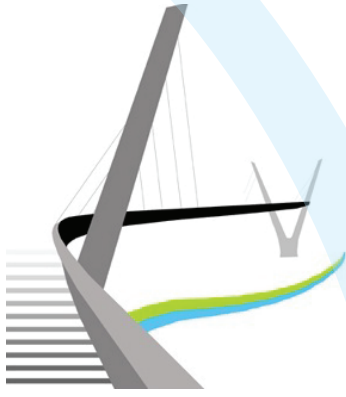




نقابة المهندسين الأردنيين
Jordan Engineers Association

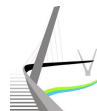
مؤتمر الهندسة المدنية الأردني الدولي السادس

The Sixth Jordanian International
Civil Engineering Conference (JCEC06)

Program and Abstracts

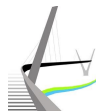
Amman - Jordan
10-12/3/2015





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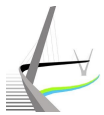


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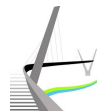




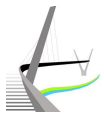
Conference Program



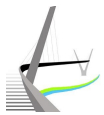
The Sixth Jordanian International Civil Engineering Conference (JICEC06) Conference Program				
Time		Tuesday, March 10th 2015		
8:30-9:30		Conference registration		
9:30-10:30		Opening Ceremony		
10:30-11:00		Coffee break		
11:00-12:00		Keynote address I: Prof. Yaser El-Mossallamy Foundations of High Rise Buildings	Chairperson: Prof. Nuri Al-Mohamadi	
12:00-12:20		Prayer Break		
12:20-12:40		Ayla Project: The Engineering Challenges By: Sahl Dudin	Chairperson: Dr. Amjad Barghouthi	
12:45-13:45		Session1 A Structures	Chairperson: Dr. Samih Qaqesh	Session1 B Geotechnical
	1	12:45-13:05 Major Steps Needed Towards Earthquake Resistant Design Abdul Razzaq Touqan, Suhaib Salawdeh	4	12:45-13:05 Stability of Natural Slopes and Embankments Underlain By Weak Clays Yousef Massanat
	2	13:05-13:25 Predicting the Seismic Response of Structures Employing Controlled Rocking As A Form of Base Isolation	5	13:05-13:25 Evaluation the Effectiveness of Rapid Impact Compaction (RIC) as a Ground Improvement Technique Bashar Tarawneh, Mounir Matraji



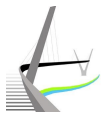
		Omar Shamayleh		
	3	13:25-13:45 Stochastic Reliability Of Unreinforced Masonry Walls Subjected To Blast Osama Habahbeh, Mark Stewart	6	13:25-13:45 Site Investigation for the Kingdom Tower Naeem O. Abdulhadi , Emad Sherif
13:45- 15:00		Lunch Break		
15:00- 16:00		Keynote address 2: Prof. Haluk Sucuoglu Chairperson: Dr. Sayfeddin Muaz Performance Based Procedures in the Assessment and Retrofitting of Existing Structures		
16:00- 16:15		Coffee Break		
16:15- 17:15		Session2		
	7	Welding/ Assessment & Retrofitting of Structures Chairperson: Eng. Imad Damashqieh TUV Austria Hellas_ Presentation		
17:15- 17:30		Discussion		



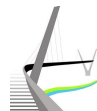
JICEC06						
Wednesday, March 11 th 2015						
8:30-9:00		Welcome Coffee break				
9:00-10:00		Keynote address 3: Prof. Hassan Saffarini		Chairperson: Eng. Sari Zuayter		
		The Dig Down below Toronto Union Station – Modern Technology Used to Revitalize a 90-Year Old Building				
10:00-11:20		Session3 A Retrofitting	Chairperson: Eng. Maher Khoury		Session3 B Material	Chairperson: Dr. Yahya Abdul jawed
	8	10:00-10:20 AL-BUKHARIA FIRE Urgent Rehabilitation Works Sami Hababbeh		12	10:00-10:20 Prediction of Silica Fume Concrete Strength by Artificial Neural Networks Muhannad Ismeik	
	9	10:20-10:40 Underpinning of Existing Structure Using Jet Grouting (case study) Mohamad Al-Sayed		13	10:20-10:40 Experimental Investigation on CFRP-Steel Bond Properties using Ionic Liquid Buthiana Al-kharabsheh, R. Al-Ameri	
	10	10:40-11:00 The New ASCE 41-13 Evaluation and Retrofitting of Existing Structures & the use of CFRP In The ACI 562 Repair Code Imad Damashqieh		14	10:40-11:00 Quality Control of Concrete in Less Technically Developed Sites: Cast Study HishamQasrawi, Jamal Qtaishat	
	11	11:00-11:20 Designing FRP for Structure and Corrosion Resistance Chandra Khoe, Rajan Sen and Venkat Bhethanabotla		15	11:00-11:20 Production of High Strength High Performance 100 MPa Rice Husk Ash Concrete Hilmi Bin Mohmad, Saymusl Bahri	
11:20-11:40		Discussion				
11:40-12:00		Coffee Break				
12:00-13:00	16	Session4: Presentation Seismic Design of Tall Buildings Prof. Haluk Sucuoglu Discussion			Chairperson: Dr. Hani Qadan	



13:00-14:00	17	Session5: Presentation Development of Jordanian Earthquake Resistant Structures Codes Dr. Anis Shatnawi Discussion		Chairperson: Dr. Jamal Qteshat		
14:00-15:15		Lunch Break				
15:15-16:15		Session6 A Structure	Chairperson: Dr. Yasser Al-Huniti		Session6 B Construction Management	Chairperson: Dr. Moh'd Heyasat
	18	15:00-15:20 Influence of Longitudinal Reinforcement and Stiffening Elements on Compressive Strength of 3D Wall Panels P. Poluraju, G. Appa Rao		21	15:00-15:20 Construction Management Approach based on FIDIC Conditions of Contract for Construction, 1999 1st Edition Munther Saket	
	19	15:20-15:40 Shear Strength of 3D Panels as Beams at Low Shear Span-to-Depth Ratio J. Leon Raj, G. Appa Rao		22	15:20-15:40 The effect of Economic Situation on Client's Choice of Procurement Approach and the Future of Construction Management Approach Salam Al-Bizri	
	20	15:40-16:00 Modeling of Indian strong motion data using Empirical Mode Decomposition technique Sangeetha Sugumar, S t g Raghukanth		23	15:40-16:00 Understanding the Key Factors of Construction Waste in Jordan Jawad Al-rifai, Omar Amoudi	



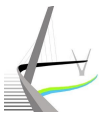
JICEC06						
Thursday, March 12 th 2015						
8:30-9:00		Welcome Coffee break				
9:00-10:00		Keynote address 4: Dr. Bernard Joos Flood Evaluation for Dam Safety		Chairperson: Dr. Adnan Al-Salihi		
10:00-11:40		Session7 A Water & Environment	Chairperson: Dr. Maha Halalsheh		Session7 B Geotechnical &Material	Chairperson: Dr. Waddah Abdullah
	24	10:00-10:20 Environmental Concrete with Solid Industrial Waste and Wood Aggregates Benmalek Mohamed		29	10:00-10:20 Behavior of Expansive Soil Treated by using Different Electrolyte Substances Ahmad Farid; Mohamed I. Wahdan	
	25	10:20-10:40 Air Quality Characterization in the City of Nablus, Palestine A. R. Hasan, Abdelhaleem Khader		30	10:20-10:40 Ground Improvement of Problematic Soft Soils Using Shredded Waste Tyre Nik Norsyahariati Nik Daud, Zainuddin Md. Yusoff, Abubakar Sadiq Mohammed	
	26	10:40-11:00 Reservoir Operation by Artificial Neural Network Model (Mosul Dam –Iraq, as a Case Study ThaThair S.K. , Ayad S. M. and Hasan H.M.		31	10:40-11:00 Investigating the effect of super absorbent polymer in plan concrete Moayyad Al-Nasra, Mohammad Daoud	



	27	11:00-11:20 High Quality Water Using Zero Energy at Urban Areas of Jordan Awali Nahhas, Adnan Al-Salihi	32	11:00-11:20 Settlement of Shallow Foundations Placed on Limestone Rock Formations with Open or Closed Cavities Ahmed T. M. Farid
	28	11:20-11:40 On the threshold of motion of sediment grains: Hydrodynamic forces effects Reza Barati, Seyed Ali Akbar Salehi Neyshabouri, Goodarz Ahmadi	33	11:20-11:40 Innovative End Anchorage for Preventing Concrete Cover Separation of NSM Steel and CFRP bars Strengthened RC Beams Mohd ZaminJumaat, Md. Akter Hosen, Kh. MahfuzUdDarain, M. Obaydullah
11:40-12:00		Discussion		
12:00-12:15		Coffee Break		
12:15-13:30		Panel discussion Water and Environmental Challenges in Jordan Moderator: Eng. Mohammad Abu-Taha		

Conference
Organizing Committee

13:30-14:00		Closing session
14:00-15:30		Lunch



General Chair

Dr. Amjad Barghouthi

General Vice Chair

Eng. Sari Zuayter

Members:

Eng. Adel Aldabobi

Dr. Adnan Alsalihi

Dr. Anis Shatnawi

Dr. Hani Qidan

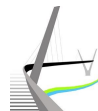
Dr. Maha Al-Halalsheh

Dr. Naeem Abdulhadi

Prof. Nuri Al-Mohamadi

Dr. Raja Younis

Eng. Sami Al-Hababbeh



General Information about Jordan

Location

Jordan is located in the heart of the Middle East to the north-west of Saudi Arabia, south of Syria, southwest of Iraq, and to the east of the Palestinian Authority. Jordan has a port on the Red Sea through the city of Aqaba located in the South of Jordan.

Geographical coordinates: 293400- North 0.35 to 39 East

Total area: 89.213 sq Km

Land: 88.884 sq Km

Population: 5.8 million

Amman is the capital of the Hashemite Kingdom of Jordan .It is built on a series of hills and highlands that allow its residents to see the beauty of the city. Amman has expanded year after year to include more regions and areas. In Graeco-Roman times, Amman was known as Philadelphia (the city of brotherly love). It is ideally situated on a hilly area between the desert and the fertile Jordan Valley. This location makes its climate always moderate and enriches the view on the city and its charming picturesque sights.

