Dept. of Civil Engineering
Razi University, Kermanshah
DOI:10.24200/J30.2018.2173.2125

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 165-172, Research Note

- Received 8 May 2017; received in revised form 9 July 2017; accepted 3 October 2017.

Abstract

The constant "F" is of significant importance when it comes to the design and theoretical understanding of crack expansion under fatigue or impact loads. Even though numerous papers on the failure of materials via the cracked disc have been published, almost no method vis−á-vis vis the optimization of the shape factor "F" has been proposed. Thereupon, this study strives to determine the stress intensity factor (SIF) for the semi-circular disc model under uniform compressive load and also to calculate the optimized shape factor. In this research, inspired by the geometry of the Brazilian disc, the stress intensity factor (SIF) and the optimized shape factor (F) under uniform compressive load have been proposed. In this paper, to assess KI under uniform compressive load, the experimental results of photo-elastic materials and also the finite element results have been employed. The shape factor of the Edge Cracked Semi-circular Disk (ECSD) under uniform compressive load can experimentally be tested more conveniently and therefore by altering the value of the factor β, the optimal shape factor is obtained.

The angleβ varies from zero (purely vertical load) to 10 degrees. Also, the length of the crack changes from 1 to 29 mm. After the carried-out investigations, it can be ascertained that the value for K_I reduces as the angle increases. The reason behind that is the reduction of the tensile area in the edges of the semi-circular disc. Further, in a particular angle, as the crack length increases, K_I initially rises and then, due to the tip of the crack approaching the compressive area of the disc, it undergoes reduction. The" zero degree" diagram is considered to be the limit state and is perpetually increasing and it should not be crossed by any other diagram. To achieve the optimal shape factor, the values of "SIF" and the length of the normal crack should first be made dimensionless and ultimately, by assessing a wide span of loading angles, the optimum geometric shape factor of the cracked semi-circular disc was determined to be equal to 1.325 at the angle $\beta = 2^0$.

Key Words: Edged cracked semicircular disk (ECSD), photo elasticity, stress intensity factor (SIF), form factor (F), finite element.

materials, such as a bilinear stress-strain curve for monotonic loading of timber, and a Mohr-Coulomb contact law for wooden members are used. Hill's yield criterion is adopted to make the timber element models. The William-Warnke yield criterion is adopted for masonry walls. Finally, non-linear static analyses of four existing timber framed masonry walls are performed.
In wooden elements of each model, stress intensity distribution, equivalent plastic strain distribution, and debonding have been studied. The results have shown that in spite of the low utilization of those masonry walls and wood capacity, the patterns of cracks have been changed, and the ultimate bearing capacity and ductility in the timber framed masonry walls have been increased.

Key Words: Masonry wall, numerical models, nonlinear analysis, timber framed buildings, experimental evidence verification.

DEVELOPMENT OF A METHOD FOR DETERMINATION OF LOCATION OF MAXIMUM SHEAR STRESS IN RIVER BENDS (VERIFICATION OF REPORT NO. 592, IRANIAN ENERGY MINISTRY)

A. Liaghat
A_liaghat2003@yahoo.com
A. Adib(corresponding author)
arashadib@yahoo.com
H.R. Gafouri
h_ghafouri@yahoo.com
Dept. of Civil Engineering
Shahid Chamran University of Ahvaz
DOI:10.24200/J30.2018.2174.2120

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 153-163, Research Note

- Received 30 April 2017; received in revised form 24 August 2017; accepted 26 September 2017.

