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2nd CONFERENCE ON SUSTAINABILITY IN CIVIL ENGINEERING

ABSTRACT BOOK

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CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING

Foreword

Welcome to the CSCE 2020, 2nd Conference on Sustainability in Civil Engineering (CSCE'20) held by Department of Civil Engineering, Capital University of Science and Technology, Islamabad, Pakistan. The main focus of CSCE'20 is to highlight sustainability related to the field of civil engineering. It provided a platform for civil engineers from academia as well as industry to share their practical experiences and different research findings in their relevant specializations. We hope all the participants experienced a remarkable opportunity for the academic and industrial communities to address new challenges, share solutions and discuss future research directions. The conference accommodated several parallel sessions of different specialties, where the researchers and engineers interacted and enhanced understanding of sustainability in the civil engineering dynamics.

This year, we had a wonderful and renowned keynote speakers for our this edition of CSCE. We received 143 manuscripts from different countries around the world including UK, Australia, Italy, Vietnam, China, KSA and Pakistan. All papers under gone a comprehensive and critical double-blind review process. The review committee comprised of 42 PhDs serving in industry and academia of UK, Hungary, Australia, New Zealand, Chile, Thailand, China, Malaysia, KSA, Oman and Pakistan. After the screening and review process, 68 papers are to be presented in Conference.

We are a grateful to all the reviewers and keynote speakers who have dedicated their precious time to share their expertise and experience. With this opportunity, we would also like to express our gratitude to everyone, especially all the faculty and staff at the Capital University of Science and Technology for their great support and participation.

In this regard, the participation and cooperation of all authors, presenters and participants is also acknowledged, without whom this conference would not have been possible. Last but not least, an appreciation to our organizing committee whose hard work and dedication has made this day a success

Conference Chair of CSCE'20

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Current Trends of Bridge Engineering in Pakistan

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*Towards Green Procurement Practices in
Infrastructure Construction Projects: A Sustainable
Approach to Manage Eco-Sensitive Projects in
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*The Use of Basalt Fibers Reinforced Polymers BFRP
in Concrete Structures*

Dr. Irfan Yousuf

NEPRA, Islamabad, Pakistan

Civil Engineering Vigilance in COVID'19 Era

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UET, Lahore

*Monitoring and Modelling of Groundwater Recharge
Through Recharging Well*



TABLE OF CONTENTS

FOREWORD.....	I
TECHNICAL COMMITTEE.....	II
CONFERENCE COMMITTEE	III
KEYNOTE SPEAKERS.....	IV
<u>PAPER ID 101:</u> SIGNIFICANCE OF INCORPORATING STEEL FIBER AND POLYVINYL ALCOHOL FIBER IN CEMENT BASED COMPOSITES UNDER STATIC AND DYNAMIC LOAD.....	1
<u>PAPER ID 102:</u> EFFECT OF U-SHAPED GFRP SHEAR KEYS ON THE BOND BETWEEN GFRP PLATE AND CONCRETE.....	2
<u>PAPER ID 110:</u> EFFECT OF WASTE FOUNDRY SAND (WFS) ON STRENGTH AND DURABILITY OF PRESSED FIRED CLAY BRICKS	3
<u>PAPER ID 111:</u> COMPARATIVE STUDY ON THE SEISMIC PERFORMANCE OF BARE FRAME AND INFILLED FRAME RC STRUCTURES WITH BRICK MASONRY AND LOW STRENGTH CONCRETE BLOCK MASONRY INFILLS.....	4
<u>PAPER ID 112:</u> ONE PART GEOPOLYMER USING RICE HUSK ASH AND METAKAOLIN.....	5
<u>PAPER ID 115:</u> STUDYING BEHAVIOR OF FIBRE REINFORCED COMPOSITES USING SCANNING ELECTRON MICROSCOPY ANALYSIS - A REVIEW.....	6
<u>PAPER ID 117:</u> BOND OF NATURAL FIBERS WITH SURROUNDING CEMENTITIOUS MATRIX-A REVIEW.....	7
<u>PAPER ID 118:</u> EFFICIENCY OF XRD METHOD FOR STUDYING FRC COMPOSITES – A REVIEW.....	8
<u>PAPER ID 119:</u> DIFFERENT TECHNIQUES FOR ENHANCING DURABILITY OF NATURAL FIBERS IN CEMENTITIOUS COMPOSITES - AN OVERVIEW.....	9
<u>PAPER ID 124:</u> ONE-PART GEO-POLYMER CONCRETE USING WHEAT STRAW ASH AND BENTONITE.....	10
<u>PAPER ID 128:</u> DESIGN AND PROBABLE IMPROVEMENT OF FIBER-REINFORCED CONCRETE CANAL-LINING BY ROLE OF ROUGHNESS COEFFICIENT.....	11
<u>PAPER ID 133:</u> UTILIZATION OF WASTE PLASTICS AGGREGATE IN CONCRETE: A REVIEW.....	12
<u>PAPER ID 202:</u> EXPERIMENTAL DETERMINATION OF THE MECHANICAL PROPERTIES OF BRICK MASONRY AND LOW STRENGTH CONCRETE BLOCK MASONRY...	13
<u>PAPER ID 204:</u> EVALUATION OF HALF-THROUGH BRIDGE LOAD-CARRYING CAPACITY BY USE OF NON-LINEAR ANALYSIS METHODS – CASE STUDIES.....	14
<u>PAPER ID 206:</u> MACHINE VISION BASED CRACK DETECTION FOR STRUCTURAL HEALTH MONITORING USING HARALICK FEATURES.....	15
<u>PAPER ID 207:</u> DETECTION OF BUGHOLES USING IMAGE PROCESSING TECHNIQUE IN HYBRID CONCRETE.....	16
<u>PAPER ID 209:</u> ASSESSMENT OF BARS LAYOUT ON THE STRENGTH OF EXISTING RC HALF-JOINT STRUCTURES USING THE PLASTIC REDISTRIBUTION METHOD	17
<u>PAPER ID 210:</u> BOND PERFORMANCE OF SUSTAINABLE REPAIRING MATERIALS WITH STEEL REINFORCEMENT.....	18
<u>PAPER ID 212:</u> EVALUATING THE BLEND OF NAOH AND KOH ACTIVATORS FOR ECO-FRIENDLY GEO-POLYMER CEMENT MORTAR.....	19
<u>PAPER ID 213:</u> EFFECT OF ADDITION OF DIFFERENT PERCENTAGES OF BENTONITE AND FLY ASH ON COMPRESSIVE STRENGTH OF CONCRETE.....	20
<u>PAPER ID 214:</u> FRESH, MECHANICAL AND DURABILITY PROPERTIES OF ECO-FRIENDLY CONCRETE CONTAINING SUGARCANE BAGASSE ASH AND WOOD SAW DUST.....	21
<u>PAPER ID 215:</u> FRESH AND MECHANICAL PROPERTIES OF AMBIENT CURED TERNARY BLENDED GEOPOLYMER CONCRETE REINFORCED WITH STEEL FIBERS ...	22
<u>PAPER ID 216:</u> CHARACTERIZATION OF BRICK MASONRY OF OLD AND NEW BUILDING BLOCKS AT GCT RASUL.....	23



2nd Conference on Sustainability in Civil Engineering (CSCE'20)

Department of Civil Engineering

Capital University of Science and Technology, Islamabad Pakistan

<u>PAPER ID 301:</u>	SUSTAINABLE BUILDINGS AND INFRASTRUCTURES DEVELOPMENT USING INNOVATIVE MATERIAL AND ADVANCE TECHNOLOGIES-A REVIEW.....	24
<u>PAPER ID 302:</u>	CRITICAL SUCCESS FACTORS FOR SUSTAINABLE BUILDING CONSTRUCTIONS-A REVIEW	25
<u>PAPER ID 310:</u>	SUSTAINABLE CONSTRUCTION AND DEMOLISHING WASTE MANAGEMENT: A CASE STUDY IN PAKISTAN.....	26
<u>PAPER ID 316:</u>	SUSTAINABILITY ASSESSMENT OF CONSTRUCTION PROJECTS IN PAKISTAN AND GEO-SAT.....	27
<u>PAPER ID 317:</u>	CHALLENGES IN ADOPTION OF BIG DATA IN CONSTRUCTION INDUSTRY OF PAKISTAN.....	28
<u>PAPER ID 319:</u>	SUSTAINABLE CONSTRUCTION RISK ASSESSMENT THROUGH DYNAMIC SITE LAYOUT PLANNING AND SIMULATION BY BUILDING INFORMATION MODELLING.....	29
<u>PAPER ID 320:</u>	PASSIVE DESIGN FEATURES FOR ENERGY EFFICIENT RESIDENTIAL BUILDING IN HOT CLIMATE.....	30
<u>PAPER ID 322:</u>	ANALYZING FACTORS INFLUENCING CONSTRUCTION LABOR PRODUCTIVITY USING FUZZY ANALYTICAL HIERARCHY PROCESS (FAHP).....	31
<u>PAPER ID 323:</u>	DAMAGE ASSESSMENT OF HISTORICAL BUILDINGS: A CASE STUDY OF HISTORIC SHRINE OF MULTAN.....	32
<u>PAPER ID 324:</u>	SUSTAINABLE DESIGN OF BUILDINGS THROUGH BIM: A COMPREHENSIVE REVIEW.....	33
<u>PAPER ID 325:</u>	A REVIEW OF VIRTUAL, AUGMENTED AND MIXED REALITY TECHNOLOGIES FOR CONSTRUCTION.....	34
<u>PAPER ID 327:</u>	DEVELOPMENT OF AUTOMATED RESOURCE MANAGEMENT SYSTEM (ARMS).....	35
<u>PAPER ID 329:</u>	ACHIEVING THE SUSTAINABILITY IN CONSTRUCTION BY USING ARTIFICIAL AGGREGATES IN CONCRETE.....	36
<u>PAPER ID 330:</u>	COST COMPARISON OF CONCRETE FRAMED STRUCTURE USING NATURAL AND ARTIFICIAL COARSE AGGREGATES.....	37
<u>PAPER ID 342:</u>	EXPLAINING SUCCESS IN GREEN BUILDING PROJECTS USING TRANSFORMATION-FLOW-VALUE GENERATION THEORY.....	38
<u>PAPER ID 404:</u>	APPLYING SEMI DISTRIBUTION HYDROLOGICAL MODEL TO ASSESS HYDROLOGICAL REGIME IN LAI GIANG CATCHMENT, BINH DINH PROVINCE, VIETNAM.....	39
<u>PAPER ID 406:</u>	APPLICATION OF HYDRODYNAMIC MODELLING TO ASSESS THE EFFICIENCY OF HURRICANE PROTECTION MEASURE AT XOM RO DIKE, PHU YEN PROVINCE, VIETNAM.....	40
<u>PAPER ID 408:</u>	SECOND STAGE STILLING BASIN AS A SOLUTION FOR CHASHMA BARRAGE DUE TO DAMAGE CAUSED BY RETROGRESSION PHENOMENON.....	41
<u>PAPER ID 409:</u>	THE CHINIOT DAM – SHEET PILE DESIGN ASPECT.....	42
<u>PAPER ID 410:</u>	PROVISION OF SUBSIDIARY WEIR AS A SOLUTION FOR DAMAGES CAUSED BY RETROGRESSION AT JINNAH BARRAGE.....	43
<u>PAPER ID 411</u>	INVESTIGATING MULTIPLE DEBRIS IMPACT LOAD AND ROLE OF VEGETATION IN PROTECTION OF HOUSE MODEL DURING FLOODS.....	44
<u>PAPER ID 501:</u>	DRIVER AND PEDESTRIANS INTERACTIONS CHARACTERIZATION.....	45
<u>PAPER ID 502:</u>	DEVELOPMENT OF A SHEAR THICKENING FLUID AND ITS USE AS A MODIFIER IN ASPHALT BINDER.....	46
<u>PAPER ID 503:</u>	INFLUENCE OF BANANA FIBERS ON ASPHALT BINDER.....	47
<u>PAPER ID 504:</u>	THE EFFECT OF USING POLYPROPYLENE FIBER ON DEFORMATION RESISTANCE OF ASPHALT CONCRETE.....	48
<u>PAPER ID 505:</u>	THE EFFECT OF USING STEEL FIBER ON DEFORMATION RESISTANCE OF ASPHALT CONCRETE.....	49



2nd Conference on Sustainability in Civil Engineering (CSCE'20)

