

## Table of contents:

<b>SESSION 1 : PLANNING AND DESIGNING TUNNELS AND UNDERGROUND STRUCTURES .....</b>	<b>1</b>
1.1 ELSAMNI, ABU-KRISHA, OTSUKA, FUJII, Evaluation of applied SFRC as a steel replacement in the design stage in a part of Cairo Metro line No. 4 .....	2
1.2 LEMKE, SCHAELOCKE, GERSTEWITZ Bonded strip termination for connecting tunnel cross passages .....	4
1.3 GILBERT, BERNARD, Time-dependent analysis of macro-synthetic FRC sections with bar reinforcement .....	6
1.4 JAMBRUSIC, SEGEDIN, Rehabilitation of underground waters in tunnel Subir .....	8
1.5 LUNARDI, MANCINELLI, ZIMBALDI, CARINI, Copenhagen Cityringen Metro: EPB-TBM head pressure definition .....	10
1.6 NAKATA, ERA, Research & development and management of technology concerning a group of expressway tunnels (83 km) with large cross sections .....	12
1.7 SATICI, GONGOR, Effects of paleo-rock landslide and heavy rainfalls to tunnel excavation .....	14
1.8 YANG, JIANG, YANG, Initial proposal and discussion on performance based waterproofing design for mountain tunnels .....	16
1.9 CHRISTER, OLLE, Rock Mechanics analyses in early design phases .....	18
1.10 BEZRODNY, LEBEDEV, YEGOROV, Construction of escalator tunnels of the St. Petersburg subway .....	20
1.11 BUSSLINGER, INSAM, Tunnel climate - challenge during the Brenner Base Tunnel construction .....	22
1.12 RUSSO, MANASSERO, CAVUOTO, CORBO, AUTUORI, The Naples metro line 1: The service tunnel at Toledo station .....	24
1.13 GUPTA, CFIAUFIAN, DHIMAN, GOYAL, SHARMA, Major cavity formation and its rehabilitation measures in Head Race Tunnel of RHEP-412 MW - A case study .....	26
1.14 SONG, BREITENBOCHER, Steel fiber reinforced concrete for precast tunnel lining segments .....	28
1.15 ZHANG, HUANG, MAO, WU, ZHANG, Lining and tunneling design method in coal measure strata at Panxing expressway .....	30
1.16 NOH, YIM, HONG, LEE, The ground full relaxation and displacements by phased excavation order... ..	32
1.17 EID, ABDELREHIM, Optimal profile pattern for NATM Tunneling in soft ground .....	34
1.18 HANSEN, GALSGAARD, FOGED, Rock mass characterization for Copenhagen Metro using face logs .....	36
1.19 SATO, MAEDA, KIMURA, KUSUMOTO, Tunnel designed with early ring closure in squeezing ground .....	38
1.20 VAZAIOS, VLACHOPOULOS, DIEDERICHS, DFN generation for mechanical stability analysis of underground works .....	40
1.21 AUDI, JULLIEN, DALOIA SCHWARTZENTRUBER, Building underground: Which benefits from a sustainable point of view? .....	42
1.22 VOJTASIK, HURTA, MOHYLA, HOLIS, Load-bearing capacity of the grouted bolt set on a physical model .....	44
1.23 HA, SEO, A numerical study on the pressure relief by a vertical shaft in a tunnel .....	46
1.24 LEE, KIM, JUN, KIM, JEONG, HONG, A study on the segmental lining design for bored tunnel in high water pressure condition .....	48
1.25 PELLI, SOFIANOS, Complex function method for the calculation of the stress field around tunnels due to incident S-Waves .....	50
1.26 RING, CASSIO ROCHA, TUROLLA MAIA, Two tunnel types with low soft overburden under horizontal stress .....	52
1.27 BANSAL, KATARIA, Construction of a station over existing revenue tunnels .....	54
1.28 JANG, KIM, KANG, LEE, Arching depending on the deformation of the tunnel face .....	56
1.29 ALLAHVERDI, SEPEHRMANESH, NASRI, Pile foundation and tunnel interaction in mechanized shield tunneling .....	58
1.30 DE LA FUENTE, LIAO, CAVALARO, AGUADO, Advances on the design of SFRC subjected to concentrated loads .....	60
1.31 KOJIMA, SAITO, KUWABARA, Connecting shield tunnels to deep undersea caisson arrival shaft .....	62
1.32 C. CHOI, Y. CHOI, KIM, YOO, J. CHOI, A case study on the design of pillars at diverging area of urban underground road .....	64
1.33 GHAREHDASH, BARZEGAR, SHARIFZADEH, Three dimensional numerical lining damage analysis under pore pressures .....	66
1.34 D'ALOIA SCHWARTZENTRUBER, LCA (Life Cycle Assessment) applied to the construction of tunnel .....	68
1.35 MARTINI, KO ESTER, PAUL ATTO, Cityringen - Inner-city TBM tunneling in mixed face conditions .....	70
1.36 RIBEIRO NETO, MAGGI, MARCHETTI, Design and constructive method for Aricanduva Station of Sao Paulo Metro Line 2 (Green) Extension - Brazil .....	72
1.37 SAYIN, ŞİRİN, KILİE, An example for wide span highway tunnel, Akyazi tunnel .....	74
1.38 WILCOCK, SEO, SOGA, ELSHAFIE, PATEL, Monitoring TBM thrust load propagation along segmental concrete tunnel lining using distributed optical fibre strain sensing .....	76
1.39 SHEN, GAO, Study on mechanics characteristics of tunnel structure crossing under high-rise building .....	78
1.40 Y. ZHANG, C. ZHANG, WANG, Analysis on surrounding rock deformation of double-arch tunnel in urban underground road .....	80
1.41 MONTENEGRO, BETTELINI, High-speed rail-tunnel aerodynamics - Advances and issues .....	82
1.42 D. LEE, H. CHOI, I. LEE, H. CHOI, Optimum freezing pipe arrangement for subsea tunnel cross passage construction .....	84
1.43 GRACHEV, CHEKANAU, Reconstruction of the Rocsky Tunnel .....	86
1.44 ZDRENGHEA, ZDRENGHEA, IFTIMIE, Pipes arch method for a railway tunnel under highway A1 .....	88
1.45 ARGHIROIU, CALINESCU, Design conditions for 2nd section of Bucharest Metro Line 5 .....	90
1.46 JI, ZUO, BAO, YUAN, YU, The influence of layered soil on dynamic analysis of underground structure... ..	92
1.47 LIKAR, M. MAZUREK, Z. MAZUREK, The resistance of underground facilities on seismic loading .....	94
1.48 MERLINI, MORANDI, FALANESCA, Ceneri Base Tunnel: Design and excavation of large caverns .....	96
1.49 SU, BLOODWORTH, Lining thickness optimisation for composite SCL tunnels .....	98
1.50 TONNESSEN, MORGAN, KASIN, Case study: Flood mitigation of Bodo River, Northern Norway .....	100
1.51 RAGAZZO, DEFO, VALDEMARIN, CHIRIOTTI, ROSA, Preliminary studies for the new metro tunnel beneath the Palais du Midi, Brussels .....	102

