.983 (Eq. 7) F ₁ = 0.325 (Eq. 7) F ₁ = 0.325 (Eq. 7) F ₁ = 0.325 (Eq. 8) F ₂ = 0.059 Shape factor (Eq. 6) I ₂ = 0.389 Depth factor (Eq. 12) I ₁ = 0.781 Immediate settlement Eq. 12 I ₁ = 0.781 Immediate settlement Primary Consolidation Settlement Pressure of initial state Eq. 17 α ₀ ' = 36.260 KN/m² KN/m² Preconsolidation pressure (Eq. 16) C ₂ = 0.062 Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) α ₂ ' = 402.462 KN/m² Preconsolidation pressure (Eq. 18) α ₂ ' = 402.462 KN/m² Preconsolidation status Overconsolidate Overconsolidate Eq. 160 α ₂ ' = 402.462 KN/m²	Location factor	(Eq. 4)	α =	4.000	
N	Computing shape factor				
(Eq. 9) A ₀ = 0.507 (Eq. 10) A ₁ = 0.547 (Eq. 11) A ₂ = 0.624 (Eq. 7) F ₁ = 0.335 (Eq. 8) F ₂ = 0.045 (Eq. 8) F ₃ = 0.045 (Eq. 8) F ₄ = 0.781 (Eq. 12) I ₇ = 0.780 mm (Eq. 12) I ₇ = 0.780 mm (Eq. 14) A ₂ = 0.546 (Eq. 14) A ₃ = 0.662 (Eq. 9) A ₁ = 0.662 (Eq. 10) A ₁ = 0.546 (Eq. 11) A ₃ = 0.546 (Eq. 12) I ₇ = 0.325 (Eq. 8) F ₂ = 0.059 (Eq. 6) I ₈ = 0.359 (Eq. 6) I ₈ = 0.359 (Eq. 6) I ₈ = 0.359 (Eq. 6) I ₈ = 0.781 (Eq. 12) I ₇ = 0.781 (Eq. 13) (Eq. 15) (Eq. 15) (Eq. 16) (Eq. 16)			m' =	1.000	
(Eq. 10) A ₁ = 0.547 (Eq. 11) A ₂ = 0.624 (Eq. 7) F ₁ = 0.335 (Eq. 8) F ₂ = 0.045 (Eq. 8) F ₂ = 0.045 (Eq. 8) F ₂ = 0.045 (Eq. 6) I ₁ = 0.361 (Eq. 12) I ₁ = 0.781 (Eq. 12) I ₁ = 0.781 (Eq. 12) I ₂ = 0.781 (Eq. 12) I ₃ = 0.781 (Eq. 12) I ₄ = 0.546 (Eq. 6) I ₄ = 0.546 (Eq. 6) I ₄ = 0.546 (Eq. 6) I ₄ = 0.662 (Eq. 4) (Eq. 6) I ₄ = 0.662 (Eq. 4) (Eq. 6) I ₄ = 0.546 (Eq. 11) A ₂ = 0.983 (Eq. 7) F ₁ = 0.325 (Eq. 8) F ₂ = 0.059 (Eq. 8) F ₃ = 0.359 (Eq. 8) F ₄ = 0.359 (Eq. 8) F ₄ = 0.359 (Eq. 8) F ₄ = 0.781 (Eq. 12) I ₄ = 0.781 (Eq. 12) I ₄ = 0.781 (Eq. 12) I ₄ = 0.781 (Eq. 12) (Eq. 12) I ₄ = 0.781 (Eq. 12) (Eq. 12) (Eq. 13) (Eq. 16)			n' =	1.324	
(Eq. 11) A₂ = 0.624 (Eq. 7)		(Eq. 9)	$A_0 =$	0.507	
(Eq. 7) F ₁ = 0.335 (Eq. 8) F ₂ = 0.045 (Eq. 8) F ₁ = 0.0361 (Eq. 6) I ₁ = 0.361 (Eq. 12) I ₁ = 0.781 (Eq. 12) I ₂ = 0.781 (Eq. 12) I ₃ = 0.781 (Eq. 12) I ₄ = 0.780 mm (Eq. 5) B' = 7.400 m (Eq. 6) B' = 7.400 m (Eq. 4) α = 1.000 (Eq. 4) (Eq. 6) (Eq. 9) (Eq. 9) (Eq. 9) (Eq. 9) (Eq. 9) (Eq. 11) (Eq. 12)		(Eq. 10)	A ₁ =	0.547	
(Eq. 8) F ₂ 0.045		(Eq. 11)	A ₂ =	0.624	
Shape factor (Eq. 6) I _s = 0.361 Depth factor (Eq. 12) I _f = 0.781 Depth factor (Eq. 12) I _f = 0.781 Depth factor (Eq. 2) S ₁ = 9.580 mm Depth factor (Eq. 2) S ₁ = 9.580 mm Depth factor (Eq. 5) B' = 7.400 m Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 9) A ₀ = 0.476 (Eq. 10) A ₁ = 0.546 (Eq. 11) A ₂ = 0.983 (Eq. 7) F ₁ = 0.325 (Eq. 8) F ₂ = 0.059 Depth factor (Eq. 6) I _s = 0.359 Depth factor (Eq. 12) I _f = 0.781 Depth factor (Eq. 12) Depth factor (Eq. 12) I _f = 0.781 Depth factor (Eq. 12) I _f = 0.781 Depth factor (Eq. 12) Depth factor (Eq. 12) I _f = 0.781 Depth factor (Eq. 15) (Eq. 15) (Eq. 16) Depth factor (E		(Eq. 7)	F ₁ =	0.335	
Depth factor (Eq. 12) I ₁ = 0.781 (Eq. 2) S ₁ = 9.580 mm (Eq. 5) S ₁ = 9.580 mm (Eq. 5) S ₁ = 7.400 m (Eq. 4) α = 1.000		(Eq. 8)	F ₂ =	0.045	
Section Sec	Shape factor	(Eq. 6)	I _s =	0.361	
B. At the Corner Effective width (Eq. 5) B' = 7.400 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.662 (Eq. 9) A ₀ = 0.476 (Eq. 10) A ₁ = 0.546 (Eq. 11) A ₂ = 0.983 (Eq. 7) F ₁ = 0.325 (Eq. 8) F ₂ = 0.059 Shape factor (Eq. 6) I ₃ = 0.359 Depth factor (Eq. 12) I ₇ = 0.781 Immediate settlement (Eq. 2) S ₁ = 4.764 mm Primary Consolidation Settlement Pressure of initial state Compression index (Eq. 15) C _c = 0.309 Swell index Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) σ _c ' = 402.462 kN/m ² Consolidation status	Depth factor	(Eq. 12)	I _f =	0.781	
Effective width (Eq. 5) B' = 7.400 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.662 (Eq. 9) A₀ = 0.476 (Eq. 10) A₁ = 0.546 (Eq. 11) A₂ = 0.983 (Eq. 7) F₁ = 0.325 (Eq. 8) F₂ = 0.059 Shape factor (Eq. 8) F₂ = 0.059 Depth factor (Eq. 12) I₁ = 0.781 Immediate settlement (Eq. 2) S₁ = 4.764 mm Primary Consolidation Settlement Pressure of initial state (Eq. 17) σ₀' = 36.260 kN/m² Void ratio of initial state (Eq. 15) C₂ = 0.309 Swell index (Eq. 16) C₃ = 0.062 Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) σ₂' = 402.462 kN/m² Consolidation status	Immediate settlement	(Eq. 2)	S _i =	9.580	mm
Effective width (Eq. 5) B' = 7.400 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.662 (Eq. 9) A₀ = 0.476 (Eq. 10) A₁ = 0.546 (Eq. 11) A₂ = 0.983 (Eq. 7) F₁ = 0.325 (Eq. 8) F₂ = 0.059 Shape factor (Eq. 8) F₂ = 0.059 Depth factor (Eq. 12) I₁ = 0.781 Immediate settlement (Eq. 2) S₁ = 4.764 mm Primary Consolidation Settlement Pressure of initial state (Eq. 17) σ₀' = 36.260 kN/m² Void ratio of initial state (Eq. 15) C₂ = 0.309 Swell index (Eq. 16) C₃ = 0.062 Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) σ₂' = 402.462 kN/m² Consolidation status					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		/F~ F\	D! _	7 400	
M' = 1.000					rm
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(Eq. 4)	α =	1.000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Computing snape factor		! _	1 000	
$ (Eq. 9) \qquad A_0 = \qquad 0.476 \\ (Eq. 10) \qquad A_1 = \qquad 0.546 \\ (Eq. 11) \qquad A_2 = \qquad 0.983 \\ (Eq. 7) \qquad F_1 = \qquad 0.325 \\ (Eq. 8) \qquad F_2 = \qquad 0.059 \\ Shape factor \qquad (Eq. 6) \qquad I_5 = \qquad 0.359 \\ Depth factor \qquad (Eq. 12) \qquad I_f = \qquad 0.781 \\ \hline \\ Immediate settlement \qquad (Eq. 2) \qquad S_1 = \qquad 4.764 mm \\ \hline \\ Pressure of initial state \qquad (Eq. 17) \qquad \sigma_0' = \qquad 36.260 kN/m^2 \\ Void ratio of initial state \qquad (Eq. 15) \qquad C_c = \qquad 0.309 \\ Compression index \qquad (Eq. 16) \qquad C_s = \qquad 0.062 \\ Corresponding cone tip resistance \qquad q_c = \qquad 2,255.530 kN/m^2 \\ Preconsolidation pressure \qquad (Eq. 18) \qquad \sigma_c' = \qquad 402.462 kN/m^2 \\ Consolidation status \qquad Overconsolidated \\ \hline $					
		/F~ 0\			
Shape factor $(Eq. 8)$ $F_2 = 0.059$ Shape factor $(Eq. 6)$ $I_s = 0.359$ Depth factor $(Eq. 12)$ $I_f = 0.781$ Immediate settlement $(Eq. 2)$ $S_1 = 4.764$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 36.260$ kN/m² Void ratio of initial state $(Eq. 17)$ $\sigma_0' = 1.169$ Compression index $(Eq. 15)$ $C_c = 0.309$ Swell index $(Eq. 16)$ $C_s = 0.062$ Corresponding cone tip resistance $q_c = 2.255.530$ kN/m² Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 402.462$ kN/m² Consolidation status					
Shape factor $(Eq. 6)$ $I_s = 0.359$ Depth factor $(Eq. 12)$ $I_f = 0.781$ Immediate settlement $(Eq. 2)$ $S_i = 4.764$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 36.260$ kN/m² Void ratio of initial state $e_0 = 1.169$ Compression index $(Eq. 15)$ $C_c = 0.309$ Swell index $(Eq. 16)$ $C_s = 0.062$ Corresponding cone tip resistance $q_c = 2.255.530$ kN/m² Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 402.462$ kN/m² Overconsolidated					
Depth factor(Eq. 12) I_f = 0.781Immediate settlement(Eq. 2) S_i = 4.764 mmPrimary Consolidation SettlementPressure of initial state(Eq. 17) σ_0' = 36.260 kN/m²Void ratio of initial state e_0 = 1.169Compression index(Eq. 15) C_c = 0.309Swell index(Eq. 16) C_s = 0.062Corresponding cone tip resistance q_c = 2,255.530 kN/m²Preconsolidation pressure(Eq. 18) σ_c' = 402.462 kN/m²Consolidation statusOverconsolidated	Change franker				
Primary Consolidation Settlement (Eq. 2) $S_i = 4.764 \text{ mm}$ Pressure of initial state (Eq. 17) $\sigma_0' = 36.260 \text{ kN/m}^2$ Void ratio of initial state $e_0 = 1.169$ Compression index (Eq. 15) $C_c = 0.309$ Swell index (Eq. 16) $C_s = 0.062$ Corresponding cone tip resistance $q_c = 2,255.530 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 402.462 \text{ kN/m}^2$ Consolidation status					
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Void ratio of initial state Compression index (Eq. 15) Co = 0.309 Swell index (Eq. 16) Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) $\sigma_c' = 402.462 \text{ kN/m}^2$ Consolidation status Overconsolidated	·				
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = \qquad 36.260 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 1.169 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.309 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.062 $ Corresponding cone tip resistance $ q_c = \qquad 2,255.530 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 402.462 kN/m^2 $ Consolidation status $ Overconsolidated $	Immediate settlement	(Eq. 2)	S _i =	4.764	mm
Void ratio of initial state $e_0 = 1.169$ Compression index $(Eq. 15) \qquad C_c = 0.309$ Swell index $(Eq. 16) \qquad C_s = 0.062$ Corresponding cone tip resistance $q_c = 2,255.530 kN/m^2$ Preconsolidation pressure $(Eq. 18) \qquad \sigma_{c}' = 402.462 kN/m^2$ Consolidation status $Overconsolidated$	Primary Consolidation Settlement				
Void ratio of initial state $e_0 = 1.169$ Compression index $(Eq. 15) \qquad C_c = 0.309$ Swell index $(Eq. 16) \qquad C_s = 0.062$ Corresponding cone tip resistance $q_c = 2,255.530 kN/m^2$ Preconsolidation pressure $(Eq. 18) \qquad \sigma_{c}' = 402.462 kN/m^2$ Consolidation status $Overconsolidated$	Pressure of initial state	(Eq. 17)	σ ₀ ' =	36.260	kN/m ²
Swell index (Eq. 16) $C_s = 0.062$ Corresponding cone tip resistance $q_c = 2,255.530 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 402.462 \text{ kN/m}^2$ Consolidation status	Void ratio of initial state		e ₀ =	1.169	
Corresponding cone tip resistance $q_c = 2,255.530 kN/m^2$ Preconsolidation pressure $(Eq. 18) \sigma_c' = 402.462 kN/m^2$ Consolidation status $Overconsolidated$	Compression index	(Eq. 15)	C _c =	0.309	
Preconsolidation pressure (Eq. 18) $\sigma_c' = 402.462 \text{ kN/m}^2$ Consolidation status Overconsolidated	Swell index	(Eq. 16)	C _s =	0.062	
Consolidation status Overconsolidated	Corresponding cone tip resistance		q _c =	2,255.530	kN/m ²
	Preconsolidation pressure	(Eq. 18)	$\sigma_{c}' =$	402.462	kN/m²
Change of void ratio (Eq. 29) $\Delta e = 0.005$	Consolidation status		Ove	rconsolidated	
	Change of void ratio	(Eq. 29)	Δe =	0.005	

Consolidation settlement	(Eq. 14)	S _c =	5.777	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	1.164	
Computing the time in which the primary consolidation ends	(assumed to be 95	% consolidation):		
Time factor	(Eq. 24)	$T_v =$	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	2.450	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	4.695	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
		t ₁ + t ₂ ' =: t ₂ =	6.695	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.012	
Secondary consolidation settlement	(Eq. 26)	S _s =	4.318	mm
Total Settlement	(Eq. 1)	S =	19.675	mm