Department of Civil Engineering

Capital University of Science and Technology, Islamabad Pakistan

<u>PAPER ID 506:</u>	INFLUENCE OF MORINGA OIL ON ADHESION AND MOISTURE SUSCEPTIBILITY OF RECLAIMED ASPHALT PAVEMENT.....	50
<u>PAPER ID 507:</u>	EFFECT OF TRANSPORT INFRASTRUCTURE DEVELOPMENT ON HEALTH OF NATIVES: A CASE STUDY OF LAHORE ORANGE LINE METRO TRAIN PROJECT.....	51
<u>PAPER ID 508:</u>	ASSESSMENT OF ADHESION AND MOISTURE SUSCEPTIBILITY OF WASTE PLASTIC AND CRUMB RUBBER MODIFIED BITUMEN.....	52
<u>PAPER ID 601:</u>	EXPERIMENTAL STUDY OF SHRINKAGE IN MUD BRICKS AND ITS CONTROL.....	53
<u>PAPER ID 602:</u>	STABILITY ANALYSIS OF SLOPES USING LIMIT EQUILIBRIUM AND FINITE ELEMENT METHODS.....	54
<u>PAPER ID 603:</u>	INVESTIGATING THE SUITABILITY OF IN-SITU SOILS OF PESHAWAR FOR UN-STABILIZED RAMMED EARTH CONSTRUCTION.....	55
<u>PAPER ID 604:</u>	CONSEQUENCES OF POORLY COMPACTED BACKFILL MATERIAL ON CONCRETE RETAINING WALLS.....	56
<u>PAPER ID 606:</u>	EFFECT OF SAWDUST- LIME AND SAWDUST ASH-LIME ON THE GEOTECHNICAL PROPERTIES OF AN EXPANSIVE CLAYEY SOIL.....	57
<u>PAPER ID 608:</u>	EFFECTIVENESS OF STONE DUST AS AN EXPANSIVE SOIL STABILIZER.....	58
<u>PAPER ID 610:</u>	CHARACTERIZATION AND STANDARDIZATION OF SAND FOR LABORATORY TESTING IN PAKISTAN.....	59
<u>PAPER ID 612:</u>	SOLUTION TO FOUNDATION PROBLEMS IN COLLAPSIBLE SOILS OF KALLAR KAHAR, DISTRICT CHAKWAL, PUNJAB, PAKISTAN.....	60
<u>PAPER ID 613:</u>	APPLICATION OF PLAXIS FOR CALCULATING THE CONSTRUCTION STABILITY AND SOFT EMBANKMENT IN PROTECTING HA THANH RIVER, BINH DINH PROVINCE.....	61
<u>PAPER ID 614:</u>	THE USE OF PALSAR (D.E.M.) FOR MEGA FRACTURE ANALYSIS OF DABBAR ANTICLINE, SULAIMAN FOLD BELT, PAKISTAN.....	62
<u>PAPER ID 701:</u>	ECONOMIC COMPARISON OF THE GEOTHERMAL HEAT PUMP SYSTEM AND CONVENTIONAL WATER HEATERS FOR HOT WATER SUPPLY IN APARTMENT BUILDINGS.....	63
<u>PAPER ID 702:</u>	INDUSTRIAL WASTE WATER ANALYSIS: A CASE STUDY OF CHASHMA SUGER MILLS, D.I KHAN.....	64
<u>PAPER ID 703:</u>	PHYSICOCHEMICAL AND BIOLOGICAL ASSESSMENT OF POTABLE WATER OF SAHIWAL CITY.....	65
<u>PAPER ID 704:</u>	DRINKING-WATER QUALITY ASSESSMENT: A CASE STUDY OF SADIQABAD CITY.....	66
<u>PAPER ID 705:</u>	DIFFERENT PERSPECTIVES ON WATER QUALITY OF LOCAL FILTRATION PLANTS IN PAKISTAN.....	67
<u>PAPER ID 706:</u>	SPREADING OF COVID'19 THROUGH WASTEWATER IN UNDERPRIVILEGED SOCIETIES - AN OVERVIEW.....	68



SIGNIFICANCE OF INCORPORATING STEEL FIBER AND POLYVINYL ALCOHOL FIBER IN CEMENT BASED COMPOSITES UNDER STATIC AND DYNAMIC LOAD

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Abstract- The single fiber reinforced concrete had improved mechanical properties than plain concrete. However, the addition of different fibers together resulted in better crack arresting performance at different scale than that of individual fibers. Therefore, the steel fibers and polyvinyl alcohol (PVA) fibers are blended together to achieve the fiber bridging performance at multi scale. The inclusion of these two fibers will contribute together at their particular level and will contribute in the improvement of mechanical and dynamic properties. In this paper, the properties of steel fibers and polyvinyl alcohol fibers are studied with different length and contents to study the static and dynamic behavior of cementitious composites. For static properties, compressive strength and peak micro strain are determined; and to evaluate the dynamic behavior the curves of column top acceleration-time are considered. The addition of multi-scale fibers resulted in enhanced peak micro strain and showed longer time period under dynamic load. This indicates the positive synergy of steel and PVA fibers blend designed for improved static and dynamic properties of cementitious composites.

Keywords- Crack Arresting Performance, Steel Fibers, Polyvinyl Alcohol Fibers, Static Properties, Dynamic Properties.



EFFECT OF U-SHAPED GFRP SHEAR KEYS ON THE BOND BETWEEN GFRP PLATE AND CONCRETE

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Abstract- The role of the bond between fiber-reinforced polymer (FRP) interface and concrete carries a key role for an interface-concrete composite structure. Various researches are conducted to study the effectiveness of different techniques for improving the bond between the FRP strips and concrete. The current study evaluates the effectiveness of the new type of U-shaped GFRP shear key on the bond between the GFRP plate and concrete. Specifically, double-lap shear tests are conducted on specimens with GFRP shear key bonded GFRP plates to evaluate the rupture modes, the extreme load, the stiffness of interface (interfacial), and curves with load on the y-axis and slip on the x-axis for static loading. The tests are conducted on the double-lap shear specimens sized 514 mm x 100 mm x 100 mm. The bond length (222.5 mm) of the GFRP plates is kept higher than that of the effective bond-length bonded with Type A epoxy resin. C60 concrete having 184 kg, 392 kg, 660 kg, 1214 kg, and 2.94 kg of water, cement, sand, aggregates, and water reducer, respectively per 1m³ of the mix is used. The influence of the shear key and its position variation i.e. 80 mm and 160 mm from the loading end is evaluated in comparison to the GFRP-concrete double-lap shear specimen without a shear key. The use of shear keys along with the interface imparts significant enhancement in the bond between the concrete and GFRP plate. Shear key located at 80 mm from loaded end performed well as compared to that at 160 mm in increasing bond strength between concrete and GFRP plate. It can be concluded that the gap between the shear key and loading end also has a considerable effect in increasing the bond between concrete and GFRP plate.

Keywords- GFRP Shear Key, Interfacial Bond, GFRP Plate, Concrete



EFFECT OF WASTE FOUNDRY SAND (WFS) ON STRENGTH AND DURABILITY OF PRESSED FIRED CLAY BRICKS

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Abstract- Bricks are significant construction material due to their cost and excellent properties such as durability and compressive strength. With the increasing demand in construction, scarcity of natural material is nowadays a major problem. To counter this, waste foundry sand has been utilized in fired clay pressed bricks in different proportions by replacing clay. Compressive strength and durability were studied as main properties. It was observed that replacing clay with 10% waste foundry sand increases compressive strength. Incorporation of 10% waste foundry sand in bricks resists acid attack and minimum weight loss was observed. Scanning electron microscope analysis suggested the crystallization of bricks by incorporation of waste foundry sand. It is recommended that waste foundry sand can be effectively used in bricks to enhance its properties.

Keywords- Acid Attack, Brick, Durability, Foundry Sand, Scanning Electron Microscope (SEM)



COMPARATIVE STUDY ON THE SEISMIC PERFORMANCE OF BARE FRAME AND INFILLED FRAME RC STRUCTURES WITH BRICK MASONRY AND LOW STRENGTH CONCRETE BLOCK MASONRY INFILLS

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Abstract - A practice of constructing RC frame structures with unreinforced masonry infill walls is being followed all over the world from the past few years. In the start, these masonries were considered as the non-structural elements of the building, but recent researches and studies have shown that the presence of these infill masonries greatly influence the seismic performance of RC structures. This research aims at the evaluation of seismic performance of bare frame, brick masonry infilled frame and low strength concrete block masonry infilled frame RC structures. For this, a six storey (G +5) commercial building being located in Abbottabad was selected for the analysis. Three models of this building namely bare frame, brick masonry infilled frame and low strength concrete block masonry infilled frame were prepared in ETABS 2015. These models were then analyzed by linear dynamic method of seismic analysis i.e. response spectrum analysis. The comparison between seismic performance of these models of the given building was made on the basis of maximum storey displacement, maximum storey drift ratio, base shear, time period and overall stiffness of the structure. From the results of the research, it was observed that when the effect of infill masonries was considered in the analysis, the performance of the building was observed to be greatly improved. Analyzing the results, it was concluded that presence of infill masonries greatly enhances the overall seismic performance of RC structures by increasing their strength, stiffness and ability of resisting the lateral loads during seismic events. It was also concluded that brick masonry has a greater effect on the seismic performance of a RC structure as compared to that of low strength concrete block masonry because of its greater strength and stiffness properties.

Keywords- Reinforced Concrete (RC), Infill Masonries, Seismic Performance, Response Spectrum Analysis (RSA).



ONE PART GEOPOLYMER USING RICE HUSK ASH AND METAKAOLIN

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Abstract- This research is conducted to assess the compressive strength of one part geopolymer mortar containing rice husk ash (RHA) and metakaolin (MK). Sodium Silicate in powder form is used as activator for the geopolymer. Water to binder ratio is kept constant at 0.5 for each sample. Two percent super plasticizer by weight of binder is added in mortar mix. The strengths of GM samples with different RHA/MK mass ratios are tested on 7, 14, and 28 days. The casted samples are placed in oven at 70°C for first 24 hours and then at ambient temperature of 19°C for rest of the time, till testing. Compressive strength of RHA/MK mass ratio of 10/90 is highest among all mixes. It is found that increasing the RHA more than 10 percent, results in reduced compressive strength.

Keywords- Geopolymer Mortar (GM), Metakaolin (MK), One Part Geopolymer, Rice Husk Ash (RHA)



STUDYING BEHAVIOR OF FIBER REINFORCED COMPOSITES USING SCANNING ELECTRON MICROSCOPY ANALYSIS - A REVIEW

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Abstract- The microscope has been a versatile tool in the study of cementitious composites since the development of these materials. The scanning electron microscope (SEM) is one of the most developmental instruments available for the analysis and examination of morphological characteristics of fibre and its matrixes. This paper gives a brief review of the accuracy of scanning electron microscopy method for understanding performance of fibre reinforced composites and prediction of behavior of fibrous concrete. It also focuses on the scope of the scanning electron microscopy (SEM) method in the near future in fields fibre reinforced concrete research work. Selected researches of SEM usage in FRC have also been discussed. The electron microscopy is used as an investigation instrument in understanding the potential of the varying behavior of different fibrous composites at different conditions, an investigation mechanism in making suitable matrix, and a diagnosis equipment on problems like cracking. The paper also investigated how microstructural analysis reveal the expected mechanical behavior.

Keywords- FRC, Performance Of Fibrous Composites, Scanning Electron Microscopy.



BOND OF NATURAL FIBERS WITH SURROUNDING CEMENTITIOUS MATRIX-A REVIEW

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Abstract-The need for sustainable material from renewable resources in the field of construction has become necessary due to large consumption of resources. Fibers obtained from plants are renewable. This literature study analyzes specifically; fiber used in various research, processing techniques, mechanical properties and their bonding mechanism in cement composites. Factors affecting the properties of concrete such as fiber types, fiber characteristics are also studied. It also presents the results obtained from pull-out tests conducted on embedded natural fibers in concrete mix. The purpose of this research is to investigate the effect of different treatment at the surfaces of natural fibers including their bonding in cement matrix. Four different treatments have been considered for this specific review. These treatment includes hybrid treatment using combination of horrifaction and polymer pigmentation, polymer pigmentation alone, horrifaction alone and alkali treatment using calcium hydroxide. A significant portion of this review is based on future trends related to the utilization of natural plant based fibers acting as curing agents and also as bond capacity improving material in cement composites.

Keywords- Bond Strength, Natural Fibers, Cementitious Matrix.



