damage whatsoever occur on the deck under the effect of 500 kilogram TNT explosives at one-meter distance from the bridge base while the has base undergone 2 meters of damage along X direction and 3.5 meters along Y direction. Moreover, the area of damage is at the pile as high as 4 meters, and under 1000 kilogram TNT explosives' blast, the length of the base damage is 3 meters at X direction and 6 meters along Y direction.

Key Words: Surface blasting, LS-DYNA, concrete bridge, dynamic behavior, TM5-855-1.

EXPERIMENTAL STUDY ON THE EFFECTIVENESS OF NANO-SIO_2 ADDITIVE IN INTERNAL EROSION OF DISPERSIVE SOIL

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Abstract

Dispersive soil is founded in many parts of Iran and world, and construction of hydraulic structure on dispersive soil created a lot of problems such as piping or internal erosion. Due to internal erosion of an earth dam water that seeps through the dam carries soil particles away from the embankment, foundation, or abutments of the dam. Internal erosion may be a result of inadequate compaction during construction, differential settlement, desiccation, earthquakes, burrowing animals, and/or vegetation roots. The erodibility of the material in the internal erosion flow path along with hydraulic stresses is the most important factors in determining the rate of erosion. The challenge in predicting failure due to internal erosion characterizes the material properties relevant to the rate of failure. Since it is not economical to change dispersive soil with non-dispersive soil, it is very important to improve the erosion resistance of soils using appropriate and cost-effective techniques. Using chemical stabilizers is one of the effective methods to prevent internal erosion in earth dams. This research is intended to study the effect of adding nano-$SiO2$ on erodibility of dispersive soil.

The new stabilizer nano-SiO_2 is utilized for the evaluation of its effectiveness in increasing erosion resistance. To conduct this research, dispersive soil has been treated with three different percentages (i.e., 1, 2, 3 % by weight of the parent soil). Erodibility parameters were obtained by Hole Erosion Test (HET). The variables taken into account are the curing time (i.e., 1, 7, 14 days) and the mixing percentages. It is found that erosion rate of dispersive clay is extremely rapid, and the increase in nano-SiO_2 content results in increasing the resistance of dispersive soil to erosion. It was also found that the erodiblity of dispersive soil increase 2 to 14 % in 2 and 3 % nano-Sio_2 content compared to 1 % nono-Sio_2. With increasing curing time, the erodibility index of dispersive soil increases 4 to 7 %, meaning that erodibility of dispersive soil is reduced.

Key Words: Dispersive soil, Nano-Sio_2, internal erosion, hole erosion test, curing time.

of geotextile achieved a similar performance to an encasement geotextile that contained three times as much mass of geotextile material.

Key Words: Stone column, soft soil, reinforcement, experimental study, numerical analysis.

MECHANICAL AND PHYSICAL PROPERTIES OF EXPANDED POLYSTYRENE STRUCTURAL CONCRETES CONTAINING MICRO-SILICA AND NANO-SILICA

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Abstract

In this paper, the mechanical and physical properties, such as strength, water absorption, type of curing, failure mode and microstructure of expanded polystyrene (EPS) structural lightweight concretes modified by Micro-silica and Nano-silica, were investigated. In the specimens without EPS beads, replacement of Micro-silica and Nano-silica up to 15% and 3% wt of cement, respectively, led to the increase of compressive strength and decrease of water absorption; after that, these trends were vice versa. These amounts of the concretes containing EPS were 10% and 2%, respectively. By replacing nearly each 5% of Micro-silica or each 1% of Nano-silica, the compressive strength increased by approximately 10% to 15% and water absorption decreased by approximately 15% to 20%. These results showed that the effect of 1% Nano-silica is almost equal to the effect of 5% Micro-silica, though it is more costly. In concretes containing EPS without silica materials, EPS beads do not have sufficient adhesion with the cement paste, and the transition zone between EPS and cement paste has a relatively large width. Therefore, by adding Micro-silica and Nano-silica to the concretes containing EPS beads, proper adhesion between the EPS beads and other concrete components was formed as confirmed by the SEM images of the specimens. On the other hand, the use of EPS beads in the concrete mixture led to increasing the slump and workability of the concretes and significant reduction in their compressive strength, density, and water absorption. Therefore, the result indicated that the use of EPS beads in concrete changed the concrete's failure mode from diagonal lines, brittle mode to soft, and parallel lines mode. In addition, the effects of three curing methods with water, limewater and water steam on the strength and water absorption of concretes were investigated. The findings showed that 28-day limewater and 1-day water steam curing resulted in the highest strength and the lowest water absorption compared to other curing methods.