Young's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		μ _s =	0.300	
Unit Weight		γ =	16.800	kN/m³
Existence of water			FALSE	
Effective unit weight		γ' =	16.800	kN/m³
Water content		w =	0.327	
Dry unit weight		γ_d =	12.658	kN/m³
Specific gravity		G _s =	2.550	
FOUNDATION PROPERTIES				
Length of the foundation		L =	7.100	m
Breadth of the foundation		B =	7.100	m
Depth of foundation		D _f =	2.500	m
Thickness of soil layer		H =	3.200	m
Maximum dranage path		H _{dr} =	1.600	m
COMPUTING NET APPLIED PRESSURE				
Weight of pedestal		W _p =	2.535	-
Weight of pedestal				ION
				Ton
Weight of footing		W _f =	60.492	Ton
Weight of footing Force on the foundation		W _f = F =	60.492 159.510	Ton Ton
Weight of footing Force on the foundation Total force		W _f = F = P =	60.492 159.510 2,183.088	Ton Ton kN
Weight of footing Force on the foundation Total force Applied pressure		$W_f =$ $F =$ $P =$ $\Delta \sigma =$	60.492 159.510 2,183.088 43.307	Ton Ton
Weight of footing Force on the foundation Fotal force Applied pressure Internal angle of friction	(Ea. 21)	$W_f =$ $F =$ $P =$ $\Delta \sigma =$ $\varphi' =$	60.492 159.510 2,183.088 43.307 32.150	Ton Ton kN
Weight of footing Force on the foundation Total force Applied pressure Internal angle of friction Coefficient of lateral earth pressure	(Eq. 21)	$W_f =$ $F =$ $P =$ $\Delta \sigma =$	60.492 159.510 2,183.088 43.307 32.150 0.305	Ton Ton kN
Weight of footing Force on the foundation Total force Applied pressure Internal angle of friction Coefficient of lateral earth pressure Depth of interest	(Eq. 21)	$W_f = F = F = A = A = A = A = A = A = A = A$	60.492 159.510 2,183.088 43.307 32.150 0.305 1.600	Ton Ton kN
Weight of footing Force on the foundation Fotal force Applied pressure Internal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1	(Eq. 21)	$W_f =$ $F =$ $P =$ $\Delta \sigma =$ $\varphi' =$ $K =$	60.492 159.510 2,183.088 43.307 32.150 0.305 1.600 4.015	Ton Ton kN
Weight of footing Force on the foundation Total force Applied pressure Internal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1 Density input-2		$W_f = F = F = A = A = A = A = A = A = A = A$	60.492 159.510 2,183.088 43.307 32.150 0.305 1.600 4.015 4.015	Ton Ton kN
Weight of footing Force on the foundation Total force Applied pressure Internal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1 Density input-2 Probability density-1 (Harr, 1977) Probability density-2 (Harr, 1977)	(Eq. 21) (Eq. 20) (Eq. 20)	$W_f = F = F = A = A = A = A = A = A = A = A$	60.492 159.510 2,183.088 43.307 32.150 0.305 1.600 4.015	Ton Ton kN

SETTLEMENT

Immediate Settlement

Effective width	(Eq. 5)	B' =	3.550	m
Location factor	(Eq. 4)	α =	4.000	
Computing shape factor				
		m' =	1.000	
		n' =	0.901	
	(Eq. 9)	$A_0 =$	0.486	
	(Eq. 10)	A ₁ =	0.549	
	(Eq. 11)	A ₂ =	0.813	
	(Eq. 7)	F ₁ =	0.330	
	(Eq. 8)	F ₂ =	0.053	
Shape factor	(Eq. 6)	I _s =	0.360	
Depth factor	(Eq. 12)	I _f =	0.804	
Immediate settlement	(Eq. 2)	S _i =	10.233	mm
B. At the Corner				
Effective width	(Eq. 5)	B' =	7.100	m
Location factor	(Eq. 4)	α =	1.000	
Computing shape factor				
		m' =	1.000	
		n' =	0.451	
	(Eq. 9)	$A_0 =$	0.468	
	(Eq. 10)	A ₁ =	0.542	
	(Eq. 11)	A ₂ =	1.223	
	(Eq. 7)	F ₁ =	0.322	
	(Eq. 8)	F ₂ =	0.066	
Shape factor	(Eq. 6)	I _s =	0.359	
Depth factor	(Eq. 12)	I _f =	0.804	
Immediate settlement	(Eq. 2)	S _i =	5.108	mm
Primary Consolidation Settlement				
Pressure of initial state	(Eq. 17)	$\sigma_0' =$	26.880	kN/m ²
Void ratio of initial state		$e_0 =$	0.976	
Compression index	(Eq. 15)	$C_c =$	0.236	
Swell index	(Eq. 16)	C _s =	0.047	
Corresponding cone tip resistance		q _c =	2,451.663	kN/m ²
Preconsolidation pressure	(Eq. 18)	$\sigma_{c}' =$	436.002	kN/m ²
Consolidation status		Ove	erconsolidated	
Change of void ratio	(Eq. 29)	Δe =	0.006	

Consolidation settlement	(Eq. 14)	S _c =	4.973	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.970	
Computing the time in which the primary consolidation ends	(assumed to be 95%	consolidation):		
Time factor	(Eq. 24)	T _v =	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.600	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	2.002	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t_1	+ t ₂ ' =: t ₂ =	4.002	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.009	
Secondary consolidation settlement	(Eq. 26)	S _s =	4.619	mm
Total Settlement	(Eq. 1)	S =	19.825	mm

Young's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		$\mu_s =$	0.300	
Unit Weight		γ =	16.700	kN/m³
Existence of water			FALSE	
Effective unit weight		γ' =	16.700	kN/m³
Water content		w =	0.359	
Dry unit weight		γ_d =	12.290	kN/m³
Specific gravity		G _s =	25.400	
FOUNDATION PROPERTIES				
Length of the foundation		L =	5.900	m
Breadth of the foundation		B =	5.900	m
Depth of foundation		D _f =	2.500	m
Thickness of soil layer		H =	2.400	m
Maximum dranage path		H _{dr} =	1.200	m
COMPUTING NET APPLIED PRESSURE				
Weight of pedestal		W _p =	2.203	Ton
Weight of footing		W _f =	37.595	Ton
Force on the foundation		F =	118.030	Ton
Total force		P =	1,548.293	kN
Applied pressure		Δσ =	44.478	kN/m ²
Internal angle of friction		ф' =	30.230	
Coefficient of lateral earth pressure	(Eq. 21)	K =	0.330	
Depth of interest		z =	1.200	
Density input-1		Z1 =	4.278	
Density input-2		Z2 =	4.278	
Probability density-1 (Harr, 1977)	(Eq. 20)	ψ(Z1) =	0.470	
Probability density-2 (Harr, 1977)	(Eq. 20)	ψ(Z2) =	0.470	
Net applied pressure	(Eq. 19)	Δσ' =	9.810	kN/m ²

SETTLEMENT

Immediate Settlement

March 1.000 March 1.00	Effective width	(Eq. 5)	B' =	2.950	m
m' = 1.000	Location factor	(Eq. 4)	α =	4.000	
N	Computing shape factor				
(Eq. 9) A ₀ = 0.482 (Eq. 10) A ₁ = 0.548 (Eq. 11) A ₂ = 0.868 (Eq. 11) A ₃ = 0.328 (Eq. 7) F ₁ = 0.328 (Eq. 8) F ₂ = 0.055 (Eq. 8) F ₃ = 0.055 (Eq. 8) F ₄ = 0.789 (Eq. 12) I ₁ = 0.789 (Eq. 12) I ₂ = 0.789 (Eq. 12) I ₃ = 0.789 (Eq. 12) I ₄ = 0.407 (Eq. 14) (Eq			m' =	1.000	
(Eq. 10) A₁ =			n' =	0.814	
(Eq. 11) A ₂ = 0.868 (Eq. 7) F ₁ = 0.328 (Eq. 8) F ₂ = 0.055 Shape factor (Eq. 6) I ₁ = 0.359 Depth factor (Eq. 12) I ₁ = 0.789 Immediate settlement (Eq. 2) S ₁ = 8.560 mm B. At the Corner Effective width (Eq. 5) B' = 5.900 m Location factor (Eq. 4) α = 1.000 Computing shape factor (Eq. 4) α = 1.000 Computing shape factor (Eq. 9) A ₀ = 0.467 (Eq. 10) A ₁ = 0.541 (Eq. 11) A ₂ = 1.293 (Eq. 7) F ₁ = 0.321 (Eq. 8) F ₂ = 0.068 Shape factor (Eq. 8) F ₂ = 0.068 Shape factor (Eq. 6) I ₂ = 0.360 Depth factor (Eq. 6) I ₃ = 0.360 Depth factor (Eq. 12) I ₁ = 0.789 Immediate settlement (Eq. 2) S ₁ = 4.281 mm Primary Consolidation Settlement (Eq. 17) σ ₀ = 20.040 kN/m² Void ratio of initial state (Eq. 15) C _c = 4.000 Swell index (Eq. 16) C _s = 0.800 Corresponding cone tip resistance (Eq. 18) σ _c = 784.532 kN/m² Preconsolidation pressure (Eq. 18) σ _c = 146.027 kN/m²		(Eq. 9)	A ₀ =	0.482	
(Eq. 7) F ₁ = 0.328 (Eq. 8) F ₂ = 0.055 (Eq. 8) F ₁ = 0.055 (Eq. 8) F ₂ = 0.055 (Eq. 6) I ₁ = 0.359 (Eq. 12) I ₁ = 0.789 (Eq. 12) I ₁ = 0.789 (Eq. 12) I ₂ = 0.789 (Eq. 12) I ₃ = 0.560 mm (Eq. 2) S ₁ = 8.560 mm (Eq. 2) S ₁ = 8.560 mm (Eq. 2) S ₂ = 8.560 mm (Eq. 2) S ₃ = 8.560 mm (Eq. 2) S ₄ = 0.000 (Eq. 4) S ₄ = 0.000 (Eq. 10) S ₄ = 0.0467 (Eq. 10) S ₄ = 0.0467 (Eq. 11) S ₄ = 0.0541 (Eq. 1		(Eq. 10)	A ₁ =	0.548	
(Eq. 8) F ₂ 0.055		(Eq. 11)	A ₂ =	0.868	
Shape factor (Eq. 6) I, = 0.359		(Eq. 7)	F ₁ =	0.328	
Depth factor (Eq. 12) I ₁ = 0.789		(Eq. 8)	F ₂ =	0.055	
Eq. 2 S ₁ = 8.560 mm Eq. 2 S ₂ = 8.560 mm Eq. 2 S ₃ = 8.560 mm Eq. 2 S ₄ =	Shape factor	(Eq. 6)	I _s =	0.359	
B. At the Corner Effective width (Eq. 5) B' = 5.900 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.407 (Eq. 9) A₀ = 0.467 (Eq. 10) A₁ = 0.541 (Eq. 11) A₂ = 1.293 (Eq. 7) F₁ = 0.321 (Eq. 8) F₂ = 0.068 Shape factor (Eq. 6) I₃ = 0.360 Depth factor (Eq. 12) I₁ = 0.789 Immediate settlement (Eq. 12) I₁ = 0.789 Primary Consolidation Settlement (Eq. 17) σ₀' = 20.040 kN/m² Void ratio of initial state (Eq. 17) σ₀ = 20.040 kN/m² Void ratio of initial state (Eq. 15) C₀ = 4.000 Swell index (Eq. 15) C₀ = 4.000 Corresponding cone tip resistance q = 784.532 kN/m² Preconsolidation status Overconsolidated <th>Depth factor</th> <th>(Eq. 12)</th> <th>I_f =</th> <th>0.789</th> <th></th>	Depth factor	(Eq. 12)	I _f =	0.789	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Immediate settlement	(Eq. 2)	S _i =	8.560	mm
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		/F - F\	D.I.	F 000	
Computing shape factor m' =					m
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		(Eq. 4)	α =	1.000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Computing shape factor				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
		(= -0)			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
Shape factor $(Eq. 8)$ $F_2 = 0.068$ Shape factor $(Eq. 6)$ $I_s = 0.360$ Depth factor $(Eq. 12)$ $I_f = 0.789$ Immediate settlement $(Eq. 2)$ $S_i = 4.281$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 20.040$ kN/m² Void ratio of initial state $e_0 = 19.274$ Compression index $(Eq. 15)$ $C_c = 4.000$ Swell index $(Eq. 16)$ $C_s = 0.800$ Corresponding cone tip resistance $q_c = 784.532$ kN/m² Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 146.027$ kN/m² Consolidation status					
Shape factor $(Eq. 6)$ $I_s = 0.360$ Depth factor $(Eq. 12)$ $I_f = 0.789$ Immediate settlement $(Eq. 2)$ $S_i = 4.281$ mm					
Depth factor(Eq. 12) I_f = 0.789Immediate settlement(Eq. 2) S_i = 4.281 mmPrimary Consolidation SettlementPressure of initial state(Eq. 17) σ_0' = 20.040 kN/m²Void ratio of initial state e_0 = 19.274Compression index(Eq. 15) C_c = 4.000Swell index(Eq. 16) C_s = 0.800Corresponding cone tip resistance q_c = 784.532 kN/m²Preconsolidation pressure(Eq. 18) σ_c' = 146.027 kN/m²Consolidation statusOverconsolidated					
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Compression index Swell index Corresponding cone tip resistance Preconsolidation status $(Eq. 17) \qquad \sigma_0' = 20.040 kN/m^2$ $Eq. 17) \qquad \sigma_0' = 20.040 kN/m^2$ $Eq. 17) \qquad C_0 = 19.274$ $Eq. 18) \qquad C_0 = 19.274$ $Eq. 18) \qquad C_0 = 19.274$ $Eq. 18) \qquad C_0' = 146.027 kN/m^2$ Overconsolidated					
Primary Consolidation Settlement Pressure of initial state (Eq. 17) $\sigma_0^{'} = 20.040 \text{ kN/m}^2$ Void ratio of initial state $e_0 = 19.274$ Compression index (Eq. 15) $C_c = 4.000$ Swell index (Eq. 16) $C_s = 0.800$ Corresponding cone tip resistance $q_c = 784.532 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c^{'} = 146.027 \text{ kN/m}^2$ Consolidation status	·				
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = 20.040 kN/m^2 $ Void ratio of initial state $ e_0 = 19.274 $ Compression index $ (Eq. 15) \qquad C_c = 4.000 $ Swell index $ (Eq. 16) \qquad C_s = 0.800 $ Corresponding cone tip resistance $ q_c = 784.532 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = 146.027 kN/m^2 $ Consolidation status $ Overconsolidated $	Immediate settlement	(Eq. 2)	S _i =	4.281	mm
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = 20.040 kN/m^2 $ Void ratio of initial state $ e_0 = 19.274 $ Compression index $ (Eq. 15) \qquad C_c = 4.000 $ Swell index $ (Eq. 16) \qquad C_s = 0.800 $ Corresponding cone tip resistance $ q_c = 784.532 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = 146.027 kN/m^2 $ Consolidation status $ Overconsolidated $	Primary Consolidation Settlement				
Void ratio of initial state $e_0 = 19.274$ Compression index $(Eq. 15) \qquad C_c = 4.000$ Swell index $(Eq. 16) \qquad C_s = 0.800$ Corresponding cone tip resistance $q_c = 784.532 kN/m^2$ Preconsolidation pressure $(Eq. 18) \qquad \sigma_{c}' = 146.027 kN/m^2$ Consolidation status $Overconsolidated$	Pressure of initial state	(Eq. 17)	σ ₀ ' =	20.040	kN/m ²
Swell index (Eq. 16) $C_s = 0.800$ Corresponding cone tip resistance $q_c = 784.532 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 146.027 \text{ kN/m}^2$ Consolidation status Overconsolidated	Void ratio of initial state		e ₀ =	19.274	
Corresponding cone tip resistance $q_c = 784.532 kN/m^2$ Preconsolidation pressure $(Eq. 18) \sigma_c' = 146.027 kN/m^2$ Consolidation status $Overconsolidated$	Compression index	(Eq. 15)	C _c =	4.000	
Preconsolidation pressure (Eq. 18) $\sigma_c' = 146.027 \text{ kN/m}^2$ Consolidation status Overconsolidated	Swell index	(Eq. 16)	C _s =	0.800	
Consolidation status Overconsolidated	Corresponding cone tip resistance		q _c =	784.532	kN/m ²
	Preconsolidation pressure	(Eq. 18)	$\sigma_{c}' =$	146.027	kN/m²
Change of void ratio (Eq. 29) $\Delta e = 0.138$	Consolidation status		Over	consolidated	
	Change of void ratio	(Eq. 29)	Δe =	0.138	