For further information on the sites of Jordan, please visit <http://www.visitjordan.com>

Climate and geography

Jordan has a combination between the Mediterranean climate and desert climate, with Mediterranean prevailing in the northern and western parts of the country, whereas the desert climate prevails in the vast majority of the country. On the whole, the country has warm, dry summers and mild, wet winters.

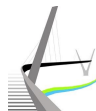
The annual temperature ranges from 12-15 degrees Celsius (54-77 Fahrenheit) in the winter and up to 40-46 degrees (105-115 F) in the summer. Rainfall averages vary from 50mm (2 inches) annually in the desert to 800mm (31.5 inches) in the northern highlands on which snow might even fall at some times of the year. Jordan enjoys a variety of geographical features starting from the Jordan Rift Valley in the west ending at the desert plateau of the east, with a range of small hills running the length of the country in between.

Lowest point: Dead Sea -408 meters (-1338.6 feet).

Highest Point: Jebel Rum, 1734 meters (5689 feet).

Time

GMT + 3 Hours.



Language

Arabic is the official language and English used widely.

Currency

The official currency in Jordan is the Jordanian Dinar which is divided into 1000 fils, or 100 piasters. The dinar appears in notes of 50, 20, 10, 5 and 1 JD denominations. Coins come in denominations of 0.5JD, 0.25 JD, and 100, 25, 10 and 5 fils. The daily exchange rate is published in local newspapers.

Electricity

In Jordan, the electric current is 220 volts AC, 50 cycles per second, and power plugs are mostly two-pronged rounded type, but also three-pin sockets (popularly known as MK) are common. On request, most hotels will provide transformers to visitors with electrical appliances of different voltage. However, it is advisable to bring an adaptor and transformer for your electrical or electronic equipment using different voltage.

Transportation

Taxis are readily available in Amman. The Hospitality Desk located in the conference venue or the hotel concierge/reception staff will be able to help arrange transportation. Taxis are inexpensive and often the most convenient form of transportation in Jordan.

The white-painted "service taxis" offer transportation on fixed routes and are shared with other passengers. The fare per passenger is fixed and varies from JOD 0.100 to JOD 0.350. Private taxis are yellow; they can be taken from ranks outside larger hotels or organized by the hotel concierge.

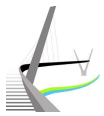
Although taxis have meters, these are typically not used after 23:00, so it is advisable to agree the cost beforehand.

Emergency

In case of emergency –dial (the call is free within Jordan) Ambulance: 911 Police: 911



Keynote Speakers



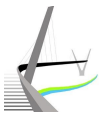
Prof. Hassan Saffarini



Hassan Saffarini is the Structural Engineering Manager at NORR Architects Engineers Planners, Toronto and is a Senior Project Manager with 30 years' experience in the design and project management of major building and infrastructure projects. He has a PhD in Structural Engineering and Structural Dynamics from the University of California at Berkeley and is a graduate of Leeds University, UK. Dr. Saffarini is an Adjunct Professor of Civil Engineering at Ryerson University and he lectures at the University of Toronto. Dr. Saffarini has authored many publications in international journals in the areas of structural engineering and seismic resistant designs. He was a professor of Civil Engineering at the University of Jordan for 25 years and was a founding partner and an Executive Vice President of Consolidated Consultants, Jordan before relocating to Canada. Over the years he has worked on many heritage and archeological sites, and provided services to such organizations as UNESCO and the American Center for Oriental Research. On the Union Station Revitalization project he worked closely with the heritage architect and Parks Canada to make sure that all proposed interventions are in compliance with standards and guidelines for the conservation of historic places in Canada.

Title of Lecture:

The Dig Down below Toronto Union Station – Modern Technology Used to Revitalize a 90-Year Old Building

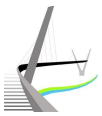


Abstract:

The City of Toronto's "Dig Down" – Union Station revitalization project entails building a retail mall below the station's viaduct structure and part of its head house. This 25,000 square meter footprint construction is taking place while the busiest transportation hub in Canada continues to operate without interruption. The 650 million dollar project covered all components of the station, including the Head House building, completed in 1920 and recognized as one of Canada's most treasured heritage sites. The massive expansion of commercial and concourse space was however performed below the entire viaduct structure and part of the Head House.

The concept that was adopted for expanding downward basically entails supporting the track slab on vertical props that are founded on bedrock and jacking the slab upward. The column is then cut and a new column is spliced and is founded on new footings on bedrock. A number of other considerations were made to ensure the successful load transfer and minimum movement of the track slab. Different bearing concepts were employed for the shores including micropiles, ring beams and bearing plates. In total 184 columns are to be extended by this procedure. Other structural innovations were applied including a load transfer by use of storey-high trusses that doubled the available span for the loading dock. Another load transfer widened the mall corridor by column removal through a complex system of load sharing between the old structure and a new steel framing using a four stage jacking and de-stressing.

A rigorous monitoring program was crucial to make sure that the structure supporting the tracks and platforms moves within an acceptable amount while its foundation is uprooted and is replaced to make room for the new mall. This is one of the most extensive monitoring program that has been performed in Canada and has offered many lessons in terms of the need for precision monitoring of buildings undergoing major retrofits.



Dr. Bernard Joos



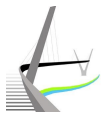
- Born in April 1952
- Civil engineer of Ecole polytechnique fédérale de Lausanne, Switzerland (1976)
- MS in Hydrology & Water resources, Colorado State University, USA (1982)
- PhD in Hydrology & Water resources, Princeton University, USA (1986)
- 1986-2002: Swiss federal railways, Division Energy
In charge of dam safety, hydrology, hydrometry, water resources and related issues, energy planning, water right concessions
- 2002 Stucky Ltd
Project manager, expert (hydrology, dam safety, energy planning, water resources, flood evaluation, due diligences)
- since June 2009, ICOLD, Technical Committee on Dams and Floods

Title of Lecture: Flood Evaluation for Dam Safety

Abstract:

The design of a flood evacuation system of a dam usually relies on two criteria:

- the dam must master a flood of a given return period (design flood) without damages
- it must also resist an extreme flood (check flood, usually a PMF), with at most limited damages.

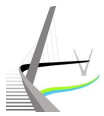


The classical approach for determining the magnitude of a flood concentrates on purely hydrological considerations. Flood frequency analysis (for the design flood) and deterministic analysis (for the PMF) are the most common applied methods.

The most widely applied criteria for selecting adequate flood return periods in more than thirty countries around the world will be presented. These criteria are in general based on either one of two lines:

- the risks linked to a failure of the structures (dam height, reservoir volume, etc.)
- or the potential damages downstream of the reservoir in case of a serious dam problem.

A new trend in flood hydrology will also be sketched, consisting in integrating reservoir operation and hydrology in the reflections aimed at determining the "right" magnitude of the extreme event. Unlike the classical methods addressing only the hydrological process per se, this new approach sets on a stochastic generation encompassing the causes and the effects of the flood. The result of the analysis is not an inflow hydrograph as usual, but the probability distribution function of a key design constraint (maximum water level, maximum released outflow, rapidity of the outflow variation, etc.).



Prof. Haluk Sucuoğlu



Haluk Sucuoğlu is a Professor at the Department of Civil Engineering, Middle East Technical University, Ankara, Turkey. He is also teaching at the earthquake engineering graduate program of the Pavia University (Rose School) in Italy. Currently, he is serving as the director of Structural and Earthquake Engineering Laboratory at METU.

Seismic assessment procedures developed by Dr. Sucuoğlu have been implemented to 150,000 buildings in Istanbul during 2002-2008 within the scope of Istanbul Earthquake Master plan. He was the technical coordinator of the school retrofitting program of the Ministry of Education during 2005-2007. He is serving as the Coordination Committee Member of the Turkish Seismic Code since 2004.

Dr. Sucuoğlu is the national delegate of Turkey at IAEE, and president of the Earthquake Engineering Association of Turkey. He is the editorial board member of Earthquake Spectra, Journal of Earthquake Engineering and Earthquakes and Structures Journals. He is the recipient of the 2012 Science Award of Parlar Science and Education Foundation. He is the author of several papers published in international peer reviewed journals, and also the textbook “Basic Earthquake Engineering” recently published by Springer.



Title of Lecture: Performance based procedures in the assessment and retrofitting of existing structures

Abstract: Existing buildings in earthquake prone regions of the world pose a serious threat to societies since most of them were constructed without considering earthquake effects. Hence they are seismically deficient. In Istanbul Turkey, it is expected that 50,000 buildings will collapse in an expected major earthquake along the North Anatolian Fault crossing the Marmara Sea. Similarly, the Dead Sea Fault is silent since more than a century. It is known that this fault has created several large earthquakes in the second Millennium, and the time for a new one is perhaps due.

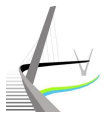
This paper discusses procedures for evaluating the seismic vulnerability and assessing the expected seismic performances of large building stocks under an expected earthquake. Several procedures in the Turkish Seismic Code for improving the seismic safety of existing buildings are presented in connection with the seismic performance expected from these buildings. Performance-based procedures for assessing the seismic performance of retrofitted buildings are introduced.



Prof. Yasser ElMossallamy



Prof. Yasser has been a researcher and consultant since 30 years. His work includes the application of numerical modeling and analyses in geotechnical projects. He has a wide experience by the design and construction of high-rise buildings, bridge foundation and heavy industry foundations such as clinker silos and LNG tanks. He was also involved in many projects dealing with special measures to increase stability of landslides, soil improvement, rock fall hazards and tunneling. Prof. El-Mossallamy has finished his baccalaureate and master degree in Ain Shams University and his PhD in Germany. Prof. Yasser has worked by ARCADIS Consult in Germany for about 13 years. Prof. El-Mossallamy is a professor at Ain Shams University, Cairo, Egypt. Dr. El-Mossallamy has more than 80 publications dealing with different geotechnical topics. He is a member of many national and international technical committees such as the German committee of piled raft and soil improvement as well as the Egyptian bridge design committee, the Egyptian committee of piling as well as the international committee TC 207.



