

# Abstracts of Papers in English

## **A STUDY ON THE EFFECTIVE PERIOD AND DAMPING RATIO OF LOW—MID RISE REINFORCED CONCRETE FRAMES**

**A. Vatani Oskouei**  
Faculty of Civil Engineering  
Shahid Rajaei Teacher Training University

**Key Words:** effective period, effective damping, nonlinear analysis, reinforced concrete structure, earthquake.

### **Abstract**

Estimating the real dynamic properties of a structure using a Direct Displacement Based Design (DDBD) is less computationally time-consuming than nonlinear dynamic analyses. Use of an equivalent linear system is associated with the effective period and effective damping for desired ductility and serviceability level of the structure model, which helps to estimate the nonlinear response. By using this technique, the effective stiffness and percent of cracking on the structure can be calculated. In this paper a 96 number of low-medium rise reinforced concrete frames were analyzed for extraction the relation between effective periods and damping ratio with ductility. The frames have one-six stories with different span lengths. The results of the analyses showed

that the period and damping ratio is increased by increasing the ductility. But increasing the dynamic properties of frames did not have the same percent. However, the length of spans decreased the fundamental, effective period and effective damping of the frame with the same rise, but the change was minimal.

## **INTRODUCING THE MOMENT RESISTING CONNECTION WITH THE SIDE PLATE SEISMIC BEHAVIOUR OF MOMENT CONNECTIONS OF BOXED-COLUMNS WITH SIDE PLATES**

**F. Nateghi**  
**Z.S. Tabatabaei**  
International Institute of Earthquake  
Engineering and Seismology

**Key Words:** rigid connection, boxed column, side plates, EQ resistant structure.

### **Abstract**

This paper elucidates the seismic behavior of side-plate moment connections to box columns, which are most

common in Iranian structures, for use in steel moment-resisting frames. In typical connections, the most severe stresses occur where the beam joins the column. This is also the weakest location in the assembly and, as a result, stresses are locally intensified at this location. Side-plate has a lot of benefits, such as; no need for continuity plates in box sections, which is a challenge in the construction phase.

Results of an analytical investigation of the cyclic behavior of 10 models, with side plates between the IPE beam and the box-column, are presented in this paper. The analysis was conducted using the ANSYS 5.4 software. The results indicate that this connection type has sufficient stiffness, strength and ductility to classify it as a rigid, full-strength, ductile connection.

## **BERTH ALLOCATION IN CONTAINER TERMINALS USING GENETIC ALGORITHMS**

**A. Babazadeh**  
**Faculty of Civil Engineering**  
**University of Tehran**  
**S.R. S-A. Ganji**  
**Dept. of Engineering Science and Research Unit**  
**Islamic Azad University**

**Key Words:** container terminals, berth allocation problem, genetic algorithm.

### **Abstract**

Optimal usage of berths plays a key role in raising the efficiency of container terminals. The berth allocation problem in a container terminal is defined as the feasible allocation of berths to the incoming ships, so that the total elapsed time of the ships' arrival and departure from the berths is minimized. In the literature of transportation, the latter problem is usually formulated as mixed integer programming models. Optimization methods, like the branch & bound algorithm, do not have sufficient efficiency to solve these models and become perfectly unusable when the problem size increases. In this situation, using an advanced search method, like genetic algorithms, may be suitable. In this paper, a genetic-based algorithm is proposed for the problem. Computational results for two test problems, i. e., small size and large size, are also presented. The results of the small test are also compared with the results obtained via the branch & bound algorithm.

## **NUMERICAL ANALYSIS ON THE EFFECT OF A CIRCULAR VOID ON**

## **THE BEARING CAPACITY OF A STRIP FOOTING ABOVE SAND**

**S.N. Moghaddas Tafreshi**  
**Dept. of Civil Engineering**  
**K. N. Toosi University of Technology**  
**A. Sharifpour**  
**A. Ghanbari**  
**Faculty of Engineering**  
**Kharazmy University**

**Key Words:** underground void, bearing capacity, strip footing, void embedment depth, footing eccentricity, numerical analysis.

### **Abstract**

The presence of a void under a foundation can affect the foundation's bearing capacity, significantly. Experimental programs or field tests are very expensive and access to all information and performed tests under various conditions is not easy. To study the effect of the underground voids, the accomplishment of a suitable numerical analysis on a physical model is necessary. As the finite element method for investigation of many geomechanic problems has been used successfully, a series of finite element analyses under vertical statically loading conditions were performed on a prototype soil-void model, using a two-dimensional plane strain model. The effect of the embedment depth of the void and the eccentricity of footing against the void were investigated. A close agreement between experimental and numerical results is observed. The results indicate that there is a critical region under the footing; when the void is located within this region, the stability and bearing capacity of the footing is significantly affected by the presence of the void and the magnitude of this effect must be considered.

