

ENHANCEMENT OF PEDESTRIAN NETWORK SYSTEM IN JOHOR BAHRU CITY CENTRE

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ABSTRACT: This topical study describes the enhancement of pedestrian network system in Johor Bahru city centre. The study is on current issues and problems regarding the pedestrian network. It identifies the design criteria required for a successful pedestrian network for all users (including the elderly and disabled). It also encourages them to browse at leisure and to spend more time within the area. This study discussed the definition, philosophy and principles of pedestrian network; as well as the understanding of design guidelines that are needed. Twelve sections were chosen for the study according to design criteria. Besides using active design methods such as good linkages, amenities and activity attractions were also used to encourage all pedestrians to move from place to place. The design criteria and guidelines will enhance pedestrian network. The outcome of this study would be beneficial to other cities and lead to a successful pedestrian network within a safer, cleaner, more comfortable and more attractive pedestrian environment.

KEYWORDS: Enhancement, Johor Bahru, Pedestrian Network System, Urban Design.

I. INTRODUCTION

Johor Bahru (JB), is the capital city of Johor state in southern Malaysia. It is within walking distance from Singapore and is linked by a causeway to Singapore. The city has a number of interesting historical buildings. However, traffic congestion in Johor Bahru is a daily feature and its impacts on the community are extensive. As the metropolitan area continues to expand and traffic congestion increases, the center of Johor Bahru is seeking better ways to serve the mobility needs of the region's population, industry, and visitors. The region's growth has given the local authority a greater appreciation in the way they include pedestrian facilities to help create a sense of community while broadening the transportation choices of the region's residents and visitors. The purpose of this study is to demonstrate the fundamental elements that must exist in order to support a pedestrian network system as well as how to improve the pedestrian linkages in downtown or traditional center of Johor Bahru. Planned pedestrian areas encourage people to walk and socialize, thereby reducing the need for automobile travel. At a minimum effort, it's very important to encourage people to feel that they can walk safely and comfortably on the city's streets. Beyond that, it is also essential that the walkways are user-friendly and attractive to encourage people to walk and hence improve traffic congestion, and air quality, and also create liveable and sociable communities. This study is to carry out a survey in urban area and will only focus on pedestrian network system in JB city centre. The popular image of city centre is very much reflective of the pedestrian crowds at street level. However, such high levels of pedestrian activity must be sustained by a safe and comfortable walking environment.

In his book, *Behavior in Public Places*: the street connectivity began to show significant and strong correlations with different types of walking[1]. Design the circulation pattern with direct connections to the surrounding streets (Visual linkage) and, pedestrian linkages with that of open space networks. Applying this to the design of pedestrian networks, however, urban designers tend to focus on open spaces[2]. Sidewalks are associated with significant, reductions in pedestrian collisions with motor vehicles. Such facilities also improve mobility for pedestrians and provide access for all types of pedestrian travel: to and from home, work, parks, schools, shopping areas, transit stops, etc. Walkways

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should be part of every new and renovated facility and every effort should be made to retrofit streets that currently do not have sidewalks [3]. A footpath is the part of road or other public place that is laid out or built for pedestrian use. Footpaths may run alongside the road or through parks and other open spaces, and include overbridges and subways. Footpaths should provide for all types of pedestrians. By designing for the needs of pedestrians with impaired mobility, a high standard will be provided for all. Provide footpaths wherever pedestrians might be expected. In urban areas, always provide footpaths[4]. Crosswalks are a critical part of the pedestrian network. A crosswalk is defined as "the portion of a roadway designated for pedestrians to use in crossing the street[5]. Institute of Highways Transportation recommends that the approach to the bridge should be by ramps of a gradient no greater than five percent but stairs should also be incorporated with horizontal landings at regular intervals. The accesses should be as short and direct as possible and should follow the main pedestrian desire-lines[6]. Outside of traffic calmed areas (where speeds are greater than 40 km/h), but within urban areas only collapsible or frangible street furniture should be placed within four metres of the edge of the nearest traffic lane, so as not to create a hazard for vehicles that leave the roadway. This distance should be increased on the outside of curves where there are higher chances of vehicles leaving the roadway[7]. Landscaping can create an attractive visual environment and a 'buffer' between the footpath and the roadway. It creates the appearance of a narrower road and can encourage drivers to travel more slowly, as well as possibly providing shade and shelter from wind for pedestrians[8]. Generally, along the road corridor, if lighting is provided at the level needed for motorized traffic to move safely, then in most circumstances this should be sufficient to light the adjoining footpaths. However, as roads become less busy, the potential for pedestrian movements and vehicle conflict declines and the requirement for continuous, equal lighting is reduced. In these areas, spot or 'highlight' lighting may be appropriate[9].

