PADESTRIAN WALKING SPEED DATA ANALYSIS OF DHAKA CITY IN BANGLADESH

Submitted By:

1. Rathindra Nath Sarkar	**171-47-318**
2. Raisul Islam	**171-47-324**
3. Sumit Shom Shuvo	**171-47-329**
4. Md. Rakibul Islam Siam	**171-47-333**
5. Md. Azharul Islam	**173-47-601**

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Bachelor of Science in Civil Engineering

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The thesis titled ' **Pedestrian walking speed data analysis of Dhaka city in Bangladesh** ' submitted by Rathindra Nath Sarkar Id: 171-47-318, Raisul Islam Id: 171-47-324, Sumit Shom Shuvo Id: 171-47-329, Md. Rakibul Islam Siam Id: 171-47-333, Md. Azharul Islam Id: 173-47-601; in the Department of Civil Engineering, Daffodil International University, has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Science in Civil Engineering (Transportation) and approved as in its style and contents presentation which has been held on 12th July, 2021.

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Dr. Miah M. Hussainuzzaman
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Daffodil International University
Daffodil Smart City
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Roads and Highways Department

Mohammad Mominul Haque
Member (Internal)
Assistant Professor
Department of Civil Engineering
Daffodil International University
Daffodil Smart City
Ashulia, Dhaka

Mr. Saurav Barua
Member (Internal)
Assistant Professor
Department of Civil Engineering
Daffodil International University
Daffodil Smart City
Ashulia, Dhaka

Kazi Obaidur Rahman
(Supervisor)
Assistant Professor,
Department Of Civil Engineering.
Daffodil International University
Daffodil Smart City
Ashulia, Dhaka

APPROVAL

This is to certify that the thesis entitled **“ Pedestrian walking speed data analysis of Dhaka city in Bangladesh** ' submitted by **Rathindra Nath Sarkar** Id: 171-47-318, **Raisul Islam** Id: 171-47-324, **Sumit Shom Shuvo** Id: 171-47-329, **Md. Rakibul Islam Siam** Id: 171-47-333, **Md. Azharul Islam** Id: 173-47-601; in the Department of Civil Engineering, Daffodil International University, has been accepted as satisfactory in partial fulfillment of the requirement for the degree of **Bachelor of Science in Civil Engineering** (Transportation) on July, 2021

Kazi Obaidur Rahman
(Supervisor)
Assistant Professor,
Department Of Civil Engineering.
Daffodil International University

DECLARATION

This is to certify that the thesis entitled "Pedestrian walking speedy in Dhaka city" submitted to the Department of Civil Engineering Daffodil International University (DIU) in partial fulfillment of the requirement for the degree of Bachelor of Science in Civil Engineering is a record of original research work done by us under the supervision of **Kazi Obaidur Rahman**, Assistant Professor, Department of Civil Engineering, Daffodil International University, and the thesis has not been submitted else where for any award/degree/diploma/fellowship or for any other purpose.

Kazi Obaidur Rahman
(Supervisor)
Assistant Professor,
Department Of Civil Engineering.
Daffodil International University

Submitted By:

Rathindra Nath Sarkar
ID NO: 171-47-318

Raisul Islam
ID NO: 171-47-324

Sumit Shom Shuvo
ID NO: 171-47-329

Md. Rakibul Islam Siam
ID NO: 171-47-333

Md. Azharul Islam
ID NO: 173-47-601

ABSTRACT

Walking is the most proficient and viable method of transportation for short excursions without cost. The Walking pace of walkers is prime significance in an investigation of capacity, plan furthermore, arrangement of walker offices. This survey focused in on the impacts of individual qualities; land utilizes reason, wireless use, carrying things and development in gatherings. Progressed research on common stream qualities is a critical prerequisite in Bangladesh for improving its street network offices. Around 5 hours of information were gathered by video recording, and an absolute number of 3612 people on foot were survey for the model improvement. The mean Walking pace of the Bangladeshi person on foot (65.78 m/min) is discovered to be more slow when contrasted with US, Europeans and Asian nations however higher than the walker of Saudi Arabia and Indonesia. A further breakdown of the speed information by sexual orientation shows that the female people on foot (31.35 m/min) male (35.36 m/min) partners. The mean Walking pace of the person on foot of Dhaka metropolitan city (32.66 m/min) is most reduced among four significant urban communities of Bangladesh. The greatest and least mean Walking speed is found at the walkway of Dhanmondi 32, Dhaka (28.99 m/min) . It could be expected the presence of higher number of walkers. Male walker are quicker than female passerby in all of the three destinations of Dhaka metropolitan urban areas. Kids pedestrian on foot are the slowest walker on the whole metropolitan urban communities. The speed of three site all middle aged (32.90 m/min) and younger (37.34 m/min) people on foot are manually higher from mean Walking speed, however the Walking velocity of three site all older pedestrian is (27.09 m/min). Various quantities of gathering size passerby with higher speed in the walkway of Dhanmondi 32, Dhaka.

This survey analyzed the elements which impacted strolling rates to give a more noteworthy comprehension of walker developments. Person on foot speed diminishes with expands the gathering group size. Mean strolling pace of walker group size two is higher than other gathering size walkers in all gender and age bunch. Essentially common of Gathering Size three or four than bigger Gathering size. In any case, in certain locales, remarkable circumstance is happened because of low number of

walkers. Female and Older walkers of Gathering Size four. Kids walkers of Gathering Size two or three. The walking velocities of walkers conveying stuff are most certainly not the same as those not conveying stuff. The walking speeds in blended land utilizes are just more slow than the mean strolling speeds among all land employments. Male person on foot strolling speed is higher than female walker in each land use.

ACKNOWLEDGEMENT

From the start we might want to pass on our significant appreciation to all-powerful Allah for giving us the strength and patience to achieve the fruitful finish of this work.

At that point, we might want to communicate our good profound respect to Mr. Kazi Obaidur Rahman, Assistant Professor, Department of Civil Engineering, Daffodil International University (DIU), Dhaka. For his important idea, motivation, direction and support and furthermore warm consolation towards the effective finish of this exploration.

At long last, we might want to thanks the entirety of our educators and batchmates of the Department Of Civil Engineering, Daffodil International University, and our parents whose consolation and motivation was useful to the compilation of this theory.

DEDICATION

This thesis is dedicated to our **Parents** and our friend **LATE Md. Soroar Hossain Santo (171-47-366)**.

LIST OF ACRONYMS

ARI	Accident Research Institute
RUET	Rajshahi University of Engineering and Technology
BUET	Bangladesh University of Engineering and Technology
BRTA	Bangladesh Road Transport Authority
DM	Data Mining
GDP	Gross Domestic Product
MAAP	Microcomputer Accident Analysis Package
RTA	Road Traffic Accident
WHO	World Health Organization
GIS	Geographical Information System
NHTSA	National Highway Traffic Safety Administration
AI	Artificial Intelligence
PC	Personal Computer
RHD	Roads and Highways Department
LGED	Local Government Engineering Department
OCR	Optical character recognition
MS	Microsoft

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CHAPTER ONE

1.1 Introduction

Every individual walks a period of the time in his/her daily life. Walking is normally known as the most proficient and variable method of transportation for short outings. The significance of passerby developments is fundamental for the financial advancement of city life. Dhaka Metropolitan City (DMC) is the biggest city in Bangladesh. The populace is expanding step by step in Dhaka city accordingly expanding passerby's interest. The increment of the populace has squeezed the passerby organization. To recognize the current state of the passerby mode, the walker attributes for different people on foot offices should be examined. Legitimate consideration has been given to concentrate on common conduct and passerby stream qualities for Dhaka city. A study of different models for bystander workplaces around the world was directed to develop a standard model in Dhaka Metropolitan City. Different investigations on walking speeds were led by numerous specialists at various regions on walkways. It was discovered that walking velocities of people on foot differ over a wide reach contingent upon the individual state of being, sexual orientation, age, and different variables. Hoel (l968) led an investigation in Pittsburgh Central Business District during top and off-top times of the day and acquired a mean walking velocity of 4.80 ft/sec (88 m/min). More seasoned (1968) directed a similar report in Oxford Street, London on footways and acquired a mean walking velocity of 78.6 m/min. Navin and Wheeler (1969) examined an examination among understudies at the University of Missouri, Columbia was discovered at a mobile speed of 79 m/min. Fruin (1971) directed an examination among workers in the United States and acquired a mean walking velocity of 81 m/min. Polus et al. (1983) inspected the developments of individual people on foot on walkways in the focal business area of Haifa, Israel, utilizing a current strategy. Rather than a cine camera, a video recording device and a computerized clock were utilized and got a normal walking rate of 78.8 m/min. Tanaboriboon et al. (1986) led the main examination in Southeast Asia and acquired a mean walking rate of 74 m/min. Murata (1978) introduced the traffic cell rule which presented pedestrianization on the greater part of the roads in Nagano City, Japan. To create passerby arranging guidelines for Dhaka metropolitan city, it is needed to direct examination on nearby common qualities. The walking rate of walkers is a vital factor for the plan of people on foot offices. The target of this paper is to build up the connection between speed, stream, thickness, and space for the people on foot at walkways of

metropolitan territories in Dhaka metropolitan city. This outcome might be valuable in the arranging and plan of passerby networks in Dhaka and can be applied to different urban communities in Bangladesh.

1.2 Objectives

This survey has been pointed toward accomplishing the accompanying destinations:

1.To count the current circumstance of interest and supply of person on foot path in the study zone.

2. To explore the overall issues in the current circumstance of the survey zone and to recognize the purpose for it.

3. To suggest a few measures with respect to the interest and supply of passerby path in the investigation zone.

Both essential and optional information has been utilized in this examination. Perception review and walker stream study are associated with essential information source.

1.3 Scope of the Study

This investigation endeavors to give progress data on neighborhood and summed up common in Bangladesh. The elements influencing walking speed are totally contemplated. Walker stream attributes are momentarily examined on the grounds that it is imperative to plan viable and proficient walker and street network offices. Passerby level of administration (LOS) is assessed to survey the nature of activities of walker offices.

1.4 Study Area Profile

This road is one of the most important road in Dhaka city. So, we choosed this area because;

1. As it's connected to all the importants roads. So all type of vehicales which can be intercity or outtercity found easily

