PROGRAM BOOK

NCE NISE TC 101 '22

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İNŞAAT MÜHENDİSLERİ ODASI
CHAMBER OF CIVIL ENGINEERS
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2nd National Civil Engineering Symposium

2. Ulusal İnşaat Mühendisliği Sempozyumu

14-15 Eylül 2022
14-15 September 2022

2nd Nature Inspired Solutions For The Built Environment Conference (NISE)

2. Uluslararası Yapılar İçin Doğadan İlham Alan Çözümler Konferansı

16 Eylül 2022
16 September 2022

International Workshop on Advances in Laboratory Testing of Liquefiable Soils

Sıvılaşan Zeminlerde Laboratuvar Uygulamaları Uluslararası Çalıştayı

17 Eylül 2022
17 September 2022

Acapulco Resort Convention SPA Hotel

North Cyprus

14 -17 Eylül 2022
14 - 17 September 2022

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Welcome Message

The 1st National Civil Engineering Symposium, in which studies specific to Cyprus were presented, made a sound, with the participation of both our country's academicians and our colleagues from the industry. Within the scope of the symposium, 8 sessions and 45 presentations were held in Turkish or English (Turkish translation) for two days in the sessions organized in the Civil Engineering sub-branches of structural engineering, geotechnical engineering, water resources, materials sciences, project management, and traffic and transportation engineering sub-branches.

It has been decided to repeat the symposium, which received the appreciation of both the academic communities of the country and our colleagues from the industry. In the following process, it was decided to organize the mentioned symposium every two years and to focus on the topics that we will examine the problems of the country in addition to general civil engineering. In this context, the first two days of the symposium to be held on 14-17 September 2022 will cover general civil engineering issues, on the third day a conference on soil improvement issues will be held with international participation, and on the last day of the symposium an international workshop will be organised with the auspiracy of TC101 Laboratory Testing - Technical Committee of International Society for Soil Mechanics and Geotechnical Engineering.

It is obvious how important such studies are in our country, where professional people as well as professional organizations are ignored and not given the necessary importance. In this sense, CCE, which has taken every necessary step within its corporate structure, has undertaken a mission to carry society in general and the professionals exclusively to the point they deserve in the national and international community.

We would like to thank all local and foreign professionals and academicians who will contribute to the symposium to be held in this context, reminding us once again that Civil Engineering, a universal profession, is the ambassador that connects countries and cultures. We wish you success.

Gürkan Yağcıoğlu
UCCTEA Chamber of Civil Engineers
President

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Themes

14-15 September 2022

National Civil Engineering Symposium

- Water Resources
- Traffic and Transportation Engineering
- Material Sciences
- Construction Management
- Structural Engineering

16 September 2022

Natural Inspired Solutions for The Build Environment Conference

- 3Ms: Nature-inspired Materials, Methods and Models
- Biomechanics, technologies, and implementation
- Risks, management and governance

17 September 2022

International Workshop on Advances in Laboratory Testing of Liquefiable Soils

- Advances in laboratory testing techniques; novel sensors for laboratory testing, digital image and PIV analysis, particle-scale experimental observation.
- Advances in ground investigation and field monitoring; geophysical methods, advanced sampling and insitu testing.
- Constitutive modelling of geomaterials; cyclic and dynamic behaviour, anisotropy and localisation,time dependent responses
- Physical modelling; thermal behaviour

General Program

2nd NATIONAL CIVIL ENGINEERING SYMPOSIUM		2nd NATURE INSPIRED SOLUTIONS FOR THE BUILT ENVIRONMENT CONFERENCE	INTERNATIONAL WORKSHOP ON ADVANCES IN LABORATORY TESTING OF LIQUEFIABLE SOILS
SEP. 14 (WED)	SEP.15 (THU)	SEP.16 (FRI)	SEP.17 (SAT)
Registration (08:30-09.00)	Registration (08:30-09:00)	Registration (09:00-09:30)	Registration (08:30-09:00)
		Opening Speech of Chair Dr. Arya Assadi Langroudi (09:30-09:45)	Opening Speech of Chair Prof. Dr. Matthew R. Coop (09:00-09:15)
Opening Ceramony (09:00-10:00)	Session 4 Construction Management Keynote Speaker Prof. Dr. Talat M. Birgönül (09:0-09:40)	Keynote speaker Dr. Henry Dicks (09:45-10:15)	Keynote speaker Prof. Dr. Atilla Ansal (09:15-09:55)
	Technical Session Construction Management (09:40-10:35)		
Coffee Break (10:00-10:15)	Coffee Break (10:35-10:50)	Coffee Break (10:15-10:30)	Coffee Break (09:55-10:10)
Session 1 Structural Engineering Keynote Speaker Senior Atila Zekioğlu (10:15-10:55)	Session 5 Traffic &Transportation Engineering Keynote Speaker Prof. Dr. Serhan Tanyel (10:50-11:30)	Technical Session (3Ms: MAterials, MEthods, Models) (10:30-12:00)	Session 1 Advances in laboratory testing techniques Keynote Speaker Prof. Dr. Nilo Cesar Consoli (10:10-10:50)
			Technical Session (10:50-11:35)
Technical Session Structural Engineering (10:55-12:10)	Technical Session Traffic &Transportation Engineering (11:30-12:25)		
LUNCH (12:10-13:10)	LUNCH (12:25-13:25)	LUNCH (12:00-13:20)	LUNCH (12:30-13:30)
Special Session: Tüfekçi Ltd. (13:10-13:20)	Session 6 Materials Sciences Keynote Speaker Prof. Dr. Rafat Siddique (13:25-14:05)	Session 2 Keynote speaker Dr. Pedro Miguel vaz Ferreira (13:20-13:50)	Session 2 Advances in ground investigation and field monitoring Keynote Speaker Prof. Dr. Robb Moss (13:30-14:10)
Session 2 Water Resources Keynote Speaker Prof. Dr. Hafzullah Aksoy (13:20-14:00)		Technical Session Technologies and Implementation (13:50-16:00)	Technical Session (14:10-14:55)
Technical Session Water Resources (14:00-15:20)	Technical Session - Materials Sciences (14:05-15:45)		Keynote Speaker Prof. Dr. Kemal Önder Çetin (14:55-15:35)
Coffee Break (15:20-15:35)	Coffee Break (15:45-16:00)	Coffee Break (16:00-16:20)	Coffee Break (15:50-16:05)
		Session 3 Keynote speaker Prof. Dr. Mustafa Laman (16:20-16:50)	Session 3 - Constitutive modelling of geomaterials & Physical modelling Keynote speaker Dr. Andrea Diambra (16:05-16:40)
Session 3 - Technical Session Water Resources (15:35-16:40)	Session 7 Technical Session - Materials Sciences (16:00-17:40)	Technical Session Risks, management and governace (16:50-18:20)	Technical Session (16:45-17:30)
Day Closure (16:40-16:50)	Day Closure (17:20-17:40)	Day Closure (18 :20-18 :30)	Keynote Speaker Dr. Cristiana Ferreira (17:30-18:10)
			Closure (18:10-18:25)
	WORKSHOP: EARTHEN CONSTRUCTION Prof. Dr. Bilge Işık (18:00-19:00)		Gala Dinner (20:00-24:00)

Daily Program

2nd National Civil Engineering Symposium
14 September 2022

EVENT CHAIR

Assist. Prof. Dr. BERTUĞ AKINTUĞ (Middle East Technical University)

THEMES:

A1- Structural Engineering A2- Water Resources A3-Construction Management A4-Traffic and Transportation Engineering A5-Material Sciences

Topic	Author	Theme	Institution	Time
Opening Ceremony				09:00-10:00
COFFEE BREAK				10:00-10:15
SESSION 1: Chair of Session: Prof. Dr. Serhan Şensoy (Eastern Mediterranean University)				
Reflections from 37+ years of… Learning Knowledge Sharing Inspiring and Inspired by My Teams & Clients…and continuing!	**Atila Zekioğlu Keynote Speaker**	**A1**	**-**	**10:15-10:55**
A Case Study: Progressive Collapse Analysis of Existing RC Buildings	Mürüde Çelikağ Ahmed Zaid Shams-Al	A1	Eastern Mediterranean University	10:55-11:05
A Method Based on Empirical and Analytical Assessment of Masonry Structures Under Seismic Action	Mehmet Cemal Geneş L. Abrahamczyk S. Kacin A. M. Erberik	A1	Eastern Mediterranean University Bauhaus University Iskenderun Technical University Middle East Technical University	11:05-11:15
Physics-Informed Neural Networks: A Rapid Solution of Structural Engineering Partial Differential Equations	Ahed Habib Umut Yıldırım	A1	Eastern Mediterranean University	11:15-11:25
A Case Study about Designing of Block Foundations	Mehmet Salih Ölmez H. Hülya Kostak	A1	TEMELSU International Engineering Services Inc.	11:25-11:35
Soil Settlement Due to Underground Tunneling in Different Soil Types	Hamza Saeed Eriş Uygar	A1	Eastern Mediterranean University	11:35-11:50
QUESTION & ANSWER				11:50-12:10
LUNCH				12:10-13:10
Special Session :Tüfekçi Ltd.				13:10-13:20
SESSION 2: Chair of Session: Prof. Dr. Umut Türker (Eastern Mediterranean University)				
Drought Conceptualization and IDF Curves for Water Resources Management	**Hafzullah Aksoy Keynote Speaker**	**A2**	**İstanbul Technical University**	**13:20-14:00**
Flood Risk Analysis of İskele Long-Beach Area	Bertuğ Akıntuğ	A2	Middle East Technical University	13:50-14:00
Open Channel Geometry Optimization Incorporating Climate Change to Mitigate Asset Loses	İbrahim Bay	A2	European University of Lefke	14:10-14:20
Transboundary Waters and Their Status in Today's Water-scarce World	Hüseyin Gökçekuş Farhad Bolouri	A2	Near East University	14:20-14:30
Impact of Model Data Availability on the Assessment of Bridge Scour Risk	Hasan Zaifoğlu Boulent Imam	A2	Middle East Technical University University of Surrey	14:30-14:40
Statistical Analyses of Extreme Weather events frequency in Northern Cyprus	Nuray Vakitbilir Adnan Hilal Bertuğ Akıntuğ	A2	Middle East Technical University	14:40-14:50
Investigating the status of water management education in line with sustainability education in higher education institutions in Northern Cyprus	Farhad Bolouri Hüseyin Gökçekuş	A2	Near East University	14:50-15:00
QUESTION & ANSWER				15:00-15:20
COFFEE BREAK				15:20-15:35

Daily Program

SESSION 3: Chair of Session: Assist. Prof. Dr. İbrahim Bay (European University of Lefke)				
Flood Management and Remedial Measures for Dikmen, Northern Cyprus	Noor Ahmad Yaqoubi Hasan Zaifoğlu Bertuğ Akıntuğ	A2	Middle East Technical University	15:35-15:45
Water Budget Analyses of Northern Cyprus	Adnan Hilal Nuray Vakitbilir Bertuğ Akıntuğ	A2	Middle East Technical University	15:45-15:55
Prediction of Runoff Using Artificial Neural Networks, MLR Regression and ARIMA Model (A Case Study: Naher El Bared River, Lebanon)	Youssef Kasssem Hüseyin Gökçekuş	A2	Near East University	15:55-16:05
Sustainable Stormwater Management Practices for Middle East Technical University, Northern Cyprus Campus	Mirza Baig Bertuğ Akıntuğ	A2	Middle East Technical University	16:05-16:15
Climate Change Adaptation and Integrated Water Resource Management in the Water Sector	Henok Seman Fidan Aslanova Gözen Elkıran	A2	Near East University	16:15-16:25 (ONLINE)
QUESTION & ANSWER				16:25-16:40
DAY CLOSURE				16:40-16:50

Daily Program

2nd National Civil Engineering Symposium
15 September 2022

EVENT CHAIR

Assist. Prof. Dr. BERTUĞ AKINTUĞ (Middle East Technical University)

THEMES:

A1- Structural Engineering A2- Water Resources A3-Construction Management A4-Traffic and Transportation Engineering A5-Material Sciences

Topic	Author	Theme	Institution	Time
SESSION 4: Chair of Session: Prof. Dr.Tahir Çelik (Cyprus International University)				
Residua: From Nostalgia Towards Future-Evolution of Construction Management Topics since 1980s	**M. Talat Birgönül Keynote Speaker**	**A3**	**Middle East Technical University**	**09:00-09:40**
Optimization of Reinforcement Steel in Building Construction Projects	Tahir Çelik Abdul İbrahim Kamara	A3	Cyprus International University	09:40-09:50
Değişik Çekiciliğe Sahip Gayrimenkul Reklamlarının Tüketiciler Üzerinde Etkilerinin İncelenmesi	Cenk Budayan Sezin Nas	A3	Middle East Technical University	09:50-10:00
The Evaluation of Relationship Between Work Accidents and Occupational Health and Safety in North Cyprus	Hasan Dilek İbrahim Bay	A3	European University of Lefke	10:10-10:10
Identifying and Managing Most Common Risks in Nigerian Construction Projects	Vivian C. Okpalaku-Nath Ali Erhan Özdemir	A3	Cyprus International University	10:10-10:20
QUESTION & ANSWER				10:20-10:35
COFFE BREAK				10:35-10:50
SESSION 5: Chair of Session: Assoc. Prof. Dr. Mehmet Metin Kunt (Eastern Mediterranean University)				
Autonomous Vehicles: What should we expect?	**Serhan Tanyel Keynote Speaker**	**A4**	**Dokuz Eylül University**	**10:50-11:30**
Improved Travelling Salesman Problem Analysis with Network Analysis Tool	Mehmet Metin Kunt	A4	Eastern Mediterranean University	11:30-11:40
Excremental Evaluation of Physical Properties Geopolymer Modified Various Sources of Asphalt Binder	Khalifa Gallouz Shaban Ismael Albrka Ali Ahmad Nazrul Hakimi Ibrahim	A4	Near East University Near East University Universiti Kebangsaan Malaysia	11:40-11:50
The Impact of Micro Bauxite Powder and Nano Bauxite Powder on the Mechanical Properties of Asphalt Mixture	Hamza Mohamed Abdulhamid Allam Musbah Al Allam Ahmed Suliman B. Ali Shaban Ismael Albrka Ali	A4	College of Technical Sciences Engineering and Information Technology Research Center Universiti Tun Hussein Onn Malaysia Near East University	11:50-12:00
Determination of Landslide Susceptibility Based on GIS with MASW Data and Machine Learning Algorithms	Hilmi Dindar Çağan Alevkayalı	A4	Cyprus International University Suleyman Demirel University	12:00-12:10
QUESTION & ANSWER				12:10-12:25
LUNCH				12:25-13:25

Daily Program

SESSION 6: Chair of Session: Assoc. Prof. Dr. Ertuğ Aydın (European University of Lefke)				
Development of Sustainable Greener Concrete By Utilizing Industrial By-Products	**Rafat Siddique Keynote Speaker**	**A5**	**Thapar Institute of Engineering & Technology**	**13:25-14:05**
Glass Fiber Utilized Low Carbon Paste Production	Şevket Can Bostancı	A5	European University of Lefke	14:05-14:15
Enhancing the Properties of the Sulfur Concrete Using Polymers	Behnam Rafie Khaled Marar Tulin Akçaoğlu	A5	Eastern Mediterranean University	14:15-14:25
A Review of the Effect of Self-Healing an of Waste Material of ECC	Ramadan İyikal Ayşe Pekrioğlu Balkıs	A5	Cyprus International University	14:25-14:35
Performance of Recycled Concrete Aggregates- Containing Concrete Exposed to Heating-Cooling Cycles	Alhamza Derki Pınar Akpınar	A5	Near East University Bahçeşehir Cyprus University	14:35-14:45
Production and Installation of Prefabricated Concrete Building Elements with 3D Printing Technology	Halit Dilşad Yılmaz Serhat Zeytun Ersel Coşkun Bahar Karadağ Ali İbiş	A5	İSTON İstanbul Beton Elemanları ve Hazır Beton Fabrikaları San. Tic. A.Ş.	14:45-14:55
Effect of Waste Glass Powder and Coal Bottom Ash in Concrete	Stephen Babajide Mohammad Ali Mosaberpanah	A5	Cyprus International University	14:55-15:05
Assessment of Ternary Gradation of Coarse Aggregate on the Mechanical Strength, Durability Properties and Microstructure of Pervious Concrete Pavement	Chibueze S. Ajuonuma Mohammad Ali Mosaberpanah	A5	Cyprus International University	15:05-15:15
Using Sawdust in Sustainable Concrete Production	Ömer Damdelen	A5	Cyprus International University	15:15-15:25
QUESTION&ANSWER				15:25-15:45
COFFEE BREAK				15:45-16:00
SESSION 7: Chair of Session:Assoc. Prof. Dr. Mohammad Ali Mosaberpanah (Cyprus International University)				
Learning from Earthen Architectural Heritage in Cyprus	Bilge Işık	A5	İstanbul Technical University	16:00-16:10
Influence of Integrating Rubbers Waste on Earthen Construction Adobe Properties	Maroan Elgallal Ayşe Pekrioğlu Balkıs	A5	Cyprus International University	16:10-16:20 (ONLINE)
Energizing North Cyprus Earthen Architecture: Rethinking the Future	Aya Ahmad Ayşe Pekrioğlu Balkıs	A5	Cyprus International University	16:20-16:30
Recycling of Fibre Reinforced Polymer (FRP) Composite Materials	Jawed Qureshi	A5	University of East London	16:30-16:40 (ONLINE)
Alternative Approaches For Sustainable Concrete Construction	Aslı Bahire Bardak Ertuğ Aydın Abdullah Ekinci	A5	European University of Lefke Middle East Technical University	16:40-16:50
Performance of Hardened Cement Mortars Prepeared with Waste Glass and Brick	Hasan Dilek Pınar Akpınar	A5	Bahçeşehir Cyprus University	16:50-17:00
Effects of Waste Utilization on Behavior of Beams	Vahid Tabrizi Ayşe Pekrioğlu Balkıs	A5	Cyprus International University	17:00-17:10
Cement Replacement with Waste Brick Powder in Paving Blocks	Victor Temiloluwalase Ojotisa Shihab Ibrahim	A5	Cyprus International University	17:10-17:20
QUESTION&ANSWER				17:20-17:40
CLOSURE and next steps				17:40-17:50
WORKSHOP: EARTHEN CONSTRUCTION Bilge Işık				18:00-19:00

Daily Program

Nature inspired solutions for the built environment (NiSE2)
16 September 2022

EVENT CHAIR

Dr. Arya Assadi Langroudi (University of East London)

THEMES:

B1: 3Ms: MAterials, MEthods, MOdels B2: Technologies and Implementation B3: Risks, management and governace

