IJBPAS, June, 2015, 4(6): 3282-3290

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

CONSIDERATION OF SURFACING IMPAIRMENTS IN THE ROADS OF KHUZISTAN PROVINCE BY MEANS OF ANALYTIC HIERARCHY PROCESS (AHP)

RAHMAN BAHRAMI ZADEH[1, 2*], SIROUS RADKIA[3], MASOUD OULAPOUR[4]

1: Department of Civil Engineering, Khouzestan Science and Research Branch, Islamic Azad University, Ahvaz, Iran.

2: Department of Civil Engineering, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran.

3: Khouzestan Construction Engineering Disciplinary Organization.

4: Assistant Professor, Civil Engineering Department, Shahid Chamran Univerrsity, Ahvaz, Iran

***Corresponding Author E Mail: rbz1354@gmail.com**

ABSTRACT

The aim of this essay is to scrutinize the impairments out of surfacing roads in Khuzistan province by means of analytic hierarchical process.

In this research by means of questionnaires which are being filled by some experts in the field of pavement management and maintenance of road surfacing some comparisons are being made. The number of these questionnaires are being considered as ten until more dependable results get achieved. A questionnaire for this issue is being compiled and being distributed among the experts of road surfacing or pavement in Khuzistan province and its results are being measured in the software of Expert Choice.

After comparing of choices based on the criterion of time the results which are relevant to the impairments with more positive influence on road surfacing (pavement) are being achieved. The results illustrates that the impairments of outgrowth, lengthwise crack, widthwise crack, tar staining, weathering, are being presented as the main impairments based on the criterion of time. By comparing of the choices based on the criterion of cost the results show that tar staining impairments, crocodile cracking, outgrowth, and weathering are being recognized as the most optimal impairments that by removing them the most positive influence on road surfacing based on the criterion for ease of paving will appear. Comparison of the choices

based on the criterion of traffic shows that outgrowth impairments, weathering, crocodile cracking, and track disruption are being recognized as the most optimal impairments that by repairing them the most positive influence on road surfacing (pavement) appears which these impairments are being recognized based on the traffic criterion.

Key words: Impairment, Pavement, AHP (Analytic Hierarchy Process) Method

INTRODUCTION

Pavement management system bestows a systematic and coherent method to choose the necessities or exigencies of repairing and maintenance and determination of priorities and the optimal time of repairing throughout predicting the situation of pavement in future. **(Gholami, 2010, pp.81-88)**

Lamptey *et al*.(2008) in an essay titled as "deciding on the optimal timing for the preventive maintenance of highway paving in the reconstruction cycle" went into carry out a case study on the optimal choice of the kind and the time of preventive maintenance which influences the repairing lifecycle.

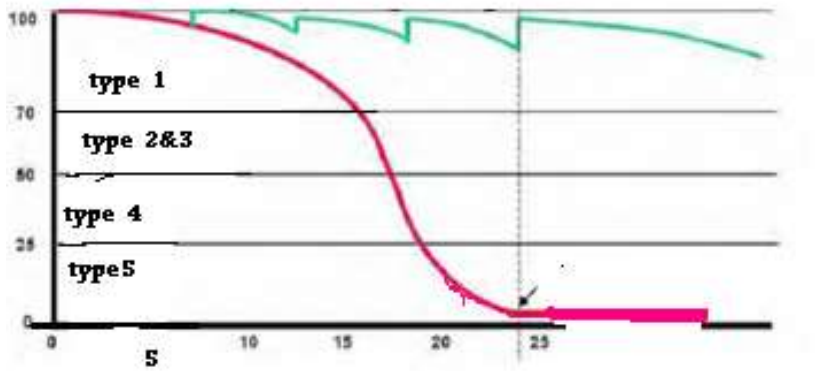
Preventive maintenance through highway agencies is being applied and day to day this affair is ever increasing. This method is being built based on this hypothesis that we should prevent the complete destruction of road paving and the need to its reconstruction. Due to the limitation of budget and financial resources highway paving agencies concerning the application of new and optimal ingredients have an intense competition with each other. Total costs of planning for the preventive maintenance are enumerated as costs of highway agencies, and costs of road paving users. The authors of this essay while considering the issues concerning the lifecycle are looking for a proper repair and also determining the prime time for this affair. The results which are being obtained from behavior influence analysis are being presented in a table in which the function of repairs appears in the two forms of immediate and slow. To do pavings which are not in a proper situation immediate repair and for pavings with little impairs milder impairs are being considered.