Consolidation settlement	(Eq. 14)	S _c =	8.194	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	19.136	
Computing the time in which the primary consolidation ends	(assumed to be 95	% consolidation):		
Time factor	(Eq. 24)	$T_v =$	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.200	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	1.126	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
		t ₁ + t ₂ ' =: t ₂ =	3.126	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.160	
Secondary consolidation settlement	(Eq. 26)	S _s =	8.455	mm
Total Settlement	(Eq. 1)	S =	25.208	mm

GENERAL SOIL	MECHANICAL	PROPERTIES
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Young's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		μ _s =	0.300	
Unit Weight		γ =	16.000	kN/m³
Existence of water			FALSE	
Effective unit weight		γ' =	16.000	kN/m³
Water content		w =	0.329	
Dry unit weight		γ_d =	12.042	kN/m³
Specific gravity		G _s =	2.530	
FOUNDATION PROPERTIES				
Length of the foundation		L =	9.300	m
Breadth of the foundation		B =	9.300	m
Depth of foundation		D _f =	3.400	m
Thickness of soil layer		H =	2.000	m
Maximum dranage path		H _{dr} =	1.000	m
COMPUTING NET APPLIED PRESSURE				
Weight of pedestal		W _p =	4.685	Ton
Weight of footing		W _f =	176.440	Ton
Force on the foundation		F =	361.040	Ton
Total force		P =	5,318.633	kN
Applied pressure		Δσ =	61.494	kN/m ²
Internal angle of friction		ф' =	32.150	
Coefficient of lateral earth pressure	(Eq. 21)	K =	0.305	
Depth of interest		z =	1.000	
Density input-1		Z1 =	8.415	
Density input-2		Z2 =	8.415	
Probability density-1 (Harr, 1977)	(Eq. 20)	ψ(Z1) =	0.496	
		>	0.406	
Probability density-2 (Harr, 1977)	(Eq. 20)	ψ(Z2) =	0.496	

SETTLEMENT

Immediate Settlement

Effective width	(Eq. 5)	B' =	4.650	m
Location factor	(Eq. 4)	α =	4.000	
Computing shape factor				
		m' =	1.000	
		n' =	0.430	
	(Eq. 9)	$A_0 =$	0.468	
	(Eq. 10)	A ₁ =	0.541	
	(Eq. 11)	A ₂ =	1.254	
	(Eq. 7)	F ₁ =	0.321	
	(Eq. 8)	F ₂ =	0.067	
Shape factor	(Eq. 6)	I _s =	0.359	
Depth factor	(Eq. 12)	I _f =	0.801	
Immediate settlement	(Eq. 2)	S _i =	18.941	mm
B. At the Corner				
Effective width	(Eq. 5)	B' =	9.300	m
Location factor	(Eq. 4)	α =	1.000	
Computing shape factor				
		m' =	1.000	
		n' =	0.215	
	(Eq. 9)	$A_0 =$	0.463	
	(Eq. 10)	A ₁ =	0.537	
	(Eq. 11)	A ₂ =	1.803	
	(Eq. 7)	F ₁ =	0.318	
	(Eq. 8)	F ₂ =	0.078	
Shape factor	(Eq. 6)	I _s =	0.363	
Depth factor	(Eq. 12)	I _f =	0.801	
Immediate settlement	(Eq. 2)	S _i =	9.566	mm
Primary Consolidation Settlement				
Pressure of initial state	(Eq. 17)	$\sigma_0' =$	16.000	kN/m ²
Void ratio of initial state		e ₀ =	1.061	
Compression index	(Eq. 15)	$C_c =$	0.264	
Swell index	(Eq. 16)	C _s =	0.053	
Corresponding cone tip resistance		q _c =	2,451.663	kN/m ²
Preconsolidation pressure	(Eq. 18)	σ _c ' =	436.002	kN/m ²
Consolidation status		Ove	erconsolidated	
Change of void ratio	(Eq. 29)	Δe =	0.015	

Consolidation settlement	(Eq. 14)	S _c =	7.401	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	1.046	
Computing the time in which the primary consolidation ends	(assumed to be 95%	consolidation):		
Time factor	(Eq. 24)	T _v =	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.000	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	0.782	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t_1	+ t ₂ ' =: t ₂ =	2.782	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.011	
Secondary consolidation settlement	(Eq. 26)	S _s =	5.682	mm
Total Settlement	(Eq. 1)	S =	32.025	mm

Young's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		μ _s =	0.300	
Unit Weight		γ =	18.800	kN/m ³
Existence of water			FALSE	
Effective unit weight		γ' =	18.800	kN/m ³
Water content		w =	0.237	
Dry unit weight		γ_d =	15.196	kN/m ³
Specific gravity		G _s =	2.580	
FOUNDATION PROPERTIES				
Length of the foundation		L =	6.800	m
Breadth of the foundation		B =	6.800	m
Depth of foundation		D _f =	3.000	m
Thickness of soil layer		H =	2.400	m
Maximum dranage path		H _{dr} =	1.200	m
COMPUTING NET APPLIED PRESSURE				
Weight of pedestal		W _p =	2.839	Ton
Weight of footing		W _f =	77.683	Ton
Force on the foundation		F =	194.890	Ton
Total force		P =	2,701.796	kN
Applied pressure			EQ 420	
••		Δσ =	58.430	kN/m²
		Δσ = φ' =	30.230	kN/m²
nternal angle of friction	(Eq. 21)			kN/m²
nternal angle of friction Coefficient of lateral earth pressure	(Eq. 21)	ф' =	30.230	kN/m²
nternal angle of friction Coefficient of lateral earth pressure Depth of interest	(Eq. 21)	φ' = K =	30.230 0.330	kN/m²
nternal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1 Density input-2	(Eq. 21)	φ' = K = z =	30.230 0.330 1.200	kN/m²
nternal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1 Density input-2	(Eq. 21) (Eq. 20)	φ' = K = z = Z1 =	30.230 0.330 1.200 4.930	kN/m²
nternal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1		φ' = K = z = Z1 = Z2 =	30.230 0.330 1.200 4.930 4.930	kN/m²

SETTLEMENT

Immediate Settlement

Effective width	(Eq. 5)	B' =	3.400	m
Location factor	(Eq. 4)	α =	4.000	
Computing shape factor				
		m' =	1.000	
		n' =	0.706	
	(Eq. 9)	$A_0 =$	0.478	
	(Eq. 10)	A ₁ =	0.547	
	(Eq. 11)	A ₂ =	0.947	
	(Eq. 7)	F ₁ =	0.326	
	(Eq. 8)	F ₂ =	0.058	
Shape factor	(Eq. 6)	I _s =	0.359	
Depth factor	(Eq. 12)	$I_f =$	0.785	
Immediate settlement	(Eq. 2)	S _i =	12.886	mm
P. At the Course				
B. At the Corner Effective width	(Eq. E)	B' =	6.800	m
	(Eq. 5)			m
Location factor	(Eq. 4)	α =	1.000	
Computing shape factor		!	1 000	
		m' =	1.000	
	/F~ 0\	n' =	0.353	
	(Eq. 9)	A ₀ =	0.466	
	(Eq. 10)	A ₁ =	0.539	
	(Eq. 11)	A ₂ =	1.394	
	(Eq. 7)	F ₁ =	0.320	
	(Eq. 8)	F ₂ =	0.070	
Shape factor	(Eq. 6)	I _s =	0.360	
Depth factor	(Eq. 12)	I _f =	0.785	
Immediate settlement	(Eq. 2)	S _i =	6.461	mm
Primary Consolidation Settlement				
Pressure of initial state	(Eq. 17)	σ ₀ ' =	22.560	kN/m ²
Void ratio of initial state		e ₀ =	0.666	
Compression index	(Eq. 15)	C _c =	0.155	
Swell index	(Eq. 16)	C _s =	0.031	
Corresponding cone tip resistance		q _c =	5,393.658	kN/m ²
Preconsolidation pressure	(Eq. 18)	σ _c ' =	929.425	kN/m²
Consolidation status		Ove	erconsolidated	
Change of void ratio	(Eq. 29)	Δe =	0.006	

Consolidation settlement	(Eq. 14)	S _c =	4.518	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.659	
Computing the time in which the primary consolidation ends	(assumed to be 95%	consolidation):		
Time factor	(Eq. 24)	T _v =	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.200	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	1.126	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t ₁	+ t ₂ ' =: t ₂ =	3.126	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.006	
Secondary consolidation settlement	(Eq. 26)	S _s =	3.981	mm
Total Settlement	(Eq. 1)	S =	21.385	mm

GENERAL SOIL	MECHANICAL	PROPERTIES
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oung's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		μ _s =	0.300	
Jnit Weight		γ =	17.300	kN/m³
xistence of water			FALSE	
Effective unit weight		γ' =	17.300	kN/m³
Nater content		w =	0.364	
Ory unit weight		$\gamma_d =$	12.686	kN/m ³
Specific gravity		G _s =	2.530	
OUNDATION PROPERTIES				
ength of the foundation		L =	4.100	m
Breadth of the foundation		B =	4.100	m
Depth of foundation		D _f =	2.500	m
hickness of soil layer		H =	2.000	m
Maximum dranage path		H _{dr} =	1.000	m
COMPUTING NET APPLIED PRESSURE				
Neight of pedestal		W _p =	2.203	Ton
Neight of footing		W _f =	18.155	Ton
Force on the foundation		F =	64.340	Ton
otal force		P =	830.887	kN
Applied pressure		Δσ =	49.428	kN/m²
Applied pressure nternal angle of friction		Δσ = φ' =	49.428 30.230	kN/m ²
	(Eq. 21)			kN/m ²
nternal angle of friction	(Eq. 21)	φ' =	30.230	kN/m²
nternal angle of friction Coefficient of lateral earth pressure	(Eq. 21)	ф' = К =	30.230 0.330	kN/m²
nternal angle of friction Coefficient of lateral earth pressure Depth of interest	(Eq. 21)	φ' = K = z =	30.230 0.330 1.000	kN/m²
nternal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1	(Eq. 21) (Eq. 20)	φ' =	30.230 0.330 1.000 3.567	kN/m²
nternal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1 Density input-2		φ' = K = z = Z1 = Z2 =	30.230 0.330 1.000 3.567 3.567	kN/m²

SETTLEMENT

Immediate Settlement

Computing shape factor m' = 1.000	Effective width	(Eq. 5)	B' =	2.050	m
m' = 1.000	Location factor	(Eq. 4)	α =	4.000	
N	Computing shape factor				
(Eq. 9) A ₀ = 0.490 (Eq. 10) A ₁ = 0.549 (Eq. 11) A ₂ = 0.772 (Eq. 11) A ₂ = 0.772 (Eq. 7) F ₁ = 0.331 (Eq. 8) F ₂ = 0.051 (Eq. 6) I ₁ = 0.360 (Eq. 6) I ₂ = 0.749 (Eq. 12) I ₂ = 0.749 (Eq. 12) I ₃ = 0.749 (Eq. 12) I ₄ = 0.749 (Eq. 14)			m' =	1.000	
(Eq. 10) A₁ = 0.549 (Eq. 11) A₂ = 0.772 (Eq. 7) F₁ = 0.331 (Eq. 8) F₂ = 0.051 (Eq. 8) F₂ = 0.051 (Eq. 8) F₂ = 0.051 (Eq. 6) I₂ = 0.749 (Eq. 12) I₂ = 0.749 (Eq. 12) I₂ = 0.749 (Eq. 12) I₃ = 0.749 (Eq. 13) (Eq. 14) (Eq. 15) Eq. 14.100 m (Eq. 2) Eq. 14.100 m (Eq. 2) Eq. 14.100 m (Eq. 14) Eq. 14.100 m (Eq. 14) Eq. 14.100 m (Eq. 14) Eq. 14.100 m (Eq. 10) Eq. 14.100 m (Eq. 11) Eq. 14.100 Eq.			n' =	0.976	
(Eq. 11) A ₂ = 0.772 (Eq. 7) F ₁ = 0.331 (Eq. 8) F ₂ = 0.051 Shape factor (Eq. 6) I ₅ = 0.360 Depth factor (Eq. 12) I ₇ = 0.749 Immediate settlement (Eq. 2) S ₁ = 0.288 mm B. At the Corner Effective width (Eq. 5) B' = 4.100 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 Computing shape factor m' = 0.488 (Eq. 9) A ₀ = 0.470 (Eq. 10) A ₁ = 0.542 (Eq. 11) A ₂ = 1.171 (Eq. 7) F ₁ = 0.322 (Eq. 8) F ₂ = 0.065 Shape factor (Eq. 8) F ₂ = 0.065 Shape factor (Eq. 6) I ₅ = 0.359 Depth factor (Eq. 6) I ₅ = 0.359 Depth factor (Eq. 12) I ₇ = 0.749 Immediate settlement (Eq. 2) S ₁ = 3.135 mm Primary Consolidation Settlement (Eq. 17) α ₀ ' = 17.300 kN/m² Void ratio of initial state (Eq. 15) C _c = 0.233 Swell index (Eq. 16) C ₇ = 0.047 Corresponding cone tip resistance (Eq. 18) α _c ' = 929.425 kN/m² Preconsolidation pressure (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status Overconsolidated (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m² Consolidation status (Eq. 18) α _c ' = 929.425 kN/m²		(Eq. 9)	A ₀ =	0.490	
(Eq. 7) F ₁ = 0.331 (Eq. 8) F ₂ = 0.051 Shape factor (Eq. 6) I ₁ = 0.360 Depth factor (Eq. 12) I ₁ = 0.749 Immediate settlement (Eq. 2) S ₁ = 6.288 mm B. At the Corner Effective width (Eq. 5) B' = 4.100 m Location factor (Eq. 4) α = 1.000 Computing shape factor Computing shape factor (Eq. 9) A ₀ = 0.470 (Eq. 10) A ₁ = 0.542 (Eq. 11) A ₂ = 1.171 (Eq. 7) F ₁ = 0.322 (Eq. 11) A ₂ = 1.171 (Eq. 7) F ₁ = 0.322 (Eq. 8) F ₂ = 0.065 Shape factor (Eq. 6) I ₁ = 0.359 Depth factor (Eq. 12) I ₁ = 0.749 Immediate settlement (Eq. 2) S ₁ = 3.135 mm Primary Consolidation Settlement Pressure of initial state (Eq. 17) O ₀ = 17.300 kN/m² Pressure of initial state (Eq. 15) C _c = 0.233 Swell index (Eq. 16) C _s = 0.047 Corresponding cone tip resistance (Eq. 18) O _c = 9.29.425 kN/m² Preconsolidation status (Overconsolidated (Preconsolidated (Precons		(Eq. 10)	A ₁ =	0.549	
(Eq. 8) F ₂ 0.051		(Eq. 11)	A ₂ =	0.772	
Shape factor (Eq. 6) I, = 0.360 Depth factor (Eq. 12) I, = 0.749 Depth factor (Eq. 12) I, = 0.749 Depth factor (Eq. 2) S, = 6.288 mm Depth factor (Eq. 2) S, = 6.288 mm Depth factor (Eq. 5) B' = 4.100 m Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 9) A₀ = 0.470 Depth factor (Eq. 10) A₁ = 0.542 Depth factor (Eq. 11) A₂ = 1.171 Depth factor (Eq. 7) F₁ = 0.322 Depth factor (Eq. 8) F₂ = 0.065 Depth factor (Eq. 6) I₃ = 0.359 Depth factor (Eq. 12) I₁ = 0.749 Depth factor (Eq. 12) I₁ = 0.749 Depth factor (Eq. 12) I₁ = 0.749 Depth factor (Eq. 12) Depth factor (Eq. 12) I₁ = 0.749 Depth factor (Eq. 12) Depth factor (Eq. 12) Depth factor (Eq. 12) I₁ = 0.749 Depth factor (Eq. 12) I₁ = 0.749 Depth factor (Eq. 12) Depth factor (Eq. 12) I₁ = 0.749 Depth factor (Eq. 12)		(Eq. 7)	F ₁ =	0.331	
Depth factor (Eq. 12)		(Eq. 8)	F ₂ =	0.051	
Eq. 2 S ₁ = 6.28 mm Eq. 2 S ₂ = 6.28 mm Eq. 2 S ₃ = 6.28 mm Eq. 2 S ₄ = 6.2	Shape factor	(Eq. 6)	I _s =	0.360	
B. At the Corner Effective width (Eq. 5) B' = 4.100 m m Location factor (Eq. 4) α = 1.000 n Computing shape factor m' = 1.000 n' = 0.488 (Eq. 9) A₀ = 0.470 0.488 0.470 0.41 0.542 0.470 0.41 0.542 0.470 0.41 0.542 0.470 0.41 0.542 0.470 0.41 0.542 0.470 0.42 0.470 0.42 0.470 0.42 0.470 0.42<	Depth factor	(Eq. 12)	$I_f =$	0.749	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Immediate settlement	(Eq. 2)	S _i =	6.288	mm
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					
Computing shape factor $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					m
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		(Eq. 4)	α =	1.000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Computing shape factor				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
Shape factor $(Eq. 6)$ $I_s = 0.359$ Depth factor $(Eq. 12)$ $I_f = 0.749$ Immediate settlement $(Eq. 2)$ $S_i = 3.135$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 17.300$ kN/m^2 Void ratio of initial state $e_0 = 0.956$ Compression index $(Eq. 15)$ $C_c = 0.233$ Swell index $(Eq. 16)$ $C_s = 0.047$ Corresponding cone tip resistance $q_c = 5,393.658$ kN/m^2 Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 929.425$ kN/m^2 Consolidation status					
Depth factor(Eq. 12) I_f = 0.749Immediate settlement(Eq. 2) S_i = 3.135 mmPrimary Consolidation SettlementPressure of initial state(Eq. 17) σ_0' = 17.300 kN/m²Void ratio of initial state e_0 = 0.956Compression index(Eq. 15) C_c = 0.233Swell index(Eq. 16) C_s = 0.047Corresponding cone tip resistance q_c = 5,393.658 kN/m²Preconsolidation pressure(Eq. 18) σ_c' = 929.425 kN/m²Consolidation statusOverconsolidated					
Immediate settlement (Eq. 2) S_i = 3.135 mm Primary Consolidation Settlement Pressure of initial state (Eq. 17) σ_0' = 17.300 kN/m² Void ratio of initial state e_0 = 0.956 Compression index (Eq. 15) C_c = 0.233 Swell index (Eq. 16) C_s = 0.047 Corresponding cone tip resistance q_c = 5,393.658 kN/m² Preconsolidation pressure (Eq. 18) σ_c' = 929.425 kN/m² Consolidation status Overconsolidated			$I_s =$		
Primary Consolidation Settlement Pressure of initial state (Eq. 17) $\sigma_0^{'} = 17.300 \text{ kN/m}^2$ Void ratio of initial state $e_0 = 0.956$ Compression index (Eq. 15) $C_c = 0.233$ Swell index (Eq. 16) $C_s = 0.047$ Corresponding cone tip resistance $q_c = 5.393.658 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c^{'} = 929.425 \text{ kN/m}^2$ Consolidation status		(Eq. 12)			
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = \qquad 17.300 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 0.956 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.233 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.047 $ Corresponding cone tip resistance $ q_c = \qquad 5,393.658 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 929.425 kN/m^2 $ Consolidation status $ Overconsolidated $	Immediate settlement	(Eq. 2)	S _i =	3.135	mm
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = \qquad 17.300 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 0.956 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.233 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.047 $ Corresponding cone tip resistance $ q_c = \qquad 5,393.658 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 929.425 kN/m^2 $ Consolidation status $ Overconsolidated $	Primary Consolidation Settlement				
Void ratio of initial state $e_0 = 0.956$ Compression index $(Eq. 15) \qquad C_c = 0.233$ Swell index $(Eq. 16) \qquad C_s = 0.047$ Corresponding cone tip resistance $q_c = 5,393.658 kN/m^2$ Preconsolidation pressure $(Eq. 18) \qquad \sigma_{c}' = 929.425 kN/m^2$ Consolidation status $Overconsolidated$	Pressure of initial state	(Eq. 17)	σ ₀ ' =	17.300	kN/m ²
Compression index $ (Eq. 15) \qquad C_c = \qquad 0.233 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.047 $ Corresponding cone tip resistance $ q_c = \qquad 5,393.658 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 929.425 kN/m^2 $ Consolidation status $ Overconsolidated $	Void ratio of initial state		e ₀ =		
Swell index (Eq. 16) $C_s = 0.047$ Corresponding cone tip resistance $q_c = 5,393.658 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 929.425 \text{ kN/m}^2$ Consolidation status Overconsolidated	Compression index	(Eq. 15)		0.233	
Corresponding cone tip resistance $q_c = \begin{array}{ccc} 5,393.658 & kN/m^2 \\ Preconsolidation pressure & (Eq. 18) & \sigma_c' = \begin{array}{ccc} 929.425 & kN/m^2 \\ Overconsolidated & Over$	Swell index			0.047	
Preconsolidation pressure (Eq. 18) $\sigma_c' = 929.425 \text{ kN/m}^2$ Consolidation status Overconsolidated	Corresponding cone tip resistance			5,393.658	kN/m ²
Consolidation status Overconsolidated	Preconsolidation pressure	(Eq. 18)		929.425	
Change of void ratio (Eq. 29) $\Delta e = 0.009$	Consolidation status			rconsolidated	
	Change of void ratio	(Eq. 29)	Δe =	0.009	

