INVESTIGATING COMMERCIAL PEDESTRIAN SPACES BASED ON FORM-BASED CODES

CHEN, DAN  
Department of Landscape Architecture, Shanghai Jiao Tong University, China, danchen.gator@sjtu.edu.cn

ZHANG, BO  
Department of Landscape Architecture, Oklahoma State University, zhangboarch@gmail.com

CHE, SHENGQUAN  
Department of Landscape Architecture, Shanghai Jiao Tong University, chsq@sjtu.edu.cn

1 ABSTRACT

Recently, form-based codes have become widely used in North America, with rapid increasing adoptions by different communities since 2003. Considering its popularity, it is essential to know the working mechanism and applicability of a form-based code. In this study, we use eight key elements selected from general form-based code to investigate commercial pedestrian spaces at Yorkville in Toronto, Canada. These eight parameters are: 1) continuity of building façade, 2) distance between buildings and sidewalks, 3) ratio of building height to the width of a street, 4) parking arrangements, 5) open spaces, 6) welcome entrances, 7) attractive windows, and 8) street plantings, which is concluded from the official website of form-based code. Specifically, we use these eight parameters to investigate and analyze the degree of matching between the elements used in Yorkville pedestrian spaces and those required by the general form-based code. In addition, a user-generated photography based analysis is employed to identify the characteristics that attract visitors. By searching photos posted by visitors on Flickr representing positive street experience (3,000 photos), we observe and analyze the elements perceived in those pedestrian streets. The results of this study characterize the features of popular pedestrian spaces that match those in the general form-based code. In addition, we identify the elements that are required by the form-based code but are not evident in the photo pool, and the elements suggested by visitor’s photos but are not mentioned in the form-based code. These mismatches also suggest several possible improvements over the current form-based code.

1.1 Keywords

Form-base code, pedestrian spaces, design elements
2 INTRODUCTION

2.1 Form-based codes

A form-based code is a regulation generated through controlling physical form of buildings and spaces to foster predictable urban forms, which is different from a traditional zoning plan. Conventional zoning plan separates various zoning based on land use, which brings many problems to the urban development of past half-century (Sitkowski, 2006). It divides lands and communities into zones of apartments, large houses, small house, education, offices and industry. To move among these areas, people have to drive, causing problems to modern cities including urban sprawl, population clustered by income, unfriendly transportation to pedestrians, and the disappearance of social gathering places, as discussed in the book “The Death and Life of Great American Cities” by Jane Jacobs (1961).

Separating incompatible land uses is reasonable, such as industrial areas and residential areas, while many land uses are compatible, effectively mixed land use bring benefits to communities. Form based codes encourages a mix of land use, and is what New Urbanism promotes. Conventional zoning regulates density use, floor area ratio, setbacks, parking requirements, maximum building heights, etc. In another way, form-based codes regulate street and building types, build to lines, number of floors, and percentage of built site frontage (Parolek et al. 2008). Form-based codes consider the development regulation from a new perspective. They help to build safe neighborhoods, communities and streets which are friendly to pedestrian, and preserve community history and environment.

A form-based code consists of a regulation plan, that mainly includes public standards building standards, and administration. A regulating plan is a map of the regulated area locating the areas where different form standards apply. Public standards regulate elements in the public area, such as sidewalk, travel lanes, on-street parking, street trees and furniture, etc (Parolek et al. 2008). An effective public standard creates comfortable and useful spaces for many activities, including walking, bicycling, driving, public transit, and relaxing. They ensure that the public space works for everyone, rather than just for transportation. Building standard control configurations, and function of buildings, include distances from buildings to sidewalks, the minimum window area of a building, ratios of buildings' height to the width of the streets, accessibility of front entrances, and building’s parking. Lastly, the administration ensures the application and review process (Parolek et al. 2008).

