Nonlinear analysis of concrete gravity dams under normal fault motion

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ABSTRACT

The importance of the seismic behavior of concrete gravity dams in their safety evaluation and stability is inevitable. Many factors affect the prediction of the behavior of concrete dams such as dam-foundation-reservoir interaction, dam and foundation cracking and also displacement due to fault movement that could causes nonlinear behavior. The aim of this study is nonlinear analysis of concrete gravity dams, including displacement caused by normal fault movement in the dam foundation. For this purpose, dam-foundation-reservoir system is modeled using Lagrangian method and analysis of system is done by finite element method. The coordinate smeared crack model based on the nonlinear fracture mechanics is used for crack modeling in the dam body and foundation. Using two separate method including split node technique and contact element, the fault movement are modeled and the position and angle of fault has been studied. To verify the results, dam crest displacement and crack profile in the body of a concrete gravity dam is presented as an example. The results show that low fault movement causes the cracks in the dam body and could be jeopardizes the stability and safety of concrete dam.

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Assessment of rubber-sliding isolator effect on progressive collapse of bridges

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ABSTRACT

The response of bridges to abnormal loads have always been significant in structural engineering, especially in progressive collapse analysis. In this paper, the performance of bridges, undergoing progressive collapse, with and without isolator is investigated. Nonlinear time history analysis is used to obtain maximum responses of the structure by considering two different damage scenarios. In the first scenario, it is supposed that the side column of the bridge is collapsed and therefore is detached from the structure while in the second one, the middle column is removed. Accordingly, several models with rubber-sliding isolators, designed according to AASHTO standards are analyzed using OpenSees software. Moreover, the friction parameter of the isolator is considered as a variable in terms of the sliding velocity and acting vertical load. Results show that isolator yield doesn't occur in both scenarios and subsequently the sliding of the bridge deck is not observed. However, a permanent displacement in the first scenario is detected because of instability of the bridge deck. It can also be noted that in most cases, using seismic isolators results in the growth of the maximum responses.

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Evaluation model of project complexity for large-scale construction projects in Iran - A Fuzzy ANP approach

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ABSTRACT

Construction projects have always been complex. By growing trend of this complexity, implementations of large-scale constructions become harder. Hence, evaluating and understanding these complexities are critical. Correct evaluation of a project complication can provide executives and managers with good source to use. Fuzzy analytic network process (ANP) is a logical and systematic approach toward defining, evaluation, and grading. This method allows for analyzing complex systems, and determining complexity of them. In this study, by taking advantage of fuzzy ANP, effective indexes for development of complications in large-scale construction projects in Iran have been determined and prioritized.
The results show socio-political, project system interdependencies, and technological complexity indexes ranked top to three. Furthermore, in comparison of three main huge projects: commercial-administrative, hospital, and skyscrapers, the hospital project had been evaluated as the most complicated. This model is beneficial for professionals in managing large-scale projects.

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The effect of axial loads on free vibration of symmetric frame structures using continuous system method

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ABSTRACT

The free vibration of frame structures has been usually studied in literature without considering the effect of axial loads. In this paper, the continuous system method is employed to investigate this effect on the free flexural and torsional vibration of two and three dimensional symmetric frames. In the continuous system method, in approximate analysis of buildings, commonly, the structure is replaced by an equivalent beam which matches the dominant characteristics of the structure. Accordingly, the natural frequencies of the symmetric frame structures are obtained through solving the governing differential equation of the equivalent beam whose stiffness and mass are supposed to be uniformly distributed along the length. The corresponding axial load applied to the replaced beam is calculated based on the total weight and the number of stories of the building. A numerical example is presented to show the simplicity and efficiency of the proposed solution.

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Assessment of the progressive collapse in the steel moment frames with L-shaped plan using sensitivity analysis

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ABSTRACT

The progressive collapse of the structure refers to the development of an initial local damage. After local damage, failure extends in the structure and structural failure occurs. In progressive collapse, the element that has the greatest potential is important because strengthening this element can improve structural performance. In this paper, the position of the critical column in L-shaped plan has been checked. So, buildings with 10, 15 and 20 stories were modeled as three dimensions. In this type of plans, to determine the key elements, columns in different situations are removed and push down analysis is done. The element which has maximum of the sensitivity index is selected as a key element in the progressive collapse. Results in this paper show that in the L-shaped plan, a central column is critical in the progressive collapse.

