PEDESTRIAN FACILITIES FOR WHEELCHAIR USERS AT UTC AREA KUANTAN

WAN NURUL NABILAH BINTI WAN SUHAIMI

Bachelor in Engineering Technology
Infrastructure Management (Hons)

UNIVERSITI MALAYSIA PAHANG

SUPERVISOR'S DECLARATION

We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor in Engineering Technology Infrastructure Management with Honors.

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Pengguna kerusi roda mempunyai banyak keperluan untuk mereka menjalani kehidupan seharian mereka. Mereka juga menghadapi kesukaran untuk bergerak di kawasan bandar. Walaupun bilangan pengguna kerusi roda yang menggunakan kemudahan pejalan kaki adalah kecil, mereka masih mempunyai hak untuk keperluan mereka. Walaubagaimanapun, kemudahan yang tersedia untuk pengguna kerusi roda adalah sangat terhad dan tidak mengikut spesifikasi. Dalam langkah untuk menggalakkan pengguna kerusi roda menjadi lebih berdikari, adalah sangat penting untuk memastikan akses kepada bangunan awam, taman awam dan setiap kawasan di bandar sesuai dan selesa untuk pergerakan pengguna kerusi roda. Oleh itu, pihak berkepentingan seperti arkitek, jurutera, kerajaan dan pihak-pihak lain bertanggungjawab untuk memastikan semua kemudahan pejalan kaki disediakan untuk pengguna kerusi roda.

Keberkesanan kemudahan pejalan kaki boleh dianalisis dengan mengadakan wawancara dengan pihak berkuasa tempatan dan audit di Pusat Transformasi Bandar (UTC) Kuantan. Pengauditan dijalankan mengikut zon untuk memastikan keputusannya lebih terperinci dan tepat.

Pengenalan kemudahan pejalan kaki menunjukkan bahawa kebanyakan kemudahan pejalan kaki adalah tidak mengikut standard dan spesifikasi dan kurang kemudahan pejalan kaki untuk pengguna kerusi roda. Kajian ini juga mendapati, dengan mencadangkan kemudahan pejalan kaki baru untuk pengguna kerusi roda akan membantu mengatasi masalah yang dihadapi oleh pengguna kerusi roda.

ABSTRACT

Wheelchair users have a lot of needs for them to live their daily life. They also faced with the difficulties to move around in the city area. Disregard the number of wheelchair users that use pedestrian facilities are small, they still have the rights to their needs. However, these facilities that are available for the wheelchair users are very limited and not according to standard specification.In order to encourage wheelchair users to be more independent, it is very important to make sure that access to public buildings, public parks and any area in the city area are suitable and comfortable for wheelchair users to move around. Hence, stakeholders such as architects, engineers, government and other parties are responsible to make sure all pedestrian facilities are provided for the wheelchair users.

The effectiveness of the pedestrian facilities can be analysed by conducting the interview with a local authorities and audit at the Urban Transformation Centre (UTC) Kuantan area. The auditing was conducted by zoning to make sure the result was more detail and accurate.

The identification of pedestrian facilities shows that there were most of the pedestrian facilities not follow the standard and specification and lack of pedestrian facilities for wheelchair users. This study also found, by proposing the new pedestrian facilities for wheelchair users will help to overcome the problem face by the wheelchair users.

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LIST OF ABBREVIATIONS

PWDs	People With Disabilities
MPK	Majlis Perbandaran Kuantan
UTC	Urban Transformation Centre
WHO	World Health Organization
JKM	Jabatan Kebajikan Masyarakat
UUK 125	Undang-Undang Kecil 125
ADA	American with Disability Act

CHAPTER 1

INTRODUCTION

Background of Research

Few years ago, former Vice Chancellor of Universiti Sains Malaysia (USM), Tan Sri Datuk Professor Dzulkifli Abdul Razak introduced the use of the terminology people with disabilities and rejected the use of disable person a terminology that has long been used to refer to those who are considered to be flawed Based on laws of Malaysia Act, *People with Disabilities 2008* people with disabilities refer to those who have lack of long-term physical, mental, intellectual or sensory when interacting with various obstacles that can block their full and effective participation in society. In addition, it is stated in the *People with Disabilities Act 2008* that people with disabilities have the right to access and use the facilities, amenities and public transport services which are open or provided to the public on the basis of equivalence with the people with disabilities. Physical disability is one of the reasons that will reduce a person's level of fitness and mobility. Therefore, people with physical disabilities require aides to move such as wheelchair because their movement is limited. Usually those with physical disabilities need time to adapt with their participation in society (Stillman, Bertocci et al. 2017).

Nowadays, public facilities are one of the basic requirements for the community around the world. Based on the student's dictionary Second Edition utilities is defined as services and infrastructures provided by the authority or Government for the needs of the public such as electricity, bridges, public transit and roads. There are three factors for sustainability of an urban development which are economic, social and ecological. Accordingly, the city intelligence can be measured based on the urban ability to manage demands and needs by the citizen.(Nuzir and Dewancker 2014)

People nowadays are more preferable to use transport for them to reach to their destination. By developing better pedestrian environments which are complete with pedestrian facilities, it will encourage people to walk. Besides that, the pedestrian facilities must be accessible by the people with disabilities (PWD's) especially for those with a physical disability or wheelchair users. The operation and maintenance of the pedestrian facilities must be conducted frequently to ensure that they are usable for everyone. The pedestrian facilities are usually designed to connect between streets to street. The connectivity is very important for the wheelchair users to access. The *American with Disability Act* (ADA) highlights that the facilities provided are such as transportation and more. The facilities must to accessible by everyone including people with disabilities (PWD's). The accessibility for pedestrian facilities is very important in order to increase the opportunities for people with disabilities to involve with community. Other than that, the improvements of the pedestrian facilities must also consider the wheelchair users in order to make sure that they can access the walkway. It is because when the improvements were done for the wheelchair users it will also be beneficial to all pedestrians. The items included for the wheelchair users needs are the adequate time to cross street, well design curb ramps and a sidewalk that are wide and clear from obstacles. These pedestrian facilities also can be used by the strollers, shopping cart and other (Zegeer 2002).

In order to encourage the wheelchair users to be more independent, it is very important to make sure that the accessibility for public building, public park and any area at the city area suitable and comfortable for wheelchair users to move (Hamzat and Dada 2005).

Problem Statement

This research considers several problems as follows:

i. The wheelchair users are seen as requiring some special attention, especially in the urban area. However the facilities that are available for the wheelchair users are very limited (Bromley, Matthews et al. 2007)

ii. Urban areas are areas with high population of people. Therefore, urban areas are equipped with facilities that can facilitate the citizens. However, the accessibility aspects for people with disabilities in urban area are lacking if compared to the facilities provided for people without disabilities. (Rimmer, Riley et al. 2004)

iii. Wheelchair users have a lot of needs for them to live their daily life. Besides that, they also face with the difficulties to move around in the city area. Hence, stakeholders such as architects, engineers, government and other parties are responsible to make sure all the pedestrian facilities are available for the wheelchair users. However, some of the authorities' do not taking it as serious issues that need to be solved. Pedestrian facilities that are available for the wheelchair users are very limited and are not according to standard specification. (Sanmargaraja and Wee 2015).

Research Objectives

The objectives to be achieved in this research are as following:

i. To identify the pedestrian facilities needs for wheelchair userss in urban area.
ii. To investigate the barriers of pedestrian facilitities for wheelchair userss at Urban Transformation Centre (UTC) Kuantan area.
iii. To propose a framework to improve the pedestrian facilities for wheelchair userss at Urban Transformation Centre (UTC) Kuantan area.

Research Questions

There are several things that should be considered in achieving the objectives of this research:

i. What are the requirements for wheelchair userss in urban area ?
ii. What are the barriers and limitations of pedestrian facilitities for wheelchair userss at Urban Transformation Centre (UTC) Kuantan area ?
iii. How to better improve the pedestrian facilities for wheelchair userss at Urban Transformation Centre (UTC) Kuantan?

Significance of Research

The significance of this research are:

i. The analysis of urban pedestrian facilities of wheelchair users at Urban Transformation Centre (UTC) Kuantan will be useful as the reference for future research.
ii. The information that is obtained from this research will be useful as a platform to improve the pedestrian facilities at Urban Transformation Centre (UTC) Kuantan especially for wheelchair users. Besides that, it is to improvise Kuantan city towards becoming PWD's-friendly city in context of accessibility and usability.
iii. This research can increase self-esteem and confidence of wheelchair users to be independent and live their daily life just like everyone as well as ensuring all the facilities for them are accordance to the local authority specifications.

Research Scopes

The boundaries of this research are as follows:

i. This research focuses on people with disabilities (PWD's) that have physical disability or wheelchair users.
ii. The area covered in this research is Urban Transformation Centre (UTC) Kuantan area.
iii. The research is specific on the pedestrian facilities for the wheelchair users.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The area investigated in this study is Kuantan city. It is located in Pahang and near to the Kuantan River, faces the South China Sea. Kuantan is also the state capital of Pahang, Malaysia with the area about 296,000 hectares. The population of Kuantan city was 607,778 in 2012 and it increased to 642,555 in 2015 (Noor and Rosni 2013). The study area for this research is Urban Transformation Centre (UTC) Kuantan that are located at Jalan Stadium, Kuantan, Pahang.(Resources 2017). The area covered by this research is within the parameter of the Urban Transformation Centre (UTC) Kuantan area include the Rapid Terminal, market and the route in front of the Transformation Centre (UTC) Kuantan.

Figure 2.1: Site Location

According to the *Persons with Disabilities Act 2008*, people with disabilities means as the person who have lack of long-term physical, mental, intellectual or sensory that is when interacting with various obstacles, can suppress their full and effective participation in society. This Act also states that people with disabilities shall have the right to access to and use of facilities, amenities and services public transport is open or available to the public on the basis of equivalence with the people with disabilities. Disability is not only due to health factors but its complex phenomenon which reflects the interaction between the characteristics of a person's body with the characteristics of the society in life that is frustrating with environmental and social barriers. Disability is a condition considered to reduce the functionality or the ability of a person when compared to normal human size (Ujang, Alias et al. 2013). Besides that, in the tourism sector of Germany, the blind are given the opportunity to visit the place the historic tourist guide by holding facilities and some the walls are provided with braille writing. Safety groups also guaranteed.in sports, the sports facilities such as swimming pools, special court badminton and tennis are available for people with disabilities. Athletes with disabilities born to represent the state in championships organized in summer. In turn, the job with disabilities have a high chance of getting an offer of employment sector normal public than people (Howard 2008).

People with disabilities (PWD's) are those that need special attention because they have a limitations on their movement. Thus, it is very important for all the public places to be designed to be a user friendly or barriers free place. The purpose of this action is to help people with disabilities (PWD's) to become more independent and confident to move alone. Besides that, the surroundings also need to be flexible for people with disabilities (PWD'S) and also to fulfilling their needs. People with physical disability might face with a lot of obstacles in the way for them to move. Thus , it is compulsory for them to have all the support facilities such as ramps, curb, handrail and so on.(Hashim, Samikon et al. 2012)

Ahad 18 Mac 2012 NASIONAL 19

Kerajaan digesa pinda Akta OKU 2008

KUALA LUMPUR: Gerakan Bersama Kebangkitan Orang Kelainan Upaya (OKU) 2012 (BANGKIT 2012) meminta kerajaan meminda Akta OKU 2008 (Akta 685) dengan memberi hukuman kepada sesiapa pihak yang gagal mematuhi atau menafikan hak OKU.