EFFICIENCY OF XRD METHOD FOR STUDYING FRC COMPOSITES – A REVIEW

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Abstract- The appropriate and proficient management of different types of fibrous materials is one of the major concerns by the agricultural countries. The plenty of natural as well as synthetic fibres from the last few decades are used by researchers for different civil engineering applications. The properties of fibres differ from each other depending upon their growing condition, harvesting and extraction method. The different fibre reinforced concrete are similar as of their texture apparently but differs structurally. Microscopic examination plays a vital role in identification of mineral composition. The microscopic study to explore micro-structure of fibre reinforced composites (FRC) needs to be done. A variety of methods are available for studying the material characterization at micro-level. This paper preliminary focuses on the characterization and efficiency of fibre reinforced composites through X-ray diffraction (XRD) test. XRD test is widely used to determine the cellulose and lignin composition. XRD test is most suitable for identification of crystallographic structure providing the crystallinity index as well. Similarly, Composition of lignin, cellulose and can be detected by use of XRD analysis. The detailed discussion on structural characterization is made.

Keywords- X-Ray Diffraction, Fibre Reinforced Concrete, Material Characterization.



DIFFERENT TECHNIQUES FOR ENHANCING DURABILITY OF NATURAL FIBERS IN CEMENTITIOUS COMPOSITES - AN OVERVIEW

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Abstract- Natural fibers in cementitious composites (NFCC) have been gaining popularity universal due to their application in low cost construction processes. In spite of the fact that there is wide scope of opening for natural fibers in cementitious composites, their long term durability performance under various exposure environmental conditions is still a question with unstable answer. Since several decades researchers have been working to dominate the durability issue by providing a correct technology for NFCC, actually possible product for different applications. This overview reveals a light on various durability mechanism of natural fibers and NFCC under several exposure environmental conditions, different techniques are accepted for enhancing the durability of natural fibers and NFCC. The durability improvement is encountered to be premier with the composites containing cementitious material than in plain fiber cement composites. Furthermore, incorporation/use of treated fibers in the treated matrix shows superior performance under durability testing. However, many studies necessity to be improved to confirm the existent improvement on durability of the natural fibers in cementitious composites.

Keywords- Different Techniques, Enhancing Durability, Natural Fibers In Cementitious Composites



ONE-PART GEO-POLYMER CONCRETE USING WHEAT STRAW ASH AND BENTONITE

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Abstract Geopolymer concrete (GC) is considered as environmentally friendly concrete as compared to traditional concrete. As the formation of GC involves the addition of liquid Alkali Activated Materials (AAM) which is hazardous to the human skin. Hence, this research has been conducted to use activators (sodium silicate and sodium aluminate) in powder form along with Wheat Straw Ash (WSA) and bentonite for making GC. Different combinations were used for making mortar as 100% Bentonite, 20% WSA, and 80% Bentonite, 30% WSA, and 70% Bentonite. In all these ratios 10% sodium silicate in each sample with w/b of 0.4. Bentonite and WSA are used because these materials are pozzolanic in nature and can replace cement. Samples containing 80% WSA and 20% bentonite with a w/b ratio of 0.3, 0.4 and 0.5. 0.4 yields the highest compressive strength of 26 MPa. Hence, this ratio can be used in the future to further explore the behavior of GPC.

Keywords- Ordinary Portland Cement (OPC), Geo-Polymer Concrete (GC), Alkali Activated Materials (AAM), Wheat Straw Ash (WSA), Carbon Dioxide (CO₂), Super Plasticizer (SP), Sodium Silicate (Na₂SiO₃).



DESIGN AND PROBABLE IMPROVEMENT OF FIBER-REINFORCED CONCRETE CANAL-LINING BY ROLE OF ROUGHNESS COEFFICIENT

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Abstract- Flow resistance in channels carries prime importance for different purposes like evaluation of stage-discharge relationship. All relationships among Manning's Roughness Coefficient (N) and Froude Number (Fr) result in obtaining valuable information concerning design of an economical section, implementation and reducing the cost of construction. Fiber Reinforced Concrete (FRC) is strongly gaining attention of researchers which is credited to its improved properties. The necessity for optimal design of water-conveyance structures offers a wide range of research in the field of Water Resource Engineering. A review carried-out on optimal channels design specifies that alteration of Manning's Roughness Coefficient (N) with water depth has not been considered. This study primarily focusses on this variation of roughness coefficient in design of lined canal with the fiber-reinforced composites. So, the substantial difference regarding the results achieved for both scenarios, roughness coefficient of FRC compared with the conventional roughness coefficients of materials validates the need for considering variation of (N) with water depth. Moreover, when dealing with a distinctive design problem by means of the proposed equation it indicated the adequacy and the need for considering variable roughness while designing an economical section.

Keywords- Alternative, Canal, Concrete-Lining, Fibers, Manning's Roughness Coefficient



UTILIZATION OF WASTE PLASTICS AGGREGATE IN CONCRETE: A REVIEW

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Abstract- Plastic a material of thousand uses is enormously produced worldwide, this production has significantly increased the generation rate of plastic waste which is causing a serious threat to life on earth and environment. Recycling and reuse of plastic waste incorporated in concrete as aggregate is an eco-friendly solution, as it decreases the incineration and safeguarding the valuable land from landfilling. It has drawn attention many researchers and in the last decades extensive studies have been done and published on the replacement of plastic waste aggregate in concrete. This paper aims at the review of the latest research on concrete made with plastic aggregate. Discussions are made on the making of aggregate from plastic waste, followed by physical properties, mechanical properties and durability performance of plastic waste concrete. Due to lesser specific gravity of plastic, decrease in dry density is concluded. The Reduction in Compressive is attributed to the weaker bond of plastic waste aggregate with mix. Lessons learned for the practical applications and recommendations for future study are provided.

Keywords- Aggregate, Concrete, Mechanical Properties, Plastic Waste.



EXPERIMENTAL DETERMINATION OF THE MECHANICAL PROPERTIES OF BRICK MASONRY AND LOW STRENGTH CONCRETE BLOCK MASONRY

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Abstract- A practice of constructing reinforced concrete frame structures with unreinforced masonries is being followed all over the world. In the past, these masonries were considered as the non-structural elements of the building, but recent researches have shown their importance during seismic events where they greatly enhance the performance of the building. The most common type of masonries used in Abbottabad are brick masonry and low strength concrete block masonry. These masonries are the composite materials that generally consist of individual units of the bricks or concrete blocks bonded together with the help of mortar. Mortar is also the mixture of cement, sand and water. Due to this heterogeneity in the composition, mechanical properties of infill masonries are not the same as that of the individual units. Moreover, there are variety of materials available in the construction market, a most widely adopted material in one region may not be used entirely in other regions e.g. low strength concrete blocks that are most widely used masonry material in Pakistan especially in Abbottabad but are not considered outside the Asian sub-continent. Therefore, it is desirable to find out the mechanical properties of these infill masonries experimentally at the local level in order to assess their response under different types of loading e.g. seismic loading. This research aims at the experimental determination of mechanical properties of two types of infill masonries i.e. brick masonry and low strength concrete block masonry. The research is further focused on the establishment of empirical relationships between different mechanical properties and making their comparison with those given by other researchers and international standards. For this purpose, masonry prisms for both these types of infill masonries were constructed and tested in the concrete laboratory of COMSATS University Islamabad, Abbottabad Campus and the results were reported in terms of compressive strength, elastic modulus, shear modulus, Poisson's ratio. From the outcomes of this research it was found out that compressive strength of masonry depends on the compressive strength of masonry units and number of joints in a square unit. Greater the compressive strength of masonry unit, greater will be the compressive strength of masonry whereas greater the number of joints in a square unit, lesser will be the compressive strength of masonry and vice versa. Moreover, compressive strength, elastic modulus, shear modulus and Poisson's ratio were found to be 790 psi, 410 ksi, 166 ksi and 0.2383 for brick masonry whereas 400 psi, 250 ksi, 97 ksi and 0.3127 in case of concrete block masonry respectively.

Keywords - Infill Masonries, Compressive Strength, Elastic Modulus, Shear Modulus, Poisson's Ratio.



EVALUATION OF HALF-THROUGH BRIDGE LOAD-CARRYING CAPACITY BY USE OF NON-LINEAR ANALYSIS METHODS – CASE STUDIES

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Abstract- UK's existing railway network relies on many half-through bridges that were built during Victorian era and are already beyond their designated service life. Therefore, maintaining bridge assets in serviceable condition to ensure sustainable replacement rate without major network disruptions is vital. Current UK practice applies the British Standards and Network Rail's assessment codes to quantify the load capacity of such bridges using hand methods. If the codified methods rate the bridge capacity as substandard more advanced analysis (based on finite elements) is usually commissioned in an attempt to improve the capacity. In this advanced analysis the structure is modelled with 3D shell elements and the load group rating is extracted from a non-linear buckling and plastic analysis. Currently, there is not enough formal guidance regarding the pre-processing and more importantly the post-processing techniques of a FEA based assessment and quite often the knowledge and experience is passed over solely from more experienced individuals. This paper presents two case studies of real half-through bridges that demonstrate how additional FE model refinement, mainly through convergence enhancements, could reveal essential information about bridge behavior at or close to collapse load. Based on findings from the case studies, a set of generic recommendations is produced to inform both pre- and post-processing aspects of future assessments where bridge capacity is extrapolated directly from FE model results. The main aim of this paper to add more clarity in the interpretation of Nonlinear Analysis results. This can lead to more appropriate maintenance or strengthening recommendations and savings in the budget.

Keywords- Half-Through, Finite Element Model, Non-Linear Analysis, Network Rail.



MACHINE VISION BASED CRACK DETECTION FOR STRUCTURAL HEALTH MONITORING USING HARALICK FEATURES

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Abstract- Crack detection in structural elements is pivotal for structural health monitoring. In this paper, an automatic machine vision-based crack detection method is proposed, which is efficient, computationally simple, and fast in contrast to the time-consuming and highly subjective traditional visual inspection approach. Textural analysis of the concrete surface image is performed using Haralick features for crack detection. First, a combination of 8 suitable Haralick features in 4 different directions are extracted from the SDNET2018 image dataset. Then, different SVM classifiers are trained on the extracted features and tested using a 5-fold cross-validation scheme to distinguish between cracked and non-cracked images. The resulting best-trained classifier achieves an overall classification accuracy of 88%. Furthermore, the high classification accuracy for individual image categories indicates that the proposed method can effectively detect cracks in the images. Finally, crack orientation is localized based on the extracted feature values.

Keywords- Crack Detection, Haralick Features, Structural Health Monitoring, Machine Learning



DETECTION OF BUGHOLES USING IMAGE PROCESSING TECHNIQUE IN HYBRID CONCRETE

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Abstract- Concrete is the most widely used construction material and its strength is affected by bugholes, caused by air entrapped in concrete, which can be removed by different admixtures and heavy compaction techniques. However, in this study waste material like silica fume (SF) and fly ash (FA) are used to remove the bugholes without compromising the compressive strength of concrete. Image Processing (IP) technique was used not only to detect the bugholes, but also to determine the area of bugholes in hybrid concrete. 24 cylinders with six different mix ratios were cast with 0%, 15%, 25% of SF, and FA as cement replacement material in concrete. 12 of them were tested in compression and 12 of them were cut into 03 slices for images. The results show that compressive strength is increased with the increase in %age of SF and FA, while the % age of bugholes decreases with an increase in %age of SF and FA.

Keywords- Bugholes Concrete, Compressive Strength



ASSESSMENT OF BARS LAYOUT ON THE STRENGTH OF EXISTING RC HALF-JOINT STRUCTURES USING THE PLASTIC REDISTRIBUTION METHOD

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Abstract - Half-joints structures are commonly used during the 1960s. Construction of concrete bridges using half joint was simplified due to the central spans being able to be lifted into place once the cantilevered spans were constructed. In this form of construction, the beam geometry consists of a reinforced concrete nib with a full depth section adjacent to it; the force transfer from the load point through the nib and to the full depth section is relying on the reinforcement detailing, which can vary from the as-designed drawings. Engineers who are assessing the existing half joints structures may be challenged by missing bars or reinforcement layout not compliant with the current standards. Experimental work was carried out by Desnerck et al. to identify the consequences of a series of reinforcement configurations on the capacity (load) of half joint's beams. The reference beam designed as per prevailing practice was analysed by Qamar et al. using both Strut and Tie Method (STM) and Plastic Redistribution Method (PRM), previous known as Yield Assessment Method (YAM). The aim of this paper is to compare the experimental results of the beams having missing reinforcement with analytical results using the plastic redistribution method. The effect of missing bars was not considered in the previous study. The reinforcement layout and details, covering either missing horizontal reinforced bars, missing diagonal reinforced bars or a decreased amount of shear bars, were taken from the Desnerck et al. experimental work. It was found that the resistance obtained from PRM differed with the experimental data by maximum 12%. The findings of both the PRM assessment and the empirical works suggest that the consequence of improper bars layout is evident on the strength of existing reinforced concrete half-joint structures.

Keywords: Half Joint, Plastic Redistribution Method, Strut and Tie, Yield Assumption Method.



