Technical note: Analysis of claims and disputes in contracts for oil and gas development projects in Iran with solutions

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ABSTRACT

Contracts for oil and gas development projects are naturally complex, they are explained with some of maps and technical specifications. To supply the goals of contracts, it is necessary to construct by a team having owner, consulting engineer and contractor. The unique aspects of each project and team working are resulting to disagreements. It should be noted that the majority of team workers have not previously worked together. It may not be expected to forecast all project aspects in design and preparation of tender documents process. However, in some cases it will occur inconsistencies in contract documents and possibly may be disagreements on commentary of the cases which there are in the provisions of the contract. Every root of disagreement resulted in to claim and finally dispute. Lack of foresight and/or existing ambiguous texts in some provisions of contract, not being aware of components of the project to conditions and obligations and rules of contract will complex and sometimes impossible the agreement on implementation problems. Therefore, the claims will be resulted in disputes and inflict financial losses to contractors and/or owners and then the projects will not be completed. In Iran many activities have not been carried out about claims and disputes in different orientations especially in areas futures and hence, it was studied in this research. Firstly, research history was considered and the causes of claims and disputes were identified in process of different levels of oil projects construction from primary to exploitation and then a questionnaire was prepared using the comments of experts. Finally, the questionnaire was analysed by SPSS and the approved factors in creation of claims and disputes and in their roots were ranked.

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Investigation of R-Factor for steel moment frame combined with cold-formed steel structures under different load patterns using pushover analysis

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ABSTRACT

The use of Lightweight Steel Frames (LSF) has grown considerably in recent years all over the world due to its unique advantages such as being cost-effective and light-weight, easy and quick installment. Another application is to use them in order to increase the number of new floors on the existing buildings. But since the behavior of the combined structure is not clear, there is no possibility of increasing new floors with Lightweight Steel Frames. Therefore, through selecting and modeling three buildings of three, five and seven floors with steel moment frames in SAP2000 software and adding one or two new floors using Lightweight Steel Frames (LSF) and conducting a non-linear static analysis with three different lateral load pattern, we dealt with the seismic behavior and determined the behavior coefficient of each of the combined structures. The results indicated that the use of cold-formed structures in order to add story do not have a significant impact on R-factor. In addition, R-factor depends on the type of the side loading pattern.

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Parametric study of the along-wind and across-wind responses of tall RC chimneys using the frequency domain analysis

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ABSTRACT

Tall industrial chimneys are sensitive structures to dynamic wind loads. Design codes generally provide approximate equations to estimate the wind-induced response of tall structures. However, they require dynamic analysis to determine the accurate response of slender and sensitive structures. In the present study, dynamic responses of 100-400 m tall RC chimneys under the random wind loads are determined using the frequency domain analysis. Due to the dominant bending mode, the structure of the chimney is modeled as a multi-degree-of-freedom (MDOF) lumped-mass system. All the modeling and analysis procedure, including element meshing, determining the transfer matrix, calculating the along-wind and across-wind force spectrum matrices, and the numerical integration to obtain the responses, are carried out using MATLAB software. The effect of different design parameters, such as chimney height, top diameter to base diameter ratio, basic wind velocity, and terrain category on the wind-induced response of structures, is investigated. The results indicate that the coefficient of variation (CV) of the along-wind response increases with increasing the basic wind velocity. The maximum across-wind responses of the studied chimneys occur in the basic wind velocity range of 10 to 20 m/sec. The across-wind response significantly decreases as the ratio of top diameter to base diameter of the chimney decreases.

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Connections rigidity effect on probability of fracture in steel moment frames

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ABSTRACT

Connections in steel moment frames are idealized in full pinned and full rigid conditions. Because with this assumption, in spite of real behavior of connection, real story drifts are less anticipated and maybe frame is designed without performance of bracing. There are several methods for modeling actual behavior of semi rigid connections. In this method a connection with certain rigidity is modeled by a rotational spring with corresponding stiffness. This stiffness is achieved by certain formula. In other words, each percent of rigidity corresponds to one rotational spring stiffness. In this research in order to evaluate the real behavior of connection in analysis and designing process and fracture probability one frame including four stories and one bay with three types of connection has been modeled and designed in ETABS. Each model has an individual rigidity which is equal to 10, 75 and 90 percent. With respect to maximum drift and different PGA in roof, probabilities of low, medium, high and complete fracture were calculated. For this purpose, with applying different PGA to modeled frames, amounts of drift in the roof are achieved. Then these values are compared with given values in American code. Finally, investigation showed that when rigidity in frame connections increases, the probability of frame fracture decreases. In other words, fully rigid assumption of connection in analysis process leads to decreasing in real probability of fracture in frames which is a noticeable risk in building designing processes.

