**Review Article:****The effect of applying (ADA) criteria in designing commercial street sidewalks in the city center of Sulaimaniyah****Hawar Taha Tawfeeq**

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**Abstract**

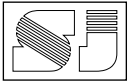
In the light of the statement that “every route and facility must be usable”, the sidewalks of the city center streets should be designed in an appropriate way that is suitable for all ages. In addition, as for their functions, the urban streets should meet the requirements to become functional for all users. Therefore, this study seeks to shed light on the requirements, which the sidewalks are supposed to meet to function in an appropriate and neatly manner so that they can serve the users of all ages and types including the people with special needs. It also informs of the consequences of lacking and neglecting such requirements and investigates the performance of the sidewalks in the absence of those requirements. The study reached a conclusion that most of the relevant criteria related to the design and the construction of the sidewalks within the targeted areas of the study have not been met, resulting to become inappropriate for the users. To address these problems, the study proposed a number of recommendations to the relevant authorities.

**1. Introduction**

To provide the sidewalk users with their needs, the relevant professionals and designers have to have a broad understanding of the users and the existing functions in those spaces.

The users are definitely different from age and physical abilities perspectives. And also, the

streets themselves are different from a functional perspective. Some might have a commercial aspect where certain activities are performed which should be taken into account; otherwise, they may create considerable obstacles to the users. In the light of the importance of this subject, this study aims to shed light on sidewalk components, instruction, standards and criterion which are



necessary to the sidewalks through drawing comparisons between the standards and the existing status of some of the sidewalks located in the city center of Sulaimaniyah in a bid to find some recommendations to the case study.

## 2. Literature review

To specify the research problem statement and the research gap, the following previous studies have been presented:

### 2.1. AASHTO, A policy on geometric design of highways and streets, 2011.

This book is considered one of the important references which provide guidance based on established practices which have been referred to in the recent studies. This document is also intended to be a comprehensive reference manual to assist the administrative, planning, and educational efforts to design a formulation.

This reference dedicated a chapter for pedestrian facilities which include sidewalk, Grade-Separated Pedestrian Crossings, and curb ramps. It also provides detailed information and necessary drawings about sidewalk so as to provide a suitable environment for all users.

### 2.2. US Department of Justice, ADA Standards for Accessible Design, 2010.

The US Department of Justice published revised regulations for Titles II and III of the Americans with Disabilities Act of 1990 "ADA" in the Federal Register on September 15, 2010.

These regulations adopted revised, enforceable accessibility standards called the 2010 ADA Standards for Accessible Design "2010 Standards". The 2010 Standards set minimum requirements - both scoping and technical - for newly designed and constructed or altered State and local government facilities, public accommodations, and commercial facilities to be

readily accessible to and usable by individuals with disabilities.

### 2.3. Beneficial design, Inc., B.A, Designing sidewalk and trails for access part II of II: Best practice guide

This guidebook is the second part of a two-phase project focused on designing sidewalks and trails for access. It was created to provide planners, designers, and transportation engineers with a better understanding of how sidewalks and trails should be developed to promote pedestrian access for all users, including people with disabilities.

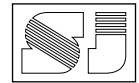
### 2.4. Hord Coplan Macht, Inc., Streetscape Design Guidelines, 2001.

This study concentrate on the quality of sidewalks and public space that should be applied in downtown so as to encourage people and to attract new business as it enhances the quality of the environment for people to live, work, and play through providing street scape elements in a suitable manner according to the standards and related regulations .

Despite the existence of a large number of researches in this field and the fact that most cities have their own standards and regulation for sidewalks so as to achieve the requirements of people with special needs, to date, some of the cities including Sulaimaniyah city do not have special regulation or they have not applied them in constructing sidewalk of the roads especially in the city center.

## 3. Problem statement

- a) Street users face difficulties to move in the commercial streets of the city center of Sulaimaniyah.
- b) Lack of safety for users on the commercial street sidewalks of the city center of Sulaimaniyah.



#### 4. Research Objectives

- a) The research explores that the problems can be attributed to the absence of applying accessibility standards on the sidewalks of commercial streets in the city center of Sulaimaniyah.
- b) It also seeks to put forward a set of general recommendations to the concerned authorities to address this kind of problems.

#### 5. Research hypotheses

Lack of applying the accessibility criteria in the sidewalks of commercial streets in the city center of Sulaimaniyah.

#### 6. Definition of key terms in the research:

##### 6.1 Americans with Disabilities Act (ADA)

The Americans with Disabilities Act of 1990 (ADA) is a landmark law that recognizes and protects the civil rights of people with disabilities. The ADA prohibits discrimination on the basis of disability by covered entities. (Beneficial design, Inc., 2001, P1-6).

The Americans with Disabilities Act (ADA), as amended by the ADA Amendments Act of 2008 (ADAAA), prohibits discrimination based on "disability" in several critical areas. Those areas include state and local government services, places of public accommodation, employment, telecommunications and transportation.

Under the ADA, you have a disability if you have at least one of the following:

- A physical or mental impairment that "substantially limits" one or more "major life activities";
- A record of such an impairment; or you are regarded as having such impairment.

