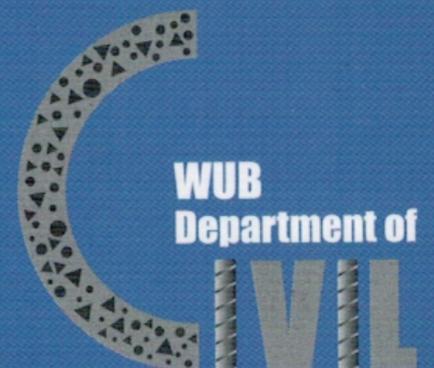
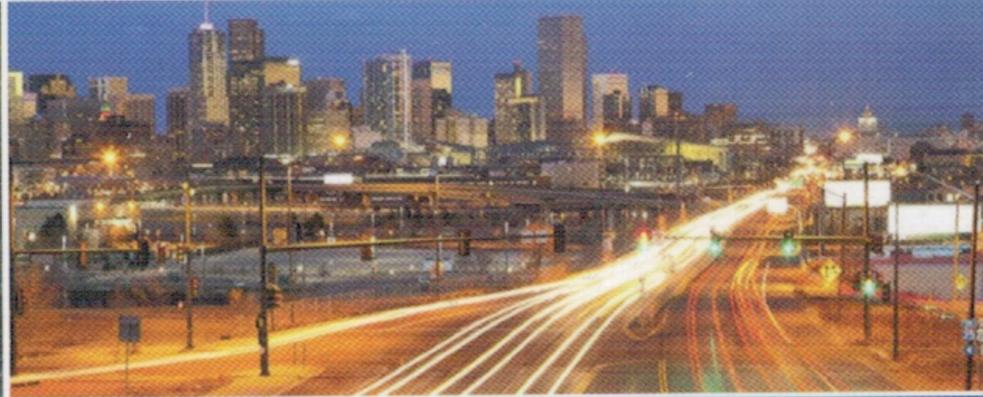
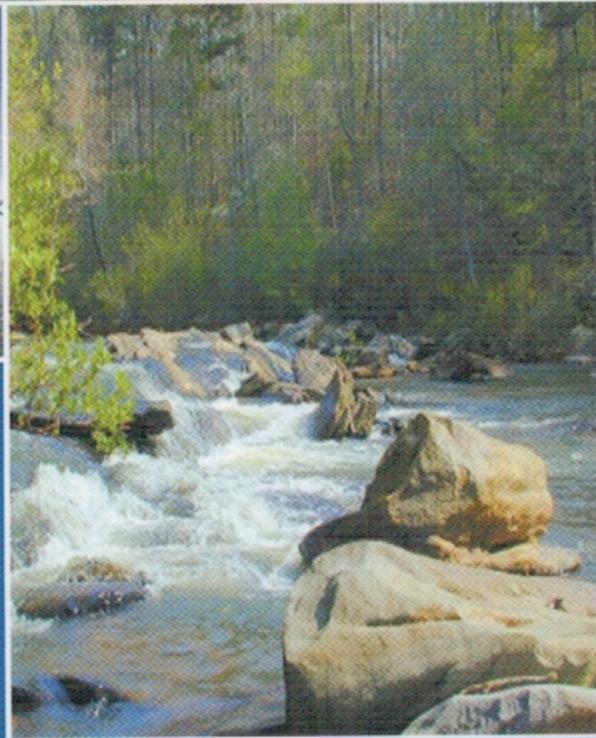


CREATION: ANNUAL SCIENTIFIC REPORT

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OF BANGLADESH
A University for Quality and Utilitarian Education

CREATION

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Professor Dr. Abdul Mannan Choudhury

Vice Chancellor
World University of Bangladesh
Editor-in-Chief



Message

I am extremely glad to know that the Department of Civil Engineering, World University of Bangladesh, is going to publish CREATION - an annual scientific report. World University of Bangladesh is a leading university of utilitarian education. The vision of the university is to create leaders who will make their brain as the tiniest laboratory capable of making enormous contributions to economic emancipation and social well-being of the country. To realize the vision, we are committed to build up a university of quality and distinction. I believe that I am a dream merchant and have become capable of selling my dream to my colleagues. My colleagues of Civil Engineering Department in line with the vision, mission and objectives of the university have translated strategies, tactics and actions in grooming students as worthy citizens. The graduates will emancipate themselves, their families and the society at large, I hope.

I appreciate all academics and render my special thanks to Professor Dr. SM Shirazi, Associate Editor of CREATION for taking the auspicious initiative.

Hope that future of Civil Engineering Department will be smoother and friction-free through attainment of appropriate attitude, education and skill.

Professor Dr. M Nurul Islam
Pro-Vice Chancellor
World University of Bangladesh



Message

I appreciate all academics of Civil Engineering Department for publishing CREATION - an annual scientific report. Our country needs technologically skilled manpower for national development in all sectors. I believe that the Department of Civil Engineering has equipped its graduates with necessary skills and knowledge through quality education.

Students graduating should be innovators and problem solvers and will have to find better solutions overcoming backdrops with goal oriented technologies. A lot of endeavors and works are ahead for the civil engineers. At World University of Bangladesh, we are creating a group of enlightened people to serve the nation and make our independence meaningful. I am confident that our enlightened Civil Engineering graduates will be able to serve the nation through their acquired knowledge and skills with sincerity, honesty and patriotism.

I wish all the graduates the very best in their future endeavors.

Morsheda Choudhury
Treasurer
World University of Bangladesh



Message

It is a pleasure to know that the Department of Civil Engineering, World University of Bangladesh (WUB), is going to publish CREATION - an annual scientific report on 1 March 2017. I appreciate the academics in the Department of Civil Engineering for taking the initiative to publish this document. The department of Civil Engineering started since the early days of the university. It has produced graduates who are either employed or pursuing higher education at home or abroad.

The success of Civil Engineering at WUB has been manifesting, because our courses and curriculum are of international standard and utilitarian in nature, and our teachers and employees share and care the same vision, mission and objectives of its founder.

Professor Musfiq M Choudhury
PhD (Durham), Post Doctoral (Southampton)
Chairman (Acting)
Board of Trustees/Governors



Message

I extend my heartiest appreciation to all academics of the Department of Civil Engineering. It is an excellent initiative to publish CREATION - an annual scientific report. I understand that such an output is the demonstration of its strength in terms of structural, water resources, environmental and transportation engineering by students and academics. I express gratitude to Professor AFM Abdur Rauf and especially to Professor Dr. SM Shirazi to monitor such a publication and make it available to the various stakeholders.

I hope Civil Engineering graduates will use their knowledge for the upliftment of the nation and prove themselves worthy human beings.

Professor AFM Abdur Rauf
Dean, Faculty of Science and Engineering



Message

It is a great pleasure for me to write a few words for “CREATION”- an annual scientific report of Civil Engineering Department, World University of Bangladesh. The initiative definitely is one step forward towards academic achievement of the department vis-à-vis of the university. I thank all the teachers who have taken initiatives for the report. I also thank the university authority for their able guidance and financial support in this respect. I would like to mention and appreciate the eagerness and enthusiasm shown by the students of the department in making the report a success. I should mention the name of Prof. Dr. SM Shirazi for taking up initiative and giving his valuable time for publication of the report.

I hope, the future generation of Civil Engineering Department will keep this trend onward and will try to enrich the quality of the “Annual Scientific Report” every year.

Professor Dr. SM Shirazi, CEng
Head
Department of Civil Engineering
Associate Editor of CREATION



Message

It is my pleasure to inform you that Department of Civil Engineering, World University of Bangladesh (WUB), is going to publish “CREATION - an annual scientific report” on 1 March 2017. I would like to congratulate this opportunity of editing CREATION as associate editor. I wholeheartedly thank the academics, technical and administrative staffs for their hard work to make this event successful. This write up is our tradition to share our outcomes throughout the year to the educationists and researchers in the university as well as to the public at large. The academic staffs are active in research in all sub-disciplines of Civil Engineering including structural engineering, water and environmental engineering, transportation, geotechnology, management and so on to contribute to the advancement of the knowledge in Civil Engineering. The teaching and research activities in the department has been contributing to train more excellent engineers. Last couple of years the department produced many graduates at bachelor levels. I do hope this annual scientific report is informative enough to present the activities of the department and this type of report will, hopefully, be published every year.

Professor Md. Sekander Ali
Department of Civil Engineering



Message

I have the great pleasure and satisfaction on the publication of CREATION - an annual scientific report from Civil Engineering department of World University of Bangladesh. It contains the research and project reports in abstract form relating to various topic of Civil Engineering discipline. The necessity of publication of such report would have been felt since long. The matter would have been roaming in the minds of the faculties of Department of Civil Engineering. But it could not have been materialized for not taking active initiative and persuasion. Recently this has been seriously discussed at the departmental meetings. By the grace of the Almighty and at the active participation of the teachers of the department, the publication has come to light. Professor Dr. S.M Shirazi and Sagor Kumar Podder, Senior Lecturer deserve the best appreciation for the successful publication of the CREATION. This report will certainly help to increase our knowledge regarding research works in Civil Engineering field which in turn will help to develop our beloved country in the arena of Engineering. I think, both the graduates and the graduating students will be benefitted to have ready references in professional and research works from this publication.

I hope, CREATION will be published every year from now on with more resources in the field of Civil Engineering. I wish all the best for the CREATION.

Assoc. Prof. Rabindra Ranjan Saha, PEng
Head (Evening Shift)
Department of Civil Engineering



Message

It is a great pleasure for us that the Department of Civil Engineering, World University of Bangladesh (WUB) is going to publish 'CREATION' an annual scientific report containing summary of the research works of the last few years performed by the students and the teachers. I think this will be guidance for the teachers and students of the Civil Engineering Department and will help them to enrich their knowledge. I congratulate all the teachers and students who have extend affords in preparing and publishing the same.

I wish this initiation is beginning and will continue its creation in regular basis.

Teaching staff of Civil Engineering Department



Professor AFM Abdur Rauf
Dean, Faculty of science and
Engineering



**Professor Md.
Sekander Ali**



**Professor Dr. SM
Shirazi, CEng**
Head, Department of
Civil Engineering



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Rangon Mondal

**USE OF SUPER PLASTICIZERS ADMIXTURE FOR HIGH
STRENGTH OF CONCRETE**

**Md. Saiful Islam, Al-Mamun Talukder, Md. Hafijur Rahman,
Munshi Eastiak Ahmed**

Department of Civil Engineering, World University of Bangladesh

New types of admixtures known as super plasticizers have been introduced in North America within the past several years. These admixtures can enormously increase the workability of normal Portland cement concrete or greatly reduce its water content requirement. Super plasticizers are more expensive than conventional water-reducing admixtures. The dosage requirements vary between 0.5 to 3 percent by weight of cement, depending on the type of admixture used. Normally, the super plasticizer is added to the truck mixer after it arrives at the jobsite and at the last convenient moment before discharge. Within 5 minutes or less, the slump greatly increases and at this time the user can get the most advantage from the high fluidity of the concrete. The slump then steadily decreases during the next hour or more and it is for this reason that the super plasticizer is not added until just before use of the concrete. The rate at which the slump decreases depends on the type and amount of super plasticizer added. This reports the results of a laboratory investigation of how super plasticizers affect the workability, strength of high-strength concrete.

**COMPARISON BETWEEN SHALLOW AND DEEP FOUNDATION FOR A
TEN STORIED RESIDENTIAL BUILDING CONSIDERING SEISMIC AND
WIND LOADS**

**Md. Saiful Islam, A. K. M Shahedul Haque, Subas Chandra Shill
Department of Civil Engineering, World University of Bangladesh**

This project paper presents the comparison between shallow and deep foundations for a ten storied residential building considering seismic and wind loads. In this study, a two way beam supported floor system ten storied residential building frame analysis was performed by computer software, Extended Three Dimensional Analysis of Building System (ETABS) for the determination of the base shear of foundation. For the design purpose the building frame dead load, live load, earth quake, wind force, stair loads and different loading combinations were considered according to Bangladesh National Building Code (BNBC). After 3D analysis, the structural member (foundation) of the building was designed by using Ultimate Strength Design (USD) method according to Bangladesh National Building Code (BNBC), 2006 and American Concrete Institute (ACI) Building Code, 2005. The result obtained from the analysis are used for preparing the reinforcement designed and drawings by manual & Auto CAD. The selection and usage of shallow foundation depend to a large extent the geological and soil condition of the area. Bangladesh is underlined by crystalline and sedimentary rocks. The soil conditions of the country provided good bases for the use of shallow foundations to support most low rise buildings in the country. For the determination of shallow foundations, parameters the Terzaghi bearing capacity equation used in Bangladesh. On the other hand, deep foundation uses most likely high rise building where soil condition of the area is very poor. It is calculated and designed by manual only foundation base shear taken from ETABS. Accurate analysis and design can be possible by using software based on ETABS, SDL and GEAR.

