

DEPARTMENT OF CIVIL ENGINEERING

UAP CE RESEARCH ABSTRACTS



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Foreword

We are pleased to publish our first booklet of undergraduate theses abstracts, that were produced by the undergraduate thesis students to fulfil the requirements of degree completion during Spring semester 2017. Such publication will be continued in future; every year two theses booklets will be published by the department covering undergraduate research works conducted within two academic semesters (Spring and Fall). These abstract booklets will be circulated among students and faculty members of UAP. In addition, such copies will also be circulated among faculty members of CE departments of different national public and private universities. We hope that these scientific abstracts will give innovative ideas to our current undergraduate students for carrying out their undergraduate research works. We also believe that our initiative will develop research collaboration bridges between CE department, UAP and other CE departments of different universities in Bangladesh working on similar interests. Full copies of these undergraduate theses are available in our departmental and university libraries.

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HYDROPOWER DEVELOPMENT IN SOUTH ASIA: BENEFITS FOR BANGLADESH

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ABSTRACT

Though demand for electricity is increasing all over the world day by day, the production of electricity cannot fulfill the required demand. In the present situation, most of the electricity comes from non-renewable energy source like gas, coal, oil, etc. For this reason, electricity production is unsustainable in Bangladesh. Bangladesh is a downstream country with flat land. By geographical location, Bangladesh has a little amount of hydropower Kaptai-230 MW (Active), Sangu-100 MW (Proposed), Matamuhuri-100 MW (Proposed) and Mohamaya-23 to 65 MW (Proposed). In 2017, electricity generation capacity is 13621 MW in which gas contributes 62.62% of total electricity generation. If gas contributes to fulfill the future electricity demand, the stock of gas will be finished between 15 to 20 years.

This study analyzes the future electricity demand in Bangladesh and potential of hydropower in reducing the pressure on non-renewable sources like coal and gas. The actual demand for electricity of Bangladesh in 2035 would be around 87991 MW. But the electricity production of Bangladesh could not achieve that required target. The current strategy of Bangladesh government is to produce extra 11600

MW generation capacity in next five years. The power system has been expanded to keep pace with the fast-growing demand. On the other hand, two power plants Rampal Power Plant (Fuel type: Coal) and Rooppur Nuclear Power Plant are proposed and are under construction with a generation capacity of 2520 MW. But this is not enough to meet the future energy demand of Bangladesh. This study concludes that Bangladesh can fulfill the demand for electricity by importing hydropower from hydropower rich neighboring countries i.e. Bhutan, Nepal, Myanmar and China.

PRODUCTION SCENARIO OF SELECTED CROPS AND WATER USAGE IN SAARC COUNTRIES DURING 1968-2014

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ABSTRACT

South Asian association for regional cooperation (SAARC) comprises eight countries of Asia. SAARC includes about 3.82% of global surface area and 23.74% of world population. Among this huge population 23% people are malnourished. Agriculture is the predominant sector of economics in all SAARC countries. International Water Management Institute (IWMI) has estimated a

requirement of 269 million metric tonnes of cereals only for India by 2025 under the changing consumption scenario. The study of production behavior of major food items like cereals, (especially rice and wheat) and vegetables is of much importance not only for assured food supply for present generation but also for future generations.

This study analyzed the production pattern changes of selected crops i.e., rice, wheat, potatoes, tomatoes, dry chillies and sugarcane during 1968-2014. It also analyses the water usage in SAARC countries during the same period. For this analysis data has been collected from aqua stat database from food and agriculture organization (FAO).

The study reveals a wide range of variations in cultivated area, water use and production of these crops among the countries. With the flow of time, the percentage of crops production is increasing along with the percentage of agricultural land use. South Asia is the second largest rice producing region in the world; currently 41% of arable land in south Asia is used for rice production and contributed to 32% of global rice production. And also, South Asian region produces 16% of the global wheat. All the countries of South Asia largely depend on ground water for irrigation and due to over exploitation, the ground water is depleted which could be the barrier to achieve sustainable food production and water security in the long run.

