M. Hessan
International Institute of Earthquake Engineering and Seismology

Key Words: ambient vibration tests, system indentification, 4 spectra method, McVerry method, peak picking method, stochastic subspace method, khorjini type connection.

Abstract

In this article, the ambient vibration test results of a $\frac{1}{2}$ scaled model of a 4-story steel structure using ten CMG-6TD, three-component seismometers, have been represented. Four different signal processing methods, including: "McVerry, Four-Spectrum, Peak Picking and Stochastic Subspace Identification" were used for modal parameter identification. The obtained dynamic parameters by the four mentioned methods were compared with the numerical modeling results and the ability of these methods was discussed. Totally, the damping values evaluated by the Stochastic Subspace Identification and Four-spectrum Methods are more accurate. Besides, the first 4 mode shapes of the model were identified more accurately by Four-Spectrum and McVerry methods. In order to generalize the results to other structures, complementary studies on both in-situ dynamic tests and numerical modeling are needed.

M. Maleki
Faculty of Engineering
Bu-Ali Sina University
A. Haqayeq
Science and Research Branch
Islamic Azad University

Key Words: low confining stress, sand, constitutive model, failure state.

Abstract

One of the fundamental aspects of sandy soils mechanical behavior is the failure state. Diverse experimental works existing in the literature show that the failure state in sands depends on confining pressure, density and stress path, however the most of these works were performed at the medium or high confining pressures (more than 100 kPa generally), and also the majority of constitutive models have been based on these type of results. The dependence of the failure state on confining pressure for low levels of this pressure is little studied and needs more investment. In this study, after a brief literature review, a set of drained triaxial tests with different confining pressures (10-200kPa) were performed. Finally, based on obtained experimental results, some of advanced constitutive models, such as Wang, Nova and CJS models were validated. The obtained results show a nonlinear relation between the failure state parameter (σ_1/σ_3) and confining stress. This nonlinearity is more important for the low levels of confining stress and must be properly introduced in the failure surfaces of constitutive models.

STUDYING THE SPECIFIC SURFACE CONCEPT FOR NON LINEAR FLOW THROUGH COARSE GRANULAR POROUS MEDIA

Z. Eshcou
S.C. Yecta
A. Tahershamsi
Dept. of Civil Engineering
Amirkabir University of Technology

Key Words: specific surface, hydraulic radius, porous media, nonlinear analysis.

Abstract

Though various relationships for the non-linear analysis of flow through coarse porous media may be found in the literature, their applicability for engineering usage is limited. Difficulties in determining the grain mean hydraulic radius is a basic issue in this regard, due to the complexities in estimating the specific surface parameter involved for such calculations. After reviewing related theoretical bases, this article examines the reliability of a number of recent models proposed for determination of the specific surface, using actual data. Findings indicate that the Sabin-Hansen method is a more realistic means for such a purpose and, in spite of it's simplicity, the Bazargan model leads to least accurate results.

DYNAMIC PENALTY FUNCTION METHOD FOR SOLVING TRAFFIC ASSIGNMENT PROBLEMS WITH NODE CAPACITY CONSTRAINTS

H. Shahpar
H.Z. Aashtiani
Dept. of Civil Engineering
Sharif University of Technology
A. Babazadeh
Dept. of Civil Engineering
University of Tehran

Key Words: traffic assignment, capacity constraint, dynamic penalty function.

Abstract

Although there are some efficient methods for solving traffic assignment problems (TAP), these methods do not consider link and node capacity constraints. Explicit consideration of these constraints in TAP causes each linearized sub-problem to be converted to a minimal cost, multi-commodity flow problem that is too difficult to solve. In this paper, a new iterative algorithm is introduced to solve the TAP with node capacity constraints. The algorithm is based on implicitly considering the node capacity constraints by means of adding a dynamic penalty function (DPF) to the link travel times. Each iteration of the algorithm is reduced to an unconstrained assignment, followed by updating the penalty functions. The unconstraint assignment is carried out using the linearization method that has been derived from the complementary formulation of TAP. The computational results of the algorithm on some well known networks and a real network, are also presented.

