



O. Kusakabe, K. Fujita & Y. Miyazaki, editors

Geotechnical Aspects of Underground Construction in Soft Ground

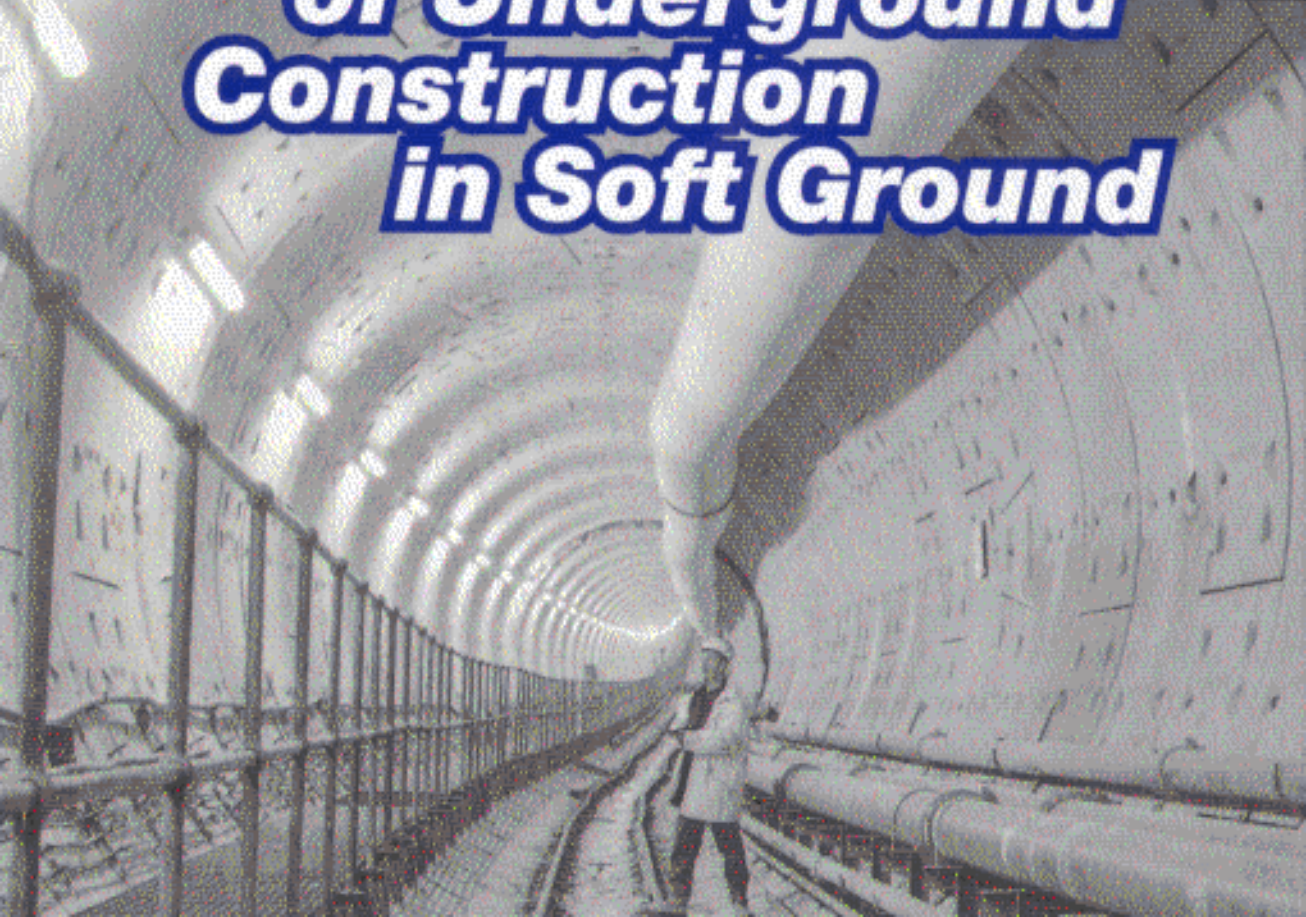


Table of contents

Preface	XIII
Organisation	XV
<i>Special lecture</i>	
Seismic design of underground structures in soft ground: A review <i>K.Kawashima</i>	3
<i>Session reports</i>	
Bored tunnelling – NATM tunnelling <i>L.E.Sozio</i>	23
Bored tunnelling – TBM and shield tunnelling <i>H.Akagi</i>	33
Modelling and prediction <i>R.N.Taylor</i>	39
Braced excavation – Deformation and displacement of walls <i>P.W.Day</i>	43
Braced excavation – Excavation in general <i>T.S.Tan & J.N.Shirlaw</i>	53
 <i>1 Bored tunnelling – NATM tunnelling</i>	
Experimental study of the stability of a tunnel face reinforced by bolts <i>R.Al Hallak, J.Garnier & E.Leca</i>	65
Geotechnical aspects regarding the construction of Bucharest Subway <i>V.Beldean, V.Ciugudean-Toma & S.Calinescu</i>	69
Ground and structure response to a hand driven decline in London clay <i>A.G.Bloodworth & S.R.Macklin</i>	75
Prediction of final displacement of tunnel section during excavation <i>H.S.Chung, N.Y.Kim & Y.C.Hwang</i>	81

Facing a major geological hazard for a highway tunnel in the French Alps <i>A.Guilloux</i>	87
Some deformation observations in underground openings <i>N.Gurung, Y.Iwao, K.Ishibashi & S.Hongo</i>	93
An example of a pile-tunnel interaction problem <i>K.G.Higgins, I.L.J.Chudleigh, H.D.St.John & D.M.Potts</i>	99
A design study for a road tunnel: The effects of construction detail <i>K.G.Higgins, R.Fernie, H.E.Edmonds & D.M.Potts</i>	105