ASSESSING BUS SERVICE QUALITY BASED ON PUBLIC PERCEPTION: A CASE STUDY COMPARING DHAKA AND CHITTAGONG CITY BY STRUCTURE EQUATION MODEL (SEM)

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ABSTRACT

Bus service performs a significant function for movement of considerable number of people in developing cities where the mobility needs are increasing due to rapid urbanization. Although buses play the crucial role in any urban areas, their services as a main mode of mass transport are commonly inadequate to meet up demand. The main aim of this work is to assess the service quality (SQ) of the bus in Dhaka and Chittagong city, based on public perception. This study presents Structural Equation Modeling (SEM) approach to identify the relationships among major attributes those affect the SQ of bus transit. A two-step methodology has been adopted for this research. The first part addressed data collection approach incorporating a purpose-built questionnaire survey. The second part included the structural equation models development. For each empirical model, the process of model development followed the approach of trial and error in terms of accommodating variables as well as by observing the overall goodness of fit values of the respective models. Specifically, 40 Bus SQ attributes drawn from 956 questionnaires from Dhaka city and 715 questionnaires from Chittagong city are used to develop different SE models. Along with the stated preferences, effect of three latent variables “Service Feature”, “Bus Quality”, “Safety and Security” on SQ is also analyzed. “Entry and Exit”, “Level of Personal safety” and “Fitness of the bus” are found to be the most significant observed variables that influence the SQ. The result shows that 53% respondents in Chittagong city rated the quality of the services as poor which is comparatively

higher than in Dhaka city which is about 41%. The findings of this research can provide operating companies and transport administrators valuable information for designing appropriate transport policies, attracting new passengers and retaining the current ones.

EXPLORING PUBLIC PERCEPTION OF RAIL SERVICE OF BANGLADESH BY USING ORDERED PROBIT MODEL (OPM).

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ABSTRACT

Public transport is the most efficient and reliable mode of transportation in developing and developed countries of the world. With the increasing rate of population public transport demand is also increasing. Train is the most cheapest and convenient for long distance journey among other modes. Hence railway transportation plays a vital role in Bangladesh. Due to lack of an adequate budget for maintenance of rail tracks and other infrastructures, the rail sector is in a deplorable condition, resulting in poor performance of Bangladesh Railway. This thesis was aimed to explore public perception of rail service of Bangladesh by using ordered probit model. The study examined survey questions for Kamalapur

railway station in Dhaka to collect the data and to get an idea of users' perception about train service quality. The survey is accomplished by 25 questions regarding the train service quality. Result indicates that waiting place condition, cleanliness of train, security inside the train, body condition of train, entry and exit facilities in train are highly correlated with service quality. Ticket cost, delay time, travel time and online ticketing system have negative impact on service quality. So, there is a probability if delay time, travel time and ticket cost are decreased, overall service quality might be improved. The railway authority should take necessary steps immediately to provide more reliable and user friendly service, which will decrease the pressure on public transport service and private vehicles in Bangladesh.

A STUDY ON GROUND IMPROVEMENT METHOD EMPHASIZED ON SAND COMPACTION METHOD (SCP)

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ABSTRACT

The sand compaction pile (SCP) method is a ground improvement technique which is applicable in both sandy soil and clayey soil. It has been developed and frequently adopted for many construction projects in Japan, in which sand is fed into ground through a casing pipe and is compacted by vibration, dynamic impact or static excitation to construct a compacted sand pile in soft soil ground. This method was originally developed in order to increase the density of loose sandy ground and to increase the uniformity of sandy ground, to improve its stability or compressibility to prevent liquefaction failure. Now-a-days, it is also being applied in soft clayey ground to assure stability and to reduce ground settlement.