Title of Lecture: Foundation of high rise buildings

Abstract:

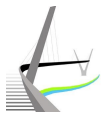
The quick growth of main cities in the last two decades all over the world led to a rapid increase in the number and height of high rise buildings even in unfavourable subground conditions. Since the 80's, a new foundation technique, the so-called piled rafts, has been developed and used extensively in order to reduce the maximum as well as the differential settlements and the associated tilting of the buildings. The analysis of piled raft is a very interesting example of the soil-structure interaction that requires the co-operation between the geotechnical and structural engineers to reach the most economic foundation system. Some aspects of behavior of piled rafts will be discussed in more details. Lot of case histories in Germany, Kuwait, Saudi Arabai and other countries will be presented and discussed.



Papers Abstract



Assessment and Retrofitting of Structures

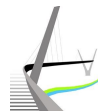


DESIGNING FRP FOR STRENGTH AND CORROSION RESISTANCE

Chandra Khoe, Rajan Sen and Venkat Bhethanabotla
University of South Florida, Tampa FL 33624

Abstract

Fiber reinforced polymers (FRP) were first used to repair corrosion damage in a prestressed girder bridge located near Tokyo in the 1970's. Forensic analysis following replacement of the bridge showed that FRP had slowed down the ingress of active species such as chlorides, oxygen and water that are responsible for sustaining electro-chemical corrosion of steel in concrete. This finding was later confirmed by researchers in several countries and also through field demonstration projects. But in the absence of quantitative information on FRP barrier properties, repairs were conservative, e.g. nine layers were used for the repair and confinement of the Champlain Bridge, Montreal. Quantitative information on the oxygen permeability of epoxy, FRP, concrete and FRP-concrete systems was recently determined. Its availability makes it possible to design FRP corrosion repairs and also to identify the FRP-concrete combinations that will lead to effective repairs. This paper provides a brief outline on how corrosion repairs can be optimized by making use of oxygen permeation characteristics.



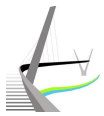
AL-BUKHARIA FIRE

Urgent Rehabilitation Works

Sami Habahbeh – Head of Consultations Division
Constructions and Sustainable Buildings Center
Royal Scientific Society
P.O.Box 1438, Al-Jubaiha 11941 Amman / Jordan
Tel. (962 6) 5344701- fax 5344806
E-mail: sami.habahbeh@rss.jo

Abstract:

The paper presents an overview of the urgent strengthening and repair works carried out for *Al-Bukharia* downtown market, the oldest and the most famous market in Amman / Jordan, after a severe fire in August, 2009. In-situ evaluation/inspection revealed several architectural damages and vast commercial losses, on one hand, and a substantial loss of strength of many super-structural elements, on the other. Some internal ground floor columns and a skylight adjoining slab were found in rather bad structural condition, similarly, stone facades overlooking the internal skylight exhibited excessive spalling and sloughing off. These defects were considered very serious as they could endanger the safety of the whole structure. Consequently, immediate structural upgrading interventions and architectural rectification/decorative actions were decided to enhance the overall condition of the market with the intention to bring it back to service in less than one-month time. The paper will focus on showing different types of damages caused by the fire, their extent and assessment, and finally, the appropriate options, strategies and techniques selected for a successful



rehabilitation. An experienced and qualified contractor was employed for the job and a qualitative approach for Quality Control/Quality Assurance (QC/QA) was implemented during repairs.

THE NEW ASCE 41-13 EVALUATION AND RETROFITTING OF EXISTING STRUCTURES & THE USE OF CFRP IN THE ACI 562 REPAIR CODE

Imad Damashqieh

Abstract

Seismic Evaluation and Retrofit of Existing Buildings describes deficiency-based and systematic procedures that use performance-based principles to evaluate and retrofit existing buildings to withstand the effects of earthquakes. This next-generation standard combines the evaluation and retrofit process and puts forth a three-tiered process for seismic evaluation according to a range of building performance levels from collapse prevention to operational that marry targeted structural performance with the performance of nonstructural elements. The deficiency-based procedures allow the evaluation and retrofit effort to focus on specific potential deficiencies deemed, on the basis of past earthquake observations, to be of concern for a permissible set of building types and heights. The systematic procedure, applicable to any building, sets forth a



methodology to evaluate the entire building in a rigorous manner. This standard updates and replaces the previous Standard ASCE/SEI 41-06, Seismic Rehabilitation of Existing Buildings, as well as Standard ASCE/SEI 31-03, Seismic Evaluation of Existing Buildings.

Non Destructive Testing and Evaluation of Structural steel Integrity, Weld Assessment, Quality Control and Quality Assurance

Eng. Fawwaz Elraie

Dip. Ing. Marine Engineer

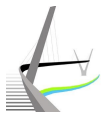
CEO TUV Austria Gulf

NDT & Weld Senior Assessor, RBI, Integrity & Plant Senior Inspector

Member of ASNT, BI NDT, AWS, ECUK, Mar.In.E.M

Abstract

Reliable performance of a component or structure depends on the pre-service quality of the component and the in –service degradation of the component or structure under operating conditions. The role of non-destructive testing NDT, weld assessment and QA/QC in ensuring pre – service quality and also monitoring in-service degradation to avoid premature failure of the component /structure is ever increasing. There are



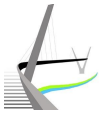
many NDT techniques based on various physical principles. The end objective of NDT is detection and characterization of defects, stresses and micro structural degradation in materials. This is accomplished by establishing correlation between a non- destructively measured physical /derived parameter and quantitative information on defects/stresses / microstructures

The NDT information together with design parameters are taken into consideration for evaluation of integrity and life assessment of the component/structures.

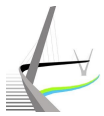
In this lecture a brief description of the physical concept of NDT methods and the physical derived parameters that are used for assessing defects, stresses and microstructures are given.

Requirements of weld and associated structure assessment. Various types of defects and indications, main causes and solutions.

Focus on requirements of QA/QC main elements and the applicable standards, codes and specifications.



Construction Management



Understanding the key factors of construction waste in Jordan

Omar Amoudi

Civil Engineering Faculty, Damascus University

Damascus, Syria

amudi75@hotmail.com

Jawad Al-rifai

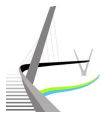
Civil Engineering Department, Philadelphia University,

Jerash Road, Amman 19392, Jordan

j.rifai@yahoo.com, Country

Abstract — Waste of construction materials has been recognized as a significant problem for different stakeholders involved in construction projects. This waste has negative impacts on the efficiency of the construction industry, the country economy at large and the environment. Thus, the minimization of construction wastes has become a pressing issue. This paper aims to investigate the main factors and causes contributing to material waste in the construction industry in Jordan. In order to achieve the aim of this study, a survey was carried out, employing semi-structured interview, to gather information from construction professionals about causes of waste in construction materials. The results show that the most significant factors contributing to construction waste can be categorized mainly into two groups: management related and workforce related. Examples of these are: ‘Lack of skilled workers and subcontractors’ and ‘Lack of quality management system’. Decision makers and construction professionals can use the findings of this study as inputs to build their strategies concerning construction waste management.

Keywords; *Material wastages, Construction projects, Environmental Impact, Jordan*



THE EFFECT OF ECONOMIC SITUATION ON CLIENT'S CHOICE OF PROCUREMENT APPROACH AND THE FUTURE OF CONSTRUCTION MANAGEMENT APPROACH

Authors:

Do Quoc Nhan, Lecturer, University of Urban Construction, Vietnam, M:
098252598, E: nhan259@gmail.com

Dr Salam Al-Bizri, Lecturer, the University of Portsmouth, the School of
Civil Engineering and Surveying

Kenneth Awinda, Senior Lecturer, the University of Portsmouth, the
School of Civil Engineering and Surveying

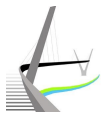
Corresponding author contact details:

Dr Salam Al-Bizri

The University of Portsmouth, The School of Civil Engineering and
Surveying, Portland Street, Portsmouth, PO1 3AH, T: 02392 84 2909, E:
salam.al-bizri@port.ac.uk

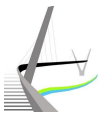
Abstract:

Construction Management (CM) procurement approach has been used in the UK construction industry for more than two decades, particularly in complex, multidisciplinary projects. However, the recent uncertainty of the economic conditions had considerable impact on the clients' and funders' choices of procurement approaches. In many recent projects, due to the uncertainty of the economic situation, the CM procurement approach has not been utilised because it is perceived as a high risk procurement



approach to clients, particularly in term of costs. Clients have preferred Lump-sum approach to procure their projects because construction costs can be fixed once the project is awarded therefore the inflationary or non-availability costs are no longer of concern to the client. On the other hand, the Specialist Trade Contractors (STCs) can play an important role in design, supply, manufacture and construction however in Lump-sum the involvement of the STCs during the design stages of the project is limited. This can lead to lack of design and construction integration, restriction of build-ability and innovation. CM procurement approach is considered more flexible than Lump-sum procurement approach as it facilitates the engagement of the STCs and construction managers in design, supply, manufacture, and construction. However, CM approach is believed to be of high risk to the client, especially in terms of cost certainty. The paper examined the role of the STCs in the UK construction industry and explored the terms of contracts and contractual relationships in order to evaluate the flexibility of Lump-sum and CM in facilitating timely involvement of the STCs. Then it investigated the cost and risk issues in both procurement approaches in order to predict the future of CM approach. This research concluded that it is necessary for CM approach to adapt to the changing markets as well as develop to suite the necessary organisational changes.

