CLIMATE CHANGE PREDICTION USING NEURO-FUZZY(CASE STUDY: TEHRAN AND TABRIZ STATIONS)

N. Turini(corresponding author)
nzl.7600gmail.com
Dept. of Civil Engineering
Graduate University of Advanced Technology
M.R. Hessami Kermani
hessami@uk.ac.ir
Dept. of Civil Engineering
Shahid Bahonar University

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 139-147, Research Note

- Received 4 February 2012; received in revised form 6 August 2012; accepted 16 October 2012.

Abstract

The spatial resolution of Global Climate Models (GCMs) is too coarse to resolve regional scale effect and to be used directly in local impact studies. Statistical downscaling techniques offer an alternative to improve regional or local estimates of variables from GCM outputs. In this study, an Adaptive Neuro-Fuzzy Inference System (ANFIS) using fuzzy c-means (FCM) clustering is presented and assessed to reconstruct the observed climate in Iran.

Outputs from the third generation Canadian Coupled Global Climate Model(CGCM3) are used to test this approach over the current period (i.e. 1961e1990), and compare results with observed temperature and precipitation from two meteorological stations located in Tehran and Tabriz.

Both ASD and ANFIS models, as these two models are evaluated and inter-compared, are calibrated using NCEP (National Center for Environmental Prediction) reanalysis data before the use of CGCM3 predictors. The comparison is performed over the period of ASD and ANFIS calibration (1961-1975) and over validation period (1976-1990), using NCEP predictors. The criteria for results comparison are computing the amount of model explained variance (R2) and Root Mean Squared Error (RMSE) for the estimated statistics and climatic indices.

For stability and robustness of the downscaling results for each application of ASD and ANFIS models, 100 simulations were performed to produce 100 synthetic series of daily precipitation and maximum temperature.

Daily precipitation and maximum temperature are generated for the periods of 2011-2040, 2041-2070 and 2071-2100 and compared to 1961-1990 period. Average maximum temperature for Tehran is 22.48, 23.52, 25.05, 26.27^0C and average precipitation is 0.63, 1, 1.1 and 1.17 millimeter per day for the periods of 1961-1990, 2011-2040, 2041-2070 and 2071-2100 respectively. For the other station, Tabriz, average maximum temperature is $17, 18.31, 19.81, 21.30^0C$ and average precipitation is 0.84, .60, 0.47 and 0.33 millimeter per day for thirty years periods respectively. Results comparison indicates the increase of temperature for both stations but precipitation behavior is totally different in Tabriz and Tehran stations.

Key Words: Climate Change, Global Climate Models, Statistical Downscaling, ANFIS, CGCM3.

ings. Wall segments formed by openings also have the same behavior as squat shear walls. Usually walls with aspect ratio less than 1.5 are known as low-rise or squat shear walls. Shear stresses have significant effect in lateral strength and ductility of such walls. Concrete structures with shear dominant behavior are more complex for Analyzing and their seismic behavior may be poor. Also squat shear walls have various failure modes under lateral loading. Few researches can be found related to the effect of boundary elements characteristics on the behavior of squat shear walls. Accordingly, in this paper, the effect of some variables such as wall aspect ratio, amount of axial force, and specially effect of boundary elements and some of their characteristics such as longitudinal reinforcement and horizontal reinforcement (concrete confinement) on the behavior of squat shear walls are investigated, and this is done by analyzing 30 models of such walls. Response parameters include maximum lateral strength, lateral displacement in maximum strength and failure mode of walls. Results suggest that the effect of boundary elements characteristics on the response parameters will differ depending on wall aspect ratio and details of design. In walls with aspect ratio of 0.5, displacement in maximum strength found to increase with increasing longitudinal reinforcements of boundary elements and in walls with aspect ratio of 1.0 and 1.5 found to decrease. Lateral strength increase with increasing longitudinal reinforcements of boundary elements and its increase has rising rate with increasing wall aspect ratio. Accordingly, the conclusion here is that with increasing longitudinal reinforcement of boundary elements, ductility increases in models with diagonal tension failure mode and decreases in models with flexural failure mode. In some cases change in boundary element characteristics result in change in failure mode of models.

Key Words: Squat Shear Wall, Nonlinear Finite Element Analysis, Failure mode, Maximum Strength, Displacement in Maximum Strength.