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Evaluation of seismic performance of X bracing systems equipped with flexural yielding dampers

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ABSTRACT

The X-bracing system is one of the lateral loads bearing system. In X-bracing system's elements, axial plastic hinges (compressive or tensile) will be formed instead of flexural hinges which are not capable to absorb high energy. Seismic performance can be improved by replacing these plastic hinges with the bending plastic joints. In this study, a new kind of X-bracing named X-bracing equipped with flexural yielding damper is introduced in which the plastic axial hinges is substituted by flexural plastic hinges. In this kind of bracing the failure mechanisms focuses on flexural hinges. The objective of this study is to evaluate the seismic performance of this kind of bracing. For this purpose, several X-bracing frames with various stories was selected and designed based on Iranian building codes. The seismic performance of these frames (stiffness capacity, strength capacity, and ductility capacity) and force reduction factors were evaluated using static and time history nonlinear analysis. In dynamic time history analysis seven acceleration-time records was applied. The results show that the damper reduces stiffness and strength capacity inconsiderably, but increases the ductility capacity significantly. It also increases the force reduction factor of the frames significantly. The amount of force reduction factor for this system is the same as eccentrically braced frame one.

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Evaluation of the dynamic responses of high rise buildings with respect to the direct methods for soil-foundation-structure interaction effects and comparison with the approximate methods

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ABSTRACT

In dynamic analysis, modeling of soil medium is ignored because of the infinity and complexity of the soil behavior and so the important effects of these terms are neglected, while the behavior of the soil under the structure plays an important role in the response of the structure during an earthquake. In fact, the soil layers and soil foundation structure interaction phenomena can increase the applied seismic forces during earthquakes that has been examined with different methods. In this paper, effects of soil foundation structure interaction on a steel high rise building has been modeled using Abaqus software for nonlinear dynamic analysis with finite element direct method and simulation of infinite boundary condition for soil medium and also approximate Cone model. In the direct method, soil, structure and foundation are modeled altogether. In other hand, for using Cone model as a simple model, dynamic stiffness coefficients have been employed to simulate soil with considering springs and dashpots in all degree of freedom. The results show that considering soil foundation structure interaction cause increase in maximum lateral displacement of structure and the friction coefficient of soil-foundation interface can alter the responses of structure. It was also observed that the results of the approximate methods have good agreement for engineering demands.

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Evaluation of new composite rigid joint under cyclic loading and its effect on one-floor composite frame

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ABSTRACT

In order to improve the performance of structure against lateral and gravity loads, new systems known as composite systems consisting of the reinforced concrete columns and steel beams (RCS) can be used and thereby the advantages of concrete beside steel are acquired. RCS joints can be implemented as either through-beam-type joint or through-column-type joint. In this paper, a concrete joint as standard reference joint and a proposed composite joint through-column with new details were built and tested under cyclic loading. Then, using numerical analysis by finite element method, the behavior of composite joint under cyclic loading has been studied and the behavior and performance of proposed composite joint has been studied by comparing the results with that of concrete joint. The results showed that the joint composition in this way resulted in decreasing of the compressive and tensile damages of concrete and increasing in loading capacity, ductility, stiffness and energy absorption. General results of application of composite joint at the one floor-one span composite frame indicating that lateral loading capacity of frame was increased and the performance of frame was improved.

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The effect of moment redistribution on the stability of reinforced concrete moment resisting frame buildings under the ground motion

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ABSTRACT

In recent years some studies have been done on the moment rredistribution in buildings and new methods offered for calculating of redistribution. Observations demonstrated that the combination of moment and shear force is important in analysis of reinforced concrete structures. But little research is done about the effect of redistribution by using moding in software. In order to study the effect of moment redistribution on the stability of RC moment resisting frame structures, four buildings with 4, 7, 10 and 13 story have been considered. In these models, the nonlinear behavior of elements (beam and column) is considered by the use of interaction PMM hinges. The average plastic rotation was calculated by performing pushover analysis and storing stiffness matrix for 5 points and then the buckling coefficients were obtained by conducting buckling analysis. By the use of modal analysis natural frequency was calculated and it was attempted to be related the average plastic rotation with the buckling coefficients and the natural frequency. It could be concluded that increase in the plastic rotation reduce the buckling coefficients to about 96% which this amount of reduction is related to the average plastic rotation. Moreover, the buildings experience instability state when the average plastic rotation reached to 0.006 radian.

