THE EVOLUTION OF THE SPATIAL ORGANIZATION OF RESIDENTIAL SQUARES

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ABSTRACT

A residential square is a part of the built environment that plays a pivotal role in the quality of life experienced by residents. Architectural design and public policy have significant effects upon the “space” and the “character” of a residential square. Due to rapidly growing populations, changes in styles of architecture, and a focus on rapid construction, many residential squares have been designed in recent decades in ways that ignore one or both of these important factors. This study therefore investigates the spatial organization and main parameters of residential squares that can be relied upon to enhance both the spatial and visual quality of these units of settlement aesthetically.

The author hypothesizes that spatial organization of urban squares, in general, share some common characteristics to those of residential squares. Thus, to understand the spatial organization of urban squares, the first step taken is a comprehensive literature review focusing on the chronological evolution of town squares in history. The next step applies the results in observations and analysis of two residential squares and one small-scale residential unit (cul-de-sac) in Montreal. Relevant secondary sources are used to introduce concepts and frame the importance of the subject. Data for the Montréal case studies is offered in the form of observations, croquis, on-site photography, and spatial analysis based on the principles drawn from the theoretical and historical review. Finally, the analysis of the spatial characteristics of the residential squares examined is used to provide guidelines that may be applied in planning the development and improvement of the spatial quality of residential squares.

Through the steps just described, the results of this study help in understanding the main parameters affecting the spatial quality of residential squares; and identifying and applying the design principles of spatial organization to residential squares. The proposed design principles can enhance both the spatial and visual quality of a residential square aesthetically, leading to the creation of an identifiable unit of settlement.

RÉSUMÉ

Un carré résidentiel fait partie de l'environnement bâti et joue un rôle essentiel dans la qualité de vie des résidents. La conception architecturale et les politiques publiques ont des effets importants sur «l'espace» et le «caractère» d'un carré résidentiel. En raison de la croissance rapide de la population, de l'évolution des styles d'architecture, et des méthodes de construction accélérées, de nombreuses carrés résidentiels ont été conçues au cours des dernières décennies sans égard à l'un ou l'autre de ces facteurs importants. Cette étude étudie donc l'organisation spatiale et les principaux paramètres des carrés résidentiels sur lesquels on peut compter pour améliorer esthétiquement la qualité spatiale et visuelle de ces unités de peuplement..

L'auteur fait hypothèse que l'organisation spatiale des places urbaines, en général, présente certaines caractéristiques communes à celles des places résidentielles. Ainsi, pour comprendre l'organisation spatiale des places urbaines, la première étape consiste en une analyse documentaire exhaustive axée sur l'évolution chronologique des places de ville au cours de l'histoire. La prochaine étape consiste à appliquer les informations ainsi acquises à l'analyse de deux carrées résidentielles et d'une petite unité résidentielle (cul-de-sac) à Montréal. Des sources secondaires sont utilisées pour introduire des concepts pertinents et définir l'importance du sujet. Les données pour les études de cas montréalaises sont présentées sous forme d'observations, de croquis, de photographies sur site et d'analyses spatiales basées sur les principes tirés de l'examen théorique et historique. Enfin, l'analyse des caractéristiques spatiales des carrés résidentiels examinés est utilisée pour fournir des lignes directrices pouvant être appliquées à la planification du développement et de l'amélioration de la qualité spatiale des carrés résidentiels.

En suivant les étapes que nous venons de décrire, les résultats de cette étude aident à comprendre les principaux paramètres affectant la qualité spatiale des places résidentielles; et l'identification et l'application des principes de conception de l'organisation spatiale des places résidentielles. Les principes de conception proposés peuvent améliorer à la fois esthétiquement la qualité spatiale et visuelle d'une place résidentielle, conduisant à la création d'une unité de peuplement identifiable.

ACKNOWLEDGMENTS

The present study is an attempt to clarify the constituent elements of the spatial organization of residential squares, with the help of text and image. To achieve this goal, this study explores urban squares throughout history. Achieving this goal would not have been possible without the sympathetic guidance of my dear Professor Dr. Avi Friedman. The subject of study was his suggestion, and his guidance reflects a long history of dedicated research and teaching in architecture and urban design at McGill University. By highlighting important points and providing effective advice, he made the entire process much easier for me to get through.