Topic	Author	Theme	Institution	Time
Opening speech: Dr. Arya Assadi Langroudi (NiSE Chair)				09:30-09:45
Realizing the Biomimicry Revolution: The End of Philosophy of Technology and the Rise of Technics	**Henry Dicks Keynote Speaker**		**Univ. of Leeds**	**09:45-10:15 (ONLINE)**
COFFEE BREAK				10:15-10:30
SESSION 1: Chair of Session: Dr. Arya Assadi Langroudi (University of East London)				
Review of utilization of biopolymer in soil stabilization	Buğse İlman Ayşe Pekrioğlu Balkıs	B1-MA	Cyprus Int'l Univ.	10:30-10:40
An investigation on the potential of cellulose for geotechnical applications	E Ramani Sujatha, Govindarajan Kannan	B1-MA	SASTRA Deemed Univ.	10:42-10:52 (ONLINE)
Scopes for using activated lime sludge in earth-based building materials	Arya Assadi Langroudi, Soheil Ghadr	B1-MA	Univ. of East London National Cheng Kung Univ.	10:54-11:04
Influence of severe climate conditions on the properties of soil reinforced with waste plastic shreds	Ahmed Basil Haider Anoosheh Iravanian Abdullah Ekinci	B1-MA	Duhok polytechnic Univ. Near East Univ. Middle East Tech. Univ.	11:06-11:16 (ONLINE)
Mitigating Collapse Potential of Calcareous Soil Using a Sodium Silicate Solution	Alfred Opukumo Wilson , Stephanie Glendinning, Collin Davie	B1-MA	Univ. of Newcastle	11:18-11:28 (ONLINE)
Geopolymer Brick from Construction and Demolition Waste	Polydor Kasongo Kahenga, Elijah Kimpinde Kipuluka, Mahmoud Bilounah, Shihab Ibrahim	B1-MA	Cyprus Int'l Univ.	11:30-11:40
Potential Applications of Enzymatic Calcium Carbonate Precipitation (EICP) for the Liquefaction Mitigation	Ahmed Miftah, Huriye Bilsel	B1-MA	San Diego State University Cyprus Int'l Univ.	11:42-11:52
Closure of B1-MA What to expect in B1-MA in Session 2	Arya Assadi Langroudi	B1-MA	Univ. of East London	11:55-12:00
LUNCH				12:00-13:20
SESSION 2: Chair of Session: Dr Arya Assadi Langroudi (University of East London)				
Cemented granular soil for road and rail infrastructure	**Pedro Miguel vaz Ferreira Keynote Speaker**		**Univ. College of London**	**13:20-13:50**
Geopolymer Soil Stabilization Using Waste Glass Powder	Elijah Kimpinde Kipuluka, Polydor Kasongo Kahenga, Mahmoud Bilounah, Shihab Ibrahim	B1-MA	Cyprus Int'l Univ.	13:52-14:02
Pine Needles as Natural Reinforcement for Adobe: Towards Green Buildings in Lebanon	Aya Ahmad, Ayşe Pekrioğlu Balkıs	B1-MA	Cyprus Int'l Univ.	14:04-14:14
Shear strength and suction properties of North Cyprus sands	Abubakar Sani Lawal, Anoosheh Iravanian	B1-MA	Near East Univ.	14:16-14:26 (ONLINE)

Daily Program

The effect of nano-SiO_2 on the unconfined compressive strength of MICP-treated kaolin soil	Sara Ghalandarzadeh, Pooneh Maghoul, Benoît Courcelles, Richard Boudreault	B1-MA	Polytechnique Montreal	14:28-14:38 (ONLINE)
Closure of B1-MA	Arya Assadi Langroudi		Univ. of East London	14:38-14:45
A novel application of close-range photogrammetry for earth retaining wall and slope stability assessment	Mehrdad Nategh, Abdullah Ekinci, Anoosheh Iravanian	B1-ME	Near East Univ. Middle East Tech. Univ. Near East Univ.	14:45-14:55
Closure of B1-ME	Arya Assadi Langroudi		Univ. of East London	14:55-15:00
Thermo-Hydro-BiogeoChemical modeling of permafrost carbon feedback	Niloofar Fasaeiyan, Pooneh Maghoul, Richard Boudreault	B1-MO	Polytechnique Montreal	15:02-15:12 (ONLINE)
Frictional directionality between snakeskin-inspired surfaces and soils	Lin Huang, Alejandro Martinez	B1-MO	UC Davis	15:14-15:24 (ONLINE)
An experimental study on the effects of A/Ac and frequency of input motion on the behavior of rocking foundations	Arash Esmatkhah Irani, Masoud Hajialilue Bonab, Fariba Behrooz Sarand, Hooshang Katebi	B1-MO	University of Tabriz	15:26-15:36 (ONLINE)
Dynamic response of shallow mat footings on coir geotextile reinforced sand under cyclic loading	Mohamad Hanafi, Abdullah Ekinci	B1-MO	European Univ. of Lefke Middle East Tech. Univ.	15:36-15:46
Closure of B1-MO	Arya Assadi Langroudi		Univ. of East London	15:46-15:56
COFFEE BREAK				15:56-16:20
SESSION 3: Chair of Session: Dr. Arya Assadi Langroudi (University of East London)				
Design, application, and quality control of popular soil improvement methods	**Mustafa Laman Keynote speaker**		**Perform Engineering&Consultancy**	**16:20-16:50**
Developing a novel methodology to calibrate building energy use in the South-eastern Mediterranean climate	Bertuğ Özarısoy, Haşim Altan	B2	Univ. of East London Arkin Univ. of Creative Arts & Design	16:52-17:02
A Phenomenological approach to light and shadow in interior built spaces	Solmaz Kamalifard, Arya Assadi Langroudi	B2	Akademie der Bildenden Künste Wien Univ. of East London	17:04-17:14 (ONLINE)
An AHP informed framework for optimised use of materials, methods, and models	Sohrab Donyavi Arya Assadi Langroudi	B2	Univ. East London	17:16-17:26
Closure of B2	Arya Assadi Langroudi			17:26-17:35
A Critical Review on Hydrocarbons Contaminated Soils and Their Mitigation	Hamza Saeed, Zalihe Nalbantoğlu, Eriş Uygar	B3	Eastern Mediterranean University	17:35-17:45
Estimations of savings for recycling construction and demolition waste on islands: A case study of northern part of Cyprus	Cemaliye Özverel Ekinci, İme Akanyeti	B3	European Univ. of Lefke Cyprus Int'l Univ.	17:47-17:57
A comparative study of using soil nailing and ground anchors for slope stabilization	Jacques Mulondwa Fataki, Anoosheh Iravanian	B3	Near East Univ.	18:00-18:10
Closure by B3	Arya Assadi Langroudi		Univ. East London	18:10-18:20
CLOSURE and next steps				18:20-18:30

Daily Program

International Workshop on Advances in Laboratory Testing of Liquefiable Soils
17 September 2022

EVENT CHAIR

Assoc. Prof. Nabi Kartal Toker (Middle East Technical University)

THEMES:

C1: Advances in laboratory testing techniques C2: Advances in ground investigation and field monitoring C3: Constitutive modelling of geomaterials & Physical modelling

Topic	Author	Theme	Institution	Time
Opening speech: Prof. Dr. Matthew R. Coop (ISSMGE-TC 101 Chair)				09:00-09:15
Liquefaction Susceptibility by Laboratory Tests	**Atilla Ansal Keynote Speaker**	**-**	**Özyeğin University**	**09:15-09:55**
COFFEE BREAK				09:55-10:10
SESSION 1: Chair of Session: Prof. Dr. Erdin Ibraim (ISSMGE-TC 101 Vice Chair)				
The use of binders to avoid tailings' liquefaction	**Nilo Cesar Consoli Keynote Speaker**	**C1**	**Universidade Federal do Rio Grande do Sul**	**10:10-10:50**
The effect of leachate on liquefaction	Ayfer Erken Aytaç Yaşargün	C1	Doğuş University İstanbul Technical University	10:50-11:05
Density dependent pore water pressure evolution in a simple cyclic shear test	Božana Baćić, Ivo Herle	C1	Technische Universität Dresden	11:05-11:20
Undrained monotonic behaviour of liquefied sands	Lucia Mele Lirer Stefania Flora Alessandro	C1	University of Napoli Federico II University of Rome Guglielmo Marconi University of Napoli Federico II	11:20-11:35
QUESTION & ANSWER				12:15-12:30
LUNCH				12:30-13:30
SESSION 2: Chair of Session: Assoc. Prof. Eriş Uygar (Eastern Mediterranean University)				
Liquefaction and Shear Wave Velocity	**Robb Moss Keynote Speaker**	**C2**	**California Polytechnic State University**	**13:30-14:10**
Gravelly Liquefaction Case Histories after 2008 Wenchuan China Earthquake Mw=7.9	Arda Şahin Kemal Önder Çetin	C2	Middle East Technical University	14:10-14:25
Liquefaction potential determination and hazard mapping based on Passive Surface Wave Geophysical tests in the Long Beach and Tuzla regions of Cyprus	Onur Selçukhan Abdullah Ekinci	C2	Middle East Technical University	14:25-14:40
Site Response Study: Tuzla/Enkomi	İsmail Safkan	C2	European University of Lefke	14:40-14:55
Case History- vs. Laboratory-based Seismic Soil Liquefaction Assessments: A Critical Overview	**Kemal Önder Çetin Keynote Speaker**	**C2**	**Middle East Technical University**	**14:55-15:35**
QUESTION & ANSWER				15:35-15:50
COFFEE BREAK				15:50-16:05

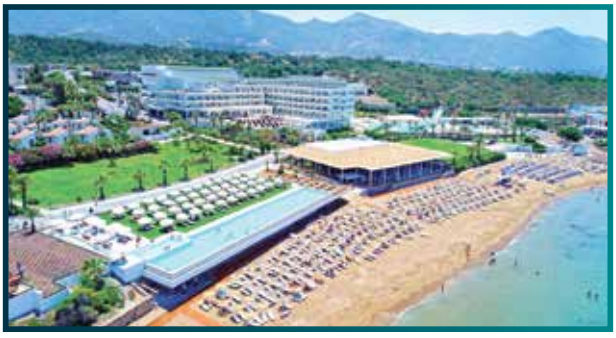
Daily Program

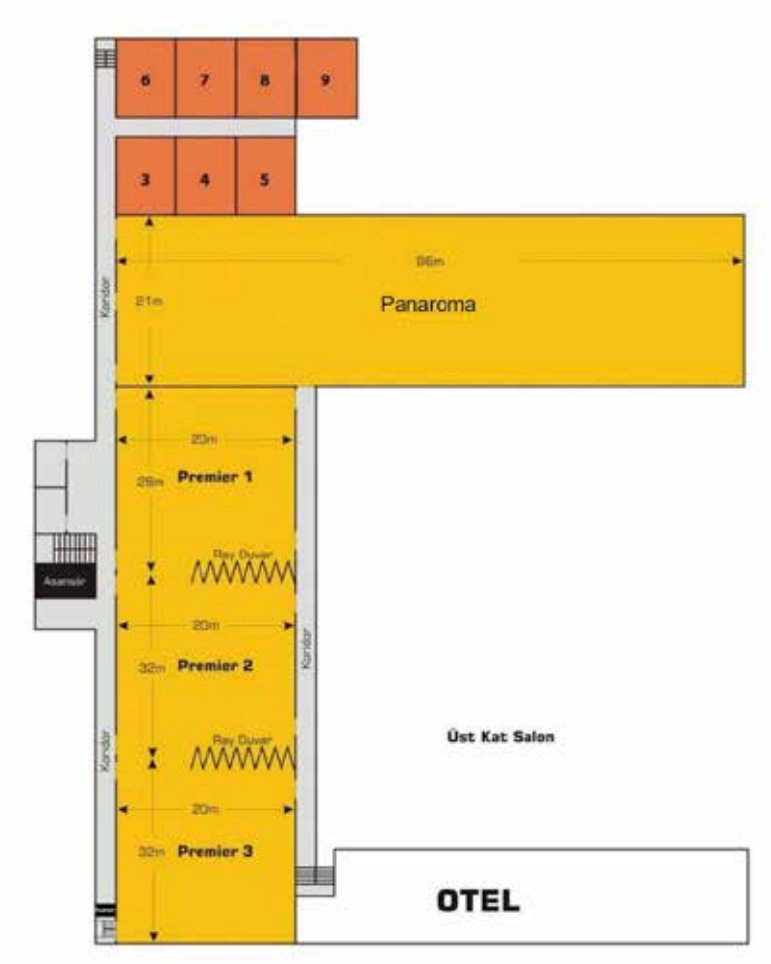
SESSION 3: Chair of Session: Assoc. Prof. Beatrice Baudet (University College London)				
Insight on multiaxial testing and modelling of liquefiable soils	**Andrea Diambra Keynote speaker**	**C3**	**University of Bristol**	**16:05-16:45**
Effects of inherent anisotropy on soil steady states and its variability	Soheil Ghadr Arya Assadi Langroudi	C3	National Cheng Kung University University of East London	16:45-17:00
Modified State Parameter Evaluation of Liquefiable Sand Containing Plastic Fines	Hamza Saeed Zalihe Nalbantoğlu Eriş Uygar	C3	Eastern Mediterranean University	17:00-17:15
The Use of State Parameter in Predicting Static Liquefaction	Matthew R. Coop A.Cartwright A.Carrera	C3	University College London Sweco, Sweden, formerly University College London Formerly Politecnico di Torino	17:15-17:30
Soil liquefaction assessment in undisturbed and reconstituted conditions: challenges and opportunities	**Cristiana Ferreira Keynote Speaker**	**C3**	**University of Porto**	**17:30-18:10**
QUESTION & ANSWER				18:10-18:25
CLOSURE				18:25-18:35

Conference Venue

Hotel Info

The Acapulco Resort Convention Spa Casino Sports, is the most favorite 5 star resort hotel in North Cyprus for both business, leisure and holidays with high quality global standards and services combined with the Mediterranean culture. The Acapulco Resort Convention is established on a 120,000 m^2 area, is a great combination of green and blue and has the longest private sandy beach of the island.





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Keynote Speakers

Atila Zekioğlu

P.E., S.E, M.ASCE - USA

He is passionate about performance-based design and resilient design principles. During his 36-year career, he has worked on a wide range of projects with responsibilities from Principal-in-Charge to Lead Structural Engineer. This is demonstrated through the body of work, which includes the Allegiant Stadium, Seattle Public Library, Denver Art Museum addition, San Francisco Federal Building, LACMA BCAM, LACMA Resnick Pavilion, Ford-Otosan Car Plant, and the Caltech Broad Center for Biological Sciences, among many others. Passionate about performance-based design, Atila is a highly regarded global seismic expert who has led the seismic design of several base-isolated projects, including the Ikitelli/Basaksehir Hospital in Istanbul, Taipei Performing Arts Center and the International Airport Terminal at Istanbul's Sabiha Gökçen International Airport.He has also specialized in structural and seismic engineering. He led the analytical and experimental work in the development of the "reduced beam section" concept. The six full-scale specimens successfully tested at UC San Diego in 1995 were the first ones to be tested in the United States. Atila is a council member of the Los Angeles Tall Buildings and Structural Design Council and leads the Council's Resiliency Committee.

Prof. Dr. Hafzullah Aksoy

İstanbul Technical University-Turkey

Hafzullah Aksoy is the Professor at the Department of Civil Engineering, İstanbul Technical University working since 2010. He obtained BS degree in 1990 from İstanbul Technical University and obtained his MS in Hydraulic and Water Resouces in year 1993 from same university. He obtained his Ph.D from Istanbul Technical University in year 1998. He has been teaching and researching at İstanbul Technic University since 1991. He has teaching and research experience in hydraulic and water resources of more than 30 years. He has lots of national and international journal papers, chapter in books, referred papers and conference proceedings.

Prof. Dr. M. Talat Birgönül

Middle East Techninal University-Turkey

M. Talat Birgönül is a Professor in the Construction Engineering and Management Division of Civil Engineering Department at the Middle East Technical University (METU), Turkey. He is a graduate of Middle East Technical University, Civil Engineering Department and received his M. Sc. and Ph. degrees from the same university. He was engaged for his Post-doc research at Reading University, Department of Construction Management and Engineering from 1993 to 1994.With forty-three years of academic experience, he is the author/co-author of 86 articles published in leading academic journals, 9 chapters in international books and more than 140 national/international conference papers. He has acted as the supervisor and/or co-supervisor of 111 M.Sc. and 13 Ph.D. thesis.His primary research interests include engineering economy, international construction, construction planning, macroeconomic aspects of the construction industry and claim management. Apart from his academic activities, he acts as an expert witness in Turkish courts and international Arbitral Tribunals and gives claim management consultancy services to leading construction companies. Currently, he is acting as the director of Construction Engineering and Management Division of the Civil Engineering Department in the Middle East Technical University.Prof. M. Talat Birgonul's full CV can be reached at http://blog.metu.edu.tr/birgonul/tr/

Keynote Speakers

Prof. Dr. Serhan Tanyel

Dokuz Eylül University-Turkey

Serhan Tanyel is the Professor at the Department of Civil Engineering, Dokuz Eylül University working since 2015. He obtained BS degree in 1992 from Dokuz Eylül University and obtained his MS in Trasportation Engineering in year 1995 from same university. He obtained his Ph.D from Istanbul Technical University in year 2001. He has been teaching and researching at Dokuz Eylül University sine 2001. He has teaching and research experience in Trasportation and traffic engineering of more than 20 years. He has lots of national and international journal papers, chapter in books, referred papers and conference proceedings. He has done a lot of research and project about Traffic Engineering, Traffic Flow, Traffic Safety, Road Safety, Transportation and Traffic Accidents.

Prof. Dr. Rafat Siddique

Thapar Institute-India

Rafat Siddique is Dean, Research and Sponsored Projects & Senior Professor of Civil Engineering at Thapar Institute of Engineering and Technology (Deemed University), India. He obtained his Ph.D from Birla Institute of Technology & Science, Pilani in year 1993. He was engaged for his Post-doc research at University of Wisconsin-Milwaukee, USA. He has extensive teaching and research experience in structural Engineering of more than 33 years.He is among top 15 academicians in the world with total citations of 18000+ having H Index of 72 in the area of sustainable construction materials. He has published 200+ Q-1 Journal articles and 80+ conference papers. His research interests are Fiber Reinforced Concrete; High Volume Fly Ash Concrete; Use of Industrial By- Products in Cement-Based Materials; Self-Compacting Concrete; Properties of Concrete at Elevated Temperatures; Microbial Concrete; Characterization of Leachate from Concrete made with Waste Materials.He is Editor of the Journal of Construction and Building Materials (Elsevier), Journal of Materials in Civil Engineering (ASCE), and European Journal of Environmental and Civil Engineering (Taylor & Francis).He has been Invited/Visiting Professor to (i) University of Wisconsin, Madison, USA; (ii) ENS Cachan, France; (iii) BAM Berlin, Germany; (iv) Consolis Technology, Finland; (v) INSA Rennes, France; (vi) University of Guanojuato, Mexico; (vii) University of Wolverhampton, U.K.; (viii) University of Cergy Pontoise, France, (ix) University of La Rochelle; (x) University of Melbourne, Australia; (xi) University of Western Sydney, Australia; (xii) University of South Australia, Australia; (xiii) University of New Castle, Australia; (xiv) and KMUTT Bangkok. He has been sought-after speaker, and been invited to deliver keynote/expert lectures in some of the best schools in Australia, Bangkok, Belgium, Botswana, Burkina Faso, Canada, China, Czech Republic, Finland, France, Germany, Hong Kong, Indonesia, Italy, Japan, Malaysia, Mexico, New Zealand, Poland, Portugal, Saudi Arabia, Singapore, Spain, Sri Lanka, Switzerland, Turkey, United Kingdom, UAE, and USA

Dr. Henry Dicks

University Leeds - UK

Henry Dicks is an environmental philosopher who lectures on environmental ethics and the philosophy of biomimicry at various universities and design schools. His research into the philosophy of biomimicry has given rise to publications in numerous peer-reviewed journals, the first special issue on the subject in Environmental Values, as well as the first academic monograph: The Biomimicry Revolution: Learning from Nature how to Inhabit the Earth, available for pre-order with Columbia University Press: http://cup.columbia.edu/book/the-biomimicry-revolution/9780231557634. He also runs the website: https://philosophyandbiomimicry.org/.

