Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 141-149, Research Note

- Received 22 January 2018; received in revised form 17 March 2018; accepted 22 April 2018.

Abstract

During previous earthquakes, a large number of used piles have been damaged, which unfortunately have been recorded in a small sample of usable information. Therefore, it would be very useful to obtain close-to-realistic information on designing and determining the behavior of the piles. The purpose of this paper is the modeling of soil and pile using Winkler's method and its probabilistic analysis under the dynamic load of the earthquake by applying uncertainty of input parameters of soil and concrete. For this purpose, by programming in the MATLAB, dynamic analysis in the time domain is combined with the New Mark method and the Monte Carlo Simulation (MCS) as a tool for probabilistic analysis to determine the probability distribution of the displacement, velocity, and acceleration of each point of the pile. In this way, the plie is modeled as beam elements, stiffness and damping of the soil, by linear springs and dampers are modeled respectively, and optional earthquake force is considered on the bedrock. The MCS is a computational algorithm that involves building models of possible results by substituting a range of values for any variable with inherent uncertainty. To verify, the results of the displacement of the pile and the spatial response of the site are compared by the output of PLAXIS and Deepsoil deterministically. Using probabilistic analysis, it is possible to determine the probability of outputs of the model. Also, in this paper, the effect of the pile length on its probabilistic displacement in the dynamic analysis is assessed and the maximum displacement probability density functions of them are compared. The results indicate that with increasing the length of the piles, the average displacement of the pile head increase. Furthermore, with increasing the length of the piles the standard deviation of displacement of the pile head also increases. This means with increasing the length of the piles the uncertainties of pile displacement increase.

Key Words: Dynamic load, winkler method, uncertainty, pile displacement, monte carlo simulation.

contents than the mainshock. Even seemingly, undamaged buildings may be damaged as a result of aftershocks. The mainshock-damaged buildings with deteriorated structural properties are more susceptible to damage. Based on the achievements of structural engineering and earthquake today, design of structures based on performance can be mentioned. Firstly, unlike traditional methods, new structures can be designed based on seismic needs and functional levels; secondly, the possibility of retrofitting existing buildings is provided. There are also famous ATC and FEMA regulations in this field. In this research, the performance of steel structure with eccentric braced frames being affected by sequence earthquakes has been studied. To do so, low-rise buildings of 3, 5, and 7 stories have been analyzed in terms of time history dynamics by nonlinear software of Perform 3D. By drawing the fragility curve of structures at different levels of performance, the seismic vulnerability of structures has been investigated. The results indicate that as the number of stories increases, the seismic vulnerability of the structure decreases, and the probability of failure in Far-field earthquakes is higher than near-fault earthquakes. In a seismic sequence discussion, the second earthquake is often affected by the fact that its PGA is larger than the first earthquake. In other words, when the PGA is the second earthquake smaller than or equal to the first earthquake, its effect on structures is very slight, which can be ignored. With regard to the fragility curves achieved, it can be concluded that the structure at the level of the safety of life (LS), which is the standard 2800 and the topic of the tenth subject of the national building regulations, has a good performance, and the design based on them is reliable.

Key Words: Eccentric braced frames, near-fault and far-field earthquake, sequence earthquake, seismic vulnerability, nonlinear dynamic analysis, fragility curve.

DOI:10.24200/J30.2018.5685.2262

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 131-139, Research Note

- Received 20 December 2017; received in revised form 3 April 2018; accepted 17 April 2018.

Abstract

Selection of Ground Motion Prediction Equation (GMPE) is one of the key elements within a seismic hazard analysis. A variety of available GMPE models makes this selection a scientific challenge. Therefore, the stability assessment of an optimized GMPE model is investigated in this paper by employing a new Re-Sampling Analysis (RSA) methodology (Azarbakht et al., 2014). The Boore and Atkinson 2008 GMPE is examined in this paper. The multi-objective Genetic Algorithm (GA) is employed in order to minimize the Log-likelihood (LLH) measure as well as maximise the RSA. The ground motion database, in this study, consists of 15348 ground motion spectra resulting from 58 seismic events. The magnitude range is between 5 and 7.4, and all the records have the distance less than 200 km. The analysis is performed for peak ground acceleration. The results are compared with the eight most common NGA GMPEs. The obtained results show that the optimum coefficients for the BA2008 model improve it in such a way that the LLH is least among the models, and the RSA measure is adequate. It is worth mentioning that all the results in this paper are constrained to the given assumptions as well as the considered methodologies and database. The results may change by using different databases and enrichment of the data during future researches.

