

IMPACT ANALYSIS OF URBAN STREET EDGES OF RESIDENTIAL AREAS IN DHAKA, BANGLADESH

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Abstract

Streets act as circulation spaces for vehicles as well as fundamental public spaces for urban people. The edges of the streets are very significant elements, while defining the character of the streets. It is observed that, boundary elements in urban residential areas, generally form the edges of their adjacent streets. If the boundary elements respond to its context, it will create a coherence of private space and the public realm, which can improve the urban experience. Dhaka, being the busiest mega polis of Bangladesh, has been experiencing a boost in residential sector, where, the development is primarily focused on individual architectural entities, rather considering an overall view of the urban area as a holistic entity. It is found in most of the cases, that, private buildings are simply ignoring the outdoor public environment by erecting solid boundary elements. However, this type of boundary elements completely separates the private and public domain, which creates a negative effect on the street environment. Therefore, the main objective of this study is to explore the existing situation of street edges of urban residential areas in Dhaka, and also to identify the impact of different types of street edges on their surrounding environment. Henceforth, a small portion of Dhanmondi, the oldest planned residential area of Dhaka, has been taken as study area. This research was principally based on observation and field survey. Books, journals, documents from websites etc. are the sources of secondary data. It is clearly demonstrated that, visually and physically permeable street edges create positive environmental scopes for both commuters and dwellers.

Keywords: Urban area, Residential area, Street edge, Boundary element, Foot path, Setback

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1. Introduction

Streets play one of the vital roles in representing the visual image of a city. While imagining a city, first thing that come in our mind is street. If a city's streets look interesting, the city looks interesting; if they look dull, the city looks dull (Jacobs, 1961). A successful city not only emphasize on individual architectural entities but also contribute positively with their surroundings and street environment. The environment of a street largely depends on the quality of the street edges. A well-designed street edge provides added activity and visual interest to the public realm, which enhances the character of the street.

Dhaka, being the capital and the most important city of Bangladesh, is developing very fast without much of thoughtful planning. Among them, most of are quantitative, rather qualitative. These developments are only designed to address the site and are confronted with the challenge of generating well-designed outdoor environments. Due to rapid increase of population in last few decades, many planned and unplanned residential developments happened in Dhaka city, to accommodate this huge population. Many housing development companies are building and selling apartments just like another regular product. Most of them are not concerned about the outdoor environments, public spaces and streets in front of their own buildings. In the conventional practices of developing the residential areas, sometimes, buildings act as isolated objects, enclosed by boundary elements, which completely separate the buildings with the adjacent outdoor public environment and the streets. This creates leftover spaces in front of the buildings and undesirable dead edges to the streets which increases negative perceptions of the place. However, a proper edge treatment of the streets, has a significant impact in the interface between the inner private space and outdoor public environment, which can contribute to create an efficacious city environment.

The main objective of this study, is to explore the existing situation of street edges of urban residential areas in Dhaka city and also to identify the impact of various types of street edges on their surrounding environment.

2. Literature review

Definitions of street edge and public space are already provided in some previous literatures. Urban street edge is the indoor or outdoor interface spanning street and building that often defines the character, spatial qualities, functions, and ultimately, people's overall experience of the street (Uttley, 2018). Kevin Lynch defined edges as a linear element that defines the boundaries between public and private domain. According to Kevin Edge may also be barriers, more or less penetrable which close one region off from another, or can be seams, lines along which two domains are related and joined together (Lynch, 1960).

Street edge can be defined as a part of individual building and the entire urban area, where the context of the street edge is one of the main criteria for evaluating its quality. If the edge nature responds to the context, it will produce outstanding results in terms of the urban environment on the street. The edge of the street can act both as barrier and binder. When the edge completely separates the private and public space, it acts as a barrier and create negative impact on the entire area. At the same time, when it connects the private and public space, it acts as a binder and contribute to enhance the overall environment. Hrishi Desai described the above-mentioned quality and characteristics about street edge, where he also proposed three basic characteristics of edges based on visual and physical permeability (Desai, n.d.). Ian Bentley et al. mentioned that visual permeability between public and private space can enrich the public

realm and physical permeability can enhance public space by increasing the level of activity around its edges (Bentley, 1985).