Ia adalah antara 11 isi kandungan memorandum yang diserahkan kepada Suruhanjaya Hak Asasi Manusia Malaysia (SUHAKAM) mewakili hampir 4.2 juta golongan berkenaan dalam negara ini.

Pengerusi Kumpulan Kerja OKU, Jawatankuasa Hak Asasi Manusia Majlis Peguam, Muhammad Faizal Che Yusof, berkata memorandum itu adalah tuntutan kepada kerajaan dan masyarakat untuk lebih memahami keperluan, keupayaan dan sumbangan OKU kepada negara.

"OKU adalah individu yang hidup dalam sistem masyarakat, tidak harus dipinggirkan atau dilihat terpinggir dalam pembangunan arus perdana dan banyak hal perlu diperhalusi demi kesinambungan lebih lestari.

"Antara isu tuntutan dalam memorandum berkenaan adalah bagi pendaftaran wajib bagi mereka yang dikenal pasti OKU sejak kelahiran, pendidikan menepati keperluan kecacatan, kemahiran hidup, pekerjaan serta sara hidup dan keperluan di hari tua," katanya kepada pemberita pada sidang media, di sini, semalam.

OKU adalah individu yang hidup dalam sistem masyarakat, tidak harus dipinggirkan atau dilihat terpinggir dalam pembangunan arus perdana dan banyak hal perlu diperhalusi

Muhammad Faizal Che Yusof
Pengerusi Kumpulan Kerja OKU, Jawatankuasa Hak Asasi Manusia Majlis Peguam

Turut hadir, Bendahari Majlis Peguam, Steven Thiru; Presiden Pertubuhan Orang Cacat Penglihatan Malaysia (SBM), Mohamad Nazari Othman; Pengarah Eksekutif Pertubuhan Untuk Orang Cacat, Sia Siew Chin; Wakil Persatuan Orang Pekak Kuala Lumpur, Lee Tur Chung; Pensyarah Fakulti Kemasyarakatan, Universiti Sains Malaysia (USM), Prof Madya Tiun Ling Ta dan Pensyarah Fakulti Pendidikan, Universiti Kebangsaan Malaysia (UKM), Dr Hasnah Toran.

Memorandum berkenaan diserahkan kepada wakil SUHAKAM, Prof Datuk Dr Khaw Lake Tee, di sini, semalam.

Figure 2.1.1: Article on PWD's Act 2008

2.2 Wheelchair users

Based on the public Service Commission Portal (SPA) Ministry of Women, Family and Community through the Department of Social Welfare has classify people with disabilities to seven (7) major categories such as disability hearing, visually impaired, physical disability, learning problems, speech disabilities, mental disabilities and multiple disabilities. Another definition for the disability is a person who has limited mobilization refers to the type of disability, whether physical (member) or mental (light, medium, and heavy), vision, and hearing. The purpose of this term disabilities featured is to avoid the "disabled" the label means that disabled people from all aspects (without categorized). Department of Social Welfare Malaysia (2008) categorize people with disabilities as follows. First, hearing disability which is cannot listen to clearly in both ears without the use of hearing aids, or are unable to listen live, even by using the tool hearing aid. There are four levels that can be categorized as deaf:

i. Minimum or Mild: - [15 - <30 dB] for children and - [20 - <30 dB] for adults
ii. Average or moderate: - [30 - <60 dB]
iii. Severe or Severe: - [60 - <90 dB]
iv. Very Severe or Profound: - [> 90 dB].

Second, the vision disabilities which is cannot see or suffer from low vision in both eyes even using visual aids such as glasses or contact lenses. There are two levels Blind, namely blind or blind where visibility is less than 3/60 or visual field less than 10 degrees of fixation and Limited or Low Vision / Partially Whereas sighted vision worse than 6/18

but equal to or better than 3/60, even with the aid of vision or visual field of less than 20 degrees of fixation.

Third, physical disability where the inability of the body, the same there is no loss or a member or disability in any body parts that suffer from conditions such as hemiplegia, paraplegia, tetraplegia, dismemberment, and weakness of the muscles The result they are unable to perform basic activities such as self-care, movement, and change the position of the body. Condition. This can occur as a result of injury (trauma) or malfunction nervous system, cardiovascular, respiratory, haematology, immunology, urology, Hepatobiliary, musculoskeletal, gynaecological, and others. Fourth, disabled speech that is unable to speak up cause trouble communicating properly and cannot be understood by those who interact with it. This situation is permanent or will not heal. Children must be judged on aged five years and above.

Fifth, the learning disabilities is the problem is not intelligence in line with biological age. Those who fall into this category is through global development, down syndrome, damp, and less intellectual effort. This category also includes conditions affecting individual learning abilities such as Autistic Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD) and problems specific learning like Dyslexia, dyscalculia and dysgraphia.

Sixth, the mental disability is a severe mental disease situation which have been treated or have been given a diagnosis for at least two years by a psychiatrist. As a result of the disease experienced and had undergone psychiatric treatment, they still do not able to work, either in part or in full in matters relating to him or relationships within the community. Among the types of the serious mental illness is an Organic Mental Disorder, Paranoid and Mood Disorder. Seventh, multiple disabilities is if a person have more than one type of disability and are generally not suitable classified in the category of one to six above.(Li, Muhamad et al. 2016)

Kumpulan Umur / *Age Group*	Penglihatan *Visson Impair*		Pendengaran *Hearing*		Fizikal *Physical*		Masalah Pembelajaran *Learning Disabilities*		Pertuturan *Speech*		Mental *Mental*		Pelbagai *Others*		Jumlah *Total*	
	L *M*	P *F*	L *M*	P *F*	L *M*	P *F*	L *M*	P *F*	L *M*	P *F*	L *M*	P *F*	L *M*	P *F*	L *M*	P *F*
Kurang dari 6 tahun / *Below 5 years*	82	71	119	101	420	320	957	608	14	11	6	2	239	168	1,837	1,281
7 - 12 tahun / *years*	173	116	171	144	424	316	1,788	1,085	53	29	9	4	289	177	2,907	1,871
13 - 18 tahun / *years*	181	117	192	134	539	343	1,128	702	12	6	42	35	128	91	2,222	1,428
Jumlah / *Total* (a)	**436**	**304**	**482**	**379**	**1,383**	**979**	**3,873**	**2,395**	**79**	**46**	**57**	**41**	**656**	**436**	**6,966**	**4,580**
19 - 21 tahun / *years*	105	49	92	72	395	206	522	304	6	4	86	48	70	42	1,276	725
22 - 35 tahun / *years*	465	277	371	298	1,418	761	884	704	33	34	707	462	253	174	4,131	2,710
36 - 45 tahun / *years*	418	257	217	191	1,321	746	412	351	36	14	801	515	196	111	3,401	2,185
46 - 59 tahun / *years*	752	451	377	329	1,809	1,156	294	245	19	18	682	556	231	147	4,164	2,902
60 tahun ke atas / *60 years and above*	627	379	400	239	1,450	956	60	67	17	5	218	176	155	99	2,927	1,921
Jumlah / *Total* (b)	**2,367**	**1,413**	**1,457**	**1,129**	**6,393**	**3,825**	**2,172**	**1,671**	**111**	**75**	**2,494**	**1,757**	**905**	**573**	**15,899**	**10,443**
Jumlah / *Total* (a + b)	**2,803**	**1,717**	**1,939**	**1,508**	**7,776**	**4,804**	**6,045**	**4,066**	**190**	**121**	**2,551**	**1,798**	**1,561**	**1,009**	**22,865**	**15,023**

Table 2.2: Statistic of new registrations of PWD's by category of disabilities age group and sex 2014

Table 2.2 shows that the numbers of the people with physical disability is the highest. There are many categories of physical disability person that has been discovered that involved part of their body, such as hand, leg and many more. Some of the physical disability also effected the movement of the person. Walking is the basic need for the human, but because of this problem the movement becomes limited. As a solution of this problem, they need a flexible equipment to help them to move around. For example, wheelchair and walking stick (Liyana 2010).

Everyone should be able to enjoy the outdoors, regardless their abilities. However, for a person that has limited mobility, or a wheelchair users, it's not always easy for them to access the countryside. Wheelchair users might face a lot of barriers to travel in the urban area. Wheelchair users might need more facilities compared to a people without disabilities. Because their movements are very limited, most of the wheelchair users prefer to travel in the city by car or taxi compared to travel by public transport such as bus. The wheelchair users consider traveling by bus is very difficult because of the lack facilities provided for people with disabilities such as high steps to get into the bus and lack of ramps which is very important for wheelchair users as a support for them. Next, for the wheelchair users to move around in the city area is not an easy thing because they have to face with different difficulties such as a lack of the dropped curbs, too high curbs steps and uneven surfaces. Besides that, the attitudes of the surroundings people also affected them such as they do not want to lend a hand to help the person who needs it.

Most of the wheelchair users feel uncomfortable to move around at the city area.(Bromley, Matthews et al. 2007).

2.3 Pedestrian facilities for People with Disabilities (PWD'S)

Pedestrian facility can be categorized into two elements which are accessibility and facilities support. Facilities available in the element of accessibility are as facilities ramp, handrail, grab-bar, walkway and sidewalk, porch in buildings, surface textured, path stairs, crossing "pedestrian", and an elevator. An area of ramp identified amounted to 9.8 m2. Facilities ramps provided have a handrail and floor surface is not smooth. This situation is indeed appropriate and conducive to people with disabilities. Home go to each the building is provided with special routes or pedestrians. Textured path also provided to prevent users from slipping during the rainy season. In addition to the then, the pedestrian crossing facilities are also available for people to cross the road the busy highway. Elevator is also available but it is not in accordance with the specification prescribed by Ms. 1184:2002 because it was not suitable for use by the handicapped vision or blindness. Buttons in the elevator is not available with the writing Braille and automatic lift announcer to be used by the blind to the greater high or low (Sanmargaraja and Ta Wee 2011).

Pedestrian facilities include the park, the recreational facilities and it also consists of the culture and social services. All of this facilities are profitable for all the human being. In other aspect, facilities are also to ease the accessibility of the public to enter the shopping mall , healthy check-up and other public space(Lotfi and Koohsari 2009). People with disabilities are circumscribed to involve in the recreational or social activity at the city. This is because they has a very limited accessibility. From researches that have been made on adult wheelchair users, they are facing with a lot of difficulties to travel in the city. It is because of the ineffective facilities which is lacking of the facilities for people with disabilities, poor maintenance on existing facilities, existing facilities do not meet the needs and usability of the user and also the limited of the wheelchair users fitness (Rimmer, Riley et al. 2004).

Pedestrian facilities should be designed to facilitate safety, accessibility and usability for everyone. People that are using the pedestrian facilities come from the

various age levels. Pedestrian facilities include the curb ramps that can be describe as a connection between road and sidewalk. Curb ramps are accessibility tools for wheelchair users to use the walkway. Because some of the curb is too high, it become barriers for the wheelchair to access. Next is the crosswalk which are very important to cross the road and as a connectivity between the walkway. The crossroad marking that is provided must along with the ramps. As a result the wheelchair users are able to access the crosswalk without need to leave the crosswalk to access the ramps. The roadway lighting is a necessary facility which can increase the comfort and safety of the pedestrian. Then the street furniture are very important for the pedestrian such as the bench, dustbin and so on. However the street furniture must not become an obstacle for the wheelchair users (Zegeer 2002).