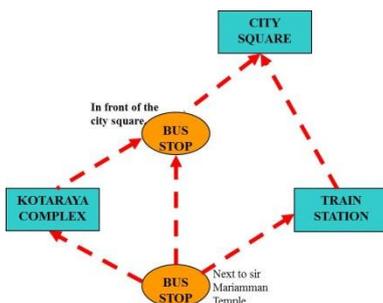
II. DATA ANALYSIS

1. Existing Pedestrian Movement and Pattern of Activities

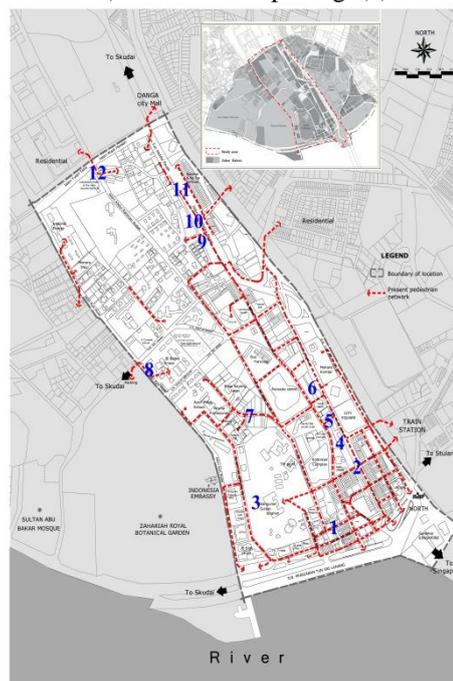
JB is well served by public transport (bus and taxi); including train station and offices of the buses, with the majority of movement within the Pedestrian Plan Area being on foot. The most popular shopping streets are close to government buildings and the key pedestrian desire lines are those between the train station entrances, major shopping centres (city square, Kotaraya and Komtar) and retail shops. Fig1(a).

2. Location of Sections

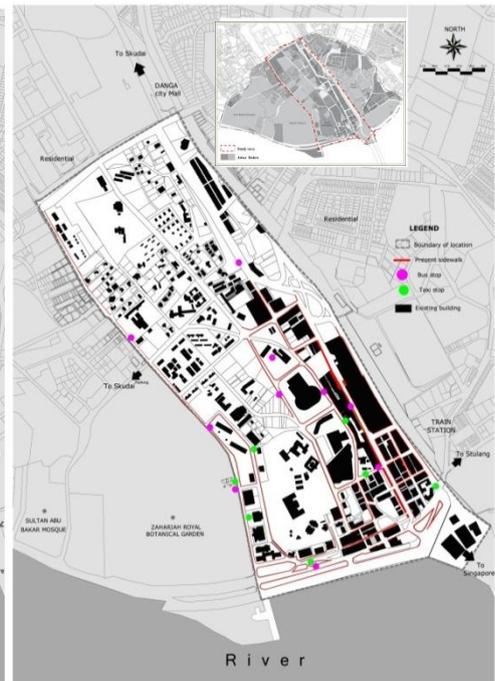
Show sections of all the existing features by photographs and captions. Twelve sections are chosen according to criteria stated, sections are; Fig 2(b). Present sidewalk, Bus stop, and Taxi stop on study area . Fig 3(c).



