

**ISSMGE Technical Committee TC 211
International Symposium on Ground
Improvement
(IS-GI BRUSSELS 2012)**

**Recent Research, Advances & Execution
Aspects of Ground Improvement Works**

**Brussels, Belgium
31 May – 1 June 2012**

Volume 1 of 4

Editors:

Nicolas Denies

Noel Huybrechts

ISBN: 978-1-62748-907-2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2012) by ISSMGE TC211 and BBRI
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact ISSMGE TC211 and BBRI
at the address below.

ISSMGE TC211 and BBRI
c/o Nicolas Denies
Avenue P. Holoffe 21
B-1342 Limelette, Belgium

Phone: +32-2-655.77.11
Fax: +32-2-653.07.29

nde@bbri.be

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

Table of contents

VOLUME I

GENERAL REPORTS

Session 1 - VIBRO AND IMPACT COMPACTION <i>Johannes F. Kirstein</i>	I-5
Session 2 - VERTICAL DRAINS, VACUUM CONSOLIDATION & PRELOADING <i>Buddhima Indraratna</i>	I-47
Session 3 - SOIL MIXING 1 – SOIL STABILISATION: SURFACE MIXING AND LABORATORY MIXTURES <i>Abir Al-Tabbaa</i>	I-63
Session 4 - SOIL MIXING 2 – DEEP MIXING <i>Nicolas Denies & Gust Van Lysebetten</i>	I-87
Session 5 - RIGID INCLUSIONS AND STONE COLUMNS <i>Bruno Simon</i>	I-127
Session 6 - SOIL REINFORCEMENT IN FILL AND IN CUT <i>John Sankey & Turan Durgunoglu</i>	I-171
Session 7 - BIOGROUT & OTHER GROUTING METHODS <i>Jian Chu</i>	I-177

LOUIS MENARD LECTURE

Recent Advances and Execution Aspects in Ground Improvement in Dredging and Environmental Marine Engineering <i>Patrick Mengé</i>	I-191
--	-------

SPECIALTY LECTURE

Design Guidelines and Full Scale Verification for MSE Walls with Traffic Barriers Impacted by Vehicles <i>J.-L. Briaud & D. Saez</i>	I-233
---	-------

VARIOUS CONTRIBUTIONS

Study on pore water pressure dissipation phenomena of soft clays through consolidation using vertical drains <i>Manish V. Shah & Arvind V. Shroff</i>	I-261
Monitoring HEIC using Landpac CIR and CIS Technologies <i>Dermot Kelly & José Gil</i>	I-273
Controlled Modulus Columns (CMC): A New Trend in Ground Improvement and Potential Applications to Indonesian Soils <i>Kenny Yee, Ryan Ade Setiawan & Olivier Bechet</i>	I-287

<u>SPONSORS</u>	I-301
------------------------	-------

VOLUME II

Session 1 - VIBRO and IMPACT COMPACTION

Soil dynamic response after ground improvement by heavy dynamic compaction or vibrocompaction <i>S. Brûlé and E. Javelaud</i>	II-3
Ground improvement tank terminal Amsterdam - The Netherlands <i>J.W. Dijkstra & A.H. Nooy van der Kolff</i>	II-11
Laboratory study of disc rotation for densification of loose sands <i>Feng Tao-Wei</i>	II-23
Lessons Learned from Millions of Square Metres of Ground Improvement <i>B. Hamidi and S. Varaksin</i>	II-29
Quantifying the Zone of Influence of the Impact Roller <i>M. B. Jaksa, B. T. Scott, N. L. Mentha, A. T. Symons, S. M. Pointon, P. T. Wrightson and E. Syamsuddin</i>	II-41
A comparison of soil improvement achieved using different vibro methods <i>R. Jimenez, F. Roman and J.-M. Garcia-Gutierrez</i>	II-53
Sand Compaction Pile Technology and its Performance in both Sandy and Clayey Grounds <i>H. Kinoshita, K. Harada, M. Nozu and J. Ohbayashi</i>	II-63
Ground improvement works on large scale projects in the North of Morocco <i>B. Meulewaeter, D. Bourlon and J. Maertens</i>	II-75
Assessment of Grid Spacing for Dynamic Compaction <i>R. Moyle and R. Turner</i>	II-83
The Effect of Different Tamper Geometries on the Dynamic Compaction of Sandy Soils <i>Y. Nazhat and D. Airey</i>	II-93
Vibro Ground Improvement Techniques – A UK Perspective <i>C.J. Serridge</i>	II-107
Effects of Fines on Vibro-compaction <i>C. H. Wong, K. C. Yeo, S. H. Yung and S. J. Liu</i>	II-115
Stone Column and Vibro-compaction of Soil Improvement for liquefaction <i>K. C. Yeo, S. H. Yung and S. J. Liu</i>	II-125