**COMPARATIVE ASSESSMENT OF MECHANICAL PROPERTIES USING
DIFFERENT TYPES OF COARSE AGGREGATE CONCRETE**

MS Islam, M Hilkaifi, Nurnabi, MS Momotaz

Department of Civil Engineering, World University of Bangladesh

In this work, an experimental investigation is carried out to observe the influence of aggregate types on the stress-strain behavior of concrete made with fresh and recycled aggregate. In addition, compressive strength by destructive test, Splitting tensile strength and Young's modulus, shear strength, flexural strength are also determined. Four types of coarse aggregates, fresh brick, recycled brick, fresh stone and recycled stone aggregate having the same gradation and water cement ratio ($w/c=0.42$) are used. The experimental results show that around 15% decrease in 28 days compressive strength of concrete made with recycled stone aggregate in comparison to fresh stone aggregate. Similar trend is observed for fresh brick and recycled brick aggregate. It may be due to brittle surface recycled aggregate. Around 15% to 17% decline in 28 days splitting tensile strength of concrete made with recycled stone aggregate in comparison to recycled fresh stone aggregate. On the other hand, 12% to 13% decrease was observed for recycled brick aggregate compared to fresh brick aggregate. It may be due to brittle surface recycled aggregate. About 24%-26% decline in Young's Modulus is seen for the both cases of concrete made with recycled aggregate (brick and stone) compared to fresh brick and stone aggregates. Rupture strain limit of fresh stone aggregate concrete was increased almost 18% -20% compared to that of the recycled stone concrete. However, for fresh brick aggregate concrete, it was almost 20% improvement compared to recycled brick aggregate concrete. In the both cases, same trend is shown for shear strength capacity and it was about 12%-13% downfall for recycled (brick and stone) aggregate compared to fresh (brick and stone) aggregate. For flexure strength, around 14% downfall is shown in case of recycled aggregate compared to fresh stone aggregate and also similar trend is observed for fresh and recycled brick aggregate. Relatively ductile failure is seen for fresh aggregate and relatively brittle failure is seen for recycled aggregate. It can also be said that relatively ductile failure is seen for fresh aggregate and relatively brittle failure is seen for recycled aggregate.

EFFECTS OF SIZE OF COARSE AGGREGATES ON THE COMPRESSIVE STRENGTH OF CONCRETE

Rokhshana Parvin, Zuel Rana, Shanjida Islam, Atikur Rahman

Department of Civil Engineering, World University of Bangladesh

Concrete is a versatile engineering material consisting of cementing substance, aggregates and water. The strength of concrete is developed from the hydration of cement and water. Many factors depend on this i. e. the aggregate size, porosity, void ratio, mix proportion etc. There are two types of aggregate used in producing concrete such as coarse aggregate and fine aggregate. The void of coarse aggregate is filled with fine aggregate and the void of fine aggregate is filled with cement paste and finally binding material the individual aggregates into a solid mass with the help of water. The principal aim of the study was to investigate the effect size of coarse aggregate on the compressive strength of concrete. To achieve the goal of the research, a total number of 24 cylinders were tested. The diameter and height of the cylinder was 4” and 8” respectively. Some physical parameters such as specific gravity, absorption capacity, and unit weigh of coarse and fine aggregate has determined to select the suitable aggregate. Fineness Modulus (F. M) was also determined for gradation purposes. The F. M of the coarse aggregate was taken as variable as 4. 81 and 6. 8. The water cement ratio and all other things were kept constant to observe the variation of the strength of concrete. The mix ratio taken as 1:1. 5:3. 0 and 1:2:3. 0 the water cement ratio was kept 0. 5. For 7 days curing the compressive strength of concrete having mix ratio 1:1. 5:3 and F. M 4. 81 is 3. 86% higher than the same mix ratio with F. M 6. 8. For the same mix ratio with the same F. M value the strength of concrete having F. M 4. 81 is 3% and 3.i.e. 12% higher than the concrete having F. M 6. 81 which has been found during 14 days and 28 days respectively. In this study, we kept the W/C ratio fixed but the mix ratio and the aggregate size different. But as our study only refers the effects of coarse aggregate on the compressive strength of concrete so we only showed that effects on the strength of concrete. From our study we have found that the aggregate with F. M 4. 81 gives higher strength than the aggregate with F. M. 8 that means the smaller the size of aggregate gives the higher strength than the bigger one. About 68% compressive strength was achieved within first 7 days and 75% strength compressive strength was achieved within 28 days.

**DESIGN OF TEN STORIED BUILDING CALCULATING
IN MICROSOFT EXCEL SHEET**

Md. Saiful Islam, Md. Hafizur Rahman, Md. Nurul Islam

Department of Civil Engineering, World University of Bangladesh

Nowadays the use of software has gained wider space in civil engineering projects due to some favorable characteristics such as quick and accurate analysis, economic design and saving time. In previous works, different types of foundation were designed using different methods. This study was concerned with the analysis and design of a ten storied building in Dhaka region. In this study, the principal aim was to design the slab, stair, beam, column and foundation and to prepare design sheets for different components of building. In this work, the deflections of beams were determined by hand calculation. Microsoft excel software was used to analyze the whole building frame. For this study, wind loads and earthquake loads were calculated by the projected area method and equivalent static force method respectively. The building frame was analyzed using the software Microsoft excel by applying different combinations of live load, dead load, wind load and earthquake load. The defining procedure of support, load, and material property were discussed. Moreover, the analyzing procedure was discussed completely. The detail designs were performed by using Microsoft Office Excel and preparing different design sheets for different components of the building which helps an engineer in designing any component of the building. The detail design calculations were discussed in this work. After that, the approximate deflection due to combination of dead load and live load was also determined. The beams were taken as both end fixed and only modulus of elasticity of concrete was taken into calculation but the concrete was a composite material. The deflection of beam was predicted by hand calculation and compared this value with the value obtained from the software Microsoft Excel. For both case, the deflection was always less than the permissible value which is proposed by Nilson. From the whole building frame, four beams are analyzed to find out deflection.

**STRUCTURAL ANALYSIS AND DESIGN OF A SIX STORIED
RESIDENTIAL BUILDING WITH PILE FOUNDATION USING ETABS**

**Tanvir Ahmed, Arifur Rahman, Mozammel Haque, Liton Chandra Sraiker
Department of Civil Engineering, World University of Bangladesh**

Structural design is an art and science of understanding the behavior of structural members subjected to loads and designing them with economy and elegance to give a safe, serviceable and durable structure. In almost every branch of civil engineering, extensive use is made of reinforced concrete for structures and foundations. Due to the increasing demand of high rise buildings particularly in the urban areas in Bangladesh, it is generally felt for analysis and design to make the high rise building strong with economy. This project paper represents a study of beam supported slab of a six storied building including pile foundation. This study has been performed following USD method. All the slabs are designed following Bangladesh National Building Code (BNBC – 2006). Beam supported slabs are designed by direct design method. Structural design of a building is very much important than other things because design life of a building mainly depends upon the structural design. It is important to select the architectural plan of the particular building and layout plan of beams and the position of columns. Therefore, the loads are calculated namely dead loads which depend on the unit weight of the materials used and the loads which according to Bangladesh National Building Code. Frame analysis of the structure is done by ETABS. Pile is needed for high rise buildings for greater stability of the structure and to transmit the loads into the soil safely. In this study pile has been designed to transmit the loads through piles to a deep stratum that is strong enough to bear the loads or to develop sufficient friction around the surface of the piles. The results obtained from slabs, beams, columns & pile after analysis and design, are used for preparing the reinforcement detailing and drawings by using Auto Cad. ETABS is now widely used and popular software for RCC frame analysis and design around the world. In this study ETABS is used for quick and accurate analysis.

COMPARISON BETWEEN PILE FOUNDATION AND MAT FOUNDATION OF A TWELVE - STORIED BUILDING USING ETABS SOFTWARE

Md. Atiar Rahman, Md. Kamal Hossain, Md. Khalilur Rahman Jenin, Md.

Asfakuzzaman

Department of Civil Engineering, World University of Bangladesh

The Present study involves a study on the performance of an on “Comparison between pile and mat foundations of a twelve storied building using ETABS”. The study has been performed following USD method. Under this study, beam, column has been analyzed using ETABS software. Gravity loads and lateral loads are also considered for beam, column, mat & pile foundation design. In this study slab, column, stair, mat & pile foundations have been designed manually. Beam has been designed using the ETABS analysis value. Different load combinations were considered in the analysis. After analysis of Twelve Storied Residential Building, maximum column reinforcement percentage is from 3 to 4 % of cross sectional area of selected column. Similarly maximum beam reinforcement percentage is 1. 60 to 2 % of cross sectional area of selected beam. The depth of the mat foundation is 4 ft& area of steel requirement is 4. 5-6 % of cross-sectional area for different strips of selected mat. The length of pile is 50 ft& area of steel requirement of 4. 0- 4. 5% of cross-sectional area is for selected pile. Maximum pile number has gotten as interior column as maximum number of pile 3 nos. & minimum as corner column as 1 nos. Pile cap reinforcement is satisfactory. Total cost of mat foundation is Tk. 23, 29, 702 & total cost of pile foundation is Tk. 41, 82, 254. In this case, cost of pile foundation is about 45% higher than the mat foundation. So in comparison cost of mat foundation is much lower than the pile foundation.

EFFECT OF COARSE AGGREGATE ON THE STRENGTH OF CONCRETE

Md. Anisur Rahman, Md. Abdul Motaleb, Md. Meron Uddin, Sk. Abdus Selim
Department of Civil Engineering, World University of Bangladesh

Aggregate are the most important component of concrete, which is widely used in construction throughout the world. According to ASTM and BS specification sieve analysis, specific gravity and absorption capacity (OD and SSD), unit weight and voids have been performed in the laboratory of World University of Bangladesh. Concrete is the most widely used construction materials throughout the world, because of the variations in properties of locally available aggregates due to seasonal and spatial variation, the properties of concrete may vary widely. Aggregates can be classified on the basis of the size of the aggregate as coarse aggregate and fine aggregate. Aggregates generally exhibits two types of properties. They are physical properties (absorption, porosity, aggregate voids, permeability, surface texture, strength and elasticity, density and specific gravity, particle size, hardness) and chemical properties (composition, reaction with asphalt and cement). The specific objective of the study has been to acquire knowledge about the effect of coarse aggregate on the strength of concrete. On the basis of experimental results, the compressive Strength for different locations of coarse aggregate as per mixing ratio of 1:1. 5:3 and 1:2:4 the Sonamosjid is 25% higher than Bholaganj and Zaflong. The compressive Strength for different size of coarse aggregate as per mixing ratio of 1:1. 5:3 and 1:2:4 the combine size(20mm & 12. 5mm) & 20mm size of coarse aggregate is 16% higher than 12. 5mm size of coarse aggregate. In this research work, the strength of concrete for different size of coarse aggregate such as: 20mm, 12. 5mm & combine (70% & 30%), the result of combine size of coarse aggregate is better than others size of coarse aggregate.