(a)



(b)



(c)

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Analysis of Twelve sections are according to criteria, as summarized in Table 1 and the detailing of the points (1, 5) shown in which to comment on the good points and the bad points, as in the Figs 4, 5.

Fig 4. Dhoby Street : Type of Pedestrian sidewalk . It serves its function, because it links between old town and, government building. Continue to public plaza. Uncomfortable, because sidewalk is very narrow.

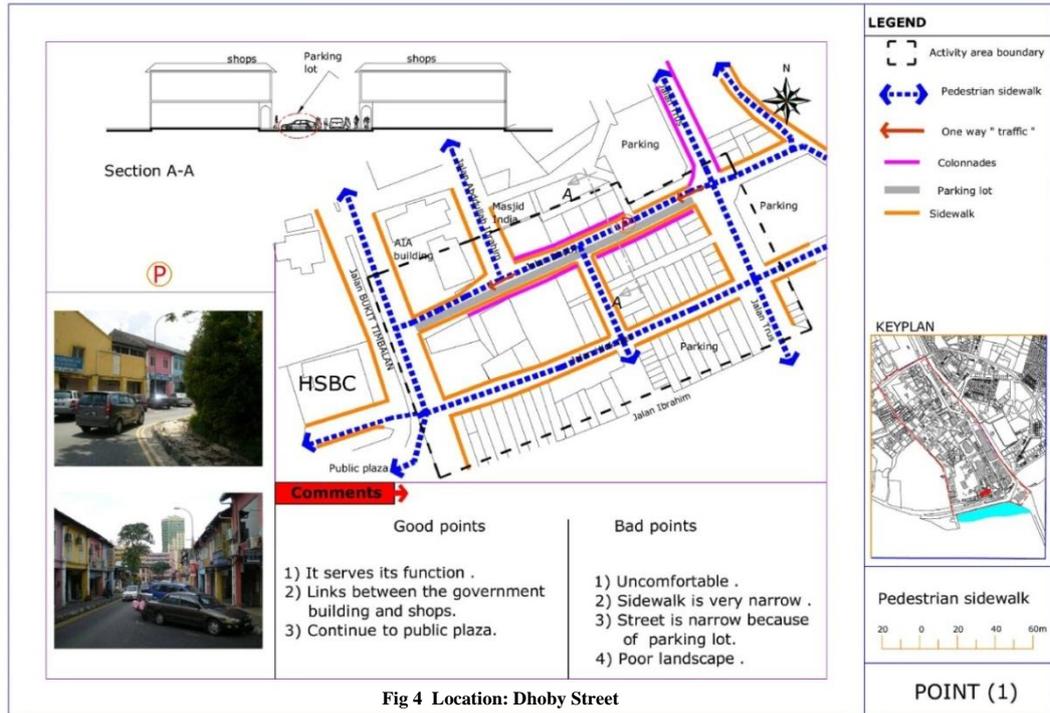


Fig 4 Location: Dhoby Street

Fig 5. Between Abd Ibrahim Street and Wong Ah Fook street : Type of Pedestrian footpath . It serves its function, because it linkage between Abdullah Ibrahim Street and Wong Ah Fook Street, continue to both of city square and Ktoaraya complex. Uncomfortable, because there is stench, reason people urinate in forbidden place.