Keynote Speakers

Dr. Pedro Miguel Vaz Ferreira

University College London-UK

Dr Pedro Ferreira holds a degree in Civil Engineering from the Federal University of Rio Grande do Sul in Brazil. In 1998, he completed his master's degree and in 2002 he obtained his PhD in Geotechnical Engineering from the Federal University of Rio Grande do Sul. From 2003 to 2005, he worked as a post-doctoral in the Soil Mechanics department of the Imperial College of Science and Medicine, London. He joined University College London in 2005 and currently he is an Associate Professor in the same institution and has around 20 years of undergraduate and post-graduate teaching experience. Dr Pedro Ferreira is the manager of the Geotechnical Laboratory at UCL and has interests in laboratory testing, soil behavior, soil-structure interaction and monitoring of geotechnical systems. Currently he doing research in cemented granular materials, natural clays and the understanding of how SCL tunnel linings behave with the aim of reducing cracking and water ingress

Prof. Dr. Mustafa Laman

Perform Engineering & Consultancy-Turkey

He graduated from Çukurova University Civil Engineering Department in 1987. He completed his PhD at the University of Liverpool, England in 1995, became Associate Professor in 1999 and Professor in 2005 in the Department of Geotechnical. He publisded total of 175 publications, 38 of which were SCI and SCI-Exp publications.He is membership in the Geotechnical Board of the Chamber of Civil Engineers of TMMOB. He has represented of it as president for a long time.Prof. Laman did Organizing Committee Presidency and Science-Advisory Board Membership of International Geotechnical Symposium, which has been held every 2 years since 2005.He was Deputy Rector at Osmaniye Korkut Ata University between 2009-2012.Also, he attended the University of Liverpool in England in 1997 and 2002 in Central Florida, USA.Prof. Laman has "Most Cited Article", "Best Study" in national and international scientific activities and "Broadcasting Incentive" awards.

Prof. Dr. M. Atilla Ansal

Özyeğin University-Turkey

He received his Ph.D. in Geotechnical Engineering from Northwestern University, USA in 1977. He was promoted to full Professorship in 1988 in Istanbul Technical University. He moved to Kandilli Observatory and Earthquake Research Institute of Bogaziçi University in 2002. Since March 2012, he is professor in the Civil Engineering Department of Ozyegin University. He has been the Secretary General of European Association for Earthquake Engineering during 1994-2014 and President during 2014-2018, and currently Vice-President until 2022.

He has been the Editor in Chief of the Bulletin of Earthquake Engineering and the book series on "Geotechnical, Geological and Earthquake Engineering" by Springer since 2002.

His main areas of interest are microzonation methodologies, effects of geotechnical factors on earthquake damage, liquefaction, cyclic behaviour of clays and sands, constitutive soil models.

Keynote Speakers

Prof. Dr. Nilo Cesar Consoli

Universidade Federal do Rio Grande do Sul-Brasil

Professor of Civil Engineering at Universidade Federal do Rio Grande do Sul (UFRGS - Brazil). He obtained B.Sc. degree in Civil Engineering in 1985 from UFRGS and his Ph.D. from Concordia University-Canada in 1991. He was engaged for his Post-doc research at University of Oxford and University of Western Australia. Researcher listed as the 2% most influential in the world according to 2020 & 2021 Stanford University studies. Innovation consultant for PETROBRAS (Brazilian oil company) and VALE (Brazilian mining company). Professor Consoli has been awarded grants worth more than US$ 3.5 million (in the last 4 years) and has published over 220 refereed journals (h-index=44 at Web of Science). Associate Editor of the ASCE Journal of Geotechnical and Geoenvironmental Engineering, ASCE Journal of Materials in Civil Engineering, Geotechnical and Geological Engineering, and Proceedings of ICE/UK - Ground Improvement. Member of Editorial Board of Canadian Geotechnical Journal, Geosynthetics International – ICE/UK, and of Transportation Geotechnics. Awarded with Telford Prize (2001) and Telford Premium (2009) by The Institution of Civil Engineers (ICE/UK) and Terzaghi Prize (2008) by the Brazilian Soil Mechanics Association. Professor Consoli has experience in Geotechnical and Geoenvironmental Engineering and Sustainability, acting on the following subjects: tailings stacking, ground improvement, cohesive-frictional soils, development of new geomateriais, offshore and onshore foundations, artificially cemented soils, encapsulation/ solidification, reuse of industrial residues and fiber-reinforcement of soils.

Keynote Speakers

Prof. Dr. Robb Moss

California Polytechnic State University-USA

Professor at the Department of Civil and Environmental Engineering, California Polytechic State University in USA since 2006. He obtained his B.S in Civil Engineering in 1995 from North Carolina State University, Raleigh, MSc in Geotechnical Engineering in year 1997 from Utah State University, Logan and Ph.D in Geotechnical Earthquake Engineering From UC Berkeley, 2003. He has been involved on many consulting and research projects over the last 20 years. His research and consulting interests are in flow failures and residual strength of liquefiable materials, risk and reliability within seismic design and earthquake effects, dynamic earth pressures for basements and retaining walls , seismic hazard analysis in poorly studied areas , probabilistic fault displacement hazard analysis , soil-structure-interaction of underground structures , probabilistic assessment of attenuation relationships , levee risk and seismic levee failure analysis , probabilistic tsunamigenic fault rupture , influence of ageing on liquefaction resistance , probabilistic liquefaction triggering , acquisition of liquefaction field case histories , pile design for dynamic lateral loading , offshore wind hazards and foundations, and environmental impact of chemical grout.

Prof. Dr Kemal Önder Çetin

Middle East Technical University-Turkey

As part of his Ph. D. studies at University of California at Berkeley, Prof. Cetin has researched on seismic soil liquefaction triggering response of fully saturated cohesionless soils. The manuscript, which presents the proposed triggering relationship, received the "Thomas A. Middlebrooks Outstanding Professional Accomplishment Award" offered by ASCE Geo-Institute in 2006. The resulting seismic soil liquefaction triggering methodology has been widely accepted and used in engineering practice, as well as, established the basis of engineering design for a number of engineering codes of practice including but not limited to AASHTO 2010. In addition to his involvement in research projects in the areas of experimental and theoretical soil mechanics, foundation and earthquake engineering, Prof. Cetin has served as a geotechnical and earthquake engineering consultant in a number of national and international mega projects including Istanbul Marmaray Submerged Tunnel, Istanbul Canal, Gebze-İzmir Motorway Project, Ankara-Istanbul Rapid Rail Project, Istanbul-Ankara-Izmir Metro Lines, Warsaw-Poland Metro Line, Efeler Geo-thermal Power Plant, Yemen-Sayhut Nishtun Highway Tunnel, Kazan Soda Facility, Alpaslan II HEPP, Oman-Duqm Port, Turkmenbashi International Seaport, Akkuyu and Sinop Nuclear Power Plants. He has served (and been serving) as an external expert and consultant to International Atomic Energy Agency (IAEA) in a number of missions and workshops, which were (and will be) held in Eqypt (2017), Malaysia (2017), Philippines (2018), Poland (September, 2019) and Uzbekistan (November, 2019) on seismic hazard, geotechnical aspects and hazards in site evaluation, and safety requirements for Nuclear Power Plants. His geotechnical engineering expertise includes the design and performance assessment of soil and structural systems, with emphasis on the design and performance assessment of i) shallow foundations, ii) piled foundations, iii) deep excavations, iv) underground structures (i.e.: TBM, NATM, cut and cover tunnels), v) retaining structures, vi) hydraulic structures (earthfill, rockfill, concrete faced rockfill, roller compacted concrete dams), vii) port structures and nuclear facilities, viii) slope stability assessments, ix) ground improvement, x) dewatering, xi) site investigations, health and performance monitoring. Similarly, his earthquake engineering expertise includes the assessments for i) seismic soil liquefaction triggering, post liquefaction shear strength and stiffness response, lateral spreading, ii) soil site response, iii) seismic hazard, iv) 2-D and 3-D static and seismic numerical modeling of soil-structure systems, v) microzonation, vi) siting for hydraulic and nuclear facilities. Prof. Cetin continues to serve the engineering community happily and enthusiastically as a lecturer, consultant, researcher and referee.

Keynote Speakers

Dr. Andrea Diambra

University of Bristol - UK

Andrea is an Associate Professor of Geotechnical Engineering at the Department of Civil Engineering, University of Bristol in UK since 2010. He obtained his MEng in Environmental Engineering in 2004 from Universita' Politecnica delle Marche, Ancona, Italy and Ph.D in Geotechnical Engineering in 2010 from University of Bristol. Since his graduation, he also gained consistent industrial experience through consultancy appointments and placements. His research and consultancy activity spans across a wide range of geotechnical problems including offshore geotechnics for renewable energy, sustainable ground improvement techniques and developemnt of novel site investigation techniques. His research expertise include advanced multiaxial element testing, development of advanced constitutive models, numerical analysis and full-scale foundation testing. His research work has attracted considerable income from both competitive grants and industry, including the leadership on the EPSRC-SFI project (EP/W006235/1) for the next generation ground investigation and design tools and the RAEng Industrial fellowship for improvement of cyclic design of offshore structures (IF2021\64). He has co-authored more than 40 peer-reviewed international articles and more than 50 conference papers.

Dr. Cristiana Maria Fonseca Ferreira

University of Porto-Portugal

BSc in Civil Engineering (2000) and MSc in Soil Mechanics and Geotechnical Engineering (2003) from UPorto. Her PhD in Civil Engineering (2009), developed in the Universities of Porto and Bristol, was entitled "The use of seismic wave velocities in the measurement of stiffness of a residual soil", having been awarded the title of "European Doctorate". Cristiana is an integrated member of CONSTRUCT (Institute of R&D in Structures and Construction) and has been involved as a research team member in 1 H2020 European and 8 national FCT research projects, two of which funded as principal investigator. She has supervised or co-advised 21 MSc dissertations and 5 ongoing PhD thesis. Cristiana has received 3 awards and 1 honours award from two Portuguese engineering societies. She has 2 published books as editor, 27 papers in national and international scientific journals and more than 50 papers in proceedings of international and national conferences. She is also a peer-reviewer for 14 international and 1 national scientific journals. She has also been on the organizing committees of 9 scientific international and national conferences and scientific workshops. Her research is mainly focused on soil characterisation, seismic wave-based non-destructive testing, geophysical and geotechnical site characterisation; seismic and static liquefaction; liquefaction mitigation; mechanics of non-textbook geomaterials (residual soils, mine tailings; cemented geomaterials).

Special Programs

Workshop - Earthen Construction

Prof. Dr. Bilge Işık

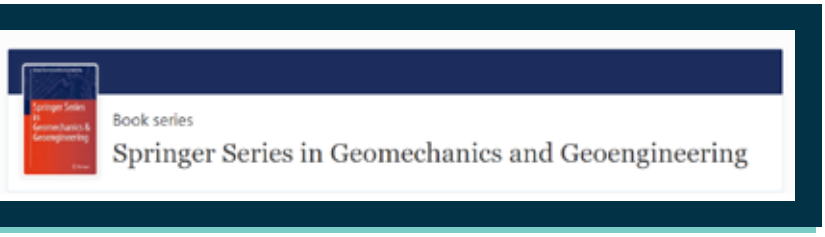
Earthen construction is vulnerable to moisture and can be easily damaged by earthquake. However, indoor quality in earthen construction is very healthy. It provides protection against hot and cold weather conditions, in view of its high thermal capacity and insulating values. Because of these advantages, earthen construction technology is subject to research in both in the industrialized and unindustrialized countries.

In this research, gypsum and lime are mixed to the soil to promote the properties of the material. The gypsum stabilized soil sets in a short time, which makes the production time shorter and the curing unnecessary. It also makes the production period independent from the rainy days. The material is porous, thereby increases the insulting value.

The mechanized construction technology for the gypsum stabilized earthen construction aims to improve the local construction material for mass-housing. It will also contribute to preserve the natural sources and save funds for the country.

Publications

Following the presentations at the event, attendees will be given an opportunity to prepare an article and publish in the following journals.



18/09/22 – 18/11/22

Paper Submission

18/12/22 – 18/01/23

Paper Review and Acceptance

A Case Study: Progressive Collapse Analysis of Existing RC Buildings Using Linear Procedure

*Mürüde Çelikağ[1], Ahmed Zaid Shams-Al[2]**
[1] *Eastern Mediterranean University, murude.celikag@emu.edu.tr*
[2] *Eastern Mediterranean University, 095308@doguakdeniz.onmicrosoft.com*

Several catastrophic events that occurred within the last few decades instigated vital debate amongst the structural engineering society in respect to the structural behavior under abnormal loading situations, such as collisions, intense fires, and explosions. Consequently, many studies have been conducted to improve the structural performance against extreme load hazards and progressive collapse phenomenon. The main objective of this study is to find the impact of the building height and the most critical location of the removed vertical-support element for the low to mid-rise buildings. Alternate load path method was used to decide on the numbers and locations of the removed columns. Then the UFC 4-023-03 has been followed as a guideline to analyze and re-design the case study buildings comprised of two four-story and two eight-story existing apartment buildings which are in Famagusta, Northern Cyprus. To accomplish this task 3D computer models of each building was prepared, design and linear static analysis were carried out by using SAP2000 program. The failed members were identified and re-designed. Observations from the results of this study demonstrated that the eight-story apartment buildings are relatively more critical, and the column removed from middle or near the middle of the short side of the building is more significant to progressive collapse event than the four-story buildings.

Keywords: progressive collapse; linear procedure, RC buildings, case study, alternate path method

A Method Based On Empirical And Analytical Assessment Of Masonry Structures Under Seismic Action

M.C. Genes[1], L. Abrahamczyk[2], S. Kacin[3], A. M. Erberik[4]

[1] Assoc. Prof. Dr., Civil Engineering Department, Eastern Mediterranean University, Famagusta, North Cyprus
[2] Jun.-Prof. Dr.-Ing., Faculty of Civil Engineering, Bauhaus University, Weimar, Germany
[3] Dr. Instructor, Civil Engineering Department, Iskenderun Technical University, Hatay, Turkiye
[4] Prof. Dr., Civil Engineering Department, Middle East Technical University, Ankara, Turkiye

Unreinforced masonry is traditionally deemed to be less suitable for strong earthquake shaking, but appropriate models are missing to describe the behavior of these building types. The pure analytical investigations to the earthquake behavior of masonry buildings based on the new code standards in middle Europe (e. g. EC 8) leads to too pessimistic damage prognosis in the range of 1 to 2 intensity steps, which are in contradiction to the observed behavior.

A multi-tasking in-situ instrumental testing procedure is carried out which in each phase is related to the outcome of parallel analytical investigation by using different analysis methods and computer programs. Additional laboratory tests on single material pieces are provided to determine the local material properties. Due to the fact that the results from 2-dimensional experimental tests are not appropriate to describe the 3-dimensional quality of existing buildings, single large scale 3-diminsional tests are conducted to describe the nonlinear behavior, damage progression and to identify damage cases.

The innovative elements have to be seen in the generation of a database for digitized masonry structures and the combination between experienced data and multi-tasking instrumental in-situ and laboratory testing in their close interaction with the performed analytical investigations. Several buildings are investigated to obtain fragility curves by using this approach.

In the frame of this study, the derived database for digitized masonry structures, the obtained fragility curves and damage prognosis for several earthquake scenarios may provide a starting point for further studies with probable interest groups such as municipalities, masonry industry.

Keywords: masonry structure, earthquake damage prognosis, nonlinear analysis, building instrumentation, ambient vibration

Physics-Informed Neural Networks: A Rapid Solution of Structural Engineering Partial Differential Equations

Ahed Habib[1], Umut Yildirim[2]*

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Artificial intelligence techniques are widely utilized in various engineering sectors thanks to the abundance of digital data, growing computing power, and advanced algorithms. A neural network as a data simulation method is considered a significantly valuable tool to approximate governing functions that map from the inputs to the outputs of a specific dataset. Recently, this technique was applied "like a knight in shining armor" to tackle complicated problems in structural engineering, such as predicting concrete properties, evaluating the behavior of concrete and steel structures, conducting seismic vulnerability assessments, assessing structural safety, identifying structural damage, and diagnosing faults. On the other hand, purely data-driven neural networks lack the robustness needed to infer results accurately in small data regimes or cases with strong nonlinearities and high dimensionality. Currently, a new approach to artificial intelligence, known as "Physics-Informed Neural Networks" (PINNs), has been developed to solve supervised learning tasks while respecting any given laws of physics. The main importance of this method arises from its ability to distill the mechanisms that govern the data evolution. As a result, the neural network's loss function is deeply embedded with the physics laws to constrain the training phase of the model to a feasible solution that can better represent the engineering issue. Previously, PINNs were applied for estimating linear and nonlinear responses of frame structures by implementing the governing equations of motion, conducting fatigue crack growth prediction and damage accumulation, and identifying model parameters of multi-degree of freedom systems. This study aims to summarize recent advances in the implementation and efficiency of PINNs for solving structural engineering problems.

Keywords: Artificial intelligence, physics-informed neural networks, structural engineering,

A Case Study about Designing of Block Foundations

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Every passing day, machines used in production are exposed to much bigger dynamic loads because of increase in world population and advancement period of industrialization. Especially as a result of advancements in geotechnical engineering and structural engineering, more trusted engineering analysis can be done with taking care of much fragile environmental limits and cheaper manufacturing costs. Main purpose of this study is designing the machine foundation systems with taking care of meeting of the criteria and contribute to advancements in this area.

This study is consisting of two parts. In the first part; basic concepts of structural dynamics, kinds of foundation and machines, methods of analysis and main factors in design stage are presented. In the last part; a case study which is about an international project supplying of water to a city is presented. There are two different pump stations which are PS-2E and PS-3E. Dynamic shear modulus of PS- 2E and PS-3E sites are 525.000 kPa and 11.500.000 kPa, respectively. Foundation system is comprising of a mass foundation and a casing foundation. Calculations have been performed in an excel software written by us. In the calculations, free vibration analysis methods are adopted with using Elastic Halfspace Approach. Foundations are analyzed under two different conditions which are, embedded and not embedded into soil. Analyses are done for both of stations separately and results are compared. According to the results, it is shown that vibration modes and dynamic displacement amplitudes under embedded case in PS-3E station are much satisfying than others.

Keywords: Block Foundations, Free Vibration Analysis, Elastic Halfspace Approach and Foundation Partially Embedded in Soil

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Soil Settlement Due to Underground Tunnelling in Different Soil Types

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Soil settlement due to underground tunnelling requires appropriate considerations to estimate the ground deformation behaviour. The surface and subsurface settlements are highly influenced by construction sequence and tunnelling methods which require empirical, analytical or finite element method approaches. This research presents the effect of single bored tunnel construction in loose sand, dense sand, soft clay and stiff clay with varying tunnelling depths, diameter and volume loss. The investigation was carried out in 2D Plaxis FEM software and the maximum surface settlement in different soil types was analysed. A set of maximum surface settlement equations were developed and the multivariable equation was validated and calibrated using the field data. In addition, the location of inflection point in the settlement curve was also investigated based on the tunnel and soil profile variables. A detailed comparative study was carried out between the developed equations and the equations available in the literature for inflection points and the differences with respect to the field data are also highlighted. The developed multivariable maximum surface settlement equation tends to be overall successful in comparison to field data obtained through several underground tunnelling projects.