TO IDENTIFY THE CRITERIA FOR SELECTING BETWEEN TRADITIONAL AND CONCRETE TUNNEL FORM SYSTEMS FOR MASS- HOUSING PROJECTS

M. Hosseinalipour
m-hosseinalipour@sbu.ac.ir
School of Architecture and Environmental Design
Shahid Beheshti University

M. Kameli(corresponding author)
kamelicivil@yahoo.com
Civil Engineering and Construction Management
Islamic Azad University of Tehran Scientific Research Unit

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 129-138, Research Note

- Received 10 January 2012; received in revised form 19 September 2012; accepted 22 September 2012.

Abstract
The use of concrete tunnel form system offers significant advantages in mass- housing construction, despite the use of modern material and equipments in mass- housing construction and fundamental problems with traditional method, mass- housing construction are still generally traditional. Then, it is being determined that; the criteria for selecting system in construction have been incomplete and general. Holistic criteria are needed to assist with the selection of an appropriate construction system in concrete buildings during early project stages. Because of this reason, the purpose of this research is to identify the criteria for selecting between the traditional and concrete tunnel form systems for mass-housing projects. Methodology selected for this research comprised of literature and field studies, questionnaire was designed; interviews were conducted with experienced practitioners in the field of mass- housing projects in Tehran province, and finally a statistical analysis of the survey was done. Following a literature and field studies a comprehensive comparison between two systems of construction, 23 criteria were identified based on time, cost and quality. To evaluate identified criteria a survey was conducted from the experienced practitioners in the field of mass- housing construction including owners, engineers, and contractors. For ranking the identified criteria a Liker scale of "High", "High-Medium", "Medium", and "Medium-low" was selected. The analysis by using SPSS 18.0 revealed that the criteria are classified in five categories: initial costs, constructability, long-term costs, and the influence of architecture and structures. Three of these factors are under the economic category, and two other factors belong to the quality category. In evaluating the criteria using descriptive and inferential statistics, concrete tunnel form system in terms of time, cost and quality, were there is high demand and shortage crisis in housing is more acceptable. Results of research will help the main beneficiaries, including governments, owners and consultants in making appropriate decision for selecting the construction system.

Key Words: Concrete tunnel form system, traditional structures, time, cost and quality.

APPLICATION OF ENDURANCE TIME METHOD IN DESIGN AND ASSESSMENT OF OFFSHORE STRUCTURES SUBJECTED TO IRREGULAR WAVES

H.Matin Nikoo(corresponding author)
matinnikoo@alumni
M. Zeinoddini
zeinoddini@kntu.ac.ir
Dept. of Civil Engineering
K.N.Toosi University of Technology
H.Estekanchi
stkanchi@sharif.edu
Dept. of Civil Engineering
Sharif University of Technology
S.M.Enderami
s.m.enderami@gmail.com
Dept. of Civil Engineering
K.N.Toosi University of Technology

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 109-118, Research Note

- Received 28 December 2011; received in revised form 8 May 2012; accepted 28 July 2012.

Abstract

In this paper a novel approach, called Endurance Wave Analysis (EWA), is established to non-linear dynamic analysis and assessment of offshore structures subjected to irregular wave loads. This is, in fact, an extension of the Endurance Time Analysis (ETA) that already presented by previous researchers for the seismic assessment of the onshore structures. With the EWA method, the offshore structure is simulated under a predefined Intensifying Wave Train Functions (IWTFs), corresponding to deteriorating sea states at a specific site. The functions are designed so that the roughness of the sea state represented by them increases over the time and even goes well beyond the design sea state. Using EWA, damage indices such as base shear, drift and allowable stress, or any other desirable parameters, from the linear elastic range of material behavior to permanent deformation or complete collapse level, can be studied directly in terms of the sea state roughness. Structural integrity can then be evaluated based on the EWA results. By definition, Endurance Wave Heights (EWHs) of a structure refers to waves that the structure would be stable against IWTFs according to any arbitrary damage index. Considering spectral features of the sea state, to incorporate waves of different heights and frequencies in a single dynamic analysis, to take into account the irregularity and randomness of the sea waves and requiring relatively short simulation times are among the advantages offered by EWA. It has been demonstrated that EWA, while utilizing a relatively simple methodology, provides a comprehensive insight into the behavior of complicated structural systems against wave actions which themselves are inherently random and complex. It produces detailed and valuable information which can be used for the assessment and design of structures subjected to wave loads. It has been also shown that the EWA approach can be integrated into a performance-based design procedure. For implementing a performance based assessment, it will be necessary to provide appropriate acceptance criteria for offshore structures in different performance levels such as IO, LS and CP. In this paper, the simple concept of the EWA is presented and the method is examined on offshore platform. Different irregular IWTF are generated and employed to evaluate the integrity of the two hypothetical two-dimensional steel jacket type platforms. The results clearly show that the proposed method is very effective for the dynamic non-linear analysis and assessment of offshore structures subjected to sea loads.