Shallow compressed air tunnelling: Field measurements and a laboratory test <i>G.Kammerer & S.Semprich</i>	111
High-speed railway tunnelling in soft granular Frankfurt ground <i>R.Katzenbach, U.Arslan, G.Festag & A.Rückert</i>	117
Tunnels for public services built in wet sand by NATM <i>M.Müller, A.Harsányi & Z.Czap</i>	123
The residual stress of a thawed overconsolidated clayey soil <i>T.Nishimura & Y.Kondou</i>	129
Tunnels in soft ground for German high speed railway line Cologne-Frankfurt <i>H.Quick, J.Michael & U.Arslan</i>	135
Ground water and underground constructions in the City Urban Development <i>G.Rasula</i>	141
A compensation grouting trial in Singapore marine clay <i>J.N.Shirlaw, W.Dazhi, V.Ganeshan & C.S.Hoe</i>	149
Experiences from the construction of a twin tunnel in a marly formation <i>A.I.Sofianos, A.Kalkantzi & Ch.Giannaros</i>	155
Building collapse and ground subsidence in northern section of Calcutta Metro Construction <i>N.N.Som</i>	161
Squeezing rock response to NATM tunnelling: A case study <i>C.P.Tsatsanifos, P.M.Mantziaras & D.Georgiou</i>	167
Monitoring ground deformation around a tunnel heading in London clay <i>J.P.van der Berg & C.R.I.Clayton</i>	173
Evaluation of environmental effects of subway in Nanjing city <i>Y.Wang</i>	179

2 Bored tunnelling – TBM, shield tunnelling

CATSBY signal aided boring: Sydney experimentation <i>P.Aristaghes & V.Blanchet</i>	187
Monitoring the second Heinenoord Tunnel and the Botlek Rail Tunnel <i>K.J.Bakker, F.de Boer & J.B.M.Admiraal</i>	191

