AN APPROACH TO PEDESTRIAN FRIENDLY COMMERCIAL STREET DESIGN

A Research Paper Submitted
In Partial Fulfilment Of The Requirements
for The Degree Of

MASTER OF ARCHITECTURE

by

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to the

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May, 2019

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Abstract
In the developing mode of modern times, the cities of the country have a good scope for urban development for providing the infrastructure opportunities for pedestrians to walk and on the human centric ground it is very needful and essential. Pedestrianization is very much sustainable for the pollution free mobility and also for better social, environmental & economic aspects. This research paper will point out the necessity of pedestrianization as a model for the commercial streets due to the increasing need of proper and safe infrastructure to walk. Firstly, it will explain the concept of walking, it’s benefits, the essential parameters & aspects, through the case and literature examples of pedestrianization and then, the condition of pedestrian infra at macro level, it’s influencing factors and then to study the ongoing policies & strategies of the other countries. And finally, on the basis of all findings & inference’s drawn from the study, to give some recommendations which can be undertaken for the pedestrianization of the commercial streets. After using selective method, the results of the study will show that, increasing the opportunities for pedestrians in the urban streets, is directly connected to the safety, economy and livability of the streets. Thus pedestrianization of the commercial streets proves to be an effective way against the increasing problems of environmental pollution & noise pollution and also enhance the shopping experience for the pedestrians. It would create increasing opportunities for the local business, reduce the private vehicle dependence, enhance the social life and overall aesthetic appeal of the street.

Key words
Walking, Pedestrianization, Commercial streets

Research Background
In urban area’s, streets act as the major spaces for the public. Most of the shopping activities as well as social activities take place on streets. Streets with shop fronts, eating joints, hawkers as well as food vendors, window shopping encourage heavy pedestrian footfall. But these activities are unsegregated and unorganized. Also poor, absent or dilapidated infrastructural facilities and environment for pedestrians, compels pedestrians to leave walking or to walk on
The methodology of this research paper will be quantitative and qualitative both. At the beginning, this research paper will first look at the concepts of pedestrian friendly street design development. The first step will be to look at the definitions and objectives, identify the importance and benefits of incorporating walking into our daily lives in terms of being a transportation tool. Then to study the specific commercial area identified as case studies. Then to do some quantitative analysis on the identified commercial area of the city in order to ascertain the current conditions and to study of their future scope of having changes. After considering all the analysis and literature reviews, this research paper will evaluate some pedestrian friendly street design recommendations which will be quantitative and qualitative both. And finally summing up with conclusion considering the whole study.

Introduction

The Context Of Walking

Walking can be explained as- to move along by putting one foot in front of the other, allowing each to touch the ground, before lifting the next. Walking is our most initial mean of transport. The beginning and ending of every trip done with walking (Claris & Scopelliti, 2016). So it is somehow a mode of transportation i.e to move from one place to the other. It is very easy to connects different activities within a predefined range through walking very easily. It is the most convenient method for short range activities especially in small and narrow streets or in the congested areas where other means of transport behave as problem creating mean for the area and getting impossible to operate. For the convenient and safe Walking the basic needs are the good design of sidewalks, street furniture, landscaping and street-crossings which guarantee the ‘ability to walk’ for citizens. As one of the sustainable methods of transport, in urban city
areas, walking may result to be more fruitful for the physical, social, environmental, cultural, political and economic aspects of sustainability.

**Who Are Pedestrians**

Everybody who is covering the distance on foot/ feet are pedestrians. This may include any person walking, running, standing or sitting on a road or persons in a mobility device not capable of exceeding 1.2m/min (Mathew, 2017).