BOND PERFORMANCE OF SUSTAINABLE REPAIRING MATERIALS WITH STEEL REINFORCEMENT

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Abstract- Owing to the notable benefits of cement concrete such as flowability, high compressive strength, temperature resistance and economy, it is being used extensively in construction industry. However, concrete structures may deteriorate due to excessive loading, aging or various environmental factors. Repairing of concrete structures is an effective approach to avoid structural collapse. Several types of repairing materials have been explored at laboratory scale as well as at industrial scale. Two recent repairing materials are; polymer cement concrete (PCC) and geopolymer concrete (GPC). Both types of repairing concrete were used in this work and their bond strength with steel reinforcement was evaluated through pullout test. Conventional concrete was also used as reference specimen and results of pull out strength were compared with it. Experimentation revealed that all three types of specimens exhibited similar bond behavior. The experimental results were also compared with the existing code. Moreover, a relationship was proposed for prediction of bond strength and it showed close correspondence with experimental observations as well as with CEB-FIP code.

Keywords- Polymer Concrete, Geopolymer Concrete, Bond Strength, Pullout Test.



EVALUATING THE BLEND OF NaOH AND KOH ACTIVATORS FOR ECO-FRIENDLY GEO-POLYMER CEMENT MORTAR

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Abstract- Geo-polymer concrete is attaining the interest of scientific community as it is significantly addressing the ash disposal and CO₂ emission issues. In this study influence of Sugarcane Bagasse ash (SCBA) was investigated on cement mortar specimens. NaOH and KOH with different molarities were used as alkali-activators in preparation of SCBA based geopolymer mortar. Forty two mortar mixtures were prepared having water to binder ratio of 0.5. Test specimens were prepared with 20% change of cement weight with bagasse ash. Compression test was conducted to find the strength properties of bagasse ash based cement composite. Additionally, water absorption test and permeable porosity test were also performed. 7 days compressive strength was found less as compared with control specimens due to less geopolymerization process. Moreover, geopolymer specimens possess higher water absorption values and found dependent on pH of molar solutions. In non-structural concrete member, the use of geopolymer will lead to green environment.

Keywords- SCBA, Molar Ratio, Geo-Polymerization, NaOH and KOH.



EFFECT OF ADDITION OF DIFFERENT PERCENTAGES OF BENTONITE AND FLY ASH ON COMPRESSIVE STRENGTH OF CONCRETE

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Abstract- Concrete is stone like manmade very used construction material and it is prepared by the use of cement, aggregates (Fine and Coarse aggregates) and water. Concrete is very strong construction material. It have very good strength in compressive. It is the most used material after water and its utilization is about a metric ton per annum per capita. Its remarkable properties in fresh and hardened state have raised its usage to 12 billion tons per year globally. It is a cheaper material and performs better than aluminum and steel. This research work is carried out for to investigate the effect of different percentages of Bentonite and Fly Ash on the compressive strength of concrete. In this research Calcium Bentonite and F class Fly Ash is used. Four types of samples are prepared in which M1, M2, M3 and M4 contains (0%Bentonite, 0% Fly Ash),(05%Bentonite, 05% Fly Ash), (15%Bentonite, 15% Fly Ash),(25%Bentonite, 25% Fly Ash) respectively. A 6" by 12" cylinder is used for to determine the compressive strength of concrete and total 36 cylinders were prepared in four groups according to different mix proportions. The composition mixture rate for water-cement (w/c) is 0.59 and target Compressive Strength is 2400kg/m³. Then, the samples were cured for 7th, 14th and 28th days before testing. The result obtained showed that the concrete with additive material achieved lower compressive strength but the workability was increased. At 5% addition of Bentonite and Fly Ash maximum Compressive Strength of concrete was achieved.

Keywords- FA: Fine Aggregate , CA: Coarse Aggregate, FA: Fly Ash, BTN: Bentonite , WA: Workability



FRESH, MECHANICAL AND DURABILITY PROPERTIES OF ECO-FRIENDLY CONCRETE CONTAINING SUGARCANE BAGASSE ASH AND WOOD SAW DUST

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Abstract-In this study, sugarcane bagasse ash (SCBA) and wood sawdust (WSD) has been partly replaced with the binder and fine aggregates respectively to propose optimum percentages for producing an eco-friendly concrete. The SCBA and WSD were replaced as 0%, 7%, 14% and 21%, by weight with ordinary Portland cement (OPC) and by volume with the Lawrencepur sand respectively. A total of 16 mix types were prepared to determine fresh (using slump test), hardened (using compressive, split tensile and flexural strength tests) and durability (using water absorption and acid resistance tests) properties for deciding an optimum mix. Considering the fresh and mechanical properties, the optimum values of SCBA and WSD for replacement with the OPC and sand respectively were found to be 14% and 7% respectively. The samples of blended OPC mixes prepared with WSD and SCBA showed more water absorption but better acid resistance than the control specimen.

Keywords- Eco-friendly Concrete, Mechanical Properties, Sugarcane Bagasse Ash, Wood Saw Dust



FRESH AND MECHANICAL PROPERTIES OF AMBIENT CURED TERNARY BLENDED GEOPOLYMER CONCRETE REINFORCED WITH STEEL FIBERS

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Abstract- This paper focuses on development of a substitute binding material to replace Ordinary Portland cement (OPC) in conventional concreting. A total of 15 mix types (cured at ambient temperature) for the fly ash (FA) and slag (SG) based geopolymer concrete (GPC) with quarry rock dust (QRD) as a partial replacement of SG, incorporated with steel fibers (SF), were prepared and tested. A series of tests to determine the fresh and hardened properties viz. slump, compressive, split tensile and flexural strength, were carried out on the prepared samples. The workability of GPC mixes decreases with the increase of QRD content. From mechanical properties, the optimum mix obtained in this study is GPC-D0.75F which contains 50% FA, 35% SG and 15% QRD by weight and 0.75% SF by volume. The compressive, splitting tensile and flexural strengths of the optimum mix have improved significantly than their OPC concrete counterpart.

Keywords- Ambient Temperature Curing, Geopolymer Concrete, Quarry Rock Dust, Steel Fibers.



CHARACTERIZATION OF BRICK MASONRY OF OLD AND NEW BUILDING BLOCKS AT GCT RASUL

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Abstract- In historical buildings the clay brick masonry was used in too much quantity. In order to characterization of brick masonry of old and new building block at GCT Rasul, for this purpose 12 samples of clay brick specimen, cement and lime mortar were collected from main (old) building block and B-Tech new building block. All the collected samples were characterized and evaluated physically, chemically and mechanically. After study and evaluation the large variation in the properties was found. Furthermore the sample of lime mortar which was used for the construction of main building block and the sample of cement mortar which was used for the construction of new B-Tech building block were also analyzed. The result of main (old) building and new B-Tech building were compared. And a significant difference were found in chemical properties, mechanical properties, water absorption, porosity, of old bricks was high which was constructed by using lime mortar and the water absorption and porosity of new building bricks was low which was constructed by using cement mortar. The main building block and new B-Tech building block were constructed 1912-16 and 1980-86 respectively.

Keywords- Clay Bricks, XRD Of Brick, Physical And Mechanical Test Of Brick, Chemical Composition Of Mortar



SUSTAINABLE BUILDINGS AND INFRASTRUCTURES DEVELOPMENT USING INNOVATIVE MATERIAL AND ADVANCE TECHNOLOGIES-A REVIEW

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Abstract- For a meaningful growth about global sustainable development, sustainability attainment in affordable housing and infrastructure development is fundamental. With the unsustainable use of energy and growing ecological issues of the industries, there is attention in our globe. The general objective of this research paper is to review the research's regarding sustainability. The specific goal is to focus on buildings and infrastructure sustainability. In methodology, Green building and infrastructure development researches are reviewed, sustainable house construction using recycle material prepared for interlocking blocks are considered, building information modeling (BIM) role adapted to improve efficiency. The output of these methodologies based on the best solutions for sustainable life are reported. This paper will help in providing the practical approach and valuable effect of sustainability on the environment.

Keywords- Sustainability, Green Buildings, Interlocking Blocks, Ecological Issues, Building Information Modelling.



CRITICAL SUCCESS FACTORS FOR SUSTAINABLE BUILDING CONSTRUCTIONS-A REVIEW

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Abstract- Green building is also known as a sustainable or high performance building. Various efforts have made by researchers to discover the critical success factors (C-S-Fs) for green building projects (G-B-P) in past few years. However, the most important C-S-Fs need to summarize from the literature review for the successful completion of G-B-P from planning to execution. The overall aim of this research is to explore the suitability of C-S-Fs for G-B-P. The current study is review of previous studies from 2010 to 2020 on important C-S-Fs for G-B-P. In addition, the C-S-Fs are identify for G-B-P by reviewing 57 research articles of different countries. The review results show the popularity of survey and case study in G-B-P related to construction management sector. The essential contributing factors are collected that are corresponded to research approaches in sustainable construction. The outcomes show that the significant attention is gain by the researchers to consider the C-S-Fs for G-B-P. The C-S-Fs of G-B-P are concisely considered by reviewing 27 articles from the total of 57 articles. After that, outcome in form of almost 12 C-S-Fs are reported in current paper. Among all critical success factors, five factors plays an important role in G-B-P for the improvement in sustainable construction. These factors include clear goals and objectives, owner's involvement and commitment, performance of project manager's, effectiveness of project control and planning and cooperation and communication between project members. These commonly identified five C-S-Fs for G-B-P are discuss in detail. Further studies are required for C-S-Fs of G-B-P, which are also suggested in this work.

Keywords- Critical Success Factors, Green Building Projects; Review; Sustainable Construction.



SUSTAINABLE CONSTRUCTION AND DEMOLISHING WASTE MANAGEMENT: A CASE STUDY IN PAKISTAN

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Abstract- Construction and Demolition waste management (CDWM) is an important topic nowadays as the world is moving towards more sustainable development. The social, economic, and environmental objectives will take into consideration as human health, safety, and quality of life is the main concern without compromising the sustainable future. In this paper, C&D waste is categorized, barriers against CDWM from different countries are analyzed and relate with CDWM in Pakistan. A case study is conducted in which a CDWM model is used to, minimize waste generation in the first place i.e. waste process management is implemented, reuse of demolished material. Suggestions are made by keeping the objectives of waste management in mind. As sustainability aims are crucial in CDWM, findings will help create some effective models of CDWM in Pakistan's construction industry.

Keywords- Waste Management Barriers, Construction And Demolition Waste Management, CDWM In Pakistan, Sustainability



SUSTAINABILITY ASSESSMENT OF CONSTRUCTION PROJECTS IN PAKISTAN AND GEO-SAT

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Abstract- Sustainability is a philosophy focused on supply and demand considering current generations as well as potential ones. Economy, environment, engineering, and equity (social) are the four foundations of Sustainable Development (SD). The second-largest industry in Pakistan is construction (after agriculture). To evaluate current practices and recommendations for the future, an assessment of the sustainability activities carried out in this sector is required. 37 of 76 generic indicators of Environmental Geotechnics Indicators (EGI) were used for the appraisal of civil engineering ventures in Pakistan. Compared with the most viable options recommended for achieving SD, the findings showed very poor performance. The results also showed the lack of a dedicated sustainability assessment tool for geotechnics, thereby, suggesting an urgent need for the development of one such tool. This paper also presents a framework for the new tool called as Geotechnical Sustainability Assessment Tool (Geo-SAT).

Keywords- Framework, Geotechnical Sustainability Assessment Tool, Impact, Sustainability



CHALLENGES IN ADOPTION OF BIG DATA IN CONSTRUCTION INDUSTRY OF PAKISTAN

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Abstract-Construction industry has an important part to play in the development of a country. There has been a recent growth in this sector after government incentivizing the industry; however, due to the prevalent traditional practices projects often exceed the constraints. With increasing infrastructure development, there has been felt a need to employ Big Data management in the construction sector to manage the huge chunks of data being produced annually. Big Data, being a rising concern, is driving huge IT investments to manage and maintain it in different sectors like genomics, simulations, environmental research, urban informatics, business and e-science etc. A research was carried out to identify the basic challenges that pose in way of formulation of a Central Big Data Management System in Pakistan for construction sector, under government supervision. The challenges were identified through a frequency analysis of the respondents, which included clients, consultants and contractors. The study highlights the importance of a central management system to increase productivity and efficiency, lower costs and risk involved and optimize the construction practices.

Keywords- Big Data In Construction Industry, Big Data In Pakistan, Big Data Management System, Hadoop.



