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The intersection of the interior in Sadr City, Baghdad Problems and solutions Studies in transportation geography

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Abstract. Traffic jams have become a phenomenon that all areas of Baghdad suffer from in general and the study area in particular, as it is characterized by a very high population density, as its population (Al-Sadr City is 5 million people), this percentage is very high and the various activities that it entails, whether at the commercial, governmental, educational or health levels, and the movement of those activities requires movement It reflects the daily traffic volume of the roads in it, which creates a stifling problem, or traffic jams, if the roads and intersections do not accommodate the volumes of traffic passing by.Proceeding from the plan of the Municipality of Baghdad to improve the performance of the transport network in Baghdad and make this network comparable to its counterparts in the capitals of developed countries, by converting most of the main intersections in Baghdad into bridges to ensure the continuity of the drainage of traffic volumes and reduce the use of traffic lights. Therefore, the Municipality of Baghdad contracted with The competent authorities to implement a bridge intersection in Sadr City for the intersection of Al-Dakhil Street with Al-Quds Street instead of the current intersection, which suffers from severe traffic jams, if the service level is less than F, which is the worst level of service. Which represents the subject of the research, which is concerned with studying the intersection in terms of its importance, its geographical location, traffic volumes, determining the peak hours, conducting an analysis of the current operating conditions, and finding future volumes for the design period of the proposed bridge, which is the target year 2030.

Keywords. transportation geography

Research problem

Traffic intersections and squares have become one of the vital joints that are the point of movement between the roads they are connected to or pass through, and because traffic congestion has become a problem that all Baghdad roads in general suffer from, and intersections and squares in particular, as they represent the confluence of more than one road serving the surrounding areas or the crossing point to the other side of The city of Baghdad, whether it is Rusafa or Karkh, and among these intersections that suffer from the problem of traffic congestion more than expected during the waiting period for vehicles at this intersection, in addition to the psychological suffering of vehicle owners and the consequent traffic violations, the intersection of the interior in Sadr City, the subject of research.

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Research Hypothesis

Given the importance of the intersection being a meeting point for the roads that reach the surrounding areas, as well as being the transition point between the roads of Sadr City and the commercial center of Baghdad (Jamila market) and vice versa, it was necessary to conduct a study on this important and vital intersection and find solutions to the traffic congestion it suffers from.

Research Importance

1. The importance of the intersection
2. Intersection site
3. Geometry of the intersection
4. Traffic of vehicles at the intersection of the interior
5. The efficiency of the current performance of the intersection
6. The future vision of the traffic volumes of the interior intersection
7. The geometry of the proposed bridge
8. Analysis of bridged parts

The importance of the intersection

Al Dakhil Intersection is one of the main intersections in Sadr City (east of the canal), which is located on the Rusafa side of Baghdad, as the number of vehicles served by this intersection reaches more than 23 million vehicles annually. Traffic is currently closed until the time of the field study 1/5/2022-1/6/2022. This intersection, which serves traffic within Al Dakhil Street (one out of three streets that crosses Sadr City and in a direction perpendicular to the Army Canal, which is Al Dakhil, Al Falah and Al Gawadar), suffers, as well as The main shopping and shopping center in Baghdad (Souk Jamila) suffers from severe traffic jams, especially at peak times, which increases the delay time for users of this intersection, as the delay rate reaches about 131 seconds for each vehicle, and this constitutes a very high number compared to the normal global rates, which range from zero to 55 seconds For each vehicle, and the negative effects that this has on the psyche of the vehicle owner who uses the intersection, as well as the pollution of the environment and the large material losses resulting from the delay in work for road users passing through this intersection, as well as the Fuel consumption and vehicle parts (decreased vehicle service life). (1)

The intersection of the interior acquires special importance, since the surrounding area is characterized by various activities and activities, represented by:

