

## **CIVIL ENGINEERING (CIV)**

**CIV 199301 ABADIES, Rosario Z. (MS Civil Eng'g.)  
Finite Element Analysis of a Triaxial Test Specimen.  
1993**

This study was conducted to analyze the state of stress in a triaxial test specimen assumed as an elastoplastic material. The computer program developed was designed particularly to simulate the effect of the rigid cap on the homogeneity of the state of stress in the specimen. The result indicated that despite the end restraints, a nearly homogeneous state of stress still prevails away from the rigid cap provided the height to diameter ratio of the test specimen is at least two.

**CIV 199302 ABDALLA, Nasralla S. (MS Civil Eng'g.)  
Determination of Residual Stresses in Locally  
Fabricated Wide Flange Steel Section. 1993**

An experimental test to determine the magnitude and the distribution of residual stresses in chosen locally fabricated wide flange sections made of flame-cut plates is presented.

Sectioning method is used for residual stresses measurements using tools and equipment readily available in laboratories in the Philippines.

The results of the tests showed that high tensile residual stresses are located on the tips and very close to the weld on the top and bottom flanges and the web. The tensile residual stresses ranged from 50% to 80% of the yield stress of the plate material.

Furthermore, the distribution of residual stresses from the tests were compared with distribution used by AISC Specifications and Column Research Council. The comparison showed a significant difference on the distribution of residual stresses between the sections made from the universal-mill plates and the sections made from the flame-cut plates.

**CIV 199303 ALDECOA, Salvador R. (MS Civil Eng'g.)  
Mean Recurrence Interval a Criterion for the  
Determination of the Directional Design Wind Loads on  
Structures. 1993**

Wind load standards and codes govern design of buildings and structures to resist wind induced loads. A major portion of wind engineering research effort ultimately translates into development of wind loading standards. With the advent of wind tunnel tests and computer simulations, wind direction is a very important aspect in structural design. This thesis focused on the sixteen univariate probability distributions of the largest yearly wind speeds recorded for the principal compass directions; obtained the design wind speed for each compass directions using the mean recurrence interval as the design criterion for the determination of wind loading.

This thesis compared the results derived by directional wind speed based on sixteen univariate probability distributions, extreme yearly wind speed without considering its directions and the deterministic approach adopted by the National Structural Code of the Philippines (NSCP) committee on wind loading. Model parameters of extreme value distributions (Type I, Type Ia, Type II and Type III) were estimated using the daily directional wind speed recorded at PAGASA weather station in Legaspi City. The Kolmogorov-Smirnov Goodness-of-Fit Tests were used to test the validity of the probabilistic model.

**CIV 200204 ALERIA, Felner C. (MS Civil Eng'g. - Geotechnical)  
An Evaluation of the Performance of Pile-Driving  
Formulas. 2002**

This study presents an evaluation of the performance of six (6) dynamic pile-driving formulas in the prediction of the ultimate pile capacities of forty-eight (48) prestressed, precast concrete piles driven into silty sands. The six pile-driving formulas studied are the Engineering News, Modified Engineering News, Hiley, Janbu, Schenck and Danish formulas. Predicted capacities ( $R_u$ ) are compared with measured capacities that were obtained using high-strain dynamic pile load tests and CAPWAP analysis ( $R_m$ ), and correlated statistically using linear regression analysis. In addition, the tendency of the pile-driving formulas to underestimate/overestimate the measured capacity was investigated

based on log-normal distribution plots and values of the mean, standard deviation and coefficient of variation of the calculated ( $R_u/R_m$ ) ratios. Finally, the results of the statistical analyses were used to determine appropriate factors of safety for use with each pile-driving formula for the calculation of allowable pile capacities.

Results of the study show that the performance of the Hiley formula was relatively superior, followed closely by the Janbu, Schenck and Danish formulas. Calculated safety factors for the Hiley, Janbu, Schenck and Danish formulas ranged from 2.0 to 4.40. On the other hand, capacity predictions obtained using the Engineering News and Modified Engineering News formulas were found have very poor correlations with and tend to significantly overpredict measured capacities, resulting to very high calculated safety factors greater than 8.

**CIV 200105 ANDALECIO, Melinda N. (MS Civil Eng'g.)  
A Study of Vibration-Control Design Parameters Using  
Models With Two Degrees of Freedom. 2001**

This thesis studies the optimum condition of design parameters in vibration control problems analyzed as two-mass model. The conclusions from this model will serve as guide for initial selection of design parameters for the vibration control system. The three problems considered are tuned mass damper (TMD) system, machine isolation (MI) system, and base isolation (BI) system.

The thesis presents: the selection of examples of 2DOF (two-degree-of-freedom) problems with their corresponding practical range of parameters; the design criteria; and procedures implemented in Mathcad2000<sup>®</sup> software. Three design criteria for each problem are formulated and adapted based on relevance and usefulness in civil engineering.

Parametric studies have been conducted to investigate the effect of design variables. Results are presented through tables and figures for many combinations of design parameters. Most cases consider harmonic excitation; but the study also extends to such simple periodic excitations as rectangular wave, or triangular or sawtooth. To calculate the dynamic response of two-degree-of-freedom problems with varying parameters, a technical tool has been developed through implementation of algorithms in Matchcad2000<sup>®</sup>; the program is called "2DOF"

The 2DOF program has been verified by comparing results with graphical or numerical results or empirical formulas that can be found in

literatures. It is illustrated that existing empirical formulas for optimum parameters and corresponding response have limitations compared to the exact results of the 2DOF program. Hence the 2DOF software is proven to be convenient alternative to the simplified empirical formulas that have been the tool of designers until now.

From a wide realistic range of parameters, it is concluded, for example, that the usual approach in the design of TMD by neglecting the damping of the primary sub-system has at least 10% underestimate of response value for  $\zeta_1 < 0.005$ . In general, for any of the three systems, optimum design parameters in frequency, damping, or mass may or may not exist, depending on the optimization criterion being chosen.

The dynamic response calculation of the two-mass model subjected to harmonic excitation is extended to periodic excitation using superposition technique offered by Fourier series. Tables are derived from the 2DOF program with periodic excitations. A parametric study shows that in most criteria, the response calculation for the three periodic excitations can be simplified by multiplying constant factor into the corresponding response for harmonic excitation.

**CIV 199606 BAID, Rodrigo S. (MS Civil Eng'g.-Transportation)  
Evaluation of Delay on Unsignalized Intersections. 1996**

In this study empirical models of capacity and delay have been developed for two-way STOP controlled intersections. The capacity model states that the maximum flow or capacity of the minor street is a function of the total conflicting flow and the basic traffic flow theories regarding capacity was confirmed true. The delay model states that at 100 vph reserved capacity, the average service time tends to remain at a nearly constant level and average service time is a function of total conflicting flow and reserved capacity being fixed. The basic traffic flow theories of delay is also confirmed true in this model. The delay model is in the form of a linear function while the capacity model is in an exponential form.

