

17TH WORLD CONFERENCE ACUUS2020

3-4 FEBRUARY 2021, VIRTUAL CONFERENCE

ACUUS2020.ORG



ALL TIMES ARE EET (CET + 1)

ON DEMAND PRESENTATIONS

A LITERATURE REVIEW OF MEDICAL SUPPORT IN CAVE RESCUE AND CONFINED SPACE MEDICINE – IMPLICATIONS IN URBAN UNDERGROUND SPACE DEVELOPMENT.

Dr Jimmy Goh CGH, Singapore

BEHAVIOUR OF AN UNDERGROUND METRO STATION FOR DIFFERENT CONSTITUTIVE MODELS - A STUDY ON THE INFLUENCE OF MOHR-COULOMB AND OTHER ADVANCED CONSTITUTIVE MODELS USING PLAXIS 2D FOR THE PROPOSED CHENNAI METRO RAIL PHASE 2 PROJECT

Ganesh Deepak Kanchuboyina AECOM, India

COMPARISON OF ENVIRONMENTAL CONTROL METHODS IN LARGE SCALE URBAN UNDERGROUND PROJECTS

Atte Werneman Forcit Consulting Ltd., Sweden

COST BENEFIT ANALYSIS OF THE ATHENS METRO LINE 3 EXPANSION PROJECT.

Prof Andreas Benardos National Technical University of Athens, Greece
Dr Athanassios Mavrikos National Technical University of Athens, Greece

DESIGN OF UNDERGROUND HIGHWAY RELOCATION TO PROMOTE URBAN REGENERATION IN ATHENS

Prof Andreas Benardos National Technical University of Athens, Greece

EFFECTS OF THE UNDERGROUND DISCHARGE CHANNEL / RESERVOIR FOR SMALL URBAN RIVERS IN TOKYO AREA

Dr Hideo Nakamura Nihon University, Japan

EXPERIENCE IN USING CROSS-WELL TOMOGRAPHY TO ASSESS SOIL STABILIZATION BY INJECTING A SOLUTION

Dr Mikhail Lebedev Research OJSC "NIPPI "Lenmetrogiprotrans", Russian Federation

FIRE SAFETY ISSUES IN UNDERGROUND SPACES: A NEED FOR REGULATORY EVOLUTION – FRENCH, SWISS AND HONG KONG SAR, CHINA (HONG KONG) CONTEXTS

Michel Deffayet Centre d'Etudes des Tunnels, France

RESEARCH ON THE DEVELOPMENT AND UTILIZATION OF UNDERGROUND SPACE IN BEIJING OLD CITY

Prof XiaoDong Shi Beijing Institute of Urban Planning and Design, China
Kejie Wu Beijing Municipal Institute of City Planning & Design, China

SIMULATION MODELS FOR URBAN TRANSPORTATION AS INPUT FOR RISK ANALYSIS

Dr Sandra König Austrian Institute of Technology, Austria

STUDY ON PLANNING OF NEW UNDERGROUND RAILWAY & NEW STATION IN THE YAESU-KYOBASHI-NIHONBASHI DISTRICT (PART 2)

Masami Yokotsuka The Urban Underground Space Center of Japan(USJ), Japan

THE DESIGN AND CONSTRUCTION OF A LARGE COMPOSITE SUBWAY STATION IN LIMITED SPACE: AN EXEMPLARY APPLICATION OF OCUE METHOD IN XUZHOU, CHINA

Dr Junzuo He Department of Geotechnical Engineering, Tongji University, China

JACKING PRECISION CONTROL OF PIPE ROOF AND LARGE BOX CULVERT BELOW URBAN EXPRESSWAY-A CASE STUDY OF A LARGE UNDERPASS IN SHANGHAI

Dr Chihao Cheng Tongji University, China

A NEW SOLUTION TO THE CONSTRUCTION OF UNDERGROUND METRO STATIONS IN DENSE URBAN AREAS IN SOFT GROUND: CONSTRUCTION COMBINATION OF OPEN-CUT SHAFTS WITH QUASI-RECTANGULAR JACKING BOXES