## **EVALUATION OF THE NON-LINEAR DYNAMIC BEHAVIOR OF A 16-STORY FRAME BUILDING DURING AN EARTHQUAKE USING RECORDS GENERATED BY WAVELET TRANSFORM**

**O. Bahar**  
**A. Taherpour**  
**International Institute of Earthquake**  
**Engineering and Seismology.**

**Key Words:** wavelets transform, nonlinear dynamic time-history analysis, spectrum compatible records, generated artificial records.

**Abstract**

Wavelet transform (WT) is a powerful method to generate. Spectrum compatible records. In this paper, four sets of real records with the same primary conditions but different values of the nearest fault rupture surface and moment magnitude are selected. Then, based on the design spectrum the new records are generated. These records should have been corrected. Subsequently, non-linear dynamic analysis of an RC 16-story building is carried out. In order to evaluate seismic behavior of the building through large dispersed response for each set a simple method is proposed. The results show that: PGA is not a reliable criterion for selection of proper records; selection of real records with small moment magnitude results in more unrealistic maximum force of floors; and using real records with a small nearest fault rupture surface results in relatively stronger generated records.

## ELASTO-PLASTIC ANALYSIS OF REINFORCED SOILS USING POINT INTERPOLATION METHOD

S.M. Binesh

Dept. of Civil and Environmental Engineering  
Shiraz University of Technology

N. Hataf

A. Ghahramani

Engineering School, Geotechnical Engineering  
Division

Shiraz University

**Key Words:** point interpolation method, reinforced soil.

**Abstract**

In this paper the enriched radial basis point interpolation (RPIM) method is implemented for the elasto-plastic analysis of reinforced soils. Enrichment with polynomial terms increases the accuracy and reproducibility of the method. In present study the reinforced soil is discretized into soil, reinforcements and interface layer. Displacement field in each part is constructed by the RPIM. Final system of equations is obtained by the substitution of generated displacement field into the weak form of governing equations. The elasto-perfectly plastic behavior is assumed for soil, reinforcement and interface layer. The application of linkage element concept provides the possibility of slippage modeling in the interface layer. Based on the derived equations, a computer code has been developed and its validity is investigated by solving some examples at the end of the paper.

## EVALUATION OF LIQUEFACTION POTENTIAL OF CLAYEY SANDS:

## BASED ON COMMON PLASTICITY CRITERIA

M. Derakhshandi

Faculty of Engineering

Arak University

**Key Words:** liquefaction criteria, clayey sands, static and cyclic triaxial tests.

**Abstract**

Liquefaction is one of the natural catastrophic phenomena, which causes some destruction of engineering structures. Various contents of plastic fines in sand deposits cause different behavior during earthquake cyclic loading. There are several criteria to evaluate the liquefaction potential of clayey sands, based on plasticity, which yield fairly various results, according to their assumptions. In this study, by evaluation of these criteria, based on plasticity, the correctness of them was assessed in sands, including plastic fines with low plasticity ( $PI=15.5$ ). To evaluate the liquefaction criteria based on plasticity, some strain-controlled cyclic triaxial tests were conducted on sand-kaolinite mixture specimens containing %0, %10, %20, and %30 kaolinite and the results were compared with these criteria. In addition, several static triaxial tests were performed on these mixtures to evaluate induced variations in the specimens' microstructure by increasing plastic fines.

## ACCURACY OF PILE BEARING CAPACITY DERIVED FROM PILE DYNAMIC MEASUREMENTS BY PDA

M.M. Khoshbakht-Marvi

A. Fakher

M. S. Marefat

Faculty of Engineering, Dept. of Civil  
Engineering

University of Tehran

**Key Words:** dynamic test of pile, PDA, CAPWAP, bearing capacity, reliability.

**Abstract**

Among advanced methods which determine pile bearing capacity, a relatively new method of dynamic pile testing is employed in practice by the use of Pile Driving Analyzer (PDA). To find the bearing capacity of a pile by PDA, the fitting of the calculated force-time signals with measured ones is undertaken, based on the selection of soil resistance parameters and resistance elements, using CAPWAP software. This is an empirical procedure. Considering the iterative nature of the procedure, a variety of soil parameters and a different number of soil

segments can be used to fit the calculated force-time signals with the measured ones. Therefore, CAPWAP may come up with the same curve fitting result, referred to as the same match quality parameter, with different bearing capacities in different analyses. In the presented paper, the level of variation in the soil parameters and their effects on the overall bearing capacity of a pile, have been studied, when the same match quality number is derived. Further to the above mentioned analysis, a statistical reliability analysis has been carried out, considering pile bearing capacities derived from both conventional static formulas and pile dynamic testing results. The undertaken statistical reliability analysis is based on the "Load and Resistance Factor Design" (LRFD) method using two approaches: 1. The determination of reliability index utilizing PDA test results, which lead to the evaluation of the probability of failure for the design, according to a specific conventional static formula, 2. The calibration of resistance factors in static pile capacity analyses with an LRFD method, utilizing PDA test results, considering a target reliability index.