Warrant for signalization or improvement of the intersection has also been developed on some types of intersections. This is a delay based warrant and states that the intersection can be efficient at a combination below the curve if the capacity minus the threshold value of 100vph reserved capacity. In the comparison made of this established

warrant to the MUTCD and the locally used TEC warrant, it was found that the use of either the two existing warrant will overestimate the Philippine situation of unsignalized intersection efficiency.

The above mentioned models and the established warrant are preliminary for reason of limited survey sites and data such that the author understands the necessity for further study to come up with a reliable conclusions regarding the characteristics and efficiency of unsignalized intersections in the country.

**CIV200307 BENGUSTA, Ferdinand F. (MS Civil Eng'g.)  
Ultimate Capacity of Biaxially Loaded R.C. Columns of  
Arbitrary Cross-Section Using Parametric Mapping. 2003**

A numerical analysis for the determination of the ultimate strength of reinforced concrete columns of arbitrary cross-sections subjected to biaxial bending is presented. In satisfying equilibrium of forces and bending moments at a cross-section, the magnitude and location of the stress block normal to the member cross-section and the location of the neutral axis must be determined. In locating the neutral axis, a procedure akin to the initial stress method in finite element analysis of non-linear continua is adopted. This iterative procedure calculates the non-linear response to loading through a series of iterations, assuming elastic response in each step. In determining the magnitude and location of the stress block, parametric mapping is used. Parametric mapping of non-dimensionalized local coordinates and Cartesian coordinates which define the square and the rectangular hexahedronal domain and two and three-dimensional isoparametric element with curved boundaries, respectively, was adopted. In this technique, evaluation of the transformed integral equations was conveniently carried out by the Gaussian integration scheme.

**CIV 199408 BIDON, Paul dJ. (MS Civil Eng'g.)  
An Enhanced Matrix Arithmetic Package for IBM RISC  
6000. 1994**

This study was conducted to enhance a Matrix Arithmetic (MA) program developed by Dr. Salvador F. Reyes and make it adaptable to the IBM Risc 6000. The enhanced version is capable of handling larger

matrices and finite element modeling which is one of its features. For the greatest possible portability, the program originally written in PASCAL has been rewritten in ANSI C.

**CIV 200109 CATBAGAN, Jerome L. (MS Civil Eng'g.-Transportation)  
Application of Interactive and Graphic Systems for  
Highway Location and Route Selection. 2001**

Computer-assisted systems are fast becoming more of a necessity than just an expensive option. The price of acquiring such systems, although quite high, may often be offset by increases in productivity and reduction in work time, thus gaining significant net savings in the long run. This study presents and evaluates a technique in highway location and route selection that uses interactive and graphic systems. A system was developed that would provide a means for efficient drawing conversion and data manipulation. Hand-drawn alignment sketches on maps were easily converted into vector drawings and all alignment coordinate and element data were stored in a data bank. Also included in the system was the evaluation module for the generated vector representation of alignments. The concept of cost models was used for the evaluation procedures, where three-dimensional cost representations of the surrounding environs of the alignment were depicted. From these models, the total alignment costs may be calculated, which may then be used as a basis for selecting the best route. The system was found to be effective in evaluating and comparing results given different alignment schemes, based on the two test cases presented.

**CIV 199510 DIAZ, Crispin Emmanuel D. (MS Civil Eng'g.)  
Effects of Opening Arterial Roads in Exclusive  
Residential Subdivisions. 1995**

Exclusive residential villages are planned residential subdivisions which are comprised of single-detached housing units, and for which access is restricted to residents only. Urbanization leads to an increasing need for additional capacity in the existing road networks. Village size, shape and location are the most important aspects of its interaction with

the road system. When villages conflict with the function of the primary road system, opening of these villages is a very visible option for increasing network capacities. Unfortunately, there has been a lack of careful consideration of the effects of such moves on the residents of these villages, and whether or not such action would necessarily abate the decline in performance of the road traffic system.

This paper sought to identify the most important benefits of exclusiveness or conversely to identify the most serious disbenefits of its loss. From the village inventory, around 16.18 percent of all residential villages in Metro Manila village inventory are exclusive, affecting a large number of households. The surveys identified security and clean, quiet environment as the most important benefit of exclusiveness.

**CIV 199911 DE GUZMAN, Mark P. (MS Civil Eng'g.)  
Analysis of Mode Choice Behavior of Students of  
Exclusive Schools in Metro Manila: *The Case of Ateneo  
de Manila University and Miriam College. 1999***

Trip purpose consequently is one major factor in the worsening traffic problem in Metro Manila School trips are one of these trip purposes that contribute to it. Many practical transport policy issues that can alleviate traffic congestion are concerned with mode choice. Travel patterns, trip characteristics, socio-economic characteristics, and transport related policies affects mode choice behavior. The mode choice for this study is generally between car and others (public transport) wherein, public transport includes jeepney, tricycle, bus, taxi, FX (HOV), and LRT. Walk is hereby considered as an access mode.

Data collection was conducted on July 14, 15, 16, 19, and August 9 of 1999 at Miriam College and Ateneo de Manila University. Target samples were 400 per university. A total of 350 and 170 samples were collected in Miriam College and Ateneo de Manila respectively.

The research is concerned with the development of a linear and non-linear regression models for mode choice. It was found out that majority of them are car users and the variables that affects this choice is car ownership, parking access, and travel time. Travel time is not accurate in the analysis since the distance between the origin and the destination is not included due to time constraints.

The choice of car is minimized with the variable Unified Vehicle

Volume Reduction Program (UVVRP) effectiveness. This UVVRP effectiveness is only applied on a one-day basis; thus, it is not effective in the alleviation of traffic congestion. Moreover, majority of them owns more than two cars so it is possible that car switching is being done when this policy takes into effect on that day. Therefore, an alternative policy is being conducted in this study which is the carpooling. Majority of the students are willing to cooperate to carpooling as a donor or a passenger. Thus, carpooling policies will probably succeed in the alleviation of traffic congestion along the study area.

**CIV 200212 DOMINGO, Razon C. (MS Civil Eng'g. - Transportation)  
Adopting a Pavement Management System (PMS) for  
Local Governments. 2002**

Many developed countries have been and even developing countries are now implementing pavement management system (PMS) to effectively and efficiently manage their highway or road pavements. The Philippine Department of Public Works and Highways will be adopting the HDM-4 tool for its PMS. However, the shortage of funds for maintenance of road infrastructures is also a problem in the local government level and therefore the need for a pavement management system arises. A simple PMS is developed for implementation at the local governments. The PMS is composed of techniques on how to prioritize road maintenance projects and a preventive maintenance program. A knowledge-base expert system (KBES) application software is also developed for data storage and analysis to complement the manual distress data collection survey. In the road prioritization strategy, the pavement condition index (PCI) is used which rates the pavement condition according to the severity and extent of distress types present. Before the calculation of PCI, each distress attribute must be assigned a distress weight, severity and extent weight. A statistical algorithm is presented which converts the subjective rating scores of distress attributes from experts to a rational weighting scale that provides quantified measurements of the effects of each distress on pavement damage and riding quality. In the pavement preventive maintenance strategy, the timing of application of maintenance treatments is presented which is also based on the opinions of experts and engineers. These strategies are both contained in the application software. The application software was validated by conducting actual surveys and the results proved to be consistent with that of a pavement expert in recommending maintenance treatments.