2. This road is connected with Dhanmondi Lake which is most important for people to spent leisure time.

3. There are so many school, college and university in this area which make this road busier.

4. As we collected data form Asad gate. Which is beside the National Parliament. VIP movement is frequent in that area .

5. There are few reknowed shopping mall in this area which makes it importants for collecting data.

6. Huge amount of pedestrian moves from asad gate to farmgate for working purposes, study purpose.

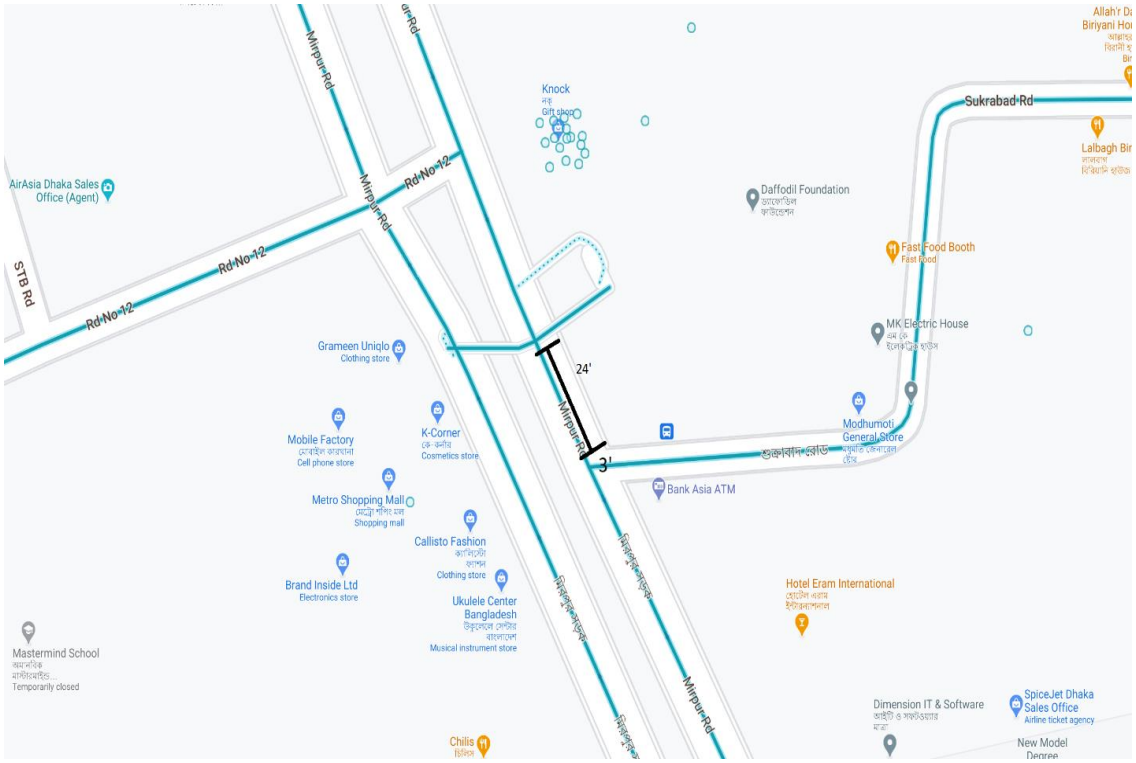


Fig 1.4.1: Dhanmondi 32, Dhaka

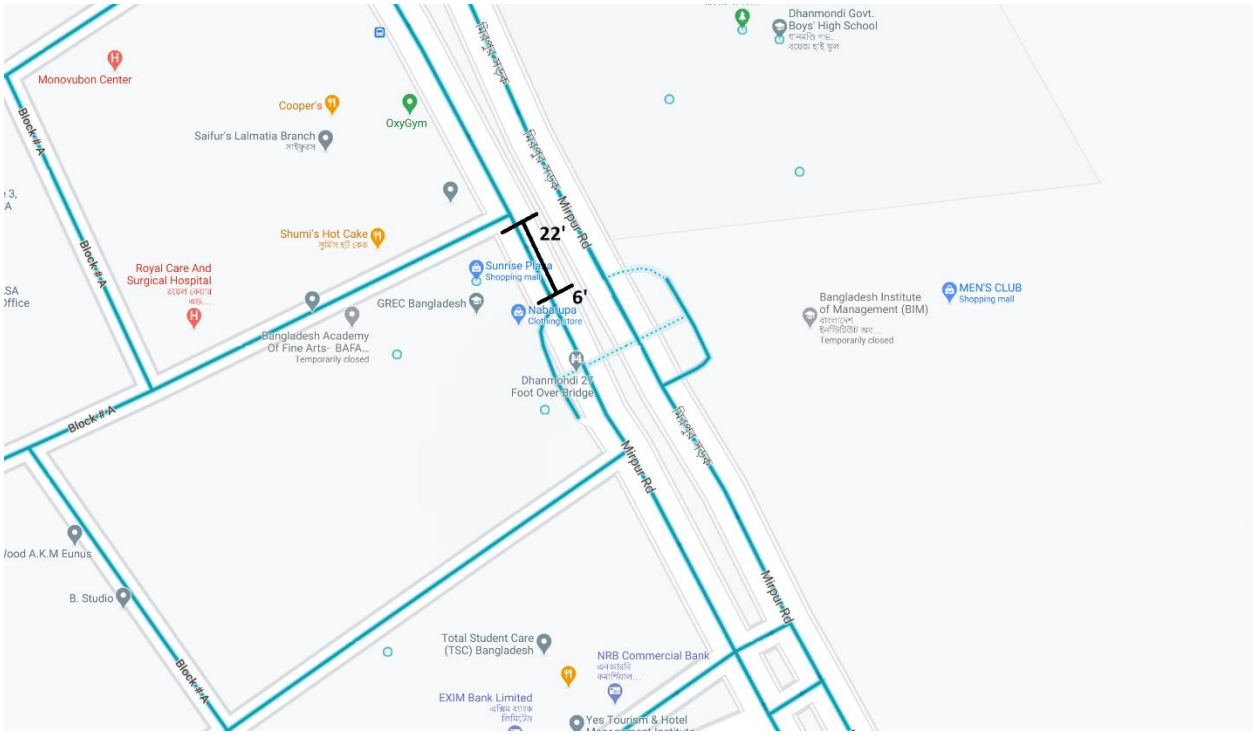


Fig 1.4.2: Dhanmondi 27, Dhaka

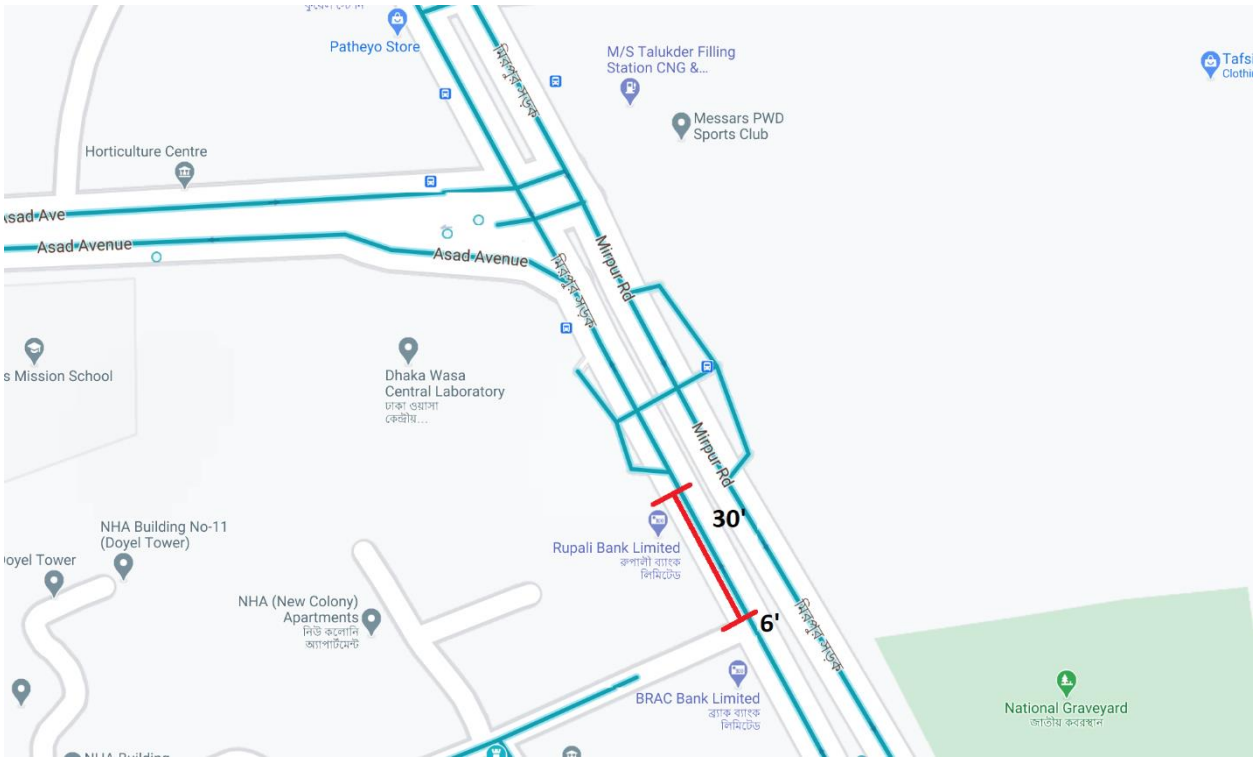


Fig 1.4.3 : Asad Gate, Dhaka

1.5 Expected Usefulness of the Study

This examination should be the principal endeavor to research the qualities of walker and its offices in one significant Metropolitan Cities of Bangladesh. The aftereffects of this examination might be helpful to the organizers and creators to plan a more effective, sufficient and more secure walker office. This investigation was done uniquely for the people on foot of walkways.

CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction

A survey of past research and distributed writing on pedestrian planning is given in this Section. At that point set out are the discoveries from past research, covering a wide scope of issues and factors which influence walker speed. These incorporate the impacts of various areas, how excursion reasons for existing are seen to affect on walking conduct and the degree to which the qualities of the climate are accepted to have a huge impact. Therefore, the conversation toward the finish of this segment draws every one of these strands together and puts things in place for the remainder of this exploration.

2.2 Significance of Walking

The attributes of human development, body measurements, including individual space inclinations and connections with others, are helpful for getting person on foot connections. Thinking about the width of the human shoulders, body influence, and shirking of contact with others, individuals require sidelong space, longitudinal space for walking, including space for pacing for agreeable development and keeping away from clashes. Individuals like to stay away from contact with others aside from where such swarming is unavoidable. At inadequately oversaw public occasions, unreasonable swarming at outrageous densities approaching the territory of the human body has brought about mass fatalities. Fruin (1971) presented the idea of Body Ellipses and Support Zones and contended that people on foot endeavor to keep a specific distance

between themselves and different people on foot. This directs their degree of solace and impacts walking speeds. For configuration purposes, the US HCM (2000) sets out an improved on body oval of 0.5 m x 0.6 m for standing territories, with an absolute zone of 0.3 m^2. Walker body circle and cushion zone prerequisite. It additionally suggests a body cushion zone of 0.75 m^2 for walking, which is close to the upper finish of the cradle zone range distinguished by Pushkarev and Zupan (1975) and which goes before the beginning of "unnatural rearranging". A mobile walker requires a specific measure of forward space. This forward space is a basic measurement, since it decides the speed of the excursion and the number of people on foot that can pass a point in a given time span.

2.3 Walker Space Requirements

The attributes of human movement, body measurements, including individual space inclinations and connections with others, are helpful for getting Pedestrian relationships. Thinking about the width of the human shoulders, body influence, and evasion of contact with others, individuals require sidelong space, longitudinal space for walking, including space for pacing for agreeable development and staying away from clashes. Individuals like to keep away from contact with others aside from where such swarming is unavoidable. At inadequately oversaw public occasions, exorbitant swarming at outrageous densities rising to the space of the human body has brought about mass fatalities. Fruin (1971) presented the idea of Body Ellipses and Buffer Zones and contended that walkers endeavor to keep a specific distance among themselves and different people on foot. This directs their degree of solace and impacts walking speeds. For configuration purposes, the US HCM (2000) sets out an improved on body circle of 0.5 m x 0.6 m for standing regions, with a complete space of 0.3 m^2. Walker body oval and cushion zone necessities appear in Figure 2.1. It additionally suggests that a body support zone of 0.75 m^2 for walking, which is close to the upper finish of the cushion zone territory distinguished by Pushkarev and Zupan (1975) and which goes

before the beginning of "unnatural rearranging". A mobile person on foot requires a specific measure of forward space. This forward space is a basic measurement, since it decides the speed of the outing and the quantity of walkers that can pass a point in a given time-frame. The forward space classified into a pacing zone and a sensory zone is as demonstrated in Figure 2.3.1.

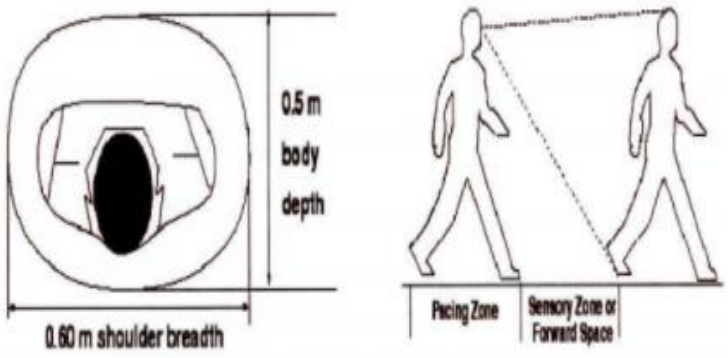


Figure 2.3.1: Pedestrian body ellipse and buffer zone requirement

Figure 2.3.2 shows the components of a survey by Still (2000) contrasting his own body measurements against the US HCM (2000) values. Still's discoveries propose the HCM allotments, which are bigger than Fruin's unique proposals, are very liberal, yet, it is important that the conditions Fruin estimated and applied his degree of administration estimations were prevalent on city roads. Hartnett el al. (1974) tracked down that male and female people moved toward diminutive people more intently than tall people. Phillips (1979) and Sanders (1976) demonstrate that someone else's body size impacts space.

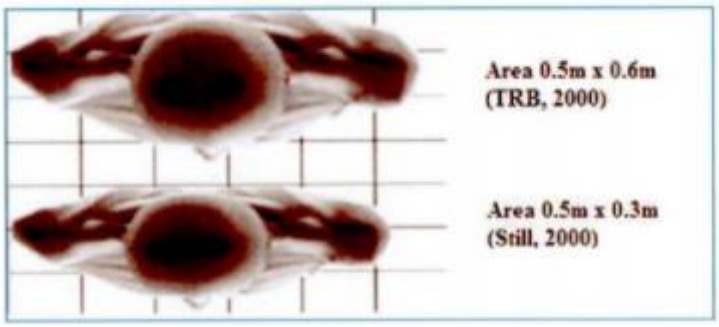


Figure 2.3.2: Comparison of Body Ellipses

2.4 Person on foot walking speed on walkways

People can decide to walk at an alternate speed that they discover generally agreeable. walking is a finished mode in itself and is a beneficial mode by which any individual gets to an individual vehicle or public transportation or arrives at the last objective in the wake of utilizing a mode. African urban areas have a more noteworthy walking modular offer than Asian and Latin-American urban communities. The normal walking portion of African, Asian, and Latin-American urban areas is 57%, 37%, and 22%, individually (Montgomery, 2006). Enormous extent of walk trips in Asian, African, and Latin-American nations requires the arrangement of restrictive walk offices. In a new overview led in West Perth, Australia, 70% of all on-ranch excursions and half of shopping trips are made by walking (Curtin University of Technology and Geografia, 2006). Because of financial conditions, transportation offices, street organization, metropolitan construction, existing offices and social foundations, individuals in agricultural nations need to walk generally significant distances for day by day exercises (Koushki, 1988). Nonetheless, insufficient consideration has been paid to the appropriate arranging and planning of walking offices for ideal execution, wellbeing and in the assessment of the current offices in least agricultural nations (Rabman et al., 2012). A thorough audit of Asian person on foot attributes can be found in Morrall et al. (1991) in which an examination of the passerby attributes in Canadian and Asian urban areas was made. Seneviratne and Morrall (1985a, b) inferred that person on foot arranging norms for Asian nations ought to be founded on neighborhood walker attributes. Tanaboriboon and Guyano (1991) additionally brought up that neighborhood plan principles are needed for walker offices in Asian nations, and nearby specialists ought not receive the western passerby plan norms straightforwardly.

2.5 Consequences for Person on foot Walking Speed

Huge examinations in common started during the 1960s. In the course of recent years, many surveys have been led attempting to uncover the effects of human factors on

passerby conduct. Different scientists (Downie and Heath, 1970; Rastogi et al., 2011; Azmi et al., 2012) have inspected the impacts of affecting variables on walkers' walking speeds at various walkways. They found that walking velocities of people on foot change over a wide reach contingent upon the individual state of being, age, sex, levels of actual wellness, stature and weight, ecological elements, bunch size, enjoying any movement and outing reason. A mix of every one of these elements may change the passerby's speed and stream extensively. The affectability examination was performed by utilizing F-test (Downie and Heath, 1970) at a certainty level of 95% to look at whether critical distinction exists between the rates seen under various impacting factors by testing the invalid speculation. The plan of an office ought to think about every one of these impacts to the degree conceivable (Rastogi et al., 2011). Individuals who walk all the more gradually will in general reason others to back off. The bundling of a person on foot in view of deterrents, for example, traffic lights, convergence will moderate walkers, window customers and choke streams. Individuals don't care to walk behind or close by with obscure individuals so they will in general walk aside and somewhat ahead, so the walking speed is really relying upon what different people do making an obstruction to different walkers (Azmi et al., 2012). Walking speeds decrease with age, especially after age 60 years, however sound more seasoned grown-ups are fit for speeding up by 40% for brief distances. Thick common traffic diminishes walking speed for all people. Normal discoveries of these examinations are that ladies walk more slowly than men and that individuals more than 60 years old walk more slowly than their more youthful partners. Across every one of these investigations, walker walking speeds shifted from 98 m/min to 33 m/min, with a mean speed of 80 m/min. Regardless of various examinations concerning human components on common traffic, particularly on walking speed, there were no predictable ends for the impact of sexual orientation, age, baggage conveying or different elements. This may part of the way result from the inconsistency of the perception destinations. Another chance is that some exploration didn't reject the commonly interferential impacts between different components and the one being examined. Specialists have recorded that typical walker speeds are an element of countless components: age, sex, and gathering size are habitually refered to (Bowman and Vecellio, 1994; Knoblauch et al., 1996; Fruin, 1971; Whyte, 1988; Puskharev and

Zupan, 1975). Individual size is a factor that has been generally examined in common writing as it identifies with individual space prerequisites (Fruin, 1971). It is generally perceived that passerby walking speed is enormously affected by age and handicap, with the slowest walking speeds commonly seen in more seasoned grown-ups, youngsters more youthful than age five, and debilitated people (Dewar, 1992). Shahrol Mohamaddan (2010) proposed that walking conduct can be estimated by walking distance starting with one spot then onto the next, walking heading, walking time, walking experience and other conduct factors that can emerge during the walking time frame. walking conduct likewise can be estimated by occupants walking gatherings. As indicated by Karim (2008), diverse age bunches have their own capacity of walking for any distance depending on the wellness of the individual. As indicated by master meet done by Azmi and Karim (2012), the discoveries shows that with regards to walking time, the greater part of the respondents concurred that they will walk 5 to 10 moments in arriving at the local area offices given in their local region. As per Barton et at. (2003), genuine distance walked changes with individual actual capacity and wellness, encumbrances, singular direction for living, seen joys and additional perils of the course, venture reason and accessibility of alternatives. No huge distinction in walking speed was found between walkers going to the city from the terminal toward the beginning of the day and people on foot making a beeline for the terminal from the city in the afternoon. The walking pace of people on foot effectively noticing their general climate is essentially lower than those walking with their heads down or gazing directly ahead. People on foot from more modest, more provincial communities were found to have quicker walking speeds than walkers from the biggest populace Center (Finnis and Walton, 2008). Walking paces will be fundamentally more slow on slants more prominent than three degree (ITE Technical Council Committee, 1976).

2.6 Land use purpose

Land use additionally assumes a significant part in deciding the walking pace of walkers. The impact of land utilization on common rates has likewise been a subject of examination. It is intriguing to discover how the walking choice and the significance of infrastructural similarity factors contrast under various land use climates. For example, blended land use is thought to give more visual assortment and interest for people on foot (Frank et al., 2010). Arasan et al. (1996) found that while individual attributes are significant, the primary effect on the choice to walk was trip reason. The reason for the outing influences speeds as the Transport and Road Research Laboratory found in an examination in London in 1979 (TRRL, 1985). They tracked down that those on shopping trips walked more slow than those on outings to cafés or on business. Polax and Turvey (1992) discovered walker travelers would in general walk more slowly than non-sightseers. A few examinations show that general climate is a significant impact and they discovered contrasts between business, private and shopping territories (Hoel, 1968; Ratnayake et al., 1991 and Al-Masaeid et al., 1993). Rastogi et al. (2011) found that people on foot walking in an instructive territory are the quickest and those in private and shopping regions are the slowest. TRB (2000) noticed a huge contrast in the walking paces of people on foot in view of the land utilizes, like business, private, and shopping territories. TRB (2000) additionally saw that Pedestrians going to and from work, utilizing similar offices for quite a while, walk at higher rates than customers. Lam and Cheung (2000) saw that people on foot walking in business zones are quicker than those in sporting facilities, and the walking rate of the walker relies upon the general climate. Wells and Yang (2008) found that walkers of nonresidential territories walk in less speed than local locations. They likewise tracked down how blended land use zones influenced walking speed. Bornstein and Bornstein (1976) announced that people on foot living in urban communities with an enormous populace have quicker walking speeds than those living in urban areas with little populaces and a relationship exists between the walking rate and populace size of the city. Finnis and Walton (2008) inferred that individuals walking for a particular object are quicker than the ordinarily walking passerby.

2.7 Survey Area Effects

The walker attributes are affected by the differential area. Different writings propose various areas effectively affect passerby developments. Lam furthermore, Cheung (2000) analyzed walker speeds on various offices and found that people on foot on indoor walkways walk more slowly than those on outside walkways. Al-Masaeid et al. (1993) created walker speed-stream connections for CBD zones in creating nations, and contrasted them with the normal estimations of TRB (1985). These outcomes demonstrate that the estimations of bi-directional CBD walkways are not relevant to modem walking attributes. This was additionally affirmed by different investigations into CBD's in Hong Kong (Morrall et al., 1991) and America (McLeod, 2000); shopping regions in the Netherlands (Hoogendoom, 2003), Germany (Brilon, 1994) and the UK (Older, 1968; O'Flaherty and Parkinson, 1972; Leake et al., 1991); local locations in Helsinki (Lautso and Murole, 1974); and generally useful regions in Bangkok (Tanaboriboon and Guyano, 1989) and Singapore (Tanaboriboon et al., 1986).