This study focuses to develop a simple and straightforward design procedure of sand compaction pile method which is applicable only in sandy ground. In this study, empirical relationships developed by several authors are used to construct graphs relating the basic design parameters of sandy soil, i.e. angle of internal friction, relative density and standard penetration test (SPT) values. The design charts and graphs are very useful in reducing the computation effort and to make the design of SCP to be more effective. The basic design parameters of sandy soil, i.e. angle of internal friction, relative density and standard penetration test (SPT) values before improvement by SCP and after improvement by SCP corresponding to a required replacement ratio, obtained from the proposed design method are compared with two case studies. The values of basic soil parameters obtained by the proposed design method are in good agreement with the field measurements. An alternative method is also suggested in the present study, which provides the opportunity of cross checking of the values of basic design parameters of sandy soil obtained from the aforementioned method.

NITROGEN REMOVAL IN TREATMENT WETLANDS WITH CONSTRUCTION MATERIALS

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ABSTRACT

This study examined pollutant removal routes and effect of recirculation on treatment efficiency, employing vertical and horizontal subsurface flow constructed wetlands that were dosed with industrial wastewater and were packed with construction materials i.e. recycled bricks. Effluent from Shyampur industrial area were collected and used as influent across the wetland systems. The influent was dosed at 219 mm/day loading rate, over a period of 6 weeks and then introducing 100% effluent recirculation with loading rate 526 mm/day for additional 7 weeks. Hydraulic loading was applied two times a day within 3 hours time interval. Results from the study illustrated that the wetland systems were effective in terms of Ammonia, Nitrate, Nitrite, Total Nitrogen and Sulfate removals. Ammonia, Nitrite, Nitrate, Total Nitrogen and Sulfate removal percentages were 35%, 68%, 40%, 26%, and 39% respectively for vertical subsurface flow wetland system and 69%, 21%, 23%, 72%, and 6% respectively for horizontal subsurface flow wetland system. The wetland systems showed improved removal performances after introducing effluent recirculation.

ORGANIC SUGARCANE BAGASSE FOR INDUSTRIAL WASTEWATER TREATMENT

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ABSTRACT

This study reports pollutant removal variation in vertical and horizontal flow wetlands dosed with industrial wastewater collected from Shyampur, Dhaka, Bangladesh. This paper mainly represents removal rates of Total Phosphorus, BOD, COD, and Total Suspended Solids in hybrid constructed wetland systems.

One cylindrical plastic pipe and one rectangular steelbox were used as vertical flow (VF) and horizontal flow (HF) systems respectively. Sugarcane bagasse was employed as the main media for the growth of microbial community. The experiment was continued for 9 weeks.

Overall Total Phosphorus removal percentages were 43% and 48% in the outlets of VF and HF systems respectively. Overall BOD removals were recorded as 70% in the HF wetland. Mean overall COD removals were 37% and 38% in the outlet of VF and HF systems respectively. On the other hand, overall Total Suspended Solid removals were -57% and -74% in the outlets of VF and HF

systems respectively. After employing recirculation, overall removal performance significantly improved in the HF wetland system.

EVALUATION OF CARBON SEQUESTRATION OF DHANMONDI LAKE ENVIRONMENT; TREE SPECIES AND TOPSOIL AND LAKE SEDIMENT

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ABSTRACT

Dhanmondi Lake of Dhaka, Bangladesh has been a prior zone of carbon sequestration as an urban park which indicates the significance of the effects of climate change and requirement for a healthy environment for city dwellers. For the very first time carbon storage capacity of Dhanmondi Lake has been evaluated with respect to storage in tree species, topsoil and sediment of the lake contributing to the natural carbon stock. Amount of carbon-di-oxide (CO₂) of the Dhanmondi Lake water body with other water quality parameters have also been analyzed in the laboratory. Water samples have been collected from different points of the Dhanmondi Lake. Quantitative analysis has been done with primary data collection of different tree species. Sampling of topsoil and sediment has been done for different locations along the lake area. The amount of carbon