**CIV 199913 CELZO, Ma. Salvacion I. (MS Civil Eng'g.)  
Study of the Compressive Strength and Unit Weight of  
Specimens Made From Lahar Sand and Lahar Sand  
Derived Materials. 1999**

Continuous work on lahar had been undertaken by different research groups in order to utilize the materials that had been considered a studies that were already done by introducing the method of separation in the lahar sand in order to produce new materials with the purpose application in the construction industry.

Lahar concentrates and lahar tailings were the materials derived from lahar. The 50-mm cube specimens that were produced using the derived materials were of good quality either in terms of the compressive strength, which were higher than the strength of specimens made of original lahar or river sand. On the other hand, the specimens made of lahar tailings were considerably lighter than the specimens made of the other sand samples. Combination of the strength and the unit weight of the samples gave a possibility in the application of lightweight load bearing concrete hollow blocks.

Another aspect that was investigated in the study is the substitution of lahar sand derived products in place of perlite. The study showed a positive results indicated by high strength attained by the specimens made of the lahar sand derived materials.

**CIV 199614 JARBADAN, Ma. Jocelyn A. (MS Civil Eng'g.-Transportation)  
Experimental Investigation on Lahar as an Alternative  
Material for Road Subbase Courses. 1996**

After six centuries of inactivity Mt. Pinatubo in Zambales erupted in June 1991, spewing million cubic meters of lahar and burying the nearby towns of Pampanga, Tarlac and Zambales. Lahar, as it is popularly called, is a form of pyroclastic material, which on close inspection, exhibit certain properties as that of fine river sand. It is composed of about 60% silicon dioxide ( $\text{SiO}_2$ ) and predominantly composed of feldspar.

Numerous research has already been conducted utilizing lahar as an alternative construction material. While most of the research dealt on lahar for industrial purposes, this study focused on lahar as an alternative pavement material, specifically ad a subbase course material, various laboratory tests were performed on lahar samples collected from Porac,

Pampanga, one of the towns worst hit by the eruption of Mt. Pinatubo. The specific gravity, grain size distribution, moisture-density relation and soundness of lahar were determined. Considering these physical properties of lahar and given its chemical and mineralogical composition, a suitable stabilizer or treating agent for lahar was chosen. Stabilization of lahar was done because it needs waterproofing and lacks the cohesion needed to perform its function as a pavement material.

Stabilization of lahar consisted of mixing lahar with varying percentages of Portland cement (0-2%), emulsified asphalt (CSS-1) (4%-7%) and moisture contents 912.85%-17.11%). The stabilized mixes were tested for its California Bearing Ratio (CBR) value and compared to the CBR value of raw lahar.

Results showed that although raw lahar (CBR=56.32%) passed the 25% CBR requirement set by the Department of Public Works and Highways (DPWH) for road sub-base courses, it cannot be recommended as a alternative pavement material because of its tendency to deform with the application of high loads. However, lahar stabilized with 2% Portland cement and 5% emulsified asphalt can be one option for road sub-base courses, with a CBR value of 84.91%. This mix was observed to be much stronger and more stable than raw lahar.

This study has shown that the properties of a substandard material like lahar can be enhanced so that it can be used as a substitute to the conventional material used for subbase courses of low-volume type of roads. In so doing, high quality construction materials can be reserved for higher type of roads.

**CIV 199815 LADAGA, Alex S. (MS Civil Engineering)  
Study on the Effects of Gap Forcing at Two-Way-Stop-  
Controlled Intersections Using Simulation. 1998**

Most methods involving estimation of capacities and delays of unsignalized intersections are based on Simple Gap Acceptance methods which assumes that major streams are not affected by the minor streams. This means that in a simple two stream case the major stream cannot experience any delay while the minor stream have to evaluate first the gaps available in the major stream before it can depart.

In this study, a simulation program is used to eliminate the usual problems encountered while doing actual surveys on capacities and delays of unsignalized intersection. The program takes into account the gap forcing that it is common among drivers and examines its effects not only on the minor stream but the major stream as well. A comparison between simulated data and the observed data using t-test shows that the actual data can be predicted using the simulation program. The program is then used to examine the behaviors of delays and capacities by varying the inputs of the following parameters; follow-on-time, and the number of left turns both from the minor and major legs. The author found out that capacities and delays are highly affected by these parameters that led to some important discussions on issues relating to delay and capacity estimation methods and warrants used for signalization.

**CIV 199516 LAMBINO, Silvino M., Jr. (MS Civil Eng'g. - Water Resources)  
The Study of Bend Losses in Large Pipes. 1995**

The study focuses on the problem of estimation of bend losses in large pipes. It verifies the relative influence of the different variables that affect this phenomenon. The uniqueness of the study is that it uses large diameters of pipes as models. The study considered two plants of Hydroelectric Development Corporation (HEDCOR) as models for experiments – the Bineng 1 and the Ampohaw Power Plants with conveyance pipe diameters of 1.01 m and 1.83 m, respectively.

The variables which affect the flow behavior were grouped into dimensionless parameters by means of dimensional analysis. Four dimensionless parameters were developed – the Euler's Number, the Reynold's Number, the angle of bend and the Relative radius. Regression analysis was used to determine the functional relationships and the degree of association among the variables. Only two important parameters were determined to have significant effect on bend losses in large pipes – the angle of bend and the Relative radius.

The study hopes to contribute to the understanding of the occurrence of losses in bends specially in large pipes. In general, the results will prove useful in the hydraulic analysis and design of large piping systems. Specifically, it will benefit Hydroelectric Development Corporation (HEDCOR), the patron and employer of the researcher, which is involved in the implementation of mini-hydro projects.

**CIV 200117 LLORIN, Maria Genelin D. (MS Civil Eng'g.)  
Limit Analysis of Reinforced Concrete Beams Under  
Combined Bending and Torsion Using Linear  
Programming. 2001**

In this study, a general systematic and efficient approach to limit analysis of reinforced concrete beams under combined bending and torsion is presented. It entails the replacement of a continuous perfectly plastic structure into a discrete mathematical model. It is then formulated as a mathematical programming problem using the static theorem of plasticity. This theorem states that the load on a perfectly plastic structure, corresponding to any arbitrary stress field that is in equilibrium with the load and nowhere violates the yield condition, is a lower bound to the actual collapse load. The discretization is done by writing the equilibrium equations of the discretized structure, and is combined with piecewise linearization of the non-linear yield curve, thereby converting the formulation into a linear programming problem. The yield curves are obtained by utilizing the plastic space-truss theory.

