ANNUAL REPORT

2023

Department of Civil Engineering

University of Engineering & Technology Lahore

civil.uet.edu.pk

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ANNUAL REPORT 2023

DEPARTMENT OF CIVIL ENGINEERING

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EDITORIAL BOARD

MESSAGE FROM VICE CHANCELLOR

The discipline of Civil Engineering, one of the oldest and most extensive field of engineering, stands as the bedrock upon which countless innovations and advancements have been built. At the University of Engineering and Technology (UET), Lahore, the Civil Engineering Department (CED) has long been a beacon of excellence, known for its unwavering commitment to education, research, and societal impact. Our department is not merely teaching future engineers; it is molding the visionaries and leaders who will redefine the future. Through innovative teaching methods and cutting-edge research, we are empowering our students to contribute meaningfully to both national and global progress.

The legacy of the CED is reflected in the thousands of alumni who have gone on to make significant contributions across various public and private organizations. Whether working with WAPDA, the Punjab Irrigation Department, or leading projects at NESPAK, DESCON, or ACE, our graduates are at the forefront of designing, executing, and maintaining the critical infrastructure that drives our nation's growth.

In recent years, the department's faculty has set new benchmarks in research and scholarship, securing the highest number of research grants among all departments at UET Lahore. This is a testament to their relentless pursuit of knowledge and innovation, a pursuit that continues to inspire our students to strive for excellence.

Our students, too, are making their mark, actively participating in the Institute of Civil Engineers (ICE) UET Chapter and excelling in both technical and extracurricular activities. The numerous national and international seminars and workshops organized by the department throughout 2023 have further enriched their experience, equipping them with the skills and confidence needed to lead in an ever-evolving world.

Under the visionary leadership of our Dean, Prof. Dr. Khalid Farooq and Chairman, Prof. Dr. Noor M. Khan, I have no doubt that the CED will continue to soar to new heights. This annual report is not just a reflection of our past achievements but a roadmap for future aspirations. It serves as a vital tool for critically assessing our performance and charting a course toward even greater success.

As Vice-Chancellor, I am proud of the strides we have made and remain steadfast in my commitment to supporting the Civil Engineering Department in its pursuit of excellence. Together, we will continue to build not just structures, but a brighter, more sustainable future for generations to come.

Prof. Dr. Nasir Hayat
Vice-Chancellor

MESSAGE FROM DEAN

Civil Engineering is a foundational discipline devoted to the planning, design, construction, and maintenance of both natural and built environments. This field encompasses a diverse array of structures and systems, including buildings, bridges, highways, canals, dams, airports, docks, harbors, as well as water supply and sewerage systems. As the second-oldest engineering discipline, civil engineering is distinct from military engineering in its focus on infrastructure that supports everyday life and societal growth.

At UET Lahore, the Civil Engineering Department (CED) stands as one of the most venerable and esteemed departments in the country. Our commitment to nurturing human resources through rigorous education and pioneering research remains steadfast. Our faculty members are dedicated to delivering innovative and high-quality educational experiences, equipping students with the expertise needed to excel in their professional careers.

Our undergraduate and graduate programs offer advanced instruction in the latest engineering tools and technologies. Students benefit from hands-on experience in cutting-edge laboratory facilities, preparing them to tackle both current professional demands and future technological challenges. The comprehensive and practical education provided at CED ensures that our graduates are exceptionally well-prepared to succeed in their respective fields.

I am proud to affirm that the Civil Engineering Department at UET Lahore is at the forefront of civil engineering education in Pakistan. Our department continues to uphold its esteemed reputation in teaching, research, and development across all academic domains.

With the unwavering dedication of our faculty and the exceptional efforts of our students, I am confident that CED will achieve even greater milestones in the future.

Prof. Dr. Khalid Farooq
Dean, Faculty of Civil Engineering

MESSAGE FROM CHAIRMAN

It is with great pride and pleasure that we present the 2023 Annual Report, highlighting the academic, research, and other endeavors pursued by the department in the last year. The Civil Engineering Department, UET Lahore stands as one of the oldest and most prestigious institutes in the country, boasting the largest number of Ph.D. faculty members nationwide.

In the year under report, our commitment to excellence in teaching, research, and consultancy services remained unwavering. Our dedicated faculty actively engaged in groundbreaking research, publishing fifty (50) research papers in esteemed journals. We have also secured competitive research grants from the Higher Education Commission (HEC) and other funding agencies. Notably, two research projects worth Rs. 12.2 million were successfully completed, while substantial progress has been carried out on ten (10) ongoing projects, valued at Rs. 42 million. This marks the highest number of research grants secured by any department at UET.

This year, we celebrated the graduation of over forty (40) master's students and three (3) Ph.D. researchers in the department. In line with our tradition of imparting knowledge and skills, the department organized twelve (12) seminars and workshops for the professional development of students, faculty members, and working engineers. The unwavering support of our alumni has resulted in the renovation of all the classrooms and most of the drawing halls, with new multimedia, air conditioning, and outlook.

Looking ahead, we plan to enhance our postgraduate research offerings and developing a new M.Sc. program "Disaster Mitigation Engineering." We also aim to strengthen our faculty and improve admissions across all programs, while expanding financial support through an endowment fund and student loan schemes.

I would like to extend my heartfelt thanks to our faculty, staff, and students for their dedication in making the Civil Engineering Department a premier teaching and learning hub. Special appreciation goes to Dr. M. Mazhar Saleem, Dr. Ubaid Ahmad Mughal, Engr. Muhammad Ahmad, and Engr. M. Faraz Javaid for their efforts in preparing this report. Together, we will continue to push the boundaries of knowledge and innovation in the field of civil engineering.

Dr. Noor Muhammad Khan
Professor, Chairman

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CIVIL ENGINEERING DEPARTMENT MISSION STATEMENT

To Impart High-Quality Civil Engineering Education Through Modern Teaching and Research for the National and International Socio-Economic Development

100+ Years of Academic Excellence
(1921-2023)

INTRODUCTION

INTRODUCTION

The Civil Engineering Department (CED), UET Lahore is one of the oldest and most prestigious departments in the country, dedicated to providing top-tier civil engineering education at both undergraduate and postgraduate levels. Established in 1939 as part of the Maclagan Engineering College in Lahore, the department has a rich history of academic excellence and professional contributions.

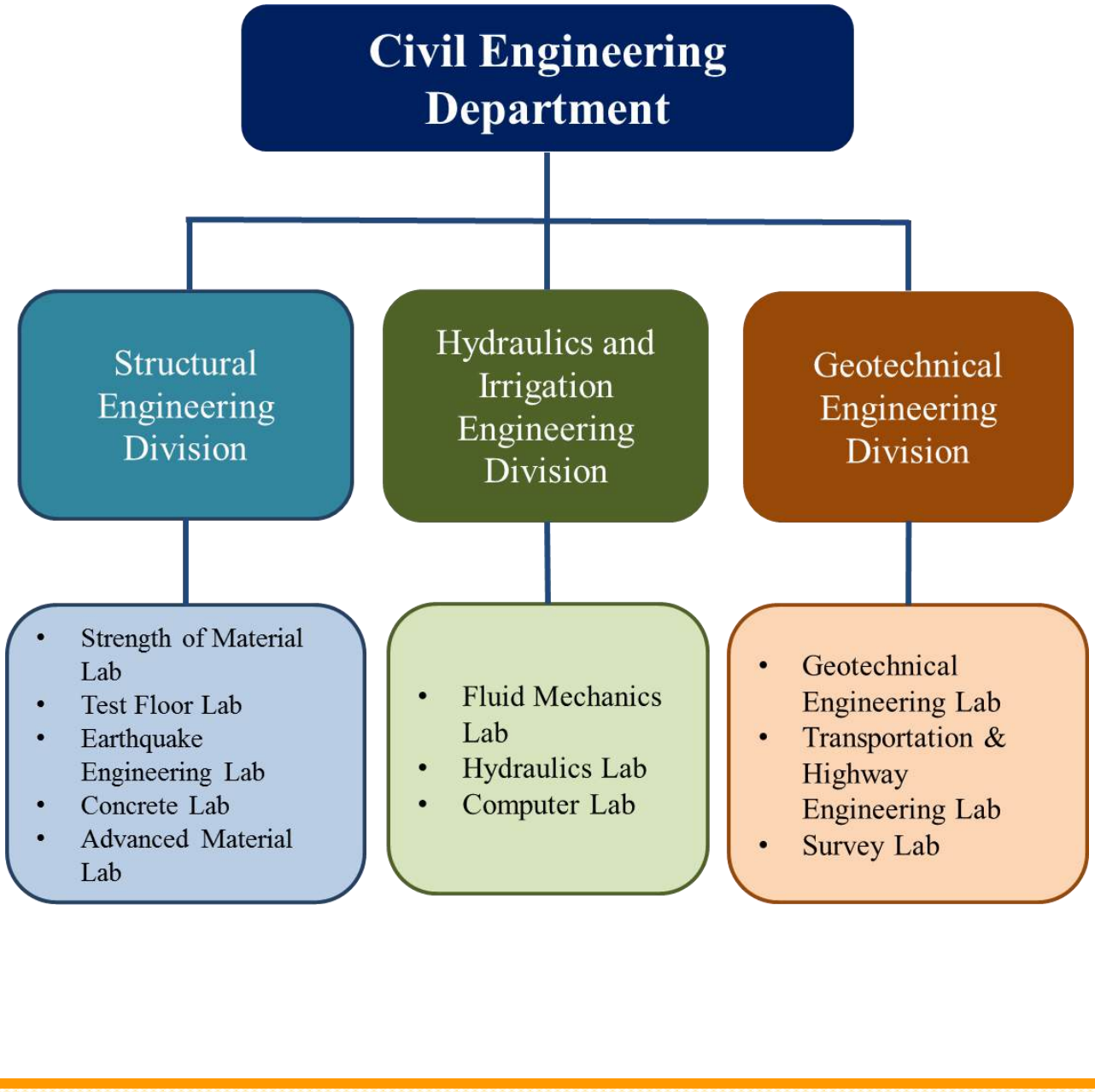
Currently, CED boasts an enrollment of over 900 students across its bachelor's, master's, and Ph.D. programs. Approximately 700 students are enrolled in the undergraduate program, around 200 students are engaged in M.Sc. research across three specialized sub-disciplines, and about 30 Ph.D. scholars are pursuing advanced research projects.

The department takes pride in its strong alumni network, with over 8,000 graduates who have been instrumental in driving national and regional development. For several decades, CED has been a leading provider of testing and consulting services to both government and private sectors. CED remains committed to advancing the field of civil engineering through excellence in education, research, and professional services.

Financial Details

Income generated through testing and consultancy services = Rs. 90 Million (Approx.)
Department Current expenses = Rs. 115 Million (Approx.)
Department Development (Public funding) = Rs. 7 Million (Approx.)
Department Development (Alumni funding) = Rs. 20 Million (Approx.)

INTRODUCTION



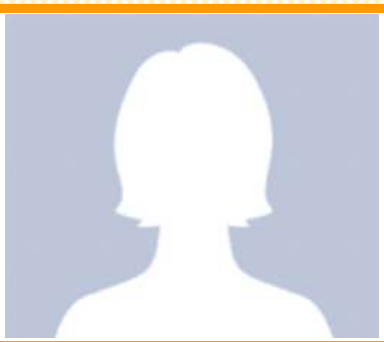
FACULTY MEMBERS

		
Prof. Dr. Khalid Farooq	Prof. Dr. Noor M. Khan	Prof. Dr. Asad Ullah Qazi
		
Prof. Dr. Asif Hameed	Prof. Dr. Burhan Sharif	Prof. Dr. Rashid Hameed
		
Prof. Dr. Hassan Mujtaba	Dr. M. Azhar Saleem	Dr. Safeer Abbas
		
Dr. Qasim Shaukat Khan	Dr. Ali Ahmad	Dr. Nauman Khurram

FACULTY MEMBERS

		
Dr. Jahanzaib Israr	Dr. Irfan ul Hassan	Dr. Waseem Abbas
		
Dr. Rizwan Azam	Dr. M. Mazhar Saleem	Dr. M. Rizwan Riaz
		
Dr. Syed Asad Ali Gillani	Dr. Usman Akmal	Dr. Imtiaz Rashid
		
Dr. Muhammad Yousaf	Dr. Ehtesham Mehmood	Engr. Usman Ali

FACULTY MEMBERS

		
Dr. Umbreen Us Sahar	Dr. Aqsa Shabbir	Dr. M. Ali Falak
		
Dr. Muhammad Kashif	Dr. Zubair Masood	Engr. M. Rehan Ashraf
		
Dr. Ubaid Ahmad Mughal	Engr. Aamina Rajput	Engr. Bilal Anwar Khokhar
		
	Engr. Abdul Rehman	

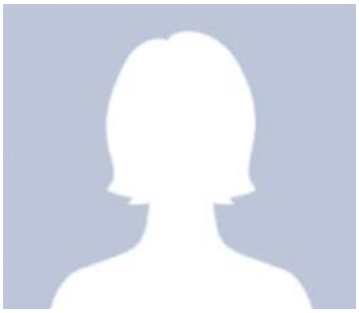
FACULTY MEMBERS

Teaching Fellows

		
Engr. Zaib Un Nisa	Engr. Muhammad Ahmad	Engr. M. Faraz Javaid

ADMINISTRATIVE STAFF

Chairman Office

		
Mr. Gulam Rasool (Assistant)	Mr. Sajjad Haider (Assistant)	Mrs. Ismat Naz (Senior Clerk)

	
Mr. Altaf Shah (Junior Clerk)	Mr. Rao Sajjad Ahmad (Naib Qasid)

STAFF MEMBERS

Test Floor Lab

		
Mr. Shahid Abdullah (Lecture Assistant)	Mr. Muhammad Nadeem (Lab Assistant)	Mr. Zahoor Ahmad (Lab Assistant)

Strength of Material Lab

		
Mr. Muhammad Hussain (Lab Supervisor)	Mr. Mahmood Ahmed Khan (Mechanic)	Mr. Badar Akram (Lab Assistant)

Concrete Lab

		
Mr. Muhammad Tausif Dar (Lab Assistant)	Mr. Hamza Mohi-Ud-Din (Lab Assistant)	Mr. Umar Saeed (Senior Clerk)

STAFF MEMBERS

Geotechnical Engineering Lab

		
Mr. Muhammad Sadiq (Lecture Assistant)	Mr. Ansar Abbas (Lab Assistant)	Mr. Imran Mukhtar (Junior Clerk)

Hydraulic Engineering Lab

		
Mr. Faisal Farooq (Senior Mechanic)	Mr. Zafar Ali (Lecture Assistant)	Mrs. Asia Parveen (Lab Attendant)

Transportation Engineering Lab

		
Mr. Muhammad Ishaq (Junior Demonstrator)	Mr. Zeeshan Siddique (Draftsman)	Mr. Shahid Sardar (Lecture Assistant)

STAFF MEMBERS

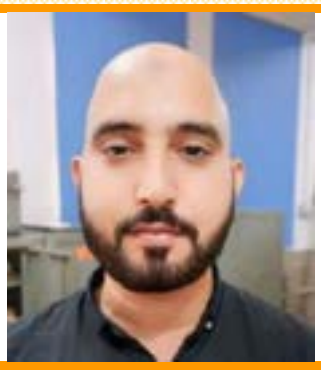
Computer Lab

		
Dr. Ijaz Ahmad Awan (Lab Supervisor)	Mr. Bilal Ahmed (Lab Assistant)	Mr. M. Junaid Qayyum (Lab Attendant)

Earthquake Lab

QDEC

Departmental Library

		
Mr. Khalid Hussain (Lab Assistant)	Mr. Kamran Javed (DQEC Coordinator)	Mrs. Tahreem Akhtar (Lab Supervisor)

Survey Lab

	
Mr. Majid Mehmood (Lecture Assistant)	Mr. Muhammad Owais Aslam (Lecture Assistant)

FUNDED RESEARCH PROJECTS

FUNDED RESEARCH PROJECTS

During 2023 two research projects worth Rs. 12.2 Million were successfully completed while ten projects worth Rs. 42 Million remained in progress at various stages. Details are appended below.

Research Projects (Completed in 2023)

1	Performance Evaluation of Multiple Aerators Installed in Series at High Head Overflow Spillways: Case Study of Mohmand Dam
2	Development of Concrete Pavers and Masonry Blocks by Using 100% Recycled Aggregate Concrete Through Compression Casting Technique: A Way Forward for Sustainable Development

Research Projects (Ongoing)

1	Challenges Posed by Swelling Clays and Their Mitigation Using Industrial Wastes: A Sustainable Solution
2	Earthquake and Flood Resistant Inter-Locking Block House
3	An Environmental Friendly Cementless Concrete for Future Constructions in Pakistan: Geopolymer Concrete A Sustainable Approach (CPEC-CRG)
4	An Environmental Friendly Cementless Concrete for Future Constructions in Pakistan: Geopolymer Concrete A Sustainable Approach (NRPU)
5	Development of Unburnt, Ecofriendly, Interlocking Masonry Units Incorporating Industrial Wastes: A Way to Low-cost Housing
6	Development of Guidelines for the Use of FRP Pipes in Pakistan
7	Development of Sustainable Construction Materials and Products Using Multiscale Experimental-Analytical Approach
8	Development of Bricks and Wall Panels for Low-Cost Housing Sector of Pakistan
9	Conservation of Cultural Heritage Structures by Monitoring of Vibrations
10	Structural Health Monitoring of Critical Bridge Infrastructure: A Sustainable, Cost-Effective and Multidisciplinary Approach

Performance Evaluation of Multiple Aerators Installed in Series at High Head Overflow Spillways: Case Study of Mohmand Dam

Prof. Dr. Noor M. Khan
(Principal Investigator)

Prof. Dr. Habib Ur Rehman
(Co-Principal Investigator)

Dr. M. Kaleem Sarwar
(Co-Principal Investigator)

Cavitation is a problem on large dam spillways prevented by the provision of aerators. The spacing of multiple aerators on steep chutes of high head spillways is a major concern to design engineers. Multiple aerators in series along flow direction must be used for cavitation prevention. CFD studies for multiple aerators along the spillway must be made to determine the allowable distance between aerators for sufficient aeration. In current study, hydraulic parameters along spillway chute will be observed using physical model, in order to validate the CFD model, the air entrainment along with its effect under various inflows at spillway will be assessed for series of aerators using CFD model, and a relationship will be developed for aerator spacing at spillway chute. This research study will provide an effective design criterion to the design engineers for spacing of multiple aerators. Since cavitation damage to the spillway can be prevented by introduction of adequate amount of air through aerators, the outcomes of this research study will be beneficial in reducing the cost of repairs.

Project Cost: Rs. Rs 5.76 Million
Funding Agency: Higher Education Commission, NRPU

Air Bubble at Flow Surface of Upper Stilling Basin

Challenges Posed by Swelling Clays and their Mitigation Using Industrial Wastes: A Sustainable Solution

Prof. Dr. Hassan Mujtaba
(Principal Investigator)

Prof. Dr. Khalid Farooq
(Co-Principal Investigator)

The primary objective of the research project is to mitigate the problematic behavior of swelling clays by mixing with industrial wastes. Swelling clays are available in abundance in areas of Gujranwala, Sialkot, Narowal, Dera Ghazi khan, Dera Ismail khan in Pakistan. Construction on such soils without treatment may lead to failure. Due to rapid industrial growth number of industrial wastes including coal ash, bagasse ash, rice husk ash and glass wastes are being produced at a very alarming rate and are available in abundance. Swelling clay will be blended with industrial waste and geotechnical characterization of these blended samples will be carried out to determine various geotechnical characteristics and ascertain the use of these blended samples as a suitable construction material.

Project Cost: Rs. 2,842,000/-
Funding Agency: HEC Pakistan

Nandipur Site, Gujranwala

Industrial Waste (Bagasse Ash)

Collection of Block Sample

An Environmental Friendly Cementless Concrete for Future Constructions In Pakistan: Geopolymer Concrete A Sustainable Approach

Dr. Qasim Shaukat Khan
(Principal Investigator)

Prof. Dr. Asad Ullah Qazi
(Co-Principal Investigator)

The scope of this project is to develop eco-friendly Geopolymer concrete (GPC) using an industrial by-product fly ash as an alternative of energy intensive cement in concrete to be used in the construction of low-cost housing and to reduce the carbon footprint and hence reduce the influence of global warming on our rapidly melting glaciers. In this research project, mix designs of GPC with target compressive strengths of 21 MPa and 28 MPa using fly ash obtained from different coal power plants will be developed. The strength and durability properties of fly ash based GPC will be investigated. The structural performance of fly ash based GPC will be investigated. The guidelines for fly ash based GPC will be developed. Fly ash bricks will be developed.

Project Cost: Rs. 8.0 Million
Funding Agency: China Pakistan Economic Corridor (CPEC) Agency and Higher Education Commission (HEC), CPEC-CRG-221

Port Qasim Fly Ash

Jhampir Sand

Hub Aggregates

GPC Specimens

An Environmental Friendly Cementless Concrete for Future Constructions In Pakistan: Geopolymer Concrete A Sustainable Approach

Dr. Qasim Shaukat Khan
(Principal Investigator)

Prof. Dr. Asad Ullah Qazi
(Co-Principal Investigator)

This research addresses the scientific challenge of Climate Action by developing cement-less concrete as an alternative of OPC concrete hence significantly reducing the CO2 emissions and adverse impacts of Climate change such as food insecurity, loss of biodiversity, soil erosion and melting of glaciers. Moreover, recycled aggregates (RA) instead of natural aggregates in development of cement-less concrete will be used as dumping of construction and demolition wastes in landfills is a gigantic task in large cities. In this research project, mix designs of recycled aggregate GPC with target compressive strengths of 21 MPa and 28 MPa using fly ash obtained from different coal power plants will be developed. The strength and durability properties of recycled aggregate GPC will be investigated. The structural performance of recycled aggregate GPC will be investigated. The guidelines for recycled aggregate GPC will be developed. Recycled aggregate bricks will be developed.