Key Words: Offshore structures, Irregular Random Waves, Intensifying Wave Train Function (IWTF), Endurance Time Analysis (ETA), Endurance Wave Analysis (EWA), Endurance Wave Height (EWH).

THE EFFECT OF BOUNDARY ELEMENT CHARACTERISTICS ON THE BEHAVIOR OF SQUAT CONCRETE SHEAR WALLS

F. Mohammadi Darani
farhad.m63@gmail.com
Faculty of Engineering
Islamic Azad Unuversity-Shahrekord Branch, Shahrekord
A. Sarvghad-Moghadam(corresponding author)
moghadam@iiees.ac.ir
International Institute of Earthquake Engineering and Seismology

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 119-127, Research Note

- Received 8 January 2012; received in revised form 7 April 2012; accepted 6 May 2012.

Abstract

Squat shear walls are common in low-rise buildings, their seismic rehabilitation and lower stories of high-rise build-

impose a considerable amount of money to the project. Therefore, in this research, just a layer of coarse-grained soil, surrounding the reinforcement layer is used and the remained volume was filled with the fine-grained soils or the soils that exist in the project site. This experimental study is performed for the selected thicknesses of coarse-grained soil surrounding the reinforcement. Furthermore, the numerical analysis for these pull-out tests was conducted using the finite element code, PLAXIS3D Tunnel. Finally, the experimental and numerical analysis results for the variety of coarse soil thicknesses were compared and the optimum thicknesses for coarse-grained soil are presented. According to the results, the pull-out resisting force increases with increasing the coarse layer thickness; in addition, the Grid-Anchor endures more pull-out resisting forces as compared with the usual geogrid. According to the experimental results, 10 centimeters coarse layer (i.e. the thickness of 5 centimeters for the top and the thickness of 5 centimeters for the bottom layer of the reinforcements) was found as optimum thickness of surrounding layer for the 5 kPa surcharge. Other findings of this research can be as follows: when the reinforcements begin to move against the soil surrounding them, the pull-out resisting force decreases due to the decrease in friction between the soil and the reinforcements. On the other hand, as the thickness of coarse layer around the reinforcements increases, a hardening state in the force-displacement curve of these reinforcements was observed. This situation is more visible for Grid-Anchor in comparison with the usual geogrid. Having compared the numerical and experimental results, there is a suitable conformance between them.

Key Words: Pull-Out Test, Geogrid, Grid-Anchor, Fine-Grained Soil, Coarse-Grained Soil, Plaxis3D Tunnel.

EFFECT OF POZZOLAN AND FILLER ON PLASTIC PHASE, STENGHT AND CONFINED CHARACTERISTIC OF NANO HIGH STRENGTH SELF COMPACTING CONCRETE

A.A. Maghsoudi(corresponding author)
maghsoudi.a.a@mail.uk.ac.ir
M. Nouri
nourimeisam@gmail.com
Dept. of Civil Engineering
Shahid Bahonar University of Kerman

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 99-107, Research Note

- Received 18 December 2011; received in revised form 5 August 2012; accepted 1 October 2012.

Abstract

Based on significant role of concrete in construction industry, this material is known as one of the most common used substance for researchers, this special consideration leads to invention of new generation concrete and various admixtures with different applications. Self compacting concrete (SCC) is one of these new combinations which was offered at 1986 due to nonqualified conventional concrete (vibrated concrete) in 1980 decade. Self compacting concrete has well application in construction procedure by passing freely around and through reinforcement and covers all the spaces inside the framework and can be compacted by its own weight without need of any vibration. Lower time and lower cost of construction, lower sound pollution and high homogeneous concrete are some advantages of SCC.