2.4 Related Works

This section shows the related works which means researches that have been done by other researchers. The related works may have the similarity in term of the outcomes or result of the thesis. The related work thesis is pedestrian safety index for evaluating street facilities in urban areas, (Asadi-Shekari, Moeinaddini et al. 2015). Pedestrian safety also needs to be considered in proposing good pedestrian facilities. In order to improve the safety of the pedestrian, it will also improve the pedestrian facilities at once enhance the safety for the elderly and people with disabilities (PWD's). This thesis uses the concept of pedestrian safety index (PSI) by evaluating the pedestrian facilities. Next after the pedestrian safety index (PSI) is evaluated, the research will come out with new guideline and compare the existing facilities with the standard. The improvement of the pedestrian facilities can be made after existing problems are detected. The objectives of this research are to identify the influence of pedestrian safety index (PSI) on urban street based on guideline, to investigate whether the existing facilities follow the standard and guideline and to propose solutions of the identified problems as well as propose the improvement. (Asadi-Shekari, Moeinaddini et al. 2015).

The similarity of the thesis with this research is the method used which is the investigation on the existing pedestrian facilities whether are follow the specifications or not. The thesis is much related because after all the problems are identified, the research will come out with the proposing solutions. The small difference between this thesis is the scope where the thesis focuses more on the pedestrian safety while this research focuses on the wheelchair users. Event though, the scope is different but the result will be the similar because once improvement were made for the wheelchair users, it will also enhance the pedestrian facilities for everyone. Thus, also increase the safety level at the pedestrian walkway.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter outlines the details on how the research will be undertaken in order to address the questions posed in chapter one. This chapter will elaborate in depth of the research questions and discus on the methods used that are appropriate to the aim of the research. Consequently, the content of this chapter are explanation on the methodology used, which is the pilot study and observation. Next is the data analysis use for this research is Microsoft Excel.

3.2 Research Methodology

The flowchart shows the overview of the research. This research starts with the literature review, the primary data collection, data analysis and the conclusion or the result

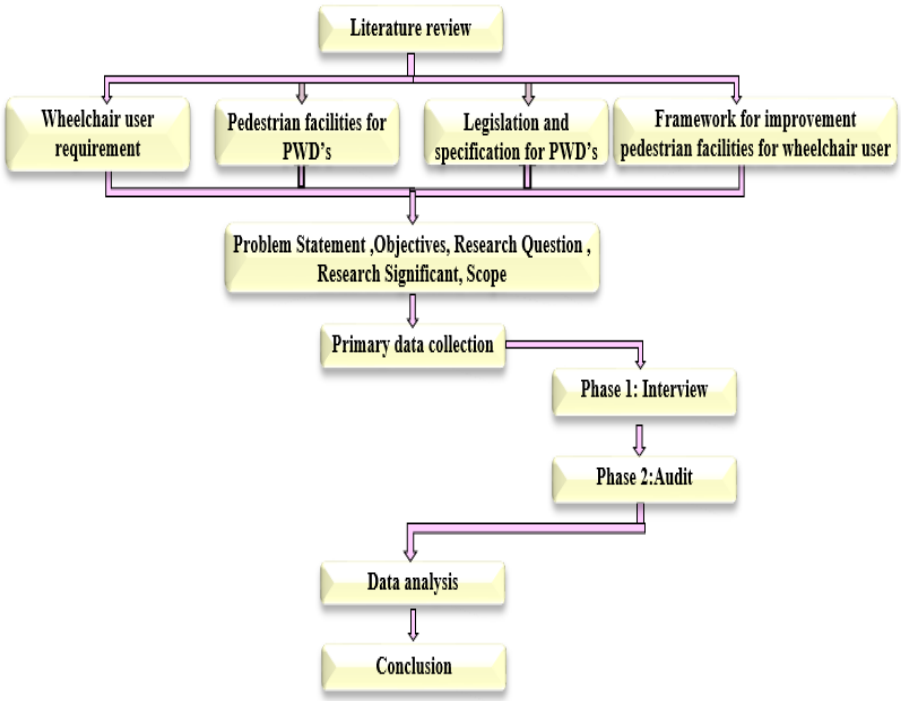


Figure 3.2: Flowchart of the research

3.2.1 Literature Review

In this chapter the pedestrian facilities for the wheelchair users regarding to their needs, barriers and limitation that they faced, the legislation and specification area analysed and also the proposed facilities as a framework / solution. All the information needed are obtained from recent research papers and other official websites. The first issue that has been discovered is the needs of the wheelchair users. Wheelchair users are people with disabilities (PWD's) under the physical impairment. Their needs are more critical than people without disabilities that have the full abilities to do their activities. Second is barriers and limitation where there a lots of the barriers that they will face along the way for them to reach to their destination. Their physical condition itself can be an obstacle and limiting their movement.

Third is legislation and specifications. Pedestrian facilities is a public facilities that can be used by everyone include people with disabilities (PWD's). The pedestrian facilities provided must follow the specifications to ensure that the pedestrian facilities can be accessible and usable by people with disabilities (PWD's).

To come out with the solutions, data will be collected to prove solution. Other than that, suggestions from other researchers are considered to come out with better solution. Next the problem statement, objectives, research questions, significance of research and scope are identified from the literature review.

Primary Data Collection

Primary data collection is the process of gathering and measuring information. Data collection is important in finding the result. The data collection will answer all the objectives which are the needs, barriers and limitations and specifications checklist. There are two ways on collecting the data.

First is a pilot interview. The pilot interview will be conducted by interviewing the local authority (Majlis Perbandaran Kuantan) and Rapid Kuantan. Based on the

interviews result, a checklist will be developed. The checklist will also refer to the universal design guideline. There are the question in the questionnaire:

Interview questionnaire for Local authorities:

Section A (Legislation)

1. What are the legislation/standard/guideline for PWD's and elderly in urban facilities for pedestrian?
2. What are the characteristic of an area that determine the necessity of providing pedestrian facilities?
3. Is there any collaboration between MPK and JKM, especially for PWDs and elderly?

Section B (Provision of Facilities)

1. From your opinion, how important do you think is to provide pedestrian facilities for PWDs?
2. What are the facilities provided for PWD's and elderly?
3. Do you think facilities for PWD's and elderly at UTC area in Kuantan are sufficient?
4. What are the maintenance provided for facilities?
5. How you conduct the whole process inspection? (*barriers/limitation)

Section C (Barriers)

1. What are the challenges (constraint) faces by the Local authorities in providing pedestrian facilities in Kuantan, specifically UTC?
2. How often do you receive any complaint from PWD's and elderly regarding facilities/mobility?
3. Normally what type of complaint that you receive?
4. How do you manage their complaint?

Section D (Future Plan)

1. What do you think are the improvement that can be done in providing pedestrian facilities for PWDs and elderly?
2. What are the future strategic/plan in improving the urban facilities for PWD's and elderly in Kuantan?
3. What are your initiatives to create awareness to public/JKM (PWD's and elderly)

Figure 3.2.1.a: Interview questionnaire for Local authorities

Interview questionnaire for Rapid Kuantan

Section A (Legislation)

1. What are the legislation, standard or guideline for people with disabilities and elderly that are used by Rapid Kuantan?
2. Is it bus stop and bus station in Kuantan is under liability of Rapid Kuantan?
3. Is there any database on people with disabilities and elderly?

Section B (Provision of Facilities)

1. What are the facilities provided?
2. Do you think these facilities are sufficient?
3. What are the maintenance provided for these facilities?
4. In your opinion, how important is providing pedestrian facilities for people with disabilities and elderly at bus station and bus stop?

Section C (Barriers)

1. What are the challenges or constraint faces by Rapid Kuantan in providing pedestrian facilities for people with disabilities and elderly in Kuantan?
2. How often do you receive complaint from people with disabilities and elderly regarding the pedestrian facilities that Rapid Kuantan provide?
3. If yes, what type of complaint? How does Rapid Kuantan manage?

Section D (Future Planning)

1. In your opinion, what are the improvement/suggestion that we can do in providing pedestrian facilities for people with disabilities and elderly at Rapid bus station and bus stop?
2. What are the future strategic plan of Rapid Kuantan in improving the pedestrian facilities for people with disabilities and elderly?
3. What are the Rapid Kuantan initiatives in creating awareness to public as well as people with disabilities and elderly?

Figure 3.2.1.b: Interview questionnaire for Rapid Kuantan

Second method is auditing. The activity that are done in this method is audit the Urban Transformation Centre (UTC) Kuantan area and photographing for documentation. Besides that, the audit also will be conducted by measuring the existing facilities provided whether it is following the specifications of MPK and accessibility of the wheelchair users. Besides, from this two method the framework of the improvement of the pedestrian facilities for wheelchair users are form.

Data Analysis

Data analysis is a process of transforming raw data into usable information. The data will be analysed to get the information needed for the thesis.

Firstly the data from the pilot interview will be analysed. The interviews result will be filtered by separate all the information into the checklist based on the standard and regulation state by MPK. The checklist that are form are based on the needs of wheelchair users and universal design. The purpose of the checklist if to ease the process of auditing and the checklist is more detail.

Second is analysing the data from the auditing. Findings from this analysation process are the barriers and whether the existing pedestrian facilities are following the specifications. The data analyzation will be conducted by comparing the measurements of the existing pedestrian facilities with the local authorities' specifications. Next the mapping will be doing by using the AutoCAD to show the facilities provided at UTC Kuantan area. The facilities provided will showing the location of the facilities through the AutoCAD layout. The analysation from the auditing process will develop the framework on the improvement of the wheelchair users' facilities.

3.3 Framework of the Thesis

The aim for this thesis is to achieve the objectives and to reach a better solution for the wheelchair users on the pedestrian facilities at UTC Kuantan area. Wheelchair users need more space to move from one place to another. Besides that, this thesis is to identify the needs and barriers for wheelchair users along the route for them to move at the UTC Kuantan are. Next, the wheelchair users needs more facilities compare to normal person. So that, the solution that are suggest are to help to improve the pedestrian facilities for the wheelchair users. This thesis also propose the future planning on enhance the pedestrian facilities for wheelchair users at UTC Kuantan area. Furthermore, it also to ensure the comfort and safety of the wheelchair during access the pedestrian facilities provided. The people with disabilities (PWD'S) have the same right with disable community to enjoy the experience moving along freely and feel the same experience. The pedestrian facilities that is proposed will considered the universal design and barriers free design, where all will get the benefit on it.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter show the result finding that conducted on the data collection. It is analysis the pedestrian facilities for wheelchair users that identify zone by zone follow with the interview with the local authorities (MPK) and audit. Last but not least, the result of the audit was including in this chapter. At the end of this chapter there will be summary for this chapter.

4.2 Site location by zoning

In this section will be further discuss on the pedestrian facilities required by wheelchair users from the questionnaire in previous chapter. The pedestrian facilities required has been separate by the zone which are zone 1, zone 2, zone 3 and zone 4. The purpose of the zoning are to discuss more detail on the pedestrian facilities at the UTC Kuantan area.