Project Cost: Rs. 2.94 Million
Funding Agency: Higher Education Commission (HEC), NRPU-16682

Sahiwal Fly Ash

Recycled Aggregates

Recycled Aggregate GPC

Recycled Aggregate Bricks

Development of Unburnt, Ecofriendly, Interlocking Masonry Units Incorporating Industrial Wastes: A Way to Low-cost Housing

Dr. Ali Ahmed
(Principal Investigator)

Dr. Safeer Abbas
(Co-Principal Investigator)

Dr. Wasim Abbass
(Co-Principal Investigator)

One of the major concerns associated with the quality of life in Pakistan is currently the air-pollution. Recently, Pakistan has been ranked second most polluted country having an air quality index of 153. Therefore, there is a dire need to control the elements causing such an increase in air pollution. One of such elements is the burning process carried out to produce conventional burnt clay bricks which are the most used construction material. Further, recent industrial growth has caused generation of various wastes including fly-ash, coal bottom ash, sugarcane baggase ash, rice-husk ash etc. causing another environmental issue associated with safe disposal of these wastes. The investigators believe that the solution to these rising problems may lie in the utilization of these wastes for development of interlocking, unburnt, compressed bricks. Moreover, Naya Pakistan Housing Scheme initiated by Government of Pakistan makes it necessary to develop a sustainable building unit for vast scale and low-cost structural applications. Therefore, it is necessary to investigate the building units from engineering performance and durability perspective. The proposed research is envisioned to help in generating much needed experimental data and general guidelines for the masonry wall panels constructed from compressible interlocking bricks incorporating waste materials under various loading conditions. Moreover, this research will facilitate stakeholders with an alternative building unit to be used in sustainable masonry construction for low-cost housing. In the end, commercial guidelines of developed sustainable bricks and wall panels will lead towards utilization of waste material instigating positive socio-economic impact.

Project Cost: Rs. 4.7 Million
Funding Agency: Higher Education Commission

Interlocking Masonry Unit

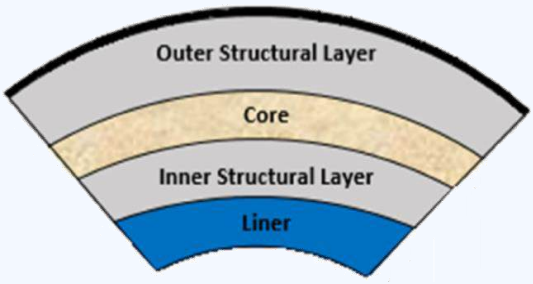
Development of Guidelines for the Use of FRP Pipes in Pakistan

Dr. Nauman Khurram
(Principal Investigator)

Dr. Usman Akmal
(Co-Principal Investigator)

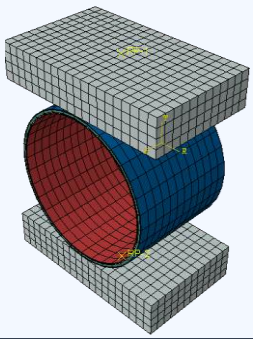
Due to the light nature and long-lasting durability, composite materials especially the fiber-reinforced polymer (FRP) are becoming quite popular in construction industry. In this regard, FRP pipes are also being used in public health engineering related projects i.e., water supply lines, sewer system and disposal of industrial waste. Lack of expertise, improper quality control in manufacturing and anisotropic nature of FRP is a big hindrance among the engineers to expand the utilization of FRP and FRP sandwich pipes in infrastructure related projects. The proposed study is planned to investigate the complete anisotropic mechanical behavior of FRP and FRP sandwiched pipes both a material level and at structural level. In second, part of the study these materials constitutive properties will be utilized to investigate the failure pattern and ultimate load carry performance of FRP pipes through numerical study. The outcomes of proposed study will be used to develop the guidelines and testing specification for Public Health Engineering Department for the usage of FRP pipes for public and industrial sector related projects in Pakistan.

Project Cost: Rs. 1,654,850/-
Funding Agency: NRPU



FRP Pipe Composition

Experimental Testing



Numerical Model of FRP Pipe

Development of Sustainable Construction Materials and Products Using Multiscale Experimental-Analytical Approach

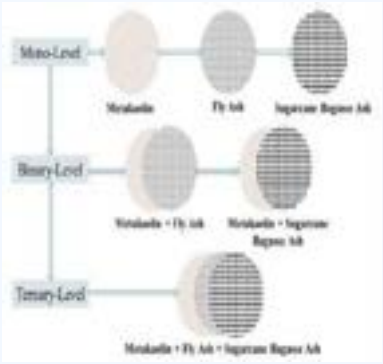
Dr. M. Irfan-ul-Hassan
(Principal Investigator)

Prof. Dr. Burhan Sharif
(Co-Principal Investigator)

Dr. Syed Ali Rizwan
(Co-Principal Investigator)

The biggest challenge to the construction industry of Pakistan is not changing the --- traditions, materials, latest technologies developed-- and not using the results of current research. This research work deals with investigating the construction materials and composites, at multi-scale level, incorporating supplementary sustainable construction materials. The materials selected for this research includes cement replacement materials. Development of materials using SCM, and energy-intensive technology will affect - environment, elements of civil engineering industry, and all the departments linked with sustainable development. Individual materials will be investigated at multiscale level to see the role of individual component and finally construction composites will be developed. These composites will then be up scaled to the industrial level. The developed material and products will be helpful in achieving the economy and sustainability in construction engineering as well as these will help in saving the environment. The team involved in this research work has already done great deal of work in the field of construction materials and structures.

Project Cost: Rs. 6.767 Million
Funding Agency: Higher Education Commission Pakistan



Multiscale investigation approach

Sustainable development goals targeted

Development of Bricks and Wall Panels for Low-Cost Housing Sector of Pakistan

Dr. M. Irfan-ul-Hassan
(Principal Investigator)

Dr. Khurram Rashid
(Co-Principal Investigator)

Globally there is growing gap between the demand and supply of housing and Pakistan is addressing it at an alarming rate. This research project is made to implement our current findings and extend the on-going research outcomes towards the development of bricks and wall panels which are tremendous need of the country. Pakistan is feeling shortage of bricks due to which price of these items is increasing. Manufacturing technique of brick is firing that is energy intensive process, and responsible for pollution and smog. Aim of this research is to develop these products by proposing an alternate technique, that is environment friendly and economical. Detailed working plan is made to challenge environmental problems like smog and CO2 emission, (i) firstly by reducing the use of natural resources for production of construction related products e.g., bricks and tiles. (ii) secondly utilizing the low-cost waste material and lesser-used precursor materials like bagasse ash and metakaolin, to produce the bricks and wall panels (iii) thirdly by applying the developed products in construction sector, thus applying green building products. This research work will open new horizon in construction industry specially in low-cost housing. PI and Co-Pi of the project has already done great deal of work in this area and extending their research work in collaboration with leading industry of Pakistan.

Project Cost: Rs. 4.246 Million
Funding Agency: Pakistan Science Foundation

Wall Panel testing

Development of compressed bricks

Conservation of Cultural Heritage Structures by Monitoring of Vibrations

Dr. Rizwan Azam
(Principal Investigator)

Dr. M. Rizwan Riaz
(Co-Principal Investigator)

Pakistan is a country rich in cultural heritage structures such as forts, shrines, monuments and other places of religious significance. Most of these structures are susceptible to damage because of ambient vibrations caused by new construction projects. In general, construction projects in the proximity of historical structures are avoided. However, if construction of new projects such as metro train is necessary to be constructed in the proximity of historical structures, monitoring of vibration before, during and after construction is needed to ensure the integrity of historical structures. In the case of Pakistan, vibration monitoring of heritage structures became essential during the construction of the orange line metro train (OLMT) project which had 11 historical structures along its alignment and there is a need for ready-to-use methodology for vibration monitoring of heritage structures for such projects in future. The objective of this study is to perform a state-of-the-art review of available standards and guidelines and check their applicability to the heritage structures of Pakistan. In addition, it aims to propose a ready-to-use methodology for vibration monitoring of heritage structures.

Project Cost: Rs. 3,622,500/-
Funding Agency: HEC Pakistan

Structural Health Monitoring of Critical Bridge Infrastructure: A Sustainable, Cost-Effective and Multidisciplinary Approach

Dr. M. Mazhar Saleem
(Principal Investigator)

Dr. Asad Ullah Qazi
(Co-Principal Investigator)

Dr. Safeer Abbas
(Co-Principal Investigator)

Engr. Muhammad Umair
(Co-Principal Investigator)

Smart Strain Meter

Project Cost	Funding Agency
Rs. 7,875,000/-	HEC Pakistan NRPU

The scope of this project is to develop a state of the art structural health monitoring system for bridges. The developed system will utilize sensors for the monitoring of strain, acceleration, displacement, and cracks in the bridges. Smart data acquisition units will be developed for all the sensors. Detailed lab testing will be carried out to validate the performance of these sensors and data acquisition units. These units will be integrated with an online portal for real-time monitoring of bridges' parameters. Once the sensor data is recorded it will be processed to acquire meaningful information regarding the operation and maintenance of the bridge. Finally, guidelines will be developed for low-cost smart structural health monitoring systems for bridge infrastructure in Pakistan.

POSTGRADUATE RESEARCH

POSTGRADUATE RESEARCH

During 2023 three (3) Ph.D. students and forty-two (42) M.Sc. students completed their degrees. The details are appended below.

List of Ph.D. Research work (Completed)

1	**Research Topic:** Optimization of Parallel Reservoir Operations for Irrigation and Flood Management **Student:** Engr. Muhammad Mohsin Munir **Supervisor:** Prof. Dr. Abdul Sattar Shakir **Co-Supervisor:** Prof. Dr. Habib Ur Rehman
2	**Research Topic:** Investigation of Torsion in Confined Masonary Structure with Opening **Student:** Engr. Ubaid Ahmad Mughal **Supervisor:** Prof. Dr. Asad Ullah Qazi
3	**Research Topic:** Development of Rockfall Hazard Rating System along KKH from Thakot to Raikot Section **Student:** Engr. Ehtesham Mehmood **Supervisor:** Dr. Imtiaz Rashid **Co-Supervisor:** Prof. Dr. M. Farooq Ahmed

List of M.Sc. Research work (Completed)

GEOTECHNICAL ENGINEERING DIVISION

1	**Research Topic:** Effect of Density and Surcharge Pressure on Collapse Potential of Loess Soil Treated with Bagasse Ash **Student:** Engr. Danial Safdar **Supervisor:** Prof. Dr. Khalid Farooq
2	**Research Topic:** Development of Correlation Between SPT-N and Consolidation Parameters of Cohesive Soil **Student:** Engr. Fahad Khalid **Supervisor:** Prof. Dr. Khalid Farooq

3	**Research Topic:** Correlation between Coefficient of Consolidation and Index Properties of Cohesive Soils **Student:** Engr. Mehwish Shakoor **Supervisor:** Prof. Dr. Khalid Farooq
4	**Research Topic:** Experimental Evaluation of the Infiltration Capacity of Urban Soils Using a Lab-Scale Model **Student:** Engr. M. Ahmed Nadeem **Supervisor:** Prof. Dr. Hassan Mujtaba Shahzad
5	**Research Topic:** Sustainable Use of Fly Ash and Used Face Masks for the Improvement of Engineering Characteristics of Fat Clays **Student:** Engr. Saira Zulfiqar **Supervisor:** Prof. Dr. Hassan Mujtaba Shahzad
6	**Research Topic:** Experimental Evaluation of Geotechnical Characteristics of Sialkot Clay Treated with Dumped Coal Ash **Student:** Engr. Hadia Ali **Supervisor:** Prof. Dr. Hassan Mujtaba Shahzad
7	**Research Topic:** Development of Correlation Between SPT-N and Undrained Shear Strength of Cohesive Soil in Pakistan **Student:** Engr. Shafiq Ur Rehman **Supervisor:** Prof. Dr. Hassan Mujtaba Shahzad
8	**Research Topic:** Physical Modelling and Laboratory Evaluation of Interface Shear Characteristics Between Soil and Steel Surface Geometry **Student:** Engr. Iftikhar Ahmad **Supervisor:** Dr. Jahanzaib Israr
9	**Research Topic:** Effect of Surcharge Pressure & Relative Density on Engineering Characteristics of Wind-Blown Deposits **Student:** Engr. Ghazanfar Shahbaz **Supervisor:** Dr. Imtiaz Rashid
HYDRAULIC ENGINEERING DIVISION	
10	**Research Topic:** Assessment of Reservoir Sedimentation in Tarbela Reservoir Using Remote Sensing Technique **Student:** Engr. Muhammad Zeeshan **Supervisor:** Prof. Dr. Habib-ur-Rehman

11	**Research Topic:** Impact of Reservoir Sedimentation on Hydrological Drought: A Case Study of Tarbela Reservoir **Student:** Engr. Faizan Ahmed Waris **Supervisor:** Prof. Dr. Habib-ur-Rehman
12	**Research Topic:** Impacts of Hydrological Regime Change on Sutlej River **Student:** Engr. Sania Khalid **Supervisor:** Prof. Dr. Noor Muhammad Khan
13	**Research Topic:** Spatial Assessment of Soil Erosion and Sediment Yield Using Remote Sensing **Student:** Engr. Sami Ullah **Supervisor:** Engr. Usman Ali
14	**Research Topic:** Assessment of Hydropower Potential for Ghizer River Using GIS and Hydrological Modelling **Student:** Engr. Rana Muhammad Ibrahim Ullah **Supervisor:** Engr. Usman Ali
15	**Research Topic:** Impact of Land Use and Climate Change of Lahore on Ravi River Flows at Balloki **Student:** Engr. Sami Ullah **Supervisor:** Engr. Usman Ali
STRUCTURAL ENGINEERING DIVISION	
16	**Research Topic:** Alkali-Silica Potential in Fly-Ash Based Geopolymer Concrete **Student:** Engr. Sikandar Hayat **Supervisor:** Prof. Dr. Asif Hameed
17	**Research Topic:** Behavior of FRP Strengthened RC Circular Columns with near Surface Mounting and External Bonding Techniques **Student:** Engr. Arslan Baig **Supervisor:** Prof. Dr. Asif Hameed
18	**Research Topic:** Experimental Investigation of the Properties of Flyash-Lime-Gypsum Bricks **Student:** Engr. Muhammad Sultan **Supervisor:** Prof. Dr. Asif Hameed

19	**Research Topic:** Flexural Strengthening of RC Beams Using near Surface Mounted and Externally Bonded FRP Techniques **Student:** Engr. Shaharyar Khan **Supervisor:** Prof. Dr. Asif Hameed
20	**Research Topic:** Performance of Coal Bottom Ash as a Fine Aggregate in Concrete **Student:** Engr. Somia Mubarak **Supervisor:** Prof. Dr. Muhammad Burhan Sharif
21	**Research Topic:** Effect of Recycled Aggregate Concrete on the Properties of Recycled Aggregate Bricks **Student:** Engr. Waheed Ullah Khan **Supervisor:** Prof. Dr. Muhammad Burhan Sharif
22	**Research Topic:** Experimental Study on the Mechanical and Durability Properties of Recycled Aggregate Concrete Bricks **Student:** Engr. Muhammad Ahmad **Supervisor:** Prof. Dr. Rashid Hameed
23	**Research Topic:** Flexural Behaviour of Reinforced Hybrid Recycled Aggregate Concrete **Student:** Engr. Abdul Basit **Supervisor:** Prof. Dr. Rashid Hameed
24	**Research Topic:** Effect of Parent Concrete Strength on the Mechanical Properties of Recycled Aggregate Concrete Bricks **Student:** Engr. Haider Ali **Supervisor:** Prof. Dr. Rashid Hameed
25	**Research Topic:** Mechanical and Durability Performance of Coal Ash Interlocked Bricks **Student:** Engr. Mirza Awais Baig **Supervisor:** Dr. Safeer Abbas
26	**Research Topic:** Experimental Investigation on Fly Ash Based Geopolymer Clay Bricks: An Alternative Sustainable Solution **Student:** Engr. Muhammad Hassan Javed **Supervisor:** Dr. Qasim Shaukat Khan

27	**Research Topic:** Effect of Alkaline Activators and Curing Regimes on the Properties of Fly Ash Based Geopolymer Concrete **Student:** Engr. Talha Mumtaz **Supervisor:** Dr. Qasim Shaukat Khan
28	**Research Topic:** Experimental Investigation of Alkali Silica Reactivity of Aggregates Available in Azad Kashmir **Student:** Engr. Waqar Mahmood **Supervisor:** Dr. Ali Ahmed
29	**Research Topic:** Investigation of Ferrocement Panels: Impact Resistance and Flexural Strength **Student:** Engr. Faisal Malook **Supervisor:** Dr. Nauman Khurram
30	**Research Topic:** Effect of Iron Slag and Waste Polymers on Nuclear Radiation Shielding of Concrete **Student:** Engr. Uzair-Ul-Hassan Waqar **Supervisor:** Dr. Nauman Khurram
31	**Research Topic:** Investigation of Engineering Properties of Multigrade Sustainable Concrete Composites **Student:** Engr. Jawad Ahmed Siddiqui **Supervisor:** Dr. Muhammad Irfan ul Hassan
32	**Research Topic:** Investigation of Bond Strength for Sustainable Brick Masonry Using Various Types of Bricks and Mortar Composites **Student:** Engr. Kamran Javed **Supervisor:** Dr. Muhammad Irfan ul Hassan
33	**Research Topic:** Upscaling the Properties of Cementitious Pastes Incorporating Different Locally Available Materials **Student:** Engr. Muhammad Usama Shafique **Supervisor:** Dr. Muhammad Irfan ul Hassan
34	**Research Topic:** Gypsum Based Composites Reinforced with Waste Fibers and Laminates **Student:** Engr. Muhammad Imran Shah **Supervisor:** Dr. Wasim Abbas

35	**Research Topic:** Material Characterization of Untreated Locally Available Deposited Waste Ashes **Student:** Engr. Muneeb Ahmed **Supervisor:** Dr. Wasim Abbas
36	**Research Topic:** Evaluation of Casting Procedure for Production of Compressed Waste Coal Ash Bricks **Student:** Engr. Soheeb Ullah Mahmood **Supervisor:** Dr. Wasim Abbas
37	**Research Topic:** Artificial Intelligence-Based Model for Prediction of Traffic-Induced Vibrations **Student:** Engr. Muhammad Faraz Javaid **Supervisor:** Dr. Rizwan Azam
38	**Research Topic:** Alkali Silica Reactivity Potential of Aggregates from Balochistan **Student:** Engr. Muhammad Saleem **Supervisor:** Dr. Muhammad Mazhar Saleem
39	**Research Topic:** Mechanical Characterization of Concrete Incorporating Recycled Hollow Tubular GFRP Sections **Student:** Engr. Muhammad Moeed Azhar **Supervisor:** Dr. Muhammad Rizwan Riaz
40	**Research Topic:** Development of Eco-Friendly Gypsum Composites Containing Recycled Gypsum **Student:** Engr. Ubaid Ullah **Supervisor:** Dr. Muhammad Rizwan Riaz
41	**Research Topic:** Mechanical Performance of Amorphous Metallic Fiber-Reinforced and Rubberized Thin Bonded Cement-Based Overlays **Student:** Engr. Ayesha Javed **Supervisor:** Dr. Syed Asad Ali Gillani
42	**Research Topic:** Investigation on Structural Behaviour of GFRP Sections Filled with Geopolymer Concrete Containing Recycled Aggregates **Student:** Engr. Muhammad Mohsan **Supervisor:** Dr. Muhammad Yousaf

POSTGRADUATE RESEARCH (Ph.D.)

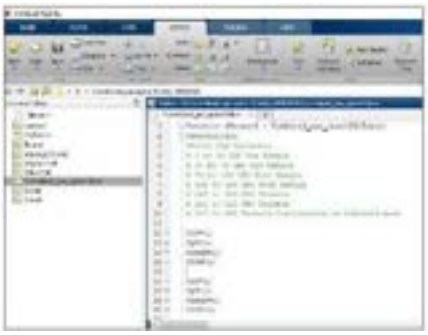
OPTIMIZATION OF PARALLEL RESERVOIR OPERATIONS FOR IRRIGATION AND FLOOD MANAGEMENT

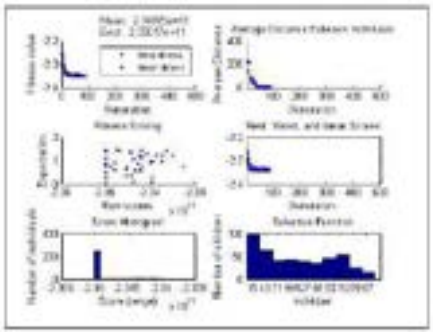
Supervisor: Prof. Dr. Abdul Sattar Shakir
Co-Supervisor: Prof. Dr. Habib Ur Rehman

Engr. M. Mohsin Munir
(Ph.D. Researcher)

Abstract

Developed and implemented a new approach that simulated and optimizes the management of multiple reservoirs (in parallel) for various objectives, including optimization of irrigation, hydropower generation, storage conservation and minimizing flood damages. The study creates novel "Parallel Reservoir Operation Optimization Considering Sediment Evacuation" (PROOSE) model that combines reservoir operation, hydropower generation, sediment evacuation & Optimization modules using Genetic Algorithm optimization technique. The PROOSE model can optimize rule curves and can provide optimized distributions of combined demands for multiple reservoirs for single criterion or multi-objective criteria, to maximize and minimize objectives, and with or without constraints. Consequently, using 10-daily time step, he applied the developed model to Tarbela and Mangla Reservoirs on Indus and Jhelum Rivers to optimize their rule curves and optimized distributions of combined demand. Eight different scenarios were established for optimizing rule curves of both parallel reservoirs to maximize objectives individually and in combination to various objectives combined in different priority weightages. According to optimization results, he has shown that enhancement in the economic benefits withs respect to current rule curves can be achieved through implementation of optimized rule curves which will be beneficial under country's food security and socio-economic considerations.