In more recent years the tendency to use high strength self compacting concrete, HSSCC are increased rapidly and also the use of nano particles in developing materials has gained enormous attention due to their extreme fine size. Nono technology has made an outstanding progress in various fields and materials and its usage is going on to increase. Materials smaller than 100 nanometer are involved in this technology and their application in HSSCC needs to be investigated. Mechanical properties (compressive and tensile strength, modules of elasticity, shrinkage and creeping) and durability (durability against freezing and thawing cycles, sulfate attack and carbonation) of concrete are seems to be dependent on nano behavior rather tan the micro behavior, and improvement of nano may leads to progress in concrete quality much more than before.

In this investigation, by trial and error procedure, different mix design of nano HSSCC were caste and tested to reach a so called standard nano HSSCC in fresh matrix phase (i.e., the rheology of fresh nano HSSCC such as; values of slump flow diameter, T_{50}, L-box, V-funnel, J-ring, and column segregation). Based on the results obtained, the two best so-called standard mix designs were selected for further investigations. The effect of two types of fillers, lime stone powder and pozzolan on parameters like uni axial compressive strength of concrete, ranged of absorbed water and concrete strength determination on confined situation which is performed by the triaxial test. Failure analysis of triaxial test stresses is performed and normal main stress and shear stress along with Mohr's circles are achieved. The results are indicated that, natural and artificial using of pozzolan materials in nano HSSCC causes increase in strength at older ages and concrete durability.

Key Words: Nano particles, Self compacting concrete, Pozzolan, Filler, Triaxial test, Mohr's circles.

sand, it causes the soil moves away horizontally and as a result, the efficiency of vertical reinforcement is increased.

Key Words: reinforcement geometry, bearing capacity, loose sand(dune sand), strip foundation.

STUDY ON THE SHAPE EFFECT OF OPEN AND INFILLED TRENCHES IN REDUCING VIBRATIONS DUE TO PASSING TRAINS

J.A. Zakeri(corresponding author)
zakeri@iust.ac.ir
M. Esmaeili
m_esmaeili@iust.ac.ir
S.A. Mosayebi
mosayebi@iust.ac.ir
School of Railway Engineering
Iran University of Science and Technology

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 81-87, Research Note

- Received 10 December 2011; received in revised form 16 May 2012; accepted 23 June 2012.

Abstract

Ground-borne vibrations due to passing trains are a complex dynamic problem. Different types of vibrations can be produced due to passing trains on the track and existing irregularity of wheel and rail surface. Due to the construction of subway and railway lines in the most urban areas in the world, they have been encountered with adjacency problem of railroads lines to some sensitive areas such as buildings, laboratories, hospitals, research centers with the precise instruments or monuments. Four major steps exist for transferring train induced vibrations to infrastructures that follow: (A) Generation of vibrations due to repeated train loads (B) Transmission of vibrations in the surrounding medium (C) the effects of vibrations on adjacent reception structures (D) Interception of vibrations. Waves transfer through structure of track including rail, traverse, ballast, sub ballast and soil so with arriving to the buildings, their effects cause discomfort of residents. Studies of Researchers indicate that the various methods are presented for controlling the train induced vibrations in the path of wave propagation (e.g. trench and wave obstacle), source of vibration (e.g. Rail grinding, resilient wheels and Floating slabs) and reception structure of the vibrations (e.g. elastic support systems). Among proposed methods for reduction of train induced vibrations, the use of open and in-filled trenches can be pointed out. In all presented researches for reduction of train induced vibrations with using trenches, the rectangular shape of trenches is considered. Because of the shape effect of trenches hasn't been investigated in reduction of train induced vibrations, therefore firstly the numerical model of present study has been verified with accomplished work by Ni et al (1994) with using two techniques for simulating boundary elements(infinite elements and dashpot elements) for common rectangular shaped trench. Finally the three shape effects of rectangular, triangular and step shaped trenches for both open and in-filled concrete ones have been investigated. In this regard, the effect of train induced vibration has been investigated with finite/infinite element method (or energy-absorbing damper elements). Amplitude reduction ratio (Ar) has been used for estimating and comparing the efficiency of the rectangular, triangular and step shaped trenches. The obtained results for three shapes of rectangular, triangular and step trenches indicate that Triangular and step shaped trenches have better efficiency than the common rectangular trench with considering equal areas and harmonic train load applied for both open and in-filled trenches.

Key Words: Ground-borne vibrations, Train induced vibration, methods of vibration reduction, open and in-filled trenches, harmonic load, finite/infinite element method.