1. Its presence on the road that leads to Jamila Commercial Market, which represents one of the two main markets in Baghdad, along with Al-Shorja market in the center of Baghdad and the main shopping centers usually form strong centers of attraction, which increases the momentum of traffic volumes throughout the day at this intersection.
2. Quality on the road that connects the densely populated Sadr City to the southern part of the capital, Baghdad, represented by Al-Baladiyat, Al-Mashtal and Al-Amin area. This road is used by taxis to a high percentage for transporting residents who go to Al-Mashtal Garage (the old Baquba Garage) and from there heading to the governorates of Karbala And Najaf for the purpose of religious pilgrimage, which increases the traffic momentum at this intersection, because the majority of the residents of this area are people with limited income and they frequent this situation with a high rate of travel to and from those governorates.
3. The presence of parking lots (garages) for public and private transport vehicles near this intersection. This intersection, with its important location, represents the first

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main option for accessing or leaving to and from the residential areas surrounding this intersection. (2)

Intersection Site

The intersection is located in Sadr City, in the northeastern part of Baghdad. And on Al-Dakhil Street, which is the road that connects Al-Omal Street (which is a road parallel to Al-Jaish Canal (Red Road 3), with a length and length of 4.4 km, starting from the intersection of Al-Habibia (Direct Sales Showrooms) and ending with Al-Dakhil Street Safi Al-Din Al-Hilli, Al-Seddah Street (in Sector No. 49, outskirts of Al-Sadr City near Al-Seddah) 3,2,1) and then intersects with Al-Quds Street and then passes through Sector 55 and then intersects with Zain Al-Qaws Street at the intersection of Al-Sadr General Hospital and then passes through sectors 54, 53, 52, 51, 49 and then ends with Al-Seddah Street.The total length of this road is 5,84 km and represents the east-west direction at the intersection, while the other direction, which is south-north, which is known as the Jerusalem Road, is a road also classified as a secondary arterial road, which connects the main Mashtal road (Baghdad-Baquba Old Road) in the Mashtal area with the Central Market Street. In the merchants neighborhood in (Al Shaab area), this street leads to the Baghdad-Kirkuk road.This road passes starting from the old Baghdad-Baquba road in Al-Mashtal area, Al-Baladiyat, 9-Nissan district, Ishbiliya district, Al-Sadr City, Al-Talibiya, Al-Banuk district, Ur district, Al-Tijjar district in Al-Shaab district, and then it meets the Baghdad-Kirkuk road (near the central markets)

