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“ArchAero”

DISASTER – RESILIENT SCHOOL/ EVACUATION CENTER FOR SASMUAN,
PAMPANGA

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The need for an adaptive and time relevant study on disaster response has reached its climax in these most urgent times. Taking this into considerations, this thesis study is dedicated to materializing a means of revolutionizing disaster – resilient engineering design in a world of unpredictable possibilities.

The problem of reducing the effects of typhoons characterized by strong winds in the most vulnerable communities in the Philippines is the core concern of this study. The proponents consider this study as significant as it aimed to design a disaster-resilient school/evacuation center for communities to function even in the presence of natural disasters.

The “AchAero” is introduced as a new strategy on how to lessen the effects of natural disaster on mankind. The project is designed with an aerodynamic inspired domes with respect to its aerodynamic shape. The likelihood of this scenario assumed that is structures are subjected to this revolutionized design, then many casualties will be saved at times of severe environmental catastrophes.

Out of the data gathered by the proponents through researches, interviews, and experimentation, it was found out there that the efficiency of the conventional design of schools that are used as an alternative evacuation center can be improved.

In the process the design criteria of the study were based in the provisions and specification of the National Structural Code of the Philippines (NSCP) 2010 Edition and Association of Structural Engineers of the Philippines (ASEP) Steel Handbook Manual 2004, Design of Steel Structures, SK Duggal (2209, Third Edition) and Module 5 Cables and Arches, Version 2 CE IIT, Kharagpur. However, the feasibility of the proposed project, as a school/evacuation center to prosper developer (government/non-governmental) will depend upon the obtained findings of future researchers.

DESIGN AND ANALYSIS OF SOLAR UPDRAFT TOWER IN THE PHILIPPINES
(Wind and Seismic Analysis)

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Solar Updraft Tower is a green technology that generates electricity and cools the atmosphere. SUT consists of a collector area to heat the air due to the wide-banded ultra-violet solar radiation, the high-rise solar chimney to updraft the heated air to the atmosphere, and in between the power conversion unit where a system of a coupled turbines and generators transforms the stream of heated air into electric power.

Tall and slender chimneys are usually used on industrial factory and oother power plants. The chimney of the SUT is similar to them. Software available on the analysis of such structures are limited nowadays.

The study presents the wind and seismic analysis and design of the SUT's Chimney and Foundation in the provision of NSCP 2010, the cost and analysis of the SUT, and the study of solar radiance in the Philippines for the suitability of SUT.

The study also presents theoretical and practical experience of making a small and less expensive educational prototype. The collector covering approximately 15.90 sq. meter ares has a tempered glass and tower made up of a polyvinylchloride (PVC) pipe and approximately 6 ft. high. The scale model is used to present the structure of SUT.

DESIGN OF REFLECTIVE PRECAST CONCRETE MEDIAN BARRIER

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Increased accident rates during the nighttime and wet weather conditions on the Bacolor along Jose Abad Santos Avenue (JASA) road, in the vicinity of Brgy Macabacle, Cabalantian, Parulog, Sta. Barbara and Cabetican necessitate the enhancement of highway concrete barrier strength and visibility. JASA road is included on the list of accident prone areas in Pampanga thus location is considered to be suitable for the installation of concrete barrier. The researcher has focused on a single precast concrete median barrier. In this study, experimental testing was performed on precast company using class A mixture with concrete strength of 3500 psi, strength of 24.15 MPa and the reinforcement with yield strength of 248 MPa. To speed up the curing process of concrete, admixtures was used on precast company depending on the contract. The design of this concrete median barrier was based on National Structural Code of the Philippines (NSCP 2010), American Association of State Highway and Transportation Officials (AASHTO) Traffic Load and Barrier. Ultimate Strength (USD) was used in the computation of its moment capacity to prove the effectiveness and safety of the strength of barrier. All forces involved in this study were assumed to be all lateral forces acting on the concrete barrier.

Black and white stripes were chosen in the color to be painter in the concrete barrier specifically acrylic paint was applied in the type of reflectorized paint to be used, due to ordinary black and white stripes used on the common highways, concrete barriers do not satisfy the enough reflected light on the drivers especially during night time. Glass beads were added to provide sufficient reflected light. Typically, glass beads were widely used on rubberized painted part of road for additional Reflectorization with 1.5 refractive index.

Pin type connection was applied to improve its effectiveness and reduce the tendency of sliding of concrete barrier. The proposed 810 mm barrier design uses a simple pin and loop connection with a single pin passing through three sets of loops at each concrete barrier segment end. The top most loops are positioned approximately 193 mm from the top of the barrier and the bottom most loops positioned at 154 mm from the bottom of the barrier.