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Case study 1: Saint-Louis Square

Place is not good or bad simply because it is real versus surrogate, authentic versus pastiche. People enjoy both, whether it is a place created over centuries, or created instantly. A successful place, like a novel or a movie, engages us actively in an emotional experience orchestrated and organised to communicate purpose and story.

Sircus (2007, p.127)

CHAPTER I

INTRODUCTION

1.1 Rationale of the study

This research is about the spatial organization of residential squares focusing on key physical parameters and what they mean for residential life experiences. It has been argued that a residential square as part of a built environment has a pivotal role in the quality of life experienced by residents (Friedman, 2010; Banerjee & Baer, 1984; Madanipour, 2003; Moughtin, 2003). Good residential squares not only have a close relationship with their inhabitants but also foster "life satisfaction" and the "individual's overall sense of well-being" (Banerjee & Baer, 1984); these positive psychological effects on residents are influenced by the aesthetic aspects of visual and spatial quality of the residential square (Tavassoli, 1997)[1]. This shows that both architectural design and public policy have significant effects upon the "*space*" of a residential square, i.e., the three-dimensional organization of the elements which make up any given place, and its "*character,*" i.e., the general "atmosphere" which is its most comprehensive property[2] (Schulz, 1979; Banerjee & Baer, 1984) (Fig. 1.1). Both designers and public policy makers should therefore be informed of not only the local inhabitants' perceptions of environment, their expectations, and their needs but also the utilization of physical elements in creating spatial structure of inhabitable residential squares (Banerjee & Baer, 1984). A successful residential square cannot be built without considering its "*space*" and "*character*" (Fig. 1.2).

1- The content used in this text is translated by the author to English form the main source: *Principles and Techniques of Urban Design in Iran*, by Mahmood Tavassoli, 1997.
2- To understand the concept of "space" and "character" refer to: *Towards a Phenomenology of Architecture* by Schulz, 1979.

Fig. 1.1. Three-dimensional organization of the elements, Plaza Mayor, Banyoles, Spain, Source: commons.wikimedia.org

Fig. 1.2. Space and Character make up a place, Plaza Mayor, Banyoles, Girona, Spain, Source: www.arquitectes.cat

Many studies of residential areas concentrate on the neighborhood unit *per se*, in accordance with a residential-design paradigm widely used throughout the world, despite the fact that this paradigm has been criticized - because of its non-scientific nature - as imprecise (Banerjee & Baer, 1984) (Fig. 1.3). Many physical and social attributes of a neighborhood unit shape the residential life of its inhabitants, but in most studies the neighborhood unit has been the focal point (Banerjee & Baer, 1984; Berk, 2005). The following spaces are among the physical structures that can be identified within the neighborhood unit (Krier, 1979; Moughtin, 2003; Berk, 2005; Madanipour, 2003) (Fig. 1.4)[3]:

- The "private space" of residential buildings.
- The "collective space" or "semi-public space" of residential buildings (generally known as residential squares[4]).
- The street space (connections) including pedestrian pathway and different types of buildings.
- The "public space" including any type of building (such as town squares).

Fig. 1.3. Clarence Perry's neighborhood concept. Source: Wikipedia

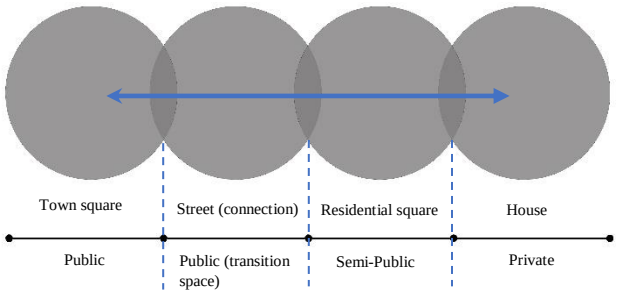


Fig. 1.4. Hierarchy of Space in a neighborhood unit. Source: After Praharaj, 2014

3- Fig. 1.4 is used by the author to diagrammatically illustrate the hierarchy of space in a physical structure of a neighborhood.
4- A residential square can be called a semi-public space but not every semi-public space is a residential square.