stored in topsoil and sediment has been analyzed by soil resource development institute of Bangladesh (SRDI). Collection points of topsoil, sediment and water have been located by google earth. Finally, zone wise distribution of carbon stock for tree species of Dhanmondi Lake has been obtained using geographic information system (GIS). Results indicated that, total tree biomass of Dhanmondi Lake for 35 different tree species consisting of 2553 trees is 46.08 ton. Total carbon stock per hectare area of Dhanmondi Lake by tree species is 23.04 ton/ha. Total topsoil carbon stock per hectare area of Dhanmondi Lake is 19.13 ton/ha. Total sediment carbon stock per hectare area of Dhanmondi Lake is 31.98 ton/ha. The average amount of CO₂ in the lake water is 6.53 ppm. For the carbon stock distribution by tree species, Dhanmondi Lake has been divided into three zones. The maximum carbon stock rate is 56% of the total carbon stock in amount of 12.9 ton/ha by tree species contributed by 1430 trees and this has been covered by Zone 2 evaluated through GIS. The medium carbon stock rate is 40% of the total carbon stock in amount of 9.22 ton/ha by tree species contributed by 1021 trees and it has been covered by Zone 3 evaluated through GIS. The minimum carbon stock rate is 4% of the total carbon stock in amount of 0.92 ton/ha by tree species contributed by 102 trees and this has been covered by Zone 1 evaluated through GIS. Evaluation of the variation of carbon storage capacity by each species of trees in the lake area suggested that the species *Albizia Procera*, *Michelia Champaca*, *Polyalthia Longifolia*, *Swietenia Mahagoni*, *Ficus Benghalensis* can sequester the maximum carbon from the environment (ranging ~100-200 tons/hectare) and thus should be grown with priority.

DEVELOPING OF DISSOLVED OXYGEN SAG CURVES AND PROFILES OF OTHER WATER QUALITY PARAMETER OF MAJOR RIVERS IN DHAKA CITY WITH FOCUS ON HEAVY METAL CONTAMINATION IN TURAG RIVER

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ABSTRACT

Dissolved oxygen sag curve conveys particular significance for the aquatic ecosystem, ecological life and water quality as well. The dissolved oxygen sag usually dictates the variation of oxygen level in a water body due to various kinds of disposal and also indicates the oxygen remaining or amount of oxygen dissolved in water.

The main objective of this study was to develop dissolved oxygen (DO) sag curves for major rivers around Dhaka city. The sampling has done in 7 points along Buriganga, Turag and Shitalakhya rivers at a 4 km distance intervals. On the basis of obtained results, sag curves for the three rivers were developed and compared. This part also included the identification of sources of waste which is responsible for maximum level of sag or deficit. This study also analyzed water quality parameters for the mentioned rivers around Dhaka city. 14 different water quality parameters including pH, biochemical and chemical oxygen demands, color, turbidity, total dissolved solids, total suspended solids etc. were analyzed for this study.

Another objective of this study was to evaluate heavy metal contamination in different compartments of Turag river. This analysis was done for determining the contamination level of heavy metals in river water, river side plants,

sediment, phytoplankton and fish species belonging to different tropic levels. Heavy metals such as zinc, chromium and lead have been analyzed in fish, water, sediment, phytoplankton and plant samples in this study.

Dissolved oxygen sag curve were obtained for Shitalakhya and Buriganga river; however, a perfect sag could not be identified for Turag river within the selected locations. Minimum DO was obtained at 0.58, 0.2 and 1 mg/L for Turag, Buriganga and Shitalakhya rivers respectively and DO levels remained below 4.0 mg/L at all instances which indicates an endangered condition for aquatic life forms especially during dry season. pH value was slightly high but still acceptable. The levels of dissolved oxygen, biochemical and chemical oxygen demands, turbidity, color and suspended solids were extremely beyond the standard ranges of surface water quality. Shitalakhya river was found to be in better situation than Turag and Buriganga river in terms of pollution.

Chromium, lead and zinc were detected at insignificant levels in the water; however significant concentrations of zinc were obtained in plants, phytoplanktons and riverside sediments. Pollution Load Index indicated low level of heavy metal contamination and bioconcentration factors suggested significant bioaccumulation of zinc in phytoplanktons and moderate level of accumulation in fish species.