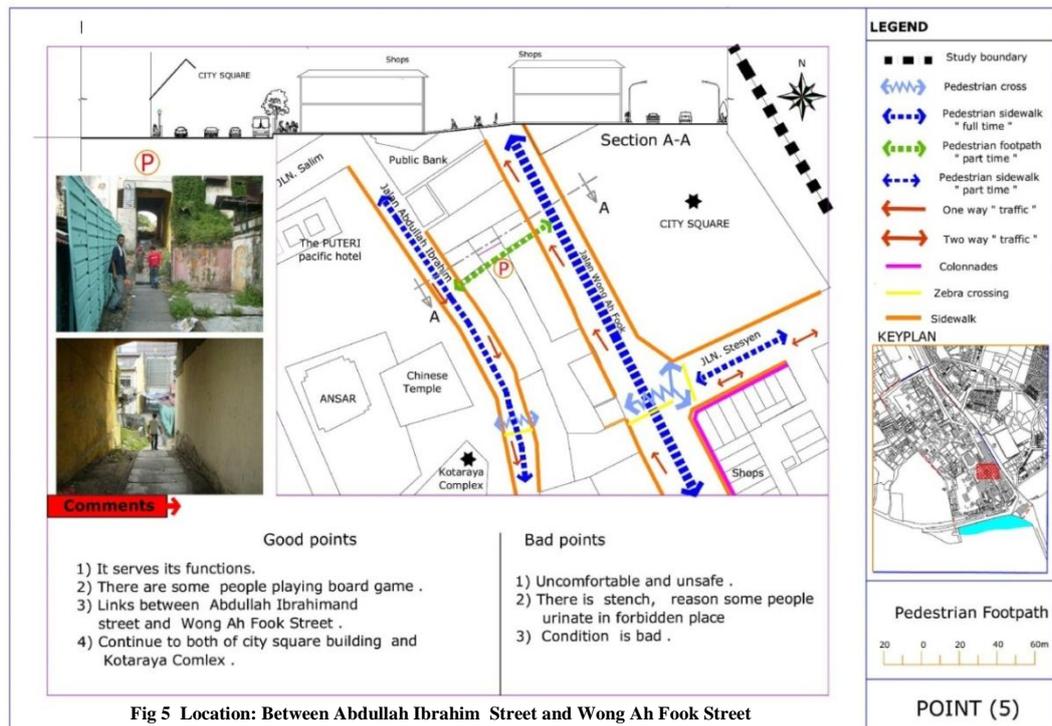


Fig 5 Location: Between Abdullah Ibrahim Street and Wong Ah Fook Street

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Table 1. Summary the present pedestrian network system for Twelve sections are chosen according to criteria in JB city centre.