**COMPARISON BETWEEN FRESH AGGREGATE AND AGGREGATE
RECOVERED FROM DEMOLISHED CONCRETE**

**Md. Anisur Rahman, Md. Mobassher Hossain, Mohammad Asaduzzaman,
Apurba Kumar saha**

Department of Civil Engineering, World University of Bangladesh

The specific objectives of the study were to acquire knowledge about fresh and demolished stone aggregate. Demolished aggregates collected from Rayerbazar, Dhaka. These demolished aggregates are pile head breaking aggregates. Type of coarse aggregate and the mix proportion of the concrete constituents is the variable in this study. Aggregates are one of the most widely used construction materials throughout the world. So, use of demolished aggregate in concrete can be described in environmental protection and economical terms. The application of recycled aggregate to use in construction activities have been practiced by developed European countries and also of some Asian countries. According to ASTM and BS specification sieve analysis, specific gravity (OD and SSD), unit weight were performed in the laboratory with demolished and fresh coarse aggregates. According to ASTM and BS specification aggregate crushing value (ACV) and Los Angeles Abrasion value (LAAV) were performed in the laboratory with demolished and fresh coarse aggregate. Specific gravity of demolished aggregates for both oven dry (OD) and saturated surface dry (SSD) are 7% higher than fresh aggregates. On the other hand Aggregate crushing value (ACV) and Los Angeles Abrasion value (LAAV) of fresh coarse aggregate are 22% & 19% higher than demolished aggregates. But Fineness Modulus (FM) and Unit weight of fresh stone aggregates are approximately same. Compressive Strength of concrete as per mixing ratio is 1:1. 5:3 and 1:2:4 in respect to 7, 14 and 28 days, whereas the fresh stone aggregates are 9. 5% & 12% higher than that of demolished aggregates.

QUALITY CONTROL PRACTICES OF BUILDING CONSTRUCTION IN BANGLADESH

Md. Shariful Islam, Md. Yousuf Hossain, Mahmudul Hossain, Md. Abu Taleb

Department of Civil Engineering, World University of Bangladesh

Construction is a symbol of development for a country. Quality is one of the critical factors in the success of construction projects. Quality control for building construction is very essential in order to build strong, durable and cost effective structures. When a project planned for construction, building materials should be selected to fulfill the functions expected for quality work. Quality work of construction projects as well as project success can be regarded as the expectations (i. e. the satisfaction) of the project participants. The construction industry in Bangladesh has been struggling with quality issues for few years. The construction costs can be significantly reduced if the construction industry embraces the concept of quality control that has been used with great success. The main objective of the present slide thesis is to ensure the quality of materials (steel, aggregates, cement, sand and others building material) according to ASTM and BSTI etc. standard that is used in different construction sites. To ensure whether all materials have been tested that met with the design criteria and assurance of good quality of workmanship. The study employed both quantitative and qualitative approaches. The study had discussion with key Stakeholders at different sites and the person involve in construction activities as well as randomly sampled households. Structured questionnaire was used to collect qualitative data while qualitative data were collected by interviewing the key informant. The study established that the most of the building constructing is not up to the quality control mark. The people who involved in construction site have no knowledge about the water cement ratio and its effect to concrete strength. For analyzing the quality of the building, some parameters like (type of bricks, type of aggregate, concrete mixed, formwork, shuttering open, curing) were selected. From the result it was seen that about 74% of columns were built by the concrete those had the strength less than 3000 psi. It also investigated that, in concreting time, most of the structure (about 96%) were compacted by manually, which is not given the desire strength. Overall from the result, it can be concluded that the quality of the buildings were not in satisfactory level.

**COMPARATIVE STUDY OF BARE FRAME AND
INFILL FRAME DUE TO SEISMIC LOAD**

Taimur Rahman, Md. Azadul Haque,

Md. Kutubuddin Rubel, Md. Asraful Azgar

Department of Civil Engineering, World University of Bangladesh

The principal aim of the paper is to determine the actual behavior of structures during earthquake designed following Bangladesh National Building Code (BNBC) 2006. The study have been performed to investigate as well as compare the performances of bare, full in-filled and open ground story buildings subjected to seismic load. The paper mainly follows the procedures of ETABS 9. 6. 0 software in the seismic analysis of residential buildings in earthquake zone II of Bangladesh. Equivalent static force method provides understanding about the actual behavior of the structures during earthquake. This type of analysis is very much familiar to structural engineers and is presented in this paper. The performances of the buildings are determined in terms of displacement, drift and base shear. The analysis shows that the performance of an infilled frame is much better than a bare frame structure. It is seen that inclusion of infill leads to significant change in the performance. Buildings with bare frame in the ground level reduce the performance of the structure significantly and make them most vulnerable type of construction in earthquake prone areas. After analysis of the structure the in-filled frame are improved than the bare frame under seismic load. The performance of a bare frame structure can be improved by placing infill masonry panels. The masonry walls provide extra lateral stiffness to the structure that contributes to resist the seismic load.

COMPARATIVE STUDY ON BRICK AND STONE AGGREGATES

Md. Shahrior Alam, Fakhruddin Chowdhury, Ratan Saojal, Md. Rubel Hossain

Department of Civil Engineering, World University of Bangladesh

Concrete is one of the most widely used construction materials throughout the world. Because of the variations in sources of locally available aggregates, the properties of aggregates and concrete made with such aggregate may vary widely. In this study, aggregates from brick and stone are the key points to make a comparison between them. Aggregates generally exhibits two types of properties as physical and chemical. The study has been carried out by comparison of few laboratory tests results as specific gravity, absorption capacity, sieve analysis, aggregate impact value (AIV), flakiness index, elongation index, aggregate crushing value (ACV), Los Angeles abrasion value (LAAV), and chemical composition test of brick and stone aggregates. This work has shown the differences in properties of brick and stone aggregates regarding the laboratory parameters so that engineers can make decision in design and using them. Specific gravity (SSD & OD conditions), absorption capacity, sieve analysis and Los Angeles abrasion value (LAAV) tests were performed according to ASTM standards. In addition aggregate impact value (AIV), flakiness index, elongation index and aggregate crushing value (ACV) tests were performed according to BS standards as well as chemical composition test was done by XRD. This study shows that the value of specific gravity (SSD & OD conditions) of stone aggregates is greater than that of the brick aggregates and absorption capacity is much more in brick aggregate. Elongation index, aggregate impact value and aggregate crushing value of brick aggregates are relatively smaller than that of the stone aggregates. Moreover Los Angeles abrasion value (LAAV) of brick and stone aggregates exhibit no noticeable variation rather they both have the values within allowable limit. The XRD analysis shows the nearest value of SiO_2 in brick and stone aggregates both, but brick aggregates has larger quantity of CO_2 that may be a factor of climate change in environmental consideration. The variation in mechanical and chemical properties of brick and stone aggregates obtained from this study will give explicit ideas while doing mix design for concrete. At the same time, the mixture of both types of aggregate at a required proportion can be used successfully in various construction sector of Bangladesh. This type of work will not only reduce the weight of structure but also reduce the cost.

**COMPARATIVE STUDY ON THE PROPERTIES OF FINE AGGREGATES
IN DIFFERENT AREAS OF BANGLADESH**

**Md. Shahrior Alam, A. K. M Tariqur Rahman, Shamim Ahmed, Md. Mizanur
Rahman**

Department of Civil Engineering, World University of Bangladesh

Sand is one of the most widely used construction materials throughout the world. Here, basically we tried to find out the physical and chemical properties of fine aggregates of different parts of Bangladesh. Physical properties of sand like fineness modulus, specific gravity and absorption capacity, unit weight and voids. Similarly chemical properties of sand have been determined. The study has been carried out by comparison laboratory test as follows fineness modulus, specific gravity and absorption capacity and unit weight. This research has shown different in properties of fine aggregate regarding to laboratory parameters so that engineers can make decision for construction work. Fineness modulus of Sylhet is 3. It is greater than Netrakona sand. Netrakona fineness modulus is 2. 76. It is better than Mymensingh, Kushtia and Munshiganj sand. Unit weight of Sylhet sand is 1672. 70 kg/m³. It is larger than Netrakona, Mymensingh, Kushtia and Munshiganj sand. Specific gravity of Netrakona sand is 2. 66. It is less than Sylhet, Mymensingh, Kushtia and Munshiganj sand. Absorption capacity of Mymensingh is 2. 00%. It is less than other sand. Chemical properties of Silicon dioxide (SiO₂) of Netrakona sand is 86. 96%. It is greater than Sylhet, Mymensingh and Kushtia sand. Aluminium oxide (Al₂O₃) of Kushtia sand is 7. 99%. It is greater than Mymensingh, Netrakona and Sylhet sand. Potassium oxide (K₂O) of Sylhet sand is 4. 72%. It is less than Mymensingh, Kushtia sand and greater than Netrakona sand. Calcium oxide (CaO) of Kushtia sand is 4. 47%. It is greater than Mymensingh, Netrakona and Sylhet sand. Iron oxide (Fe₂O₃) of Mymensingh is 5. 00%. It is greater than other sand. The analysis in physical and chemical properties of fine aggregates obtained from this study will give explicit ideas while working for construction area. Fine aggregate can be used successfully in various construction sector of Bangladesh.

**ANALYSIS AND DESIGN OF A NINE-STORIED RESIDENTIAL
BUILDING INCLUDING FOUNDATION IN DHAKA CITY**

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This project report presents the analysis and design of a nine-storied residential building including foundation at 33 Toyenbee Circular Road, Motijheel in Dhaka. Structural design of a building is the responsibility of a civil engineer; because design life of a building is mainly dependent upon the structural design. Engineers must keep in mind the economy, aesthetics, safety and other aspects of any project. This study concentrates on designing structural parts of a nine storied residential building on actual plan for the Dhaka zone. Complete structural parts analysis and design of the building have been performed considering gravity loads, seismic loads & wind loads only. Gravity loads are considered for slab design. Gravity loads and lateral loads are also considered for beam, column, and pile design. In this study, slab, beam, column and pile have been designed by both hand calculations and using finite element software ETABS. From the architectural plan of the building, the largest slab panel was selected for design of slab. Beam is designed manually for the maximum moment and shear (from ETABS). Column is designed manually for axial force and moment (from ETABS). Pile foundation is also designed by considering the column axial forces and moments got from ETABS analysis result. The wind loads & earthquake affect the design of a high rise building frame to a great extent. Through the analysis, it is seen that found that earthquake and wind loads have considerable effects on beam and column design. In this analysis, all inputs those are required for the design of building structure is successfully applied.

COMPARISON OF COMPRESSIVE STRENGTH OF FIBER REINFORCED CLAY SOIL

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The improvement in strength properties of soil has become one of the important tasks of geotechnical engineers due to scarcity of good sites, dramatic rise in land prices and increase in infrastructure growth. There are different improvement techniques to stabilize the poor ground in which soil reinforcement is an effective and reliable technique. In this study, three soil samples were collected from three different places namely Amin Bazar, Rejendrapur & Ashulia. After that physical properties test of this specimen for example, liquid limit, plastic limit, specific gravity, hydrometer test, standard proctor test, and unconfined compression test were done. We used three types of fibers, such as- i) Nylon fiber, ii) Coir fiber and iii) Jute fiber. As a admixture, we used cement. We tested cement in labratory before mixing with soil samples. In order to get more strength, we mixed fibers and admixture. Step by step, we changed ratio of fibers and admixture. After mixing, we were curing of these soil samples for 7 days and 14 days. After finising curing, we tested “Unconfined Compression Test”. We got various types of results, it was increasing share strength of these soils. For example, when we used 0. 25% fibers, 5% admixture, 7 days curing that strength was lower compare to 0. 50% fibers, 10% admixture and 14 days curing. We made 96 types of samples. Strength were changing while we were changing ratios of fibers and admixture with soil samples. Therefore, in order to increase in the bearing capacity of the soil to hold a larger load in the same area, this can prove useful in many aspects of housing development. Some of these aspects are the ability to build larger structures, reduce the size of footings, and easily stabilize soil for roads.

**COMPARISON BETWEEN THE DIFFERENT STRENGTH OF WASTE
POLYMER CONCRETE WITH NORMAL CONCRETE**

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Owing to the construction boom in developing countries and reconstruction of urban areas of developed countries, there is a need of alternative of good quality conventional aggregates in many areas throughout the world. If recycled polymer aggregates can be reused as construction materials, it would greatly alleviate the demand of natural aggregate. In this study, the feasibility of recycled polymer aggregate concrete has been studied. The natural aggregate in concrete was replaced by 10%, 20%, 30%, and 40% recycled polymer aggregate. The investigation was carried out to determine the compressive strength, modulus of rupture, split cylinder test, unit weight and water absorption capacity. There were total of 30 cylinders and 5 beams consisting of brick aggregate with 0%, 10%, 20%, 30% and 40% replacement by recycled polymer aggregate using water to cement ratio of 0.45 for strength characteristics. Test results exhibited that the compressive strength, modulus of rupture, splitting tensile strength, and unit weight gradually decreased with the increase of recycled polymer aggregate whereas the water absorption decreased with higher replacement of recycled polymer aggregate. Test results revealed that recycled polymer aggregate can be used to produce light weight concrete.