Session 2 – VERTICAL DRAINS, VACUUM CONSOLIDATION and PRELOADING

Numerical 3D comparison between real PVD and equivalent permeability in consolidation process <i>B. M. Bacas and F. Schmidt</i>	II-137
Performance and prediction of surcharge and vacuum consolidation via prefabricated vertical drains with special reference to highways, railways and ports <i>B. Indraratna, Ch. Rujikiatkamjorn and G. Xueyu</i>	II-145
Use of Temporary Water Drawdown for Site Improvement <i>R. A. Jewell</i>	II-169
Back analysis of a trial embankment settlement based on CPTu and oedometric test results <i>T. Mateos</i>	II-177

Preloading of a hydraulic fill for foundation of LNG tanks <i>F. Román, R. Jimenez, J. C. García Suarez and A. Coz</i>	II-187
Radial Consolidation Modelling Incorporating Downdrag Effect for a Multi-Layer Soil <i>Ch. Rujikiatkamjorn and B. Indraratna</i>	II-201
EKGs Application for Hydro-Mechanical Behaviour Changing in Saturated Clay <i>Shariatmadari Nader, Karbalaieali Sogand and Saeidjam Saeid</i>	II-211
Finite Element Modeling of Vacuum Consolidation using Drain Elements and Unsaturated Soil Conditions <i>R. Witasse, J. Racinais, F. Maucotel, V. Galavi, R. Brinkgreve and C. Plomteux</i>	II-219
Electro-osmotic Consolidation for Improvement of Geotechnical Engineering Properties of Tropical Peat <i>J.H.S. Yee, A.M.R.G. Athapaththu and H.H. Lau</i>	II-231
Multi-dimensional electro-osmosis consolidation of clays <i>J. Yuan, M. A. Hicks and J. Dijkstra</i>	II-241
<u>Session 3 – SOIL MIXING 1 - SOIL STABILIZATION (surface mixing & laboratory mixtures)</u>	
Improvement of Geotechnical Properties of Silty sand Soils Using Natural Pozzolan and Lime <i>N. Abbasi, M. Mahdieh and M. Hadi Davoudi</i>	II-251
Volume Change Behaviour of a Sand-Bentonite Mixture Improved by Potassium Silicate <i>M. Ajdari and H. Bahmyari</i>	II-261
Nucleation centres in lime stabilised soils <i>P. Beetham, T. Dijkstra and N. Dixon</i>	II-269
A non-traditional treatment for the compaction of fine-grained soils <i>G. Blanck, O. Cuisinier and F. Masrouri</i>	II-281
Chemical Stabilization of Subgrades for Better Support of Highway Infrastructure <i>B. Chittoori and A.J. Puppala</i>	II-289
Rational criteria for the assessment of the target mechanical strength and stiffness of artificially sand-cement mixtures <i>N. Cesar Consoli and A. Viana da Fonseca</i>	II-297
Application of Polypropylene and Carpet Fibres to Improve Mechanical Properties of Cement Treated Clay <i>B. Fatahi, H. Khabbaz and B. Fatahi</i>	II-303
Numerical analysis of the behavior of cement treated sand <i>H. Ghorbanbeigi, H. Mroueh, L. Lancelot and J. F. Shao</i>	II-309
Soil Cement Stabilization - Mix Design, Control and Results during Construction <i>J. N. Gomez S. and D.M. Anderson</i>	II-319
Influence of tire chips on the mechanical properties of cement treated soil <i>M. Grisolia, E. Leder, I. P. Marzano, T.-A. Mizutani and Y. Morikawa</i>	II-325
Laboratory study on the applicability of molding procedures for the preparation of cement stabilised specimens <i>M. Grisolia, M. Kitazume, E. Leder, I.P. Marzano and Y. Morikawa</i>	II-335
On the strength and durability of cement-stabilised sands <i>A. Guimond-Barrett, F. Szymkiewicz, Ph. Reiffsteck, A. Pantet, A. Le Kouby and S. Guédon</i>	II-345