1.52	YI, TONG, Construction experiences from cross passage in very hard rock and blasting works near segmental lining.....	104
1.53	ARGOMEDO, VALENZUELA, HERRERA, Design and construction tunnels new lines 3 and 6 Metro de Santiago, Chile.....	106
1.54	HOLTER, FOORD, Testing of properties and constructability considerations of EVA-based sprayed membranes for waterproofing of tunnel .....	108
1.55	SPYRIDIS, BERGMEISTER, Behaviour of primary linings at lateral breakouts fortunnel junctions.....	110
1.56	DOGRUOZ, ROSTAMI, HEDAYATZADEH, Analysis of rock mass based on rock characterization by roofbolt drilling and 3D data visualization in tunneling.....	112
1.57	AKSOY, UYAR, Principles of non-deformable support system .....	114
1.58	LARIVE, ROGAT, CHAMOLEY, WELBY, REGNARD, Creep behaviour of fibre reinforced sprayed concrete... ..	116
1.59	HASHIGUCHI, OKADA, Improvement of Shimbashi Sta. of Ginza line, the East's first subway .....	118
1.60	ZLATANIC, OZTURK, MUNFAH, Istanbul strait road tube crossing project uses good practices to manage risks .....	120
1.61	KOH, HWANG CHOI, CHOO, JANG, PARK, Gap parameter and settlement by shield TBM tunneling .....	122
1.62	OLIVEIRA, MONTEIRO, ROCHA, NASCIMENTO, FACURI, SANTOS ANTONELLI, OPTV application in the line 4 phase 3 design at Sao Paulo subway.....	124
1.63	PAN, BAI, The application of movable support system in deep foundation pit.....	126
1.64	ANDERSSON, ROSLIN, Load capacity of inner lining systems due to impact from falling rocks .....	128
1.65	HERNANDEZ, LAM, VALDEMARIN, CHIRIOTTI, A special case of interface between TBM tunnel and underground station.....	130
1.66	SAKAI, OKAZAKI, KUMASAKA, SHINGO, SHINJI, Average material properties of inhomogeneous ground .....	132
1.67	MUSTAPIC, Extension of single-tube tunnel with service tube to a two-tube tunnel.....	134
1.68	BAKOS, SNAUKOVA, Tunnel Kresna - Challenge for designers and constructors.....	136
1.69	BERNARD, Effect of exposure on post-crack performance of FRC for tunnel segments.....	138
1.70	DI PRISCO, TOMBA, BONALUMI, MEDA, On the use of macro synthetic fibers in precast tunnel segments .....	140
1.71	FILLIBECK, Tunnel-Induced settlements - Analysis of measurements and FE-calculations.....	142
1.72	OU, YU, YUAN, CHEN, ZUO, BI, 3D seismic response analysis of a metro-station with atrium in soft soils .....	144
1.73	DEMIR, RAMOGLU, Non-early-age crack concrete-tunnels and underground structures .....	146
1.74	ENGELHARDT, SCHWARZ, THEWES, ADDEN, Life-cycle costing part 2 - The modular-process-model. ....	148
1.75	ESPEDAL, BUSET, S/ESTAD, BUVIK, E39 Rogfast - core sampling .....	150
1.76	FLORA, VIGL, TEUSCHER, JAGER, Decision-making for the selection of the most suitable tunneling method .....	152
1.77	FLYNN, GAKIS, SPYRIDIS, 3D numerical analysis of sprayed concrete lining tunnels: Influence and optimization of the simulation of varied construction schemes.....	154
1.78	GROSSAUER, LINDSTROM, GABRIELSSON, Forbifart Stockholm - Design of tunnels under road Lovstavagen.....	156
1.79	HENDRIX, MAESSEN, Tunnel A2 Maastricht & the Dutch tunnel standard.....	158
1.80	JUHASZ, NAGY, WINTERBERG, Full-round numerical analysis of traditional steel bar and macro synthetic fibre reinforced concrete segments for the Shanghai metro extension .....	160
1.81	KATZENBACH, BERGMANN, LEPLA, Tunnel constructions in swelling rock .....	162
1.82	KATZENBACH, LEPLA, SEIP, Existing underground structures in the vicinity of new constructions.. ..	164
1.83	KIM, HONG, JUN, MOON, KIM, JO, A study on the optimum cross section design for single track double bored tunnels in high speed railway.....	166
1.84	KUSAKA, KAWATA, ISAGO, MASHIMO, An evaluation on load-bearing capacity of rock tunnel lining against earthquake-attributed loading.....	168
1.85	MERIKUKKA, LANGSTEDT, Parking facilities and shelters in rock .....	170
1.86	NOLL, HESS, GalgenbuckTunnel - Tunnelling in extremely changeable geological conditions .....	172
1.87	PARISI, FARINETTI, GILLI, BRINO, First results from the excavation of the Lyon-Turin Maddalena exploratory tunnel.....	174
1.88	POMPEU-SANTOS, Optimized TBM tunnel solution for the fehmarnebelt fixed link .....	176
1.89	BARTAK, PRUSKA, Numerical models of tunnels and Eurocode 7 .....	178
1.90	QIU, K. LIU, SUN, H. LIU, Water pressure free design for an infrastructure of parking.....	180
1.91	REHBOCK-SANDER, TRUNK, Utility plants in underground rock caverns in Singapore .....	182
1.92	ROCHA, TAKEUCHI, ROBBE, NERY, Line Green 2 Sao Paulo Subway - New stretch - Main aspects of the basic engineering design .....	184
1.93	SEO, YUN, MOON, Multiple regression analysis of the effects of the weight ratios of clay minerals and fine-grained soils on the shear strength of fault rock.....	186
1.94	SHIMOMURA, NAKANO, AMANO, AKIYOSHI, KITAOKA, Reconstruction of a heaved invert without closing expressway .....	188
1.95	SHIN, HAN, D. KIM, H. KIM, Effect of ground-born vibration induced by intersecting tunnels.....	190
1.96	SILVESTRE, DEL AMO, GONZALEZ, Numerical model for building settlement and damage analysis .....	192
1.97	1.97TENDER, GOMES, COUTO, Portuguese strengths and fragilities on safety and health practices.....	194
1.98	WANG, LIU, MA, YUAN, FANG, Statistical evaluation of buildings disturbed from metro shield tunneling in soft soil .....	196
1.99	PACHOUD, SCHLEISS, Parametric study of steel-lined pressure shafts in anisotropic rock .....	198
1.100	EUN ROH, DUK LEE, SUK PARK, Behavior of the fragmental rocks during the tunnel excavation .....	200
1.101	NASRI, ABEDI, Storage tunnel and pump station in Hartford, Connecticut .....	202
1.102	VLACHOPOULOS, FORBES, Temporary tunnel support strategies: Optimization and easting .....	204
1.103	PERAZZELLI, TROMBETTA, ANAGNOSTOU, Key design issues of lined tunnels and shafts used for compressed air energy storage.....	206
1.104	SCHEFFER, CONRADS, RAHM, DUHME, THEWES, KONIG, Simulation-based TBM performance prediction .....	208
1.105	CELADA, ADASME, GONZALEZ, Experiences in the construction of the interstation tunnels of L-6 Santiago Subway (Chile).....	210
1.106	1.106THOMAS, EBERLE, PSOMAS, Itatech design guidance for precast fibre reinforced concrete segments .....	212
1.107	BAO, YUAN, YU, JI, ZUO, Longitudinal rigidity of shield tunnels based on numerical investigation.....	214