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Evaluation equivalent pulse of pulse-like ground motion to estimate the response of RC moment-resisting frames

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ABSTRACT

In this study the ability of equivalent pulse extracted by a mathematical model from pulse-like ground motion is investigated in order to estimate the response of RC moment-resisting frames. By examining the mathematical model, it is obvious that the model-based elastic response spectra are compatible with the actual pulse-like record. Also, the model simulates the long-period portion of actual pulse-like records by a high level of precision. The results indicate that the model adequately simulates the components of time histories. In order to investigate the ability of equivalent pulse of pulse-like ground motion in estimating the response of RC moment-resisting frames, five frame models including 3, 6, 9, 12 and 15 stories analyzed under actual record and simulated one. The results of the base shear demand, the maximum value of the inter-story drift and the distribution of inter-story drift along the height of the structures in three levels of design ductility is investigated. According to the results of this study, the equivalent pulses can predict accurately the response of regular RC moment-resisting frames when the fundamental period of the structure is equal to or greater than the equivalent pulse of the record. For the ground motion with high-frequency content the difference is high; but with increasing the number of stories and approaching pulse period to the fundamental period of the structure and increasing the level of design ductility of structure, more accurately predict the structural response.

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Effect of CFRP location on flexural and axial behavior of SHS steel columns strengthened using CFRP

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ABSTRACT

In recent years, the use of Carbon Fiber Reinforced Polymers (CFRP) for strengthening and retrofitting of steel structures has been considerably developed. Strengthening and retrofitting of structures have several reasons, including: design and calculation errors, lack of proper construction techniques, change in application after construction, damage caused by natural disasters such as floods and earthquakes, the occurring of fatigue cracking, metals corrosion, and so on. The column is an important member in building structures that has the duty to bear and transferring loads incurred to the structure. The stability in structural steel columns is very important. According to research conducted in literature, a few studies have done on the axial behavior of slender steel columns strengthened using carbon fiber reinforced composite. However, the main purpose of this study is to analyze the ultimate load of compressive and compressive-flexural (interaction loads) of square hollow section steel columns strengthened using composite carbon fiber with CFRP in different locations. For modeling and analysis of samples ANSYS software was used. 40 steel columns that strengthened using CFRP were analyzed by nonlinear static under axial compressive load. Three samples of the columns were also analyzed under compressive axial load and flexural moment interaction. The results showed that location, coverage percent and number of layers of CFRP are effective on the ultimate load of SHS steel columns under axial compression load and flexural moment. The results also showed that moving the location of the carbon composite with percentage of defined coverage can be have different effects on the axial compression load of steel columns.

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Experimental assessment and numerical modeling of the nonlinear behavior of the masonry shear walls under in-plane cyclic loading considering the brickwork-setting effect

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ABSTRACT

In this article, the main purpose is nonlinear analysis of the cyclic behavior of the masonry shear walls including brickwork setting using finite element method. Three different brickwork-settings including running bond style, herringbone style and Zarbi style (herreh style) were investigated. To this end, the walls (in dimension of 195×1500×1720 mm) were tested in the laboratory and then were simulated using macro modeling method by Abaqus software, and their hysteretic curves was drawn. The concrete damaged plasticity criteria in the Abaqus software is a model used in this research. In this method, the main failure mechanisms of fracture are cracking in tension and crushing in compression. The macro modeling method was used for numerical assessment of the masonry walls. After numerical modeling and drawing hysteretic curves and contrasting them with laboratory results, it was proven that the concrete damaged plasticity model, which is behavioral model for simulating concrete material, can be used for modeling masonry materials under seismic loading. However, this model cannot be used to simulate pinching effect in hysteretic curve drawn from seismic loading. The envelope curve resulted from the numerical analysis of all three brickwork layouts had a good agreement with the results of the laboratory tests, but in Hysteretic curve of Herringbone style and Zarbi style the pinching effect did not match experimental results.

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Evaluation of seismic reliability of steel moment resisting frames rehabilitated by concentric braces with probabilistic models

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ABSTRACT

Probability of structure failure which has been designed by "deterministic methods" can be more than the one which has been designed in similar situation using probabilistic methods and models considering "uncertainties". The main purpose of this research was to evaluate the seismic reliability of steel moment resisting frames rehabilitated with concentric braces by probabilistic models. To do so, three-story and nine-story steel moment resisting frames were designed based on resistant criteria of Iranian code and then they were rehabilitated based on controlling drift limitations by concentric braces. Probability of frames failure was evaluated by probabilistic models of magnitude, location of earthquake, ground shaking intensity in the area of the structure, probabilistic model of building response (based on maximum lateral roof displacement) and probabilistic methods. These frames were analyzed under subcrustal source by sampling probabilistic method "Risk Tools" (RT). Comparing the exceedance probability of building response curves (or selected points on it) of the three-story and nine-story model frames (before and after rehabilitation), seismic response of rehabilitated frames, was reduced and their reliability was improved. Also the main effective variables in reducing the probability of frames failure were determined using sensitivity analysis by FORM probabilistic method. The most effective variables reducing the probability of frames failure are θ_1 in the magnitude model, ground shaking intensity model error and magnitude model error.

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