A STUDY ON EFFECT OF VARIATION OF CEMENT CONTENT AND JUTE FIBER IN COMPRESSED EARTH BLOCK (CEB)

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ABSTRACT

Compressed Earth Blocks (CEBs) represent a cost-effective, sustainable and environmental-friendly building alternative to traditional masonry elements. Since its emergence in the '50s CEB production technology and its application in building has continued to progress and to prove its scientific as well as its technical worth.

A total of 118 number of CEB cubes (2 inches × 2 inches × 2 inches) were prepared. Jute fibers were incorporated to 54 blocks at the ratio of 0.25% by weight. Cement was used as soil stabilizer at the ratio of 0%, 2%, 4%, 6% and 8% by weight. CEB blocks were compacted with 5 MPa compression applied by Universal Testing Machine. Blocks were tested for compressive strength at 7, 14 and 28 days of air curing. All the materials were collected from Savar and Dhaka. Tests like Sieve analysis, Dispersion test and Atterberg limit test has been performed on soil samples. The soil was identified as Silty clay soil.

The compressive strength of CEB blocks showed almost linear increase with age. Addition of jute fiber improved nearly 29% over blocks without fiber. 8% cement content with jute fiber gained maximum strength of 12.52 MPa at 28th day.

EFFECT OF VARIATION OF CEMENT CONTENT AND ADMIXTURE IN COMPRESSED EARTH BLOCK

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ABSTRACT

Most developing countries have an urgent need to construct and build houses that are more durable at a low cost. Compressed Earth Block (CEB) could provide sustainable solution to this. The principal objective of this research is to investigate the mechanical and physical properties of CEB.

Soil sample has been collected from Savar, Dhaka. Ordinary Portland cement (OPC) from Shah Cement factory and Master poly heed 8632 from BASF industry has been collected. Soil sample has been prepared by drying, pulverizing and screening process. Total five samples have been used with mixing soil, cement and water. Also four other samples have been used with admixture. Here the block size is (2 inches × 2 inches × 2 inches). The cement percentage have been varied for five mixing with 0%, 2%, 4%, 6%, 8%. For testing the soil samples sieve analysis, dispersion test, Atterberg limits have been performed. Compressive strength has been tested for 7 days, 14 days and 28 days. Total of

45 blocks have been prepared without admixture and 36 blocks have been prepared with admixture.

The compressive strength of CEB without admixture was found as high as 9 MPa for 4% cement stabilization. Whereas with admixture the highest strength was found to be 9.86 MPa for 4% cement replacement. The unit weight of CEB blocks is on an average 1.8 gm/cm³ which is 28% less than clay bricks.

From the study it has been found that the compressive strength of blocks with admixtures varies increasing. It could be said that by increasing cement content and admixture there is a general decrease in total water absorption of the blocks. CEB can be a good solution to low cost housing.

STUDY ON WASTEWATER DISCHARGING FROM POINT SOURCES IN GULSHAN LAKE, DHAKA, BANGLADESH

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ABSTRACT

Gulshan Lake is the northernmost lake in a sequence of water bodies in Dhaka. Gulshan Lake is about 3800 m lengthy having a common depth of about 2.5 m. Gulshan Lake is located on 23°48'N and 90°25'E.

This study focuses on the assessment of point sources wastewater discharging in Gulshan Lake. The main point sources of wastewater are domestic wastewater and surface drain run off. Gulshan Lake was divided into four segments and found total 102 numbers point sources of wastewater discharging in the Lake. For these purposes, total 17 numbers of samples were collected from 17 locations of four segments. From 1st segment 3 samples, 2nd segment 5 samples, 3rd segment 5 samples and from 4th segment 4 samples were collected. All samples were collected from February to June 2017. Different parameters such as pH, Dissolved Oxygen (DO), Color, Turbidity, Electrical Conductivity (EC), Hardness, Chemical Oxygen Demand (COD), NH₃, NO₃, NO₂, Total Dissolved Solids (TDS), PO₄-P, Cl₂, Fe and Salinity were examined for water of each sampling points to monitor the level of these parameters whether it exceeded or within the permissible limit of Bangladesh standard.