Tabatabayi et al.(2009), in an essay titled as "using paving management to choose the most economic strategy, determination of optimal time for repairing, and maintenance and the least surfacing costs during the lifetime used the paving management system. Based on this method the costs are being calculated in a realistic manner and by means of the discount rate of these costs they are being transmitted to the first year. Pavement management system is a targeted instrument for managers which is being designed to increase the efficiency of

decision-making and finding an effective and economic strategy for assessing, repairing, maintenance, and protection of road pavements in an acceptable level. This system is an informational, analytical, and evolutionary system that its data should be analyzed by means of a plan which is being regulated based on the modern engineering sciences and technologies, economic technologies and evolutions until a possibility for performing a economic feasibility study and an engineering strategy to repair, treatment, and optimal and on time protection and maintenance appear.

In this essay a case study on the road paving conditions from 1996 to 2011 in the city of Grisham is being stated as a sample in which the costs of road paving in the first year and its repair and maintenance is being illustrated.

Road paving condition in a good or excellent situation in the lifetime of designing remains.
total sum=$1870
Three successive times tar grout by a six year distance by a cost of $2.4 in 0.91 square meter+paving with a cost of $11.5 in 0.91 square meter.



reconstruction by a cost of $38.50 per each 0.91 square meter

Above **Diagram** road paving in case of periodical repair vs. total reconstruction plus costs. As it's being observed incase in a proper period that is after fifteen years of time (after paving) the repairing operation being carried out the best economical saving during the life cycle of a road occurs. By considering the presented results in this essay on a part of Andimeshk-Ahvaz road and considering the various scenarios to perform repairing and maintenance during the lifetime of the performed designing the proper time for the performance of repairing is being set as fifteen years. (Tabatabayi, 2009)

Gholami and Rezayimehr(2010), in an essay titled as "considering the types of repairing methods in the preventive maintenance of road and the way of choosing the optimal way" got into choosing the most optimal required way of repairing and maintaining for paving and the proper time of doing it. Characteristics which are being considered in choosing the preventive methods are enumerated as lifetime, the influence of intended maintenance method, the influence of existing paving situation on the applied method and vice versa, climatic influences and their costs are being considered as well. In the present essay consideration of the following items for correct performance of the work are being enumerated:

1-Selection of road paving.

2-proper time.

3-proper repair.

The first choice of repair is being performed based on one of the two methods of branch diagrams of decision-making and decision-making matrices. To choose the proper method of repairing determination of the optimal time of using repairing and its cost and finally engineering judgment are being suggested. Proper decision-making matrices to choose the preventive repairing choices in general and in particular are being presented in some tables. Optimal timing concerning the repairing and the maintenance should be determined in a way that the costs of road pavement lifecycle abate. Thus, for a specific pavement and for a preventive repairing method a definite time (optimal lifetime or situation) or a stratum of lifetime or situation exists in which the ratio of profit to cost is in a maximal level. Real timing toward different kinds of repairings is being considered according to the traffic level and various environments. To choose the most economical repairing the annual uniform costing method is being used. In the final level for determining the best or most proper choice for the preventive repairing it is necessary to prepare the decision-making matrices. After choosing a repairing method out of various methods decision-making matrices for a project makes ready.(Gholami, 2010)

Burns et al.(1971) in a research titled as constructive optimization for asphalt pavement got into minimizing the administrative costs of flexible road paving by means of a modified linear planning technique. In this research the designing model consists of a target function and nine limitation equation. Total cost is being defined by means of a target function. For each of the equations which is relevant to the cost of buying the building materials designing conditions and the environmental conditions for the minimum amount of cost will be achieved. Based on the results which are being obtained from this sensitivity

analysis research on the flexible pavements it appears that the variables of building material unit price, density of the building materials, the amount of California bearing ratio, and the index of freezing for the variables of designing and the environmental variables intensely influences the steps of designing.