In addition, a form-based code may include the following aspects: architectural standards controlling the materials and qualities of building facades; landscaping standards controlling landscape design; signage standard controlling sizes, materials, illumination and location of signage; and environment resource standards controlling issues like storm water drainage, tree protection, low impact development, etc (Parolek et al. 2008).

Recently, more and more communities have adopted form-based codes in North America, especially since 2011, showing the wide application of form based codes. However, form-based codes have their inherently flaws, such as incompleteness and expensiveness. For instance, form-based code is not as easy to understand as it mentioned. In addition, a code that is conceptual easy does not mean it is easy to implement. To simplify form-based codes, only those standards that are necessary should be established. Despite these flaws, form-based codes are predictable, well-illustrated, mixed use oriented, and address regional and local scale.

In this study, we use eight main characters of form-based codes to study Yorkville area (Parolek et al. 2008). The eight parameters are: 1) continuity of building façade, 2) distance between buildings and sidewalks, 3) ratio of building height to the width of a street, 4) parking arrangements, 5) open spaces, 6) welcome entrances, 7) attractive windows, and 8) street plantings, concluded from "Form Based Codes: a guide for planners, urban designers, municipalities, and developers" by Parolek et al. (2008). To indicate the application value of form-based codes, we study Yorkville that is a historical and successful commercial area, discuss how important element of form-based codes are applied in Yorkville, and is there any other element that a successful place may have. This paper aims to prove the value of key characteristics from form-based codes and investigate the essential characteristics of a popular mixed land use (commercial and residential).
2.2 Yorkville in Toronto

The village of Yorkville was founded in 1830 as a residential suburb. The Victorian-style residential architectures and the pedestrian friendly neighborhood survive until today. With the opening of many high end businesses, Yorkville was becoming a top grade commercial area in City of Toronto in 1980s (Figure 1)

In this article, we study the southwest part of Yorkville, with a north boundary of Scollard St and an east boundary of Yong St. The total area is around 2,000,000 square feet. Most streets in Yorkville consist of two lanes for general traffic, and they are highly walkable and encourage pedestrian experience.

![Figure 1. The map of Yorkville and boundary of the study area (Edited from Google map2014)](image)

Today, Yorkville is an upscale shopping and residential district in Toronto, Canada, including the Holt Renfrew store on Bloor Street, Luxury hotels such as Four Seasons, Canada's largest museum and the fifth largest in North America, the Royal Ontario Museum, and Toronto's most expensive, etc. Since it is a successful model for a popular neighborhood, this study selects the southwest part of Yorkville to study the essential elements that consist of this commercial-residential mixed used area.

2.3 Yorkville Park

In 1993, the land Yorkville Park was built on was used as a parking lot. Local residences insist that they needed a park here as early as 1950s, which encourage the built of this park. The objectives of this park are: "to reflect and extend the Victorian scale and character of the original village; to provide ecological opportunities and display of native plant species and communities; to provide a variety of spatial and sensory experiences; and to link the park to existing pedestrian walkways and adjacent areas.

To achieve these objectives the park was divided into ten different gardens with distinct spaces, reflecting landscapes of Canada - pine grove, prairie, marsh, orchard, rock outcropping and so on. The ten gardens are arranged in the layout style of the nineteenth century row houses, extending the character of this Victorian style. The Village of Yorkville Park becomes a local landmark since its completion in 1994, though its size is small.

3 METHODOLOGY

In this study, we use the eight key elements previously stated to investigate commercial pedestrian spaces at Yorkville in Toronto, Canada. Specifically, we use these eight parameters to investigate and analyze the degree of matching between the elements used in Yorkville pedestrian spaces and those required by the general form-based code.

Besides the study of the eight parameters, a user-generated photography-based analysis is employed to identify the characteristics that attract visitors. This method is sourced from photo elicitation which is based on the simple idea of inserting a photograph into a research interview (Harper, 2002). Stepchenkova & Zhan (2010) applied the user-generated photography to compare the projected and
perceived tourism destination. To study visitors’ experience, photos are more effective than words alone. This study adapts the user-generate photography method to study the essential elements from form-based codes and Yorkville neighborhood.