Key Words: Seismic hazard analysis, GMPE, , RSA, LLH, BA 2008.

EMPLOYMENT OF THE RE-SAMPLING ANALYSIS IN DEVELOPMENT OF THE BOORE-ATKINSON 2008 GROUND MOTION PREDICTION EQUATION

Z. Rafiee
z_rafiee1990@yahoo.com
A.R. Azarbakht(corresponding author)
a-azarbakht@araku.ac.ir
Z. Rajabi
matinrajabi@yahoo.com
Dept. of Civil Engineering
University of Arak

DISPLACEMENT RELIABILITY ASSESSMENT OF DYNAMIC LOADED PILE USING WINKLER METHOD

A. Johari(corresponding author)
johari@sutech.ac.ir
R. Shiravani
r.shiravani@sutech.ac.ir
Dept. of Civil Engineering and Environment
Shiraz University of Technology
DOI:10.24200/J30.2018.50077.2281

Key Words: Creeping behavior, coefficient of secondary consolidation, fine-grained soil, coefficients of compression and swelling.

SEISMIC ANALYSIS OF BASE-ISOLATED WATER STORAGE TANKS SUBJECTED TO LONG-PERIOD EARTHQUAKES USING CRITICAL EXCITATION METHOD

A. Ahmadi
aliwman@yahoo.com
N. Khaji(corresponding author)
nkhaji@modares.ac.ir
A. Bazrafshan
arsalan.bazr@yahoo.com
Dept. of Civil and Environmental Engineering
Tarbiat Modares University
DOI:10.24200/J30.2018.4939.2187

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 111-118, Research Note

- Received 2 September 2017; received in revised form 21 January 2018; accepted 17 April 2018.

Abstract

In this paper, the seismic behavior of base-isolated water storage tanks under the effect of long-period earthquakes has been investigated; as relatively high period of these types of structures causes them to be sensitive against long-period earthquakes. In this regard, an efficient and new method called critical excitation method (CEM), is employed for seismic behavior of base-isolated water storage tanks, for the first time. In the CEM, it is tried to produce critical earthquakes for each structure based on its characteristics and parameters, and then apply them to the undertaken structure so that the seismic behavior of structures during and after the earthquake may be increased. To investigate behavior of base-isolated water storage tanks under long-period earthquakes, three types of broad, middle and slender storage tanks have been used, for which two types of isolators (i.e., lead rubber bearing (LRB) and friction pendulum system (FPS)) are equipped. In order to model seismic behavior of water storage tanks considering fluid-structure dynamic interaction effects, a simplified and practical model proposed by Haroun has been employed in this research. The base-isolated water storage tanks have been exposed to long-period earthquakes to magnify responses. In addition, in order to develop the CEM, it has been used to analyze base-isolated water storage tanks through modifying available matrices in the equation of motion, rewriting the required formulas and developing the necessary codes in MATLAB environment. According to the results obtained from this research for the specific cases considered, it was found that using energy dissipation systems has caused these structures to perform better. Moreover, by proposing the CEM, this method was investigated for the first time with regard to base-isolated water storage tanks. In addition to introducing the critical parameters of this method, it was found that using this method leads to critical conditions in base-isolated water storage tanks.

Key Words: Water storage tanks, seismic isolator, critical excitation method, long-period earthquakes.