Rafi'i and Kavousi (2006) in an essay titled as "paving maintenance planning by means of genetic algorithm" turned to planning the way of distributing the costs concerning the maintenance of paving in the roads network. To put it simply, just two kinds of principal impairments are being considered which are as follows:

Cracking and annihilation of road paving materials.

The hypothesized parameters for maintenance and repairing the paving of the parameters of network, designing period, traffic parameters, critical points, maintenance costs, repairing costs, and the limitation of resources. The applied optimization method in this research is optimizing by means of genetic algorithm and its target function is being designed for minimizing the current value of the total costs of repairing and maintenance. The output of this project is a complete program of repairing activities based on the year and the paving particle. This output meets the functional needs of paving in a way that the impairment and paving serving during the analytical period of ten years being kept over their relevant critical period. In the previous researches that the genetic algorithm was being used for optimizing the road network the exchanges of repairing and maintenance activities are not being considered and it was assumed that the development of an impair during a road paving should never become under the influence of repairings or the maintenance of other impairs.(Morcous, 2004;Chan, 1994.) Also, the U.S. transportation research board's executive committee reports the widespread researches which have been done concerning the optimization of road networks costs that are based on the lifecycle costs.PESHKIN,(2004), and Morcous et al., (2004), by means of genetic algorithm method get into optimizing the costs of roads network.[8].Chootinan et al. also in an essay went to scrutinize the optimization of road paving costs by means of a statistical method based on a genetic algorithm.(Piya, 2004.) Safarzadeh et al.(2006) went to present a model for the paving management of roads in the network level by means of a hierarchical analysis.

Research method

In the present research by means of a questionnaire which is being filled by some experts in various areas of paving management and maintenance some

comparisons are being done. The number of these questionnaires are being considered as ten until more dependable results be achieved. The questionnaire which is being compiled for this work is being distributed among the elites of the field of paving in the province of Khuzistan and its results are being calculated by means of Expert Choice software. At last the result of these calculations will be presented.

Research findings

General comparison of choices

Inconsistency rate in general is relevant to the dual comparison are being presented in the following choices that the inconsistency rate equals 0.04 that by considering that the rate of inconsistency is less than 0.1 it is indicative of the optimality of the dual precision that is relevant to these comparisons.

Comparison of choices based on the criterion of cost

The results concerning the ranking of the impairments based on the criterion of cost are being achieved. These results are being presented in the following diagram. As the results show tar stain impairments, crocodile cracking, outgrowth, and weathering as the most optimal impairs are being determined as the most optimal impairs that their repairings have the most positive influence on the paving. The incompatibility rate which is relevant to this diagram also equals 0.09 that is indicative of the optimality of the accuracy of the dual comparisons that are being achieved in this section.

Comparison of choices based on the criterion of ease

The results which are relevant to the ranking of the impairments are being obtained based on the criterion of ease. These results are being presented in the following diagram. As the results show the methods of crocodile cracking, outgrowth, indentation, and weathering are being recognized as the most optimal impairs that by repairing them the most amount of positive influence on the paving appears based on the criterion of ease. The rate of incompatibility which is relevant to this diagram also equals 0.09 that is indicative of the optimality of the accuracy of the dual comparisons which are being obtained in this section.