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Evaluation of seismic parameters of steel moment resisting frames based on "FEMA P-695" under near-field rotated ground motion

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ABSTRACT

Behavior factor (R) is one of the seismic design parameters that considers nonlinear performance of structures during an earthquake. In most of the seismic design codes, behavior factor has been used for considering nonlinear performance of structures in linear analyses. The purpose of this study is an evaluation of seismic parameters of structures under far-field and near-field ground motions (rotated to fault strike-normal and fault strike-parallel) based on the method presented in FEMA P-695 and comparing the results with those in the code. Thus, five intermediate steel moment resisting frames with 4, 7, 10, 15, and 20 stories were considered. The capacity curve of each model were obtained by Displacement-based Adaptive Pushover Analysis. All of the nonlinear analyses were conducted by OpenSees. The results state that the behavior factor due to the ground motions used in this study decreases as the structure's height increases. Average of difference of behavior factor in far-field ground motions and average of behavior factor in near-field ground motions is 6.5 percent and the reason is that the behavior factor in far-field ground motions is greater. Also, the behavior factor in fault strike-parallel near-field ground motions (SP) is greater than fault strike-normal near-field (SN) and the average of this difference for different structures is almost 4 percent.

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The characteristics of ultra-high performance concrete and cracking behavior of reinforced concrete tensile specimens

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ABSTRACT

The tensile behavior of concrete depends on some factors such as member dimensions, reinforcement ratio, diameter of rebar, strength and elasticity modulus of material. In this research the experimental method is used to examine the characteristics and the behavior of ultra-high performance concrete on the tensile behavior of concrete members reinforced by steel rebar. The results show that increasing the rebar cover on diameter rebar ratio (C/d) increases the initial stiffening before the cracking stage in concrete. Also, by increasing of reinforcement ratio the cracking space decreased.

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Effect of magnetic water on strength and workability of high performance concrete

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ABSTRACT

Nowadays, concrete is one of the most important and widely used human product. Improving concrete characteristics have always been one of the fundamental subjects for engineers. Improve the physical properties of water, as one of the main elements of concrete, is one way to improve the characteristics of the concrete. When water passes through the magnetic field, its physical quality has changed, it is called Magnetic water. This study examines the effect of the use of magnetized water (MW) with a solenoid current-carrying, on the compressive strength and workability of high performance concrete. The variables of this study were the intensity of magnetic field, the silica fume replacement level and water to cement ratio in different mixes. The results show that using MW increases the workability of concrete about 36% in average.MW in combination with superplasticizer is more effective than MW on workability and compressive strength of concrete. MW had more positive effects on the samples without silica fume. Increasing the intensity of magnetic field improved the workability, 28 and 90 days compressive strength concrete.

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Identify subcontractors selection criteria in construction companies with new approach using Kano model

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ABSTRACT

In most projects, contractors play a managerial role and subcontractors get the executive responsibility of main contractors. Consequently, subcontractors' management is one of the most important issues in the program of project management. This research intends to investigate the subcontractors' selection criteria. The Kano model, applied here to classify these criteria into three categories including must be, one-dimensional, and attractive. The Kano questionnaire was distributed among the best contractor companies in Tehran and the results were calculated by applying weighted mean method. The most important outcome of this paper is to present a realistic classification of criteria for the subcontractor selection in Iran.

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Seismic performance assessment of knee bracing equipped with shape memory alloys

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ABSTRACT

According to current seismic design codes, the serviceability of the building is not necessary after the sever earthquakes but the life safety is important. It is caused to reduce the cost of construction. In recent years, the researchers have proposed the new methods and materials to improve the purposes of seismic design and to reduce the cost of construction. For example, the use of materials such as shape memory alloys (SMA) with high elastic property and low residual strain was suggested. In this study the use of these alloys is evaluated for steel knee bracing. The result showed that the structures with SMA remain survival during the sever earthquakes with low retrofitting.

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