The measurement for impairment is when the condition is most acute. Therefore, if you have sporadic impairment, disability will be assessed at

the time when the symptoms are most evident. (Chai R. Feldblum, p.16)

##### 6.2. Sidewalk

Sidewalk or Pavement is an essential component of any streetscape (Rehan, 2012, p174). Sidewalks function as integral components of pedestrian-friendly street systems where pedestrians can experience safety, comfort, accessibility, and efficient mobility. Sidewalks also function as outdoor rooms and gathering places, and help define community character. (Otak, Inc, 2019)

##### 6.3. Commercial Street

Commercial Connector streets are minor arterials that provide connections between commercial areas of the city, such as neighborhood business districts. (Mayor Edward, ch4)

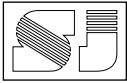
#### 7. Sidewalk design criteria

##### 7.1. Sidewalk corridor

The "Sidewalk Corridor" is the portion of the pedestrian system from the edge of the roadway to the edge of the right-of-way (property line or building edge), generally parallel to the street. Attributes of good sidewalk corridor design include:

- a) Accessibility by All users.
- b) Adequate width.
- c) Safe to use (sidewalk users should not feel threatened by adjacent traffic or by the environment).
- d) Continuity and connectivity.
- e) Landscaping to create a buffer space between pedestrians and traffic and also provide shade.
- f) Social space (area where pedestrians can safely participate in public life).

Generally sidewalks consist of the following zones: the building frontage zone, the pedestrian



zone, the planter/furniture zone, and the curb zone (FHWA, 2001, P7) (Figure 1).

#### **7.1.1. Building Frontage Zone**

The building frontage zone is the area between the building wall and the pedestrian zone. At minimum pedestrians, prefer to keep at least 0.6 m (2 ft.) of "shy" distance away from the building wall. Some use the building edge as a guide for a white cane, traveling between 0.3 m-1.2 m (1 ft-4 ft.) from the building. The frontage zone should be free of obstacles and protruding objects.

#### **7.1.2. Pedestrian Travel Zone**

The pedestrian zone is the area of the sidewalk corridor that is specifically reserved for pedestrian travel. This area should be free of all obstacles, protruding objects, and any vertical obstructions hazardous to pedestrians, particularly for individuals with vision impairments.

The pedestrian zone should be at least 1.8 m-3.0 m (6-10 ft.) wide or greater to meet the desired level of service in areas with higher pedestrian volumes. This allows pedestrians to walk side by side or for pedestrians going in the opposite direction to pass each other. The pedestrian zone should never be less than 1.2 m (4 ft.), which is the minimum width required for people using a guide dog, crutches, and walkers. Wheelchair users need about 1.5 m (5 ft.) to turn around and 1.8 m (6 ft.) to pass other wheelchairs. (FHWA, 2001, P8)

#### **7.1.3. Planter/Furniture Zone**

The planter/furniture zone lies between the curb and the pedestrian travel zone. This area provides a buffer from the street traffic and allows for the consolidation of elements like utilities (poles, hydrants, telephone kiosks, etc.), and street furniture (benches, signs, etc.). The intent is to ensure that the pedestrian travel zone is free of ALL obstacles. On local and collector streets,

1.2m (4ft.) is preferred and on arterial and major streets 1.8m (6 ft.) is preferred. Additional space will be required for transit stops and bus shelters which may include a boarding pad typically 1.5m x 2.4m (5 ft-8 ft.). (FHWA, 2001, P8)

#### **7.1.4. Curb Zone**

The curb zone is the first 0.15m (6 in) of the sidewalk corridor, located adjacent to the roadway. It is an integral part of the road/drainage system and keeps excess water off the sidewalk corridor. The curb zone also discourages motor vehicles from entering/exiting the sidewalk corridor except at designated locations and is a valuable safety and guide cue for pedestrians with vision impairments. (FHWA, 2001, P8)

### **7.2. Sidewalk location and width**

Sidewalks are to be at least 5 ft. wide. However, if necessary due to geometric constraints, the width of the sidewalk may be reduced to 4 ft. minimum width, as required in PROWAG, by completing the Design Exception process.

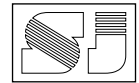
### **7.3. Clearances and obstructions**

The full width of the circulation path should be free of protruding objects, if possible. Permanent, stationary objects are not to project into the pedestrian access route more than 4 in. from 27 in. to 80 in. above the ground.

Freestanding objects mounted on posts, pylons, etc., may overhang a maximum of 12 in. from 27 in. and 80 in. above the ground, although this situation should be avoided whenever possible. (EPG, 2018)

### **7.4. Sidewalk surfaces**

The choice of surface materials for sidewalks, plazas, or other spaces where pedestrians walk can have a significant impact on accessibility. Sidewalk materials generally consist of concrete



or asphalt; however, tile, stone, and brick are also frequently used. Although these materials provide an aesthetic benefit, they can lead to grooves or odd spacing that can catch wheelchair castors or create a tripping hazard for pedestrians, especially those with vision or mobility disabilities. Decorative surfaces may also create a vibrating, bumpy ride that can be uncomfortable or painful for those in wheelchairs.