The results which are relevant to the ranking of the impairs are being achieved based on the criterion of traffic. These results are being presented in the following diagram. As the results show the impairments of outgrowth, weathering, crocodile cracking, and track disruption are being recognized based on the criterion of traffic as the most optimal impairs that their repairing the most amount of positive influence appears in the paving. Incompatibility rate which is relevant to this diagram also equals 0.09 that

is indicative of the optimality of accuracy in the dual comparison in this section.

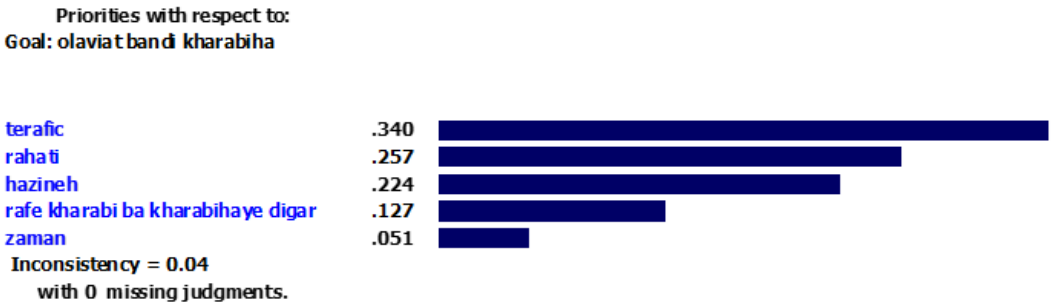


Figure1-1: Comparison of choices for the determination of impairments with the maximum influence on the paving.