A CASE STUDY OF ALTERNATIVE USE OF RAW GREYWATER IN PRODUCTION OF CONCRETE

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ABSTRACT

In Bangladesh and many countries worldwide, water used in the manufacturing

of concrete must be potable. This research empirically investigated on how the compressive strength of concrete can be affected while using greywater. At present, it is currently thought that concrete properties are highly influenced by the water type used and its proportion in the concrete mix, but actually there is little knowledge of the effects of different, alternative water sources used in concrete mix design. Therefore, identification of the level and nature of contamination in available water sources and their subsequent influence on concrete properties is becoming increasingly important. The water collected was of different qualities and sources and manufacturing concrete cylinder. The raw greywater has been considered for use in concrete mixing plants because of the great benefit in terms of reducing the cost of waste disposal cost and environmental conservation. The objective of this study was to investigate the effects of using greywater on the properties of fresh concrete. The chemical composition of water (tap water and greywater) qualities was analyzed while 161 concrete cylinders were produced at a ratio 1:1.5:3 using each water quality type. It was observed that the concrete produced with greywater had their compressive strength are close to fresh water produced cylinder at 7, 14 and 14 days but greywater produced cylinder strength are low. With the result of this study, it is recommended that greywater could be used for low strength concrete production.

DESIGN AND ANALYSIS OF INDUSTRIAL STEEL BUILDING: A CASE STUDY

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ABSTARCT

This study investigates the static and dynamic response of an industrial steel building (5-storied) by employing ETABS and STAAD Pro. The results are evaluated and compared between early mentioned software. And the results are used to design some important elements of the building such as column and beam. Also the design sections are compared with the field section dimensions. It is observed that the sections are a bit of under designed even for static loads. However, it needs to be mentioned that the design was done by American Institute of Steel Construction (AISC), Load and Resistance Factor Design (LRFD) method, shortly, AISC-LRFD. And for the numerical implementations the Bangladesh National Building Code (BNBC) is used.

One step further, the time-history analysis (THA) is performed by employing the original El Centro 1940 earthquake both in ETABS and STAAD Pro. And it is observed that the displacements are quite a lot. The THA results confirmed that the structure will struggle a lot to survive if there is an earthquake.

Therefore, the recommendation of this study is to consider dynamic loads analysis for important structures.

PERFORMANCE EVALUATION OF LOW STRENGTH CONCRETE ON STRUCTURES

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ABSTRACT

Many structures in Bangladesh are made with low strength concrete due to the un engineered construction and poor construction materials. Typically, low strength structure is used in rural area as well as in municipalities around Bangladesh. The aforementioned issue has motivated to study the properties of low strength concrete and its application on structures. To do this end, this study investigates the performance of low strength concrete on structures by performing experimental tests. Firstly, for understanding the low strength concrete, the tests are conducted for 45 cylinders made with the brick chips. The cylinders are made with a water-cement ratio of 0.5 and the volumetric mixing ratio 1:2:4 (e.g. cement: sand: coarse aggregate). In order to assure the low strength sand and stone dust are used to replace a certain percentage (e.g. 10%, 15% and 20%) of cement. And in a later stage, a flat slab and two flat plate slabs are made and tested in the lab. The responses are evaluated both for static and seismic load. The static loads were applied by placing a step-by-step load on top of each slab. And the dynamics responses are studied by employing shake-table

tests where a scaled El Centro 1940 earthquake data is used. The results obtained from experiments are compared with numerically observed results. The numerically simulations are performed via SAP2000 version 19 and post-processing of results are done by MATLAB®. And it can be summarized that the numerically observed results agreed quite well with the experimental data. The outcome of this study is expected to assist the real engineering application of low strength concrete on structures in Bangladesh.