Consolidation settlement	(Eq. 14)	S _c =	4.826	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.947	
Computing the time in which the primary consolidation ends	(assumed to be 95%	consolidation):		
Time factor	(Eq. 24)	$T_v =$	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.000	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	0.782	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t_1	+ t ₂ ' =: t ₂ =	2.782	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.009	
Secondary consolidation settlement	(Eq. 26)	S _s =	5.274	mm
				·
Total Settlement	(Eq. 1)	S =	16.388	mm

Young's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		$\mu_s =$	0.300	
Unit Weight		γ =	17.900	kN/m³
Existence of water			FALSE	
Effective unit weight		γ' =	17.900	kN/m³
Water content		w =	0.416	
Dry unit weight		γ_d =	12.646	kN/m³
Specific gravity		G _s =	2.520	
FOUNDATION PROPERTIES				
Length of the foundation		L =	4.600	m
Breadth of the foundation		B =	4.600	m
Depth of foundation		D _f =	2.500	m
Thickness of soil layer		H =	2.400	m
Maximum dranage path		H _{dr} =	1.200	m
COMPUTING NET APPLIED PRESSURE				
Weight of pedestal		W _p =	2.203	Ton
Weight of footing		W _f =	22.853	Ton
Force on the foundation		F =	82.050	Ton
Total force		P =	1,050.710	kN
Applied pressure		Δσ =	49.655	kN/m ²
Internal angle of friction		ф' =	15.230	
Coefficient of lateral earth pressure	(Eq. 21)	K =	0.584	
Depth of interest		z =	1.200	
Density input-1		Z1 =	2.508	
Density input-2		Z2 =	2.508	
Probability density-1 (Harr, 1977)	(Eq. 20)	ψ(Z1) =	0.426	
Probability density-2 (Harr, 1977)	(Eq. 20)	ψ(Z2) =	0.426	
Net applied pressure	(Eq. 19)	Δσ' =	9.004	kN/m ²

SETTLEMENT

Immediate Settlement

Computing shape factor m' = 1.000	Effective width	(Eq. 5)	B' =	2.300	m
m' = 1.000 n' = 1.043 (Eq. 9) A₀ = 0.493 (Eq. 10) A₁ = 0.549 (Eq. 11) A₂ = 0.738 (Eq. 17) F₁ = 0.332 (Eq. 8) F₂ = 0.050 (Eq. 18) F₂ = 0.056 (Eq. 18) F₂ = 0.063 (Eq. 18) F₂ = 0.063 (Eq. 18) Eq. 19	Location factor	(Eq. 4)	α =	4.000	
	Computing shape factor				
(Eq. 9) A ₀ = 0.493 (Eq. 10) A ₁ = 0.549 (Eq. 11) A ₂ = 0.738 (Eq. 11) A ₂ = 0.738 (Eq. 11) A ₂ = 0.332 (Eq. 8) F ₂ = 0.050 (Eq. 6) I ₁ = 0.360 (Eq. 6) I ₂ = 0.763 (Eq. 12) I ₂ = 0.763 (Eq. 12) I ₃ = 0.763 (Eq. 12) I ₄ = 0.522 (Eq. 9) A ₀ = 0.471 (Eq. 10) A ₁ = 0.522 (Eq. 9) A ₀ = 0.471 (Eq. 10) A ₁ = 0.543 (Eq. 11) A ₂ = 1.128 (Eq. 7) F ₁ = 0.323 (Eq. 11) A ₂ = 1.128 (Eq. 7) F ₁ = 0.323 (Eq. 11) A ₂ = 0.63 (Eq. 12) I ₄ = 0.763 (Eq. 12) (Eq. 12) I ₄ = 0.763 (Eq. 12) (m' =	1.000	
(Eq. 10) A₁ =			n' =	1.043	
(Eq. 11) A ₂ = 0.738 (Eq. 7) F ₁ = 0.332 (Eq. 8) F ₂ = 0.050 Shape factor (Eq. 6) I ₁ = 0.360 Depth factor (Eq. 12) I ₁ = 0.763 Immediate settlement (Eq. 2) S ₁ = 0.7226 mm Immediate settlement (Eq. 2) S ₁ = 0.7226 mm Immediate settlement (Eq. 5) B' = 0.600 Immediate settlement (Eq. 5) B' = 0.600 mm Immediate settlement (Eq. 4) α = 0.000 Immediate settlement (Eq. 9) A ₀ = 0.471 Immediate settlement (Eq. 11) A ₂ = 0.522 Immediate settlement (Eq. 11) A ₂ = 0.323 Immediate settlement (Eq. 8) F ₂ = 0.063 Shape factor (Eq. 8) F ₂ = 0.063 Immediate settlement (Eq. 12) I ₁ = 0.763 Immediate settlement (Eq. 12) I ₁ = 0.763 Immediate settlement (Eq. 12) I ₁ = 0.763 Immediate settlement (Eq. 12) I ₂ = 0.763 Immediate settlement (Eq. 12) I ₃ = 0.359 Immediate settlement (Eq. 12) I ₄ = 0.763 Immediate settlement (Eq. 13) (Eq. 16) (Eq. 16) (Eq. 16) Immediate settlement (Eq. 17) (Eq. 16)		(Eq. 9)	$A_0 =$	0.493	
(Eq. 7)		(Eq. 10)	A ₁ =	0.549	
(Eq. 8) F ₂ 0.050		(Eq. 11)	A ₂ =	0.738	
Shape factor (Eq. 6) I ₁ = 0.360 Depth factor (Eq. 12) I ₇ = 0.763 Depth factor (Eq. 2) S ₁ = 7.226 mm Depth factor (Eq. 2) S ₁ = 7.226 mm Depth factor (Eq. 5) S ₁ = 7.226 mm Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 9) A ₀ = 0.471 (Eq. 10) A ₁ = 0.522 (Eq. 9) A ₀ = 0.471 (Eq. 11) A ₂ = 1.128 (Eq. 7) F ₁ = 0.323 (Eq. 8) F ₂ = 0.063 Depth factor (Eq. 6) I ₂ = 0.359 Depth factor (Eq. 6) I ₂ = 0.359 Depth factor (Eq. 12) I ₇ = 0.763 Depth factor (Eq. 12) Depth factor (Eq. 12) Depth factor (Eq. 12) I ₇ = 0.763 Depth factor (Eq. 12) Depth factor (Eq. 13) Depth factor (Eq. 15) Depth factor ((Eq. 7)	F ₁ =	0.332	
Depth factor (Eq. 12) I ₁ = 0.763		(Eq. 8)	F ₂ =	0.050	
Eq. 2 S ₁ = 7.226 mm Primary Consolidation Settlement Eq. 2 S ₁ = 7.226 mm Primary Consolidation Settlement Eq. 15 Corresponding cone tip resistance Eq. 18 Corresponding cone tip resistance Corresponding tone tip resistance Cap. 18 Cap. 19 C	Shape factor	(Eq. 6)	I _s =	0.360	
B. At the Corner Effective width (Eq. 5) B' = 4.600 m m Location factor (Eq. 4) α = 1.000 m Computing shape factor m' = 1.000 n' = 0.522 (Eq. 9) A₀ = 0.471 0.522 (Eq. 10) A₁ = 0.543 0.62 0.471 (Eq. 11) A₂ = 1.128 0.63	Depth factor	(Eq. 12)	$I_f =$	0.763	
Effective width (Eq. 5) B' = 4.600 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000	Immediate settlement	(Eq. 2)	S _i =	7.226	mm
Effective width (Eq. 5) B' = 4.600 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		(5 5)	D.	4.600	
Computing shape factor m' =					m
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(Eq. 4)	α =	1.000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Computing shape factor				
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
		()			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
Shape factor $(Eq. 8)$ $F_2 = 0.063$ Shape factor $(Eq. 6)$ $I_s = 0.359$ Depth factor $(Eq. 12)$ $I_t = 0.763$ Immediate settlement $(Eq. 2)$ $S_i = 3.599$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 21.480$ kN/m² Void ratio of initial state $e_0 = 0.955$ Compression index $(Eq. 15)$ $C_c = 0.234$ Swell index $(Eq. 16)$ $C_s = 0.047$ Corresponding cone tip resistance $q_c = 2.451.663$ kN/m² Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 436.002$ kN/m² Consolidation status					
Shape factor $(Eq. 6)$ $I_s = 0.359$ Depth factor $(Eq. 12)$ $I_f = 0.763$ Immediate settlement $(Eq. 2)$ $S_i = 3.599$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 21.480$ kN/m² Void ratio of initial state $e_0 = 0.955$ Compression index $(Eq. 15)$ $C_c = 0.234$ Swell index $(Eq. 16)$ $C_s = 0.047$ Corresponding cone tip resistance $q_c = 2.451.663$ kN/m² Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 436.002$ kN/m² Consolidation status					
Depth factor(Eq. 12) I_f = 0.763Immediate settlement(Eq. 2) S_i = 3.599 mmPrimary Consolidation SettlementPressure of initial state(Eq. 17) σ_0' = 21.480 kN/m²Void ratio of initial state e_0 = 0.955Compression index(Eq. 15) C_c = 0.234Swell index(Eq. 16) C_s = 0.047Corresponding cone tip resistance q_c = 2,451.663 kN/m²Preconsolidation pressure(Eq. 18) σ_c' = 436.002 kN/m²Consolidation statusOverconsolidated					
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Compression index (Eq. 17) $\sigma_0' = 21.480 \text{ kN/m}^2$ $\sigma_0' = 0.955$ $\sigma_0' = 0.$			$I_s =$		
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Void ratio of initial state Compression index (Eq. 15) Compression index (Eq. 15) Compression index (Eq. 16) Compression index (Eq. 18) Compression index Consolidation pressure (Eq. 18) Compression index Consolidation status	Depth factor	(Eq. 12)	I _f =	0.763	
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = 21.480 kN/m^2 $ Void ratio of initial state $ e_0 = 0.955 $ Compression index $ (Eq. 15) \qquad C_c = 0.234 $ Swell index $ (Eq. 16) \qquad C_s = 0.047 $ Corresponding cone tip resistance $ q_c = 2,451.663 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = 436.002 kN/m^2 $ Consolidation status $ Overconsolidated $	Immediate settlement	(Eq. 2)	S _i =	3.599	mm
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = 21.480 kN/m^2 $ Void ratio of initial state $ e_0 = 0.955 $ Compression index $ (Eq. 15) \qquad C_c = 0.234 $ Swell index $ (Eq. 16) \qquad C_s = 0.047 $ Corresponding cone tip resistance $ q_c = 2,451.663 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = 436.002 kN/m^2 $ Consolidation status $ Overconsolidated $	Primary Consolidation Settlement				
Compression index $ (Eq. 15) \qquad C_c = \qquad 0.234 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.047 $ Corresponding cone tip resistance $ q_c = \qquad 2,451.663 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 436.002 kN/m^2 $ Consolidation status $ Overconsolidated $	Pressure of initial state	(Eq. 17)	σ ₀ ' =	21.480	kN/m ²
Swell index (Eq. 16) $C_s = 0.047$ Corresponding cone tip resistance $q_c = 2,451.663 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 436.002 \text{ kN/m}^2$ Consolidation status	Void ratio of initial state		e ₀ =	0.955	
Corresponding cone tip resistance $q_c = 2,451.663 \text{ kN/m}^2$ Preconsolidation pressure $(Eq.\ 18) \qquad \sigma_c' = 436.002 \text{ kN/m}^2$ Consolidation status $Overconsolidated$	Compression index	(Eq. 15)	C _c =	0.234	
Preconsolidation pressure (Eq. 18) $\sigma_c' = 436.002 \text{ kN/m}^2$ Consolidation status Overconsolidated	Swell index	(Eq. 16)	C _s =	0.047	
Consolidation status Overconsolidated	Corresponding cone tip resistance		q _c =	2,451.663	kN/m ²
	Preconsolidation pressure	(Eq. 18)	$\sigma_{c}' =$	436.002	kN/m²
Change of void ratio (Eq. 29) $\Delta e = 0.007$	Consolidation status		Ove	erconsolidated	
	Change of void ratio	(Eq. 29)	Δe =	0.007	