Abstract

Hydraulic conditions and identification of reach based on which maximum shear stress occurs are very complex problems in river bends. In this research, a method is developed for determining the location of this reach in bends. In addition, results of this method are compared to instructions of report No. 592 (prepared by Iranian Ministry of Energy). Downstream of the Karkheh dam is the case study of this research. The reason for selecting this region is evaluation of effects of dam construction on river bends.
The number of bends was 24 in 1996 (before construction of dam) and was 42 in 2011 (after construction of dam). Important results of this research are:
1- For $R/W < 1.5$, percentage of instructions accuracy of report No. 592 is 90%, and the average shear stress in the reach that has maximum shear stress is 1.38 times shear stress of the tip bend. The maximum shear stress occurs in the convex bank.
2- For $1.5 < R/W < 3.5$ and the concave bank, percentage of instructions accuracy of report No. 592 is 82%, and the average shear stress in the reach that has maximum shear stress is 2.78 times shear stress of the tip bend.
3- For $1.5 < R/W < 3.5$ and the convex bank, percentage of instructions accuracy of report No. 592 is 71%, and the average shear stress in the reach that has maximum shear stress is 1.98 times shear stress of the tip bend.
4- For $3.5 < R/W < 5$, percentage of instructions accuracy of report No. 592 is 91%, and the average shear stress in the reach that has maximum shear stress is 4.35 times shear stress of the tip bend. The maximum shear stress occurs in the concave bank.
5- For $R/W > 5$, percentage of instructions accuracy of report No. 592 is 91%, and the average shear stress in the reach that has maximum shear stress is 3.22 times shear stress of the tip bend. The maximum shear stress occurs in the concave bank.
Results of the CCHE2D software illustrate that percentage of instructions accuracy of report No. 592 is acceptable. For small values of R/W, maximum shear stress occurs in the convex bank of river. By increasing R/W, the reach of maximum shear stress transfers to the concave bank of river, and this reach displaces toward the downstream.

Key Words: Report no.592, CCHE2D software, the Karkheh river, shear stress, the relative curvature of river bends.

DETERMINE THE OPTIMAL FORM FACTOR EDGED CRACKED SEMICIRCULAR DISK UNDER UNIFORM PRESSURE LOAD

E. Khalilzadeh Vahidi(corresponding author)
e_vahidi2000@yahoo.com
A. Permanoon
Permanoon.ali@gmail.com
R. Raeisi
Raeisiroya@yahoo.com

from soil contaminated with 6000 mg/kg of crude oil up to 20 percent. In this process the soil moisture content variations were controlled well, and the microbial population growth was observed. In addition, increasing the initial pollutant concentration and also applied voltage gradient led to the improvement of the decomposition and thus enhancement of contaminant removal efficiency.

Key Words: soil treatment, oil contamination, bioelectrokinetic, polarity exchange, pH.

DESIGN AND IMPLEMENTATION OF A SEMI-ACTIVE STRUCTURAL CONTROL SYSTEM USING SHAKE TABLE TEST

M. Soleymani(corresponding author)
m-soleymani@araku.ac
T. Asgari
t-asgari@arshad.araku.ac.ir
M. Sadeghi
sadeghi70new@gmail.com
Dept. of Mechanical Engineering
Arak University
DOI:10.24200/J30.2018.1922.2079

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 133-142, Research Note

- Received 12 April 2017; received in revised form 9 July 2017; accepted 29 August 2017.

Abstract

In this paper, a semi-active structural control system, which incorporates a magnetorheological damper, is devised, built, and implemented in a two-degree-of-freedom shear frame model. First, parameters of the damper model are identified based on the Bouc-wen model using test data. Furthermore, two control systems, including the skyhook and PID, are implemented in the structure. The performance of the control systems is then evaluated via shake table tests for a sample earthquake. Experimental results reveal that the skyhook control system can successfully mitigate the transmitted accelerations to the floors. As a result, the base shear is considerably decreased. Furthermore, it is shown that performance of the proposed PID control system is quite comparable with that of the ideal skyhook one, implying successful performance of the PID controller in tackling the seismic disturbance.

Key Words: Semi-Active control, MR damper, shake table test.

THE ROLE OF WOODEN ELEMENTS FOR IMPROVING SEISMIC PERFORMANCE AND CRACKING PATTERNS OF MASONRY WALLS

M. Mohammadi Nikou
m.mohamadi30@ymail.com
A.H. Akhaveissy(corresponding author)
Ahakhaveissy@razi.ac.ir
Dept. of Engineering
Razi University, Kermanshah
DOI:10.24200/J30.2018.1845.1981

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 143-152, Research Note

- Received 19 April 2017; received in revised form 1 July 2017; accepted 14 October 2017.

