# Investigation of Plunging Depth and Density Currents in Eğrekkaya Dam Reservoir†

**Fatih ÜNEŞ***
**Hakan VARÇİN****

**ABSTRACT**

*Fresh water sources are dwindling and becoming contaminated throughout the world due to environmental problems and fast growing population. Therefore, definition of reservoirs, reservoir flows, efficient use and proper modeling of fresh water sources gain great importance. In the real dam reservoirs, the density differences between inflow river water and ambient dam reservoir water create stratified flows. The density differences can be due to the discrepancies in temperatures, concentration of dissolved or suspended substances or a combination of both. In this study, a mathematical model is used for modeling reservoir flow and determining the plunging point and depth. The model consists of nonlinear and unsteady continuity, momentum, energy and k-ε turbulence model equations. The equations are constructed on actual dimensions, shape, boundary and initial conditions of the Eğrekkaya dam. The model successfully simulates the formation of density currents and plunging flow. The results are found to be in accordance with the actual measured values. The results of this study are important with regard to sedimentation studies, water quality modeling and management and habitat assessment in reservoirs.*

***Keywords:*** *Plunging flow, dam, reservoir, density current, mathematical model*

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# Selection and Scaling of Ground Motion Records Using Harmony Search†

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**ABSTRACT**

*In this study, a solution algorithm which is based on meta-heuristic harmony search algorithm is used for selecting and scaling ground motion records for the use in time history analysis. By means of the applied algorithm, ground motion record sets are obtained by selecting and time-domain scaling of real records complying with the elastic design spectrums defined in The Turkish Earthquake Code for different soil types. Firstly, the traditional approach is utilized and ground motion record sets are generated by selecting 199 ground motion records from PEER (Pacific Earthquake Engineering Center) Strong Motion Database considering the magnitude, distance and ground conditions. Selecting and scaling of ground motion record sets are performed by using these records. The results indicate that, various ground motion record sets can be obtained which are compatible with the requisite constraints by using harmony search algorithm. In conclusion, it is seen that harmony search algorithm can be used as an effective method for selecting and scaling real ground motions.*

***Keywords:*** *Ground motion selection, harmony search algorithm, time history analysis*

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# The Effects of Addition of Asphaltite on the Mechanical Properties of Bitumen and Bituminous Hot Mixes†

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**Mehmet YILMAZ****
**Necati KULOĞLU*****

**ABSTRACT**

*In this research the asphaltite obtained from Şırnak (Silopi) region was added to B160/220 bitumen by 2%, 4%, 6% and 8% by weight. The mechanical properties of original bitumen and asphaltite added (modified) bitumen were investigated. It was observed that standard penetration was reduced, viscosity and complex modulus were increased and there was no noticeable change on softening point and on phase angle by the addition of asphaltite. The test results on the Marshall specimens showed that retained Marshall stability, indirect tensile strength ratio, stiffness modulus at temperatures of 15°C, 25°C and 35°C and fatigue life were significantly increased by the addition of asphaltite to bitumen. In conclusion, it is seen that the addition of certain amounts of asphaltite to bitumen can effectively improve the mechanical properties and moisture resistance of hot bituminous mixes. It was determined that 4% asphaltite content is optimum for the mixtures tested.*

***Keywords:*** *Asphaltite, modified bitumen, modified bituminous hot mix, mechanical properties*

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# Investigation of Link Member Length on the Basis of 2007 Turkish Earthquake Code in an Eccentric Braced Frame†

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**İlyas Devran ÇELİK****

**ABSTRACT**

*Steel Structures Section of the Turkish Earthquake Code 2007 includes very important improvements. Especially, extensive modifications have been presented in the computation of link member's lengths in eccentric braced frame systems. Different values can be chosen for the lengths of the link members based on upper and lower limits using an equation given in the code. The aim of this study is to investigate the effect of various link member lengths on the lateral load capacity of eccentric steel braced frames in which the lengths are chosen in between upper and lower bounds specified in the code. Three-dimensional two-storey experimental steel frame systems were built using rectangular hollow cross sectioned V-bracings and inverted V-bracings. Then, these experimental systems were numerically analyzed using general purpose finite element software-SAP2000. The results obtained from experimental study and numerical analyses were evaluated on the basis of Turkish Earthquake Code 2007.*