ON	Location	Types of Pedestrian	Serves its Functions	Link	Comfortable / Safe	Disadvantage
1	Dhoby Street	Pedestrian sidewalk	It serves its function, because it links between old town and government building. Continue to public plaza.	Yes	Uncomfortable, because sidewalk is very narrow	Narrow
2	Wong Fook street close to Indai Temple	Pedestrian crossing	It serves its function, because it links between Ungku Pan Street and Sui Chin Street also; continue to city square and a train station.	Yes	Unsafe, because it no zebra cross	No crosswalk
3	Between Bangunan Sultan Ibrahim and Mohamed Sayed Street	Pedestrian footpath	It no serves its function; because it closed by rubbish and very narrow.	No	-	Closed by rubbish
4	Wong Ah Fook street close to city square	Pedestrian sidewalk	It serves its function, because it links between bus stop next to India Temple, and bus stop in front of the city square.	Yes	Uncomfortable, because it number of stairs is not sufficient ,also illegal of vehicles and bicycles	Illegal parking
5	Between Abd Ibrahim Street and Wong Ah Fook street	Pedestrian footpath	It serves its function, because it linkage between Abdullah Ibrahim Street and Wong Ah Fook Street, continue to both of city square and Ktoaraya complex.	Yes	Uncomfortable, because there is stench ,reason people urinate in forbidden place	Stench
6	Wong Ah Fook Street in front city square and Komtar	A- Pedestrian sidewalk	It serves its function, because it links good between bus stop and bridge also, continue to city square.	Yes	Uncomfortable, because it number of stairs are very high and not enough for feet ,also illegal of vehicles and bicycles	Illegal parking
		B- pedestrian sidewalk	It serves its function, because it links between city square to shops also, continue to city center.	Yes	Uncomfortable, because it number of stairs are very high and not enough for feet.	Stairs are not enough for feet
7	Dato Dalam Street	pedestrian sidewalk	It serves its function, because it links between Abdullah Ibrahim Street and Yahya Awal Street also, continue to Menara TJB	Yes	Uncomfortable, because there is no sidewalk	No sidewalk
8	Yahya Awal Street close to JB prison	pedestrian sidewalk	It serves its function, because it links between the shops and JB prison.	Yes	Uncomfortable, because sidewalk is very poor	Poor
9	Between Abdul Rahman Andak Street and TunAbddulRazak Street	A- pedestrian sidewalk	It serves its function, because it links between Abdul Rahman Andak Street to the bus stop.	Yes	Uncomfortable, because there is no sidewalk	No sidewalk
		B- Pedestrian footpath	It serves its function, because it links between Abdul Rahman Andak Street to the bus stop.	Yes	Uncomfortable, because there is no footpath	No footpath
10	TunAbddulRazak Street close to bus stop	Pedestrian footpath	It serves its function, because it links between the shops and bus stop also, continue to Landmark building.	Yes	Uncomfortable, because there is grasses instead of the sidewalk	Poor
11	TunAbddulRazak Street close to shops (services)	Pedestrian cross	It serves its function, because it linkage between shops (services) and residential area also, continue to city centre.	Yes	Unsafe, because it is not crosswalk	No crosswalk

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Table 1: Summary the present pedestrian network system in JB city centre

ON	Location	Types of Pedestrian	Serves its Functions	Link	Comfortable / Safe	Disadvantage
12	Wadi Hassan street and YusofTaha Street	Pedestrian cross	It serves its function, because it link to residential area	Yes	Unsafe, because it is not crosswalk	No crosswalk