EVALUATING THE DIFFERENT SYSTEM IDENTIFICATION METHODS IN AMBIENT VIBRATION TEST OF A $\frac{1}{2}$ SCALED STEEL STRUCTURE

M. Davoodi
M. Mahmoudabadi

CONTROL ON THE RELIABILITY OF MEETING WATER DEMANDS USING THE GA-LP APPROACH

A. Attarzadeh
S. J. Mousavi
A. Tahershamsi
Dept. of Civil Engineering
Amirkabir University of Technology

Key Words: surface reservoir, capacity optimization, linear programming, genetic algorithm.

Abstract

Optimal capacity estimation of surface reservoir systems with control on reliability of meeting water demands using mathematical programming techniques has been investigated in this study. Having control on the reliability needs the use of binary variables, which makes formulation of the required optimization model a mixed integer linear program (MILP). A hybrid genetic algorithm-linear programming (GA-LP) model has been proposed to deal with solving the MILP models, in which binary variables are the GA decision variables, while the remaining linear programs are solved by standard LP solvers for objective function evaluations. The model, with 420-840 binary variables, has been used in the optimum capacity estimation of the Chergh-Veis dam and compared with branch-and-bound and GA techniques. The results reveal the satisfactory and relative performance of the proposed hybrid algorithm compared to its competitors, in terms of computational speed and quality of solutions. However, in a large-scale problem, generating a huge number of binary variables in GA may pose a significant computational burden on the proposed methodology to guide the generated solutions into the feasible space of the problem.

EVALUATION OF HOT MIX ASPHALT FATIGUE USING DISSIPATED ENERGY CONCEPT

M. Ameri
Dept. of Civil Engineering
University of Science and Technology
A. Khavandi
Faculty of Engineering
Zanjan University

Key Words: fatigue cracking,fatigue life, bending beam, stiffness reduction, dissipated energy.

Abstract

Fatigue cracking is one of the most prominent distresses in asphalt pavement. Different researcher have developed some various approaches to evaluate fatigue in hot mix asphalt. In the constant strain mode, the fatigue life failure at 50 percent reduction in initial stiffness is widely used by asphalt professionals. In this paper, the criteria based on the dissipated energy concept consistency of energy ratio, reduced energy rate and rate of dissipated energy change were compared with the 50 percent reduction in initial stiffness by four point bending beam. The loading pattern used in bending fatigue test was a semi sinusoidal load. The method based on rate of dissipated energy change indicates the actual fatigue life, while this is most different from the one that was indicated by the method based on 50 percent reduction in initial stiffness. In order to determine the asphalt mixtures fatigue life, the criteria based on stiffness reduction percent in equivalent to "true failure"was suggested as a new criteria.

SEISMIC ANALYSIS OF WASTE NUCLEAR REPOSITORY BASED ON MODIFIED INTERACTION ROCK SUPPORT

M. R. Adlparvar
Faculty of Technology and Engineering
University of Qom
H. R. Vosoughifar
Dept. of Civil Engineering
Islamic Azad University, Tehran South Branch

Key Words: lining, waste nuclear repository, interaction curve, displacement.

Abstract

In this paper, seismic analysis of a waste nuclear repository, based on a modified interaction rock-support model, was evaluated. Designers should consider the direction and type of distributed stress and their effects on the rock around the buried rock location in the design of bolt systems. Another effective parameter in the strength of the system design on the rock is the lifetime of the mentioned systems. To verify a communication rock bolt, the load displacement of the rock should be calculated. Before designation of the lining system, the load-displacement specification of the rock should be calculated. If the lining has set after displacement and the rock bolt has not modified the rock lining interaction model, the mentioned problems will be solved. In this modifying process, construction time has also been considered.

FAILURE STATE OF SANDY SOILS IN LOW CONFINING STRESS

Key Words: embankment dam, signal processing, 4 spectra method, time-frequency distribution, modal frequencies, mode shapes, explosian test.

Abstract

In this paper, the dynamic characteristics of two Iranian large embankment dams in explosion tests will be presented. Based on the results of the tests, the recorded velocity time histories of the dam bodies in 12 explosions at the Masjed Soleiman dam site and 7 explosions at the Marun dam site were measured. Since the input excitations are unknown, the modal frequencies and mode shapes of the dams were evaluated based on the "4 spectra" method. Due to non-stationary characteristics of recorded signals and in order to increase the accuracy of calculations, an advanced signal processing method, named Time-Frequency Distribution (TFD), was used. In this paper, the obtained results and a comparison between classical and advanced signal processing methods will be presented.

