A Discussion on the Capacity of Rotary Intersections[†]

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ABSTRACT

In this study, capacity of multi-lane rotary intersections is discussed by using observations from four intersections in İzmir. Firstly, critical gap acceptance methods, especially gap forcing and reverse priority conditions are discussed. In the second part of the study, regression analysis methods, particularly TRL method, are introduced. A new capacity method which depends on regression analysis is also suggested. In the last part of the study, both methods are compared. As a result, both methods are found to be applicable but further research with increased number of observations is needed.

Keywords: *Rotary intersections, capacity, critical gap acceptance method, regression analysis method*

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Area Utilization and the Determination of the Ecological Factor of the Land Transport: On İstanbul[†]

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ABSTRACT

One of the negative effects of transport on environment is the land use. The land which is suitable for agriculture is being destroyed during the construction of transport systems, considerable quantities of green areas are being destroyed and the ecological balance is being damaged due to transport systems. In the studies conducted, the areas required by the transport systems are determined and the costs of these areas are calculated. Such a study is not conducted for Istanbul, which is one of the most important cities of Turkey, with a population of 12 millions. In the study that is conducted in order to fill this gap and by using the number of passengers transported and the area occupied by two land transport systems for Istanbul city, which are highways and railroads, the areas per unit and the ecological factors for these areas are examined.

Keyword: *Land use, ecological factor, highways, railways*

Seeding of the Cement in Regards to Strength[†]

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ABSTRACT

In this study, some properties of mortar specimens produced through the cement seeding method were investigated. In two different experiments, hydrated cement mass were produced by cement seeding initially. In first and second experiments, hydrated cement was used at the ratios of 5, 15, 30 % and 2, 3, 5 % respectively, subsequently; strength properties of mortars were determined and discussed in both experiments. The experimental results obtained at the end of tests proved that the method of cement seeding is feasible and this method can be useful in determining concrete properties.

Keywords: *Cement, seeding, hydration, compressive strength*

A Traffic Congestion Pricing Model for Eminönü District[†]

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Mustafa Sinan YARDIM**
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ABSTRACT

An investigation on applicability of a congestion pricing scheme to the Eminönü District, which is subject to heavy traffic that is situated in the Historical Peninsula of Istanbul, has been conducted. The area borders are set; field studies are performed to determine speed-flow characteristics of the roads and the demand function for automobile users. Akçelik and MTC speed-flow models are found suitable to represent the area's traffic. A computer program is developed to assess the optimum toll under many different conditions with higher sensitivity. As a result, optimum congestion toll rates for different scenarios are calculated and it is concluded that the congestion pricing application would have a decreasing effect on the automobile road traffic of 15-40% and would increase the mean traffic speed approximately by 15-25 km/h.

***Keywords:** Congestion pricing, speed-flow relationship, Eminönü, logit modal split model*

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Bending Capacity of T-Shaped Reinforced Concrete Beams Subjected to High Temperatures[†]

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ABSTRACT

Fires, which cause life and material loss, result in a decrease both in strength of concrete and steel and moment capacity of reinforced concrete (RC) members. Reinforced concrete (RC) beams are also affected by heat and a decrease in the moment capacity occurs. To investigate hazardous effects of high temperature, temperature distribution, and internal forces in the investigated cross-sections need to be established. In the present study, the temperature acting on section surfaces is calculated by the equation given in ISO834. The temperature distribution within the section is defined using Laplace temperature transmission equation and losses in the strengths of materials are determined using the given formulation in Eurocode2. The heat conduction equation is solved by finite difference method, and the temperature distribution in small segments inside the cross-section is obtained. The tensile and compressive forces are calculated using the decreased strengths of materials in small segments inside the cross-section. Later, the moment capacity is calculated using equilibrium equations. Additionally, a practical method is suggested to determine temperature-distribution in RC beams with T-section. Efficiency of the suggested practical method and negative effects of high temperature on moment capacity of beams are investigated. According to the obtained results, it is observed that the suggested practical method is quite effective in determining temperature-distribution in T-sections, and bending capacity of the cross-section decreases significantly with increasing fire exposure time.