Yifeng Yang Department of Geotechnical Engineering, Tongji University, China

WATERPROOFING DESIGN FOR BURIED DECKS

Ben Hickman CSSW.LONDON, United Kingdom

RYAZANSKAYA TRANSIT ORIENTED DEVELOPMENT, MOSCOW RUSSIA

Dr Stefano Ceccotto Geodata SPA, Italy

STUDY ON THE DISTRIBUTION OF SULFUR-BEARING FORMATIONS IN THE SICHUAN BASIN AND ITS DAMAGE TO TUNNEL ENGINEERING

Prof Peidong Su Southwest Petroleum University, China

SPATIAL ACCESSIBILITY AND FUNCTIONAL LAYOUT IMPACTS ON URBAN UNDERGROUND SPACE DEVELOPMENT: A CASE STUDY OF SHANGHAI

Yun-Hao Dong Research Center for Underground Space and Department of Geotechnical Engineering, Tongji University, China

UNDERGROUND HEAT STORAGES

Arto Wegelius AFRY Finland Oy, Finland

PRINCIPLES OF THE INTEGRATED DEVELOPMENT OF MOSCOW CITY UNDERGROUND SPACE

Prof Dmitry Koniukhov JSC Mosinzhproekt, Russian Federation

17TH WORLD CONFERENCE ACUUS 2020

3–4 FEBRUARY 2021, VIRTUAL CONFERENCE

ACUUS2020.ORG



Associated research Centers
for the Urban Underground Space
Association des Centres de recherche
sur l'Utilisation Urbaine du Sous-sol



S A F A

ril

GOLD PARTNERS

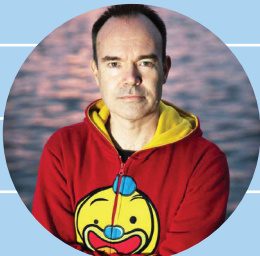



SILVER PARTNER

normet

ALL TIMES ARE EET (CET + 1)

WEDNESDAY FEBRUARY 3

9:00	OPENING & WELCOME WORDS CHAIR: ILKKA VÄHÄÄHO		
9:05	WELCOME WORDS FROM ACUUS ACUUS PRESIDENT DIMITRIS KALIAMPAKOS		
9:15	WELCOME WORDS FROM CITY OF HELSINKI DEPUTY MAYOR FOR URBAN ENVIRONMENT ANNI SINNEMÄKI		
9:30	KEYNOTE 1 - PETER VESTERBACKA Wake Up Call		
9:50	KEYNOTE 2 - TUOMAS SILVENNOINEN PES-Architects- Underground	PETER VESTERBACKA FinEst Bay Area	TUOMAS SILVENNOINEN Design Director, Partner, PES-Architects
10.20-10.45	BREAK		