**Need Of Pedestrianization In Context of Urban Area’s**

- There is rapid increase in urbanization, due to increase in population.
- Increasing need of different transportation modes.
- Increasing expectations of population.
- Vehicular access is overcoming more & more, as less attention paid to facilitate pedestrianization infrastructure (Iranmanesh, 2008).
- Negative impact of this increased expectations especially in cities of developing countries.
- Heavy traffic, increase in air & noise pollution, increasing number of pedestrian fatalities, unsustainable environment are some unpleasant results. Thus, causes negative impact on the number of pedestrians using urban space, is minimizing day by day (Iranmanesh, 2008).
- Thus pedestrianization is a solution and in result it is safe, healthy, comfortable and compatible for the sustainable development of an urban.

**Making Commercial Streets More Walkable.**

Commercial streets being a business center attracts more & more buyers. If the streets are pedestrian friendly with having sufficient walking space, they may be more viable to use by pedestrians, thus commercial streets will need to be design properly so as to fulfill the expectations of pedestrians. Commercial are mainly meant for the shopping purposes. So pedestrianization in the commercial streets will help to boost the environmental character and the socio-economic outcomes. People may have increasing opportunity for walking, shopping, socializing and may feel more safe and happier than the streets full of motor-vehicles. Commercial streets, where motor vehicles are used overwhelmingly are not safe for pedestrians and the environment is also not feasible to the human health.

**Benefits Of Pedestrianization**

Walking on foot is a form of physical exercise giving mental relaxation while vehicle driving Is physical comfort but tiresome mentally. Urban cities are getting more motor-centric, and this arises a very basic question that is, why walk, where you can drive. This is on account of the numerous benefits that are,
associated with walking a shift from car-centric to human-scale cities can be achieved. (Claris & Scopelliti, 2016). Here different types of benefits identified, are as follows:

- **Social Benefits**: Such as health and wellbeing, safety, placemaking, social equality and accident free.
- **Economic Benefits**: It keeps the area attractive, boosts the local economy, urban regeneration, and decrease the household transportation budget, hike in local area land cost etc.
- **Environmental Benefits**: The fusion of fuel in vehicular movement produces harmful gases and also causes air & sound pollution. Pedestrianization is pollution free, no emission of gases takes place & helps in maintaining the sustainable environment (Claris & Scopelliti, 2016).
- **Political Benefits**: Associated with planning & policies, local urban governance, implementing & following traffic rules and increasing planning opportunities for that area to be pedestrianized.

**Types Of Pedestrianization**

Pedestrianization may be done through three different ways and each are given with specific features, strategies etc. (Iranmanesh, 2008). These different types of pedestrianization are discussed bel

**Full Time Pedestrian Streets**

In this design vehicular entry into the street is fully banned and usually the service entries are given through the back of the street. In this type access to the service & emergency vehicles is allowed.(Iranmanesh, 2008).

**Part-Time Pedestrian Streets**

In Part-time pedestrianization vehicular access is allowed only to specific types of vehicles and also for specific time duration. Provision for freight loading bays are given and no provision is given for the on-street parking.(Iranmanesh, 2008).

**Traffic Calming Streets**

This form is for traffic calming streets, who serves to reduce the speed of motor vehicles. In this type, vehicle access is not restricted, footpaths are widened with proper grade separation between footpath and carriageway. Various traffic calming measures speed tables, narrower traffic lanes, use of signage's to show the drivers that they are using traffic calming zones. (Iranmanesh, 2008).

**Principles For Pedestrian Street Design**

There were various principals of the pedestrian street design identified in different studies. Some of the these principals taken in this study are diversity of uses, safety, orientation of the building, accessibility, creative use of space, livability of the area & quality of the area. Further these principals are taken for the qualitative analysis of the case and the literature studies.
**Sensitivity To Local Context**
Street must be designed by keeping in mind the activities it is known for, patterns of pedestrian movement, micro climate and the surrounding land uses.

**Pedestrian Accessibility**
All pedestrian streets should be universally accessible, must have continuous walking lanes & safer shared space with appropriate grade differences and appropriate clear space to ensure comfortable pedestrian movement.

**Liveability & Quality Of Life**
Pedestrian street must be incorporated with the space for relaxation, interaction, vending, and other activities.