- a) Brick or cobblestone is not recommended surface materials for the pedestrian zone• Surface materials should be slip resistant. A broom finish on concrete can help increase slip resistance.
- b) Surface texture should not include more than a ¼-inch rise for every 30 inches.
- c) A ¼ to ½ -inch rise should be beveled with a maximum grade of 50 percent (Figure 2).
- d) If there is a greater than ½-inch rise, the surface should be leveled or a ramp should be installed with a maximum grade of 8.3 percent. (NJDOT, 2017, 37)

#### 7.5. Running slope or Grade

The running slope or grade is defined as the slope parallel to the direction of travel, with the running grade defined as the average grade along a continuous grade. The grade of a sidewalk should be as level as possible allowing easy use by travelers. For pedestrian facilities on public access routes, the running grade of sidewalks will be a maximum of 5% (figure 3).

#### 7.6. Cross slopes

Cross slope is defined as the slope measured perpendicular to the direction of travel. A minimum slope of 1% should be provided to allow proper drainage. When necessary the maximum 2% cross slope allowed by ADA standards may be used. Cross slopes of less than 2% are desirable to provide easier passage and to allow for some construction tolerance and settlement. Sidewalks with a cross slope greater than 2% are

noncompliant and must be made compliant by whatever means necessary and including replacement.

#### 7.7. Landings

Landings are level areas built to provide pedestrians with a place to rest or make turning maneuvers, or where it is necessary to have a level, stable area to allow access to another feature such as a pedestrian pushbutton. The slope of a landing should allow for drainage and be designed and built with a minimum 1% slope and may not exceed a slope of 2.0% in any direction. (EPG, 2018)

#### 7.8. Passing Space and Passing Space Interval

Passing space is defined as a section of path wide enough to allow two wheelchair users to pass one another or travel abreast (Figure 4). The passing space provided should also be designed to allow one wheelchair user to turn in a complete circle. (U.S. Access Board, 2002)

### 8. Sidewalk ramp and curb ramp

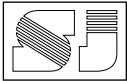
#### 8.1. Slope and rise of sidewalk ramps

When the running slope, or grade, of a sidewalk exceeds 5% it is a ramp. If the sidewalk is adjacent to the street or separated by a narrow planting strip, the sidewalk grade may be equal to the grade of the street and not be considered a ramp. Ramps typically occur on an accessible route leading to a facility or otherwise separated from the street.

The cross slope for all ramps are to be 1%, but a maximum of 2.0% is allowed by ADA standards.

The maximum rise in any run will be 30 in. Examples of various slopes and ramp lengths are shown in (Figure 5).

A landing will be located at the top and bottom of all ramps and between segments that have a 30 in. rise. The landing will be at least the width of the ramp with a minimum length of 60 in. If a turn is required the landing must be 5 ft. x 5 ft.



For example, a segment with a running slopes of 1V:12H or 8.33% will require a 5 ft. x 5 ft. landing every 30 ft. if it is part of a switchback access route (ADA, 2010, P129).

## 8.2. Curb ramps

Curb ramps provide critical access between the sidewalk and the street for people with mobility impairments .Without curb ramps, people who use wheelchairs cannot access the sidewalk .Curb ramps are most commonly found at intersections but may also be used at midblock crossings and medians.

### 8.2.1. Curb ramp components

Curb ramp is consisted of the following elements which are Shawn in the (figure 6).

- 1- The ADA curb ramp slope standards require the slope to be no more than a maximum of a 1:12 ratio or 8.33%. Transitions from ramps to walks, gutters, or streets shall be flush and free of abrupt changes. Maximum slopes of adjoining gutters, road surface immediately adjacent to the curb ramp, or accessible route shall not exceed 1:20.
- 2- The minimum width of a curb ramp shall be 36 in (915 mm), exclusive of flared sides.
- 3- If a curb ramp is located where pedestrians must walk across the ramp, or where it is not protected by handrails or guardrails, it shall have flared sides; the maximum slope of the flare shall be 1:10. Curb ramps with returned curbs may be used where pedestrians would not normally walk across the ramp.
- 4- Built-up curb ramps shall be located so that they do not project into vehicular traffic lanes.
- 5- A curb ramp shall have a detectable warning,(Detectable warnings shall consist of raised truncated domes with a diameter of nominal 0.9 in (23 mm), a height of nominal 0.2 in (5 mm) and a center-to-center spacing of nominal 2.35 in (60 mm) and shall

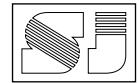
contrast visually with adjoining surfaces, either light-on-dark, or dark-on-light. Also the detectable warning shall extend the full width and depth of the curb ramp (Figure 7).

- 6- Curb ramps shall be located or protected to prevent their obstruction by parked vehicles.
- 7- Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides. (U.S. Access Board, 2002)
- 8- Curb ramps can be configured in a variety of patterns, depending on the location, type of street, and existing design constraints. Curb ramps are often categorized by their position relative to the curb line. The three most common and basic configurations are termed perpendicular, parallel, and diagonal. (Figure 8) (FHWA, 2017).