2.8 Difference between of the Speed of Bangladeshi Pedestrian with different countries

It may very well be seen that speed examinations directed in the United States and Britain yielded walking speed going from 79 m/min to 88m/min (Older, 1968; Hoel, 1968; Navin and Wheeler, 1969; Fruin, 1971). Be that as it may, the walking velocity of the Asian passerby will in general be lower than the Caucasian, to specify Israel with mean walking velocity of 79 m/min (Polus et al., 1983) than that of Singapore walking rate of 74 m/min (Tanaboriboon et al., 1986). Koushki and Ali (1993) considered that walker stream qualities around there and referenced that the passerby walking speeds were lower in Kuwait City focus as contrasted with those in the United States and England however were like passerby speeds seen in Riyadh, Saudi Arabia (Koushki, 1988). Morrall ci al. (1991) registered passerby walking speeds on walkways in Calgary, Canada (84 m/min) and Colombo, SriLanka (75 m/min) for men, ladies,

youthful, senior walker and contrasted them and comparative measurements from Singapore and Bangkok, Thailand, as revealed by Tanaboriboon and Guyano (1991). The mean walking speed of the Bangladeshi pedestrian (65.78 m/min) is found to be slower as compared to United States, Europeans and Asian countries but higher than the pedestrian of Saudi Arabia and Indonesia.

2.9 Gender and Age

It is generally perceived that walker walking speed is incredibly affected by sex, age what's more, inability. The writing survey proposes that people have diverse walking speed. Fruin (1971), Gibson (1980), Polus et al. (1983), Young (1999), Shi et al. (2007), Finnis and Walton (2008) and Laxman et al. (2010) saw that guys walk quicker than females. Yet, a few analysts didn't discover critical contrast between the paces of male and female walkers (Knoblauch et al. (1996), Gates et al. (2006) and Arango and Montufar (2008)). Fitzpatrick et al. (2006) tracked down no huge contrasts in walking speed between elderly people men and elderly people ladies. Laxman et al. (2010) found that guys were quicker than females by almost 0.13 m/s. Polus et al. (1983) proposed that guys are reliably seen to dominate females, in all likelihood as a result of their more extended step and furthermore maybe on account of their intentional hurry to work. They perceive that ladies are more reluctant to walk in areas where they feel perilous or different obstructions exist. Finnis and Walton (2008) discovered that Females who wear obeyed shoes were not essentially more slow than their level shoe wearing partners. The higher the stature of a heel, the more effect it might have on walking speed.

People on foot may shift their walking speeds over a wide reach. Normal velocities were found to decrease with age, however individual lethargic and quick walkers were seen altogether age gatherings. Age has appeared to influence walking speeds in different examinations. Fruin (1971), McGee, et al. (1983), Murray (1986), Ando et al. (1988), White (1994), Coffin and Morall (1995), Knoblauch et al. (1996), Dewarr (1992),

Tarawneh (2001), Maylor et al. (2001), Doors et al. (2006), Fitzpatrick et al. (2006), Arango and Montufar (2008), Laxman et al. (2010) and Ye et al. (2012) shows an expansive scope of walking speeds among people on foot. From the vast majority of the above investigation it is seen that youthful people on foot walk essentially quicker than others. White (1994) showed that people on foot may differ their walking speeds over a wide reach, when unobstructed by swarm thickness or different grindings. White (1994) too presumed that normal free-stream walking speed for guys, females and the blend of all walkers in the studies was 81, 76 and 80 rn/mm, individually. Normal rates were found to decay with age, yet individual lethargic and quick walkers were seen on the whole age gatherings. Youthful (1999) inferred that there was no critical variety found in the free-stream walking speed with any noticed walker qualities including person on foot's evident age. Ando et al. (1988) shows free walking speed is a component old enough.Differential velocities, which cause weakness to mishaps, for instance, to more youthful females moving in a group containing more seasoned guys, are obviously apparent. Knoblauch et al.(1996) tracked down that the mean walking speed for more youthful people on foot (1.51 mlsec) was higher than more established walkers (1.25 mlsec). Youthful male walkers had the quickest walking speeds (1.56 mlsec) and more established females had the slowest (1.19 mlsec). Guerrier and Jolibois (1998) distributed an investigation of passerby crossing speeds in Miami, and found an normal intersection speed of 4.42 ft/sec for more youthful and 3.19 ft/sec for more seasoned walkers.Tarawneh (2001) presumed that youthful matured walkers (21-30 years of age) were the quickest gathering of walkers and people on foot more than 65 years of age were the slowest. Doors et al. (2006) called attention to that common more youthful than 65 had a normal 0.3 m/s higher speed than more established ones (more than 65 years). Fitzpatrick et al. (2006) led an investigation of walking speed and discovered that normal speed of walkers more youthful than 60 was 0.14 m/s higher than that of more established walkers (more seasoned than 60). Carey (2005) tracked down that more youthful people on foot walk quicker than more established people on foot and are not influenced by season. Murray (1986) presumed that ordinary walking speed declined with age, however that by expanding pacing rates and step lengths, all members in the examination were equipped for surpassing their typical loosened up

walking speeds by about 40%. Strangely Fitzpatrick et al. (2006) and Doors et al. (2006) didn't discover critical distinction of walking speed among youthful walkers and moderately aged ones.(Dewarr, 1992) noticed slowest walking speeds regularly in more seasoned grown-ups, youngsters more youthful than age five, and crippled people. Edlmann and Pitcairn (2000) found that there were enormous and critical contrasts among grown-ups and youngsters on absolute intersection speeds. Walking speed was found to altogether diminish with the presence of youngsters. People on foot walking with youngsters were found to have an altogether more slow scrolling speed than people on foot without kids (Finnis and Walton, 2008). Worldwide mishap measurements demonstrate that older walkers are an incredibly weak street client bunch. In France, the greater part of all people on foot slaughtered out and about (51%) in 2004 were more than 65 a long time old, while this age bunch addresses under 15% of the populace (NHTSA, 2001; OECD, 2001). Fruin (1971), McGee et al. (1983), White (1994), Knoblauch et al. (1996), Tarawneh (2001), Fitzpatrick et al. (2006), Arango and Montufar (2008); and Finnis and Walton (2008) saw that the walking speed generally decreases after the period of 65. Concerning more seasoned walkers, all the examination recognized that the old had fundamentally lower speed than the youthful. Notwithstanding, the degree of speed decay for more seasoned people on foot acquired by Finnis and Walton (2008) and Fitzpatrick et al. (2006) is a lot more modest than those in different examinations. Arango and Montufar (2008) analyzed the walking rate of more established people on foot utilizing sticks or walkers for versatility with the more established walkers who are walking without these helping gadgets. More seasoned guys are walking quicker than more established females without the helping gadgets, while no sex distinction is appeared in walking speed when the helping gadgets are utilized. As per Patricia (2010), the normal walking pace in senior residents will be a piece lower, when contrasted with the normal speed of walking in more youthful individuals. It tends not out of the ordinary that the old would respond all the more unequivocally to higher vehicular densities and traffic speeds, out of a dread of traffic (Knoblauch, 1996).

2.10 People on foot walking who use phone

Late gauges have shown that starting in 2007 cell phone utilization has developed to more than 255 million supporters in the United States (CTIA, 2008). In excess of 61,000 passerby—engine vehicle mishaps that happen yearly (NHTSA, 2006); it isn't especially amazing that questions concerning the potential impacts of interruption on common conduct have emerged. Hatfield and Murphy (2007) and Nasar et al. (2008) inspected the impact of PDA use on road crossing conduct and saw that people on foot cross all the more gradually when chatting on a cell, are more averse to take a gander at traffic prior to entering the street, furthermore, make more hazardous intersections contrasted with non-occupied people on foot. Loeb and Clarke (2009) likewise tracked down an unfriendly impact of mobile phone use on common's speed and security. People on foot wearing earphones and walkers chatting on mobile phones are walking more slowly than the individuals who don't enjoy these exercises (New York Pedestrian Study, 2006). Be that as it may, Finnis and Walton (2008) weren't ready to decide the impact of current propensities, for example, tuning in to music and utilizing cells on walking speed because of the low- number of walkers.

Fig: 2.10.1 When Pedestrians use Phone

2.11 People on foot who walks in Group

Huge contrast is seen in the walking velocity of walkers while moving alone or then again in a gathering in various investigations. Rastogi et al. (2011) saw that gatherings of three or more are walking more slowly than the populaces mean speed and the gathering size of four or more are influenced exceptionally. Carey (2005) found that gathering size of people on foot influences the walking speed essentially. As per Knoblauch ci al. (1996) perceptions, people on foot walking with others will be more slow than people on foot walking alone. Tarawneh (2001) found that people on foot walking as a gathering of at least three will in general be more slow than when walking separately or in couples.

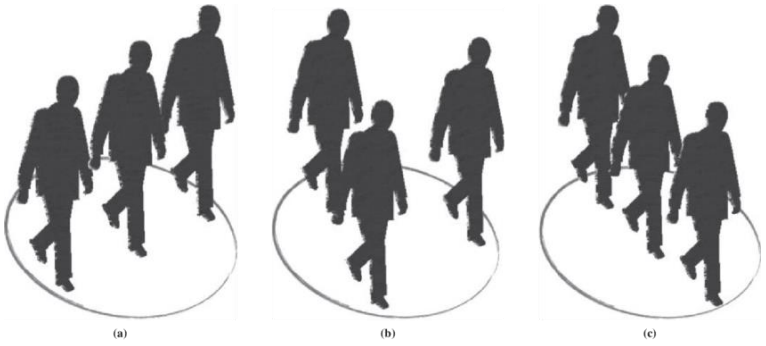


Fig 2.11.1: When Pedestrians walks in Group

2.12 People on foot who walkways Environment

Daamen and Hoogendoorn (2005) saw that the speed of walkers is impacted by walking attributes like the width, sort of office, and ecological components. Hoel (1968) directed an examination in Pittsburgh Central Business District during top periods and inferred that natural elements influence passerby walking pace like season of day, outer impacts, and temperature. Moreover, a walkway redesign of 10% or more lessens walking speed by 0.1m/s .

Fig 2.12.1: When Pedestrian walkways Environment

2.13 Widths of Walkway

Shockingly, next to no exploration appears to have been completed on the impacts of variable widths of person on foot walkways. Annesley el al. (1991) and Buckman and Leather (1994) referenced that widths are typically viewed as in bound regions like underground stations and related passage associations or rail line stages. The TRB (2000) emphasizes a proposal made by AASHTO that the successful walkway width ought not be less than five feet on any office. Indeed, even five feet might be a moderate least width. Tarawneh (2001) found that people on foot going across more extensive

roads will in general be quicker than when going across smaller roads. Clear walkway width alludes to the bit of a walkway that can be utilized viably for walker developments. Moving walkers avoid the check furthermore, don't press intently against building dividers. Subsequently, this unused space should be limited while investigating a person on foot office. TRB (2000) additionally suggests diminishing the viable walkway width by 12-18 crawls on each side to represent the cushion space among people on foot and deterrents. The exact birthplace of this distance is hard to affirm, yet numerous scientists additionally advocate a supposed "timid distance", "cushion zone", or "pad" and have endeavored to quantify what those distances ought to be. Pushkarev and Zupan (1975) proposed a "timid distance" of two and half feet between the control close to unsnag and a walker walking contiguous the impediment. Stucki et al. (2003) blended crafted by Weidmann (1993) to think of timid distances for various sorts of obstructions. For instance, people on foot walk 0.45m (- 4.5 ft.) from dividers, 0.35m (- P1. 14ft.) from wall, and 0.30m (- 1 ft.) from little deterrents, for example, streetlamps, trees, and seats. To keep away from obstruction when two people on foot pass one another, each ought to have at least 0.8 in of walkway width.

2.13 Levels of Service Standards on Walkways

Walker developments and offices are broke down utilizing arrangement of walking solace and security markers, which evaluate the Level of Service (LOS), experienced by walkers as they navigate the territory being inspected. The LOS idea was first presented in the Thruway Capacity Manual (TRB, 1965). A few examinations have been done pointed as it were at creating LOS guidelines for walkways of unidirectional and bi-directional streams in light of the scopes of normal region inhabitance and passerby stream rate for a solitary passerby. Oeding (1963) alludes to five primary degrees of administration, the limits of which are portrayed by inhabitance spaces of between 3.3 m2per passerby for a significant degree of administration and 0.7 m2per person on foot for a low degree of administration. Oeding (1963) likewise depicted the components that impact the quality and simplicity of person on foot traffic stream at the various degrees of administration. Pushkarev and Zupan (1975) offer a comparative degree of administration definitions, counting low densities—enormous inhabitance

spaces (over 5 m2per walker) which are past the reach researched by Oeding (1963) and Fruin (1971). Fruin (1971) conceived the LOS pointer by estimating the progression of people on foot per unit space of walkway and distinguished six kinds of LOS pointers, going from A (the most free progression of conditions) to F (very clogged conditions, where progress would be through rearranging). Soon after Fruin (1971) distributed the work, the Transportation Research Board (TRB), a unit of the National Research Council in the United States, consolidated Fruin's LOS idea in its Highway Capacity Manual (TRB, 1985). The US HCM at that point J. sets out the six LOS ranges in a diagrammatical structure, to control the investigator as demonstrated in Figure 2.13.1 . The current US HCM utilizes passerby space as the essential proportion of viability (MOE), with mean speed and stream rates as auxiliary measures (TRB,2000). The walker LOS estimation has colossal benefits—it is moderately simple to gather information for its estimation, and the ensuing LOS is not difficult to figure. The US HCM's person on foot LOS technique endeavors to make a general norm in common investigation paying little heed to the size of the city, the kind of people on foot, or different natural factors. The US HCM utilizes a solitary LOS scale for all people on foot, yet empowers organizers to consider their own LOS philosophies in territories with critical older populaces or with a prevailing outing reason. Throughout the long term, the US HCM has been ceaselessly refreshed also, reproduced, and is presently become the hotspot for most common LOS factors for use in person on foot evaluations in the United Kingdom.Lately, a few choices have been recommended for improving the scaling and assurance of LOS. The investigations of Polus et al. (1983), Benz's (1986), Whyte (1988), Tanaboriboon and Guyano (1989), Sarkar (1993), Gerilla et al. (1995), Dixon (1996), Cameron (1996), Maitra et al. (1999), TRB (2000), Still (2000), Miller et al. (2000), Gallin (2001), Wright and Dixon (2004) and Dandan et al. (2007) all gave a few understanding into the impediments of the current LOS measure. A new report at the University of Warwick delivered an elective arrangement of LOS ranges (Still, 2000). Landis et al. (2001) built up a model to foresee passerby level of administration. The model was created through a multi-variable relapse investigation dependent on perceptions from the 42 directional fragments in the Pensacola metropolitan territory. The model and its person on foot LOS expectations depend on

apparent wellbeing comparative with traffic conditions. Dixon (1996) created LOS execution measures for the Gainesville, Florida street for bike also, walker utilizes that outcomes in LOS appraisals from An and F. Gallin (2001) created model for evaluating the Level of Service (LOS) of passerby offices in Western Australia. The LOS model created gives a sound premise to the estimation of LOS for people on foot. Their model not just gives the chance to test the LOS gave by a passerby course, yet in addition figures out which elements add to low and high LOS. Dandan et al. (2007) contemplated the strategies for surveying person on foot level of administration by breaking down the connection between the passerby's emotional insights and the quality of the street actual offices just as the traffic stream activity. Sarkar (1993) proposed a subjective technique to process person on foot LOS dependent on six variables: wellbeing, security, accommodation and solace, congruity, framework rationality, and allure. Khisty (1994) built up a quantitative strategy to decide the walker LOS dependent on practically the same measures proposed by Sarker. Mill operator et al. (2000) likewise proposed a scale strategy for walker LOS evaluation. Polus et al. (1983) recommended that for densities more prominent than 2 people/m^2, conditions are quickly moving toward stuck streams and should be examined further. Tanaboriboon and Guyano (1989) created LOS norms for Bangkok, Thailand. Albeit likely not valuable for most spaces of the United States, those information feature the significance of social qualities and actual attributes on LOS breakpoints. The creators noticed that one consequence of the contrast among Thai and American LOS principles was that passerby offices in Thailand could oblige higher streams at a given LOS. In Benz's (1986) time-space level of administration philosophy. Among the methodologies recommended by these investigations, growing the six current LOS assignments to at least nine trying to better depict traffic conditions was a typical topic.