According to Jane Jacobs, streets and the sidewalks are one of the main public places and essential part of a city with three main qualities: first, a demarcation between what is public and private space; second, to offer opportunities for natural surveillance³ and finally the presence of active sidewalk for users (Jacobs, 1961). Project for Public Spaces described four key qualities of a successful public spaces, which are; accessibility, participation of people in different activities, comfortable environment and a good sociable place for mass people (Heffernan, 2014). DeklavaAljosa et al. has stated that the residential architecture with its negotiating boundaries is a product of today's complex social situations and interactions, this can be utilized to share facilities with the neighbors and public or can be used to isolate the residential areas (Heffernan, 2014).

Auckland Design Manual stated that, the treatment of the front edge of the site defines the boundaries between public and private open spaces. The design of boundary elements⁴ has a significant impact on the interface between the building and the street. The space between the building and the street, should be designed as an essential part of the whole design. According to Roger Trancik, leftover unstructured spaces at the base of multistoried buildings can act as lost space, which have no positive contribution to the surroundings and the users (Trancik, 1986). In residential area, walls are used as the most common edge treatment along the streets. According to Georgiou, walls usually abut public space and therefore, their design and construction must be considered the aesthetic planning as well as the local community planning (Quaofio, 2018).

As said by Datta, pedestrian ways are the public spaces at the edges of the streets and the space between built structures and pedestrian path with some amenities, like seats, shaded trees, lighting, water features and rubbish bins can act as an interactive space for the users and pedestrians (Datta S., 2017).

The above-mentioned literatures have led to promising frontiers towards the design of street edges and public spaces in urban areas like Dhaka City, which has undergone potential changes not only by territorial expansion, but also through internal physical transformations over the last few decades (Ahmed, 2009). The residential development pattern has also transformed significantly with these changes in urban form.

With a rising population and increased housing demand, multi-storied apartment culture has prominently developed in the urban areas of Dhaka city. These buildings are mostly enclosed with solid boundaries, in order to provide security and avoid unwanted onlookers. Moreover, these boundaries provide, very less contribution to the urban street environment due to lack of proper rules and regulations, provided by Bangladesh National Building Code.

3. Methodology

This is a generalized study and it is expected that the outcome of this study would be almost similar in the same contexts in Dhaka city. A small portion of residential area around the

³Natural surveillance describes a person's ability, whether a resident or a member of the public, to survey (overlook) public or private spaces.

⁴ Boundary elements typically include vertical elements such as walls, fences, screens, planting and changes in level, which work to provide visual cues that define spaces and provide privacy

'Dhanmondi 4' playfield has been selected for this study. This study is focused on the prevailing condition of various types of street edges and mainly based on empirical study.

The overall study has conducted in several phases. Firstly, both primary data and secondary and have been collected to identify the present situation of the street edges in the specific residential area. The primary data have been collected through visual observations, photographs, field survey, sketches and field-note. Secondary data on street edges and related aspects have been gathered thorough literature study. Thensurvey information and computer aided drawings based on GIS map and field survey has been prepared, where necessary information on plot and road configuration, building orientation, front setback as well as layout of pedestrian ways are available. Accordingly, specific types of street edgeswere grouped together, based on the physical features and their relations to the adjacent private and public areas. Finally, analysis phase aimed to find out the impact of different types of the street edges on the pedestrian ways and the front setback area of the building.