THE EFFECT OF SEQUENCE EARTHQUAKE ON FRAGILITY CURVE DUAL SYSTEMS OF LOW RISE STEEL MOMENT FRAME WITH ECCENTRIC BRACED FRAME

N. Jahan
noroozejahan@gmail.com
A.M. Heydari Tafreshi
heidari.amirmahdi@semnan.ac.ir
M. Gerami(corresponding author)
mgerami@semnan.ac.ir
Dept. of Civil Engineering
Semnan University
DOI:10.24200/J30.2018.5211.2217

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 119-130, Research Note

- Received 28 November 2017; received in revised form 3 April 2018; accepted 17 April 2018.

Abstract

Following a large earthquake, numerous aftershocks can be triggered due to the complex stress interaction between and within tectonic plates. Although aftershocks are normally smaller in magnitude, their ground motion intensity can be large and have different energy

• Received 8 January 2018; received in revised form 3 April 2018; accepted 17 April 2018.

Abstract

The reliability of structures under different loading conditions is the main objective of civil engineers. Progressive collapse is a catastrophic phenomenon which has been of greatest interest to many researchers and engineers during the last decade. The incidence of diverse accidents such as burst, fire, vehicle collision, miscalculation, mistake in construction can result in a partial failure in a structure, which sometimes extends to collapse the majority of or entire a building. This phenomenon is called the progressive collapse. This collapse is defined in some regulations in the same way. For example in NISTIR-7396 "the progressive collapse is the expansion of a primary damage triggered by a primer incident from an organ to others consequently causing either major or entire damage to a construction". The main aim of this project is to study the reaction of the steel moment frame with the rigid connection of SP, WUF-B and RBS under the progressive collapse.

To pursue the study, we used six-, nine- and 12-floor buildings representing short, mid and tall structures equipped by the steel moment frame system. The alternative path method and UFC 4-023-03 regulation were used as standard methods to estimate the progressive collapse. The modelling of the buildings was run by software SAP 2000 which is in 3D, and then non-linear dynamic time history performed to analyze the data. Moreover, we predicted the different scenarios of column removals regarding the regulation criteria in order to study the progressive collapse.

The results from the alternative path method showed that unlike the WUF-B and SP connections, the RBS has more potential resistance due to higher ductility. Furthermore, the tall buildings presented the better resistance against collapse as well, because of the higher indeterminate degree. The results from column removals in the given models showed the more destruction in the upper floors unlike the removals of columns in downward floors.

Key Words: Progressive collapse, rigid connections, reduced beam section (RBS), improved WUF-bolted web (WUF-B), side plate (SP).

INVESTIGATION AND COMPARISON OF MASHHAD'S CLAY AND SILTY SOILS CREEP BEHAVIOR

A. Haddad(corresponding author)
haddad@semnan.ac.ir
A. Oliaee
alioliaee@yahoo.com
Dept. of Civil Engineering
Semnan University
DOI:10.24200/J30.2018.2281.2158

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 101-110, Research Note

• Received 29 August 2017; received in revised form 21 February 2018; accepted 8 April 2018.

Abstract

Creeping behavior of fine grained soils under constant loading over time is a significant subject in evaluating their behavior and the long-term settlements of foundations of the high rise buildings and lateral displacements of various retaining structures in contact of these soils. Grain soils often have no significant creeping behavior. This study, conducted on undisturbed samples of fine-grained soils of clay and silt from different parts of the city of Mashhad. By continuing constant loading over time consistent with the creep studies of a number of researchers, the changes of creeping coefficients were investigated after the main consolidation stage; in addition, the results of the secondary consolidation of the samples were evaluated and controlled by previous investigations. By using regression statistical analysis, the correlations of creep coefficients with other physical characteristic parameters of the fine grain samples has been evaluated. Studies on fine grained specimens in the city of Mashhad showed that they were mainly clay and silt with a low level of liquidity. In the statistical analysis of regression, the secondary consolidation coefficient and creep behavior of samples in the type of fine-grained clay CL with physical characteristic parameters of fine grained samples, especially with coefficient of compression, is more significant than the regression of ML fine-grained samples. Correlational equations have been analyzed and presented for both groups of local fine-grained soils. In addition, the results are compared with the limits of the proposed secondary compression coefficients of other researchers. The results can be used in predicting control and rapid calculations of creeping settlements, and displacements of high-rise structures, retaining structures, etc. in the city over time under constant load. For rapid initial calculations, without the need for results of long-term experiments, relationships of coefficients of creep behavior were obtained through regression analyses with other physical properties of fine grained material. The results of statistical analyzes for the clayey fine-grained soils have a more significant correlation with the physical properties of the soil than the fine-grained silts.

