

Review Article

The Rating of the Roadway Network in the Republic of Iraq

A. P. Lupanov^{*1}, A. S. Sukhanov¹, Mustafa Mohammed Al-karaguli¹, Sarmad Shawkat Shoman¹ & Yasir Ahmed Shakir²

¹Moscow Automobile and Road Construction State Technical University (Madi), Russia

²Institute of Architecture and Civil Engineering of Volgograd State Technical University (IACE of VSTU), Russia

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Abstract: The article presents the opportunity of assess the state of the roadway network in the Republic of Iraq, the city of Baghdad taken as an example. The characteristics of operational features, safety profile of the roads and the state of environment depending upon the field studies.

Keywords: Transport Infrastructure, Durability, Highways, Deformation, Service Life, Traffic Accidents, Air Pollution.

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INTRODUCTION

The article presents the opportunity of assess the state of the roadway network in the Republic of Iraq, the city of Baghdad taken as an example. The characteristics of operational features, safety profile of the roads and the state of environment depending upon the field studies are given in the paper.

During the three decades, the transportation infrastructure in Iraq was suffering from insufficient maintenance and low budgeting. Between 1980 and 2003, the national resources were used to support military initiatives. The long period of economic sanctions and lack of repair works contributed to the annual stockpiling of road pavement tear and wear and the total reduction in the transportation service quality (<http://catalog.fmb.ru>). Annually, the country encounters great difficulties when rehabilitating roadway network and engineering constructions as well as providing transportation services. More than 50 percent of the roadway network in Iraq fail to meet the standards due to the old-fashioned techniques of repair and the outdated technology of building materials.

The research shows that the highways provide 70 percent of all transportation service in Iraq. The total

length of the nation's roadway network makes more than 60,000 km, 75 percent of roads have flexible surface, 10 percent have rigid surface and 15 percent have no surface pavements. Having more than 39 million of population and the area of 435,000 square kilometers, the road and street network in the country can be called a limited one (Shoman, S. S. A., & Al-karaguli, M. M. 2016).

According to the governmental data published by the Central bureau of statistics at the Ministry of Planning, "there was a considerable increase in the number of cars in Iraq after the year 2003, since it had reached 6 million cars", 23 percent of heavy vehicles and 77 percent of passenger cars. Annually, the fleet of motor vehicles increases by 17.5 percent. The daily fuel consumption makes 20 million liters, in the city of Baghdad more than 7 million liters a day, which results in the increase of released harmful substances in the atmosphere as is shown in Table 1 with types of pollution, and Table 1,2 presents the classification of atmospheric emissions (Mahmoud Al-Saadi, M.T. 2008; & Ministry of Oil in Iraq. 2018).

Table 1. Major sources and types of environmental pollution

Major sources of pollution	Types of pollution								
	Physical					Chemical			
	vibration	noise	dust	heat	radiation	sulfur	oxides carbon	nitrogen hydrocarbons	
Highway transportation	*	*	*	*			*	*	*

Table.2 Classification of atmospheric emissions in the city of Baghdad

Nº (code)	Name (formula) of compounds	Maximum concentration limit	Permissible	Hazard category
200	Lead monoxide	12 mg\m ³	2 mg\m ³	2
701	Sulfur oxide(expressed as SO ₂)	0.049 part/mil.	0,14 part/mil.	3
322	Carbon oxide CO	9,5 part/mil.	9 part/mil.	4
360	Carbon oxide CO ₂	418 part/mil.	250 part/mil.	2

The largest urban agglomeration is the city of Baghdad taking the first place by the number of cars – 35 percent of the car fleet in the country (2.1 million of cars) (Mahmoud Al-Saadi, M.T. 2008; & Ministry of Oil in Iraq. 2018).

The highway network takes more than 15 % percent of the total urban area occupying the third place by the land allotment following the housing development and the agricultural objects (See Table 3).

Table.3 Breaking down spaces in the city of Baghdad by purpose

	Purpose	Area, km ²	Share, %
1	Residential development	287	34,11
2	Aagricultural use	193	22,90
3	Street and road network	132	15,15
4	Aquatic regions	95	7,73
5	Commercial use	61	7,26
6	No development	56	5,35
7	Industrial use	28	3,32
8	Government facilities	13	1,55
9	Social services	12	1,42
10	Green plantations	10	1,21
	Total sum	840	11

According to the statistics by the Health Ministry, the number of traffic accidents for the last decade in the country totaled about 66,000 cases and more than 100,000 deaths and injuries. In Baghdad only, more than 250 accidents pro month were registered in the years 2018-2019. The Human Rights Commission in Iraq declared that due to the traffic accidents 23,556 died and were injured in 2019. One of the main reasons of traffic accidents in Iraq is low traffic operating factors of road surfaces and the insufficient level of road facilities.