4. Background of the study area

Dhanmondi is the first planned residential area in Dhaka city. As stated by Mamun, the area was planned and developed in the early fifties to provide residential accommodation for high and higher middle-income groups of population in Dhaka city (Ahmed, 2009). There were large plots, wide streets and good environment. The houses were mostly one or two storied with large front yard and building coverage of the land was very low. Before 1990, there were no six-storied buildings in Dhanmondi (Mahabub-Un-Nabi, 2007). But now the large plots are physically fragmented into 3 to 5 kathas (1 katha= 67 m²). This land fragmentation induces multistoried apartment housings, which are found to accommodate large front open spaces and leave minimum setback spaces around them, followed by the rules of Bangladesh National Building Code. Additionally, the recent trend is using ground floors of the buildings as parking spaces and upper floors for residential uses. Therefore, now a day, privacy issue in the ground floor of apartment building, is not a matter of great concern. However, to provide privacy and security, buildings are still surrounded by boundary elements, that separate the front setback spaces and the public footpaths. But connection between public footpaths and private buildings plays a significant role for experiencing better urban features.



Fig. 1: Dhanmondi residential area masterplan

5. Analysis & Outcomes

5.1 Selection & present condition of the site:

The selected site is located around the playfield area at 'Dhanmondi 4', where diversified street edges were observed. The playfield is surrounded by twelve plots with residential buildings, which are divided in orthogonal (grid iron) pattern. Among the twelve buildings, three are two storied, one is under construction & others are six storied. In most case, ground floors are used for non-residential purpose and upper floors are used for residential purposes. Ground floor of seven buildings are used for parking space, guard room & other service areas. Only twoold buildings have residential units on ground floor. Others have shops, offices and coaching center along with parking spaces.

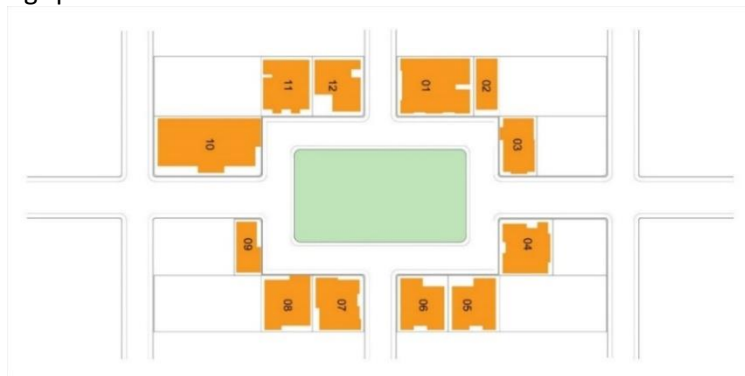


Fig. 2: Building block, plot division & road pattern of selected site around Dhanmondi 4 playfield

5.2 Front setback & footpath configurations

Eight buildings were built according to the previous rules and regulation of Bangladesh National Building Code (BNBC) – 1996, where width of front setback was 1.5 meter. The building of plot no 12 followed the rules of the updated version of Bangladesh National Building Code (BNBC)-2008 and also have a front setback area of min 1.5 meter. Among twelve building, only three buildings did not follow the setback rule of BNBC, where few buildings do not have proper front set back areas. Existing configuration of footpath & building front setback areas of selected sites are presented in the plan, where red color represents footpath and green represents front setback.

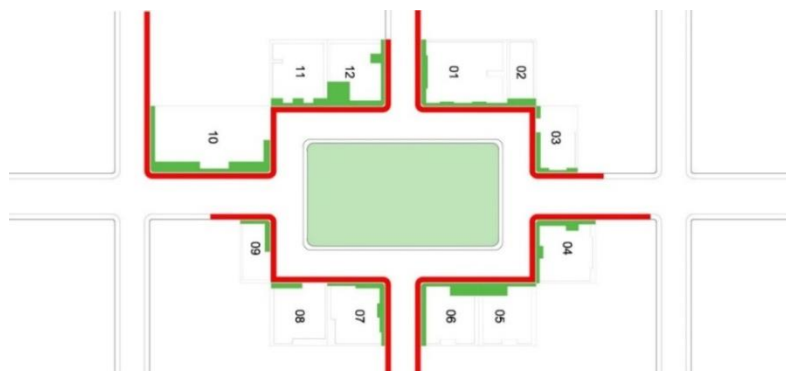


Fig. 3: Footpath & building front setback area of selected site around Dhanmondi 4 playfield

5.3 Typologies of street edges & their impacts on surrounding

Four buildings are surrounded by solid boundary walls, which act as edge of their adjacent street. Two buildings are partially enclosed by perforated fences and rest five have low height seating walls or changes in levels to demarcate the boundary between private and public space. The building of corner plot, plot no 4, has perforated fence in one side and other part has no boundary except some changes in levels.