Abstract

Masonry buildings are the most common type of structures in Iran. In spite of their proper compression strength, due to fundamental weakness caused by lack of enough confinement, they are vulnerable during the earthquakes. To improve their seismic performance, various methods have been provided to reinforce and retrofit them, in recent years. There are enough evidence to show that performance of masonry walls has been improved by the placement of wooden elements in the masonry walls. Timber framed buildings are well known as an efficient seismic-resistant structures popular all over the world due to not only their seismic performance, but also for low-cost and ease of access to them. Timber framed buildings generally consist of masonry walls reinforced by horizontal and vertical timber elements.

This paper deals with a numerical study on the structural performance of timber framed masonry walls. The 3D models are generated with the ANSYS program to perform parametric analysis. The models are validated based on the relevant experimental results.

After a number of verification of numerical models of different combinations of masonry wall and timber elements, the load-displacement graph of reinforced walls is extracted. The nonlinear static analysis is used to perform a generation of the program. Then, the impact of wooden elements on strength properties and changing the patterns of cracking in walls in four separate models have been investigated. Non-linear laws for the

• Received 30 May 2017; received in revised form 7 August 2017; accepted 15 August 2017.

Abstract

Nowadays, due to population growth, climate change impacts, hydrological uncertainty, and increasing water requirements, society, more than ever, needs to have an accurate integrated management to supply its demands in different parts such as agriculture, hygienists, and industry. One of the fundamental steps in performing an integrated water resources management in a wide basin, and supplying its demands is the optimum conjunctive use of surface water and groundwater. In this regard, in this study, the optimum utilization of surface water and groundwater resources is applied in Najafabad plain in Gavkhooni basin, which is one of the most important sub-basins due to the following reasons: (1) its contribution to supplying the agricultural needs of the basin, (2) having negative balanced problems and loss of quality and quantity of groundwater resources, (3) having certain complexity in terms of nutritional conditions and interaction between water surfaces such as Zayandehrud River. To solve the problem, the simulation-optimization method using Artificial Neural Network model for simulating and Honey-Bee Mating algorithm as the optimization model was applied. After training Artificial Neural Network model with 276 rows of data from the last 23 years, the optimization model was developed due to different constraints such as water resources capacity, drawdown of water table in aquifer, maximum amount of surface water, and ground water. To create an optimal utilization model, after linking simulation model and optimization models, an operating policy including 3 scenarios with different climatic conditions was developed. The results showed that selected simulation model with R2 above 95 percent and less than 8 percent error in the validation of the model for forecasting has a good performance in simulating the aquifer behavior. In addition, results show that the model can improve the mean groundwater level in three different climatic conditions: wet, normal, and dry years in the left region to the 2.3, 0.75, 1.36 meters and in the right region to the 2.14, 1.14, 0.8 meters, respectively.

Key Words: Water resource management, surface water, groundwater, simulation, artificial neural networks, optimization, honey bee mating algorithm.

EVALUATION OF THE EFFECT OF ALTERNATING POLARITY EXCHANGE ON CRUDE OIL REMOVAL FROM SOIL BY BIOELECTROKINETIC METHOD

B. Khataei
b.khataei@modares.ac.ir
N. Mokhtarani(corresponding author)
mokhtarani@modares.ac.ir
H. Ganjidoust
h-ganji@modares.ac.ir
Dept. of Civil and Environment Engineering
Tarbiat Modares University
DOI:10.24200/J30.2018.1919.2014

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 123-131, Research Note

• Received 21 December 2016; received in revised form 7 August 2017; accepted 21 August 2017.

Abstract

Removal of petroleum hydrocarbons from contaminated soil using electrokinetic method or biological processes has been considered in recent century. The most limiting factors in the electrokinetic process are extreme changes in pH around the electrodes and non-polarity of some pollutants. On the other hand, the key factor of biological treatment is simultaneous presence of microorganisms, pollutants (carbon source of microorganisms), electron acceptors, and essential nutrients for microorganisms' growth. But in fine-grained soils with low permeability, it is difficult to uniformly distribute bacteria, electron acceptors and nutrients, or making available pollutants for microorganisms. To solve these problems, bioelectrokinetic method is used to eliminate the limitations of both biological and electrokinetic processes. But the main limitation of this hybrid method is reduction of decomposition rate due to pH extreme changes caused by electrolysis reactions in electrodes. This study investigates the influence of alternating polarity exchange on soil conditions, bacteria pollution and thus removal efficiency of crude oil from kaolin by bioelectrokinetic method in the presence of Pseudomonas Putida strain. Effects of initial concentration of crude oil and voltage gradient on soil treatment were also evaluated. In this study each test was conducted in cylindrical cells made of Plexiglas with the length and diameter equal to 55 and 5 cm respectively, for 35 days. Based on the results, in experiments without polarity exchange, due to extreme changes in soil pH and therefore effect on the electroosmosis flow and bacteria activity, overall crude oil degradation rate was decreased. However, applying alternative polarity exchange, soil pH was retained in the neutral range. Then, better activity of bacteria caused the treatment efficiency improvement. According to the results, during a 35-day process, switching polarity in 1-hour periods increased pollutants removal efficiency