Key Words: Micro-silica, Nano-silica, EPS beads, structural lightweight concrete, curing methods.

INVESTIGATION OF DYNAMIC BEHAVIOR OF CONCRETE BRIDGE COLUMNS UNDER SURFACE BLASTING

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Abstract

This paper, using hydro code -LS-DYNA, investigates and observes the dynamic response of cemented bridge under the effect of a number of TNT explosives placed around the columns. Damage quantities will be reported accordingly. To ensure the efficacy of the finite-element method, a comparison is made between numerical and experimental results derived from army explosive ordinance America TM5-855-1. The results indicate that no

GEOMETRICAL STATES OF LARGE AND SMALL PILED RAFTS

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Abstract

In recent decades, the non-connected piled raft system has been used to cope with substructure vulnerability in piles junction point. This system decreases settlement of foundation. Also, this system is able to decrease stress concentration in pile cap and improve the mechanism of loading transfer to the soil whose proper performance of non-connected pile raft is dependent on the performance of its components. In this paper, the effect of large and small pile rafts is evaluated on lateral displacement by abaqus 3d software which is based on finite-element method. In this study, the effects of variation of gravel layer strength and thickness are assessed on foundation settlement. The results show that increasing non-connected piles diameter increases the proportion of pile group loading capacity. Addition, increasing raft thickness has more influence on the reduction of partial settlement. The results of this paper show that using non-connected pile raft system increases loading capacity of system up to 17% until 18%.
Also, increasing gravel layer strength leads to decreasing non-connected pile raft settlement up to 1.6 times, whose optimal strength parameters, such as friction angle and young's modulus, suggest 36 degree and 120 mpa, respectively.

Key Words: Non-connected pile raft, large pile raft, small pile raft, gravel layer, 3D FEM.

EXPERIMENTAL AND NUMERICAL INVESTIGATIONS ON THE BEHAVIOR OF STONE COLUMN REINFORCED BY GEOTEXTILE ENCASEMENT AND GEOTEXTILE LAYERS

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Abstract

Ground improvement using stone columns is a popular technique for foundation of structures and embankments on soft grounds. However, due to the lack of sufficient lateral confinement for the columns and greater required bearing capacity, this technique may not be effective for improvement of soft soils. In order to provide lateral confinement and increase the bearing capacity of stone columns, installed in soft soils, the stone columns are usually reinforced by layers of geosynthetics (i.e. geotextiles or geogrids) or encased with geosynthetics. In this research, the effect of unreinforced and reinforced stone column in the loose soil bed using Triaxial Test was investigated. Number of twelve independent Triaxial Tests and numerical simulation using Abaqus software were performed on specimens with diameter of 100 mm and height of 200 mm. Five of the tests were repeated twice to examine the performance of the apparatus, the accuracy of the measurements and the repeatability of the system. The stress-strain variation of two repeated tests having the same test conditions, gave a close match with a maximum difference in results of around 7%. In the reinforced test, two forms of reinforcement (1) geotextile as encasement and (2) laminated disks were used. Reinforcement of stone column by one, two, three, and four layers of geotextile (i.e., laminated disks) was investigated, and its performance was compared to that of the stone column reinforced by geotextiles encasement, in terms of bearing capacity improvement, construction, and economy. The results indicated that the stone column improved the strength of sample about 200% as compared with loose soil bed. The results of numerical studies are in good agreement with experimental results. The comparative investigations imply that in order to achieve a specified improvement in strength of reinforced specimens, less mass of geosynthetic material would be used in a geotextile layers implementation compared to an encasement geotextile one at 60% of stone column's length. In the example given in this paper, four layers