Buildings situated on Plot no 8 and 9 has a different type of edge treatment along the street. A few portions of both buildings' front facade, have created boundary element. In plot on 9 almost half of the front setback, has no boundary and for plot no 8, some portion has solid boundary walls. Existing types of edge treatments of selected sites are presented in the following plan where blue, red and green line represents solid boundary wall, perforated fence and no boundary or changes in levels, respectively.

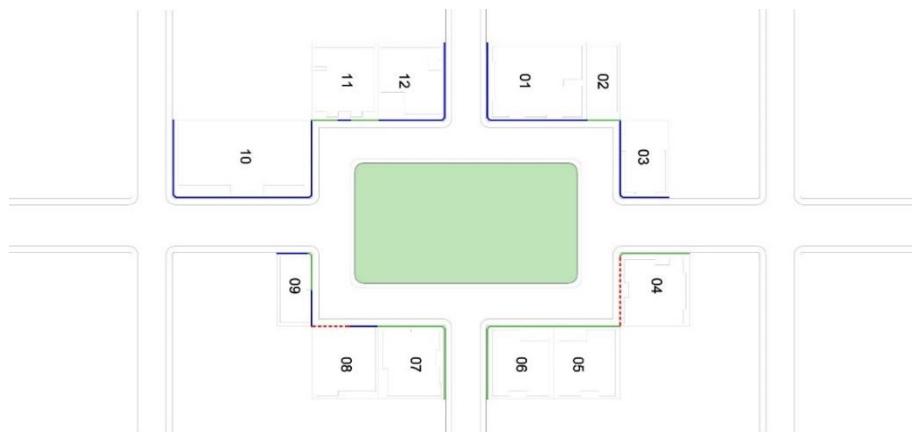


Fig. 4: Different types of edge treatment of street

Among 12 buildings, only five building's boundary treatment do not separate footpaths and front setback areas completely, rather provide connection between private open space and public space and create usable spaces, both for inhabitants and pedestrians. Existing configuration of public accessible setback areas and non-accessible setback areas of selected sites along with footpath are presented in the following plan where red color represents accessible area and grey color represents non-accessible area.

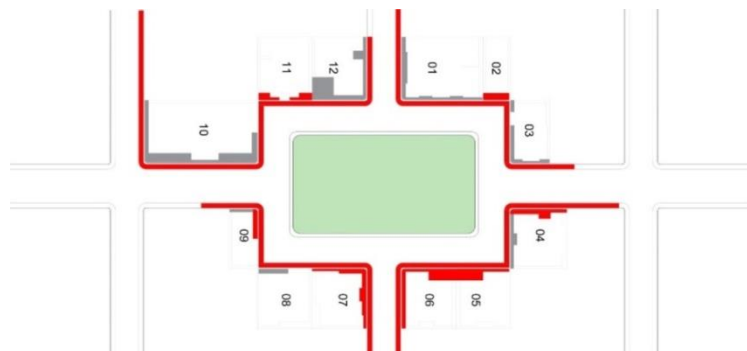


Fig. 5: Public accessible area & non-accessible area

Table 9: Condition of individual building plots of selected site around Dhanmondi 4 playfield

