

Introduction to CIEM2000 Group Assignment

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CIEM2000 Assessment

- Theory & Modelling of Geo-Processes – written exam (15%)
- Testing & Modelling of Soil Behaviour – written exam (30%)
- Foundations & Excavations – oral exam (30%)
- **Group Assignment (25%)**

Group Assignment – Introduction

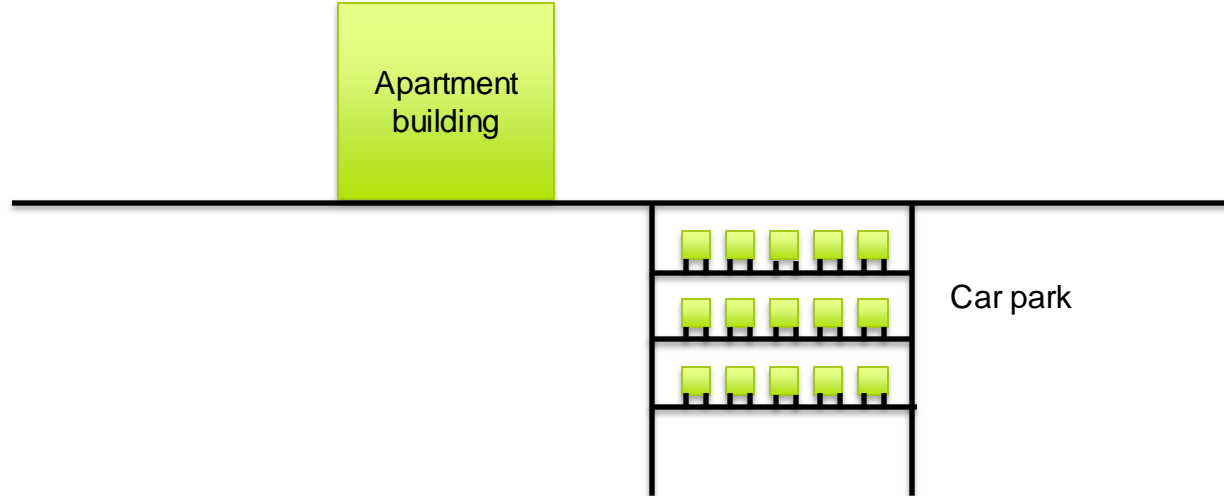
Case study

- Excavation for a car park next to an apartment building in [Zevenkamp, Rotterdam](#)



Group Assignment – Introduction

Case study



Group Assignment – Tasks

Engineering and modelling issues to be reported:

- 1-3. Introduction, description, project data (background info)
4. Historic site reclamation (T&MoGP)
5. Soil and model parameter determination (T&MoSB)
6. Foundation design (F&E)
7. Excavation design (F&E)
8. Numerical analysis

Group Assignment – Task 4

Engineering issues to be considered:

4. Historic site reclamation (T&MoGP)
 - Soil deposition
 - Excess pore pressures
 - Consolidation
 - Settlement

Group Assignment – Task 5

Modelling issues to be considered:

5. Soil and model parameter determination (T&MoSB)
 - In view of foundation and excavation design
 - Subgrade reaction model
 - Finite element model
 - Soil parameters (for Task 7)
 - Model parameters (for Task 8)
 - Other parameters

Group Assignment – Task 6

Engineering issues to be considered:

6. Foundation design (F&E)
 - Shallow foundation?
 - Deep foundation?

Group Assignment – Task 7

Engineering issues to be considered:

7. Excavation design (using subgrade reaction model, D-Sheetpiling)
 - Retaining wall
 - Wall deflection
 - Structural forces
 - Supports
 - Anchor / strut forces
 - Excavation floor
 - Stability, basal heave
 - Role of water pressures!