***Keywords:*** *Eccentric braced frames, link member length, and pushover analysis*

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# Determination of Reinforcement Ratios in Reinforced Concrete Columns†

**Hasan ELÇİ***

**ABSTRACT**

*The structures, in which all frames and vertical structural elements (column and shear walls) are in two planes perpendicular to each other, are called orthogonal structures. Structures which do not meet this definition are called non-orthogonal structures. In contemporary earthquake-resistant design codes, it has been indicated that the earthquake analysis of the structures containing non-orthogonal elements can also be made according to end forces calculated for two directions perpendicular to each other. For this aim special combination formulae have been given. However, how the interaction of the end forces obtained for the two principal axes in these formulae will be taken into consideration has not been clearly explained. Several studies have been performed on this subject and new combination equations have been proposed. The results obtained from these studies are limited by their scopes. As a result, a combination equation giving accurate results in each case has not been obtained yet. The aim of this study is to develop a combination equation which was proposed previously. For this aim a general table has been developed.*

***Keywords:*** *Orthogonality, earthquake, reinforced concrete column*

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# Solution of Kinematic Wave Model using DQM and Sütçüler Flood Example†

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**ABSTRACT**

*Floods are characterized by large discharges, high flow velocities and high water levels. These flood characteristics should be known for all structures to be built in river basins. In this study, Muskingum Method and Kinematic wave model (KWM) are used for flood hydrograph prediction. In the numerical solution of the KWM, the Differential Quadrature Method (DQM) is employed. Kinematic wave modeling with DQM was applied to a real flood problem for the first time in this study. For this purpose, the flood which occurred in Sütçüler Değirmendere, a branch of Aksu River, was considered. The DQM simulated the measured hydrograph more suitably than Muskingum Method.*

***Keywords:*** *Flood routing, muskingum method, kinematic wave, differential quadrature method*

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*Digest 2012*

# Reduction of Lateral Earth Pressure by EPS Geofoam Inclusions†

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**ABSTRACT**

*Applications of expanded polystrene (EPS) geofoam in geotechnical projects have gained an increasing popularity in recent years. Research indicated that EPS geofoam is a suitable material as a compressible inclusion behind retaining walls in order to reduce lateral earth pressures. Most of the studies addressing the use of compressible inclusions behind earth retaining structures were concerned with the controlled yielding of the backfill material against rigid non-yielding walls. In the present study, EPS geofoam presence as a compressible inclusion behind both rigid and flexible retaining walls are evaluated in terms of lateral pressures and wall displacements by a physical modeling study. Reductions are observed in lateral stresses depending on the inclusion thickness and wall type.*

***Keywords:*** *EPS geofoam, retaining wall, physical modeling, granular backfill*

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# A Method for Estimation of Probable Flexural Strength of R/C Columns†

**Cem AYDEMİR***
**Mustafa ZORBOZAN****

**ABSTRACT**

*In this study, the effects of uncertainties on column flexural moment capacity are investigated taking into consideration the statistical distributions of effective parameters on column flexural moment capacity Mp. For this purpose, the variability on material strengths, section properties and analytical moment curvature responses (Mmax) which use different confined and unconfined concrete models are modeled with Monte Carlo simulation. Flexural overstrength ratios based on ultimate moment capacity Mr (λr=Mmax/Mr) are obtained for sample column sections with different reinforcement configuration, section dimension, concrete strength, reinforcement strength and mechanical index of lateral reinforcement with a computer program and statistical evaluation is performed for analysis results. Also, the effects of basic design variables on column moment capacity are investigated and a simple expression is derived for the estimation of the probable flexural strength ratio with the 10% probability of being exceeded (λr,%10) using characteristic material strengths. Finally, the proposed method is compared with ACI 318, Eurocode 8 and Turkish seismic design code provisions.*