Rheological properties of cement-stabilised kaolin <i>A. Guimond-Barrett, A. Touati, A. Pantet, Ph. Reiffsteck and A. Le Kouby</i>	II-355
Influence of the clay content of a lime-treated soil on its compression strength <i>M. A. Hashemi, H. Kadiri, Th. Massart, J.-Cl. Verbrugge and B. François</i>	II-365
Recycled Bassanite in Conjunction with Coal Ash for Stabilization of Soft Clay Soil <i>T. Kamei, A. Ahmed and T. Shibi</i>	II-373
Influence of specimen preparation on unconfined compressive strength of cement-stabilized Kaolin clay <i>M. Kitazume</i>	II-385
Immediate modification of clays with quicklime: alteration of grain-size distribution <i>A. J. Lutenegeger</i>	II-395
Stabilizing clays using basic oxygen steel slag (BOS) <i>H. Mirzaeifar and M.R. Abdi</i>	II-403
Effectiveness of lime stabilisation in organic clay <i>N.Z. Mohd Yunus, D. Wanatowski and L. R. Stace</i>	II-411
Strength increase in time of an alluvial clay, typical of the coast of Brazil's Northeastern, mixed with different dosages of cement <i>G. Vanzolini Moretti, A. Viana da Fonseca, J. A. Paschoalin Filho, D. de Carvalho</i>	II-421
Case Study Analysis of OPMC Improved Foundation Ground, Pavement and Other Geo-structures Employing the GECPRO Model <i>J.N. Mukabi</i>	II-431
Remedy of Deep Soil Mixing Quality for Montmorillonite Clay Deposited in the Mekong and Mississippi Deltas <i>M. Nozu, N. Tuan Anh, N. Shinkawa and K. Matsushita</i>	II-443
Stiffness of Soil-Cement-Fly Ash by means of Shear Wave Velocity <i>K. Piriyaikul and S. Pochalard</i>	II-451
A study on strength and swelling characteristics of three expansive soils treated with fly ash <i>T. L. Ramadas, N. Darga Kumar and G. Yesuratnam</i>	II-459
Alkali Activation of Industrial By-Products for use in Soil Stabilisation <i>P. Sargent, M. Rouainia, P. N. Hughes and S. Glendinning</i>	II-467
Soils treatment with hydraulic binders: physicochemical and geotechnical investigations of a chemical disturbance <i>L. Saussaye, M. Boutouili, F. Baraud and L. Leleyter</i>	II-479
Effect of fabric on elastic properties of a lime treated clayey sand <i>B. Sonon, M. A. Hashemi, J.-C. Verbrugge, B. François and T.J. Massart</i>	II-489
Laboratory study of the workability of the Deep Soil-Mixing material and in situ applications <i>F. Szymkiewicz, F.-S. Tamga, A. Le Kouby, Ph. Reiffsteck and J.-L. Tacita</i>	II-501
Some laboratory soil mixing trials of Irish peats <i>M. Timoney, P. Quigley and B.A. McCabe</i>	II-511
Consolidation of dredged mud in the Venice Lagoon <i>D. Vanni and G. Preda</i>	II-521