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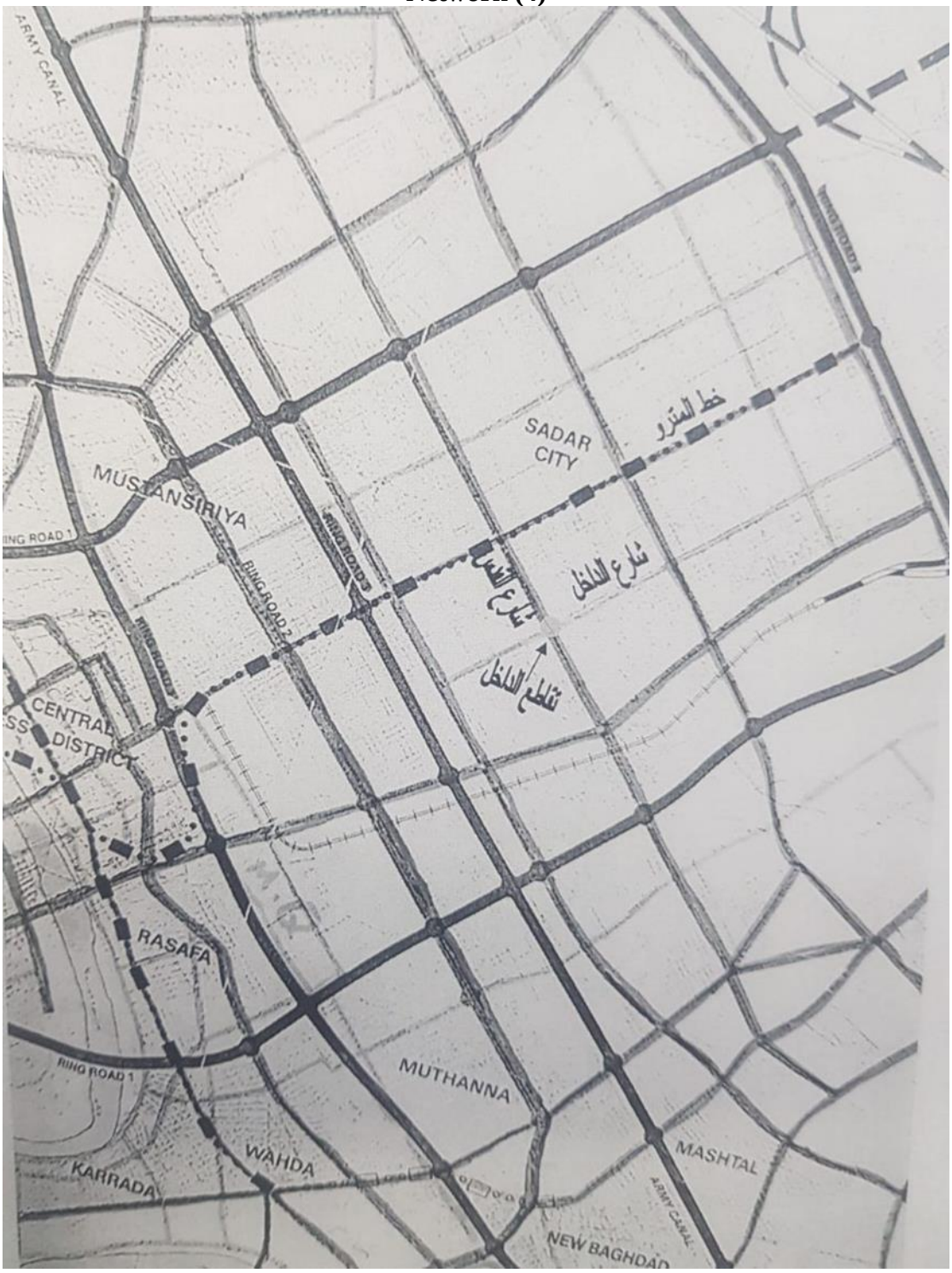
The total length of this path is approximately 13 km (3). As shown in Figure (1)

Figure (1) The Location Of The Intersection In Relation To The Main Road Network (4)



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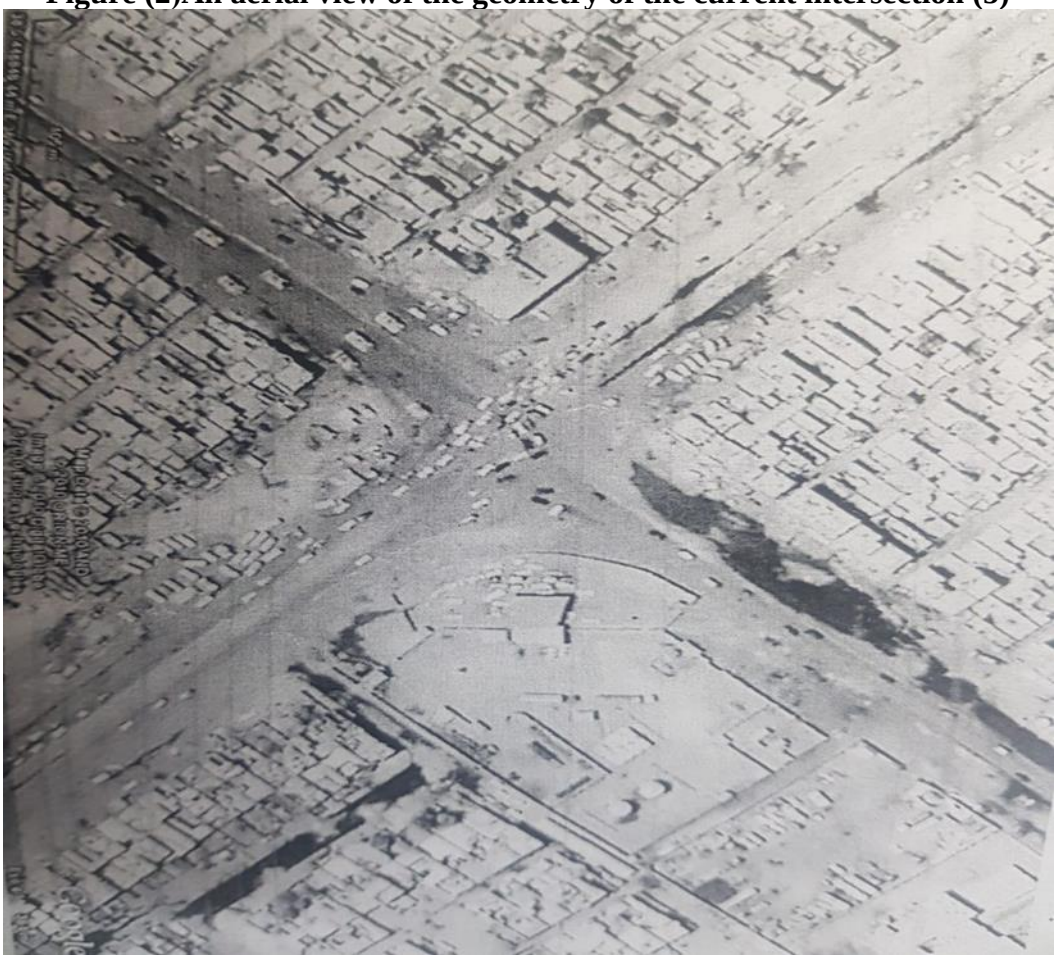
Geometric Figure of the intersection