Consolidation settlement	(Eq. 14)	S _c =	4.360	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.948	
Computing the time in which the primary consolidation ends	(assumed to be 95	% consolidation):		
Time factor	(Eq. 24)	T _v =	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.200	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	1.126	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
		t ₁ + t ₂ ' =: t ₂ =	3.126	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.009	
Secondary consolidation settlement	(Eq. 26)	S _s =	5.104	mm
	<u> </u>			
Total Settlement	(Eq. 1)	S =	16.691	mm

GENERAL	SOIL MECH	ANICAL PRO	PERTIES
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oung's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		μ _s =	0.300	
Jnit Weight		γ =	18.000	kN/m ³
existence of water			FALSE	
Effective unit weight		γ' =	18.000	kN/m ³
Water content		w =	0.418	
Dry unit weight		$\gamma_d =$	12.690	kN/m ³
Specific gravity		G _s =	2.520	
OUNDATION PROPERTIES				
ength of the foundation		L =	5.200	m
Breadth of the foundation		B =	5.200	m
Depth of foundation		D _f =	2.500	m
hickness of soil layer		H =	2.000	m
Maximum dranage path		$H_{dr} =$	1.000	m
COMPUTING NET APPLIED PRESSURE				
Neight of pedestal		W _p =	2.117	Ton
Veight of footing		W _f =	35.693	Ton
orce on the foundation		F =	87.140	Ton
Fotal force				
Total Torce		P =	1,225.756	kN
		P = Δσ =	1,225.756 45.331	kN kN/m ²
Applied pressure				
Applied pressure nternal angle of friction	(Eq. 21)	Δσ =	45.331	
Applied pressure nternal angle of friction Coefficient of lateral earth pressure	(Eq. 21)	Δσ = φ' =	45.331 6.570	
Applied pressure nternal angle of friction Coefficient of lateral earth pressure Depth of interest	(Eq. 21)	Δσ = φ' = K =	45.331 6.570 0.795	
Applied pressure Internal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1 Density input-2	(Eq. 21)	Δσ = φ' = K = z =	45.331 6.570 0.795 1.000	
Applied pressure Internal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1	(Eq. 21) (Eq. 20)	$\Delta \sigma = $ $\phi' = $ $K = $ $z = $ $Z1 = $	45.331 6.570 0.795 1.000 2.917	
Applied pressure Internal angle of friction Coefficient of lateral earth pressure Depth of interest Density input-1 Density input-2		$\Delta \sigma = \phi' = K = z = Z1 = Z2 = V = V = V = V = V = V = V = V = V = $	45.331 6.570 0.795 1.000 2.917 2.917	

SETTLEMENT

Immediate Settlement

Computing shape factor m' = 1.000	Effective width	(Eq. 5)	B' =	2.600	m
m' = 1.000	Location factor	(Eq. 4)	α =	4.000	
N	Computing shape factor				
(Eq. 9) A ₀ = 0.480 (Eq. 10) A ₁ = 0.548 (Eq. 11) A ₂ = 0.899 (Eq. 7) F ₁ = 0.327 (Eq. 8) F ₂ = 0.056 (Eq. 6) I ₁ = 0.359 (Eq. 12) I ₁ = 0.777 (Eq. 8) F ₂ = 0.056 (Eq. 12) I ₁ = 0.777 (Eq. 12) I ₂ = 0.777 (Eq. 12) I ₃ = 0.777 (Eq. 12) I ₄ = 0.777 (Eq. 14) (Eq. 2) (Eq. 4) (m' =	1.000	
(Eq. 10) A₁ = 0.548 (Eq. 11) A₂ = 0.899 (Eq. 11) A₂ = 0.899 (Eq. 7) F₁ = 0.327 (Eq. 8) F₂ = 0.056 (Eq. 6) I₂ = 0.359 (Eq. 6) I₂ = 0.777 (Eq. 12) I₃ = 0.777 (Eq. 12) I₃ = 0.777 (Eq. 12) I₃ = 0.760 (Eq. 12) (Eq. 12) (Eq. 12) (Eq. 13) (Eq. 14) (Eq. 15) (Eq. 14) (Eq. 15) (Eq. 14) (Eq. 15) (Eq. 14) (Eq. 15) (Eq. 14) (Eq. 16) (Eq. 17) (Eq. 12) I₃ = 0.777 (Eq. 16) (Eq. 12) I₃ = 0.777 (Eq. 12) (E			n' =	0.769	
(Eq. 11) A₂ = 0.899 (Eq. 7) F₁ = 0.327 (Eq. 8) F₂ = 0.056 (Eq. 12) I₁ = 0.359 (Eq. 12) I₁ = 0.777 (Eq. 12) I₁ = 0.766 (Eq. 12) I₁ = 0.766 (Eq. 12) I₁ = 0.766 (Eq. 12) I₁ = 0.385 (Eq. 14) (Eq. 15) (Eq. 15) (Eq. 16)		(Eq. 9)	A ₀ =	0.480	
(Eq. 7) F ₁ = 0.327 (Eq. 8) F ₂ = 0.056 (Eq. 8) F ₂ = 0.056 (Eq. 8) F ₂ = 0.056 (Eq. 6) I ₃ = 0.359 (Eq. 12) I ₁ = 0.777 (Eq. 12) I ₁ = 0.777 (Eq. 12) I ₂ = 0.756 (Eq. 12) I ₃ = 0.756 (Eq. 12) I ₄ = 0.777 (Eq. 12) I ₄ = 0.777 (Eq. 12) I ₄ = 0.777 (Eq. 12) I ₄ = 0.767 (Eq. 12) I ₄ = 0.000 (Eq. 12) I ₄ = 0.000 (Eq. 12) I ₄ = 0.385 (Eq. 9) A ₀ = 0.467 (Eq. 10) A ₁ = 0.540 (Eq. 11) A ₂ = 1.332 (Eq. 7) F ₁ = 0.320 (Eq. 11) A ₂ = 1.332 (Eq. 7) F ₁ = 0.320 (Eq. 8) F ₂ = 0.069 (Eq. 11) (Eq. 12) I ₄ = 0.777 (Eq. 12) (Eq		(Eq. 10)	A ₁ =	0.548	
(Eq. 8) F ₂ 0.056		(Eq. 11)	A ₂ =	0.899	
Shape factor (Eq. 6) I, = 0.359		(Eq. 7)	F ₁ =	0.327	
Depth factor (Eq. 12) I ₁ = 0.777		(Eq. 8)	F ₂ =	0.056	
Eq. 2 S ₁ = 7.567 mm	Shape factor	(Eq. 6)	I _s =	0.359	
B. At the Corner Effective width (Eq. 5) B' = 5.200 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.385 (Eq. 9) A ₀ = 0.467 (Eq. 10) A ₁ = 0.540 (Eq. 11) A ₂ = 1.332 (Eq. 7) F ₁ = 0.320 (Eq. 8) F ₂ = 0.069 Shape factor (Eq. 6) I ₅ = 0.360 Depth factor (Eq. 12) I ₇ = 0.777 Immediate settlement (Eq. 2) S ₁ = 3.788 mm Primary Consolidation Settlement Pressure of initial state Compression index (Eq. 15) C _c = 0.232 Swell index Corresponding cone tip resistance Preconsolidation pressure (Eq. 18) σ _c ' = 18.0911 kN/m ² Consolidation status Overconsolidated	Depth factor	(Eq. 12)	I _f =	0.777	
Effective width (Eq. 5) B' = 5.200 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000	Immediate settlement	(Eq. 2)	S _i =	7.567	mm
Effective width (Eq. 5) B' = 5.200 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		(5 5)	D.I.	F 200	
Marcon M					m
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(Eq. 4)	α =	1.000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Computing shape factor		,	4 000	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
		(= -0)			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
Shape factor $(Eq. 8)$ $F_2 = 0.069$ Shape factor $(Eq. 6)$ $I_s = 0.360$ Depth factor $(Eq. 12)$ $I_f = 0.777$ Immediate settlement $(Eq. 2)$ $S_i = 3.788$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 18.000$ kN/m^2 Void ratio of initial state $(Eq. 15)$ $C_c = 0.948$ Compression index $(Eq. 15)$ $C_c = 0.232$ Swell index $(Eq. 16)$ $C_s = 0.046$ Corresponding cone tip resistance $q_c = 980.665$ kN/m^2 Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 180.911$ kN/m^2 Consolidation status					
Shape factor $(Eq. 6)$ $I_s = 0.360$ Depth factor $(Eq. 12)$ $I_f = 0.777$ Immediate settlement $(Eq. 2)$ $S_i = 3.788$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 18.000$ kN/m² Void ratio of initial state $e_0 = 0.948$ Compression index $(Eq. 15)$ $C_c = 0.232$ Swell index $(Eq. 16)$ $C_s = 0.046$ Corresponding cone tip resistance $q_c = 980.665$ kN/m² Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 180.911$ kN/m² Overconsolidated					
Depth factor(Eq. 12) I_f = 0.777Immediate settlement(Eq. 2) S_i = 3.788 mmPrimary Consolidation SettlementPressure of initial state(Eq. 17) σ_0' = 18.000 kN/m²Void ratio of initial state e_0 = 0.948Compression index(Eq. 15) C_c = 0.232Swell index(Eq. 16) C_s = 0.046Corresponding cone tip resistance q_c = 980.665 kN/m²Preconsolidation pressure(Eq. 18) σ_c' = 180.911 kN/m²Consolidation statusOverconsolidated					
Primary Consolidation Settlement (Eq. 2) $S_i = 3.788 \text{ mm}$ Pressure of initial state (Eq. 17) $\sigma_0' = 18.000 \text{ kN/m}^2$ Void ratio of initial state $e_0 = 0.948$ Compression index (Eq. 15) $C_c = 0.232$ Swell index (Eq. 16) $C_s = 0.046$ Corresponding cone tip resistance $q_c = 980.665 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 180.911 \text{ kN/m}^2$ Consolidation status					
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Compression index (Eq. 17) $\sigma_0' = 18.000 \text{ kN/m}^2$ $e_0 = 0.948$ Compression index (Eq. 15) $C_c = 0.232$ Swell index (Eq. 16) $C_s = 0.046$ $q_c = 980.665 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 180.911 \text{ kN/m}^2$ Consolidation status	·				
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = \qquad 18.000 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 0.948 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.232 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.046 $ Corresponding cone tip resistance $ q_c = \qquad 980.665 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 180.911 kN/m^2 $ Consolidation status $ Overconsolidated $	Immediate settlement	(Eq. 2)	S _i =	3.788	mm
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = \qquad 18.000 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 0.948 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.232 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.046 $ Corresponding cone tip resistance $ q_c = \qquad 980.665 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 180.911 kN/m^2 $ Consolidation status $ Overconsolidated $	Primary Consolidation Settlement				
Compression index $ (Eq. 15) \qquad C_c = \qquad 0.232 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.046 $ Corresponding cone tip resistance $ q_c = \qquad 980.665 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 180.911 kN/m^2 $ Consolidation status $ Overconsolidated $	Pressure of initial state	(Eq. 17)	σ ₀ ' =	18.000	kN/m ²
Swell index (Eq. 16) $C_s = 0.046$ Corresponding cone tip resistance $q_c = 980.665 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 180.911 \text{ kN/m}^2$ Consolidation status	Void ratio of initial state		e ₀ =	0.948	
Corresponding cone tip resistance $q_c = 980.665 \text{ kN/m}^2$ Preconsolidation pressure $(Eq. 18) \sigma_c' = 180.911 \text{ kN/m}^2$ Consolidation status $Overconsolidated$	Compression index	(Eq. 15)	C _c =	0.232	
Preconsolidation pressure (Eq. 18) $\sigma_c' = 180.911 \text{ kN/m}^2$ Consolidation status Overconsolidated	Swell index	(Eq. 16)	C _s =	0.046	
Consolidation status Overconsolidated	Corresponding cone tip resistance		q _c =	980.665	kN/m ²
	Preconsolidation pressure	(Eq. 18)	$\sigma_{c}' =$	180.911	kN/m²
Change of void ratio (Eq. 29) $\Delta e = 0.008$	Consolidation status		Over	consolidated	
	Change of void ratio	(Eq. 29)	Δe =	0.008	

Consolidation settlement	(Eq. 14)	S _c =	4.088	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.940	
Computing the time in which the primary consolidation ends	(assumed to be 95%	6 consolidation):		
Time factor	(Eq. 24)	$T_v =$	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.000	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	0.782	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t.	ı + t ₂ ' =: t ₂ =	2.782	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.009	
Secondary consolidation settlement	(Eq. 26)	S _s =	5.264	mm
Total Settlement	(Eq. 1)	S =	16.918	mm

GENERAL SOIL N	MECHANICAL	PROPERTIES
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oung's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		$\mu_s =$	0.300	
Jnit Weight		γ =	18.100	kN/m ³
xistence of water			FALSE	
ffective unit weight		γ' =	18.100	kN/m ³
Vater content		w =	0.425	
Ory unit weight		$\gamma_d =$	12.703	kN/m ³
Specific gravity		G _s =	2.550	
OUNDATION PROPERTIES				
ength of the foundation		L =	4.500	m
Breadth of the foundation		B =	4.500	m
Depth of foundation		D _f =	2.500	m
hickness of soil layer		H =	3.000	m
Maximum dranage path		H _{dr} =	1.500	m
COMPUTING NET APPLIED PRESSURE				
Neight of pedestal		W _p =	2.203	Ton
Weight of footing		W _f =	21.870	Ton
Force on the foundation		F =	79.800	Ton
otal force		P =	1,018.996	kN
Applied pressure		Δσ =	50.321	kN/m²
nternal angle of friction		ф' =	23.800	
Coefficient of lateral earth pressure	(Eq. 21)	K =	0.425	
Coefficient of lateral earth pressure Depth of interest	(Eq. 21)	K = z =	0.425 1.500	
·	(Eq. 21)			
Depth of interest	(Eq. 21)	z =	1.500	
Depth of interest Density input-1	(Eq. 21) (Eq. 20)	z = Z1 =	1.500 2.301	
Depth of interest Density input-1 Density input-2		z = Z1 = Z2 =	1.500 2.301 2.301	