Flickr is one of the best websites for photo management, and attracts a large number of users all around the world. After searching “Yorkville, Toronto”, all photos under this theme are shown, and we choose the top 3,000 photos on December 07, 2014. By searching photos posted by visitors on Flickr representing positive street experience, we are able to observe and analyze the elements perceived in those pedestrian streets. For each photo, all elements shown in the photo are recorded, and the numbers are counted to get percentages. For example, for each element, we computed the number of times that this element appears in the total of 3000 photos.

The results of this study characterize the features of popular pedestrian spaces that match those in the general form-based code. In addition, we identify the elements that are required by the form-based code but are not evident in the photo pool, and the elements suggested by visitor’s photos but are not mentioned in the form-based code. These mismatches also suggest several possible improvements over the current form-based codes. In general, all parameters keep the characters derived from the overall historic and aesthetic values of buildings, streets and open spaces together.

4 RESULTS
4.1 Application of eight parameters presented in Yorkville

4.1.1 Continuity of building facade

The architectures in Yorkville are well preserved with consistent house forms reflecting the unique mix of Victorian Toronto life. Among almost 200 properties in Yorkville, more than 65% were built before 1900, and there are 39 properties were built even earlier. These buildings have a coherent sense of scale, material, and rhythm (Yorkville-Hazelton Area Heritage Conservation District Plan, 2002).

The buildings have a mixture of 19th century housing types, built close together and sharing a similar experience with the street (Figure 2). These human-scaled commercial/industrial properties are built of wood, stucco, and brick. Building facades are unified with building style, color, or material. There are consistent floor heights from 2 to 3 stories throughout, with steep pitched gables, foundations, porches, front steps and window openings that vary from street to street and by their scale. The form, rhythm, proportions and texture of steep pitched gables support the heritage character of the individual building and the whole area. Porches, porticos, and exterior stairs are integral to the principal elevation and have a similar proportion and an open appearance to traditional porches in the District. Brick is the predominant material in this District.

Figure 2. Boutiques in Yorkville (Photo by Author)
4.1.2 Distance between buildings and sidewalks (streets)

The consistent relationship between a house (front door) to the sidewalk and the street lies on the distances between buildings and sidewalks, and these spaces are taken advantages to be used as planting areas, plazas, steps, and seating areas. These diverse spaces provide various opportunities for visitors. The planting areas improve and beauty the environment, and the plazas and seating areas create places for gathering, talking and relaxing. Figure 3 shows a typical place in Yorkville where there are gathering spaces between buildings and sidewalks. For instance, the Yorkville Ave, with an 80’ building-face-to-building-face width has an approximate 20’ to 30’ relationship between front doors and sidewalks on both sides of the street which are wide in the district. Several internal streets have 50’-60’ building-face-to-building-face distances and approximately 12’ to 24’ relationship between front doors and the sidewalk. In general, these spaces benefit the pedestrian environment and help build a walking friendly neighborhood.

4.1.3 Ratio of building to height to width of a street

We use W to represent the width of a street, and H to represent the height of the building along that street. If W/H<1, the space is enclosed, long and narrow, providing a driving force of moving forward. If W/H=1, there is a balance between width and height, and there is no obvious feeling of enclosed or open. In this situation, it is better to adding plants or art installations along the street (Figure 3). If W/H>1, the enclosed feeling decreases, with a sense of open. If W/H>4, the space loses the relationship between two sides of a street. Previous studies (Yoshinobu, 2002, etc.) show that people prefer enclosed spaces without any sense of oppression from buildings; therefore, a favorite ratio of W/H is between 1 and 2.