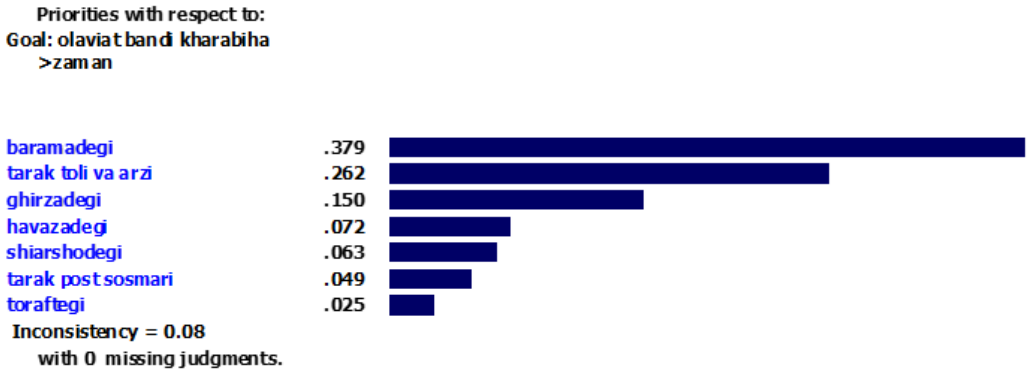


Figure 2-1.Comparison of impairments based on the criterion of time

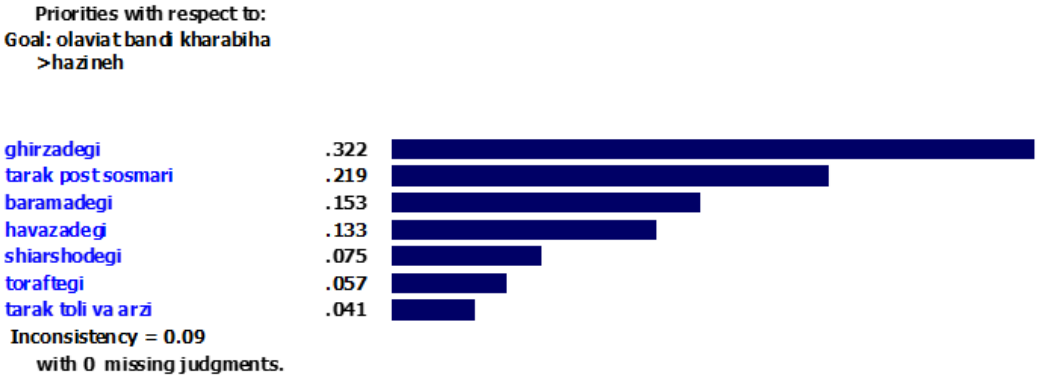


Figure 3-1: Comparison of impairments based on the criterion of cost

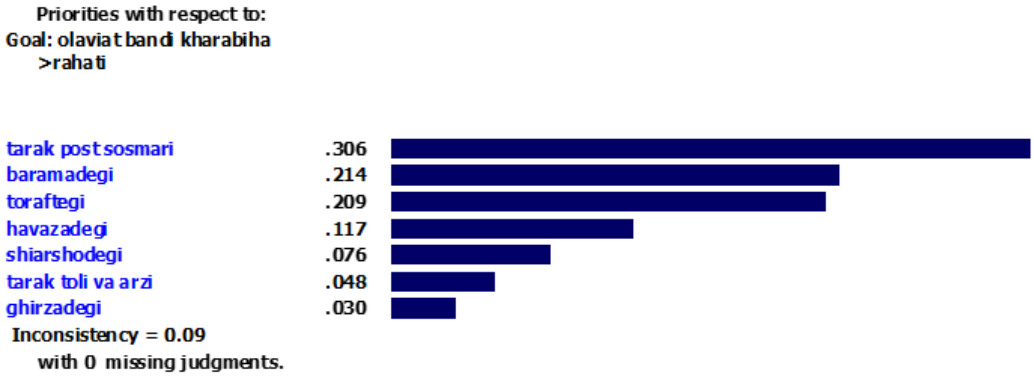


Figure 4-1: Comparison of choices based on the criterion of traffic

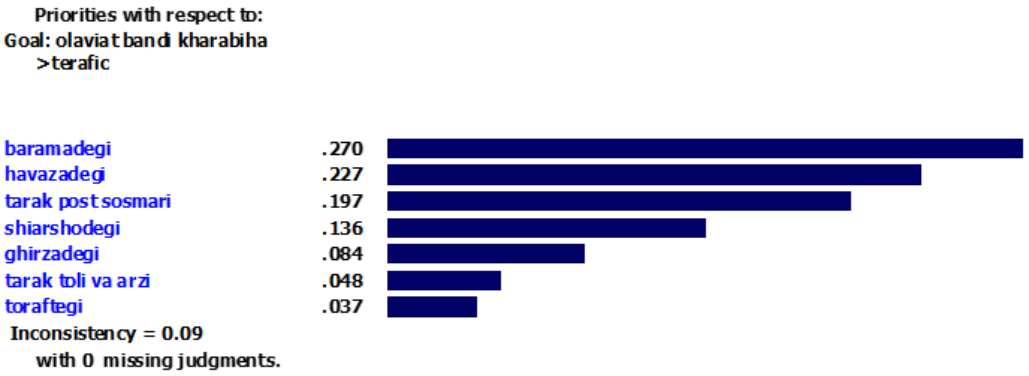


Diagram 5-1.Comparison of impairs based on the criterion of traffic

CONCLUSION

By comparison of choices based on the criterion of time the obtained results concerning the impairments with a more positive influence on paving. The results show that the impairments of outgrowth, lengthwise and widthwise cracks, tar stain and weathering are being presented as the main impairments based on the criterion of time. Comparison of choices based on the criterion of cost shows that the impairments of tar stain, crocodile crack, outgrowth, and weathering are the most optimal impairs that by repairing them the most amount of positive influence on the paving appears based on the criterion of ease respectively. Comparison of choices based on the criterion of traffic shows that the impairs of outgrowth, weathering, crocodile crack, and track disruption are being determined as the most optimal impairs that by repairing them the most positive influence on the paving appears based on the criterion of traffic.

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