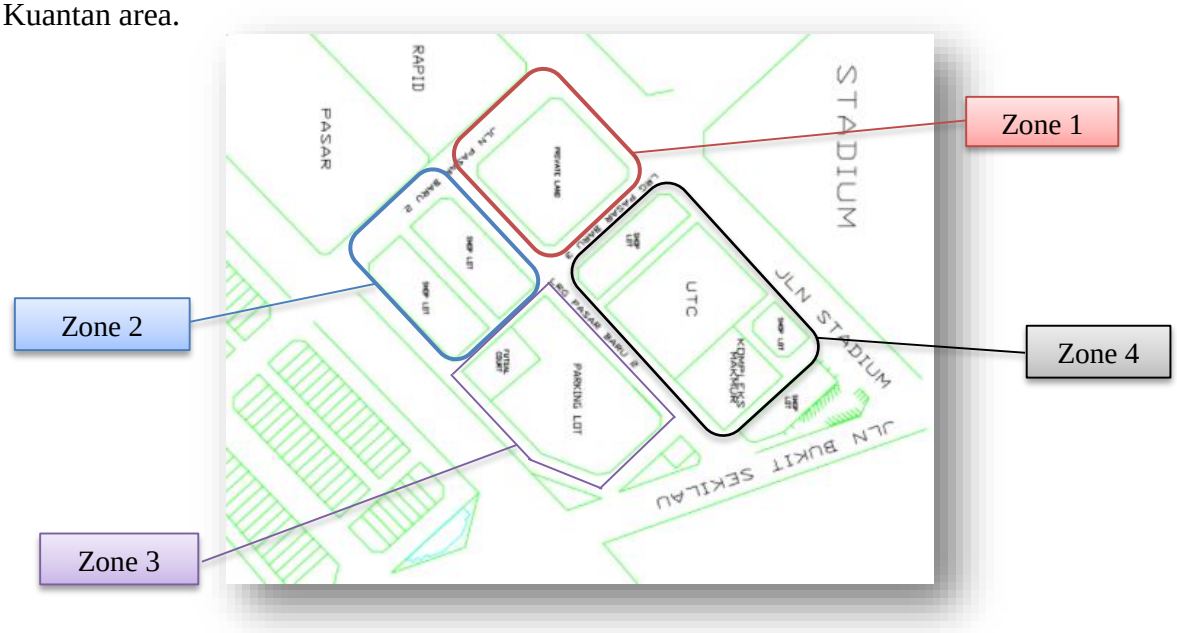


Figure 4.2: Zoning of the research area

4.3 Phase 1

4.3.1 Interview

Data was collected by interviewing the Majlis Perbandaran Kuantan (MPK) and Rapid Kuantan. The respondent from MPK are from department of planning and development, engineering department and building department.

Table 4.3.1: Result by interviewing with local authorities

Items	Data
Legislation	Undang-Undang Kecil :125 • Building requirements for people with disabilities
Provision of facilities	• Zebra crossing, parking space and ramp • Existing facilities is not efficient and many things to improve
Barriers	• Challenges for MPK to provide the facilities for wheelchair users is the limitation of budget. • The user at Kuantan is more to vehicle dependent. • Limited space because the development of Kuantan city “pocket development”.
Future planning	• Provides user friendly pedestrian walkway with complete with connectivity between one walkway to another. • Provide the facilities that can direct access for wheelchair users. • Increase the service and facilities for PWD’s.

4.4 Phase 2

4.4.1 Audit

The audit was conducted at UTC Kuantan area that include Rapid Kuantan Terminal, Kuantan Market and parking lot in front of the UTC Kuantan. The audit method was doing by measuring the existing pedestrian facilities and identify the current situation of the study area either it is follow the standard.

Table 4.3.1: Checklist for Pedestrian Facilities

Facilities	Provide (✓) / Not Provided (✖)				Comply
	Zone 1	Zone 2	Zone 3	Zone 4	
Walkway	✓	✓	✓	✓	✖
Parking space for PWD's	✖	✓	✖	✓	✖
Ramp and kerb ramp	✓	✓	✓	✓	✖
Handrail, drain cover and passing space	✓	✓	✖	✓	✖
Zebra crossing	✖	✓	✖	✓	✖

This checklist is overall pedestrian facilities that are available at the UTC Kuantan area. Most of the facilities is provided but not in good condition. The existing facilities cannot be use by the wheelchair users because it already damage and rusty. So from the audit the real condition can be identify and the barrier also can be detected.

4.5 Classification of zoning

4.5.1 Zone 1

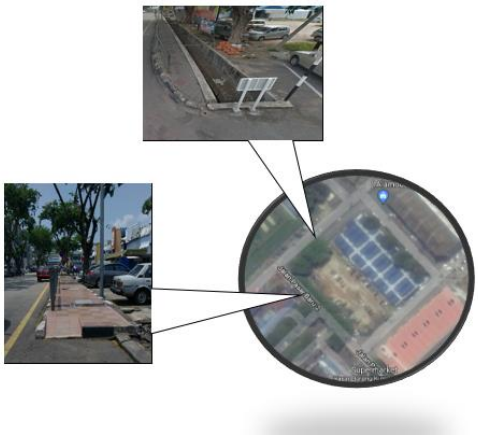


Figure 4.5.1: Zone 1

Zone 1 is the location that cover the private land and the walkway at the rapid terminal. There are many pedestrian facilities provided at zone 1. Besides that, this zone also one of the focusing area because there are the rapid terminal and food stall.

4.5.2 Zone 2

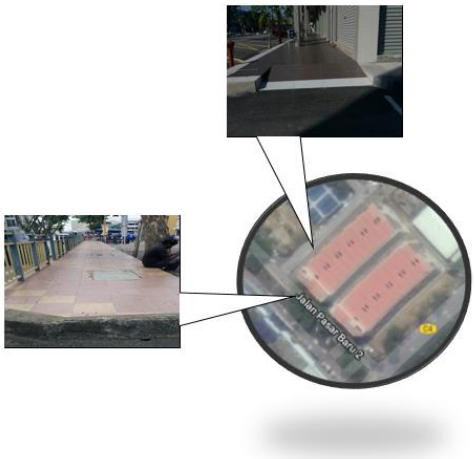


Figure 4.5.2: Zone 2

Zone 2 is a location that cover the walkway beside the market and shop lot. The shop lot building is a new building where there have a pharmacy, Mr. DIY and many more. Zone 2 also one of the focus area because people are going to the market and there is “pasar pagi” every weekend.

4.5.3 Zone 3

Figure 4.5.3: Zone 3

Zone 3 is a walkway surrounding the parking space area and this walkway is very long. This walkway is located right off the main road. Actually at the beginning it is a drain cover which have multi-function that became the walkway and can be used by the public.

4.5.4 Zone 4

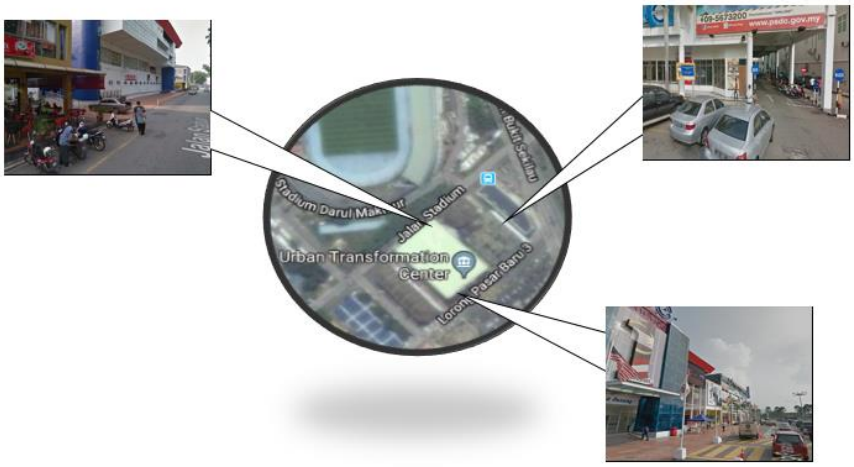


Figure 4.5.4: Zone 4

Zone 4 is location where the building is connecting to each other and this area is most busy where it is community centre. This zone cover the UTC Kuantan building, Complex Makmur, Hotel Makmur and shop lot where there are Aida's restaurant,7 eleven and Jakel.

4.6 Walkway

Walkway is one of the element needs by the wheelchair users to move from one place to another. The criteria of the good walkway are have a suitable widths and wide for wheelchair users to pass through it. Besides that, it's also to allow the wheelchair users to pass to each other. Next, the walkway must have a continuous paths to make sure there is the connectivity and easy for the wheelchair to move around without any obstacle. Other than that, street furniture also one of the obstacle that interrupt the wheelchair to pass through the walkway and need to be remove from the walkway. The surface of the walkway need to be consider as non-slip pavement for the safety of the wheelchair users and also other people with disabilities (Yusof 2011).

4.6.1 Walkway Zone 1

Zone 1 are include the private land and the rapid terminal area. This location are very specific because that is one of the way that connect between the UTC and rapid terminal. So zone 1 is the main route that use by the public to go through from UTC to the rapid terminal.

There is 2 type of the pavement at zone 1 which are the block type is at the private land walkway and the second type which is the tile at the rapid terminal walkway. The pavement of the walkway at the zone 1 is very poor and unsafe. First of all, the pavement type at the private land walkway is a block pavement where it is non-slip pavement and suit for the wheelchair users to use it. However, there is lack of the safety factor and it will harm the wheelchair users and others. There are many holes and obstacle at the middle of the road. The condition of the walkway are very poor where there is the holes, poles and the width of the walkway also not follow the standard. The surface of the walkway is uneven and some part of the road is very sloppy and it can cause the wheelchair users slip into the drain that just beside the walkway.

Secondly, the pavement type at the rapid terminal is tile pavement. The tile pavement is very slippery and can cause the public to skew when rainy day. Besides that, it also danger for the wheelchair users because the possibility for them to slip is very high when the pavement is to smooth. Along the walkway there's is the obstacle at the middle such as the pipe and hole. All the obstacle will not allow the wheelchair users to use the walkway

and even danger for the normal people itself. The safety factor at this walkway is very poor and dangerous.

Next the measurement at both walkway are not follow the standard. The standard measurement for the walkway are 1800 mm for the constant two-way traffic and 1500 mm for the frequent two-way traffic. However, the actual measurement at pavement walkway is 1050 mm which shorter than the standard measurement and the tile pavement is 1840 mm more than the standard is allowable.

Figure 4.6.1.a: Block type

Figure 4.6.1.b: Tile type pavement

Figure 4.6.1.c: Figure 4.6.1.c: Improper pavement

Figure 4.6.1.d: Barrier at the middle of walkway

4.6.2 Walkway Zone 2

Next is a zone 2 where the area including the walkway besides the market and the whole walkway at the shop lot. This walkway should be connecting between the market and the shop lot because at the shop lot there is the pharmacy and other shop. The walkway at zone 2 will be separated into 2 which are one is the walkway A and walkway B. Walkway A is the walkway beside the market and walkway B is the walkway at the shop lot.