Plot	Building info	Ground floor use	Front setback condition	Street edge treatment	Footpath condition
01	<ul style="list-style-type: none"> • 6 storied apartments • Constructed under the rules of BNBC 1996 	<ul style="list-style-type: none"> • Parking • Guard house 	<ul style="list-style-type: none"> • Width 1m • Using as parking 	<ul style="list-style-type: none"> • 2.1m high solid plastered brick wall with perforated metal fence at top up to 1st floor 	<ul style="list-style-type: none"> • Effective Width around 2.1m • Absence of street furniture zone and trees • Small plants at the edge of footpath
02	<ul style="list-style-type: none"> • 6 storied apartments • Constructed under the rules of BNBC 1996 	<ul style="list-style-type: none"> • Parking • Guard house 	<ul style="list-style-type: none"> • Width 1m • Using for plantation • Soakable green area 	<ul style="list-style-type: none"> • Height .3m • Low height brick boundary wall • No provision for sitting and taking rest 	<ul style="list-style-type: none"> • Effective Width around 2.1m • Absence of street furniture zone and trees • Small plants at the edge of footpath
03	<ul style="list-style-type: none"> • 2 storied residential building • No rule was followed 	<ul style="list-style-type: none"> • Parking • Residential unit 	<ul style="list-style-type: none"> • Width 1m-2m • Have Large tree • Soak able green area • Remained as left-over space 	<ul style="list-style-type: none"> • 1.8 m high solid brick wall with .3m perforated metal fence at top 	<ul style="list-style-type: none"> • Effective Width around 2.1m • Presence of large tree that provide shade for pedestrians • Absence of street furniture zone • Small plants at the edge of footpath • Sometimes used for parking against solid wall
04	<ul style="list-style-type: none"> • 6 storied apartments • Constructed under the rules of BNBC 1996 	<ul style="list-style-type: none"> • Parking • Guard house 	<ul style="list-style-type: none"> • Width 1m • Using for plantation • Soakable green area 	<ul style="list-style-type: none"> • One side with perforated metal screen of mesh & bar • Other side with low height wall (.5m-1m). Partially used as public sitting area. 	<ul style="list-style-type: none"> • Effective Width around 2.1m • Absence of street furniture zone • Presence of large tree
05	<ul style="list-style-type: none"> • 6 storied apartments • Constructed under the rules of BNBC 1996 	<ul style="list-style-type: none"> • Parking • Guard house 	<ul style="list-style-type: none"> • Width 1.5m-2.5m • Using as garden with shaded tree, fountain, • Soakable green area 	<ul style="list-style-type: none"> • Changes in levels (max 150mm per level) • Used as public sitting 	<ul style="list-style-type: none"> • Effective Width around 1.8 m • Absence of street furniture zone and trees

06	<ul style="list-style-type: none"> • 6 storied apartments • Constructed under the rules of BNBC 1996 	<ul style="list-style-type: none"> • Parking • Guard house 	<ul style="list-style-type: none"> • Width 1.5m-2.5m • Using as garden with shaded tree, fountain, • Soakable green area 	<ul style="list-style-type: none"> • Changes in levels (max 150mm per level) • Used as public sitting 	<ul style="list-style-type: none"> • Effective Width around 1.8 m • Presence of few trees • Absence of street furniture zone
07	<ul style="list-style-type: none"> • 6 storied apartments • Constructed under the rules of BNBC 1996 	<ul style="list-style-type: none"> • Parking • Guard house 	<ul style="list-style-type: none"> • Width 1m • Using for plantation • Soakable green area 	<ul style="list-style-type: none"> • Height .6m • low height brick wall used as sitting area 	<ul style="list-style-type: none"> • Effective Width around 1.8 m • Absence of street furniture zone • Presence of large tree
08	<ul style="list-style-type: none"> • 2 storied mixed-use building • No rule was followed 	<ul style="list-style-type: none"> • Shop • Residential unit 	<ul style="list-style-type: none"> • Almost half portion of site has no front setback. • Width of half front setback area 1.5 m • Using as parking space 	<ul style="list-style-type: none"> • Half portion is low (.5m) height perforated fence • Building facade itself has created edge of the street on other part 	<ul style="list-style-type: none"> • Effective Width around 1.8 m • Absence of street furniture zone • Presence of large tree
09	<ul style="list-style-type: none"> • 6 storied apartments • Constructed under the rules of BNBC 1996 	<ul style="list-style-type: none"> • Parking • Coaching Center 	<ul style="list-style-type: none"> • Almost half portion of site has no front setback. • Width of half front setback area 1 m • Paved area • Remained as left-over space 	<ul style="list-style-type: none"> • Half portion is 2m solid boundary wall with .5m perforated barbed wire on top. • Building facade itself has created edge of the street on other part 	<ul style="list-style-type: none"> • Effective Width around 1.5m • Absence of street furniture zone and trees • Small plants at the edge of footpath • Susceptible to become dumping zone • Sometimes unsocial behavior occurred
10	<ul style="list-style-type: none"> • 2 storied mixed-use building • No rule was followed 	<ul style="list-style-type: none"> • Office 	<ul style="list-style-type: none"> • Width 1m-4m • Paved area • Remained as left-over space 	<ul style="list-style-type: none"> • 1.5m solid boundary wall with .1m perforated fence on top 	<ul style="list-style-type: none"> • Effective Width around 1.5m • Absence of street furniture zone • Presence of few trees • Susceptible to become dumping zone • Sometimes used for parking against