SESSION 1 ARCHITECTURE

STREAM 1 11.00-12.00 CHAIR Pia Selroos

10:45		QUANTITATIVE ANALYSIS OF SPATIAL VITALITY OF UNDERGROUND SPACE IN METRO AREA BASED ON SPATIAL CHARACTERISTIC AND SOCIAL ACTIVITY Yajie Xu Anhui University of Science and Technology, China
11:00	DESIGN FRAMEWORK FOR LIGHTING AND OCCUPATIONAL WELL-BEING IN UNDERGROUND SPACES Dr Henrika Pihlajaniemi Oulu School of Architecture, University of Oulu, Finland	Underground Space Development in the Congested Urban Areas - Challenges, Opportunities and Key Design Considerations Y.K. Ho HKSAR Government, Hong Kong Jeffrey Wong HKSAR Government, Hong Kong
11:15	A SPATIAL PROTOTYPE OF NATURAL VENTILATION IN UNDERGROUND PUBLIC SPACES COMBINING COURTYARD WITH WIND TOWER Dr Yueming Wen Southeast University, School of Architecture China	DEPTH ESTIMATION OF UNDERGROUND PIPES USING GROUND PENETRATING RADAR BASED ON 3D VELOCITY SPECTRUM METHOD Dr Jian Peng China Construction Eighth Engineering Division .Corp .Ltd, China
11:30	THE IMPLICATIONS OF TECHNOLOGICAL PROGRESS IN ARCHITECTURAL THINKING: THE FUTURE IMPOSSIBILITY FOR AN ARCHITECTURE OF HIDING Julian Beqiri Architect at OMA (Office for Metropolitan Architecture) Rotterdam, Netherlands	THE IMPLEMENTATION OF NETWORK GOVERNANCE FOR SUSTAINABLE URBAN UNDERGROUND USAGE, A COMPARATIVE ANALYSIS OF THE CASE STUDIES OF THE CITIES OF RIO DE JANEIRO, BRAZIL AND HELSINKI, FINLAND. Luis Carlos Mestrinho MSc. Bartlett School of Planning, UCL, United Kingdom
11:45	WILLINGNESS TO WALK IN UNDERGROUND SPACE – EVIDENCE FROM SINGAPORE Dr John Zacharias Peking University, China	
12.00-12.30	BREAK	

SESSION 3 SAFETY AND HUMAN FACTORS 1

STREAM 1 12.30 - 13.30 CHAIR Janne Lehto

12:30	CONSTRUCTION OF UNDERGROUND SERVICE TUNNELS AS PART OF DISASTER MANAGEMENT Nanami Suzuki The Urban Underground Space Center of Japan(USJ), Japan	READ MORE INFORMATION BY CLICKING HERE - Speakers include: The ITACUS co-chairs Han Admiraal (Enprodes Management Consultancy) & Antonia Cornaro (Amberg Engineering)
12:45	RESILIENCE OF UNDERGROUND PEDESTRIAN SYSTEM: A NEW APPROACHES THROUGH NETWORK ANALYSIS Dr Ziwei Zhao Research Center of Underground Space, Army Engineering University of PLA, China	Dr. Marilu Melo (University of NSW and ITACUS lead on Urban Integration) Dr. Loretta von der Tann (NGI – Norwegian Geotechnical Institute) Shana Debrock (Flanders Government, Department of Environment and Spatial Planning and University of Antwerp PhD candidate)
13:00	CAVERN FIRE SAFETY – OVERVIEW OF REQUIREMENTS AND PRAGMATIC SOLUTIONS IN HONG KONG Wai Hon Tsang Geotechnical Engineering Office, Hong Kong	Dr. Chrysotthemis Paraskevopoulou (University of Leeds and ITACUS lead on urban sustainability)
13:15	ENHANCING UNDERGROUND DEVELOPMENT USERS' HEALTH THROUGH FACILITIES MANAGEMENT: A STUDY OF THE UNDERGROUND METRO SYSTEM IN HONG KONG Dr Isabelle Chan University of Hong Kong	Petr Salak (Dr. Sauer & Partners and ITACUS co-lead for the Young Professionals Think Deep Program), Rosanne Verloop (Amberg Engineering and ITACUS co-lead for the Young Professionals Think Deep Program)
13.30-14.00	BREAK	

SESSION 2 CITY DEVELOPMENT 1

STREAM 2 10.45-11.30 CHAIR Max Pihlström

SESSION 4 ITACUS SESSION PLANNING FOR SUSTAINABLE UNDERGROUND SPACES

STREAM 2 12.30 - 13.30 CHAIR Han Admiraal and Antonia Cornaro

17TH WORLD CONFERENCE ACUUS2020

VIRTUAL CONFERENCE

3-4 FEBRUARY 2021, VIRTUAL CONFERENCE

ACUUS2020.ORG



ALL TIMES ARE EET (CET + 1)

