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Abstract

Objective: Today, despite the increase in global competition in the market, the prevalence of temporary forms of cooperation and project-based work is increasing. Likewise, the intensity of knowledge of the content of the work is growing. However, the temporary nature of projects does not support the transfer of knowledge between and within projects. Some researchers acknowledge that knowledge management is one of the most successful ways to improve team performance .As a result, the present study analyzed the relationship among knowledge management infrastructure, knowledge management processes, and project team performance.

Research Methodology: The strategy used in the present study is survey-based. The statistical population comprises the project work teams in contracting companies ranked in construction, road, transportation, mining, communications, oil, and gas in Tehran province. People working on projects have participated as representatives of teams in filling out questionnaires. Data collection was done by sending a web-based version of the questionnaire via Email. Of 400 qualified companies, nearly 100 companies accepted to participate in research. Finally, 86 valid questionnaires were collected. Data analysis was performed using path analysis through structural equations.

Results: The results of data analysis showed that the state of knowledge management infrastructure including cooperation, trust, learning culture, decentralization, senior management support, motivation, and IT support is not appropriate in project teams and is below average. Moreover, knowledge management processes including the components of knowledge acquisition, sharing, knowledge creation, coding, and knowledge retention are not in good condition, and their average is lower than the average. The standard is higher and in an acceptable condition. The results show that the culture of cooperation, trust, support of senior management, motivation, and IT support, which are components of knowledge management infrastructure, affect knowledge management processes which affect such elements as project team performances, namely effectiveness and innovation. Performance has a positive effect.

Key Words: Performance, project team, knowledge management, knowledge management infrastructure, knowledge management processes.

cross-section impose negative effect on shear stress mobilized on the pile surface. In addition, the pile group efficiency of tapered piles is generally lower than corresponding values for uniform cross-section piles. Also, the group efficiency of all tapered pile groups was almost equal to unity, meaning that the load carried by the group is equal to the sum of the load carried by individual similar piles.

Key Words: Tapered pile, pile group, numerical simulation, geometry of surface area, group efficiency.

SEISMIC CONTROL OF BENCHMARK HIGHWAY BRIDGE USING SEMI-ACTIVE CONTROL SYSTEM AND SELF-TUNING FUZZY CONTROLLER

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Abstract

During the past few decades, extensive damage to structures due to severe earthquakes has encouraged structural engineers to use seismic control systems. Bridges are critical nodes in transportation networks and must remain utilizable after an earthquake. Therefore, a higher level of performance with less structural damage is required for bridges. In the present research, a self-tuning fuzzy controller (STFC) with semi-active MR dampers is proposed to reduce the seismic response of the benchmark highway bridge. This controller combines the advantages of fuzzy inference systems and adaptive control in a two-part control architecture consisting of primary and secondary controllers. More specifically, the self-tuning mechanism considers different characteristics of seismic excitations and structural conditions to increase the controller efficiency in different situations. The role of the primary controller is to determine the input damper voltage, while the secondary controller adjusts them online according to seismic excitations and structural conditions. In order to increase the effectiveness of the proposed controller, the output parameters of the Sugeno fuzzy inference systems in the primary controller were set by a genetic algorithm. Finally, the proposed STFC was employed under several patterns from actual benchmark earthquakes and the evaluation criteria of a seismically excited highway bridge benchmark were determined. The obtained results exhibited a higher ability of the proposed self-tuning fuzzy controller to improve the highway bridge benchmark criteria, especially those related to damage such as displacement at bridge midspan, deformation of bearings, curvature of bent columns, and dissipated energy at the structural members. On the other hand, the evaluation criteria suggest that the proposed self-tuning fuzzy controller could reduce seismic responses under different earthquakes and adapt to different seismic excitations. Moreover, comparing the proposed controller with another adaptive fuzzy controller indicates the higher efficiency of the proposed STFC approach, especially in improving damage-related performance measures.

Key Words: Seismic control, semi-active control, MR damper, self-tuning fuzzy controller, adaptive controller, benchmark highway bridge, damage.

THE EFFECT OF KNOWLEDGE MANAGEMENT INFRASTRUCTURE THROUGH KNOWLEDGE MANAGEMENT PROCESSES ON THE PERFORMANCE OF TEMPORARY TEAMS IN THE PROJECT

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INVESTIGATION OF PERIODIC RESONATORS AS WAVE BARRIERS FOR MITIGATING SURFACE SEISMIC WAVES USING BLOCH-FLOQUET THEORY