USE OF SUPER PLASTICIZER ADMIXTURE FOR HIGH STRENGTH CONCRETE

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New type of admixtures known as super plasticizer has been introduced into North America during the past several years. These Admixtures can enormously increase the workability of normal Portland cement concrete or can greatly reduce its water content. Super plasticizers are more expensive than conventional water- reducing admixtures. The dosage requirements vary between 0. 5 and 3 percent by weight of cement, depending on the type of admixture used. Normally, the super plasticizer is added to the truck mixer after it arrives at the jobsite and at the last convenient moment before discharge. Within 5 minutes or less, the slump greatly increases and at this time, the user can get the most advantage from the high fluidity of the concrete. The slump then steadily decreases during the next hour or more and it is for this reason, the super plasticizer is not added until just before use of the concrete. The rate at which the slump decreases depends on the type and amount of super plasticizer added, This report have shown the results of a laboratory investigation of how super plasticizers affect the workability, strength and durability of high-strength concrete.

**STUDY OF BUILDING CONSTRUCTION PRACTICE AND WORKERS
SAFETY ON MIRPUR, DHANMONDI AND GULSHAN AREAS**

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Site safety is an important function regardless of project size. Certainly, larger and more complex construction sites do require more sophisticated safety programs. A key goal, which must be met for a successful project, is to finish the project with a good safety record. A good safety performance has a strong bearing on being able to accomplish all the other goals of a project. Safety in construction is a prime requisite, but often it gets neglected on the working site. With the increased volume of construction work in Bangladesh, the need for proper attention in safety aspect has become essential for human, economic and other considerations. Interview survey and questionnaire surveys were conducted to the reputed construction companies of Bangladesh to examine the present safety situation in construction sites. The finding shows that if certain safety regulations are practiced, accidents on construction sites can be reduced. The result illustrates that after following the construction safety checklist construction site accidents have been reduced to 60 to 70 percent. All construction related companies should design a safety checklist and properly follow it to reduce the construction site accidents. Proper protection equipment and safety precautions are necessary to protect the lives of workers and preserve the well-being of their families. Proper steps should be taken to improve the safety at the construction sites. Promotion of safety measures at the working site results in a better working environment, higher productivity and greater contentment among the workers.

**EFFECT OF ADMIXTURE AND FIBER CONTENT ON UNCONFINED
COMPRESSIVE STRENGTH OF CLAY SOIL AT
DIFFERENT CURING DAYS**

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Soil reinforcement is defined as a technique to improve the engineering characteristics of soil. In this way, using natural fibres to reinforce soil is an old and ancient idea. Consequently, randomly distributed fibre reinforced soils have recently attracted increasing attention in geotechnical engineering for the second time. There are different improvement techniques to stabilize the poor ground in which soil reinforcement is an effective and reliable technique. In this study, First of all, we collected three soil sample from Savar. After that, we started physical properties test of these specimen. For example, liquid limit, plastic limit, specific gravity, Hydrometer test, standard proctor test, and unconfined compression test. Step by step, we had finished these test and we had selected two specimens among them in order to unconfined compression test with mixing different fibers and different ratio of cement. We used two types of fibers, such as- i) coir fiber ii) Jute fiber. As a admixture, we used cement. The name of cement brand is scan. We tested cement in laboratory before mixing with soil samples. In order to get more strength, we mixed fibers and admixture. Step by step we changed ratio of fibers and admixture. After mixing, we were cured of these soil samples for 7 days and 14 days. After finishing curing we tested "Unconfined Compression Test". We got various types of results, shear strength of these soils was increasing. For example, when we used 0.5% fibers, 5% admixture, 1 days curing that strength was lower compare to 1.00% fibers, 10% admixture and 14 days curing. We made 108 samples. There were changes in the strength while we were changing ratio of fibers and admixture with soil samples. Therefore, in order to increase in the bearing capacity of the soil to hold a larger load in the same area, this can prove useful in many aspects of housing development. Some of these aspects are the ability to build larger structures, reduce the size of footings, and easily stabilize soil for roads.

IMPACTS OF SIDE FRICTION IN REDUCING EFFECTIVE ROADWAY WIDTHS OF DHAKA CITY

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The roadway width is often hampered by the disturbances like side friction, bad drainage or poor maintenance of pavement. Dhaka city is not an exception to this problem. Approaches of six important signals near to Dhaka city were investigated and the impacts of side frictions on these roads were assessed. It was observed that, the footpaths were frequently blocked by tea stalls, fruit stalls, garments shops and dustbins. Moreover, as a consequence of illegal parking beside the road, the friction became even worse. These factors contribute to traffic congestion and a stagnant transport system. Only effective enforcements of rules and regulations can stop these side frictions and save the traffic system. Unplanned and uncontrolled exposition of the city also induce around 4000 indiscriminate and unexpected road side garments industries with more than 1 million employees which are generating almost 2.5 million trips per day. Almost 75 percent of those industries are located along the primary roads and the rests are along the secondary roads and creating mammoth adverse impact on the city. These added transport demand necessitates the road widths for full capacity of the approach. However, the capacity is decreased by the reduction in width of road due to frictions. Six important signals of Dhaka city named Taltola, Agargaon, Khamar Bari, Mirpur-10, Science Lab and New Market were taken for this study. The roadway widths of the adjacent approaches were taken and the width of road blocked by side frictions was also recorded. The percentage of width loss for each kind of friction was calculated separately. Thus, the most and least influential type of side frictions was determined. It was observed that, Parking on the road was responsible for roughly 20% reduction in road width. 24% of the parking was even double rows while Bus and Rickshaw contributed to 22% and 15% of parking respectively. Roadside stalls contributed to roughly 15% reduction in road width. Among these stalls, garments and tea/fruit stalls shared 40% each. Some other type of miscellaneous problems also contributes to 10% loss. These losses include roadside cutting for drainage and utility service works, dustbins, police barricades and electric poles. In nutshell, it was seen that, the roadway width at different important roads of Dhaka city was reduced from 12% to 29% due to various side frictions. However, among the frictions, unauthorized Car and Bus parking was the most significant one. So, illegal parking should be stopped. Moreover, illegal stalls on footpath should also be taken under action.

**STUDY ON PARKING FACILITIES AT KAMALAPUR
RAILWAY STATION, DHAKA**

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Traffic usually travels towards a destination and the vehicle must be parked while some business e. g. private, public, recreational or servicing is transacted. Failure to provide suitable parking facility can result in traffic congestion and frustration. The purpose of parking study is to provide recommendations for the development of a parking program which will meet the requirements of the area. The main objective of this study is to assess the parking demand and to determine the capacity and usage of existing parking facilities. The other objective is to estimate the desire and demands of the people for parking. To fulfill the above objectives we have proceeded to the steps e. g. patrol survey, cordon count, direct interview, land use method and customer interview method. There exist two parking stations at Kamalapur Railway station with a total space area of 62, 540 sft. Space. The theoretical Parking Space (T. P. S) is 195 no. of medium size vehicles at that area. The parking demand at Kamalapur Railway Station depends upon the arrival and departure of train i. e. on the schedule of train. We have surveyed as seven days parking condition and found that the peak demand is on Monday from 1:0 am to 2:0 pm, was 59 vehicles and that was lower than the required. That means the peak parking space was about 30% of the total space available. A large amount of space remains unused. Although there is a huge amount of empty space, but the Kamalapur Railway Station is seen full of traffic congestion around all the time. The main reason behind this is not to obey the parking rules properly. As the parking space is sufficient for the present parking demand, there is no need to extend the parking space. But necessary traffic rules and regulations should be enforced by the government to the drivers for safe and disciplined parking.

**A STUDY ON INEFFICIENT USE OF OVERPASS AND
UNDERPASS IN DHAKA CITY**

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This study has been conducted by the Department of Civil Engineering of World University of Bangladesh with the objectives to find out inefficient use of Overpass and Underpass in Dhaka city. The specific objectives of the study are to measure the volume of pedestrian who use the overpass or underpass and who do not use the overpass and underpass although having an overpass or underpass available, explore the existing problems that are encountered for safe and convenient pedestrian movements through overpass and underpass in Dhaka City, recommend policies and options for better pedestrian facilities in Dhaka City, observe the condition of the overpass and underpass in Dhaka city, find out the causes for ignoring the overpass and underpass by pedestrians, find out where underpass or overpass is warranted, increase awareness among the people using underpass and overpass, and to provide some suggestion to mitigate the existing problems. A lot of research works are going on for assessing the pedestrian's level of services in the developed nations but in developing countries like Bangladesh, it is not a significant one for the transport planners. Six broad categories have been observed during the field survey to assess the movement by using overpass and underpass in terms of 1) system 2) security 3) convenience and comfort 4) walkway 5) system coherence and 6) attractiveness by some specific facilities. Far more important than encouraging people to walk is creating the environment in which it will be enjoyable and safe to do so. This paper focuses on how activists can work to raise awareness of the need for policy changes that result in better condition for pedestrian's movement by using overpass and underpass and thus contribute to a better living environment for all.

**A STUDY ON TRAVEL TIME RELIABILITY AND ITS
IMPROVEMENT IN DHAKA CITY**

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The unexpected delay due to traffic congestion in roadways is the common problem in Dhaka city. Commuters suffer a lot due to the variability of their travel time in the city. To reduce the problem; the reliability of travel time is to be ensured. Travel time reliability is an important measure of traffic congestion and can serve as baseline for prioritizing improvements into a region's transportation system. This paper begins with a literature review of travel time reliability and its value as a congestion measure. The study presents the methodology and results of a content analysis of two important routes in Dhaka city for several months while measuring the delay time due to traffic congestion, average travel time and the average velocity of the selected routes. It also provides a solution of variability of travel time as Buffer Time Index and Planning Time Index which ensure the on-time arrival to the destination through the routes for 95% of time along with a reliable travel time for transport agencies and commuters to budget their time before travelling through the routes. This analysis concludes that travel time reliability is an effective concept to use as a congestion measure rather than the measurement of volume-to-capacity ratio. This paper ends by recommending how to improve travel time reliability and the condition of traffic congestion in Dhaka city. The application of Bangladesh Road Transport Authority (BRTA) and introduction of various transport modes are suggested to improve the condition of present situation and to reduce the dependency on roadways to minimize traffic congestion.

**ASSESSMENT OF LEVEL OF WATER POLLUTION
DISCHARGED FROM HAZARIBAGH**

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The study was carried out on the environment pollution level of the Hazaribag discharged point. For this study, water samples were collected from three different pollutant discharge sources namely Rayerbazar (south of Hazaribagh), Sicksion (near to Hazaribagh) and Kamrangirchar (west of Hazaribagh). The water quality parameters studied were temperature, dissolved oxygen, PH, chloride, biological oxygen demand, Chemical oxygen demand etc. Air temperature in four sampling stations ranged from 18°C to 30. 5°C and that of water from 19°C to 32°C. The dissolved oxygen contents in water samples fluctuated from 1. 2 to 2. 3 mg/l with an average of 1. 7 mg/l. The lowest value of dissolved oxygen was observed in Ryerbazar area and the second lowest value in Kamrangirchar during the lean flow period (Month of April). The PH value in two sampling stations ranged from 7. 35 ± 0. 02 to 8. 10+ 0. 03. The BOD value fluctuated from 600 to 800= mg/l, with an average 690 mg/l during the study period. The above parameters showed strong seasonal variations being higher during lean flow period (March and April). The canal also showed spatial fluctuations among the sampling stations. Except PH and dissolved oxygen, concentrations of other parameters were higher, in Rayerbazar stations, particularly during lean flow period (March and April). The water quality of canal deteriorates during lean period and improves during monsoons with flow of increased flush water. Some of the water parameters clearly indicate that the river is polluted and this is much pronounced in station A, B and C. The changes in water quality, particularly during lean season, may pose threat to bio diversity. In addition, the Water quality index (WQI) for Water level sources nearly 44 representing bad water which is not acceptable for irrigation and livestock. Other parameters also found to be in satisfactory limit in most of the samples. Finally, the findings of the study may be useful to predict the surface water contamination vulnerability for various sources and may take appropriate step to minimize the problem by the concern authority.