The actual periods between overhauls of asphalt-concrete pavements under the conditions in Iraq do not exceed 5 years resulting from a low quality of road surfaces under construction.

According to the norms (Mahmoud Al-Saadi, M.T. 2008), motor roads and streets in Iraq (depending upon economic, administrative and cultural purposes, design characteristics and functional features) are subdivided into:

- major and minor roads providing intercity and inter-regional communication;
- major roads of regional significance providing redistribution of traffic flows between primary and local roads;
- Local roads providing vehicle access to adjacent areas.

In Iraq, there is also a classification of roads on several levels (The state corporation for roads 2003). As is presented in Tables 4 and 5

Table.4 Classification of roads with respect to the star rating

Road classes	Road Categories	Function	Examples	Length, km
(Freeways)	IA	Providing communication between regions and lands with high traffic intensity	«F1» Highway Jordan-Baghdad-Kuwait	1900
(Express Ways)	IB	Providing express communication between towns and provinces	«H3» Baghdad-Baakuba-Kirkuk-Iran	15000
(Arterial Roads)	II	Providing ties within one province	«R26» Basrah-Umm-Kasr	12000
(Collector Roads)	III	Redistribution of traffic flows between intra-regional and local roads	-	13000
(Local Roads+ Rural roads)	IV, V	Providing access to adjacent areas	-	18100

Table.5 Indices and characteristics of roads in Iraq

Road Categories Indices and characteristics	I	II	III	IV	V
Total number of driving lanes	4 and more	4 and more	2-4	2	1
Width of lane, m	3,75	3,75	3,5-3,75	3	3,5
Width of shoulder, m	3,75	2,5-3	2-2,5	1,5-2	1-1,75
Design flow, vehicles/h.	Up to 2000	Up to 1400	800-1200	600-800	500-600
Design speed , km/h	120	80	60	40	20-30
Presence of median strip	Yes	May be	No	No	No
Type of grade separation layout	Grade separation	Grade separation, regular and irregular	Grade separation, regular and irregular	At grade, regular and irregular	At grade, irregular
Intersections with motor highways, bicycle, pedestrian paths and railroads	Grade separation	Grade separation	At grade crossing	At grade crossing	At grade crossing
Presence of outdoor lighting	Yes	Yes	No	No	No
Presence of barrier net at the right of way	Yes	Yes	No	No	No
Presence of guardrails	Yes	Yes	Yes	No	No
Presence of service facilities (rest areas, auto repair shops, cafeterias)	Yes	Yes	Yes	No	No
Surface material	Bitumen concrete and cement concrete	Bitumen concrete and cement concrete	Bitumen concrete	Bitumen concrete	Bitumen concrete

Along with increasing the traffic intensity and the axial load of vehicles, among major factors resulting in the roadway surface damages, it is necessary to point out a low quality of the used building materials, violation of construction and operation techniques as well as errors in the research and design processes.

Damages in the roadway surfaces in flexible pavement result from aging and wearing of bitumen concrete pavements, the fatigue rupture and the development of residual deformation during the operation of roads which have a great impact on the long life of road constructions, and as a result there appear various types of deformation, for example, cracks, traffic width, potholes, and sliding. See fig. 1.



A



B



B

Figure 1: Types of pavement damages on the roads in Iraq.

A-Ruts in the bitumen concrete pavement; B-Cracks and potholes, ruptures; C- Sliding on a road in Iraq .

CONCLUSION

Analysis of climatic conditions and classification of motor roads and the assessment of functional transport-operational and consumer properties will enable to forecast a road condition for the future, how long a road can be used and what methods of repair works can be done. Thus, the primary target for the road building complex in the republic today is an increase in works of repair, reconstruction and modernization of the road and street network, in which connection there is a need to actively introduce the scientific-based methods of operations. Consequently, the actual problem for the road network conditions in Iraq is reconstruction of damaged roads with a considerable reduction in consumption of materials owing to the application of resource saving technologies including the recycling of the old bitumen concrete. To that end, it is necessary to find optimum solutions to cut expenditures on maintenance, as well as to develop road repair techniques under which the

amount of harmful substances will be reduced and the number of traffic accidents will be minimized.

As repair technologies can be used modern technologies for Iraq conditions based on recycling old asphalt concrete. This is the technology of cold and hot regeneration at the plant.

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