Recognizing these divisions is helpful for the purposes of this research. It should be specified at the outset, however, that the focus of this study is not on the "neighborhood unit" but rather on the parts of it called "semi-public spaces" and known as residential squares. For this purpose, town squares are studied to build a better understanding of the design needs of these semi-public spaces called residential squares.

"A square is an area framed by buildings and an area designed to exhibit its buildings to the greatest advantage" (Moughtin, 2003, p.87). Squares are classified by two main factors: "function" and "form" (Moughtin, 2003) (Fig. 1.5). Residential squares have an important role in the constitution of neighborhood units (Friedman, 2010). Cultural and social issues, population, climate, and topography are factors that affect both the "form" and "function" of residential squares (Moughtin, 2003). Due to rapidly growing populations, changes in styles of architecture, and a focus on rapid construction many residential squares have been designed in recent decades in ways that ignore one or both of these important factors of residential squares (Friedman, 2010).

Fig. 1.5. Piazza-Del-Campo-Dall'alto, Siena, Italy. Source: www.gogofirenze.it

The concept of a residential square with surrounding houses may be the most significant thought of urban design and planning (Moughtin, 2003; Madanipour, 2003). Failing to appreciate the importance of its visual and spatial quality to inhabitants' perception of the environment can result in the devastation of the kinds of small-scale units called "micro-urbanism" (Moughtin,

2003; Madanipour, 2003). Considering the value of “micro-urbanism” can ameliorate the design and development of “small-scale” units called residential squares: semi-public residential units capable of extending private intimate space beyond the home (Madanipour, 2003) (Fig. 1.6).

Fig. 1.6. Chatham square, a semi-public unit in Alexandria, Northern Virginia, USA. Source: nvaha.org

It has often been suggested that the full, proper perception of space has been largely lost in today’s urban world (Krier, 1979; Tavassoli, 2016). Identifying and analyzing the functional and aesthetic aspects of urban space requires considering the design of urban spaces throughout history, and the designer who deals with urban space today needs to understand this evolutionary process (Tavassoli,1997). This study proceeds from Edmond Bacon’s principle that thoughtlessness or confusion in designing an urban space will result in the inability of its users to properly perceive and experience it. From this point of view, the current weakness of design in residential squares can be attributed to the lack of a coherent perception of space consolidated from meaningful past experiences (Bacon, 1976).

In recent decades, not much attention has been paid to residential squares *per se*: only buildings are considered, and usually only individually (Tavassoli, 2016). Although there have been many changes made in terms of appearance and proportionality in comparison with other existing buildings, residential squares and urban spaces have been reduced to make construction more profitable (Tavassoli, 1997). In residential squares of new neighborhoods, the similarity in the physical appearance of buildings and the lack of attention to fundamental constituent elements have made these units of settlement monotonous and tedious (Moughtin et al, 1999) (Fig. 1.7).

The continuous erection of buildings pursued on a given piece of land without due consideration for details such as the relationships between the buildings' forms, uniformity, dimension and proportion, the angle of the land with respect to the streets, and the location of monuments or other three-dimensional elements has a negative effect on the visual and functional aspects of residential squares (Moughtin, 2003). They cease to be recognizable, valued everyday life environments, which has a direct impact on inhabitants' levels of "life satisfaction" and their basic human sense of "well-being" (Banerjee & Baer, 1984). The intention of this study is therefore to understand the constituent parameters of the spatial organization of residential squares in order to enhance both the spatial and visual quality of these units of settlement aesthetically.