**Creative Use Of Street Space**
Careful & creative use of each space is a smart pedestrian street design. Street parking lane can become multifunctional if it includes occasional bulb-outs for street vending or street furniture.

**Diversity Of Uses**
It ensures the safety in pedestrian environment by making streets available for the varying needs of the people at different time.

**Safety**
Streets need to be safe for pedestrians, this demands the slow pedestrian walking zones which would be available for walking purpose only. Thus, a dedicated zone/lane is necessary.

**Orientation Of Buildings & Front Facades**
Buildings around pathways should be oriented to allow people to see & be seen. This also makes the street users to feel safe and also façade treatment increases the aesthetic appearance of the area.

*Figure 1: Image A to G showing different principals of pedestrian street design (Source: Author)*
Pedestrianization Strategies
Adopting innovative techniques for pedestrian street design may become heaven of walking streets. Such efforts are being done in terms of space, time, visual elements, grade separation, speed, traffic management and in terms of legislation. (Venkatraman, 2011). These are discussed below:

In Terms Of Space
Sidewalks, for the use of pedestrians must be made wide and carriageway narrow. Cities like Manhattan in U.S. has successfully maintained such approach.

By Grade Separation Of Pedestrians.
Pedestrian footpaths must be made elevated from the vehicular roads. Sidewalks must adorned by street lights, street furniture, signage's, landscaping etc.

In Terms Of Time
For the ease of transport, part time pedestrianization system may be allowed for the specific time. By allowing Vehicular entry on the pre defined days of the week. Access to the delivery-vehicles must be allowed only in non-peak hours.

In Terms Of Speed
By opting traffic calming features like speed humps, curb extensions, raised crossings etc. and implementing controlled speed limit on vehicles, while they enter into a pedestrian precinct (Venkatraman, 2011).

In Terms Of Visual Elements
To illustrate the pedestrian area for the vulnerable age groups specified colours, signage's, pavement material should be use for the user knowledge.

In Terms Of Traffic Management
By implementing full time or part-time pedestrianization. This may also be achieve by limiting the entry of different types of vehicles. By following proper speed limit signage's and also by following specific dedicated lanes on both the sides.

In Terms Of Legislation
Odd/even numbers restrictions on vehicles, levying parking charges, parking time restrictions, strategies like one day without car to encourage walking and also by levying extra carbon emission and discharge charges etc. Also by offering people some rewards against the redemption of the points generated by counting the number of steps through an app (Claris & Scopelliti, 2016).

Elements For Pedestrian Street Design
Streets design must emphasize in the light of some places for leisure with needful of amenities to encourage more sustainable lifestyle. Streets need to be
design with barrier-free and wide sidewalks, with amenities like street furniture, adequate landscaping and provisions for public toilets and drinking water fountains etc. (Venkatraman, 2011). The major design components required to make an attractive pedestrian street are:

**Sidewalks**
Sidewalks or footpaths are the dedicated space in right of way. It must be wide and free of obstacles, to encourage un-interruptible & continuous movement. sidewalks must be planned with various dedicated zones for different activities, with sufficient space allocated that caters all age groups needs, human physical conditions and activities which use to be the identity of that area.

**Street Furniture**
Pedestrian Street must be furnish with accessories of convenience like benches, dustbins, lighting, signage's etc which allows the users with different physical conditions, to enhance their social life and provides mind satisfaction to the users, street furniture are allows users to stay and spent some time on the road.

**Landscaping**
Landscaping features specially large trees or plantation plays an important role in saturating the air quality of cities may also be creatively use as the shading device on the pedestrian footpaths. Planting is eye catching ,visually and functionally. Planting trees must be less water consuming, must withstand with the local climate. These plants location must be well designed seeing their utility and viability.

**On-grade And Grade-separated Crossings**
Every street design must effort in the safety of locations where pedestrians and vehicles will cross paths. Whether marked or unmarked, legal crosswalks must exist at all legs of all intersections.