**PROBLEMS OF PURE WATER AND SANITATION FACILITIES IN
SELECTED RURAL AREAS OF BANGLADESH DURING FLOOD**

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Sanitation has received international attention in recent times. In January 2012, the United Nations General Assembly endorsed Eight Millennium Development Goals (MDG). Two of these goals were directly linked with sanitation. Sanitation system is not only the protection of diseases, but also a part of our daily living. Sanitation means proper health care. As Bangladesh is a land of rivers, flood occurrence is a regular matter here. Bangladesh is an over populated country with almost poorer living level. With over 1000 people per square kilometer, Bangladesh has one of the highest population densities in the world. 50% of the population is categorized as poor and 20% as hard core poor. So, sanitation and pure water supply facilities is very rare i. e. poor and during rainy season, it becomes worse. The main objectives of this study are the observation of pure water crisis and sanitation problems during rainy season. The study focuses also on hygienic awareness during that period. We have selected one union, named Kakua of Tangail Upazilla in order to perform the research about pure water and sanitation facilities. The main reason for selecting the area is that it is situated near the bank of Jamuna River; as a result, the area is prone to heavy rain and occasional flood. Almost 73% latrines were damaged during the flood. Out of those damaged latrines, 62% became unusable within the first week of the flood. On average, 26% flood affected people defecated at other's house during flood, whereas almost 55% defecated from floating places like boats, rafts, hanging latrines etc. Around 19% people defecated in open spaces, 99% percent of the respondents thought that the reason behind sanitation damages were due to flood. In the study, no significant impact of main income earner's gender or size of the family was found on the damage of sanitation. Almost 70% tube wells or wells were damaged during flood, whereas 46% of those were completely damaged during first 10 to 15 days. About 23% people used tube well of flood shelter during flood and about 5% to 7% people use bottle water or water purifier kit for drinking and cooking, but almost all the people used flood water for their house hold work and bath.

**EFFECTS OF MEDICAL WASTES ON SURROUNDING ENVIRONMENT
DUE TO OPEN DUMPING AT SIR SALIMULLAH MEDICAL COLLEGE
MITFORD HOSPITAL, DHAKA**

**Md. Mahmud-Al-Azad, Md. Mahbubur Rahman, Md. Mazedur Rahaman
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Hospital waste is unwanted and discarded materials which are generally of less or no value. Medical waste is all waste materials generated at health care facilities, such as hospitals, clinics, physician's offices, dental clinics, blood banks and veterinary hospital/clinics, as well as medical research facilities and laboratories. This study examined the medical waste management practices in Sir Salimullah Medical College Mitford Hospital (SSMCMH). The results of this study revealed that both general and medical wastes are generated in the hospital. Segregation of medical wastes into infectious and non-infectious medical waste is not conducted according to the definite rules and standards. A review of waste management systems of Sir Salimullah Medical College Mitford Hospital was performed to understand (a) Source of waste (b) Types of waste (c) The various handling and disposal procedures in Sir Salimullah Medical College Mitford Hospital (SSMCMH). (d) The knowledge and awareness of individuals involved in medical waste generation, handling and disposal and (e) the potential impacts of the waste stream on both human health and the natural environment. Information was collected mainly from literature review and Sir Salimullah Medical College Mitford Hospital (SSMCMH) practical source. It was found that a variety of methods were used at Mitford Hospital (SSMCMH). It was found that a variety of methods were used by the medical authority to dispose of their wastes including burning burial, entombing, selling, dumping and removal by municipal bins. The waste disposal practice was found to be quite unsafe, and both clinical and non-clinical wastes were found to be thrown together. There was insufficient awareness about the impact of the medical wastes issue by all concerned. All associates have the potential to come into contact with these wastes which may pose severe health risks. There is lack of safety measures observed in dealing with waste disposal or laboratory analysis of various diseases.

A STUDY OF ELECTRONIC WASTE MANAGEMENT IN DHAKA AND CHITTAGONG CITY

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E-waste or electronic waste is an outcome of diversified technological developments in the form of electric and electronic equipment in present world. The main target of this study is to assess the overall condition of electronic waste management in two major cities of Bangladesh: Dhaka and Chittagong. The outcome of this study would include the comparative situation of the fraction of recycled e-waste in these cities. Moreover, the overall situation of the e-waste management can also be known at the end of this study. E-waste covers all the items of any electronic equipment which is discarded by the user after its use is over. The fraction of gold, aluminum and other metals in e-waste is 60% whereas 2.7% contains pollutants. E-waste recycling operations are available in China and India but Ghana, Pakistan and Bangladesh lag behind in this case. Although, Europe has WEEE (Waste Electrical and Electronic Equipment) management, a developing country like ours' lack in this management which should be done immediately. In order to get rid of this toxicity and reuse the huge volume of waste, the inventory of local secondary shops for broken materials of e-waste is necessary. Five places in Dhaka (Mirpur, Nimtoli, Elephant Road, Gulistan and Dholaikhal) and five places in Chittagong (New Market, Kornophuli market, CDA market, Shah Amanat market, Vatiary) were selected for the inventory. The numeric value of the total e-waste received, e-waste repaired and e-waste dumped was collected. The overall costs of recycled waste were also noted down. For this study, only e-waste from Mobile phones and computer parts were taken in consideration. It is observed that, these places in Dhaka and Chittagong generated 13.16 and 10.12 million e-waste each year respectively. However, the amount of recycling is greater in the latter, having 77.8% recycled whereas the former one recycles 71.2%. Among the computer products, mother boards were mostly dumped and printers had the highest recovery of 86%. The aggregated amount of recycling for mobile products was 64% only. However, among the other products Television has the maximum recycling record of 97% while stabilizers experience the lowest, only 60%. In total the recycled waste gathered a sum of Tk. 4873 million throughout the country per year. Again, roughly 75% products in Mobile and Computer wastes is recycled which means, three-fourth of the wastes could be utilized by the proper recycling channel. So, the government need to create a new channel for the proper take care of these recycling process and also to make mass people aware of the recycling of e-waste.

**SOLID WASTE COLLECTION AND TRANSPORTATION AT ZONE ONE
IN DHAKA SOUTH CITY CORPORATION: A CASE STUDY**

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The increasing quantity of solid wastes is an environmental and financial concern in Bangladesh. Nowadays, rapid generation of solid waste is considered one of the most serious problems in Bangladesh. There are many temporary storage locations of wastes that produce odour in city environment. Quick transportation of wastes is a solution for the problem. The study has been carried out for assessing the collection system and their advantages and disadvantages, the quantity of waste collection vehicle and total generated waste in zone one i.e. Dhaka South City Corporation (DSCC) by interviewing the municipal staff, conservancy officers, conservancy inspectors and drivers and vehicle crews. Zone one consists of ward number 15 to 21 of DSCC. The two most common collection systems of zone one DSCC are hauled container system (HCS) and stationary container system (SCS). There are three types of vehicles used in DSCC e. g. open truck, container and compactor. The total generated solid waste at zone one is 514 ton/day on an average. There are 40 open trucks, 24 containers and 17 compactor vehicles for transportation of the daily generated waste. In haul container system, one container type vehicle makes only one trip per day whereas it is possible to make 5 trips /day. If the 5 trips are made as suggested, the dependency on other types of vehicles may be reduced.

**SUSTAINABLE SANITATION SOLUTION THROUGH URINE
DIVERSION AND APPLICATION AS FERTILIZER**

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Md Shahirul Islam Khan, Mohammad Showkat Ali
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This paper aims to highlight the effectiveness of improved sanitation for the rural communities. The primary aim of this study is to assess the viability of available sanitation technologies which can be applied in a development context. The study mainly focuses on the recycling of human urine and re-use of plant nutrients obtained from urine in agricultural production without involving major costs. This thesis document can be applicable to demonstrate the appropriate, integrated and sustainable sanitation solutions for rural poor communities with lack of safe sanitation facilities. Throughout the study, it was found that the easiest option for implementation of safe sanitation in Bangladesh is the traditional simple pit latrine under the sanitation coverage and to achieve the Millennium Development Goals. Its viability reflects to the simplicity, economic feasibility and cultural suitability of the technology. The Urine Diversion (UD) sanitation technologies may also be considered as highly sustainable solutions, providing environmental, cost effectiveness, health benefits and most importantly recovery of productive resources. However at this initial stage, this ecological-sanitation option is focusing on urine diversion and reuse only. So it does not require large educational and too much resources but only demands the technical operational requirements and social mobilization. Awareness raising and capacity building are the central requirements of this concept, with the objective of empowering and building the capacity of the poor communities and stakeholders to proper management of urine diversion sanitation systems and safe handling of plant nutrients. This document demonstrates a sample design of the urine application procedure that can be most effective for the marginal farmer groups in our rural contexts. The urine diversion sanitation system provides wider community benefits by reducing the disease burden, increasing agricultural production, ensuring environmental ecosystems and contributing to safe energy.

**STUDY ON BARREL COMPOSTING AS AN ALTERNATE
SOLUTION OF SOLID WASTE MANAGEMENT SYSTEM**

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Thowai Mong Marma, Tanvir Ahmad Bhuiyan
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The increasing quantity of solid wastes is an environmental and financial concern in Bangladesh. Nowadays, the rapid generation of solid waste is considered one of the most immediate and serious problem of environment. Composting is a growing solution to solid waste management. The household solid waste can be converted from burden to resource through composting. In composting process, the organic portion of wastes is converted into stable end product of compost by bio-degradation. Organic waste can be recycled through composting and the resulting product can be used to improve soil quality. The study was done to determine the quantity of solid waste generation by three bin placed to collect (i) plastic, cane, paper type's waste (ii)vegetable wastes (iii)fish, meat other fat content wastes respectively. Two barrel was filled with wastes. The first barrel used for vegetable waste and another was used for organic waste. Wastes were collected about 40 days in one or two interval and put into the barrel. In first 15 days the wastes were aerated in two days interval and in the remaining days wastes were in 7 days interval. It was taken about three month to prepare the compost. After composting, the sample was collected and lab analysis was done. Heavy metals were tested by automatic spectrophotometer. The application of compost fertilizer combined with or without chemical fertilizer to soil is considered as a good management practices in any agricultural production system because it improves plant quality and soil fertility. The application of compost improves the soil characteristics, increasing soil productivity and organic matter content. Compost application can compensate the use of chemical fertilizers, which have adverse environmental effects.

**VEHICULAR INDUCED NOISE POLLUTION AT VARIOUS
PUBLIC POINT OF DHAKA CITY**

**Rajib Kumar Das, Md. Kamrul Hasan, Md. Milon Rana
Department of Civil Engineering, World University of Bangladesh**

As Dhaka is the capital city of Bangladesh, it attracts lots of people to come here for various purposes. To cope up with the pressure of transporting a huge number of people comprising both permanent dwellers and transitory; increase in number of vehicles is not unlikely; and sound level increases as a consequence. When sound level crosses the acceptable range (dB), it creates noise that harms human well being in multidimensional way. Although noise can be created from various sources, this report is prepared mainly concerning vehicle induced noise. A conscious endeavor had been given to determine the level of noise at some selected but important public places of Dhaka city along with the aim to find out if it depends on vehicle volume or not. For this purpose, four important public places of Dhaka city were selected. These were Farmgate, Banglamotor, Asadgate and Mohakhali. These places were chosen because of the noise level created at these points; so, it would be easy to assess the overall scenario of Dhaka City. Level of sound of the four places was recorded using Digital Sound Level Meter in decibel unit at 15 minutes time interval, also the number of vehicles was counted at the same time interval. From the record of dB, it was found that noise level of all the selected points far exceeds the acceptable limit as recommended by the DOE. The maximum level of dB was 102.4. Noise level tends to be comparatively lower at mid day time. On the other hand, highest number of vehicles passed through Banglamotor point. However noise level is not related with the volume of vehicles. Strict regulations, noise barrier, speed controls, measures may be useful to reduce the noise level.