To determine the application of the proposed method, the collapse loads of spandrel and circularly curved reinforced concrete beams are presented. The results of the analysis of these beams show that the skew-bending theory and the space-truss theory can both be used to derive the interaction diagrams for combined bending and torsion.

**CIV 199518 MACABIOG, Rafael B. (MS Civil Eng'g.–Water Resources)  
Peak and Low Flow Investigation of Benguet  
Mountainous River Catchments. 1995**

Streamflow estimation has been the subject of considerable attention by many different private and government organizations involved in the development of water resources projects. Several techniques and approaches have been utilized in dealing with ungaged catchments or catchments of inadequate flow records. It was observed that factors directly and indirectly related to flow characteristics are good measures for derivation. These factors vary with topography, climate, morphology, geology, and land use. This thesis deals on investigating the peak and low flow characteristics of Benguet's mountainous river catchments.

A number of stations within the mountainous region with adequate

flow records were used to derive several flow characteristics. The flow characteristics considered were the average daily flow, flow availability magnitudes, flood frequency magnitudes, and the base flow index. Likewise, the unit hydrograph of selected catchments within the study area was also derived. The flow availability magnitudes or commonly illustrated as the flow duration curves were computed transforming the daily flows into percentages of the average daily flows. The flow magnitudes at 25, 50, 75, and 95 percent of time availability were derived from the computed flow duration curves. The average daily flow is the mean of all the daily flows recorded at that station. The annual maximum daily flows derived from the streamflow data gathered were analyzed using frequency distributions such as the Normal Distribution, Type I External Distribution, Two Parameter Log Normal Distribution, Three Parameter Log Normal Distribution, Pearson Type III Distribution and the Log Pearson Type III Distribution. The best fit frequency distribution was used to compute for the flood frequency magnitudes at return periods of 2, 5, 10, 15, 20 and 25. The Unit Hydrograph was derived using the recorded hourly flows and rainfall at the selected catchments. Observations were conducted for every occurrence of a significant typhoon within the year.

Factors defined by the basin characteristics were derived from the stations used to evaluate flow characteristics. These include the drainage area, average annual rainfall, circularity ratio, main channel length, main channel slope, basin perimeter, stream frequency, drainage density, basin elevation, maximum basin relief, geology, soil and land use. They were analyzed using maps, records and figures gathered from several agencies.

Prediction models were derived in this study to estimate flow characteristics of an ungaged catchment within the region or of catchment with similar site specific characteristics. The flow characteristics were the dependent variables and the basin characteristics served as the predictors in the analyzed model. The study showed that some of the basin characteristics were significant and served as a good measure. The prediction model for the flood frequency magnitude revealed a dependence on the area extensive variable such as the drainage area and the main channel length. Included also is the measure of stream frequency. The flow duration curves were predicted from the area extensive variables. The base flow indices were dependent on the geology of the basin. It showed that base flow is directly proportional to the permeability of the rock structure within the basin. Basins lying on a more permeable rock structure were more likely to produce greater base flow discharge.

**CIV 199519 MANGUBAT, Frederick G. (MS Civil Eng'g.)  
Speed Flow Relationships and Passenger Car  
Equivalent for Truck in Philippine Expressways. 1995**

This paper presents the results of research on the capacity determination in the considered segments of North and South Luzon Expressways. This study focuses on the establishment of a speed flow curve. The peak of the curve could define the maximum rate of flow or capacity. The capacity being obtained in this study is being compared to the capacity obtained in other studies like the Highway Planning Manual which is prepared by the Ministry of Public Highways and the U.S. Highway Capacity Manual. This study also includes lane utilization analysis of the considered segments and a macroscopic approach in the estimation of passenger car equivalent for truck.

**CIV 199920 NAVAL, Herminio S. (MS Civil Eng'g.)  
Development of Demand Model for Regional  
Commodity Flow in the Philippines. 1999**

Transportation planners and engineers are becoming more aware of the need for planning at the regional level. Transportation problems are no longer confined to urban areas. Emerging patterns of passenger and commodity flow movement have direct impact on the growth or decline of the regional economies. As developments in passenger and cargo handling are becoming more sophisticated so are the problems associated with it. Thus, a basic understanding on the relationship between economic activity, investment and goods movement is needed.

The research is concerned with the development of demand models for regional commodity flow. It analyzed past and present patterns of commodity movement using measures of regional economic activities as well as infrastructure investments as explanatory variables. It also described qualitatively and quantitatively the patterns of goods production, consumption and shipment among the regions of the country. It also assessed the suitability of using standard techniques in modeling goods movement. The study used data taken from the National Statistics Office and from several government agencies dealing with regional transportation planning.

The study revealed how airport investments, gross value added in services, mining and quarrying, gross value added in construction plus the presence of seaports relate to goods production, consumption and

distribution. It was also shown that trade imbalance exists in most of the regions and that majority of domestic trading occurs between the more developed regions of the country. It found out how traditional methods of demand modeling fail when faced with goods movement. As such, the study recommended that further studies, research, and more refined approaches to freight modeling be undertaken.

**CIV 199321 ONATE, Cesar E. (MS Civil Eng'g.)  
A Study of Natural Lightweight Aggregates for  
Structural Concrete. 1993**

This is a study of natural Lightweight Aggregates for Structural Concrete. The natural lightweight aggregates used were pumice, cinder and scoria which are available in the country. These were gathered from Pampanga, Laguna, and Batangas, respectively. The chemical and physical properties of these three types of lightweight aggregates were verified first with the requirements of ASTM C330 (5) before they were employed in the concrete mixes designed (ACI-211.2-81,2). To determine the effects of replacing lightweight fines by normal sand, three amounts of sand replacements, 0, 50, and 100 percent by volume, were introduced at each compressive strength level.

In the determination of plastic lightweight concrete properties, slump, air content and yield were measured. Further, compressive strength, unit weight, splitting tensile strength, shrinkage and popout tests were conducted to obtain the properties of hardened lightweight concrete.

The findings showed that pumice is suitable for structural concrete. With regards to the effect of replacing lightweight fines by normal sand, structural properties of lightweight concrete were improved as the amount of natural sand was increased.

**CIV 199622 ORTIZ, Gilbert Roland C. (MS Civil Eng'g.)  
An Exploratory Study on Shopping Center Trip  
Generation. 1996**

The current boom in shopping center construction entails the usage of some shopping center trip factor. The main objective of this research was to determine these rates. The results were that the observed shopping center vehicle trip rates greatly differed from foreign trip rates.

This was due to the fact that 69-80 percent of Filipino shoppers use the bus and jeepney while 90 percent of the foreign shoppers' use private vehicle. Due to the lack of samples, no accurate and stable trip prediction multi-linear model was established. As a result thereof, the researcher recommended more samples to be gathered using this formulated survey methodology.