1.108	ANTIGA , DE LUCA, Observational approaches in tunneling: Some thoughts.....	216
1.109	AWAJI, ISAGO, KUSAKA, KAWATA, Waterproof rock tunnels for the preservation of hydrological environment in Japan.....	218
1.110	BADARCEA, BOROIANU, DARABAN, The influence of metro stations on tall buildings settlement .....	220
1.111	BETTELINI, RIGERT, Advances in optimum ventilation control for road tunnels .....	222
1.112	ARMIGLIATO, DA SILVA, PRADO, K0 parameter influence in tunneling superficial settlements and in liner stresses.....	224
1.113	ALTUNTA5, GONGOR, BAYRAM, TUNAY, GENgOGLU, SATICI, Planning and designing the Izmir bay crossing and connections.....	226
1.114	1.114TREVIZOLO DE SOUZA, Cross section templates for Brazilian railway tunnels .....	228
1.115	VESTER, MAY, GARLY ANDERSEN, Implementing BIM in large civil works projects.....	230
1.116	WANG, GAO, SHEN, Study on the mechanism of seismic technology of deep soft rock circular tunnels subjected to incident plane p waves.....	232
1.117	KIM, LA, LEE, Numerical investigation on the enlargement of an old existing tunnel .....	234
<b>SESSION 2 : FIRE SAFETY OF TUNNELS AND UNDERGROUND STRUCTURES .....</b>		<b>237</b>
2.1	WORM , Considerations regarding water mist as a safety measure.....	238
2.2	GENDLER, CASTANEDA, BELEN, Increasing tunnels fire safety due to use of jet fans and portal gates.....	240
2.3	QIAN, AGNEW, CHARLTON, PALACIN, PFLITSCH, Towards an integrated evaluation of smoke or toxic gas dispersion based on subway climatology and evacuation of a subway station .....	242
2.4	ANNEREL,BOTH, LEMAIRE, Passive fire protection and life safety.....	244
2.5	XU, YU, HUANG, FAN, A preliminary study on the comprehensive evaluation of the Disaster Prevention System of large urban underground space .....	246
2.6	ISAGO, ISHIMURA, MASHIMO, Behavior of lining concrete under high temperature condition .....	248
2.7	HAHNE, LEUCKER, Evacuation of underground stations with elevators in case of fire.....	250
2.8	WAELECHLI, BADDE, Cross-city-link - Optimization of the smoke extraction system .....	252
2.9	CUI, LU, QIU, WANG, ZUO, YUAN, Simulation and analysis on fire scenario for subway station.....	254
2.10	QIU, YUAN, LUO, LU, WANG, A performance-based structural fire-resistance design system for underground public structure.....	256
<b>SESSION 3 : MECHANIZED TUNNELLING IN DEVELOPMENT AND USE .....</b>		<b>259</b>
3.1	BAE, CHOI, CHANG, Measurement of cutter forces acting on a double disc cutter in a full-scale liner rock cutting test.....	260
3.2	SCHOESSER,THEWES, Marsh funnel testing for rheology analysis of bentonite slurries for slurry shields.....	262
3.3	CHANG, LEE, CHOI, BAE, KOH, Full-scale loading test of a hybrid SFRC segment lining.....	264
3.4	ISHIZAKA, OE, TEZUKA, IRITA, MINAKAMI, SHIMIZU, Development of new composite segment and use in the field .....	266
3.5T	IBERTI, CONFORTI, PLIZZARI, MORO, Experimental investigation on the local splitting behavior under TBM hydraulic jacks.....	268
3.6	SIMIC, EPB operation to avoid settlement problems .....	270
3.7	CLASSEN, TOTO, BANDIERI, Inovations and challenges operating the world's largest TBM .....	272
3.8	DIAS, BEZUIJEN,TBM pressure models: Calculation tools .....	274
3.9	K. LEE, J. PARK, J. PARK, KWON, CHOI, I. LEE, Numerical study on the resistivity tomography applicable to TBM.....	276
3.10	STASCHEIT, HINTZ, KLADOS, Process controlling in Klang Valley MRT Project, Malaysia .....	278
3.11	LOG, OFIARA, ANDERSON, WETLESEN, Hard rock TBM tunnelling in karst conditions: Developments and lessons learned from the field.....	280
3.12	ROSSLER, VfTEK, Innovative support of segmented liner at TBM tunnel crosspassages .....	282
3.13	LIU, GRANDIS, FACHINO, DEMATTEIS, Analysis of TBM advancement data ofthefrejus tunnel safety gallery .....	284
3.14	HEDAYATZADEH, ROSTAMI, PEILA, Experimental investigation on effect of ambient pressure of conditioned soil on tool wear in earth pressure balance (EPB) shield tunneling .....	286
3.15	SAKATA, MATSUO, NAKANISHI, WADA, The adoption of the SENS in an urban railway tunnel .....	288
3.16	MERRITT, STORRY, BRAIS, Soil conditioning testing and monitoring for the Port Miami Tunnel .....	290
3.17	SITARENIOS, LITSAS, PAPANAKOS, KAVVADAS, Effect of hydraulic conditions in controlling the face in EPB excavated tunnels ..	292
3.18	MARCHIONNI, BONTEMPI, Large diameter EPB excavation with low overburden in St.Peterburg .....	294
3.19	CAMUS, MANACORDA, European Project NeTTUN - Making it happen.....	296
3.20	GROTHEN, Optimizing soft ground excavation: Development and design of EPB and slurry cutter heads.....	298
3.21	BALCI, COMAKLI, POLAT,TUMAC, AVUNDUK, COPUR, BILGIN, A new generation of portable linear rock cutting machine (PLCM) and comparision with full scale linear rock cutting tests.....	300
3.22	HARDING, CHAPPELL,The case for adopting new segmental lining technologies.....	302
3.23	PARK, K. LEE, CHOI, S. LEE, I. LEE, Harmony search algorithm to predict anomalous zone ahead of tunnel face.....	304
3.24	SCIALPI, OFIARA, Unique hybrid EPB design for use in coal mine drifts .....	306
3.25	BARZEGAR, GHAREHDASH, SHARIFZADEH, Numerical model for simulation of face seizure in EPB.. .....	308
3.26	M. AKGOL, E. AKGOL, BOSTANCI, COPUR, Analysis of disc cutter consumption of a double shield TBM .... .....	310
3.27	DUHME, RAHM, THEWES, SCHEFFER, A review of planning methods for logistic in TBM tunneling... .....	312
3.28	ESLAMI, GOLSHANI, Application of the hardening soil model during underground excavation analysis Case study line 2 metro of Mashhad .....	314
3.29	LOSACCO, VIGGIANI, BRANQUE, BERTHOZ, ALE FE analysis of a laboratory test for the simulation of mechanised tunnelling in soft soil .....	316
3.30	SILVA, AGUIAR, GONSALVES, Twin tunnels excavated in sandy soils in a density urban area .....	318
3.31	SORLINI, GILLI, Environment and health monitoring for the exploratory tunnel of La Maddalena .... .....	320
3.32	ZARRIN ,ZARE, JALALI, Backfill grouting with two-component grout - Case study Tehran metro line 7 east-west lot .....	322