The current geometric Figure of the intersection is four-armed, as for the traffic volumes passing by both roads (Al-Quds Road, the direction coming from Hamzah Square towards Square 55 and the opposite direction, and the Dakhil Road, the direction coming from Al-Sada Street towards Al-Omal Street and the opposite direction) We conclude that the Dakhil Road is the main direction at the intersection, as the traffic volumes in it reach 64% of the total traffic volume (Al Dakhil Road + Al Quds Road), while Al Quds Road is a secondary direction at this intersection, and the right-turning movement in the intersection approaches is not isolated by islands. From the rest of the movements (forward and left), except for the direction coming from the side of Al-Sada Street, since it is separated by a carrot, but there are paths in each of the remaining three approaches for this movement. As for the vehicles that want to turn left, they are not isolated from those heading forward in each approach Of the four approaches, as in Figure (2)

Figure (2)An aerial view of the geometry of the current intersection (5)



Traffic of vehicles at the intersection of the interior

In order to know the traffic movement of vehicles at the intersection, a traffic count was carried out three times, distributed on Saturdays, Mondays, and Thursdays, in order to know the variation in traffic during weekdays, and the weekend was excluded from the count, because the expected traffic in these days The days are few if compared to the days that were chosen. As for the reason for choosing Saturday as one of the counting days, despite the fact that it is a

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holiday, because the main activity in the intersection area is shopping, and shoppers usually choose Saturday (the beginning of the week) for this purpose, and the time period for counting was from seven in the morning to seven evening) in order to determine the peak hour (the hour in which the highest traffic volume of vehicles passes), which represents the design hour that is relied upon in the analytical study of the intersection movement.During the counting process, the vehicles passing through the intersection were classified into two main categories: Small vehicles, including saloon cars, pickup cars, or small transport vehicles, which run on four tires. Heavy vehicles and included all vehicles except for those included in the previous category, i.e. including trucks, large public transport vehicles (buses) and other vehicles that run on more than four tires. The vehicles were classified in order to take into consideration the impact of heavy vehicles on traffic and the decrease in the drainage capacity of intersection approaches when the traffic light is green, because each heavy vehicle is equivalent to two small vehicles. Forward only, through the intersection of the interior and the proportion of heavy vehicles in each direction, and we find that the rush hour for vehicles is from eight to nine in the morning. This time period represents the work trip for the residents of the surrounding areas of the intersection, whether they are employees, students or business earners first for shopping purposes. The traffic volume of passing vehicles reflects Through the intersection, the extent of the high population density served by the intersection, in addition to the large economic activity surrounding the intersection, which gives a clear picture of the amount of traffic pressure that the intersection suffers from disproportionately to its current engineering design, which leads to slow movement and thus leads to suffocating traffic jams. This is illustrated by Table 1.) As for determining the peak hours in Najd, it is between (8) to (9) in the morning. As for the volumes a For the traffic of the different directions at the intersection and through the field study, they are shown in Table (2)