POSTGRADUATE RESEARCH (Ph.D.)

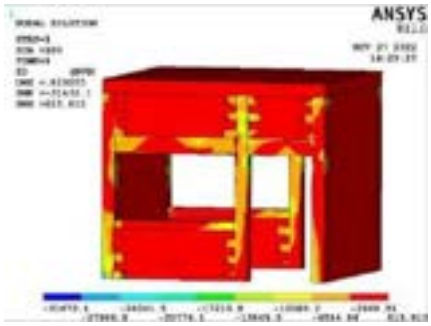
INVESTIGATION OF TORSION IN CONFINED MASONRY STRUCTURE WITH OPENING

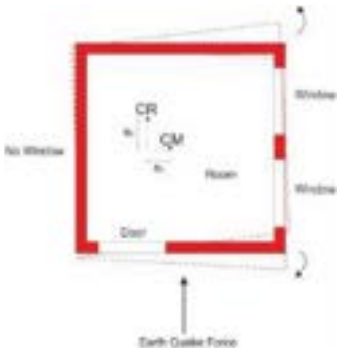
Supervisor: Prof. Dr. Asad Ullah Qazi

Engr. Ubaid Ahmad Mughal
(Ph.D. Researcher)

Abstract

A detailed comparative study was carried out to investigate the impact of unsymmetric openings on the torsional resistance of confined masonry rooms constructed in highly seismic-prone regions. To investigate in detail, an experimental and numerical investigation was carried out. Confined masonry wall panels with and without openings were experimentally tested to study the reduction in stiffness/lateral load-carrying capacity of walls due to the provision of openings. Further, a three-dimensional masonry room was tested experimentally to determine the torsion induced due to openings in confined masonry rooms. It was observed that on the provision of unsymmetric openings in confined masonry rooms, torsion was observed causing a reduction in the load-carrying capacity. The same was also confirmed using numerical simulation where it was revealed that on the provision of unsymmetric openings, 10% reduction in lateral load carrying capacity was observed in the confined masonry rooms as compared to the room with symmetric openings. Similarly, a lesser difference (0.1 mm) in the displacements between two corners of the wall opposite to the applied load was observed in the case of the confined masonry room having symmetrical openings on opposite sides. Therefore, it might be concluded that in highly seismic-prone regions, the provision of symmetric openings or utilizing other means of manipulating in-plane wall stiffness should be considered to reduce the impact of torsion.





POSTGRADUATE RESEARCH (Ph.D.)

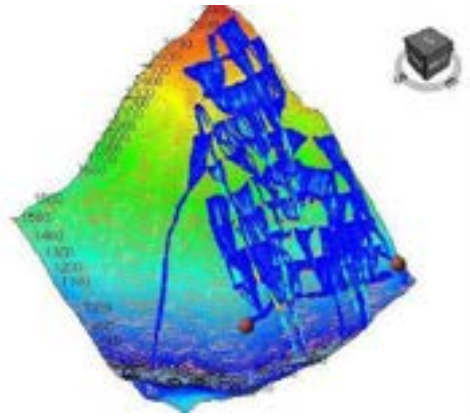
DEVELOPMENT OF ROCKFALL HAZARD RATING SYSTEM ALONG KKH FROM THAKOT TO RAIKOT SECTION

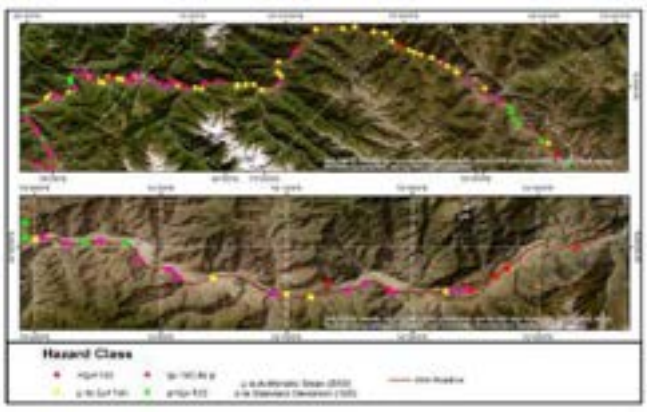
Supervisor: Dr. Imtiaz Rashid
Co-Supervisor: Prof. Dr. M. Farooq Ahmed

Engr. Ehtesham Mehmood
(Ph.D. Researcher)

Abstract

This study focuses on developing a comprehensive framework for assessing rockfall hazards along the Karakoram Highway (KKH) from Thakot to Raikot bridge, covering a distance of 285 kilometers. The study area was meticulously divided into 129 sections based on geological characteristics and identified potential for rockfall incidents. This included upgrading three parameters, introducing four additional parameters crucial to the region, and incorporating a novel parameter tailored specifically for this research study. The resulting framework, termed the Rockfall Hazard Rating System for KKH (RHRSK), was then implemented across all 129 sections using a combination of remote sensing data and detailed on-site assessments. The study generated a comprehensive rockfall hazard map that highlights varying levels of risk along the entire stretch of the KKH. Furthermore, a predictive model was developed specifically for the section identified as posing the highest hazard within the study area. Additionally, localized risk maps were produced for ten critical sites along the highway. These maps informed the design and installation of safety barriers aimed at mitigating the impact of potential rockfalls on infrastructure and ensuring traveler safety.In conclusion, this study not only advances understanding of rockfall hazards along the KKH but also provides practical tools and strategies for infrastructure planning and risk management in mountainous regions susceptible to such natural phenomena.





POSTGRADUATE RESEARCH (M.Sc.)

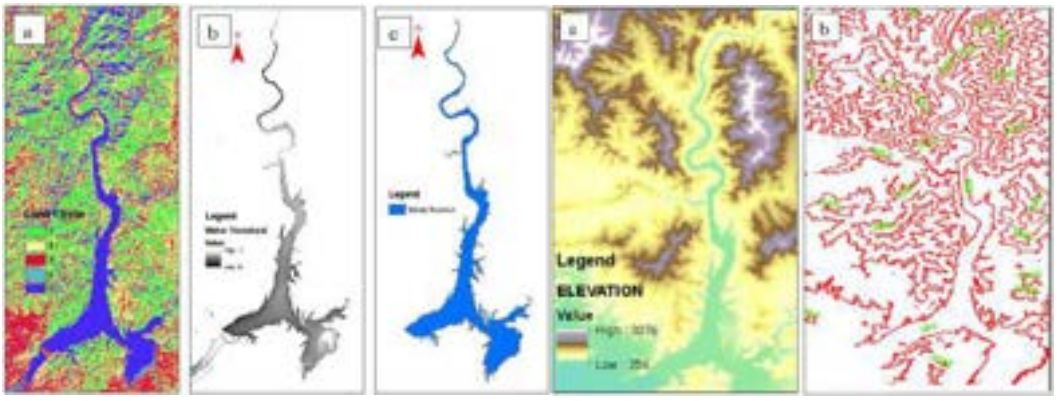
ASSESSMENT OF RESERVOIR SEDIMENTATION IN TARBELA RESERVOIR USING REMOTE SENSING TECHNIQUE

Supervisor: Prof. Dr. Habib-ur-Rehman

Engr. Muhammad Zeeshan
(Researcher)

Abstract

To determine the life of reservoir and assess the sedimentation rate in the reservoir, it is essential to periodically conduct hydrographic surveys and this technique is somehow accurate but tedious, costly and time consuming. Remote Sensing, through its spatial, spectral and temporal attributes can provide repetitive and timely information in regard to determine current storage capacity of a reservoir. In this study, remote sensing data such as SRTM DEM, Landsat mission satellite data was used to develop Elevation-Area-Capacity curves of Tarbela Reservoir for different temporal durations. The satellite data was acquired from freely available online source and processed using ArcGIS tool. From Landsat imageries, water spread area of Tarbela reservoir was extracted following NDWI (Normalized Difference Water Index) technique and volume by trapezoidal formula. The Elevation versus Area and Capacity data from DEM was generated using Spatial Analyst Supplemental tool in GIS. These developed EAC curves from remote sensing data was then validated with hydrographic survey data. The results depicted that capacity reduction rate during the period 1974-2020 estimated from Landsat imageries was 0.12 Bm^3/year and 0.09 Bm^3/year by SRTM DEM as compared to 0.10 Bm^3/year through Hydrographic survey conducted by WAPDA. Therefore, it is concluded that determination of EAC curves by DEM may be considered as more realistic remote sensing method as compared to satellite imageries in predicting the life of reservoir.



POSTGRADUATE RESEARCH (M.Sc.)

IMPACT OF RESERVOIR SEDIMENTATION ON HYDROLOGICAL DROUGHT: A CASE STUDY OF TARBELA RESERVOIR

Supervisor: Prof. Dr. Habib Ur Rehman

Engr. Faizan Ahmed Waris
(Researcher)

Abstract

In Pakistan, water regulation in irrigation canals relies on two major reservoirs: Tarbela and Mangala. By 2020, Tarbela had lost 43% of its gross storage capacity, while Mangla lost 11%, despite a dam raising in 2009. Sedimentation in these reservoirs threatens long-term water supply, exacerbating hydrological droughts. This study assesses Tarbela's sedimentation, live storage capacity reduction, and Delta Pivot point movement over 40 years (1981-2020). Using Indus River discharge data, hydrological drought severity is measured through Mean Annual Flow (MAF) deviation and Streamflow Drought Index (SDI). Results show Tarbela's cumulative 40-year sediment deposition at 5.29 Bm3, averaging 0.141 Bm3/year, with Live Storage Capacity Reduction Rate at 0.10 Bm3/year. The Delta Pivot point moved from 23.02 km to 6.44 km at an average Annual Advancement rate of 0.4 km/year, with elevation rising from 397.6m to 423.8 m at 0.62 m/year. Recent years saw an increase in drought months during low flow seasons, with more medium and high drought months due to reservoir sedimentation and storage loss. To mitigate drought risks, recommendations include constructing upstream reservoirs like Bhasha Reservoir and adopting more efficient irrigation systems. These findings guide water resource managers in formulating strategies for future drought risk management.

POSTGRADUATE RESEARCH (M.Sc.)

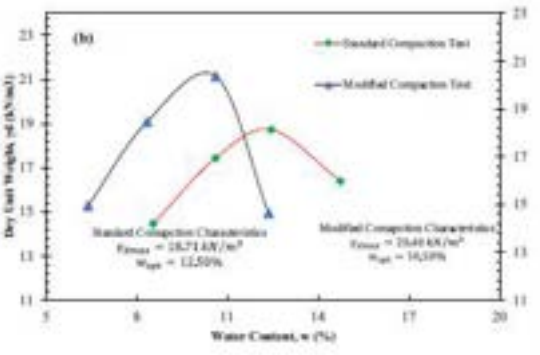
EFFECT OF DENSITY AND SURCHARGE PRESSURE ON COLLAPSE POTENTIAL OF LOESS SOIL TREATED WITH BAGASSE ASH

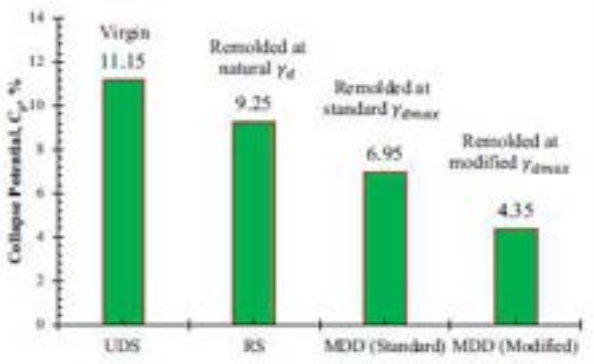
Supervisor: Prof. Dr. Khalid Farooq

Engr. Danial Safdar
(Researcher)

Abstract

Massive structures constructed on loess soil are prone to failure owing to sudden alterations in the soil-structure dynamics upon flooding. Utilizing industrial waste, such as bagasse ash (BA), offers a potential solution to address this issue. In the scope of this investigation, both undisturbed and disturbed soil samples were procured from the arid region of District Muzaffargarh in Punjab, Pakistan. BA was incorporated at a concentration of up to 8% to enhance the performance of the loess soil, with a curing period of 7 days. To determine the influence of BA, density variations, and surcharge pressure on collapsible potential, specimens were reconstituted at natural density, standard Proctor dry density, and modified Proctor dry density, in conjunction with corresponding natural and optimal water content. Exponential mitigation of collapse behavior in the treated soil is observed with an increase in density, surcharge pressure, and BA content. Additionally, to compare microstructural characteristics, analyses involving scanning electron microscope (SEM) was conducted on both untreated and treated samples. The incorporation of BS is reflected in SEM results, revealing the establishment of bonds (due to the formation of cementitious gel) among soil particles, attributed to hydration and pozzolanic reactions. SEM analyses also elucidate the transformation of the dispersed and silt-dominated structure of the native loess soil into a reticulated structure without of micro-pores, attributed to the incorporation of BA.





POSTGRADUATE RESEARCH (M.Sc.)

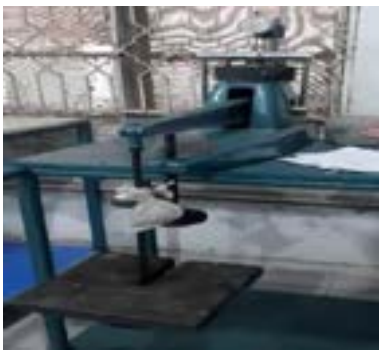
DEVELOPMENT OF CORRELATION BETWEEN SPT-N AND CONSOLIDATION PARAMETERS OF COHESIVE SOIL

Supervisor: Prof. Dr. Khalid Farooq

Engr. Fahad Khalid
(Researcher)

Abstract

Settlement is the most common problem in Geotechnical engineering. Settlement analysis can be carried out using the consolidation parameters i.e. Compression index (Cc). To determine the consolidation parameters there are two methods. First one is laboratory testing which requires a lot of time (one test requires 10 days to be completed) and money, which is added to the project's budget. Second method is using the developed correlations. The Standard Penetration Test is a well-known and most common field test for geotechnical investigation. Insitu state of soil can be predicted based on SPT-N blow count. For completion of research work soil samples were taken from UET Narowal campus. After the sample collection laboratory tests were performed on virgin soil including sieve analysis, hydrometer analysis, specific gravity test, modified proctor test, unconfined compression test. All tests were performed according to ASTM standards. Compression test was performed in unsaturated condition. From this test results developed the correlation between coefficient of volume compressibility, deformation modulus and SPT-N value. These results were utilized in settlement analysis in unsaturated condition. Consolidation test was performed in saturated condition and developed the correlation between SPT-N and consolidation parameters. However, no direct relation is present between compression index (Cc) and SPT-N value because SPT-N depend upon the initial conditions. So, multiple variable regression analysis was need to be done and developed the correlation between compression index (Cc) and SPT-N, initial void ratio (e_o) and natural moisture content. After developed the correlation compared the results with other researcher's data and check the validation of results.



POSTGRADUATE RESEARCH (M.Sc.)

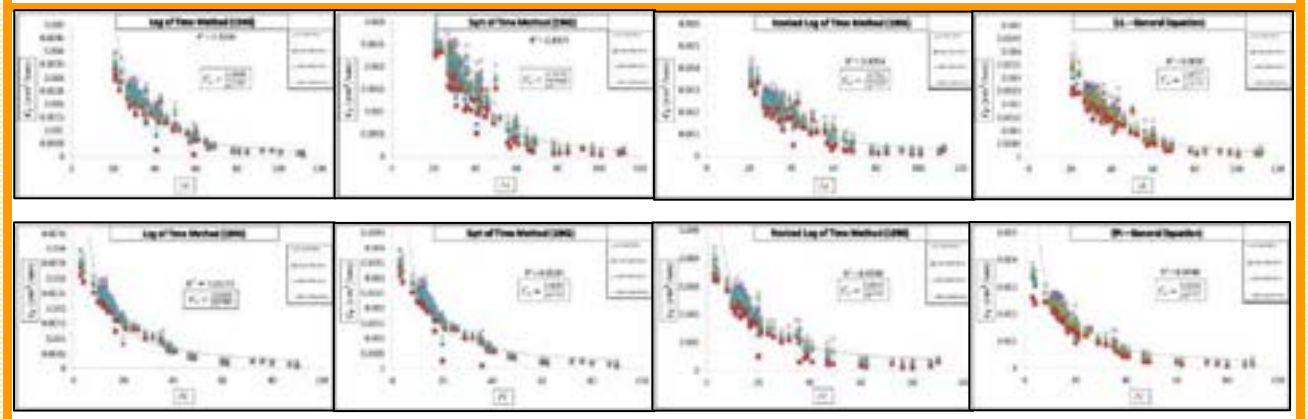
CORRELATION BETWEEN COEFFICIENT OF CONSOLIDATION AND INDEX PROPERTIES OF COHESIVE SOILS

Supervisor: Prof. Dr. Khalid Farooq

Engr. Mehwish Shakoor
(Researcher)

Abstract

This research aims at development of correlations between Coefficient of Consolidation (C_V) and index properties (LL & PI) of low to high plastic cohesive soils and validation of developed correlations through experimental values of Coefficient of Consolidation (C_V) of undisturbed soil samples recovered from the field. For accomplishment of objective, entire research work was distributed in two phases including data analysis and development of correlations and experimental work for validation of developed correlations. For data analysis and development of correlations purpose, one dimensional consolidation test data of 82 x soil samples displaying wide range of plasticity index (3-90) & liquid limit (21-112)% was collected from previous researchers and coefficient of Consolidation (C_V) was determined for samples using Sqrt of Time Method (1942), Log of Time Method (1940) and Revised Log of Time Method (1996). In this study, 4 x correlations are developed for liquid limit (3 x method of analysis based and 1 x independent of method of analysis/ using average C_V values by all methods) and 4 x correlations for plasticity index (3 x method of analysis based and 1 x independent of method of analysis/ using average C_V values by all methods). For validation of correlations, 25 x un disturbed soil samples were recovered from Lahore, Okara and Multan with a Liquid Limit (LL) range of 23-55% and Plasticity Index (PI) range of 7-26. All the samples were tested for sieve and hydrometer analysis, Atterberg's limits, specific gravity and one-dimensional consolidation tests. The experimental validation of developed correlations displayed better coordination for general correlations both for LL and PI with least percentage deviation from 18.9 – 22 %.



POSTGRADUATE RESEARCH (M.Sc.)

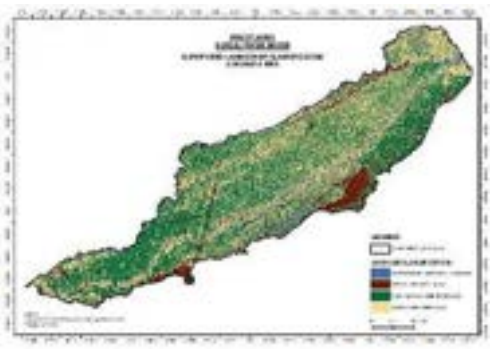
IMPACTS OF HYDROLOGICAL REGIME CHANGE ON SUTLEJ RIVER

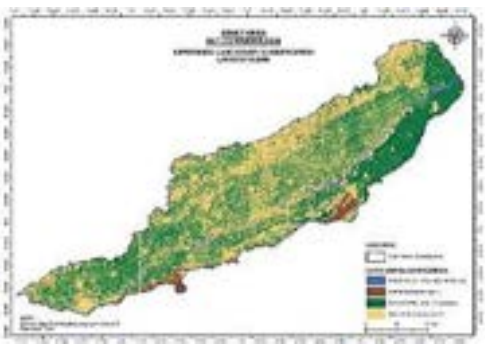
Supervisor: Prof. Dr. Noor Muhammad Khan

Engr. Sania Khalid
(Researcher)

Abstract

The impact of Hydrological Regime Changes on the Sutlej River after the construction of Dams on Sutlej River i.e., Bhakra Dam, in India in 1963 has been assessed in this study. The construction of Bhakra Dam in India which have reservoir capacity of 9.34 BCM is one of the major reasons for change of river regime in Pakistan. Low flows are being released by India which causes water scarcity in riparian districts along Sutlej River in Pakistan. To assess the change in regime of Sutlej River, the flow and flood data have been evaluated in terms of the mean daily, mean monthly, and mean annual flow discharges at Suleimanki and Islam Barrage. The flow regime change of 36 years has been assessed by analyzing the flow data from 1986 – 2022 and flood data of 97 years from 1925 to 2022, by dividing the time periods in multiple time spans. Similarly, the changes in stream width, its sinuosity, and land use have been analyzed by comparing the Satellite images of 1995 and 2022. After analyzing data, it has been found that the Sutlej River flows in Pakistan have been reduced from 431.0 cumecs in1986-1995 period to 340.5 cumecs in 2009-2022 period. A total of 21.1% (1.12 BCM per year) flow reduction has been observed. Flow reduction has resulted in increase of river sinuosity from 1.37 in 1995 to 1.41 in 2019. Flood analysis with hundred-year return period shows that the high flows in river are reduced from 13,900 cumecs to 10,066 cumecs in period 1925-63 & 1964-2022 respectively. Land-use pattern have also changed with reduction of water bodies (3%), barren land (6%), agriculture land (3%), while built-up area is increased by 12%, over the period of 1995-2019. This study can be utilized to plan a revival of River Sutlej and its ecology and similar studies on other rivers like Ravi, and Chenab may also be done to analyze their status.