**CIV 200223 PADAYHAG, Grace U. (MS Civil Eng'g.-Transportation)  
Evaluation of Electronic Toll Collection Along South  
Luzon Expressway and Manila Skyway. 2002**

Electronic Toll Collection (ETC) system in different countries has different operating characteristics. In this paper, the operational evaluation of the local ETC system, which was launched in August 2000, was being conducted primarily through video survey depicting the traffic condition of the selected toll plazas. The overall aim of the study is to determine the service rate of vehicles that passed through a toll plaza, comparing the manual, mixed-mode and dedicated ETC collecting tollbooths. The results of the analysis show that the dedicated E-pass lane has a lesser tollbooth transaction time with an average service time of 1.15 seconds/vehicle. However, usage of the E-pass lane was not maximized because, in spite the speedy transaction, more motorists pass through the conventional scheme, which is, paying tolls in cash coupons. This manual scheme has slower average service time rate of approximately 15 seconds/vehicle. Based on these results it can be concluded that the dedicated E-pass lane is faster in tollbooth transaction than that of the manual and mixed-mode scheme. Furthermore, lane capacity and delay of each toll-lane also vary widely with the type of toll-collecting booths. On the other hand, the queue delay in mixed-mode scheme is significantly less than for the purely manual scheme.

**CIV 199824 PARAYNO, Frederick C. (MS Civil Eng'g.)  
Post-Liquefaction Study of Dagupan City and  
Liquefaction Assessment of Pinatubo Lahar Deposits.  
1998**



The thesis involves the validation of known in-situ liquefaction assessment methods, namely: (a) Seed and Idriss (1982); (b) JSCE (1980 and 1991); and (c) Rodriguez and Palacio (1991), in the soil liquefaction-induced damaged Dagupan City during the July 1990 Philippine earthquake. The occurrence of liquefaction failure was based on the appearance of sand boils, tilting and/or settlement of overlying structures. On the other hand, the lack of the mentioned liquefaction evidences was taken as the non-occurrence of liquefaction failure. Possible corrections/adjustments were proposed to the methods, to conform with the surface manifestations of liquefaction failure in Dagupan City.

The validated/adjusted liquefaction assessment methods were then used to predict the susceptibility of the lahar devastated Pinatubo area to soil liquefaction failure. The validated methods concluded that the Pinatubo area has a high potential to soil liquefaction failure if subjected to high intensity ground movement.

**CIV 199425 QUEZON, Emer T. (MS Civil Eng'g.-Transportation)  
Study on the Effects of Flyover Construction on Traffic  
Flow: The Case of Metro Manila**

The study seeks to presents the effects of the flyover construction on traffic flow within the selected area in Metro Manila adopted the “with” and “without” case at-already completed flyover construction. These two views were categorically differentiated by bringing up several viewpoints that will evaluate the effectiveness of the flyover construction. The said viewpoints are the following, to wit: 1. what will happen if the flyover was not constructed?, 2. what is the current traffic situation?, 3. what are the problems being experienced by the travelers brought about by this set up?, and 4. is this flyover properly utilized? These are some of the many questions raised by cause-oriented group which this research attempts to clarify.

The comparative analysis concerning those viewpoints on “with” and “without” case at-already completed flyover construction was based on a basic concept of the study. This basic concept is the use of the travel time and delay as the measure for evaluation. The evaluation measure is used in applying the mathematical model formulated by DOHERTY and CATLING. This model would be used for “with” case of flyover construction to compare with the observed values by applying statistical analysis to test the model. After the test of the model, due validation of

the results and the same model would be applied for “without” case at-already completed flyover construction to provide for a comparative analysis.

A research paper such as the present work is justified by the need to present a more profound, truthful and understandable presentation of the subject, More so, because there have not been many studies conducted tackling this line of endeavor in the Philippine setting, maybe due to its very recent age and short experience how these flyovers work efficiently.

The research area studied was Nagtahan – R. Magsaysay Boulevard intersection. The traffic flow accentuated along the main corridors, namely, along R. Magsaysay Boulevard – Legarda, a second level overpass and Nagtahan – Gov. Forbes, a third level overpass. The ground level is converged into a five (5)-legged signalized junction of J.P. Laurel – Nagtahan – R. Magsaysay Boulevard – Legarda and Gov. Forbes.

The conceptual framework of the study takes the “with” and “without” case at-already completed flyover construction as the main course of consideration. The “with” case of flyover discusses mainly the views on how it affects the current traffic condition, included are subsequent topics on; 1. the normal growth of traffic, 2. the testing of the mathematical model and, 3. the weaving behavior of traffic flow. While the “without” case of flyover construction discusses the condition if the flyover was not constructed, included are subsequent topics on; 1. the right-of-way (R-O-W) and geometric configuration, 2. the intersection analysis, and, 3. the application of the mathematical model.

To complete the topic on the current traffic situation, a discussion on the possible solutions of the occurring problems based on findings were also presented. There were two issues from which delineation of the current traffic problem had been developed under one scheme, the Traffic Management and Enforcement, to wit: 1. move pedestrian overpass and jeepney stops further away from the separation level, and, 2. exclusive design of flyover for jeepney utilization.

**CIV 199526 REGIDOR, Jose Regin F. (MS Civil Eng'g.)  
Initial Development of a Simulation Program for the  
Evaluation of Jeepney Stop Configurations with Focus  
on Single Lane Roadways. 1995**

The current practice for public transit vehicles, notably jeepneys, is to perform loading and unloading operations at almost any point along a road section. This behavior leads to congestion as jeepneys effectively block the flow of traffic. There are existing policies for the designation of stops along Metro Manila's thoroughfares. However, these policies are not reliable as they fail to take note of important factors such as traffic flow and road characteristics. The author seeks to initiate the development of a practical and effective stop policy. As such, he presents a general methodology for the examination of various stop configurations. This paper focuses on the initial development of a computer program for the simulation of traffic flow given various stop configurations. The present form of this program is applicable only to single lane roadways and considers a test section composed of seven meter cells. Vehicles are generated using a shifted exponential distribution. Passenger arrivals were assumed to be normally distributed. The program is able to simulate jeepney stopping behavior as well as boarding and alighting operations. Realistic simulation is limited by assumptions made in this paper and the program was tested under somewhat 'ideal' conditions using real world input data. Results were evaluated to establish trends with respect to the relationship between stop designation and delay. The present form of the program is envisioned to include more aspects of the jeepney stop environment in the future and be extended to include multilane roadways as well as stops at intersections.

**CIV 200127 ROSARIA, Nicetos E. (MS Civil Eng'g.)  
Estimation of Extreme Wind Speeds for the  
Development of Wind Zone Map for the Philippines. 2001**

The thesis covers key concepts in the estimation of extreme wind speed for the development of a wind zone map. The present wind code provisions presented in NSCP-92 is modeled after UBC-91. Comparison of three different wind codes from the United States of American namely UBC-91, ASCE 7-88, and ASCE 7-95 showed that NSCP-92 do not have the same levels of safety as that of the more recent ASCE 7-95. A need to update NSCP wind provisions is therefore realized and ASCE 7-95 is eyed as the target model. However, adopting the ASCE 7-95 wind code requires that our present wind map be updated as well, in order to match the new definition of basic wind speed used in ASCE 7-95. Basic wind speed is defined in ASCE 7-95 as the 3-second gust speed at 10m above ground in Exposure C (or open terrain) associated with an annual

probability of 0.02 of being equaled or exceeded (i.e. having a 50-year return period). It is estimated from an extreme value model or distribution that best describes the extreme wind speeds of a particular area.