**A STUDY ON THE TREATMENT OF INDUSTRIAL WASTEWATER
USING LOCALLY AVAILABLE CHARCOAL**

**Sunil Kumar Roy, Md. Masudur Rana Yasin Arafat, Sumi Akter
Department of Civil Engineering, World University of Bangladesh**

The treatment of industrial effluent has received great attention in the past few years. This is partly due to increasing environmental awareness and the implementation of ever stricter environmental rules. Adsorption is one of the techniques used for the effective treatment of dyes. However, the efficiency of the adsorption process depends on the choice of a suitable adsorbent. Because of the high cost of some conventional adsorbents, researches have been seeking alternatives, such as locally available adsorbent. After the collection of the samples, tests were carried out in the laboratory of World University of Bangladesh. In our test according to ECR 97, pH of drinking water is 6.5 - 8.5, but result of pH of our study area fulfill the standard. Standard is BOD 0, so BOD is very high. Turbidity is 10 NTU, so is very high. Iron is 0.3 - 1.0mg/l, so those also fulfill the limit. Standard of Color of water is 15 ECU, so the color is very high limit. Obviously this textile Industry water free from fecal coliform can be an alternative source of drinking water supply for Beximco Textile Industry with some degree of treatment which will lessen the risk of arsenic and other toxic metals contamination associated with the extensive use of waste water.

**THE ENVIRONMENTAL IMPACT OF DISPOSAL OF
WASTES GENERATED FROM GARMENTS FACTORIES
AT MIRPUR AREA IN DHAKA**

**Md. Emrul Hasan, Md. Rashidul Islam,
Md. Ahsanul Habib, Mohammad Hafizur Rahman
Department of Civil Engineering, World University of Bangladesh**

The garment industries play an important role in the economic growth as well as in the environmental issues of Bangladesh. Bangladesh has now become a significant supplier of Readymade Garments to both North America and Europe. More than 50% of Bangladeshi garment exports go to European Union and 44%, to the USA. There are many garment factories in our country which are mainly located at Gazipur, Narayanganj and Dhaka city area. But the garments factory has been condemned as being one of the world's most offenders in terms of pollution. This study was aimed at the garments factory at Mirpur area in Dhaka city to assess the present situation of environmental impacts arises from such activities and proposes several mitigation measures. The environmental survey that has been conducted at the 05 selected garments factory of Mirpur area and the practices that were observed there in the relevant sections. During the study period, data and information were collected by questionnaire survey in the garments factory. Garments industries in Mirpur area are getting polluted. In addition, ecological environments are being contaminated because of these Garments industries. The major sources of Garments wastes in the study area include house hold sources, Textile yarn, Fabric manufacture, Garment-making processes, Retail industry, Post-industrial waste, Post-consumer waste. The significant amounts of Garment wastes are generated form Cutting (70%), Knitting (12%), Sewing (5%), Dying (3%), and others (10%). The Problems facing by people around the Garments area include Health risk (55%), Insects (15%), Toxic substances (17%), Odor (8%),and Others (5%). nature of Environment pollution surrounding the Garments are in Mirpur include water pollution (50%), Soil pollution (30%), Air pollution (10%), Sound pollution (7%) Others (3%). Water Quality parameters values of the wastewater samples collected from 3 sampling points exceeded the standard values.

USE OF WASTE PLASTIC IN CONSTRUCTION OF BITUMINOUS ROAD**Md. Saiful Islam, Md. Fazly Rabby Nakib,****Md. Jubaier Ahmed, Md. Belal Hossain****Department of Civil Engineering, World University of Bangladesh**

In this research work, waste plastic (Low Density Polyethylene) is used as modifier to prepare samples required for tests to determine the engineering properties of the modified bitumen. Other objectives of the research were to analyze the effect of waste plastic modified bitumen on road quality. To fulfill the objectives of the study, waste plastic was collected in shredded form (<4.75 mm) from old Dhaka. Then a total of three modified binders and mixes were prepared with and without waste plastic, 5% and 7.5% waste plastic content were used to perform the test of penetration, specific gravity, softening point, ductility, flash & fire point. For making these test samples, blending operation was done by manually. The results of the study conclude that rheological properties like penetration, ductility, specific gravity of LDPE (waste plastic) modified bitumen decreases with increase of waste plastic contents while softening point, flash & fire point increases with increase in polymer contents in bitumen. It is expected that using the output of this research, the waste plastic materials can be used in bituminous road works, resulting in minimization of the frequency of rehabilitation work and thereby providing an economic solution. It is also expected to substantially reduce volume of environmentally hazardous plastic and environmental pollution.

**SOLID WASTE MANAGEMENT AT KALABAGAN AND
DHANMONDI POLICE STATIONS IN DHAKA CITY**

Sunil Kumar Roy, Md. Abdul Gaffar, Md. Sohel Rana,

Most. Shahajabin Haque

Department of Civil Engineering, World University of Bangladesh

Solid waste management and disposal is both an urban and rural problem. Every person is a potential generator of waste and thus a contributor to this problem. To generate waste is one thing; the type of waste generated is another. And the way the generated waste is managed or disposed of is quite a different issue. This study was carried out at Kalabagan and Dhanmondi Police Stations in Dhaka City. The main objective of this study was to explore the level of public participation in solid waste management at Kalabagan and Dhanmondi Police Stations, in light of the challenges and prospects for future management. The findings revealed that the majority proportion of the people at Kalabagan and Dhanmondi Police Stations exhibited concern. The level of item reuse is similarly low at Kalabagan and Dhanmondi Police Stations and the people still think that they cannot do anything to reduce the volume of solid waste they generate. However, there are plans for formal disposal facilities, use of the legal instrument and awareness-raising as a way to deal with the challenges, Therefore, because the level of public participation in solid waste management at present at Kalabagan and Dhanmondi Police Stations is low, the best way to start dealing with the problem is for the authorities to show the people that they are worth by involving them in the initial planning process.

**ANALYSIS OF HOUSEHOLD GREY WATER QUALITY
AT RUPNAGAR RESIDENTIAL AREA IN THE DHAKA CITY**

**Sunil Kumar Roy, Md. Sohrab Hossain, Sanjoy Saha, Md. Sharif Miah
Department of Civil Engineering, World University of Bangladesh**

Water is absolutely essential for the survival of any form of life. But unfortunately, as one of the most adverse side effects of the civilization, we have to face acute water pollution which is a major problem in global context. The consequences of this pollution are even greater in highly populated city like Dhaka which has a population of over 15 million. The scarcity of water is tremendous here during the summer season as the surrounding rivers of Dhaka are subjected to severe pollution and at the same time the lowering of ground water table is alarming. So it is high time to switch to other alternative options of water supply like the recycling and reuse of grey water which is less contaminated compare to sewage or black water as it produces from daily activities like washing, bathing, laundering and so on. Samples of grey water were collected from Road# 04, House# 12 & Road# 05, House# 04 & Road# 06, House# 01, Rupnagar residential area, Mirpur-02, Dhaka. During the sampling period grey water were collected to find out the deterioration of water quality after washing purposes in addition to the characteristics of grey water. During the characterization, emphasis was given on the determination of some basic parameters like pH, turbidity, color, TSS, TDS, BOD₅, COD, phosphate and ammonia content etc. The laboratory works were accomplished in the lab of World University of Bangladesh.

A STUDY ON WATER SUPPLY AND SANITATION FACILITIES FOR THE STREET DWELLERS IN DHAKA CITY

**Md. Golam Rabbane, Suman Biswas, Md. Siddikur Rahman, Md. Sarfuddin
Department of Civil Engineering, World University of Bangladesh**

This study was conducted by the department of civil engineering of world University of Bangladesh with the objectives to find out water supply and sanitation facilities for the street dwellers in Dhaka city. About 90% of street dwellers think that the collected water is suitable for drinking. About 80% of street dwellers use collected water only for drinking and cooking, and 20% of them use for washing, cleaning and household purpose in excess of drinking and cooking. 100% of the street dwellers drink and cook food with the water that they collect without boiling it or adopting any purification technique (use alum or filter). About 38% street dwellers use drainage line as their toilet. About 14% use public toilet and 26% use roadside and different park, 14% use mosque, 8% use hospital as a point of defecation. About 58% of street dwellers use non-sanitary latrine, 42% sanitary latrine. About 82% of people said that there are no separate facilities for woman and 18% of them said that they have separate facilities for woman. Street Dwellers spend daily Tk5-10 for a household of four members on an average and monthly Tk150-300 per family for water collection and transportation. They also spend Tk10-15 for sanitation purpose for a house hold of four members on an average and monthly expenditure is about Tk300-450. Their total monthly expenditure for water supply and sanitation system is about Tk450-750. The study reveals that average income of 60% of street dwellers is in between Tk6, 000-9, 000 per month and they spend monthly Tk450-750 for water supply and sanitation purpose. From observation it is found that a street dweller spends more money in water supply and sanitation than slum dwellers. So for reducing their expenditure on this sector they use drainage line, open space, roadside in spite of public toilet, mobile toilet etc. As a result, environment is polluted and environmental ecosystem is also disrupted. So, if a family of street dwellers is rehabilitated from roadside to slums, their standard of living can be increased without expending any extra cost. The overall environment of the dwellings of the street dwellers is not at all healthy. Most of the people live in the roadside tents mostly beside the DCC dustbin. Those places are suffocating and huge amount of pollution occurs due to heavy traffic. More over during rainy season situation becomes unbearable due to heavy rains. Finally, this study reveals that the street dwellers should be shifted to slum area for better facilities.

**ANALYSIS OF ELECTRONIC WASTE COMPUTER MANAGEMENT
SCENARIO IN DHAKA CITY**

**Md. Emrul Hasan, Shakil Ahmed, Md. Ruhul Amin, Md. Shahidul Islam
Department of Civil Engineering, World University of Bangladesh**

The changing lifestyle of people coupled with urbanization, rapid technological progress and decreasing lifespan of a single electronic device, has led to increasing rates of consumption of electronic products. This has made electronic waste management a burning issue of environment and health concern. The direct study on Dhaka city has shown that e-waste generation is 0.26 kg per capita in 2013. On the other hand from statistical analysis, per capita e-waste generation in urban areas of Bangladesh has been found to be 0.15, 0.016 and 0.65 kg per capita in 2013 from three different scenarios. Nimtoli, Chankherpul is the largest secondary e-waste accumulation centers in the city. Besides e-wastes are also accumulated and dismantled in Elephant Road, Kodomtoli, Jinjira, and Mohammadpur. Most of the elements of e-waste has its own recycling process such as plastic, PVC are recycled using local technique in Islambag. Metal, wire, glass etc. are recycled in industries near Becharamdeuri, Mredhabari and Kachpur. But some other elements like printed circuit board (PCB) and Cathode ray tube (CRT) which cannot be recycled are thrown to dustbin as procedure of extraction of valuable metals from PCB (Acid bath) is not exercised here. But there are few agents who export those to foreign Countries. Land filling, one of the major processes of disposal of e-waste is not exercised here. Open burning to recover valuable metal from e-waste is exercised here in a small scale.

**CHARACTERIZATION AND TREATMENT OF
GREY WATER COLLECTED FROM A SPECIFIC SITE
AT DHAKA AND OPTIONS FOR REUSE**

**AHM Golam Hyder, Md. Delwar Hossain,
Md. Tarik-Uz-Zaman, Md. Ashrafuzzaman
Department of Civil Engineering, World University of Bangladesh**

One of the natural resources available in nature is water; generally, it is not readily available for domestic use for millions of people across the globe. With the increasing of urbanization as well as population, not only the demand of fresh water but also the volume of wastewater is being increased. In general, increase in water demand and changes in the geographic condition as well as in climate are responsible for water supply problems. New water use models and wastewater reuse patterns are of utmost importance in water sector today. Therefore, water reclamation, recycling and reuse are now recognized as key components of water and wastewater management. As long as the problem is about the scarcity of water and no new sources developed in Bangladesh without the traditional underground water, surface water and some other sources of potable water, the only choice remain is to reuse the household greywater. Any wash water that has been used in the residence, except water from lavatory and urinal, is called greywater. Though greywater contains small amount of pathogen, it is necessary to reuse it to maintain the environmental balance. Nowadays, its reuse has become the crying need globally. This study has been a little effort to introduce greywater recycling and to find its potentiality for reuse in WUB campus. The goal of this research is to develop a concept for treating greywater on-site for non-potable usage such as lavatory flashing, gardening, irrigation and others. Our objectives are to explore the quality of greywater and its potentiality for recycling, if necessary, with a model graded sand filters. For this purpose we have performed thirteen water quality parameter tests- pH, Color, DO, TC, TDS, FC, COD and BOD₅, Alkalinity, Hardness, Chloride, Nitrate, Phosphate. The quality of grey water varies from sample to sample. Of the filtered water, the pH varies from 7. 10 to 8. 0 mg/l; Color varies from 15 to 20 (Pt-Co); DO varies from 6. 50 to 7. 5 mg/l; COD varies from 80 to 100 (mg/l); **BOD₅** varies from 6. 0 to 5. 5 (mg/l); The Chloride varies from 68 to 70 mg/l; Hardness varies from 15 to 25 (mg/l) as **CaCO₃**; TDS varies from 285 to 300 mg/l; Alkalinity varies from 127. 5 to 175; Phosphate varies from 0 to 0; Nitrate varies from 44. 3 to 30 mg/l, TC varies from 0 to 0, FC varies 0 to 0 in our tested samples.