Group Assignment – Task 8

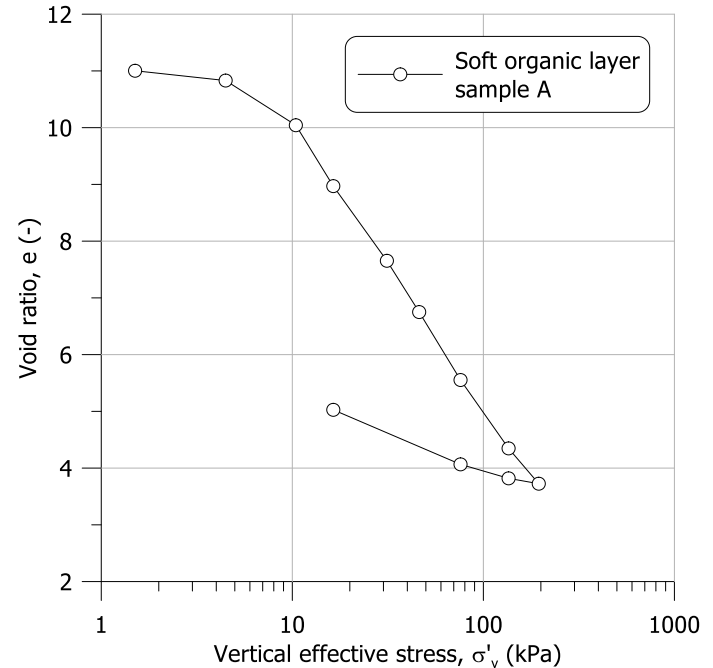
Modelling issues to be considered:

8. Numerical analysis (using finite element method, PLAXIS)
 - Model geometry and boundaries
 - Model parameters (from Task 5)