					solid wall • Sometimes road side parking can be found
11	<ul style="list-style-type: none"> • 6 storied apartments • Constructed under the rules of BNBC 1996 	<ul style="list-style-type: none"> • Parking • Guard house 	<ul style="list-style-type: none"> • Width 1m • Using for plantation • Soakable green area 	<ul style="list-style-type: none"> • Changes in levels (max .3m per level) • No provision for sitting and taking rest 	<ul style="list-style-type: none"> • Effective Width around 2.1m • Absence of street furniture zone and trees
12	<ul style="list-style-type: none"> • Under construction • Following the rules of BNBC 2008 		<ul style="list-style-type: none"> • Width 1.5m 	<ul style="list-style-type: none"> • Temporary solid wall (2.1m) by metal sheet 	<ul style="list-style-type: none"> • Effective Width around 2.1m • Absence of street furniture zone and trees

According to the above-mentioned observation, street edge of the selected site can be grouped into three basic typologies on the basis of physical and visual connectivity.

5.3.1 Type 01

These types of street edges are both visually and physically impermeable. These are blank walls of the building itself or solid boundary wall along the edge of street, which are generally constructed for extreme privacy and security. However, it has observed that, those creates obstructions for social interactions and do not assure the safety and security. Rather, it is one of the reasons of unsocial behaviors and street crimes as it visually disconnects the people on the footpath from the people inside the private buildings. The area besides unwatched boundary element is very vulnerable to become dumping zone. It is found that, the street besides inactive edges are used for parking of vehicles that often deteriorate the condition of the street. Moreover, these types of street edges convert the front setback areas of building into a leftover space and create negative impacts to the inner private spaces.



Fig. 6: Solid boundary wall
 Source: Author

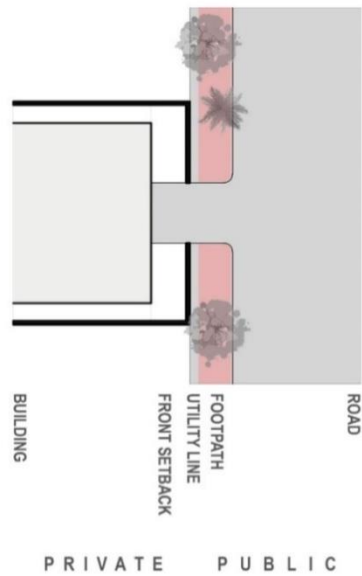


Fig. 7:Formation pattern of type 01A
 (Solid boundary wall)