### 8.2.2. Accessible Pedestrian Signals

Pedestrian signal indications are special types of traffic signals that are used to control pedestrian traffic patterns and movements (Beneficial design, Inc., 2001, p6-12). Accessible Pedestrian Signal (APS) requirements:

- a) Locate the push button as close as possible to the curb ramp without interfering with clear space.
- b) The device should be operated from a level landing.
- c) Mount the device no higher than 1.0 m (3.5 ft.) above the sidewalk.
- d) The control face of the button shall be parallel to the direction of the marked crosswalk.
- e) One button per pole, each separated by 3 m (10 ft.) is preferred.
- f) Place the device no closer than 760 mm (2.5 ft.) to the curb, and no more than 1.5 m (5 ft.) from the crosswalk.
- g) The button should be a minimum of 50 mm (2 in) in diameter to be easily operated by pedestrians with limited hand function.



- h) Avoid activation buttons that require conductivity (unusable by pedestrians with prosthetic hands). (Figure 9)
- i) The force to actuate the button should require a minimum amount of force no greater than 15.5 N to activate (FHWA, 2001, P.29)

### 9. Field of study

This research takes the sidewalk of one of the main roads of Sulaimaniyah city as its study sample and that is Goran Street which runs through Sara roundabout up to the junction of Ibrahim Pasha Street. The length is approximately 640 meters with an average of 20 meters width. (Figure 10)

#### 9.1. Reasons for taking Goran Street as a sample

- 1- It is a busy high street used by many people for shopping, medical affairs and residential purposes. As said, the street is highly congested as it has been used for multiple purposes by its users as one of the central streets of the city.
- 2- As there are a high number of private medical clinics and hospitals situated on Goran Street, many people with special needs and varying ages visit this street.

#### 9.2. Methodology

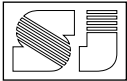
This research relies on field survey using Total Station device to survey the street at full length and the core elements of the street scape such as trees, posts, benches and road signs which were designed and modeled by AutoCAD program and divided into 14 zones in accordance with the accesses that flow into the street. The researcher then used a checklist as shown in the Table 1, and relied on ADA criteria to apply on each zone for which graphical and statistical analyses were conducted. And then the results were compared with the international standards relevant to

people with special needs to identify the engineering shortcomings in the sidewalks.

### 10. Data analysis

Based on the data collected from the field study and after analyzing and comparing them, the research came to the following results:

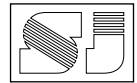
- 1- As discussed in the theoretical section, every sidewalk should be divided into four zones( building zone, pedestrian zone, planter zone, and curb zone), but the zones have been mixed up in the study area as the elements of the street scape have been randomly implemented or misused for commercial functions. This has led to creating certain obstacles for all users, especially people with special needs.
- 2- The outcome analysis of the sidewalk corridor shows that the construction condition for 93% of the sidewalk is poor and damaged due to the presence of potholes, cracking and fractures in the finishing materials and hence the sidewalk cannot be used properly by people with special needs. And 86% of the sidewalks bear/have shade which is a convenient factor for the pedestrians to go through a suitable atmosphere and be protected from hot and cold weather conditions. (Figure 11)
- 3- As for Sidewalk Grade and Cross Slope, the results demonstrate that the range for 64% of the sidewalk is higher than 2% which is more than the required level; however the sloping level is suitable with all the sidewalks and yet no landing can be seen as shown in figure (12).
- 4- In all the sidewalks, various materials such as( Tile, concrete, brick, asphalt)in different colors, textures and thickness were used in the finishing of the walkways which made them not to be suitable for use by people with special needs causing obstacles to their wheelchairs and they cannot be identified by visually impaired people. (Figure 13)



- 5- There are steps in all segments of the sidewalks with different heights and materials. Moreover, they have been constructed in a random manner and there is no any kind of ramps, resulting in creating obstacles for the wheelchairs. (Figure 14)
- 6- 50% of the sidewalks (trees, electric poles, and traffic signs) can be seen, and more than half of this percentage does not fall into the planter zone, but they fall into the other parts of the sidewalks and thereby have become obstacles for transportation of people with special needs. Not to mention that there is only one seating place which does not fit into its special zone. Furthermore, in all the parts of the sidewalks in the street, trespassing has been seen onto the sidewalks by the shops or houses or street vendors. (Figure 15).
- 7- Only 21% of the sidewalks have gutters that lead to the stagnation of water during heavy rainfall. Space is also more than 2.5 cm between the grills which prevents the tires of the wheelchairs of people with special needs.
- 8- The driveway slope is compatible for 93% of the sidewalks and so is the cross slope.
- 9- 86% of the sidewalks are not curb ramp which is one of the most important parts of the sidewalk and has special importance for people with special needs (Figure 16). For the remaining 14%, the ramps have not been built to reach the standard and they are close to perpendicular and depressed corner type.
- 10- There are no any Pedestrian signal indications except in one place in all the zones of the sidewalks of the street to control pedestrian traffic patterns and movements such as (audible tone, pedestrian signature, detectable warning, verbal message, and vibrio tactile information).
- 11- There is not any pedestrian crossing in any parts of the street which has become a burden for the crossing of people with special needs and sometimes has caused tragic accidents as it's shown in the figure 17.
- 12- Trespassing continues to occur on the sidewalks, which are created both temporarily and permanently by the individuals and shop owners, which has narrowed the sidewalk corridors.(Figure 18)
- 13- Despite of the irregular shapes of the sidewalks, the average width of the sidewalks are between (3.27m -6.87m)as it is shown in (table 2), implying that the sidewalk widths are suitable to divide them to the standard zones (frontage zone, pedestrian zone, planter zone and curb zone).
- 14- Despite the fact that the Iraqi highway design manual has specified some criteria related to the sidewalks, the local government depends only on the some local regulations that relate to the width of sidewalks according to the street width while the other criteria related to the property of the sidewalks have been neglected.
- 15- The results which have been reached from the check lists that applied to all segments of the sidewalk in the study area have shown that most of the necessary regulations have not been considered in this area which makes various problems to the users especially for those who has special needs.(figure 19).