The paper concludes the reliability of PDA as a testing procedure to determine the bearing capacity of piles. It also presents a reliability analysis, which could be used to evaluate a specific conventional static formula by the use of dynamic testing results, based on the LRFD method.

## INVESTIGATION OF ASPHALT CONCRETE BEHAVIOUR FOR USAGE IN EMBANKMENT DAMS

S. Feizi-khankandi

A.A. Mirghasemi

A. Ghalandarzadeh

Faculty of Engineering, Dept. of Civil Engineerin

University of Tehran

Karre Hoeg

University of Oslo and Norwegian Geotechnical Institute

**Key Words:** embankment dams, asphalt concrete, cyclic test, monotonic test.

### Abstract

The seismic behavior of asphaltic concrete core dams under earthquake loads has been studied. In order to evaluate the dynamic behavior of asphalt concrete, an extensive series of monotonic and cyclic tests were carried out on triaxial specimens. The MTS-dynamic equipment at the Norwegian Geotechnical Institute (NGI) was used for this purpose. Temperature and frequency effects on specimen behavior and sample degradation have been studied under cyclic loads. To investigate fatigue behav-

ior, thousands of cyclic loads were imposed to some specimens. The tests were accomplished under both isotropic and anisotropic conditions. To study any sign of material degradation due to cyclic loading, the post-cyclic monotonic stress-strain curve was compared to the corresponding curve for specimens not first subject to cyclic loading. The determination of geotechnical parameters to be used in numerical models has also been studied.

## STUDY OF PERFORMANCE LEVELS AND ANNUAL FREQUENCY OF EXCEEDING MAXIMUM INTERSTORY DRIFT IN LOW-RISE STEEL MOMENT RESISTING FRAMES BY USING INCREMENTAL DYNAMIC ANALYSIS (IDA)

S.H. Badri

F. Daneshjoo

Structural Engineering

Tarbiat Modares University

**Key Words:** incremental dynamic analysis, steel moment frame, performance level, annual frequency of exceeding, limit state.

### Abstract

In this study, with respect performance levels and annual frequency of exceeding maximum interstory drift, using Incremental Dynamic Analysis (IDA), 3 steel moment resisting frames with various heights (2,4,6 stories) and 10 records in soil II have been used. Each record, which has been scaled in 15 levels of PGA, has been applied to the frames and the results are shown in IDA curves. These curves are summarized with a zero-length window and with respect to limit states in FEMA350, the capacity of the structures in immediate occupancy, Life safety and collapse prevention are found. By processing the curves and use of probabilistic relations, annual frequency of exceeding maximum interstory drift in each frame was established. For this reason intensity level measured by spectral acceleration  $S_a(T1;5\%)$ , and damage measured by maximum interstory drift. The result shows that by increasing the height of frame the length of linear behavior in IDA curve reduce and annual frequency of exceeding maximum interstory drift increase. Furthermore by increasing the number of stories, the capacity in performance levels decrease, which can be due to higher mode effect.

## APPLICATION OF ENDURANCE TIME METHOD IN SEISMIC

## ANALYSIS AND DESIGN OF CONCRETE GRAVITY DAMS

V. Valamanesh

H. Estekanchi

A. Vafai

Dept. of Civil Engineering

Sharif University of Technology

**Key Words:** endurance time method, acceleration functions, dynamic analysis of concrete dams, performance level.

### Abstract

In this paper, application of the Endurance Time (ET) method in seismic analysis of concrete gravity dams has been investigated. This relatively new method is based on a time history analysis procedure and it is expected that, by extending its application to the seismic analysis of dams, useful information about seismic performance and safety margins based on various design criteria, can be obtained. A comparison of the analysis results for the Koyna and Folsom dams in a linear phase under different earthquakes has shown that the ET method has the potential of predicting dam behavior under earthquakes. In order to investigate the general performance of a dam at the OBE level in a linear range, the target time can be selected as the equivalent OBE of the proposed site. If the value of the intended damage index exceeds the limit value at target time, the dam design is considered inadequate and, if it does not exceed the limit value, the dam is considered adequate. In general, the ET method simplifies the procedure of the seismic assessment of concrete gravity dams.