the reinforcing plate increases the flexural strength, energy dissipation, and connection stiffness. In addition, an increase of 20 kn of post-tensioning force leads to an Increase connection power in the lateral force bearing to 6%. Use web angle as a new idea, leads to increased flexural strength, Increase connection power in the lateral force bearing, energy dissipation, and connection stiffness.

Key Words: Post-tensioned connection, energy dissipation, numerical modeling, cyclic loading.

NUMERICAL INVESTIGATION OF THE EFFECT OF REINFORCEMENT SOIL BY GEOFOAM ON REDUCING THE EFFECTS OF EXPLOSION LOADING

R. Mohamad Momeni
r.mohamadmomeni@stu.qom.ac.ir
M. Khodaparast(corresponding author)
khodaparast@qom.ac.ir
Dept. of Civil Engineering
University of Qom
DOI:10.24200/J30.2018.5676.2279

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 81-91, Original Article

- Received 6 January 2018; received in revised form 7 April 2018; accepted 22 April 2018.

Abstract

In recent decades, due to increased military and terrorist attacks in the world, attention has been paid to the construction of underground security structures. Since most of the vital, sensitive and important structures of the country, like other structures, are based on soil or in soil, the study of the effect of the explosion on the performance of these structures is essential for their safe design. Secure underground structures are structures that are constructed at a certain depth of the ground, generally made by reinforced concrete, then the embankment is applied as overhead cover. Overhead embankment plays an important role in removing the tensions caused by the explosion. Consideration of this aspect of the design of underground structures requires the expertise and knowledge of geotechnical engineering that combines civil engineering with passive defense, i.e., a step forward in the design of secure structures underground. In the present study, 3D modeling of the soil mass and the geofoam layer in ABAQUS finite element software examined the efficiency of geofoam as an obstacle to the explosive separator. For modeling soil behavior, modified Dracke-Prager model with a cap and for modeling the behavior of geofoam, stress strain graphs under a high strain rate have been used, In addition, in order to analyze the effect of using geofoam in reducing the pressure caused by explosive charge, a reduction percentage was used to compare the results. Investigations have shown that the use of geofoam layer in underground structures overhead, the maximum pressure due to explosion significantly reduced (up to 61%). The change in the specific mass of the geofoam layer from 110 to 80 Kg per cubic meter, the reduction percentage has changed +10%. By changing the thickness of the geofoam layer in the range of 0.25 m to 1 m, the percentage of reduction +14.7% has improved. By changing the length of the geofoam layer in the range of 2 to 8 m, the reduction percentage has changed+15.8%. By increasing the thickness of the overhead embankment above the geofoam layer, the reduction percentage has changed +9%. Considering the specific circumstances of each project, including the cost-benefit graph, can be obtained an optimal and appropriate amount for each of the variables declared. At the end of this research, a relationship has been found to calculate the reduction coefficient that will be effective in designing intelligent defense embankments.

Key Words: Intelligent defense embankment, geofoam, underground security structure, explosive loading, reduction percentage.

PROGRESSIVE COLLAPSE RESISTANCE OF STEEL FRAMED BUILDINGS WITH DIFFERENT CONNECTIONS

G.R. Nouri(corresponding author)
r.nouri@khu.ac.ir
A. Ghonooi Rastegar
amir.rastegar63@gmail.com
A. Yoosefpooravandari
a.yousefpoor70@gmail.com
Dept. of Engineering
Kharazmi University
DOI:10.24200/J30.2018.5613.2273