## 11. Conclusions

- a) One of the most important factors that should be taken into consideration in the design of the sidewalks is the kind of its users. However, the results of this research shows that no consideration has been made with regards to people with special needs in most of the parts of the sidewalks of the streets, in spite of the fact that this street has residential, medical and commercial functions, and one of its main pedestrians is people with special needs who visit this street for medical purposes.
- b) The existence of steps in the sidewalk corridor and the low quality of construction has made the sidewalks to be unsafe for its users especially people with special needs



while the width of the sidewalks is appropriate.

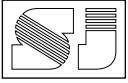
- c) The slope of most of the sidewalks including both kinds of running and cross is in an appropriate range according to the instructions of ADA.
- d) Certain types of material with different colors such as, concrete, brick, tile and marble in were used in the finishing steps of sidewalks regardless of the joints and their connection styles, which has made certain difficulties to the users.
- e) Installment of a certain number of (trees, traffic signs, posters and electric poles) randomly without of being studied on the sidewalks has created barriers for people to walk conveniently. The sidewalks also lacked seating places other than one which is situated in the sidewalk corridor which has created obstacles for safe walking.
- f) The gutters of rainwater have not been made based on the standard measures and make difficulties for the people who use wheelchairs.
- g) The driveway crossing has not been considered and thus cars keep driving through the sidewalks to find parking places, which also has created barriers to safe walking.
- h) The lack of the curb ramp in the sidewalks of this road is another reason that doesn't let people with special needs use the sidewalks both easily and safely. However, there are some improvised ramps in certain locations regardless of any standards or regulations.
- i) The lack of APS, which provides information and detectable warnings for the people with special needs on the sidewalks.
- j) Ignoring the above mentioned concerns and shortages in conducting and designing the sidewalks has caused so many problems to the users particularly those with special needs.

## 12. Recommendations

- The required designs should be prepared by the municipality to the sidewalks according to width and function of the roads and the necessary cross sections concerning every kind of roads based on standards and credible engineering instructions in the field should be constructed. The follow-ups of the implementation of the relevant regulations are also necessary.
- The removal of all trespassing on the sidewalks should be taken place.
- Installment of special signs and offering instructions to those with special needs have to be conducted.
- Reorganizing of the sidewalk of the road in terms of used materials and color, renovating useless parts, separating parts of the sidewalk and putting all needed materials in their fitting place should be made according to the standards.
- The research recommends the municipality should pay attention to the relevant international criteria especially in the development process and preparation new master plans.
- The public awareness should be raised regarding the provision of the needs of the people with special needs with respect to the construction of the buildings and their entrances locating on the sidewalks.

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## أثر تطبيق معايير (ADA) في تصميم أرصفة الشوارع التجارية في مركز مدينة السليمانية

هاوار طه توفيق - مدرس مساعد

جامعة السليمانية، كلية الهندسة، قسم العمارة

### المستخلص

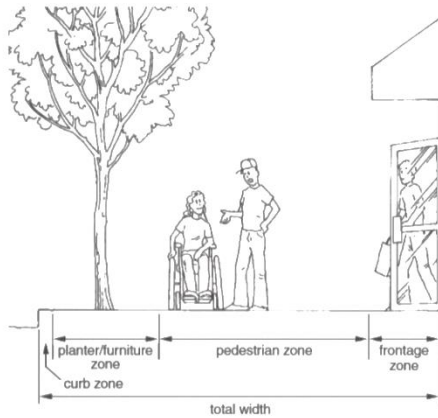
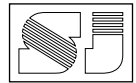
في ضوء هذه العبارة التي مفادها أن (كل طريق ومسار يجب أن يكون صالحاً للإستعمال)، فمن المفترض ان تصمم جميع الأرصفة بطريقة تناسب مع جميع الأعمار، وان تحقق الشوارع التجارية الحضرية جميع متطلبات ورغبات مستخدميها وظيفياً.

وعليه فإن الدراسة تسعى الى تسليط الضوء على المتطلبات التي من المفترض ان يتضمنها تصميم تلك الأرصفة والمسارات لتعمل بطريقة تناسب جميع الفئات العمرية ولكل أصناف المستخدمين بما فيهم ذوي الاحتياجات الخاصة. تحاول الدراسة أيضاً تحديد المشاكل المرتبطة بهذا الجانب والكشف عن العواقب والأضرار نتيجة عدم استخدام المعايير الخاصة بالأرصفة وغياب تلك المتطلبات التي قد تكون لها تأثيرات مباشرة وغير مباشرة على مستخدميها.