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Table(1)Traffic Volumes Of The Main Movements And The Percentage Of Heavy Vehicles During Daylight Hours At The Intersection

Traffic volumes (vehicles/hour)												Heavy Vehicles Percentage(%)	direction	
2-1	1- 12	12-11	11- 10	10-9	9-8	3-2	4-3	5-4	7-6	6-5m	8-7 A.m			
303	445	516	578	590	547	490	528	443	562	699	620	15	Next from 55 Square (beautiful direction(	southbound
382	392	443	456	562	580	600	647	695	670	705	730	18	Coming from Hamza Square	heading north
830	950	1040	1119	1150	1206	1190	1135	1196	1205	1011	1280	11	Coming from the hospital intersection	heading west
816	940	ten thirty	1205	1260	1211	1330	985	860	813	705	600	13	Coming from Workers Street	eastbound

Table (2)The current traffic volumes at the interior intersection of various directions

vehicle/hour	the movement	Direction
380	Turn right	The next of the cutter the hospital
1280	marllam ahead	
217	Turn left	
133	Turning in the opposite direction	
three hundred fifty	Turn right	Coming from Hamza Square
730	marllam ahead	
183	Turn left	
137	Turning in the opposite direction	

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318	Turn right	Coming from the direction of Workers Street
1330	marllam ahead	
357	Turn left	
63	Rotation in the opposite direction	
208	Turn right	coming from 55 . square)beautiful(
699	marllam ahead	
155	Turn left	
91	Turning in the opposite direction	

We note from the above table that the percentages during the rush hour for all movements, which include turning to the right and left and passing forward, as well as turning in the opposite direction, for each of the four approaches at the intersection of Square (55), we find that the percentage of vehicles that pass forward is the highest in the approaches The percentages of the four were (56%) and the two directions coming from Al-Mudhaffar Square and coming from Al-Sadr Square amounted to (54%) respectively, while the two directions coming from Square 83 and coming from Al-Falah Street were (57%) and (56%) respectively.
The criteria used in determining the level of service (LOS) adopted by the Municipality of Baghdad in order to know the level of service at the intersection before making any engineering change in the Figure of the current intersection in order to develop the appropriate solution to the intersection, and these criteria are illustrated in Table (3)

Table (3)Criteria used to determine the level of service (LOS) (8)

The level of service	Delay rate (veh/sec)
A	<10
B	>20-10
C	>35-20
D	>55-35
E	>80-55
F	>80

This table represents the levels of service in force globally, through which the Municipality of Baghdad seeks when making solutions to the problems experienced by the intersections by bringing them to the best levels in terms of the flow of vehicles and the lack of time to wait, as all intersections in the city of Baghdad have a service level below the F level.)), which represents the worst levels of service in traffic transport, which gives the size of the problem experienced by the intersections of Baghdad city in general and the intersection of the interior in particular, especially since it is located in the most densely populated residential areas in the city of Baghdad, which is Sadr City.

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Through the study, we find that all intersections in the city of Baghdad operate with a pre-timed traffic lights system, that is, depending on the traffic volumes passing from each direction at the intersection, the time required for the (green) traffic for each direction and the total cycle time and the phase system is determined. This timing is updated between the period of And another (6 months to a year) depending on the change in traffic volumes. (A phase is one direction or more that receives the instruction to move (green) at the same moment for the purpose of traffic. Within one time cycle of traffic lights, there are usually 2-6 phases of movement and the number of phases is usually 4 as is the case in most of the existing intersections In Baghdad, which operates the traffic lights system)

In order to reach the ideal service to perform the intersection, the Municipality of Baghdad worked to analyze the current performance of the intersection and determine service levels for the approaches and the intersection, especially since the traffic lights are out of order and do not work, and in order to know the cycle time and time phases (meaning the total time of the light signal to complete one cycle and be Usually from (60-120 seconds), the current traffic volumes and the current geometric Figure of the intersection were used in the HCS program), a program that is usually used to calculate the optimal timings for the cycle and phases, especially if it is broken, which is the case of the intersection in question.