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 93-100, Original Article

Abstract

In this paper, applied element method for linear analysis of structures based on energy concept in the range of small deformations has been developed and introduced as modified applied element method. This method considers the structure as a set of rigid elements and connecting springs. Both elements of the structure are connected by a single spring with normal, shear and rotary stiffness. Springs stiffness can be calculate according to the properties of the materials. Considering principle of minimum total potential energy for the structure, deformation in the structure can be calculated. This method estimates the linear behavior of the structure with a very good accuracy and low analytical time in the range of small deformations. In this paper, first, the formulation of the modified applied elements method for the analysis of the behavior of linear structures in the small range of deformation is expressed, then, compare the accuracy and speed of this method with applied element method and theoretical values. The results show that in analyzing a cantilever beam with the proposed method, even with a model that includes the minimum number of elements, the error rate is less than 2 percent. This comparison was also used to analyze a one-story frame with simple supports, in this case the rate of error was less than 0.15 percent. However, solving this two problems by applied element method with the same dimensions of element, has more than 31% and 32% of the error rate in case of cantilever beam and one-span frame respectively. The calculation time of the proposed method is less than 40% of the calculation time in the applied element method with 10 series of connection springs. Also, in this method, the value of the frame ductility was estimated with an error of about 3%, while the corresponding error value in the applied element method was as much as 41% in the same element size.

Key Words: Applied element method, principle of minimum total energy potential, small deformations, linear analysis.

INVESTIGATING THE ROLE OF EFFECTIVE PARAMETERS IN THE BEHAVIOR OF POST-TENSIONED CONNECTION BETWEEN STEEL BEAM AND COMPOSITE COLUMN

M. Azizi
mohsen.30vil@gmail.com
N. Siahpolo(corresponding author)
n.siahpolo@mjdkh.ac.ir

Dept. of Civil Engineering
Institute For Higher Education ACECR
Khouzestan
DOI:10.24200/J30.2018.5187.2209

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 71-80, Original Article

- Received 23 December 2017; received in revised form 21 February 2018; accepted 17 April 2018.

Abstract

Many arrangements of beam-column connection have been considered since the start of steel construction. In the early times of steel construction, engineers provided bolted connections with different detailing of pinned and fixed connections. In the late 1950s welded-flange-bolted-web connections replaced earlier connections. Speed of erection and cost-efficiency were among the reasons that led to wide use of this connection detail. Prior to the major earthquake of Northridge, welded-flange-bolted-web connections were considered the most seismic resistant detail of any beam-column connection based on experimental work conducted at Lehigh University and University of California at Berkeley which proved their good cyclic behaviour. The experimental work showed that this connection can withstand high plastic rotations, especially for welded-flange-welded-web connection. These results led to widespread use of welded-flange-bolted-web connections in the 1980s. The Northridge earthquake caused extensive damage to many structures and changed the general idea about steel structures.

The observation of the damage to the construction in 1994, with the Northridge earthquake, revealed that, unlike the expected behavior, in many cases, the brittle failure in the connections It happened at the of the Plastic rotations was much lower than the requirement, and in some cases, even when the elastic structures Have remained. According to the damages, the researchers proposed new connections, one of connections is the post-tensioned connection. Post-tensioned connections include high-strength steel strands for self-centering and energy dissipation to control plastic deformation.

In this study, the numerical modeling of the post-tensioned connection was performed using Abaqus finite element software. In addition to verifying the accuracy of the modeling with the experimental results, 3 samples of the connection were modeled and Was investigated the effect of some parameters on the connection behavior under cyclic loading, this parameters including the use Angle and reinforced plate with greater length and width, the larger post-tensioning force, use the web angle. In the range of models of this paper, the results show that increasing the angle length and the width of

seismic performance coefficients were controlled through the methodology proposed by FEMA P-695 taking into consideration the uncertainties in modeling, designing, earthquakes and experimental data. Results show that the effect of diagonal angles on the response modification factors depend on the building height. However, it can be stated that, in general, changing the angles of diagonals in steel diagrid systems do not have a significant effect on their R-factor. It is also observed that an increase in the angle of diagonal members will reduce the uncertainty in collapse data.

Key Words: Diagrid structures, nonlinear static analysis, nonlinear dynamic analysis, seismic performance factors, collapse fragility curve, steel structures.