Walkway A is one of the main walkway and usually used by the public because there is beside the market. User will coming from the market walking through the walkway A to go to the parking lot. The pavement type at walkway A is a tile pavement. Tile pavement is not suitable to use for the uncover walkway because when rainy days the rain water will cause the pavement become slippery and its will harm the people that are coming out from the market because market is a very wet place. Other than that, it is not desirable for the wheelchair users to use the tile pavement. Besides that, along besides of walkway A there is the night market and "Pasar Pagi" in every weekend. The seller usually will put their stuff at the edge of the walkway. Their action will effected and trouble to the wheelchair users to use the walkway because of the limited space. There is no barriers along the walkway A other than weekend. However the safety factor at walkway A is low where there is no divider from falling and not even kerb at the side of walkway since the walkway is quite high. It will danger the wheelchair users because they need all the item as precaution for them if fall or slip.

Walkway B is located across the street from the market where walkway B is the walkway at the shop lot. The type of the pavement use for walkway B is tile pavement which is same goes to walkway A. That is different cases from the walkway A even the type of pavement is the same because the location of the walkway located the different type of place. The shop lot are necessary to use the tile pavement because it is part of the building. The standard for the walkway at the building must covered with the roof and protected from the weather. Even though there is tile pavement but it is not slip and suitable for wheelchair users.

The standard measurement for walkway A should be 1800 mm for the constant two-way traffic and 1500 mm for the frequent two-way traffic. The result of measurement for

walkway is 2000mm which is pass because it is more than 1800 mm. Nevertheless, walkway A still not suitable for wheelchair users because lack of safety factor. In addition the standard measurement for walkway B should be 1500 mm x 1500mm to 1600 mm x 2150 mm. The real measurement on the site is 1900 mm more than the standard so its pass and suitable for wheelchair users.

Figure 4.6.2.a: Walkway A

Figure 4.6.2.b: Walkway B

Figure 4.6.2.c: Improper pavement

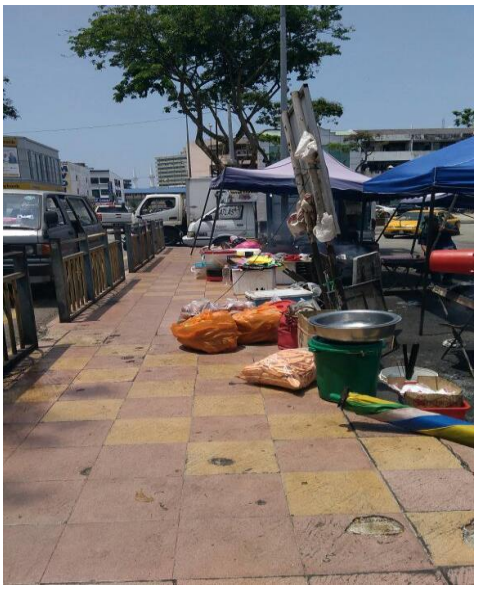


Figure 4.6.2.d: Business stuff at the edge of walkway

4.6.3 Walkway Zone 3

Zone 3 is the walkway around the parking lot in front of UTC. This walkway will be beside the main road and at the open area. It is a little bit high and the connectivity of the walkway is between the shop lots to the UTC. Type of pavement use for this walkway is concrete pavement. The design for this walkway is multi-function because the real design is a drain cover but it's also can be used as a walkway. The concrete pavement is suitable for wheelchair users because it is non-slip type of pavement.

Walkway at zone 3 is the longest walkway and there are a lot of the obstacle and barriers along the walkway. The walkway have an even surface that is good for wheelchair users. However along the walkway there is the barriers of 2 signboard, 2 litter bin and the grading. All the barriers are located at the middle of the road which this can block the route of the wheelchair users. The presence of this barrier will limit the space. On the other hand, wheelchair users need an enough space to ease them to move around. Grading will become a barriers when the direction is wrong because it will cause the wheel of the wheelchair stuck at the grading. So, the direction must be correct to avoid any incident happen.

The measurement of the walkway must be correct by following the standard. The standard measurement for the walkway are 1800 mm for the constant two-way traffic and 1500 mm for the frequent two-way traffic. The actual measurement at the site are 2900 mm which more than the standard so the measurement part is pass. However, the standard of the walkway must be barriers free and can be access by everyone. This walkway not applying the concept of barrier free and it also lack of the safety factor where there is no kerb at the edge of the walkway since the walkway is quite high too. The function of the kerb at the edge of the walkway is to avoid the wheelchair users from fall aside the walkway. The material of the walkway is pass because it suit the wheelchair users where it is not slippery.

Figure 4.6.3.a: Walkway that connecting Zone 2 and Zone 3

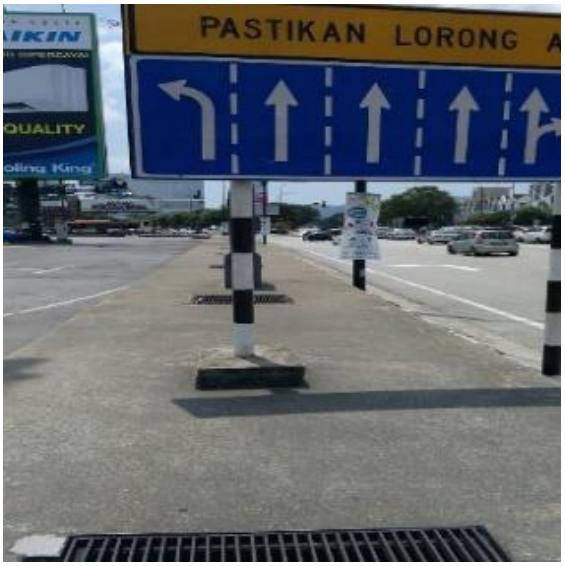


Figure 4.6.3.b: Signboard in the middle of the walkway

Figure 4.6.3.c: Litter bin that blocking the path of the walkway

4.6.4 Walkway Zone 4

Zone 4 is the location that include the UTC, Complex Makmur, Hotel Makmur and shop lot (location of Jakel Kuantan). The connectivity of this walkway is between all buildings around the UTC area. UTC is the public place where all the government and public sector in one roof. So everyone can come to settle their things at one place.

The walkway in front of UTC Kuantan, Kompleks Makmur and shop lot is a tile type pavement. The walkway at this zone is a walkway at the building. This walkway is not continuous because the some of the runway finish after the building is end. At this zone the walkway has to be classified into walkway A, walkway B and walkway C.

The walkway A start from in front of the UTC to Complex Makmur. The pavement walkway in front of UTC, Complex Makmur and shop lot is a tile type. The pavement use for this walkway is suitable because this walkway has been covered with the roof. There is the different level for the walkway at this walkway A and the only facilities provided is a stairs. It difficult for wheelchair users to use this walkway even the pavement is smooth but the different level without ramp will effected the movement of wheelchair users. Next this walkway is disconnected between the Complex Makmur and Hotel Makmur that are located behind the Complex Mamur and in between there is the motorcycle parking where it is very unsafe for wheelchair users to pass through it.

Next, the walkway B are continued from the Hotel Makmur until at the behind of UTC. The walkway start from the Hotel Makmur. The pavement at this walkway is a tile pavement which is the common pavement use for walkway at the building. The problem at walkway B is there the different level of the walkway and there is no ramp provided at the gap between the levels. After the Hotel Makmur there is the restaurant. The problem occur at this walkway is the pedestrian walkway has been block by the table and chair of this restaurant. The restaurant owner is very irresponsible when they has been block the route that should be by public with their stuff. Wheelchair users usually need to use the very wide space will cannot pass through it and even use the route. The pavement use is suitable but this route is not suitable by the wheelchair users because it is not barriers free. There is also no connectivity between the restaurant and UTC where there's is no

ramp provided by the wheelchair users and the only facilities provided is only the stairs. However the pavement at the UTC area is suitable which the tile pavement and it is the non-slip type of tile. So the possibility to fall or skew is low.

Walkway C will be cover on the shop lot where there are located of Aida restaurant, Jakel Kuantan and 7 eleven. The pavement use for this walkway is mixture pavement half is a concrete pavement and another half is a tile pavement. The walkway in front of the Aida restaurant is concrete pavement and it is uncover walkway. So the material of this pavement is suitable where is non-slip and not slippery for wheelchair users. Next the other half is a tile pavement where this type of pavement is under the roof and covered from the weather.

Figure 4.6.4.a: Walkway A

Figure 4.6.4.b: Barriers (table and chair at the middle of the walkway) at walkway B

Figure 4.6.4.d: Walkway C

Figure 4.6.4.e: Barrier at the walkway

Figure 4.6.4.f: Improper pavement

4.7 Parking space

Parking space also one of the pedestrian facilities that are need by the wheelchair users who are drive vehicles. Therefore, the parking space should be suit the wheelchair users' needs such as the correct width and wide. The width of parking space must have an enough wide to ensure that the wheelchair users get an enough space for them to open the door widely and get out smoothly without any problem. Next the car space should be located at the near entrance or at the nearest facilities provided.(Yusof 2011)

4.7.1 Parking space Zone 1

At zone 1, there is the location of the private land and still have the new building that is under construction. The nearest facilities is a rapid terminal and also the food stall. The parking lot also provided at the private land. The problem is the parking lot provided far from the terminal and the food stall. Besides, the wheelchair users need to cross the road to go to the nearest facilities. It is very dangerous because at that location the traffic is busy and near to the junction. The driver might not see if the wheelchair users cross the road because their move movement is limited and slow. However, at zone 1 there is no people with disabilities (PWD's) parking provided.

Figure 4.7.1. a: Parking space at zone 1

4.7.2 Parking space Zone 2

Zone 2 are includes the shop lot and the walkway at the side of the market. The only location provide the parking space for people with disabilities (PWD's) is at the shop lot where there is 2 parking lot for PWD's. The parking space for PWD's is strategic because it is in front of the building and near to the building entrance.

The standard for PWD's parking is the parking space should not more 50 m from the building entrance and the minimum amount of parking space for PWD's should have at least one. The measurement of PWD's parking is minimum 5400 mm x 3600 mm and transfer space minimum 1200 mm. The transfer space is to allow the doors to be opened fully so that the wheelchair users can get out easily. Next, the signboard for PWD's also provided for their information and the symbol for PWD's parking lot is a wheelchair symbol.

At zone 2, the parking space provided for PWD's is 2 lot with measurement 4900 mm x 2850 mm and transfer space is 1100 mm. So the, amount of parking space provided for PWD's is pass which is more than 1 but the measurement is failed because it's not follow the actual measurement of the standard stated by MPK.

4.7.3 Parking space Zone 3

The location of zone 3 is the parking lot area in front of the UTC Kuantan. This parking is a paying parking lot so there's is provided the payment counter for the customer. Besides that, at the entrance there is provided the automatic parking ticket machine. Even thought, this parking space areas are very spacious the only problem at this zone 3 is a no parking lot provided for PWD's. The standard for the height of automatic parking ticket machine is between 800 mm to 1100 mm.

Figure 4.7.3.a: Parking space at Zone 3

4.7.4 Parking space Zone 4

Zone 4 is at the UTC building, Complex Teruntum and the shop lot where location of the Jakel, Aida's restaurant and any other shop. The area include in zone 4 is huge so the parking space is separate. In front of the UTC Kuantan building there is provided one parking lot for PWD's.