## CALIBRATION AND VERIFICATION OF WATER QUALITY MODELS WITH GENETIC ALGORITHMS, CASE STUDY: ZAYANDEHROOD RIVER

H.R. Safavi

Dept. of Civil Engineering

Isfahan University of Technology

**Key Words:** river quality, modeling, genetic algorithm, calibration, verification and zayanderood.

### Abstract

River water quality models are commonly used to study the response of river quality, due to different management strategies. In this paper, a genetic algorithm is used to calibrate for the kinetic constants, including biochemical decay rate ( $k_1$ ), re-aeration rate coefficient ( $k_2$ ), and BOD settling rate ( $k_3$ ), with reference to BOD and DO observation data. For this purpose, the QUAL2K

is used as a simulation model. An objective function, defined by the sum-of-least squares, is used in order to describe the difference between the observed and simulated BOD and DO concentrations. The constraints include search spaces of kinetic rates. The results show that GAs can successfully carry out calibration and verification and estimate the best set of kinetic coefficients, with minimum RMSE, to be used in river water quality modeling with QUAL2K as an embedded model. In the case study for the Zayandehrood river, the results show  $0.02 < k_1 < 3.27$ ,  $0.082 < k_2 < 22.13$ , and  $0.06 < k_3 < 4.27$  (day<sup>-1</sup>).

## DUCTILITY AND HINGE (DIAMETER) LENGTH OF REINFORCED CONCRETE CONNECTIONS CONSISTING OF SCC AND F.E. MODELING

A.A. Maghsoudi

K. Masti

Dept. of Civil Engineering

Shahid Bahonar University of Kerman

**Key Words:** SCC, ductility, Plastic Hinge, beam-column connection, ANSYS.

### Abstract

In reinforced conventional concrete tall buildings, especially in the lower stories of beam—column connections, concrete casting and vibrating is a big problem, often due to reinforcement congestion. A good alternative for conventional concrete is to use a new concrete generation called Self Compacting Concrete (SCC). With its high fluidity and no need of inner or outer vibration, it offers both quality and cost improvement over conventional concrete. To achieve acceptance for the use of SCC in reinforced concrete in RC beam-column connections, the available results of experimental research conducted on three reinforced SCC specimens, with different percentages of  $\rho$  and  $\rho'$ , were used, to determine the ductility and concentrated plastic rotation developed in the connections. The simulated beam-column connections were loaded incrementally, using a point load, and the vertical deflection, tensile steel and compressive concrete strain were measured at different sections up to failure.

In the theoretical phase of this investigation, a 3-D model i.e., ANSYS nonlinear software, was used and the load-deflection and plastic hinge developed were plotted. A comparison of the experimental and theoretical results of the member was performed and it was shown that a reasonably good agreement is available. As a general conclusion, it is possible to design RC ductile connections made of SCC.

## EVALUATION OF PERFORMANCE OF CONCRETE SMRF WITH SHEAR WALL DESIGNED ACCORDING TO LOADING OF THE 2800-84 CODE

**B. Hosseini Hashemi**

**A. Tabnak**

**International Institute of Earthquake Engineering and Seismology**

**Key Words:** concrete structures with shear wall, artificial acceleration time history, inelastic time history analysis.

### Abstract

In recent years, much research has been undertaken to evaluate the Force-Based Design methods that apply to the design of building structures. Following this research, this investigation is focused on the seismic behavior of concrete frame-wall structures. This article is focused on the performance of a special concrete frame with a shear wall that is designed according to the 2800 code and ACI318-02. For this purpose, one set of 4, 8, 12 and 16 storey reinforced concrete frame-wall structures (3D) are designed and tested using inelastic time-history analyses. These models are subjected to a suite of seven artificial acceleration time-histories that are selected to be compatible with the design spectrum. Then, the results are processed to obtain displacements, storey drifts and shear stories.

A review of the results obtained from the time-history analyses indicates that the 2800 method predicts the shear of the stories, but that this method cannot estimate inelastic displacements and drifts in earthquakes.

## OPTIMAL RESERVOIR OPERATION USING TWO PROBABILISTIC MECHANISMS IN TABU SEARCH; RANKING BASED AND FITNESS BASED

**S.H. H. Nourzad**

**M. H. Afshar**

**Dept. of Civil Engineering**

**Iran University of Science and Technology**

**Key Words:** optimal reservoir operation, tabu search, probabilistic development.

### Abstract

Nowadays, Meta-heuristic methods play an important role in solving reservoir operation problems; one of the most challenging subjects in water resource management all over the world. The Tabu Search, one of the most powerful Meta heuristic methods, is less considered in this field. In this article, two probabilistic mechanisms are developed and applied to the selection phase of Standard TS using the Roulette Wheel method, on the basis of two criteria: Ranking of the solution and the value of its objective function. Afterwards, the simple and hydropower operation of the Dez Dam is solved and the solutions are compared with basic optimal solutions, using LINGO9, and other researcher's results, and the best, mean and worst solutions in 10 iterations are presented. The best solution is improved with these methods, but the standard deviation is greater than that of other research results. There is a suggestion for future research to consider intensification and diversification criteria in the method to improve its qualifications.