Compared to modern streets, streets of old time have smaller ratios of W/H, and create intimate feelings. It is the function that determines the scale of streets. The street spaces for automobile are absolutely different from those for pedestrians. As a modern city, wide streets are required for City of Toronto considering the large traffic flow. Though Bloor Street is 20meters wide, its ratio of W/H is still smaller than 1 because of the high-rise along Bloor Street.

The ratio of building height to the width of a street varies in the study area. The buildings are generally located between 12’ and 30’ from the street. In general, the ratio is high, and greater than 1:1. There are many pedestrian streets with a width of only 2 to 3 meters. This human-scale street interprets the intimate lifestyle in the old time to visitors.

**Figure 3.** Different street scales in Yorkville(Photo by Author)
4.1.4 Parking arrangements

There is a large parking building in the study area, and the first floor is used for commercial. Besides the parking building, on street parking is encouraged (Figure 4). Parking is allocated primarily to the street with few cars between building face and the street. Comparing to other ways of parking, on street parking is convenient and economic. In Yorkville, where luxury cars are more likely to appear, on street parking becomes an attraction. In addition, street parking helps reduce the traffic flow and create a street that friendly to pedestrians.

Figure 4. Parking arrangements (Photo by Author)

4.1.5 Open spaces

As mentioned before, the Yorkville Park is arranged in the layout pattern of the nineteenth century row houses to express the Victorian style of collecting landscapes of Ontario. The park is a bridge between the old neighborhood to the left and the high rises of Toronto’s urban redevelopment to the right and beyond. In addition, the divided park creates diversity experiences and extends the spatial depth, therefore, increase the perceived size of this one acre park.

It has been found that open spaces provide social, health, economic, and environmental advantages to cities (Woolley, 2003; Waits, 2008; Garvin & Brands, 2011). With the Village of Yorkville Park being fifteen years old, it is clear that these benefits have been reached. This place, which used to be a parking lot, has been transformed to an attractive oasis providing year-round interest for relaxing, dating, tourism, etc. The park now serves as a popular meeting place for residents, business owners and tourists.

Here we discuss several points proposed by the project statement of Village of Yorkville Park from the website of 2012 ASLA Professional Awards, which are transparent “rain curtain”, steel arbor, granite outcrop, and some seating opportunities.

Transparent Rain Curtain: The transparent “rain curtain” fountain provides an experience of raining, as well as creates white noise during the warm seasons and become ices in the winter seasons (Figure 5). In addition, the “rain curtain” separates the park into two parts, where the granite outcrop part is busier and another part that is more quite. This transparent “rain curtain” works as a screen which appears in the traditional Chinese indoor design and it frames views.

Steel Arbor: The galvanized steel arbor aligns with an adjacent mid-block passageway, connecting the park to Bloor Street (Figure 5) and mixing the park into the entire layout of Yorkville area. The material and color of the steel arbor is same to the rain curtain, with a sense of sculpture. The arbor has become a popular sitting place for talking and reading. The pavement under the steel arbor breaks the stiffness of straight lines, and the passageway keeps the human-scale experience.
Granite outcrop: A reconstructed native Muskoka granite outcrop creates the dominating terrain feature of the park, and provides visitors a high perspective to observe the whole area (Figure 6). This place provides a vantage place with high-rise as its background, and it is the most popular and busiest space in the park. Many activities happen here, including meet, talk, eat, and relax. People observe surroundings and they are observed.

Seating opportunities: Seating opportunities are everywhere throughout the Yorkville Park, including movable cafe tables and chairs, built-in seats at the arbor, stone slabs with suitable height (Figure 6), the granite outcrop, as well as seat concrete rings in the area of Pine grove. These seating opportunities are design to be well involved into the landscape. Visitors have many choices to use the diverse spaces created in this park.