Earthquake Standard No. 2800. To analyze these structures, nonlinear dynamic time history analysis method has been used for seven accelerograms of far-field earthquake and seven accelerograms of near-field earthquake. Analysis of both cases of the fixed base and the base of interaction was carried out, and the results showed that shear-to-weight ratio of the effective cumulative story on soils of harder classes (Type 3), in both near- and far-field earthquakes, inconsiderably changed. However, in softer soil classes (Type 4), in both near- and far-field earthquakes, this ratio decreases. The relative structures of stories displacement (drift) in hard soil classes to soft soil classes have a lower rise, and this problem in soft soil classes can result in further damage to the structures. The results showed that the effect of the behavior of steel-plate shear wall systems with thin sheets in near-field earthquake is proven to be high.

Key Words: Thin steel plate shear wall, soil-structure interaction, far field and near field earthquake.

NUMERICAL STUDY OF 1D AND 2D SEISMIC RESPONSE OF SEDIMENTARY BASINS: CASE STUDY OF PERSIAN GULF BRIDGE

M. Rahimi
rahimmashaie.maryam@yahoo.com
H. Alielahi(corresponding author)
h.alielahi@iauz.ac.ir
Dept. of Civil Engineering
Zanjan Branch, Islamic Azad University
DOI:10.24200/J30.2018.2211.2137

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 97-109, Original Article

- Received 28 May 2017; received in revised form 7 August 2017; accepted 14 October 2017.

Abstract

The experience obtained from recent earthquakes has indicated the influence of local geologic conditions on the significant characteristics of strong ground motion including amplitude and frequency content. In this regard, the role of material properties of alluvial layers and the topography of the site can be significant. This paper studies the effect of mentioned parameters on the Basin of Persian Gulf Bridge, considering the complex seismic characteristics by 1D (equivalent column) and 2D analysis, using FLAC2D software based on Visco-elastic soil behavior. In addition, in order to verify the numerical modeling, the 1D analysis is conducted by FLAC2D and DEEPSOIL programs for each pier of bridge due to 18 input motions. The obtained results indicated that the local variations of topography and sediment deposit might affect the propagation of seismic waves, resulting in a significant difference in the spatial variation of ground motions. Furthermore, the results represent the significant influence of mentioned parameters on the seismic amplification patterns, predominant period and response spectra of site. As a result, in comparison of 1D and 2D results, the maximum amplification is observed in periodic bound of 0.5 to 1s at surface of sediment canyon. Moreover, in periods greater than 1s the amplification values of 1D and 2D analysis almost coincide. The obtained PGA values of both analyses more than the input motion is observed. Besides, the predominant period of 2D model has been greater than 1D model especially in the corners of basin. In comparison with the obtained response spectra of 1D and 2D models and the design spectrum of AASHTO code, it is observed that the results of AASHTO in the periods greater than 1s can be conservative. Finally, it can be concluded that the 1D results can lead to unrealistic results in design of Persian Gulf Bridge. Hence, a careful consideration of 2D model can provide more accurate results.

Key Words: Site effects, topographic features, alluvial sediments, 1D and 2D numerical analysis, seismic amplification.