POSTGRADUATE RESEARCH (M.Sc.)

ALKALI-SILICA POTENTIAL IN FLY-ASH BASED GEOPOLYMER CONCRETE

Supervisor: Prof. Dr. Asif Hameed

Engr. Sikandar Hayat
(Researcher)

Abstract

Alkali-Silica Reaction (ASR) is a deleterious chemical reaction in which the reactants are hydroxyl ions (OH-) present in pore solution within the concrete matrix and reactive silica of the aggregates used in concrete. ASR is detrimental in nature and could cause damage to concrete structures in terms of cracking, volume instability and loss of strength, and even potential failure of structures. This research is intended to investigate ASR potential in geo polymer concrete using locally available aggregates from different sources. ASTM class F Fly Ash was used as a binder and Sodium hydroxide and Sodium Silicate Solution was used as an alkaline activator to prepare different specimens. ASTM C 1260 was used as a test methodology to explore ASR potential in aggregates by measuring the variation in the length of expansion bars up to 150 days. Cubes and prisms were cast to find variations in compressive and flexural strength respectively. For comparison, OPC samples were also prepared. The experimental results showed that expansion in GPC bars was less than ASTM C 1260 standard limits and was less than 0.025% at 28 days as compared to OPC samples that showed ASR expansion greater than 0.2% at 28 days and crossed ASTM C 1260 standard limits. In terms of compressive and flexural strength, the GPC samples showed an increase from 15% to 25% in compressive and 5% to 15% in flexure strength respectively under harsh conditions. While on the other hand, OPC samples have shown a decrease of up to 6% in compressive and 5% in flexure strength respectively under harsh conditions. Results showed that geopolymer concrete has better and excellent resistance to ASR and has more durability, and can survive a long life span as compared to OPC.

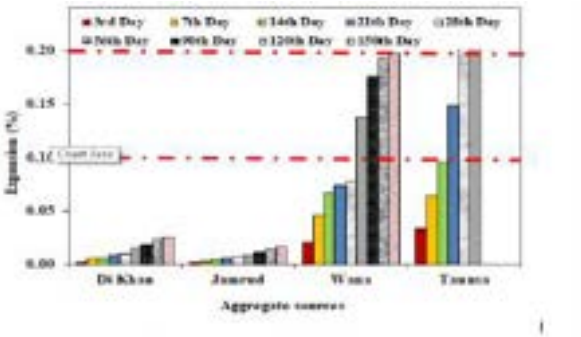


Figure 3.2 Average Accelerated Mortar Bar Expansion in ASR Conditions of OPC

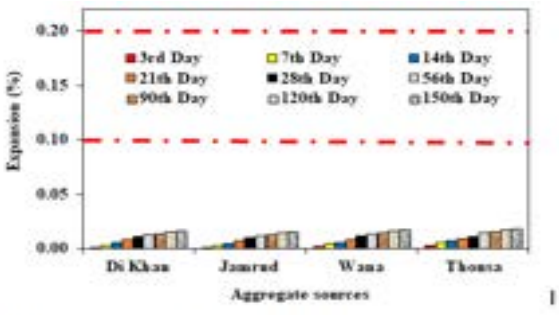


Figure 3.1 Average Accelerated Mortar Bar Expansion in ASR Conditions of GPC

POSTGRADUATE RESEARCH (M.Sc.)

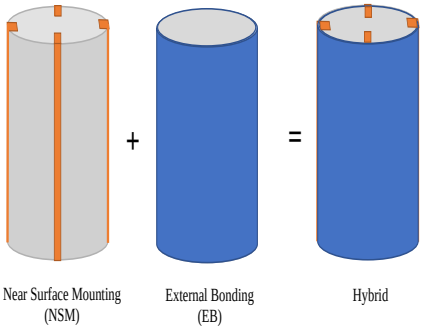
BEHAVIOR OF FRP STRENGTHENED RC CIRCULAR COLUMNS WITH NEAR SURFACE MOUNTING AND EXTERNAL BONDING TECHNIQUES

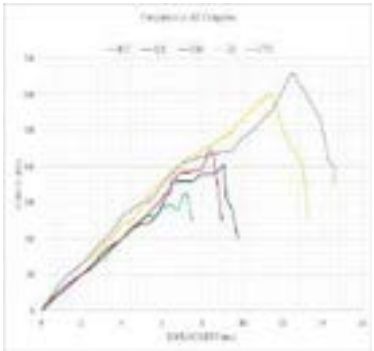
Supervisor: Prof. Dr. Asif Hameed

Engr. Arslan Baig
(Researcher)

Abstract

Columns may require strengthening due to numerous reasons like adding another story to a preexisting building, repair of damaged columns, addressing the oversights in the design, change in usage of a building, corroding of steel reinforcement etc. Traditionally the cross-sectional enlargement and steel jacketing procedures used to cater these requirements, but these methods came with many limitations. FRP (Fiber Reinforced Polymer) strengthening methods have been known to circumvent many of the drawbacks presented by the traditional methods. An experimental study was conducted for this purpose wherein, RC circular columns were cast and were strengthened using three techniques: the Near Surface Mounting (NSM) technique with GFRP bars inserted into the longitudinal grooves, the External Bonding (EB) technique with CFRP fabric wrapping along the circumference of the sections and finally the Hybrid Strengthening Technique in which the columns were first strengthened with the NSM technique followed by the CFRP wrapping on top of it. It is concluded that all three strengthening techniques yielded encouraging results with the hybrid strengthening technique resulting in the highest increase in the load carrying capacity of the section as well as most improvement in the ductility. Furthermore, the steel was found to be lesser stressed in those sections where the NSM bars were also present. The NSM bars allured some portion of the stress which would've otherwise been borne entirely by the steel bars in their absence.





POSTGRADUATE RESEARCH (M.Sc.)

EXPERIMENTAL INVESTIGATION OF THE PROPERTIES OF FLYASH-LIME-GYPSUM BRICKS

Supervisor: Prof. Dr. Asif Hameed

Engr. Muhammad Sultan
(Researcher)

Abstract

The production of burnt clay bricks utilizes top fertile layer of soil and firing of bricks in brick kilns significantly contribute in smoke production. Flyash (FA), a byproduct from coal power plants poses a serious health risk, necessitating its safe disposal management. FA can be utilized in brick manufacturing to conserve top fertile soil, reduce carbon dioxide (CO2) emissions and a safe disposal of FA. Generally, lime and gypsum are used in bricks to economize the brick manufacturing process. This research work investigates varying FA and lime contents, and casting pressures to produce Flyash-Lime-Gypsum (FaL-G) bricks. The experimental work was carried out in two phases. In the first phase, 100 mm sized cubes with varying FA to sand ratios (0.30:0.70, 0.35:0.65 and 0.40:0.60), casting pressures (0 MPa, 5MPa and 10 MPa) with 12.5% lime and 2% gypsum contents were cast and tested. The FA to sand ratio of 0.35:0.65 and 10 MPa casting pressure exhibited the optimum compressive strength of 13.9 MPa. In the second phase, FaL-G bricks with varying lime contents (10%, 12.5%, 15%, 17.5% and 20%), and casting pressures (0 MPa, 5 MPa, 10 MPa, 15 MPa and 20 MPa) using FA: Sand ratio (0.35:0.65) and 2% gypsum content were cast and tested. The compressive strengths of FaL-G bricks increased with increasing lime content and casting pressures. FaL-G bricks exhibited higher compressive strength, lower initial rate of absorption and water absorption than clay bricks. FaL-G bricks exhibited reduced efflorescence, greater resistance to acid attack and improved dimensional stability. FaL-G bricks are environmentally friendly and cost effective compared to clay bricks.

POSTGRADUATE RESEARCH (M.Sc.)

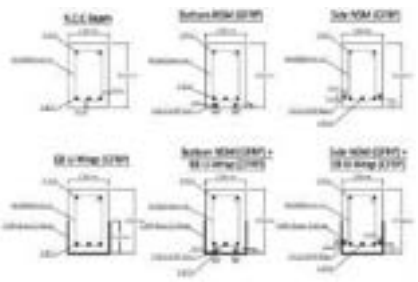
FLEXURAL STRENGTHENING OF RC BEAMS USING NEAR SURFACE MOUNTED AND EXTERNALLY BONDED FRP TECHNIQUES

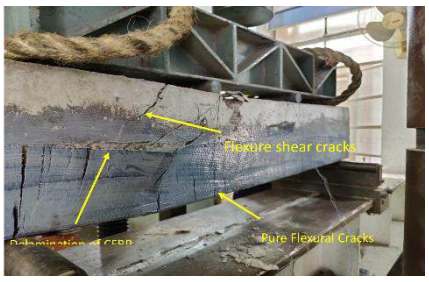
Supervisor: Prof. Dr. Asif Hameed

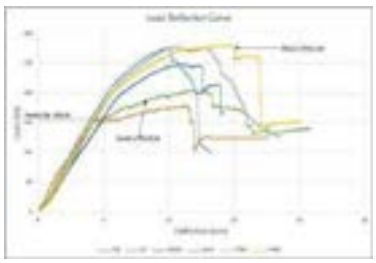
Engr. Shaharyar Khan
(Researcher)

Abstract

Our research endeavors culminate in a comprehensive examination of the flexural strengthening of Reinforced Concrete Beams through the utilization of near surface mounted and externally bonded techniques, employing fiber-reinforced polymers (FRPs). Specifically, our study delves into the application of glass-fiber reinforced polymers (GFRPs) and carbon-fiber reinforced polymers (CFRPs) in enhancing the load-bearing capacity of beams subjected to flexural loads. Our primary objective is to investigate the structural behavior following the retrofitting of these beams with FRPs. Within this investigation, various strengthening applications are explored, including Near Surface Mounted (NSM), Side Near Surface Mounted (SNSM) FRP, and External Bonded (EB) sheets. Additionally, we employ hybrid techniques to discern the impact on the debonding failure mode of GFRP bars, as well as the resultant increase in the load-carrying capacity of beams when compared to control specimens. Among all the beam specimens the control beam & externally bonded specimen failed showing pure flexural cracks at mid span while the failure pattern of NSM, SNSM, Hybrid-I & II beams resulted in flexural shear cracks originating from near the supports along with debonding at ultimate stage. The hybrid strengthening samples exhibited the best results out of all other techniques in terms of both strength & ductility. This research represents a significant contribution to the understanding of flexural strengthening methods in reinforced concrete structures, with the potential to advance the field's knowledge and practical applications.







POSTGRADUATE RESEARCH (M.Sc.)

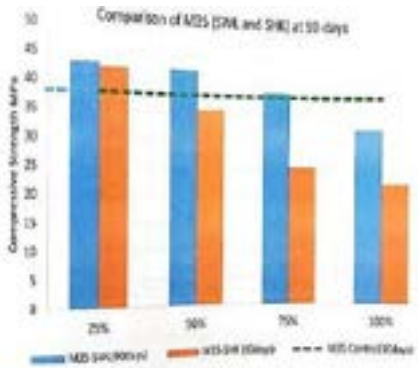
PERFORMANCE OF COAL BOTTOM ASH AS A FINE AGGREGATE IN CONCRETE

Supervisor: Prof. Dr. M. Burhan Sharif

Engr. Somia Mubarak
(Researcher)

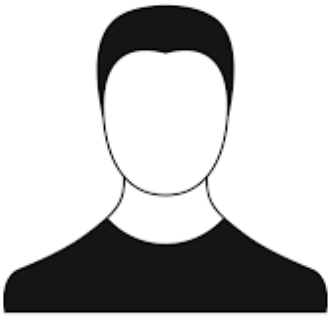
Abstract

This study explores the feasibility of using CBA sourced from Sahiwal Coal Power and Nimir Chemicals Sheikhupura as fine aggregate substitutes. Various tests—compressive strength, flexural strength, split tensile strength, water absorption, and water sorptivity—were conducted to evaluate optimal CBA quantities in concrete mixes targeting slumps of 2-4 inches. Twenty mixes were prepared for each CBA type, replacing fine aggregates at 0%, 25%, 50%, 75%, and 100% levels for M25 (3000 psi) and M35 (4000 psi) design mixes. Testing occurred over 7, 28, and 90-day curing periods. Results indicated that increasing CBA content raised water demand to maintain target slump. Initial 7-day tests showed lower compressive, split, and flexural strengths in CBA mixes compared to controls, attributed to reactive silica presence in CBA. By 28 and 90 days, Sahiwal ash achieved comparable compressive, flexural, and split strengths to controls up to 50% replacement in both M25 and M35 mixes. Conversely, Sheikhupura Ash only matched control compressive strength at 25% CBA content after 90 days. Both ashes exhibited increased water absorption and sorptivity with higher CBA content due to its hygroscopic nature, though absorption decreased with longer curing periods. These findings underscore CBA's potential as a sustainable alternative in concrete, mitigating environmental impact while conserving natural resources. Future studies could focus on optimizing CBA's performance in specific concrete applications and refining production techniques to maximize its beneficial use in construction.



POSTGRADUATE RESEARCH (M.Sc.)

EFFECT OF RECYCLED AGGREGATE CONCRETE ON THE PROPERTIES OF RECYCLED AGGREGATE BRICKS



Supervisor: Prof. Dr. M. Burhan Sharif

Engr. Waheed Ullah Khan
(Researcher)

Abstract

This study examined the effects of RA content in RAC bricks manufactured from different partial replacements i.e., 20%, 30%, 40%, 50%, 60% and 100% of 3000-4000 psi recycled aggregates obtained from concrete lab through crushing. Natural Aggregates Concrete (NAC) bricks were also cast to compare results with RAC bricks. Different tests i.e., compressive strength, flexural strength, impact strength (flexural and disc test), water absorption, rebound hammer and effect of aggressive environment were performed on the RAC and NAC bricks. It was found that RAC bricks met the necessary strength requirement as established by national and international standards. The compressive strength and flexural strength of all the partial replacements of BRAC at 7 and 28 days were higher that first class bricks (13.8 MPa) and (1.9 MPa) respectively but lesser than the NAC bricks. Impact strength of RAC bricks were also reduced when compared with the NAC bricks. Water absorption of all partial replacements of RAC bricks were higher than NAC bricks but less than the maximum limit of first-class bricks (20%). Rebound hammer also had no effect on the partial replacements of RAC bricks but also 28 days strength of RAC bricks was lower than NAC bricks. Compression result of dumped bricks of both NAC bricks and RAC bricks aggressive environment were also showing negative effect after 90 days but within acceptable limit of first-class bricks.

POSTGRADUATE RESEARCH (M.Sc.)

EXPERIMENTAL STUDY ON THE MECHANICAL AND DURABILITY PROPERTIES OF RECYCLED AGGREGATE CONCRETE BRICKS

Supervisor: Prof. Dr. Rashid Hameed

Engr. Muhammad Ahmad
(Researcher)

Abstract

Construction industry is growing rapidly in Pakistan and in many other developing countries all over the world. During the process of reconstruction and new construction, a large amount of construction and demolition (C&D) waste is generated which is creating problems related to C&D waste disposal. Scarcity of natural resources and huge energy consumption are the severe challenges that directly impact environmental pollution. In the construction sector, recycling C&D waste is the most feasible and promising option that can reduce the adverse environmental effects of rapidly growing construction industry. In this research investigation, standard size recycled aggregate concrete (RAC) bricks having minimum compressive strength of 15MPa have been manufactured through compression casting technique (CCT) by using 100% recycled aggregate concrete. Based upon experimental results of this research study, it has been concluded that manufacturing of concrete masonry units by CCT has shown positive impact on mechanical and durability properties of RAC bricks. Among the different mixes studied in this research, a maximum improvement of 5.5%, 17%, 36.95%, 20.25% and 16.27% in density, compressive strength, modulus of rupture, shear strength and water absorption, respectively was observed by changing the pressure from 25 MPa to 35 MPa for the bricks. Similarly, water absorption of RAC-70C30F bricks was 52% less than RAC-60C40F bricks.

Compressive strength

Flexural strength

Flexural impact

Shear strength

Drying shrinkage

POSTGRADUATE RESEARCH (M.Sc.)

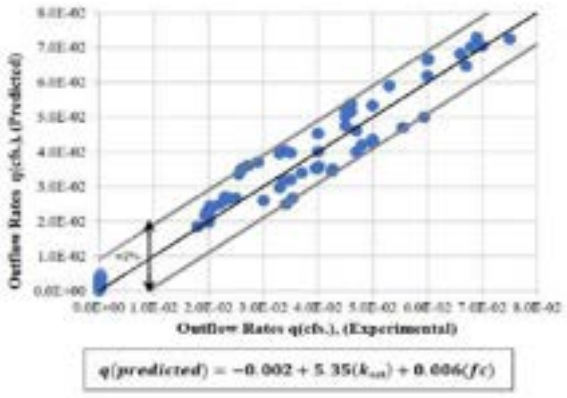
EXPERIMENTAL EVALUATION OF THE INFILTRATION CAPACITY OF URBAN SOILS USING A LAB-SCALE MODEL

Supervisor: Prof. Dr. Hassan Mujtaba Shahzad

Engr. M. Ahmed Nadeem
(Researcher)

Abstract

Due to existing developments in urbanized environment the in-situ infiltration capacity of urban soils has decreased. As result of these developments over-compaction takes place which renders the soil structure to behave closer to a brick rather than a sponge to absorb water. To mitigate this issue, one commonly employed low impact development (LID) technique is the use of Drywell, which is a gravity fed cylinder that captures and infiltrates stormwater into the subsurface. Correlations are available in literature that predict the Drywell outflow rates prior to installation. However, these methods are not site specific and are based solely on the soil properties. This present research addresses this issue and evaluates the infiltration capacity of urban soils in Lahore including ML (Sandy Silt), CL (Lean Clay) and SP (Poorly Graded Sand: Fine, Fine-Medium and Coarse) at varied initial moisture content (0, 10, 20, 30, 40 and 50%) and unit weight (17.66 KN/m³,19.62 KN/m³, $(\gamma_d)_{max}$ and $(\gamma_d)_{min}$) using a lab-scale drywell physical model. A correlation was developed between outflow rate of Drywell (q) and (hydraulic conductivity, infiltration capacity) of soil. The developed correlation had a prediction accuracy of ±2% and has R^2 of 0.94 with ranges of (k_{sat} = 1.50E-06-6.75E-03 cm/s) and (f_c = 0.2-6.8 in/hr.).



POSTGRADUATE RESEARCH (M.Sc.)

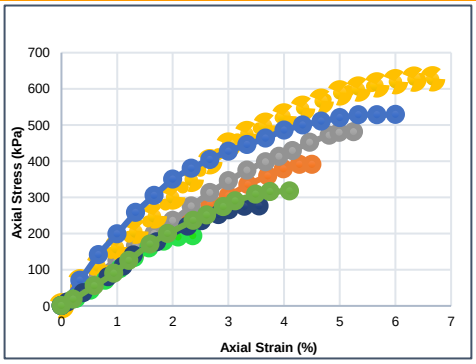
SUSTAINABLE USE OF FLY ASH AND USED FACE MASKS FOR THE IMPROVEMENT OF ENGINEERING CHARACTERISTICS OF FAT CLAYS

Supervisor: Prof. Dr. Hassan Mujtaba Shahzad

Engr. Saira Zulfiqar
(Researcher)

Abstract

In Pakistan, highly problematic expansive soils are common in areas such as Nandipur, Dera Ghazi Khan, Sialkot, Bannu, Khairpur, and Dera Ismail Khan, etc. It is recommended to treat such soils with certain chemical or mechanical stabilizers to enhance their properties for better response and reliability. Various methods have been employed to enhance the engineering characteristics of expansive soils, by treating them in situ. Stabilization by using chemical additives is a common and economical phenomenon comparatively, for shallow stabilization. Expensive additives include cement, lime, and marble while economical and eco-friendly alternatives to these additives are fly ash, rice husk ash, bagasse ash, silica fumes, etc. All these economical alternatives are waste ashes that are non-recyclable, which are of use to the world and their discharge is becoming serious threat to the environment. Cement and lime treated soils get excellent strength and reduce the plasticity by binding the particles together. However, they are expensive treatment techniques. A suitable substitute is Fly Ash that gives approximately equal strength and binding approach to expansive soils. But fly ash causes brittle failure, which means failure will occur without any ultimatum or visible signs straight away. Therefore, to cater this issue, polypropylene shredded face masks have been selected as fiber reinforcement, which not only improves strength but also improves the ductility and deformability of soil. The current study proposes optimum dosage of fat clays blended with Fly Ash and used Shredded Face Mask (PPE) Fibers to be used as construction material by conducting extensive geotechnical testing, along with the suitable disinfection strategies for used PPE face masks.



Optimum Mix:
20% Fly Ash + 0.9% Face Masks
Improved Parameters:

- MDD = 16.86 kN/m3
- OMC = 12.8%
- UCS = 627 kPa
- CBR = 14 %
- % Swell = 1.8%
- Cc = 0.22
- Cohesion = 140 kPa
- Angle of Internal Friction = 38°

POSTGRADUATE RESEARCH (M.Sc.)