VOLUME III

Session 4 – SOIL MIXING 2 - DEEP MIXING

Partial Factor Design for a Highway Embankment Founded on Lime-cement Columns <i>M. S. Al-Naqshabandy and S. Larsson</i>	III-3
Soil Mix Technology for Integrated Remediation and Ground Improvement: Field Trials <i>A. Al-Tabbaa, M. Liska, R. McGall and C. Critchlow</i>	III-13
Long-term performance of CSM walls in slightly overconsolidated clays <i>D. Bellato, A. Dalle Coste, F.-W. Gerressen, P. Simonini</i>	III-23
Geomix Caissons against liquefaction <i>L. Benhamou and F. Mathieu</i>	III-33
Foundation Soils Improvement by “Cutter Soil Mixing” <i>J. Bilé Serra and B.F. Mendes</i>	III-41
Ground improvement works for an LNG storage tank foundation <i>G. Chapman, J. Gniel, M. Greenough and A. Bouazza</i>	III-53
Lateral displacements due to installation of soil-cement columns <i>J. Chai and J. Carter</i>	III-63
Quality Assurance and Quality Control for Deep Soil Mixing (DSM) in Punggol Waterway Project, Singapore <i>S.H Chew, C.Y. Tan, T.Y. Yap, K.E Chua, H.M Yim, S.Y Kee, T.K. Khoo and Ja Naw</i>	III-73
SOIL MIX WALLS as retaining structures – Belgian practice <i>N. Denies, N. Huybrechts, F. De Cock, B. Lameire, J. Maertens and A. Vervoort</i>	III-83
SOIL MIX WALLS as retaining structures – mechanical characterization <i>N. Denies, N. Huybrechts, F. De Cock, B. Lameire, A. Vervoort, G. Van Lysebetten and J. Maertens</i>	III-99
Mechanical characterization of DEEP SOIL MIX material – procedure description <i>N. Denies, N. Huybrechts, F. De Cock, B. Lameire, A. Vervoort and J. Maertens</i>	III-117
Mechanical characterization of large scale soil mix samples and the analysis of the influence of soil inclusions <i>A. Vervoort, A. Tavallali, G. Van Lysebetten, J. Maertens, N. Denies, N. Huybrechts, F. De Cock and B. Lameire</i>	III-127
Foundations reinforced by soil mixing: Physical and numerical approach <i>M. Dhaybi, A. Grzyb, R. Trunfio and F. Pellet</i>	III-137
Design, Construction and Monitoring of a Test Section for the stabilization of an Active Slide Area utilizing Soil Mixed Shear Keys installed using Cutter Soil Mixing. <i>S. Gaib, B. Wilson and E. Lapointe</i>	III-147
CSM-Cutter Soil Mixing – Worldwide experiences of a young soil mixing method in challenging soil conditions <i>F.W. Gerressen and Th. Vohs</i>	III-159
Deep mixing for reinforcement of railway platforms with a spreadable tool <i>A. Guimond-Barrett, J.-Fr. Mosser, N. Calon, Ph. Reiffsteck, A. Pantet and A. Le Kouby</i>	III-169
Soil-cement columns, an alternative soil improvement method <i>S. Lambert, F. Rocher-Lacoste and A. Le Kouby</i>	III-179