Monitoring: Evaluation of stresses in the lining of the Second Heinenoord Tunnel <i>K.J.Bakker, W.L.Leendertse, P.S.Jovanovic & G.P.C.van Oosterhout</i>	197
Reducing settlement caused by shield tunnelling in alluvial soils <i>S.Benmebarek, R.Kastner & C.Ollier</i>	203
Factors influencing the ground loss due to tunnels driven by EPB shield <i>C.T.Chang, Y.W.Chen & J.J.Wang</i>	209
Settlement, rotation and distortion of Piccadilly Line tunnels at Heathrow <i>M.L.Cooper & D.N.Chapman</i>	213
Field investigations of long term ground loading on an old tunnel in London Clay <i>S.M.Gourvenec, M.D.Bolton, K.Soga, M.W.Gui, R.J.Mair, H.E.Edmonds, I.L.J.Chudleigh & A.P.Butler</i>	219
Compensation grouting to control tilt of Big Ben Clock Tower <i>D.I.Harris, R.J.Mair, J.B.Burland & J.R.Standing</i>	225
Investigation on successive settlement due to shield tunnelling <i>T.Hashimoto, K.Hayakawa, K.Mizuhara & T.Konda</i>	233
From spoil to soil: Reuse of soil from TBM's in the Netherlands <i>M.B.G.Ketelaars & L.E.B.Saathof</i>	239
Centrifuge investigation on deformations around tunnels in nailed clay <i>J.Kuwano, A.Takahashi, T.Honda & K.Miki</i>	245
A case study of ground control mechanisms of EPB shield tunnelling in soft clay <i>K.M.Lee, H.W.Ji, C.K.Shen, J.H.Liu & T.H.Bai</i>	251
The effects of compensation grouting on segmental tunnel linings <i>S.W.Lee, G.R.Dasari, R.J.Mair, M.D.Bolton, K.Soga, T.Sugiyama, Y.Ano, T.Hagiwara & M.Nomoto</i>	257
Pipe jacking through soft alluvial clay near London: A case history <i>M.A.Marshall & G.W.E.Milligan</i>	263
Ground movements caused by TBM tunnelling in the Athens Metro Project <i>I.Mihalis & M.Kavvadas</i>	269
Experiences in the subsidence problems in Madrid Subway Extension <i>C.S.Oteo, M.Arnáiz, J.Trabada, M.Melis & F.Mendaña</i>	275
Design of bored tunnel linings installed within partially excavated C&C boxes <i>F.Prinzl & A.R.A.Gomes</i>	281
The Westerschelde tunnel: New shield technologies in Europe <i>H.-J.Sager & M.Herrenknecht</i>	287
The effects of boring a new tunnel under an existing masonry tunnel <i>H.R.Samuel, R.J.Mair, Y.C.Lu, I.L.J.Chudleigh, P.Readings & T.I.Addenbrooke</i>	293
Construction principles for large-sized grid shield tunnelling in soft clay <i>Y.Shao, E.J.Macari, M.Xia & X.Ye</i>	299

The construction of Pinglin tunnel through adverse geology <i>C.P.Shen, H.C.Tsai, Y.S.Hsieh & B.Chu</i>	305
Injection/grouting near pile foundations: Full scale test Amsterdam <i>A.E.C.van der Stoel & A.F.van Tol</i>	313
Compensation grouting at the Docklands Light Railway Lewisham Extension project <i>T.Sugiyama, T.Nomoto, M.Nomoto, Y.Ano, T.Hagiwara, R.J.Mair, M.D.Bolton & K.Soga</i>	319
Study on ground behavior by 4-centered slurry shield driving method <i>H.Yamada, M.Sugimoto, M.Nishio & K.Kayukawa</i>	325
Construction simulation for the interaction between shield segments and ground <i>H.Zhu, W.Ding, T.Hashimoto, J.Nagaya & T.Tamura</i>	331
 3 Modelling and prediction	
Influence of infiltration and groundwater flow on tunnel face stability <i>W.Broere & A.F.van Tol</i>	339
Centrifuge modelling of a spile-reinforced tunnel heading <i>M.Calvello & R.N.Taylor</i>	345
Three dimensional simulation of slurry shield tunnelling <i>D.Dias, R.Kastner & M.Maghazi</i>	351
Segmental tunnel lining behaviour in axial direction <i>W.H.N.C.van Empel, R.G.A.de Waal & C.van der Veen</i>	357
Neural networks as a means for predicting convergence in tunnels <i>K.B.Fifer</i>	363
Designing shallow tunnel linings upon the action of moving surface loads <i>N.N.Fotieva, N.S.Bulychev & A.S.Sammal</i>	369
Evaluating plasticity solutions for the response of clay around tunnels <i>R.J.Grant & R.N.Taylor</i>	373
The role of the soil k_0 value in numerical analysis of shallow tunnels <i>P.F.M.Guedes de Melo & C.Santos Pereira</i>	379
A field case of rock-bolt deformations in pullout tests <i>N.Gurung, Y.Iwao, K.Ishibashi, S.Hongo & M.R.Madhav</i>	385
Displacement of saturated sand during slurry shield driving <i>K.Hosokawa & H.Akagi</i>	391
Earth pressure exerted on tunnels due to the subsidence of sandy ground <i>K.Komiyu, E.Shimizu, T.Watanabe & N.Kodama</i>	397
Effects of excavation sequence on the 3-D settlement of shallow tunnels <i>T.Nakai, M.M.Farias, H.Matsubara & S.Kusunoki</i>	403
Prediction and performance: A review of numerical analyses for tunnels <i>A.Negro & P.I.B.de Queiroz</i>	409