building. These buildings were analyzed under different time history records, including Hachinohe, El Centro and Kern-County earthquakes, as far field ground motions and Coalinga, Kobe and Northridge earthquakes as near field ground motions. The results obtained by the proposed control method were compared with those of uncontrolled structure, structure with tuned mass damper (TMD), and structure with ATMD with type 1 fuzzy logic controller. Numerical results indicated that Interval type 2 fuzzy logic controllers used in ATMD are very effective in reducing the structural response under the effect of different base excitations. The comparison of time history responses for type 1 fuzzy logic controller and Interval type 2 fuzzy logic controller also shows that the displacement response obtained using Interval type 2 fuzzy logic controller is smaller and smoother than, those obtained by type-1 fuzzy logic controller. In the view of the external control force needed to reduce the building response, the magnitude of the control force in Interval type 2 fuzzy logic controller is little more than those needed for type 1 fuzzy logic controller with the average about 8 percent. In case of considering SSI effects, the results show that the soil properties have important effects on the uncontrolled response of the building. In addition, it can be understood from the results that considering SSI can improve the efficiency of ATMD with IT2FLC in the case of suppressing the structural responses.

Key Words: Structural control, active tuned mass damper, soil-structure interaction, earthquake excitation, high-rise building.

EFFECT OF OPENING ON THE LATERAL STIFFNESS OF MASONRY WALLS WITH AND WITHOUT CONCRETE TIES

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Abstract

Necessity for making openings in masonry walls due to architectural considerations justifies a comprehensive study to have a thorough understanding of the behavior of masonry walls with openings. Based on size and place of an opening, different modes of failure may develop within the body of wall. Failure around the opening can govern the total lateral behavior of a masonry wall. If the pier besides an opening is too slender, in-plane or out-of-plane buckling might occur due to large compression in such components under overturning moment of wall. Since a large opening reduces the effective horizontal section area of a masonry wall, shear failure in the shape of long and wide diagonal cracks might govern the lateral behavior. On the other hand, if no sufficient depth remains for the lintel above a tall opening, the wall might fail because of shear or bending failure of the lintel as a local behavior. In this study, lateral response of masonry walls with openings is studied. The numerical modeling and analysis is followed and the developed models are validated using available experimental results. Samples selected for validation analysis include two masonry walls confined with reinforced concrete perimeter ties and one masonry wall with no ties. Validity of the numerical models has been established against the experimental samples within Abaqus software using nonlinear static analysis. Variations in the size, location and aspect ratio of the opening are taken into account and the lateral stiffness and strength of the walls are calculated. In addition, a series of equations have been developed based on the strength of materials for simple calculation of lateral stiffness, strength and ductility of masonry walls with opening. This has the important advantage of avoiding complex and time consuming 3D nonlinear finite-element analysis for the same purpose. To do this task, three different cases of failure are accounted for the walls including: when presence of the opening is not effective, when behavior of the two piers besides the opening is governing, and when the overhead lintel governs the lateral behavior of wall. Each of the mentioned cases is in turn divided into other sub-cases and several nonlinear finite-element analyses are undertaken. Results of the developed analytical equations are compared and calibrated with those of the finite-element analysis and the desirable accuracy of the relations developed in this study is confirmed.

Key Words: Masonry wall, opening, ductility, finite element, tie.