Soil mixing in highly organic materials: the experience of LPV111, New Orleans, Louisiana (USA) <i>F. M. Leoni and A. Bertero</i>	III-189
Stability Analyses of a Floodwall with Deep-Mixed Ground Improvement at Orleans Avenue Canal, New Orleans <i>M. McGuire, E. Templeton and G. Filz</i>	III-199
Assessing the feasibility of a foundation treatment solution based on CSM panels at a river dock in Lisbon <i>B. Mendes, E. Maranhã das Neves, L. Caldeira and J. Bilé Serra</i>	III-211
Earth Retaining Structure using Cutter Soil Mixing technology for the “Villa Paradisio” Project at Cannes, France <i>A. Peixoto, E. Sousa and P. Gomes</i>	III-223
Permanent Excavation Support in Urban Area using Cutter Soil Mixing technology at Cannes, France <i>A. Peixoto, E. Sousa and P. Gomes</i>	III-233
Solutions for soil foundation improvement of an industrial building using Cutter Soil Mixing technology at Fréjus, France <i>A. Peixoto, E. Sousa and P. Gomes</i>	III-243
Solution of earth retaining structure using Cutter Soil Mixing technology: “Parking Saint Nicolas” Project at Cannes, France <i>A. Peixoto, E. Sousa, P. Gomes</i>	III-251
The application of Cutter Soil Mixing to an urban excavation at the riverside of Lagos, Portugal <i>A. Peixoto, M. Matos Fernandes, E. Sousa, P. Gomes</i>	III-261
Ground Improvement Solutions using CSM Technology <i>A. Pinto, R. Tomásio, X. Pita, P. Godinho and A. Peixoto</i>	III-271
State of the art in “Dry Soil Mixing” – Basics and case study <i>P. Quasthoff</i>	III-285
Parametric study of embankments founded on soft organic clay using numerical simulations <i>K. Suganya and P. V. Sivapullaiah</i>	III-299
Design of in-situ soil mixing <i>M. Topolnicki and P. Pandrea</i>	III-309
<u>Session 5 - RIGID INCLUSIONS and STONE COLUMNS</u>	
Reliability-based design of stone columns for ground improvement considering settlement and bulging as failure modes <i>J. A. Alonso and R. Jimenez</i>	III-319
Ordinary and Encased Stone Columns Under Repeated Loading <i>N. K.S.Al-Saoudi, M. R. Mahmoud, F.H. Rahil and Z. W.S.Abbawi</i>	III-329
Assessment of software for the design of columnar reinforced soil <i>M. Bouassida, L. Hazzar and A. Mejri</i>	III-339
Possibilities and limitations of embedded pile elements for lateral loading <i>R.B.J. Brinkgreve, E. Engin and T. Dao</i>	III-347

Full Scale Instrumented Load Test for Support of Oil Tanks on Deep Soft Clay Deposits in Louisiana using Controlled Modulus Columns <i>Br Buschmeier, Fr. Masse, S. Swift and M. Walker</i>	III-359
Theoretical analyses of laboratory tests of kaolin clay improved with stone columns <i>J. Cañizal, J. Castro, A. Cimentada, A. Da Costa, M. Miranda and C. Sagasetta</i>	III-373
Numerical modelling of stone column installation in Bothkennar clay <i>J. Castro, D. Kamrat-Pietraszewska and M. Karstunen</i>	III-383
Settlement reduction and stress concentration factors in rammed aggregate piers determined from full- scale group load tests <i>A. ÇEVİK ÖZKESKİN, O. EROL and Z. ÇEKİNMEZ</i>	III-393
Behavior of a Pile-Supported Embankment using rigid piles with variable inertia <i>D. Dias, J. Grippon and M. Nunez</i>	III-401
Spread foundations on rigid inclusions subjected to complex loading: Comparison of 3D numerical and simplified analytical modelling <i>D. Dias and B. Simon</i>	III-411
Improvement of soft soils using reinforced sand over stone columns <i>N. A. H. El Mahallawy</i>	III-423
Determination of pore size distribution to identify plastic zones around stone columns <i>J.N.F. Gautray, J. Laue and S. M. Springman</i>	III-433
Optimisation of Stone Column Design Using Transparent Soil and Particle Image Velocimetry (PIV) <i>P. Kelly and J. A. Black</i>	III-443
Ground improvement methods for establishment of the federal road B 176 on a new elevated dump in the brown coal area of MIBRAG <i>J. F. Kirstein, C. Ahner, S. Uhlemann and P. Uhlich</i>	III-453
Rigid inclusions in combination with fast wick drain consolidation as soil improvement method in very soft and fat northern German clay <i>J. Kirstein and N. Wittorf</i>	III-469
Critical Height of Column-Supported Embankments from Bench-Scale and Field-Scale Tests <i>M. McGuire, J. Sloan, J. Collin and G. Filz</i>	III-481
Load-settlement responses of columnar foundation reinforcements <i>G. Modoni, J. Bzówka, A. Juzwa, A. Mandolini and F. Valentino</i>	III-491
Axial Capacity of Vibro-Concrete Columns <i>A. B. Reeb and J. G. Collin</i>	III-503
A Study on the Use of Drilled Shafts to Reinforce Stiff Clay with Very Weak Sliding Planes <i>R. Sancio, O. Safaqah, P. Wong, Ch. Li, P. Sabatini, B. Villet</i>	III-509
Behaviour of a shallow foundation on soil reinforced by Mixed Module Columns® – Experimental study <i>H. Santruckova, P. Foray, S. Grange, A. Cofone, S. Lambert, Ph. Gotteland and J. Wher</i>	III-519