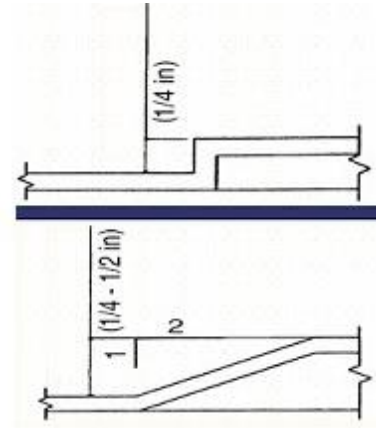
وقد استنتجت الدراسة ان تلك المسارات تعاني من غياب مجموعة من المتطلبات الأساسية التي تجعلها غير ملائمة لذوي الاحتياجات الخاصة.

وطرحت الدراسة أيضاً مجموعة من التوصيات الخاصة بالخطوات التي تراها ضرورية لمعالجة تلك المشاكل.

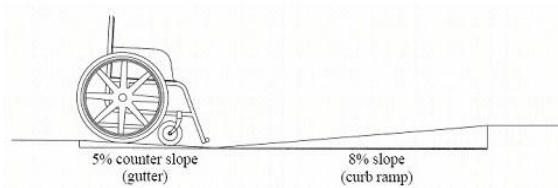
**الكلمات المفتاحية:** ADA، الرصيف، الشارع التجاري، مركز المدينة، مدينة السليمانية.



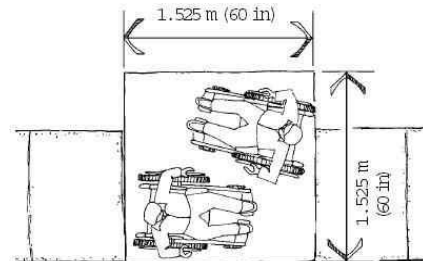
**Fig.1: The zone system divides the sidewalk corridor into four zones to ensure that pedestrians have a sufficient amount of clear space to travel.**  
 (Source: Beneficial Designs, Inc,2001,P4-3)



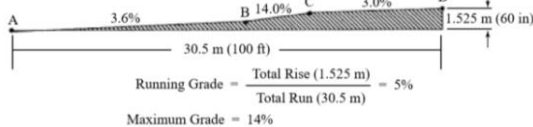
**Fig.2: shows changes in level.**  
 (Source: U.S. Access Board, 2002)



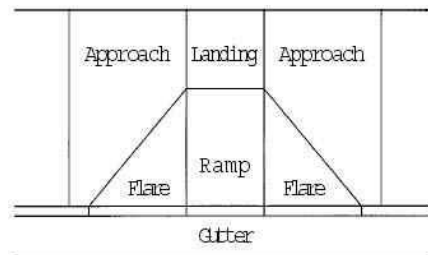
**Fig.3: The gutter slopes counter to the slope of the curb ramp to promote drainage.**  
 (Source: Beneficial Designs, Inc,1999,P33)



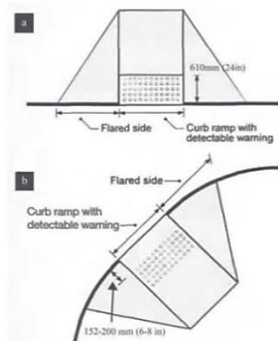
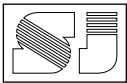
**Fig.4: Passing spaces should be included at intervals on narrow sidewalks to allow wheelchair users to pass one another.**  
 (Source: U.S. Access Board, 2002)



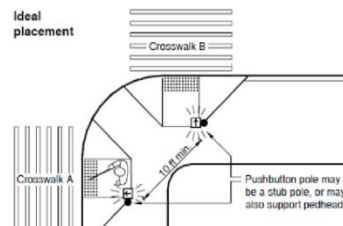
**Fig.5: Maximum grades can make a sidewalk difficult to traverse, even if the overall running grade is moderate.**  
 (Source: Beneficial Designs, Inc,1999,P33)



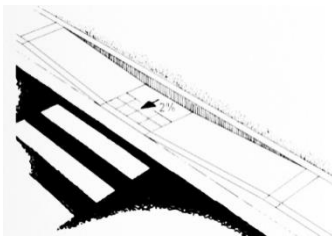
**Fig.6: curb ramp components.**  
 (Source: FHWA,2001,19)



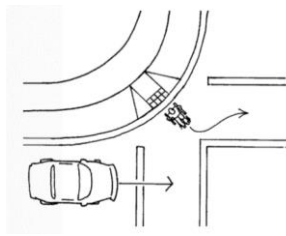
**Fig.7: Curb ramp designs showing 610 mm (24 in) detectable warning.**  
(Source: FHWA,2001,25)



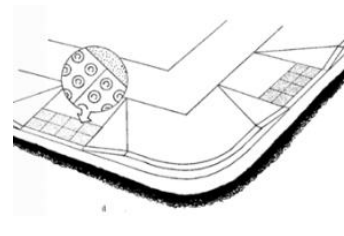
**Fig.9: optimal location of Pushbutton-integrated APS.** ( Source: Harkey,2007,150)