SETTLEMENT

Immediate Settlement

Effective width	(Eq. 5)	B' =	2.250	m
Location factor	(Eq. 4)	α =	4.000	
Computing shape factor				
		m' =	1.000	
		n' =	1.333	
	(Eq. 9)	$A_0 =$	0.507	
	(Eq. 10)	A ₁ =	0.546	
	(Eq. 11)	A ₂ =	0.621	
	(Eq. 7)	F ₁ =	0.335	
	(Eq. 8)	F ₂ =	0.045	
Shape factor	(Eq. 6)	I _s =	0.361	
Depth factor	(Eq. 12)	I _f =	0.761	
Immediate settlement	(Eq. 2)	S _i =	7.153	mm
D. Avyl.				
B. At the Corner	(F., F)	D.	4 500	
Effective width	(Eq. 5)	B' =	4.500	m
Location factor	(Eq. 4)	α =	1.000	
Computing shape factor		,	1 000	
		m' =	1.000	
	(5 0)	n' =	0.667	
	(Eq. 9)	A ₀ =	0.476	
	(Eq. 10)	A ₁ =	0.546	
	(Eq. 11)	A ₂ =	0.979	
	(Eq. 7)	F ₁ =	0.325	
	(Eq. 8)	F ₂ =	0.059	
Shape factor	(Eq. 6)	I _s =	0.359	
Depth factor	(Eq. 12)	I _f =	0.761	
Immediate settlement	(Eq. 2)	S _i =	3.557	mm
Primary Consolidation Settlement				
Pressure of initial state	(Eq. 17)	σ ₀ ' =	27.150	kN/m ²
Void ratio of initial state		e ₀ =	0.969	
Compression index	(Eq. 15)	C _c =	0.234	
Swell index	(Eq. 16)	C _s =	0.047	
Corresponding cone tip resistance		q _c =	2,451.663	kN/m ²
Preconsolidation pressure	(Eq. 18)	$\sigma_{c}' =$	436.002	kN/m²
Consolidation status		Ove	erconsolidated	
Change of void ratio	(Eq. 29)	Δe =	0.006	

Consolidation settlement	(Eq. 14)	S _c =	4.358	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.964	
Computing the time in which the primary consolidation ends (assumed to be 95%	consolidation):		
Time factor	(Eq. 24)	$T_v =$	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.500	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	1.760	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t	+ t ₂ ' =: t ₂ =	3.760	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.009	
Secondary consolidation settlement	(Eq. 26)	S _s =	4.723	mm
Total Settlement	(Eq. 1)	S =	16.233	mm

Young's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		μ _s =	0.300	
Unit Weight		γ =	17.900	kN/m³
Existence of water			FALSE	
Effective unit weight		γ' =	17.900	kN/m³
Water content		w =	0.395	
Dry unit weight		$\gamma_d =$	12.832	kN/m³
Specific gravity		G _s =	2.520	
FOUNDATION PROPERTIES				
Length of the foundation		L =	6.300	m
Breadth of the foundation		B =	6.300	m
Depth of foundation		D _f =	3.400	m
Thickness of soil layer		H =	2.000	m
Maximum dranage path		H _{dr} =	1.000	m
COMPUTING NET APPLIED PRESSURE				
Weight of pedestal		W _p =	5.549	Ton
Weight of footing		W _f =	66.679	Ton
Force on the foundation		F =	188.910	Ton
Total force		P =	2,561.764	kN
Applied pressure		Δσ =	64.544	kN/m²
Internal angle of friction		φ' =	17.390	
Coefficient of lateral earth pressure	(Eq. 21)	K =	0.540	
Depth of interest		z =	1.000	
Density input-1		Z1 =	4.287	
Density input-2		Z2 =	4.287	
Probability density-1 (Harr, 1977)	(Eq. 20)	ψ(Z1) =	0.470	
D	(Eq. 20)	ψ(Z2) =	0.470	
Probability density-2 (Harr, 1977)	(Lq. 20)	+ (/		

SETTLEMENT

Immediate Settlement

Computing shape factor m' = 1.000	Effective width	(Eq. 5)	B' =	3.150	m
m' = 1.000 n' = 0.635 (Eq. 9) A₀ = 0.475 (Eq. 10) A₁ = 0.546 (Eq. 11) A₂ = 1.008 (Eq. 11) A₂ = 0.0325 (Eq. 8) F₂ = 0.060 (Eq. 12) I₁ = 0.764 (Eq. 11) A₂ = 1.000 (Eq. 12) I₁ = 0.764 (Eq. 12) I₁ = 0.317 (Eq. 9) A₀ = 0.465 (Eq. 10) A₂ = 0.339 (Eq. 11) A₂ = 0.339 (Eq. 11) A₂ = 0.340 (Eq. 12) I₁ = 0.764 (Eq. 12) (Location factor	(Eq. 4)	α =	4.000	
N	Computing shape factor				
(Eq. 9) A ₀ = 0.475 (Eq. 10) A ₁ = 0.546 (Eq. 11) A ₂ = 1.008 (Eq. 11) A ₂ = 1.008 (Eq. 11) A ₂ = 0.325 (Eq. 8) F ₂ = 0.060 (Eq. 6) I ₁ = 0.359 (Eq. 8) F ₂ = 0.060 (Eq. 6) I ₂ = 0.764 (Eq. 12) I ₂ = 0.764 (Eq. 12) I ₃ = 0.764 (Eq. 12) I ₄ = 0.317 (Eq. 4)			m' =	1.000	
(Eq. 10) A₁ = 0.546 (Eq. 11) A₂ = 1.008 (Eq. 11) A₂ = 1.008 (Eq. 11) A₂ = 1.008 (Eq. 7) F₁ = 0.325 (Eq. 8) F₂ = 0.060 (Eq. 6) I₂ = 0.359 (Eq. 12) I₂ = 0.764 (Eq. 12) I₂ = 0.764 (Eq. 12) I₃ = 0.310 (Eq. 14) Eq. 1000 (Eq. 14) Eq. 1000 (Eq. 14) Eq. 1000			n' =	0.635	
(Eq. 11) A ₂ = 1.008 (Eq. 7) F ₁ = 0.325 (Eq. 8) F ₂ = 0.060 Shape factor (Eq. 6) I ₅ = 0.359 Depth factor (Eq. 12) I ₇ = 0.764 Immediate settlement (Eq. 2) S ₁ = 12.829 mm B. At the Corner Effective width (Eq. 5) B' = 6.300 m Location factor (Eq. 4) α = 1.000 Computing shape factor (Eq. 4) α = 1.000 Computing shape factor (Eq. 9) A ₀ = 0.465 (Eq. 10) A ₁ = 0.539 (Eq. 11) A ₂ = 1.474 (Eq. 7) F ₁ = 0.319 (Eq. 8) F ₂ = 0.072 Shape factor (Eq. 8) F ₂ = 0.072 Shape factor (Eq. 6) I ₅ = 0.361 Depth factor (Eq. 6) I ₅ = 0.361 Depth factor (Eq. 12) I ₇ = 0.764 Immediate settlement (Eq. 2) S ₁ = 6.444 mm Primary Consolidation Settlement (Eq. 17) σ ₀ ' = 17.900 kN/m² Void ratio of initial state (Eq. 15) C _c = 0.927 Compression index (Eq. 16) C ₇ = 0.045 Corresponding cone tip resistance (Eq. 18) σ _c ' = 301.091 kN/m² Preconsolidation pressure (Eq. 18) σ _c ' = 301.091 kN/m² Consolidation status Overconsolidated		(Eq. 9)	$A_0 =$	0.475	
(Eq. 7) F ₁ = 0.325 (Eq. 8) F ₂ = 0.060 (Eq. 8) F ₂ = 0.060 (Eq. 8) F ₂ = 0.060 (Eq. 6) I ₁ = 0.359 (Eq. 12) I ₁ = 0.764 (Eq. 12) I ₁ = 0.764 (Eq. 12) I ₁ = 0.764 (Eq. 12) I ₂ = 0.764 (Eq. 12) I ₃ = 0.764 (Eq. 12) I ₄ = 0.300 m (Eq. 4) (Eq.		(Eq. 10)	A ₁ =	0.546	
(Eq. 8) F ₂ 0.060		(Eq. 11)	A ₂ =	1.008	
Shape factor (Eq. 6) I, = 0.359		(Eq. 7)	F ₁ =	0.325	
Depth factor (Eq. 12) I₁ = 0.764		(Eq. 8)	F ₂ =	0.060	
Eq. 2 S ₁ = 12.829 mm	Shape factor	(Eq. 6)	I _s =	0.359	
B. At the Corner Effective width (Eq. 5) B' = 6.300 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.317 (Eq. 9) A₀ = 0.465 (Eq. 10) A₁ = 0.539 (Eq. 11) A₂ = 1.474 (Eq. 7) F₁ = 0.319 (Eq. 8) F₂ = 0.072 Shape factor (Eq. 6) I₃ = 0.361 Depth factor (Eq. 12) I₁ = 0.764 Immediate settlement (Eq. 12) I₁ = 0.764 Primary Consolidation Settlement (Eq. 17) σ₀' = 17.900 kN/m² Void ratio of initial state (Eq. 17) σ₀ = 0.927 Compression index (Eq. 15) C₂ = 0.226 Swell index (Eq. 16) C₃ = 0.045 Corresponding cone tip resistance q₂ = 1,667.131 kN/m² Preconsolidation status Overconsolidated	Depth factor	(Eq. 12)	I _f =	0.764	
Effective width (Eq. 5) B' = 6.300 m Location factor (Eq. 4) α = 1.000 n Computing shape factor m' = 1.000 n' = 0.317 (Eq. 9) A_0 = 0.465 0.465 (Eq. 10) A_1 = 0.539 0.66	Immediate settlement	(Eq. 2)	S _i =	12.829	mm
Effective width (Eq. 5) B' = 6.300 m Location factor (Eq. 4) α = 1.000 n Computing shape factor m' = 1.000 n' = 0.317 (Eq. 9) A_0 = 0.465 0.465 (Eq. 10) A_1 = 0.539 0.66	D. Atthe Comer				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		/Eq. E\	D' -	6 200	m
Computing shape factor $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					Ш
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		(Eq. 4)	α =	1.000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Computing snape factor		! _	1 000	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
		/F~ 0\			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
Shape factor $(Eq. 8)$ $F_2 = 0.072$ Shape factor $(Eq. 6)$ $I_s = 0.361$ Depth factor $(Eq. 12)$ $I_f = 0.764$ Immediate settlement $(Eq. 2)$ $S_i = 6.444$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 17.900$ kN/m² Void ratio of initial state $e_0 = 0.927$ Compression index $(Eq. 15)$ $C_c = 0.226$ Swell index $(Eq. 16)$ $C_s = 0.045$ Corresponding cone tip resistance $q_c = 1,667.131$ kN/m² Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 301.091$ kN/m² Consolidation status					
Shape factor $(Eq. 6)$ $I_s = 0.361$ Depth factor $(Eq. 12)$ $I_f = 0.764$ Immediate settlement $(Eq. 2)$ $S_i = 6.444$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 17.900$ kN/m² Void ratio of initial state $e_0 = 0.927$ Compression index $(Eq. 15)$ $C_c = 0.226$ Swell index $(Eq. 16)$ $C_s = 0.045$ Corresponding cone tip resistance $q_c = 1,667.131$ kN/m² Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 301.091$ kN/m² Consolidation status					
Depth factor(Eq. 12) I_f = 0.764 Immediate settlement(Eq. 2) S_i = 6.444 mmPrimary Consolidation SettlementPressure of initial state(Eq. 17) σ_0' = 17.900 kN/m²Void ratio of initial state e_0 = 0.927 Compression index(Eq. 15) C_c = 0.226 Swell index(Eq. 16) C_s = 0.045 Corresponding cone tip resistance q_c = $1,667.131$ kN/m²Preconsolidation pressure(Eq. 18) σ_c' = 301.091 kN/m²Consolidation statusOverconsolidated					
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Compression index Corresponding cone tip resistance Preconsolidation status (Eq. 17) $\sigma_0' = 17.900 \text{ kN/m}^2$ $\sigma_0' = 17.900 \text{ kN/m}^2$ $\sigma_0' = 0.927$ σ					
Primary Consolidation Settlement Pressure of initial state (Eq. 17) $\sigma_0^{'} = 17.900 \text{ kN/m}^2$ Void ratio of initial state $e_0 = 0.927$ Compression index (Eq. 15) $C_c = 0.226$ Swell index (Eq. 16) $C_s = 0.045$ Corresponding cone tip resistance $q_c = 1,667.131 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c^{'} = 301.091 \text{ kN/m}^2$ Consolidation status	·				
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = \qquad 17.900 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 0.927 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.226 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.045 $ Corresponding cone tip resistance $ q_c = \qquad 1,667.131 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 301.091 kN/m^2 $ Consolidation status $ Overconsolidated $	Immediate settlement	(Eq. 2)	S _i =	6.444	mm
Void ratio of initial state $e_0 = 0.927$ Compression index $(Eq. 15) \qquad C_c = 0.226$ Swell index $(Eq. 16) \qquad C_s = 0.045$ Corresponding cone tip resistance $q_c = 1,667.131 kN/m^2$ Preconsolidation pressure $(Eq. 18) \qquad \sigma_{c}' = 301.091 kN/m^2$ Consolidation status $Overconsolidated$	Primary Consolidation Settlement				
Void ratio of initial state $e_0 = 0.927$ Compression index $(Eq. 15) \qquad C_c = 0.226$ Swell index $(Eq. 16) \qquad C_s = 0.045$ Corresponding cone tip resistance $q_c = 1,667.131 kN/m^2$ Preconsolidation pressure $(Eq. 18) \qquad \sigma_{c}' = 301.091 kN/m^2$ Consolidation status $Overconsolidated$	Pressure of initial state	(Eq. 17)	σ ₀ ' =	17.900	kN/m ²
Swell index (Eq. 16) $C_s = 0.045$ Corresponding cone tip resistance $q_c = 1,667.131 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 301.091 \text{ kN/m}^2$ Consolidation status	Void ratio of initial state		e ₀ =	0.927	
Corresponding cone tip resistance $q_c = 1,667.131 kN/m^2$ Preconsolidation pressure $(Eq. 18) \sigma_c' = 301.091 kN/m^2$ Consolidation status $Overconsolidated$	Compression index	(Eq. 15)	C _c =	0.226	
Preconsolidation pressure (Eq. 18) $\sigma_c' = 301.091 \text{ kN/m}^2$ Consolidation status Overconsolidated	Swell index	(Eq. 16)	C _s =	0.045	
Consolidation status Overconsolidated	Corresponding cone tip resistance		q _c =	1,667.131	kN/m ²
	Preconsolidation pressure	(Eq. 18)	$\sigma_{c}' =$	301.091	kN/m²
Change of void ratio (Eq. 29) $\Delta e = 0.011$	Consolidation status		Ove	rconsolidated	
	Change of void ratio	(Eq. 29)	Δe =	0.011	

Consolidation settlement	(Eq. 14)	S _c =	5.955	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.915	
Computing the time in which the primary consolidation ends	(assumed to be 95%	consolidation):		
Time factor	(Eq. 24)	T _v =	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.000	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	0.782	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t_1	+ t ₂ ' =: t ₂ =	2.782	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.009	
Secondary consolidation settlement	(Eq. 26)	S _s =	5.194	mm
Total Settlement	(Eq. 1)	S =	23.978	mm