Keywords: *Fire, reinforced concrete, T-shaped, heat transfer, bearing moment capacity*

Load-Deflection Curves of Reinforced Concrete Columns Subjected to Biaxial Bending and Axial Load[†]

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ABSTRACT

In the presented study, a theoretical method is proposed for determination of the load–deflection curves of reinforced concrete columns subjected to biaxial bending and axial load. The proposed method can be applicable to the polygonal sections incorporating various reinforcing steel configurations. In the proposed procedure the nonlinear behaviour of the materials are considered. Therefore, the concrete compression zone is divided into segments for computation of concrete stresses. The proposed procedure has been compared with the results of square and L-shaped reinforced concrete columns tested under biaxial bending and axial load. The theoretical load–deflection curves computed using test parameters of concrete compression strength, yield strength of steel, cross section properties and eccentricities of column specimens have been compared with the experimental curves and the results are found to be in good agreement.

Keywords: *Reinforced concrete column, stress-strain, load-deflection curves*

An Approach to Ground Transport Superstructure Costs for Istanbul[†]

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ABSTRACT

In this study, superstructure construction and maintenance costs of highway and railway, the most important means of ground transport in urban passenger transportation in Istanbul were analyzed. In this research, only superstructure costs were taken into consideration, infrastructure costs were left out. For the research to be significant, first of all, superstructure construction and maintenance costs were calculated within the whole area that these two systems cover. After that, the services which will be provided to passenger transportation by these systems, namely, expected traffic values in this period were determined. Consequently, the costs for a unit traffic and unit area were calculated. The costs of highways were found higher than railway per square meter and passenger.km except for the superstructure construction costs. These results were examined by causality and rates.

Keywords: Highway, railway, superstructure cost

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LDPE Matrix SiO$_2$ Filled Composite Building Materials[†]

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ABSTRACT

Production and characterization of silicon dioxide (SiO$_2$) filled low density polyethylene (LDPE) matrix composite building materials are the aim of this study. Particle filled polymer matrix composite materials of different compositions are manufactured by the injection moulding technique. Samples are characterized with 3 point flexural strength, elastic modulus, hardness, density tests and microstructure investigations. Mechanical and structural properties of 70 wt. % SiO$_2$ filled 30 wt .% LDPE matrix materials are observed to be better than other products.

***Keywords:** LDPE, SiO$_2$, composite, tile.*

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Determination of Compressibility Parameters of Clay-Silt Soils of Lagoon Origin by means of Regression and Artificial Neural Network Methods[†]

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ABSTRACT

In this research, compressibility properties of blue soft clays in the Hurma and Sarısu regions (Antalya) were investigated by means of in situ and laboratory tests. Various depositional environments, sea level changes and drying effects have resulted in highly complex soil profiles throughout the area. Soil parameters can vary 5 to10 times only in one borehole. In practice, oedometer tests have been carried out in limited numbers and consequently, it was observed that the number of compressibility parameters could be increased by means of correlations with index parameters and in-situ tests. For this purpose, samples were taken in every 0.5 m from 7 boreholes of 10 m depth and were investigated in the laboratory. Additionally, as in situ tests, standard penetration test (SPT) and cone penetration test (CPT) were conducted. Geotechnical properties were determined by in situ and laboratory test results. Comprehensive multi-statistical analysis was performed by SPSS and DataFit software for establishing specific correlation between the soil parameters. Artificial Neural Network was developed to simulate the mapping between index and compressibility parameters by Matlab. In conclusion, to evaluate compressibility parameters, ANN models appear to estimate values closer to the measured values than the empirical equations of regression analysis.

***Keywords:** ANN, Antalya, CPT, Lagoon, Regression, SPT*

A Binary Logit Model Based on Logistics Costs for Mode Choice Decisions in Freight Transportation†

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ABSTRACT

In this study, a binary logit model was calibrated for mode choice decisions in freight transportation. Freight transportation system was undertaken within the context of logistics chain and analyzed through a logistics cost model. The logistics regression analysis method of the multivariate statistical analysis technique was employed to calibrate the binary logit model. In the analysis, data related to ceramics transported to the city of Antalya with trucks and combined transport (road and rail) were used. The model with the maximum forecast performance was chosen as the logit mode-choice model based on logistics costs. Sensitivity analysis carried out by using the chosen model have shown that the most important decision variables for mode choice in freight transportation are transportation cost, transportation time and transshipment delays. Transport policy proposals were made to promote the combined transport in the selected corridor.