**Curb Ramps**
Curb ramps are mostly made for the wheel-chair users and they must be compulsorily installed on sidewalks where there is level or grade difference.

**Street Lighting**
Street lighting becomes a need for pedestrian footpaths after dark. Appropriate intensity of light would definitely improve pedestrian safety and security.

**Utilities, Signage's & Paving's**
Utilities are something which is very important in sidewalk design. Signage can be a lot informative for the local area users & can be a lot more individualistic & interesting as pedestrians have more time to read than drivers.. Pavers must have a regularity of size and evenness of texture.
# Footpath Design Norms & Guidelines in India

Table 1: Showing IRC and UTTIPEC Design Norms & Guidelines (Source: Author)

<table>
<thead>
<tr>
<th>component</th>
<th>Street Design Guidelines - UTTIPEC</th>
<th>Indian Road Congress-IRC:103-2014</th>
</tr>
</thead>
</table>
| **Minimum Clear Walking Zone** | • 1.8 M clear width.  
• 2.4 M Clear height.  
• 2.0 M for Residential Areas.  
• 2.5 M minimum for Comm./Mixed. | • Varies between 1.8 M to 4 M depending on the pedestrian flow and land use |
| **Multi-Functional Zone with Planting** | • Multi-Functional Zones on a Street should be a minimum of 1.8 M Wide.  
• Provision of MFZ is most critical otherwise other components of streets would encroach upon pedestrian space. | • Multi-functional zones on a street should be a minimum of 1.5 M wide. |
| **Maximum Kerb Height** | • Max. height of a pavement (including kerb, walking surface, top-of-paving) shall not exceed 150 MM (6").  
• 100 mm (4") kerb height is preferable for Arterial Roads. | • Shall not exceed 150 from the road level. |
| **Kerb Ramps** | • 1:12 Minimum Slope at all level change points.  
• 1.2 M Width of Ramp; | • 1:12 minimum slope.  
• 1.2 M width of ramp. |
| **Kerb Radius** | • Maximum corner radius = 12 M  
• It may be reduced to 6 M in residential areas to slow down turning buses, trucks etc. with the provision of a corner mountable kerb for emergency vehicles. | • Maximum corner radius = 12 M  
• It may be reduced to 6 M in residential areas |
| **Guard-Rail** | • 0.85-.9 M.  
• Not desirable in most instances on urban roads, except near intersections. | • 1.1 m above the median of .15 m. |
| **Frontage Zone or “Dead Width”** | • For sidewalks in shopping areas, an extra 1M should be added to the stipulated 4.0 M width.  
• This extra width is called “Dead Width”.  
• In other situations where sidewalks pass next to buildings and fences, a dead width of 0.5 M can be added. | • Varies between 0.5 m to 1.0 m. |
| **Refuge Islands** | • Minimum Width of a Pedestrian Refuge Island at a Crossing is 1.2 M, enough to accommodate a wheelchair or strolley.  
• Bollards must be used to prevent vehicular U turns. | • Minimum width of a pedestrian refuge island at a crossing is 2 M, enough to accommodate a 2-wheelchair at a time. |
| **Footpath Lighting & signals** | • All traffic signals should have red & green man symbols and auditory signals.  
• Mid-Mast Lighting 10-12 M tall. | • Red phase of traffic signal should stop at least 12 seconds for min. Distance of 7.5 M. |
Footpath Design Norms & Guidelines in India

Table 1: Showing IRC and UTTIPEC Design Norms & Guidelines (Source: Author)

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian crossings</td>
<td>• Minimum 3 M wide pedestrian crossing and 2.5 M wide cycle crossing must be provided at all road crossings.</td>
<td>• Minimum 3 M wide pedestrian crossing and 2.5 M wide cycle crossing must be provided at all road crossings.</td>
</tr>
<tr>
<td>Pavement</td>
<td>• All walking surfaces should be very Rough/ matt-finish/ anti-skid.</td>
<td>• Even paved surface to prevent tapping.</td>
</tr>
<tr>
<td></td>
<td>• Tactile pavers to avoid the confusion and universally accessible.</td>
<td></td>
</tr>
</tbody>
</table>

Findings & Inferences From By-laws:

- These guidelines, sets the benchmarks for the minimum LOS, these can be modify as per conditions & requirement of different cities but, should not less than the minimum benchmarks provided.
- These guidelines are not complete in terms of not exploring pedestrianization and its strategies and how they need to be planned for an area.