EVALUATION OF NON-CONNECTED PILED RAFT BEHAVIOR IN

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Abstract

In this study, the application of one steel structural system called steel frames with knee element connections (KCF) is investigated for seismic resistant structures. In these structural systems, ends of beams are connected to columns by hinges (simple connection), and ends of knee elements are connected to columns and beams by hinges as well. This configuration creates one zonular rigid connection instead of concentrated rigid connection in moment resisting frame (MRF). This structural system has several advantages for example, it provides more flexibility in architecture design, and it avoids the construction difficulties of rigid connections, which need an advanced technology of manufacturing and inspection. Besides, some defects of moment resisting frames such as insufficient lateral stiffness and large lateral displacements are avoided too. Using this system, the repairing cost of the buildings after a moderate earthquake could be greatly reduced because the knee members can be easily fixed or replaced. In addition, this system is a suitable technique for retrofitting the damaged or existing buildings. This study applied finite-element analysis to this frames and compared seismic performance factors, collapse mechanism and material usage of frames under pushover and cyclic analyses in ABAQUS software. Results showed the relative advantages in connection with KCF with respect to MRF rigid connection such as increase of lateral stiffness and strength and improvement in hysteretic behavior of KCF with respect to MRF. However, the lateral torsional buckling (LTB) of beam in KCF must be considered more than MRF beam's because of different configurations in beam to column connection. In addition two tree-story four-bay frames of each structural system were designed according to ASCE7-SEI10 and AISC360-10 criteria without any special seismic design approach to case studies and their pushover and incremental dynamic analyses (IDA) were carried out using the "OPENSEES" software. Seismic performance evaluation results according to FEMA-P695 criterion and fragility curves showed that collapse mechanism of KCFs is similar to MRFs mechanism's; this structural system has a better seismic performance and low probability to collapse compared to the MRFs. For the main result from this study, one can use the seismic design factors (ω_0, R, C_d) of ordinary moment resisting frames (OMRF) of ASCE7- SEI10 for design of KCFs in ordinary ductility level without any special consideration in seismic design.

Key Words: Knee element, yielding criterion, energy dissipation capacity, hysteresis curve, IDA curve.

SEISMIC CONTROL OF BUILDINGS WITH ATMD THROUGH IT2FLC INCLUDING SOILSTRUCTURE INTERACTION (SSI)

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Abstract

This study focuses on the application of Interval type 2 fuzzy logic controller (IT2FLC) in an active tuned mass damper (ATMD) for the purpose of decreasing structural response under different types of earthquake excitations with and without considering Soil-Structure Interaction (SSI) effects. One of the main shortcomings of the type 1 fuzzy logic systems is their inability to consider uncertainty in fuzzy rule base data. Interval type 2 fuzzy logic system has the ability to handle this problem. It also takes into account the uncertainty in loading and structural behavior. To evaluate the efficiency of the proposed control method (Interval type 2 fuzzy logic control method), three realistic shear buildings (five, eleven, and fifteen stories), were used. ATMD was placed on the top floor of the eleven story shear

this study, can in turn, lead to the suggestion of some guidelines for the design of CFDST columns.

Key Words: CFDST columns, interaction of concrete and steel, fire, confinement, longitudinal stiffeners.

NUMERICAL ANALYSIS OF INTERACTION OF SUPPORT SYSTEM OF URBAN TUNNELS WITH ITS SURROUNDING ENVIRONMENT IN TIME-DEPENDENT AND TIME-INDEPENDENT STATES

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Abstract

Predicting the behavior of urban tunnels in weak rocks with a behavior similar to soils' or rocks' by swelling and squeezing ability is one of the important challenges in tunnel engineering and rock mechanics. In this research plane strain two-dimensional model of a real urban tunnel with horseshoe cross section is modeled through 2D finite element method. The aim of modeling is the investigation of the effects of considering or ignoring time factor in the constitutive model of materials on the interaction behavior of tunnel support system and also stress-strain and deflection behavior of surrounding rock masses.

For numerical modeling of tunnel-support system interaction two constitutive models including Mohr-Coulomb model (time-independent model), MC, and soft soil creep model (time-dependent model), SSC, similar and constant rock mass properties were considered. The results of these two models in the framework of structural behavior of tunnel support system and also stress-strain and deflection behaviors of its circumference rock mass were compared. The results of study show that considering time effect on some cases caused an approximately 63 percent difference between two models' results. For verification of research problem, a tunnel with similar conditions and jointed rock mass constitutive model in the frameworks of 2D and 3D finite-element analyses were used. The results of verification show good agreement between the obtained results by numerical models of the present paper and numerical models of the reference paper.