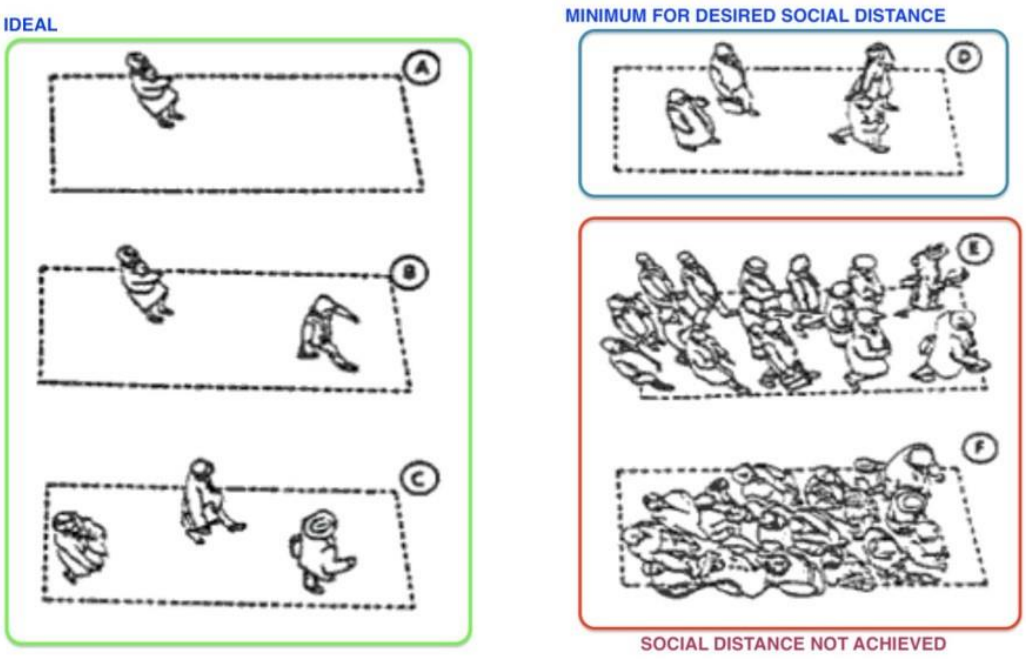


Fig 2.13.1 : Illustration of US HCM Walkway LOS Thresholds (TRB, 2000)

Table 2.13.2 : US HCM Walkway Pedestrian Level of Service (LOS) criteria (TRB, 2000)

LOS	Space (Area Occupancy)		Flow Rate		Speed	V/C Ratio
	(m^2/ped)	(ft^2/ped)	(ped/min/m)	(ped/min/ft)	(ft/sec)	
A	≥ 5.6	≥ 60	≤16	≤5	>4.25	≤0.21
B	3.7-5.6	40-60	16-23	5-7	>4.17-4.25	>0.21-0.31
C	2.2-3.7	24-40	23-33	7-10	>4.00-4.17	>0.31-0.44
D	1.4-2.2	15-24	33-49	10-15	>3.75-4.00	>0.44-0.65
E	0.75-1.4	8-15	49-75	15-23	>2.50-3.75	>0.65-1.00
F	≤0.75	≤8	Var	Var	≤2.50	Variable

2.14 Discussions

An audit of past surveys and distributed writing on common qualities has been talked about in this part. The discoveries of the writing audit in this proposition showed that there are a wide number of variables possibly affecting people on foot stream attributes. Most of this writing survey appears to recommend an absence of comprehension of the multitude of intricacies of walking attributes and the degree to which varieties happen both inside and between various walking conditions. Specifically, the discoveries of this Chapter propose the accompanying:

- People on foot comprise of numerous people with varying walking qualities. In the principle, walker displaying will in general utilize a standard relationship of speeds, flows, density and space for a wide range of walkers, despite the fact that exploration recommends that there should have the option to recognize the different various sorts of people on foot. This would permit people on foot streams to be proportioned into fitting gatherings, and each gathering to be broken down utilizing the most significant speed, stream and thickness qualities.

- People on foot respond to their current circumstance, and are impacted by its calculation and different components. While there is by all accounts some investigation into connections for various sorts of person on foot conditions, this appears to have been done either utilizing restricted information or focusing on one kind of walking climate.

- To allow walking to assume a larger part in transport arranging requires a superior

comprehension of the chances and obstructions confronting people on foot in reality. Regardless the unconstrained individual by walking workplaces will not fulfill their greatest limit and on occasion will make risk for walkers.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This Chapter starts by summing up how common qualities are examined. This incorporates a prologue to the ideas and procedures presently utilized. The philosophy of this examination has been chosen based on the various scientists. The strategy which ought to be followed for this exploration is communicated beneath.

3.2 Site Selection and Survey Details

Site determination is vital in light of the fact that various kinds of walkway give various sorts of walker attributes. This examination has been led at 3 extraordinary significant metropolitan urban areas of Bangladesh. The areas of the walkways with its actual attributes are given. Destinations are ordered as land use example like shopping, instructive, business, blended, private and sporting facility. It was obvious that three of the locales are utilized for shopping , business and instructive purposes furthermore. The determination of the locales is done in these various regions as to have walkways with various evaluations of 'walkability', so that their commitments on common speed could be explored. At each examination site, noticed development of walkers is bidirectional with no access from or exit to other walkways and people on foot are expected to have diverse excursion purposes.

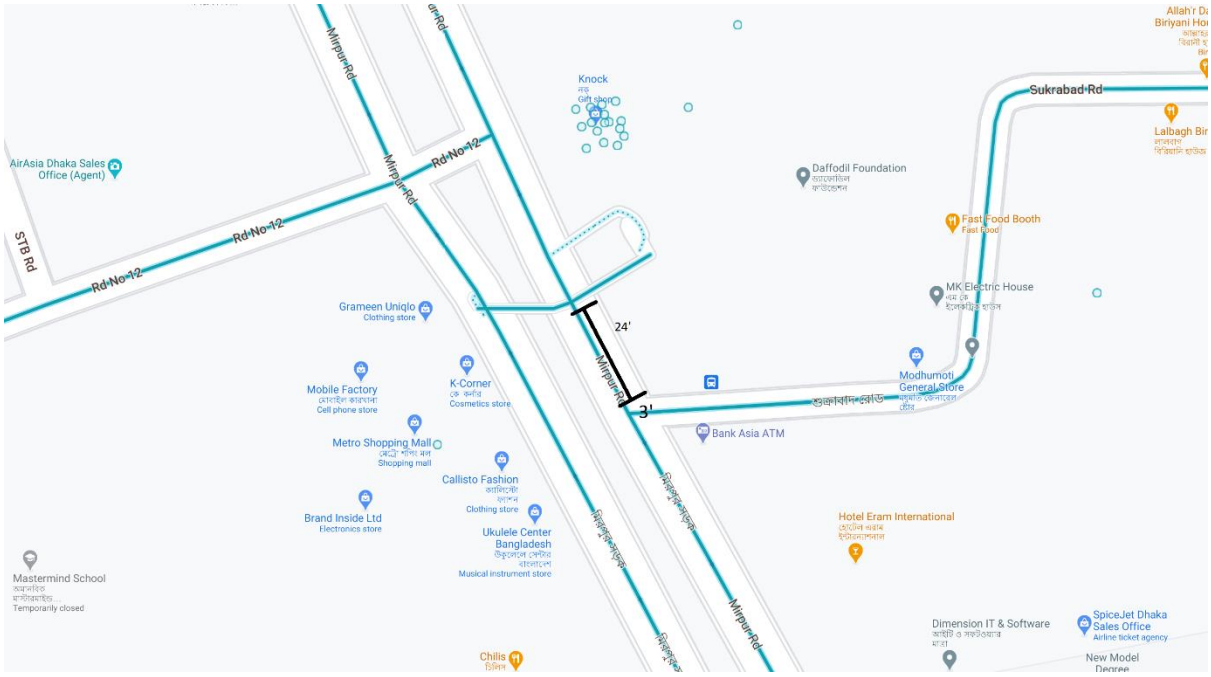


Fig 3.2.1 :- Dhanmondi 32, Dhaka

Here Length=24’ & Width= 3’

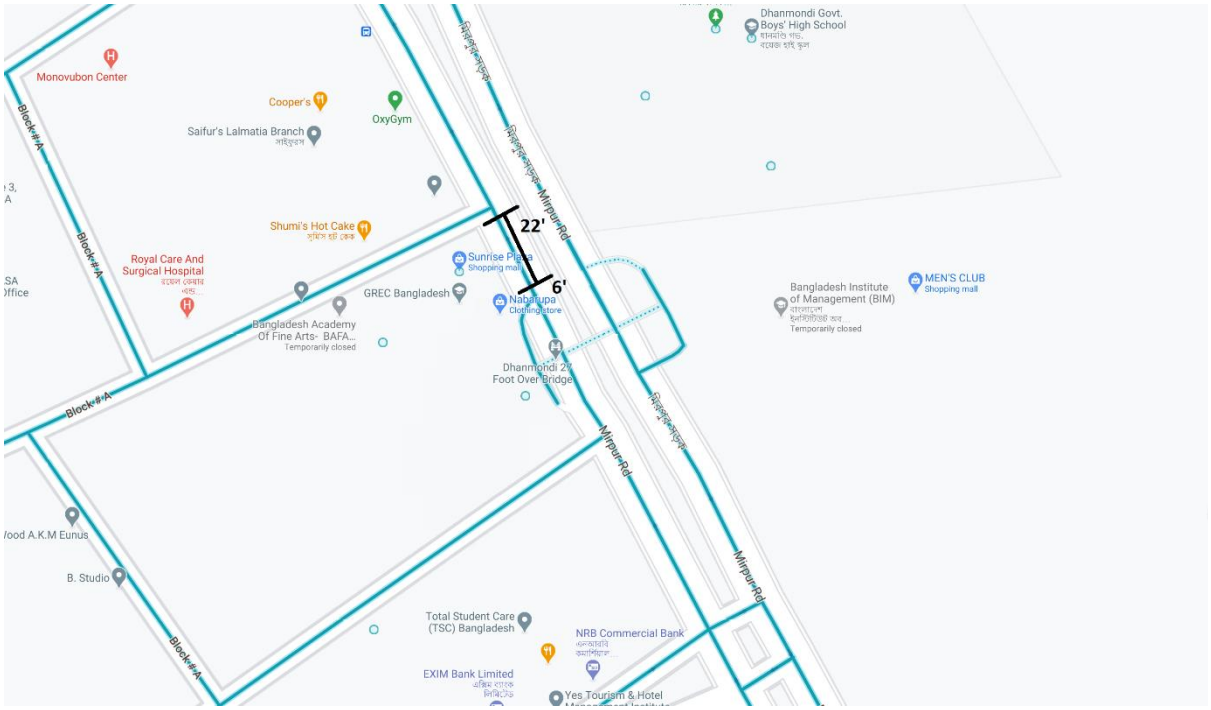


Fig 3.2.2 :- Dhanmondi 27, Dhaka

Here Length=22’ & Width=6’

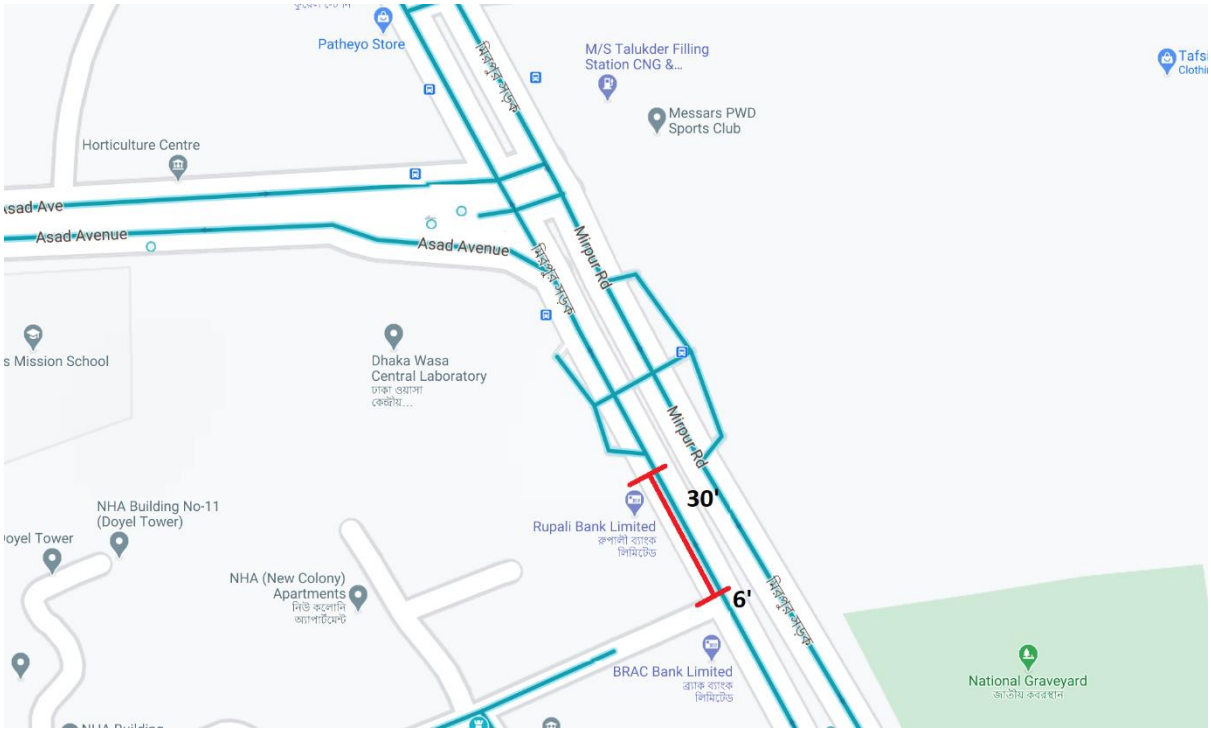


Fig 3.2.3 :- Asad Gate, Dhaka

Here Length=30’ & Width=6’

3.3 Information Collection And Methodology

This survey was taken in Dhaka Metropolitan City (DMC), Bangladesh. To take the speed measurement in the concentrated territories, three walkways were chosen. People on foot were physically coordinated over a deliberate test length and velocities were then estimated.

Table 3.3.1. Details of Survey Site Locations

Walkways			
Site ID	**Location of Observation Sites**	**Dimensions**	
		Length (ft)	**Effective Width (ft)**
NH1	Dhanmondi 32, Dhaka (Walkway beside the Islam Tower)	24	3
NH2	Asad Gate, Dhaka (Walking beside the Tanin Center)	30	6
NH3	Dhanmondi 27, Dhaka (Beside the Nabarupa Clothing Store & Sunrise Plaza)	22	6

The idea of utilizing moderate movement video studies to gather passerby information to create speed-stream thickness space relations in the United Kingdom was presented by Thompson and Heydon (1991). From here on out, the procedure has been comprehensively used and is viewed as the supported methodology for social event walker data (Zegeer et al. 1994). This survey depends on this procedure. The idea includes stamping out a territory of known dimensions (length and width) and recording passerby developments through the survey zone. The videotapes are by then played back, and data eliminated genuinely by an enumerator. This can take a lot of time, particularly with huge quantities of walkers. However, the benefits are that long time spans can be examined; more exact estimations of information can be found, and there is a perpetual record of occasions.

3.4 Standard Sample Size

A populace is the whole gathering of individuals. Test is a subset or subgroups of the populace. Test size assurance is the demonstration of picking the quantity of perceptions. Test size is the most persuasive technique for accomplishing adequate exact and solid assessment. The example size is resolved dependent on the cost of information assortment, and the need to have adequate measurable force.

3.5 Outline of Data Collection Techniques

3.5.1 Background

Throughout the long term, different person on foot information assortment methods have been created and utilized by organizers. The various alternatives are audited in this segment, with a view to choosing the most reasonable methodology for this exploration. This has been finished by contrasting the benefits and hindrances of every choice.