**Perpendicular type**

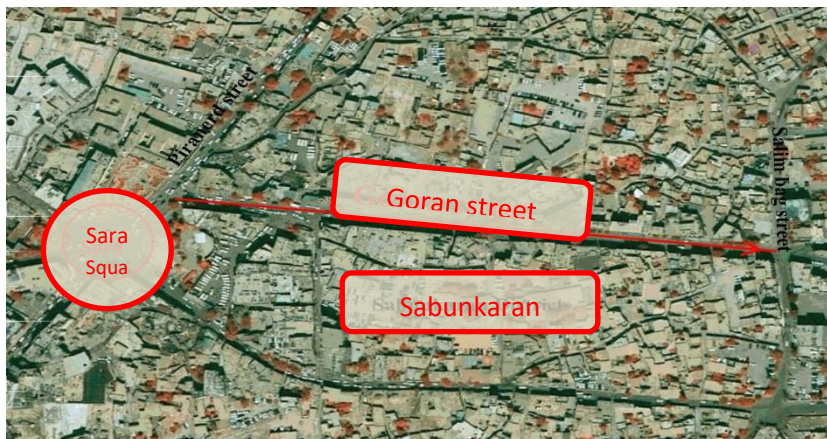


**Diagonal type**

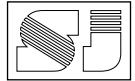


**Paralell type**

**Fig.8: shows various types of curb ramps.** (Source: Beneficial design ,Inc,2001,p7-5)



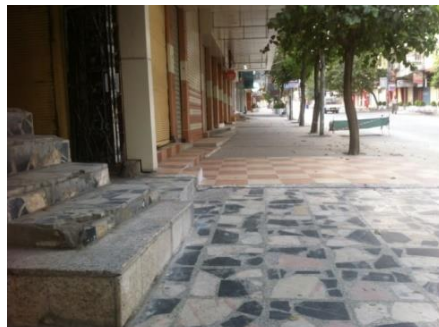
**Fig.10: illustrates the case study location according to the Boundaries.**  
(Source: The Researcher by depending on Sulaimaniyah satellite image -2007).



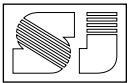
**Fig.11: Construction conditions of the sidewalks.** (Source: Researcher)



**Fig.12: Slope and cross slope of the sidewalks.** (Source: Researcher)



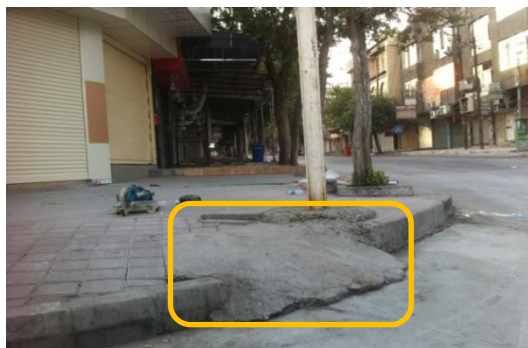
**Fig.13: Various materials in different colors, textures and thickness were used in the finishing of the walkways.** (Source: Researcher)



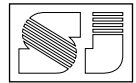
**Fig.14: The existence of steps into the sidewalks.** (Source: Researcher)



**Fig.15: The planter zone of the sidewalks in the study area.** (Source: Researcher)



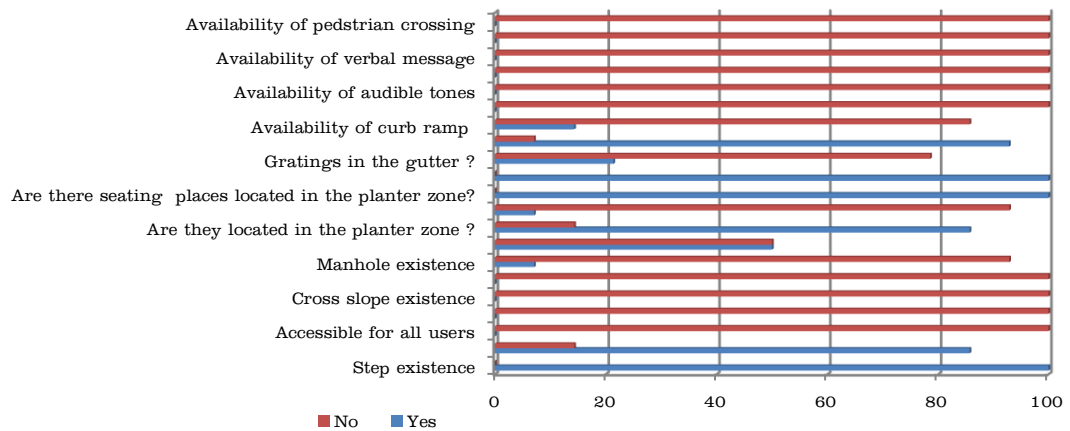
**Fig.16: Lack of standard curb ramp into the sidewalks of the study area** (Source: Researcher)