SUSTAINABLE CONSTRUCTION RISK ASSESSMENT THROUGH DYNAMIC SITE LAYOUT PLANNING AND SIMULATION BY BUILDING INFORMATION MODELLING

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Abstract- Construction industry is prone to risks due to the dynamic nature of activities and the placement of numerous facilities at site. Mostly, site layouts are treated as static, whereas, construction projects are dynamic in nature, whose requirements change over time. With the growing concern for sustainable development in construction sector, it is imperative that risks at construction projects related to all aspects of sustainability; social, economic and environmental must be evaluated. Therefore, dynamic site layout planning integrating sustainability risks was performed in this study. A model considering the interaction flows between construction facilities and their safety/environmental concerns was employed to assess the safety risks for the sustainable site layout planning. A case study of a commercial building project of developing country was selected to validate the safety risk assessment model. The interaction flows between facilities and their safety/environmental concerns were evaluated and risk of site layout was calculated for the case study. The risk assessment model was then optimized by varying the interaction flows for all phases of project and a new site layout scenario was developed with reduced risks. Sustainability risks arising due to various facilities were evaluated from their interaction flows and safety/environmental concerns. Building Information Modeling (BIM) was used to develop the dynamic site layout scenarios. By dynamic site layout planning risky nature of construction site was reduced by 26.47% and social, economic and environmental risks are reduced by 25.43%, 18.31% and 17.71% respectively. This model is valid for a variety of construction and infrastructure development projects and can be used by various stakeholders of the construction industry for sustainable site layout planning.

Keywords- Building Information Modeling, Construction Safety, Construction Site Layout Planning, Sustainability Risks Assessment



PASSIVE DESIGN FEATURES FOR ENERGY EFFICIENT RESIDENTIAL BUILDING IN HOT CLIMATE

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Abstract- The rapidly growing use of energy has raised concerns for depleting energy resources and the resulting heavy environmental impacts. The contribution from the buildings towards energy consumption has steadily increased over the past few decades. Growth in the population, increase in the use of technology, increasing demand for building services, enhanced comfort levels, as well as increase in the time spent inside the buildings depicts an upward trend in energy demand. For this reason, energy efficiency in building sector is of prime importance today. The reduction in energy consumption in buildings can be achieved by simple methods and techniques such as using passive design features and renewable resources. Climate responsive design of buildings and energy efficient systems and technologies such as passive solar systems can reduce the energy demand in buildings. This research is aimed to make contribution in the designing of energy-efficient residential buildings. This study provided guidelines for designing the energy-efficient residential building with passive design features and suggested environmental friendly materials in the context of Rahim Yar Khan, Pakistan. A model house was designed with passive design features and using climate responsive design strategies, evaluated with Ecotect software to analyze the efficiency of suggested passive design features which showed promising results in terms of energy efficiency.

Keywords- Energy-efficient Buildings, Passive Design, Renewable Resources, Residential Building Design



ANALYZING FACTORS INFLUENCING CONSTRUCTION LABOR PRODUCTIVITY USING FUZZY ANALYTICAL HIERARCHY PROCESS (FAHP)

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Abstract- The construction sector contributes an indispensable role in the country economy. Among many other factors the significance of the construction labour production cannot be denied. The cost of labor comprises of 30-50% of the project costs. To improve the productivity of the construction labor, it needs to explore the factors that affect the productivity. This study is conducted to analyze the factors that affect the construction labor productivity in developing country like Pakistan. The factors were tabulated after studying detailed literature about the topic of discussion. The factors were then analyzed by taking the experts responses on a scale of 1-9. The fuzzy Analytical Hierarchy Process (Fuzzy AHP) is used to rank the factors considering the expert responses. The results reveal the “leadership and effectiveness” of the managing personals on site is the main factors that affect the labor productivity. The outcomes of this study will be used as an input of making policies for improving the labour productivity in construction industry.

Keywords- Labor Productivity, Factors affecting, Fuzzy AHP



DAMAGE ASSESSMENT OF HISTORICAL BUILDINGS: A CASE STUDY OF HISTORIC SHRINE OF MULTAN

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Abstract- Assessment of safety is very important before taking any prevention decision through qualitative and quantitative data. Qualitative information involves visual examination of structural failure, erosion, and damage, and quantitative data includes a measurable quantity such as laboratory testing, numerical methods, etc. The quantitative data is a comprehensive approach to collecting data that requires expertise as well as takes more time and resources. Hence, there is a need to find out effective approaches for examining the damage level of such structures because there are so many historical landmarks and only a few experts in this area. There are guidelines and checklists are available for designing seismic resistance structures especially for current structures including assessing damage level. However, damage assessment before the hazard is still not common for historical buildings and shrines. This research presents the visual inspection practice for the identification of the damage level of the historical masonry buildings. Based on the assessment results, this study will help specialists to design the high-damage buildings towards the visual inspection.

Keywords- Historical structures, Masonry, Damage assessment, visual inspection.



SUSTAINABLE DESIGN OF BUILDINGS THROUGH BIM: A COMPREHENSIVE REVIEW

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Abstract- Building Information Modeling (BIM) is an effective and emerging approach for managing the complex construction projects. BIM has been successfully applied in construction industry. However, several compatibility issues were recorded. This article provides an overview of the literature on sustainable digital building models. Moreover, it covers cost estimation, energy savings, energy analysis, carbon calculation and waste management in the buildings. Furthermore, this study suggests that these parameters should be considered at an early stage of project. In practice, this type of management is usually done at later stage in the design process, which leads to the re-design of complete project. In addition to this, it also provides information on the various software tools that can lead to the selection of efficient structure. Autodesk Revit, Dynamo Factory and HBERT Recovery are the different softwares selected. Future aspirations are also offered for implementation.

Keywords- BIM, cost estimation, energy efficiency, sustainable buildings.



A REVIEW OF VIRTUAL, AUGMENTED AND MIXED REALITY TECHNOLOGIES FOR CONSTRUCTION

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Abstract- Construction is an important industry which has a potential to uplift the social and economic progress of any country and is directly related to improve the quality of humans' life. Unfortunately, its operations are very complex that hinder its performance to its full potential, thus, very less improvements are made to increase its productivity and efficiency as compared to other industries. Furthermore, it is a slow adopter of new technologies due to associated cost and risk. Recent visual technologies, such as, Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) are developed and being adopted in different trades. With the development of Building Information Modelling, it is possible for the construction industry to employ these technologies. This study is aimed at reviewing the latest developments in VR/AR/MR technologies and presents a fundamental understanding of these technologies. The adoption of these technologies by the construction industry at present is also given. Furthermore, a few practical applications of VR/AR/MR for the industry are outlined. Nonetheless, few research gaps are highlighted that need to be explored by the research community. The VR/AR/MR technologies seem promising to offer benefits to many industries including the construction sector, however, as these technologies are new at present, an in-depth exploration, investigation and analyses are required for a practical and profitable adoption.

Keywords- Augmented Reality, Construction Industry, Mixed Reality, Virtual Reality



DEVELOPMENT OF AUTOMATED RESOURCE MANAGEMENT SYSTEM (ARMS)

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Abstract- The efficiency of construction industry is measured by on time project completion. Unfortunately, most of the construction projects suffer time and cost overruns owing to complex nature of construction industry. To overcome this challenge, construction industry needs to incorporate automation and information technology (IT) application in various construction processes. Projects subsume enormous unmanned resources to undertake project tasks on time and conforming to the quality standards. Unscrupulous resource management leads to schedule slippage, poor budgeting and disputes among project stakeholders. The application of modern automated tools can make efficient information management and project data sharing alongside augmenting productivity. This research focuses to integrate automated communication system with resource management processes to improve overall project efficiency. Factors contributing automated resource management have been identified through extensive literature review. Further, the scrutiny of factors has been carried out by gathering responses from industry experts using a questionnaire. A framework for automated management of non-labor resources is developed based upon communication links and relative information flow of construction activities. This framework supports in developing a mobile application that allows construction personnel to request for resources, check request status and resource monitoring. This research signifies that automated resource management system entails efficient communication among participants and leads to auspicious project delivery.

Keywords- Communication System, Construction Database, Construction Automation, Resource Management



ACHIEVING THE SUSTAINABILITY IN CONSTRUCTION BY USING ARTIFICIAL AGGREGATES IN CONCRETE

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Abstract: Environmental issues compel construction experts to search materials that do not pose hazard to environment. Reduction of natural resources and higher density of natural aggregates results in production of dense concrete that increase dead load, and hence overall building cost. Therefore, cost effective and lightweight concrete mix can resolve these problems. The aim of this research is to choose the best locally available material to produce cost effective lightweight concrete which has required strength, lesser density, electrical conductivity, and thermal conductivity as compare to normal weight concrete (NWC). For this purpose, three types of sample were taken to evaluate compressive strength, thermal conductivity, and electrical conductivity. First sample was made by using bloated Shale from Islamabad, Lahore, and Peshawar, second one by using bloated Shale from Karachi and third one by using bloated Slate from Peshawar and these samples were used as replacement of natural aggregate in concrete. Concrete samples were tested for strength, electrical conductivity, and thermal conductivity. The strength and other properties were used to design the multistory building to check variation in member sizes and hence cost. These tests showed that, the particle size of artificial lightweight aggregates is larger than particle size of natural aggregates that will helpful in improving strength of concrete. Bulk density of artificial lightweight aggregates in loose state is only 70% of that of natural aggregates and similarly bulk density of artificial lightweight aggregates in compact state is around 68% of that of natural aggregates. Thermal conductivity of artificial lightweight aggregates concrete is 1.030 which is around 49% of that of normal concrete. The electrical conductivity of artificial lightweight aggregates is 0.141 which around 16% lesser than electrical conductivity of normal concrete. Normal weight concrete has the highest strength and shale Karachi with 10% sawdust has the lowest strength. On basis of pairwise comparison putting their relative scores in the software and result extracted from the software shows that NWC is best alternative with respect to compressive strength. The artificial light weight aggregate concrete has lesser energy demand, better comfort level and lesser structural cost compare to normal weight concrete. As artificial light weight produced in lesser amount therefore, manufacturing cost of these aggregate is higher than normal aggregate.

Keywords: Energy Performance, Normal Concrete, Lightweight Concrete, Natural Aggregates, Artificial Lightweight



COST COMPARISON OF CONCRETE FRAMED STRUCTURE USING NATURAL AND ARTIFICIAL COARSE AGGREGATES

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Abstract: Due to increase in environmental issues, construction industry is continuously in search of materials that do not pose hazard to the environment. There is a need of cost effective and lightweight concrete mix that resolves these problems. This research provides solution to these problems alongside with significant compressive strength using naturally available lightweight structural aggregates concrete (LWSAC). Due to their low density they produce lightweight concrete, which also have better insulation property and brings down construction, operational and maintenance cost of the building. The aim of this study is to choose the best locally available material to produce lightweight concrete. Low density of these materials will lead to less dead load, hence reduced size of structural members which reduces overall construction cost. Low thermal conductivity leads to energy efficient housing. For this purpose, three samples will be taken. Low density means less dead load and hence reduced size of foundations, which reduces cost and concrete production. Low thermal conductivity leads to energy efficient housing. For this purpose, a sample was prepared using artificial (slate) aggregates from PCSIR Lab Peshawar as replacement for natural aggregates in concrete. Concrete samples were tested for strength, electrical conductivity, and thermal conductivity. These tests showed that, the particle size of artificial lightweight aggregates is larger than particle size of natural aggregates that will helpful in improving strength of concrete. Bulk density of artificial lightweight aggregates in loose state is only 70% of that of natural aggregates and similarly bulk density of artificial lightweight aggregates in compact state is around 68% of that of natural aggregates. Thermal conductivity of artificial lightweight aggregates concrete is 1.030 which is around 49% of that of normal concrete. The electrical conductivity of artificial lightweight aggregates is 0.141 which around 16% lesser than electrical conductivity of normal concrete. After that, these properties were used in design of multistory building to check any variation in the member sizes. It is noted that compressive strength of LWSAC is similar to normal concrete but this concrete has better insulation properties than that of normal concrete. Overall cost of structural members has also reduced when LWSAC was used instead of normal concrete.

Keywords: Energy Performance, Normal Concrete, Lightweight Concrete, Natural Aggregates, Artificial Lightweight Aggregates, Human Comfort



EXPLAINING SUCCESS IN GREEN BUILDING PROJECTS USING TRANSFORMATION-FLOW-VALUE-GENERATION THEORY

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Abstract- Green Buildings (GBs) are construction projects developed on the principles of sustainable development. Project success in GBs is an important concept to determine their performance. This concept is operationalized by success factors which affect the performance of a GB project and success criteria based on which a project's performance can be determined. Previous studies on GBs are limited in providing an interpretation of the Success factors and Success criteria in terms of the theories related to construction. This lack of interpretation has constrained the development of theory as well as research on GB project success. With a focus towards Green Buildings, this paper aims to explore the use of the Transformation-Flow-Value-generation (TFV) theory for interpreting success factors and success criteria. Upon analysing a few examples of Success factors and criteria, it is realized that the TFV theory can interpret GB project success. The findings presented in this paper have theoretical implications as these can inform research in construction projects in general and GB projects in particular. For future research on GB project success, the TFV theory can be used as a theoretical framework.