Figure 5. Transparent rain curtain and steel arbor. 
Source: http://www.bloor-yorkville.com/Photo-Gallery.aspx

Figure 6. Granite outcrop; Source: http://www.bloor-yorkville.com/Photo-Gallery.aspx and seating opportunities (Photo by Author)

4.1.6 Welcome entrances

Doors located on the principal elevations are an important expression of the character and architectural style of the building in study area and they are the linkage between public and private realms.
To attract visitors, the store entrances in Yorkville usually are carefully designed with novel forms and detail decorations. Front doors must face the street, with clear sight lines to the sidewalk (Figure 7). Most of the entrances have awning to be a transaction between interior and exterior. The style and material of these entrances represent the building culture of Yorkville. In addition, glass entrance is used quite often, which connect interior and exterior and create rich hierarchies.

4.1.7 Attractive windows

Windows are essential to the overall architectural character of the building, and attractive windows is definitely a remarkably feature in Yorkville (Figure 7). The window proportions in the District are generally vertical and rectangular. Windows and other openings in the visible elevation of the additions repeat the proportions, location and rhythm of windows in the existing building. Large glass windows with a superb collection of beautiful goods connect interior and exterior, and attract visitors to stop and shop. During the night, bright and colorful windows light up the whole area and form a flourishing and safe commercial area.

Figure 7. Welcome entrance and attractive windows (Photo by Author)

4.1.8 Street plantings

Views created by the canopy of street trees, boulevards and sidewalks are essential to the experience of the district. There are various types of street plantings, including alee-trees, shade trees, flowerbeds and tubs, and climbing trees. Most streets are lined with mature deciduous trees that creating an intimate street shed and enclosure spaces that is losing on the other streets in the district. Besides mature trees, sidewalks are complimented by small, intensely planted front yard gardens, and other planting boxes and containers. Most trees are native in the area which includes Freeman Maple Autumn Blaze, Red Oak and White Ash. Planting beds and grass treatment along the boulevards are maintained well, with proper drainage system.

4.2 Photo elicitation

A total of 3,000 photos from the Flickr were used in this study. The frequency of each parameter is shown in Table 1. The attractive windows are the primary parameter that is photographed by most people, followed by street plantings, open spaces, welcome entrances, continuity of building facade, ratio of building height to the width of a street, and distance between buildings and sidewalks. Nearly half of the photos (49.7%) are related to attractive windows, indicating its essential influence to visitors’ experience. Street planting is the second most important parameter from the photo elicitation, showing that visitors directly experience them and that they are fundamental to the district. The next important parameter is open space.
which becomes a landmark in Yorkville. In addition, entrances are also noticed by visitors, reflecting the successful design.

**Table 1.** The frequency percentage of eight parameters showed in the photo elicitation study

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuity of building façade</td>
<td>8.3%</td>
</tr>
<tr>
<td>Distance between buildings and sidewalks</td>
<td>6.5%</td>
</tr>
<tr>
<td>Ratio of building height to the width of a street</td>
<td>7.2%</td>
</tr>
<tr>
<td>Parking arrangements</td>
<td>5.8%</td>
</tr>
<tr>
<td>Open space</td>
<td>27.3%</td>
</tr>
<tr>
<td>Welcome entrances</td>
<td>20.7%</td>
</tr>
<tr>
<td>Attractive windows</td>
<td>49.7%</td>
</tr>
<tr>
<td>Street plantings</td>
<td>29.5%</td>
</tr>
</tbody>
</table>

In addition, there are other elements that often appear in photos, see Table 2. This table shows that activity is captured more often than other elements, followed by night scene, art installations, residential property, and so on. The popular activities reflected from photos are Icefest, Holiday Magic, automobile exhibitions, World Pride, and other local events. The reasons that Yorkville attracts so many activities are 1) Yorkville Park provides various spaces serving different types of activities; 2) Yorkville is one of Canada’s most fashionable shopping districts; 3) historical and cultural background (by the 1960’s Yorkville was the heart of one of Toronto’s finest and most creative arts communities, and is known as the Canadian capital of the hippie movement). In addition, the night scene is another key element that attracts visitors. Art installations represent art, culture, and aesthetic, which is essential to a livable commercial district, especially a historical commercial district. Residential properties retain and extend the Victoria-style of this area, forming the character of this district.