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Abstract

Every year around the world, earthquakes and other seismic waves cause damage to civil infrastructures. The most harmful waves for civil infrastructure are surface waves, as this study focused on it. Therefore, this study aims to investigate the behavior of resonators as an approach to reducing surface seismic waves based on both infinite and finite lattices for the proposed resonator. To this end, first, an infinite lattice is evaluated using the Bloch-Floquet theory by modeling the smallest repetition of the considering lattice. The dispersion relation of the considered resonator is obtained by an eigenfrequency analysis for each wave vector in the first irreducible Brillouin zone. Then, the bandgap for surface waves is defined using the sound line concept, a common approach in solid-state physics to find the pure surface modes of the dispersion relation for resonators. The sound line concept is used to distinguish between the pure surface and other waves, such as body waves. In Bloch-Floquet theory, the lattice is assumed to have an infinite number of unit cells; however, in real applications, the lattice needs to have a finite number of unit cells. Therefore, the accuracy of the bandgap obtained for the infinite lattice is evaluated by considering a finite lattice model in both frequency and time domains to consider a more realistic case. The results show that the considered resonator has a notable surface wave bandgap. Moreover, the results of the finite lattice conform well to the results of the infinite lattice in both frequency and time domains. The proposed resonator is made of concrete and has a height of six meters, and the unit cell constant is considered two meters. The obtained bandgap is between 14 and 21 Hz, confirmed by a finite model in both frequency and time domains. As a result, the proposed resonator can reduce surface seismic waves efficiently.

Key Words: Seismic barriers, resonator, bandgap, bloch-floquet theory, sound line.

NUMERICAL INVESTIGATION OF THE EFFECT OF SHAFT SURFACE GEOMETRY OF TAPERED PILE GROUP WITH CIRCULAR AND SQUARE CROSS-SECTIONS ON BEARING CAPACITY AND GROUP EFFICIENCY INQUIRY

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Abstract

Piles with a gradually decreasing cross-section area from pile top to the tip is called tapered piles. Making this change in pile geometry could improve pile behavior in terms of axial compression load bearing, compared to conventional uniform cross-section piles. The beneficial effect of shaft taper pile on the capacity and performance of axially loaded single piles is well documented in the literature. However, the behavior of tapered pile groups has been rarely investigated experimentally and numerically. In this study, a numerical investigation of single tapered pile and pile group behavior based on an experimental investigation in geotechnical centrifuge is conducted. This investigation included both circular and square cross-sections for tapered pile and 2x2 pile group. The results of experimental and numerical modeling highlight the considerable advantage of circular and square tapered piles over the uniform cross-section ones in terms of axial compressive load-bearing capacity. Although the surface area of the circular tapered piles is smaller than square ones, the results surprisingly imply upon an increase in the axial bearing capacity. In numerical simulation, pile group efficiency of tapered pile and shear stress distribution in the soil medium around the pile are investigated. Moreover, the effect of shaft surface geometry of tapered pile with circular and square cross-sections on axial compression load-bearing capacity is also investigated. The findings of numerical simulations indicate that the concave corners of the pile

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Abstract

Reactive Powder Concrete (RPC) is a type of ultra-high-performance concrete (UHPC). Reactive powder concrete is composed of very fine aggregates (Cement, fine aggregate, quartz powder and Silica sand), strong superplasticizers, and a small amount of water. Improvement of microstructure, elimination of coarse aggregate, particle packing, and toughness enhancement are the main principles of RPC development. Reactive powder concrete has a high modulus of elasticity and low water absorption and also has a high compressive strength. Reactive Powder Concrete contains high amounts of cement. This high ratio increases the production cost of this concrete in addition to causing issues such as high hydration temperature and concrete shrinkage. In this study, due to the difference in material and composition of materials in Iran with other countries, one should use 5 ratios of silica sand to cement including 1, 1.1, 1.2, 1.25, 1.3 and, then, add 4%, 5%, and 6% of the volume of concrete Fiberglass to each ratio. Increasing the sand to cement ratio up to 1.2 can improve the concrete behavior by reducing the amount of cement used. Moreover, According to the SEM images, by increasing the sand-cement ratio to 1.2 with the improvement of concrete microstructure, the compressive strength increased..On the other hand, in this sand-cement ratio, microcracks were reduced compared to the sample with a sand-cement ratio of 1, and water absorption of concrete was reduced.Moreover, the tensile behavior of RPC must be improved using another material due to the limit set on the largest grain size in it. Adding glass fibers at the rate of 4-5% of concrete weight to the mix design and converting reactive powder concrete to composite reduces the number of microcracks, which improves the microstructure of concrete. As a result, the behavior of concrete is enhanced against tension and flexure. Moreover, with the addition of glass fibers, the behavior of concrete against water is strengthened and the water absorption of reactive powder concrete sample armed with glass fibers is appropriate.

Key Words: Reactive powder concrete, glass fiber, silica sand, scanning electron microscope.