Keywords: Finite element modelling, Ground movements, Surface settlement, Tunneling

Drought Conceptualization and IDF Curves for Water Resources Management

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Characterization of droughts has been traditionally made through statistical methods. We introduce a statistical methodology based on novel drought concepts different from the classical drought concepts exiting in the literature. As the novelty, we define dry periods within which we recognize droughts of different durations. The most severe drought for each drought duration in each year is called the critical drought. By using the standardized precipitation index, we develop critical drought intensity-duration-frequency (IDF) curves. The total probability theorem-coupled frequency analysis is used to determine the best-fit probability distribution function of drought severity, which is then converted to intensity. Critical drought intensity decreases linearly with increasing drought duration, whereas the return period increases exponentially when the drought becomes more severe. The site-specific IDF curves furnished with an empirical relationship between the intensity and return period allow one to characterize the drought not by an index-based intensity but by its return period. This kind of presentation is physically easier to understand, in particular for stakeholders and decision makers in practice.

Keywords: critical drought, drought intensity-duration-frequency curve, frequency analysis, standardised precipitation index, total probability theorem

Flood Risk Analysis of İskele Long-Beach Area

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In the Mediterranean islands because of attractive climate conditions and beaches, international community has an interest to buy a property for vacation or for rent. İskele Long-Beach area in Northern Cyprus is one of those popular areas. Urbanization in the area is increasing every day. However, there are two rivers in the İskele Long-Beach Area where they deliver surface runoff from Kantara Mountains to Famagusta Bay. In this study, since a number of floods already experienced in the area in the history, a flood risk assessment of Long-Beach area has been performed. After converting rainfall events into surface runoff, flood inundation maps of the area have been developed using HEC-RAS software. The results show that the area is under the risk of urban flooding and the urbanization development at the flood plains should be performed by considering this flood risk. In order to decrease the loss during the flood, the capacity of a number of hydraulic structures must be increased as well.

Keywords: Hydrologic Modeling; Hydraulic Modeling; HEC-RAS, Flood Inundation Map; Long- Beach İskele.

Open Channel Geometry Optimization Incorporating Climate Change to Mitigate Asset Losses

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It is rare to hear about a loss of life caused by flooding in arid and semi-arid regions, however, floods may cause damages on assets and may cost a fortune for any small developing country such as Northern Cyprus. Therefore, applying an appropriate engineering and using relevant risk reduction methods are inevitable for further developments.
Estimating the maximum expected discharge for a storm event over a certain catchment or an interested area is possible. Alternative approaches are available in the literature to forecast the next flashy event and amongst, using IDF curves is the most reliable one. An open channel geometry that can facilitate draining lands for a predicted rainfall can be designed and used as part of a rainwater harvesting system for sustainable water budget. However, on the other hand, Climate Change (CC) is a fact and is one of the most challenging component when designing infrastructures of new development plans, worldwide. Adding certain percentage of currently recorded precipitation can represent the CC effect and helps predicting future possible discharges.
This paper proposes alternative techniques that can be applied in Northern Cyprus to mitigate asset losses associated by flood risks.

Keywords: Optimization, Climate Change, Flooding, Risk Management

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Transboundary Waters and Their Status in Today's Water-scarce World

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Approximately 40% of the world's population lives in transboundary river and lake basins, accounting for an estimated 60% of global freshwater flow. These shared water resources support the livelihoods of more than 3 billion people. Today, with the decrease in the amount of water in the world, the dispute over transboundary waters has increased. In this research, using library studies (including articles, books, reliable reports from the United Nations and other relevant organizations, etc.), problems of the most important transboundary waters have been investigated. Since transboundary water problems are widespread all over the world, solutions by researchers, relevant organizations such as UN sub-organizations (such as the United Nations Environment Programme (UNEP), Integrated Water Resources Management (IWRM), United Nations Secretary-Generals' Advisory Board on Water & Sanitation (UNSGA) and ...) and politicians have been suggested. Also, in cases like what happened in "Moldova and Ukraine (Rome, November 29, 2012)", successful plans have been made to solve the crises that occurred in transboundary waters. Finally, by examining the most important problems of transboundary waters all over the world, as well as the most critical cases and using successful experiences in the world in solving transboundary water crises, peaceful proposals to solve such problems and reach sustainable solutions in order to reach the Sustainable Development Goals (2030 SDGs) have been proposed depending on the regional and country conditions of each of these basins.

Keywords: Climate change, Water scarcity, International waters, Transboundary waters, Water conflict, Sustainable management.

Impact of Model Data Availability on the Assessment of Bridge Scour Risk

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Several studies about the river bridges that have been heavily damaged or collapsed in recent years reveal that most of the damage is caused by hydraulic factors. Essentially, due to the insufficient evaluation of hydraulic and structural interaction in bridges, adverse conditions such as scour around bridge elements become more likely to occur, especially during flood events. In this context, developing a hydraulic model and assessing the risk due to scour is of vital importance. However, since a detailed hydraulic model requires detailed data sets for modeling the river and the bridge, infrastructure managers need to decide if additional model data availability can improve the accuracy of bridge scour risk. Therefore, in this study, the widely used scour risk assessment guidelines in the UK were applied to four case study bridges considering different data availability scenarios, and the qualification of the approaches in these guidelines was discussed. The results suggested that for the cases of limited or no data availability, the total scour depths and the scour risk ratings significantly differed, and even changes in risk levels were observed compared to the benchmark scenario of fully known data. In addition, the sensitivity analysis of hydraulic parameters used in scour models indicated that the most influential parameter that causes significant variations in total scour depth and scour risk is average velocity, followed by mean flow depth, mean floodplain depth, and mean floodplain width.

Keywords: Model data availability, hydraulic model, total scour depth, scour risk assessment, sensitivity analysis

Statistical analyses of extreme weather events frequency in Northern Cyprus

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In this study, gamma statistical distribution function has been employed to analyze spatial and temporal annual rainfall patterns using time series data of 36 consecutive hydrological years collected at 31 rainfall stations across Northern Cyprus. By splitting the data into two periods and comparing the pattern changes between the two periods, temporal rainfall features have been explored in the study area. The stations have also been divided into three classes in the light of those changes. According to the findings, most precipitation stations exhibit a larger likelihood of extreme yearly rainfall values in the second period compared to the first one, which has a direct bearing on the occurrences of extreme rainfall events. Additionally, the probability function has been used to identify threshold values of dry, normal, and rainy years for every station. The results of this study provide a better understanding of the changes in rainfall patterns Northern Cyprus located in the Eastern Mediterranean region.

Keywords: Spatial and temporal rainfall characteristics, Climate change, Gamma statistical distribution, Extreme weather events, Rainfall patterns.

Investigating the status of water management education in line with sustainability education in higher education institutions in Northern Cyprus

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Today, the brand of higher education in North Cyprus is not hidden from anyone in the world. More than 100 thousand students study in higher education institutions (HEIs) in this country every year. The top scores of the prestigious universities of this country in various world rankings indicate the scientific level according to the international standards of education in these institutions. This research, by using a library and field study, has been tried to investigate the level of water resource management education in the top 5 universities of Northern Cyprus. This review includes bachelor's, master's, and doctoral courses, as well as conferences, workshops, and other related activities from these HEIs. In this way, how many courses and in which disciplines are taught to students in relation to water resources management. What do these courses include in teaching and to what extent are they in line with sustainable education. For this purpose, all the fields of the HEIs in bachelor's, master's and doctorate are reviewed and it is also checked whether there is a special field of water resources management or not. If it does not exist, the courses of related fields such as civil engineering are checked to see how many credits are dedicated to water resources management education and whether these courses are mandatory courses or optional. With an inter-university comparison, the factors of attention or lack of attention to this issue are also examined and recommendations are presented.

Keywords: Water management, Education, Higher education institutions, Sustainability education, Northern Cyprus.

Flood Management and Remedial Measures for Dikmen, Northern Cyprus

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This study aims to execute a flood management system and examine the appropriate structural measures to protect Dikmen town against the severe impacts of flooding. At first, hydrologic models using HEC-HMS tools are developed to simulate the rainfall-runoff processes in each of the three main ungauged sub-basins located at the upstream side of the town. The resultant discharge hydrographs are then used as the main boundary conditions in the hydraulic models. Next, the discharge hydrographs of the 5th December 2018 flood event are defined in the 2D HEC- RAS model, and the flood inundation maps of the study area are generated. The initial model indicates a 78% goodness-of-fit between the observed flood map and the model flood map. However, the model is then calibrated using Manning's roughness coefficients until the goodness- of-fit ratio rises to 84%, and the relative error (RE) between the two maps declines from 4.2% to 1.5%.

Furthermore, a technical impact analysis of the three mitigations measures (i.e., the concrete channel, the detention reservoirs, and the integration of both the channel and the reservoirs) are performed along with their cost analyses to determine the optimal solution in terms of reducing the risks of flooding with the optimum cost. The results indicate that the concrete channel with the lowest cost has the potential to provide protection against up to 100-year floods. However, for more extreme events, such as having a 500-year return period, the channel capacity cannot be sufficient to keep the flood water into the channel. Therefore, additional non-structural measures, such as increasing flood awareness and developing early flood warning systems, also need to be considered along with the structural measures.

Keywords: Dikmen, Hydrologic Model, Hydraulic Model, HEC-RAS, Flood Inundation Map, Mitigation Measures

Water Budget Analyses of Northern Cyprus

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Surface and subsurface water resources have been overused in many areas of the world, particularly in arid and semi-arid regions, as a result of population growth, industrialization, and climate change. Therefore, it is crucial to quantify the components of the hydrological cycle in those regions for a sustainable water resources managemet. Thus, the importance of quantifying the hydrological cycle components cannot be overstated in those areas. In this study, GIS and Thornthwaite and Mather (TM) models are used to assess the key elements of the water balance in Northern Cyprus, including potential evapotranspiration, actual evapotranspiration, soil storage capacity, water surplus, and runoff. The monthly average temperature and monthly total precipitation of 36-years collected in 33 stations across the study region, digital elevation map, and soil map have been used in the analyses. Moreover, the available runoff water for harvesting the main water streams in the main cities is evaluated. Additionally, this study also shows the spatial distributions of water budget components throughout the study area. It is found that a sizeable portion, about 12%, of the rainfall is available for harvesting in the major streams. Furthermore, it is discovered that actual evapotranspiration accounts for the majority of precipitation loss over the study region.

Keywords: Water budget, Water resources, Thornthwaite and Mather models, Runoff, Evapotranspiration.

Prediction of Runoff using artificial neural networks, MLR regression, and ARIMA model (A case study: Naher El Bared River, Lebanon)

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In this paper, Multi-layer perceptron neural network (MLPNN) and Radial basis function neural network (RBFNN) have been used to predict the monthly runoff in Bared River, Lebanon. Moreover, the accuracy of the proposed models is compared with the ARIMA model and Multiple Linear Regression (MLR). For this aim, maximum temperature, minimum temperature, solar radiation, wind speed, soil moisture and were collected and used as input parameters for the proposed models. The results showed that MRIMA and MLPNN models were suitable for predicting the monthly. Among the developed models, the ARIMA has the best performance for runoff prediction.

Keywords: Runoff, Naher El Bared River, MLPNN, RBFNN, ARIMA, MLR

Sustainable Stormwater Management Practices for Middle East Technical University, Northern Cyprus Campus

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In recent years, due to the increasing population there is a substantial expansion of urbanization which has led to increase in imperviousness of the surfaces, thus increases the urban runoff. Therefore, controlling the surface runoff is utmost necessary in order to avoid future consequences. such as urban flooding. In this study, sustainable stormwater management (SSWM) strategies are implemented including rainwater harvesting, green roof, and detention basin. On-site application of stormwater detention basin, green roof and rainwater harvesting on different catchment areas of the Middle East Technical University – Northern Cyprus Campus (METU-NCC) are performed using EPA – Stormwater Management Modelling (SWMM) software and the discharge and volume of surface runoff are evaluated in order to recommend the best SSWM method for the catchment area. A comparative evaluation is carried out by observing the simulations performed on the existing stormwater system with and without implementing SSWM strategies.

Keywords: Urban flood; Sustainable Stormwater; SWMM, METU-NCC.

Climate Change Adaptation And Integrated Water Resource Management In The Water Sector

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Water as a natural resource is one of the most important one on earth. It is an input for the survival of human life, livestock, industries and all other living beings. Despite of the spatial and temporal variation, its availability, accessibility and affordability making it hard for water users and water managers, climate change is making the problem more intense. According to the recent report made by Inter Governmental Panel on Climate Change (IPCC), water is the most affected natural resource due to climate change. Global warming and associated climate changes are anticipated to result a considerable difficulty over the following centuries to come. For that reason, the conventional method of fragmented water resource management should be actually changed through a method that can easily carry effective, equitable as well as lasting advancement and management of the worlds limited water resource and also for dealing with clashing needs. Integrated water resource management (IWRM) is such a device that was commonly approved globally as the method ahead. This paper discusses the concept of climate adaptation and integrated water resources management, how we can use IWRM for sustainable and efficient use of water resources. Also, there is discussion about the adverse impact and possible strategies that can be adopted to minimize the adverse effects of climate change on water resources.

Key words: Climate Change, Global Warming, Management.

Residua: From Nostalgia Towards Future-Evolution of Construction Management topics since 1980s

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In his keynote speech, Prof. Birgönül will present the hot topics that have evolved in the field of construction management, since 1980s, in a chronological order. Within this context; time management and construction planning, quality management, expert systems and claim management topics will be examined by giving reference to Prof. Birgönül's publications, experience and realized consultancy services.
Prof. Birgönül will conclude his speech by giving recommendations to junior colleagues and graduate students about the trendy topics that will shape the research agenda of the next coming years, in the construction management field.

Keywords: Construction management, time quality management, management, construction planning

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Optimization Of Reinforcement Steel In Building Construction Projects

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A common issue in reinforced concrete construction is a large fraction of reinforcing steel wasted due to unplanned cutting of fixed length reinforcement steel. This study demonstrates a method for reducing waste from cutting. Waste optimization models are critical for reducing trim loss in the steel reinforcement cutting process. Unfortunately, waste minimization is frequently regarded as a purely mathematical problem to be solved outside of the context of project management. Many construction projects necessitate the use of a significant amount of reinforcing steel bars (rebar). They require the provision of this steel in various specified sizes and lengths based on the structural design. The cutting processes result in significant trim loss, which is considered waste, and is one of the losses that raises the project's cost. As a result, "cutting is one of the most difficult problems in optimization research." The goal is to find the best cutting pattern for items of various lengths from a stock of standard size material to meet the construction needs while minimizing wastage due to cutting. To address steel waste on the construction site, a mathematical model and procedure were used in this study to arrange cut plans with the least amount of loss. To generate the optimal stock usage plan and cutting plan for each alternative layout arrangement for a specific structural component, Microsoft Excel and the Cutting Optimization Pro programming technique are used. The Cutting Optimization Pro program was evaluated using data from a villa house construction in Famagusta area. The results clearly show that the proposed methodology and the developed program are capable of producing solutions in terms of reducing waste, as a result of identifying the optimal cutting layout. The study's findings have a significant impact on the amount of steel wasted and, as a result, the cost of the projects.

Keywords: Reinforcement steel, optimization, BOQ, Reinforcement steel optimization

Değişik Çekiciliğe Sahip Gayrimenkul Reklamlarının Tüketiciler Üzerinde Etkilerinin İncelenmesi

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Toplumun hayattaki beklentilerindeki değişimlerle beraber gayrimenkul firmalarının kendilerini tanıtabilmek için daha çok reklam yatırımı yapmak zorunda kaldığı görülmektedir. Özellikle son yıllarda gayrimenkul reklamlarında gözle görülebilir bir artış söz konusudur. Fakat, çok miktarda gayrimenkul reklamı olsa bile bazı reklamlar insanların zihinlerinde yer elde ederken birçok reklam ise kısa süre içerisinde unutulmakta ve müşteriler üzerinde beklenen etkiyi gösterememektedir. Literatür tarafından reklamların farklı çekicilikleri olduğu ortaya çıkarılmıştır. Bu çekiciliklere bağlı olarak reklamların etkinlikleri farklılık görülmektedir. Bu nedenle gayrimenkul reklamlarının etkinliğini artırabilmek için mutlaka hangi reklam çekiciliğin müşteriler üzerinde daha etkili olduğu ortaya çıkarılmalıdır. Böylece, gayrimenkul firmaları daha etkili reklamlar verebilecek ve iletmek istedikleri mesajları iletebilmeleri mümkün olacaktır. Bu çalışma çerçevesinde Türkiye'de gösterilmiş olan farklı çekiciliklere sahip 4 adet reklam incelenmiş. Bu amaçla İstanbul şehrinde yaşayan 216 kişiden veri toplanmış, toplanan veriler ise ANOVA ile incelenmiş ve farklı reklam çekiciliklere sahip reklamların müşteri üzerinde farklı etkilerinin olduğu ortaya çıkarılmıştır.

Anahtar Kelimeler: Gayrimenkul proje reklamları, reklam çekicilikleri, reklam etkisi

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The Evaluation of Relationship Between Work Accidents and Occupational Health and Safety In North Cyprus

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Based on the obtained data from the Ministry of Social Security and Labor, North Cyprus covering 2006 to 2020, the recorded work-related injury and death rate was calculated to be around 232 and 6 workers per year respectively. The mean of labor loss was estimated to be around $250,000 per year due to employee having accidents in occupational life. Work-related injuries and fatalities in all businesses and construction fields were examined for the period covering 2006 to 2020. 18% of all recoded injuries happened within the construction sites. Similarly, 35% of causalities occurred in building construction areas. These rates play an important role for occupational health and safety in North Cyprus. These rates are found using models, which include significant equations. As a result, the rate of estimated labor loss because of employee having an accident in construction field corresponds to 22% of the overall labor loss. Further study may contain work-related injury rates and mortalities in all other sectors to be compared for similar scenarios with some developed countries.

Keywords: Occupational, Health, Safety, Injured, Dead, Mortality, Labor, Loss

Identifying And Managing Most Common Risks In Nigerian Construction Projects

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Risk in construction projects is inevitable but can be controlled to avoid delay or cost overrun. Therefore construction project risk management is simply a method of planning, identifying, assessing and providing the best method for handling or managing projects risks. In Nigeria, a high rate of project failure is being encountered due to the lack of risk management techniques in Construction Industry. This research helped to identify and asses the most common risk factors in various phases of Nigerian construction projects which will help in allocating responsibilities to the construction parties involved.

The quantitative research method was used, first, through a questionnaire survey to collect data from field practitioners in various Nigerian construction firms to identify the probability of occurrence of risks identified in literature review (44 risk factors) and the impact of such risks on the project. After the collection of data, results were used for statistical analysis. Mainly, one- way analysis of variances and Pearson product-moment correlation coefficient tests were used.

As a result of survey, top three Risk factors are, first, the technical/management related risk factors [70%]; second, the owner/client related risk factor [20%]; third, the project security risk factor by [10%]. Also, it was observed that the owner and contractors had a different opinion on how the risk factors affected construction project. The project security risk category has the least negative effect on construction project during the construction period. And, there was a strong agreement between the contractor and consultant in term of the categorized risk factors.

Keywords: Risk management, Risk factors, Nigerian Construction Projects, Construction risk

Autonomous Vehicles: What should we expect?

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The rapid developments in technology give clues that there will be important and permanent changes in the transportation infrastructure as well. The most up-to-date and the most researched areas of these are autonomous vehicles and systems that communicate with each other. A large part of the studies in literature are focused on the development of autonomous vehicles, both in hardware and software. However, the possibilities they can offer and the threats they can create in our daily life, especially in traffic management, have not been discussed in detail yet. In this study, the effects of autonomous vehicles on traffic in Turkiye are examined and possible capacity and performance changes are compared. Also suggestions about how autonomous vehicles can be evaluated in traffic management are tired to be suggested.