Minimum Pedestrian Zone Width According To Land Use

![Diagram of Commercial and High-intensity commercial zones](image-url)

Figure 2.: Images A & B showing different street sections according to land use (Source: IRC, 2014)
CASE STUDY - NEW MARKET, KOLKATA

About The Street

- Total area of the market- 0.13sq.Km.
- One of the main market of the city attracts and the majority of visitor’s choose to walk for the shopping purposes.
- The market is well arranged.
- The diversity of the products available in the market ensures the presence of the pedestrians at varying time interval.
- Multi purpose use of the public buildings existing in the area.
- More priority given to pedestrian on row.
- Traffic calming Pedestrianization type.
- Designated parking space at all the entries to the market.
- Good connectivity with different modes of transport.

Physical Indicators:

Table 2: Table Showing Different Indicators & Their Values

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>44,96,584</td>
</tr>
<tr>
<td>Total Area</td>
<td>886 sq.km</td>
</tr>
<tr>
<td>Density</td>
<td>22408 Person / Sq.km</td>
</tr>
<tr>
<td>Mode Sahre (Walk, pt, pr-t, nmt)</td>
<td>67%, 2%, 18%, 11%</td>
</tr>
<tr>
<td>Pedestrian Volume</td>
<td>2259 Person / hr.</td>
</tr>
<tr>
<td>Pedestrian Volume Sex Ratio (Male / Female)</td>
<td>68% , 32%</td>
</tr>
</tbody>
</table>

New Market Area Map & Different Street Views

Figure 3: Images showing map and pictures of the new market area (Source: Primary Survey)
Street Sections

- Different street blowup plans & sections are given showing the variation in the width of road of the same area.
- Figures also showing the different activities, level of encroachment by the shopkeepers, street vendors, hawkers done, parking upon the right of way.
- The road width varies from 9.0m to 24.0m

**Figure 4**: Images showing section @ detail at A-A’ (Source: Primary Survey)

**Figure 5**: Images showing section @ detail at B-B’ (Source: Primary Survey)

**Figure 6**: Images showing key map of the area (Source: Primary Survey)
Street Sections

Figure 7: Images showing section @ detail at C-C’ (Source: Primary Survey)

Figure 8: Images showing section @ detail at D-D’ (Source: Primary Survey)

Figure 9: Images showing section @ detail at E-E’ (Source: Primary Survey)

Figure 10: Images showing key map of the area (Source: Primary Survey)
4.1.7. Visual Experience

Figure.11: Images showing visual pedestrian environment of the study area (Source: Primary Survey)

CASE STUDY 2 - CHURCH STREET, BANGLORE

About The Street

- Total length of the street- 715M.
- This street is known as a famous “Tourist hotspot” of the city.
- The street is newly planned as pedestrian friendly street.
- More priority given to pedestrian on row.
- Traffic calming Pedestrianization type.
- Designated parking space at all the entries to the market.
- Good connectivity with different modes of transport.
- The street is one of the major revenue generating area.