A model study on settlement behaviour of granular columns in clay under compression loading <i>M. Tekin and M. Ufuk Ergun</i>	III-529
Basal reinforced piled embankments in the Netherlands, Field studies and laboratory tests <i>S.J.M. Van Eekelen and A. Bezuijen</i>	III-539
Design risks of ground improvement methods including rigid inclusions <i>J. Wehr, M. Topolnicki and W. Sondermann</i>	III-551

VOLUME IV

Session 6 – SOIL REINFORCEMENT IN FILL AND IN CUT

15 years of experience with geotextile encased granular columns as foundation system <i>D. Alexiew, M. Raithel, V. Küster and O. Detert</i>	IV-3
Modelling and analysis of the pullout behaviour of Granular Pile Anchor in expansive soils <i>A. N. Aljorany</i>	IV-21
Bearing Capacity of Foundations Reinforced with Micropiles <i>J. Bolouri Bazaz and H. Jalilan</i>	IV-29
Numerical Analysis of walls constituted by fine soil reinforced with Geosynthetics <i>D.M. Carlos, M. Pinho-Lopes and M.L. Lopes</i>	IV-41
The undrained mechanical behaviour of a fibre-reinforced heavily over-consolidated clay <i>A. Ekinici and P.M.V. Ferreira</i>	IV-53
A simple expression of the shear strength of anisotropic fibre-reinforced soils <i>A. Flora and S. Lirer</i>	IV-63
Comparison of the performance of rectangular footings on cohesionless soils reinforced with geogrid and geotextile <i>C. Gel, S. Oguzhan Akbas and O. Anil</i>	IV-75
Drilled shafts for slope stabilization in expansive soils <i>Ramanuja Chari Kannan</i>	IV-85
Soil Reinforcement Vegetation Effect An analysis applied to the Earth moving volume of California High Speed Railway System <i>L. Fort López-Tello and C. Fort Santa-Maria</i>	IV-95
Realization of a railway enlargement in unstable excavations alongside the existing line at Dilbeek (Belgium) <i>W. Maekelberg, J. Verstraelen and E. De Clercq</i>	IV-107
Performance of multi-anchor walls under cyclic transient flooding <i>Y. Miyata, R. J. Bathurst, T. Konami and K. Dobashi</i>	IV-123
Laboratory study of displacements in a geogrid reinforced soil model under lateral earth pressures <i>L. Ruiz-Tagle and F. Villalobos</i>	IV-133
Case studies on application of sandwich connection design for shored reinforced earth walls <i>J. E. Sankey and S. Rafalko</i>	IV-141
Study of shored mse walls (smse) in high earthquake <i>K Truong, J. Sankey and J. Sullivan</i>	IV-151