The efficiency of the current performance of the intersection

From the field study of the intersection, we find that the traffic indicators of the level of service and the degree of saturation, in addition to the rate of delay for vehicles in different directions of the intersection, as well as the intersection itself, the performance of the intersection is below level F and the level and rate of delay for vehicles reaches 131.1 seconds and this is illustrated in Table (4). The results show the need to change the engineering design of the intersection in proportion to the changes taking place in the traffic volumes passing through it, in a way that ensures more flow of vehicles and less waiting time.

Table (4)Traffic performance indicators for the interior intersection before constructing the bridge(9)

performance level	delay rate vehicle/sec	degree of saturation	the movement	direction	
F	88.9	1.08	Turn right Traffic forward Turn left	Coming from Workers Street	eastbound
F	43.8	0.60	Turn right	Coming from the hospital intersection	heading west
F	149.3	1.22	pass forward Turn left		
F	216.9	1.36	Turn right pass forward Turn left	Coming from Hamza Square	heading north

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F	105.5	1.09	Turn right Traffic forward Turn left	Coming from 55 square (beautiful(	southbound
F	131.1	Intersection			

The future vision of traffic volumes at the Dakhil Intersection

Road facilities are designed to be economically feasible, by setting a design life and an annual increase in traffic volumes, thus ensuring that these facilities perform the acceptable role and tasks required during the years of the operational life and with a predetermined efficiency during the design (10)The bridge design shall be on the basis of the expected future traffic volumes, on which the engineering design of the bridged parts is based. 2030. As shown in Table (5)

Table (5)Traffic performance indicators for the intersection inside the bridge for the year 2030 (11)

performance level	Delay rate (veh/sec)	green time(sec)	phase	the movement	direction	
D	44.3	15th	1	Turn right Turn left	Coming from Workers Street	vector to the east
C	25.0	15th	2	Turn right Turn left	Coming from the hospital intersection	vector for the west
D	41.1	30	3	Turn right Turn left	Coming from Hamza Square	vector to the north
C	27.4	30	4	Turn right Turn left	Next from the beautiful 550 square	vector to the south
C	34.8	bridge intersection				

Total cycle time is 110 seconds

Amber's time is 3 seconds for each phase, and the time for all red All Red phases is 2 seconds.

Geometric Figure of the proposed bridge

After taking into account the future traffic volumes of the different directions and as shown in Table (5), the limited space available to be invested in the implementation of bridges and the high cost of acquiring land, in addition to the presence of the Jerusalem sewer line that passes through the intersection and towards Square 55 - Hamza Square, were reasons for determining The options available to the Municipality of Baghdad with an engineering design commensurate with the engineering Figure of the intersection on the land of the buffer and the obstacles that

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determine the engineering Figure that the intersection takes. On the idea of raising traffic volumes for the direction coming from the hospital intersection, as well as those coming from the direction of Workers Street and the traffic in front, by making a bridge for these movements and keeping the rest of the different movements and directions on the ground after they are refined in terms of turns, carrots and the number of lanes to be able to serve future traffic volumes at a level Predetermined performance of at least D. (12)By making a bridge for the traffic in front of me coming from the intersection of the hospital and workers street, this will lead to reducing the volumes passing by the intersection and in the proportions shown below:
The future traffic volume for the direction of the hospital intersection = 1894 vehicles/hour
The future traffic volume in the direction of Workers Street = 1968 vehicles/hour
Total = 3,862 vehicles/hour
The total number of vehicles for different directions = 9813 vehicles/hour
The percentage of decrease in traffic volume = (3862/9813) x 100 = 39.3% (13)
That is, by making this bridge, the percentage of vehicles occupying the intersection is reduced to less than two-thirds of the size, and this provides an additional space in time (cycle time) to serve the rest of the movements in the different directions of the intersection and also leads to a reduction in the percentage of intersecting movements.