Physical Indicators:

Table 3: Table Showing Different Indicators & Their Values

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>84,25,444</td>
</tr>
<tr>
<td>Total Area</td>
<td>1109 sq.km</td>
</tr>
<tr>
<td>Density</td>
<td>1145 Person / Sq.km</td>
</tr>
<tr>
<td>Mode Share</td>
<td>71%, 1%, 14%, 16%</td>
</tr>
<tr>
<td>(Walk, pt, pr, t, nmt)</td>
<td></td>
</tr>
<tr>
<td>Pedestrian Volume</td>
<td>2107 Person / hr.</td>
</tr>
<tr>
<td>Pedestrian Volume Sex Ratio (Male / Female)</td>
<td>47%, 53%</td>
</tr>
</tbody>
</table>
Street Map, Church Street

Figure 12: Showing pictures of the church street (Source: Author)

Figure 13: Showing existing street layout of the church street (Source: Author)

Street Sections

Figure 15: showing street section of 9.0m wide street (source: Author)

Figure 14: showing street section of 16.0m wide street (source: Author)

Visual Experience

Figure 16: Images showing visual pedestrian environment of area (Source: Primary Survey)
### Comparative Analysis

**Table 4: Table Showing Comparative Study Of Case Studies (Source: Author)**

<table>
<thead>
<tr>
<th>KOLKATA</th>
<th>BANGALORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Availability of parking at all the entries.</td>
<td>• Frontage zone &amp; front setback in majority of the buildings.</td>
</tr>
<tr>
<td>• Diversity of uses maintains the pedestrian flow at all the time.</td>
<td>• Open or fully visible building facades.</td>
</tr>
<tr>
<td>• More preference given to the pedestrians on ROW.</td>
<td>• Dedicated zone for the on-street parking.</td>
</tr>
<tr>
<td>• Multi-purpose use of most of the public buildings.</td>
<td>• Major preference given to the NMT mode.</td>
</tr>
<tr>
<td>• Availability of cctv cameras at all major nodes and streets make the area safe &amp; secure.</td>
<td>• Good availability of amenities like public toilets, dustbins Etc.</td>
</tr>
<tr>
<td></td>
<td>• Availability of cctv cameras at all major nodes and streets make the area safe &amp; secure.</td>
</tr>
<tr>
<td></td>
<td>• Availability of the pedestrian crossings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KOLKATA</th>
<th>BAN.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No specific architecture character followed in all the private buildings.</td>
<td>• Open dustbins.</td>
</tr>
<tr>
<td>• No façade control</td>
<td>• No provision for shading devices.</td>
</tr>
<tr>
<td>• No provision for universal accessibility</td>
<td>• No provision of street furniture.</td>
</tr>
<tr>
<td>• No dedicated service vehicle entry.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KOLKATA</th>
<th>BANGALORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Multi purpose use of the public buildings.</td>
<td>• More sustainable street design and the elements used.</td>
</tr>
<tr>
<td>• Multipurpose public space enhance the social character.</td>
<td>• Fully paved row gives more opportunities for the pedestrians to walk.</td>
</tr>
<tr>
<td>• Zoning makes pedestrian movement more easier.</td>
<td>• Planters acts as a barrier for the footpath to get encroached.</td>
</tr>
<tr>
<td>• Movement corridors at some part of the streets.</td>
<td>• Speed limit zone for motor vehicles.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KOLKATA</th>
<th>BAN.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• No designated zone for the street vendors.</td>
<td>• Bad drainage system.</td>
</tr>
<tr>
<td>• Ill-maintained solid waste management.</td>
<td>• Flooded row during the rainy season.</td>
</tr>
<tr>
<td>• Encroachment on carriageway make the vehicle entry inaccessible in case of emergency.</td>
<td></td>
</tr>
<tr>
<td>• No provision for the pedestrian crossings.</td>
<td></td>
</tr>
</tbody>
</table>
### Comparative Study Of The Design Parameters