Keywords- Green Building, Transformation-Flow-Value-Generation Theory, Waste, Success Factors, Success Criteria



APPLYING SEMI DISTRIBUTION HYDROLOGICAL MODEL TO ASSESS HYDROLOGICAL REGIME IN LAI GIANG CATCHMENT, BINH DINH PROVINCE, VIETNAM

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Abstract- The discharge of water is considered as one of the most significant hydrological parameters as it defines the stream course, size, and shape. The information related to flood forecasting and prediction of sediment load can be thus obtained from observing flow discharge. The present study is carried out to determine the effects of various factors including climatic circumstances, topography, land use, type of soil on the water discharge in Lai Giang River Basin, Vietnam by using Geographic Information System (GIS), and semi distribution hydrological model (SWAT). In this process, GIS supplies spatial input files for the SWAT model set up and calibration. The simulation of water discharge in Lai Giang river basin was carried out between the years 1995-2009, has shown comparatively good results because R^2 and E values were above 0.7.

Keywords- Flood Forecasting, GIS, SWAT, Sediment Load.



APPLICATION OF HYDRODYNAMIC MODELLING TO ASSESS THE EFFICIENCY OF HURRICANE PROTECTION MEASURE AT XOM RO DIKE, PHU YEN PROVINCE, VIETNAM

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Abstract- Coastal erosion is a phenomenon caused by anthropogenic impact and climate change in recent years. With a rise in highly unpredicted frequency of hurricanes, wave impact on the coasts lead to debris removal and coastline erosion. Sudden sea level rise and unstable surge made by unpredicted trajectory of severe wave impacts could be considered as the main cause of erosion and destruction of coastal constructions such as sea dike, especially in the Xom Ro sea dike in the central Vietnam, which has important mission to protect citizens life and properties of Phu Yen province. The present study is based on the coastal region modeling using hydrodynamic model Mike 21 from Binh Dinh to Binh Thuan province and particularly for the Xom Ro sea dike, Phu Yen province. By assessing different scenarios of hurricane protection of the Xom Ro sea dike under simulated hurricane (level 6, 9 and 12), this study will help to have comprehensive views of the affection of coastal protection measures along with detailed assessment of coastal shoreline status before and after extreme weather conditions.

Keywords- Climate Change, Flood, Hurricane, Hydrodynamic Modeling, Coastal Erosion



SECOND STAGE STILLING BASIN AS A SOLUTION FOR CHASHMA BARRAGE DUE TO DAMAGE CAUSED BY RETROGRESSION PHENOMENON

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Abstract- Chashma Barrage located on the Indus River in district Mianwali was constructed in 1971 as a part of Indus Basin Project. The Barrage is different in the sense that it has some storage capacity for regulation of water for irrigation releases, power generation and supply of cooling water for Chashma Nuclear Power Project. The riverbed below Chashma barrage has been degrading since its commissioning in 1971. This has resulted in low tail water levels for the whole range of discharges, and consequent deterioration in the performance of stilling basin of the barrage. For the maximum flood record of 1,038,873 cusecs observed in 2010, the tail water level was 5.3 ft. lower than design value. Similarly, for flood discharge of 636,000 cusecs in 2015, the tail water level was lower to the extent of 6 ft. from the designed figure. For discharges of 500,000 cusecs and below the tail water level is lower by 5 ft. on the average. Observations show that in general, tail water lowering has continued even after the record flood of 2010. As a result of lowering tail water levels, the required conjugate depth for formation of hydraulic jump is not attained with the consequence of inadequate jump formation and the passage of undissipated energy downstream, causing scour and damages to stone apron, as a recurring feature. Solution for the formation of a stable jump on the protected area could be achieved from either of following options: Construction of a secondary weir and addition of an auxiliary stilling basin of appropriate length with a lower floor level, immediately below the existing stilling basin floor.

Keywords- Chashma Barrage; Stilling Basin; Retrogression.



THE CHINIOT DAM – SHEET PILE DESIGN ASPECT

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Abstract- The hydraulic structures can be built on either of permeable or impermeable foundations. The structures built on permeable foundations are subject to seepage pressures and the optimal cost of these structures is a non-linear function of the factors that cause the seepage force under the structure. However, the basic parameters of hydraulic structure, such as the depth of sheet piles or cut edges, and the length and thickness of the floor, cannot be determined in a cost-effective manner. In designing hydraulic structures, sheet piles are needed to reduce uplift force and hydraulic gradient. Usually, two sheet piles are required. The upper pile is used to reduce the uplift force, and the d/s pile is used to reduce the hydraulic gradient. The results show that if the d/s pile is deeper than the upper cutting wall, the resulting lifting force will increase. The increase in the depth of the d/s pile and the increase in the overall length of the floor result in a decrease in the resulting hydraulic gradient. When the two piles meet at the end of the hydraulic structure, the exit is lower than when the pile in the d/s direction is larger. On the other hand, the obtained results provide the best optimal parameters in terms of seepage flow, length and floor thickness. Use safe exit gradient and filters, respectively to incorporate soil type and hydrological conditions into the dam design.

Keywords- Chiniot Barrage; Chiniot River; Sheet Pile; Khosla Theory



PROVISION OF SUBSIDIARY WEIR AS A SOLUTION FOR DAMAGES CAUSED BY RETROGRESSION AT JINNAH BARRAGE

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Abstract- The process of retrogression initiates temporary soon after the construction of hydraulic structures on the alluvial rivers. Retrogression resulted in unusually high speeds downstream of the barrage, resulting in repeated structural damage to friction blocks, reverse filter blocks, and stone apron. Operational problems of sluice gates and hoists. The main objectives of this research work are to study how damages were controlled caused by Retrogression and to check different discharges with their effects of D/S for safety. The hydraulic performance was checked for different flows starting from 20,000 cfs. In first case no additional retrogression was considered with 20% flow concentration. In second case 3ft additional retrogression was considered due to Kalabagh dam and 20% flow concentration. The results indicate that the lowest jump formation level with Blench equation with 20 % concentration of flow and additional 3 feet retrogression downstream of the proposed weir is at RL660.28. Maximum water level downstream of Barrage in main weir portion is RL693.14. Moreover, subsidiary weir provided will stop downstream erosion of barrage.

Keywords- Subsidiary Weir, Retrogression, Jinnah Barrage, Discharge



INVESTIGATING MULTIPLE DEBRIS IMPACT LOAD AND ROLE OF VEGETATION IN PROTECTION OF HOUSE MODEL DURING FLOODS

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Abstract- Storms and flooding caused significant damage to buildings. The waterborne debris created during such natural disasters will cause significant damage to the many structures unless they were designed for these loads. Flood field survey findings suggested large objects such as wooden logs, cars, vessels, storage barrels, and other containers intensify the damage. For this cause, a driftwood approach was established to test tree washout, floating trees movement, and collisions with the house model. This paper addressed the findings of experimental analysis on the frameworks to measure the debris impact, hydrostatic and hydrodynamic forces. It also analyzed the formulas, which were defined with the experiment results in the recently released design guidelines (FEMA P-646, 2012). Moreover different hydraulic jumps were observed while observing water surfaces in three different situations (without house model and vegetation, only vegetation and with vegetation and house model). This resulted in an energy reduction of up to 18 % for only vegetation case and 19 % for vegetation with house model.

Keywords- Experimental Modeling, Flood Born Debris, Floods, Flume Experiment, Vegetated Channel.



DRIVER AND PEDESTRIANS INTERACTIONS CHARACTERIZATION

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Abstract- Traffic accidents comprising pedestrian have been a huge problem in third world countries. These accidents occur due to robust and greater number of urban infrastructural developments, increase in the number of vehicles and lack of traffic rules followed by the drivers and pedestrians. The basic road design in the developing countries does not provide pedestrian safety. A case study has been conducted at Inter Junction Principal (IJP) Road in Rawalpindi to find out the effect of pedestrians on traffic flow. Similarly, a linear relation has been found between the flow and density while an inverse relation of the travel time with flow and density.

Keywords- Pedestrians, Speed, Density, Travel Time, Flow, Vehicles



DEVELOPMENT OF A SHEAR THICKENING FLUID AND ITS USE AS A MODIFIER IN ASPHALT BINDER

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Abstract- This study presents development of a Non-Newtonian fluid, also referred to as a Dilatant or Shear Thickening Fluid (STF), and its use as an additive/modifier for improvement of different visco-elastic properties of bitumen. Dosage optimization of STF was done with the help of Superpave performance grading (PG) technique and other conventional asphalt binder tests. Storage stability test was carried out to ensure the stability of the new STF modified bitumen samples. Binder samples were prepared using different dosages of STF and then different conventional and rheological tests were used to study the effect of STF on the properties of modified binders. From the results of investigations, an optimal dose of 4% STF by weight of the binder is selected for upgrading the binder properties. The addition of 4% STF helped to improve the high-temperature visco-elastic properties of the asphalt binder which is a major requirement of the local pavement industry in Pakistan. STF improved the high-temperature range of the binder under study from Superpave PG 52 to PG 64.

Keywords- Shear Thickening Fluid, Performance Grading (PG), Complex Shear Modulus, Modified Bitumen



INFLUENCE OF BANANA FIBERS ON ASPHALT BINDER

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Abstract- The application of natural fibers as a modifier in the asphalt binder has been extensively increased due to their environment and economic friendly extraction. In this study, banana fibers of 6mm length have been used to prepare modified asphalt binder with three different dosages of 2, 4 and 6% by weight of binder. The effect of banana fibers on various binder properties was investigated by conducting a combination of conventional and rheological testing which includes penetration, softening point, ductility, performance grading and frequency sweep tests. The study concludes that penetration and ductility of modified asphalt binder decreases but the softening point increases with the increase in the percent dosages of banana fibers. The shear modulus improved significantly with an increased dose of fibers which concludes that banana fibers made the asphalt binder harder, stiffer and improved its resistance to high temperature performance.

Keywords- Banana Fibers, Asphalt Binder, Performance Grading, Dynamic Shear Rheometer.



THE EFFECT OF USING POLYPROPYLENE FIBER ON DEFORMATION RESISTANCE OF ASPHALT CONCRETE

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Abstract- Asphalt concrete (AC), a mixture of bitumen and aggregates is one of the widely used material in Civil Engineering with an approximate worldwide usage of 102 million tons annually. Since the pavement construction is only expected to increase with time, scientists and engineers have been putting great effort into improvement of the performance of asphalt pavements from both the functional and sustainability perspectives. Binder has been of special focus in this regard and has been modified with the addition of various fibers in one of the recognized techniques to improve the Asphalt Concrete. Fibers modified asphalt is referred to as Fiber-Reinforced Asphalt-Concrete (FRAC). One key fiber that has shown promising outcomes is polypropylene fiber. In this study, we investigated FRAC materials modified by polypropylene fiber inclusion and its effect on the deformation resistance. The Effects of modification were also observed on the mixing procedure. Results showed that the Optimum Binder Content increases 10-11% and the stability of the polypropylene fiber modified asphalt pavement increases up to 14% however, the flow values decrease up to 7-8%. Addition of polypropylene fibers significantly improved the deformation resistance of asphalt. In addition to achieving the asphalt mechanical improvement through polypropylene fibers lead to the concept of a new market to utilize the waste fiber thereby lessening the environmental consequences.

Keywords- Asphalt Concrete, Fiber-Reinforced Asphalt Concrete (FRAC), Polypropylene Fiber.



THE EFFECT OF USING STEEL FIBER ON DEFORMATION RESISTANCE OF ASPHALT CONCRETE

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Abstract- Asphalt concrete (AC), a mixture of bitumen and aggregates is highly temperature sensitive and an equally important material used in civil engineering due to its utility and universal usage and thereby making it one of the highly researched area in the field with a focus on improving the Asphalt concrete. Of the many approaches, modification of the asphalt binder is one that focuses on addition of external agents for improving *Asphalt Concrete*. Nowadays, different materials are used to reinforce asphalt concrete. Fibers have made a reputation for themselves among the other modifiers used mainly due to the promising results that they have shown. Steel fiber modified asphalt is referred to as steel fiber-reinforced asphalt-concrete (SFRAC). This study investigates the usage of steel fiber as a modifier and its results on the deformation resistance of the *Asphalt Concrete*. The whole process was investigated carefully to observe the effects steel fiber on the mixing procedure of Asphalt Concrete during the manufacturing phase, and performance of asphalt concrete was inspected later using several laboratory tests. Results showed that the Optimum Binder Content increases 4-6% however, the stability of the steel fiber modified asphalt pavement decreases up to 20% and hence causes no significant improvement in deformation resistance. This reduction in the stability is mainly due to the insufficient bonding of the steel fiber with asphalt concrete. Whereas, from the sustainability perspective, it leads to concept of the new market to utilize waste fibers.

