

ABSTRACTS OF PAPERS IN ENGLISH

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**MODELING OF NITRATE
CONTAMINATION IN
UNSATURATED ZONE OF
TEHRAN AQUIFER:
COMBINATION OF LUMP
PARAMETER AND MASS
BALANCE METHODS**

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Abstract

Regarding urban and industrial development, greater Tehran, with a population of more than 6.8 million, suffers continuously from lack of water. In addition, because of the geographical characteristics of Tehran, which is located in an arid and semi-arid region, the critical role of groundwater resources in supplying drinking water has doubled. Groundwater has a major and outstanding role in responding to the drinking water demand of Tehran's inhabi-

tants a 45% share of which has been contaminated by human activities over a period of several years. In this paper, nitrate has been considered as the best criterion for showing groundwater contamination, especially due to anthropogenic activities. In order to study nitrate contamination in groundwater in Tehran, there are several problems such as lack of data, and the large area of the case study, as well as the complexity of nitrate activity. Hence, some methods, such as complicated numerical models, which need detailed data, were useless. All of the methods were developed in the GIS base using ArcGIS software. This study focuses on contaminant sources, unsaturated zone nitrogen activity and the amount of nitrate discharged into groundwater. At first, contaminant sources were studied and major sources were determined. As a result, it was found that wastewater (95%), parks and agriculture activities (4%) and contamination due to air pollution (1%) were the major sources of nitrogen discharge in groundwater.

Furthermore, a simulation of the nitrogen compounds, activity was done, in order to assess the discharged amounts of nitrogen and nitrate activity in the unsaturated zone, as well as the in-depth removal of nitrogen compounds. Modeling of nitrate activity in the unsaturated zone was done

by a lump parameter method in a one-dimensional model as well as by a mass balance method. Utilizing these two methods lead to an understanding of nitrate and nitrogen compound activities in the unsaturated zone. According to the results, nitrate will be produced in depths of between 2 and 3 meters. Although the ammonia amount decreases very fast, in the first meters the rate of ammonia removal decreases gradually. In depths of between 20 and 30 meters, the rate of removal is almost fixed and very low. Based on the results of the mass balance method, 55% of nitrogen compounds are averagely removed in the unsaturated zone. These methods had good correlations in the results, which shows their versatility in the study of cases such as Tehran, in which there are not enough and reliable data.

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APPLICATION OF DAMAGE INDEXES IN NONLINEAR ANALYSIS OF STEEL FRAMES BY ENDURANCE TIME METHOD

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Abstract

Development of sound methods for analysis, construction and retrofit of the structures located in high seismicity areas is one of the most effective methods for reduction of losses. In recent years, along with the developments in computational technology and considerable increase of experience and knowledge in the seismic behavior of structures, alternative methods for evaluation and design of earthquake resistant structures have been proposed. Endurance Time is one of these methods, in which seismic resistance of structures is evaluated considering their performance, while subjected to calibrated intensifying accelerograms. In this paper, damage indexes that can be used in evaluation of endurance time for steel frames, have been studied. Application of endurance time linear and nonlinear analysis of these structures is investigated. The concept of endurance time is explained. Sample intensifying acceleration functions and a few popu-

lar damage indexes are selected. Steel frames with 3, 7 and 15 stories are designed and linear and nonlinear static and dynamic analyses under predefined accelerograms are performed. Variations of damage indexes as a function of time are calculated. Endurance time, considering these damage indexes, is calculated and the results of nonlinear endurance time analysis of the steel frames using the OpenSeas program are explained and discussed.

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THE EARTH PRESSURE AT REST UNDER CYCLIC SURCHARGES

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Abstract

Dynamic earth pressure, due to its complicated nature and the unknown problems associated with the values and point of application of the pressure developed behind the wall, needs to be further studied and investigated. In spite of large and extensive research carried out in this regard, a specific method or building code, by which dynamic earth pressure can be calculated accurately, have not been recommended. One of the most reliable ways to determine dynamic earth pressure may still be to develop a physical model, which, in some cases, is time and money consuming.

Although many investigations have been performed to study the behavior of retaining walls subjected to earthquake loadings and valuable results have been achieved in this regard, the exact pattern of the pressure acting behind the wall and the soil-wall interaction in this condition have not been clearly specified.

To study the behavior of retaining walls under cyclic surcharges, as a limited but the most common type of the dynamic loadings produced by the traffic loadings, due to easier nature, may play a fundamental and helpful role in this respect.

In this paper, a great effort has been made to model soil-wall interaction under cyclic loading surcharges by a special geotechnical software (PLAXIS) using the finite element method. Since, prior to this study, a physical model, capable of studying earth pressure behind the medium scale model retaining

walls under different loading and constraint conditions, has been developed in the department, the experimental data obtained from this model during different tests, have been used to verify and validate the analytical model developed in this study.

The influences of frequency, number of load cycles, surcharge amplitude, distance of load from the wall and the soil density have been studied and investigated. Finally, the analytical results were compared with the experimental results and some new and further recommendations have been suggested in connection with soil-wall interaction under cyclic surcharges.

■ DELAY FUNCTION FOR SIGNALIZED INTERSECTIONS

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Abstract

Delay at intersections constitutes a major part of travel time in urban networks. Nevertheless, in traffic assignment models, intersection delay is either ignored or assumed constant, due to difficulties in considering the delay for one approach as a function of various conflicting approach traffic volumes, as well as lack of appropriate functions to measure the delay. In this paper, by using the data which has been collected from five intersections in the city of Tehran, two types of delay function are presented which are, not only dependent on the traffic light setting and the approaching traffic volume, but, depend on the traffic volume in conflicting approaches. Moreover, based on the data collected in a signalized intersection which was previously unsignalized, the effect of traffic light installation on an unsignalized intersection is closely studied. Finally, two actuated signalized intersections are examined to see the effect of installed actuated traffic light systems upon intersection delay.