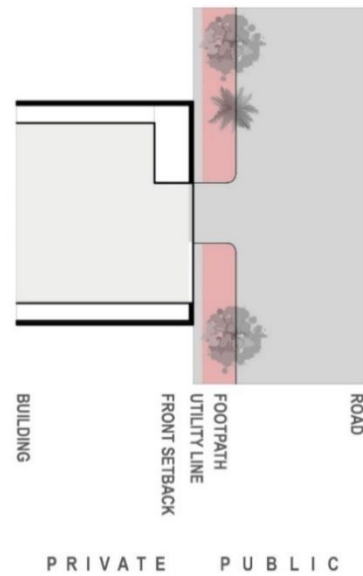


Fig. 8:Formation pattern of type 01B
 (Building itself is creating boundary wall)

5.3.2 Type 02

This type of street edge is visually permeable but physically impermeable. Perforated screen, fences form this type of street edge. In most cases, this type of street edge contributes to safety through natural surveillance, which reduces unsocial behaviors and crimes. It is found that, front setback areas behind this type of edges are used for landscaping to ensure a certain level of privacy.



Fig. 9: Perforated boundary elements
 Source: Author & Google street view

5.3.3 Type 03

This edge treatment along the street allows both visual and physical access between private open space and public space. Low height seating walls and changes in levels form this type of street edge. It is found that, ground floors of most of the buildings are now used for parking area, so privacy for ground level is not the main concern. In this case, security of the building is achieved by designing the front facade properly. Here, front setback areas are used for landscaping and sometimes, seating areas for pedestrians. This enriches pedestrian experience by increasing the level of activities around its edges which makes the street safe. However, the issue has also found that there are no added amenities for pedestrians and shaded trees on the front set back area which can create shade and comfort for users.

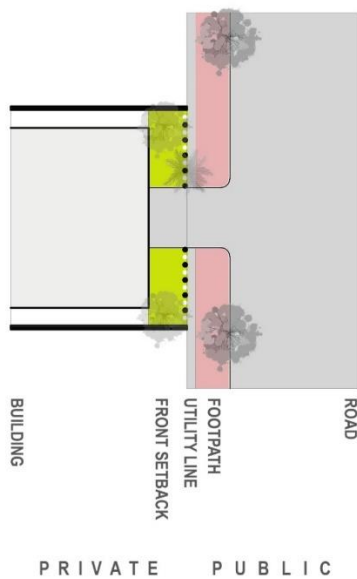


Fig. 10: Formation pattern of type 02



Fig. 11: Formation pattern of type 03

It is evident from the study that, the 'Type 3' street edge contributes in creating a positive impact on the surroundings. This type of edge is visually and physically permeable, as therefore, the setback area does not act as leftover space and pedestrians can use the area for sitting and relaxation purpose. This create a connection between private and public space, which helps to create an active environment and the active environment can provide safety and security for dwellers as well as commuters.



Fig. 12: Low height boundary elements and changes in levels
Source: Author&Google street view

6. Recommendation & scope for future research

Though visually and physically permeable street edge treatment works better than others, still it has some drawbacks. According to the literature review, we have found that some amenities including street furniture, lighting, drinking facilities and garbage bins can be incorporated to improve overall pedestrian experience. There are outstanding potentials for further investigations on front setback space as a useful way of streetscape plantings to preserve the nature. Research on having shaded trees along with sitting space for pedestrians can open up the alternative dimensions of this study.

7. Conclusion

Street edge characterizes a part of individual building and also represents a part of the entire urban area. Buildings, streets and edge of the streets must be designed as an integral part of the overall design process. An active street edge connects private and public domain and creates well used, safe street environment. The boundary elements which is visually and physically permeable helps to create an active street edge. Previously, there was a common trend in Dhaka to build solid boundary elements in front of residential buildings for privacy and security purpose. But unfortunately, this creates an inactive street environment which leads to unsocial behavior and street crime. However, the trend of incorporating parking spaces and non-residential usage on ground floor in residential building, is increasing day by day. In such context, visually and physically permeable boundary elements can contribute to improve the outdoor public environment while maintaining the security by designing the front facade of the buildings properly. This also allows the pedestrians to enjoy the aesthetics of architectural design of the building and enhance the urban streetscape.

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