EVALUATION DEMAND OF SEPARATION GAP ANGLE IN ADJACENT STEEL MOMENT RESISTING FRAMES UNDER FAR-FIELD AND NEAR-FIELD EARTHQUAKES

M. Khatami
m_khatami@semnan.ac.ir
M. Gerami(corresponding author)
mgerami@semnan.ac.ir
A. Kheyroddin
akheyroddin@semnan.ac.ir
Dept. of Civil Engineering
Semnan University
DOI:10.24200/J30.2018.5316.2232

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 53-61, Original Article

- Received 13 November 2017; received in revised form 24 February 2018; accepted 4 March 2018.

Abstract

In crowded cities, building structures are usually constructed in close proximity to one another because of restricted availability of space. In many cases, every building in a block is in full or partial contact with its neighboring buildings. Because of insuffb01cient separations, their different heights and seismic-resisting systems collision can occur between adjacent buildings during strong ground motions. This collision can make partial or general damages to the structural elements and accelerate their failure by affecting their stiffness. This phenomenon is commonly referred to as structural pounding. Pounding between inadequately separated buildings has been observed in most previous major earthquakes. Each time pounding occurs, building structures will sustain short duration large impact force not specifically considered in conventional designs. The severity of the impact depends on the dynamic characteristics of the adjacent buildings in combination with the earthquake characteristics. Aiming to prevent such collisions, the present study tends to estimate the demand of separation gap angle at the highest collision level using various proximity compositions of two regular steel moment resisting frames under near-field and far-field earthquake records. Accordingly, 2, 4, 6, 8, 10, 12, 14, 16, 18, and 20 story three-span steel moment resisting frames are placed in all possible pair proximity states, and their demand of separation gap and separation gap angle is calculated using dynamic analysis of the nonlinear time history with the OPENSEES software, and compared to Standard 2800 (Fourth Edition) requirements. The results indicate that in some proximity states the Standard 2800 requirements underestimate the demand of separation gap angle. Meanwhile, the average of demand of separation gap angle in the states studied under the component vertical to the fault of near-field earthquakes is 1.48 and 1.35 times greater than those of the far-field earthquakes and the component parallel to the fault of near-field earthquakes respectively.

Key Words: Separation gap angle, adjacent buildings, collision level, component vertical and parallel to the fault.

MODIFIED APPLICATION OF MODIFIED ELEMENTAL ELEMENTS, BASED ON THE CONCEPT OF ENERGY, FOR ANALYZING STRUCTURES, IN THE RANGE OF SMALL DEFORMATIONS

M.R. Shokri
mrshokri88@gmail.com
H.R. Tavakoli(corresponding author)
tavakoli@nit.ac.ir
Dept. of Civil Engineering
Babol University of Technology
DOI:10.24200/J30.2018.5582.2251

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 63-70, Original Article

- Received 5 December 2017; received in revised form 7 April 2018; accepted 22 April 2018.

just focused on scouring at bridge piers under steady flow condition and uniform-graded bed materials even by applying ANFIS model, a lack of studies exists on scouring under unsteady flood flow condition as well as for non-uniform bed materials. Generally, river beds are composed mainly of non-uniform materials. Motion of the finer sediment particles initiates results in the protective effect of greater particles, namely armoring effect on the bed surface, thereby eliminating further erosion of the bed. Furthermore, in most of the rivers the flow regime is commonly unsteady. During a flood, the maximum scouring depth regarding to the peak of the flood hydrograph would be smaller than the equilibrium scouring depth which is commonly estimated using a constant flow discharge. When the flow unsteadiness is pronounced, the difference between the maximum scouring depth and the equilibrium scouring depth is quite substantial and thus should be addressed.