THE EFFECT OF MATRIX SUCTION, DEGREE OF SATURATION AND RELATIVE COMPACTION ON THE SHEAR STRENGTH AND MECHANICAL BEHAVIOR OF UNSATURATED CLAYEY SAND

A. Mirzaii
S.S. Yasrebi
Faculty of Civil and Environmental Engineering
Tarbiat Modares University

Key Words: unsaturated soils, matrix suction, degree of saturation, pore pressures, unsaturataed triaxial tests, mechanical behavior, shear strength.

Abstract

In this paper, a laboratory study on the influence of matrix suction, degree of saturation and relative compaction on the shear strength and mechanical behaviour of clayey-sand is presented. For this purpose, triaxial tests under saturated and unsaturated conditions have been carried out. Saturated triaxial tests were operated in two groups with different relative compactions in consolidated-drained and consolidated-undrained situations at effective consolidation pressures of 50, 100 and 200 kpa. Unsaturated tests were carried out with an unsaturated triaxial apparatus built at the University of Tarbiat Modares. These unsaturated triaxial tests were operated under a constant water content condition in two groups with different relative compactions at initial matrix suctions of 30, 100 and 150 kpa, and effective consolidation pressures of 50, 100 and 200 kpa. An axis translation technique and a double-walled triaxial cell have been used to measure soil matrix suction and variation of pore air volume. Based on the results, the effect of matrix suction, degree of saturation, relative compaction and consolidation pressures on variations of pore air and water volume, and pressures of soil specimens, have been studied. In addition, the mechanical behaviour of the soil is studied by using stress state variables, and the shear failure parameters have been calculated.

THE EFFECTS OF HYDROMECHANICAL BEHAVIOR OF ROCK JOINTS ON THE STABILITY OF CONCRETE ARCH DAM ABUTMENTS

S. Yazdani
M. Yazdani
Faculty of Civil and Environmental Engineering
Tarbiat Modares University

Key Words: hydromechanic, jointed rock mass, concrete arch dam.

Abstract

Due to extensive loading commonly applied in concrete arch dams, the rocky sites selected as their foundation and abutments must be of high strength and degree of stiffness. However, hard rock usually contains discontinuities arising from its brittle behaviour under different natural loadings. Thus, the foundations of arch dams often consist of discontinuities in the forms of joints, bedding planes and faults. It is, then, necessary to investigate the effects of these weak elements on the stability of the structure.

In this paper, the authors present the response of a typical concrete arch dam abutment under the hydraulic and mechnical interaction of rock joints within abutments, using UDEC software. Two different approaches of increasing hydrostatic water pressure and reduction in the strength of rock joints have been utilized to discover abutment stability. In this study, the values of the sliding and opening of rock joints and the resulting water flow through these discontinuities are adopted as indicators for an estimation of dam abutment safety. The results show that the hydromechanical effect is of great importance to the stability of abutments and hence, must be considered in the modelling of arch dams. Otherwise, the failure mechanisms and the level of safety obtained from the analyses may lead to an unsafe design.

OPTIMAL CAPACITY ESTIMATION OF DAM RESERVOIRS WITH

FRP sheets is necessary. In this paper, a micro mechanical approach is introduced for simulating tension stiffening and crack formation in RC members strengthened with FRP. On the basis of the proposed theoretical approach, the spatial average stress-strain relationship of reinforcing bars, FRP and cracked concrete, as well as average crack spacing and width, can be numerically simulated. Verification of the proposed method is carried out through comparison with some experimental results.

THE EFFECT OF THE PERFORMANCE LEVEL OF SPECIAL REINFORCED CONCRETE FLEXURAL FRAMES ON THE SEISMIC-NONLINEAR BEHAVIOR OF INTERIOR BEAM-COLUMN JOINTS

M. Fallah Ziarani
A.A. Tasnimi
M.T. Ahmadi
Faculty of Civil and Environmental Engineering
Tarbiat Modares University

Key Words: RC-special flexural frame, interior beam-column joints, plastic hinge, performance level, nonlinear numerical analysis, nonlinear behavior, energy dissipation.

Abstract

The development of plastic hinges in reinforced concrete moment resisting frames (RC-MRF) is an important key element to increase the deformational capacity and energy dissipation ability, in order to maintain overall structural stability, while experiencing a severe earthquake. Numerous experimental and analytical researches show the formation of plastic hinges in beams away from the column face increases the overall ductility of the structure, while the core of the beam-column joints should remain in an elastic state. The latter condition is one of the requirements of many codes of practice.