Keywords: Automous vehicles,transportation, traffic management, traffic

Improved Traveling Salesman Problem Analysis With Network Analysis Tool

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Multiple destination visits are common for delivery services such as mail and goods deliveries. Nowadays, due to the increase in fuel costs, the organizations may want to reduce the total traveled distance or total travel time to reduce the fuel consumption. For this purpose, the order of visit to these destinations should be optimized to minimize the total travel distance or travel time. One tool for obtaining the optimum order of the destinations is the Traveling Salesman Problem (TSP). TSP is being used in many professions including but not limited to the logistic companies or organizations providing deliveries to multiple destinations. TSP uses distance matrix for calculating the shortest total distance or total time. Most of the time the distance matrix is formed by great-circle distance calculation, which does not account for the road network layout. Hence, in some cases this approach may result in inaccurate total distance or time. In this study actual distances were produced with OpenStreetMap network to form the distance matrix. The proposed approach was applied to selected locations in Cyprus. Results showed improvement in finding the optimum order when the proposed approach is used.

Keywords: Traveling salesman problem; network analysis; openstreetmap

Excremental Evaluation of Physical Properties Geopolymer Modified Various Sources of Asphalt Binder

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Asphalt binder modifiers and blending techniques are some of the important effective parameters to improve the performance of modified asphalt binders. The modification method aims to provide sustainable mixtures that have long-serve life. This study presents the experimental evaluation of the physical properties of geopolymer-modified asphalt binders. Three various concentrations of geopolymer namely; 3, 5, and 7% were added to mixtures by weight of the base asphalt binder using the wet technique and two different asphalt binder sources (80/100 and 60/70). The physical properties of base and modified asphalt binders in terms of penetration, softening point, and viscosity was evaluated. The results show that the additional increment of geopolymer into the matrix of asphalt binder was able to improve the physical properties of asphalt binder which indicate better resistance to permanent deformation compared to base asphalt binder. The improvement was up to 20% and 24% for softening points of binders modified with 60/70 and 80/100 individually, while the reduction of penetration value was 26% and 17% respectively. Finally, considering the present results, the geopolymer can be one of the best modifiers to improve the physical properties of asphalt binder.

Keywords: Modified asphalt binder, geopolymer, physical properties

The Impact of Micro Bauxite Powder and Nano Bauxite Powder on the mechanical properties of asphalt mixture

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Abstracts: Asphalt mixture design is the process of selecting the appropriate material ratio that will provide long-term performance of the asphalt mixture during its service life. The primary goal of this part is to assess the effect of Malaysian bauxite powder in micro and nano sizes on the mechanical characteristics of an asphalt mixture under unaged and aged conditions. The asphalt binder was modified by applying different ratios of Micro and Nano bauxite powders (MBP and NBP) which were 3%, 5%, and 7% of the binder weight respectively. In terms of asphalt mixtures, it was noted that the modified asphalt mixtures consistently presented higher resilient modulus and resistance to rutting than the base asphalt mixtures. In addition, the evaluation of aging conditions noted that MBP and NBP had the ability to resist and delay aging which can promote pavement durability.

Keywords: Nano bauxite, and Micro Bauxite Powder, Resilient Modulus, Dynamic Creep

Determination of Landslide Susceptibility Based on GIS with MASW Data and Machine Learning Algorithms

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Landslide is a disaster that threatens existing structures as well as complicates the construction process. In recent years, there has been a rapid increase in studies to identify susceptible regions in areas with potential for landslides. Most studies that landslide susceptibility maps are created using machine learning methods and different spatial data. In these applications, Geographic Information Systems-based analyzes come to the fore. The original aspect of this study is the definition of ground properties was made with the Multi Channel Analysis of Surface Waves (MASW) method for determining the susceptible landslide areas. The aim of this study is to determine the landslide-susceptibility in the Girne (Kyrenia) Mountains zone with the Machine Learning methods. The shear velocity values of the soil layers obtained by the MASW method which is used together with other parameters for landslide risks. For this purpose, geology, vegetation (Normalized Difference Vegetation Index), altitude, slope, precipitation, slope curvature, drainage density, and Topographic Wetness Index data of the study area were trained with the help of MASW data by using the Random Forest and Support Vector Machine algorithms from machine learning methods. The obtained findings were validated with in-situ data sets. Consequently, it has been determined that the north-facing slopes of the Girne Mountains are more sensitive for landslides, especially around Esentepe, Arapköy and Alsancak settlements.

Keywords: Landslide, MASW, Machine Learning, Geographical Information System

Development of Sustainable Greener Concrete By Utilizing Industrial By-Products

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Large quantities of industrial by-products are generated from manufacturing processes and service industries. As a result, solid waste management has become one of the major environmental concerns in the world. With increasing awareness about environment, scarcity of space for land-filling and due to its ever increasing cost, by-product utilization has become an attractive alternative to disposal. Utilization of by-products is gaining significant importance in cement based materials particularly concrete and controlled low-strength materials. There are several types of by-products such as fly ash, bottom ash, foundry sand, scrap-tires, cement kiln dust, waste glass, recycled plastic, dredged materials, etc, the use of these materials in concrete not only makes it economical, but also help in reducing disposal and environmental related issues.

This keynote lecture presents possible utilization of some of these byproducts in the development of normal, high strength, and self-compacting concrete

Keywords: By-Products, Sustainable Materials, Concrete, Cement, Properties

Glass Fiber Utilized Low Carbon Paste Production

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Concrete production contributes to global CO2 emissions considerably due to higher energy requirement of Portland cement (PC) production. Waste materials are fundamental part of the sustainable approaches in aiming to reduce emissions associated with PC use. Use of these materials can lead to environmentally and economically sustainable productions. However, reduced performance of waste utilized materials forces industry to reinforce these approaches with fibers to avoid performance loss.

This study aims to produce lower carbon paste production through replacing PC partially with wood ash (WA) waste. WA, with two different particle sizes, was used with proportions of 5% and 10%. Furthermore, glass fiber was utilized with proportions of 0.25% and 0.5%. Mixes were tested against various fresh (mini slump, flow table and fresh density) and hardened (hardened density, compressive strength, flexural strength and porosity) tests. Test results suggests that developed mixes reduced fresh properties and hardened properties but improved flexural performance. Produced mixes have a potential to promote sustainable development through lower carbon emissions. The results also suggest that benefits of sustainable development could be maximized if effective waste management is carried out.

Keywords: Wooh Ash, Sustainability, Glass Fiber, Low Carbon, Cleaner Production

Enhancing The Properties Of The Sulfur Concrete Using Polymers

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Concrete containing sulfur as a binder is becoming more popular due to its properties. Its rapid gain of early age strength, low shrinkage, impermeability, and high durability make sulfur concrete superior to conventional concrete. Moreover, utilizing sulfur as a byproduct of petroleum industry as well as benefiting melted sulfur as a binding paste in place of Portland-cement and water makes this concrete environmentally friendly. Therefore, researchers have been increasingly intrigued by the production of sulfur concrete on earth and other planets.

The purpose of this study is to optimize the material ratio required to synthesize self-compacting concrete by proposing different mix proportions. An investigation was conducted on the physical and mechanical properties of sulfur concrete incorporating high density polyethylene and linear-low density polyethylene. FTIR results indicated that sulfur was not decomposed; however, there was no chemical reaction between sulfur and polymers. Although sulfur and polymers did not react chemically, specimens containing HDPE and LLDPE had enhanced mechanical properties compared to those without polymers.

Keywords: sulfur concrete, environmentally friendly materials, sustainable material

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A Review Of The Effect Of Self-Healing An Of Waste Materials Of Ecc

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This paper reviews some recent research work focusing on self-healing efficiency of Engineered Cementitious Composites (ECC) produced by high volume mineral admixtures such as Ground Granulated Blast Furnace Slag (GBFS) and Marble Dust (MD). The ECC is a type of fiber reinforced cement based composite, that is used in various construction applications. However, ECC applications are beneficial due to its long life cycle, high strength, high durability, low cost in the long-term, low maintenance and inherently sustainable. GBFS is often used as a Supplementary Cementitious Material (SCM) in concrete. GBFS can be activated in the alkaline environment in concrete, contributing to the compressive strength in a long-term. The inclusion of GBFS changes the autogenous healing efficiency of concrete. The effect of MD as cement placement and as sand replacement was investigated, most of the researches showed positive results and benefits. Waste MD can be used as an additive material in production of cement and cost of cement production can be reduced by application.

Keywords: Engineered cementitious composites (ECC), Ground granulated blast furnace slag (GBFS), Marble dust (MP), Self healing, Sustainability

Performance Of Recycled Concrete Aggregates-Containing Concrete Exposed To Heating-Cooling Cycles

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As world population is increasing, the need for new construction has increased. Construction industry became larger while yielding higher quantity of waste materials due to construction and demolition (C&D) activities. Increased construction activities also lead to depletion of natural resources since aggregates needed for new concrete are quarried, while landfilling for eliminating the C& D wastes has negative effect on soil.

In this study, a concrete mixture including recycled concrete aggregates (RCA) obtained from 3 years old concretes has been produced in order to investigate its performance when exposed to heating- cooling cycles. Heating-cooling cycles that can be experienced by concrete elements during their service lives are known to cause expansion-contraction on concrete which is a heterogeneous material. In the case of RCA-containing concrete, heterogeneity of the construction material becomes more remarkable, as the concrete element would increase both the new mortar as well as the old mortar attached to old aggregates.

Performance of 50% RCA- containing concrete mixtures when exposed to different numbers of heating-cooling cycles were investigated by determining compressive and splitting tensile strength evolution. Results show that RCA-containing concrete yielded lower splitting tensile strength when they were exposed to more heating-cooling cycles; even though, no strength drop has been observed in their compressive strength compared to the quarried aggregate-containing concrete mix.

Keywords: Construction and demolition wastes; recycled concrete aggregates; compressive strength; splitting tensile strength; heating and cooling cycles

Production And Installation Of Prefabricated Concrete Building Elements With 3D Printing Technology

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For the construction industry, the Fourth Industrial Revolution represents the beginning of a profound change. In the last decade, the perspective on designs, materials and construction techniques has been developing rapidly due to additive manufacturing technology. On the other hand, even though 3D printing technology is developing rapidly in the construction industry, the potential of 3D concrete printing in building prefabrication remains unexplored. Implementing new digital manufacturing technologies in the construction industry requires redesigning the construction process and its components. This article proposes a new concept, design and prototype of a prefabricated building to be installed with precast concrete elements by 3D concrete printing (3DCP). The new design and concept aimed to fully exploit the potential of 3D printing, especially for prefabricated components in terms of assembly, speed of implementation, reusability, recyclability, modularity and sustainability. The research also tested a 3D printable cementitious concrete material based on standard concrete raw materials in the production of precast elements. Finally, a scaled prototype construction application was carried out with additive manufacturing technology to optimize sustainability and modularity. This study aims to be an indicator that the combination of prefabricated systems, construction automation and innovative materials can definitively improve the sustainability of the construction industry in the future.

Keywords: 3D concrete printing; prefabricated elements; building elements; high-performance; additive manufacturing

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Effect of Waste Glass Powder and Coal Bottom ash in Concrete

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This Research work presents a criterion experimental study, which investigates the effect of incorporating waste glass powder and raw bottom ash from 0% to 20% with an interval of 5% to prepare high-performance mortar. The optimum percentage use is 20%. For rheological, mechanical, and durability properties cured under different conditions (water and dry) and temperatures (20 0C) at different curing stages at 7 and 28days. The water/cement ratio is at constant 0.35 and the cementitious material dosage which is the cement paste will be from 684, 547.2, 547.2 547.2, 547.2 ,547.2kg/m3 were done on the fresh and hardened mortar . These properties include workability, water absorption, compressive strength, flexural strength, fire resistance, acid attack, and drying shrinkage. Coal bottom Ash has been accumulated and the particle size distribution is 75µm and Glass has also been accumulated and grounded into waste glass powder (WGP) with a particle size distribution of 75µm similar to Portland cement.

Keywords: CementReplacement; Waste Glass Powder; Coal Bottom Ash; Waste Materials

Assessment of Ternary Gradation of Coarse Aggregate on The Mechanical Strength, Durability Properties, and Microstructure of Pervious Concrete Pavement

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Pervious concrete notable for its distinctive pore structure comprising of interconnected pore network induces high porosity, leading to good internal drainage and infiltration. With the recent emphasis on environmental sustainability and eco-friendly construction, this property becomes ideal especially in low-impact development. This study carefully considered the influence of aggregate size and gradation on pervious concrete pavement with mixtures proportioned to obtain optimum aggregate percentage in three aggregate sizes of 4.75 – 9.5mm, 9.5 - 12.5mm and 12.5 – 19mm at 0, 25, 50, 100% replacement levels in single, binary and ternary combinations to achieve a design array of pore structure characteristics and porosity attaining optimal pavement permeability, while sustaining satisfactory mechanical characteristics and durability. The 7 and 28 –day compressive strength, splitting tensile and flexural strengths for all mixtures were between 7.22 – 12.5 MPa, 11.98 – 14.63 MPa, 0.79 – 1.30 MPa and 2.94 – 3.44 MPa respectively. The single aggregate combination 7 – day compressive strength decreased with decrease in aggregate size; conversely, the 28-day compressive strength, splitting tensile strength and flexural strength increased with decrease in aggregate size. Binary and ternary aggregate combinations gave proper aggregates interlocking within the structure of the specimens resulting to higher strength. Water permeability coefficient, infiltration rate and porosity were 0.48 – 1.06 cm/s, 1.14 – 2.56 mm/hr and 31.66 – 37.10 % respectively, decreasing with decrease in aggregate sizes. Pore structure details indicate the accumulation of interconnected microstructure voids of sizes (20µm – 3.661 mm), limited binder content improves the hydraulic properties. Weight loss values between 28.76 – 59.64% were recorded using Cantabro Test, with abrasion resistance increasing with decrease in aggregate sizes.

Keywords: Pervious Concrete; Pore Size Characteristics, Porosity; Infiltration Rate; Permeability;

Using Sawdust in Sustainable Concrete Production

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The construction industry has been aiming to find cheaper, cleaner and smarter alternatives. Especially for its methods and materials over the course of the last few years. On the other hand, recycling and reuse are two unquestionably vital areas in which we need to practice improvement and innovation to help the world battle the enormous problem of waste. This paper is combining the two, as it is investigating the use of sawdust, a waste material generated in the production of wood, in concrete. The basic idea is to partially replace sand as fine aggregates with the sawdust particles. Three concrete mixes plus a reference mix with zero replacement by sawdust and five samples of each mix were prepared with different percentages of replacement by sawdust which were 30% (MRW2), 40% (MRW3) and 50% (MRW4) by weight. The impact on the mechanical properties such as compressive, splitting tensile and flexural strengths, density and modulus of elasticity at the period of curing of 28 days as well as the thermal performance of concrete was examined. Results found a reduction in all the mechanical properties as well as the thermal performance when compared to the reference ordinary concrete mix. The performance found the mixes suitable for use in lightweight concrete construction. Making this research a good try at improving the usage of waste material in hopes of minimizing damages caused to the environment and producing more sustainable concrete options for the future.

Keywords: sawdust, thermal performance, lightweight, sustainable concrete

Learning from Earthen Architectural Heritage in Cyprus

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Cultural heritage is under threat of the lack of awareness despite the importance of it. The way to provide a high quality of life and to contribute to identity creation for societies is through the preservation and management of cultural heritage. It is also critical to inform policy makers about the importance of such social identity and heritage should be protected as stated UNESCO World Heritage Convention. Earthen architecture is part of the cultural heritage.

Research and Development at ITÜ (Istanbul Technical University) has been carried on about 1. Durability of earthen construction material, 2. Earthquake safety of earthen loadbearing construction, and3. Contemporary construction technology using the mechanical infrastructure.

The study in Cyprus aimed to follow the local earthen architectural heritage, climate conditions for healthy living, construction performance and employment infrastructure. Contemporary earthen construction technology from İTÜ, has been applied in Dilekkaya village on a small home in 2012 in Cyprus. As a result: It has been observed Mechanical and physical properties of earthen construction material create healthy indoor climate. If the building doesn't use energy for heating and cooling, it creates opportunity for 0-energy building, and homeowners save money; and world is not polluted.

Finally, to reintroduce and use the findings on contemporary earthen construction there is the need for managing 1.social awareness 2.renewal of laws 3.renewal of curriculum from higher education on contemporary earthen construction

Keywords: Architectural heritage in Cyprus, Earthen building technology, Traditionally and contemporary construction, Earthen building in Dilekkaya village

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Influence of Integrating Rubbers Waste on Earthen Construction Adobe Properties

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Earthen structures possess an expanded popularity in recent years because of its potentials to create a sustainable and environmentally friendly buildings. one of the key elements of earthen structure is Alker which is mainly composed of sand clay mixture with varying proportions of gypsum and lime. Alker might form a significantly rigid materials by adjusting the proportions of gypsum and lime, which is well investigated in the literature. However, the influence on incorporating shredded rubber waste on the mechanical and dynamic properties of the Alker is rather ambiguous. Not to mention the possibility of minimizing the negative environmental impact of dumped rubber tire on the environment by incorporating the shredded rubber wastes into Alker production. This extremely vital as the rubber waste will be reused without any treatment or chemical alteration. This study aims to investigate the mechanical and physical properties of earthen construction mason bricks that incorporate shredded rubber waste. The key properties investigated are compressive and flexural strengths, dry and wet unit weight, in addition to the linear shrinkage and coefficient of damping under seismic activities.

Keywords: Alker, compressive strength, rubbers waste, gypsum, lime

Energizing North Cyprus Earthen Architecture: Rethinking the Future

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Cyprus has been using stone and earth for construction since the Neolithic era, and its architectural heritage has served as its identity. Stone was the primary building material during the Luzinian (1192–1489) and Venetian (1489–1571) periods. Throughout the Ottoman Empire, adobe was used as a building material. After that, around 1940, reinforced concrete was introduced to Cyprus. Nowadays, the construction industry accounts for 23-40% of worldwide greenhouse gas emissions. Traditional building materials, as opposed to modernized construction, have been demonstrated to be environmentally friendly, emitting almost no carbon footprint. Adobe is a naturally occurring material that has been utilized for a very long time and can be used in a significant way on the island. Due to cost issues and the negative impacts of stone mining areas on the surrounding ecology, there have recently been a number of initiatives in North Cyprus to develop an alternative construction material that is both affordable and ecologically friendly to the commonly used natural stone. Natural materials should be assessed in order to utilize limited resources for a sustainable environment and contribute to North Cyprus's zero-waste sustainable society. Adobe is one of the most important aspects of architecture for resource conservation and maintaining investment sustainability. Adobe is also considered to be cost-effective because materials can be simply transported and no specialized labor or equipment is required. Earthen architecture has to be reassessed in terms of material durability, and its usage in North Cyprus cannot be underestimated.