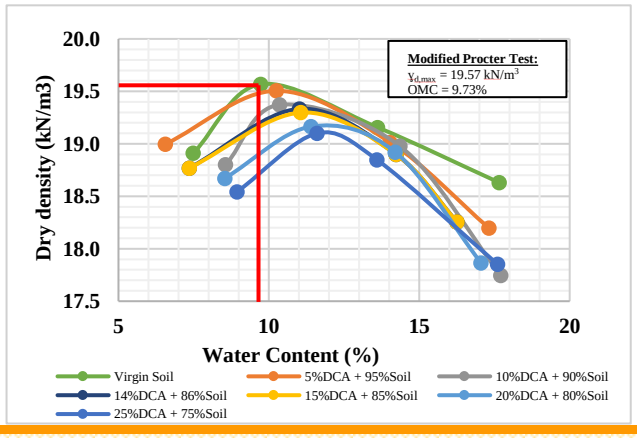
EXPERIMENTAL EVALUATION OF GEOTECHNICAL CHARACTERISTICS OF SIALKOT CLAY TREATED WITH DUMPED COAL ASH

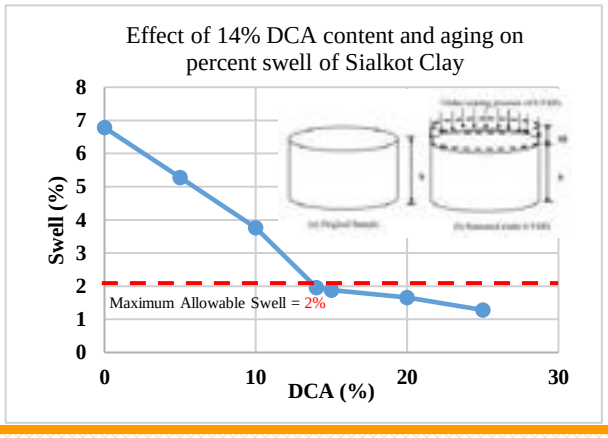
Supervisor: Prof. Dr. Hassan Mujtaba Shahzad

Engr. Hadia Ali
(Researcher)

Abstract

The Sialkot region of Pakistan faces a significant challenge stemming from the presence of problematic clay in the ground. These clays tend to expand and contract with moisture variations, posing stability and performance issues in construction projects. Traditional soil stabilization methods, such as soil replacement and expensive binders, are often economically unfeasible and environmentally unsustainable in this context. This research investigates the potential use of dumped coal ash, an industrial waste from coal power plants, as an economical and eco-friendly soil stabilizer. The study aims to bridge existing knowledge gaps through comprehensive experimental evaluations of dumped coal ash's effectiveness in stabilizing Sialkot clay. The problematic clay in Sialkot causes instability and performance issues in construction projects due to its tendency to expand and contract with changes in moisture. Traditional stabilization methods are economically unfeasible and environmentally unsustainable. The experimental approach involves collecting representative Sialkot clay and dumped coal ash samples. In a two-phase testing regimen, laboratory tests are conducted on both materials separately, followed by assessing the geotechnical properties of the treated soil with varying percentages of dumped coal ash. The study reveals promising findings, with a significant decrease in the plasticity index, 2.8 times increase in unconfined strength at 14% dumped coal ash content after 28 days, and an optimum increase in California Bearing Ratio (CBR) at the addition of 14% dumped coal ash. Consolidation characteristics are improved, and the percentage swell of Sialkot clay is reduced to less than 1%. Aligned with Sustainable Development Goals (SDGs) such as SDG-9 (industry, innovation, and infrastructure), SDG-11 (sustainable cities and communities), and SDG 13 (climate action) this research promotes sustainable soil stabilization practices in the region. By addressing challenges in construction practices and contributing to safe waste disposal, the study offers a potential solution to the increasing amount of dumped coal ash.





POSTGRADUATE RESEARCH (M.Sc.)

DEVELOPMENT OF CORRELATION BETWEEN SPT-N AND UNDRAINED SHEAR STRENGTH OF COHESIVE SOIL IN PAKISTAN

Supervisor: Prof. Dr. Hassan Mujtaba Shahzad

Engr. Shafiq Ur Rehman
(Researcher)

Abstract

Standard Penetration Test is known to be ancient and most popular test used in geotechnical applications for soil exploration and foundation design. Undrained shear strength (S_u) is a crucial factor for determining the bearing capacity of soil. During project feasibility stage, empirical correlations are preferred for estimating the geotechnical design parameters due to time constraints. Undrained shear strength of soil can be found by establishing empirical correlations between S_u and SPT-N. Undrained shear strength (S_u) can also be found by Field Vane Shear test, however this test is suitable for soils of low shear strength. Other method is laboratory testing (Unconfined Compression Strength test, Triaxial test etc.) on undisturbed soil samples (UDS). For completion of research work, comprehensive field and laboratory tests were performed. The soil samples (SPT and UDS) were obtained from University of Engineering & Technology, Lahore (Narowal campus). After the sample collection, laboratory tests were performed (sieve analysis, hydrometer analysis, Atterberg limits test, unconfined compression test and consolidation test) according to ASTM standards. Unconfined compression test was carried out on UDS along with remoulded samples. Consolidation test was carried out in saturated condition on undisturbed soil samples. From the test results, correlation was developed between the undrained shear strength of UDS and that of remoulded samples. Another relationship between secant modulus (E_{50}) and undrained shear strength (S_u) was established. Consolidation test results were utilized in settlement analysis. Linear regression analysis was carried out to establish the relationship between SPT-N and undrained shear strength (S_u). After development of correlation, results were compared with other researches and validity of results was checked. It was observed that SPT is adequate for reliable evaluation of S_u.

POSTGRADUATE RESEARCH (M.Sc.)

EXPERIMENTAL INVESTIGATION ON FLY ASH BASED GEOPOLYMER CLAY BRICKS: AN ALTERNATIVE SUSTAINABLE SOLUTION

Supervisor: Dr. Qasim Shaukat Khan

Engr. M. Hassan Javed
(Researcher)

Abstract

Burnt clay bricks, a traditional construction material used since ancient times, are produced worldwide at a rate exceeding 1.3 trillion units annually. This production is driven by increasing urbanization, with Pakistan ranking third globally. However, the process emits approximately 14,000 tons of CO2 yearly from its 18,000 brick kilns, contributing to severe environmental and health concerns. To mitigate these issues, this study focuses on developing environmentally friendly unburnt geopolymer clay bricks, replacing clay with fly ash (FA). This by-product of coal burning in power plants not only conserves natural resources but also offers an efficient disposal method for FA. The study involved pilot testing with various clay (CL) to FA ratios and concentrations of alkali activator (AA), followed by main testing. Optimal compressive strengths were observed with mixes such as 30% CL-70% FA with 12M AA, 20% CL-80% FA with 14M AA, and 20% CL-80% FA with 16M AA, selected for further testing. The geopolymer bricks showed superior mechanical and durability properties compared to conventional burnt clay bricks, including 66.7% higher compressive strength, 58.7% higher modulus of rupture, and 38.3% reduced water absorption. They exhibited minimal efflorescence and were resilient to acidic and salt solutions, as confirmed by SEM analysis demonstrating a dense microstructure.

POSTGRADUATE RESEARCH (M.Sc.)

EFFECT OF ALKALINE ACTIVATORS AND CURING REGIMES ON THE PROPERTIES OF FLY ASH BASED GEOPOLYMER CONCRETE

Supervisor: Dr. Qasim Shaukat Khan

Engr. Talha Mumtaz
(Researcher)

Abstract

Ordinary Portland Cement (OPC) is globally ubiquitous, second only to water as a construction material. However, its widespread use significantly contributes to carbon dioxide (CO2) emissions, exacerbating global warming. Consequently, there is an urgent need for eco-friendly alternatives to traditional OPC concrete. This study focuses on geopolymer concrete (GPC), replacing conventional precursors entirely with supplementary cementitious materials like fly ash sourced from the Port Qasim Coal Power Plant in Karachi, Pakistan. The research evaluates GPC's performance under ambient and heat curing conditions, analyzing how varying sodium hydroxide (NaOH) molarity, sodium silicate to sodium hydroxide (Na2SiO3/NaOH) ratios, and alkaline activator to fly ash (AA/FA) ratios affect its mechanical properties. Twenty-four GPC mixes were tested, adjusting NaOH molarity from 10 M to 16 M, Na2SiO3/NaOH ratios from 1.5 to 2.5, and AA/FA ratios from 0.5 to 0.6. Each mix included six cylinders and prisms for comprehensive testing under different curing methods. Key findings highlight substantial improvements in compressive and flexural strengths with specific NaOH and Na2SiO3/NaOH ratios. For example, compressive strengths increased by 81% and 37% for ambient and heat-cured GPC as NaOH molarity rose from 10 M to 14 M, respectively. Flexural strengths also saw enhancements under similar conditions. SEM analysis confirmed a homogeneous microstructure due to the formation of sodium aluminosilicate hydrate (N-A-S-H) gel, crucial for GPC's durability.

POSTGRADUATE RESEARCH (M.Sc.)

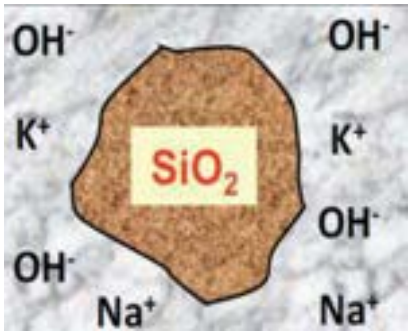
EXPERIMENTAL INVESTIGATION OF ALKALI SILICA REACTIVITY OF AGGREGATES AVAILABLE IN AZAD KASHMIR

Supervisor: Dr. Ali Ahmed

Engr. Waqar Mahmood
(Researcher)

Abstract

Alkali silica reactivity (ASR) is a significant issue affecting concrete durability worldwide, with concerns about the reactivity potential of local aggregates in Azad Kashmir. This research investigates the ASR potential of normal strength concrete using local aggregates, addressing the limited documented literature on this subject. Aggregate samples were collected from six locations: Maghlora District Bhimber, Channi District Bhimber, Panjeri District Bhimber, Jhelum I District Mirpur, Jhelum II District Mirpur, and Yadgar Batmang Muzaffarabad. The ASR potential was evaluated by preparing mortar bars with these aggregates and examining their expansion per ASTM C227 and ASTM C1260 standards. Chemical analysis revealed most samples had over 90% silica, except Yadgar Batmang with 36.4% silica. Calcium oxide content varied, with Yadgar Batmang at 35.40% and Panjeri at 1.80%. High silica content necessitated ASR testing. Results showed no ASR expansion exceeding ASTM C1260 limits: expansions observed were 0.062% for Channi, 0.067% for Panjeri, 0.055% for Jhelum I, and 0.047% for Jhelum II at 28 days. Minimal expansion was observed under ASTM C227 in the early stages (up to 90 days). Despite expansions being within acceptable limits, a reduction in compressive and flexural strength was noted under ASR conditions, indicating potential long-term ASR-related deterioration.



POSTGRADUATE RESEARCH (M.Sc.)

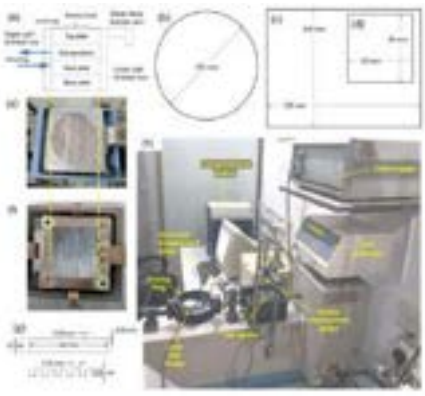
PHYSICAL MODELLING AND LABORATORY EVALUATION OF INTERFACE SHEAR CHARACTERISTICS BETWEEN SOIL AND STEEL SURFACE GEOMETRY

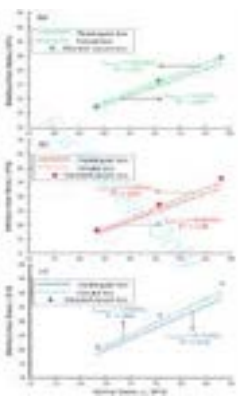
Supervisor: Dr. Jahanzaib Israr

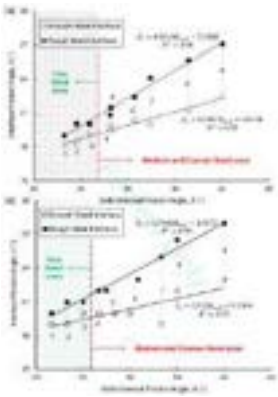
Engr. Iftikhar Ahmad
(Researcher)

Abstract

In this study, results have been reported from a series of laboratory tests to determine the interface friction angle of steel surfaces with sand through modified direct shear testing. For completion, steel surfaces with different surface geometry to replicate the roughness have been slid against various sands compacted at different relative densities under both dry and wet conditions. The standard square shape direct shear box has been modified into circular and rectangular boxes to sufficiently enhance the contact area and to subsequently quantify its effect on interface friction angle. Mild steel interface of smooth and rough texture with a groove depth of 0.2 mm and tipping at an angle of 90° has been used in this study. The analysis of results revealed that the interface friction angles obtained from standard direct shear box agree closely with those obtained from both modified rectangular and circular shear boxes. However, the ratio of interface friction angle from modified apparatus and soil's angle of internal friction significantly depends upon the roughness of the surface in contact with the sand, its median particle size, and is independent of the effects of box size, soil's relative density and dry or wet condition. A comparison between existing well-accepted guidelines and current observations has been presented for use by the practicing engineers dealing with soil-structure interaction.







POSTGRADUATE RESEARCH (M.Sc.)

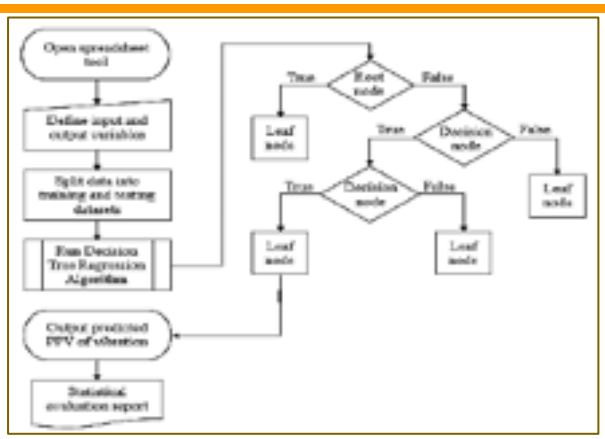
ARTIFICIAL INTELLIGENCE-BASED MODEL FOR PREDICTION OF TRAFFIC-INDUCED VIBRATIONS

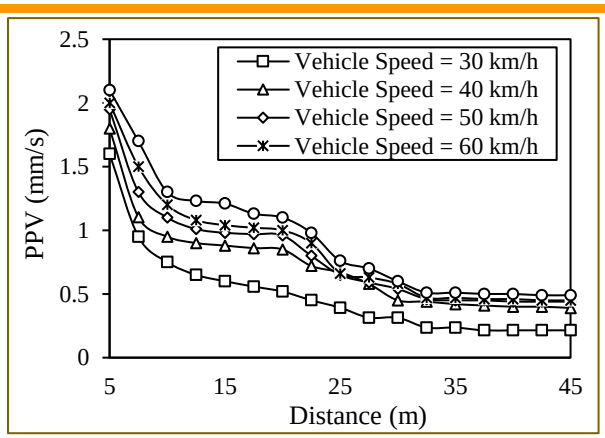
Supervisor: Dr. Rizwan Azam

Engr. M. Faraz Javaid
(Researcher)

Abstract

In this work, a simple method is created using the well-known MS Excel to create a prediction model for the vibrations caused by traffic. Additionally, a parametric analysis is carried out to comprehend how traffic-induced vibrations behave in relation to each input variable. In this study, the prediction method is the Decision Tree Regression Algorithm found in the MS Excel Prediction Laboratory. The study acquired two datasets, the first of which used the vehicle mass, the type of speed bump, and the height of the speed bump as input variables, and the second of which used the vehicle speed and the distance from the vibratory source as input variables to forecast the peak particle velocity of traffic-induced vibrations. Training and testing datasets were created for each dataset. The effectiveness of the created prediction model has been verified using the published measured datasets 1 and 2 while taking the same input factors into consideration. For the training and testing datasets of 1 and 2, the developed Decision Tree Regression Algorithm-based prediction model is assessed to have Coefficient of Determination values of 0.96, 0.97, 0.90, and 0.95, respectively. The proposed prediction methodology is shown by the parametric research to be beneficial for analyzing the effects of various input factors. If the vibrations exceed the limits recommended by the applicable standard, the trends derived through parametric investigation will be helpful for the design engineers in proposing efficient corrective measures during the design phase. The same methodology as provided in this study can be employed to create parametric trends for additional situations based on the available measured data.





POSTGRADUATE RESEARCH (M.Sc.)

ALKALI SILICA REACTIVITY POTENTIAL OF AGGREGATES FROM BALOCHISTAN

Supervisor: Dr. Muhammad Mazhar Saleem

Engr. Muhammad Saleem
(Researcher)

Abstract

Alkali Silica Reactivity (ASR) poses a significant challenge to concrete structures globally. While extensive research has investigated ASR in various aggregates worldwide, there has been a notable scarcity of research focused on local aggregates in Balochistan. This study aims to fill this gap by assessing the ASR potential of diverse aggregates found in the Balochistan region. To achieve this objective, two standardized methods, ASTM C227 and ASTM C1260, were employed. In ASTM C227, mortar bars, cubes, and prisms were prepared and subjected to testing at specified intervals. These specimens were stored in an environment of 100% humidity at 40°C in ordinary water. In ASTM C1260, all specimens, including mortar bars, cubes, and prisms, were immersed in sodium hydroxide solution at 80°C. The expansion of mortar bars was measured up to 28 days. These findings will provide valuable information regarding ASR potential in aggregates which decide to use in construction projects. Additionally, this research evaluates the effect of ASR on the mechanical properties of concrete.

POSTGRADUATE RESEARCH (M.Sc.)

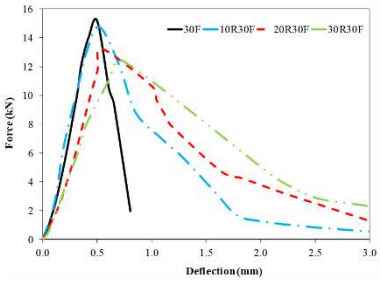
MECHANICAL PERFORMANCE OF AMORPHOUS METALLIC FIBER-REINFORCED AND RUBBERIZED THIN BONDED CEMENT-BASED OVERLAYS

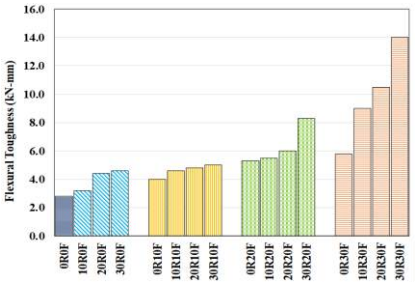
Supervisor: Dr. Syed Asad Ali Gillani

Engr. Ayesha Javed
(Researcher)

Abstract

To improve the flexural behavior of thin bonded cement-based overlays, this study was carried out on the use of repair material incorporating amorphous metallic fibers (AMFs) in combination with the rubber aggregates obtained from grinding of worn-out tires. For this study, sixteen mortar mix compositions were prepared to contain AMFs and/or rubber aggregates to be used as overlay material while the substrate used was plain cement mortar. Rubber aggregates were incorporated at three different replacement ratios (i.e., 10%, 20% and 30%) by an equivalent volume of sand, and AMFs were added in three different dosages (i.e., 10 kg/m^3, 20 kg/m^3 and 30 kg/m^3). In this study, composite beams (500 x 100 x 140 mm) comprising substrate (500 x 100 x 100 mm) and repair layer (500 x 100 x 40 mm) were prepared and investigated under flexural loading. Experimental results showed that the increase in rubber content resulted in a decrease compressive strength, flexural strength and modulus of elasticity. Rubberized fiber-reinforced cementitious composites (30R30F) exhibited higher flexural toughness and the flexural toughness improved up to 400%. Toughness and maximum deflection of composite beams enhanced significantly due to synergetic effect of AMF and rubber aggregates. It was observed that before peak load, rubber plays its role by delaying the microcrack propagation. Results also revealed that the steel fibers reinforcement plays an important role in restraining the crack openings under flexure loading. In the post-peak region, steel fibers control the cracks from propagating further by bridging action and provide higher post-peak residual strength.





POSTGRADUATE RESEARCH (M.Sc.)

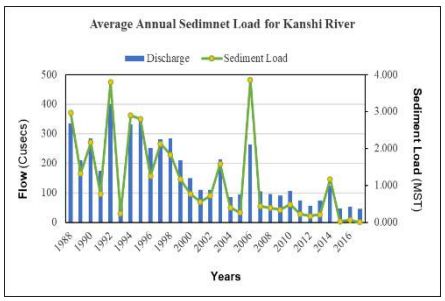
SPATIAL ASSESSMENT OF SOIL EROSION AND SEDIMENT YIELD USING REMOTE SENSING

Supervisor: Engr. Usman Ali

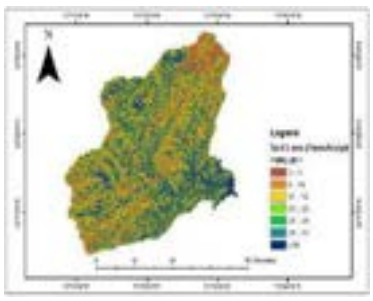
Engr. Sami Ullah
(Researcher)

Abstract

Soil erosion, a long-standing global issue, negatively impacts agriculture, water resources, environment, and landscapes. Human activities have exacerbated the problem, necessitating the assessment of spatial erosion intensity for better land use management. Estimating soil erosion supports policymakers in forecasting and sustainable management at the catchment scale. This research employed the Revised Universal Soil Loss Equation (RUSLE) model, integrated with GIS and Remote Sensing, to manage soil erosion in the 1,111 km² Kanshi River Basin in Pakistan. The study revealed an average annual soil erosion of 19.9 tons/ha/year and a total soil loss of 2.37 million tons/ha/year between 1990 and 2020. Sediment deposition was estimated at 8.9 tons/ha/year, and sediment yield at 1.68 million tons/year, closely matching observed data. Effective erosion reduction measures, such as terracing, which reduced annual soil loss by 38%, were identified. Analysis indicated land cover/use (C) and slope steepness (LS) as key erosion factors, emphasizing the need for continuous improvement efforts like afforestation and soil conservation structures. The study suggests using higher resolution satellites for more accurate land use maps, enhancing future erosion control and natural resource protection efforts.