DETERMINATION OF THE OPTIMUM THICKNESS OF GRANULAR SOIL SURROUNDING THE GEOGRID AND GRID-ANCHOR IN COHESIVE SOIL

N. Sohrabi
sephid82@yahoo.com
N. Hataf(corresponding author)
nhataf@shirazu.ac.ir
Dept. of Civil and Environmental Engineering
School of Engineering
Shiraz University

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 89-98, Research Note

- Received 17 December 2011; received in revised form 2 September 2012; accepted 13 October 2012.

Abstract

In order to increase the efficiency of reinforcements in a reinforced soil structure, the granular soils are usually used. However, in the most situations, we have to transfer granular soils from the borrow area, usually far from the site of the soil structures. This will

Abstract

Construction of the railway embankments on loose foundations without using reinforcing elements leads to reduction of the embankments' slope, which significantly increases the volume of soil operation. Hence improving such loose foundations is an essential part for the aim of increasing bearing capacity of the embankments. One of the solutions for static - dynamic stabilization and the axial load enhancement of the rail lines constructed on high embankments (with the height more than 5m) is use of micropiles in embankments slope to transmit the applied loads to the tenacious layers of subgrade. Generally, micropile, as a supporting element in the soil with the main characteristic of improving the mechanical-experimental properties of the soil, is a proper methodology for the purpose of improving such loose earth with low load capacity and intensive settlement characteristics. It should be mentioned that micropile is a pile with less than 30 cm diameter, light reinforcement and impacted grout injection. Review of the literature indicates that there are no comprehensive studies on micropiles performance to reinforce the high railway embankments. So, this paper presents a model of high embankment in laboratory scale of 1 to 20 in order to setup some experimental tests on non-reinforce and reinforced embankments. It should be mentioned that the experimental tests are based on a non-reinforced embankment and two reinforced ones strengthened with two different arrangements of micropiles. Moreover, by the use of instrumentation tools during the experimental tests, the data such as load-bearing capacity of embankments, displacements of different points and axial strain of micropiles have been measured. In the next step, a 3D numerical model was developed based on the finite element method and the load-deformation behavior was simulated in the two mentioned experimental states with two different micropiles arrangements; then, the numerical model was calibrated. In the numerical analysis procedure, the behavior of embankment materials and elasto-plastic bed were considered with the Mohr-Coulomb failure criterion and other structural components of rail line and micropiles were regarded as linearly elastic. At the end, the numerical model was developed by improving it with different arrangements of micropiles in order to verify their effects on magnitude of providing safety factor of slope stability and find the optimum arrangements to reinforce the high railway embankments on loose foundation. By using this methodology can determine the efficiency factor of each geometrical parameters of micropiles group, too.

Key Words: high railway embankments, loose foundations, 3D numerical model, finite element method, reinforced embankment, experimental tests, micropiles arrangements.

BEARING CAPACITY OF STRIP FOUNDATION ON THE SOFT SAND STRENGHTENED WITH REINFORCED SAND OVERLAY

R. Pour Hosseini(corresponding author)
r-porhoseini@yazduni.ac.ir
S. N. Hoseini Navi
navid_navi@yahoo.com
Dept. of Civil Engineering
Yazd University

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 73-79, Research Note

- Received 25 October 2011; received in revised form 14 April 2012; accepted 29 May 2012.

Abstract

Based on experimental results, application of reinforced sand layer is an appropriate strengthening method in foundations on problematic soils such as loose sands. In this article results from the laboratory model studies on a number of strip foundation models laid on loose sand subgrade strengthened with reinforced sand layer using different reinforcement geometry are presented. For this purpose a series of tests were conducted on laboratory models to examine the effect of soil reinforcement on foundation bearing capacity. In the experiments, the soft soil that was selected was part of Yazd (a city in the center of Iran) dune sand that passed from sieve no. 40 (0.425 mm) and its friction angle was 29^0. This type of sand moves away from loading area when a direct load is applied. The model scale effect was considered on maximum size of soil grain and the strength of reinforcement elements. Additionally, various geometrical profiles used for the reinforcement elements (e.g. hyperbolic shape), positioned vertically, horizontally flat or both. The results show that the efficiency of reinforcement was decreased by increasing the number of horizontal reinforcement layers and by increasing the depth of reinforcement. Based on the laboratory model test results, the bearing capacity of strip foundations were improved significantly in comparison to conventional horizontal reinforcement in the following conditions: 1. When reinforcement elements were used both vertically and horizontally in a specific configuration, the bearing capacity ratio (BCR) and the reinforcement influence factor (RIF) were resulted 16.6 and1.8 respectively.
2 When horizontal reinforcement element in the form of concaved hyperbolic shape was used, BCR and RIF were resulted 11.4 and 1.3 respectively. Applying vertical reinforcement under horizontal reinforcement produced more effective results when compared with the vertical reinforcement alone. This behavior can be attributed to the fact that as loading increase on the loose