3.33	TAHERIAN , MEMARI AN, Water inflow analysis in toTBM tunnel - Case study Nowsud tunnel in Iran.....	324
3.34	D. KIM, JEONG, K. KIM, FEM based Estimation of EDZ underTBM induced vibration.....	326
3.35	NAMLI, MOROY, HIZEL, ZENGIN, EREN, Uskudar-Umraniye-Cekmekoy metro construction project: Cement injection filling of limestone karst cavities in Kemerdere tunnels.....	328
3.36	MAIDL, TUROLLA MAIA, COMULADA, MAHFUZ, COUTINHO, First experiences gained with the hybrid EPB technology in the Rio de Janeiro sands.....	330
3.37	HASANPOUR, ROSTAMI, OZCELIK, A simple precaution for preventing of the lining failures in the shielded TBM tunnelling through squeezing ground.....	332
3.38	IVANTCFIEV, DEL RIO, Two-component backfill grouting for double shield TBMs.....	334
3.39	BAPPLER, Successful engagement of mechanized tunnelling technology in Russia.....	336
3.40	JOO, OH, CHO, HONG, New hydro-mechanical tunnel excavation method using an abrasive waterjet system.....	338
3.41	YOUN, BREITENBUCHER, Dewatering and infiltration behaviour of annular gap grouts.....	340
3.42	XIAO, WANG, YANG, Effect of soil conditioning on the ground response during EPB shield tunneling in sandy ground.....	342
3.43	CLARK, Extreme excavation in fault zones and squeezing ground at the Kargi HEPP in Turkey.....	344
3.44	GONZALEZ, ARROYO, GENS, Observations of tool wear and excavation performance in urban tunnels.....	346
3.45	KHALIGHI, WILLIS, TBM design for long distance tunnels: How to keep hard rockTBMs boring for 15 km or more.....	348
3.46	KIM, OH, YOO, CHUNG, SEO, Operation technique of mechanized tunnelling in mixed ground.....	350
3.47	FARROKH, KIM, SIM, Rotary cutting test for hard rock TBM performance evaluation.....	352
3.48	FRIGYIK, HORNY, HOCH, The importance of the Temporary structures on a large project like Doha Metro Green Line.....	354
3.49	GENC^AY, AKGOL, BILGiN, COPUR, BILGIN, Performance of EPB TBM in Beylerbeyi-Kucuksu wastewater tunnel in Istanbul.....	356
3.50	HUYNH, CHEN, SUGIMOTO, Study on steering method of H&V shield to construct a spiral tunnel.....	358
3.51	FUJIKI, MINAKAMI, IWASAKI, Development of the new joint (SB joint) for shield tunnels.....	360
3.52	LANGMAACK, KLADOS, NG,TREVISIN, LEE, Metro Kuala Lumpur-The chemical contribution.....	362
3.53	LITSAS, PATERIANAKI, KAVVADAS, Investigation of the influence of cracking on the stiffness and capacity of segmental tunnel lining.....	364
3.54	KAWATA, MATSUMOTO, NAKANO, TBM Excavation of a long-distance water transfer tunnel.....	366
3.55	MAZEIN, FEDUNETS, VOZNESENSKY, Recommendations for TBM-monitoring of face bentonite support ..	368
3.56	MESCHKE, ALSAHLI, FREITAG, NINIC, GALL, CAO, Simulation based real time prognosis for mechanized tunneling.....	370
3.57	M^ZYK, KLEIN, KANIA, PAWLAK, BASIURA, Review of modern concepts of tunnel construction machinery.....	372
3.58	POLAT, BALCI, COMAKLI, AVUNDUK, TUMAC, COPUR, BILGIN, Cutter forces measurement with (PLCM©) using mini conical pick: Comparison with the empirical and theoretical models.....	374
3.59	ROSSI, DE RIVAZ, Design of only fibers reinforced concrete segments.....	376
3.60	WEINER, THEWES, Prediction of the dispersion of soil in slurry shield tunneling.....	378
3.61	ZIZKA, THEWES, POPOVIC, Analysis of slurry pressure transfer on the tunnel face during excavation ..	380
3.62	CARATELLI, DE RIVAZ, MEDA, RINALDI, Full-scale tests on precast tunnel segments in fiber reinforced concrete.....	382
3.63	WANG, YE, YANG, Soil conditioning for shield tunneling in argillaceous siltstone in Nanchang metro line 1, China.....	384
3.64	ULKAN, SCHMAEH, Tunnelling technology for marine pipeline installations.....	386
3.65	SCHNEIDER, KIESLING, HANDKE, Koralmbahn-Challenges and solution concepts for the realization of the lot KAT 3 of the Koralm tunnel with a major focus on different geological conditions with reference to the specification of the shield machine.....	388
3.66	BAKHSI, NASRI, Design of segmental tunnel linings for serviceability limit state.....	390
3.67	BITETTI, CHIRIOTTI, MONOSILIO, Tunnelling of Bucharest metro line 5: Hard-points and performances ..	392
3.68	CHMELINA, RABENSTEINER, LAMMER, GIMPEL, New developments for roadheader navigation.....	394
3.69	COMAKLI, BALCI, BILGIN, COPUR, TUMAC, POLAT, AVUNDUK, Cutter forces measurement with (PLCM©) using mini disc cutters: Comparison with the theoretical models.....	396
3.70	NOVIN, FOROUGH, TARIGHAZALI, FASIHI, LEE, Comparison between simultaneous backfilling methods with two components and single component grouts in EPB shield tunneling.....	398
<b>SESSION 4 : OPERATION AND MAINTENANCE OF TUNNELS AND UNDERGROUND STRUCTURES... ..</b>		<b>401</b>
4.1	LONGTIN, Intelligent lighting control for energy and maintenance saving.....	402
4.2	VALDES, THAKKER, DIMITROVA, COHN, THIAUDIERE, Development of decision support system on tunnel diagnosis.....	404
4.3	SRAMOON, KUNAVIRIYA, WONGSA, Water transmission tunnel rehabilitation in Thailand.....	406
4.4	P. LI, SHI, XIE, LU, J. LI, Determination of tunnel external loads based on Betti's theorem.....	408
4.5	H. KIM, AN, Y. KIM, LEE, SUK, OH, A study on development of the performance evaluation index of tunnels using the Delphy-Method.....	410
4.6	MICHELIS, DAL NEGRO, PLESCIA, Innovative waterproofing system for "Rivarolo" tunnel.....	412
4.7	VOLLMANN, THEWES, KLEEN, Development of a highly ductile sprayed concrete as a counter-measure for explosion and fire impacts on underground structures.....	414
4.8	CHIU, LEE, WANG, HUANG, Lining crack evolution: A qualitative and quantitative index for degradation of tunnels in operation.....	416
4.9	SHIMAMOTO, YASHIRO, OKANO, ASAKURA, Floor heave in mountain tunnels and the effects of counter measures.....	418
4.10	TSUNO, N AKAYAMA, USHIDA, Influence of corroded segment joint on strength of shield tunnel.....	420
4.11	FORDYCE, Patricia, Developing a tunnel operation and maintenance plan.....	422
4.12	GERLACH, PIAZZOLLA, SPUNDFLASCH, LEHAN, THIENERT, On-site tests on innovative automatic incident detection systems.....	424
4.13	LEI, QI, CHEN, LI, The analysis of the lining cracks caused by the cavity behind lining in the high-speed railway tunnel based on XFEM.....	426