Mohr-Coulomb constitutive model is a model independent of time, stress history conditions, consolidation state, creep, hardening and softening, in order that no change could occur in the results obtained with this model in plastic numerical analyses by changing time intervals of numerical computations. However, considering creep of materials and time factor will generally increase the values of structural interaction parameters (secondary parameters such as bending moments, shear forces and axial forces in shotcrete and rock bolts) and geotechnical interaction parameters (initial parameters such as stress-strain relationships parameters, displacements and deflections of rock materials) of SSC model rather than MC model in the excavation of tunnel and installation of its support system. Impressibility of secondary parameters (i.e., structural parameters) in support system of tunnel compared to initial parameters (i.e. geotechnical parameters) is half by changing time intervals of implementation of creep plastic analyses. In other words, with respect to the obtained results by changing real time in numerical analysis of geotechnical parameters (initial parameters) is approximately 2.30 times greater than structural parameters (secondary parameters), because the occurrence of geotechnical parameters will generate and mobilize secondary parameters (structural parameters) in the interaction of support system of tunnel-rock.

Key Words: Urban tunnels, support system, time factor, Mohr-Coulomb and soft soil creep models, jointed rock-mass model.

CYCLIC BEHAVIOR EXAMINATION AND PERFORMANCE EVALUATION OF STEEL FRAME WITH KNEE ELEMENT CONNECTION BY FINITE ELEMENT ANALYSIS

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Abstract

Stability analysis is an important issue during designing and operation of earthfill dam. Importance of this issue is related to failure possibility and other risks for people who are living in downstream. The various sources of uncertainties exist in stability analysis of earthfill dam body, such as random parameters (Parameter Uncertainty) and randomness characteristic of stability model (Model Uncertainty). Therefore, the estimated stability safety factor is more accurate by considering the mentioned sources of uncertainty. There are many new methods of slope stability analysis that use statistical approach to the consideration and quantification of uncertainties. In this study, LHS and GLUE were used as sampling methods for extraction probability distribution of stability safety factor. In this respect, stability safety factor of Parsian rockfill dam was estimated by considering the uncertainty of random variables in semi-static analysis with full reservoir. In addition, "limit equilibrium general" theory and "method of components" were used for estimating stability analysis of Parsian dam. In this respect, the randomness characteristic of the resistance parameters of different dam sections was quantified by considering the different probability distributions. The obtain result showed that, the uncertainty and variability of horizontal drain and filter geomechanical parameters has no main effect on safety factor variability. In addition, the comparison between derived probability distribution of safety factor using LHS and GLUE approach shows that, the LHS method is more conservative compared to GLUE approach in evaluating dam failure. The reliability indexes (β) of GLUE and LHS were computed. The magnitudes of(β) for GLUE and LHS are 1.36 and 0.93, respectively. So, according to obtain result, the estimated stability safety factor by GLUE approach is more reliable compared to LHS method. In addition, the average of safety factor in both LHS and GLUE methods is equal to 1.12 that is very close to allowable stability safety factor of Parsian dam.

Key Words: Risk, stability, uncertainty, parsian dam.

INVESTIGATION INTO THE EFFECT OF INNER STEEL TUBE- CONCRETE COMPOSITE ACTION ON THE FIRE RESISTANCE OF CFDST COLUMNS

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Abstract

As an innovative type of composite construction, concrete-filled double skin steel tube (CDFST) has the potential to be used as columns in high-rise buildings. CFDST columns consist of two concentrically-arranged inner and outer steel skins with the annulus between the skins filled with concrete. Of prime features of CFDST columns is the interaction between steel tubes and concrete core. The confinement of the steel tubes on the concrete core benefits the interaction along the interfaces. However, when the interface interaction of steel tubes and concrete core vanish, the deformation starts to loom large. The deformation rate of the columns is increased under fire exposure. The current study aims to investigate the effect of interaction of concrete core and inner steel tube on the fire resistance of CFDST columns considering steel links (longitudinal stiffeners) embedded inside the concrete core welded to exterior surface of the inner tube. Finite element models for CFDST columns were developed using ABAQUS package in this study. A sequentially-coupled thermal-stress analysis procedure is conducted to evaluate the effects of inner steel tube- concrete interaction on the fire performance of these columns. The uses of stiffeners in the CFDST columns increase the fire resistance of the columns effectively. The specimens with stiffeners embedded in the exterior surface of the inner tubes exhibited excellent fire resistance. It can be attributed to the fact that interaction of stiffeners, inner tube and concrete core provides adequate bond and friction at the interface surfaces, contributing to the composite action improving strength during the process of fire exposure. This implies that the interaction of concrete and steel components increases the fire performance of these columns significantly, a striking conclusion, which requires strategies to retain such performance. The conclusions, drawn from

