

## Analysis Methods for the Investigation of the Seismic Response of Concrete Dams<sup>†</sup>

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### ABSTRACT

*The consideration of the dam-foundation-reservoir interaction is extremely important for estimating the seismic response of concrete gravity dams. Moreover, nonlinear analysis may be required for determining the possible risk associated with dams. In order to address these issues, DSI recently published the “Guidelines for Seismic Design of Concrete Dams”. Authors who have contributed to the preparation of this document provide a perspective on the seismic safety/design of concrete dams and structural analysis methods along with a set of illustrative solutions. The study presented herein provides important results on the necessity of conducting two and three dimensional seismic analysis, the use of nonlinear analyses techniques and the important factors that affect the seismic response of the concrete gravity dams.*

**Keywords:** Concrete dams, analysis methods, design.

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## Properties of Roman, Byzantine and Seljuk Period Mortar in Andriake Harbour<sup>†</sup>

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### ABSTRACT

*In this study, the physical, chemical, mechanical and micro-structural properties of mortars in historic constructions built during Roman, Byzantine and Seljuk periods in Andriake Harbour, Antalya were investigated. Samples were generally taken from the regions to provide information about the different periods of the structure. Petrographic evaluation on the polished surfaces of the samples collected from the historic constructions was performed with stereo microscope in laboratory environment. XRD, SEM/EDX, TG/DTA, XRF, unit weight, water absorption by weight, water absorption by volume, specific mass, compactness, porosity, acid loss, sieve, salt, pH, protein, fat, pozzolanic activity-conductivity analyses together with point load tests were applied and the results were evaluated. Due to analysis results, a significant difference was not observed among the structures built in Roman, Byzantine, Seljuk periods in terms of physical, chemical and mechanical properties, although they were produced from the rocks with certain distributive properties.*

**Keywords:** Historical building, characterization, microstructural, mortar.

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## Evaluating the Mechanical Behaviour of Geotextile Reinforced Sand<sup>†</sup>

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### ABSTRACT

*It is important to determine the mechanical properties of reinforced soils, since they are extensively used in practice. In this study, laboratory triaxial tests and direct shear tests were carried out in order to determine the stress-strain and dilation characteristics of geotextile-reinforced river sand. The mechanical behaviour of the composite material was investigated through varying the type of geotextile and confining pressure. Interface properties of geotextile-reinforced samples were evaluated with the direct shear tests. The results demonstrated that geotextile inclusion increases the peak strength, and reduces dilation especially at higher confining pressures.*

**Keywords:** *Triaxial test, direct shear test, geotextile, sand, reinforced soil.*

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## Implementation of Improved Finite Elements Over Circular Cross-Section Subjected to Effect of Non-Uniform Wind<sup>†</sup>

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### ABSTRACT

*In this study, a finite element program based on p-version finite element method (pFEM) and augmented by blending function method is coded. The program has a solid 3 dimensional finite element defined in cartesian coordinates, by which application of continuous or discontinuous nonlinear loads are taken into account and exact representation of curved edge and/or surface boundary is performed. With the aid of the coded program, a series of static analyses under defined wind loads for uniform and non-uniform loadings according to TS 498 and non-uniform loading according to pr EN 1991-1-4 are carried out on an industrial chimney with a circular cross-section. It is concluded that the coded program gives reliable results. Due to the capability of modeling of non-uniform loadings it is observed that the standards may lead to vastly different results.*

**Keywords:** *p-version finite element method (pFEM), finite elements, blending function method, finite element having curved surfaces, non-uniform loading, wind loading.*

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## Investigation of Manning Coefficient Caused by Rigid Body Plants<sup>†</sup>

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### ABSTRACT

*To study flows in man-made or natural channels, the identification of the roughness caused by vegetation is important. The roughness parameters used in several equations such as Manning, Chezy, and Darcy-Weisbach are the experimental coefficients that represent mostly sidewall characteristics. In open channel flows having natural or man-made vegetation to control the flow sections, the knowledge of flow velocities, flow depths and/or flow rates are crucial for planning and management studies. For such studies, the quantification of the roughness caused by the vegetation becomes vital. In this study, roughness caused by vegetation in open channel flows is investigated experimentally and a non-linear regression equation relating Manning roughness coefficient to flow and vegetation characteristics is proposed.*