***Keywords:*** *Column probable moment capacity, flexural overstrength ratio, Monte Carlo simulation, strain hardening, confined concrete*

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# Experimental Investigation of Glass Fiber Reinforced Plastic Profiled Passive Pile Group Behavior†

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**Arif Ş. KAYALAR*****

**ABSTRACT**

*In this study, the use of glass fiber reinforced plastic (GFRP) profiled passive piles in slope stability is investigated and it is aimed to contribute to the literature as the first model study regarding this topic. A special experimental setup is designed in order to model pile groups subjected to soil movement under its own weight. Soil pressure distributions acting on instrumented GFRP pile groups are examined for various pile spacings. As a result of experiments, it is revealed that the loads acting on piles increase with decreasing pile spacing due to soil arching. Experimentally determined soil pressure distributions are compared with the soil pressure values calculated by analytical methods.*

***Keywords:*** *Slope stability, GFRP pile, pile spacing, load transfer, soil pressure distribution*

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# Effect of Microwave Curing on Mortar Properties†

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**ABSTRACT**

*Microwave curing (MC) is a method that can accelerate hydration of cement, which results in rapid strength increase of mortars. In this study, first the effect of MC (90 W, during 100 mins) on temperature change and water content properties then the effect of MC (90 W, 32 mins) on 2, 7 and 28 day compressive strength of mortars having different precuring times (PT) as (15, 60, 120, 240 ve 360 mins) were investigated. MC can be used to determine the hydration degree of the mortars and rapid strength increase of mortars. The highest 2 day compressive strength was obtained for 120 mins PT.*

***Keywords:*** *Microwave curing, mortar, hydration degree, compressive strength*

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# Monthly Runoff Model for Kemer Dam with Radial Based Artificial Neural Networks†

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**ABSTRACT**

*It is very important to make reliable runoff estimations and runoff modeling studies when planning and designing water resources systems. In the study presented, a Radial Based Artificial Neural Network (RBANN) model is developed and applied to the monthly flows of Kemer Dam reservoir in the Büyük Menderes Basin. The best radial based neural network model which requires monthly precipitation, temperature and a month before precipitation as the input data, is trained by using 225 months of runoff data observed between March 1979 and October 1997. The model is then tested by 97 months of runoff data recorded between December 1997 and December 2005. When the statistics of the long term and seasonal term recorded and modeled runoff are compared, it can be seen that the developed model successfully represents the monthly runoff input to Kemer reservoir and can be used to forecast the monthly runoff in a watershed.*

***Keywords:*** *Monthly runoff model, radial based artificial neural networks, kemer dam*

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# Performance Comparison of SBS Modified and Fatty Amine Modified Asphalt Mixes†

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**Şeref ORUÇ*****
**Halit ÖZEN******

**ABSTRACT**

*The purpose of this study is to compare the performances of SBS polymer and fatty amine modified asphalt mixtures. With the laboratory produced traditional and modified Marshall Briquettes, three experimental test groups in which one control and two conditioning systems based on moisture damage application were created. Indirect tension strength test for cracking resistance was conducted at 10°C and 20°C, while indirect tension strength test and indirect tension test were carried out at 20°C in three loaded periods to investigate the load distribution capacity of mixtures and moisture damage problem. It was understood that both additives ameliorated the mechanical characteristics with respect to the traditional mixtures. SBS modified mixtures showed higher resilient modulus value than the amine modified ones and proved higher cracking resistance in general. Regarding moisture damage, SBS modified mixtures have higher performance for high loading periods and excessive conditioning systems.*

***Keywords:*** *Conditioning systems, water damage, SBS, fatty amine*

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# The Effects of Utility Based Accessibility on Transportation Mode Choice†