4.14	KAWAKAMI, MUTOU, KONISHI, MIURA, MATSUKAWA, MOROHASHI, Utilization of IT and the current condition of the repair measures in the maintenance of subway tunnels .....	428
4.15	JEON, T. KIM, JEONG, YOU, J. KIM, Stability analysis of damaged concrete jack lining in an urban cable tunnel.....	430
4.16	MAMMINO, Structural outlines of the static and geostatic restoration proposed for two railways tunnels in a state of serious deterioration following instability inherent in the original phases of design and realization, which have risked collapse .....	432
4.17	HAFNER, KAMMERER, Road infrastructure security manual - SecMan .....	434
4.18	OKAZAKI, ITO, NIWA, MURAYAMA, SASAYA, Project study of tunnels with time-dependent behaviour-geochemical and mechanical characteristic of rock mass .....	436
4.19	MORIDI, KAWAMURA, SHARIFZADEH, CHANDA, Underground spaces communication and monitoring systems integrated ZigBee and GIS .....	438
4.20	MURAYAMA, NIWA, ITO, Project study of tunnels with time-dependent behaviour - Records of planning and construction .....	440
4.21	WITTEW, WIGLER, Use of thermography for tunnel-inspection.....	442
4.22	YASUDA, TSUKADA, ASAKURA, Stress analysis of cylindrical tunnel with void behind the lining .....	444
4.23	ZANTEN, ADMIRAAL, Repairing an ageing national monument-The world's first box shaped immersed tunnel .....	446
4.24	ZHANG, GAO, WANG, HUANG, Numerical modeling of the seepage erosion process around tunnels using DEM .....	448
4.25	ZHANG, HUANG, Field study on tunnel lining resilience under extreme surcharge .....	450
4.26	NIWA, MURAYAMA, OKAZAKI, Project study of tunnels with time-dependent behaviour - A diagnostic method using seismic velocity .....	452
4.27	SANCHEZ-DOMINGUEZ, RAMOS-GARCIA, GAVILAN-VELASCO, GARCIA-LORENTE, CALVO-HARO, Automated structural evaluation of tunnels in service.....	454
4.28	YOO, CHUNG, PARK, Tunnel lining behavior under high hydraulic head in water bearing ground - A numerical investigation .....	456
4.29	AI, YUAN, BI, LIU, FENG, An automated and rapid measuring method for cross-section deformation of shield tunnels .....	458
4.30	YANG, WANG, CUI, WANG, Evaluation model of technical condition for highway tunnel lining structure based on matter-element theory.....	460
4.31	GJ/ERINGEN, Rehabilitation of road tunnels in Norway .....	462
4.32	SUZUKI, KIMURA, MORIYAMA, HIRA, A risk exposure method of tunnel management for expressways.....	464
4.33	CHOO, SHIN, RYU, JUNG, D. LEE, I. LEE, Assessment of deterioration in underground structures using field inspection .....	466
4.34	KASHIHARA, NAGAMI, IWAMOTO, The first application of CIM to tunnel project in Japan .....	468
4.35	ITO, OKAZAKI, SASAYA, Case study of a tunnel with time-dependent behaviour in a volcanic area of Hokkaido .....	470
4.36	NICKERSON, CECCATO, BONO, CIMIOTTI, Lake Mead intake no. 3 -TBM tunneling at high pressures .....	472
4.37	MOUSSAEI, SHARIFZADEH, SAHRIAR, KHOSRAVI, Evaluation of tunnel instability in layered structures using physical modelling.....	474

## **SESSION 5 : DEVELOPMENTS IN USE OF UNDERGROUND SPACE : CASE STUDIES (TRAFFIC, WASTE,**

	<b>ENERGY, WATER, SEWER, FLOOD PROTECTION, COMMERCIAL AND OTHER USES) .....</b>	<b>477</b>
5.1	CARRARETTO, NOIRET, ZGHONDI, TBM at the Meuse/Haute-Marne underground research laboratory. ....	478
5.2	SHAU, HSIAO, KAO, Preliminary assessment of environmental impact for a high potential water inflow tunnel in Taiwan.....	480
5.3	TORRICO, LOPEZ, PARAMO, SANCHEZ, Design and construction of The San Jose Hydroelectric Project (Cochabamba, Bolivia).....	482
5.4	FOGARASI, FLATLEY, RIZKALLA, Concept of using underground space in Canadian cities .....	484
5.5	JAVADI, SHARIFZADEH, SHAHRIAR, SAYADI, The role of operational factors on water inflow to unlined rock caverns .....	486
5.6	MAO, LU, Water control of vertical shaft in Singapore.....	488
5.7	PAPADOPOULOU, 3-D F.E. back analyses of two N ATM tunnels in weak flysch .....	490
5.8	MASSINAS, SINGH, SAINI, BHARDWAJ, KUMAR, Settlement analysis and monitoring instrumentation of Delhi Metro's operational Line-2 tunnels during TBM, of new Line-8, underpass .....	492
5.9	PIAGGIO, Swelling rocks characterization: Lessons from the Andean region .....	494
5.10	POPIELAK, WEINIG, STETLER, Hydrostatic pressure control at Sanford underground research facility.....	496
5.11	KUMAR, BHARDWAJ, MASSINAS, SINGH, SAINI, NATM - Metro tunnel below elevated metro line .....	498
5.12	JANUSZ, CZEREPAK, Application of deep corrugated flanged structural plates for construction of vertical shafts and horizontal lining.....	500
5.13	GALERA, ANDERSSON, Rock engineering aspects of the cheves hydropower project powerhouse and transformer caverns .....	502
5.14	GIL LOPEZ, DE LA PAZ COBOS, CARRERA PÉREZ, CORROCHANO PERDONES, Construction project for the rainfall collector in Pinos sub-basin, Madrid, Spain .....	504
5.15	DAMIANI, ALFIERI, PEDRAZZI, "Piazza Meda" underground car park in Milan (ITA).....	506
5.16	KALIAMPAKOS, New challenges in the use of underground space .....	508
5.17	KHALI, Construction of railway tunnels in highly adverse geological conditions in Himalayas by using NATM - A case study.....	510
5.18	SUN, QIU, LIU, Optimal anti-floating design of underground parking garage in Yitian town, Shenzhen .....	512
5.19	GONZALO, SANCHEZ TOSTON, Energy efficiency studies for the Folgoso Tunnel-Introducing the new UNELEC, a portable device for electrical measurements and tests in tunnels .....	514
5.20	MAHDAVI, NASRI, AKBARPOUR, Highway crossing for sheppard east LRT project in Toronto .....	516
5.21	SHARIFZADEH, GHODRAT, GHORBANI, Effect of building's geometrical factors on the interaction of the tunnel-surface structures, the case of Niayesh tunnel in Iran .....	518
5.22	SPINEDI, BASSETTI, MALAGUTI, LUNGHI, SANFILIPPO, CIANI, Vezia Crespiera cable tunnel .....	520
5.23	VANNI, SIEPI, Use of special jet grouting technologies for tunnel's crown and core advance consolidation: Technical aspects and case studies.....	522
5.24	THAKUR, GUPTA, SHARMA, Execution of contact and consolidation grouting in 162.5m deep, 38m dia urge shaft of 412 MW Rampur Hydro Electric Project, HP - India - A challenging activity.....	524
5.25	CH A, CHO, HONG, RYU, Numerical analysis on settlement behavior of shallow box tunnel widening .....	526