ANALYSIS AND STRENGTHENING OF RC EXTERIOR BEAM-COLUMN JOINTS CONSIDERING COLUMN AXIAL FORCE VARIATION

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Abstract

In this study, an analytical method is developed to predict the behavior of deficient reinforced concrete beam-column joints after strengthening. Deficient joint is a joint without shear reinforcement. In this analytical method, different types of failure are estimated using principal stress-strain relationships in the joint and by determining the final capacity of beam and column. The use of relations between principal stresses in the joint accounts for the variation of the axial stress of the column in equations and joint capacities. The equations are obtained by considering the strength and deformation limit states in the joint, and a numerical method is employed to solve them. The proposed analytical method provides useful information regarding the strengthened joint capacity as well as how different types of strengthened methods work. This information can be used to select the strengthening method of the deficient joints. In the study, the calculation sequence of beam-column joints is illustrated using column axial force versus flexural capacity relationship of the joint members, employed as a criterion to determine the method and the amount of strengthening materials. In the experimental part of the study, 3 specimens with axial load variation and 3 specimens with constant axial load were conducted. The specimens were strengthened using either near-surface mounted steel reinforcement (NSM) or externally bonded reinforcement (EBR) with CFRP sheets. The experimental results indicated that the behavior of joints was significantly affected by considering the column axial force. Additionally, strengthening the joints by NSM method with steel bars rather than EBR method led to more ductile behavior. Finally, the proposed analytical method was compared with the results of the experimental specimens from other studies and 6 experimental specimens conducted in this study. Comparison of the experimental results with the values of the analytical method demonstrated that the proposed analytical method could adequately predict the behavior of beam-column joints.

Key Words: Beam-column joint, NSM strengthening, EBR strengthening, axial force variation.

different diameters 5, 10, 15, and 20 cm and three different ratios of skirt length to bucket diameter (d/D) were 0, 0.5, and 1. Similar to the first series, in the second series of experiments, the bucket foundation was subjected to a vertical loading at a ratio of saturated sand to excessive pore pressure ($ru = \Delta u/\sigma$). In these experiments, two kinds of bucket foundation with diameters of 10 and 20 cm and different buried foundation depths of 0, 0.5, and 1 were used. The results showed that skirt length and width of the foundation enhanced the bearing capacity of foundation. The bearing capacity of bucket foundation was twice more than the surface circular foundation at both ratios of pore water pressure. By increasing the ratio of pore water pressure, the reduction of bearing capacity of surface circular foundation was greater than that of bucket foundation.

Key Words: Vertical bearing capacity, bucket foundation, offshore constructions, saturated soil.

FEASIBILITY STUDY ON PROMOTING THE VALUE OF LARGE-SCALE CONSTRUCTION PROJECTS USING THE COMBINATION OF VALUE ENGINEERING AND THE ANFIS METHOD

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Abstract

Value Engineering (VE) enables project managers to discover the size and location of problems in a project and to mitigate any potential backwardness. The current research aimed to find major impressive criteria and to measure their impact level on promoting the value of large-scale/mega projects using VE concepts. The hindrance and obstacles available in the application of VE in construction engineering were considered to ensure the accuracy. The main research objective was to forecast the effect of quality, cost, and time factors on the project value using an adaptive neuro fuzzy inference system (ANFIS) model. To create the ANFIS model, the required data were collected through a five-point scale Likert questionnaire, by which the expert opinions were obtained, and pairwise comparisons of the items were accomplished. The model was created using MATLAB. The statistical population was adopted from the experts and managers working in a large-scale project who were familiar with the concepts and details of VE and project management. According to the literature, more than 50 VE criteria were found, which were then reduced to 25 criteria based on experts' opinions. These final criteria were categorized into three groups: cost, time, and quality. Afterwards, the data collected via the questionnaires were analyzed by the ANFIS model. Before completing the calculations, validity and reliability of the analytical model were investigated to ensure that the results are both valid and reliable enough for further use. The results showed that the criterion entitled 'proper programming ...' had the highest impact on promoting the projects value, while the criterion entitled 'prevention of work and responsibility interference ...' had the least influence. Both of the mentioned criteria were situated in the group of cost, indicating the higher importance of this group than that of the other groups.

Key Words: Value engineering; analytical model; large-scale construction projects; ANFIS method.

LABORATORY STUDY OF THE EFFECT OF ADDING GLASS FIBERS ON REACTIVE POWDERED CONCRETE

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Abstracts of Papers in English

EVALUATION OF THE VERTICAL BEARING CAPACITY AND SETTLEMENT OF BUCKET FOUNDATION IN SATURATED SAND

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Abstract

The rapid growth of the demand for renewable energy and the development of infrastructure in offshore area in order to produce the green energy have attracted the attention of many researchers. One of the well-known foundations used for offshore wind turbines is bucket foundation. In this study, the behavior of bucket foundations in saturated sandy soil at different levels of pore water pressure ratios was investigated via physical modeling approach to reach a better understanding of such foundations.

A large soil container of 1.20 m in length, 0.9 m in width, and 0.9 m in height was selected. The Boblosar sand was chosen for experimental tests and is classified as poorly graded sand (SP) categorized by unified soil Classification system (USCS). Excessive pore water pressure could be applied in the soil medium by upward seepage. The problem was investigated for excessive pore water pressure ratios of 0 and 1. Two series of experiments were conducted to study the behavior of bucket foundation under vertical loading. In the first series of experiments, the bucket foundation was loaded by a vertical load in saturated sand without any excessive pore water pressure. Four kinds of bucket foundation were used with