■ A TWO-DIMENSIONAL CURVILINEAR MODEL OF

POLLUTANT DISPERSION IN RIVERS

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Abstract

This paper is concerned with the introduction of PDM2, a 2D curvilinear model of dispersion of pollutants in rivers of variable geometry. The model can handle rivers with variable width, depth and path and is capable of grid generation, input data preparation and the processing of output results. The governing two-dimensional advection-dispersion equation is solved numerically, using a finite difference technique. The numerical scheme used is second order accurate in time and space and is unconditionally stable. Pollutant dispersion is assumed to be unsteady. Considering the present gap of knowledge about the mechanics of mixing in rivers and the uncertainties in the proposed equations for mixing coefficients, the model makes use of a number of simplifying assumptions in order to reduce the amount of input data. These are the assumptions of steady river flow and constant depth across the river. The formulation and structure of the model, along with an illustrative example, are discussed in this paper.

■ OBJECTIVE ANALYSIS OF STRAIN LOCALIZATION PHENOMENON

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Abstract

In this paper, at first the philosophical concept of objectivity in scientific studies and analyses is described. Then, its meaning in damage analysis and, especially, "strain localization analyses" is represented. After that, the most important solution for making an analysis objective i.e. using the non-local values of relevant variables, is discussed. Then, the current idea on objective analysis based on the secant modulus, is represented and the authors suggestion for objective analysis, based on the tangent

modulus, is represented. Finally, a sample problem is solved.

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CLASSIFICATION OF INDUSTRIAL SOLID WASTES AND ITS IMPORTANCE IN RECYCLING AND DETERMINATION OF LANDFILL TYPE

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Abstract

Solid waste and its disposal procedures have always been a source of trouble for industries. Although in solid waste management "volume reduction" and "recycling" have priority over "land disposal", the landfilling of industrial solid waste is considered to be the most common method in solid waste management. Due to the variability of industrial solid waste, classification plays an important role in a sound waste management system and the proper land disposal of waste in engineered sanitary landfills. In this paper, based on past experiences in other countries, a classification method is proposed for Iran which does not require chemical experiments. This classification method has been applied to the industrial solid wastes of the Gilan province as a case study. In the province of Gilan more than 2000 industrial units are operating and, because of the high level of ground water, the landfilling of solid waste poses serious problems. For determining the appropriate type of landfill for each of the waste types, first of all, different kinds of solid waste should be classified. Since there was no data or statistics regarding the solid waste generated by the industries, 142 industrial units were selected as representative samples for data gathering. These units were carefully selected so that the obtained data could be generalized to other similar industrial units in the province. This study revealed that 86 types of solid waste are produced in Gilan's industrial sector. For classification of these 86 types of wastes, 10 major criteria that in-

dicating the level of hazard caused have been introduced. Each of these criteria has an Importance Factor associated with them, which varies between 0 and 20. The severity of each criteria is evaluated using the gathered quality data and a severity factor ranged between 0 (not existent) to 4 (highest severity) is specified. By multiplying the Importance Factor by the severity Factor and adding the values of multiplications, a Hazard Ratio (R_H) for each of the 86 types of solid waste is obtained. Based upon R_H , the industrial solid waste of the Gilan province are classified into 4 groups and, for each group of waste, a class of engineered landfill is proposed.

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CORRECTION OF EQUIVALENT MEDIA PROPOSED BY SITHARAM AND VERIFICATION OF THE MODIFIED CRITERION

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Abstract

Sitharam proposed empirical equations in the year 2000 to evaluate the elastic modulus and the compression strength of rock masses. The equation proposed by him for evaluation of the elastic modulus is dependent on coefficient "a". He has introduced this coefficient up to 7Mpa of confining pressure. In this paper, a correction of the Sitharam equation is dealt with and, also, the coefficient "a" has been proposed up to a confining pressure of 60 Mpa, although the verification of the confining pressure was undertaken up to 20 Mpa.

Verification of the modified equation is undertaken with a hypothetical numerical model. These models were constructed considering the equivalent (continuum) and discontinuum media. Flac was used for analysis of the equivalent and UDEC for the discontinuum media. These models were investigated for various conditions of joint distances, joint dips, etc. The results obtained are satisfactory for the above-mentioned equation and also for different values of "a". The Sitharam equation for evaluation of rock equivalent strength has also been compared

with Hoek & Brown, Ramamurthy, Kalamars and Barton equations. The results show that the Sitharam equation is over estimating in comparison with others, whereas the Barton equation is under estimating. Ramamurthy and Kalamars equations estimate almost the same strength for the rock masses.

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**A NEW MODEL FOR
 ESTIMATING OF THE
 SOIL-WATER
 CHARACTERISTIC CURVE
 IN COHESIVE SOILS**

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Abstract

The measurement of soil parameters for unsaturated soil constitutive models needs extensive laboratory tests. For most practical problems, it has been found that approximate soil properties are adequate for analysis. Thus, empirical procedures to evaluate unsaturated soil parameters would be valuable. The soil-water characteristic curve (SWCC) can be used to estimate various parameters used to describe unsaturated soil behavior. The SWCC is a relationship between soil suction and some measure of the water content. It can be measured or predicted, based on soil index properties. Estimation based on index properties is highly desirable, due to its simplicity and low cost.

In this paper, a new model for predicting the SWCC, based on soil index properties and the Van Genuchten equation, is presented. The comparisons show that the SWCC predicted by this model is in good agreement with the experimental results.