<b>SESSION 6 : COST OPTIMIZATION AND FINANCING OF UNDERGROUND STRUCTURES</b>	<b>529</b>
6.1 GUMUSOGLU, A global cost estimation model for mechanized tunnels based on in-situ data .....	530
6.2 TOWERS, SCOTT, Effects of risk management on project insurance costs .....	532
6.3 MOERGELI, SANDER, REILLY, Risk-based, probabilistic cost estimating methods.....	534
5.4 HUMBERT, Site investigations reduce cost overruns in tunnelling projects .....	536
6.5 OCAK, SELCUK, NAMLI, EKER, Cost comparison of NATM and umbrella arch method.....	538
6.6 POURHASHEMI, SADEGHI,TAROMI, ASKARZADEH, Tunnel monitoring during the excavation phase and cost optimization A case study of Hakim Tunnel.....	540
<b>SESSION 7 : IMMERSED AND FLOATING TUNNELLING .....</b>	<b>543</b>
7.1 INGERSLEV, QUINN, CARTER, Immersed tunnels - Immersion joints.....	544
7.2 BERGSMA, DOORDUYN, Immersed tunnel: A viable option for the Orlovsky crossing.....	546
7.3 VAN WESTENDORP, RUESINK, GROOT, MOSE project: Immersion of caissons within less than 10mm .....	548
7.4 B. JELIC, H. JELIC, Conceptual design of immersed tunnel tubes of the Adriatic .....	550
7.5 JIN, YUN, A review of foundation treatment in immersed tube tunnels in mainland China.....	552
7.6 XU, LI, Research on rapid calculating method of seismic analysis of immersed tunnel .....	554
7.7 MORTIER, BERKHOUT, HAKKAART, KIRSTEIN, Assessment and preservation of immersion joints.....	556
7.8 SAKAEDA,TSANG, OZGUR, Risk management in immersed tunnelling projects .....	558
7.9 XIAO, YU, YUAN, TAERWE, FANG, CHAI, Experimental investigation on the flexural mechanical behaviour of an immersion joint .....	560
7.10 YUAN, YU, XU, SU, LIU, CHAI, Multi-shaking-table test of a long immersed tunnel.....	562
7.11 XU, FU, LI, LIU, A simplified method for calculation of allowable longitudinal differential settlement of mmersed tunnel .....	564
7.12 KALMAR PEDERSEN, LUNDBERG, THOMAS, The design of the Fehmarnbelt tunnel .....	566
<b>SESSION 8 : INTELLIGENT SYSTEMS, MECHATRONICS AND ROBOTICS IN TUNNELLING .....</b>	<b>569</b>
8.1 JEON, BAE, LEE, CHO, LEE, BIM application case for shallow subway tunnel construction .....	570
8.2 INAGAKI, TSUSAKA, AOYAGI, NAGO, IJIRI, SHIGEHIRO, Effective 3D data visualization in deep shaft construction.....	572
8.3 RODER, DEMEL, Cityringen Copenhagen: Innovative groundwater management .....	574
8.4 STENTOUMIS, LOUPOS, DOULAMIS, AMDITIS, A computer vision system for tunnel inspection.....	576
8.5 BOHNE, AID in road tunnels with intelligent loop technology.....	578
8.6 FARJOW, RAAHEMIFAR, FERNANDO, Novel wireless channel characterization model for reliable communication networks in tunnels .....	580
8.7 KUBOTA, TSUNO, YE, Tunnel investigation based on hammering sound analysis on Grassmann manifold.....	582
8.8 BEDI, INVERNICI, DONOVAN, Monitoring the deformations induced by large diameter SCLtunnels on existing tunnels for Victoria Station Upgrade, London .....	584
8.9 GAICH, POTSCHE, HENZINGER, SCHUBERT, Circular 3D images fromTBMs for geological mapping .....	586
8.10 LENSING, CORRIOLS, HARTKORN, MESSING, PEZONE, Guiding and monitoring the Eurasia tunnel construction under the Bosphorus strait.....	588
8.11 LOUPOS, AMDITIS, STENTOUMIS, Integrated robotic system for tunnel structural assessment – The ROBO-SPECT EC project .....	590
8.12 MARTINEZ DE OSABA, PRADERA, VARELA CASTRO, NUNEZ BLANCO, VERDE LLAMAS, Tunnel as-built analysis with shotcrete monitoring system GEOKRET.....	592
8.13 BARWART, HIMMELSBACH, GALLER, Disc cutter load monitoring system - DCLM.....	594
8.14 CHENG, QIU, LENG, Study on the visual scheme of tunnel detection data based on web .....	596
<b>SESSION 9 : CONVENTIONAL TUNNELLING METHODS IN DEVELOPMENT AND USE .....</b>	<b>599</b>
9.1 MARCHINO, PESCE, A particular grouting application for the stability of a tunnel .....	600
9.2 SCHNEIDER, WEHRLI, LEHTO, MARTIKAINEN, New innovative system for layer thickness control on Normet spray mobile .....	602
9.3 WEI, GUO, ZHOU, Face stability of crossing river shield tunnel under geological conditions of soft and hard uneven strata .....	604
9.4 DAL NEGRO, PLESCIA, OSSOLA, GROSSO, Monte Ceneri Base Tunnel: A successful job-site experience .....	606
9.5 STEFANIZZI, LOGARZO, RIZZO, PONTES, AGNELLA, GONCALVES, Analysis of the excavation of large caverns in the Sao Paulo Metro .....	608
9.6 BAUER, REDA, BEIRNE, Urban tunnelling: The Vauxhall Underground Station upgrade .....	610
9.7 FORTSAKIS, MARINOS, NIKOU, CHORTIS, PROUNTZOPOULOS, Tunnelling in weak rock mass with overlying competent stratum .....	612
9.8 HU, FANG, Freeze-sealing pipe roof-viable tunnelling technique in soft ground .....	614
9.9 OSTIADAL, ZAHARIA, COSMAN, Open gallery solution for a tunnel on the National railway corridor IV. ....	616
9.10 RUZICKA, KOCHANEK, KUNAK, Prague experience from driving metro tunnels in developed areas.....	618
9.11 Y. JIANG, Q. YANG, J. YANG, LIU, SHENG, The field experiences of spray-applied acrylate waterproofing membrane for tunnels in alpine and cold areas.....	620
9.12 SRB, DE MELLO, Collapse of Brezno railway tunnel made by prevault (Perforex) method in the Czech Republic.....	622
9.13 GRADNIK, HAUCK, SCHWAIGER, KICHERER,The extension of the U12 Lot 3 in Stuttgart tunneling at its best.....	624
9.14 NAKAYA, ONUMA, YAMAMOTO, NISHIKAWA, NIITSUMA, Seismic survey using excavation blasting under tunnel construction -TFT survey at road tunnel construction in Japan .....	626
9.15 MARULANDA, MARULANDA, GUTIERREZ,Tunnelling experience in the Andes mountain range .....	628