**Table 2.** The frequency percentage of other elements showed in the photo elicitation study

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Art installations (sculptures, clock, drawings)</td>
<td>8.1%</td>
</tr>
<tr>
<td>Activities</td>
<td>17.6%</td>
</tr>
<tr>
<td>Night scene</td>
<td>12.0%</td>
</tr>
<tr>
<td>Residential property</td>
<td>8.1%</td>
</tr>
<tr>
<td>People</td>
<td>7.0%</td>
</tr>
<tr>
<td>Architecture (Museum, church, fire station)</td>
<td>3.6%</td>
</tr>
<tr>
<td>Landscape Furniture(fountains, advertisement, light)</td>
<td>5.2%</td>
</tr>
<tr>
<td>Diverse Pavement</td>
<td>1.7%</td>
</tr>
<tr>
<td>Others(Interior, food, Motorcycle)</td>
<td>8.0%</td>
</tr>
</tbody>
</table>

**5 DISCUSSION & CONCLUSIONS**

In general, all eight parameters play important role in attracting and impressing visitors. The most influential parameters are open spaces, welcome entrances, attractive windows, and street plantings. The Yorkville Park, as the major open space in the study area, reflects the scale and context of the neighborhood, incorporates the native ecology of the surrounding region, and make connections with the circulation of local streets and a system of midblock passageways, therefore, creating a sense of place for local people and an attractive place for visitors. Yorkville Park celebrates the history of Yorkville and reflects the diversity of the Canadian landscape. The attractive windows are the soul of the commercial district, without which this area would be a backwater. The glass windows combine the old building style with modern material and fashion, and project the cultural inheritance. More important, they pass the information that comprises the sense of the place, as well as the welcome entrance.

Entrances are important elements on the principal elevation and should address the street and be clearly visible. Style and type of doors reflect the character and the architectural style of the building. The
scale of humanity of entrance invites people, and contributes to the popularity of Yorkville. Finally, various types of street plantings provide shades, green, sense of nature, and colorful views to visitors, which is absolutely one of the most important elements to attract visitors in a shopping district.

In addition, continuity of building façade, distance between buildings and sidewalks, ratio of building height to the width of a street, and parking arrangements are essential for creating a friendly space and neighborhood, though they do not happen as frequently as the other four parameters. The continuity of building façade assures the quality of the overall architecture, and keeps visitors' visual perception in a stable mode, which is essential for creating a sense of continuous space and a sense of place. The similar architectural style and overall proportions of the residential buildings balance and complement one another. Distance between buildings and sidewalks takes advantage of small spaces to provide more choices and activity opportunities to visitors, which makes the spaces more diverse and friendly to pedestrians. The high ratio of building height to the width of a street creates various scale of pedestrian streets, from human scale paths to automobile streets, making Yorkville thriving. Two types of parking arrangements meet the requirements, and form this area making Yorkville a car exhibition show district.

Moreover, some other elements attract the camera; activities and night scenes highly occur in the photo elicitation. The reason for highly noticed activities and night scenes lies in the spaces that designers created, which include the parameters that help create this kind of place. Therefore, we believe that the high frequency of activities and night scenes is an underlying reflection of the application of the above eight main parameters.

In summary, parameters from form-based codes contribute to the visitors' experience in the study area. Open spaces, welcome entrances, attractive windows, and street plantings are the most influential elements for visitors' experience in Yorkville. While continuity of building façade, distance between buildings and sidewalks, ratio of building height to the width of a street, and parking arrangements are elements that form the space, their frequency of showing in the photos are not high. Besides these eight parameters, activities and night scene are also essential, which also indicate the importance of spatial layout and the main parameters from form-based codes. Therefore, this paper suggests that form-based codes should consider adding regulations on forming open spaces for activities, and regulating light design for night scenes.

6 References