lyzing the results of the tests the various failure mechanisms with this type of wall ,shear modulus and damping values are obtained at different frequencies. AS results of visual inspection of the models, during the applying all of input motions especially in the worst case, none of the failure modes didn't observed in any MSE walls components but the walls movements were appeared in the form of partial sliding and minor bulging. Finally Using the regression , relationships presented for shear modulus and damping in terms of Reinforced lengths .The final article compares the maximum and average values of the force in strip with Design factor of safety offer the real values and compared with the values of the regulations.

Key Words: Damping ratio, Failure mode , Shear modulus , Seismic stability ,MSE wall ,Steel strip.

EXPERIMENTAL AND ANALYTICAL ESTIMATION OF MECHANICAL PROPERTIES OF ENGINEERED CEMENTITIOUS COMPOSITES (ECC) WITH POLYVINYL ALCOHOL FIBERS

A. Dehghani(corresponding author)
a.dehghani@pgu.ac.ir
Dept. of Engineering
Persian Golf University
F. Nateghi Elahi
nateghi@iiees.ac.ir
International Institute of Earthquake Engineering & Seismology

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 45-57, Original Article

- Received 7 January 2012; received in revised form 9 April 2012; accepted 17 November 2012.

Abstract
A number of experimental tests were conducted to better understand of the mechanical performance of a special class of high performance fiber reinforced cementitious composites, namely engineered cementitious composites (ECC) which is reinforced with high modulus polymeric fibers. The design approach of the ECC materials is based on fracture mechanics principles, which will be described in the first part of the paper. Unlike concrete or regular fiber reinforced concrete (FRC), ECC materials are characterized by their ability to sustain higher level of loading after first cracking undergoing additional straining. This strain hardening gives ECCs a significant advantage under flexural loading. The application of ECC materials and other strain hardening cementitious composites require adequate information on their basic material properties for structural purpose. The ECC examined in this investigation is a Portland-cement based mortar matrix with a low volume fraction (typically 2%) of high modulus PVA fibers. The ECC properties measured by use of accurate experimental test setups include uniaxial tensile, compressive, and flexural behaviors as well as multiple cracking development. The experimental results showed that the ECC material exhibits a unique strain hardening behavior with high tensile strain capacity due to multiple cracking. The results of uniaxial tensile tests presented in terms of first crack strength, ultimate strength and ultimate strain at the peak stress. The average first crack strength was found to be 3.25 MPa and all ECC dogbone specimens showed strain hardening behavior with strain capacity from 3 to nearly 3.7%. The compressive behavior of ECC cylinders exhibited an average of ECC beams compressive strength of 47 MPa at a strain level of 0.55%. The flexural characteristics tested under four-point bending revealed high deformability and strain hardening behavior in comparison to low deformation capacity and strain softening behavior of steel fiber reinforced concrete beams. The significant enhancement of energy absorption capacity and tight crack width control in ECC beams under bending indicate that ECCs can serve as a basic structural material or use in repair works.

Key Words: Engineered cementitious composites (ECC), Fiber reinforced concrete (FRC), Strain hardening behavior, Multiple cracking.

EXPERIMENTAL AND NUMERICAL INVESTIGATION OF EFFICIENCY OF MICROPILES FOR REINFORCING HIGH RAILWAY EMBANKMENTS

M. Esmaeili(corresponding author)
m_esmaeili@iust.ac.ir
M. Gharouni Nik
gharouni@doctor.com
F. Khayyer
f_k@engineer.com
School of Railway Engineering,
Iran University of Science and Technology

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 59-72, Original Article

- Received 21 January 2012; received in revised form 21 July 2012; accepted 6 November 2012.

DETERMINATION OF MSE WALL PSEUDO STATIC COEFFICIENT BASED ON SEISMIC PERFORMANCE

A. Komakpanah
a-panah@modares.ac.ir
R. Sadeghzadegan(corresponding author)
sadeghzadegan@live.com
M. yazdandoust
mj.yazdandoust@modares.ac.ir
Dept. of Civil Engineering
Tarbiat Modares University

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 25-32, Original Article

- Received 12 November 2011; received in revised form 15 April 2012; accepted 8 July 2012.