Key words: Lump-sum, Construction Management, Procurement, Specialist Trade Contractors, Risk, Cost



Study and Assessment of the Reasons for Project Delay or Stalled from Project Management View

Mohamed. I. Wahdan
Faculty of Science, Zagazig Univeristy
Zagazig, Egypt
Mohamed._whdan@yahoo.com

Mostafa S. M. Abu Yousef
Zuhair Fayez & Partnership, (ZFP)
Riyadh, Saudi Arabia
Mos.saleh2013@gmail.com

Ahmed T. M. Farid
Housing and Building National Research Center, (HBRC)
Cairo, Egypt
atfarid2013@gmail.com

Abstract—As a result of new development in most of Arab countries, there is a need for more construction projects. These projects are costs more and needs a highly experience engineering and contracting companies. Also, of the highly experience companies and the importance of the projects, high percentages of the project numbers are started and delayed or not completed on time scheduled to them. Therefore, the present study is prepared to evaluate and analysis the reasons for that matter from the project management view. The study was performed as a



collective data achieved from different projects in different places as a model for the study. The percentage of the effect of each of project activities was explained. According to the present study, the most significant reasons for the project delay or not complete is presented and discussed.

Keywords-construction; project; managment; delay

Construction Management Approach based on FIDIC Conditions of Contract for Construction, 1999 1st Edition

Dr. Munther Musa Saket

Deputy Managing Director

Allied Planning & Engineering Corporation

Amman - Jordan

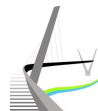
Abstract — The Construction Management (CM) approach in delivering projects is over fifty years old now. Many standard conditions of contract between the project owner and the construction contractor(s) have been developed internationally specifically for this approach. In Jordan, the most used conditions of contract in delivering construction projects are those based on FIDIC Conditions of Contract for Construction, 1999 1st Edition. Some stakeholders in the construction industry have adopted the construction management approach, yet have used the said FIDIC conditions of contract between Employer and Contractor without making



the appropriate amendments to the conditions to reflect the CM approach. This has caused many contractual time-related and cost-related problems. Proper amendments of the roles of the CM and Engineer are necessary to avoid such problems. This paper proposes such amendments that have been tested and proved reasonably successful on a number of construction projects in Jordan.



Environmental Engineering



Air Quality Characterization for the city of Nablus, Palestine

Abdelhaleem I. Khader
Civil Engineering Department
An-Najah National University
Nablus, Palestine
a.khader@najah.edu

A. Rasem Hasan
Civil Engineering Department
An-Najah National University
Nablus, Palestine
mallah@najah.edu

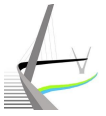
Abstract—The city of Nablus is considered as one of the largest cities in the West Bank, Palestine. The topography of the city, combined with multiple sources of air pollution creates a potential air quality problem that might affect the human health. Preliminary measurements of indoor and outdoor air quality using an optical particle counter showed elevated concentrations of particulate matters. Studies in the United States, Brazil, and Germany have related higher levels of particulates to increased risk of respiratory, cardiovascular, and cancer-related deaths, as well as pneumonia, lung function loss, hospital admissions, and asthma. Some investigations have pointed toward particle sizes smaller than 2.5 μm (PM_{2.5}) as a major contributor to elevated death rates in polluted cities. This research aims at investigating the presence of air quality problems, especially elevated concentrations of PM_{2.5} in the city of Nablus,

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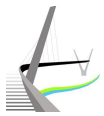


Palestine, and to link these pollutants to potential sources. This research will help to understand the nature of air pollutants and their main sources in the city of Nablus, in order to provide decision makers with knowledge to choose proper regulatory decisions that can help to alleviate the problem. Implementing these decisions can enhance the health situation and hence improve the socio-economic conditions of the people living in the city of Nablus.

Keywords-component; air quality; pollution; particulate matter; Nablus; Palestine.



Geotechnical Engineering



Evaluation the Effectiveness of Rapid Impact Compaction (RIC) as a Ground Improvement Technique

Bashar Tarawneh, Ph.D, P.E
Mounir Matraji
Assistant Professor
Operation Manager
Civil Engineering Department
Menard Vibro Middle East
The University of Jordan
Dubai, UAE
Amman, Jordan

Abstract

In recent years, Rapid Impact Compaction (RIC) has gained popularity as a ground improvement technique. RIC is an innovative dynamic compaction technique mainly used to compact sandy soils, where silt and clay contents are low. The RIC system uses "controlled impact compaction" of the ground using a 9-ton hammer dropped from height between 0.3 m to 1.2 m onto a 1.5 m diameter steel patent foot delivering about 26,487 to 105,948 Joules of energy per drop. To evaluate the effectiveness of this technique, RIC is used to improve an area of approximately 35,000 m² in a project site near Dubai, UAE. Cone Penetration Tests were carried out before and after improvement. The results showed improvement of the soil down to 5.0 meters below the ground level. CPT results showed a significant

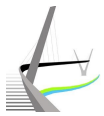


improvement in soil tip resistance (q_c) when the friction ratio (R_f %) is less than 1% and a slight improvement when R_f is above 1%. Calculations showed enhancement in the soil bearing capacity and reduction in the expected settlements.

Settlement of Shallow Foundations Placed on Limestone Rock Formations with Open or Closed Cavities

Ahmed T. M. Farid
Geotechnical Institute
Housing and Building National Research Center (HBRC)
Cairo, Egypt
atfarid2013@gmail.com

Abstract— Limestone formation is the main formation of the subsurface strata in Riyadh region, KSA. Due to high strength of rock formation, most of the buildings are designed on shallow foundations. Limestone strata may have cavities through its formation in some places which reduces the rock strength and increases its settlement. These cavities are varied in their location depths below the foundation, and their widths or thicknesses. In our study, the settlement prediction of shallow foundations placed on rock formation which contains open or closed cavities were compared. Results showed that, spread foundations placed on limestone formation with closed cavities reduced the settlement up to ten times compared to that with open cavities. In the other hand, the settlement



due to mat foundation placed on limestone formation with closed cavities reduced the settlement up to three times compared to that with open cavities. Therefore, grouting should be recommended to fill the open cavities of limestone rock formation to the significant depth below footings before placing the foundations to gain more strength with reducing the limestone settlement. Recommendation of the study are given for geotechnical investigation engineers to expect the maximum depth for cavity probing search through any project depending on the loads and widths of the shallow foundation.

Keywords- limestone; shallow; footings; settlement; cavities; grouting.

Behavior of Expansive Soil Treated by using Different Electrolyte Substances

Ahmed T. M. Farid
Geotechnical Institute
Housing and National Building Research Center, (HBRC)
Cairo, Egypt
atfarid2013@gmail.com

Mohamed I. Wahdan
Chemical and Environmental Department
Riyadh Geotechnical and Foundation Co., (RGF)
Riyadh, Saudi Arabia



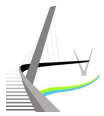
Abstract— Expansive soil is one of the problematic soils which need more investigation and study. This soil is expected to swell or shrink as its moisture content increase or reduce, respectively. Cracks and severe damage could be happened to structure members construct on this expansive soil. In the present work, laboratory tests were performed on expansive samples to predict the behavior of the expansive soil by adding different electrolyte substances to the soil. The tested samples are collected from Tabuk region in the northwest part of Saudi Arabia. Laboratory tests were performed to investigate the improvement of soil properties, free swell and unconfined compression test values after using the electrolyte substances compared to the original soil behavior. It is observed from the laboratory studies that a significant improvement of the expansive soil strength with a reduction in its swell behavior with adding electrolyte substances.

Keywords-problematic; expansive; improvement; electrolyte

Modeling of Indian strong motion data using Empirical Mode Decomposition technique

S Sangeetha Research Scholar (PhD): Dept. of civil Engineering
Indian Institute of Technology, Madras
Chennai, India
ssangee.civil@gmail.com

STG Raghukanth
Associate Professor: Dept. of civil Engineering
Indian Institute of Technology, Madras
Chennai, India



raghukanth@iitm.ac.in

Abstract—In India, the frequency of occurrence of earthquakes is more, especially in Himalaya, northeast India and Gujarat region. Therefore it becomes essential to estimate the seismic inputs for such earthquakes to reduce the structural damage. From engineering point of view, the most sought-after data is the strong motion accelerograms (SMA), recorded in the places where earthquake has occurred. The article analyzes the Indian strong motion records of past earthquakes by empirical mode decomposition (EMD) technique and in-turn presents few strong ground motion parameters, which finds its use in the simulation of artificial ground motions. The recorded earthquake acceleration time histories are decomposed into a finite number of empirical modes of oscillation. The instantaneous frequency and amplitude of these modes and evolutionary power spectral density (PSD) is estimated from the Hilbert Huang transform (HHT). Strong motion parameters such as spectral and temporal centroid, spectral and temporal standard deviation, instantaneous power, Arias intensity, correlation coefficient of frequency and time are derived from the evolutionary PSD. The variation of these parameters with magnitude and distance of the recording station has been examined. Empirical equations to estimate these ground motion parameters are derived from the strong motion data by regression analysis. These equations can be used by engineers to estimate the design ground motion.

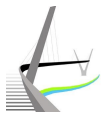


Keywords- Evolutionary Power Spectral Density; Empirical Mode Decomposition; Hilbert Huang Transform; Ground motion prediction equations; design ground motion

Site Investiagtion for Kingdom Tower

Naeem O. Abdulhadi & Emad Y. Sharif
Arab Center for Engineering Studies (ACES)

Abstract— This paper describes the site investigation campaign carried out for the Kingdom Tower in Jeddah, Kingdom of Saudi Arabia. The height of the tower is expected to exceed 1,000m, which will make it the tallest building in the world. The site investigation was carried out in three phases and included 81 boreholes in which the deepest borehole was drilled down to 200m. Extensive field tests were carried out including permeability packer, high-pressure dilatometer, and PS suspension down-hole geophysics. The laboratory tests ranged from routine index and classification tests to more complex tests like instrumented unconfined compression and advanced consolidated drained triaxial tests. The site-specific ground conditions will be addressed and discussions on field and laboratory tests results will be made, in particular variations of results with depth and comparisons between field and laboratory test results.