Table 5: Table Showing Comparative Study Of Design Parameters (Source: Author)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Components</th>
<th>New market, Kolkata</th>
<th>Church Street, Bangalore</th>
<th>Final Dimensions Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1). Sidewalk Dimensional Adequacy</td>
<td>Width of walking zone</td>
<td>0.75m to 3.5m</td>
<td>2.4m to 2.7m</td>
<td>2.0m-3.0m</td>
</tr>
<tr>
<td></td>
<td>Width of multi-functional zone</td>
<td>0.6m to 4.05m</td>
<td>0.5m</td>
<td>1.5m-1.8m</td>
</tr>
<tr>
<td></td>
<td>Width of frontage zone</td>
<td>0.6m</td>
<td>0.9m to 4.5m</td>
<td>0.50m-0.75m</td>
</tr>
<tr>
<td></td>
<td>Width of carriageway</td>
<td>7.5m to 12m</td>
<td>4.5 to 9m paved</td>
<td></td>
</tr>
<tr>
<td>2). Pedestrian Safety &amp; Security</td>
<td>Pedestrian Crossing width</td>
<td>No provision</td>
<td>1.5 m wide</td>
<td>2m</td>
</tr>
<tr>
<td></td>
<td>Provision of guard rail</td>
<td>M.S railing 1m to 1.2m high</td>
<td>No provision given</td>
<td>1.0m high</td>
</tr>
<tr>
<td></td>
<td>Availability of street lights</td>
<td>Pole street lights 20m c/c</td>
<td>Street lights 15m c/c</td>
<td>15.0m c/c</td>
</tr>
<tr>
<td></td>
<td>Provision Of Cameras On Major Nodes</td>
<td>On major nodes given on 4m high pole</td>
<td>given on 4m high pole. At 15m c/c</td>
<td>30m c/c</td>
</tr>
<tr>
<td>3). Pedestrian Convenience &amp; Comfort</td>
<td>Width of curb ramp</td>
<td>No provision</td>
<td>1.06m to 4.0m</td>
<td>1.8m</td>
</tr>
<tr>
<td></td>
<td>Curb height</td>
<td>0.15m high</td>
<td>0.15m high</td>
<td>0.10m</td>
</tr>
<tr>
<td></td>
<td>Curb parking</td>
<td>L- 4m to 4.6m W- 2.1m to 2.4m</td>
<td>L- 2.4m to 9.6m W- 2.0m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Signage</td>
<td>No provision given</td>
<td>Given on 3.0m high post 15.M c/c</td>
<td>3.0m high post 15.M c/c</td>
</tr>
</tbody>
</table>
Recommendations

*Dimensional Standards*

- Street sections need to be revise, inorder to accommodate all the existing activities, to be given with the pedestrian friendly environment in the commercial streets.
- It is also very much profitable for the pedestrian friendly street design to retain all the existing activities especially in the case of the commercial streets so as to maintain the character and the diversity of the uses ensures the presence of the pedestrians on the street at varying time interval.
- In case of the commercial streets sidewalks must be given with atleast 2.0m wide dedicated walking zone which has to be free from obstructions and universally accessible as seen in literature & the case study.
- To dedicate 1.5m wide multi-functional zone to accommodate the street furniture, on street utilities and zone for hawkers which generally, forms as one of the reason for making congested streets. Thus, makes the walking zone free from obstructions, make it convenient and safe for the pedestrians movement and also enhances the overall quality of the area.
- The idea of providing bonus F.A.R. can be use to get some space from the ground floor area of the buildings existing on the edge of the main commercial street where the width of the R.O.W is less than 10.0m.
- Proper zoning needs to be done inorder to segregate different types of on street informal activities takes place in the commercial streets. Thus, makes the activities well planned and also ease the pedestrian movement.
- As seen in the survey, the behavior of motorist causes safety problems for the pedestrians and congestions problems in the street. So, inorder to minimize these problems, dedicated zone to be given for the movement of motor- vehicles in each direction along with the part-time pedestrianization.
- Pedestrian street design should be given with proper grade separation of minimum 100mm and maximum of 150mm between the sidewalks and the carriageway. Also barrier can be install with the minimum height of 700mm on the curb edge, so that sidewalk can’t be encroached by the motor vehicles.
- As seen in the case study, pedestrian street need to be universally accessible or by the people under different physical conditions . Thus, the pedestrian friendly street design must incorporate elements like curb ramps, tactile paving's, and raised platform at the entry/exit existing on the edge of the walking zone
- To provide traffic calming measures like sped humps, curb extension at the intersections, raised crossings which are beneficial for the pedestrians, as they are vulnerable to the high motor speed.