Broken parts analysis

In light of the results obtained for the future traffic volumes at Al Dakhil Intersection, the necessary calculations were made by the Resident Engineer Department, to determine the level of service and to find the number of lanes for each direction of the bridged part of the intersection (the direction of the hospital intersection - Workers Street and vice versa, after implementing the bridge, the level of the bridge will be Service C (14)

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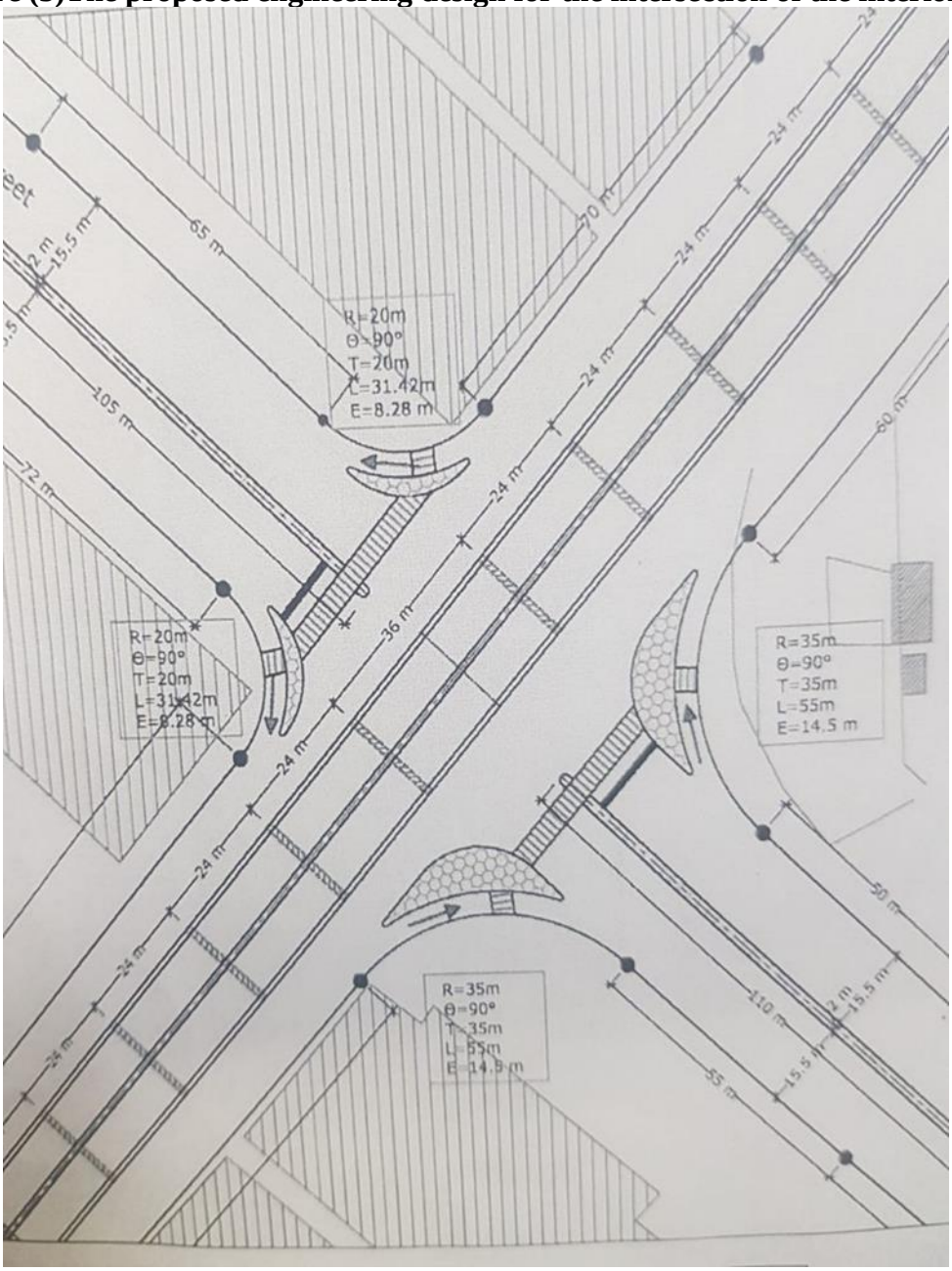
Figure (3)The proposed engineering design for the intersection of the interior (15)