 - Mesh and refinements
 - Initial conditions
 - Calculation phases
 - Interpretation of results

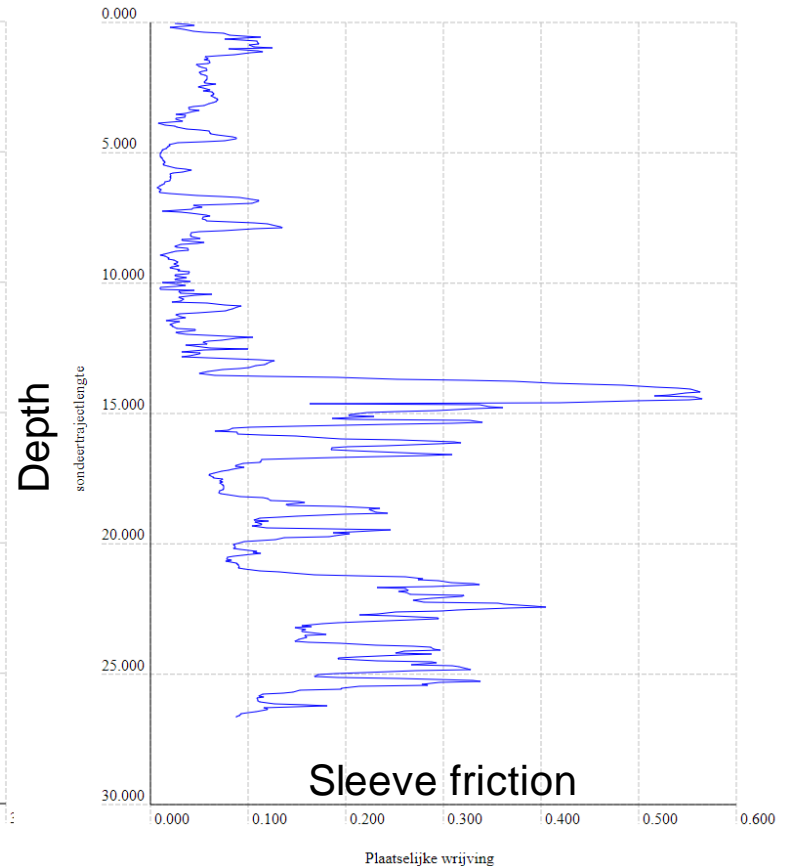
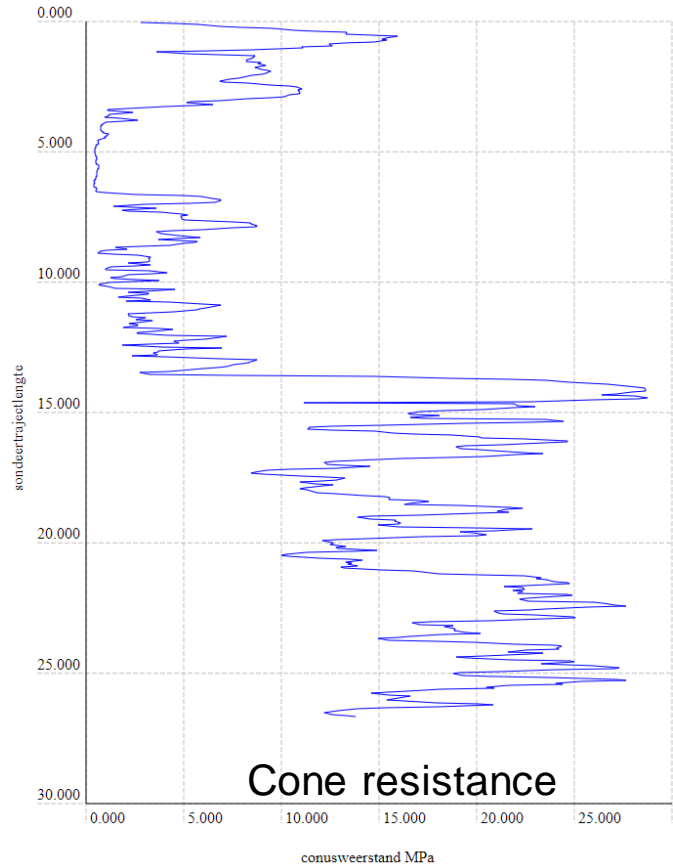
Group Assignment – Data