Keywords; Kingdom Tower; elastic modulus; in-situ tests; laboratory tests; site investigation; tall buildings

Influence of specimen size and loading feature on fracture toughness of rocks

Ahmad Fahimi far, Reza Heidari Moghadam

Abstract

Fracture toughness of mode I (opening mode) is an important parameter to describe the failure of rocks in many industries such as mining, tunneling, underground excavations, rock cutting and hydraulic fracturing. This parameter was determined by two types of laboratory tests: three-point loading tests (SENB) and direct tension tests (DT) on notched specimens. This paper compares the toughness parameter of limestone measured from the two type of tests and from specimens of different diameters. The toughness parameter in DT tests was obtained by analysis of 27 specimens with different ratios of notch length to specimen diameter in finite element code Abaqus. The results of these analyses are then processed by code SPSS to derive a relation for the toughness parameter. To study the effect of specimen diameter, toughness parameter was measured from DT tests in four different diameter and then variation analysis was performed on the



results. The rock elastic parameters were obtained from uniaxial compression tests.

An increase of about 20 percent in the measured toughness parameter was observed as the specimen diameter increases from 35 mm to 95 mm. Furthermore, the toughness parameters obtained from SENB and DT tests differ by nearly 16 percent.

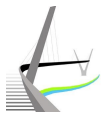
Ground Improvement of Problematic Soft Soils Using Shredded Waste Tyre

N. N. Nik Daud^{1*}, Z. M. Yusoff¹, A. S. Muhammed¹

¹Department of Civil Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

**E-mail: niknor@upm.edu.my*

Abstract— Soft soils are problematic soils, which are extensively researched to improve their geotechnical properties. This study focused on shredded waste tyres mixed with soft soils to improve their strength and drainage properties. Series of tests were carried out on peat and clay soil mixed with 0%, 10%, 20% and 30% of shredded waste tyre. The compaction results for both soils showed that the dry density reduced with increase of percentage of shredded tyre waste. The optimum moisture content for peat and clay soil increased by adding waste tyre. The shear strength parameter for peat and clay soil shows a general improvement with addition of shredded tyre. The California bearing ratio (CBR) results show an increased in value for both soils with the addition of shredded tyre waste. However, the coefficient of permeability increases with an increase



of tyre waste percentage. Thus, the drainage characteristic of the soil has been improved by varying the mixing percentage of shredded waste tyre.

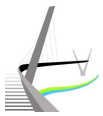
Keywords- strength, drainage, soft soils, waste tyre, subgrade

Stability of Natural Slopes and Embankments Underlain By Weak Clays

Prof. Dr. Yousef Masannat

Abstract

A comprehensive review of the literature concerning case histories of failures of cuts of natural slopes and embankments constructed on very soft to medium stiff clays was conducted. The merits and limitations of the different field and laboratory testing techniques and construction procedures were outlined. The consideration of the paleogeological history as well as the hydrological and geological characteristics of the sites of cuts in natural slopes comprised of jointed competent rocks with interbeds of weak shales, clays and mudstones in establishing the design criteria of the cuts is emphasized. Also, the proper selection of the investigation and testing techniques of weak sensitive clays for the determination of their shear strength parameters used in the stability analysis of embankments constructed on these weak soils is emphasized.



Recommendations, based on experience and judgment concerning the site investigations and field and laboratory testing techniques and construction procedures are developed to help designers and practicing engineers in their task of constructing safe and economic structures.

The targeted factors of safety largely on the type of material involved, level of risk and uncertainty of gathered data used in the stability analysis.

Underpinning of Existing Structure Using Jet Grouting (case study)

Mohammad T. Alsayyed Ahmad, Ph.D., P. E.

International Center for Geotechnical & Engineering Studies

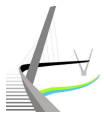
Palestine

Abumoath2@yahoo.com

Abstract

Many of the structures problems occur due to weakness of soil supporting them. If the structure was designed carefully in terms of elements sizes and reinforcement, then any problem that may appear in the structure can be related to settlement, differential settlement or bearing capacity deficiency. Conventional methods which include excavation and

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jacketing of the foundations are sometimes adopted to underpin the structures in order to stop the settlement and increase the bearing capacity. Sometimes these methods stand short due to circumstances related to the site. Accessibility to the foundations and to the soil need to be strengthened is important and risk of failures is a concern.

In this paper, a description of a case where differential settlement took place a year after completion of the construction of a stadium in Florida, USA. The settlement occurred before any significant live loading took place. Investigation was made to find the reason behind this settlement and to how to strengthen soil layer/s in order to solve the settlement problem.

The problem was defined as follows: The site was mainly composed of very soft organic soil. The designer elected to use soil replacement in order to adopt shallow foundations; isolated and strip. During soil replacement, in part of the site, the excavation was not extended outside the limits of the edge of the foundations. The stress distribution zone was not fully improved. This caused excessive settlement in these areas more than other places.

The owner solicited proposals for solving the problem and stopping the continuous settlement. The hired a company specialized in soil improvement who submitted a quotation and technical proposal for using jet grouting technique.



Structures and Materials



Behavior of Ferrocement Slabs Containing Waste Plastic Fibers under Impact Loadings

Dr. Abdulkader Ismail Abdulwahab Al-Hadithi*+ and Zayd Abdul-Jabbar Al-Obaidi*

*Dams & Water Resources Engineering Department, College of Engineering, University of Anbar. Ramadi, Anbar, Iraq.

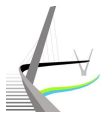
+Corresponding author: al_hadithi2000@yahoo.com , Mobile Phone: +964 7710007876

Abstract

Ferrocement is one of the structural materials, widely used due to its advantage from its particular behavior such as mechanical properties, and impact strength. The main aim of this work was to investigate the behavior of ferrocement reinforced with waste plastic fibers WPF panels under impact loading.

A total of 48 ferrocement panels with dimensions of (500×500×50 mm) were constructed and tested, 32 panels tested under low velocity impact. For low velocity impact test at age of (56) days, the results showed that the addition of waste plastic fibers increased the number of blows which were required to make the first crack and ultimate failure, with the increase of number of wire mesh layers.

Keywords: Ferrocement, Impact, fiber reinforced concrete, waste plastic fibers, wire mesh



Engineering behavior of recycled granulated tire rubber-filled concrete incorporating palm oil fuel ash

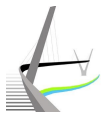
Parham Forouzani, Ibrahim Ogiri Hassan, Pandian Bothi Raja and
Mohammad Ismail*

*UTM Construction Research Centre, Faculty of Civil Engineering,
Universiti Teknologi
Malaysia, 81310 UTM Johor Bahru, Johor, Malaysia,

*Corresponding author: Tel: +6075531757, Fax: +6075566157, Email:
mohammad@utm.my

Abstract-Reutilization of waste materials instead of conventional aggregate can help to reduce the environmental pollution. The present study aims to investigate the feasibility and performance of using granulated tire-rubber particles (incorporating from 5% to 30% as substance of coarse aggregate) and 20% palm oil fuel ash (POFA) as cement replacement. The effect of waste tire rubber replacement was evaluated for mechanical strength of POFA concrete. The results showed that granulated tire rubber leads to concrete with lower compressive strength and showed suitable capability in flexural and tensile strength. Thus, there is an opportunity for industry to develop rubberized POFA concrete products that can be used on commercial basis. This can lead to sustainable urban development from both economic and environmental perspectives.

Keywords: waste tire; palm oil fuel ash; rubberized concrete; mechanical strength.



USING OF LIBYAN CALCINED CLAY AS REPLACEMENT CEMENT IN CONCRETE

Abdelsalam .M. Akasha*

Civil Engineering Department

Sebha University

Sebha – Libya

Hamza M. Addussalam**

Civil Engineering Department

Sebha University

Sebha – Libya

Abstract: An extensive research work has been carried out in the past years by the industrial research center on the natural raw materials in the south region of Libya. The investigation shows that there are many raw materials that can be used in the building material industry, one of that materials was natural pozzolan . From that point we start thinking to carry out a wide range investigation for the possibility of using the natural pozzolans as replacement cement material in concrete. Pozzolana is a siliceous material which whilst itself possesses no cementitious properties, either processed or unprocessed and in finely divided form, reacts in the presence of water with lime at normal temperatures to form compounds of low solubility having cementitious properties. Pozzolanas may be natural or artificial, fly ash being the best known in the latter category. These were used with lime to make concrete before the advent of cement. Currently their principal use is to replace a proportion of cement when making concrete. The advantages gained are economy, improvement in workability



of the mix with reduction of bleeding and segregation. Other advantages are greater imperviousness, to freezing and thawing and to attack by sulphates and natural waters. In addition, the disruptive effects of alkali-aggregate reaction and heat of hydration are reduced. It is generally held that the additions of natural pozzolanas reduces the leaching of soluble compounds from concrete and contribute to the permeability of the concrete at later ages. When mixed with cement the silica of the pozzolana combines with the free lime released during the hydration. Silicas of amorphous form react with lime readily compared to those of crystalline form and this constitutes the difference between active pozzolanas and materials of similar chemical composition which exhibit little pozzolanic activity. It is commonly thought that lime-silica reaction is the main or the only one that takes place, but recent information indicates that alumina and iron if present also take part in the chemical reaction. This study were undertaken to produce reactive pozzolana i.e. calcined clay from five different places. The calcined clay produce from these places were grinding to pass 150 micrometer sieve and calcined at 800 C° for 2 hrs The effect of addition calcined clays 10%, 15%, 20% as replacement with Portland cement was investigated by various tests.

Keywords: Metakaolin. calcined clay. pozzolana concrete.



Laboratory Investigation of Bolted Angle Joints for Cold-formed Steel Double Channel Sections

Cher Siang Tan
Faculty of Civil Engineering
Universiti Teknologi Malaysia (UTM)
Johor, Malaysia
tesiang@utm.my

Mahmood Md Tahir
UTM Construction Research Centre (UTM CRC)
Universiti Teknologi Malaysia (UTM)
Johor, Malaysia
mahmoodtahir@utm.my

Abstract— The application of cold-formed steel in light steel framing design can serve as an alternative for Industrialized Building System, by extending steelwork construction into residential housing. There is a lack of in-depth study on the joints behaviour for cold-formed steel frames, particularly the beam-to-column connection. This paper presents the isolated joint test on three types of joints using bolts and steel angles, namely webcleats, top-seat flange-cleats and combined flange-web-cleats connections. Six specimens with different joint configuration and thickness of angle were tested. The experimental setup, procedures and failure modes of the joints are discussed in detail. From the comparison, it is observed that by increasing the thickness of angle from 2 mm to 6 mm, the strength in term of joint's moment resistance increases in the range of 1.80 to 2.28.