Soil Loss Range (ton/ha/yr)	Severity Classes	Area (ha)	% Area
0 - 5	Very Low	55841.76	47.8%
5 - 10	Low	7203.41	6.2%
10 - 15	Low Medium	7333.92	6.3%
15 - 20	Medium	6722.71	5.8%
20 - 25	High Medium	5727.8	4.9%
25 - 30	High	4837.79	4.1%
30 - 84	Very High	28147.56	24.0%



POSTGRADUATE RESEARCH (M.Sc.)

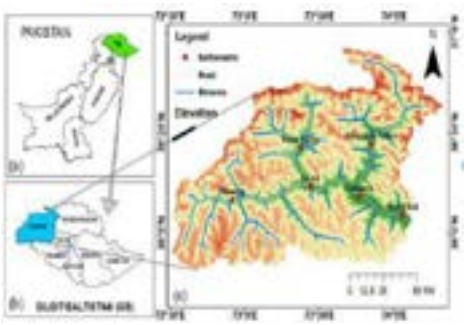
ASSESSMENT OF HYDROPOWER POTENTIAL FOR GHIZER RIVER USING GIS AND HYDROLOGICAL MODELLING

Supervisor: Engr. Usman Ali

Engr. Rana M. Ibrahim Ullah
(Researcher)

Abstract

The rising energy demand due to the rapidly increasing population has widened the demand supply gap which requires to develop more renewable source of energy for the sustainable solution of rising energy crises. In this present Research assessment of hydro power potential on Ghizer river of Pakistan using GIS and remote sensing technique along with Swat hydrological model. Water shed of Ghizer river was delineated using GIS software then the swat hydrological model was implied to simulate the flows at the outlet of Ghizer river considering the topographical or spatial dataset considering the dem file by preparing and adding the input datasets for the swat model adding the layer in spatial data set which include dem file, metrological data land use and land cover and snow-covered area. The model was then calibrated and validated with coefficient of determination as 0.79 for calibration and 0.75 for validation. In the Watershed area 37 sites are evaluated along the main course of ghizer river based on the minimum availability of head at 10m or more and having distance of 5 km between the two consecutive sites. Flow duration curve was made for all sites considering the simulated flows and flow rate with 35 % age exceedance was selected for estimation of hydropower at each site. The hydropower potential was then assessed for each selected site considering 90% plant efficiency the results showed that the hydropower potential varies from 27.17MW to 186.2MW with an average of 78.59MW out of the 37 selected sites.



POSTGRADUATE RESEARCH (M.Sc.)

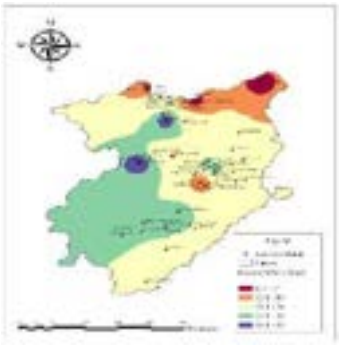
IMPACT OF LAND USE AND CLIMATE CHANGE OF LAHORE ON RAVI RIVER FLOWS AT BALLOKI

Supervisor: Engr. Usman Ali

Engr. Sami Ullah
(Researcher)

Abstract

In the present study, the impact of Land Use and climate change on the flows of River Ravi has been assessed through GIS remote sensing and applying the hydrological model at the catchment scale. A Soil and Water Assessment Tool (SWAT) model has been applied to simulate the hydrological response of River Ravi considering the current and future Land Use and climate changes. The model was calibrated and validated for the periods of 1999-2002 and 2003-2005, respectively. The good fit values of NSE, R^2, and PBIAS for the calibrated model are 0.85, 0.83, and 10.01 while for the validated model are 0.87, 0.89, and 7.2. By supervised classification techniques current and future Land Use maps were prepared for the study area using Landsat images and the TerrSet model for the prediction of future change in the built-up area. The result showed that the built-up area increased by 15.8% over the period 1990 to 2020 and the Future built-up area is expected to increase by 31.7% over the period 2020-2100. Climate change projections of precipitation and temperature under two Shared Socioeconomic Pathways SSP2 and SSP5 have been carried out, and statistical downscaling has been performed by the CMhyd model. The result indicated that over the period 2016-2100, precipitation is expected to increase by 10.9% under SSP2 and 14.9% under SSP5. Similarly, temperature is expected to increase by 12.2% under SSP2 and 15.9% under SSP5. The result of the SWAT model considering the increased precipitation over the period 2016-2100 shows the inflows of River Ravi are expected to increase by 19.4% by SSP2 and 25.4% by SSP5 in Scenario I. Similarly, the inflows of River Ravi are expected to increase by 22.4% by SSP2 and 28.4% by SSP5 in Scenario II. Based on the past observed data, it is found that average Groundwater depth decreased at a rate of 0.8 m per annum over the period from year 1996 to 2020.



FINAL YEAR PROJECTS

LIST OF FINAL YEAR DESIGN PROJECTS [2023]

During 2023 forty-two (42) groups of students completed their Final Year Design Projects. The list is presented below.

GEOTECHNICAL ENGINEERING DIVISION

1	**Title:** Environment-Friendly Use of Bagasse Ash for the Stabilization of Soft Clays **Project Advisor:** Prof. Dr. Khalid Farooq
2	**Title:** Use of Waste Rice Husk Fibers to Optimize Swell-Consolidation Properties of Expansive Soils **Project Advisor:** Prof. Dr. Khalid Farooq
3	**Title:** Design of Deep Excavation Support System in Lahore- A Case Study **Project Advisor:** Prof. Dr. Hassan Mujtaba Shahzad
4	**Title:** Experimental Evaluation of Subgrade Soil Stabilized with Rice Husk Ash for Use in Road Construction **Project Advisor:** Prof. Dr. Hassan Mujtaba Shahzad
5	**Title:** Laboratory Study for Stabilization of Soils Contaminated with Industrial Waste Using Lignosulphonate **Project Advisor:** Dr. Jahanzaib Israr
6	**Title:** Use of Lignosulphonate to Improve Strength and Deformation Characteristics of Silts- A Pilot Study **Project Advisor:** Dr. Jahanzaib Israr
7	**Title:** Design and Economic Analysis of Pavements with Variation in Subgrade Strength and Traffic **Project Advisor:** Dr. Imtiaz Rashid
8	**Title:** Strength Enhancement of Weak Subgrade Using Industrial Wastes for Road Infrastructure **Project Advisor:** Dr. Imtiaz Rashid
9	**Title:** Development of Correlation for Engineering Fills with SPT N Values **Project Advisor:** Dr. Ehtesham Mehmood
10	**Title:** Parameter Selection for Rockfall Hazard Rating System for Pakistan **Project Advisor:** Dr. Ehtesham Mehmood
11	**Title:** Geospatial Mapping of Bahawalpur Division Using GIS **Project Advisor:** Engr. Akbar Tufail

HYDRAULIC ENGINEERING DIVISION

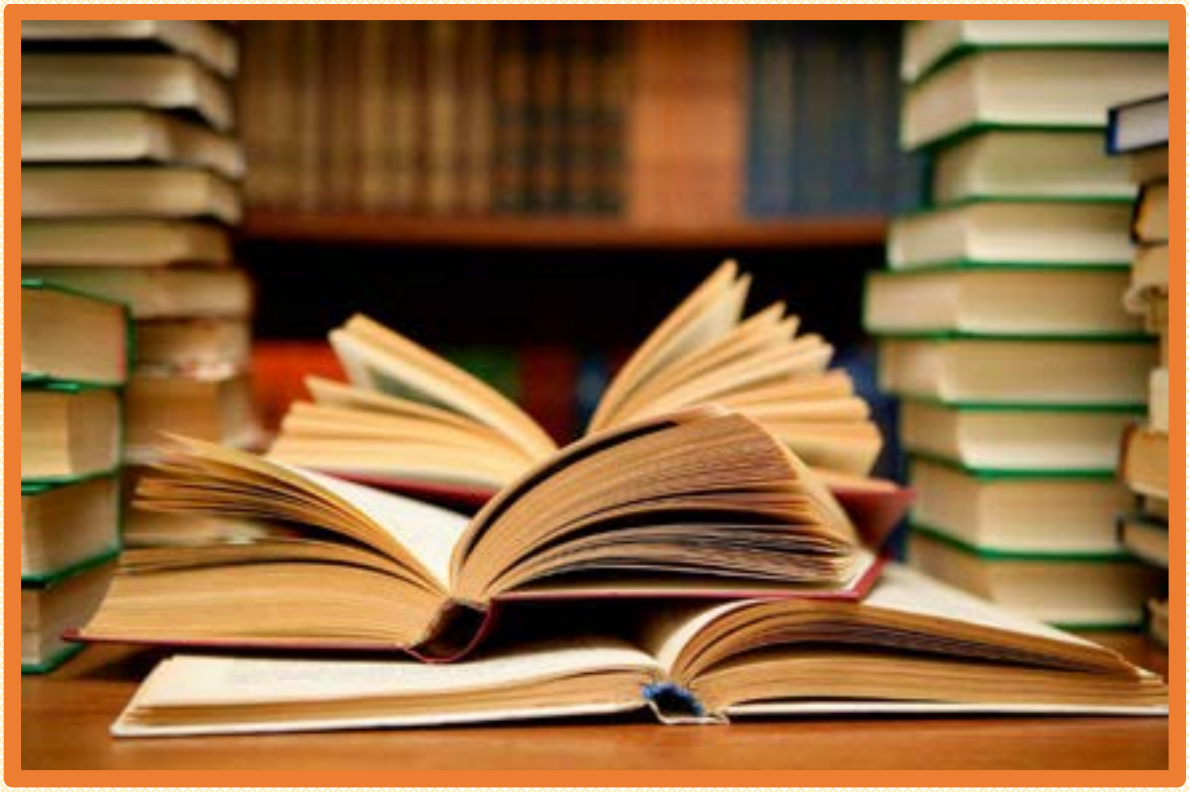
12	**Title:** Assessment of Hydropower Potential of Lahore Branch Canal by Installing Whirlpool Turbines at Outlets **Project Advisor:** Prof. Dr. Habib-ur-Rehman
13	**Title:** Design and Development of Ultra-Small Hydropower Generator for Small Irrigation Channels **Project Advisor:** Prof. Dr. Habib-ur-Rehman
14	**Title:** Evaluation of Hydraulic Performance of Sorra Dam Spillway Using Computer Model **Project Advisor:** Prof. Dr. Noor Muhammad Khan
15	**Title:** Evaluation of Vertical Drop Structures on Canals in Energy Dissipation and Mitigation Measures **Project Advisor:** Prof. Dr. Noor Muhammad Khan
16	**Title:** To Investigate the Impact of Climate Change on Surface Water Availability and Demand in Punjab Province **Project Advisor:** Engr. Usman Ali
17	**Title:** Design of Sprinkler Irrigation System for an Area and it's Cost Comparison with Canal Irrigation System **Project Advisor:** Engr. Usman Ali
18	**Title:** Rainwater Harvesting Systems as a Strategy for Urban Storm Water Management: A Case Study of Lahore **Project Advisor:** Dr. Muhammad Shahid
19	**Title:** Land Use and Climate Change Impact on Groundwater Resources of Lahore **Project Advisor:** Dr. Muhammad Shahid
20	**Title:** Physical and Numerical Modelling for Flow in a Typical USBR Stilling Basin for Low Froude Number **Project Advisor:** Engr. Abdul Rehman

STRUCTURAL ENGINEERING DIVISION

21	**Title:** A Study of Structural Health Monitoring of Bridges **Project Advisor:** Prof. Dr. Asad Ullah Qazi
22	**Title:** Analysis and Design of Prestressed Concrete Bridge Using AASHTO Bridge Design Specifications **Project Advisor:** Prof. Dr. Asif Hameed

23	**Title:** Automation of ASCE -07 Wind Loading on Various Type of Structures **Project Advisor:** Prof. Dr. M. Burhan Sharif
24	**Title:** Shear Behavior of Reinforced Recycled Brick-Aggregate Concrete **Project Advisor:** Prof. Dr. Rashid Hameed
25	**Title:** Structural Performance of Earth Retaining Systems **Project Advisor:** Dr. Safeer Abbas
26	**Title:** Development of Cement Less Recycled Aggregate Concrete: A Sustainable Solution for Future Construction **Project Advisor:** Dr. Qasim Shaukat Khan
27	**Title:** Cost Effectiveness of Earth-Retaining Structures **Project Advisor:** Dr. Ali Ahmed
28	**Title:** Impact Resistance and Mechanical Properties of Concrete Incorporating Various Coarse Aggregates **Project Advisor:** Dr. Nauman Khurram
29	**Title:** Low-Cost Housing Solutions: Development of Prefabricated Panels and Building Units **Project Advisor:** Dr. M. Irfan-ul-Hassan
30	**Title:** Development of Construction Chemicals Using Local Materials for Different Structural Applications **Project Advisor:** Dr. Wasim Abbass
31	**Title:** Optimization-Based Economical Design of RC Members **Project Advisor:** Dr. Rizwan Azam
32	**Title:** Condition Assessment of Bridges **Project Advisor:** Dr. M. Mazhar Saleem
33	**Title:** Experimental and Analytical Study on Eco-Friendly Concrete-Filled GFRP Beams **Project Advisor:** Dr. Muhammad Rizwan Riaz
34	**Title:** Bond Behavior of Deformed Steel Rebar Embedded in Recycled Brick-Aggregate Concrete **Project Advisor:** Dr. Syed Asad Ali Gillani
35	**Title:** Evaluation Of Impact Resistance and Mechanical Properties of Ferrocement Panels Incorporating Fibers from Waste Materials **Project Advisor:** Dr. Usman Akmal
36	**Title:** Performance of Molasses Waste as Cement Replacement Material for Concrete **Project Advisor:** Dr. Muhammad Yousaf

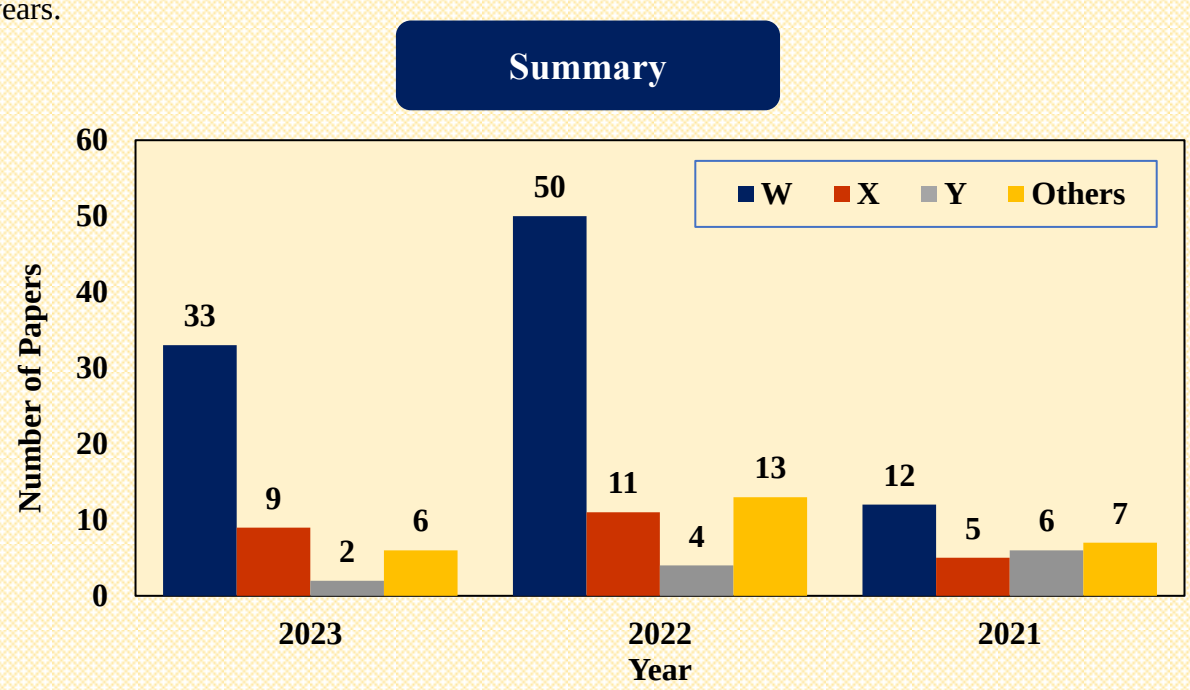
37	**Title:** To Investigate the Water Requirement of Recycled Brick Aggregates Concrete **Project Advisor:** Dr. Umbreen-Us-Sahar
38	**Title:** Investigating Implementation of Construction Regulation in Pakistan Construction Industry **Project Advisor:** Dr. Aqsa Shabir
39	**Title:** Performance of Masonry Room Subjected to Lateral Load **Project Advisor:** Dr. Ubaid Ahmad Mughal
40	**Title:** Effect of Different Types of Fibers on the Mechanical Properties of Recycled Brick-Aggregate Concrete **Project Advisor:** Engr. Muhammad Rehan Ashraf
41	**Title:** Optimization of FRP Pipes Design through Alternative Numerical Approaches **Project Advisor:** Engr. Aamina Rajput
42	**Title:** Development of Predictive Models for Material Performance Analysis **Project Advisor:** Engr. Bilal Anwar Khokhar



RESEARCH PUBLICATIONS

RESEARCH PUBLICATIONS

Faculty members of the Civil Engineering Department published a total of fifty journal papers in 2023. Below are the details of the publications for 2023 and a comparison with previous years.



Journal's Publications (2023) in the Civil Engineering Department, UET Lahore

1. Abbas, S. (2023). Preventive Measures of Alkali–Silica Reaction in Concrete Buildings: Use of Hybrid Waste Coal Ash and Steel Wire Cut Fibers. *Buildings*, *13*(3), 710. https://doi.org/10.3390/buildings13030710
2. Abbas, S., Baig, A., Hameed, R., Kazmi, S. M. S., Munir, M. J., & Shaukat, S. (2023). Manufacturing of Clay Bricks Using Hybrid Waste Marble Powder and Sugarcane Bagasse Ash: A Sustainable Building Unit. *Sustainability*, *15*(20), 14692. https://doi.org/10.3390/su152014692
3. Abbas, S., Hameed, R., Nehdi, M., Afzal, M., & Shaukat, S. (2023). Investigation of reinforcing steel rebar manufactured from local scrap at various finishing rolling temperature. *Case Studies in Construction Materials*, *19*(10), e02499. https://doi.org/10.1016/j.cscm.2023.e02499
4. Abbas, S., Jabeen, F., Faisal, A., Nehdi, M. L., Kazmi, S. M. S., Mubin, S., Shaukat, S., & Munir, M. J. (2023). Alkali–Silica Reactivity Potential of Reactive and Non-

Reactive Aggregates under Various Exposure Conditions for Sustainable Construction. *Sustainability*, *15*(6), 4927. https://doi.org/10.3390/su15064927

5. Abbass, W., Aslam, F., Ahmed, M., Ahmed, A., Alyousef, R., & Mohamed, A. (2023). Predicting the performance of existing pre-cast concrete pipes using destructive and non-destructive testing techniques. *Heliyon*, *9*(5), e15471. https://doi.org/10.1016/j.heliyon.2023.e15471
6. Ahmad, M., Hameed, R., & Farooq, M. (2023). Non-Destructive Testing of Fully Recycled Aggregate Concrete Bricks Prepared by Compression Casting Technique. *Sustainable Structures and Materials*, *6*(1), 106–110.
7. Ahmad, M., Hameed, R., Shahzad, S., & Ghous Sohail, M. (2023). Performance evaluation of loadbearing compressed fully recycled aggregate concrete bricks. *Structures*, *55*, 1235–1249. https://doi.org/10.1016/J.ISTRUC.2023.06.098
8. Ahmed, T., Ali, M., Akmal, U., Aslam, F., Abbass, W., Aziz, M., Hamza, M., Shah, I., & Shah, H. A. (2023). Coupled effect of waste glass powder and glass fibers on mechanical properties of concrete: A step towards the elimination of non-biodegradable waste. *Structural Concrete*, *24*(6), 7603–7624. https://doi.org/10.1002/suco.202201000
9. Ajmal, M. M., Qazi, A. U., Ahmed, A., Mughal, U. A., Abbas, S., Kazmi, S. M. S., & Munir, M. J. (2023). Structural Performance of Energy Efficient Geopolymer Concrete Confined Masonry: An Approach towards Decarbonization. *Energies*, *16*(8), 3579. https://doi.org/10.3390/en16083579
10. Akmal, U., Fatima, S., Khurram, N., Shaukat Khan, Q., Ahmed, T., Alabduljabbar, H., & Ahmed Awad, Y. (2023). Performance of Concrete Developed by Enhanced Gradation of Natural Fine River Sands by Partial Replacement of Waste Quarry Dust. *Advances in Civil Engineering*, *2023*, 1–15. https://doi.org/10.1155/2023/5508001
11. Ali, U., Azam, R., Shakeel, M., Adil, M., & Riaz, M. R. (2023). A practical tool for structural design optimization of steel frames: development and application for parametric analysis. *Innovative Infrastructure Solutions*, *9*(1), 3. https://doi.org/10.1007/s41062-023-01314-3
12. Alyousef, R., Abbass, W., Aslam, F., & Gillani, S. A. A. (2023). Characterization of high-performance concrete using limestone powder and supplementary fillers in

binary and ternary blends under different curing regimes. *Case Studies in Construction Materials*, *18*, e02058. https://doi.org/10.1016/j.cscm.2023.e02058