Numerical solution model for instability of underground cavity <i>S.A. Sadrnejad</i>	419
Development of compensation grouting modelling and control system <i>K. Soga, M.D. Bolton, S.K.A. Au, K. Komiya, J.P. Hamelin, A. Van Cotthem, G. Buchet & J.P. Michel</i>	425
Development of a ground reaction curve for shield tunnelling <i>A. Sramoon & M. Sugimoto</i>	431
Study on shield behaviour by 3-D shield simulator <i>M. Sugimoto, N. Yoshiho & A. Sramoon</i>	437
Stress paths around a 3-D numerically simulated NATM tunnel in stiff clay <i>D.K.W. Tang, K.M. Lee & C.W.W. Ng</i>	443
Evaluation of active earth pressure on the facing of the shield entrance in a shaft <i>A. Wakai, K. Ugai & K. Anan</i>	451
Tunnel face reinforced by longitudinal bolts: Analytical model and in situ data <i>H. Wong, V. Trompille, D. Subrin & A. Guilloux</i>	457
Behavior of tunnel face pre-reinforced with sub-horizontal pipes <i>C.S. Yoo & H.K. Shin</i>	463
Discussion: Comment on conventional access inaccuracies and advanced general earth pressure model <i>P. Koudelka</i>	469
Discussion: Can settlements over tunnels be accurately predicted using advanced numerical methods? <i>J.N. Shirlaw</i>	471
 4 Braced excavation – Deformation and displacement of walls	
Simulation failure mechanism of anchored sheet pile walls in a small centrifuge <i>H.G.B. Allersma & Y. Toyosawa</i>	475
Behavior of large-scale cylindrical earth retaining wall <i>K. Ariizumi, T. Kumagai & A. Kashiwagi</i>	481
Movement of stabilized coal-ash soil wall during excavation <i>K. Azuma, S. Noguchi, K. Kurisaki, H. Hyodo & M. Nagaoka</i>	487
Successful excavation to 15 m depth in clay downtown Oslo, Norway <i>A. Bye, A.S. Simonsen & N. Bergersen</i>	493
Informational construction approach for deep excavation <i>S.Y. Chi, J.C. Chern & C.C. Wang</i>	499
Behavior and control of cable duct in proximity to ground excavation work <i>H. Hanakura, N. Sakata & H. Yoshikuni</i>	505
The use of numerical methods for the design of base propped retaining walls <i>K.G. Higgins, R. Fernie, D.M. Potts & C. Houston</i>	511