The ratio of difference for rotational stiffness increases in the range of 1.27 to 2.06.

Keywords-cold-formed steel; double channel section; bolted joints; angle connection; partial strength; stiffness.

Quality Control of Concrete in Less Technically Developed Sites: Cast Study

Hisham Qasrawi

Senior Lecturer, Civil Engineering, Department,
The Hashemite University, Zarqa, Jordan

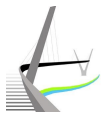
Jamal Qtaishat

Manager of Jordanian Codes and Specification Committee,
Ministry of Public Works and Housing, Jordan

Imad Abed-Al-Rahim

cProject Director, King Abdul Azziz International Airport,
Bombardier, Saudi Arabi

Abstract—The paper summarizes the authors' experience in quality control and quality management of site concrete in less technically developed sites; such as those prevailing in many local sites. Major problems of quality control of concrete are discussed from a distinct point of view. The problems that were overviewed, are: (1) Lack of genuine specifications and standards, (2) lack of communication between academic institutions and



the industry, (3) technology, (4) lack of well-trained and experienced workmanship, (5) lack of supervision, (6) incorrect production practices, (7) lack of testing and evaluation, (8) the role of the consultant and the contractor, and, (9) competition, tendering, costs and benefits.

The authors have provided practical examples and figures showing the results of incorrect application of the procedures encountered during construction. Special tests and plots, obtained from a practical case, in order to control and overcome the problems are introduced. Special solutions and recommendations are suggested to overcome the basic problems using available resources.

Keywords-Concrete, quality control, less developed sites; mix design, construction.



Environmental concrete with solid industrial waste and wood aggregates

Benmalek Mohamed Larbi
Department of Civil Engineering
University of 08 may 1945
Guelma, Algeria
bmalek2@yahoo.fr

Abstract—Exploitation of aggregate quarries in Brittany (west of France) generates important quantities of solid wastes not reused at the current time. These industrial wastes have been tipped out in the nature for a long time and constitute now a serious environmental problem. The choice has been made to transform them into insulating lightweight concrete. The lightening has been achieved by adding treated wood aggregates of dimensions 3 to 8 mm. In this communication, authors give results of an experimental work using five types of mineral wastes as raw materials in manufacture of a lightweight concrete. They differ in their mineral compositions, densities, extracting process and their (esthetic) colors. The mixtures were prepared with the same ponderous dry materials and stabilized with the wood aggregates. The workable mixing water has been determined for each mixture to have the same consistency. The physical, mechanical, thermal properties have been studied. The elaborated concretes ranged in class II or class III in the RILEM functional classification. Their thermal conductivities have been found to depend of



the water content. In addition to that, the microstructure examined by electron microscopy has shown a homogeneous matrix and a very good adhesion matrix-wooden aggregate. The experimental results of the investigation show that the performances acquired by these environmental concretes are similar to the ones of the usual lightweight materials with satisfactory compressive strengths (in hydrous equilibrium state) and a low cost. The ensuing analysis serves to suggest the possibility of manufacturing insulating and load-bearing concretes using little energy (no burning and no autoclaving).

Keywords- environmental concrete; solid waste; wood aggregates; properties; lightweight composites.



ANALYTICAL EVALUATION OF A SUDDEN PUNCHING SHEAR FAILURE FOR POST- TENSIONED CONCRETE FLAT SLABS

Zaher Abou Saleh, assistant professor

Department of Civil Engineering

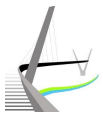
Beirut Arab University

Debbieh, Lebanon.

z.abousaleh@bau.edu.lb

Abstract-Punching shear often controls the required slab thickness or column size of flat-plate slabs. This paper presents the results of an experimental investigation of the brittle punching shear failure of post-tensioned concrete slabs. The test results are compared with ACI equations for punching shear strength. An analysis accounting for the sudden shear failure at the critical sections is also presented which provided a theoretical equation of the punching shear capacity at service stage.

Keywords: post-tensioned slab; sudden shear failure; punching shear



The Effect of Blended Palm Oil Fuel Ash and Pulverised Burnt Clay on the Relationship between Hardened Properties of Self-Consolidating High Performance Concrete

Ibrahim Ogiri Hassan*, Mohammad Ismail, Taliat Ola Yusuf, Ainul
Haezah Noruzman,
Parham Forouzani,

*1 UTM Construction Research Centre, Faculty of Civil Engineering,
Universiti Teknologi Malaysia, 81310 UTM
Skudai, Johor, Malaysia*

***Corresponding author: iohassan2@live.utm.my;
ibrahim.hassan270@gmail.com**

Abstract— The application of palm oil fuel ash and pulverized burnt clay in self-consolidating concrete has been acknowledged to have significant influence on the fresh properties of the concrete. In contrast, the effect on the hardened properties has not yet been established. In this study, a blend of Palm oil fuel ash (POFA) and pulverized burnt clay (PBC) was used as partial replacement of Ordinary Portland cement (OPC) to produce self-consolidating high performance concrete (SCHPC). Fifteen different mixes were prepared with varying percentages of blended POFA/PBC, high range water reducing admixture (HRWR) and water to binder ratio (W/B)



ranging from 0.30-0.40. Three key hardened properties were investigated. The mechanical properties were investigated based on the compressive strength, tensile strength, flexural strength and ultrasonic pulse velocity. The deformation characteristics were investigated with respect to drying shrinkage and modulus of elasticity. The durability properties were investigated based on the water permeability, total porosity, rapid chloride ion penetration and electrical resistivity. A comparative analysis was carried out on the results based on the correlations established among the hardened properties of the respective mixes. The research findings revealed strong correlations between most of the hardened properties of the respective SCHPC.

Keywords- Blended; Concrete; High Performance; Palm oil fuel ash; Pulverised burnt clay; Self-consolidating.



Stochastic reliability of unreinforced masonry walls subjected to blast

Osama M. Al-Hababbeh
Mechatronics Engineering Department
The University of Jordan
Amman, Jordan
o.hababbeh@ju.edu.jo

Mark G. Stewart
Center for Infrastructure Performance and Reliability
The University of Newcastle
Callaghan, NSW, Australia
mark.stewart@newcastle.edu.au

Abstract— Unreinforced bricks masonry (UBM) is widely used for construction of walls. However, due to their weight and low blast resistance, they can present a significant hazard to occupants when subjected to blast loads. There are considerable uncertainties associated with material properties, threat scenarios, as well as expected damage. In this work, a stochastic simulation is conducted to evaluate the reliability of UBM wall subjected to blast load, thus accounting for these uncertainties. Nonlinear dynamic Finite Element Modeling (FEM) is used to simulate the brick and mortar wall. Sensitivity to input parameters is tested so as to select the major factors. The uncertainties of the major factors are included in the model simulation. In order to reduce computational cost, sampling is performed using LHC technique. The stochastic reliability analysis



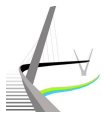
proved effective for studying the damage risks for UBM walls subjected to blast loadings, where results in the form of Probability Density Function (PDF), Cumulative Distribution Function (CDF), and survival function are obtained. It is shown that the occurrence of total wall collapse is a low possibility.

Keywords- Stochastic reliability simulation, Dynamic finite element, Unreinforced brick masonry, Explosive blast loading, Latin hypercube sampling.

Major steps needed towards earthquake resistant design

Abdul Razzaq Touqan		Suhaib Salawdeh
Civil Engineering Department	Department	Civil Engineering
An-Najah National University	University	An-Najah National
Nablus, Palestine		Nablus, Palestine
touqanar2000@najah.edu		
Suhaib.salawdeh@najah.edu		

Abstract—the main lesson learned from past earthquakes is the need to make matching between reality and mathematical model. The structure responds according to real prevailing conditions at site and not according to the mathematical model used in the engineering offices. Since earthquakes hit the whole structure dynamically, a 3D dynamic analysis of structures is the main step needed after the first important step of



conceptual configuration. Designing structures elastically to resist large earthquakes is unrealistic in terms of optimizing cost against such a random phenomenon. Thus nonlinear (both geometry and materials) and probabilistic studies are also necessary steps to achieve such goals. The paper will address all previous points in a systematic way emphasizing challenging local areas needed to be solved. Making design of earthquake resistant structures enforced by law implies a continuous learning and development process to be monitored to enhance possibilities of success especially when we are far from achieving many main principal issues.

Keywords-seismic design; design codes; UBC; Eurocode 8; IBC.

Influence of longitudinal reinforcement and stiffeners on strength and behaviour of 3D wall panels under axial compression

P. Poluraju

PhD Scholar, Structural Engineering Division
Department of Civil Engineering
Indian Institute of Technology Madras, Chennai-
600036, India.

rajupolup@gmail.com

G. Appa Rao

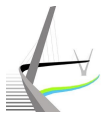
Professor, Structural Engineering Division,
Department of Civil Engineering,
Indian Institute of Technology Madras, Chennai-



600036, India.
garao@iitm.ac.in

Abstract—3D precast concrete sandwich panels are often used in building construction due to their better performance, thermal efficiency, and speed of construction. This paper reports on experimental studies on 3D panels made up of wythes of concrete on interior and exterior faces separated by 50 mm of lightweight insulation material to obtain typically 150 mm thickness. Performance of 3D panels under axial compression emphasizing the influence of parameters such as longitudinal reinforcement and stiffening elements has been investigated. Full-size and onethird size elements as slender and squat walls were tested. Loaddeformation response, strain in steel connectors, crack formation and crack propagation under axial compressive loading were analyzed. Along with a brief review of literature, laboratory test results are compared with the existing code provisions such as current ACI design formula reported for solid walls to verify the validity of this empirical formula for sandwich 3D panels. The test results showed that the 3D panels exhibited composite behaviour under axial compression up to failure. The ultimate strength of 3D panels was found to decrease non-linearly with the increase in the slenderness ratio. Further, the addition of longitudinal reinforcement and stiffening elements showed better strength and deformability.