In the present study, armoring effect on local scouring under unsteady flow condition was investigated based on a comprehensive dataset collected by different former investigators using ANFIS model. For this purpose, two different models were constructed. The first model was based on 372 dataset collected in a practical study on different bridges in USA. Measurements were conducted under steady flow condition. The second model was developed for estimating the maximum scouring depth in the beds of uniform and armored materials under unsteady flow condition. To present a more accurate model, some strategies including; reduction of dimension and detection of outlier were used to improve the performance of calculations. Genetic algorithm and particle swarm optimization methods were applied to develop a novel hybrid learning algorithm for ANFIS model. The new hybrid learning algorithm train the antecedent part of the fuzzy rules. Then the least square method was applied for training the conclusion part of the rules. It was shown that ANFIS model gives more accurate results compared to the empirical equations. Results highlighted the effectiveness of the data on the estimations of ANFIS model. Furthermore, according to the results, this approach is potentially able to train the ANFIS model in both steady and unsteady flow conditions.

Key Words: Bridge piers, scouring, unsteady flow, armoring effects, ANFIS, optimization algorithms.

THE EFFECT OF ANGLE CHANGE OF DIAGONAL MEMBERS ON R-FACTOR AND COLLAPSE

FRAGILITY CURVES OF MID-RISE STEEL DIAGRID STRUCTURES

A. Seyedkazemi
seyedkazemi@kish.sharif.edu
Dept. of Civil Engineering
Sharif University of Technology
Kish International Branch
F. Rahimzadeh Rofooei(corresponding author)
rofooei@sharif.edu
Dept. of Civil Engineering
Sharif University of Technology
DOI:10.24200/J30.2018.5434

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 39-51, Original Article

- Received 7 November 2017; received in revised form 10 March 2018; accepted 8 April 2018.

Abstract

A new structural system of diagonally gridded elements, the so called "diagrid", has been introduced in recent years in which the frames that are made up of intersected members surround the main structure. This type of system provides excellent shear rigidity and stiffness, in contrast to the similar tubular structures. The triangular configuration offers structural stability for gravity and lateral loads, and the removal of external columns gives the building a unique architectural beauty. Swiss Re (London), Hearst Tower (New York), Cyclone Tower (Asan, South Korea), Capital Gate Tower (Abu Dhabi) and Jinling Tower (Nanjing, China) are prominent cases with diagrid system worldwide. The response modification factor (R-factor) for diagrid systems is not yet explicitly introduced in the existing building codes and few studies have been conducted on the assessment of this parameter. On the other hand, previous researches show that the angle of diagonals play an important role in the structural behavior. In this paper, the effect of the angle change of diagonal elements on R-factor, collapse capacity and collapse fragility curves of steel diagrid structures are investigated. To this end, 6, 8, 10, and 12 story diagrid buildings with different angles for diagonals varying from 58^0 to 78^0 were selected and modelled using OpenSees software. The post-buckling behaviour of diagonal members was taken into account in modelling process. The models were then analyzed using nonlinear static analysis and the R-factor of the system was calculated according to the proposed method by ATC-19 guielines. Nonlinear incremental dynamic analysis (IDA) were performed and collapse fragility curves were extracted using 44 far-field records in order to evaluate their seismic performance and to validate the calculated R-factor. Next, the reliability of the applied

bentonite and kaolinite clay samples with different percentage of lime were studied experimentally. Studied samples during the time of 7 and 28 days were cured and uniaxial test were performed on them. Then Scanning Electronic Microscope (SEM) images were done to investigate the effect of the percentage and clay mineral type on the lime stabilized clay samples. The results of this research indicate that lime stabilization increase the UCS of soft clay soils about 2 to 10 times. Also, the interaction of soil-additive, the pozzolanic reaction progresses over the time, the optimum mixture of soil and lime as well as the stabilization efficiency, significantly dependent on the type and percentage of clay minerals in the soil.

Key Words: SEM, lime, kaolinite, bentonite, uniaxial strength.

STUDY OF TIME-DEPENDENT BEHAVIOR OF SOFT CLAYS IN DEEP EXCAVATIONS

J. Maleki
jafarmaleki@alum.sharif.edu
A. Pak(corresponding author)
pak@sharif.edu
Dept. of Civil Engineering
Sharif University of Technology
DOI:10.24200/J30.2018.5207.2216

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 13-25, Original Article

- Received 4 October 2017; received in revised form 3 February 2018; accepted 10 March 2018.