The measurement for the PWD's parking in front of the UTC Kuantan building is 4900 mm x 3000 mm and transfer space is 1100 mm. The signboard for PWD's parking is provided and complete with the PWD's parking symbol. The parking space also have been block and it will not allow the wheelchair users' car to park at the PWD's parking space. So the amount of the parking space is pass but the measurement is failed because it not follow the standard. Next, at the other building such as at the Hotel Makmur, back of the UTC Kuantan and at the shop lot there are no PWD's parking provided.

Figure 4.7.4.a: Parking space is block

4.8 Ramps and Kerb Ramps

Ramp and kerb ramp are the facilities that are very important for the wheelchair users when they need to access the route that have a different level. The gradient of the ramp and kerb ramp must be the ratio of 1:12 to ease the wheelchair users to use it. The material for the surface or pavement for both ramp and kerb ramp must be non-slip to avoid the wheelchair users to avoid any accident. Besides every ramp must have the handrail and no obstacle at the middle of the ramp. Next the criteria of kerb ramp must have a flare side and usually it is at the end of the walkway, side walk and intersection of the walkway.

4.8.1 Ramp and Kerb Ramp Zone 1

Zone 1 have 2 walkway, the first walkway is at the location of the private land and the second walkway is at the rapid terminal. At zone 1 there is no ramp because the level is not to high and no building at this zone. Walkway at the private land is in very poor condition and not well maintain. There are a lot of damage and no kerp ramp at the beginning and at the end of the walkway. So that, the wheelchair users will be in trouble when they want to use the walkway because they can't even get into the walkway.

Next, the second walkway at rapid terminal where it is the regular route and a lot of people use this walkway. At this walkway the kerp ramp is provided at the beginning of the walkway but no kerp ramp at the end of the road. So the, walkway is not complete and wheelchair users still can't use the walkway because the can get in but cannot get out from it.

The standard for the ramp is different when is at the different rise. At this zone the kerp height is 210 mm so the ramp complete with handrail should be provided with the measurement of maximum length between landings is 2500 mm, maximum slope 83 mm and the ratio is 1:12 with percentage of maximum slope 8.3%. Next the area is 2000 mm x 1500 mm and size of flare side is 1500 mm for every side. The measurement of the existing ramp provided are the width is 790 mm x 980 mm. Besides, there is barriers at beginning of the ramp where the starting level is 100 mm. This type of barrier cause a problem to the wheelchair users where they can't access to the walkway. Furthermore, the ramp should be provided at the beginning and end of the walkway.

The ramp facilities at this zone is very poor and need to improve. The ramp should be provided and need to fixed the existing ramp. The safety factor of the ramp must look seriously such as the material for pavement must be non-slip and suitable for wheelchair users to use it.

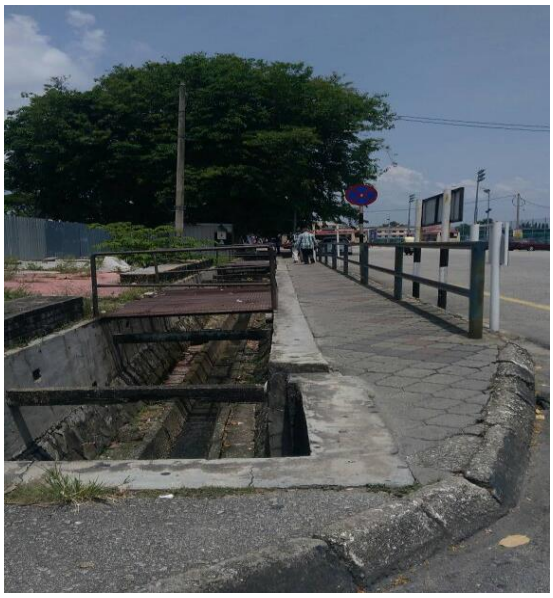


Figure 4.8.1. a: Kerb ramp not provided

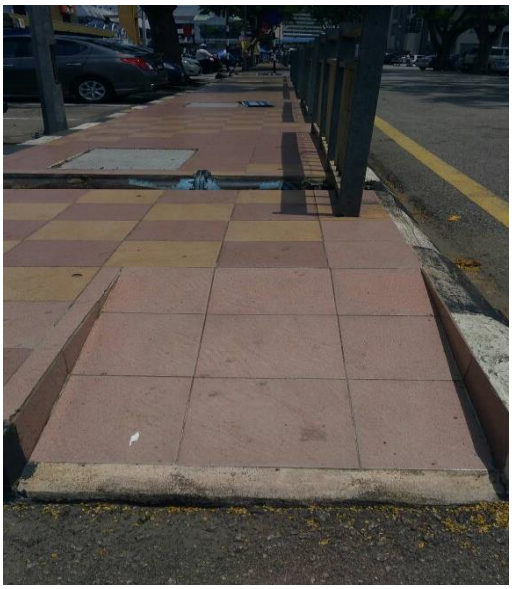


Figure 4.8.1.b : Improper kerb ramp

4.8.2 Ramp and Kerb Ramp Zone 2

Zone 2 location at the side of the market and the shop lot. Basically there are a lot of ramps at this zone. The walkway at the side of the market is one of the public walkway and wheelchair users still one of the user. So that, even the number of wheelchair users that use the walkway is very small but they still have their right to get their needs.

The first walkway is at the walkway side of the market, where there no ramp provided at the beginning of walkway. The place of the ramp should be at the beginning where it will allow the wheelchair to use it but it is not provided not even at the end of the walkway. The movement of the wheelchair users will be disturb because they can't even use the walkway.

Next are the kerb ramp at the shop lot, since this shop lot is a new building and have 2 building so the kerb ramp that is provided is 6 in total. The kerb ramp position also correct at the near with the parking and connected to the entrance of the building, the corner of the walkway and at the end of the walkway. Besides, at the shop lot there is the zebra crossing and the kerp ramp provided is connected to the zebra crossing. This facilities is very useful for wheelchair users to cross the road safely.

The kerb ramp at the shop lot is connected with the entrance of the building. The measurement of the kerb ramp is 700 mm height, 2200 width and slope is 2920 mm. The standard that has highlighted by the MPK when the rise is more than 500 mm the maximum length between landings should be 6000 mm with the maximum slope 5.0% and the width is minimum 1000 mm. So the ramp at shop lot is fail because the slope is not reach the slope percentage.

Figure 4.8.2. a: No kerb ramp provided

Figure 4.8.2. b: Kerb ramp

4.8.4 Ramp and Kerb Ramp Zone 4

Zone 4 are the zone where include the building such as UTC Kuantan, Complex Makmur , Hotel Makmur and the shop lot. Mostly the ramp will provided at the entrance of the building because it is the needs for wheelchair users. UTC Kuantan is a community centre where everyone will come settle their things. Besides, the level of the walkway at this zone is different because there is the division of every building is different.

There are a ramps provided at UTC Kuantan building at the main entrance and at the back exit of UTC Kuantan building. The location of the ramp is correct where it is at the entrance and exit of the building. The measurement of the ramp at the entrance is 3100 mm width, 1050 mm slope and height is 100 mm. Next is the measurement of the ramp located at the back of UTC Kuantan building is 1080 mm width, 960 mm height and slope 4400 mm. Next is the second ramp at the back of UTC Kuantan building where the measurement is 920 mm width, 600 mm height and slope is 3450 mm. So, the ramp at the UTC Kuantan building is no proper because the measurement is not follow the standard where the ratio that have been stated is 1:12. However, UTC Kuantan building still provided the handrail and stairs for the wheelchair users.

In addition, UTC Kuantan and Complex Makmur walkway is connected but it have a different level of walkway the only facilities provided is a stairs. The wheelchair users can't even go through the walkway because no ramp provided. Next the walkway is stop at the Complex Makmur so there is no connectivity. The walkway is continue at Hotel Makmur and at the beginning of the walkway there is no kerb ramp provided until at the middle of the walkway there is a kerb ramp provided. The measurement of the kerb ramp is 900 mm width, 50 mm height and 320 mm slope. Besides that, at the shop lot where there is the location of Aida's restaurant and other more there is no ramp provided. So wheelchair users can't even access to the walkway and very hard for them to go at this location alone without any assistant. This is the main problem face by the wheelchair users because lack of the facilities for them and sometimes the existing facilities provided is not follow the standard, so they can even use it.

Figure 4.8.4.b : No kerb ramp provided

Figure 4.8.4.a: Improper kerb ramp

4.9 Handrail, Drain Cover and Passing Space

Handrail is facilities that need to provide when there is the ramp. Handrail is the rail that can prevent someone from fall where the function is to support and provide the stability for the user. Handrail usually provided when there is the ascending or descending level such as the ramp, stair and also when the level of the walkway is high. Handrail also can be classified as the safety facilities for wheelchair users (Gardner, Skinner et al. 1991). The standard specification for handrail is the minimum height of handrail must be 840 mm-900 mm maximum from the ground level, the minimum distance is 50 mm-100 mm maximum from the building wall and the diameter is minimum 40 mm-60 mm maximum with smooth surface and safe to hold. (The Universal Design, Town and Regional Planning of Peninsular Malaysia, 2012).

The drain cover at walkway must be follow the standard where the drain cover must non-slip type and flat with the surface of the walkway. The maximum aperture between the drain cover is 13 mm (The Universal Design, Town and Regional Planning of Peninsular Malaysia, 2012).

The passing space is very important for wheelchair users as temporary rest area or the place to stop when they disputing with other wheelchair users and the place is limited. The standard of passing space for wheelchair users is when the walkway width is 1800 mm and the overall length is 50 m the passing space should be provided is maximum 25 m apart. Next the measurement for the passing space 1800 mm x 2000 mm. (The Universal Design, Town and Regional Planning of Peninsular Malaysia, 2012).

4.9.1 Handrail, Drain Cover and Passing Space Zone 1

Zone 1 is the walkway that cover from private land to the rapid terminal. First of all, walkway at the private land have a drain beside the walkway. The drain is big and not maintain well because there is no drain cover at that drain. Besides that, the handrail are available only next to the side of the main road but not available in the separator drain and walkway. The handrail must be provided at both side of the walkway because the level of the walkway is uneven and it may cause the wheelchair use falling down to the drain. This situation is very dangerous for wheelchair users. The drain cover must be provided and the existing handrail must be replace because the old one already rusty and damage.

Next the walkway at the rapid terminal also have a handrail but only at one side. If there is no handrail provided at both side of the walkway the walkway must have a kerb at the edge of walkway because there is a gap between the walkway and the ground which mean the level is different. This is to avoid the wheelchair users from fall from the walkway. The existing handrail is not follow the standard where the shape is rectangle and hard for wheelchair users to hold it.

So, the handrail need to replace with the new one and must follow the standard. The walkway at zone one is quite long so the passing space must be provided. The actual situation at this zone is no passing space for wheelchair users and the walkway width also not follow the standard.

Figure 4.9.1a: Handrail only provided at one side and no passing space and improper drain cover

4.9.2 Handrail, Drain Cover and Passing Space Zone 2

Zone 2 is the location at the side of the market and the shop lot. The walkway at the market have the gap between the walkway and the ground level. The walkway have the handrail at the side of the walkway which is the separate between the walkway and the road. Next the walkway must have a kerb at the edge of the walkway because it is to prevent the wheelchair users from fall. The existing handrail at this zone is not follow the standard because the shape is rectangle hard for wheelchair users to hold it and it already damage. Next at this zone there is no drain cover so that will not cause the problem for wheelchair users. Besides that, there is also no passing space for wheelchair users since the walkway is long so the passing space should be required.