Keywords: Earth Architecture, Sustainability, Natural material, Carbon footprint, North Cyprus

Recycling of Fibre Reinforced Polymer (FRP) Composite Materials

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Traditional design approach using conventional construction materials, such as concrete, steel, masonry and timber, is based on performance and economy. Sustainable design approach using sustainable materials, such as fibre reinforced polymer (FRP), accounts for environmental, economic and social factors, and energy and resource consumption in addition to performance criterion. The evaluation of sustainability of materials involves life cycle assessment from cradle-to-grave including raw material procurement, fabrication and processing, construction, maintenance, recycling and disposal. The focus of this paper is on recycling, reuse and disposal of FRP composite materials. The life span of FRP materials, from raw material extraction, production, manufacturing and use to disposal, is discussed. Different recycling technologies for FRP composite materials and current research are reviewed. Three main processes for recycling of thermoset resin based FRP waste materials are discussed that include: (1) Incineration – with partial energy recovery from heating of the organic part and co-incineration – with both raw material and energy recovery; (2) Thermal and chemical recycling – with decomposition processes to partially recover fibres and energy; (3) Mechanical recycling – with breakdown of FRP composite material by shredding, grinding and milling resulting in smaller fibrous or powdered products. With growing use of FRP materials in construction industry, recycling of FRP waste materials is becoming a major environmental challenge. Sustainable tools and technologies should be employed for eco-friendly and efficient disposal of FRP waste materials.

Keywords: FRP composite materials; recycling and reuse; sustainability; life-cycle assessment (LCA) of FRP; Disposal of FRP waste.

Alternative Approaches For Sustainable Concrete Construction

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In recent years, CO2 emissions in the cement industries have increased significantly. Due to global warming, the increase in CO2 levels must be reduced through alternative sustainable strategies. Actually, the solution to this problem can be solved by using alternative raw materials and using alternative binders such as bottom ash and eggshell in cement production. In addition, with the decrease in natural resources, sustainable concrete studies are increasing rapidly.

The study was composed of two different Phases and samples were tested at 7, 28, 56, and 90-days. In Phase 1, three different weight percentages of bottom ash (%30, %40, and %50) and two different weight percentages of eggshell (%5 and %10) were used. In Phase 2, the two mixture groups from Phase 1 were chosen and enriched with two different volume proportions (0.3% and 0.75%) of basalt fibers. The highest compressive strength was measured at 18 Mpa and the highest flexural strength 7.16 MPa was measured as in Phase 1 in 7 days.

Based on the experimental results, cement composite composed of bottom ash and basalt fiber showed a decrease in workability due to the higher absorption capacity of the bottom ash and basalt fibers. However, the composites are satisfactorily used in controlled low strength (less than 10 MPa) and medium strength (20-35 MPa) applications. The compressive strength and flexural strength at 90 days were measured as 29 MPa and 9.04 MPa, respectively. When considering the sulfate and seawater resistance tests, bottom ash mixture groups were reported as 30% more durable compared to the reference mixture, and basalt fiber reduced the penetrability of salt concentration and makes the composite's highest resistance to sea-water attack. It was concluded that the maximum weight loss was 0.17. Since eggshell has the same chemical composition as lime, it was observed that it affects the physical and mechanical properties positively. The results reported in this thesis study showed that eggshell, bottom ash, and basalt fiber can promising candidates for alternative binders in cement production and concrete manufacturing. It can easily manufacture environmentally friendly, cost-effective, and sustainable concrete by using those wastes.

Keywords: Cement Replacement; Coal Bottom Ash; Eggshell; Basalt fibers; Waste Materials

Performance Of Hardened Cement Mortars Prepared With Waste Glass And Brick

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Human life of today, which needs to consume natural sources, has caused an increment in the number and kind of waste materials being formed, causing a waste annihilation crisis. This study focuses on the waste problem that may originate from construction areas, such as waste brick and glass.

Cement mortars are widely used in several construction applications. In this study, mortar samples prepared with CEM I cement, waste brick and glass that are used as a replacement of natural sand were examined. This re-using not only helps preserve natural aggregate resources of Beşparmak Mountains, but also the recycling helps to overcome an increasing waste annihilation crisis. Waste bricks and glasses were utilized to substitute 0%, 50% and 100% of fine aggregates in the mortar samples and the compressive and flexural strength of hardened mortars were determined with laboratory tests done.

The test results show that the replacement of fine aggregates by waste glass and brick at level of 50% and 100% by weight has a significant negative effect on the compressive and flexural strength of the mortar samples as compared with the control sample. The obtained results show that mortars containing waste glass cause a decrease in especially compressive strength up to around 15% at 28 days, while mortars containing waste brick caused a decrease in compressive strength up to 30 % at 28 days.

Keywords: Cement mortar; waste bricks; waste glass; flexural strength; compressive strength

Effect Of Waste Utilization On Behavior Of Beams

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One of the main industries that has a detrimental impact on the environment is the construction industry. The natural sand resources that are now accessible are becoming depleted as construction activity expands quickly. As a result, natural sand in concrete must be partially or entirely replaced with an alternative material without lowering the quality of the concrete.

Massive amounts of power and fuel are needed to produce cement, and these resources emit heat, noise, and fuels like carbon dioxide (CO2), nitrous oxides (NOx), sulfur dioxide (SO2), and carbon monoxide (CO).

Researchers have looked at the advantages of using alternative sustainable materials to cement and sand to lessen the amount of waste that is dumped into the environment. One such substance that pollutes the air and gets dumped in landfills is marble dust. In the present work, a review on the utilization of marble dust as reusable material on behaviour of beams is presented. The research uses various marble dust filler percentages to illustrate the compressive strength of concrete. The review highlights the mechanical qualities and durability of the material, such as the concrete's compressive and split tensile strength, the initial crack load, the ultimate failure load, and the deflection of the beams when marble dust is used. Admixtures are frequently added to modern concrete mixtures to modify them and enhance their structural qualities.

Reviews show that marble dust may be utilized in lieu of sand in the concrete industry and typically enhances the mechanical qualities of concrete with lower water-cement ratios. Marble dust doesn't have any influence on the hydration process, but it gives concrete a filler effect and improves performance. In light of this, marble dust can be utilized as a suitable fine aggregate in sustainable concrete.

Keywords: Waste Materials, Marble Dust, Concrete Beams.

Cement Replacement With Waste Brick Powder In Paving Blocks

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This research presents a series of laboratory experiments for investigating the influence of waste clay brick (WCB) as cement replacement on density and compressive strength in concrete paving blocks. Fired clay brick is considered a supplementary cementitious material due to the burning process. North Cyprus has two major production companies for fired clay brick and the estimated waste is approximately 950 kg/day. Mixes with 5%, 10%, 15%, 20%, and 25% replacement are cast using Vibro-compaction and pressure method. Samples were cured after 24 hours by sparing water once and left at room temperature until the testing date. Density and compressive strength on the 7th and 28th days are measured. The test results showed a decrease in density when using WCB at all percentages. At 10% WCB, the 28th-day compressive strength increased by 6.6% compared to the control mix.

Keywords: Density, Compressive Strength, Paving Block, Supplementary Cementitious Material, Waste Clay Brick

Realizing the Biomimicry Revolution: The End of Philosophy of Technology and the Rise of Technics

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Janine Benyus has popularized the idea that to overcome the ecological crisis we need a "Biomimicry Revolution" of comparable scope and scale to the "Industrial Revolution". In this talk, I argue: i) that the Industrial Revolution was grounded on the rejection of the traditional view of techne as imitation of nature and the concomitant emergence of the view of techne as human creation; and ii) that this coincided with the emergence of philosophy of technology as a stand-alone discipline, for it was only when techne was cut off from the natural models on which it formerly rested that it could become an isolated object of philosophical study. I infer from this that, for the Biomimicry Revolution to come to pass, philosophy of technology must come to an end and be replaced by what I call "technics", understood as that branch of philosophy that studies in a single field both natural and human technics, that is to say, both natural and human designs. I then explain the important ramifications of this for the technical disciplines, i.e., engineering, architecture, and design.

Keywords: Biomimicry, revolution, engineering, architecture, design

Review of utilization of biopolymer in soil stabilization

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The main purpose of improving the soil is to provide them with features that will provide more suitable and adequate conditions for inadequate floors and building foundation floors affected by disasters such as heavy loading situations, earthquakes or landslides. Bio-stabilization of soils is defined as the products or biological process used to improve soil properties. Although bio-stabilization is considered to be a new technical process, it is actually a process that has been used and known by humanity before. In the literature, the Romans used bio-stabilizers such as protein as a set retardant for gypsum used in building construction (Plank, 2005). The Chinese, on the other hand, used sticky rice mortar as a binding material when building the Great Wall of China (F. Yang et al. 2010). Nowadays, bio-stabilization techniques are widely preferred for soil stabilization. Bio-stabilization techniques (e.g. biopolymer stabilization) are recommended as a potential alternative to chemical stabilizers. Polymers synthesized by biological processes are known as biopolymers. Biopolymers are polysaccharides consisting of a monosaccharide network. Monosaccharides, on the other hand, are bound to hydroxyl groups. In addition, these hydroxyl groups have carbon atoms, these atoms are known as the simplest form of carbohydrates (for example, glucose, fructose and galactose). The hydroxyl groups are defined as each monosaccharide in the polysaccharide. When biopolymers are mixed in water, hydroxyl groups react immediately with water to form 'hydrogels'. When these hydrogels are mixed with soil and water, an uncomplicated structure connecting the soil particles to each other occurs, and to ensure the stabilization effect, the hydrogels hold on to the surface of the soil particles. It has been found that it is sufficient to use biopolymer solutions with limits of 1.0% - 3.0% to significantly increase the strength and durability of the soil during biopolymer soil stabilization (Cabalar and Canakci, 2011; Chang, Im et al., 2015; Qureshi et al., 2017). In this research, utilization of biopolymers in stabilization for different soil types will be reviewed and its advantageous will be discussed by considering the literature researchers that have been conducted up to the present day.

Keywords: bio-stabilization, biopolymer stabilization, soil stabilization

An Investigation On The Potential Of Cellulose For Geotechnical Applications

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Construction industry remains a major contributor to global carbon emissions. In an attempt to move forward with sustainable goals, nature based materials are advocated for various construction activities including large-scale applications in geotechnical engineering. Carboxymethyl cellulose is an anionic ether derivative of natural cellulose which has a good binding and moisture-retaining capacity. In this study, cellulose an abundant biopolymer is investigated for its potential to modify geotechnical properties favourably. Experimental investigations were conducted on organic silt stabilized with 0.25% to 1.00% CMC and the results indicate that strength increased by 76.7% with 0.5% CMC treated soil after 28 days. Permeability of the 0.5% CMC treated soil decreased by 91.7% after 28 days and the additives suppressed the compression index of the soil by 50%. CBR test indicated that the additive improved the subgrade strength by 33.2% making it from very poor to a fair sub-grade material. Microstructural analysis using SEM and chemical investigation using XRD indicates that CMC's interaction with soil did not form any new chemical compounds. However, the viscous nature of the material formed fibrous threads that bind the soil well to enhance the geotechnical properties establishing itself as a prominent stabilizer for ground improvement applications.

Keywords: CMC, organic silt, UCS, permeability, CBR

Scopes For Using Activated Lime Sludge In Earth-Based Building Materials

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This study outlines the development of an earth-based, alkali-mediated composite material that can be used as micro piles for stabilization of railway embankments. The base material used is the crushed Mercia Mudstone (from Ratcliffe-on-Soar, Nottingham) due to its moderate plasticity and predominantly loamy texture. The base material is mixed, in various proportions, with an organic precipitate calcium carbonate precursor, known as lime cake, lime sludge and press mud. This is the residual waste from refinement of brown sugar. It is also mixed with small proportions of diluted sodium silicate solution as alkali activator. Test specimens are remolded to a high 0.5 void ratio and degree of saturation of 55%. A range of curing conditions and times are exercised. Specimens are subjected to a broad range of mechanical, chemical, and microanalytical testing. Emphasis is put on role of ferric oxides and cementing gels, their interplay and how each component contribute to strength, stiffness, and volumetric change behavior. The stabilized mudstone appears to provide little shrinkage, high water retention capacity, good peak strength, good stiffness, and low carbon footprint. The material is light, porous, and provides good drainage and aeration. To this end, it functions as a natural means for thermal insulation. It would absorb moisture from air through its pores and consume it in alkali- exothermic reactions. The heat from exothermic reactions then is consumed in series of dehydration events at particle level, all leading to progressive gain in strength. It utilizes CO2 as a feedstock and yield cleaner production with fortuitous advantage of hardening with age.

Keywords: Alkali activator; earth-based; building material; stabilization; insulation; cracking

Influence Of Severe Climate Conditions On The Properties Of Soil Reinforced With Waste Plastic Shreds

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One of the most common challenges faced during the construction of highways is encountering weak clay soil. Improving such soils using cement has been a widely practiced implementation, despite the negative effects of it on the environment.
This study evaluates the efficiency of using waste plastic bottles polyethylene terephthalate (PET) shreds as a soil reinforcing material and effect of it in reducing the amount of consumed cement. For this purpose, soil samples were reinforced with variable percentages of PET shreds and later were mixed with different percentages of cement. The shear properties, durability, stiffness and microstructure of un-stabilized, cement stabilized, and PET reinforced stabilized samples were examined through California Bearing Ratio (CBR), Accumulated Loss of Mass test (ALM), the variations of maximum shear modulus (Gmax), X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM) microstructure when exposed to wetting/drying cycles.
Results revealed that reinforcing soils with waste plastic shreds improved the strength of soils compared to plain soil samples. In addition, using cement conjoined with PET shreds did considerably reduce the ALM of all samples tested compared to soil with only cement. While, the stiffness decreased in the initial wetting/drying cycles it fluctuates about an average value for the later cycles. The porosity/binder index was found to be a predictor of the ALM and Gmax after a series of wetting/drying cycles. Finally, inspired by the high correlations between ALM and stiffness of the samples, an innovative approach to predict durability through the stiffness was proposed.

Keywords: Soil stabilization; PET shreds; CBR; durability; stiffness; microstructure; porosity/binder index.

Mitigating Collapse Potential of Calcareous Soil Using a Sodium Silicate Solution

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Collapsible soils have caused infrastructural damages resulting in several economic losses and loss of lives in certain cases. To mitigate collapse potential (CP) of a calcareous clay soil, a suitable sodium silicate solution was formulated under a rigorous process in a preliminary investigation of the setting/curing characteristics of samples treated with different silica/sodium (SiO2/Na2O) ratios and concentrations. The adjudged most suitable solution was then applied in the main study, to treat samples by impregnation of pre-formed oedometer specimens. A non-destructive means of treatment (impregnation) was preferred in order to benefit from the inherent structure and bonding of samples. However, impregnation method proved unsatisfactory to treat samples containing greater than 12 % calcite (CaCO3) content. Thus, only moderately calcareous (the 12 % CaCO3 content) samples were investigated. Treated oedometer specimens were simply heat-cured (45 – 50 0C) for 24 hours as informed by the preliminary study. CP was estimated by the percentage decrease in height of an oedometer specimen due to wetting at 300 kPa overburden stress. Different wetting fluids (distilled water and a 5 % acid solution (AS)) were used in order to investigate the influence of pore fluid pH on CP. It was found that at 300 kPa wetting stress, silicatization and heat-curing reduced CP of samples by between 59 % – 73 % under distilled water wetting and 70 % – 78 % under acidic solution (AS) wetting. Therefore, it is concluded that a well selected Na2SiO3 solution can improve the CP of loose-structured moderately calcareous clay samples. However, setting of treated samples occurs only after heat-curing.

Key Words: Calcareous clay, Collapsibility, Silicatization. Fluid pH, Heat curing.

Geopolymer Brick from Construction and Demolition Waste

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Construction and demolition waste (CDW) can be recycled effectively through alkali-activation or geopolymerization, which can be a significant step in the direction of waste management. In the current work, sodium silicate and sodium hydroxide were used as alkaline activators to examine the synthesis of geopolymer brick based on the alkaline activation of construction demolition waste (CDW). The CDW was generated by combining concrete waste, brick waste, glass waste, and gypsum waste with proportions according to construction waste in Turkey. The materials are ground to have a particle size smaller than 150 microns. For this research effect of sodium hydroxide molarity (SH) (8 and 10), sodium silicate (SS) to sodium hydroxide ratio (2.5:1 and 3.5:1), and curing conditions were chosen (Ambient and 40 C) studied. Dry materials are mixed and the solutions were added followed by 5 minutes of mixing to ensure the homogeneity of the mixes. 6 cubes of 5 cm were cast using normal compaction, 25 blow per/3 layer. Samples are cured in ambient and 40 C until the day of casting. For the samples cured at ambient temperature the higher the sodium hydroxide ratio the higher the compressive strength. For 40 c curing lower molarity gives higher compressive strength. The 7th-day compressive strength of 27.01 MPa was attained in the case of 8 SH mol, 3.5:1 SS/SH ratio, and 40 C curing. For the ambient curing condition, the mix with 10 SH mol, and a 3.5:1 SS/SH ratio gave 13.48 MPa. This study indicates that CDW has the potential to be activated by geopolymerization process for producing bricks. Using the pressure method can enhance the mechanical properties of the CDW geopolymer bricks.

Keywords: Construction and Demolition Waste, Geopolymer Brick, Waste Management, Ambient Curing, Alkali activation.

Potential Applications of Enzymatic Calcium Carbonate Precipitation (EICP) for the Liquefaction Mitigation

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Cyprus has a long historical record of damaging earthquakes, (Ambraseys, 1992; Ambraseys & Adams, 1993). Recently, several earthquakes struck the region, and the need for sustainable and effective technologies has become one of the priorities for geotechnical engineering researchers. Enzyme-induced carbonate precipitation (EICP) is a recently proposed new biologically-based technique aimed at providing environmental-friendly and sustainable ground improvement. EICP changes the mechanical properties of soil by precipitating calcium carbonate within the pores of granular soil through hydrolysis of the urea catalyzed by the urease enzyme in the presence of calcium ions. Various researchers have demonstrated that bio-cementation technologies have considerable promise for the efficient mitigation of liquefaction. Simatupangb et al. (2018) additionally performed undrained cyclic shear strength tests on Toyoura and Keisha No. 4 sands, taking into account various testing factors, such as the particle dimensions, percentage of calcite, confining pressure and the saturation level in the precipitation process. The study findings also supported the suitability of the EICP technique for mitigating liquefaction. Nafisi et al. (2019) recently examined the effects of EICP and MICP treatments on the shear responses of two conventional sand soils: Ottawa 20–30 and Ottawa 50–70. It concluded that the shear wave velocity rate was increased in the EICP sample in comparison to the MICP sample, thus enhancing the liquefaction resistance capacity. In this presentation, we will review the current literature regarding the bio-cementation of sandy soil and discuss the applications, challenges, and limitations of using EICP treatment for liquefaction mitigation.

Keywords: Liquefaction mitigation, bio-cementation, EICP.

Cemented Granular Soil For Road And Rail Infrastructure

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Nowadays, a lot of pressure is put on our road and rail infrastructure to perform at the lowest cost and in certain instances maintenance is neglected causing performance reduction or failure. New cost-effective engineered materials are needed to withstand the toughest new requirements and bonded soils is a viable alternative. This research shows the effect of the addition of small quantities of a binder to well graded compacted base and subbase granular material. Preliminary results from the same concept as applied to railway ballast are also shown. To understand the benefit of the addition of small percentages of cement in the behaviour of these materials, monotonic and cyclic triaxial tests with more than 700 thousand cycles were performed. The monotonic tests results show that the addition of small quantities of cement increase the strength of the soil due to the increase in volumetric strains. The cyclic tests show that the addition of cement reduces the total settlement to a small fraction of the settlement measured for the uncemented samples. It also allows the cemented soil to support higher stress ratios than the uncemented. This has the potential to reduce maintenance costs by increasing the maintenance intervals.