Conclusions

1. All traffic intersections in Baghdad suffer from traffic jams and a long waiting period for one vehicle, meaning that the service level in them is below F, which is the worst level of service.
2. .2All traffic intersections operate with a traffic light system that determines the cycle time for different directions at the same time, but unfortunately all of them are broken.
3. The limited available lands in the intersection taboos, and therefore solutions remain restricted in light of those limited spaces, as well as the conflict between the bridge pillars and the sewer lines.

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4. According to the proposed geometric Figure of the intersection, it will improve the traffic performance of the intersection and transform it from level F to level C at the time of the target, ie, an average delay time for vehicles that is four times less than the current level.

Recommendations

1. Adoption of the proposed engineering design for the intersection by constructing the bridge for the direction coming from the hospital intersection and coming from the Workers Street and for the traffic volumes passing ahead, due to the high momentum of these volumes on the intersection, and the proposed design will lead to modifying the service level from F to level B after implementing the bridge and to after c Expiry of the design life of the bridge.
2. The necessity of adjusting the timings of the traffic signals every 6 months to a year after the implementation of the bridge intersection to ensure high efficiency in the flow of traffic volumes.

Margins

1. From the researcher's work as part of the field study 15/4/2022-15/5/2022
2. Same source
3. Al-Sadr Second Municipal Department, GIS Division, p. 17, 2022, unpublished data.
4. Baghdad Municipality, Department of Designs, the location of the intersection of the interior for the main road network in Baghdad, unpublished.
5. Al-Sadr Second Municipal Department, Transport and Traffic Department, an aerial photo of the interior intersection, 2022, unpublished.
6. From the researcher's work in the field study 15/4/2022-15/5/2022.
7. Same source.
8. Baghdad Municipality, Traffic Engineering Division, unpublished data, 2015, p. 20.
9. Baghdad Municipality, Resident Engineer Department, unpublished data, 2020, p. 17.
10. Ammar Imad Kadhim, Preparation of composite rubber materials as bearing cushions for bridges and a study of some of their physical and mechanical properties, Master's thesis, University of Baghdad, College of Engineering, 2007, p. 20.
11. Baghdad Municipality, Traffic Engineering Division, unpublished data, 2022, p. 14.
12. Personal interview with engineer Uday Ghafel, official of the Traffic Engineering Division in the Municipality of Baghdad, on 4/27/2022.
13. Baghdad Municipality, Transport Planning Department, unpublished data, 2022, p. 17.
14. The researcher's work in the framework of the field study 15/4/2022-15/5/2022.
15. Municipality of Baghdad, Department of Designs, the proposed engineering design for the interior intersection, 2022, unpublished.

References

[1] Field study 15/4/2022-15/5/2022.
[2] The personal interview within the framework of the field study of the engineer Uday Ghafel, the official of the Traffic Engineering Division in the Municipality of Baghdad, on 4/27/2022.
[3] Baghdad Municipality, Department of Designs, the location of the interior intersection in relation to the main road network in Baghdad, unpublished.

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www.techniumscience.com

[4] Baghdad Municipality, Department of Designs, the proposed engineering design for the interior intersection, 2022, Ghasr published.
[5] Baghdad Municipality, Resident Engineer Department, unpublished data, 2020.
[6] Baghdad Municipality, Traffic Engineering Division, unpublished data, 2015.
[7] Baghdad Municipality, Transport Planning Department, 2022, unpublished.
[8] Al-Sadr Municipality Third Department, Geographical Information Systems Division (GIS), 2022, unpublished data.
[9] Al-Sadr Municipality Third Department, Transport and Traffic Department, an aerial photo of the current geometric Figure of the Al-Dakhil Intersection, 2022, unpublished.
[10] Ammar Imad Kadhim, Preparation of composite rubber materials as bearing cushions for bridges and a study of some of their physical and mechanical properties, Master's thesis, University of Baghdad, College of Engineering, 2007.