Keywords- Asphalt Concrete, Asphalt Mechanical Improvement, Fiber-Reinforced Asphalt Concrete (FRAC), Steel Fiber.



INFLUENCE OF MORINGA OIL ON ADHESION AND MOISTURE SUSCEPTIBILITY OF RECLAIMED ASPHALT PAVEMENT

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Abstract- Due to high traffic loading and environmental exposure the bitumen binder becomes stiff which losses its physical and chemical properties. To use the high content of Reclaimed Asphalt Pavement (RAP) in asphalt mixture, recycling is done. Recycling of asphalt pavement not only save the money but also at the same time it protects our environment. Therefore, to recover its properties different types of rejuvenators have been used in RAP. In this study Moringa Oleifera (MO) lam seeds oil (0%, 3%, 6% and 9% by weight of binder) is used as a rejuvenator and Bitumen bond strength (BBS) and Rolling Bottle Test (RBT) is performed. Results of Conventional testing revealed that by adding MO oil in RAP binder penetration values increases and softening point decreases respectively, as percentage increases. Results of BBS testing shows that by increasing the percentage of MO oil in RAP Pull of Tensile Strength (POTS) values are decreased and failure changes from cohesive to adhesive after wet conditioning.

Keywords- Conventional, Reclaimed Asphalt Pavement, Recycling, Adhesion



EFFECT OF TRANSPORT INFRASTRUCTURE DEVELOPMENT ON HEALTH OF NATIVES: A CASE STUDY OF LAHORE ORANGE LINE METRO TRAIN PROJECT

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Abstract: Development of Transport infrastructure is an essential necessity for evolution of economic growth and continuing improvement in living standards of citified occupants. However, it causes environmental contamination also lead by several factors. Construction activities yield inorganic dust, noise, vibrations, and volatile organic compounds. Natives along the urban project sites are exposed frequently to multiple health hazards including immunological, neurological, hematological, and respiratory diseases. Implementation of environment management plan (EMP) is considered mandatory for infrastructure projects and is followed by all stake holders in developed countries but there are so many challenges in developing countries like Pakistan. Environmental impact assessment (EIA) is obligatory part of the construction projects according to Pakistan Environmental Protection Act (PEPA), 1997. But unfortunately, EPM is not implemented and followed in its true sense. This research is comprised of Effects of Lahore Orange Line Metro Train project to the health of natives along the project sites regarding construction phase of project. 142 respondents are selected randomly along corridor i.e. from stabling yard to Depot. Data collected through questionnaire survey and analyzed by descriptive analysis using statistical tools. Specific sensory nervous system i.e. Sight (vision), Hearing (audition), Taste (gustation), Smell (olfaction), Touch (somatosensorial), skin (dermatological) and respirational effects are the special areas of research. Distress due to obtrusion of utility lines and general living of natives of project have also been investigated. The study framed guide lines to identify the health hazards for natives of project and concluded logical severity level against each hazard. This will be helpful to adopt realistic approach to distinguish the concerning nuisances individually in connection with remedial measures for future projects to enhance sustainable urban infrastructure development trends in developing countries like Pakistan.

Keywords: Bus Rapid Transit System, Environment Management Plan, Lahore Orange Line Metro Train, Health Effects.



ASSESSMENT OF ADHESION AND MOISTURE SUSCEPTIBILITY OF WASTE PLASTIC AND CRUMB RUBBER MODIFIED BITUMEN

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Abstract- Inappropriate disposal of a large amount of waste material in the form of plastic and rubber tires is a serious environmental concern. The use of these waste materials in asphalt not only enhance the properties of asphalt binder but also serves an effective means for their safe disposal. In this study Polyethylene Terephthalate and Crumb Rubber have been used in various combinations to modify 60-70 pen grade bitumen. Bitumen Bond Strength test using Pneumatic Adhesion Tensile Testing Instrument and Rolling Bottle Test were performed to evaluate the adhesion and moisture susceptibility of the modified binder. The experimental results revealed that modified bitumen with 15% Polyethylene Terephthalate shows better adhesion and moisture susceptibility compared to crumb rubber modified and control binder.

Keywords- Waste Material, Asphalt, Bitumen Bond Strength, Rolling Bottle Test.



EXPERIMENTAL STUDY OF SHRINKAGE IN MUD BRICKS AND ITS CONTROL

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Abstract- Shrinkage in mud Adobe-Buildings is one of the major issues, need to be consider before the construction. Cracks formation occurs during shrinkage is the result of water evaporation from the mud. Cracking in any materials can lead to a pattern formation over a wide range of length scale from microscopic to macroscopic. It is unwanted phenomena often result in the abandonment of the technological process. Many researchers solve this process up to some extent but yet to overcome on it. In this study Poly Vinyl Alcohol (PVA) is used in some specific proportion with water to minimize the shrinkage and maximize the strength of adobe construction. The performance of different laboratory tests helps to determine the specific ratio of chemical stabilizer with soil through which the shrinkage get reduced to control cracks. The results show that chemical stabilizer used have reduced the shrinkage in the mud beam up to 3.02%.

Keywords- Adobe Bricks, Chemicals Ratio, Shrinkage, Sustainable Development



STABILITY ANALYSIS OF SLOPES USING LIMIT EQUILIBRIUM AND FINITE ELEMENT METHODS

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Abstract- The stability of natural and manmade slopes is a common geotechnical problem. Due to its importance, the analysis of slope stability has received wide attention in literature. Various methods have been developed to analyze slope stability each of which is based on different assumptions and conditions. Each technique has some advantages and limitations. This paper compares the factor of safety and failure surfaces of slopes obtained by limit equilibrium and finite element method. For this purpose, Rocscience SLIDE 6.0 for limit equilibrium (LE) and PLAXIS for finite element (FE) analysis was used. The safety factors were calculated for different slope geometry and soil types. A comparison was made among the slip surfaces and factor of safety values obtained using both approaches. It was concluded that LE approach, estimated a higher factor of safety as compared to the FE approach. Also, significant variation is found in the failure surfaces as determined from both approaches.

Keywords- Slope Stability, Limit Equilibrium, Finite Element Method, PLAXIS, Rocscience Slide 6.0



INVESTIGATING THE SUITABILITY OF IN-SITU SOILS OF PESHAWAR FOR UN-STABILIZED RAMMED EARTH CONSTRUCTION

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Abstract- Rammed earth building is a sustainable solution globally. Particularly when built utilizing local soils it reduces the carbon footprint. The time-tested examples of traditional rammed earth constructions and the achievements/accomplishments of contemporary rammed earth constructions is appealing. Though remarkable buildings are being constructed by a handful of experts yet the data supported knowledge base and expertise is scarce locally. Other than careful design detailing and controlled construction, material suitability plays a vital role in its success. For sustainable earth building construction with the optimum use of material resource, soil suitability must be determined. In this research, five random soil samples from all around Peshawar were selected and their suitability for un-stabilized rammed earth application was investigated according to NZS 4298:1998. All the specimens failed the compression and wet-dry appraisal tests. All the specimens passed the Geelong Drip Test. S1, S2 and S4 passed the spray erosion test and S5 passed the linear shrinkage test. No soil specimen passed all the tests suggested by the standard for rammed earth construction. Hence silty-clayey soils of Peshawar with approx. 985 kN-m/m³ compactive effort at optimum moisture content (OMC) was found to be not suitable for rammed earth application according to NZS 4298:1998.

Keywords- Earth Building, Earth Construction, Soil Suitability, Un-Stabilized Rammed Earth



CONSEQUENCES OF POORLY COMPACTED BACKFILL MATERIAL ON CONCRETE RETAINING WALLS

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Abstract- Reinforced concrete retaining walls are extensively used in civic and transport infrastructure. Their integrity plays an important role in ensuring public safety. Despite the advancement in construction techniques and improvement in design codes, retaining wall failures are still common and instigating life and property loss. The quality of backfill material is directly related to the distresses generated in the wall. The classical design techniques used for earth pressure estimation normally consider triangular earth pressure distribution and ignores the soil arching effects. In this research prevalent finite element analysis has been done on concrete retaining walls with different backfill characteristics. Overall 12 cases has been investigated to highlight the consequences of poorly compacted backfill material on concrete retaining walls. This multi-physics approach considers the real effect of the backfill soil on pre-failure distresses generated in the concrete retaining walls. It has been observed that poorly compact backfill material can generate higher stresses in wall at critical sections. The analysis results can be effectively utilized to improve the wall geometric designs and hence, enhance the public safety and furthermore, believed to be helpful for the engineers involve in the design and construction of retaining walls.

Keywords- Concrete Retaining Walls, Backfill Material, Horizontal Thrust, Wall Stresses.



EFFECT OF SAWDUST- LIME AND SAWDUST ASH-LIME ON THE GEOTECHNICAL PROPERTIES OF AN EXPANSIVE CLAYEY SOIL

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Abstract- When the applied loads on the soil is higher than its capacity, the engineers resort to certain methods to stabilize the soil by improving its load carrying capacity against the externally applied loads. The utilization of natural materials to improve engineering parameters of soil have become very popular in recent years; they are environmentally friendly materials and are available cheap. In this research, expansive clay is treated with a mixture of sawdust (SD) with Lime (L) and sawdust ash (SDA) with lime (L). Atterberg limits, unconfined compression, and permeability tests were conducted to study the effects of the additives in the soil. It was concluded from the tests that the sawdust – lime and sawdust ash – lime mixtures decreased the consistency limits of the clay. Also, an improvement was noticed in the unconfined compressive strength and coefficient of permeability of the stabilized soil. Also, optimum dosages of sawdust – lime and sawdust ash – lime of 3% and 4% respectively were found to give the best results.

Keywords- Consistency Limits, Expansive Clay, Lime, Sawdust, Sawdust Ash, Permeability, Unconfined Compressive Strength



EFFECTIVENESS OF STONE DUST AS AN EXPANSIVE SOIL STABILIZER

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Abstract- This paper mainly deals with the laboratory investigation of waste stone dust to improve problematic expansive soils that shrink and swell during wet and dry season. The expansive soils result in shrink /swell and differential settlement of structures. Soil survey conducted in Sudan reveals the fact that almost one third of Sudan's 2,600,000 km² area is occupied with the expansive soil. Usage of certain kind of admixtures on expansive soil looks prepossessing on the works where other improvement techniques become extensive and therefore are expensive too. So, to maintain a balance in between the source budget and project efficiency and ultimately to avoid problem of disposing available soil, and borrowing the soil, betterment in problematic soil through admixtures looks appealing. Therefore, an experimental examination was conducted on the soil by blending the soil with SD (Stone Dust) to study impact of stone dust on soil properties. The percentage of stone residue was taken within range of 5% to 20% of the total soil sample in tests. The primary arrangement of tests incorporates specific gravity, liquid limit, plastic limit, CBR, Optimum moisture content and maximum dry density were performed on soil and same tests were directed in the second arrangement on the soil sample blended with stone dust. Laboratory examinations states that soil swell potential was diminished to 4.4% from 8.4% at 12% SD and soil transformed to non-expansiveness from medium expansiveness similarly plastic index and liquid limit values were found to be gradually decreasing from 20.1% to 8.4% and 40.7% to 31.9% respectively at 0% to 18% SD, moreover the values of OMC reduced from 12.4% to 6.2% and MDD improved from 1.84 (g/cm³) to 2.16 (g/cm³) at 0% to 20% SD, likewise the void ratio and porosity improved from 0.632 to 0.637 and 38.74% 38.89% respectively at 0% to 18% SD.

Keywords- Soil Stabilization, Expansive Soil, Stone Dust.



CHARACTERIZATION AND STANDARDIZATION OF SAND FOR LABORATORY TESTING IN PAKISTAN

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Abstract- This study focuses on characterization and standardization of sand for geotechnical research in Pakistan. Sand samples were collected from two different locations inside Pakistan keeping in view annual mineral production reports of Mines and Mineral Department Government of Punjab. Samples were tested in different educational and commercial laboratories for determination of required properties. The tests carried out were color, specific gravity, grain size distribution, minimum dry density and maximum dry density, minimum void ratio and maximum void ratio, direct shear test, mineral composition, shape of grains and hydraulic conductivity. Results of samples were compared with Ottawa F-65 & F-50 standard sand in Illinois in United States of America in order to find out standard source of sand for geotechnical research in Pakistan. After comparing samples it was revealed that sand sample having identification D-KP collected from Khusab-Punjab Pakistan has more resemblance with Ottawa-sand therefore this source has been recommended as Standard Sand for Laboratory based Research activities in Pakistan.