The other location of zone 2 is at the shop lot where at this area there have many kerb ramp. Shop lot usually is an open space so no handrail needed at this area. Next the drain cover use at this area also follow the standard which is not harm the wheelchair users.

Figure 4.9.2.a: Handrail only provided at the side of the walkway

4.9.3 Handrail, Drain Cover and Passing Space Zone 3

Zone 3 is the longest walkway and have a ramp at the beginning of the walkway. The handrail must be provided at the ramp because the length of the ramps more than 800 mm that is already stated in The Universal Design, Town and Regional Planning of Peninsular Malaysia, 2012. There is no handrail provided at this zone and it will cause a problem for wheelchair users because they may fall if no safety precaution provided. The ramp without handrail will cause difficult for wheelchair users up on the walkway because they need the support when they want to go to the high level.

Next is the drain cover at zone 3. There are man of drain cover at this zone and type of drain cover use is the grading type. The problem occur when the direction of the drain cover is incorrect which will cause disruption of the smooth movement especially wheelchair users. There is also no passing space provided at this zone because the width of the walkway is already enough for wheelchair users.

Zone 3 walkway is improper because the handrail need to be provided at the ramp, the kerb need to be provided at the edge of the walkway and the drain cover but be at the correct direction to avoid any trouble for wheelchair users.

Figure 4.9.3.a: No handrail provided, no passing space and drain cover is wrong direction

4.9.4 Handrail, Drain Cover and Passing Space Zone 4

Zone 4 is the location where there is the building and the building is connected to each other. The handrail is provided at the ramp and the handrail have two size and the measurement is 200 mm diameter for the big size and 130 mm for the small size. The size is too big because the standard diameter for handrail is 40 mm-60 mm only. There is no problem on drain cover at this area because mostly the drain is cover with a concrete because it is part of the walkway of the building. The passing space also no need because the width of the walkway is big enough.

Figure 4.9.4. a: Handrail provided

Figure 4.9.4. b: Handrail is not provided at the ramp but the kerb is providing

Figure 4.9.4.c: Not proper maintenance of the drain cover

4.10 Zebra Crossing

Zebra crossing is longitudinal strips at the road where it is a crossing route for pedestrian to cross the road. The zebra crossing is designed to keep pedestrian cross the road safely at the heavy traffic flow. Next, the standard for zebra crossing is need to be provided at both side of the road (The Universal Design, Town and Regional Planning of Peninsular Malaysia, 2012). The main function of zebra crossing is to ensure that drivers more aware that there are pedestrians who want to cross the road. The wheelchair users are one of the zebra crossing user and that facilities very important for them because their movement is limited and slow. Zebra crossing need to be provided at certain place at UTC Kuantan area such as at zone 1 and zone 2.

4.10.1 Zebra Crossing Zone 1

Zone 1 have two walkway which are at the private land and rapid terminal but the walkway is not connected to each other. There is connectivity problem between the walkway and problem occur when the wheelchair users itself will face the problem when they want to cross the road. They zebra crossing need to be provided because it will ease the journey of wheelchair users and to keep them save.

Figure 4.10.1 a: Zebra crossing should be provided at this Zone 1

4.10.2 Zebra Crossing Zone 2

Zone 2 also have two walkway are at the side of the market and at the shop lot. The walkway is not connected because there is no zebra crossing provided. So, this mean that there is no connectivity at this walkway. The real situation at this zone is no zebra crossing provided and the walkway is not connected because separated by the road the zebra crossing is required. However, at the road in front of the shop lot there is zebra crossing provided which it is connecting with the walkway 3.

Figure 4.10.2.a: Zebra crossing should be provided at zone 2

Figure 4.10.2. b: Zebra crossing between zone 2 and zone 3 but it is improper because no ramp provided

4.10.3 Zebra Crossing Zone 3

Zone 3 is the walkway at the parking lot and this walkway should be connecting with the walkway at zone 4. The zebra crossing is already provided which it is connecting between zone 3 and zone 4. It is because there parking lot in from of the UTC Kuantan and zebra crossing is provided to ensure that the pedestrian can cross safely. The wheelchair users also can use this zebra crossing because it is safer.

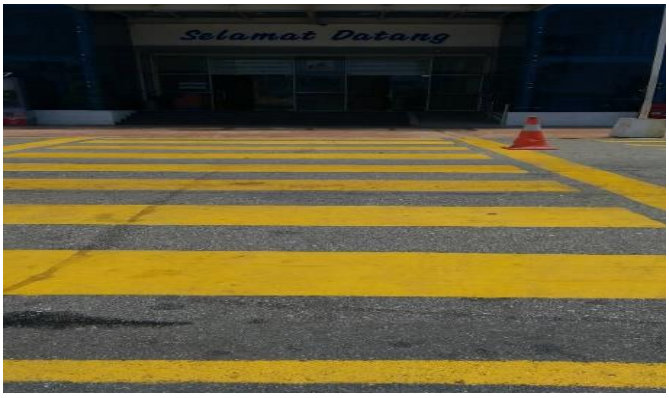


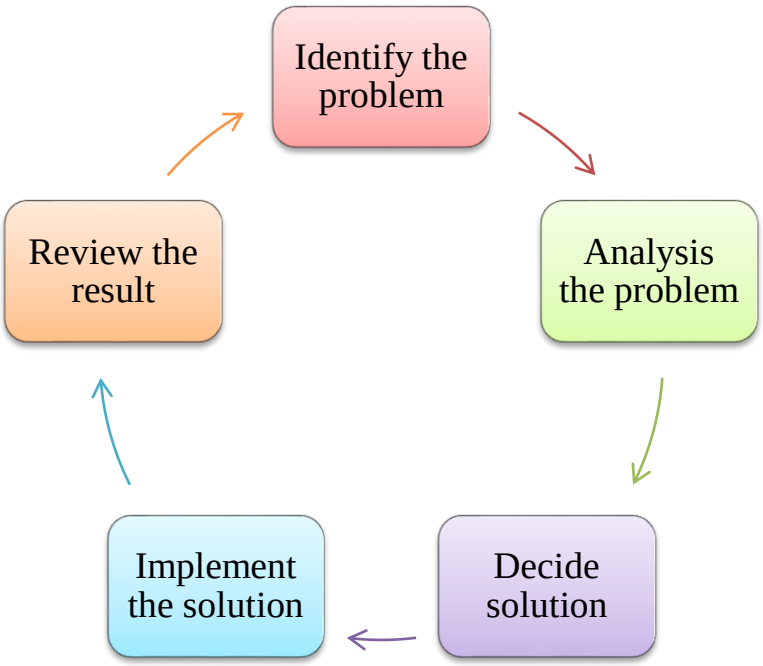
Figure 4.10.3.a: Zebra crossing that connecting between zone 3 and zone 4

4.10.4 Zebra Crossing Zone 4

Zone 4 is there are the building such as UTC Kuantan, Complex Makmur, Hotel Makmur and shop lot. At this zone the only zebra crossing provided is only in front of the UTC Kuantan which is connecting between zone 3 and zone 4. Besides that, the walkway between the buildings is very improper because there is no connectivity and walkway is intermittent. The zebra crossing need to provide between the gap of the building for example between UTC Kuantan and shop lot. So that, it will encourage wheelchair users to use the walkway because it is more safe.

4.10.4.a : Zebra crossing should provide at the Zone 4.

4.11 Framework to improve the pedestrian facilities for wheelchair users



4.11. a: Framework to improve the pedestrian facilities for wheelchair users

4.11.1 Identification of the problem

The identification of the problem is get from the interviewing and auditing at the research area which is Urban Transformation Centre (UTC) Kuantan area. The result form the interview is to find out on the issues and problem face by the local authorities. Next the auditing is to find out on the real problem happened at the research area. The measurement, barriers and problem face by wheelchair users.

4.11.2 Analysis the problem

From the result, the result shows that there a lot of the problem at the Urban Transformation Centre (UTC) Kuantan area. The problem as listed below :

Table 4.11.2: barriers at the UTC Kuantan

Pedestrian facilities for wheelchair users	Barriers
Walkway	• Width and wide is not enough to allow passing space of two wheelchairs users. • Have obstacle on walkway. • Pavement or surface are cracked and damaged, enabling to support the load of wheelchair.
Parking space for PWD's	• Width of parking space are not wide to allow door to fully open. • Far from the entrance and any facilities.
Ramp and kerb ramp	• Not provided when there are differences in level. • Gradient is not accordance to the ratio 1:12 for wheelchair users. • Ramp is not provided with handrail and kerb. • Landed is not provided at maximum gradient or when there are changes of the direction of ramp.
Handrail, drain cover and passing space	• Handrail is not provided at every ramp or at gap between walkway and ground level. • Drain cover is uneven with the surface of the walkway. • Drain cover is installed in the wrong direction. • Passing space for wheelchair users is not provided.
Zebra crossing	• Zebra crossing is not provided at critical junction.

4.11.3 Decide the solution

The solution are made after analysing the problem face by the wheelchair users. The solution must be consider on the standard and specification state by MPK. The solution also match with the requirement and need of wheelchair users in order to improve the pedestrian facilities for wheelchair users.

4.11.4 Implement the solution

The implementation of the solution is to improve the pedestrian facilities at the UTC Kuantan area by providing the walkway at the building with a barrier free walkway where there no business staff at the middle of the walkway which can block the way of the wheelchair users. So that, the wheelchair users can pass through the walkway without any barriers.

Besides that, there are the kerb ramp and ramp is provided at every different level. So that, the wheelchair users can access without any problem. They also can be more independent and confidence to use the facilities provided. The ramp and kerb ramp provided must follow the standard which is the gradient is 1:12. The ramp is provided complete with the handrail as the standard.

The covered walkway is proposed for the walkway outside the building it is to cover the wheelchair users from sunlight. So the, the wheelchair users will feel more comfortable to use the walkway. The handrail and kerb also provided at the edge of the walkway. The purpose are to avoid the wheelchair users from fall and safety purpose.

The zebra crossing is proposed in between of every walkway. The main function of zebra crossing to ease the wheelchair users to cross the road. Next, it is to fulfil the element on connectivity between walkway. The zebra crossing will help wheelchair users to be independent and feel safe to cross the road.