3.5.2 Manual Data Collection Methods

Numerous person on foot organizers (e. g. London Underground Limited and New York City Gathering) have utilized manual assortment strategies for a long time, to dissect speeds and densities. The cycle includes an enumerator doing 'observational' studies over brief timeframe stretches (e. g. five minutes) to take note of the time gone for to walk along a formerly estimated walking territory. This is utilized to assess the walking speed, and a second enumerator tallies the complete number of walkers entering and leaving the spot of study. While this technique has been broadly utilized in different examinations, Turvey et al. (1987) and Annesley et al. (1989) tried the interaction and appeared there were huge disadvantages as appeared in Table.

Table 3.5.2.1 : Advantages and Disadvantages of Manual Data Collection

Advantages	Disadvantages
Basic instrument needs	Huge propensity for taking value and lasty some error also
Easy to oparate	Just low time frame spans can be studied on survey of the restrictions of manual enumerators
Valuable for 'recognize checks' and short investigations	Low times of perceptions lead to little quantities of studies which can raise questions over factual certainty

London Underground Limited (1995) expressed in the Annual Report that they are despondent with a portion of the outcomes they had been getting from manual reviews and therefore would be changing their information assortment technique in their future variants of the Station Arranging Manual. Thus, in view of the above reservations, it was reasoned that manual information assortment isn't reasonable for this examination.

3.5.3 Time-Lapse Photography

Time-slip by photography techniques have been utilized to accumulate restricted amounts of data from little actual territories where people on foot are seen to walk. During the beginning of person on foot examination, this procedure was utilized to gather information for investigations of person on foot streams to build up connections among speed and thickness for different classifications of walker developments. These incorporate Older (1968), Navin and Wheeler (1969), and O'Flaherty and Parkinson (1972). Notwithstanding, time-slip by photography for the most part includes a predetermined number of photographic pictures, and Turvey el al. (1987) contended that its use can be risky for that. Moreover, Lovas (1994) affirmed this via doing trial of timeslip by photography reviews. Washington et al. (2003) discovered this technique

improper by featuring the significance of huge quantities of perceptions to guarantee a more vigorous investigation. The key benefits and hindrances of time-slip by photography are set out in Table 3.6.1. Therefore, in view of the underlying concerns, it was inferred that the time-slip by photography strategy isn't proper for this examination.

Table 3.5.3.1 : Advantages and Disadvantages of Time-Lapse Photography Techniques

Advantages	Disadvantages
Basic instrument needs	Restricted quantities of photos because of significant expense of creation
Gives effectively practically identical data about most perceptions	Because of significant expenses of photography preparing, just little quantities of overviews are generally monetary which can raise questions over factual certainty
Easy to oversee reviews	Images probably won't have the option to cover all review points .Many cameras expected to cover specific kinds of all encompassing sees

3.5.4 Digital Video Capture

Mobile picture catch includes utilizing a type of video recording with particular programming which is equipped for perceiving singular people on foot, following them through an examination territory also, noticing their entrance and leave times in the framework. These occasions are then used to figure walking speed. Simultaneously as the guinea pig is being followed, a subsequent imaging framework notices the quantities of walkers in the investigation walking speed, consequently giving the degree of thickness. In head, this interaction is by and large equivalent to the wide range of various methods, however the equipment attempts to robotize the means. Notwithstanding,

Daamen and Hoogendoorn (2003) conveyed out an audit of picture arrangement survey procedures which have been utilized to perform passerby checking and person on foot volume estimation. They distinguished a linked framework and tried the technique to show it is fit for separating person on foot data, in any case, recognized that it had huge limits, as demonstrated in Table 3.7.1. Consequently, based on the worries, it was presumed that advanced picture acknowledgment isn't suitable for this research.

Table 3.5.4.1 : Advantages and Disadvantages of Digital Image Capture

Advantages	Disadvantages
Lasting record of occasions is kept	Huge propensity for taking value and lasty doubts also
Can cover wide all encompassing video	Huge equipment costs
For survey some zone expected to cover huge investigation zones	Possibilty to 'miss' various passerby subjects, and therefore needs numerous perception reviews to meet required number of test information sizes

3.5.5 Video Surveys

With the appearance of generally accessible video recording and playback hardware, the Mobile video camera has demonstrated helpful and turned out to be progressively famous to passerby, traffic and transport analysts. Video has a lot of benefits over direct perception: One can gather information from the video cautiously back in the workplace or research facility. It can without much of a stretch offer video with others to outline a point and there are apparatuses accessible for information assortments. On the other hand, it is hard to gather video information in an unpretentious manner and identifying pedestrian attributes—even sexual orientation—can be troublesome on a video screen (New York Walker Study, 2006). Probably the most punctual client was Polus et al.

(1983) who utilized sluggish movement video studies to gather person on foot information. Whyte (1988) spearheaded the utilization of film to record person on foot conduct in metropolitan conditions, utilizing a blend of ground level also, overhead cameras to gather information. Thompson and Heydon (1991) utilized sluggish movement video reviews to gather walker information to create speed—flow—density connections. Mauron (2002) and Kwon et al. (1989) set camcorders straightforwardly overhead to get an unmistakable image of passerby development. This technique has been broadly utilized by Benz and Fruin (1984), Turvey et al. (1991) and Reading etal. (1995) and summed up in Table 3.8.1.

Table 3.5.5.1: Advantages and Disadvantages of Video Surveys

Advantages	Disadvantages
More exact estimations of information	Complicated research center gear arrangements exorbitant
Permanent record of occasions for extensive stretches of studies	Take a lot of preparing time for huge quantities of people on foot.

3.6 Favored Data Collection Technique

In view of the survey of doable alternatives, video recording examination is chosen as the most suitable strategy for gathering new information for this examination. Throughout the most recent decade, huge propels have been made in video innovation, and it is currently conceivable to complete these kinds of overviews without the requirement for cutting edge computerized recording hardware. The benefits of this strategy is that the information can be dissected for longer time spans covering a more extensive scope of people on foot; in light of the fact that the camera is covered up, the ordinary walking conduct of the walkers can be noticed and the record of person on foot development and conduct is lasting. The person on foot walking speed is then investigated in a walker office affected by different components. A new survey has

shown that, thus of these mechanical upgrades, video overviews are currently among the most broadly utilized techniques for gathering walker information.

3.7 Data Collection Process

A photographic procedure is utilized to gather the information on walkways of 3 destinations of 3 diverse significant sites in Dhaka metropolitan urban areas in Bangladesh. The camera is set in a raised fixed situation by mount to acquire the general perspectives on the chosen study regions. The estimated zones are checked which are filled in as the reference focuses. This reference focuses ought not to be clouded when walker traffic fills the investigation region. Self-glue covering tapes are utilized to get ready longitudinal people on foot traps on walkways. The successful width of every walkway is consistent all through the noticed length with the exception of Dhanmondi 32, Dhaka, Asad Gate, Dhaka, Dhanmondi 27, Dhaka. These walkways are involved by merchants and the widths were estimated by barring the space involved by the merchants. Five hours of information were recorded along the test segment. Two hours in the first part of the day (9:00-11:00) and two hours in the evening (04:00-6:00) and one hour around early afternoon (12.00-01.00) under clear, dry climate conditions. This survey just incorporated those people on foot who walked through the test segment and didn't quit walking when they passed the investigation zone. About 5 hours of information were gathered by video recording, and an all outnumber of **3612** people on foot are investigated for the walking speed model turn of events. The walking rate of a specific walker is registered by partitioning the separate length by the movement time taken by that person on foot. As well as walking speed; sex, age, stuff, land use reason, PDA utilization, and gathering size practices are recorded. Walker age is ordered into four age classifications as youngsters (17 or less), adults (18-35 years), middle-aged (35-60 years), and old people on foot (more than 60 years). The two classifications of sexual orientation are male furthermore, female. The distance between tape-markings in the walking heading is chosen critically. The chance of estimating walking speed expanded with expanding the walking length. The lower walking length expands the overall mistake in deciding walking velocity and makes thickness gauges less

meaningful. The width of the chosen destinations differed. The information obtained at the chosen locales is sufficient and solid for computing the walking speed, density, and flow.

3.8 Calculation of Speed, Flow, Density, and Area Module

The pedestrian characteristics data is accumulated at picked areas by signifying a longitudinal section of known length and width on the walker office and continually recording the advancement of individuals by walking inside this part. The recorded tapes of the person on foot developments are then played back, and information is disconnected utilizing the accompanying advances:

- A walker going to enter the selected position is chosen, and the time taken by the walker to cross the length of the segment is noted to an accuracy of 0.01 s. The walking paces of people on foot were assessed as a proportion of the known length of the selected position and the time taken by the person on foot to cross the selected position.

- Rewind the tape back to when the chosen walker was in the investigation zone, stop the tape furthermore, check them all-out quantities of people on foot in the elected length.

- Thickness was obtained by separating the absolute number of walkers in the survey area by the zone of the selected length.

- The Level of Service (LOS) was obtained by the determined thickness in the past step.

- Different subtleties of the person on foot walker-like age, sexual orientation, use the telephone or not, conveying stuff or not, and so on was recorded from the information.

- Repeated the cycle until the videotape is totally dissected or the required example size was gotten.

The cycle embraced for abstracting information for this underlying survey is a similar method utilized in numerous past investigations by different scientists including Polus et al. (1983), Turvey et al. (1987), Annesley et al. (1989), Lam and Chcung (2000), Ratnayake et al. (1991), and Daamen and Hoogendoom (2003).

3.9 Build up the connections between Speed, Flow, Density and Area Module

The person on foot information is examined utilizing factual by counting from video. The investigation is accomplished for both the bearings of developments. The information obtained from all investigation locales are consolidated to track down the general connections between speed, stream, thickness and territory module in Bangladesh. This is done dependent with the understanding that the person on foot qualities at all locales are something similar. From this information, relapse models were developed and the presentation of these models evaluated. The connection among speed and thickness can be expected to be direct. Thus from this straight relationship between Speed, Flow, Density and Area module connections were formed. The straight model addressed the best fit among speed and thickness relationship and was aligned regarding connection coefficient and other measurable boundaries.

3.10 Build up the Levels of Service Design Standards.

There were three sorts of approaches to surveying passerby levels of administration for walkway abroad. The principal type thought about the passerby stream activity and territory inhabitants, which was addressed by the philosophy of Highway Capacity Manual (TRB, 2000). Huat et al. (2005) additionally thought to be the normal stream to decide the degree of administration of walkways. The subsequent kind is based on and about climate quality, which was addressed by the excursion quality technique (Jaśkiewicz, 2000). The third sort considered both the traffic stream activity and the street actual qualities, which was addressed by the Australian strategy (Gallin, 2001)

and Landis technique (Landis et al., 2001). It is accepted that the system from the Transportation Research Board (TRB, 2000) for the investigation of LOS is by and large and actually the most unrivaled. The US HCM's techniques for dissecting passerby LOS depend on the estimation of walker stream rate (ped eminem) and walkway space (m2/ped). Person on foot LOS is determined by tallying walkers who disregard a point in a specific timeframe (typically 15 minutes), decreasing that figure to people on foot each moment and afterward isolating by the viable width of the walkway. The subsequent figure is known as the stream rate. An organizer may then look into the stream rate in a table to decide the walker LOS grade, going from A (free stream) to F (for all intents and purposes no development conceivable). Successful width of the walkway is determined by taking the complete width of the walkway and taking away impediment widths. The degrees of administration principles depend on a scope of territory inhabitants per individual reflects closeness to different walkers and is in this manner the proper marker of opportunity to move with solace and accommodation, just as relatives saw wellbeing.

3.11 Outline of Methodology.

Methodology represents the systems that have been followed to operationalize the assessment plan for the variety and examination of the information and data in confirmation with the investigation. Data from both fundamental and helper sources has been used for this examination. This assessment in like manner keeps up the going with the framework for the achievement and viable accomplishment of the desk work.

Field study has been directed to recognize the current walkers passing through offices are available at significant intersections in Dhaka city. Existing walker crossing offices have been gathered physically. Person on foot development information has been gathered by manual and video recording technique for some chosen convergences where traffic interest and passerby exercises are high. Course astute passerby crossing information has been gathered at evening top period. Information investigation has been performed by MS Excel.

Walker conduct contemplates have been finished by manual perception and video recording study. From this perception issues related to passerby getting through at intersections has been recognized.

Some signalized crossing points have been chosen to present selective walker stages which are occupied and in which passerby exercises are high. The video recording review has been performed to gather the traffic volume information and from those information signal plan has been performed considering select person on foot stage and postpone investigation has been performed by prestigious Webster technique.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

The straightforward demonstration of walking has a key impact in the vehicle framework. It is essential for supporting the social and financial connections of city life. Walking empowers people to have direct contact with individuals from one spot to another and makes conceivable the entrance of people on foot to regions where vehicular development is unimaginable. The current US HCM utilized speed as the essential Proportion of Adequacy (MOE). Specifically, the US HCM's article analysis chapter (Part 11; TRB, 2000) utilizes by and large normal travel speed as the MOE. Zegeer et al. (1994) has appeared in the survey of industry rehearses in the UK and different pieces of Europe that speed is transcendently utilized as a MOE. Speed is additionally utilized for the testing of the viability of upgrades of existing walking offices or looking at of changed plans of new foundation. The motivation behind this Section is to examinations and analyzes the walking velocities of Bangladeshi people on foot and distinguishes those factors that appear to altogether influence walking speeds.

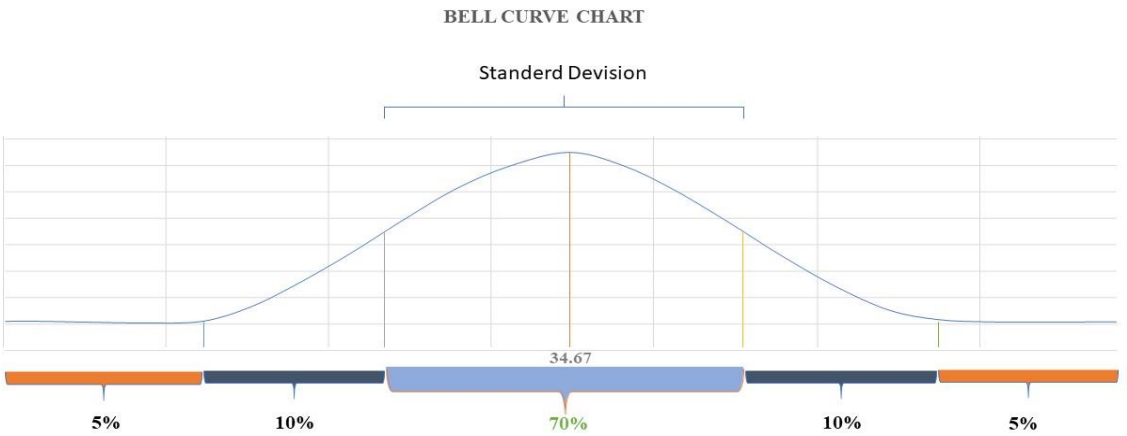


Table 4.2. Comparison of the Observed Walking Speeds in Different Studies

City, Country	Mean Speed (m/min)	Author(s)
America and Europe		
Pittsburgh, United States	88.0	Hoel (1968)
London, England	79.0	Older (1968)
Columbia, United States	79.0	Navin and Wheeler (1969)
New York, United States	81.0	Fruin (1971)
Paris, France	87.6	Kamino (1980)
Asia		
Koori-cho, Fukushima, Japan	69.6	Kamino (1980)
Osaka, Japan	90.0	Kamino (1980)
Tokyo, Japan	93.6	Kamino (1980)
Haifa, Israel	79.0	Polus et al. (1983)
Delhi, India	72.0	Gupta (1986)
Singapore	74.0	Tanaboriboon et al. (1986)
Riyadh, Saudi Arabia	65.0	Koushki (1988)
Madras, India	72.0	Victor (1989)
Bangkok, Thailand	73.0	Tana Boriboon and Guyano (1991)
Kuwait	71.0	Koushki and Ali (1993)
China	72.0	Yu (1993)
Tiruchirapalli, India	74.0	Arasan et al. (1994)
Metro Manila, Philippines	70.6	Gerilla (1995)

4.3 Standard Sample Size

A populace is the whole gathering of individuals. Test is a subset or subgroups of the populace. Test size assurance is the demonstration of picking the quantity of perceptions. Test size is the most compelling strategy for accomplishing adequate exact and solid assessment. The example size is resolved depending on the cost of information assortment, and the need to have adequate measurable force.