Keywords: 3D panel; longitudinal reinforcement; stiffening elements; axial compression



Shear strength of 3D panels as beams at low shear span-to-depth ratio

J. Leon Raj

Research scholar, Department of Civil Engineering,
Indian Institute of Technology Madras,
Chennai - 600036, India

Email: leonraj.civil@gmail.com

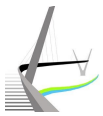
G. Appa Rao

Professor, Department of Civil Engineering,
Indian Institute of Technology Madras,
Chennai 600036, India

Email: garao@iitm.ac.in

Abstract - An attempt has been made to study the behaviour of 3D steel wire sandwich panels, as a structural member. Width and span are the primary parameters, whereas height was kept constant. Thickness of concrete cover was kept constant, whereas inner core polystyrene thickness was varied. Emphasis of this study is to evaluate the influence of distributed wire mesh for mitigation of shear crack propagation and enhancement of shear strength. Strength and serviceability aspects of the beam elements were investigated. Failure mechanism was inferred from the normal strain profile along the depth.

Key words: Beam panels, 3D steel wire light weight beam panels, Shear capacity.



Effect of silica fume and metakaolin on properties of GGBS ternary concrete

Noor Azline Mohd Nasir

Department of Civil Engineering

Faculty Engineering, Universiti Putra Malaysia

43400 UPM Serdang, Selangor, Malaysia.

Abstract—The paper is concerned with the use of GGBS as a binder in binary and ternary concretes. Various levels of silica fume and metakaolin in GGBS ternary concrete were evaluated. A short term study was carried out to examine the strength development and permeation characteristics of ternary concrete compared to GGBS binary and Portland cement concretes up to the age of 28 days. Mix proportions were designed at 0.35, 0.50 and 0.65 w/c. The studies shown that GGBS ternary concrete show better performance compared to GGBS binary concrete and Portland cement concrete. 10% silica fume addition exhibits better strength development and low capillary suction.

Keywords-GGBS ternary; silica fume; metakaolin; blended concrete



Production of high strength high performance 100 MPa rice husk ash Concrete

H.B Mahmud a and Syamsul Bahri a, b

a Dept of Civil Engineering, University of Malaya, Kuala Lumpur,
Malaysia

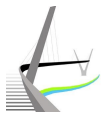
b Dept of Civil Engineering, Lhokseumawe State Polytechnic,
Lhokseumawe, Indonesia

Abstract— The high demand of high strength high performance concrete (HSHPC) in concrete industries attracts researchers to be more focused on improving the performance characteristics of HSHPC: workability, mechanical properties and durability. Applying high strength concrete, one of the performance characteristics, is beneficial for high rise buildings to increase the space of occupation and save the cost of maintenance in the long term. There is a need to study on HSHPC incorporating rice husk ash (RHA) due to limited information on utilizing RHA in HSHPC with low w/b. The binder and w/b adopted in this study were 550 kg/m³ and 0.25, respectively. The results reported included fresh, hardened and durability properties of high performance 100 MPa concrete incorporating 0%, 10%, 15% and 20% RHA as well as 10% condensed silica fume (CSF). The results revealed that the compressive, flexure and tensile strengths, and modulus of elasticity of concrete incorporating 10 % RHA are better than that of 10% CSF and plain concrete. The initial surface absorption (ISA) value of RHA is also better than that of OPC and CSF concrete at 28 days. RHA is proven as the alternative to silica fume in producing high performance concrete through achievable workability, strength, durability



and strength efficiency of cement. The outcomes show the potential of using RHA to produce HPC. RHA has the prospective for contributing to the sustainable development and economic prosperity of the construction and agricultural industries especially to the rice growing nation worldwide.

Keywords-component: high performance concrete; rice husk ash; workability; mechanical properties.



Influence of Styrene-Butadiene-Rubber latex (SBR) and Polyvinylidene Chloride (PVDC) on mechanical properties of HPC

*Mohmed Yahya1)

School of Engineering and the Built Environment
Edinburgh Napier University
Edinburgh, United Kingdom
10014172@live.napier.ac.uk

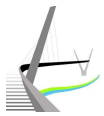
Binsheng Zhang2

School of Engineering and Built Environment
Glasgow Caledonian University
Glasgow, United Kingdom
ben.zhang@gcu.ac.uk

Michael Barker3

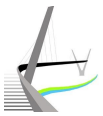
School of Engineering and the Built Environment
Edinburgh, United Kingdom
M.Barker@napier.ac.uk

Abstract—The major difference between conventional concrete and HPC is basically the use of chemical and mineral admixtures. It is necessary in order to find ways to improve the tensile strength, and eventually design and manufacture concrete materials with high strength. In this study, strengthening effects of polymer materials on the high performance concrete (HPC) were studied. The HPC was manufactured using ordinary



class 52.5 N Portland cement, silica fume and superplasticiser. Adopted polymers included the styrene-butadiene-rubber (SBR) latex, Polyvinylidene chloride (PVDC) with contents of 1.5%, 3% and 5% by weight of cement content. The measured included compressive and tensile strengths, modulus of rupture and dynamic Young's modulus. The preliminary test results at 28 days indicate that the addition of 1.5% and 3% SBR and PVDC into the HPC could largely improve the compressive strength by up to 15.7%, while the addition of 5% SBR did not show any enhancement except for 5% PVDC which increased the compressive strength by 10.9%. The tensile strength was significantly increased for all dosages of polymers, with the maximum increases of 72.7% for 3% SBR. The modulus of rupture and dynamic Young's modulus were not improved for lower dosages but slightly decreased for higher dosages of polymers.

Keywords-component; polymers; high performance concrete; mechanical properties;

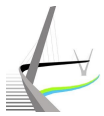


Performance of Exterior RC Joints with Different Reinforcement Detailing under Cyclic Loading

S.Kanaka Durga
Research Scholar, Structural Engineering Division
Department of Civil Engineering
Indian Institute of Technology Madras
Chennai, India
kanakadurga2004@gmail.com

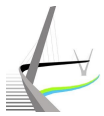
Dr.G.Appa Rao
Professor, Structural Engineering Division
Department of Civil Engineering
Indian Institute of Technology Madras
Chennai, India
garao@iitm.ac.in

Abstract—Evaluation of seismic performance of reinforced concrete (RC) structures built during the 1950's through 1970's designed only for gravity loads is very important. Understanding the behaviour of structural components in such non-seismically designed structures when subjected to earthquake forces through experimental investigation is necessary prior to the application of any retrofitting measure. Beam-column joint in such structures is one of the critical structural sub-assembly severely damaged due to high shear stresses under earthquake loading. The joints in non-ductile reinforced concrete buildings have the characteristics like



anchorage length not extended into the joint core and limited or no confinement of the joint region. The present study deals with the performance of poorly, lightly and ductile detailed exterior joints designed for gravity and seismic loading respectively as per IS 456:2000 and IS 13920:1993 under cyclic loading. To accomplish the objective three exterior beam-column joints were prepared and tested to failure under reversed cyclic loading. All joints are geometrically similar but different in reinforcement detailing, which are designated as poorly, lightly and ductile detailed according to the anchorage length of beam bars and confinement of lateral reinforcement in the joint. The mode of failure, shear strength, energy dissipation capacity and stiffness degradation of joints are important properties investigated.

Keywords-beam-column joint; reversed cyclic loading; anchorage length; confinement reinforcement.

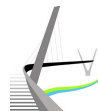


Predicting the Seismic Response of Structures Employing Controlled Rocking As A Form of Base Isolation

Omar A. Y. Shamayleh
Structural Engineering Department
Engicon Consulting Engineers
Amman, Jordan
oshamayleh@engicon.com

Abstract—A wide variety of rocking systems have been proposed to reduce damage induced by earthquakes. These systems rely on rocking as a form of base isolation, but also employ post-tensioning to limit rocking amplitude and ensure re-centering of the system. Often performance based design approaches (i.e. static pushover) are used to predict the response of these systems. This paper employs a simple analytical model to investigate the response of post-tensioned flexible rocking structures using two different approaches. First, analytical dynamics is used to predict the full dynamic response. Second, a performance based design approach is used to predict the maximum response. The simple model allows a wide parametric study to determine the effects of relative tendon stiffness, relative structural stiffness, and rocking parameters, on the maximum response. Comparison of the results defines limits for the relative tendon stiffness and the rocking amplitudes for which performance based design approaches are reliable. Beyond these limits, the full dynamic response must be considered. In addition, the results give insight regarding the parameters for which the benefits of rocking behavior can best be exploited.

Keywords: Rocking; Earthquake Engineering; Seismic Response; Base Isolation; Performance Based Design



Experimental investigation on CFRP-steel bond properties using ionic liquid

B. Al-kharabsheh

PhD student, Deakin University, School of Engineering
Geelong, VIC 3217. Australia

buthal@deakin.edu.au

R. Al-Ameri,

Senior Lecturer, Deakin University, School of Engineering,
Geelong, VIC 3217. Australia

r.alameri@deakin.edu.au

B. Fox

Associate Professor, Deakin University, IFM,
Geelong, VIC 3217. Australia

Bronwyn.fox@deakin.edu.au

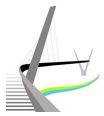
N. Hameed

Research Fellow, Deakin University, IFM
VIC 3217. Geelong, Australia

nishar@deakin.edu.au

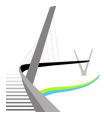
Abstract - Solving the problem of pre mature debonding of CFRP retrofitted structure is a main concern for most of structural engineers nowadays. Reducing the brittleness of the bonding agent at the

80



CFRP/concrete interface is a major factor to avoid this behaviour. In this research, the effect of modifying the bonding agent using different percentages of ionic liquid (IL) is investigated. This paper reports on an experimental investigation on the behaviour of modified epoxy resin with IL. Steel plates were used as hosting surface of the CFRP laminates, the laminates were attached to the steel surface using the IL modified epoxy. The shear mechanism at the interface of CFRP laminates to steel plates is discussed considering the relationship between the shear and the slip at the interface. The shear stress- displacement are traced for all specimens, the results are compared with control test prepared using unmodified epoxy. A 20% IL modified epoxy shows improved Behaviour. The improvement is with respect to ductility enhancement of the overall behaviour.