13. Alyousef, R., Abbass, W., Aslam, F., & Shah, M. I. (2023). Potential of waste woven polypropylene fiber and textile mesh for production of gypsum-based composite. *Case Studies in Construction Materials*, *18*, e02099. https://doi.org/10.1016/j.cscm.2023.e02099
14. Aziz, I., Hassan, M. I. U., Haq, E. U., & Abbass, W. (2023). Development of Geopolymer Foam Concrete Incorporating Sugarcane Bagasse Ash and Fly Ash; 100% Recycled and Cement-Less Concrete. *Arabian Journal for Science and Engineering*, *48*(4), 5655–5665. https://doi.org/10.1007/s13369-022-07511-z
15. Faisal, A., Abbas, S., & Ahmed, A. (2023). Mechanical performance of spun-cast full-scale precast pipes incorporating hybrid conventional rebar cage and steel fibers. *Structures*, *52*, 104–116. https://doi.org/10.1016/j.istruc.2023.03.176
16. Faisal, A., Abbas, S., Kazmi, S. M. S., & Munir, M. J. (2023). Development of Concrete Mixture for Spun-Cast Full-Scale Precast Concrete Pipes Incorporating Bundled Steel and Polypropylene Fibers. *Materials*, *16*(2), 512. https://doi.org/10.3390/ma16020512
17. Farooq, M., Hameed, R., & Ahmad, M. (2023). Effect of Casting Pressure on the Properties of 100% Recycled Aggregate Concrete Pavers. *Sustainable Structures and Materials*, *6*(1), 127–131.
18. Farooq, M. U., Hameed, R., Tahir, M., Sohail, M. G., & Shahzad, S. (2023). Mechanical and durability performance of 100% recycled aggregate concrete pavers made by compression casting. *Journal of Building Engineering*, *73*, 106729. https://doi.org/10.1016/j.jobe.2023.106729
19. Ghafoor, H., Abbas, S., Shahid, S., & Ali, S. (2023). Investigating the potential of waste polyethylene in concrete. *Proceedings of the Institution of Civil Engineers - Waste and Resource Management*, *177*(2), 82–89. https://doi.org/10.1680/jwarm.22.00028
20. Hameed, A., Afzal, M. F. U. D., Javed, A., Rasool, A. M., Qureshi, M. U., Mehrabi, A. B., & Ashraf, I. (2023). Behavior and Performance of Reinforced Concrete Columns Subjected to Accelerated Corrosion. *Metals*, *13*(5), 930. https://doi.org/10.3390/met13050930

21. Hameed, R., Gul, M. M., Tahir, M., Shahzad, S., Jamil, O., Awais, M., & Asghar, Z. (2023). Mechanical Properties of Plastic Concrete Made Using Recycled Aggregates for Paving Blocks. *International Journal of Engineering Research in Africa*, *63*, 13–31. https://doi.org/10.4028/p-hmjs0o
22. Hameed, R., Imran, M., Hassan, M. I., Khadija, & Arshad, E. (2023). Mechanical performance of 100% recycled aggregate concrete (RAC) bricks. *Revista de La Construcción*, *22*(1), 203–222. https://doi.org/10.7764/RDLC.22.1.203
23. Hameed, R., Tahir, M., Zaib-un-Nisa, Shahzad, S., Kazmi, S. M. S., & Munir, M. J. (2023). Impact of Compression Casting Technique on the Mechanical Properties of 100% Recycled Aggregate Concrete. *Sustainability*, *15*(10), 8153. https://doi.org/10.3390/su15108153
24. Hamza, M., Farooq, K., Rehman, Z. ur, Mujtaba, H., & Khalid, U. (2023). Utilization of eggshell food waste to mitigate geotechnical vulnerabilities of fat clay: a micro–macro-investigation. *Environmental Earth Sciences*, *82*(10), 247. https://doi.org/10.1007/s12665-023-10921-3
25. Hassan, W., Alshameri, B., Maqsood, Z., Haider, A., Jamil, S. M., & Mujtaba, H. (2023). An innovative application of fine marble dust for the construction industry to mitigate the piping, internal erosion and dispersion problems of sodium-rich clays. *Construction and Building Materials*, *408*, 133834. https://doi.org/10.1016/j.conbuildmat.2023.133834
26. Hassan, W., Farooq, K., Mujtaba, H., Alshameri, B., Shahzad, A., Nawaz, M. N., & Azab, M. (2023). Experimental investigation of mechanical behavior of geosynthetics in different soil plasticity indexes. *Transportation Geotechnics*, *39*, 100935. https://doi.org/10.1016/j.trgeo.2023.100935
27. Israr, J., & Iqbal, A. (2023). Physical Modeling of a Soft Soil Improved with Stone Columns. *Journal of Testing and Evaluation*, *52*(1), 20230384. https://doi.org/10.1520/JTE20230384
28. Javaid, M. F., Azam, R., & Riaz, M. R. (2023). Decision tree regression algorithm-based model for prediction of traffic-induced vibrations: development and application for parametric investigation. *Innovative Infrastructure Solutions*, *8*(3). https://doi.org/10.1007/s41062-023-01073-1
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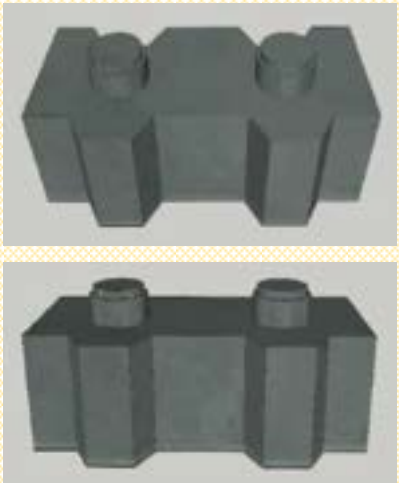
Patent (Submitted)

Bi-directional Interlocking Bricks

Safeer Abbas, Wasim Abbass, Ali Ahmed, Moncef Nehdi, Mirza Awais Baig, Ammad Hassan Khan



Various images of proposed interlocking bricks

A Bi-directional interlocking brick has been proposed, which resists loads in both the in-plane and out-of-plane directions. Grooves and notches in the horizontal and vertical planes have been included in the proposed brick design. The dimensions of the proposed bricks are comparable to conventional brick sizes to facilitate its use in traditional masonry walls.

In Collaboration with

Faculty of Engineering, University of Engineering and Technology, Lahore, Pakistan
Civil Engineering Department, Faculty of Engineering, McMaster University, Canada

TESTING AND CONSULTANCY SERVICES

Testing & Consultancy Services

Test Floor Laboratory

Test Floor lab plays a pivotal role in facilitating the B.Sc., M.Sc., and PhD students in their research work. In addition, commercial testing of a variety of specimens including steel bars and sewerage pipes etc. was carried out in the lab. The revenue generated by this laboratory was approximately Rs.13.5 million.

Prof. Dr. Asif Hameed
Lab Director

Laboratory Staff

- Mr. Shahid Abdullah (Lecture Assistant)
- Mr. Muhammad Nadeem (Lab Assistant)
- Mr. Zahoor Ahmad (Lab Assistant)

List of Commercial Tests

- Tensile test on steel reinforcing bars
- Calibration of pressure & displacement gauges
- Calibration of the testing machines (in laboratory &
- Strength test of concrete pipe 3-edge bearing test
- Size and shape test of any structural shape
- Steel grating load test
- Bend test on GI pipe
- Tensile test on Anchor/ J-Bolt
- Test on capacity of hydraulic jacks
- Tension test on PC wires & wire rope
- Test on bearing rubber pad
- Tests of manhole cover/ RCC slab &
- Flattering test on seamless pipe
- Steel and aluminum strips

Testing & Consultancy Services

Concrete Laboratory

In addition to facilitating the B.Sc., M.Sc., and PhD students in their research work the Concrete Laboratory of the Civil Engineering Department performed commercial testing of different construction materials and generated a revenue of approximately Rs. 15 million in 2023.

Prof. Dr. Muhammad Burhan Sharif
Lab Director

Laboratory Staff

- Mr. Muhammad Tauseef Dar (Lab Assistant)
- Mr. Hamza Mohi-Ud-Din (Lab Assistant)
- Mr. Umer Saeed (Senior Clerk)

List of Commercial Tests

- Compressive strength test (cubes, cylinders, bricks, tuff-tiles, hollow blocks, etc.)
- Mix design of concrete
- Modulus of elasticity
- Concrete core tests
- Sieve analysis of coarse and fine aggregates
- Cement test (grouting, fineness)
- Crushing value of coarse aggregate
- Impact value of coarse aggregate
- Bulk density of coarse aggregate (loose and rodded)
- Specific gravity of aggregates
- Non-Destructive Testing (rebound hammer and ultrasonic pulse velocity test)
- Load test of building
- Ferro scanning of concrete structures for the determination of embedded reinforcement size and spacing along with cover information

Testing & Consultancy Services

Strength of Material Laboratory

The Strength of Materials Laboratory of the Civil Engineering Department performed commercial testing for various government & private sector organizations and generated a revenue of about Rs. 17.5 million.

Prof. Dr. Rashid Hameed
Lab Director

Laboratory Staff

- Mr. Muhammad Hussain (Lab. Supervisor)
- Mr. Mahmood Ahmad (Mechanic)
- Mr. Badar Akram (Lab Assistant)

List of Commercial Tests

- Tensile test on steel reinforcing bars
- Test on bearing rubber pad and expansion joint (rubber)
- Size and unit weight test of any structural shape
- Hardness, shear & torsion tests
- Test on screw coupling of fiber glass
- Tests on timber
- Test on cat eyes light for roads
- Test of manhole cover
- Apparent hoop tensile strength (plastic pipes)
- Test on AC pipes
- Test on GFRP and PVC pipes
- Tension test on bolts
- Impact test on metallic samples

Testing & Consultancy Services

Geotechnical Engineering Lab

In addition to facilitating the B.Sc., M.Sc., and PhD students in their research work the Geotechnical Engineering Laboratory of the Civil Engineering Department performed soil investigation and commercial testing of the government & private sector projects. The lab earned a revenue of around Rs. 23 million during 2023.

Dr. Jahanzaib Israr
Lab Director

Laboratory Staff

- Mr. Muhammad Sadiq (Lecture Assistant)
- Mr. Ansar Abbas (Lab Assistant)
- Mr. Imran Mukhtar (Junior Clerk)

List of Commercial Tests

➢ Unconfined compression test (on soil & rock)	➢ Direct shear test & consolidation test
➢ Moisture content (Oven dry method)	➢ Specific gravity test (soil & rock)
➢ Bulk and dry unit weight (Laboratory test)	➢ Standard and modified proctor test
➢ Sieve analysis (coarse and fine aggregate) & hydrometer analysis	➢ UU triaxial compression at NMC and at saturation
➢ Liquid limit, plastic limit & shrinkage limit test	➢ One point and three-point CBR test
➢ Permeability test (constant head & variable head) ➢ ultrasonic pulse velocity test)	➢ Maximum and minimum index density
➢ Point load index test on rock sample	➢ Collapse potential test

Testing & Consultancy Services

Transportation Engineering Lab

In addition to facilitating the B.Sc., M.Sc., and Ph.D. students in their laboratory/research work, the Transportation Engineering Laboratory performed commercial testing of different construction materials used in roads and bridges. The lab generated a revenue of approximately Rs. 5.34 million during 2023.

Dr. Imtiaz Rashid
Lab Director

Laboratory Staff

- Mr. Muhammad Ishaq (Junior Demonstrator)
- Mr. Zeeshan Siddique (Draftsman)
- Mr. Shahid Sardar (Lecture Assistant)

List of Commercial Tests

- Ductility, specific gravity, solubility & softening point test on bitumen
- Penetration test on bitumen
- Shape test on coarse aggregate (Flakiness Index, Elongation Index and Angularity Number)
- Gradation, specific gravity, unit weight and water absorption of aggregates
- Bitumen extraction test
- Clay lumps and friable particles in aggregate
- Organic impurities determination in aggregate
- Thin film oven test and loss on heating test on bitumen
- Flash and fire point test on bitumen
- Kinematic viscosity of bitumen and liquid asphalt
- Los Angeles abrasion test on coarse aggregate
- Soundness test on aggregate
- Asphalt mix design

Testing & Consultancy Services

Consultancy Services

1. Quaid-e-Azam Industrial State

The Civil Engineering Department carried out structural health evaluation of a building in Quaid-e-Azam Industrial State.

2. Government Sadiq College Women University, Bahawalpur

The Civil Engineering Department performed structural health assessment of Government Sadiq College Women University, Bahawalpur through non-destructive testing.

3. PACE Lahore

The Civil Engineering Department performed the structural health evaluation of PACE located opposite to Hafeez Center, Lahore.

4. Etimad Saudi VISA Processing Office, Lahore

The Civil Engineering Department performed structural safety analysis of Etimad Saudi Visa Processing Office, Lahore.

5. E-Mall, Gulberg III Lahore

Department of Civil Engineering performed non-destructive testing of E-Mall Gulberg III Lahore.

6. Deltons Construction Ashrafi Heights, Gulberg II

The Civil Engineering Department evaluated the structural health of precast columns of Deltons Construction Ashrafi Heights, Gulberg II.

7. **Varioline Intercool (Pvt.). Ltd. Lahore**

The Civil Engineering Department performed the health assessment of the columns and beams of Varioline Intercool (Pvt.). Ltd. Lahore.

8. Multistory Building at Askari-X (SEC-F), Lahore

The Civil Engineering Department performed a geotechnical investigation of a multistory building located in Askari-X (SEC-F), Lahore.

9. Allama Iqbal International Airport, Lahore

The Civil Engineering Department carried out the geotechnical investigation for the construction of the Quarantine center at Allama Iqbal International Airport, Lahore.

10. King Edward Medical University (New Campus), Muridke

A detailed geotechnical investigation was conducted by the Civil Engineering Department for the new campus of King Edward Medical University, Muridke.

IMPROVEMENT IN FACILITIES

Five classrooms, two lobbies, and corridors were renovated in the department in 2023 with a generous donation of about Rs. 20 million from our alumni.

Renovation of Classrooms C-1 & C-2

By Engr. Abid Wazir Khan (83/S-C-439)

The classrooms C-1 and C-2 of the Civil Engineering Department were renovated by the generous donation of our alumnus Engr. Abid Wazir Khan (83/S-C-439). The upgrade included new furniture, multimedia, an audio system, and air conditioners, etc. The rooms were inaugurated by Worthy Vice-Chancellor, Prof. Dr. Habib Ur Rehman. The renovation was made possible by the personal efforts of Prof. Dr. Khalid Farooq.

Renovation of Classroom C-6

By Engr. Shehzad Ayub (92-C-377)

The classroom C-6 of the Civil Engineering Department was renovated with the financial support of Engr. Shehzad Ayub (92-C-377), a proud alumnus of our department. The upgrade included new furniture, multimedia and air conditioners, etc. The room was inaugurated by Worthy Vice-Chancellor, Prof. Dr. Habib Ur Rehman. The renovation was made possible by the personal efforts of Prof. Dr. Khalid Farooq and Dr. Ehtesham Mehmood.

Renovation of Classroom C-7

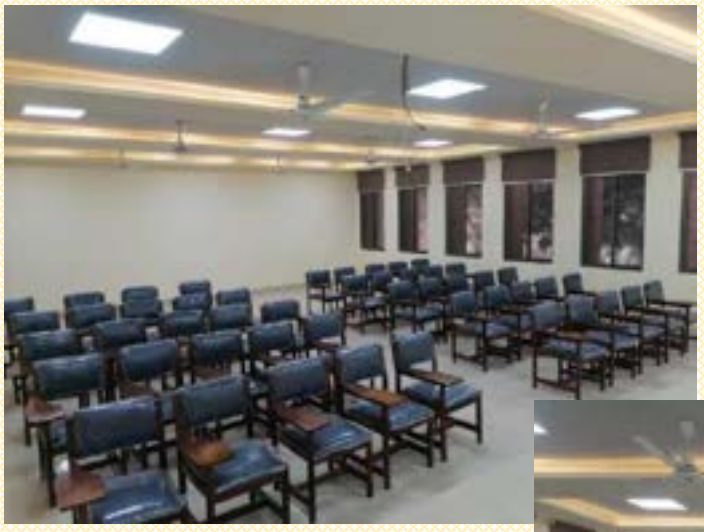
By Dr. Qasim Shaukat Khan (2004-Civ-187)

The classroom C-7 of the Civil Engineering Department was renovated with the generous support of our faculty member and alumnus Dr. Qasim Shaukat Khan (2004-Civ-187) and his brothers. The upgrade included new furniture, multimedia, false ceiling and air conditioners, etc. The room was inaugurated by Worthy Vice-Chancellor, Prof. Dr. Habib Ur Rehman. The renovation was made possible by the personal efforts of Prof. Dr. Khalid Farooq.

Renovation of Classroom C-11

By Engr. Muhammad Yousaf Rao (81-Civil)

The classroom C-11 of the Civil Engineering Department was renovated by the generous donation of our alumnus and Ex-GM WAPDA Engr. Muhammad Yousaf Rao (81-Civil). The upgrade included new furniture, multimedia, false ceiling and air conditioners, etc. The room was inaugurated by Worthy Vice-Chancellor, Prof. Dr. Habib Ur Rehman. The renovation was made possible by the personal efforts of Prof. Dr. Khalid Farooq.



Renovation of Lobbies

By Engr. Abid Wazir Khan (83/S-C-439)

The two Lobbies (one in front of chairman office and the other in front of C-1 & C-2) of the Civil Engineering Department were renovated by the generous donation of our alumnus Engr. Abid Wazir Khan (83/S-C-439). The renovation included a false ceiling, electrical appliances, whitewash and paint etc. The lobbies were inaugurated by Worthy Vice-Chancellor, Prof. Dr. Habib Ur Rehman. The renovation was made possible by the personal efforts of Prof. Dr. Khalid Farooq.

Renovation of Corridors

By Engr. Ameer Faisal (95-Civil)

The ground floor corridors connecting the chairman office to the classrooms C-1 & C-2 of the Civil Engineering Department were renovated by the generous donation from 95 Civil alumnus Engr. Ameer Faisal (MD, City Survey and Engineering Consultants). The corridors were inaugurated by the Worthy Vice-Chancellor, Prof. Dr. Habib Ur Rehman. The renovation was made possible by the personal efforts of Prof. Dr. Khalid Farooq.

DEPARTMENTAL ACTIVITIES

Faculty and students from the Civil Engineering Department hosted twelve events in 2023 to enhance the skills of students, faculty, and staff members.

EFFECTIVE COMMUNICATION

On Wednesday, 12th April 2023, the Civil Engineering Department hosted an enlightening seminar titled "Effective Communication." The event featured Dr. M. Azhar Saleem as the guest speaker. Dr. Azhar Saleem holds a B.Sc. in Civil Engineering and an M.Sc. in Structural Engineering from UET Lahore, and he earned his Ph.D. in Structural Engineering from Florida International University, USA. Additionally, he possesses a bachelor's degree in law and brings approximately twenty years of teaching and research experience from various universities around the world.

Dr. Azhar's presentation covered diverse aspects of communication, including effective techniques for presentations, meetings, emails, and interviews. He provided detailed insights into the dos and don'ts of each communication form, offering valuable guidance to the attendees.

The seminar was well-attended by faculty members and a large number of students. The event concluded with Prof. Dr. Asad Ullah Qazi presenting a commemorative shield to Dr. Azhar Saleem, acknowledging his valuable contribution to the seminar.

ENVIRONMENT, HEALTH, AND SAFETY

On Wednesday, 12th July 2023, the Civil Engineering Department organized an informative seminar titled "Environment, Health, and Safety." The event featured Prof. Dr. Naveed Ramzan, Dean of the Faculty of Chemical, Metallurgical, and Polymer Engineering, as the distinguished speaker. Prof. Dr. Khalid Farooq, Chairman, Civil Engineering Department, warmly welcomed the guest and presented him with a bouquet. In his opening remarks, Prof. Farooq appreciated Dr. Mazhar Saleem and his team for their efforts in arranging the seminar.

Prof. Dr. Ramzan's presentation delved into various aspects of environment, health, and safety in the workplace. He began by defining key terms such as health, safety, welfare, hazard, safety signs, and risk. He then elaborated on different categories of hazards, including physical, chemical, biological, ergonomic, and psychological hazards. The speaker provided insights into how these hazards can be identified and how their associated risks can be evaluated.

Additionally, Prof. Dr. Ramzan explained the General Control Hierarchy (ERIC DP) for the effective management of hazards. His comprehensive presentation was followed by a detailed question and answer session, allowing attendees to engage deeply with the topic.
The seminar was attended by faculty and staff members, who found the session highly informative and beneficial for their professional development.

STATE OF THE ART FOR USE OF GEO RADAR FOR DETECTION OF HISTORICAL UNDERGROUND STRUCTURES

Civil Engineering Department, UET Lahore in collaboration with Pakistan Geotechnical Engineering Society (PGES) arranged a seminar titled " State of the Art for Use of Geo Radar for Detection of Historical Underground Structures" on Wednesday, 26th July 2023. The event featured Dr. Tarunjit Butalia, an Associate Professor in the Department of Civil, Environmental, and Geodetic Engineering at The Ohio State University, USA, as the distinguished speaker. Prof. Dr. Khalid Farooq, Chairman of the Civil Engineering Department, warmly welcomed Dr. Butalia and presented him with a bouquet.