Displacement control design method of excavation <i>X.Y.Hou, G.B.Liu & Y.X.Huang</i>	517
Soil-structure interaction of deep excavations in urban environment <i>R.Katzenbach, U.Arslan & Chr.Moormann</i>	523
Behavior of a braced structure for excavation under asymmetrical lateral load <i>S.Kazama</i>	531
The Rotterdam sheet pile wall field test: Test setup <i>D.A.Kort, A.F.van Tol & A.Jonker</i>	537
A case of a braced excavation in Bangkok clay <i>K.Matsumoto, K.Horio, Y.Kikuchi & K.Yaegashi</i>	543
A case of deep braced excavation for subway in Tokyo <i>T.Okada, T.Hoshino, S.Sakuma & S.Kohda</i>	549
Behavior of an earth retaining wall during deep excavation in Shanghai <i>K.Onishi & T.Sugawara</i>	555
A customised earth retaining system for deep excavation works <i>K.B.Poh, J.M.Lim, S.K.Tang & T.W.Tan</i>	561
Design and construction of deep circular cofferdam in collapsed ground <i>A.J.Powderham</i>	567
Behavior and soil resistance of shaped cantilever diaphragm walls <i>H.Sei & Y.Miyazaki</i>	573
Particular demands on deformations of building pit side <i>T.Siemer, S.Herzberg & H.Fricke</i>	581
3-D finite element modelling of slurry trenching <i>T.-S.Tan, K.-Y.Yong & B.Hou</i>	587
Behavior of cantilever earth retaining with buttress type stabilisation <i>M.Tsuzuki, J.Nakajima, S.Takayama & T.Kanekura</i>	593
Case studies of buttress-wall type ground improvement in strutted excavations <i>N.Uchiyama, Y.Katsura & M.Kamon</i>	599

5 Braced excavation – Excavation in general

Three dimensional analysis of building settlement caused by shaft construction <i>A.G.Bloodworth & G.T.Houlsby</i>	607
Stability of excavations in soft clay with floating self supported DMM wall <i>A.El Nahas, J.Takemura & M.Kouda</i>	613
Construction of the CTA cofferdam at Heathrow Airport, London <i>J.D.Findlay</i>	619
Settlement of sewer pipes in soft clay installed in a trench <i>G.Franzén, T.Spetz & G.Sällfors</i>	625

Earth retaining structures under seismic motion of Kobe earthquake <i>M.Furukawa, T.Tamano, Y.Toyosawa, S.Tanaka, J.Matuura & K.Sekiya</i>	631
Soil behavior due to freezing and frozen column during excavation of soft ground <i>T.Hongo, Y.Iwasaki & T.Ohrai</i>	635
Ground settlement around a braced excavation work <i>T.Horiuchi & M.Shimizu</i>	641
Earth pressures acting on a deep shaft and the movements of adjacent ground in sand <i>S.Imamura, T.Nomoto, T.Fujii, T.Hagiwara & O.Kusakabe</i>	647
Ground bottom heave due to large and deep excavation <i>T.Inoue, M.Nishi, Y.Kanaoka, M.Iwagaki, M.Uekuri, K.Ishikawa, K.Yaegashi, A.Uchida & H.Kikuchi</i>	653
Experimental study of heaving in a cofferdam on soft ground <i>T.Kawasaki & Y.Shioi</i>	659
Effect of anchor installation on settlement of nearby structures in soft soils <i>H.G.Kempfert & B.Gebreselassie</i>	665
Design of pretensioned soil nailing systems in excavations <i>H.T.Kim, I.K.Kang, S.W.Park & S.K.Lee</i>	671
Measures to prevent heaving during the excavation of soft ground <i>N.Kubota, H.Sako, M.Morota & K.Kojima</i>	677
Behavior of grout column reinforced clay under lateral compression <i>H.J.Liao & S.F.Su</i>	681
Considering time-space-effect's excavation design software <i>G.B.Liu, Y.X.Huang & X.Y.Hou</i>	687
Deformation behaviour and heaving analysis of deep excavation <i>K.Ohnishi, M.Katagiri, K.Saitoh & K.Azuma</i>	693
Investigation of groundwater status for deep underground construction <i>S.Ono, M.Kamon & T.Tamano</i>	699
Surface settlements due to walled excavation on 200 projects in Tokyo <i>S.Saji, J.Murata & T.Sugimoto</i>	705
In situ measurements and FE-analysis of a deep excavation <i>H.F.Schweiger, M.G.Freiseder & H.Breymann</i>	711
Seepage failure experiments on sand behind sheet piles <i>T.Tanaka, A.Verruijt & K.Hayashi</i>	717
Full scale test on environmental impact of diaphragm wall trench excavation in Amsterdam <i>J.C.W.M.de Wit, J.C.S.Roelands & M.de Kant</i>	723
FEM analysis of excavation with soils improved in its passive zone <i>K.H.Xie, D.J.Zhang & X.Wang</i>	731

Miscellaneous

Photo of participants

739

Author index

741