GENERAL SOIL	MECHANICAL	. PROPERTIES
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SENERAL SOIL MECHANICAL I NOI ENTIES				
Young's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		μ _s =	0.300	
Unit Weight		γ =	18.200	kN/m³
Existence of water			FALSE	
Effective unit weight		γ' =	18.200	kN/m³
Water content		w =	0.453	
Dry unit weight		$\gamma_d =$	12.524	kN/m³
Specific gravity		G _s =	2.500	
FOUNDATION PROPERTIES				
Length of the foundation		L=	6.200	m
Breadth of the foundation		B =	6.200	m
Depth of foundation		D _f =	3.400	m
Thickness of soil layer		H =	3.200	m
Maximum dranage path		H _{dr} =	1.600	m
COMPUTING NET APPLIED PRESSURE				
Weight of pedestal		W _p =	5.549	Ton
Weight of footing		W _f =	64.579	Ton
Force on the foundation		F =	183.840	Ton
Total force		P =	2,491.426	kN
Applied pressure		Δσ =	64.813	kN/m²
nternal angle of friction		φ' =	2.200	
Coefficient of lateral earth pressure	(Eq. 21)	K =	0.926	
Depth of interest		z =	1.600	
Density input-1		Z1 =	2.013	
Density input-2		Z2 =	2.013	
Probability density-1 (Harr, 1977)	(Eq. 20)	$\psi(Z1) =$	0.407	
Probability density-2 (Harr, 1977)	(Eq. 20)	ψ(Z2) =	0.407	

SETTLEMENT

Immediate Settlement

Computing shape factor m' = 1.000 n' = 1.032	Effective width	(Eq. 5)	B' =	3.100	m
m' = 1.000 n' = 1.032	Location factor	(Eq. 4)	α =	4.000	
N	Computing shape factor				
(Eq. 9) A ₀ = 0.493 (Eq. 10) A ₁ = 0.549 (Eq. 11) A ₂ = 0.744 (Eq. 7) F ₁ = 0.332 (Eq. 8) F ₂ = 0.050 (Eq. 6) I ₁ = 0.360 (Eq. 6) I ₂ = 0.762 (Eq. 12) I ₃ = 0.762 (Eq. 12) I ₄ = 0.543 (Eq. 14) (Eq. 14) (Eq. 14) (Eq. 15) (Eq. 14) (Eq. 14) (Eq. 14) (Eq. 14) (Eq. 14) (Eq. 14) (Eq. 11) (Eq. 12)			m' =	1.000	
(Eq. 10) A₁ = 0.549 (Eq. 11) A₂ = 0.744 (Eq. 7) F₁ = 0.332 (Eq. 8) F₂ = 0.050 (Eq. 8) F₂ = 0.050 (Eq. 6) I₂ = 0.762 (Eq. 12) I₃ = 0.516 (Eq. 4) (Eq. 5) B¹ = 0.200 m (Eq. 4) (Eq. 5) Eq. 1000 (Eq. 4) (Eq. 5) Eq. 1000 (Eq. 11) (Eq. 10) I₃ = 0.516 (Eq. 11) A₂ = 0.516 (Eq. 11) A₂ = 0.543 (Eq. 11) A₂ = 0.471 (Eq. 10) A₁ = 0.543 (Eq. 11) A₂ = 0.323 (Eq. 8) F₂ = 0.064 (Eq. 7) F₃ = 0.323 (Eq. 8) F₂ = 0.064 (Eq. 8) F₂ = 0.064 (Eq. 12) I₃ = 0.762 (Eq. 12) I₃ = 0.762 (Eq. 12) (Eq.			n' =	1.032	
(Eq. 11) A₂ = 0.744 (Eq. 7)		(Eq. 9)	$A_0 =$	0.493	
(Eq. 7) F ₁ = 0.332 (Eq. 8) F ₂ = 0.050 (Eq. 8) F ₁ = 0.350 (Eq. 8) F ₂ = 0.050 (Eq. 6) I ₁ = 0.360 (Eq. 12) I ₁ = 0.762 (Eq. 12) I ₁ = 0.762 (Eq. 12) I ₁ = 0.762 (Eq. 12) I ₂ = 0.762 (Eq. 12) I ₃ = 0.269 mm (Eq. 2) S ₁ = 12.694 mm (Eq. 2) S ₁ = 12.694 mm (Eq. 5) S ₂ = 0.200 m (Eq. 4) (E		(Eq. 10)	A ₁ =	0.549	
(Eq. 8) F ₂ 0.050		(Eq. 11)	A ₂ =	0.744	
Shape factor (Eq. 6) I, = 0.360 Depth factor (Eq. 12) I _I = 0.762 Depth factor (Eq. 12) I _I = 0.762 Depth factor (Eq. 2) S ₁ = 12.694 mm Depth factor (Eq. 2) S ₁ = 12.694 mm Depth factor (Eq. 5) B' = 6.200 m Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 9) A ₀ = 0.471 (Eq. 10) A ₁ = 0.543 (Eq. 11) A ₂ = 1.134 (Eq. 7) F ₁ = 0.323 (Eq. 11) A ₂ = 1.134 (Eq. 7) F ₁ = 0.323 (Eq. 8) F ₂ = 0.064 Depth factor (Eq. 6) I ₃ = 0.359 Depth factor (Eq. 6) I ₃ = 0.359 Depth factor (Eq. 12) I _I = 0.762 Depth factor (Eq. 12) I _I = 0.762 Depth factor (Eq. 12) I _I = 0.762 Depth factor (Eq. 12) Depth factor (Eq. 12) I _I = 0.762 Depth factor (Eq. 12) Depth factor (Eq. 12) Depth factor (Eq. 12) I _I = 0.762 Depth factor (Eq. 15) Depth factor (Eq. 15) Depth factor (Eq. 15) C ₀ = 0.237 Depth factor (Eq. 15) C ₀ = 0.237 Depth factor (Eq. 15) C ₀ = 0.237 Depth factor (Eq. 16) C ₁ = 0.047 Depth factor (Eq. 16) C ₂ = 0.237 Depth factor (Eq. 16) C ₃ = 0.237 Depth factor (Eq. 16) C ₄ = 0.471 Depth factor (Eq. 16) C ₄ = 0.471 Depth factor (Eq. 16) Depth factor (Eq. 17) Depth factor (Eq. 18) Depth factor (Eq.		(Eq. 7)	F ₁ =	0.332	
Depth factor (Eq. 12) I ₁ = 0.762 Immediate settlement (Eq. 2) S ₁ = 12.694 mm Immediate settlement (Eq. 2) S ₁ = 12.694 mm Immediate settlement (Eq. 5) S ₁ = 1.2694 mm Immediate settlement (Eq. 5) S ₁ = 6.200 m Immediate settlement (Eq. 4) α = 1.000 Immediate settlement (Eq. 4) α = 1.000 Immediate settlement (Eq. 9) A ₀ = 0.471 (Eq. 9) A ₀ = 0.471 (Eq. 10) A ₁ = 0.543 (Eq. 11) A ₂ = 1.134 (Eq. 7) F ₁ = 0.323 (Eq. 8) F ₂ = 0.064 (Eq. 8) F ₃ = 0.762 (Eq. 8) F ₄ = 0.762 (Eq. 12) F ₁ = 0.762 (Eq. 12) F ₂ = 0.762 (Eq. 12) (Eq. 13) (Eq. 14) (Eq. 15) (Eq. 15) (Eq. 15) (Eq. 15) (Eq. 16) (Eq. 16) (Eq. 16) (Eq. 17) (Eq. 16) (Eq. 17) (E		(Eq. 8)	F ₂ =	0.050	
Eq. 2 S ₁ = 12.694 mm mm mm mm mm mm mm mm	Shape factor	(Eq. 6)	I _s =	0.360	
B. At the Corner Effective width (Eq. 5) B' = 6.200 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.516 (Eq. 9) A₀ = 0.471 (Eq. 10) A₁ = 0.543 (Eq. 11) A₂ = 1.134 (Eq. 7) F₁ = 0.323 (Eq. 8) F₂ = 0.064 Shape factor (Eq. 6) I₅ = 0.359 Depth factor (Eq. 12) I₁ = 0.762 Immediate settlement (Eq. 12) I₁ = 0.762 Immediate settlement (Eq. 12) I₁ = 0.762 Immediate settlement (Eq. 17) σ₀' = 29.120 kN/m² Void ratio of initial state e₀ = 0.958 Compression index (Eq. 15) C₂ = 0.237 Swell index (Eq. 16) C₃ = 0.047 Corresponding cone tip resistance q₂ = 2,549.729 kN/m² Preconsolidation status	Depth factor	(Eq. 12)	I _f =	0.762	
Effective width (Eq. 5) B' = 6.200 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.516 (Eq. 9) A ₀ = 0.471 (Eq. 10) A ₁ = 0.543 (Eq. 11) A ₂ = 1.134 (Eq. 7) F ₁ = 0.323 (Eq. 8) F ₂ = 0.064 Shape factor (Eq. 8) F ₂ = 0.064 Shape factor (Eq. 12) I _f = 0.762 Immediate settlement (Eq. 2) S ₁ = 6.324 mm Primary Consolidation Settlement Pressure of initial state (Eq. 17) σ ₀ ' = 29.120 kN/m² Void ratio of initial state (Eq. 15) C _c = 0.237 Swell index (Eq. 16) C _s = 0.047 Corresponding cone tip resistance (Eq. 18) σ _c ' = 452.731 kN/m² Consolidation status Overconsolidated	Immediate settlement	(Eq. 2)	S _i =	12.694	mm
Effective width (Eq. 5) B' = 6.200 m Location factor (Eq. 4) α = 1.000 Computing shape factor m' = 1.000 n' = 0.516 (Eq. 9) A ₀ = 0.471 (Eq. 10) A ₁ = 0.543 (Eq. 11) A ₂ = 1.134 (Eq. 7) F ₁ = 0.323 (Eq. 8) F ₂ = 0.064 Shape factor (Eq. 8) F ₂ = 0.064 Shape factor (Eq. 12) I _f = 0.762 Immediate settlement (Eq. 2) S ₁ = 6.324 mm Primary Consolidation Settlement Pressure of initial state (Eq. 17) σ ₀ ' = 29.120 kN/m² Void ratio of initial state (Eq. 15) C _c = 0.237 Swell index (Eq. 16) C _s = 0.047 Corresponding cone tip resistance (Eq. 18) σ _c ' = 452.731 kN/m² Consolidation status Overconsolidated	D. At the Common				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		/Fa F\	D! _	6 200	
Computing shape factor m' =					m
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(Eq. 4)	α =	1.000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Computing snape factor		! _	1 000	
$ (Eq. 9) \qquad A_0 = \qquad 0.471 \\ (Eq. 10) \qquad A_1 = \qquad 0.543 \\ (Eq. 11) \qquad A_2 = \qquad 1.134 \\ (Eq. 7) \qquad F_1 = \qquad 0.323 \\ (Eq. 8) \qquad F_2 = \qquad 0.064 \\ Shape factor \qquad (Eq. 8) \qquad F_2 = \qquad 0.064 \\ Shape factor \qquad (Eq. 12) \qquad I_f = \qquad 0.762 \\ Immediate settlement \qquad (Eq. 12) \qquad I_f = \qquad 0.762 \\ Immediate settlement \qquad (Eq. 12) \qquad S_i = \qquad 6.324 mm \\ \hline Primary Consolidation Settlement \\ Pressure of initial state \qquad (Eq. 17) \qquad \sigma_0' = \qquad 29.120 kN/m^2 \\ Void ratio of initial state \qquad (Eq. 15) \qquad C_c = \qquad 0.958 \\ Compression index \qquad (Eq. 15) \qquad C_c = \qquad 0.237 \\ Swell index \qquad (Eq. 16) \qquad C_s = \qquad 0.047 \\ Corresponding cone tip resistance \qquad q_c = \qquad 2.549.729 kN/m^2 \\ Preconsolidation pressure \qquad (Eq. 18) \qquad \sigma_c' = \qquad 452.731 kN/m^2 \\ Consolidation status \qquad Overconsolidated \\ \hline$					
		/F~ 0\			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					
Shape factor $(Eq. 6)$ $I_s = 0.359$ Depth factor $(Eq. 12)$ $I_f = 0.762$ Immediate settlement $(Eq. 2)$ $S_i = 6.324$ mm Primary Consolidation Settlement Pressure of initial state $(Eq. 17)$ $\sigma_0' = 29.120$ kN/m² Void ratio of initial state $e_0 = 0.958$ Compression index $(Eq. 15)$ $C_c = 0.237$ Swell index $(Eq. 16)$ $C_s = 0.047$ Corresponding cone tip resistance $q_c = 2,549.729$ kN/m² Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 452.731$ kN/m² Consolidation status					
Depth factor(Eq. 12) I_f = 0.762Immediate settlement(Eq. 2) S_i = 6.324 mmPrimary Consolidation SettlementPressure of initial state(Eq. 17) σ_0' = 29.120 kN/m²Void ratio of initial state e_0 = 0.958Compression index(Eq. 15) C_c = 0.237Swell index(Eq. 16) C_s = 0.047Corresponding cone tip resistance q_c = 2,549.729 kN/m²Preconsolidation pressure(Eq. 18) σ_c' = 452.731 kN/m²Consolidation statusOverconsolidated					
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Compression index (Eq. 17) $\sigma_0' = 29.120 \text{ kN/m}^2$ $\sigma_0' = 0.958$ Compression index (Eq. 15) $\sigma_0 = 0.958$ Compression index (Eq. 15) $\sigma_0 = 0.958$ Corresponding cone tip resistance $\sigma_0 = 0.237$ $\sigma_0' = 0.237$					
Primary Consolidation Settlement Pressure of initial state Void ratio of initial state Compression index (Eq. 17) $\sigma_0' = 29.120 \text{ kN/m}^2$ $e_0 = 0.958$ Compression index (Eq. 15) $C_c = 0.237$ Swell index (Eq. 16) $C_s = 0.047$ $q_c = 2,549.729 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 452.731 \text{ kN/m}^2$ Consolidation status	·				
Pressure of initial state $ (Eq. 17) \qquad \sigma_0' = 29.120 kN/m^2 $ Void ratio of initial state $ e_0 = 0.958 $ Compression index $ (Eq. 15) \qquad C_c = 0.237 $ Swell index $ (Eq. 16) \qquad C_s = 0.047 $ Corresponding cone tip resistance $ q_c = 2,549.729 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = 452.731 kN/m^2 $ Consolidation status $ Overconsolidated $	Immediate settlement	(Eq. 2)	S _i =	6.324	mm
Void ratio of initial state $e_0 = 0.958$ Compression index $(Eq. 15) \qquad C_c = 0.237$ Swell index $(Eq. 16) \qquad C_s = 0.047$ Corresponding cone tip resistance $q_c = 2,549.729 kN/m^2$ Preconsolidation pressure $(Eq. 18) \qquad \sigma_{c}' = 452.731 kN/m^2$ Consolidation status $Overconsolidated$	Primary Consolidation Settlement				
Compression index $ (Eq. 15) \qquad C_c = \qquad 0.237 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.047 $ Corresponding cone tip resistance $ q_c = \qquad 2,549.729 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c' = \qquad 452.731 kN/m^2 $ Consolidation status $ Overconsolidated $	Pressure of initial state	(Eq. 17)	σ ₀ ' =	29.120	kN/m ²
Swell index (Eq. 16) $C_s = 0.047$ Corresponding cone tip resistance $q_c = 2,549.729 \text{ kN/m}^2$ Preconsolidation pressure (Eq. 18) $\sigma_c' = 452.731 \text{ kN/m}^2$ Consolidation status	Void ratio of initial state		e ₀ =	0.958	
Corresponding cone tip resistance $q_c = 2,549.729 kN/m^2$ Preconsolidation pressure $(Eq. 18) \sigma_c' = 452.731 kN/m^2$ Consolidation status $Overconsolidated$	Compression index	(Eq. 15)	C _c =	0.237	
Preconsolidation pressure (Eq. 18) $\sigma_c' = 452.731 \text{ kN/m}^2$ Consolidation status Overconsolidated	Swell index	(Eq. 16)	C _s =	0.047	
Consolidation status Overconsolidated	Corresponding cone tip resistance		q _c =	2,549.729	kN/m ²
	Preconsolidation pressure	(Eq. 18)	$\sigma_{c}' =$	452.731	kN/m²
Change of void ratio (Eq. 29) $\Delta e = 0.006$	Consolidation status		Ove	rconsolidated	
	Change of void ratio	(Eq. 29)	Δe =	0.006	