The study of the proposed reflective precast concrete median barrier in this research was proven to be safe and economical. The difference from the cost of this barrier compared to DPWH concrete barrier is P 376.82 cheaper based from the estimated cost computed.

EARTHQUAKE RESISTING OVERPASS PEDESTRIAN USING ELASTOMERIC BEARING PAD

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The Philippine Archipelago lies in a highly sensitive position in the Asian continent, named the Pacific “Ring of Fire” and it is one of the most seismically active and disaster prone areas in the world.

This study presents a design of structure using a material that would possibly minimize the destructive effect of an earthquake. This material is called the elastomeric bearing pads which will be added on the system of the overpass.

In addition, overpass pedestrian is designed to achieve effective separation of people and vehicles and improve the traffic conditions, and as a result, to enhance the quality of environment for the residents. Ideally, the separation of people and vehicles will be completely realized when the Overpass Pedestrian System has been appropriately established. Traffic lights for facilitating pedestrians will be no longer set up to improve the efficiency of vehicles in vehicle lanes of busy sections. With the passing efficiency of the main road increases, local traffic pressure will be naturally alleviated.

GROUNDSILL AND GABION PROTECTION: MODERN APPROACH FOR SCOURING
MITIGATIONS (A COMPARATIVE DESIGN AS BEST SOLUTION FOR THE PRESERVATION OF
THE MANCATIAN BRIDGE)

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LOW COST HOUSING USING BAMBOO AS REINFORCEMENT IN CONCRETE

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As a response to the country's problem facing today, low cost house using bamboo reinforced concrete was a research study that will provide a method of designing a single storey house. The research explained why and how economical using bamboo as reinforcement in the single-storey house existing in the Philippines.

The substantive aim of the study was focused to the design of low cost houses using bamboo reinforced concrete. Working Stress Design or Allowable Stress Design was used. The beam was designed using Transformed Area Method and the column was assumed as short column and axially loaded. The equations and design procedures of steel reinforced concrete in Working Stress Design were used for analysis and design of bamboo reinforced concrete. Thus, the gathered mechanical properties of bamboo were substituted for the reinforcement. The design of footing was not included in the computation. Computerized computations were generated for the design process. *Dendrocalamus giganteus* which was available in Pampanga was chosen due to unlimited number of bamboos in the Philippines. The existing plan came from Nayong Tsinoy located at San Pablo, San Simon, Pampanga. Moreover, the study also considered that the bamboo was already available and already cut and trimmed into different sizes with different colors and symbols for identification of its strength. Furthermore, a portion of actual beam and column size with actual materials were constructed.

The designed beam has a cross-section dimension of 250 mm by 250 mm. the said structural element has a total of four (4) bamboo rods which has a diameter of 20 mm. Two (2) rods will be on upper portion while the other two (2) rods will be at the bottom. For stirrups, a diameter of 10 mm spaced at 200 mm will be enough.

The designed column has a cross-section dimension of 200 mm by 200 mm. The said structural element has a total of four (4) bamboo rods which has a diameter of 16 mm. Two (2) rods will be on upper portion while the other two (2) rods will be at the bottom. For lateral ties, a diameter of 10 mm spaced at 200 mm will be enough.

The difference of the two materials was PhP 50,629.47. The cost of steel was higher compare to bamboo. Using bamboo as reinforcement in concrete will deviate cost. Moreover, bamboo was significantly safe, at the same time, economically effective.

STRUCTURAL ANALYSIS OF CONTAINER VANS APPLIED IN HEALTH AND DAY-CARE
CENTER IN GUAGUA

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This study discusses the design of a two-storey health and da-care center using container vans and investigates it using LRFD approach. Since the container vans that were confiscated by the Bureau of Customs were just left stagnant, the group aim to convert it into a rigid and permanent structure.

China International Marine Containers (CIMC) is the brand that the proponents investigate because this has a better quality and readily available in the market. Unfortunately, other parts of the structural members of the container vans are not adequate to carry the loading that is why it needs to be reinforced.

Load and Resistance Factor Design is defined as a method for proportioning structures intended that no applicable limit state is exceeded when the structure is subjected to all appropriate factored load combination. It uses separate factor for each load and for the resistance. Because of different factors reflected the degree of uncertainty of different loads, and combination of loads, and the accuracy of predicted strength, a more uniform reliability is possible.

After generating the models and results were interpreted, the study pointed to positive and negative results, the design adapt all the maximum and minimum criteria of the NSCP codes but in terms of the minimum area requirement, the floor plan partition failed to meet the standards which led the researchers in a conclusion that the health and day-care center made up of container vans in Guagua is still safe under normal standard conditions.