Keywords: Triaxial testing, Cyclic testing, cemented soil, Scaled ballast

Geopolymer Soil Stabilization Using Waste Glass Powder

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Due to the inconsistent nature of waste glass streams, waste glass poses a major threat to the environment. The construction sector has adopted several strategies to meet this objective in response to significant environmental pressure to reduce solid waste and recycle as much as possible. The geopolymerization process is a technique that can utilize many solid wastes into cementitious materials and it is considered to be a sustainable process by many researchers. This research studies unconfined compressive strength (UCS) and Direct shear strength of stabilized soil using glass waste powder geopolymer. A standard proctor test was used to find optimum moisture content and maximum dry density of the soil. Glass waste was crushed to powder form passing 75 microns. 10% of glass powder was used for soil stabilization. Effect of sodium hydroxide (SH) molarity (10 and 12 mol), sodium silicate (SS)/sodium hydroxide ratio (2.5:1and 3.5:1), and curing condition (ambient and 60 C) were studied. The higher the silica ratio in the mix the higher the UCS. The highest UCS of 18.612 MPa on the 28th day was measured in the case of 12 molarity for a 3.5:1 SS/SH ratio cured at 60C. In the case of ambient curing, the mix with 10 Molarity of SH and a 3.5:1 SS/SH ratio gave UCS of 13.664 MPa on the 28th day. A direct shear test was performed on the optimum mix. The result gives a cohesion value (c) of 697.18 kPa and an angle of internal friction (ϕ) of 42.595. Feature research can be focused on the long-term properties and durability of the high-strength geopolymer stabilized soil.

Keywords: Soil Stabilization, Geopolymer, Waste Glass, Sodium Silicate, Sustainability, Ambient Curing

Pine Needles as Natural Reinforcement for Adobe: Towards Green Buildings in Lebanon

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Adobe construction is gaining popularity because of its availability, economy, and ease of workability. These features make it an exceptionally sustainable material, with minimal energy usage in manufacturing and recyclability. Natural fiber-reinforced bio composites have grown in popularity in recent years, owing to rising environmental and health concerns, more sustainable manufacturing methods, and lower energy use. In recent years, the use of natural biomass as a raw material for engineering construction has become a focus of research in order to meet the criteria of energy savings, green environmental protection, and sustainable development in engineering construction. Pine needles are already recognized to have several beneficial qualities, such as their capacity to remove dye from water, their antibacterial capacity, their ability to prevent DNA damage and cancer tumors, and their capacity to predict trends in air pollution. Adobe can be reinforced with pine needles. Pinaceae plants provide an abundance of renewable leaves (pine needles) with a low consumption rate that might be used to make natural plant fibers. Since Lebanon has a huge number of pine trees, adding pine needles to adobe can increase its mechanical and durability properties.

Keywords: Adobe, Sustainability, Pine needles, Durability, Lebanon

Shear Strength And Suction Properties Of North Cyprus Sands

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Suction properties are influential on the shear strength of unsaturated soils. North Cyprus has different types of sands that could be investigated from the suction and shear strength characteristics point of view. Natural sea sand, crushed limestone and yellow sand of North Cyprus are the types of sand that are experimentally studied in this thesis. Shear strength of a soil provides resistance against stress exerted along a horizontal plane. The shear strength of any given soil is affected by its suction capability. Shear strength test can help obtain the values of parameters like angle of friction and cohesion of the tested soil. Suction means the capacity of soil to absorb water. The three components of suction are matric suction, osmotic suction and total suction. The Tube Suction Test (TST) was used to calculate the matric suction while shear strength test was conducted using Direct Shear Test (DST). The samples consist of natural sea sand from Gaziveren (GAZ), yellow sand from Serhatköy and two crushed limestone sands from Gürdal (GÜR) and Roads Department Quarry (RDQ). SoilVison software is used to fit 'Fredlund and Xing' and 'van Genuchten (1980)' formulas to predict the soil water characteristics curve, SWCC, for the sand samples. Results indicated that the more the matric suction, the less moisture content the sand contained. Angle of friction seemed to decrease as the moisture content increased. The shear strength of each sample increased with increasing matric suction.

Keywords: Sand; shear strength; suction; SWCC; tube suction test

The Effect Of Nano-Sio2 On The Unconfined Compressive Strength Of Micp-Treated Kaolin Soil

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In this study, the effect of nano-SiO2 on enhancing the MICP processes in a kaolinite clay is investigated. The nanomaterials and bacteria and cementation solutions were added to the host soil with different percentages. A series of unconfined compressive strength (UCS) tests was conducted to study the effect of nano-enhanced bio-cementation on soil strength after different curing times. It was shown that the MICP method with 25% bacteria solution and cementation solution had the highest increase in UCS, while using 30% bacteria and cementation solution UCS has shown a decrease compared to that of 25%. For the MICP-treated sample with 30% bacteria and cementation solutions, adding 1.5% nano-SiO2 has created higher strength in comparison to samples treated by 1% and 2% nano-SiO2. However, at curing time of 4 weeks, the strength of the sample treated by 2% nano-SiO2 was higher than the samples with 1.5% nano-SiO2. The effect of curing time can indicate the effect of nano-SiO2 on continued precipitation of calcite crystals over time. The effect of nano-SiO2 on moisture adsorption and increasing the matric suction can be another factor that increases the UCS of the treated soils. Taking a look into SEM images confirms the formation of calcium carbonate crystals in MICP treated samples after one week of curing time. However, after 2 and 4 weeks, the presence of flocculated crystals within the host soil caused higher strength in the samples having nano-SiO2.

Keywords: MICP, Bacillus pasteurii, nanomaterials, nature-based soil stabilization, biocalcification, kaolinite.

A Novel Application Of Close-Range Photogrammetry For Earth Retaining Wall And Slope Stability Assessment

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In recent years, with the advances in the construction sector monitoring techniques have been extended to be used in geotechnical assets such as slopes, embankments, and retaining walls. The current study analyzed the slope stability problem near the Kyrenia Castel which belongs to the 7thcentury and is located in the northern part of Cyprus. In the current case, the landslide and RC/Stone walls built for rehabilitation purposes were monitored for a period of 2 years. As a conventional analysis method, the Finite Element Method (FEM) was adapted to back analyze the current condition of the site. On the other hand, close-range photogrammetry (CRP) was adopted by using an unmanned aircraft vehicle (UAV) to obtain the required photographs that are necessary to build the dense cloud model and detect the changes in geotechnical assets. The results show that the CRP method confirms the numerical analyses. As a result, this approach can be used vastly in various civil engineering applications, especially geotechnical engineering applications, as it is proven to be fast, cost-effective, and non-destructive when compared to conventional methods.

Keywords: Retaining Wall, Unmanned Air Vehicle (UAV), Close Range Photogrammetry (CRP), Monitoring, FEM

Thermo - Hydro - Biogeochemical Modeling Of Permafrost Carbon Feedback

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Permafrost is likely the greatest source of terrestrial carbon sink in human history. It is currently estimated that permafrost stores between 1,460 and 1,600 billion tonnes of organic carbon. This amount is about twofold the amount of carbon in the atmosphere today. Climate warming has affected the permafrost areas and resulted in thawing process and subsequently biogenic activity and greenhouse gases emissions (methane and carbon dioxide) to atmosphere. It is worth noting that carbon emissions from permafrost thaw, are not even fully accounted for in global emissions budgets or into recently updated national commitments for emission cuts made under the Paris Agreement. This process, which is called positive carbon feedback, can contribute to climate warming. In order to simulate the carbon transport in a degrading permafrost and predict the carbon-dioxide flux from the soil surface, we propose a model in which the effects of microbial activity and plant root respiration as the sources of carbon production are considered and calculated in time and space (spatiotemporal modeling of carbon transport). Our finding and results for CO2 efflux from the soil surface to atmosphere, are in good agreement with experimental data. This model provides a framework to consider the effect of seasonal temperature changes, biogenic activity and the plant root respiration on net carbon-dioxide production and evaluation of the effective parameters on the sources of carbon production within the soil.

Keywords: Thermo-hydro-Biogeochemical modeling, Permafrost, Soil-vegetation, climate change, Carbon-feedback.

Frictional Directionality Between Snakeskin-Inspired Surfaces And Soils

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The transfer of load at soil-structure interfaces plays a key important role in the stability of many geotechnical structures. In recent decades there has been a growing interest in the field of bio- inspired geotechnics due to the potential benefits in environmental and economic impacts. The adaptations of snakes for locomotion on soil are of particular relevance for the transfer of load at soil-structure interfaces. The underbelly skin of snakes can generate different friction coefficients in the caudal (i.e. along the scales) and cranial (i.e. against the scales) directions. This frictional directionality is enabled by the asymmetric shape of the scales, scale compliance, and changes in the scale angle of attack. This paper evaluates the effect of scale geometry and scale compliance on the shear behavior and frictional directionality of soil-interfaces with sandy and clayey soils. Interface shear experiments were performed in a shear box device on surfaces with rigid and compliant snakeskin-inspired surfaces. The results indicate that shearing in the cranial direction results in greater friction coefficients in all testing configurations. However, certain conditions led to greater frictional directionality. Namely, changes in the scale geometry led to greater frictional directionalities than changes in the scale compliance and tests in sands led to greater frictional directionalities than those in clay.

Keywords: soil-structure interfaces, bio-inspired geotechnics, sands, clays

An Experimental Study On The Effects Of A/Ac And Frequency Of Input Motion On The Behavior Of Rocking Foundations

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Rocking isolation is one of the most effective methods to minimize the structural damage to bridge piers caused by earthquakes. A rocking foundation protects the structure from seismic loads by taking advantage of soil failure. Rocking isolation of foundations leads to a reduction in the ductility demand and the amount of ground shaking that can be transmitted to the columns and superstructures. This study investigates the seismic behavior of a bridge pier constructed on fine dry sand using 1-g physical modeling tests. The modeled bridge pier is considered rigid enough compared to the soil media, and the rocking degree of freedom of the pier is considered non-constrained. Influences of different critical contact area ratios (A/Ac) on the behavior of the pier are evaluated. The modeled critical contact area ratios are provided using various values of concentrated masses. In addition, the effects of the input motion frequency on the modeled pier's seismic behavior are assessed. The achieved results indicate that the occurred settlements and rotations of the considered model are rate- dependent parameters and will increase by decreasing the frequency of input motion. Moreover, it is shown that the increment of the critical contact area ratio leads to an increment in settlements and a reduction in occurring rotations.

Keywords: Rocking isolation, Shaking table tests, inspired solution, Bridge pier, Physical modeling, Critical contact area ratio.

Dynamic Response Of Shallow Mat Footings On Coir Geotextile Reinforced Sand Under Cyclic Loading

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A series of shaking table tests were conducted on a well-graded fine sand to investigate the dynamic behavior of laboratory scale mat foundation when subjected to cyclic loading. This study also investigates the effects of geotextile inclusion, as a reinforcement, on the behavior of the mat foundation constructed on fine sand.

Six tests were carried out on unsaturated and saturated, reinforced, and unreinforced conditions. The results show that adding geotextile to both the unsaturated, and saturated sand resulted in a reduction in the acceleration of the model foundation.

Keywords: Liquefaction, fine sand, shaking table, geotextile, soil reinforcement

Design, Application, And Quality Control Of Popular Soil Improvement Methods

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The foundations of the structures on the soil are designed by the Geotechnical Engineer after investigation of the type of soil and its characteristics. If the soil properties are good at shallow depth below the ground surface, application of shallow foundation types such as footings and rafts, are generally most economical. Soil at a construction site may not always be suitable for supporting structures in its existing conditions. If the soil just below the ground surface is not good, deep foundations, such as piles or piers are required. But these foundations are quite costly as compared to shallow ones. Nowadays an increasing proportion of building development takes place on poor soil conditions, which presents the geotechnical engineer with the challenge of providing satisfactory foundation performance at low cost. Therefore, a soil improvement method with several alternatives can be employed to that achieve project objectives. In such case, the soil is improved to increase the shear strength and decrease the compressibility. Soil improvement methods have been developed largely as an experience-based technology. Hence, the proper selection and design of the soil improvement method, there is a need to obtain soil and column parameters with more comprehensive quality control tests on site after its implementation.

The objective of this paper is to describe the important aspects of the popular soil improvement methods. For this purpose, soil improvement methods will be discussed together with design, implementation, and quality controls through examples of infrastructure facilities, residential buildings, office buildings and industrial buildings.

Keywords: Soil Improvement, Design, Quality Tests

Developing A Novel Methodology To Calibrate Building Energy Use In The South-Eastern Mediterranean Climate

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Scientific evidence is growing that greenhouse-gas emissions have a noticeable effect on the earth's climate. Many existing buildings in Cyprus that form high-density residential-tower blocks, however, do not meet current stringent energy-efficiency standards. As a result, many of these structures are under threat of overheating and require careful planning to implement holistic retrofitting schemes. This study presents a novel methodology that was developed according to the in-situ measurements of building-fabric thermal performance to calibrate as-built energy models of post-war social-housing development estates in the coastal city of Famagusta, where the summer climate is hot and humid. It also examines the gap between as-designed and as-built energy performances. A quantitative research methodology based on in-situ measurements— which included recordings of household indoor air-temperature integrated with thermal-imaging surveys and heat-flux measurements of the building-fabric elements, along with a concurrent monitoring of environmental conditions and review of household energy bills to accurately determine actual energy use—was employed. It was found that the main reasons for thermal lag resulted from infiltration through the building fabric, a lack of natural ventilation through living spaces and excessive heat gains through sizeable glazed areas. On a typical summer day, the internal temperatures of the simulated condominiums remained high throughout the day and night, ranging from a minimum 28.5°C to a maximum 36.5°C. Insights from this study reinforce the need for European Union objectives to require integrated building-fabric testing as a component of retrofitting measures to ensure that performance targets are acknowledged and met.

Keywords: Calibration, Energy use, In-situ measurement, Overheating risk, Retrofit

A Phenomenological Approach To Light And Shadow In Interior Built Spaces

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The implication of the exterior natural environment on the experience of people within the interior built environment has received interest in the architectural discipline. This paper studies the problem of light in space as a source of stimulation and cause of spatial experience. Emphasis is put on the patterns of sunlight and shadow, sky condition, sun position, architectural forms, and how the interaction of these control people's experiences. A phenomenological approach is adopted. Two sites are chosen for the field study: Sheikh Lotfollah Mosque in Isfahan and Donau City Church in Vienna. About 180 participants were randomly chosen and interviewed as 'occupants of space'. Occupants' perceptual responses to various light and shadow scenarios (direct and patterned, direct and plain, indirect) are collected as data. The perceptual response is quantified in terms of visual interest rating, impressions (pleasure, arousal), and visual perception (clarity, complexity, spaciousness). The data is then analysed in conjunction with environmental factors including sky conditions (clear/overcast) and sun position (morning, midday, afternoon). Findings show that both sky conditions and sun position impact participants' evaluative impressions and visual perception. In particular, impressions of pleasure, arousal, and perceptual clarity can enhance in presence of direct light compositions. Variations in the intensity of light and shadow patterns improve occupants' sense of pleasure and arousal. The striking patterns of light and shadow appear to be perceived as the most exciting and attractive spatial components of the interior spaces. Findings here encourage a novel approach to the design of buildings, a nature-inspired way, yielding interiors that are not only comfortable and energy-efficient but also pleasurable and exciting for their occupants.

Keywords: Nature-inspired; sunlight; shadow; patterns; architecture; experience; environment

An AHP Informed Framework For Optimized Use Of Materials, Methods, And Models

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The efficiency, governance, and compliance with environmental ideals in construction projects is only possible through a decision support system that ensures materials, models, and methods (3Ms) are adaptable and integrated. Recent advances in building information modelling (BIM) facilitates visualization of sequences and production stages in construction, yet, it falls short in giving compatibility among the 3Ms, their suitability and workability, and their financial and legislative viability a miss. To this end, this paper rethinks the concepts of sustainability and productivity, and lays foundation for a new decision support system that is simple, affordable, and portable enough to attract large enterprises as well as SMEs — 90% of the UK construction stakeholders.

Ideally, an efficient construction project has good flow of workstreams, is least complex, cost minimized but with added value, timely and in symbiosis with natural health provisions of the ecosystem. A combination of data from literature and select real-world projects are systematically collated to draw out impediments to efficiency and challenges. The analytic hierarchy process (AHP) is then used to classify, measure and monetized (rate) the impacting factors. Among factors considered are methods of management, corporate structures, mechanisms of systems thinking, governance and public perception, automation and technology, integrity and corruption. The outputs of the AHP analysis feeds into the novel decision support system, the concepts of which are briefly introduced in this contribution.

Keywords: Construction; Productivity; Efficiency; Systems; Integration

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A Critical Review on Hydrocarbons Contaminated Soils and Their Mitigation

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Soil contamination, due to urban and industrial activities has caused significant land degradation and changes in geotechnical characteristics of soil. This review study summarizes the critical aspects of different hydrocarbons contamination in various soil types and their implications in the geotechnical design. The modification of geotechnical properties requires an in-depth investigation especially at micro scale by assessing the soil particle interaction with hydrocarbons. The hydrocarbon compounds possess the ability to alter the morphological and geometrical arrangement of particles which in turns influences the shear mobilization characteristics of soil. Furthermore, several mitigation techniques are available such as biological, chemical or physical methods to solidify, removal or immobilization of hydrocarbons. However, limitations exist due to the applicability of some methods. Therefore, considering these factors, the primary purpose of this review study is to create a consensus about how different hydrocarbons interact with different soil types, what are the trigger of these interactions, which geotechnical properties are affected the most, which mitigation technique will be more effective and how quick the mitigation techniques can be applied.

Keywords: Hydrocarbons, Geotechnical Properties, Mitigation Techniques

Estimations Of Savings For Recycling Construction And Demolition Waste On Islands: A Case Study Of Northern Part Of Cyprus

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Scientific evidence is growing that greenhouse-gas emissions have a noticeable effect on the earth's climate. Many existing buildings in Cyprus that form high-density residential-tower blocks, however, do not meet current stringent energy-efficiency standards. As a result, many of these structures are under threat of overheating and require careful planning to implement holistic retrofitting schemes. This study presents a novel methodology that was developed according to the in-situ measurements of building-fabric thermal performance to calibrate as-built energy models of post-war social-housing development estates in the coastal city of Famagusta, where the summer climate is hot and humid. It also examines the gap between as-designed and as-built energy performances. A quantitative research methodology based on in-situ measurements— which included recordings of household indoor air-temperature integrated with thermal-imaging surveys and heat-flux measurements of the building-fabric elements, along with a concurrent monitoring of environmental conditions and review of household energy bills to accurately determine actual energy use—was employed. It was found that the main reasons for thermal lag resulted from infiltration through the building fabric, a lack of natural ventilation through living spaces and excessive heat gains through sizeable glazed areas. On a typical summer day, the internal temperatures of the simulated condominiums remained high throughout the day and night, ranging from a minimum 28.5°C to a maximum 36.5°C. Insights from this study reinforce the need for European Union objectives to require integrated building-fabric testing as a component of retrofitting measures to ensure that performance targets are acknowledged and met.

Keywords: Calibration, Energy use, In-situ measurement, Overheating risk, Retrofit

A Comparative Study Of Using Soil Nailing And Ground Anchors For Slope Stabilization

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Soil nailing and ground anchors are techniques used to strengthen a retaining wall, an existing slope or excavation wall. These reinforcements are placed closely to each other for the sake of improving the factor of safety. Both nails and anchors have the same process of installation, and are used with the aim of withstanding tensile forces, shearing forces, and bending.