Keywords: IL, CFRP, ATBN, CTBN, Two way slab.



Prediction of silica fume concrete strength by artificial neural networks

Muhannad Ismeik

Department of Civil Engineering, Australian College of Kuwait,

Safat 13015, Kuwait

Abstract

Artificial neural network (ANN) models have been widely used in materials modeling, inter-correlations, as well as behavior and trend predictions when the nonlinear relationship between system parameters cannot be quantified explicitly and mathematically. In this study, an ANN model was proposed to predict the compressive strength of silica fume concrete. Various amounts of silica fume were added at different water/cementitious ratios. Concrete specimens were tested and compared with plain concrete specimens at different ages. The ANN training, testing, and validation results indicated that the concrete strength was predicted accurately with ANN techniques. The reliability between the predicted outputs and the experimental data was high as suggested by several



statistical indices. With new ingredients, the proposed ANN model is an alternative reliable and efficient approach to estimate the strength of silica fume concrete as a rapid inexpensive substitute for cumbersome experimental testing.

Keywords

Concrete, silica fume, compressive strength, modeling, artificial neural networks.



Investigating the Effect of Super Absorbent Polymer on the Performance of Plain Concrete

Moayyad Al-Nasra

Civil Engineering Department

Applied Science University

Amman, Jordan

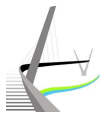
Mohammad Daoud

Department of Civil Engineering,

Zarqa University,

Zarqa, Jordan

Abstract-- The super absorbent polymer (SAP) has the ability to absorb relatively large amount of water and convert it into gel at the same time the volume increases proportionally. These properties are found to be very useful and effective in plain concrete. Also the use of super absorbent polymer in concrete is proven to have many positive effects on the

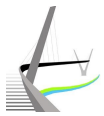


properties of concrete in its both stages; fresh concrete and hardened concrete. This study focuses on the water tightness properties of plain concrete with time. The study includes short term and long term effect of the super absorbent polymer on the water sealing properties. There are also many advantages of the use of the super absorbent polymer in plain concrete including providing internal water source. This internal water source acts as internal curing agent after the final setting of concrete. At the same time the SAP releases water at relatively slower rate at the fresh concrete stage. The SAP also provides additional voids in the concrete mass. These voids affect the concrete strength negatively at the same time improve the concrete performance by improving the concrete workability and placeability, reducing the concrete susceptibility to freezing thawing cycle, and improving concrete stability.

Keywords – Concrete Curing; Concrete Strength; Sealant; Super Absorbent Polymer; Water Tightness



Water Resources and Hydraulic Structures



Reservoir Operation by Artificial Neural Network Model (Mosul Dam –Iraq, as a Case Study)

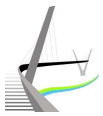
Thair S.K.¹
University of Technology,
Building and construction Eng. Dept.
Baghdad-Iraq;

Ayad S. M.²
Al-Anbar University,
Civil Engineering Dept
Baghdad-Iraq

THSHKHMA@YAHOO.COM
AYAD_ENG2001@YAHOO.COM

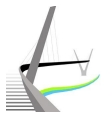
Abstract:

Reservoir operation forecasting plays an important role in managing water resources systems. This is especially the case for reservoirs because of the among all man-made hydraulic structures in river basins, reservoirs take a key role in redistributing water more evenly both in space and time to prevent damage and increase benefits, either in an economical or in ecological and societal manner. In recent years research on Artificial Neural Networks (ANN) proved to be most convenient and easy tool for modeling and analysis of non-linear events. For the reservoir operation, there is a need to find optimal solution to release water downstream and to keep maximum storage within the reservoir with no or minimum downstream damage during flood peak. ANN model was applied for Mosul-Dam reservoir which locates on Tigris River_Iraq with the objectives of water resources development and flood control. Feed-forward multi-layer perceptions (MLPs) are used and trained with the back-propagation algorithm, as they have a high capability of data mapping.



The data set has a record length of 23 years covering (1990-2012). The Input data were Inflow (I_t), Evaporation (E_t), Rainfall (R_t), reservoir storage (S_t) and Outflow (O_t). The data were divided into two parts, the first part that has a data for training and testing ANN Model. The remaining data were used for validation. The data set with simulated release for monthly duration was used to Model ANN. The best convergence after more than 1000 trials was achieved for the combination of inflow (I_t), inflow (I_{t-1}), inflow (I_{t-2}), Evaporation (E_t), reservoir storage (S_t), Rainfall (R_t), outflow (O_{t-1}) and outflow (O_{t-2}) with error tolerance, learning rate, momentum rate, number of cycles and number of hidden layers as 0.001, 1, 0.9, 50000 and 9 respectively. The coefficient of determination (R^2) and MAPE were (0.972) and (17.15) respectively. The results indicate that the Inflow(I_t) and Outflow(O_{t-1}) had the most significant effect on the predicted outflow of the reservoir with a relative importance of 21.80 and 18.56 respectively, followed by Inflow(I_{t-1}), Inflow(I_{t-2}) and Evaporation (E_t), Storage (S_t) and Rainfall (R_t), with a relative importance of 13.71, 13.28, 11.34, 10.84 and 10.43 % respectively. The results of ANN models for the training, testing and validation were compared with the observed data. The predicted values from the neural networks matched the measured values very well. The application of ANN technique and the predicted equation by using the connection weights and the threshold levels, assist the reservoir operation decision and future updating, also it is an important Model for finding the missing data. The ANN technique can accurately predict the monthly Outflow.

Keywords: ANN , Mosul Reservoir, Iraq , and Outflow.

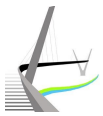


HIGH QUALITY WATER USING ZERO ENERGY AT URBAN AREAS OF JORDAN

Adnan Al-Salihi
Consolidated Consultants Group
Hydrological Analysis &
Hydraulic Structures Division (HAHS)
Amman, Jordan
A.Alsalihi@group-cc.com

Awali Al-Nahhas
Consolidated Consultants Group
Hydrological Analysis &
Hydraulic Structures Division (HAHS)
Amman, Jordan
a.nahhas@group-cc.com

Abstract -Water budget of Jordan is about one billion cubic meters with domestic water more than 40%. The quality of water is low in general due to the water shortage at all levels. The drinking water as well is of bad quality and high in dissolve solids little less than 1000 ppm as reflect of water scarcity. The solution could be the reverse osmosis (RO) but it is required energy. The energy consumed is high at main cities of Jordan just for drinking water since household RO is very common at every house and office. The attractive solution can be rainwater harvesting using no energy



out of houses roofs. The only extra infrastructure required is a storage tank, which must be feasible economically or otherwise will be wasting energy. Building large storage tank for no rainwater to be stored is the waste. This practice is common as a result of wrong interpretation of rainfall measurements. Rainfall records of nine major cities in Jordan are investigated and average annual rainfall-runoff coefficients are developed to guide the sizing of the storage tanks. The selected rainfall stations are of average annual rainfall of as low as 40 mm per annum at Ma'an city up to 625 mm per annum at Ajloun city. The resulted average annual runoff coefficients are very low for Ma'an about 5% but high at Ajloun about 50%. Power equation is developed to estimate the runoff coefficient for paved roof out of the average annual rainfall with estimated error at $\pm 10\%$.

Keywords- Rainwater Harvesting, runoff curve number, annual rainfall, annual runoff, runoff coefficient.



On the threshold of motion of sediment grains: Hydrodynamic forces effects

Reza Barati and Seyed Ali Akbar Salehi Neyshabouri

Faculty of Civil and Environmental Engineering

Tarbiat Modares University

Tehran, Iran

r88barati@gmail.com; salehi@modares.ac.ir

Goodarz Ahmadi

Department of Mechanical and Aeronautical Engineering

Clarkson University

Potsdam, New York, USA

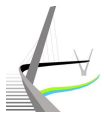
gahmadi@clarkson.edu

Abstract—Particle movement will occur when the instantaneous fluid force on a particle is just larger than the instantaneous resisting force. One of the most important issues in this regard is the influence of different hydrodynamic forces on threshold of motion. In the present study, effects of different forces; such as non-linear drag force, the shear lift force, Magnus force, the buoyancy force, the added mass force, Basset history force and torque; on the initiation of motion of sediment grains were studied by developing a 3D Lagrangian numerical model. The particle-wall collision were included using Discrete Element Method (DEM) and a random process. The non-cohesive sediments grains for the range of sand to gravel were considered. The verification step was performed using



different particle diameters and flow conditions. The results indicated that the drag force is the dominating force. Also, it is observed that the influence of lift force increase by increasing grain diameter.

Keywords; Numerical modeling, Sediment transport, Incipient motion, forces.



Innovative End Anchorage for Preventing Concrete Cover Separation of NSM Steel and CFRP bars Strengthened RC Beams

Mohd Zamin Jumaat, Md. Akter Hosen, Kh. Mahfuz Ud Darain, M.
Obaydullah

Department of Civil Engineering, Faculty of Engineering, University of
Malaya,

50603, Kuala Lumpur, Malaysia.

Email: zamin@um.edu.my;

enggakter@gmail.com; khmahfuz@gmail.com; md_obaydullah@yahoo.com

Abstract—Strengthening of structural members are now quite common in the construction industry due to a number of reasons. These include the increase in loading requirements, change in the type of usage and even due to deficiencies in either material properties or design of the structure. Flexural strengthening using near surface mounted (NSM) technique currently is getting more popular compared to the externally bonded reinforcement (EBR) technique. Most of the research works on NSM technique of strengthening reinforced concrete (RC) beams are focused on using carbon fiber reinforced polymer (CFRP) because of its good resistance to corrosion. This paper presents an experimental study on the flexural strengthening of RC beams with NSM steel or CFRP bars, and NSM steel together with the Uwrap end anchorage using CFRP fabrics.



Four point bending tests were carried out on six rectangular RC beams (125 mm width by 250 mm depth by 2300 mm length). The first cracking and ultimate load, displacement and failure modes were presented in the paper. The test results showed that the ultimate load increased up to 116%, CFRP-end anchorage eliminate the concrete cover separation failure and the ductility was found to be very good.

Keywords-flexural strengthening; NSM, concrete cover separation; CFRP fabrics.