Available data and sources:

- Original and current ground surface
- Oedometer test data
- CPT data, [Dinoloket](#)
- NEN 9997-1 Table 2b
- [Rotterdam waterlevels](#)
- Other data depending on your own design decisions



CPT data (CPT000000149495_IMBRO_A.gef)



Interpretation of CPT data

CPT interpretation according to:

- Robertson
 - Soil Behaviour Type, CPT parameters, correlations
 - Elaboration in spreadsheet CPT_interpretation_149495
- NEN 9777-1 Table 2b
 - See next slide

Background information:

- Lectures in T&MoSB (Field testing, Parameter determination)
- Separate lecture note on Cone Penetration Testing
- Robertson & Cabal, 2022 (available on BrightSpace)

NEN 9777-1 Table 2b

Hoofd-naam	Bijmengsel	Consistentie ^b	γ^c kN/m ³	γ_{sat} kN/m ³	$q_c^{d,g}$ MPa	C'_p	C'_s	$C_c/(1 + e_0)$ [-]	C_{α}^f [-]	$C_{sw}/(1 + e_0)^e$ [-]	E_{100}^f MPa	ϕ'^f Graden	c' kPa	c_u kPa
grind	zwak siltig	los	17	19	15	500	∞	0,0046	0	0,0015	45	32,5	0	n.v.t.
		matig	18	20	25	1000	∞	0,0023	0	0,0008	75	35,0	0	
		vast	19 20	21 22	30	1200 1400	∞	0,0019 0,0016	0	0,0006 0,0005	90 105	37,5 40,0	0	
	sterk siltig	los	18	20	10	400	∞	0,0058	0	0,0019	30	30,0	0	n.v.t.
		matig	19	21	15	600	∞	0,0038	0	0,0013	45	32,5	0	
		vast	20 21	22 22,5	25	1000 1500	∞	0,0023 0,0015	0	0,0008 0,0005	75 110	35,0 40,0	0	
zand	schoon	los	17	19	5	200	∞	0,0115	0	0,0038	15	30,0	0	n.v.t.
		matig	18	20	15	600	∞	0,0038	0	0,0013	45	32,5	0	
		vast	19 20	21 22	25	1000 1500	∞	0,0023 0,0015	0	0,0008 0,0005	75 110	35,0 40,0	0	
	zwak siltig, kleiig		18 19	20 21	12	450 650	∞	0,0051 0,0035	0	0,0017 0,0012	35 50	27,0 32,5	0	n.v.t.
	sterk siltig, kleiig		18 19	20 21	8	200 400	∞	0,0115 0,0058	0	0,0038 0,0019	15 30	25,0 30,0	0	n.v.t.
leem ^e	zwak zandig	slap	19	19	1	25	650	0,0920	0,0037	0,0307	2	27,5 30,0	0	50
		matig	20	20	2	45	1300	0,0511	0,0020	0,0170	3	27,5 32,5	1	100
		vast	21 22	21 22	3	70 100	1900 2500	0,0329 0,0230	0,0013 0,0009	0,0110 0,0077	5 7	27,5 35,0	2,5 3,8	200 300
	sterk zandig		19 20	19 20	2	45 70	1300 2000	0,0511 0,0329	0,0020 0,0013	0,0170 0,0110	3 5	27,5 35,0	0 1	50 100
klei	schoon	slap	14	14	0,5	7	80	0,3286	0,0131	0,1095	1	17,5	0	25
		matig	17	17	1,0	15	160	0,1533	0,0061	0,0511	2	17,5	5	50
		vast	19 20	19 20	2,0	25 30	320 500	0,0920 0,0767	0,0037 0,0031	0,0307 0,0256	4 10	17,5 25,0	13 15	100 200
	zwak zandig	slap	15	15	0,7	10	110	0,2300	0,0092	0,0767	1,5	22,5	0	40
		matig	18	18	1,5	20	240	0,1150	0,0046	0,0383	3	22,5	5	80
		vast	20 21	20 21	2,5	30 50	400 600	0,0767 0,0460	0,0031 0,0018	0,0256 0,0153	5 10	22,5 27,5	13 15	120 170
	sterk zandig	-	18 20	18 20	1,0	25 140	320 1680	0,0920 0,0164	0,0037 0,0007	0,0307 0,0055	2 5	27,5 32,5	0 1	0 10
	organisch	slap	13	13	0,2	7,5	30	0,3067	0,0153	0,1022	0,5	15,0	0 1	10
		matig	15 16	15 16	0,5	10 15	40 60	0,2300 0,1533	0,0115 0,0077	0,0767 0,0511	1,0 2,0	15,0	0 1	25 30
veen	niet voorbelast	slap	10 12	10 12	0,1	5 7,5	20 30	0,4600 0,3067	0,0230 0,0153	0,1533 0,1022	0,2 0,5	15,0	1 2,5	10 20
	matig voorbelast	matig	12 13	12 13	0,2	7,5 10	30 40	0,3067 0,2300	0,0153 0,0115	0,1022 0,0767	0,5 1,0	15,0	2,5 5	20 30
variatiecoëfficiënt			0,05		-	0,25					0,10		0,20	

Group Assignment

- [Description](#) in Content section on BrightSpace
- Groups of 3 students; enrollment via Collaboration section on BrightSpace
- Deliver final report before **April 19th**, 18:00h (max. 50 pages) via [Assignments](#) section on BrightSpace
- To obtain formative feedback on parts:
 - Deliver preliminary report Sections 1-4 before **January 8th**, 18:00h
 - Deliver preliminary report Section 5 before **February 9rd**, 18:00h
 - Deliver preliminary report Section 6,7 before **April 5th**, 18:00h

Group Assignment

- Some parts will be elaborated in class; rest to be done in your own time.
- Organise your group!
- Start on time! Set and obey deadlines for sub-tasks!
- Success!