Keywords- Ottawa Sand, Characterization Of Sand, Geotechnical Research, ASTM Specifications



SOLUTION TO FOUNDATION PROBLEMS IN COLLAPSIBLE SOILS OF KALLAR KAHAR, DISTRICT CHAKWAL, PUNJAB, PAKISTAN

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Abstract -This study aims at providing the solution to Foundation Problems in Collapsible Soils of Kallar Kahar, District Chakwal, Punjab, Pakistan. Kallar Kahar is located in a semi-arid area. Most of the structures built in Kallar Kahar are cracked after or even during the construction stage. Generally, such cracks are related to bearing capacity problem i.e. either sub-soils possess low shearing strength or foundations undergo excessive settlement. Apparently, this is not the case. Soils are seen hard possessing moderate shearing strength and similarly chances of excessive settlement under existing structural loads seems to be unlikely. With no apparent reason, this is a challenge to Geo-technical Engineers of this region. One of such problematic sites is identified as the Fauji Foundation Hospital and Model School, Kallar Kahar. This study is carried out to identify the collapsible soils, assess the collapse potential and employ appropriate mitigation measures of this particular site and adjacent area. The research work is found to be of practical importance and beneficial for soil and foundation engineers to deal with collapsible soils. After the detailed analysis, it is concluded that soils present around the FFHS, Kallar Kahar, are potentially collapsible and needs proper attention in this regard.

Keywords- Collapsible Soils, Collapse Potential, Single Oedometer, Double Oedometer, Kallar Kahar



APPLICATION OF PLAXIS FOR CALCULATING THE CONSTRUCTION STABILITY AND SOFT EMBANKMENT IN PROTECTING HA THANH RIVER, BINH DINH PROVINCE

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Abstract- The study aims to assess the anti-erosion efficiency of Ha Thanh embankment system to the downstream river sections nearby Dieu Tri bridge, which has been affected significantly by heavy floods, especially during flood season. With a great curvature, the loss of land (riverbank erosion) and the gain of land (riverbank accretion) are happening frequently and significantly. Besides, this study would clarify the model of stress, work ability and deformation calculation of embankment application in reality. With the significant development of natural and uncontaminated measures as Geotextile fabric Soft Rock and Vetiver grass in riverbank and coastal protection, this study would assess the stability through scenarios for both hard and soft embankments and comparison of these measures with current methods applied against erosion.

Keywords- Stability, Flood, Model Of Stress, Deformation, Embankment, Geotextile Fabric Soft Rock.



THE USE OF PALSAR (D.E.M.) FOR MEGA FRACTURE ANALYSIS OF DABBAR ANTICLINE, SULAIMAN FOLD BELT, PAKISTAN

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Abstract: The structural analysis has been carried out on the Dabbar Anticline using D.E.M. (Digital Elevation Model) data derived from Phased Array type L-band Synthetic Aperture Radar (PALSAR) of 12.5m resolution. The main structure is interpreted as upright, asymmetrical, gentle anticlinal fold based on the stereographic analysis. A total of three hundred fractures are marked across the Dabbar anticline having multiple lengths and orientations. One hundred and three fractures are marked on the Northern segment, sixty-one fractures are marked on the Central segment and one hundred and thirty-six fractures are marked on the Southern segment of the Dabbar anticline. Stereographic analysis and Rose diagrams show that the most major trend of lineaments is in NW-SE direction, parallel to maximum stress and termed as oblique fractures. This research in the Sulaiman Fold Belt indicates that mapping the structural features through D.E.M. data can provide a fair amount of geological information for understanding the characteristics of hydrocarbon reservoirs and engineering structures.

Keywords- PALSAR-D.E.M., Tensional Fractures, Asymmetrical, Rose Diagrams.



ECONOMIC COMPARISON OF THE GEOTHERMAL HEAT PUMP SYSTEM AND CONVENTIONAL WATER HEATERS FOR HOT WATER SUPPLY IN APARTMENT BUILDINGS

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Abstract: Saudi Arabia is in the process of dealing with energy availability, production, and consumption by foreseeing the possible issue of energy shortage in the country. Considering a huge demand for energy in the region the government has taken solid steps to address the issue and has formed various authorities to monitor, control, and manage energy consumption. The building industry is the highest consumer of energy where it is used for heating/air conditioning the indoor spaces, lighting, and running appliances and heating water during winters. This article presents an economic comparison of a conventional hot water heating system and another technique of Geothermal Heat Pump System (GHPS) which uses the heat energy of earth for heating water for domestic use. The effort has been made to assess the possible use of GHPS in apartment buildings in Saudi Arabia. Detailed design and analysis are conducted for both systems and a cost estimate is prepared. Life Cycle Costing is performed which includes the installation and operational costs of both the systems for a period of 5 years. The conventional system proves to be economical in terms of installation but in terms of energy consumption for the next 5 years, it becomes very expensive. Whereas the GHPS system shows almost one-third the total cost of the conventional hot water heating system showing a significant amount of energy consumption and financial benefit. The research shall prove to be beneficial for the construction and building industry in their efforts to reduce energy consumption by creating innovative designs and ideas.

Keywords: Hot Water Supply, Geothermal Energy, Geothermal Heat Pump, Economic Comparison, Life Cycle Costing,



INDUSTRIAL WASTE WATER ANALYSIS: A CASE STUDY OF CHASHMA SUGER MILLS, D.I KHAN

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Abstract - Sustainability is one of the most important concerns of the world today. The concept of sustainable development is gaining popularity of all around the world in day by day in economic sector like construction, architecture, agriculture, water resource & public health engineering. Water is life of all human activities so sustainable usage of water is very critical. Waste water generate from industries are to be reuse in other purposes to maintain circular economy. To reserve natural resources, reduce, reuse and recycling of waste water are very important. This research is about Industrial waste water analysis of Sugar Mills. The waste water generating form various processing units of the mill are discharged into a nearby canal. The water of this canal is further used for various purposes of economy and social purposes e.g. for agriculture, drinking (animals), construction and by other aquatic life. The purpose of the research is to analyze this waste water to know whether it is hazardous or advantageous for above social and economic activities. Un-treated sewage is also responsible for contaminating of environment with harmful micro-organisms called pathogenic bacteria. This pathogenic bacterium causes serious diseases like cholera, typhoid, dysentery, dangi etc. Also the floating sewage of untreated sewage decomposes & creates unpleasant smell & odors in waste water. Grab samples of water were together from all the units and particular areas at regular intervals inside Mills. They were analyzed for physical perimeters (color, taste, odor, turbidity, Total dissolved solid), chemical parameters (Hardness, chlorides, alkalinity, PH values) and for Biological perimeters (COD, BOD). We compare the results of physicals, chemicals and biological tests with the environmental standards CFWQG and NEQS. Some of the results are within range but some are positive. It is recommended that appropriate water treatment system is to be planned to treat the waste water before entering to the canal or river to make the environment free from pollution.

Keywords- Sustainability, Water Quality, Public Health, Social Well-Being, Circular Economy, Chashma Sugar Mills D.I Khan.



PHYSICOCHEMICAL AND BIOLOGICAL ASSESSMENT OF POTABLE WATER OF SAHIWAL CITY

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Abstract: - Water is one of the essential necessities among all and used for various purposes from human consumption to industrial use. Over 70% above, of the Earth's surface, comprises of water, only less than 1% of which is available as freshwater. Approximately more than one billion people lack safe drinking water worldwide. This paper studies the physicochemical and biological contamination in potable water of Sahiwal, for exactness of their influence on water quality. For this purpose, the bore and municipal water samples were collected from 6 different localities of the city. They were analyzed for 11 parameters including, temperature recorded by the ordinary thermometer, taste, color and odor were detected by six senses, the value of pH and total dissolved solids (TDS) with the help of pH meter and TDS meter, turbidity by using nephelometer, total hardness, alkalinity and dissolved oxygen (DO) by the titration method. This qualitative analysis strategy adopted to undertake this research has provided valuable data and information. For all the samples, the degree of temperature and measure of color, taste and odor were unobjectionable. The amount of turbidity, alkalinity and hardness were satisfactory. The amount of pH also lies within the permissible ranges set by PS: 1932-2010, WHO and IS: (10500-2004) standards. The amount of TDS was also in between excellent to the fair ranges. However, the amount of DO in municipal water samples of Shadman Town and Sadman Town and bore water of Johar Town and Sadman Town samples was found less than the required limit set by the WHO. The research signifies that overall, the water quality of all the samples was fit for the drinking purpose and can be utilized for various domestic purposes without any reluctance or second thoughts. The results of this study can enhance the understanding of quality of safe drinking water in Sahiwal.

Keywords: - Assessment, Alkalinity, Acidity, Potable Water, Dissolved Oxygen, Physicochemical, Total Dissolved Solids



DRINKING-WATER QUALITY ASSESSMENT: A CASE STUDY OF SADIQABAD CITY

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Abstract- Water used by humans should be fresh and non-toxic as it is one the most important need among all and used for various purposes from human consumption to industrial use. Drinking water is causing many deaths in Pakistan. Pakistan falls on number 80, in the list of 122 those states which consume contaminated potable water. The water quality in several municipalities of Pakistan is getting worse day by day. It is required to examine and analyze the quality of water in Sadiqabad, as there are no primary reports or in-depth research available related to ground and municipal water quality assessment of Sadiqabad city. This analysis was particularly concerned about the collection of water samples, to test physicochemical and biological contamination present in potable water of Sadiqabad, for exactness of their influence on water quality. For this purpose, the tube wells (bore) samples were collected from fifty-eight different localities of the city and were analyzed for 17 parameters including, Taste, Color, and Odor detected by senses, pH value by using pH meter, Total Dissolved Solids (TDS) with the help of TDS meter, Turbidity by using Nephelometer, Total Hardness, alkalinity, etc. This qualitative analysis strategy adopted to undertake this research has provided valuable data and information. For all the samples, the measure of color, taste, and odor was unobjectionable. The amount of turbidity and hardness was satisfactory. The amount of pH also lies within the permissible ranges set by WHO standards. The amount of TDS was also in between excellent to the fair ranges. It was, concluded that overall, the water quality of the city, was satisfactory and there was no need for water treatment. The results of this research can boost up the knowledge of the quality of safe drinking water in Sadiqabad. The methodology adopted can be replicated in other cities of Pakistan, where significant issues of the potable water pollution, are being risen.

Keywords- Water Quality, Potable Water, Total Dissolved Solids.



DIFFERENT PERSPECTIVES ON WATER QUALITY OF LOCAL FILTRATION PLANTS IN PAKISTAN

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Abstract- Water is very important for the survival of all living beings on earth. Water quality plays an important role for health of human beings, especially when it comes to potable water. The main sources include ground and surface waters. In this paper, a review is made on different perspectives about water quality of filtration plant for use by the common people. These include water quality importance, processes involved in filtration, different tests on quality and guidelines for safe water supply. The main aim of this literature research is to document necessities required for filtration plants for safe water so that an easy to implement ways from water supply to quality water can be proposed. Many aspects are discussed in detail to recommend some practical line of action for regulatory authorities. For efficient output, government and private organizations should work together. A proper coordination is must regularity bodies and public.

Keywords- Water Quality, Filtration Plant, Water Supply, Quality Tests And Guidelines, Regulatory Authorities



SPREADING OF COVID'19 THROUGH WASTEWATER IN UNDERPRIVILEGED SOCIETIES - AN OVERVIEW

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Abstract- The prospective spread of unique human coronavirus by means of contaminated food and water and by aerosols-borne itineraries are turning up to be a major up challenge for all. All over the globe, every country is, at the moment, trying to overcome defies imposed by this disease. There is a need to comprehend the destiny of the virus in the environment. In this literature research, different modes of disease transmission with special focus on the wastewater management are emphasized. The literature up till now indicates that, in addition to direct person to person transmission (which is the most common form of transmission), the virus can also be transmitted through air born droplets, and also through feco-oral rout through contaminated food and water. As there is a knowledge gap indicating no evidence about transmission of coronavirus through the untreated potable water, questions regarding the consequences of non-availability or poor wastewater management strategies, increasing population rate, and failing economy of many countries, need to be addressed. It is concluded that more research is needed to estimate the future of coronavirus and form strategies for its eradication.

Keywords- Waste Water, Sewage Associated, SARS-Cov-2, Virus-Containing Aerosols, ARDS, Water Management.