**Keywords:** *Open channel flow, vegetation roughness, Manning roughness coefficient.*

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## The Optimization of Multi-Storey Composite Steel Frames with Genetic Algorithm Including Dynamic Constraints<sup>†</sup>

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### ABSTRACT

*Optimum design of the structures, in other words designing the structures with minimum weight is one of the major research areas in structural engineering. The priority during optimization process is to ensure whether the necessary conditions are satisfied or not. In this study, the optimization of steel frame systems is carried out for traditional and dynamic constraints by using a genetic algorithm that mimics the biological processes. The stress constraints are determined according to TS648-Turkish code for design and construction of steel structures. Furthermore, displacement constraint are considered in the optimization procedure. In addition, natural frequencies are incorporated as dynamic constraints. Optimum design of multi-story plane frames is obtained and comparisons with the results of previous studies are made. The same design processes are repeated for the case of frames with composite beams. A program is coded in MATLAB to carry out all these applications. Results obtained in the study for the frame systems are also verified by SAP2000. It is concluded that the weight of the frames with composite beams are less and the dynamic constraints affect the design.*

**Keywords:** Genetic algorithm, steel frame, dynamic constraint, composite beam.

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## Evaluation of Surface Texture Properties of Different Types of Flexible Pavements<sup>†</sup>

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### ABSTRACT

*In order to provide traffic safety on the road, the skid resistance should be at a certain level between the wheel and the surface of the pavement. Skid resistance on which road safety depends is closely related to the pavement surface texture.. The deformations especially the polishing effect seen on the surface of wearing course due to the traffic loads, involves a change in the surface texture. In recent years, efforts are performed to develop more advanced technologies for evaluating pavement surface texture. In this study, the 3D laser scanner was utilized to quantify the mean profile depth (MPD) of 4 different types of flexible pavement in Izmir according to ASTM E 1845–09. The results have been compared with the results of sand patch test (MTD) and skid resistance test result for a period of 3 months. The results indicated that a close correlation exists between MTD and MPD values. Besides the variation of reduction in MPD values is not the same as the friction value corresponding to 60 km/h speed ( $f(60)$ ).*

**Keywords:** *Pavement, surface texture, mean profile depth, mean texture depth, skid resistance.*

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## The Behavior of Double-Whyte Hollow Clay Brick Walls under Bidirectional Loads in R/C Frames<sup>†</sup>

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### ABSTRACT

*In this study, tests performed for three almost full scale reinforced concrete frames with two different infill conditions, namely sandwich walls with and without Z-ties under bi-directional load imposed on the walls, and a bare frame under uni-directional in-plane load are presented and the experimental results are evaluated. Particular emphasis on the behavior of these types of walls is given regarding the following aspects: (i) as a function of in-plane damage levels, decrease in out-of-plane stiffness and (ii) due to the progressively increased in-plane damage, determining a lower bound out-of-plane strength limit. Contrary to the classical arching action observed under only out-of-plane loads, subjected to combined bi-directional action it is observed that damage on the walls appeared on the wall diagonals. Z-ties substantially improve the out-of-plane stability of the wall compared to the one without Z-ties, and help the wall to maintain its integrity up to higher inter-story drift levels. Based on these results, it is strongly suggested that certain constructive principles regarding ties used for double-whyte walls and damage limits for these type of walls should be introduced in earthquake and design codes.*

**Keywords:** Reinforced concrete infilled frames, double-whyte wall, cyclic in-plane loading, simultaneous out-of-plane loading, experimental methods; earthquake engineering.

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## An Application of the Ball-bank Technique for the Evaluation of Horizontal Curves<sup>†</sup>

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### ABSTRACT

*In this paper, the ball-bank device, little-known in Turkey, has been introduced and a special application has been demonstrated on five horizontal curves. A solution has been proposed for the technique's only known disadvantage of positioning, without worrying about the GPS connection and synchronization difficulties. The primary goal of the paper is only to show the application of the technique from various aspects and not to establish geometric parameters for these curves. Field observations have shown that by means of this method it is possible to estimate the curve radius, or when the curve geometry is known, for a given comfort limit, the super elevation rate as well as the advised curve speeds (being different from the design speeds).*

**Keywords:** Lateral acceleration, superelevation, centrifuge.

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## Investigation of the Water Hammer Problems in Water-Wind Hybrid Systems<sup>†</sup>