Recommendations

• To lower down the eclectic cables and surface drains separately through the underground channels provided with the chambers at 100m c/c distance for the proper maintenance.
• At grade crossings required at every min. Interval of 60.0m for the ease of movement for all age groups.
• As seen in the case studies option for the on-street parking can be fruitful and would be given in multifunctional zone at every 100-120m of the distance with some green patch.

Qualitative Standards

• To bring some uniformity in the building façade designs, in terms of their architecture, colour & material especially, in the buildings existing on the edge of the main commercial street. Thus, enhances the aesthetic quality & identity of that street at both micro & macro level.
• The idea of part-time pedestrianization not only minimizes the traffic congestion problem but also reduces the overall problem of noise & air pollution and thus, enhances the quality of environment in the commercial streets and provides a pollution free environment for the pedestrians to walk.
• Public spaces other than the right of way to be re-design and to gives with architectural features like fountains, artifacts, furniture, shady trees etc. inorder to allow people to sit, socialize and enjoy. Thus, makes the commercial spaces more livable.
• To install the architectural elements by keeping in mind about the importance of the context of the street as well as of the city.
• To design spaces and elements creatively, which will result in it’s multiple use for different activities. For example in the case of Amritsar case study, planters given for the tress are also being used by the people to sit and in literature study the median is widened enough to use it as multi-functional zone also.
• To bring some uniformity in the signage's in terms of it’s design, size & colour combination, inorder to enhance to overall aesthetical appeal & the quality of the commercial area.
• The design elements should be so arranged that, it should be legible for the pedestrian to get then easily understand to segregate between different needs and purposes. Thus, forms the image of the commercial street.

Policies

• There is a strong need of governance by the local authorities, which will ensure the security of the pedestrians and management according to the street design.
Recommendations

- To draft some needful rules & regulations for the designated private zone and the public zone(includes spaces for the pedestrians & the spaces for the motor vehicles) to obey the purpose of pedestrian friendly commercial street.
- To initiate an idea of bonus reward point for walking as seen in the study of the international experience. To convert the walking footsteps into reward point through an app and to redeemed the same afterwards. This will generate public interest to walk more and also and to leave the use of motor vehicles especially, for shorter distances.
- To levy heavy penalties for the people who breaks the rules, so that he/she will re-think to do so again.
- Proper screening of the installed security cameras, frequent patrolling to be done by the security personals. All this will behave as a deterrent towards crime and will give more secure environment especially for the pedestrians to walk more.

Figure 17: Showing proposed street plan and section for the commercial street (source: Author)
CONCLUSION

The reason behind this study was to establish, wither a good pedestrian design of a commercial street enhance the user experience and the overall commercial activity of the street. The object of the present study is to increase the body of knowledge related to pedestrianization of the commercial street.

The approach to the study has been through similar case studies, by focusing on various benefits, needs & principals, which are some of the essential aspects that are good enough to divert the general mindset of car-friendly street to more pedestrian friendly commercial street and this will also promotes more business opportunities and social interactions among the street stakeholders. Then formulating some guidelines and some strategies for incorporating the pedestrian facilities and also for the renewal & improvement of existing pedestrian facilities in the commercial streets based on the inferences drawn from the whole study.

Further, with the key aim of making commercial streets pedestrian friendly, these proposed guidelines and standards also be recommended for the other commercial streets with same physical conditions, by doing some needful alterations & additions. Though incorporating a pedestrian friendly approach in urban planning may result in making more sustainable & eco-friendly urban development in the urban cities.

Figure 18: Image showing pedestrian friendly commercial street view (source: Author)
REFERENCES


REFERENCES