9.16	KIM, BRULAND, Comparison of Norwegian and Korean tunnels for tunnel excavation cycle time .....	630
9.17	ZHIGANG, HONGZHOU, JIA, Study on key technology of the shed-tunnel design and construction by mountain .....	632
9.18	ZOVIC, VRCA, BARCOT, LONCAR, Non explosive method used for the widening excavation in a small diameter inclined tunnel ....	634
9.19	AYDAN, IMAZU, SOYA, IDEURA, The possibility of infrared camera thermography for assessing the realtime stability of underground excavations .....	636
9.20	IMAZU, IDEURA, SOYA, AYDAN, An integrated study on the stability and dynamic response of the Taru-Toge Tunnel during excavation .....	638
9.21	GJ/ERINGEN, The Bjoroy tunnel - Blasting on the seabed above the tunnel running through the Bjoroy zone" (Jurassic sediments in the fracture zone) .....	640
9.22	GAKIS, SALAK, STJOHN, Temporary sprayed concrete lining tunnels in rarrington crossrail station .....	642
9.23	FENEZIANI, FLORIA, BARBERO, Numerical analysis of settlements due to conventional tunnelling.....	644
9.24	GALL, MUNFAH, MATTHEI, Large cross sections for soft ground and soft rock conventional tunneling projects in urban areas - recent developments in the US .....	646
9.25	HASIK, RYCHTECKY, ILIEV, Metro tunnel under Cvetan Lazarov Boulevard in Sofia .....	648
9.26	KABIR, SAGONG, AHN, Analysis of tunnel rock cutting by diamond wire saw blade using a finite element model .....	650
9.27	OH, JOO, PARK, CHO, Erosion performance with abrasive flow rate for abrasive waterjet rock cutting.....	652
9.28	OSS, FUOCO, CASAGRANDE, Design and excavation for the widening of a railway tunnel: The case of the Castellano tunnel in Italy.....	654
9.29	PAN, SHI, GAO, LI, Gongbei port tunnel excavation support design and construction .....	656
9.30	RYCHTECKY, HASIK, ILIEV, Metro tunnel with minimum overburden under a boulevard in Sofia .....	658
9.31	SINTIC, Tunnel excavation in carbonate rocks - Drilling and blasting calculation .....	660
9.32	ZENTI, STERPI, GFRP pipe for tunnel face reinforcement: The laboratory characterization .....	662
9.33	SUEYOSHI, KURIKI, OCHIKAWA, KOSHIKAWA, IWANO, ANDOH, Environmentally low impact blasting in urban residential area .....	664
9.34	HASIK, JUNEK, ZAMECNIK, ANDOH, A Comparison of the use of spray applied waterproof membranes versus traditional sheet membrane waterproofing in the construction of deep level stations on the Prague Metro .....	666
9.35	YOO, PARK, LEE, ZHENG, KIM, A study on the method of using camera and laser marker for tunnel face mapping .....	668
9.36	ZENTI, CULLACIATI, Semi-automatic tubular steel arch: An innovation on safety .....	670
9.37	ZHANG, YANG, LIN, YAO, Field test research on long distance horizontal jet grouting pile for preeinforcement in L7 deep weathering rich water steep dip weak stripe area of Liangshang Tunnel .....	672
9.38	KIM, SIM, JUNG, LEE, Numerical analysis of PSTM(Pressurizing Support Tunnelling Method) using reinforced steel beam for obtaining constructability .....	674
9.39	LEE, RYU, Tunnel excavation effect on pre-existing underground structure .....	676
9.40	OANCEA, IFTIMIE, Study of solutions for realization of portals in difficult grounds .....	678
9.41	AGUIAR, SILVA, Design and construction aspects of a conventional shallow tunnel in very soft soil .....	680
9.42	BATYREV, NEVLEVA, The first on-site comparison between NATM and ADECO-RS during construction of the "Dubler Kurortnogo prospekta" tunnels in Sochi (Russia) .....	682
9.43	CHORTIS, KAVVADAS, Numerical investigation of the interaction between twin tunnels .....	684
9.44	PALMA FILHO, The use of umbrella arch method and rebars spiles, in the same road rock tunnel .....	686
9.45	KIM, CHO, PARK, LIM, CHO, LEE, Case study on the application of conventional tunneling method in .....	688
<b>SESSION 10 : URBAN PLANNING AND USING OF UNDERGROUND SPACE .....</b>		<b>691</b>
10.1	PASHKIN, MAZEIN, RYABOV, Optimization of geological researches for subway planning in Moscow.....	692
10.2	GYORGY, FOGARASI, Management of effective use of urban underground space.....	694
10.3	SOH, CHRISTOPOULOS, LU, CAR, JENSSEN, NG, Psychological, health and social parameters associated with working in underground spaces .....	696
10.4	TYAGI, LEE, Centrifuge modelling of large diameter tunnels in improved soils .....	698
10.5	GALLI, BASSETTI, SANFILIPPO, SPINEDI, Lugano tramway system: A part of the public transport network ... ..	700
10.6	GLAZER, Reviving burial in tunnels .....	702
10.7	FICALORA, RIMAURO, ZAFRAN, Procedure for urban infrastructure project's minimization due to the impacts of the undergrounds public service's networks.....	704
10.8	GUO, FANG, YANG, XU, Numerical analysis of influence of oblique undercrossing subway shield tunneling construction on the overlying frame tunnel .....	706
10.9	MERAND, APPERE, TOURAIN, CANOPEE: Programming, designing and construction of urban covers.. ..	708
10.10	BRAZA, Feldkirch city tunnelsystem - First rockmade roundabout in the EU .....	710
10.11	BESNER, LAVAGNO, ZLATANIC, Underground space use evolves via application of best practices .....	712
<b>SESSION 11 : SEE SESSION : SOFT GROUND URBAN TUNNELLING / ROCK TUNNELLING IN KARST.....</b>		<b>715</b>
11.1	SAYADI, SHARIFZADEH, SHAHRIAR, JAVADI, The role of constitutive model selection on tunnel induced subsidence in urban area .....	716
11.2	HARRIS, SISMONDI, WEINMAR, Review of ground movements during SCL tunnelling in an urban environment.....	718
11.3	ATZL, ULLMANN, SCHMIDT, SELAN, Tunnel design for the Vienna underground construction lot U1/9 .....	720
11.4	ZHOU, MARWAN, MESCHKE, Modeling and optimization of ground freezing in tunneling .....	722
11.5	AMOUN, SHARIFZADEH, SHAHRIAR, ROSTAMI, Soil abrasiveness for EPB-TBM along Tehran metro tunnel line 7, Iran.....	724
11.6	BEDI, HEATH, McCARRON, Controlling the impacts of constructing a large diameter SCL tunnel on adjacent assets for Victoria Station Upgrade, London .....	726