The factor of safety values depends on variables such as (1) the length of nails or anchors, (2) the nails' or the anchors' inclination angle, (3) the angle of the slope, (4) the patterns for spacing, as well as (5) the height of the slope. The soil properties are the most important elements which govern the increase or the decrease of the factor of safety.

In this study, the factor of safety of stabilized slopes using both nails and anchors, within the same conditions were compared using the computer program "Slide 6.0" and the "Bishop method". The angle of studied slopes was 30ϕ,45ϕ and 60ϕ in two different heights of slope, at 10m and 15m. The lengths of both nails and anchors used were 10m, 13m and 15m. The research was done on a clay soil with a unit weight of 19KN/m3, the cohesion C=25kPa and, the internal friction angle ϕ=5ϕ. In all types studied, an additional uniform distributed surcharge of q=10kN/m2 is put at the top of the slope. The results showed that the use of nails gives better values in terms of factor of safety in all circumstances compared to anchors. Expectedly, the effect of increasing the height of slope in the studied soil type does not exhibit any positive result for neither soil nailing or ground anchor technique.

Keywords: Nails, anchors, factor of safety, soil stabilization, slope angle.

Liquefaction Susceptibility by Laboratory Tests

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Liquefaction of sandy soil layers has been a major concern for geotechnical engineers ever since the devastating 1964 Alaska and Nîgata earthquakes. Significant efforts have been made to evaluate the mechanics of the soil behaviour during cyclic excitations and to determine the factors affecting liquefaction susceptibility based on laboratory and field tests. Large number of different laboratory tests were conducted over the years to study the effects of major factors controlling liquefaction phenomena. The first liquefaction tests in Turkey were conducted using cyclic stress controlled triaxial testing system at Istanbul Technical University during late 1979. In the beginning of 1980s, liquefaction tests were conducted using the cyclic simple shear testing system donated by Japan Osaka World Fair. In later years, after moving to Maslak Campus new cyclic triaxial and torsional cyclic testing systems were acquired by the support of Japan Jica project. Significant number of MS and Ph.D thesis and technical conference and journal papers were produced. The purpose of this manuscript is to review the important findings from these research investigations and discuss the importance and short comings of laboratory liquefaction tests.

Keywords: soil liquefaction, cyclic triaxial, cyclic simple shear, cyclic torsional tests

The Use Of Binders To Avoid Tailings' Liquefaction

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Catastrophic failures of tailings dams, primarily due to liquefaction, have occurred in Brazil in the last years. Mine tailings deposited behind upstream dams are materials of low in situ densities and strengths. In order to avoid future disasters, the Brazilian government placed restrictions on the construction of new dams, as tailings deposited behind upstream dams by spigotting have been shown to be prone to failure. This work presents two distinct trends for tailings disposal: (a) stacking compacted filtered ore tailings–cementitious binders blends for new disposals, and (b) chemical improvement methodologies such as deep mixing and mass stabilization technologies to be used for decommissioning existing upstream tailings dams with high risk of collapse. As the first part of the proposal, it analyses the behaviour of compacted tailings–cement blends for dry stacking, considering the use of small amounts of cement under distinct compaction degrees. For decommissioning, it has been considered the in-situ addition of cement to tailings deposited behind upstream dams as an important alternative for safe decommissioning of such structures.

Keywords: Binders, tailings, liquefaction, dams

The Effect Of Leachate On Liquefaction

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In this research, uniformly graded clean sand was used to study the effect of leachate on liquefaction. The leachate was obtained from the site of Kemerburgaz solid waste landfill in Istanbul. The cure ratio is 100% leachate. Sand samples polluted by leachate and clean sand samples were prepared by the dry raining method. The polluted sand samples were prepared in the modified split mold. The mold has the bottom and upper caps with small draining holes. Sand samples in the modified mold were put in the wastewater pool to keep for different cure time as 1 day, 7 days, 30 days, and 717 days. After taking the sand samples from the cure pool they were put on the dynamic triaxial cell. A small amount of vacuum was applied to the polluted sand samples. Sand samples were isotropically consolidated to the 100 kPa in the triaxial cell and the backpressures ranging between 200-300 kPa were applied to provide saturation. After consolidation, the relative density of sand samples varied from 47% to 57%. CO2 was applied to clean sands but not to the sand samples including 100% leachate to avoid a change in its characteristics. The B values were between 43-100 %. The frequency of cyclic load was 0.1 Hz during the tests. Stress control cyclic tests were applied to both clean sand and polluted sand. Test results show leachate makes the sand more liquefiable depending on cure time at the same saturation value. As the B value decreases the number of cycles that causes liquefaction increases both in clean sand and polluted sand.

Keywords: liquefaction, leachate, mold, saturation, cure ratio

Density Dependent Pore Water Pressure Evolution In A Simple Cyclic Shear Test

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Laboratory studies on sand liquefaction are mostly carried out using cyclic undrained triaxial tests. These are complicated and time consuming. Installation of sand specimens and the reliable acquisition of measured quantities pose very high demands that only a few laboratories can meet. The aim of this research is the assessment of the density dependent pore water pressure build-up in coarse-grained soils using a cyclic undrained shear test of a simple setup. This method allows a fast installation of highly saturated sand specimens and a subsequent investigation of the pore water pressure build-up during cyclic shearing in undrained conditions within a short time. The new method has shown a good repeatability of the test results and was validated using the results of cyclic undrained triaxial test for density dependent pore water pressure build-up in several sands. The aim of this research is to establish a simple (index) test which enables a comparison of density dependent pore water pressure build-up in different coarse-grained soils while installed and tested under the same conditions.

Keywords: cyclic shear test, sand liquefaction, index test, cyclic triaxial test

Undrained Monotonic Behaviour Of Liquefied Sands

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The loss of shear strength and stiffness which occurs in saturated sandy soil deposits subjected to rapid forms of seismic loading may cause relevant damage to engineering structures, due to loss of bearing capacity or significant ground settlements, partly associated to the volumetric strain of the soil induced by the dissipation of the excess pore pressure. Knowledge of the post-liquefaction stress-strain response of sandy soils allows the designer to predict the potential resistance of liquefied sand, to sustain monotonically increasing post-earthquake loading. This paper presents the results of a series of undrained monotonic simple shear tests performed on liquefied sandy soils. In the first series, undrained monotonic tests were carried out after dissipating the excess pore water pressure developed during liquefaction. The influence of different parameters such as shear strain amplitude, relative density and vertical effective stress on the monotonic behaviour of post-liquefied soils has been investigated. The results show an insignificant influence of the aforementioned parameters on the undrained monotonic stress-strain response. In the second series, monotonic tests were performed without dissipating the excess pore water pressure. In this case, the amplitude of the shear strain plays an important role on the monotonic behaviour of liquefied soils. The monotonic tests with and without the dissipation of the excess pore water pressure have been compared with the response of virgin soils. The results show as the final strength is affected by the dissipation of the excess pore pressure, probably due to a fabric change. A microstructural interpretation is finally provided.

Keywords: simple shear tests; post-liquefaction behaviour; sands; fabric change.

Liquefaction and Shear Wave Velocity

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Shear wave velocity is the small strain measure of a geomaterial's shear stiffness. By definition the initial shear stiffness is identical to the density of the material times the shear wave velocity squared. It is an excellent property for earthquake engineering applications because of the high fidelity between field and lab measurements, and because the shearing motion is identical to the primary loading from earthquakes of near surface soils. This talk presents existing and new applications of shear wave velocity to the problem of soil liquefaction; addressing issues of triggering, ageing, deformation potential, and other. The means and methods for acquiring shear wave velocity in the lab and in the field are discussed in depth. For field testing, invasive versus non-invasive methods are compared in terms of accurracy and precision. For non- invasive testing, the pros and cons of active versus passive sources are discussed. For lab testing, the details and nuances of capturing this measure for different sample sizes is discussed. The overall goal is to promote the use of shear wave velocity in liquefaction engineering where it is beneficial.

Keywords: liquefaction, shear wave velocity, soil, lab testing

Gravelly Liquefaction Case Histories after 2008 Wenchuan- China Earthquake Mw=7.9

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Gravelly soils used to be considered as non-liquefiable due to their high pore pressure dissipation capacity owing to their larger grain size. However, recent case histories have shown that gravelly soils are prone to seismic liquefaction triggering. More specifically, site investigations by Chengdu Plain, following the 2008 Wenchuan earthquake (Mw = 7.9) provided seismic liquefaction manifestation of gravelly soils mixtures. As part of site investigations, rotary and/or core drilling followed by dynamic penetration test (DPT) and multiple channel analysis of the shear wave velocity (MASW) measurements, were performed. In 73 locations, 65 Vs measurements and 47 DPT blow-counts were taken. In this paper, available gravelly liquefaction case histories are introduced along with their processing details. The assessment procedure involves the identification of susceptible critical layer, estimation of representative in-site density state, ground water table depth, intensity, and duration parameters along with gradation characteristics including but not limited to D50 and D10. The resulting preliminary results were presented in the CSR vs N120 and Vs domains.

Keywords: Database, gravelly soils, case history, liquefaction

Liquefaction Potential Determination And Hazard Mapping Based On Passive Surface Wave Geophysical Tests In The Long Beach And Tuzla Regions Of Cyprus

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Cyprus is the third largest and populated island in the Mediterranean Sea, which is rapidly expanding in every way. Significant infrastructures, such as hotels, educational institutions, and large residential complexes, are being built. Historically, two major earthquakes with magnitudes of 6.5 Mw struck the island in 1953 and 1996. Potential liquefaction areas have been detected on the island's east coast as a result of these significant earthquakes. In this study, the liquefaction potential of Tuzla and Long Beach in the northern part of Cyprus is estimated using the passive surface waves or refraction microtremor (ReMi) data from more than 61 surveys conducted at different locations at the sites. The overall results are presented in a liquefaction potential index obtained from the factor of safety (FS) coefficient. It is clear that both study areas are susceptible to liquefaction. Thus, risk index maps are prepared to identify susceptible liquefiable areas. In addition, the average factor of the safety line was introduced for both sites to create a correlation between the liquefaction risk area. It is clear that the adopted approach precisely provides the suspected depth of the liquefiable soil layer when compared with the risk index maps. Additionally, the results prove that the liquefaction potential must be considered during the design stage of new infrastructure in these areas.

Keywords: liquefaction, hazard mapping, passive surface wave testing, factor safety coefficient

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Site Response Study: Tuzla/Enkomi

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Tuzla (Enkomi) in Cyprus observed to have significant liquefaction potential as several studies were conducted in the region. Having unordinary soil conditions (soft saturated clay, deep bedrock etc.) hints the fact that site amplification of Tuzla soil will differ when compared with other soils in Cyprus. This paper is the complete seismic site response analysis of Tuzla region. The study considers the local geotechnical data to estimate the shear wave velocity and other parameters for the entire region. SPT, CPT boreholes and seismic refraction data were used to model 1D soil columns for site response analysis. In general, the geological formation includes alluvium covering the surface (5- 10m) and underneath soft silty clay with varying bedrock depth respect to the distance from riverbed. Then the peak ground acceleration for hard soil condition is analysed for estimating the effect of local soil conditions in Tuzla.

The results indicate that high amplification is expected especially at long period range at the surface of the old riverbed which passes through the Tuzla/Enkomi city. Furthermore, the recorded long period spectral ordinates in the end of analysis shows a significant difference with current local code Turkish Earthquake Code 2007. Finally, both acceleration response spectrum and displacement response spectrum are presented herein for the professional use.

Keywords: Tuzla, Site Response, Response Spectrum

Case History- vs. Laboratory-based Seismic Soil Liquefaction Assessments: A Critical Overview

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Cyclic performance of susceptible soils has been commonly assessed through case history-based liquefaction triggering models or cyclic laboratory tests performed on "undisturbed" or re- constituted soil samples. Both methods have their limitations. More specifically, due to limited number of case histories falling in the transition zone from non-plastic to plastic soil responses, evaluating the liquefaction susceptibility and/or triggering responses for soils with 7<PI<20 is challenging, where laboratory test-based assessments can be more conclusive. A contrary remark in the favor of case history-based assessments is that the field liquefaction performance of a soil site is a system response, which is governed by the interaction of the underlying and overlying soil layers with the susceptible layer. This interaction is influenced by several factors including but not limited to the strength, stiffness, and permeability characteristics of soil site system components (i.e.: individual soil layers). Unfortunately, majority of conventional laboratory tests are element tests, and naturally exhibit the common disadvantages of decoupled methods to assess a coupled system response. Within the confines of this study a critical review of pros and cons of field case history- vs. laboratory-based seismic soil liquefaction assessment methods will be presented. As the concluding remark, the joint use of these two methods will be illustratively presented with the intent to eliminate the limitations sourcing from their single use.

Keywords: Earthquakes, Liquefaction, Case Histories, Laboratory Tests, System Response.

Insight On Multiaxial Testing And Modelling Of Liquefiable Soils

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This presentation provides an overview on how advanced element testing, constitutive modelling and numerical procedures can interact among each other to improve the assessment of geotechnical structures in liquefiable soils. The first part of the presentation focuses on the importance of considering the multiaxial nature of loading induced stress paths and the soil's loading history when exploring the cyclic undrained response of granular soils. Experimental observations are then used as inspiration for the development of the new the hardening memory surface concept, which can successfully improve the predictions of constitutive models under cyclic undrained loading. The last part of the presentation shows how improved memory surface models can benefit the assessment of foundation performance in the particular case of offshore geotechnical applications, where the foundation design is driven by both the cyclic response and the loading induced pore water pressure generation. A discussion on future modelling challenges and needs is also provided

Keywords: multiaxial testing, constitutive modelling, numerical analyses, undrained behaviour

Effects Of Inherent Anisotropy On Soil Steady States And Its Variability

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Particulate materials, like soil, constitute four interconnected phases of solids (frame and binding), voids (or pore spaces) and a spatial structure. Establishing the basic characteristics of structures enables determining constituting properties of voids from solids and vice versa. The solid phase is characterised by its size (mean, mead, maximum and minimum), shape (sphericity and roundness) and sorting (uniformity and curvature coefficients). These are anisotropic qualities; hence, the structure and at larger scale, the particulate material inherits a quality of anisotropy from their constituting solids. Of many complications caused by anisotropy is spatial variability of soil properties. To better understand the problem, three loose sands are subjected to various combinations of undrained triaxial compression, torsion, and combined compression-torsion, totaling 42 experiments. The deviator stress at phase transformation ($q'PT$) is chosen as an index of strength and consistency. The $q'PT$ varies to a greater extent with loading directions in coarser, less spherical, and less rounder sands. A further 8 undrained static triaxial shear tests on two sands mixed with varied contents of non-plastic silt are conducted. Mixing sand with silt increases the post-consolidation porosity and decreases the strength. More spherical more rounded sands, mixed with silt (<30%) become slightly more porous and slightly stronger. Small variations of silt content will have large implications. For sands mixed with greater silt content (>30%), sand shape and small variations of silt content become less important and would only marginally affect the
($q'PT$). Here, the post consolidation porosity is high and strength low, but stable, and might suffice ground engineering needs. A further 4 undrained static triaxial shear tests are conducted on one sand mixed with varied contents of non-plastic nanosilica (NS). The NS phase form onion-skin coating around particles and to some extent neutralize the particles' texture and shape, thereby, the inherent anisotropy. Changes to the NS content appear not have any substantial effect on data disparity and therefore, sand size, continues to be the pivotal factor.

Keywords: Granular; size; shape; anisotropy; variability; disparity

Modified State Parameter Evaluation of Liquefiable Sand Containing Plastic Fines

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Liquefaction of saturated sand containing plastic fines may be triggered owing to the propagation of seismic waves or by monotonically increasing loads. In such circumstances, excess pore-water pressure development results in loss of confinement in soil strata and a decrease in intergranular force transfer, leading to strain-softening behaviour under shear. This study assesses the effect of plastic fines on the liquefaction susceptibility of carbonate sand from Famagusta Bay, Cyprus. The study simulates the diverse composition of Famagusta Bay sand by incorporating varying proportions of silt and clay to form reconstituted specimens. Consolidated undrained triaxial compression tests were conducted to analyse the behaviour of fines effect on stability/instability, compressibility, location of isotopically consolidated/critical state lines and soil fabric at low- stress levels with varying relative densities of 35% and 70%. The varying percentages of silt and clay fractions (10, 20 and 30%) were added to Famagusta Bay sand to form a set of mixed soils. The findings indicated that sand and clayey-silty sand (10%) specimens prepared in a loose state (relative density of 35%) exhibited susceptibility for flow liquefaction whereas diverse behaviour was observed for other soil groups in terms of state parameter values. In addition, factors affecting state parameter evaluation due to the presence of plastic fines along with a modified state parameter empirical relationship for sand containing plastic fines is also discussed.

Keywords: Carbonate Sand, Plastic Fines, State Parameter, Static Liquefaction, Triaxial Test.

The Use of State Parameter in Predicting Static Liquefaction

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Many authors have emphasised the importance of state parameter in determining whether a soil undergoes static liquefaction in monotonic undrained shearing. Testing tailings recovered from the site of the Stava tailings dam disaster, Carrera et al. (2011) investigated the dependence of static liquefaction on the soil grading. They demonstrated that for critical state lines that are curved in the void ratio – log stress plane for clastic soils, by definition, static liquefaction simply occurs for any soil with its initial void ratio above the horizontal asymptote of the critical state line at low stress levels. This implies that state parameter is insufficient on its own to predict when liquefaction will occur and in this paper the data of Carrera et al. are reanalysed to demonstrate this problem. Others have identified a stress level effect, so that modified state parameters have been proposed (e.g. Bobei et al., 2009). This stress level effect is undoubtedly linked to the curvature of the critical state line in the volumetric plane. However, the reanalysis of the Stava data shows that while such an approach may be valid for one soil, the link between the modified state parameter and the monotonic behaviour is unique for each soil, so that its use as a general predictive tool for all soils is limited.

References

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Keywords: static liquefaction, tailings, state parameter

Soil Liquefaction Assessment In Undisturbed And Reconstituted Conditions: Challenges And Opportunities

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Recent alluvial sandy deposits in seismic regions are often susceptible to earthquake-induced liquefaction. The assessment of the liquefaction resistance of these soils is typically based on field test data or on laboratory testing of reconstituted soil specimens. Liquefiable soils are particularly challenging for sampling, since significant volume changes and structural collapse may occur during sampling and handling. For this reason, the assessment of liquefaction susceptibility has been rarely performed on undisturbed samples.

In this work, a large pilot site on natural liquefiable deposits set up in the greater Lisbon area, Portugal, will be presented, where extensive field tests were performed and the Gel-Push (GP) and Mazier (M) samplers were used for the collection of high-quality undisturbed samples. In the lecture, the results of the liquefaction susceptibility assessment of the deposit in undisturbed and reconstituted conditions will be extensively analyzed and discussed. Given the alluvial nature of the soil deposit, undisturbed samples often evidence interbedded layers, which typically increase the fines content of the soil. Since this feature cannot be adequately reproduced in reconstituted conditions, significant differences in cyclic behavior have been observed. While undisturbed samples are valuable for an accurate characterization of the soil profiles, representative constitutive parameters are more clearly defined based on reconstituted specimen testing. Undisturbed samples were found to a have a more stable behavior than reconstituted specimens, due to the presence of interbedded fine soil layers.

Keywords: High-quality sampling, Gel-push sampler, soil fabric, liquefaction resistance

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