Monthly maximum wind data of about 30 years from 50 weather stations nationwide, collected and compiled by the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA), were utilized in the study. These data were subjected to two methods of extreme value analysis, the classical approach and the Peak-Over-Threshold (POT) approach, to determine which type of extreme value distribution is appropriate. The method of moments and the chi-square test were used for the classical approach, while the de haan method of parameter estimation was used for the POT approach. The results of the two approaches were generally consistent and most stations were found as best modeled by the Gumbel (Type I) distribution. Distributions of most stations under regions of different frequencies of typhoon passage were found with also same type.

Basic wind speeds for a 50-year return period for all stations were estimated. A procedure for estimating basic wind speeds at different return periods was also presented. Values of the estimated basic wind speed were utilized to develop a wind zone map. Similar to the present wind map, the developed map is divided into three zones. However, values of basic wind speeds assigned to each zone have significantly changed. Wind pressures on some selected structures resulting from the use of the proposed map in conjunction with the provisions of ASCE 7-95, which is eyed as the new model code for the forthcoming revision of NSCP, are then compared with those computed with the present wind code.

**CIV 200128 ROMERO, Jane R. (MS Civil Eng'g.)  
Port Development Projects and their Traffic Impact.  
2001**

The Port District of Manila drafted a 25-year port development plan that will cover the expansion of the South Harbor, the North Harbor and the Manila International Container Terminal to cope up with the growing container cargo and passenger traffic. At present, it is the dominant source of an market for port traffic in the country.

The port is located within the Old City of Manila characterized by

narrow streets so its land operations are hampered by Metro Manila's traffic congestion. Numerous studies in the past recommended that port development projects should be evaluated in terms of its traffic impact in its hinterland. This study aims to assess the traffic impact of the proposed port development projects through traffic simulation. Traffic simulation is a cost-effective means of testing different scenarios that may be very difficult to execute in actuality prior to implementation of the proposed projects.

Four cases were simulated to represent the different scenarios prior and upon completion of the said development projects. Case 0 depicts the present condition that is, present traffic volume on the existing roadway facilities. Case 1 represents the scenario for the year 2015 assuming that the proposed port development projects will not materialize. Case 2 will simulate the scenario for the year 2015 wherein forecasted traffic volume as per MMUTIS study plus the forecasted truck traffic to be generated by the port development will be tested on the existing roadway facilities. The MMUTIS Study proposed a port access improvement plan consisting of the elevated expressways and expansion of R-10 that would help decongest the existing road network. Case 3 considers the effect of these proposed infrastructures on the existing road network in simulating the forecasted traffic volume for year 2015 of the MMUTIS Study and the forecasted truck traffic.

**CIV 199829 RUBITE, Caesar P. (MS Civil Eng'g.)  
Modeling Car Ownership and Use in Metro Manila. 1998**

The rapid pace of motorization is presently being felt in the Metro Manila region. With the increasing trend in the households' standard of living, the demand for private cars is expected to increase also. However, the limited supply of road space cannot keep pace with increasing demand. Therefore, it is necessary to manage the growth of car ownership and use in metropolitan areas. A basic understanding of individual and household attitudes towards car ownership and patterns of car usage would enable the formulation of effective policies and plans for managing car ownership and use. Knowledge of car ownership and car use paves the way for a better understanding of the people's behavior which will greatly affect policy formulation and analysis in the future.

The research is concerned with determining the various household characteristics which influence the household's decision to own a car. The decision is modeled as a binary choice incorporating the different

household and individual characteristics as explanatory variables. It also sought to describe and explore qualitatively the nature and factors influencing car use. The study used data taken from the Metro Manila Urban Transportation Integration Study (MMUTIS) Home-Interview Survey (HIS) database; and a Focus Group Session undertaken specially for this research.

The research revealed that the major factors affecting household decision to own a car are household income, and age, gender, and occupational type of the household head. Car use is generally limited to serve activities of the household head and traffic congestion and the quality of service of alternative modes of travel influence car usage patterns.

**CIV 199430 SALDON, Antonio C., Jr. (MS Civil Eng'g.)  
Evaluation of Signal Parameters at Intersections of  
Metro Manila. 1994**

The operation of the Intersection is often the critical factor in determining the over-all capacity and performance of the road network. Traffic engineers are continually faced with the problem of controlling flows at intersections in order to improve the road network performance. The continuing increase of population and car ownership in the Metropolis urgently needs Government action to provide the increasing demand for intersection facilities to facilitate and control traffic movements. Metro Manila adapted the Area Signal Control System starting 1980. Since then, the Government is continually trying to solve this problem of facilitating the flow of traffic at the intersections of major thoroughfares. In spite of the poor economic situation in the country the Government is doing its best to ease the road users' discomfort, frustration. Loss of travel time and high fuel consumption brought about by the deplorable traffic situation in the Metropolis.

At present, there is now a computerized control system in Metro Manila, as part of the Government's program to solve the traffic congestion problem especially at intersections. The ability of this signalized intersection to move traffic is determined by the roadway, traffic and signalization condition of the intersection. Most of the physical (roadway) improvements of these intersections were done just to cope with the increasing traffic demand. However, traffic signal control is the crucial factor in the ability of the intersection to move traffic. It is an important element in the traffic management of road transportation system since it

involves allocation of road space to road users. The signal controller does the allocation of green time for every phase or the cycle time. This form of control can be obtained either through automatic control or by police direction (manual control). In traffic signal control, signal parameters are important to maximize the capacity of the intersection especially when it is oversaturated. In order to maximize the ability of the intersection to move traffic, the allocation of green time in every phase or cycle time should be optimized.

In this study, it was aimed to assess the current situation of signal setting at intersections in Metro Manila, to determine if the signal parameters used are at its optimum. It focused only on signal parameters, namely; phase length, cycle time and phase pattern which the signalization condition of the intersection is greatly dependent on. Through reevaluation of signal parameters, we could determine if these intersections need necessary physical improvement or redesign of intersection to deal with and perhaps improve the deplorable traffic situation in the Metropolis. For this purpose, a field survey of traffic volume and signal setting were conducted for 11 intersections which were selected as typical intersections in the Metropolis.