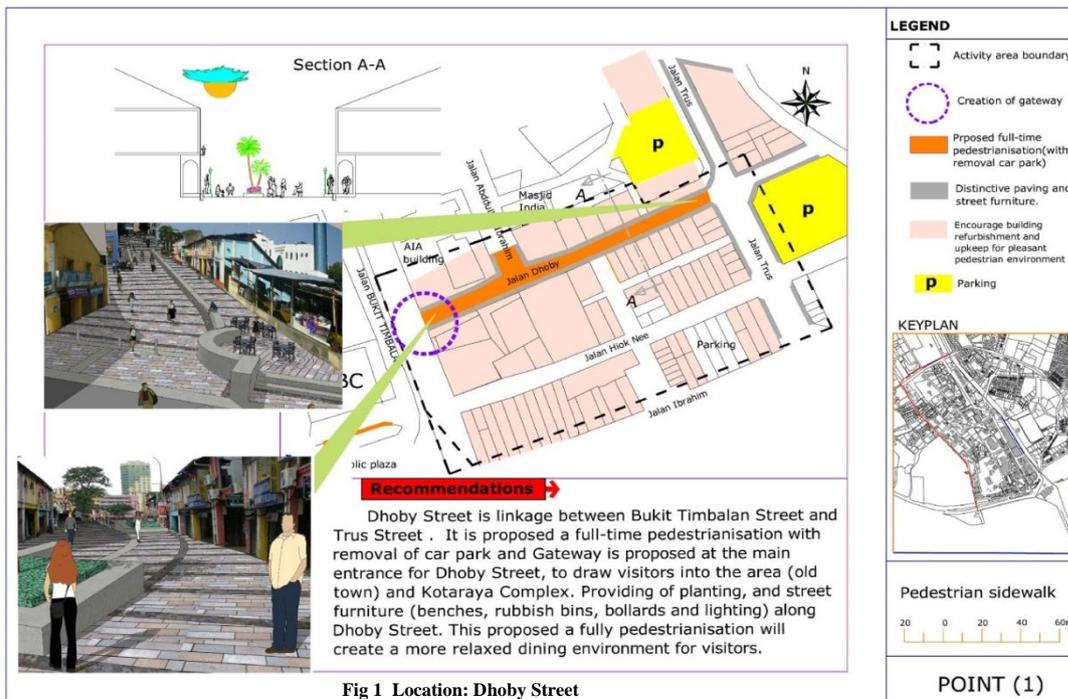
III. CONCEPT AND DESIGN GUIDELINES

1. ENHANCING INTRA-DISTRICT LINKAGES

The pedestrian network system should be enhanced to minimize pedestrian congestion/crowding, create a more pleasant experience for visitors, be fully accessible for all users (including the elderly and disabled), to encourage them to walk at leisure and to encourage them to spend more time within the area. This requires upgrading of linkages according to the principles of universal design to allow pedestrians a greater choice of routes so that they can walk from one place to the next comfortably and conveniently.

2. Proposals:

It is proposed to improve intra-district linkages through the creation of new or enhanced pedestrian links. Such links will enable more convenient and direct pedestrian routes between main pedestrian streets, activity nodes such as retail attractions. All linkages should be subject to universal design to ensure accessibility by all users. Enhancement of at-grade links is generally preferred as these reflect the general pattern of movement in JB city centre. A summary of proposals associated with the Pedestrian network system is provided in Table 2 and, Figs 1, 2, 3, 4 .



Figs.2 ,3. Between Abd Ibrahim Street and Wong Ah Fook street :Should be comfortable because it linkage between Abdullah Ibrahim Street and Wong Ah Fook Street, continue to both of city square and Ktoaraya complex. Also proposed a toilet because some people urinate in this footpath which is forbidden place and the kiosks for pleasant the place. These proposals shall create comfort for pedestrians, to improve both of city square and Ktoaraya complex.

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Fig 2 Location: Between Abdullah Ibrahim Street and Wong Ah Fook Street