SESSION 5 TECHNICAL APPROACHES AND INNOVATIONS

PARTNERED BY



STREAM 1 14.00 - 15.30 CHAIR Juha Kukkonen

14:00	INNOVATIONS OF THE SERIES TECHNOLOGIES OF SELF - ADVANCING MACHINE IN SOIL AND THEIRS APPLICATION PROSPECT Prof Lu Qingguo Beijing University of Technology, China
14:15	A NON-INVASIVE GROUNDWATER FLOW DETECTION BEHIND SHORTCRETE SURFACES BY MEANS OF THERMOGRAPHIC MEASUREMENTS. Arend Oudman City of Helsinki, Finland
14:30	OPPORTUNITIES AND CHALLENGES IN THE DIGITALIZATION OF THE TUNNEL BLASTING OPERATION Hector Parra Forcit International, Finland
14:45	DIAGNOSTICS OF CONDITION OF SOIL LYING IN THE FOUNDATION OF SEWER COLLECTORS AND METRO TUNNELS BY CROSSHOLE SOUNDING METHOD IN URBAN UNDERGROUND SPACE Dr Aleksei Arkhipov "Geodiagnostika" LLC, St. Petersburg, Russian Federation
15:00	INFLUENCE OF THE DEEP PIT CONSTRUCTION ON A SETTLEMENTS OF SURROUNDING BUILDINGS Prof Ilizar Mirsayapov Kazan State University of Architecture and Engineering, Russian Federation
15:15	IMPROVING TUNNELING LONG-TERM DRILL AND BLAST PRODUCTIVITY Jouko Muona Sandvik Mining and Rock Solutions, Finland

15.30 - 16.00 BREAK

SESSION 6 UNDERGROUND INFRASTRUCTURES

STREAM 2 14.00 - 15.15 CHAIR Mikael Rinne

AN EDGE-COMPUTING-BASED SENSING SYSTEM FOR TUNNEL AND UNDERGROUND SPACE RISKS Ruida Huang Tongji University & Shanghai Municipal Engineering Design Institute (Group) Co., Ltd, China
RENOVATION MODE FOR GROWING UNDERGROUND PEDESTRIAN SYSTEM WITHIN STATION AREA: A CASE STUDY OF SHANGHAI JING'AN TEMPLE STATION Ziyun Zhang Tongji Research Center for Underground Space, Tongji University, China
DEFORMATION CHARACTERISTICS OF SEDIMENTARY ROCK DUE TO CONTINUOUS CHANGES OF MOISTURE CONTENT IN WETTING PROCESS Dr Yota Togashi Saitama University, Japan
INTEGRATION OF 3D MODELS OF STRUCTURES AND GEOLOGICAL COMPOSITION AS AN UNDERGROUND INFRASTRUCTURE MODEL Toshiaki Hakoda JGC Japan Corporation, Japan

SESSION 7 CITY DEVELOPMENT 2

STREAM 1 16.00-17.00 CHAIR Eivind Grøv

16:00	CHALLENGES IN DESIGN AND CONSTRUCTION OF UNDERGROUND CEMETERY Arik Glazer Rolzur Underground Solutions, Israel
16:15	A PERSPECTIVE ON THE GOVERNANCE OF LONDON'S SUBSURFACE Loretta von der Tann Norwegian Geotechnical Institute, Norway
16:30	MULTIPLE ROCK WORKS IN DEMANDING URBAN AREA FOR WASTE WATER TREATMENT DEVELOPMENT IN STOCKHOLM Kari J Korhonen YIT, Finland
16:45	RE-PROMOTING SUSTAINABLE UNDERGROUND URBANIZATION FOR DEVELOPED AND DEVELOPING COUNTRIES IN OUR MODERN HISTORY Dr AMY HUANQING LI ACUUS, Canada

17:00

17.00 - 17.30 BREAK

SESSION 8 URBAN PLANNING 1

STREAM 2 16.00-17.15 CHAIR Jouko Kunnas

UNDERGROUND URBANISM - PLANNING IN 3D Elizabeth Reynolds MRTPI, United Kingdom
INITIATIVES FOR FORMATION AND EFFECTIVE UTILIZATION OF UNDERGROUND PEDESTRIAN NETWORKS IN JAPAN Yuji Tsutsui Ministry of Land, Infrastructure, Transport and Tourism, Japan
MAPPING OF UNDERGROUND SERVICE SPACE IN THE CENTER OF HELSINKI. Arend Oudman City of Helsinki, Soil and Bedrock Unit, Finland
UNDERGROUND URBANISM IN THE U.S. Dr Priscilla Nelson Colorado School of Mines, United States