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**ABSTRACT**

*Accessibility index is defined as the ease of people to reach the desired facilities, products and activities [1]. It has a considerable potential for the application in travel demand models because it is focused on the main purpose and expected utility of transportation activities. In this study, the effects of utility based accessibility on aggregate mode choice behavior and modeling facilities by using only accessibility indices are investigated. As the result of linear approaches like correlation and elasticity analysis, the accessibility indices like residential and social infrastructure are found to be effective but not enough for the prediction of aggregate mode choice ratios. On the other hand, the artificial neural networks, as a nonlinear approach is found to have high prediction capability especially for the private car driving alternative.*

***Keywords:*** *Accessibility, transportation mode choice, artificial neural Networks*

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# Monitoring Roof Displacements with GPS in a Long Period Structure[†]

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**Bilge DORAN*****

**ABSTRACT**

*Relative displacements play an important role in assessing drift and damage distribution in structures. GPS technology gained great attention in the last decade for static and dynamic structural monitoring of displacements in long-period structures as an alternative. In this study, roof displacements of a long-period structure with a total of 31 storeys located at Maslak, Istanbul were monitored under deforming effects such as wind using real-time kinematic (RTK) differential GPS (DGPS) technology. The DGPS system was first tested on a prototype, and then assembled on the building. The structural model of the building was also constructed and periods were estimated and compared with GPS related estimation results due to the modal analysis of the building.*

***Keywords:*** *DGPS, structural monitoring, relative displacements, roof displacement, high-rise buildings*

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# Effect of Microcalcite on the Workability, Mechanical Properties and Durability of Concrete†

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**Y. Egemen KESLER****

**ABSTRACT**

*Due to their pozzolanic activity, silica fume and fly ash are mostly used for the production of high performance concrete. However, quality control of these materials exhibit a challenge since these materials are industrial by-products. In this study, microcalcite, fly ash and silica fume are added to concrete, and workability, setting time, heat development, strength development, fracture energy, permeability and sulphate resistance properties are tested. Microcalcite concrete exhibited loss of workability and decrease in setting time. Compared to fly ash and silica fume concretes, microcalcite concretes exhibited higher early age compressive and split tensile strength, while their long term strength development and sulphate resistance were lower.*

***Keywords:*** *Calcite, puzzolans, early age, fly ash, silica fume, fracture energy*

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# Predicted and Observed Deformation Behavior of Akköprü Dam†

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**İbrahim SAK****

**ABSTRACT**

*In this study, the settlement behavior of Akköprü Dam, which is a 162.50 m high rockfill dam with clay core, is investigated for the end-of-construction and reservoir impoundment stages. Finite element analyses that are based on a 2-D plain strain solution are performed to determine the displacements. Hardening soil model is used to represent the non-linear, inelastic, and stress-dependent behavior of rockfill. Material model parameters for clay are selected from triaxial compression test results. For other materials, preliminary values for model parameters are chosen based on the results from previous studies on dams. Predicted and measured displacements are in agreement as a function of time, in terms of magnitude and location for the end-of-construction stage. The maximum settlement is observed to be approximately at the middle of the dam height. Predictions are also made for the displacements for reservoir impoundment conditions.*

***Keywords:*** *Dams, rockfill, settlement, finite element analysis, field measurements*

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# Experimental Investigation of the Liquid Sloshing in a Rigid Cylindrical Tank†

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**Taylan BAĞCI*****

**ABSTRACT**

*Investigations on pressure variations and free surface displacements of liquid from the mean static level in a cylindrical tank have been carried out experimentally. The primary objectives of this study are to investigate the sloshing problem in a rolling cylindrical tank and to measure pressure distributions at different locations. For this purpose, an experimental setup is designed to study the non-linear behaviour and damping characteristics of liquid sloshing in a partially filled cylindrical tank. Several configurations of tanks with and without damping walls are studied. Hydrodynamic load variations on the cylindrical tank are investigated by changing the filling ratio, the rolling period and the rolling angle systematically.*

***Keywords:*** *Pressure variations, baffles, sloshing loads, experimental study, cylindrical tank*

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# Damage Limits for Ductile Reinforced Concrete Shear Walls†