Keywords: *Freight transport, combined transportation, logistics costs, logit model*

Estimation of the Local Void Ratios of Compacted Sands[†]

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ABSTRACT

In this study, the variation of local void ratio in granular soils is investigated through an experimental study. In this regard, 2D local void ratios of sands compacted under three energy levels and corresponding optimum water contents are determined via image analyses performed on images obtained from selected cross-sections. Afterwards, it was investigated whether the variation of the void ratios in horizontal and vertical directions is pertinent or not. Moreover, the effect of particle shape on the variation of the local void ratio is examined by employing statistical analyses on these parameters. Although it is inferred that increasing particle angularity results in denser structures, however, a mathematical expression identifying the relationship between particle shape parameters and relative densities or void ratios is not obtained. As a consequence, multiple variable linear and nonlinear regression equations are employed to obtain the local void ratios at certain points in terms of a number of particle shape parameters, compaction energy level and global void ratio.

Keywords: *Sand, particle shape, local void ratio.*

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Reliability-Based Design Optimization of Structural Systems with Continuous and Discrete Design Variables[†]

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ABSTRACT

Random variations in the parameters used in the traditional optimization techniques employed for optimum design of the structural systems satisfying predefined criteria are not taken into account. Yet, the randomness in the determination of the loads, material strength, geometry of the structure, manufacturing of the members, and quality of workmanship etc. are inevitable parameters encountered in real life. Optimization performed with random parameters leads to the reliability based design optimization concept. In this study, an integrated algorithm is proposed in consideration of random parameters to attain the minimum value of a specified object function. Continuous and discrete design variables are considered in the optimization process. It is concluded that by taking random parameters in the optimization process the specified reliability level can be attained.

***Keywords:** Reliability analysis, optimization, reliability based design optimization*

Fragility Curves for Single Story Precast Industrial Buildings[†]

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ABSTRACT

In this study, fragility curves for existing precast industrial buildings were calculated. Depending on the structural parameters such as column section dimension, longitudinal reinforcement ratio, column height and stirrup spacing, 16 typical building models were used. A total of 360 ground motions from 28 earthquakes were used for nonlinear time history analysis. Peak ground velocity, which is assumed to have lognormal distribution, is chosen as the ground motion parameter. Lateral displacement was selected as structural response parameter. Damage states and damage levels for columns were defined according to Turkish Earthquake Code. Limit displacements for damage levels were calculated based on the concrete strain and longitudinal reinforcement at the critical section of columns. Results show that column section dimensions and stirrup spacing are more influential on the degree of fragility of the structure.

Keywords: *Precast industrial buildings, fragility curves, nonlinear analysis.*

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1457

Determination of Dynamic Parameters of Buildings by Operational Modal Analysis[†]

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ABSTRACT

Dynamic behavior of structures depends on dynamic characteristics of structures. The dynamic characteristics are determined according to the structural properties, material properties, boundary conditions and damage history of the structure. It is known that the dynamic characteristics of buildings vary depending on the construction stages. In this study, the dynamic characteristics of three buildings at different stages of construction are determined using experimental measurements. The natural frequencies, mode shapes and modal damping ratios of these buildings are extracted from the measured data. Also, the first natural frequencies of these building are calculated using empirical relationships. The measured and calculated values of the first natural frequencies are compared for each building. It is observed from the study that the predicted dynamic behaviors of these buildings are attained from experimental measurements, and the first measured natural frequencies of these buildings are greater than the calculated frequencies.

Keywords: *Dynamic behavior, modal parameters, operational modal analysis*

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Investigation of the Stability of the Collapsible Loess Soil under the Infrastructure of Roads[†]

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ABSTRACT

Excessive deformations occur in the loess soil due to wetting that will result in the loss of resistance and stability of the road infrastructures which are built on loess soils. Mainly, the road infrastructure will lose the correct geometrical shape given during construction and the profile designed in the project stage will change. Therefore, the stability of the fill and cut of the roads which are constructed on loess soils must be assessed considering the properties of the loess soil underneath.

After experimental and theoretical studies, a set of correlations are obtained to determine the stress state of the foundation soils at fill and cut of the roads, the increment of water content of the loess soil of the road infrastructures due to infiltration of water from different water resources, variation of the shear strength parameters and conditions in which excess deformations occur. A new method for solution of the stability of loess soils under road infrastructures is presented from the obtained correlations.

***Keywords:** Loess soil, infrastructure of roads, stability, fill and cut of roads*