**CIV 200031 SUNDO, Marloe B. (MS Civil Eng'g.-Transportation)  
Effect of Hump Spacing on Speed Selection of Isolated  
Vehicles: The Case of Exclusive Villages in Metro  
Manila. 2000**

Over-speeding and reckless driving are important factors contributing to traffic accidents, sometimes resulting in the loss of lives and damage to property especially in residential and institutional areas where the movement of pedestrians should be given preference over the fast passage of motor vehicles. Accidents involving pedestrians have necessitated countermeasures such as traffic calming to reduce the risk of fatal injuries. The most common traffic calming measure being implemented in the Philippines is known as the road hump. Past studies in other countries have shown that road humps be effectively used as a traffic calming device, the design aspects of humps especially their spacing which affects the speed selection behavior of drivers should be taken into consideration. This research was conducted primarily to determine relationships between hump spacing and the speed selection of isolated vehicles in residential street environments. The speed profile of each of the observed isolated vehicles was used to determine the patterns

of drivers in selecting their speed within a given road hump interval. The effect of hump spacing and its relationships to the average speed 85<sup>th</sup> and 95<sup>th</sup> percentile speed and maximum speed were analyzed using regression. Similarly, the effects of the geometric design of road humps to post entry speed, and the post entry to maximum speed were also examined. The locations at which the majority of the observed isolated vehicles reach their peak speed were also identified. Recommendations for various hump spacings and proposed speed limits were then stated.

**CIV 199732 TAGAPOLOT, Humprey Ariel (MS Civil Eng'g.–Transportat'n)  
Effects of Lane Blockage on the Traffic Flow Behavior at  
Expressway. 1997**

South Expressway serves as the main gateway of Metro Manila to the southern corridor of Luzon. With the country's favorable economic growth and the emergence of industrial zones in the south, the expressway system has experienced an increase of travel demand of about 25% in just a span of two years. With no corresponding improvements in road infrastructure, the expressway system becomes overloaded and experiences several operational problems that eventually lead to system breakdown and result in user dissatisfaction. As such, the effective management of the system becomes increasingly important, and this requires reliable information on traffic flow pattern and behavior from which to base appropriate actions. The most obvious manifestation of the various problems besetting the expressway is the frequent occurrence of lane blockage that is caused by the overflowing of exiting vehicles in the main-lane roadway especially during peak hours. This research study mainly tries to investigate the effects of lane blockage on the traffic flow behavior at the bottleneck section and to the volume pattern of the upstream section. It also tries to quantify the reduction of discharge as a function of the number of lanes blocked.

Secondary as well as primary data obtained from a video survey were used in establishing the expressway's traffic characteristics. Calibration of the various established traffic stream models was done using on-site data to reflect current operating characteristics. Origin-destination pattern shows that interchanges located near the urban core have experience the highest demand of exiting traffic, particularly in the southbound direction which captures about 47.8% of the total exiting southbound traffic. The frequent occurrence of lane blockage at these interchanges significantly reduces the capacity and influences much the



traffic flow behavior of the expressway.

It was found out that lane blockage causes a reduction of capacity of as high as 49.88%. This results to the deterioration of the level of service which is evidently manifested by excessive delay, instability of travel time and erratic stop-and-go operation. Model calibration showed that Underwood's model outperforms the other models in terms of predicting capability. The shockwave associated with the alternating trend of lane blockage has prevented the facility to sustain its operation at its optimum or near-optimum condition for a relatively long period of time. Results and findings of this research are deemed to be relevant in the formulation of possible measures in solving current problems that beset the country's expressway systems and can be taken into consideration for future traffic management schemes and possibly construction.

**CIV 199733 TAMAYO, Miriam L. (MS Civil Eng'g.)**

**The Influence of Delayed Superplasticizer Addition on the Workability and Compressive Strength of High Strength Concrete. 1997**

There are many documented cases showing the economical benefits from the use of high strength concrete (HSC). Practicality dictates that for that the concrete to be of any use, it should be workable. A common problem encountered by ready-mix concrete suppliers is the slump loss of the concrete before it even reaches the jobsite because of prevailing traffic situation and the generally hot weather in Metro-Manila. Superplasticizer are commonly used in the concrete mix to improve the slump but their plasticizing effect is known to be short-lived (from 30-60 minutes).

Related literature indicate that delaying the addition of superplasticizer after a previous addition of water can enhance the action of the superplasticizer and can extend its effectivity time. Previous research based on laboratory experiments show the effects of 5 to 50 minute time-delays on the concrete slump. Data about the effects of 0 to 5 minute delays, however, is limited. For practical use, particularly on its effect on the batching plant operations, the 0 to 5 minute time range is of more importance and solicits more interest.

Through a laboratory experiment involving 9 trial mixes of batch volume equal to 0.035 m<sup>3</sup> and production trials involving 4 trial mixes with batch volume of 2.0 m<sup>3</sup> each, the effects on the workability and compressive strength of time-delays in superplasticizer addition 0-, 15-

seconds, 2-minutes, and 4-minutes were studied.

The results of the experiments show that delayed superplasticizer addition affects the workability property of concrete but has no significant effect on the compressive strength.

**CIV 200134 TAN, Alan T. (MS Civil Eng'g.)  
Finite Element Analysis of First-Order Shear Deformable  
Plates (Hencky-Mindlin Plates) Considering Large  
Deformation. 2001**

This paper presents a finite element formulation of the Hencky-Mindlin plate theory coupled with the Von Karman plate theory (Plates with large deformations). The problem is described by five coupled partial differential equations. The formulation is a general solver for plates. It satisfies Kirchhoff's hypothesis which is described by classical plate theory (thin plates with small deformations), the Hencky-Mindlin plate which is described by first order shear deformation theory (thick plates) and also thick plates with large deformations. The analysis employs a time-dependent and nonlinear finite element solution.

**CIV 200035 TAVANLAR, Melendre B. (MS Civil Eng'g.-Transportation)  
Evaluation of Pedestrian Facilities at Signalized  
Intersections in Metro Manila. 2000**

Nineteen crosswalks in Metro Manila were surveyed and several variables were assessed. These included the availability and condition of pedestrian signals, crosswalk markings, safety railings, and pedestrian signs, as well as crosswalk geometry, and the presence of vehicle obstructions along the crosswalk. Pedestrian flow characteristics such as volume per cycle, signal delay, and the percentage of non-complying pedestrians were also measured during selected times of the day.

A model for non-compliance was developed using these parameters as explanatory variables. The model showed that non-compliance is greatly influenced by pedestrian volume, crosswalk width, the availability of pedestrian traffic signals, and the condition of pavement markings. However, the model also proved that crosswalk length, pedestrian signs, safety railings, and vehicle obstructions did not have a significant effect on non-compliance.

To determine the general effect of pedestrian non-compliance on average delay, a second model was developed with average delay as the response variable. The model illustrated the degree to which non-compliance affects delay and showed how Braun and Roddin's equation could be modified to account for factors which contribute to the difference between theoretical and actual delay.

Sensitivity analysis revealed that it is easiest to achieve total compliance at intersections with short cycles and high green ratios for pedestrians, than at intersections with any other combinations of cycle length and green ratios for pedestrians, than at intersections with any other combinations of cycle length and green ratio.

Based on these results, design standards for crosswalks were developed. Six levels of service for crosswalks were developed using delay as the primary criteria, with the quality and intensity of the critical declining from LOS A to F.