Abstract

The supremacy of reinforced soil walls in easy installation, flexibility and economical aspects in comparison with other stabilization technics has caused the widespread use of these structures. Observation of these walls during the earthquakes and also the experimental studies have shown their appropriate behavior and flexibility. Since these walls have adaptable flexibility, using them in seismic areas has widely developed. Therefore recognition of the seismic behavior of these structures is mandatory. The high costs and needed time of dynamic analysis based on Time-History analysis has caused that pseudo static method become more desirable in spite of lacking suitable accuracy. Independency of pseudo static analysis to effective parameters on seismic behavior of structures, and ignoring dynamic loading characteristics, are some of the deficiencies of this method.

The current study, by finite difference numerical modeling, tries to suggest a design method based on displacement. In this case, loading characteristics, such as magnitude, frequency, peak ground acceleration and geometrical characteristics of reinforced soil structure are considered to correct the pseudo static method and finally introduce the pseudo static coefficient as a function of seismic performance level and peak ground acceleration.

In addition, the authors have tried to simply suggest the equivalent harmonic load of selected acceleration records. Considering the loading parameters, mechanically stabilized earth wall parameters and type of the site have caused that the used method in this study leads to most efficient design in comparison with other current methods suggested in regulations that are usually based on limit-equilibrium concept. The outputs shows the over-estimation of current design method in comparison with displacement based method.

Key Words: Reinforced Soil Wall, Performance based design, Pseudo Static coefficient, Seismic Performance.

EXPERIMENTAL STUDY OF SEISMIC BEHAVIOR OF SEGMENTAL REINFORCED SOIL WALLS WITH STEEL STRIP

M. Esmaeili(corresponding author)
m_esmaeili@iust.ac.ir
School of Railway Engineering
Iran University of Science and Technology
A. Ghalandarzadeh
aghaland@ut.ac.ir
Dept. of Civil Engineering
Tehran University
M. Partovian Nozad
mahdi.partovian@gmail.com
School of Civil Engineering,
Islamic Azad University of Mahabad

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 33-43, Original Article

- Received 10 January 2012; received in revised form 10 April 2012; accepted 29 May 2012.

Abstract

Due to developing the construction of mechanically stabilized earth walls (MSEW) near to the main transportation lines as well as inter-city routes, investigating the seismic stability of these structures has considerable importance. Reinforced soil walls can be considered of the flexible wall the characteristics aforementioned in earthquake condition cause to a significant depreciation of seismic energy. Flexibility of the structures is Affected by interaction between metal strip, soil and concrete wall facing. Technical literature in this field indicates This structure has not been studied about stiffness and damping. For this purpose in this research with building six 1g laboratory models, Reinforced soil wall to a scale of 1 to 10 consist of two types of soil, sand and composition of sand and clay with different lengths of steel strip and segmental concrete facing seismic behavior of these walls studied. To simulate the seismic acceleration we use the sinus wave with acceleration range of 0.1 g to 0.8g and Frequency of 5 and 8 Hz for the model. In these models studied strain values on the strip ,and acceleration the layers of soil, acceleration the concrete facing. Ana-

the risk consequences, the qualitative model of different risks are similarly constructed. Then, the relationships existed between different factors are determined and the quantitative model of different risks are built. The magnitude of risks is determined using a fuzzy logic based "risk magnitude perdition system" which implements a Mamdani style fuzzy inference mechanism. Finally, the project model is simulated in two different cases, i.e., considering the risks and disregarding the risks. The consequences of different risk are determined by the comparison of simulated results achieved from the project model. The proposed approach determine the negative impacts of risks on the project cost and time simultaneously by simulation of the project execution process and considering the systemic nature of risks.
In order to evaluate the capabilities of the proposed model, it is implemented in a sample water pipeline project. The consequences of "construction errors risk" are simulated on the project and time using the proposed integrated fuzzy system dynamics approach. It is shown that the proposed method has the ability to determine the risk consequences at different confidence levels. It is believed that the proposed risk analysis technique provides a new tool by which the risk consequences on the project cost and time could be simulated efficiently.

Key Words: System dynamics, fuzzy logic, risk management, simulation, construction industry.