The figure below shows all the new pedestrian facilities for wheelchair users that have been proposed:

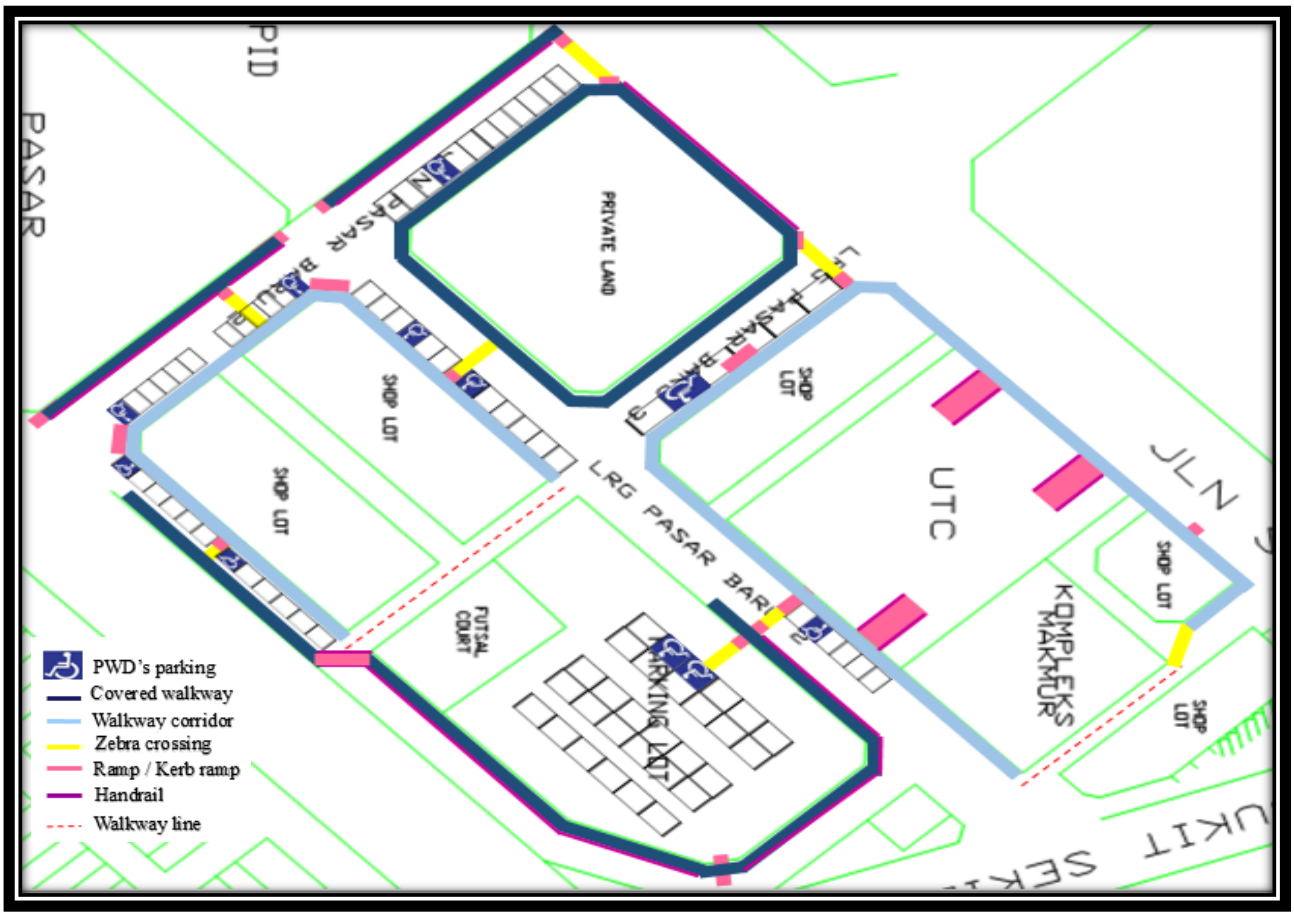


Figure 4.11.4: The new propose pedestrian facilities for wheelchair users

4.11.5 Reviewing the result

The result can be review by the local authorities such as MPK to decide either the new pedestrian facilities that have been proposed is follow the standard and specification. It is very important to get the approval from the local authorities.

Next result can be get from the wheelchair users itself either the new pedestrian facilities that have been proposed is parallel to their needs. They also can suggest to any addition because they have their right.

4.12 Conclusion

As a conclusion the facilities for wheelchair users need to provide to encourage wheelchair to be more independent. The facilities are walkway, parking space, ramp and kerb ramp, handrail, drain cover and passing space and zebra crossing.

Table 4.12: Requirement of pedestrian walk

Pedestrian facilities for wheelchair users	Requirement
Walkway	• Width must be wide to make sure that wheelchair users can pass to each other. • Barrier free • Pavement or surface must non-slip type and must be strong enough to support the load of wheelchair.
Parking space	• Width of parking space must be wide to allow door open fully. • Near to the entrance and any facilities.
Ramp and kerb ramp	• Need to provide when there is the different level. • Gradient must within the ration 1:12 for wheelchair users. • Every ramp must have handrail and kerb. • Landed areas must be provide at maximum gradient or when the changes of the direction of ramp.
Handrail, drain cover and passing space	• Handrail must be provided at every ramp or have gap between walkway and ground level. • Drain cover must non-slip type and flat with the surface of the walkway. • Drain cover must be at the correct direction. • Passing space for wheelchair users is when the walkway width is 1800 mm and the overall length is 50 m the passing space should be provided is maximum 25 m apart.
Zebra crossing	• Zebra crossing is need to be provided at both side of the road

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

In this chapter will discuss about the conclusion of the finding on this study. The finding about the question and objective with relation to research question are discuss. Furthermore, the importance of the result that will highlighted, implication and benefit of the finding are presenting.

5.2 Conclusion

The purpose of this study was to identify the pedestrian requirement for wheelchair users in urban area. Based on this study finding, wheelchair users have a lot of requirement because their movement is very limited and restricted. The wheelchair users need support for them to move around freely. Therefore, the pedestrian facilities is very important for them because they also have their right as already mention in Undang-Undang Kecil: 125 about the needs of PWD's.

Next, this study is to investigate the barriers and limitations of pedestrian facilitities for wheelchair userss at Urban Transformation Centre (UTC) Kuantan area. So, the study have been conducted through the interview and audit method. Based on that, the finding shows that there are a lot of barriers that will effected wheelchair users movement at UTC Kuantan area. The barriers are the existing facilities that are already rusty and damaged. Pedestrian facilities are not provided for wheelchair userss and there is the obstacle at the middle of the road such as pipe, pole and hole. However the pavement of the walkway also improper because some of the walkway pavement is already broken, perforated and uneven surfaces which may effected the movement of wheelchair users. The elevation of

the walkway is very poor because when the elevation is too sloppy it may cause wheellchair user fall and hurt. The limitation movement of wheelchair users also cause by the barriers at this area. There is no connectivity from one walkway to another and it also contributing to the distress wheelchair users to use the walkway provided.

Futhermore , the investigate was conducted to identify whether the pedestrian facilities provided for wheelchair users are in accordance to the local authorities specifications. Most of the pedestrian facilities provided is improper and lack of maintenance. The resut shows that lack of pedestrian facilities provided and the existing pedetrain facilities provided in very poor condition. The standard has been stated by MPK regarding to the specification of pedesrian facilities. The pedestrian facilities provided such as walkway is not follow the standard where the width might be pass but most of the pavement is fail. The parking space is not provided at certain zone which it need to be provided at least one at every parking space. Next the ramp and kerb ramp where it is the most critical problem and not regarding to the standard. The kerb ramp must be provided at every rise but the real situation is kerb ramp is not provided and even there is the kerb ramp that is not follow the standard. Besides the handrail, drain cover and passing space are the most important pedestrian facilities for wheelchair users. The handrail provided is improper and not complete where it is only on the one side. The drin cover also will effected the journey of the wheelchair users where the direction is wrong and not follow the standra. The passing space very poor where is not provided. The finding are the pedestrian facilities at UTC Kuantan are not follow the specification and the condition of existing facilities is very poor.

As a conclusion, the wheelchair users is one of the community and they have a lot of requirement and needs in order for them be more independent. So that, the local authorities, private sectoe and public are resposible to provided all the facilities for as human being and they also have their right. The pedestrian facilities is very importand for them because it may ease their movement and encourage them to socialize. The standard that have been stated by the MPK regarding for their need. So it is compulsary to provide the pedestrian facilities by following the standard.

5.3 Recommendation

This study would to recommend for use by local authority in order to identify the lack of pedestrian facilities for wheelchair userss at Urban Transformation Centre (UTC) Kuantan area. This study also can be used to propose the new framework or solution regarding the current problem at this study area. Futhermore , this study can be continued by other researcher to find out the effective way in solution of the problem.

The responsibility of the local authorities (MPK) is to provide the good facilities for the user. From this research, we find out the local authorities have a problem in budgeting in order to provide the good facilities for wheelchair users. Thus, the public and local authorities should cooperate to find funds to repair and upgrading the existing pedestrian facilities.

The proper pedestrian facilities can be provided in a way to approch wheelchair users to be more independent and confident to travel alone. This approach can carried out by providing the good pedestrian facilities such as coverd walkway, zebra crosssing , traffic light, contuinity walkway, pedestrain bridge and many more. Next, the local authorities should do a frequent maintenance and check the condition of the facilities regularly.

5.4 Future research

For the future step, the research of the pedestrian facilities can be expend on the safety and usability if the pedestrian facilities for people with disabilities (PWD's). It can discuss further on the pedestrian facilities for PWD's but still can be used for normal person. Besides, the research area can be extent to be wider to another critical place at Kuantan city. Therefore the result from this research can be used to improve the pedestrian facilities at another places. The safety and usability of the existing pedestrian facilities can be compare with the result from this research that only covered on the accessibility of the pedestrian facilities for wheelchair users.

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APPENDIX A
SAMPLE APPENDIX 1

Questionnaire

SECTION A (LEGISLATION)

1) What are the legislation/standard/guideline for PWD's and elderly in urban facilities for pedestrian?
   a. Process? (from the early phases)
   b. Is there any specific standard for blind, wheelchair and elderly?
   c. Is there any database regarding the PWDs and elderly?

      *For references purposes

2) What are the characteristic of an area that determine the necessity of providing pedestrian facilities?

3) Is there any collaboration between MPK and JKM, especially for PWDs and elderly?

SECTION B (PROVISION OF FACILITIES)

1) From your opinion, how important do you think is to provide pedestrian facilities for PWDs?

2) What are the facilities provided for PWD's and elderly?

3) Do you think facilities for PWD's and elderly at UTC area in Kuantan are sufficient?

*Specifically, at UTC.

4) What are the maintenance provided for facilities?

5) How you conduct the whole process inspection? (*barriers/limitation)

SECTION C (BARRIERS)

1) What are the challenges (constraint) faces by the Local authorities in providing pedestrian facilities in Kuantan, specifically UTC?

2) How often do you receive any complaint from PWD's and elderly regarding facilities/mobility?

3) Normally what type of complaint that you receive?

4) How do you manage their complaint?

SECTION D (FUTURE PLAN)

1) What do you think are the improvement that can be done in providing pedestrian facilities for PWDs and elderly?

2) What are the future strategic/plan in improving the urban facilities for PWD's and elderly in Kuantan?

3) What are your initiatives to create awareness to public/JKM (PWD's and elderly)?

APPENDIX B
SAMPLE APPENDIX 2

Gantt chart

This study is done on February 2017 until April 2017. Table below Gantt chart for final year project 1.

No	Activity description	Week										
		1	2	3	4	5	6	7	8	9	10	11
1	Find the issue of research problem											
2	Read previous article related to the issue											
3	Find the objectives of the of the study											
4	Read relevant article for literature review											
5	Plan your research methodology											
6	Writing up the research proposal											
7	Submit research proposal											
8	Presentation FYP 1											

This study is done on September 2017 until December 2017. Table below Gantt chart for final year project 2.

No	Activity description	Week														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Meet supervisor and discuss on data collection															
2	Writing the research proposal															
3	Supervisor comment and advice for any correction															
4	Student FYP 2 presentation															
5	Submit correction report															
6	Student fill up the approval for binding form to be endorsed by supervisor submit the endorsed form to FYP coordinator															