11.7	HOFER-OLLINGER, New approach on characterizing Karst aquifers in tunnel design	728
11.8	FARGNOLI, GRAGNANO, BOLDINI, AMOROSI, CAMPA, UMILIAO, Soil-structure interaction during tunnelling: An integrated approach	730
11.9	FOROUGH, GERANMAYEH, TARIGHAZALI, Evaluation of long-term settlement induced by shield tunnelling case study: Tehran metro line 7 (east-west lot)	732
11.10	ST.JOHN, POTTS, PERKINS, BALOGH, Use of TBM pilots for large diameter SCL caverns: Crossrail C300/ C410	734
11.11	VU, BROERE, BOSCH, The impact of shallow cover on tunnelling in soft soil	736
11.12	BOSCARO, BARBANTI, DAL NEGRO, PLESCIA, ALEXANDROWICZ, The first successful experience in Poland of tunnel excavation with EPB for the Metro Warsaw	738
11.13	LI, GRASMICK, MOONEY, Influence of slurry TBM parameters on ground deformation	740
11.14	NASSERY, MALEKI, ALIJANI, ABBASI, Estimating of groundwater inflow into the Sabzkuh tunnel (Chaharmahal and Bakhtiari)	742
11.15	JEONG, JEONG, JANG, KIM, Ultrasonically enhanced material properties of liquid grout	744

**SESSION 12 : RISK ANALYSES AND TECHNIQUES FOR UNDERGROUND STRUCTURES ..... 747**

12.1	LU, JI, JIA, Influence on the existing building caused by shallow metro tunnel by excavation under crossing in short distance.....	748
12.2	MONIN, JANUTOLO-BARLET, COLLOMB, VAN MARK, DUDT, DELISIO, Management of construction time and cost effectiveness by im-plementation of the DAT software through the NeTTUN project .....	750
12.3	KAUNDINYA, MAYER, ROTHENPIELER, Identifying and assessing critical road infrastructure .....	752
12.4	CHEN, YANG, ZHANG, LIU, HAN, Study on effect of excavation of pit on its underlying metro tunnel... ..	754
12.5	WANG, ZHAN, LIU, LAN, CHEN, SU, Applying hydrogeological investigation to determine high potential zones of water inrush for a shaft construction .....	756
12.6	PARK, CHOI, K. LEE, I. LEE, Risk analysis using Bayesian networks applicable to shield TBM tunnels.....	758
12.7	GARCIA ROBLES, SALVA GOMAR, ARNAUD, Non-linear motion detection using SAR images in urban tunneling .....	760
12.8	CORRIOLS, CANDITO, FENRICH, MAYER, Integration of TBM-driving and surface auscultation data on a common web-based platform for global risk assessment. Application in Auckland waterview connection .....	762
12.9	HONG, CHO, HONG, RYU, Tunnel face ahead prediction on TBM using tunnel electrical resistivity prospecting system (TEPS) .....	764
12.10	JEON, W. KIM, S. KIM, Flexural performance evaluation of macro PET fiber reinforced tunnel shotcrete .....	766
12.11	KOHL, KAMMERER, Design and cost optimization using the latest developments in risk analysis.....	768
12.12	MORADABADI, LAEFER, CLARKE, Steps toward a probabilistic framework for tunnelling damage.....	770
12.13	LIU, HU, YUAN, YU, JI, ZUO, Evaluation of transverse seismic calculation method fora circular tunnel in soft soil.....	772
12.14	SANDER, MOERGELI, REILLY, Quantitative risk analysis - Fallacy of the single number .....	774
12.15	SCHUBERT, RADONCIC, MORITZ, Managing residual risk - A case study .....	776
12.16	SENTHILNATH, Probabilistic estimation of operating pressure for TBM tunneling .....	778
12.17	SHI, XU, MOON, YU, Boundary element simulation of tunneling induced pile settlement .....	780
12.18	OU, ZHANG, YANG, LIU, HAN, A study on the security effect of the construction of new subway station on parallel subway station structure .....	782
12.19	QI, LEI, WANG, Y. LI, Z. LI, Harmful gas eruption prediction and its protection based on solid-fluid-gas coupling in shield tunneling .....	784
12.20	SEO, CHOI, LEE, Crack detection in pillar structure using infrared thermo-graphic imaging .....	786
12.21	BOURGET, Using risk analysis in construction tendering processes .....	788
12.22	J. CHEN, YU, YUAN, LI, J. CHEN, A comparative study of mountain tunnel subjected to seismic load using 2D and 3D numerical simulations .....	790
12.23	WAGNER, Risk control in planning water conveyance tunnels.....	792
12.24	ROBINSON, SAGE, Effective application of jet grouting in soft ground tunneling .....	794
12.25	ROGUSKA, LEJK, Fuzzy risk matrix as a risk assessment method - A case study .....	796
12.26	GUPTA, GOYAL, SHARMA, SEHGAL, Risk analysis in tunnel linkage of 1500 MW Nathpa Jhakri Hydro Power Station .....	798

**SESSION 13 : EQUIPMENT OF TUNNELS AND UNDERGROUND STRUCTURES ..... 801**

13.1	SHATERPOUR MAMAGHANI, BILGIN, Raise boring operation in Kure, Kastamonu cooper mine	802
13.2	GELMI, CORTINOVIS, Sinking shaft by drill and blast using the new concept service equipment for shaft "G18-GC30/15".	804
13.3	MASUKURA, SHIRAHIGE, AZUMA, KON, YUHARA, Operation analysis and effective inspection of Model-based predictive Ventilation Control (MPVC)	806