CONJUNCTIVE MANAGEMENT OF GROUNDWATER AND SURFACE WATER USING HONEY-BEE MATING ALGORITHM

M. Kalantari
m.kalamtari@cv.iut.ac.ir
H.R. Safavi(corresponding author)
hasafavi@cc.iut.ac.ir
Dept. of Civil Engineering
Isfahan University of Technology
O. Bozorg Haddad
obhaddad@ut.ac.ir
Dept. of Irrigation and Reclamation Engineering
College of Agriculture and Natural Resources
University of Tehran
DOI:10.24200/J30.2018.2188.2130

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 111-122, Original Article

Sh. Dabirian(corresponding author)
sh.dabirian@aui.ac.ir
Faculty of Architecture and Urban Design
School Art University of Isfahan
S. Abbaspour
s.abbaspour@khuisf.ac.ir
Dept. of Engineering and Management
Islamic Azad University Isfahan
Khorasgan Branch
M. Khanzadi
khanzadi@iust.ac.ir
Dept. of Engineering and Civil Engineering
Iran University of Science and Technology
DOI:10.24200/J30.2018.2152.2115

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 69-79, Original Article

- Received 7 May 2017; received in revised form 17 July 2017; accepted 8 August 2017.

Abstract

Human resource management is regarded as a fundamental process for effective labor application to ensure desired performance in the project. The project goals are met only through human resource management, and the project success relies on it. Construction is a labor-intensive industry that heavily depends on human resources. Moreover, construction projects are naturally complex and dynamics. One of the effective human resource management practices that greatly affects the project workflow and progress is to obtain required labor. System dynamics is applied to model the labor requirements of the construction projects', considering project dynamics. System dynamics is used as a research tool to provide useful insights for human resource planners to ensure that the project will be delivered on time and within the budget. The labor need of the construction projects is investigated based on project progress. A causal loop diagram is obtained, and the Stock-Flow model is developed for estimating the labor need of the construction projects. The proposed model consists of subsystems including the human resources, project workflow, project performance indexes, and policies. The required data are collected for a housing project executed in Iran. Finally, the dynamic model of the labor need of construction projects is built. The model has been validated using standard testing methods of system dynamics models. Simulation results show that the required labor in construction projects has fluctuations over time. These fluctuations affect the labor supplying process. Two policies have been proposed to reduce the fluctuations of the labor need of construction projects including hiring policy at different times and employment of different groups of the labor in terms of experience and skills. Although both policies improve the system, each one of them has different effects on project performance. By using the model, the required labor based on project progress can be determined. The opportunity can be given to decision-makers to plan for timely supply of project labor.

Key Words: Human resource management, labor need, simulation, construction projects, system dynamics.

STUDY BEHAVIOR OF THIN STEEL PLATE SHEAR WALL SYSTEM BY EFFECT OF THE SOIL - STRUCTURE INTERACTION UNDER AWAY FROM THE FAULT AND NEAR THE FAULT EARTHQUAKES

M. Gholhaki(corresponding author)
mgholhaki@semnan.ac.ir
S. Balool
sinabalool@semnan.ac.ir
O. Rezayfar
orezayfar@semnan.ac.ir
Dept. of Civil Engineering
Semnan University
DOI:10.24200/J30.2018.2183.2127

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 81-95, Original Article

- Received 24 May 2017; received in revised form 21 August 2017; accepted 23 September 2017.

Abstract

The methods for regulations of the analysis of structures are based on the assumption that the structures are located on a rigid substrate, while the studies demonstrate that the soil effect causes a significant change in the structural response. Apart from the discussion of soil-structure interaction, the nature of near-field and far-field earthquakes is at focus here. Nearfield earthquakes are different from far-field earthquakes in terms of both amplitude and frequency content. In this study, the impact of soil-structure interaction between near-field and far-field earthquakes on the structures whose lateral load-bearing system is the thin steel plate shear wall has been investigated. The models applied in this study include six-, twelve-, and twenty-five-storey structures with the system of thin steel plate shear wall, and there are two types of soft and hard soil beneath these structures which respectively have the properties of soil types 3 and 4 and have been modeled according to Iranian

is dependent on the location of the force applied to the span or the frame. The results show the effectiveness of this approach, particularly in the third case .

Key Words: Optimization, tapered frames, multi-search method, prestressing.

A NEW RELATIONSHIP FOR ESTIMATING THE SEISMIC INTERACTION OF FLOATING PILE ROW-SANDY SLOPE BY ANALYTICAL TRANSFORM OF M-Z AND P-Y CURVES

H. Sharafi(corresponding author)
h_sharafi@razi.ac.ir
Y. Shams Maleki
yazdan_12507@yahoo.com
Dept. of Civil Engineering
Razi University, Kermanshah
DOI:10.24200/J30.2018.2170.2116

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 51-67, Original Article

- Received 1 May 2017; received in revised form 8 July 2017; accepted 8 August 2017.