The main aim of this paper is to evaluate the behavior of interior beam-column joints in special moment resisting frames, which have been designed according to standard 2800, the Iranian national building code Part9 and the Iranian concrete code (ABA). The behavior of such joints was numerically studied for different performance levels of the overall structural behavior for more than 30 interior beam-column joints, utilizing the "ANSYS" finite element program. The main important variables which influence joint behavior, such as: column axial force, bonding effect, amount of main reinforcements and stirrups, concrete strength and reinforcement strength, were considered during this evaluation.

AN ELASTOPLASTIC-VISCOPLASTIC MODEL FOR SOILS

M. Maleki
Faculty of Engineering
Bu-Ali Sina University

Key Words: time-dependent behavior, elastoplasticity, viscoplasticity, creep, strain rate effect.

Abstract

Elasto-viscoplastic constitutive models, based on the Perzyna overstress concept, have been applied vastly to describe the time-dependent behavior of soils. The response of these models is divided into two parts: time-independent elastic and time-dependent viscoplastic. Despite their simplicity, some important behavioral aspects, such as the plastic failure state and plastic deformation in rapid loading, cannot be modeled. In fact, the consistency condition is not verified. On the other hand, the yield surface can be crossed by the stress state. In this manner, for rapid loading, the model response is elastic, and viscoplastic strain occurs during the time. However, in the case of rapid loading, a great part of the response is plastic. In this approach, an elastoplastic-viscoplastic model is proposed. The model has been developed from a basic elastoplastic model by considering an additional viscous mechanism. This model is able to explain the time-dependent behavior of soils such as creep (primary and secondary), stress relaxation and strain rate effects. In addition, existing problems in the classical elasto-viscoplastic models related to the plasticity failure and rapid loading are solved in the proposed model. The physical meanings and the identification strategy of the model parameters are clearly given. A simple example of model validation has been presented in the last part of the paper. The results of validation indicate the good capability of the proposed model.

EVALUATING MODAL FREQUENCIES AND MODE SHAPES OF MASJED SOLEIMAN AND MARUN EMBANKMENT DAMS USING CLASSICAL AND ADVANCED SIGNAL PROCESSING TECHNIQUES

S. Khademi
M. Davoodi
International Institute of Earthquake Engineering and Seismology

Abstracts of Papers in English

EXPERIMENTAL RESEARCH OF STIFFENERS EFFECTS ON THE BEHAVIOR OF CONCRETE FILLED STEEL TUBE COLUMNS (CFST)

T. Moradi Shaghaghi
Science and Research Branch
Islamic Azad University
F. Nateghi E.
International Institue of Earthquake Engineering and Seismology

Key Words: concrete filled steel tube columns, steel tube, steel stiffners, ductility, lateral cyclic load.

Abstract

Composite columns have been used in constructions for many years due to their advantages over ordinary columns. Concrete filled steel tubes, CFST are one such column. Some of the advantages of these types of column are known as; not needing molding, high ductility, relatively high resistance with low volume properties, low deformation capability relative to ordinary steel columns and, most commonly, economic potential.

Due to these enormous potentials, a general research program was launched to investigate CFST's in an experimental manner. This program was planned and done in the IIEES structural lab in Tehran, Iran. In order to achieve the goals of the project, ten specimens were constructed using a 1:3 scale and were tested as cantilever columns. Specimens were loaded under a constant axial load, while laterally loading under an enhancing lateral cyclic load based on a displacement controlled condition. Three distinct geometrical shapes namely, square; circle and octagonal sections were considered and tested. Specimens were also tested using stiffeners in comparison to specimens without stiffeners. This paper presents the results obtained and ways and methods of achieving the goals of the project.

Using stiffeners inside a steel tube in the critical zone, significantly improves column behavior and ductility.

MODELING OF TENSION STIFFENING BEHAVIOR OF REINFORCED CONCRETE ELEMENTS STRENGTHENED WITH FRP

S. Rahnamay S.
M. Soltani M.
Faculty of Civil and Environmental Engineering
Tarbiat Modares Univesity

Key Words: FRP strengthened reinforced concrete, micro modeling, tension stiffening.

Abstract

Concerning the extent of applying composite materials, especially Fiber Reinforced Polymer (FRP), for the rehabilitation of concrete structures, developing a suitable method for analyzing RC elements strengthened with