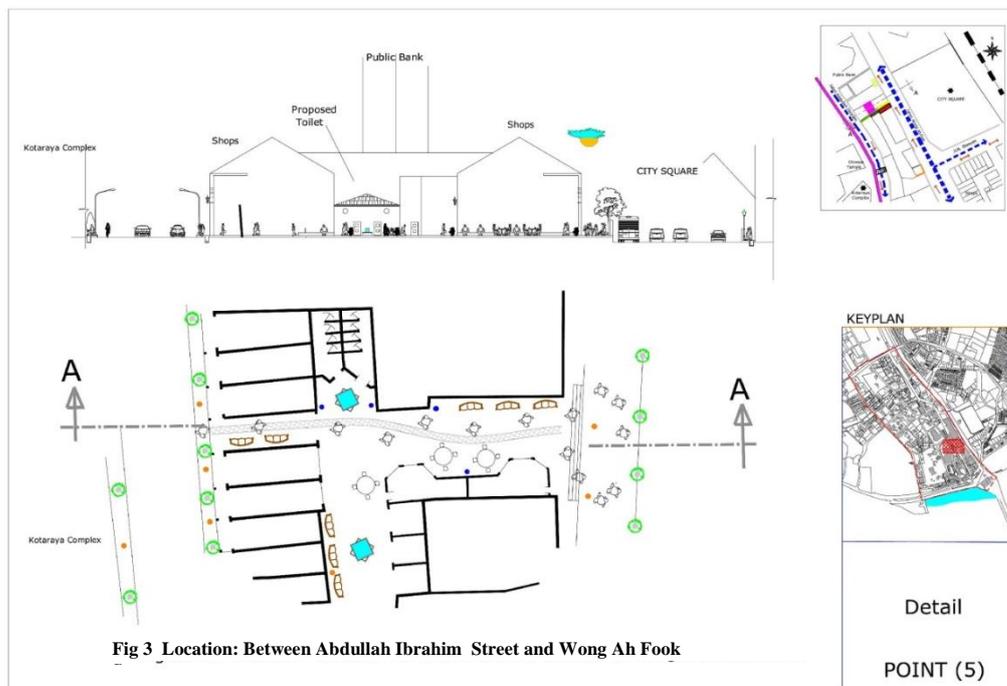


Fig 3 Location: Between Abdullah Ibrahim Street and Wong Ah Fook

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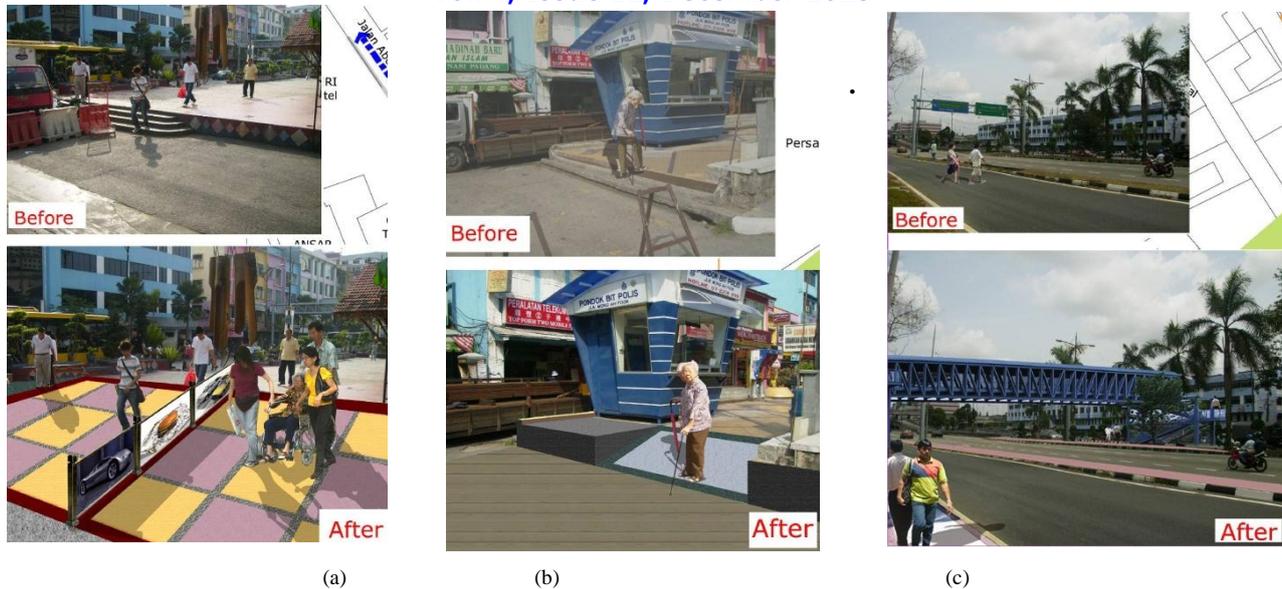


Fig. 4Wong Ah Fook street close to city square (a),TunAbdRazak Street close to Selamat(b),TunAbdRazak Street close to Selamat(c) .

Table 2: Summary of the enhanced pedestrian network system in JB, according to design criteria.