Abstract

Due to the potential contamination of groundwater and surface water in the vicinity of the consumer dye industry, removal of this dyestuff waste is an environmental priority. Water clarity and solubility of gases in the presence of even a small amount of dye is reduced. If there are colored substances toxic to lower layers light penetration in the water is low. In addition, photosynthesis of aquatic plants and the amount of dissolved oxygen is so low that aquatic animals are destroyed. Dyes are stable compounds that are not easily biodegradable, and azo dyes are considered especially carcinogenic. Dye removal via various methods of physical, chemical, biological or a combination of them is possible that can be noted on physical methods such as adsorption, membrane filtration and ultrasonic waves, chemical methods, such as ion exchange, electrolysis, coagulation and flocculation, canonical and advanced oxidation, and biological methods, using algae, fungi and bacteria.

Chemical coagulation is a common method of wastewater containing dye. High levels of dissolved solids and sludge in purified effluent are the disadvantages of chemical coagulation. In recent years, because of the versatility and compatibility with the environment, the electrochemical method as an effective method for treating wastewater of containing dye industries is taken into consideration. In the electric coagulation, production happens in the place of coagulant materials that are the result of dissolution metal anode (steel) by passing an electric current.

If we put sewage between the positive anode and negative cathode that are plugged to electricity, an electric field is established because of the electrical conductivity of the solution. By electrolysis of water, tiny bubbles of oxygen and hydrogen are produced and they move upwards and form a blanket on the surface. Bubbles bring suspended particles to the surface and form a sludge layer that is mechanically collected.

Expected use of electric flotation process simultaneously with electric coagulation eliminates the requirement of gravity sedimentation unit for the separation of the clots, resulting in the separation of both emissions and reducing the cost of the filtration.

Studies in the field of electrochemical dye degradation based on electric coagulation and flotation property of the produced bubble are rarely used. In this study, reactors designed in a manner intended to electric coagulation properties and electric flotation can be used simultaneously. In addition, this study is a used innovation, such as the use of grille stainless steel electrodes with horizontal arrangement.

In this research, the electrode-related parameters affecting the performance of the electric coagulation and flotation system, including the surface, distance, type, and shape of electrodes, were investigated. In addition, the influences of each of these parameters on the removal efficiency of Acid Red 14 from synthetic wastewater, energy and the anode consumption were determined and their values were optimized.

The surface of electrode equal to 20.5 cm2, the distance between the electrodes equal to 0.5 cm, and stainless steel as type of electrode and a grid shape electrode (mesh generator) were chosen as optimized.

Under optimal conditions in about 20 minutes, 100% dye removal efficiency with special energy consumption equal to 6.2 kWh/kg was obtained. Dye removal with the anode consumption equal to 4.4 kg Fe/kg and sludge TSS 17000 mg/L was also obtained.

According to electric coagulation and flotation benefits such as the ability to fully automatic exploit, easy control of parameters involved in the process, safe operation conditions and very high tolerance to organic, hydro and toxins shocks and considering the importance of reducing the cost using systems with less material and energy and TSS consumption, use of this method for filtrating or pre- filtrating is suggested prior to supplementary filtration of industrial wastewater containing dye. The advantages of this method compared to other methods of dye removal are as follows: simple equipment, high speed and short retention time to remove pollutants, easy navigation, and low amount of chemicals, and low produced sludge which has high sedimentation or floating rate with low amount of water.

Key Words: Electro-coagulation-flotation, dye removal, energy consumption, anode dissolution, electrode surface, electrode distance.