Abstract

Deep excavations in soft clayey soils usually cause excessive ground settlement and wall movements due to the creep in soft soils. One of the commonly used methods for predicting these displacements is numerical analysis, however, in most cases for modeling soft clayey soils, soil behavior is considered to be time-independent. So, the effect of excavation time and creeping in soft soils are ignored. In this paper, the impact of the time of construction of the excavation and creep effect that occurs in soft soils are studied using three case studies. These three excavations are stabilized using a combination of soil anchorage and soil nailing methods. For studying the time influence and creep effect in soft soils with numerical modeling, excavations are modeled using three different soil constitutive models, namely Mohr-Coulomb, Hardening Soil (HS), and Soft Soil Creep (SSC) models. The real field records by installed in-situ instruments are employed to evaluate the performance of three constitutive models for simulating the excavation wall behavior. The obtained results show that for realistic simulation of the behavior of deep excavations, the construction time and the corresponding creeping behavior should be included in the numerical modeling procedure in order to better match the numerical predictions with the time-independent behavior of soft soils.

Key Words: Deep excavation, numerical modeling, soft clay, creep, soil anchorage, soil nailing, time factor, wall deflection.

SCOURING AT BRIDGES PIERS UNDER UNSTEADY FLOW CONDITION AND ARMORED BEDS USING ANFIS AND OPTIMIZATION ALGORITHMS

S. Karkheyran
s.karkheiran@cv.iut.ac.ir
A. Kabiri-Samani(corresponding author)
akabiri@cc.iut.ac.ir
Dept. of Civil Engineering
Isfahan University of Technology
M. Zekri
mzekri@cc.iut.ac.ir
Dept. of Electrical and Computer Engineering
Isfahan University of Technology
DOI:10.24200/J30.2018.5075.2199

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 27-37, Original Article

- Received 11 October 2017; received in revised form 4 February 2018; accepted 10 March 2018.

Abstract

Several studies have been performed to study the scouring depth at bridge piers. Due to the complication of the problem and variety of the hydraulic and geometric parameters affecting the scouring phenomena, a generalized relationship has not been presented yet. Therefore, adaptive neuro-fuzzy inference system (ANFIS) is an alternative to overcome these problems. This approach is an effective tool to provide the hydraulic engineers, precise estimation of the scouring depth around the bridge piers. Although a large number of former studies have

Abstracts of Papers in English

EFFECT OF TYPE AND PERCENTAGE OF CLAY MINERALS ON THE POZZOLANIC STABILIZATION OF CLAYEY SOILS (MACROSTRUCTURE AND MICROSTRUCTURE STUDY)

S. Soltaninejad
sanaz.soltaninejad86@yahoo.com
S. Hamidi
s.hamidi@eng.uk.ac.ir
S.M. Marandi(corresponding author)
marandi@uk.ac.ir
Dept. of Civil Engineering
Shahid Bahonar University of Kerman
DOI:10.24200/J30.2018.2226.2139

Sharif Civil Engineering Journal
Volume 35, Issue 4.1, Page 3-12, Original Article

- Received 1 July 2017; received in revised form 21 February 2018; accepted 8 April 2018.

Abstract

The type and percentage of clay minerals in the soil as well as the pore fluid properties of double layer are the important parameter that influence on the strength and behavioral properties of the clay Soils. In this regard, clay soils are highly sensitive to changes in environmental conditions and their behavior and strength parameters will be affected by many factors such as soil disturbance, water content, loading and drainage conditions, loading rate, temperature, etc. Therefore, one of the important parameter that affect the results and efficiency of lime stabilized clay soil samples and optimum lime content (OLC) is the type and percentage of clay minerals in the clay soils. In common, methods of lime stabilization, the most effective innate factor of clay minerals in the soil is not considered comprehensively. So it has been observed that the results of various test methods are completely in conflict with each other. The accuracy of the test results depends on the simultaneous consideration of chemical and mineralogical properties of the soil. In this research, to study the micro and macro-structure of stabilization process of lime stabilized clay soil samples, different combination of