SESSION 9 KEYNOTE SESSION

STREAM 1 17:30 CHAIR Per Tengborg

17:30	KEYNOTE 3 - BERND HAGENAH & THOMAS GRASSI Ventilation and Architectural Measures to Mitigate Pathogen Related Safety and Health Risks in the Transportation Sector
18:00	KEYNOTE 4 - K.N. GUNALAN



BERND HAGENAH
Associate Vice President,
HNTB Corporation



THOMAS L GRASSI
Associate Vice President,
HNTB Corporation



K. N. GUNALAN
Asce President 2020

17TH WORLD CONFERENCE ACUUS2020

3–4 FEBRUARY 2021, VIRTUAL CONFERENCE

ACUUS2020.ORG



ALL TIMES ARE EET (CET + 1)

THURSDAY FEBRUARY 4

SESSION 10 KEYNOTE SESSION

STREAM 1 09.00 - 10.00 CHAIR Jenny Norrman

- 9:00 **KEYNOTE 5 - JIAN WANG**
Shenzhen Chegongmiao Integrated Underground Traffic Hub Project
- 9:30 **KEYNOTE 6 - ROSS DIMMOCK**
Smart technologies for creating urban underground spaces

10.00-10.30 **BREAK**



ROSS DIMMOCK
Normet Vice President - Europe
and Middle East

SESSION 11 URBAN PLANNING 2

STREAM 1 10.30 - 11.45 CHAIR Dongjun Guo

- 10:30 **A FEASIBILITY STUDY OF URBAN UNDERGROUND LOGISTICS SYSTEM - A CASE STUDY OF SHANGHAI**
Dr Bin Lu Shanghai Municipal Engineering Design Institute (Group) Co., Ltd., China
- 10:45 **EVALUATION OF SPATIAL PERFORMANCE OF URBAN UNDERGROUND PUBLIC SPACE: A CASE STUDY OF WUJIAOCHANG SUB-CENTER IN SHANGHAI**
Chen-Xiao Ma Research Center for Underground Space and Department of Geotechnical Engineering, Tongji University, China
- 11:00 **STUDY ON IMPLEMENTATION STRATEGIES OF MULTIFUNCTIONAL LINEAR UNDERGROUND SPACE: A CASE STUDY IN BEIJING'S SUB-CENTER**
Wei Meng Beijing Municipal Institute of City Planning and Design, China
- 11:15 **THE MAIN CHARACTERISTICS OF URBAN UNDERGROUND SPACE REGULATORY PLAN FROM THE PERSPECTIVE OF CHINA'S SPATIAL PLANNING: A PRACTICE IN BEIJING SUB-CENTER**
Gao Chao Beijing Municipal Institute of City Planning and Design, China
- 11:30 **AN EXPLORATION OF THE PLANNING APPROACH FOR NEW DEVELOPMENT AREA WITH UNDERGROUND SPACE IN HONG KONG**
Kelvin Law AECOM Asia Co Ltd, Hong Kong

11.45 - 12.15 **BREAK**

SESSION 12 PERSPECTIVES

STREAM 2 10.30 - 11.30 CHAIR Timo Saario

- STUDY ON THE MANDATORY STANDARD OF URBAN UNDERGROUND SPACE CONSTRUCTION**
Dr Yiqun Fan Shanghai Municipal Engineering Design Institute (Group) Co., Ltd., China
- VISUALIZATION OF 3D ROCK MASS PROPERTIES IN UNDERGROUND TUNNELS USING EXTENDED REALITY**
Dr Mateusz Janiszewski Aalto University, School of Engineering, Finland
- TUNNELING FOR FUTURE TRANSPORTATION TECHNOLOGIES**
Anthony Bauer HNTB, United States
- POSIVA EKA PROJECT - CONSTRUCTING THE WORLD'S FIRST FINAL DISPOSAL FACILITY OF THE SPENT NUCLEAR FUEL**
Sanna Mustonen Posiva Solutions Oy, Finland