Abstract

Considering countless repetitions of Gaussian-shape bending moment-depth curves, M(z)-z, in the results of several experimental/numerical and static-seismic physical modeling, suggestion of a new relationship for using this opportunity appears to be suitable. This relationship is created a connection between high-used p-y curves and the structural internal efforts of piles in the form of bending moment along the piles lengths. In this study, the bending moment equation along the depth for the issue of floating pile row under near-fault earthquake lateral loading in the dry sandy slope is obtained by using the results of the three-dimensional numerical models and physical models. Therefore, in the next step, the values of bending moment by the suggested new relationships transform to the proportional p-y curves. The main abilities and advantages of the new suggested relationships include generation of relationships compatible for different soil types such as clayey soils (i.e., cohesive soils), mixed cohesive-granular soils, sandy soil and some weak rocks. Furthermore, other advantages of new relationships include (1) the compatibility of relationships with the experimental tests and the static field tests, cyclic, and seismic modeling, (2) have no need to calculate slip depth in the sliding sand mass in the sandy slope failure problem and the fully analytical form of the relationships. In addition, all the conducted mathematical calculations are done in the parametric form; therefore, all other kinds of similar problems can be totally computed by the suggested new analytical relationships. In this study, the mathematical-analytical relationships among monotonic static p-y curves, tangent hyperbolic cyclic p-y curves, and Gaussian bending moment curves were presented. The Gaussian-shape bending-moment curves have been calculated for dynamic loading of floating pile row in the dry sandy slope under different combinations of near-fault earthquakes.

According to the findings of the present paper, the values of Gaussian bending moment curves can be simply transformed to the soil pressure, p, and relative pile-soil deflection, y. Essentially, by using this strategy, the quantity of generated stresses within the soil due to pile lateral loading and soil yielding or soil plasticity can be controlled. On the other hand, by understanding the deflection of pile, y, the values of pile lateral deflection can be compared with allowable deflections in each project; the surviving of the superstructure can be judged based on the pile in the safe zone. In each arbitrary depth, the values of two parameters pu and Ki are different, and the values of these two parameters generally depend on the depth change; in addition, these differences there are between p-y curves in the different depths. The slope of the initial portion of both static and cyclic p-y curves at points p=0 (equivalent to the earth surface i.e., z=0 in the sandy soils) and y=0, according to the present article calculations is always Ki, which is a stress-kind parameter and has a stress unit. The findings of the paper show that the shape of the bending moment curves obtained from the double integration of static and cyclic p-y curves, p(z) component, similar to the shape of numerical bending moment curves, is Gaussian. Moreover, the sign and depth-pattern of the obtained bending moment curves are completely similar to the considered predictions. The depth location of the maximum bending moment from double integration of static monotonic p-y curves is in a depth that is close to the depth of the maximum bending moment of numerical results, while the maximum bending moment from double integration of cyclic p-y curves occurs in the shallow depth (i.e., at the zone of failure surface of the slope).

Key Words: Pile row, sandy slope, physical and numerical modeling, p-y curves, M-z curves.

DYNAMIC MODELING OF CONSTRUCTION PROJECTS' LABOR NEED

Volume 35, Issue 2.2, Page 29-38, Original Article

- Received 10 April 2017; received in revised form 29 July 2017; accepted 21 August 2017.