ON	Location	Enhanced	Recommendations
1	Dhoby Street	Sidewalk	Should be comfortable, because linkage between Kotaraya Complex and the government building also, continue to public plaza. This proposed a fully pedestrianisation will create a more relaxed dining environment for visitors and also, to draw visitors into the area (old town) and Kotaraya Complex.
2	Wong Fook street close to Indai Temple	Zebra Crossing	Should be safe link to a train station and city square. Zebra crossings should be sufficiently wide to minimise pedestrian congestion. It is proposed a zebra cross will create a safer link to a train station and city square.
3	Between BangunanSltan Ibrahim and Sayed Street	Footpath	A proposed redevelopment of the footpath in terms of widening. Footpath should be comfortable along street. This proposed will create a linkage between Bangunan Sultan Ibrahim and government buildings.
4	Wong Ah Fook street close to city square	Sidewalk	This proposed should be comfortable, and fully accessible for all users (including the elderly and disabled), because it linkage between the bus stop next to India temple and the bus stop in front of the city square.
5	Between Abd Ibrahim Street and Wong Ah Fook street	Footpath	Should be comfortable because it linkage between Abdullah Ibrahim Street and Wong Ah Fook Street, continue to both of city square and Ktoaraya complex. Also proposed a toilet because some people urinate in this footpath which is forbidden place and the kiosks for pleasant the place. These proposals shall create comfort for pedestrians, to improve both of city square and Ktoaraya complex.
6	Wong Fook street in front city square and Komtar	Sidewalk	Should be comfortable, and fully accessible for all users, because it linkage between the bus stop in front of the city square and pedestrian bridge. This proposal will create comfort, and fully accessible for all users
7	DaloDalam street	Sidewalk	Should be comfortable because it linkage between Abdullah Ibrahim Street and AyeiMolek Street. This proposed will create comfort to Menara TJB and WismaProfesional .

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Table 2: Summary of the enhanced pedestrian network system in JB, according to design criteria.

ON	Location	Enhanced	Recommendations
8	YahyaAwla Street close to JB prison	Sidewalk	Should be comfortable link to JB Prison .In addition, sidewalk widening is proposed along the street. These proposals shall create comfort and pleasant for pedestrians
9	Between Abdul RahmanAndakstreetandTunRazak street	Sidewalk	Should be comfortable, because it linkage between Abdul Rahman Street and Andak Street. This proposal will create comfort for pedestrians and to enhance the pedestrian environment
		footpath	Linkage between bus stop and Andak Street. It is proposed a footpath and this proposed should be comfortable, and fully accessible for all users to bus stop.
10	TunAbdRazak Street close to shops and bus stop	footpath	Should be comfortable and suitable for pedestrians, because it linkage between the shops and bus stop also, continue to Landmark building, and will create comfort for pedestrians.
11	TunAbdRazak Street close to Selamat	bridge	Should be safer for pedestrians and by ramps of a gradient no greater than five percent but stairs should also be incorporated with horizontal landings at regular intervals.
12	Wadi Hassan street and YusofTaha Street	bridge	Should be safe link to residential area. This is proposed will create a safer for pedestrians.

IV. CONCLUSION

The purpose of this study was to enhance the pedestrian network system in **JB**. The pedestrian network system has been enhanced. This requires upgrading of linkages according to the principles of universal design to allow pedestrians a greater choice of routes so that they can walk from one place to the next comfortably and conveniently. This study involved the definition, philosophy and principles of pedestrian network; and the understanding of enhancement guidelines that are needed through literature review. Twelve sections were chosen for the study according to design criteria. The Pedestrian Enhancement Results can be stated as follow:

1. Enhanced pedestrian ways which are clearer and more direct to give pedestrians a greater choice of ways.
2. Pedestrian safety has been enhanced through design - pedestrian linkages have been better lit, sight lines improved and key road crossings improved.
3. Pedestrian congestion has been relieved and disabled access enhanced through pavement widening to (1) increase space in the through place; and (2) to provide space for the street furniture place.
4. Pedestrian exposure to noise and air pollution from vehicles would be minimized by the reduction in vehicular traffic and through road side planting and amenity prevision.
5. Pedestrian ways and networks become integral parts of the entire pedestrian plan area - the pedestrian environments accommodate a wide variety of activities and features to promote tourism, and enhance pedestrian vibrancy and activity.

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