Dr. Butalia's presentation explored various approaches for detecting historical underground structures, focusing on technologies such as Ground Penetration Radar (GPR), Electric Resistivity (ER), and Magnetometer (MR). He provided an in-depth discussion on the application, advantages, disadvantages, and limitations of each method. The seminar included a comprehensive question and answer session, allowing attendees to engage with the topic further.

In his concluding remarks, Prof. Dr. Khalid Farooq expressed gratitude to Dr. Butalia for his insightful presentation and presented him with a commemorative shield. He also appreciated the efforts of Dr. Mazhar Saleem and his team in arranging this informative seminar. The seminar attracted a large audience, including faculty members, students, and online participants, all of whom found the session highly informative and engaging.

INTERNATIONAL SEMINAR ON DISASTER PREVENTION AND MITIGATION

The Civil Engineering Department at the University of Engineering and Technology (UET), Lahore, in collaboration with the City and Regional Planning Department and the Department of Civil Engineering at Yokohama National University, organized a one-day International Seminar on Disaster Prevention and Mitigation. The program was rich in content, covering a broad spectrum of topics essential to disaster resilience.

The seminar began with an inaugural speech by Prof. Dr. Habib-ur-Rehman, Vice Chancellor of UET Lahore who emphasized the profound impact of floods on human life and infrastructure. This was followed by Professor Dr. Akira Hosoda, Director of the Research Center for Disaster Mitigation at Yokohama National University, who discussed the development of long-life and eco-friendly concrete structures, highlighting their importance in creating a resilient and sustainable society. Engr. Sohail Kibria, Head of R&D at NESPAK, addressed the mechanics of landslides, focusing on failure mechanisms and mitigation strategies.

Prof. Mihoko Matsuyuki from Yokohama National University underscored the role of community empowerment in flood resilience, while Prof. Dr. Atiq ur Rehman from Lahore College for Women University presented innovative approaches to domestic food security through participatory urban farming. Prof. Dr. Khalid Farooq, Chairman Civil Engineering Department, UET Lahore, discussed geotechnical characterization and zonation as methods to mitigate damage caused by swelling clays.

The international segment of the seminar featured Prof. Mamoru Kikumoto of Yokohama National University, who explored the micro-mechanics of granular media with a particular focus on the effect of particle shape on granular response. Dr. Satoshi Komatsu, also from Yokohama National University, shared advancements in seismic verification methods for underground reinforced concrete structures. Engr. Ehtesham Mehmood, a postgraduate student, presented his work on developing a rockfall hazard rating system, while Engr. Ubaid Ahmad, another postgraduate student, discussed strategies for disaster mitigation in confined masonry construction.

The seminar concluded with an acknowledgment of the speakers' contributions. Prof. Dr. Habib ur Rehman, Vice Chancellor UET Lahore, along with Prof. Dr. Khalid Farooq, Chairman Civil Engineering Department, UET Lahore, and Prof. Mihoko Matsuyuki, Chairperson, Department of Civil Engineering at Yokohama National University, presented certificates to the presenters, recognizing their dedication to advancing disaster prevention and mitigation strategies.

TOWARDS CONSTRUCTION 4.0: EMERGING TECHNOLOGIES IN THE MODERN AEC INDUSTRY

Civil Engineering Department, UET Lahore arranged a seminar titled "Towards Construction 4.0: Emerging Technologies in the Modern AEC Industry" on Monday, September 4, 2023. The speaker of the event was Dr. Salman Azhar. He is an alumnus of the Civil Engineering Department,

UET Lahore and currently serving as William A. Hunt Endowed Professor and Graduate Programs Chair in the McWhorter School of Building Science at Auburn University, Alabama, USA. Prof. Dr. Khalid Farooq, Chairman, Civil Engineering Department (CED) welcomed the guest and presented him with a bouquet.

The speaker first gave an overview of Construction 4.0 with a focus on its core concepts, associated technologies, and benefits for the project stakeholders. Then emerging 4.0 technologies such as BIM and Digital Twins, Virtual, Augmented and Mixed Reality, 3D Laser Scanning and Photogrammetry, Sensing Technologies and Robotics, and 3D printing and Digital Fabrication were discussed with specific AEC examples. Towards the end, the impact of these emerging technologies on the AEC industry was analyzed. The presentation was followed by a detailed question & answer session. In the end, Prof. Dr. Khalid Farooq, Chairman CED gave concluding remarks and presented a shield to the guest.

He appreciated the efforts of Dr. Mazhar Saleem and his team in organizing the event. A large number of faculty members and students attended the seminar.

After the seminar, an MOU was signed between Prof. Dr. Khalid Farooq, Chairman CED and Prof. Dr. Salman Azhar to enhance cooperation for the improvement of teaching and research. Meanwhile, the guest also had a fruitful meeting with the faculty members and discussed various matters of mutual interest.

EARTHQUAKE ENGINEERING – SIMPLE AND SHORT ANSWERS TO COMPLEX QUESTIONS

Civil Engineering Department, UET Lahore arranged a seminar titled "Earthquake Engineering – Simple and Short Answers to Complex Questions" on Wednesday, October 18, 2023. The speaker of the event was Engr. Rizwan Mirza. He is an alumnus of the Civil Engineering Department, UET Lahore and is currently the CEO of Rizwan Mirza Consulting Engineers, Lahore. Prof. Dr. Khalid Farooq, Chairman, Civil Engineering Department (CED) welcomed the guest and presented him with a bouquet.

The guest delivered a detailed presentation on different aspects of earthquakes such as major earthquakes in history, tectonic plates and their movement, earthquake magnitude, seismic risk management, seismic waves and response spectrum, etc. The presentation was followed by a detailed question & answer session. In the end, Prof. Dr. Khalid Farooq, Chairman CED gave concluding remarks and presented a shield to the guest. He also appreciated the efforts of Dr. Mazhar Saleem and his team in organising the event. A large number of faculty members and students attended the seminar.

ENGINEERING BUSINESS DEVELOPMENT & STUDY/JOBS IN USA

Civil Engineering Department, UET Lahore arranged a seminar titled "Engineering Business Development & Study/Jobs in USA" on Thursday, November 30, 2023. The speaker of the event was Engr. Maqsood Ali Kamboh. He is an alumnus of the Civil Engineering Department, UET Lahore and is currently the President and CEO of TSI Engineering, Inc., a leading construction company in the United States. Prof. Dr. Khalid Farooq, Chairman, Civil Engineering Department (CED) welcomed the guest and presented him with a bouquet.

The guest delivered a detailed presentation on different aspects of business development and jobs in the US such as a comparison of business and job, different types of business and steps to establish a successful business, etc. He further explained the process of getting admission to universities in the US for higher education. The speaker also highlighted different funding opportunities available to the students for sponsoring their studies. The presentation was followed by a detailed question & answer session. In the end, Prof. Dr. Khalid Farooq, Chairman CED gave concluding remarks and presented a shield to the guest. A large number of faculty members and students attended the seminar.

REVOLUTIONISING THE STEEL INDUSTRY

The Civil Engineering Department, UET Lahore successfully hosted an informative seminar titled “Revolutionizing the Steel Industry” on December 13, 2023. Held in the Chemical Seminar Hall, the event featured speakers from Sheikhoo Steel, who provided valuable insights into the steel industry’s current trends and future challenges.

The seminar focused on the latest technological advancements, sustainable practices, and the role of steel in modern construction. It provided an excellent opportunity for students and faculty to engage with industry experts, deepening their understanding of the practical applications of their academic knowledge.

The event proved to be a valuable platform for learning and networking, bridging the gap between academia and industry. The Civil Engineering Department thanks Sheikhoo Steel and all the participants for contributing to the seminar’s success and looks forward to organizing similar events in future.

INAUGURATION CEREMONY OF RENOVATION WORKS CARRIED OUT AT CIVIL ENGINEERING DEPARTMENT

The Civil Engineering Department (CED), UET Lahore celebrated the inauguration of newly renovated and upgraded spaces, including four classrooms (C1, C2, C7, C11), two lobbies, and ground floor corridors. This transformation was made possible by the generous contributions of esteemed alumni. Engr. Abid Wazir Khan sponsored the renovation of Classrooms C1 and C2 and the two lobbies. Dr. Qasim Shaukat Khan, Associate Professor, CED along with his brothers, supported the renovation of Classroom C7. Engr. Muhammad Yousaf Rao, an Ex-GM at WAPDA, facilitated the upgrade of Classroom C11. Engr. Ameer Faisal, MD of City Survey and Engineering Consultants, contributed to refurbishing the ground floor corridors.

The ceremony was honored by the presence of Prof. Dr. Habib ur Rehman, Vice Chancellor of UET Lahore, who praised the alumni's efforts. Prof. Dr. Khalid Farooq, Chairman of the Civil Engineering Department, highlighted the renovations' significance and expressed gratitude to the alumni.

Over the past years, alumni contributions have fueled the renovation of various spaces, including Classrooms C1, C2, C4, C6, C7, C11, Seminar Hall (C3), two lobbies, corridors, and the Chairman's Office. Dr. Farooq announced upcoming plans for renovating Classrooms C8, C9, and C10, thanks to alumni support.

The event reflected the department's commitment to excellence and progress, with the collective efforts of alumni, faculty, and administration driving continual innovation at UET Lahore's Civil Engineering Department.

ICE ORIENTATION 2023

The ICE Student Chapter held an Orientation Ceremony for Civil Engineering students on October 16, 2023, to kick off the 2023 session. This event was crucial for newcomers, offering them valuable insights into the UET Lahore system and its educational framework.

IGNITE POSSIBILITIES - ENGINEERING THE CHANGE TO A SUSTAINABLE

ICE and IEEE organized a seminar titled "Ignite Possibilities: Engineering the Change to a Sustainable World" on November 21, 2023. Esteemed guest speakers included Sana Ibrahim, Development Director at Bondhe Shams; Raza Ali Dada, Managing Partner at Nayyar Ali Dada & Associates; and Imrana Tiwana, Convener of Lahore Bachao Tahreek and Board Member of Lahore Conservation Society. Their speeches inspired UET's future engineers with valuable insights and experiences, motivating them to take active roles in developing sustainable engineering solutions.

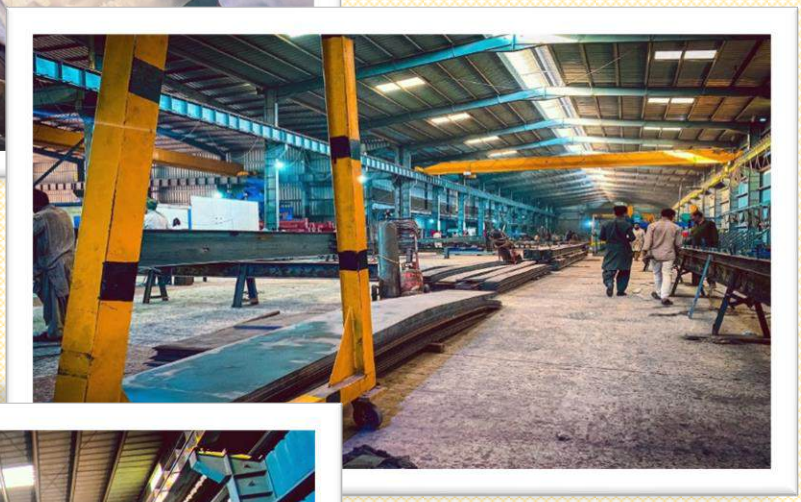
1st PRIZE IN 5TH ENGINEERING CAPSTONE EXPO (PUNJAB)

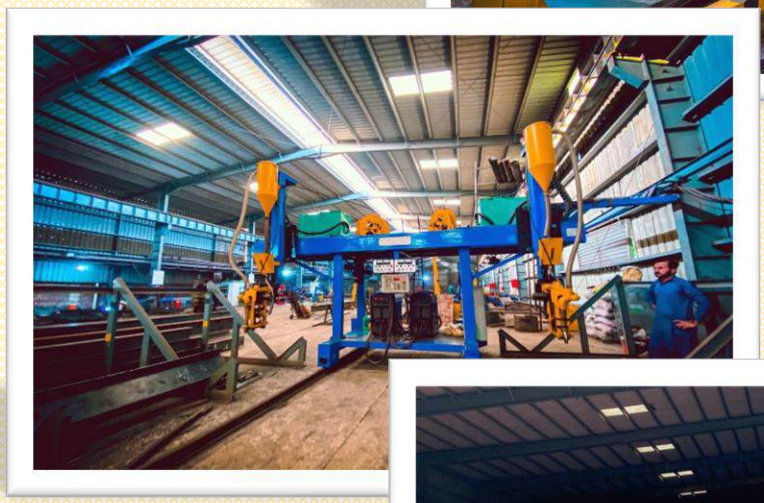
Pakistan Engineering Council (PEC) organised the 5th Engineering Capstone Expo (Punjab) at its regional office in Lahore. This event was a significant platform designed to highlight the culmination of academic excellence and practical engineering expertise. The Expo was attended by participants from 29 universities and 170 final year design projects were showcased, carefully chosen for their relevance to current industry needs. A panel of three judges meticulously evaluated these projects.

The 1st Prize was conferred upon the Final Year Design Project of the Civil Engineering Department, UET Lahore. The title of this project was "Low-cost Housing Solutions". It was supervised by Dr. Muhammad Irfan ul Hassan. This great achievement of our students is a testament to their unmatched ingenuity, creativity, excellence, and steadfast commitment to revolutionizing civil engineering solutions for cost-effective and resilient construction.

STUDY TOURS

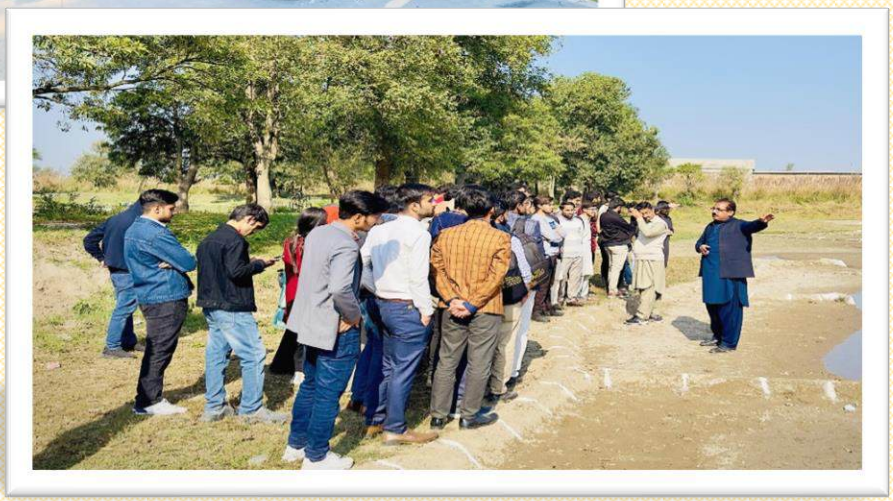
Tour To RECO Steel





Members of the Civil Engineering Department, including faculty and graduate students, visited RECO Steel's Fabrication Facility in Lahore as part of their Steel Structures course. Engr Abdul Manan and Engr Riaz ud Din led the tour, providing a detailed overview of the facility and answering all student questions.

Tour to Hydraulic Research Station Nandipur



Final-year students visited the Hydraulic Research Station in Nandipur, gaining valuable insights into hydraulic engineering. They attended an engaging session on major dams like Mangla and Tarbela and explored various sections of this historic research centre. Renowned for its pioneering work in hydraulic structures, the institution continues to shape the future of hydraulic engineering in the water sector.

Tour to the Mangla Power House

The 5th semester Civil Engineering students (Session 2021) visited the Mangla Power House. The main objective of the tour was to observe the installation of two new turbines that will significantly enhance power generation at the facility. Led by Dr. Ehtesham Mehmood and Dr. M. Kashif, this tour provided students with a unique learning experience in power house upgradation. Witnessing the installation of these massive turbines offered invaluable insights into the practical aspects of their engineering studies, making it an unparalleled educational opportunity.

Tour to a plaza on Raiwind Road Lahore

A field visit was organized for the Geotechnical Engineering students at a housing society on Raiwind Road, Lahore. This visit was focused on the structural and geotechnical issues of a leaning plaza within the society. During the visit, students thoroughly examined the building, conducting field observations to identify the causes of the leaning. This hands-on experience was crucial in helping students understand complex engineering problems and develop practical solutions

Survey Camp at Abbottabad

Survey camp at Abbottabad is a mandatory part of BSc. Civil Engineering, during which students are trained to practically apply knowledge of land surveying. In the summer of 2023, a survey camp was held for the students of sessions 2020 in three separate batches.

The survey camp provides students with a great opportunity to learn the subject of surveying in a region of this country that is full of natural scenic beauty. Abbottabad is a city surrounded by many spots that students visit for recreation during free hours. This has made the survey camp a memorable experience for the students, faculty, and supporting staff.

Team of Instructors

The following faculty members joined various batches of survey camps as instructors

1. Prof. Dr. Noor Muhammad Khan
2. Prof. Dr. Asad Ullah Qazi
3. Prof. Dr. Rashid Hameed
4. Dr. Muhammad Azhar Saleem
5. Dr. Jahanzaib Israr
6. Dr. Wasim Abbas
7. Dr. Rizwan Azam
8. Dr. Muhammad Rizwan Riaz
9. Dr. Ali Falak
10. Dr. Ubaid Ahmad Mughal
11. Engr. Abdul Rehman

Supporting Staff

The supporting staff was comprised of the following members

1. Mr. Ghulam Rasul
2. Mr. Shahid Sardar
3. Ms. Ismat Naz
4. Mr. Muhammad Owais
5. Mr. Majid Mehmood
6. Mr. Khalid Hussain

Conclusion of Survey Camp

The survey camp for each batch concluded with;

1. Competition for the best surveyor
2. Competition for the best survey group
3. Competition of best athlete
4. Leisure trip to local areas

COMMUNITY SERVICE PROJECTS

Community Service Program

The students of the Civil Engineering Department, UET Lahore, from 2020-session demonstrated their commitment to social responsibility through a range of community service initiatives. These activities aimed to foster empathy and civic duty among our future engineers. Dr. Mazhar Saleem served as the faculty advisor for this community service program under the leadership of Prof. Dr. Khalid Farooq, Chairman, Civil Engineering Department.

Throughout the semester, our students engaged in impactful projects, including collecting donations and serving at orphanages and old homes. Their efforts provided support and companionship to residents, addressing immediate needs and bringing joy. The students also organized road safety awareness campaigns, educating the public on traffic rules and safe driving practices, contributing to improved community safety.

Our students also participated in multiple plantation and cleanliness drives, promoting environmental sustainability and well-being. These initiatives not only beautified the environment but also instilled a sense of stewardship among the participants. Moreover, they distributed rations to needy families, providing essential supplies during challenging times. This act of kindness demonstrated their compassion and commitment to helping those in need.

The overarching goal of this program is to develop a sense of social responsibility among our students. By participating in these activities, they learned the value of giving back to society and using their skills for the greater good. We are immensely proud of our students for their dedication and hard work in making a positive impact on society, reflecting the core values of the Civil Engineering Department at UET Lahore.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NIKE

APPOINTMENTS AND RETIREMENTS

RETIREMENT OF FACULTY

Prof. Dr. Habib ur Rehman

Prof. Dr. Habib ur Rehman retired from his services on December 31, 2023. He served in the positions of Vice-chancellor, UET Lahore, Dean of the Faculty of Civil Engineering, Chairman Civil Engineering Department, and Director of the Center of Excellence in Water Resources Engineering. The department wishes him all the best for his future endeavors.

Dr. Riaz Ahmed Goraya

Dr. Riaz Ahmed Goraya retired from his services at the Civil Engineering Department on May 12, 2023. He had joined the department on March 03, 1991. At the time of retirement, he was serving as the Director of Strength of Materials Lab. The department wishes him all the best for his future endeavors.

APPOINTMENT OF TEACHING FELLOW

Engr. Muhammad Ahmad

Engr. Muhammad Ahmad joined the Civil Engineering Department on September 01, 2023 as a Teaching Fellow. He obtained his M.Sc. in Structural Engineering and B.Sc. in Civil Engineering from the same department.

RETIREMENT OF STAFF

Mr. Zulfiqar Ali Asadi

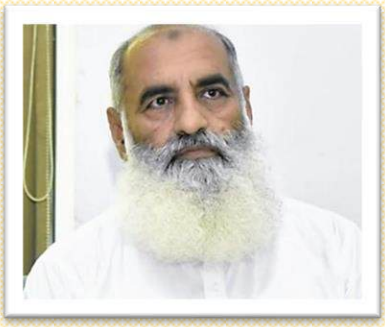
Mr. Zulfiqar Ali Asadi retired from his services on March 28, 2023, serving as a lab supervisor in the Hydraulic & Irrigation Lab. He joined the department on February 02, 1985. He served in the Strength of Materials Lab, Geotech Lab, and Hydraulics Lab during his career.

Mr. Saif Ali

Mr. Saif Ali retired from his services on January 05, 2023, serving as a chief technician in the Hydraulic & Irrigation Lab. He joined the department on September 08, 1981. He served in the Geotech Lab, Concrete Lab, and Hydraulics Lab during his career.

Mr. Muhammad Hafeez

Mr. Muhammad Hafeez retired from his services on July 05, 2023, serving as a lecturer assistant in the Survey Lab. He joined the department on February 03, 1985. He served in the Test Floor Lab, Concrete Lab, Transportation Lab, and Survey Lab during his career.



Mr. Muhammad Riaz

Mr. Muhammad Riaz retired from his services on September 08, 2023, serving as a lab assistant in the Strength of Material Lab. He served in several departments of the university during his career.

100+ Years of Academic Excellence (1921-2023)

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