EXTRACTION OF PROBABILITY DISTRIBUTION OF STABILITY SAFETY FACTOR USING LHS AND GLUE METHODS (CASE STUDY: PARSIAN DAM)

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dations is preferable to the common strip footings and other folded plate models. The contact soil stresses adjacent to the shell are non-uniform. Increasing the foundation depth of embedment and density, leads to the increase in the bearing capacity of foundations. The effect of improving sand geotechnical properties on bearing capacity is more than changes in shells patterns. The results show that bearing capacity is 2.5 to 4.8 times more in dense sand in comparison with the loose one. The maximum increase in bearing capacity for different shapes of shell foundations is about 72 percent.

Key Words: Folded plate shell foundation, strip foundation, elastic-plastic analysis, drucker-prager theory.

NONLINEAR NUMERICAL ANALYSIS OF RC PRECAST SHEAR WALLS WITH SELF CENTERING SYSTEM

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Abstract

Yet, the main aim of most of the seismic design codes is to design a building to ensure life safety during a design level earthquake, and hope that the performance of the building under different levels of seismic excitation would be acceptable. However, experiences exhibit that most of structures in severe earthquakes receive damages and residual displacements which prevent serviceability and, in some cases, impose repair costs higher than new construction investments. In addition, the damage resulted from earthquakes has been unacceptable to building owners due to the cost of structural and non-structural repairs. One of the methods to reduce the cost of repair and maintenance is to utilize a structural self-centering system that provides considerable energy dissipating capability, limits the lateral displacement, and reduces probable damages that the structure can experience. On the other hand, the seismic design of self-centering system exhibits excellent performance regarding the energy dissipation enhancement, reducing damages and minimizing the residual displacements. The use of "hybrid" precast reinforced concrete wall structures for high seismic regions provides ample rocking mode of behavior and reduces the residual lateral displacements. In this system, by allowing the wall to rock at its base, the peak structural forces are limited without structural damage. Post-tensioning and energy dissipation are used to ensure stability and limit displacements.

In this paper, three tested wall specimens, containing two precast reinforced concrete hybrid shear walls and one emulative precast reinforced concrete shear wall, were simulated and modeled with ample precision regarding their details in ABAQUS software, and then were numerically analyzed under both gravity and monotonic lateral loading to investigate their seismic nonlinear behavior. The obtained results indicate that the self-centered RC walls are favorite systems in high seismic-prone areas, and the nonlinear numerical results of tested specimens mutually correlate to the experimental results.

Key Words: Prestressed concrete, residual displacement, nonlinear numerical analysis, hybrid shear wall, vertical base displacement.

OPTIMIZATION OF PARAMETERS DEPENDED ON THE ELECTRODE IN THE DYE TREATMENT BY USE OF THE ELECTRO-COAGULATION-FLOTATION PROCESS

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Abstracts of Papers in English

NUMERICAL AND EXPERIMENTAL COMPARISONS OF DIFFERENT BEHAVIOR SHAPES OF FOLDED PLATE SHELL FOUNDATION ON SANDY SOIL

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Abstract

Use of shells in foundations can be economically beneficial due to the increase in the columnar load and decrease in soil allowable stress. Shell foundation would be, therefore, a proper alternative to the shallow footings in soils with low allowable stress magnitude. Shell foundations are proper patterns with optimal design to obtain higher bearing capacity. Shell foundations enjoy a larger area of contact with soil due to their geometry. Shell footings are capable of carrying a larger load through more area contact with the soil. In this paper, the elasto-plastic behavior of the sandy soil, located under some shape of folded plate shell strip foundation, is studied. The Drucker Prager theory and experimental results are used in this analysis. Four geometrical models (A, B, C and D models) of shell foundation with different depths are located in sand with different densities (loose and dense sands). The experiment process includes foundation installation over the soil surface and embedded 50-100% of the foundation width. Also, to carry out a perfect analysis of foundations, a powerful three- dimensional finite element program (ABAQUS 6.9-1) was used. This investigation shows that the predictions made by the developed model are found to be in good agreement with those of experimental data obtained from laboratory.

Results of these analyses are compared with the same width in strip foundation (model E). This investigation shows that using (D) model of folded plate shell foun-