**MICROBIOLOGICAL QUALITY ANALYSIS OF WATER
SUPPLIED BY DWASA IN SIDDHESWARI AREA**

**Sunil Kumar Roy, Md. Maksudur Rahman, Abu Nayem Md. Kowser, Md. Asad
Department of Civil Engineering, World University of Bangladesh**

The study was conducted by the Department of Civil Engineering, World University of Bangladesh. To assess the Microbiological Quality of the five selected Deep Tube Well (DTW) water in the Siddheswari Area, the Microbiological Quality of water at the nearest point of the selected area and the Microbiological Quality of water at the user end point of the selected area. To do so, samples were collect from 5 DTW's of DWASA and 15 points. After the collection of the samples, tests were carried out in the laboratory of World University of Bangladesh. In our test according to ECR 97, pH of drinking water is 6.5 - 8.5. Total coliform test was found to be zero and fecal coliform test was found to be zero. Arsenic content was found to be zero, Nitrate test was found to be zero, and Nitrite are also to be zero. Based on the above results conclusions were made and many suggestion/recommendations were made which would improve the quality of water.

**STUDY ON SPATIAL AND TEMPORAL VARIATION OF WATER
QUALITY OF THE TURAG AND THE BURIGANGA RIVERS,
DHAKA CITY**

**Md. Abu Bakkar Sidik, Md. Sohel Rana, Md. Shihab Alam, Md. Moshen Ali
Department of Civil Engineering, World University of Bangladesh**

Dhaka is one of the most densely-populated cities in the world. All the economic activities in Bangladesh are Dhaka centric. Water supply problem is acute in this city. This work is a Study on Spatial & Temporal Variation of Water Quality of the Turag & the Buriganga Rivers around Dhaka City over few months. The water samples collected from five different points around Turag & Buriganga River area. Mainly, this paper deals with the present scenario of surface water quality and comparison with the standards. This study will also observe the seasonal fluctuation of water quality parameters of this river. From P^H 6. 4 to 8. 2 at (Minimum 6. 4, Month of April and Maximum 8. 2, Month of July), TDS 660 to 73 mg/l at (Maximum 660, Month of April and Minimum 73, Month of July), TSS 750 to 200 mg/l at (Maximum 750, Month of April and Minimum 200, Different Month), DO 0 to 8. 8 mg/l at (Minimum 0, Month of April and Maximum 5. 8, Month of July), BOD₅ 3. 1 to 0 mg/l at (Maximum 3. 1, Month of April and Minimum 0, Month of Jun), COD 290 to 90mg/l at (Maximum 290, Month of May and Minimum 90, Month of July), NH₃-N 5 to 0mg/l at (Maximum 5, Month of April and Minimum 0, Month of July). At the last moment, we found that P^H, TDS, TSS, DO, BOD₅, NH₃-N are satisfied with standards limited. The values of some parameters remained high during the dry season with a lower river flow as compared to the rainy season. Alternatively, during the rainy season the concentration was diluted from the higher water flow. The various industries can be investigated which are harmful for environment the river water. Department of Environment should keep monitoring and controlling pollution of river water.

TREATMENT OF WASTEWATER FROM TEXTILE INDUSTRY BY ZERO EFFLUENT DISCHARGE TECHNOLOGY

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Department of Civil Engineering, World University of Bangladesh

The textile dyeing and washing industry plays an important role in the economic growth as well as in the environment of Bangladesh. The textile dyeing industries has been condemned as being one of the world's most offenders in terms of pollution. There are many dyeing industries in Bangladesh which are mainly located at Narshindi and Narayanganj and Tejgaon industrial area. This study aimed at the dyeing industries to assess the present situation of environmental impacts arising from the activities of dyeing industries in Bangladesh. This was done by analyzing numerous data obtained from different laboratory test concerning a range of water quality parameters of Bangladesh. Important water quality parameters like pH (12-14), turbidity (NTU 25), TSS (2300 ppm), BOD (600 ppm), COD (1200 ppm), Nitrate (90 ppm), Alkalinity (250 ppm), Total Coliform (600/L) and presence of metals were measured by testing samples. The samples were collected from effluent water of renowned and international buyer recognized industries named Unilon Textile Ltd, Padam Poly Cotton Knit Fabrics Ltd, Esquire knit composite ltd and Woven, dyeing & knitting industry Limited in Narshingdi, Tejgaon & kachpur. The results show that all the water quality parameters pH (6. 5-8. 5), Color (PCU 15), Turbidity (NTU 10), TSS (2300 ppm), BOD (600 ppm), COD (1200 ppm), Nitrate (90 ppm), Alkalinity (250 ppm), Total Coliform (600/L) are within the permissible limits. Though the water test report shows no vulnerable change in water quality for this particular industry, but the overall (Environmental Impact Assessment) EIA report shows the highest negative impact on physico-ecological environment. The objective of the present paper is to give insight information regarding the appropriate technology for treatment of wastewater. The paper discusses sustainable wastewater treatment systems in the context of industry of the developing world. In order to determine the appropriate treatment system, the developer must consider the area's climate, topography, and socioeconomic factors. The study also revealed that high quality water could be produced by treatment system incorporating membrane technology at affordable costs and recycled back into the process in the textile dyeing industry.

ARSENIC, IRON AND COLIFORMS REMOVAL EFFICIENCY OF HOUSEHOLD LEVEL BIOSAND FILTERS

**Sunil Kumar Roy, Md. Mamun Sharkar, Md. Al Muktadi, Md. Shawal Hossain
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Experimental investigations were carried out to study the removal of arsenic, iron and coliforms in drinking water by bio-sand filters using iron nails. Three cycles of experiment were performed using two household filters. The experiments were carried out using different quality of waters such as arsenic spiked ground water, tap water and natural arsenic contained ground water. The filters under study consist of two parts combined in a single unit. The top part of the filter consists of iron nails for the adsorption of arsenic, while the bottom part of the filters is basically a small size slow sand filter, which removes the suspended materials present in water. At the same time, it also removes the micro organisms present in water by biological action. Both the filters have showed moderate results regarding the removal of arsenic, iron, and coliforms during the first cycle of study. First cycle of study was carried out for 10 days using arsenic spiked ground water of central road, Dhanmondi. The performances of filters were found satisfactory in second cycle of study, in which arsenic spiked tap water was used. Average removal of arsenic in single bucket filter and double bucket filter were 81. 01% and 46. 94% respectively. Both filters produced water with acceptable concentration of arsenic (50 ppb). Treated water exceeded the interim standard of arsenic for Bangladesh. The efficiency of filters to remove iron and turbidity is satisfactory. Iron removal is about 50% in both the filters. But, maximum concentration of 4 mg/l of iron was reduced to 1 mg/l. Average turbidity of 12 NTU was reduced to value of less than 2 NTU. The average removal of total coliforms in the filters is found 100%.

STUDY ON DIFFERENT WATER TREATMENT TECHNIQUES AVAILABLE

**A. K. M. Maminul Islam, Munshi Kamal Hossain, Habibullah, Kamrunnahar
Department of Civil Engineering, World University of Bangladesh**

Natural water contains impurities in different forms. The presence of these impurities in excess of acceptable limits makes the water unsuitable for domestic supplies. The objective of the study is to provide information necessary for the selection of drinking water treatment techniques used for removal of contaminant and subsequently reduce human exposure to contaminant. The goal of this process is to produce water usable for a specific purpose. Most water is disinfected for human consumption (drinking water) but water purification may also be designed for a variety of other purposes, including meeting the requirements of medical, pharmacological, chemical and industrial applications. The treatment process of water may reduce the concentration of particulate matter including suspended particles, parasites, bacteria, algae, viruses, fungi; and a range of dissolved and particulate material derived from the surfaces that water may have made contact with after falling as rain. The standards for drinking water quality are typically set by governments or by international standards. These standards will typically set minimum and maximum concentrations of contaminants for the use. There are many water treatment techniques such as Sand filter, Water chlorination, Coagulation and flocculation, Sedimentation, Sludge storage and removal, Flocculation clarifiers, Dissolved air flotation, Filtration (Rapid sand filters, Slow sand filters), Membrane filtration, Removal of ions and other dissolved substances, and Disinfection (Chlorine disinfection, Chlorine dioxide disinfection, chloramine disinfection, Ozone disinfection, Ultraviolet disinfection, Various portable methods of disinfection Solar water disinfection). This study has gathered adequate information on the ability of various water treatment technologies to remove contaminant that may be present in source waters. The results of this study will be used by municipalities, and drinking water utilities for selecting optimal contaminant removal Processes and subsequently reducing human exposures to contaminant. Chandnighat Water Treatment Plant (Old Dhaka City), with its subsequent improvement, supplies 39 million liters of filtered water daily which meets 1.8% of the total water supply of Dhaka now. Only 22% of Dhaka WASA water currently comes from surface water sources, in the Dhaka City Corporation area. Water treatment transforms raw surface water into safe drinking water. Surface water treatment involves two major processes: Physical removal of solids and chemical disinfection.

**EXISTING SCENARIO OF MEDICAL WASTE MANAGEMENT: A CASE
STUDY OF SHAHEED SUHRAWARDY MEDICAL COLLEGE
AND HOSPITAL, DHAKA**

**Shariful Islam, Anisuzzaman, Mahua Kabir Setu, Nur-E-Alam
Department of Civil Engineering, World University of Bangladesh**

A review of Waste Management Systems of Shaheed Suhrawardy Medical College and Hospital (ShSMCH) was performed to understand (a) source of waste (b) types of waste (c) The various handling and disposal procedures in Shaheed Suhrawardy Medical College and Hospital (ShSMCH) (d) the knowledge and awareness of individuals involved in medical waste generation, handling and disposal and (e) the potential impacts of the waste stream on both human health and the natural environment. Information was collected mainly from literature review, Shaheed Suhrawardy Medical College and Hospital (ShSMCH) on spot sources and field surveys. It was found that a variety of methods were used by the medical authority to dispose of their wastes including burning, burial, entombing, selling, dumping, and removal by municipal bins. The waste disposal practice was found to be quite unsafe, and both clinical and non-clinical wastes were found to be thrown together. There was insufficient awareness about the impact of the medical wastes issue by concerned individual at different level. Children, adults, and animals all have the risks to come into contact with these wastes which may pose severe health risks to them. There were lacks of safety measures observed in dealing with waste disposal or laboratory analysis of various diseases. The chemicals used for the staining and preservation of slides and for the sterilization and cleaning of equipment and surroundings are potentially harmful to the laboratory technicians and the environment. Hospital wastes pose a significant impact on health and environment. From this study, it can be said that there is an urgent need for raising awareness and education on medical waste issues. Proper waste management strategy is needed to apply. It is needed to collect more information on impacts, disposal and management to draw a clear conclusion, need to collect information and examples from developed country or the country which has effective medical waste management system. In future, extensive study in needed on Shaheed Suhrawardy Medical College and Hospital (ShSMCH) waste and its management aspects in order to prepare a strategic action plan to manage all the wastes.

TREATMENT OF TANNERY WASTEWATER BY ELECTRO COAGULATION

Md. Rajedul Islam, Rana Bikash Tripura, Md. Imtiyaz, Sharmin Mallick
Department of Civil Engineering, World University of Bangladesh

This research work was conducted by the Department of Civil Engineering of World University of Bangladesh (WUB). The specific objectives of the study were to acquire knowledge about treatment of tannery waste water. The tannery industries located at Hazaribagh are one of the major polluting industries in Dhaka. Treatment of tannery effluent is a challenging task as it is a biogenic matter of hides and a large variety of organic and inorganic chemicals. Electro coagulation (EC) is becoming a popular process to be used for wastewater treatment. In this study, the application of EC technique in the treatment of tannery effluent has been investigated. The experiments were carried out in an electrochemical reactor using aluminium electrode. Different operating time and electrode spacing has been studied in an attempt to achieve a higher removal capacity. Tannery wastewater sample was collected from Bay Tanneries Limited located at Hazaribagh. Operating time was varied from 15 to 90 minutes, and 4 cm and 6 cm electrode spacing was used. The result has shown that the effluent wastewater was very clear and its quality exceeded the direct discharge standard. Colour removal efficiencies were found to be 88% at 75 minutes with 4 cm electrode spacing and 93% at 90 minutes with 6 cm electrode spacing. Chemical Oxygen Demand (COD) removal efficiencies were found to be 53.2% at 30 minutes with 4 cm electrode spacing and 61.6% at 90 minutes with 6 cm electrode spacing. The obtained results indicate that the EC technology can enhance the settling velocity of suspended particles and removal of COD and colour.