Abstract

Compared to typical hot-mix asphalt (HMA), Warm-mix asphalt (WMA) is produced at a lower temperature; therefore, it can be a good alternative for pavement located in cold climates. On the other hand, the low-temperature cracking is one of the main concerns of highways agencies in cold climates. Many different additives including fibers have been used for improving hot-mix asphalt performance; however, a few types of research have been conducted to investigate the effects of fibers on warm-mix asphalt performance. In this paper, warm-mix asphalt containing Sasobit and different percentages of natural and synthesis fibers (0.7%, 0.5% and 0.3% by weight of the total warm mix asphalt) were prepared by gyratory compactor. The cylinder specimens were cut to prepare semi-circular bending (SCB) specimens to determine the critical intensity factor (fracture toughness) of the warm-mix asphalt specimens. Using ABAQUS software the finite element analysis was conducted to determine the geometry factors and crack positions for pure tension (mode I), pure shear (mode II) and mixed modes (I/II). The cracked specimens were loaded at a constant rate (3 mm/min) at 0 oC, -10 oC and -20 oC until they were fractured; then the fracture toughness of each specimen was calculated. Analysis of test results indicated that the fracture toughness of warm-mix asphalt specimens containing natural or synthesis fibers increased when the temperature test decreased. In addition, the tests results showed that fracture toughness of warm mix specimens containing natural or synthesis fibers in mixed mode (with the same portion of tension and shear) and pure tension mode are higher than that of the control asphalt mixtures. However, this trend was not observed for loading modes with the higher portion of shear, especially for specimens containing natural fibers. Furthermore, in the same percentages of fibers, the effect of synthesis fibers to improve the fracture toughness of the mixtures was higher than that of the natural fibers.

Key Words: Warm-mix asphalt, fracture toughness, low temperature, natural fibers, synthesis fibers.

OPTIMIZATION OF TAPERED FRAMES BY MULTI-SEARCH METHOD AND APPLYING PRESTRESSING FORCE IN MEMBERS

V.R. Kalatjari
V.Kalatjari@gmail.com
Dept. of Civil Engineering
Shahrood University of Technology
M.H. Talebpour(corresponding author)
M.H.Talebpour@du.ac.ir
Dept. of Engineering
Damghan University
A. Askari
Abolfazl.askari@yahoo.com
Dept. of Civil Engineering
Shahrood University of Technology
DOI:10.24200/J30.2018.2122.2097

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 39-50, Original Article

- Received 30 April 2017; received in revised form 15 August 2017; accepted 5 September 2017.

Abstract

In recent years, the application of tapered frames has increased in industry. In this regard, many researchers investigate different approaches to optimizing the design procedure of the industrial tapered frame. In this paper, optimization of tapered frames by applying prestressing force has been demonstrated to minimize the weight of the whole structure. Multi-Search Method (M.S.M) based on GA has been selected as the approach to optimization. Therefore, steel tapered frame has been optimized using M.S.M on the base of AISC code. The results of the process in each step, including analysis, design, and optimization, have been verified by comparing it with analytical solution. In the aforementioned process, each member of frame has 5 optimized design variables including height of web at the end of member, thickness of web, thickness of flange, and width of flange. In addition, the optimal prestressing force is provided by the code. The place of the applied prestressing force has been determined at the bottom and the top of column. The prestressed cable is one of the practical methods for applying force. The location and amount of prestressing force are the variables of optimization. Regarding the practical approach to applying prestressing in the steel structure, the prestressing force has been applied in three locations. In the first, second, and third cases, the force has been applied to the bottom of the column, the top of the column, and the top and bottom of the column, respectively. In each case, the prestressing force as a variable will be optimized. The efficiency of applying prestressing force has been evaluated by means of examples with different geometries and spans. The obtained results indicate the effect of applying presressing force to the tapered frames. The effectiveness of this method

mark cracked plates are calculated. The obtained results compared with the values obtained by the other analytical and numerical methods presented in literature where good agreement can be seen. These comparisons indicate the capability of the presented FVM for studying of the cracked plates. Furthermore, the size of support domain found in this research can be considered as the convenient values for the FVM analysis of cracked plate in the future researches.

Key Words: Reissner cracked plate, stress intensity factor, moving least squares.

MATHEMATICAL MODELING OF HYDRAULIC FRACTURE PROPAGATION IN ELASTIC MEDIUM: VISCOSITY-TOUGHNESS-DOMINATED

A. Asgari(corresponding author)
a.asgari@umz.ac.ir
Faculty of Engineering and Technology
University of Mazandaran
A.A. Golshani
golshani@modares.ac.ir
Dept. of Civil and Environmental Engineering
Tarbiat Modares University
DOI:10.24200/J30.2018.1991.2094

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 17-28, Original Article

- Received 12 April 2017; received in revised form 13 August 2017; accepted 29 August 2017.