Consolidation settlement	(Eq. 14)	S _c =	5.277	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.952	
Computing the time in which the primary consolidation ends	(assumed to be 95%	consolidation):		
Time factor	(Eq. 24)	T _v =	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	1.600	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	2.002	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t ₁	+ t ₂ ' =: t ₂ =	4.002	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.009	
Secondary consolidation settlement	(Eq. 26)	S _s =	4.670	mm
Total Settlement	(Eq. 1)	S =	22.640	mm

oung's modulus		E _s =	14,715.000	kN/m ²
Poisson's ratio		μ _s =	0.300	
Jnit Weight		γ =	18.500	kN/m³
Existence of water			FALSE	
Effective unit weight		γ' =	18.500	kN/m³
Nater content		w =	0.438	
Dry unit weight		$\gamma_d =$	12.869	kN/m³
Specific gravity		G _s =	2.580	
OUNDATION PROPERTIES				
ength of the foundation		L =	7.600	m
Breadth of the foundation		B =	7.600	m
Depth of foundation		D _f =	3.500	m
Thickness of soil layer		H =	4.000	m
Maximum dranage path		H _{dr} =	2.000	m
COMPUTING NET APPLIED PRESSURE				
Neight of pedestal		W _p =	4.915	Ton
Neight of footing		W _f =	110.899	Ton
Force on the foundation		F =	194.420	Ton
Total force		P =	3,043.399	kN
Applied pressure		Δσ =	52.690	kN/m ²
nternal angle of friction		φ' =	18.390	
Coefficient of lateral earth pressure	(Eq. 21)	K =	0.520	
Depth of interest		z =	2.000	
Density input-1		Z1 =	2.634	
Density input-2		Z2 =	2.634	
Probability density-1 (Harr, 1977)	(Eq. 20)	ψ(Z1) =	0.430	
	/	1./72) -	0.430	
Probability density-2 (Harr, 1977)	(Eq. 20)	ψ(Z2) =	0.430	

SETTLEMENT

Immediate Settlement

Location factor (Eq. 4) α = 4,000 Computing shape factor m' = 1,000 n' = 0,049 4 (Eq. 9) A₀ = 0,549 9 6 1,000 1,000 0 1,000 <td< th=""><th>Effective width</th><th>(Eq. 5)</th><th>B' =</th><th>3.800</th><th>m</th></td<>	Effective width	(Eq. 5)	B' =	3.800	m
m' = 1.000 n' = 1.053 (Eq. 9)	Location factor	(Eq. 4)	α =	4.000	
No control of the c	Computing shape factor				
(Eq. 9) A ₀ = 0.494 (Eq. 10) A ₁ = 0.549 (Eq. 11) A ₂ = 0.734 (Eq. 11) A ₂ = 0.050 (Eq. 6) I ₁ = 0.332 (Eq. 8) F ₂ = 0.050 (Eq. 6) I ₂ = 0.781 Immediate settlement (Eq. 12) I ₁ = 0.781 Immediate settlement (Eq. 12) I ₁ = 0.781 Immediate settlement (Eq. 2) S ₁ = 12.963 mm Immediate settlement (Eq. 2) S ₁ = 1.000 Immediate settlement (Eq. 4) Q = 1.000 Immediate settlement (Eq. 11) A ₂ = 1.122 (Eq. 11) A ₂ = 1.122 (Eq. 7) F ₁ = 0.323 (Eq. 8) F ₂ = 0.063 (Eq. 11) A ₂ = 0.781 Immediate settlement (Eq. 2) S ₁ = 0.457 mm Immediate settlement (Eq. 2) S ₁ = 0.457 mm Immediate settlement (Eq. 12) I ₁ = 0.781 Immediate settlement (Eq. 17) Q ₀ ' = 37.000 (EN/m²) (Eq. 16) (Eq. 16) C ₂ = 0.230 (Eq. 16) C ₃ = 0.230 (Eq. 16) C ₄ = 0.320 (Eq. 16) C ₅ = 0.230 (Eq. 16) C ₇ = 0.246 (Eq. 16) C ₇ = 0.24			m' =	1.000	
(Eq. 10) A1 = 0.549 (Eq. 11) A2 = 0.734 (Eq. 11) A2 = 0.734 (Eq. 7) F1 = 0.332 (Eq. 8) F2 = 0.050 (Eq. 8) F2 = 0.050 (Eq. 6) I3 = 0.360 (Eq. 12) I4 = 0.781 (Eq. 12) (Eq. 12) I4 = 0.781 (Eq. 12)			n' =	1.053	
(Eq. 11) A₂ = 0.734 (Eq. 7) F₁ = 0.332 (Eq. 8) F₂ = 0.050 (Eq. 12) F₁ = 0.781 (Eq. 12) F₁ = 0.780 (Eq. 12) F₁ = 0.780 (Eq. 12) F₁ = 0.780 (Eq. 12) F₁ = 0.526 (Eq. 12) F₁ = 0.526 (Eq. 11) F₁ = 0.323 (Eq. 8) F₂ = 0.063 (Eq. 12) F₁ = 0.781 (Eq. 12) (Eq. 12) F₁ = 0.781 (Eq. 12) (Eq. 12) (Eq. 12) F₁ = 0.781 (Eq. 12) (Eq. 12) (Eq. 12) F₁ = 0.781 (Eq. 12)		(Eq. 9)	$A_0 =$	0.494	
(Εq. 7) F₁ = 0.332 (Εq. 8) F₂ = 0.050 (Εq. 8) F₂ = 0.050 (Εq. 8) F₂ = 0.050 (Εq. 6) I₃ = 0.360 (Εq. 12) I₁ = 0.781 (Εq. 12) I₁ = 0.780 I = 0.000 I = 0.000 (Εq. 14) I = 0.000		(Eq. 10)	A ₁ =	0.549	
Fq. 8 Fq. 8 0.050		(Eq. 11)	A ₂ =	0.734	
Shape factor (Eq. 6) I ₁ = 0.360 Depth factor (Eq. 12) I ₁ = 0.781 Depth factor (Eq. 12) I ₁ = 0.781 Depth factor (Eq. 2) S ₁ = 12.963 mm Depth factor (Eq. 2) S ₁ = 12.963 mm Depth factor (Eq. 5) B' = 7.600 m Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 4) α = 1.000 Depth factor (Eq. 9) A ₀ = 0.471 (Eq. 10) A ₁ = 0.526 Depth factor (Eq. 11) A ₂ = 1.122 (Eq. 7) F ₁ = 0.323 (Eq. 8) F ₂ = 0.063 Depth factor (Eq. 6) I ₂ = 0.359 Depth factor (Eq. 6) I ₃ = 0.359 Depth factor (Eq. 12) I ₁ = 0.781 Depth factor (Eq. 12) I ₁ = 0.781 Depth factor (Eq. 12) I ₁ = 0.781 Depth factor (Eq. 12) I ₂ = 0.781 Depth factor (Eq. 12) Depth factor (Eq. 12) I ₃ = 0.457 mm Depth factor (Eq. 12) Depth factor (Eq. 12) Depth factor (Eq. 15) C ₁ = 0.967 Depth factor (Eq. 15) C ₂ = 0.230 Depth factor (Eq. 15) C ₃ = 0.461 Depth factor (Eq. 15) C ₄ = 0.967 Depth factor (Eq. 15) C ₅ = 0.230 Depth factor (Eq. 16) C ₆ = 0.967 Depth factor (Eq. 16) C ₇ = 0.350 Depth factor (Eq. 16) C ₈ = 0.967 Depth factor (Eq. 16) C ₉ = 0.967 Depth factor (Eq. 16) C ₉ = 0.967 Depth factor (Eq. 16) Depth factor (Eq.		(Eq. 7)	F ₁ =	0.332	
Depth factor (Eq. 12) I ₁ = 0.781		(Eq. 8)	F ₂ =	0.050	
Immediate settlement (Eq. 2) S ₁ = 12.963 mm	Shape factor	(Eq. 6)	I _s =	0.360	
B. At the Corner Effective width (Eq. 5) B' = 7.600 m Location factor (Eq. 4) α = 1.000 m Computing shape factor m' = 1.000 n' = 0.526 (Eq. 9) A₀ = 0.471 0.526 0.62 0.62 0.62 0.62 0.62 0.62 0.62 0.63 0.62 0.63 0.62 0.63 0.62 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.64 0.63 0.64 0.63 0.64 </th <th>Depth factor</th> <th>(Eq. 12)</th> <th>I_f =</th> <th>0.781</th> <th></th>	Depth factor	(Eq. 12)	I _f =	0.781	
Effective width (Eq. 5) B' = 7.600 m Location factor (Eq. 4) \(a\) = 1.000 \(\begin{align*} ht = 1.000 \\ n' = 0.526 \\ (Eq. 9) \(\begin{align*} ht = 0.543 \\ (Eq. 10) \(\begin{align*} ht = 0.543 \\ (Eq. 11) \(\begin{align*} ht = 0.543 \\ (Eq. 10) \(\begin{align*} ht = 0.543 \\ (Eq. 10) \(\begin{align*} ht = 0.543 \\ (Eq. 10) \(\begin{align*} ht = 0.323 \\ (Eq. 8) \(\begin{align*} ht = 0.323 \\ (Eq. 8) \(\begin{align*} ht = 0.323 \\ (Eq. 12) \(\begin{align*} ht = 0.781 \\ (Eq. 10) \(\begin{align*} ht = 0.359 \\ (Eq. 10) \(\begin{align*} ht = 0.359 \\ (Eq. 10) \(\begin{align*} ht = 0.359 \\ (Eq. 10) \(\begin{align*} ht = 0.781 \\ (Eq. 10) \(\begin{align*} ht = 0.320 \\ (Eq. 10) \(\begin{align*}	Immediate settlement	(Eq. 2)	S _i =	12.963	mm
Effective width (Eq. 5) B' = 7.600 m Location factor (Eq. 4) \(a\) = 1.000 \(\begin{align*} ht = 1.000 \\ n' = 0.526 \\ (Eq. 9) \(\begin{align*} ht = 0.543 \\ (Eq. 10) \(\begin{align*} ht = 0.543 \\ (Eq. 11) \(\begin{align*} ht = 0.543 \\ (Eq. 10) \(\begin{align*} ht = 0.543 \\ (Eq. 10) \(\begin{align*} ht = 0.543 \\ (Eq. 10) \(\begin{align*} ht = 0.323 \\ (Eq. 8) \(\begin{align*} ht = 0.323 \\ (Eq. 8) \(\begin{align*} ht = 0.323 \\ (Eq. 12) \(\begin{align*} ht = 0.781 \\ (Eq. 10) \(\begin{align*} ht = 0.359 \\ (Eq. 10) \(\begin{align*} ht = 0.359 \\ (Eq. 10) \(\begin{align*} ht = 0.359 \\ (Eq. 10) \(\begin{align*} ht = 0.781 \\ (Eq. 10) \(\begin{align*} ht = 0.320 \\ (Eq. 10) \(\begin{align*}					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					
Computing shape factor $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					m
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		(Eq. 4)	α =	1.000	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Computing shape factor				
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(Eq. 10) A1					
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		(Eq. 8)	F ₂ =	0.063	
Immediate settlement(Eq. 2) S_i =6.457 mmPrimary Consolidation SettlementPressure of initial state(Eq. 17) σ_0' =37.000 kN/m²Void ratio of initial state e_0 =0.967Compression index(Eq. 15) C_c =0.230Swell index(Eq. 16) C_s =0.046Corresponding cone tip resistance q_c =1,765.197 kN/m²Preconsolidation pressure(Eq. 18) σ_c' =318.074 kN/m²Consolidation statusOverconsolidated	Shape factor	(Eq. 6)	I _s =	0.359	
Primary Consolidation SettlementPressure of initial state $(Eq. 17)$ $\sigma_0' = 37.000 \text{ kN/m}^2$ Void ratio of initial state $e_0 = 0.967$ Compression index $(Eq. 15)$ $C_c = 0.230$ Swell index $(Eq. 16)$ $C_s = 0.046$ Corresponding cone tip resistance $q_c = 1,765.197 \text{ kN/m}^2$ Preconsolidation pressure $(Eq. 18)$ $\sigma_c' = 318.074 \text{ kN/m}^2$ Consolidation statusOverconsolidated	Depth factor	(Eq. 12)	I _f =	0.781	
Pressure of initial state $ (Eq. 17) \qquad \sigma_0^{'} = \qquad 37.000 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 0.967 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.230 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.046 $ Corresponding cone tip resistance $ q_c = \qquad 1,765.197 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c^{'} = \qquad 318.074 kN/m^2 $ Consolidation status $ Overconsolidated $	Immediate settlement	(Eq. 2)	S _i =	6.457	mm
Pressure of initial state $ (Eq. 17) \qquad \sigma_0^{'} = \qquad 37.000 kN/m^2 $ Void ratio of initial state $ e_0 = \qquad 0.967 $ Compression index $ (Eq. 15) \qquad C_c = \qquad 0.230 $ Swell index $ (Eq. 16) \qquad C_s = \qquad 0.046 $ Corresponding cone tip resistance $ q_c = \qquad 1,765.197 kN/m^2 $ Preconsolidation pressure $ (Eq. 18) \qquad \sigma_c^{'} = \qquad 318.074 kN/m^2 $ Consolidation status $ Overconsolidated $	Primary Consolidation Settlement				
Void ratio of initial state $e_0 = 0.967$ Compression index $(Eq. 15) C_c = 0.230$ Swell index $(Eq. 16) C_s = 0.046$ Corresponding cone tip resistance $q_c = 1,765.197 kN/m^2$ Preconsolidation pressure $(Eq. 18) \sigma_c' = 318.074 kN/m^2$ Consolidation status		(Eq. 17)	σ ₀ ' =	37.000	kN/m ²
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Swell index (Eq. 16) $C_s = 0.046$ Corresponding cone tip resistance $q_c = 1,765.197$ kN/m² Preconsolidation pressure (Eq. 18) $\sigma_c' = 318.074$ kN/m² Consolidation status		(Eq. 15)			
Corresponding cone tip resistance $q_c = 1,765.197 kN/m^2$ Preconsolidation pressure $(Eq. 18) \sigma_c' = 318.074 kN/m^2$ Consolidation status $Overconsolidated$					
Preconsolidation pressure (Eq. 18) $\sigma_c' = 318.074 \text{ kN/m}^2$ Consolidation status		, , ,			kN/m ²
Consolidation status Overconsolidated		(Eq. 18)			
		, , ,			,
	Change of void ratio	(Eq. 29)	Δe =	0.005	

Consolidation settlement	(Eq. 14)	S _c =	4.761	mm
Secondary Consolidation Settlement				
Void ratio at the end of primary consolidation	(Eq. 27)	e _p =	0.962	
Computing the time in which the primary consolidation ends (a	ssumed to be 95%	consolidation):		
Time factor	(Eq. 24)	$T_v =$	1.129	
Coefficient of consolidation		c _v =	2.78E-06	m²/min
Drainage path		H _{dr} =	2.000	m
Time at the end of primary consolidation	(Eq. 25)	t ₁ =	3.129	years
The time considered for secondary consolidation		t ₂ ' =	2.000	years
	t ₁	+ t ₂ ' =: t ₂ =	5.129	years
Empirical value for C_{α}/C_{c}		$C_{\alpha}/C_{c} =$	0.040	
Secondary compression index		$C_{\alpha} =$	0.009	
Secondary consolidation settlement	(Eq. 26)	S _s =	4.034	mm
Total Settlement	(Eq. 1)	S =	21.758	mm