AN EXPERIMENTAL STUDY ON BOND STRENGTH BETWEEN CONCRETE AND GFRP BARS FOR LAP-SPLICED CONCRETE BEAMS

M. Rakhshani Mehr
rakhsh_77@yahoo.com
M.R. Esfahani(corresponding author)
esfahani@um.ac.ir
Dept. of Civil Engineering
Ferdowsi University of Mashhad
S. R. Mousavi
s.r.mousavi@endg.usb.ac.ir
Dept. of Civil Engineering
Sistan and Baloochestan University

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 13-23, Original Article

- Received 22 October 2011; received in revised form 7 April 2012; accepted 29 September 2012.

Abstract
Steel reinforcing bars have not performed well in applications where members have been subjected to corrosive environments. To reduce the risk of reinforcement corrosion, several techniques have been employed. However, none of these methods have proven to serve as long-term solutions. Fiber-Reinforced Polymer (FRP) bars can be used as a reinforcing material by nature corrosion resistant. FRP reinforcing bars are available in different grades of tensile strength and modulus of elasticity. The behavior of concrete beams reinforced with FRP bars is different from that of steel reinforced concrete beams. FRP bars have high tensile strength and appropriate durability but are not ductile. In addition, the bond between concrete and FRP bars is different from steel bars because of the difference in their surface geometries and mechanical characteristics.

In this experimental study, fifteen Lap-spliced concrete beams reinforced with GFRP bars were manufactured and tested. The parameters of concrete compressive strength, amount of transverse reinforcement along the splice length, the surface conditions and the diameter of longitudinal bars were selected as the variables for the beam specimens. There are ten specimens reinforced with ribbed GFRP bars and five specimens reinforced with sand coated GFRP bars. Laboratory specimens were designed so that bond failure occurs. The cracks of the specimens were mapped and test observation was recorded during loading steps and at the time of failure. Also, the relationships of force versus mid-span displacement were obtained by means of a Load Cell, a LVDT (Linear Variable Displacement Transducer), a Data Logger and a computer system. Then the bond strength and ductility of specimens were analyzed. Based on the experimental results, the effects of transverse reinforcement along the splice length, concrete compressive strength and bar diameter on bond strength are evaluated. The experimental results show that the effect of transverse reinforcement along the splice length on bond strength of GFRP bars is largely dependent on the surface conditions of the bars. Bond strength increases with increase in the amount of transverse reinforcement. The concrete beams reinforced with sand coated GFRP bars are more ductile than ribbed GFRP reinforced concrete beams.

The results of forty three beam specimens tested by other researchers are used in the study. The experimental bond strengths are compared with the values obtained using CAN/CSA-S806-02 and ACI 440.1R-06 Code provisions. The comparison shows that the bond strengths calculated with the code provisions are higher than the experimental values especially in the specimens with no transverse reinforcement along the splice length. Therefore, the code provisions should be modified to consider the effect of transverse reinforcement on bond strength.

Key Words: FRP bars, Transverse reinforcement, Reinforced concrete beam, Ductility, Bond strength, splice.

Abstracts of Papers in English

SIMULATION OF SIMULTANEOUS CONSEQUENCES OF RISKS ON THE PROJECT COST AND TIME CONSIDERING UNCERTAINTIES

F. Nasirzadeh(corresponding author)
f.nasirzadeh@gmail.com
Dept. of Civil Engineering
Faculty of Engineering, Payame Noor University (PNU)
M. Khanzadi
khanzadi@iust.ac.ir
A. Afshar
a_afshar@iust.ac.ir
Dept. of Civil Engineering
Iran University of Science and Technology

Sharif Civil Engineering Journal
Volume 30, Issue 1.1, Page 3-11, Original Article

- Received 13 September 2011; received in revised form 2 April 2012; accepted 22 September 2012.

Abstract
Construction projects risks have a systemic nature that imposes difficulties to determine their consequences. Moreover, it is impossible to determine the consequences of risks on the project cost and time simultaneously using traditional risk analysis approaches taking account of the interactions existed between the project cost and time.

This research aims to present a new approach for the risk analysis in construction projects that resolves the major shortcomings of the traditional risk analysis techniques by integrating system dynamics simulation scheme and fuzzy logic. The proposed approach can determine the risks consequences quantitatively. For this purpose, first a qualitative model of the project execution process is constructed using cause and effect feedback loops. The relationships existed between different variables are then determined and a quantitative model of the project is built. The presented project model can simulate the project objectives in terms of cost and time simultaneously since the interdependencies existed between project cost and time are accounted by the governing cause and effect feedback loops. In order to determine