SESSION 13 DESIGN PARTNERED BY



STREAM 1 12.15 - 13.30 CHAIR Mikko Inkala

- 12:15 **ENVIRONMENTALLY DRIVEN TUNNELLING IN FINLAND, TURKU WASTEWATER TREATMENT PLANT OUTLET INCREASE**
Guido Nuijten AFRY Finland Oy, Finland
- 12:30 **SUB SEA TUNNEL LINKING FÖGLÖ WITH THE MAIN CITY MARIEHAMN IN ÅLAND**
Prof Eivind Grov SINTEF, Norway
- 12:45 **DISPLACEMENT OF 'SLURRY WALL' IN THE COURSE OF SUBWAY STATION CONSTRUCTION ON THE WATER-BORNE TERRITORY ACCORDING TO 'TOP-DOWN' TECHNOLOGY**
Dr Mikhail Lebedev OJSC "NIPPI "Lenmetrogiprotrans", Russian Federation
- 13:00 **ROAD TUNNEL CONSTRUCTION UNDER LIIPOLA DISTRICT IN VT12 LAHTI SOUTHERN BYPASS -PROJECT**
Olli Salo AFRY Finland Oy, Finland
- 13:15 **PREDICTION OF BLAST-INDUCED GROUND VIBRATIONS WITH THE USE OF ARTIFICIAL NEURAL NETWORKS. A CASE STUDY IN GREECE**
Zannis Xenios National Technical University of Athens, Greece
Prof Andreas Benardos National Technical University of Athens, Greece

13:30

13.45-14.15 **BREAK**

SESSION 14 GEOTHERMAL ENERGY

STREAM 2 12.15 - 13.45 CHAIR Gregor Hillers

- THERMAL MODELLING OF DEEP GEOTHERMAL WELLS**
Dr Elias Pentti AFRY Finland Oy, Finland
- ST1 DEEP HEAT PROJECT: GEOTHERMAL ENERGY TO THE DISTRICT HEATING NETWORK IN ESPOO**
Matti Pentti ST1 Oy, Finland
- SEISMIC NETWORKS TO MONITOR THE 2018 AND 2020 GEOTHERMAL STIMULATIONS IN ESPOO/HELSINKI: DEPLOYMENT, DATA FEATURES, AND OBSERVATIONS**
Prof Gregor Hillers University of Helsinki, Finland
- GEOTHERMAL ENERGY IN URBAN PLANNING**
Dr Nikolai Bobylev Saint Petersburg State University, Russian Federation
- COULD GROUND HEAT AND GEOTHERMAL ENERGY BE THE ANSWER TO CLIMATE CHANGE PREVENTION AND ENERGY DEMAND?**
Ilkka Vähäaho City of Helsinki, Soil and Bedrock Unit, Finland
- LOCAL GEOTHERMAL LOW TEMPERATURE HEATING NETWORKS – CARBON NEUTRAL FUTURE OF DISTRICT HEATING**
Mikael Maksimow QHeat, Finland

17TH WORLD CONFERENCE ACUUS2020

VIRTUAL CONFERENCE

3-4 FEBRUARY 2021, VIRTUAL CONFERENCE

ACUUS2020.ORG



ALL TIMES ARE EET (CET + 1)