4.4 Results And Discussion

4.4.1 The person on foot Flow Characteristics in Walkways

As referenced previously, there were three complete perception locales in Dhaka metropolitan city. The perception destinations are Dhanmondi 32 Length is 24ft and width 3ft , Dhaka, Asad Gate Length is 30ft and width 6ft, Dhaka, Dhanmondi 27 Length is 22ft and width 6ft, Dhaka. The accuracy of every area appears in Table 2. The noticed walking speed for the different kinds of walker offices in walkways were gotten from the video recording studies and arranged in Table 4.3.1.1. or Table 4.3.1.2 .

Table 4.4.1.1. People on foot Walking Speeds on Walkways For Dhanmondi 32 and 27

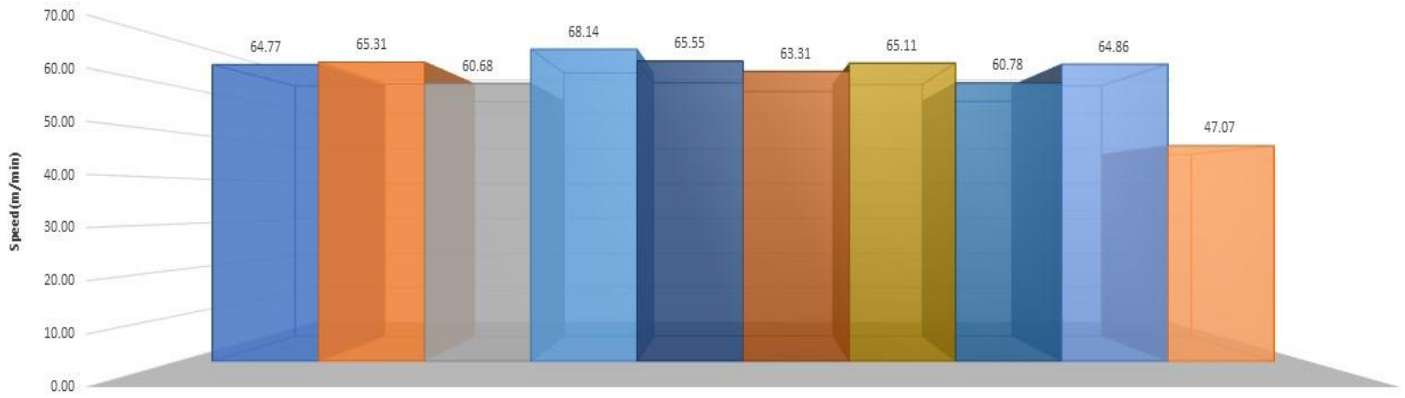
Characteristics						
	Pedestrian Types	Sample Size	Mean Speed	Standard Deviation	Range	
					Low	High
Overall	Male	2450	28.37	4.37	8.94	57.47
	Female	514	25.77	5.03	8.05	40.23
	Combined	2964	28.09	4.54	8.05	57.47
Children	Male	131	28.91	3.48	16.09	33.76
	Female	35	27.05	6.07	13.41	36.57
	Combined	166	28.52	4.23	13.41	36.57
Younger	Male	1253	30.29	4.04	14.9	57.47
	Female	231	30.04	3.89	19.16	40.23
	Combined	1466	30.25	4.02	14.9	57.47
Middle Aged	Male	883	26.56	3.4	11.49	44.7
	Female	206	24.37	3.15	13.41	33.53
	Combined	1089	26.14	3.47	11.49	44.7
Older	Male	183	23.53	3.87	8.94	36.57
	Female	42	20.05	4.16	8.05	28.74
	Combined	225	22.88	4.16	8.05	36.57

Table 4.4.1.2. People on foot Walking Speeds on Walkways For Asad Gate

Characteristics						
	Pedestrian Types	Sample Size	Mean Speed	Standard Deviation	Range	
					Low	High
Overall	Male	572	65.31	11.84	30.48	91.44
	Female	76	60.68	10.49	39.19	91.44
	Combined	648	64.77	11.78	30.48	91.44
Children	Male	9	68.14	17.6	39.19	91.44
	Female	1	0	0	0	0
	Combined	10	65.9	18.05	39.19	91.44
Young	Male	345	65.55	12.17	30.48	91.44
	Female	30	63.31	10.82	45.72	91.44
	Combined	375	65.37	12.07	30.48	91.44
Middle Aged	Male	194	65.11	10.49	39.19	91.44
	Female	40	60.78	9.3	39.19	91.44
	Combined	234	64.37	10.41	39.19	91.44
Older	Male	24	64.86	12.79	32.27	78.37
	Female	5	47.07	5.8	39.19	54.86
	Combined	29	59.78	14.79	32.27	78.37

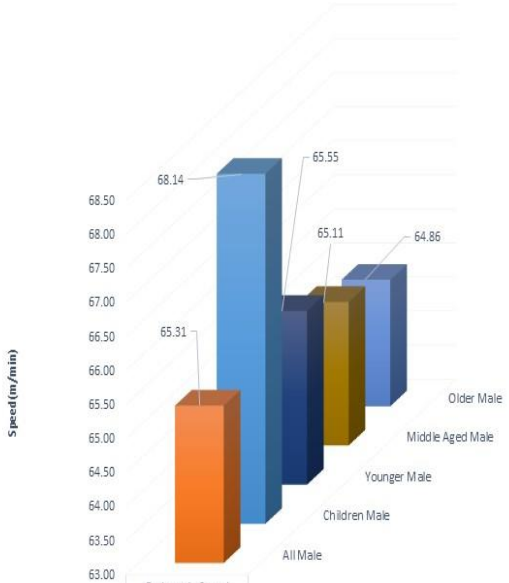
Asad Gate, Dhaka

04.00-05.00 Pm	All	All Male	All Female	Children	Children Male	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	64.77	65.31	60.68	65.90	68.14	65.37	65.55	63.31	64.37	65.11	60.78	59.78	64.86	47.07
SD	11.78	11.84	10.49	18.05	17.60	12.07	12.17	10.82	10.41	10.49	9.30	14.79	12.79	5.80
Max	91.44	91.44	91.44	91.44	91.44	91.44	91.44	91.44	91.44	91.44	91.44	78.37	78.37	54.86
Min	30.48	30.48	39.19	39.19	39.19	30.48	30.48	45.72	39.19	39.19	39.19	32.27	32.27	39.19
Sample Size	648	572	76	10	9	375	345	30	234	194	40	29	22	5

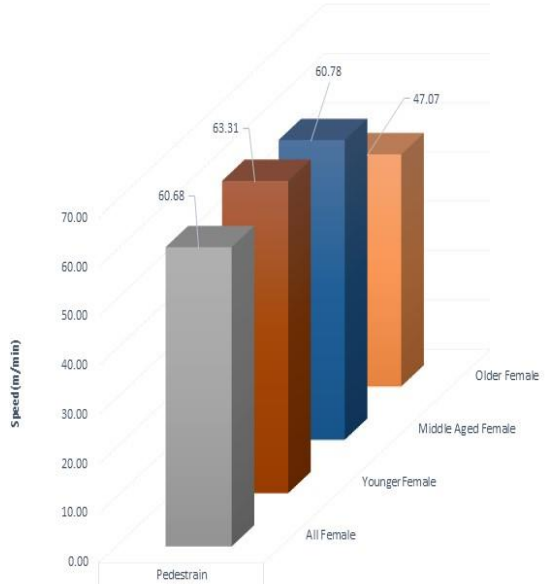


	Pedestrain Speed
All	64.77
All Male	65.31
All Female	60.68
Children Male	68.14
Younger Male	65.55
Younger Female	63.31
Middle Aged Male	65.11
Middle Aged Female	60.78
Older Male	64.86
Older Female	47.07

Asad Gate, Dhaka



	Pedestrain Speed
All Male	65.31
Children Male	68.14
Younger Male	65.55
Middle Aged Male	65.11
Older Male	64.86



	Pedestrain Speed
All Female	60.68
Younger Female	63.31
Middle Aged Female	60.78
Older Female	47.07

4.4.2 Difference in walking speed between Asad Gate, Dhanmondi-27 & Dhanmondi-32 With The rest of the World

According to previous study of KUET we found the result of walking speed on other cities of the country. In this research we collected our data by video recording through smartphones. While Collecting the data we have faced a small problem in Asad Gate area as it is closer to the area of the parliament & due to security of that area we could only collected one hour of data and after that we got waning form the Administration. But it was worth enough to collecting the data.

In previous study of KUET we found that they have collected data from different location of our country and got excellent results. They have found overall mean speed of our country is 65.78(m/min) which is very similar with Asad Gate walkway. By calculating the found data we got the overall mean speed from Asad Gate is 64.77(m/min) where the length was 30ft and width was 3ft. which was very close to international walking speed. The difference happened in Asad Gate from other two location because of some reason. Those are may be describe as follows:

- The width and length was unchanged in full walkway.
- As there was no street hawker in calculation length people could move easily.
- The time was a big issue for free walkway as it was not during any peak hour.
- The location was near parliament house so clear walk way is essential for that walkway.
- As it was near an office building called Tanin Center sometime while car is going to the parking we got some slow movement during that time.

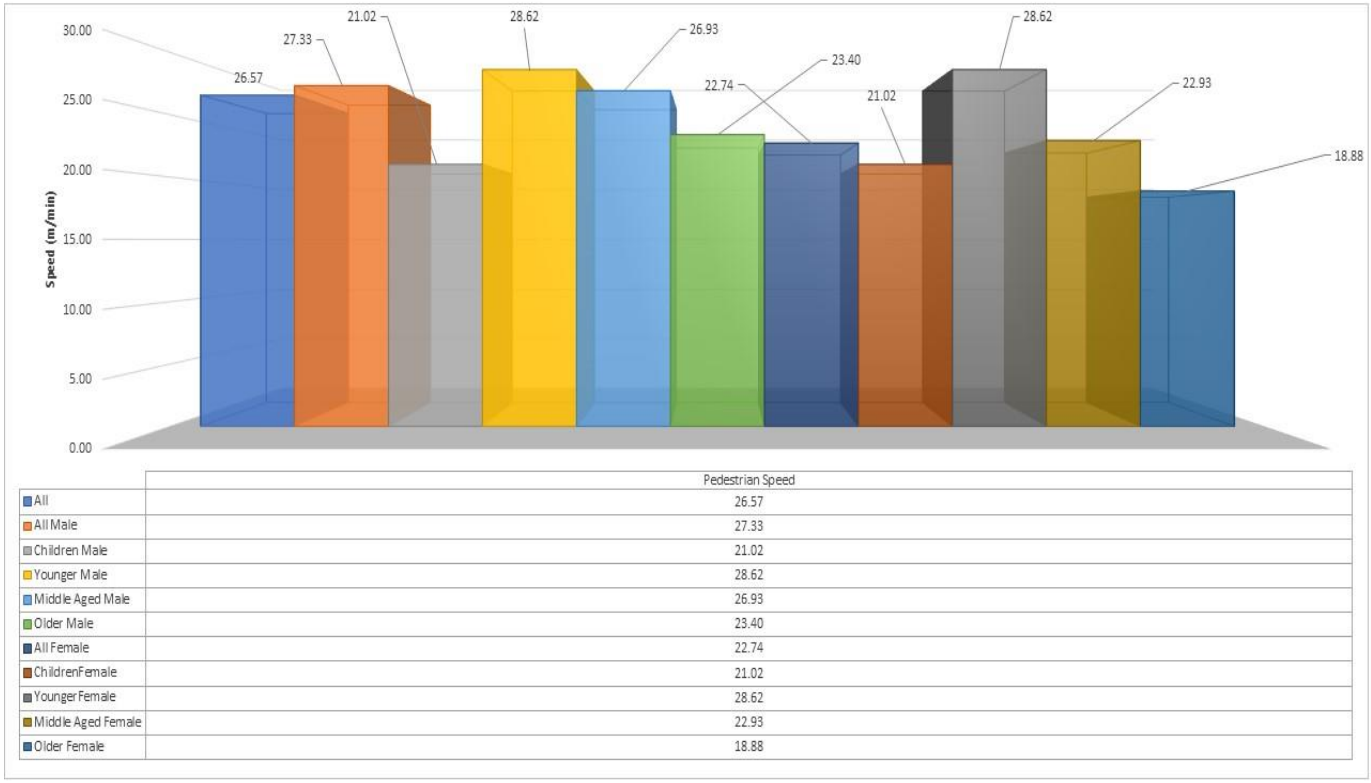
Dhanmondi 27, Dhaka

12.00-02.00PM	All	All Male	All Female	Children	Children Male	Children Female	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	26.57	27.33	22.74	19.46	21.02	17.74	28.24	28.62	25.05	26.12	26.93	22.93	22.43	23.40	18.88
SD	5.35	5.17	4.53	3.53	3.70	2.48	4.85	4.82	3.84	4.97	4.90	3.85	5.53	5.31	4.95
Max	57.47	57.47	40.23	26.82	26.82	21.17	57.47	57.47	40.23	44.70	44.70	33.53	36.57	36.57	28.74
Min	8.05	8.94	8.05	13.41	16.09	13.41	14.90	14.90	19.16	11.49	11.49	13.41	8.05	8.94	8.05
Sample Size	1109	926	183	19	10	9	508	453	55	461	368	93	121	95	26

12.00-01.00 Pm	All	All Male	All Female	Children	Children Male	Children Female	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	25.14	26.06	21.14	18.10	19.17	17.31	27.24	27.61	23.52	25.13	26.07	22.04	21.33	22.41	17.06
SD	4.98	4.75	3.86	2.86	3.42	2.27	4.17	4.10	2.92	4.35	4.28	2.92	5.59	5.38	4.34
Max	40.23	40.23	30.95	25.14	25.14	20.12	36.57	36.57	30.95	40.23	40.23	30.95	36.57	36.57	25.14
Min	8.05	8.94	8.05	13.41	16.09	13.41	14.90	14.90	20.12	11.49	11.49	16.09	8.05	8.94	8.05
Sample Size	570	464	106	14	6	8	200	182	18	272	209	63	84	67	17

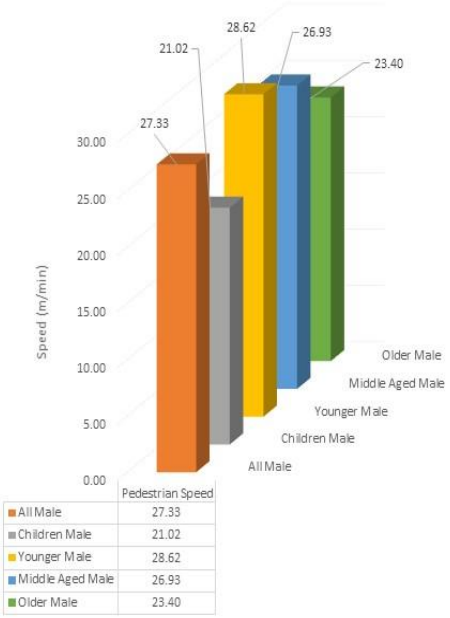
01.00-02.00 Pm	All	All Male	All Female	Children	Children Male	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	28.09	28.61	24.94	23.27	23.80	28.88	29.30	25.79	27.54	28.06	24.79	24.92	25.75	22.32
SD	5.32	5.27	4.48	2.17	2.11	5.15	5.15	4.05	5.45	5.41	4.87	4.55	4.38	4.29
Max	57.47	57.47	40.23	26.82	26.82	57.47	57.47	40.23	44.70	44.70	33.53	33.53	33.53	28.74
Min	13.41	14.90	13.41	21.17	22.35	17.49	17.49	19.16	13.41	14.90	13.41	16.09	17.49	16.09
Sample Size	539	462	77	5	4	308	271	37	189	159	30	37	28	9

Dhanmondi 27, Dhaka

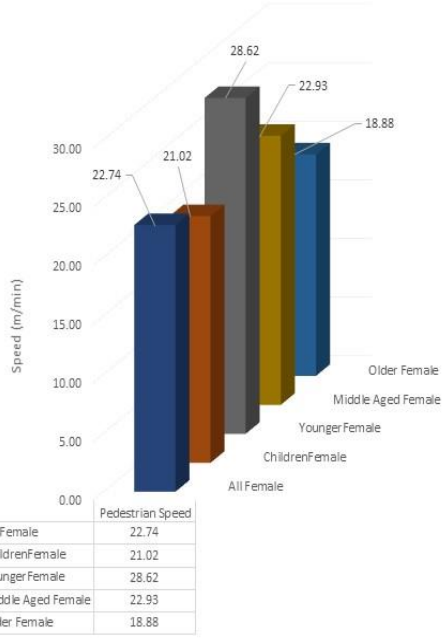


	Pedestrian Speed
All	26.57
All Male	27.33
Children Male	21.02
Younger Male	28.62
Middle Aged Male	26.93
Older Male	23.40
All Female	22.74
ChildrenFemale	21.02
YoungerFemale	28.62
Middle Aged Female	22.93
Older Female	18.88

Dhanmondi 27, Dhaka



	Pedestrian Speed
All Male	27.33
Children Male	21.02
Younger Male	28.62
Middle Aged Male	26.93
Older Male	23.40



	Pedestrian Speed
All Female	22.74
ChildrenFemale	21.02
YoungerFemale	28.62
Middle Aged Female	22.93
Older Female	18.88

4.4.3 Comparison of the speed of Dhanmondi 27, Dhaka pedestrian with other countries

It tends to be seen that speed examines directed in United States and Britain yielded walking speed going from 79 m/min to 88 m/mm (Older, 1968; Hoel, 1968; Navin and Wheeler, 1969; Fruin, 1971). Be that as it may, the walking pace of the Asian walker will in general be lower than the Caucasian, to specify Israel with mean walking rate of 79 m/min (Polus et al., 1983) than that of Singapore walking rate of 74 m/min (Tanaboriboon et al., 1986). Koushki and Ali (1993) contemplated that person on foot stream qualities in Kuwait City and referenced that the passerby walking speeds were lower in Kuwait City focus as contrasted with those in the United States and England yet were like walker speeds seen in Riyadh, Saudi Arabia (Koushki, 1988). Morrall ci al. (1991) processed passerby walking speeds on walkways in Calgary, Canada (84 mlmin) and Colombo, Sri Lanka (75 m/mm) for men, ladies, youthful, senior walker and contrasted them and comparable insights from Singapore and Bangkok, Thailand, as announced by Tanaboriboon and Guyano (1991). Nazir ci al. (2012) tracked down the mean speed of Bangladeshi people on foot in Dhaka Metropolitan City is 69.49 m/min. This finding recommend that Bangladeshi walkers are slower than those of

Western nations, yet are similar contrasted with some Asian partners & also Europe. From our data collection we found that the mean speed is 26.57 m/min which is lower than the ideal mean speed of Dhaka metropolitan city.