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### ABSTRACT

*Water hammer is an undesirable event, caused by sudden flow changes in confined pipe systems. When it occurs, its consequences can be very costly and even sometimes deadly. In general, it may be encountered in the penstocks of hydropower plants, water transmission lines, water networks, etc. Therefore, the operation guidelines of the hydropower plants should be defined correctly and if necessary, preventive measures should be considered. In the present study, water hammer problems in pumped-storage hydropower plants supported by wind energy (water-wind hybrid systems) are investigated. Time dependent flow conditions in the penstocks are studied by the use of the computer software, HAMMER. The software solves nonlinear differential equations by using method of characteristics. Firstly, hydraulic transients for various operational cases are investigated using some scenarios. In this study, only the scenario 5 which gives the most critical results is investigated.*

**Keywords:** Waterhammer, hydraulic transients, pumped-storage hydropower plants, water-wind hybrid system.

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## A Study for Determining the Hydraulic Conductivity of Geosynthetic Clay Liners in the Laboratory<sup>†</sup>

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### ABSTRACT

*This study was prepared to show how to perform the hydraulic conductivity test on geosynthetic clay liners (GCLs) and how to evaluate the results. In the content of this study, four types of GCLs were subjected to hydraulic conductivity tests using deionized water and tap water. The tests lasted six months and the final hydraulic conductivities of GCLs were measured within the range of  $7.1 \times 10^{-10}$  -  $1.4 \times 10^{-9}$  cm/s. To terminate the tests, it was checked to see whether hydraulic stability was achieved or not throughout the test duration. To do this, hydraulic conductivity ratio was defined and it was accepted that the stability was assured when this ratio was reduced below 1.5. Besides, it was found that the effect of permeant water and the GCL types on the hydraulic conductivity were limited. The results of this study were also compared with the hydraulic conductivities that were reported in the literature as a function of effective stress. It is concluded that the findings of this study are in agreement with those in the literature.*

**Keywords:** Waste disposal area, bentonite, geosynthetic clay liner, hydraulic conductivity

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## Slenderness Effect in Reinforced Concrete Frames<sup>†</sup>

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### ABSTRACT

*In this study, the results of “Moment Magnification” method provided are compared with those obtained by applying second order theory and the order of accuracy is examined. The bending moments of slender columns of chosen typical frames are obtained by applying moment magnification method and compared with those found by the second order theory. The error ranges are found to be quite high in positive (safe) direction. In order to resolve this drawback a method is developed and applied to typical frames. In this method second order effects are represented by fictitious loads. Average error order is found to be  $\pm 4.6\%$  when this method is applied to typical frames. It is concluded that this method can be used successfully in practical applications.*

**Keywords:** Numerical test, moment magnification, second order theory, effective flexural rigidity, slenderness, fictitious loads.

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## Bending Stiffness of Reinforced Concrete Sections<sup>†</sup>

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### ABSTRACT

*Bending stiffness of cracked reinforced concrete sections defined by Turkish Earthquake Code Section 7 and bending stiffness to be used at the beginning of push-over analysis, increased the importance of a realistic determination of bending stiffness before collapse. In this study for considering behaviour of reinforced concrete sections under various stress phases, the factors effecting rigidity are revisited. Deflections obtained by using these bending rigidities are compared with the published results obtained in various laboratory tests. Some proposals are made depending on the results of this work.*

**Keywords:** *Stiffness, concrete section, push-over analysis, earthquake code, nonlinear analysis.*

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## **Modeling Plastic Hinging Regions in Reinforced Concrete Bridge Columns<sup>†</sup>**

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### **ABSTRACT**

*Examining the spread of plastic deformations at various stages of loading is a complicated problem for bridge structures under multi axial dynamic loading. A detailed three dimensional nonlinear finite element model of a bridge column was developed using the computer program ABAQUS and the model was compared with the measured displacement results along the column of a bridge system subjected to dynamic biaxial loadings in an earthquake simulator. The bridge system was subjected to a series of test trials with increasing earthquake intensities. Computer simulations were performed for complete trials in order to provide information about the variation in the spread of plasticity. According to the results, it was observed that changes in the length of plastic hinging regions on the bridge column depend on the strain in the longitudinal reinforcement.*

**Keywords:** Reinforced concrete bridge column, FE modelling, photogrammetry, spread of plasticity.

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