Ice-Soil Composites Created by Method of Cryotropic Gel Formation: A preliminary report of direct shear and permeability tests <i>N. Vasiliev, A. Ivanov, V. Sokurov, I. Shatalina and K. Vasilyev</i>	IV-161
Realisation of integrated steep landscape slopes within existing railway embankments <i>J. Verstraelen, C. Lejeune and E. De Clercq</i>	IV-169
<u>Session 7 – BIOGROUT and other GROUTING METHODS</u>	
Numerical Studies on the Design of Compaction Grouting <i>A. Anthogalidis, U. Arslan and O. Reul</i>	IV-183
Grand Carré de Jaude: an exceptional building site of soil treatment by jet-grouting in the middle of a volcano <i>P. Berthelot, Fr. Durand, O. Madec and A. Reynaud</i>	IV-193
A large diameter jet grouting method for arrival of shield tunnelling machine <i>S. H. Cheng, R. K. N. Wong and H. J. Liao</i>	IV-205
Prediction of jet grouting efficiency and columns average diameter <i>P. Croce, A. Flora, S. Lirer and G. Modoni</i>	IV-215
Offshore Jet Grouting - A Case Study <i>T. Durgunoglu, F. Kulac, S. Ikiz, O. Sevim and O. Akcakal</i>	IV-225
Construction of the Bellinzona Portal Ceneri Base Tunnel, AlpTransit Gottard Tunnel <i>R. D. Essler and Fr. M. Rossi</i>	IV-235
Modelling of Jet Grouting and its interactions with surrounding soils <i>J. M. Gesto, A. Gens and M. Arroyo</i>	IV-247
Laboratory investigations on groutability of the alluvial used in ground improvement for construction metro tunnels <i>M. Gharouni Nik, M. Esmaeili, and H. Hosseinpour</i>	IV-257
The design and execution of Settlement Mitigation Measures for Bridge 404, North South Metro Project, Amsterdam <i>F.J. Kaalberg, R.D.Essler and R. Kleinlugtenbelt</i>	IV-267
Jet grouting foundation under the overpass of the A27 in the polder construction sealed with a foil at Amelisweerd <i>O.S. Langhorst</i>	IV-281
Injections of microfine cement grouts into sand columns for penetrability and effectiveness evaluation <i>I.N. Markou, D.N. Christodoulou and A.I. Droudakis</i>	IV-291
Ground Improvement Solutions for the new Cruise Terminal in Lisbon <i>A. Pinto, R. Tomásio and J. Ravasco</i>	IV-303
Analysis of soil solidification with the help of “jet grouting” method when constructing a municipal collector <i>A.B. Ponomaryov, A.L. Novodzinsky and A.V. Zakharov</i>	IV-311
Application of a sensitivity analysis procedure to interpret uniaxial compressive strength prediction of jet grouting laboratory formulations performed by SVM model <i>J. Tinoco, A. Gomes Correia and P. Cortez</i>	IV-317
Innovative monitoring tools for on line monitoring of excavations. A monitoring test site <i>G. Van Alboom, L. De Vos, K. Haelterman and W. Maekelberg</i>	IV-327

Preservation of Panorama Mesdag, The Hague IV-339
A.E.C. van der Stoep and M. de Koning

Groutability of clean sand using sodium pyrophosphate modified bentonite suspensions IV-349
J. Yoon, C. El Mohtar

OTHER

Ground freezing of diaphragm wall joints in Amsterdam IV-361
J.K. Haasnoot and D.G. Goeman

SHRP 2 R02: Geotechnical Solutions for Transportation Infrastructure: A Web-Based Toolkit IV-367
V. R. Schaefer, R. R. Berg and S. Caleb Douglas