**EVALUATION OF WATER QUALITY AND SANITATION SYSTEM AT
KURIL SLUM AREA IN DHAKA**

**H. M. Golam Hyder, Md. Shujon Ahammed,
Md. Shaheen Alam, Gausia Akhter
Department of Civil Engineering, World University of Bangladesh**

Slum population has been increasing in Bangladesh over the last three decades along with the growth and expansion of cities and towns. But, slum facilities are very much insufficient and unsatisfactory for them due to lack of proper water supply and sanitation system. Therefore, the major portion of excreta is deposited into water bodies that are polluting surface water, groundwater sources and surrounding environment. As a result, majority of slum population in Bangladesh suffer from different kinds of water and excreta- borne diseases. That's why the goal of the study is to investigate the water supply and sanitation facilities of Kuril slum in Dhaka city. During the study, data and information were collected by survey in slum. However, the level of hygienic knowledge has been found to be significantly low in the slum dwellers. The study in the slum area of Dhaka city has found that the sanitary and water supply condition are improving very slowly. Majority slum people use tube well water for drinking purpose which is connected to Dhaka supply line. The slum has pit latrines, which are hygienic, but these cause groundwater contamination depending on the soil characteristics and distance between the water sources and latrines. The drainage system is the most neglected sector in the sum. The open disposal of human excreta into nearby water bodies through drains cause severe water pollution. Solid waste management and drainage system are unsatisfactory in the slum area. Motivational work from government and NGO are needed to improve water supply and sanitation condition in the slump area.

**VEHICULAR INDUCED NOISE POLLUTION AT VARIOUS
PUBLIC POINT OF DHAKA CITY**

Md. Asaduzzaman, Rajib Kumar Das

Department of Civil Engineering, World University of Bangladesh

As Dhaka is the capital city of Bangladesh, it attracts lots of people to come here for various purposes. To cope up with the pressure of transporting a huge number of people comprising both permanent dwellers and transitory; increase in number of vehicles is not unlikely. So, increases insound level is a consequence. When sound level crosses the acceptable range (dB), it creates noise that harms human well being in multidimensional way. Although noise can be created from various sources, this report is prepared mainly concerning vehicle induced noise. A conscious endeavor had been given to determine the level of noise at some selected but important public places of Dhaka city along with the aim to find out if it depends on vehicle volume or not. For this purpose, four important public places of Dhaka city were selected. They were Farmgate, Banglamotor, Asadgate and Mohakhali. These places were chosen because of the noise level here; so, it would be easy to grab the overall scenario in Dhaka City. Level of sound of the four places was recorded using Digital Sound Level Meter in decibel unit at 15 minutes time interval, also the number of vehicles was counted at the same time interval. From the record of dB, it was found that noise level of all the selected points far exceeds the acceptable limit as recommended by the DOE. The maximum level of dB was 102. 4. Noise level tends to be comparatively lower at mid day time. On the other hand, highest number of vehicles passed through Banglamotor point. However, noise level is not related with the volume of vehicles. Strict regulations, noise barrier, speed controls etc. measures may be useful to reduce the noise level.

WATER LOGGING AT SHANTINAGAR-MALIBAG - KAKRAIL AREA IN DHAKA - A CASE STUDY

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Dhaka, the capital city of Bangladesh is one of the populous mega cities in the world. As the growth of urban population is taking place at an exceptionally rapid rate, the city is unable to cope with changing situations due to their internal resource constraints and management limitations. This paper focuses on the rainfall induced flooding that is caused by high intensity storm rainfall runoff in the city area that is inundated for several days mainly due to lack of proper drainage system and inefficient management. It ascertain the inherent causes of such water logging and its effects on the city life from the perception of authorities of different development organizations, experts and people living in Dhaka city as well as different parts of Santinagar, Malibag & kakrail. Heavy downpour occurs in Dhaka city during monsoon, as it is located on the extensive floodplains of Ganges and Brahmaputra. But, the unplanned spatial development activities and growth of habitation due to rapid population growth are causing encroachment on retention areas and natural drainage paths with little or no care of natural drainage system that creating obstacles to properly drained out the urban runoff. Inadequate drainage sections, conventional drainage system with low capacity and gravity, natural siltation, absence of inlets and outlets, indefinite drainage outlets, lack of proper maintenance of existing drainage system, and over and above disposal of solid waste into the drains and drainage paths are accounted for the prime causes of blockage in drainage system and water logging. In addition, seasonal tidal effect and the topography of the city area also causing water logging. This water logging becomes a burden for the inhabitants of Santinagar, Malibag & kakrail and creating adverse social, physical, economic and environmental impacts. The storm water becomes polluted as it mixes with solid waste, clinical waste, silt, contaminants, domestic wastes and other human activities that increase the water born diseases. The stagnant storm water leads to the creation of breeding sites for diseases vectors that becomes a hazard to health as well as being unsightly and foul smelling. Management of drainage system of Dhaka city is presently a challenge for the urban authorities because of rapid growth of population and unplanned development activities. Therefore, a close coordination among concerned authorities and agencies and collaboration between public and private sectors is needed for effective management and sustainable operation of drainage system as well as water logging.

A STUDY ON FUTURE WATER DEMAND OF DHANMONDI AREA

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Water supply in Dhaka city heavily depends on groundwater extraction where more than 87 percent of the supplied water is being extracted from this source. Such extensive dependency enhances a very high depletion rate of groundwater table. Dhanmondi area is selected as it is one of the most affluent residential areas in Dhaka city. In Dhanmondi area, groundwater extraction started from a depth of 100 meters and in some extreme condition the well goes up to 300 meters to reach the main aquifer. Taking into account the current groundwater depletion, a projection has been made for 2066 to illustrate the future scenario. The present population of Dhanmondi area is approximately 1, 53, 338 and present water supply from DWASA is 2, 30, 40, 000 liter/day. The calculated population of the next 50 years will be 2, 79, 875 and total consumption of water will be 4, 19, 81, 250 litre/ day in 2066. The study finds out from a key informative survey that, one-third of the respondents receive less than 40 l/p/d and somehow they manage their daily activities with this minimum amount of water. On the other hand, 31. 5 percent respondents adjusted their daily activities with minimum 40-50 l/p/d, but among them, only 8. 6 percent receives the required amount. Those who desired to get water supply of more than 60 l/p/d, can get access to such amount by only 5. 1 percent. On an average, 42. 8 percent of the respondents can receive basic requirement of 50 l/p/d and the rest 57. 2 percent respondents are suffering from water scarcity despite having piped connection. Furthermore, 31. 68 percent of supplied water is consumed by system loss in between production and end-user level. However, at present, 10 pumps are fully operative in Dhanmondi area (MODS Zone -03) to supply the above amount of water and each pump can provide 1600 liter of water per minute. It is estimated that, in 2066, 9 more pumps will be required to fulfill the demand. In response to the solutions of this overwhelming water crisis, one-third (34 percent) of respondents emphasized on raising awareness to reduce the misuse of water. To eliminate dirt and ill-smelling, 23 percent respondents demand technologically improved water treatment plant. Significant proportion (17 percent) of the respondents opined that efficient human resources and seeking alternative sources of water might fulfill the demand. However, technological advancement to reduce the percentage loss, proper management in authority and appropriate awareness can increase the supply and create a proper balance between supply and demand.

Photographic View of Civil Engineering Department

Orientation program



Celebration of foundation day



Sports program



Field visit



Convocation program



Seminar and workshop



Procession against terrorism



Class and lab activities



Class and lab activities



Class and lab activities



Class and lab activities



Cultural Program



Cultural program



Cultural program



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Md. Mamun Hasan Khan Choudhury WUB 10/08/23/626	Md. Ased Dulal Islam WUB 10/09/35/1051	Md. Jahangir Alam WUB 10/08/28/783
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Tanzina Afrin	Md. Jahangir Alam	WUB10/10/41/1300
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WUB 10/10/42/1271	Md. Abul Kashem	Md. Amrun Hossin
Md. Mizanoor Rahman	WUB 10/09/35/1047	WUB10/10/46/1393
WUB 10/08/29/857	Md. Mahibur Rahman	Md. Zahangir Alam
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Md. Suzon Islam WUB 10/09/33/986	Mohammad Rayhan Uddin Pramanik WUB 10/08/27/821	Md. Jahur Ahmed WUB 10/09/32/982
Sonia Akter WUB 10/09/36/1084	Md. Enamul Kabir WUB 10/09/30/924	Iftakher Hossain WUB 10/09/33/1005
Md. Jahid WUB 10/09/40/1218	Md. Mosharrof Hossain WUB 10/09/39/1194	Md. Sarower Hossain Arif WUB 10/09/33/1007
Hasina Akter Lima WUB 10/09/40/1223	Karim Mohammad Istiaque WUB 10/07/20/580	Md. Golam Faruk Akanda WUB 10/09/35/1045
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Md. Wadud Hossen WUB 10/10/42/1249	Md. Shoyeb Uddin Munshi WUB 10/08/25/720	G. M. Kamrul Islam WUB 10/10/40/1215
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Ashikur Rahman WUB 10/09/37/1144	Md. Abul Kashem WUB 10/09/36/1085	Md. Ashraful Zakariae WUB 10/10/42/1265
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Md. Russell WUB 10/09/33/989	Mohammad Nazrul Islam WUB 10/10/43/1334	Md. Shehab Uddin WUB 10/07/15/432

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WUB 10/09/39/1189	WUB 10/09/33/995	Kazi Md. Rafiqul Islam
Ashwini Kumar Biswas	Md. Moheuddin	WUB10/11/50/1677
WUB 10/09/40/1204	WUB 10/09/36/1097	Sree Pradip Kumer Sarker
Zillur Rahman	Md. Riajur Rahman	WUB10/11/50/1678
WUB 10/09/40/1227	WUB 10/09/37/1161	Md. Mazharul Islam
Md. Obaydur Rahman	Md. Farid Aktar	WUB10/08/28/788
WUB 10/06/14/400	WUB 10/09/40/1232	Jobair Ibne Hasan
Sormista Ghosh	Md. Manjurul Eamam	WUB10/09/35/1053
WUB 10/08/29/869	WUB 10/09/40/1243	Mohd. Abdul Zabbar
		WUB10/09/38/1131
Md. Ziaunnabi	Md. Aminul Islam	
WUB 10/07/18/494	WUB 10/10/42/1277	Md. Masud Pavez
Khan Mohammad Mohshin	Md. Robiul Islam	WUB 10/10/41/1285
WUB 10/08/25/699	WUB 10/10/41/1282	Amena Tasnim Lucky
Mohammad Alimuzzaman		
Khan	Md. Kamrul Hasan	WUB 10/10/41/1295
WUB 10/08/25/700	WUB 10/10/41/1283	Md. Toriqul Islam
Md. Nazmul Haque	Md. Bayajid Khan	WUB 10/09/36/1098
WUB 10/09/40/1229	WUB 10/10/41/1288	Mahmuda
Abu Mohammad Ahamedur		
Rahman	Md. Alip Molla	WUB 10/10/41/1296
WUB 10/09/40/1236	WUB 10/10/41/1290	Sadia Farah Mitu
Md. Habibullah	Kazi Ariful Islam	WUB 10/10/41/1302
WUB 10/10/43/1305	WUB 10/10/41/1292	Rajan Chandra Biswas
Md. Samim Hossen	Aparajit Roy	WUB 10/10/46/1383
WUB 10/10/43/1332	WUB 10/10/41/1293	Azahar Uddin
Md. Rashedul Islam	Md. Iftekharul Alam	WUB 10/10/47/1453
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