From my location we can see some abstract is reason behind slowing down the speed of pedestrian. the reason may be as follows:

- As corona pandemic is around the globe, the density of pedestrian was lower than the regular pedestrian density.
- In my location where we collect the sample, the walk way width is not equal form starting point to end point. Usually, the ideal footpath width is 6 ft (1.8m). but in our location the width of path was not same in different location.
- Between 22 ft of path there were two setups of foot over bridge and electric piler, that is why pedestrian is not walking easily, for the reason they could not maintain their walking speed.
- In Bangladesh usually 8:00-10:00 am & 5:00-7:00 pm is the peak hour. But we collected the data during lunch hour that is why density of pedestrian was low.
- In my location there was a shopping mall beside the path, the stair of mall decreased the width of the path that can be a reason behind slowing down the pedestrian speed.

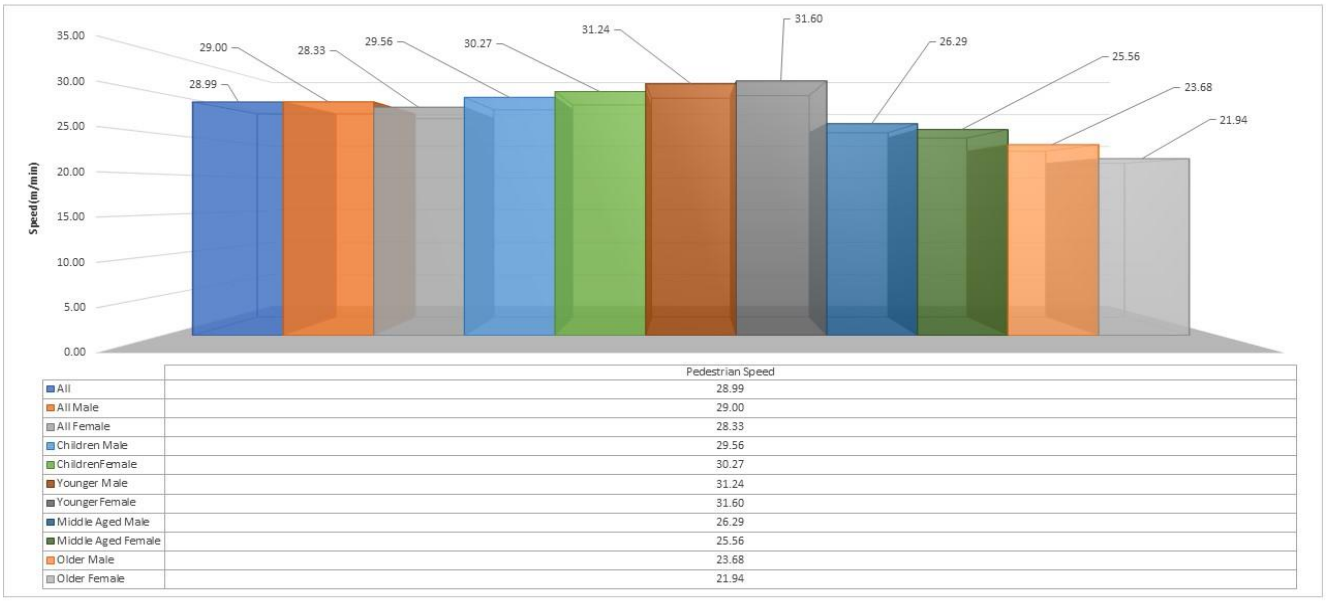
Dhanmondi 32, Dhaka

09.00-11.00AM	All	All Male	All Female	Children	Children Male	Children Female	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	28.99	29.00	28.78	29.69	29.56	30.27	31.30	31.24	31.60	26.16	26.29	25.56	23.41	23.68	21.94
SD	3.70	3.67	3.89	2.60	2.57	2.75	3.02	3.16	2.27	1.66	1.62	1.70	1.24	1.04	1.25
Max	48.77	48.77	39.90	36.57	33.76	36.57	48.77	48.77	39.90	36.57	36.57	31.35	25.82	25.82	23.10
Min	19.95	21.94	19.95	21.94	21.94	25.82	24.38	24.38	24.38	19.95	21.94	19.95	19.95	21.94	19.95
Sample Size	1855	1524	361	147	121	26	976	800	176	628	515	113	104	88	16

09.00-10.00AM	All	All Male	All Female	Children	Children Male	Children Female	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	28.95	28.98	28.83	30.09	29.78	31.24	31.43	31.36	31.72	26.03	26.2	25.41	23.47	23.74	22.1
SD	3.7	3.66	3.87	2.03	1.86	2.26	2.96	3.12	2.12	1.42	1.33	1.55	1.22	1.06	1.06
Max	48.77	48.77	39.9	36.57	33.76	36.57	48.77	48.77	39.9	31.35	29.26	31.35	25.82	25.82	23.1
Min	19.95	21.94	19.95	21.94	21.94	27.43	24.38	24.38	25.82	20.9	23.1	20.9	19.95	21.94	19.95
Sample Size	905	725	180	81	64	17	457	370	87	307	241	66	60	50	10

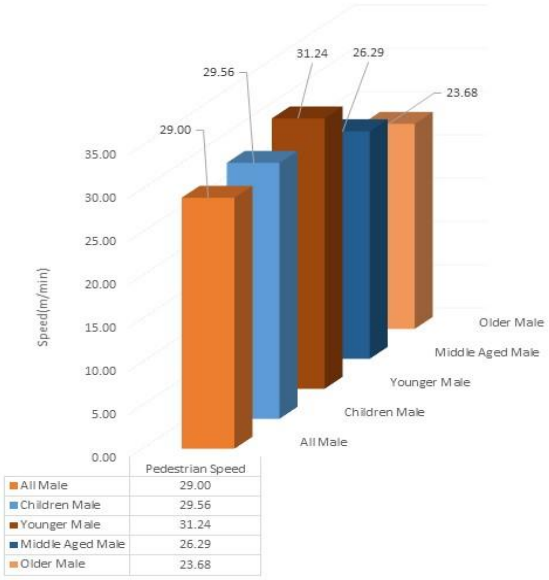
10.00-11.00AM	All	All Male	All Female	Children	Children Male	Children Female	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	29.03	29.01	28.73	29.19	29.31	28.44	31.19	31.13	31.48	26.28	26.37	25.77	23.34	23.60	21.68
SD	3.69	3.68	3.67	3.12	3.18	2.76	3.07	3.19	2.41	1.86	1.84	1.89	1.28	1.03	1.59
Max	48.77	48.77	39.90	33.76	33.76	33.76	48.77	48.77	39.90	36.57	36.57	29.26	25.82	25.82	23.10
Min	19.95	21.94	19.95	21.94	21.94	25.82	24.38	24.38	24.38	19.95	21.94	19.95	19.95	21.94	19.95
Sample Size	950	799	181	66	57	9	519	430	89	321	274	47	44	38	6

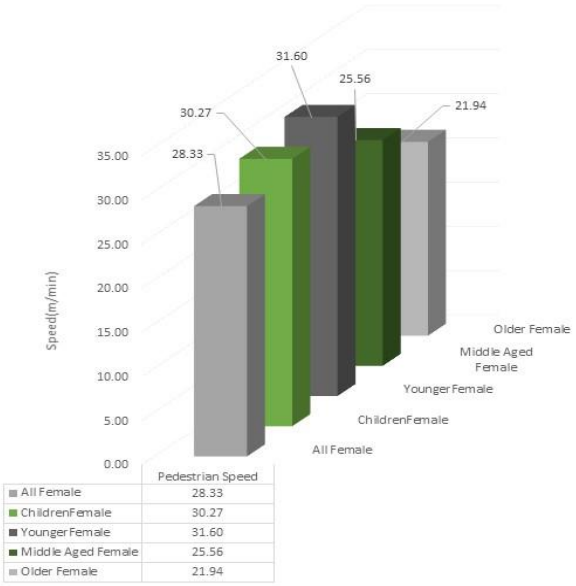
Dhanmondi 32, Dhaka



	Pedestrian Speed
All	28.99
All Male	29.00
All Female	28.33
Children Male	29.56
ChildrenFemale	30.27
Younger Male	31.24
YoungerFemale	31.60
Middle Aged Male	26.29
Middle Aged Female	25.56
Older Male	23.68
Older Female	21.94

Dhanmondi 32, Dhaka





4.4.4 Comparison of the speed of Dhanmondi 32 pedestrian with other places In Dhaka City of Bangladesh and other countries.

We use video recording processes for gathering the information on walkways at " Dhanmondi 32". In this study area the footpath or pedestrian is 24 ft long and 3 ft wide. Pedestrian volume flow has been counted one time a day. Where 9:00 am to 11:00 am is the peak hour. In this survey, we are collecting 1855 people data. After calculation we found the average walking speed is (28.99 m/min) which is very low compared to different Metropolitan City located in Bangladesh as well as American, European and Asian Countries. From the data sheet, we saw female pedestrians (28.33 m/min) walked slower than male (28.99 m/mm) counterparts. Person on foot walking velocity can be diverse for various Gender and age gatherings. The walking speed of a person on foot in various age bunches is concentrated to comprehend the impact old enough on speed. Younger pedestrians are the fastest and older pedestrians are the slowest among all the pedestrians. The speed of younger pedestrian (31.30 m/min) and children pedestrians (29.68 m/min) are a little bit higher from mean walking speed, but the speed of older (23.41 m/min) pedestrians and middle aged (26.15 m/min) pedestrians are comparatively low.

According to a previous survey, the overall average walking speed of the Bangladeshi pedestrian at twelve selected study sites of four different Metropolitan City is 65.78 m/min. (**reference kuet thesis sheet**) Speed studies have been investigated by many research studies which showed the mean walking speed in American, European and Asian Countries range from 52 m/min to 94 m/min. The mean walking speed is 78.8 m/min and 74.0 m/min in Israel and Singapore. However, the walking speed of the Asian pedestrians tend to be lower than American and European Countries. The mean free flow walking speed of Bangladeshi pedestrians is approximately 65.78 m/min which is found to be slower as compared to the United States, the United Kingdom, Japan, Israel, Singapore, China, Thailand and India but higher than Saudi Arabia and Indonesia.

Also According to a Asad Gate survey , Bangladeshi pedestrians walking speed are suitable . which mean walking speed is 64.77 m/min. Because here wide is 6 ft and there were no shops on the sidewalk and it was free. For which the walking speed of the pedestrians was comfortable.

4.4.5 There are various reasons behind the decreasing the mean walking speed in my location (Dhanmondi 32). They are,

1. Street hawkers are illegally occupying the pedestrian's walking space.
2. In my location wide is less than normal wide of footpath. also which reason are gathering people and walking speed is slowly.
3. Some roads besides shops put their shop materials on the footpath.
4. Between 24 ft of length there were a electric piler, that is why pedestrian is not walking easily, for the reason they could not maintain their walking speed.
5. Sometimes people are standing on the footpath and waiting for vehicle . As a reason, pedestrians walking speed was decreasing.
6. Pedestrian are walking to talk on mobile. As a result, his speed was decreasing and at the same time the speed of the people in the back and walking was decreasing

4.4.6 Walking Speed Under Different Influences

People on foot mean walking speed is significantly relied upon area and discovered distinctive in three spots of Dhaka Urban Communities as demonstrated in Table 4.4.6.1

Table: 4.4.6.1 Pedestrian Counting Section

Category	Dhanmondi 32	Dhanmondi 27	Asad gate	Range	
Gender				High	Low
Male	1524	927	572	57.47	8.94
Female	331	183	76	40.23	8.05
Age					
Children	147	19	10	36.57	13.41
Younger	976	508	375	57.47	14.90
Middle Aged	628	461	234	44.70	11.49
Older	104	121	29	36.57	8.05

The mean walking rate of people on foot at the walkways three better places of Dhaka urban communities are 64.77 m/min, 26.57 m/min, and 28.99 m/min individually. Male people on foot are walking quicker altogether puts are Dhaka urban areas than female people on foot since male people on foot can walk in higher speed than female in the most exceedingly terrible circumstance. The mean walking rate of male and female people on foot are most noteworthy at Asad gate (64.77 m/mm) and least in Dhanmondi 27 (26.57 m/mm). Youngsters people on foot are the slowest walker altogether places of urban areas. More youthful people on foot speed are less in Dhanmondi 27 and Dhanmondi 32 entryway than moderately aged passerby yet higher in Asad gate of Dhaka Metropolitan Cities. The mean walking velocity of kids, more youthful, moderately aged and more established walkers are most elevated at Dhanmondi 32 and least in Dhanmondi 27 Surprisingly in Dhanmondi 27 more established people on foot

walking speed are higher than other people on foot. Since more established people on foot are remain lower number in Dhanmondi 27 more often than not they are walking in high velocity with the gathering of youthful and moderately aged walkers. In every three spots of Dhaka urban areas mean walking pace of more modest bunch size walkers are higher than bigger gathering size people on foot. Excellent circumstance found in Dhanmondi 32 door where mean walking pace of gathering size three walkers are lower than bunch size five people on foot. Walkers without conveying things are walking in higher speed than those people on foot who conveying stuff in each three spots of Dhaka urban areas since additional weight diminishing the speed of the people on foot who conveying things. People on foot who use telephone during walking are walking in higher speed than different people on foot in every three spots of Dhaka urban communities.

4.4.7 How can we increase the speed of pedestrian walking

1. First of all, the normal width of the footpath should be kept the same everywhere.
2. If hawkers have to be removed from the sidewalk, pedestrians walking speed will increase.
3. No people can be allowed to parked on the sidewalk.
4. No electric poles can be placed between the footpath. Then the walking speed of the people will not happen and as a result the walking speed will increase.
5. Care should be taken to ensure that no one occupies the sidewalk illegally. Then the walking speed of pedestrians will increase.

CHAPTER FIVE

CHARACTERISTICS OF PEDESTRIAN

5.1 Introduction

This part looks at the general kinds of individuals by walking workplaces as portrayed underneath. Moreover, discuss those workplaces available in Dhaka City. To recognize the assorted existing workplaces in Dhaka city an investigation was done all through the space.

5.2 Definition Of Pedestrian

Pedestrians might be characterized as those human traffic who should walk as a piece of their development and to utilize those offices like bridge, zebra crossing, trams, pathway and so on at any phase of their movement to achieve their exercises with which they are occupied with. They are single street clients and actually unprotected.