DYNAMIC RESPONSE EVALUATION OF DAMAGED & UNDAMAGED STEEL FRAMES

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ABSTRACT

Steel structures are taking serious attention over the last few decades due to its serviceability and feasibility. The aforementioned structures are considered to be lighter than reinforced concrete structures. However, all of the structures are typically vulnerable due to dynamic loads such as seismic loads, blast and gale. Those loads may cause serious damage or partial damage to the structures. Hence it is essential to understand the behavior of the damaged and undamaged

structures under extreme dynamic loads. To deal with the aforementioned issue two 2-storied adjustable steel frames have been made and studied. In order to achieve the goal of the study, one frame was used to evaluate the undamaged responses of the structure. And the second frame was used to study the behavior of the damaged structure. The damage was incorporated by damaging the columns and several damage scenarios were considered such as 5%, 10% and 15%. In a first step, first floor columns are damaged sequentially and then top floor columns were damaged as well by maintaining the same damage sequence. In a second step, all of the cases were tested by performing shake-table tests. The shake table tests were conducted by employing scaled El Centro 1940 earthquake data. Finally, the simulations are performed via SAP2000 version 19 by employing the same material properties and input excitation. MATLAB® is used to post-process both experimental and numerically obtained results. The true results are compared (both damaged and undamaged) with the numerical one and a good agreement is observed. The outcome will help the engineers to understand the seriousness of damage and damaged structures which requires attention for designing/retrofitting.

INTERSECTION ANALYSIS WITH SATURN TRANSPORT MODEL

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ABSTRACT

Dhaka is becoming an unlivable city and many factors have contributed to this. It is clear that increasing traffic congestion does impose costs upon not only travelers but also on the whole economic activities and finally affect national income. Every year, millions of dollars are lost in the local economy due to traffic congestion. Long hours spent on congested roadways are draining away valuable time, energy and money from the economy. Thus delay should be reduced to increase productivity and to minimize environmental pollution. Intersections play an important role on traffic efficiency of Dhaka City. Saturation flow rate depends on the effectiveness of these intersections. Gulshan-Badda area is known as a diplomatic and VIP residential area. From economic point of view, the importance of this area is very high. As a result, it has become a traffic congestion prone area with rapidly increasing transport. This area includes Gulshan-1, Gulshan-2, Badda and Notun Bazar intersections. Suitable traffic movement depends on the performance of this area. The objective of this thesis is to calibrate a model of Gulshan-Badda area by using "SATURN" suit with present situation (i.e. Year 2017) and analyze the intersection. The area is divided into four internal and six external zones. Data collection consists of traffic survey, road width, geometrical co-ordinates and signal timing. SATURN model has been simulated based on the real condition to determine delay time and volume to capacity ratio of this real scenario. The existing traffic condition is based on non-lane based heterogeneous traffic. The transport model is developed for morning peak hour (9.00A.M. to 10.00A.M.). Results from the model shows delay time and volume to capacity ratio from node to node of each intersection. Therefore the roads and intersections where the delay time and v/c ratio is maximum can be detected easily. Bir Uttam Rafiqul Islam Avenue to Badda has the most delay time among all roads of these four intersections. Jamuna Future Park to Notun Bazar is the road with most v/c ratio. Modification is needed at the point with high delay time and v/c ratio which will increase the effectiveness of

these intersections. As a result, traffic congestion at this area can be reduced and the effectiveness of these intersections will be increased to desired level.

ROADS SAFETY AUDITING APPROACH IN ASSESSING SAFETY HAZARDS OF SELECTED ROADS in DHAKA CITY

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ABSTRACT

Dhaka, the capital of Bangladesh, is located in Dhaka District surrounded by river. Dhaka is a metropolis of 1528 km². Population density in Dhaka is over 10,000 per km² in the city area. The population in greater Dhaka has already crossed 10 million and average annual growth rate is 7%. Over the last 10 years, the population of Dhaka has become more than double. According to official information, 3,000 people die in road accidents every year in Bangladesh. 2074 road accident occurred in 2014, 2067 people died during this year and 1535 were injured. According to a study conducted by the Accident Research Centre (ARC) of BUET, road accidents claim on average 12,000 lives annually and lead to

about 35,000 injuries. According to World Bank statistic, annual fatality rate from road accidents is found to be 85.6 fatalities per 10,000 vehicles.