SESSION 15 SUSTAINABILITY AND ENVIRONMENT

STREAM 1 14:15 - 15:45 CHAIR Arend Oudman

14:15	SEASONAL UNDERGROUND STORAGE OF SOLAR THERMAL ENERGY Dr Mateusz Janiszewski Aalto University, School of Engineering, Finland
14:30	UNDERGROUND GREEN FARMING Klaus Wachter SCAUT Association, Switzerland
14:45	CARGO SOUS TERRAIN – AN INTELLIGENT LOGISTIC SOLUTION FOR OUR CITIES Dr Hans-Martin Braun AFRY Switzerland Ltd., Switzerland
15:00	HYDROGEOLOGY AND HYDROGEOCHEMISTRY IN PLANNING OF UNDERGROUND FACILITIES Anneli Wichmann AFRY Finland Oy, Finland
15:15	SUSTAINABLE UNDERGROUND OPERATIONS – THOUGHTS ON BATTERY ELECTRIC VEHICLES IN TUNNELLING Panu Oikkonen NORMET OY, Finland
15:30	CARBON FOOTPRINT IN ROCK CONSTRUCTION PROJECT Jyri Liukko YIT Suomi Oy, Finland

15:45-16:15 BREAK

SESSION 17 URBAN PLANNING 3

STREAM 1 16:15 - 17:15 CHAIR Sanja Zlatanic

16:15	MAPPING SUBSURFACE QUALITIES FOR PLANNING PURPOSES: A PILOT STUDY Dr Jenny Norrman Chalmers University of Technology, Sweden
16:30	UNDERGROUND MASTER PLAN OF THE CITY OF HELSINKI Pasi Rajala City of Helsinki, Finland
16:45	SIGNIFICANT ROLE OF THE UNDERGROUND WORLD IN HELSINKI ENERGY TRANSITION Jouni Kivirinne Helen LTD, Finland
17:00	THE ONSET OF UNDERGROUND URBAN PLANNING IN FLANDERS Shana Debrock Departement Omgeving Flanders/ Faculty of Design Sciences University of Antwerp, Belgium

17:15-17:30 BREAK

SESSION 16 REUSE OF UNDERGROUND SPACES

STREAM 2 14:15 - 15:15 CHAIR Erik Johansson

DEVELOPMENT OF PUBLIC SPACES AFFECTED BY THE DEVELOPMENT OF UNDERGROUND SPACES: A NEW METHOD TO IMPROVE LIVING STANDARDS IN TEHRAN METROPOLIS Mohammad Mahdi Safaei ACUUS Iran, Islamic Republic of	14:15
UNDERGROUND HEAT MINE – POTENTIAL FOR LARGE SCALE PRODUCTION AND STORAGE OF CO2-FREE THERMAL ENERGY Dr Lasse Ahonen Geological Survey of Finland, Finland	14:30
THE EFFECTS OF PREDESIGN ON REUSABLE UNDERGROUND SPACES IN AN URBAN CONTEXT Ville Annala Kalliosuunnittelu Oy Rockplan, Finland	14:45
SAVILAHTI UNDERGROUND SPORT AND EVENT CENTER Veera Tasapuro AINS Group, Finland	15:00

BREAK 15:15-15:45

SESSION 18 SAFETY AND HUMAN FACTORS 2

STREAM 2 15:45 - 16:45 CHAIR Raymond Sterling

PARAMETERS THAT AFFECT TENABILITY CONDITIONS DURING FIRE EMERGENCY IN METRO TUNNELS Despoina Papakonstantinou National Technical University of Athens, Greece	15:45
ROLE OF FAN CONTROL TECHNOLOGIES IN SAFE, RELIABLE AND ENERGY EFFICIENT TUNNEL VENTILATION. Maria Fedorovicheva ABB, Finland	16:00
UNDERGROUND RESCUE 2019 - 2022 Risto Mäkeläinen Callio Underground Rescue, Finland	16:15
COMPUTER MODELING ANALYSIS OF METRO TICKET GATES IMPACT TO EVACUATION PROCEDURES Despoina Papakonstantinou National Technical University of Athens, Greece	16:30

BREAK 16:45-17:30

CLOSING SESSION

STREAM 2 17:30-19:00 CHAIR Jacques Besner

KEYNOTE 7 - JANET BENINI Sustained Transportation Operations During Pandemic	17:30
KEYNOTE 8 - DIMITRIS KALIAMPAKOS	18:00
ACUUS 2023 ANNOUNCEMENT AND CLOSING WORDS	18:30



JANET K. BENINI



DIMITRIS KALIAMPAKOS
ACUUS President