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**Polat GÜLKAN****

**ABSTRACT**

*Although the strain based damage limits proposed in the existing Turkish Earthquake Code were adopted from reported studies of leading researchers, the appropriateness of these limit state definitions and corresponding values to evaluate the performance with the analytical tools and methods used in the displacement based design and assessment procedures has not been verified properly. The moment-curvature analysis based on the plane section hypothesis is severely violated especially for reinforced concrete walls. This indicates that a comprehensive investigation is required to investigate the validity of proposed damage limits for structural walls. This study is based on advanced and computationally rigorous numerical procedures to investigate the relation between drift ratio, plastic rotation and curvature, compressive strain in concrete and tensile strain in steel for rectangular reinforced concrete structural walls. Validity of the requirements related to deformation limits in the Turkish Seismic Code and other design guidelines is then evaluated. Modeling and acceptance criteria that are more accurate than the existing ones have been proposed for structural walls.*

***Keywords:*** *Damage limit, RC shear wall, strain, plastic hinge, acceptance criteria*

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# Corrosion Performance of Steel Rebars Coated with Additive Containing Dyes†

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**ABSTRACT**

*In this study, the corrosion performance of steel bars embed into concrete and mechanical properties of concretes coated with basaltic pumice, colemanite, barite and blast furnace slag dyes are investigated. In the study single, double, triple and quadruple combinations of these materials were used and the dyes are applied on the steel bars. The method of investigating the corrosion performance of the dyes is embedding the coated steel bars in to the concrete and curing them in the 3.5% salty water for one year and then calculating the mass loss of each steel bar. Furthermore, galvanic cell method and accelerated corrosion tests were also applied for testing the corrosion performance of the dyes. The results have shown that colemanite and barite added dyes are more resistant to corrosion and are useable for dye production.*

***Keywords:*** *Barite, pumice, blast furnace slag, colemanite, corrosion, dye, rebar*

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# Investigation of Wind Effects on Tall Buildings through Wind Tunnel Testing†

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**S. M. Nima SHOJAEE*****
**Oğuz UZOL******

**ABSTRACT**

*There has been significant increase in tall building construction in Turkey in the last decade. As the height of building increases, wind effects become more pronounced. Wind can interact with flexible buildings and can significantly magnify the wind loads and wind induced oscillations. Wind tunnel tests have been widely utilized for estimating the wind effects on buildings. In order to perform a successful test, however, flow conditions inside the tunnel must represent the actual conditions rather closely. In this study, passive devices were designed to create wind profiles defined in wind codes inside Ankara Wind Tunnel that has a short test section. The performance of the designed passive devices was investigated through numerical and experimental studies. Then, wind effects on a rectangular shaped building were examined with high frequency base balance technique. The effect of turbulence intensity, vortex shedding and wind attack angle on wind loads were questioned. Finally base moments calculated from test results were compared with the results of various wind codes.*

***Keywords:*** *Wind, tall buildings, wind tunnel testing, wind loads*

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# Seismic Performance Evaluation and Strengthening of a Curved Bridge Having Concrete Piers and Composite Deck†

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**Alpay ÖZGEN****
**Enver ALTINOK*****

**ABSTRACT**

*In this study, the seismic performance of a curved highway bridge having rectangular concrete piers and composite deck is evaluated by nonlinear elasto-plastic analysis method. The time-acceleration records of the Izmit (1999), San Fernando (1971) and Loma Prieta (1989) earthquakes which are modified corresponding to a probability of exceedance of 2% in 50 years are used in the analysis. According to the analysis results, strengthening of the bridge is required. In the strengthening strategy, the viscous dampers are mounted on each bearing at the top of the piers in the transverse direction preserving the existing architectural appearance of the bridge as much as possible. Thus the relative displacements between the composite superstructure and the piers are limited, and the internal forces which occur in the piers and foundations are reduced.*

***Keywords:*** *Nonlinear analysis, seismic performance, plastic deformation, plastic curvature, yielding curvature, plastic rotation, viscous damper*

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