Abstract

In the process of hydraulic fracture, various physical parameters such as; viscosity, inertia of fluid and toughness of rock do not influence the fracture propagation identically, and it is probable that one or more of the parameters be more pronounced. Therefore, it may persuade one special regime which is named base on dissipation of energy. In an impermeable rock, the two limiting regimes can be identified with the dominance of one or the other of the two energy dissipation mechanisms corresponding to extending the fracture in the rock and to flow of viscous fluid in the fracture, respectively. In the viscosity-dominated regime, dissipation in extending the fracture in the rock is negligible compared to the dissipation in the viscous fluid flow, and in the toughness-dominated regime, the opposite holds. Here, it is supposed that the flow of incompressible fluid in the fracture is unidirectional and laminar. Besides, the fracture is fully fluid-filled at all times and fracture propagation is described in the framework of linear elastic fracture mechanics (LEFM). In this paper, a new semi-analytical method has been introduced for solving the plane-strain fluid-driven fracture propagating in an impermeable medium in viscosity-toughness dominated (the MK-edge solution). Standard methods of analysis and improvement of diverging series have been applied on the expansion series method to gain the more convergence for the viscosity series diverge due to a nearest (non-physical) singularity on the negative real axis of the viscosity parameter for larger viscosity. For more explanation, Euler transformations have been suggested in terms of small parameter which is a function of viscosity parameter. Compared to the other analytical solution (e.g. Garagash, 2006), the new M-K edge solution represents a significant improvement in term of convergence. In addition to, the results have been compared to the numerical solution (e.g. Adachi, 2000) and it is shown good agreement in the light of quantity and quality. Contrary to numerical methods, the new proposed method can pragmatically be used for the range of M-K edge.

Key Words: Hydraulic fracture; viscosity-toughness dominated; expansion series; euler transformation.

EVALUATION OF FRACTURE TOUGHNESS OF WARM-MIX ASPHALT CONTAINING NATURAL AND SYNTHESIS FIBERS AT LOW TEMPERATURES

A. Mansourian(corresponding author)
a.mansourian@bhrc.ac.ir
Dept. of Bitumen and Asphalt, Road Housing and Urban development Research Center
A. Razmi
m_razmi@iau-ahar.ac.ir
M. Razavi
a_razavi@iau-ahar.ac.ir
Faculty of Engineering
Ahar Branch, Islamic Azad University
M.R. Mohammad Aliha
mrm_aliha@iust.ac.ir
Dept. of Industrial Engineering
Iran University of Science and Technology
DOI:10.24200/J30.2018.2139.2107

Sharif Civil Engineering Journal

Abstracts of Papers in English

USING MOVING LEAST SQUARES APPROXIMATION FUNCTION IN THE FINITE VOLUME METHOD FOR THE CALCULATION OF THE STRESS INTENSITY FACTOR OF THE CRACKED BENDING PLATES

A. Amraei
amraei_a@yahoo.com
N. Fallah(corresponding author)
fallah@guilan.ac.ir
Dept. of Civil Engineering
University of Guilan
DOI:10.24200/J30.2018.1974.2045

Sharif Civil Engineering Journal
Volume 35, Issue 2.2, Page 3-15, Original Article

- Received 13 February 2017; received in revised form 17 July 2017; accepted 16 September 2017.

Abstract

Due to cyclic nature of applied pressure on engineering structures like airplane fuselages, storage tanks, and ship hulls, members evolving the through crack, results in the sudden failure; so-called as fatigue fracture. Investigation of this type of fracture is an important issue for a successful design of these structures. On the other hand, the finite volume method (FVM) as a well-known method in the computational mechanics, is found as a powerful method for the bending analysis of beams and plates, with no matter of thickness varies from very thin to moderately thick beams and plates. Usually in this method, according to the classic approximation of the field variables, the displacement at a favorite point on the face of control volume is approximated linearly in terms of displacement of cell centers adjacent to that face. However, accuracy of the approximation can be increased by using of the higher-order approximation techniques like Moving Least Squares (MLS) approximation which is well suited in the mesh free methods. In this research the MLS approximation is used in the finite volume method, and the Reissner plate with a through-the-thickness crack (through crack) is analyzed for the computation of the stress intensity factors (SIFs) at the crack tip. First, the influence of the size of support domain as one of the key parameter of the MLS approximation is investigated. By using of the obtained value of the support domain size, the SIF values of several bench-