In Dhaka road safety problems are the most prominent. This is primarily because of the lack of sufficient transportation facilities and poor economic condition of the people. Because of these, day –by-day the road accidents are increasing.

There are three specific objectives in our thesis. Those are the factors that influence road safety; evaluate of road safety in major arterial roads, recommend some possible improvement.

Finding in this resource shows that, most of the pedestrians and drivers are not following traffic rule and regulation. Peoples are not using zebra crossing, foot over bridge, pavement or any facility that is provided on the road. Drivers are not obeying the signal and sign. Drivers are always in a rush. Drivers are under aged and driving unfixed vehicle.

The finding show that present condition of the existing facilities need to improve. Traffic rules and regulation need to be stick. Hawkers need to remove from the pavement. Drivers and pedestrians need to be charged if they're not following traffic rules.

EFFECT OF GLASS FIBER REPLACEMENT ON PHYSICAL AND MECHANICAL PROPERTIES OF CONCRETE

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ABSTRACT

It is well known fact that concrete is weak in taking tensile load and brittle in nature. For static loading, this characteristic does not affect the overall structural behavior. However, during dynamic event like earthquake, the failure pattern, failure timing, thus the ductility of concrete plays a crucial role. To overcome this problem, glass fiber could be a viable option as it has higher tensile strength that can compensate what plain concrete currently lacks. In this study, the behavior of the glass fiber in concrete has been investigated to determine the workability, compressive strength, stress-strain responses, Young's modulus tensile strength, flexural strength, load-displacement responses and failure pattern. Four mixes were made with different percent of fiber (0%, 1%, 2% & 4%) by total weight of cement. The cement content, water to cement ratio, and fine aggregate to total aggregate ratio was kept constant for every mixes. The experimental results show that, addition of glass fiber significantly improves the tensile behavior and failure pattern. No major change is observed in terms of compressive strength, and Young's modulus. To modify the structural failure pattern from sudden failure to ductile failure, addition of non-corrosive glass fiber could be a viable option, especially in the marine structures that are situated in high earthquake prone area.

EFFECT OF RECYCLED POLYETHYLENE TEREPHTHALATE (PET) AGGREGATE AS COARSE AGGREGATE ON THE FRESH AND HARDENED PROPERTIES OF CONCRETE

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ABSTRACT

The demand of natural coarse aggregate has been increasing drastically due to huge infrastructural development in recent years. The supply of such aggregate is limited in the nature. In this context, alternative sources of aggregate have been a major research area in the last few decades. Using recycled aggregate, crushed brick already gained acceptance in the construction industry. However, the energy consumption during the production of recycled aggregate is higher and still expensive in Bangladesh. Thus, the research community is trying other materials that could partially substitute the coarse aggregate and sometime even give added properties.

Polyethylene terephthalate (PET) bottles, one of the waste plastic types, is used in this study to assess the possibility of utilizing this as a replacement of coarse aggregate. The reason to choose the PET bottles is to develop a novel method to transfer it to valuable product and to solve the problem of dumping the tons of

plastic waste. This study focused on the bottle neck of PET as coarse aggregate replacement and behavior of concrete with PET, varying the percentage of coarse aggregate replacement of PET by weight 0%, 0.5%, 1.5%, 2%, 3%, 4%, 6%, 8% and 12%. The results of experiments show the feasibility to use PET plastic in concrete mixes. No significant changes are observed for mixtures containing up to 0.5% of PET-aggregates in compressive, tensile and flexural strength results. Higher percentage of PET replacement resulted decrease in workability and mechanical properties.

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