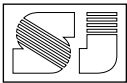
**Fig.17: The drive way crossing has not been considered into the sidewalks of the study area.** (Source: Researcher)



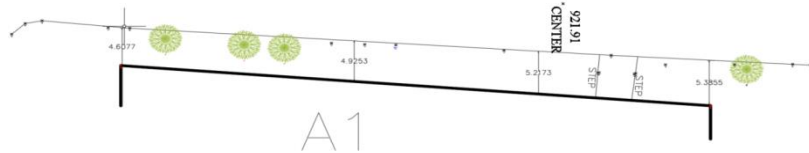
**Fig18: Shows different kinds of Trespassing into the sidewalks.** (Source: The researcher)



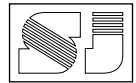
**Fig.19: Check list results.** (Source: Researcher)



**Table 1: Checklist relied on ADA criteria that applied on each zone.** (Source: Researcher)



<b>Sidewalk corridor</b>	Step existence (change in level)	Yes	•	<b>Grating</b>	Grating existence in the gutter	Yes	•
	Construction condition	Fair	•		Space between the gratings	≥13ml <13ml	•
<b>Sidewalk grade and cross slope</b>	Shade or ceiling (buffer) existence	Yes	•	<b>Crossing</b>	Existence of driveway crossing	Yes	•
	Average width	No	•			No	
<b>Sidewalk surface</b>	Is this sidewalk accessible for all users?	503	cm	<b>Curb ramp</b>	Curb ramp existence	Yes	•
	Grade	Yes	•		If the answer is yes ,determine the followings:	No	
<b>Utility cover</b>	Landing existing	No	•	<b>Providing information</b>	Curb ramp material properties ?	Rough	•
	Landing dimension (if available)	Yes	•			smooth	
<b>Protruding objects</b>	Cross slope existence	No	•	<b>Pedestrian crossing</b>	Curb ramp types (shapes)	perpendicular	•
	Cross slope grade	Yes	•			Diagonal	
<b>Passing space (for wheelchair users)</b>	Passing space	No	•		Parallel		
	Tile	Yes	•		Depressed corner	•	
<b>Manhole existence</b>	stone	No	•		Combined		
	concrete	Yes	•		Curb ramp grade	6.25	%
<b>Is manhole cover flashed with the surface?</b>	Asphalt	No	•		Curb ramp length	800	cm
	Brick	Yes	•		Approach width	460	cm
<b>Existence of pole, traffic signs, tree and advertising elements lower than 2m height</b>	Different type	No	•		Providing detectable warning and tactile perceptual information	Yes	•
	Consistent use of color	Yes	•		Gutter existence	No	•
<b>If the answer is yes, are they located in the planter zone?</b>	Inconsistent use of color	No	•		Availability of pedestrian signature	Yes	•
	Yes	Yes	•		Availability of Audible ones	No	•
<b>Is there any seating place?</b>	Yes	Yes	•		Availability of Detectable warning	Yes	•
	No	No	•		Availability of verbal message	No	•
<b>If the answer is yes, is there located in the planter zone?</b>	Yes	Yes	•		Availability of vibrotactile information	Yes	•
	No	No	•		Availability of pedestrian crossing	No	•
	No	Yes	•		Are there provided with any information like (Signs, traffic lights and marking)?	Yes	•
	No	No	•			No	•

**Table 2: sidewalk measurements.** (Source: Researcher)

Segment name	Average Curb height (cm)	Cross slope	Sidewalk length(m)	Sidewalk height (m)	Running slope (grade)	Side walk width				Average width(m)
<b>A1</b>	22.5	2.37	84.312	2.05	2.43	4.6	4.92	5.21	5.38	5.03
<b>A2</b>	8.5	1.75	16.2	0.55	3.40	9	8.66	6.69	3.12	6.87
<b>A3</b>	25	1.7	102.5	3.28	3.20	3.72	4	4.28	4.57	4.14
<b>A4</b>	30	2.5	25.68	0.92	3.58	3.85	4.27	4.66	4.86	4.41
<b>A5</b>	21	4	46.08	1.6	3.47	4.26	4.1	3.95	3.81	4.03
<b>A6</b>	27.5	3.25	29.96	0.96	3.20	3.85	3.82	3.8	3.77	3.81
<b>A7</b>	38.7	2.83	49.94	1.58	3.16	3.5	3.64	3.74	3.86	3.69
<b>A8</b>	18	1.5	31.78	0.94	2.96	3.83	3.7	3.58	3.47	3.65
<b>A9</b>	26	1.5	25.55	0.79	3.09	3.31	3.4	3.47	3.53	3.43
<b>A10</b>	35	2.5	15.44	0.54	3.50	3.32	3.29	3.24	3.22	3.27
<b>B1</b>	22	2.5	84.5	2.18	2.58	4.45	4.2	4.05	4.17	4.22
<b>B2</b>	23.3	1.3	132.96	4.32	3.25	4.14	4.17	3.81	3.15	3.82
<b>B3</b>	15	2.5	97.88	3.3	3.37	4.74	4.57	4.42	4.28	4.50
<b>B4</b>	36.5	2.12	126.3	3.95	3.13	4.53	4.36	4.88	4.75	4.63