5.3 Pedestrian Travel Characteristics

The development of individuals and merchandise are connected with distribution and force of land use. Individuals don't obviously move about the streets in vain. Individuals move due to active binds with which they are occupied with. As such common is, in this manner, a component of exercises. They are gathered around in light of the fact that exercises are concentrated there. The more ,the walkers, the more they travel, the more is the person on foot trips that comprise a critical part of all out trips.

It is attractive to examine the walker travel examples and perspectives, and remember them in the plan of passerby offices. A portion of the highlights of person on foot travel are as underneath: (Victor, 1979).

- Pedestrian travel is restricted and is exceptionally packed in mechanical and business territories.
- Pedestrian outing purposes change by area and season of day.
- Pedestrians will in general continue to walk distance as short as could really be expected.
- The quantity of individuals walking for entertainment or joy in significant movement habitats is not exactly those for different purposes.
- Pedestrian rates on level ground shifts extensively from 0.8m to 2.5m/sec. in cross walks and to about 1.3 m/sec. on side walks.
- Pedestrian rates decline as evaluation rises, from about 1.4 m/sec. on level ground to about 1.0m/sec. at 10% evaluation and to about 0.8m/sec. at 15% evaluation.
- Pedestrian limits and space prerequisites rely upon the adequate level of swarming.

A comprehension of the different reasons for the outings can encourage the compelling plan of the walker offices.

5.4 General Facilities

The various kinds of individuals by walking workplaces that have adequately been practiced all through the world is basically to ensure prosperity and comfort for the walkers. These workplaces may be described into three critical social events, dependent upon whether walkers and vehicles are segregated. (Victor, 1979). These are analyzed under .

5.5 Types of Pedestrian Facilities in Dhaka City

In non-industrial nations like Bangladesh, where the generally financial state of the country is poor, the distribution of assets for passerby offices has been far shy of the

attractive level. Luckily, there is presently a developing familiarity with the requirement for sufficient person on foot offices.

5.6 Frictional Effects Between Pedestrian

The issue of bi-directional person on foot streams and its consequences for passerby stream attributes is one that has been acquiring expanding acknowledgment in common exploration. The bi-directional stream impacts are shifted and get critical when the passerby streams are near the limit of the two way walkways. Some new examinations that explored the impacts of bidirectional passerby streams incorporated the examination by Adler and Blue (1999), where the bi-directional developing basic walker stream was a-reproduced by utilizing the cell automata miniature reenactment technique. . Adler and Blue (2000 also, 2001) proposed that with a fifty: fifty passerby stream blend, the two-way traffic limit of the walkway was about equivalent to its single direction limit. Daly et al. (1991) aligned the person on foot speed-stream connections for walking offices in London Underground(LU) stations and proposed powerful capacities with regards to various bi-directional stream conveyances. Nonetheless, these proposed compelling limits have not been approved or on the other hand upheld by observational information. Cheung and Lam (1997) noticed the impacts of bi-directional stream on paths and flights of stairs with an accentuation on streams under at limit condition.

5.7 Pedestrian Accessibility

Openness Le., the case (regarding time, solace, security and cost) of getting to the exercises wanted, is what is the issue here. However, hardly any examinations have been made regularly. Passerby availability is just a piece of it. The greater part of the significant transportation examinations have overlooked excursions by walking or by pedal cycle; they saw no significance in them, nor their pertinence to the huge vehicle issues. (Victor, 1979). All things considered, clearly the extent of outings made by walking or bike is a lot higher in Dhaka Metropolitan territory than others. individuals

regularly walk, not on the grounds that: they need to but since they would be able to manage the cost of the tolls on transports or cable cars which are excessively packed and moderate. Indeed, even in European and American Cities, there are individuals who walk to save the admission or on the grounds that public transportation is insufficient. Along these lines, altogether urban communities, it is hard to decipher the meaning of pedestrian volumes.

5.8 Problems

The major problems which have been come out from the survey area:

5.8.1 Casual inhabitance on footpath

In investigation region there are nearly pathway or walker ways are exist, however passerby can't access there as expected. Road hockers are illicitly involved the walker's walking spaces. For that people on foot are frequently compelled to walk on carriage path or out and about. There are a different kinds of sellers are in the examination territory, the greater part of them are found . where the greatest part of the footpath are involved by them.

Fig 5.8.1.1 : Casual inhabitance on footpath

5.8.2 Abuse of footpath

There are different explanations for the abuse of the footpath of the investigation territory. At times different sorts of vehicles are park on the footpath; they consumed the entire space of the footpath area,for that person on foot power to walk on the primary street. There are some ghetto inhabitants on the footpath area, they live here. Some streets other than shops put their shop materials on the footpath, here and there development materials are additionally on footpath, for that person on foot can't walk easily here. These are the significant reasons for abuse of footpath area.

Fig 5.8.2.1 : Abuse of footpath

5.8.3 Improvement in Pedestrian Planning

1. Integration of walking as a mode in transportation arranging.

2. Active interest of public and private areas to improve the road climate.

3. A methodical program to raise awareness for walkers and to build up a change in mentalities portrayed by an overall interest for a quality climate.

4. An interdisciplinary way to deal with plan ought to be associated with building up successful passerby arranging rules.

5. There is a requirement for building up a voting demographic for pedestrianization.

6. Needs of various gatherings, like concerned authorities, shippers, engineers, organizers

what's more, designers, ought to be viewed as appropriately in any far reaching transport plan.

5.8.4 Improvements in pedestrian mobility, accessibility, safety and convenience

1. Standard or rules ought to be created to work with choosing the most fitting levels of walker control to deal with singular circumstances.

2. Pedestrian organizations ought to be all around associated with interfaces with the public vehicle framework through common cordial steering and stops.

3. Pedestrian nature of administration ought to be improved through metropolitan plan, finishing, asphalt improvement, climate assurance and so forth

4. Pedestrian exercises ought to be isolated from vehicular traffic beyond what many would consider possible.

5. Driver's stoppage ought to be made obligatory at walker grade intersections.

6. Public spaces and walker offices ought to be intended for the clients, everything being equal, and actual requirements.

5.9 Rationale of the study

Dhaka is the managerial, business and social capital of Bangladesh which fills in as the operational hub of the country. It is one of the 10 uber urban areas on the planet. Developing at a quick rate, Dhaka's metropolitan Population is anticipated to increase from 11.3 million to around 21 million by 2015. With the developing significance of the city and mounting up pressing factor of populace, gridlock is getting increasingly more unstable consistently.

Passerby represents a huge situation in rush hour gridlock age and expanding step by step in Dhaka. The majority of the outings are begun and finished as the methods for a passerby. Dhaka is one of the quickest developing urban communities of the world. The city needs appropriate transportation arranging. Dhaka incorporated vehicle study assessed 66% of all work trips are walking.

Yet, tragically common offices are ineffectively overseen in Dhaka City. Walking is an ordinarily utilized method of transport in Dhaka. The extent of outings made by Walking is expanding step by step. Existing people on foot foundation and passerby offices are not acceptable. There is no common getting through stage at signalized intersections. There exist just 320.44 kilometers of pathways in Dhaka City Corporation Area which have a place with 155 sections of land. Normal width of the pathways is 1.96 meter. In any case, sadly a large portion of them are not utilized as expected. Subsequently, passerby development at the convergence ought to be one of the significant worries to traffic engineers. Fruitful arranging and plan of walker office

generally relies on the better understanding of the person on foot crossing conduct and powerful requirement measures. A couple of studies have been so far directed with respect to walker offices. Md. Abdul Waresh (1991) called attention to in his proposal "Impact of Pedestrian Underpasses on Traffic Flow Characteristics: Metropolitan Dhaka" walker crossing conduct specifically connected to the evaluation of isolated persons on foot offices. He likewise evaluated the impact of underpasses on traffic stream attributes Hamed (2000) considered the components that impact a passerby's holding up time and recurrence of endeavors to go across the road.

Md. Hadiuzzaman (2008) called attention to in his postulation "Improvement of Saturation Flow and Delay Models for Signalized Intersection in Dhaka City" gave standard phrasing, immersion model which has been concentrated to get optional data. In any case, none of the examinations were directed on the best way to consider the selective passerby staging concerning Dhaka city. In these conditions, such an investigation envelopes walkers getting through conduct at intersections and mid squares.

5.10 Impacts on Pedestrian Walking Speed

Critical examination in common started during the 1960s. In the course of recent years, truly scarcely any investigations have been directed attempting to uncover the effects of human factors on person on foot conduct. Different specialists (Downie and Heath, 1970; Rastogi et al., 2011; Azmi et al., 2012) have inspected the impacts of affecting elements on people on foot's walking speeds at various walkways. They found that walking paces of walkers fluctuate over a wide reach contingent upon the individual state of being, age, sexual orientation, levels of actual wellness, stature and weight, natural components, bunch size, enjoying any action and excursion reason. Walking speeds were likewise concentrated corresponding to motivation behind walking, for example, practice walk in the first part of the day and recreation walk in the evening by sightseers furthermore, the roundabout impact of direction defined by the land utilization of a zone viable. A blend of every one of these variables may change the

passerby's speed and stream impressively. The affectability examination was performed by utilizing F-test (Downie and Heath, 1970) at a certainty level of 95% to analyze whether critical contrast exists between the speeds seen under various affecting components by testing the invalid speculation. The plan of an office ought to think about every one of these impacts to the degree conceivable (Rastogi et al., 2011). Individuals who walk all the more gradually will in general reason others to back off. The grouping of passerby due to hindrances, for example, traffic lights, crossing point will moderate walkers, window customers and choke streams. Individuals don't prefer to walk behind or close by with obscure individuals so they will in general walk aside and marginally ahead, so the walking speed is really relying upon what different people do making an obstruction to different people on foot (Azmi et al., 2012). . Walking speeds decrease with age, especially after age 60 years, yet solid more established grown-ups are equipped for speeding up by 40% for brief distances. Thick common traffic diminishes walking speed for all people. Regular discoveries of these investigations are that ladies walk more slowly than men furthermore, that individuals more than 60 years old walk more slowly than their more youthful partners. Across every one of these examinations, walker walking speeds differed from 98 ml min to 33 rn/mm, with a mean speed of 80 rn/mm. Regardless of various examinations concerning human factors on walker traffic, particularly on walking speed, there were no reliable ends for the impact of sexual orientation, age, baggage conveying or different components. This may part of the way result from the error of the perception locales. Another chance is that some examination did not reject the commonly interferential impacts between different components and the one being considered.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This section sums up the examination revealed in this theory and features the principle results furthermore, suggestions. This section likewise examined about the extension and bearing of future research. The rundown of the commitments of this exploration is introduced underneath.

6.2 Conclusion

1. The overall mean speed of two locations **(Dhanmondi 32 & Dhanmondi 27)** pedestrians is 28.09 m/min. On the mean speed of another location (Asad gate) pedestrians is 64.77 m/min. Which is not acceptable. However, it was discovered to in our coutries mean speed be more slow when contrasted with the United States, Europeans Saudi Arabia and Indonesia.

2. We get lower mean speed from location 2 **(Dhanmondi 27)** 26.57 m/min & then location 1 **(Dhanmondi 32)** 28.99 m/min. Those data is lower than the data from previous research of overall mean speed of Dhaka metropolitan area (69.08 m/min).

3. From location 3 **(Asad gate)** we get mean speed 64.77 m/min which is almost the same as previous overall mean speed of Dhaka city area. The mean walking speed of the pedestrians of our three locations (26.57 m/min, 28.99 m/min & 64.77 m/min). From our research we found overall mean speed of two location are lowest among four major cities of Bangladesh Chittagong (66.94 m/min), Rajshahi (66.96 m/min), Khulna (61.69 m/min). But in Asad Gate we found the mean speed is higher than Khulna city and lower than Chittagong and Rajshahi.

4. In two locations the overall mean walking speeds of male pedestrians (35.36 m/min) are higher than female pedestrians (31.35 m/min) & in another location The overall mean walking speeds of male pedestrians (65.31 m/min) are higher than female pedestrians (60.68 m/min). Male pedestrians are walking faster than female pedestrians in all of the three locations.

5. In all types of land use male pedestrians walk faster than female pedestrians. Maximum walkway speed of male and female pedestrians is found in shopping (68.14 m/min) and recreational areas (63.31 m/min). The highest difference between male and female walking speed is observed in mixed land uses (4.83 m/min).

6. At locations **"Dhanmondi 32 & Dhanmondi 27"** we get mean speed 28.91 m/min for the children male and 27.05 m/min for children female but at Asad Gate the mean speed for the children male is 68.14 m/min which is different from locations **"Dhanmondi 32 & Dhanmondi 27"**. There is a huge difference between these two places mean speed and the difference is 39.23 m/min.

7. In two areas **"Dhanmondi 32 & Dhanmondi 27"** the general mean walking speed of younger male and female on foot are 30.29 m/min and 30.04 m/min respectively. But in another area which is **"Asad Gate"** mean speed values for younger male and female are 65.55 m/min and 63.31 m/min. There is a tremendous contrast between these two areas mean speed and the thing that matters is 35.26 m/min and 33.27 m/min for younger male and female.

8. Maximum walking speed of middle aged male and females at **"Dhanmondi 32 & Dhanmondi 27"** are 26.56 m/min and 24.37 m/min. But in another area which is **"Asad Gate"** the maximum walking speed of middle aged male and females are 65.11 m/min and 60.78 m/min. Mean speeds difference between these two areas are 38.55 m/min and 36.41 m/min.

9. The mean speed of two locations **"Dhanmondi 32 & Dhanmondi 27"** for the older male and female are 23.53 m/min and 20.05 m/min. But at **"Asad Gate"**

we get mean speed for the older male and female are 64.86 m/min and 47.07 m/min which is large compared to the other two locations. Mean speed differences among these areas are 41.33 m/min and 27.02 m/min for the older male and female.

10. We also shown those difference in **Bar Chart** as like Male vs female.

11. We also shown the most average value in this survey by **Bel Curve**.

6.3 Proposals for Further Investigations

The speed-flow density model was created for passerby flow stream in significant urban communities of Bangladesh. This model can be checked for different urban areas in Bangladesh. The bi-directional duplication model for walker stream can likewise be completed for further examination.

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APPENDIX

Asad Gate

04.00-05.00 Pm	All	All Male	All Female	Children	Children Male	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	64.77	65.31	60.68	65.90	68.14	65.37	65.55	63.31	64.37	65.11	60.78	59.78	64.86	47.07
SD	11.78	11.84	10.49	18.05	17.60	12.07	12.17	10.82	10.41	10.49	9.30	14.79	12.79	5.80
Max	91.44	91.44	91.44	91.44	91.44	91.44	91.44	91.44	91.44	91.44	91.44	78.37	78.37	54.86
Min	30.48	30.48	39.19	39.19	39.19	30.48	30.48	45.72	39.19	39.19	39.19	32.27	32.27	39.19

Dhanmondi 32, Dhaka

09.00-11.00AM	All	All Male	All Female	Children	Children Male	Children Female	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	28.99	29.00	28.33	29.69	29.56	30.27	31.30	31.24	31.60	26.16	26.29	25.56	23.41	23.68	21.94
SD	3.70	3.67	3.89	2.60	2.57	2.75	3.02	3.16	2.27	1.66	1.62	1.70	1.24	1.04	1.25
Max	48.77	48.77	39.90	36.57	33.76	36.57	48.77	48.77	39.90	36.57	36.57	31.35	25.82	25.82	23.10
Min	19.95	21.94	19.95	21.94	21.94	25.82	24.38	24.38	24.38	19.95	21.94	19.95	19.95	21.94	19.95

Dhanmondi 27, Dhaka

12.00-02.00PM	All	All Male	All Female	Children	Children Male	Children Female	Younger	Younger Male	Younger Female	Middle Aged	Middle Aged Male	Middle Aged Female	Older	Older Male	Older Female
Mean	26.57	27.33	22.74	19.46	21.02	17.74	28.24	28.62	25.05	26.12	26.93	22.93	22.43	23.40	18.88
SD	5.35	5.17	4.53	3.53	3.70	2.48	4.85	4.82	3.84	4.97	4.90	3.85	5.53	5.31	4.95
Max	57.47	57.47	40.23	26.82	26.82	21.17	57.47	57.47	40.23	44.70	44.70	33.53	36.57	36.57	28.74
Min	8.05	8.94	8.05	13.41	16.09	13.41	14.90	14.90	19.16	11.49	11.49	13.41	8.05	8.94	8.05

The End