The results of this study should prove useful when designing or improving intersections.

**CIV 199636 TEODORO, Rene Val R. (MS Civil Eng'g.–Transportation)  
Empirical Analysis on the Relationship Between Air  
Pollution and Traffic Flow Parameters. 1996**

Increasing motorization trend, aging vehicle fleet, and worsening traffic congestion are among the most significant factors contributing to the severe degradation of air quality in Metro-Manila. With motor vehicles contributing about 78% of the total air pollution load, it is necessary for transportation planners and air quality analysts to work more closely than ever in providing mobility while improving air quality at the same time. However, the current status of knowledge demonstrates a need for information and tools to bridge the gap between local transportation and air quality issues. This paper seeks to initiate a step to what will be a ladder of empirically based, vehicle-attributed, air pollution investigation and estimation tool development. It presents the formulation of an empirical model that estimates the ambient concentrations of air pollutant in a roadside environment. The present form of the model applies only to mid-block of a straight road section. The model is expressed in terms of traffic flow parameters such as traffic volume and traffic speed and a simple meteorological parameter, wind speed at a particular direction. Calibration and validation were done using separate carbon monoxide measurements from two different sites. Results of the performance test

hinted at the possibility of the model's applicability to other sites of different road type and traffic composition. Factors to be considered to further enhance the suitability of the model to other sites and seasons were also determined. The conduct of sensitivity analysis identified traffic volume, followed by wind speeds, as the most significant parameters affecting pollutant concentration. Combinations of traffic level and meteorological conditions that will bring about critical levels of CO were also established. In addition, the study made an assessment of the ambient air quality of the study area, identified general air pollution problems and their causes, and cited workable abatement strategies based on the observed conditions. The model is also envisioned to include pollution source and receptor locational parameters and may be extended to cover different road layouts in the near future.

**CIV 199537 TIGLAO, Noriel Christopher C. (MS Civil Eng'g.)  
Discrete Choice Model in Locational Choices of  
Manufacturing Firms In Industrial Estates: The Case of  
CALABARZON in the Philippines. 1995**

The Philippine government adopts agri-industrial development as one of its strategies in the Medium-Term Philippine Development Plan for the country's attainment of an NIC-status by the turn of the century. One concern that must be addressed is the means by which these industrial developments can be effectively attracted and promoted.

The study is interested in finding out the locational choices of industrial firms in the manufacturing sector. It is also concerned with the application of discrete choice models to describe how manufacturing firms decide among alternative locations as final site for its facility. It provides an understanding about the behavior of firms across varying industry characteristics. The model is structured as a binary choice model incorporating both objective and subjective factors as explanatory variables. The case study used data from questionnaire surveys on individual firms, interviews with firms, developers and concerned government agencies, and other secondary sources.

The study identifies the underlying factors that influence firm decisions. Furthermore, it presents a general framework on the current locational choices of manufacturing firms in the Philippines.

**CIV 200338 VIBAL, Timi H. (MS Civil Eng'g.-Transportation)**

## **Traffic Accident Analysis Through Hospital Records. 2003**

With an increasing trend of population growth and vehicle registration, road safety is becoming one of the major issues arising from the traffic system of the country. Concentrating much on innovations and urban developments, road safety is oftentimes given the least importance. Several studies proved that the occurrence of accidents are prevalent yet few road safety programs have been effectively established. One of the enormous reasons of this is discussed in the study – the under-reporting of road accidents. This is considered as a global phenomenon that is widely affected by the definition of fatality. Most traffic accident studies analyze data from police traffic units. In this study, data were gathered from hospitals having the highest number of traffic accident cases which actually resulted from an initial survey in macroscopic view of the study. The macroscopic view allows cross-checking of fatality records between hospitals and traffic enforcement units. This process compares how many fatality records were gathered from hospitals and how many were reported at police units. The reasons of under-reporting are thoroughly discussed in the study. The study presents an evaluation of reporting and record-keeping system of hospitals and traffic enforcement units. The criteria for evaluation are effectiveness, uniformity and maintenance of the system. The study also highlights the shortcomings of concerned authorities in data management system mostly in fatality cases. It also provides a summary of findings and conclusions of the research are: (1) most hospital records revealed that vehicular accidents contribute about 40% of all types of accidents; (2) 60% of fatality records gathered from hospitals were not found in police records; (3) the responsibility for reporting of a fatality after hospitalization is not clearly defined because neither the hospital or the traffic units take initiative; (4) pedestrians and motorcycle riders were mostly the casualties of accident cases with a large percentage of fracture, cerebral concussion, cerebral contusion, hematoma and abrasions as can be observed from the distribution of final diagnosis; (5) the standard reporting and record-keeping system suggested by the Department of Health (DOH) is practiced by some hospitals but some Traffic Enforcement Units (TEUs) have unreliable record-keeping system; and (6) reliable records cannot be obtained unless more resources are allocated, advanced equipment such as computer packages are adopted, well-trained staffs are employed and an independent group or authority is formed. Recommendations were presented for the improvement of the reporting and record-keeping system

as a guide in policy formulation in promotion of traffic safety for future studies both in traffic planning and engineering. These recommendations are: (1) the traffic accident record-keeping system should be locally centralized; (2) a reconciliation between the hospitals and traffic units with regards to the level of fatality reporting; (3) the campaign for issuance of a standard traffic accident form should be fully enforced to all traffic units; and (4) proper implementation of the 30-day definition of fatality as suggested by the United Nations/Economic Commission for Europe (UN/ECE).

**CIV 198639 VILLASEÑOR, Vince Nicholas R. (MS Civil Eng'g.)  
Mean Recurrence Interval as a Criterion for the  
Determination of Design Wind Load on Structures in  
the Metro-Manila Area. 1986**

The thesis presents some probabilistic methods of determining the basic design wind load as an alternative to the current deterministic wind speed of 175 kph for the Metro-manila area as specified by the National Structural Code for Buildings (NSCB). Other engineering codes have recognized the need to specify wind loading based on the probabilistic concepts consistent and adequate levels of safety. The mean recurrence interval as the design criterion for the determination of wind loading is proposed in keeping with the continuously improving standards of other engineering codes.

The basic design wind speed specification of the NSCN is discussed. Model parameters of the Gumbel and Frechet distributions (Type I and Type II distributions of the largest values respectively) are estimated using annual maximum wind speed data obtained from the three weather stations of the Philippine Atmospheric Geophysical, and Astronomical Services Administration (PAGASA) in Metro-Manila. Two sets of parameter values are determined for the Gumbel distribution; the parameters derived by the Lieblein fitting technique and the parameters derived by the method of moments. The Kolmogorov-Smirnov goodness-of-fit test is used to determine the acceptability of the probabilistic models and the Gumbel distribution (Type II distribution of the largest values) is found to best model annual maximum winds in Metro-Manila. The basic design wind speeds corresponding to suggested values of mean recurrence intervals are computed on the probabilistic model chosen.