Fig. 1.7. Left and Right: A monotonous residential square, Cedar Glen Apartments- Philadelphia, USA. Source: www.apartmentfinder.com

1.2 Theoretical Framework

Since this research is intended to explore the spatial organization of residential squares, the main key parameters of town squares, both physical and perceptual, are considered in a chronological process. This study argues that the residential square plays an important role in the structure of the city, and that due to its close relationship with inhabitants it can enhance "life satisfaction" and the "individual's overall sense of well-being" (Banerjee & Baer, 1984). However, the problems of urbanization as we now it today have diminished the attention paid to this small urban cell in the hierarchical structure of the city. In discussing the importance of the spatial organization of residential squares, Zucker argued in *Town and Square* (1970) that "the unique relationship between the open area of the square [here the residential square], the surrounding buildings, and the sky above creates a genuine emotional experience comparable to the impact of any other work of art." He emphasized the correlation of these elements as a proper focal point of

urban design. Later scholars such as Moughtin (2003) employed the same approach. Krier, for example, described the needs of urban space (1979, p.15) in these terms: “It is only the clear legibility of its geometrical characteristics and aesthetic qualities which allows us consciously to perceive external space as urban space.” In building upon the work of such authors, Webb (1990) argues that older squares have fewer spatial difficulties rather than new spaces designed by planners preoccupied with other needs.

In this context, the advantages of considering the development of residential squares with a historical lens is clear. Reviewing historical practice alone cannot, however, address more recent needs and lifestyles. New knowledge and technologies are required to respond to new needs. This study therefore concentrates on the evolution of the key parameters of urban squares throughout history to use them as indicators to understand the main parameters of spatial organization of residential squares in order to bring them up-to-date based on the new needs, the new knowledge, and the new technologies involved in enhancing both the spatial and visual quality of residential squares aesthetically today.

1.3 Research Question

What are the key parameters of a residential square that can enhance its spatial and visual quality aesthetically and make it a more identifiable[5] unit in the built environment?

1.4 Goals and Objectives

The main goal of this study is to understand the main parameters of the spatial organization of residential squares in order to enhance both spatial and visual quality of these units of settlement aesthetically. Thus, this study is, first, intended to explore the evolution of the spatial organization of town squares, using the method of literature review to understand the physical and perceptual characteristics of their main constituent elements. Second, the results that emerge from this investigation of town squares will be applied in case study analysis, and finally, the results from the case study analysis will be applied in providing design criteria for the semi-public spaces known as residential squares, addressing the major physical and perceptual parameters involved in making them identifiable spaces. The main objectives of this research are therefore in short the following:

5- Identifiable space here implies physical and spatial characteristics of a space which make the space unique.

- To elucidate the relationship between the spatial and visual qualities, and the physical organization of the residential squares.
- To evaluate the spatial organization of residential squares in recent design practices.
- To provide design guidelines and criteria for future development of residential squares in Montréal.

1.5 Intended Audience

The expected fruits of this study concern professionals and non-professionals who have an effective role in shaping the spatial organization of residential squares: architects, urban designers, public policymakers, urban planners, and environmental designers. Moreover, scholars and researchers in related fields or with similar subjects of interest will be able to benefit from the literature review, methodology, and analysis.

1.6 Methodology

The methodology used in this study is first to explore the constituent parameters of urban squares. To achieve this, a comprehensive literature review focusing on a chronological review of the evolution of town squares in history is pursued. The literature review discusses Zucker's *Town and Square* (1970), Krier's *Urban Space* (1979), and Webb's *The City Square* (1990) in depth. The chronological evolution of town squares is traced using these sources. This extensive survey of urban squares' typology and morphology throughout history includes photos and sketches making the relevant developments and principles as clear as possible for readers.

Second, a Table of indicators (design principles) obtained from Chapter 2 is used to examine case studies in detail. The analysis of the case studies offered in Chapter 3 uses Carmona's *Public Spaces, Urban Spaces* (2003), and *Spatial Spaces* (2012); Moughtin's *Urban Design, Ornament and Decoration* (1999), and *Urban Design, Street and Square* (2003); and Friedman's *Fundamental of Sustainable Neighborhoods* (2015).

Finally, the results of the literature review (Chapter 2) and the analysis of the case studies (Chapter 3) are applied in Chapter 4, providing design guidelines and strategies capable of improving the visual and spatial quality of residential squares in Montreal.

1.7 Scope and Limitations

The case studies are not involved with the personal territories of participants. Therefore, there is no foreseeable harm at all.

1.8 Research Outline

The study is organized into 4 Chapters. Chapter 1 describes the rationale of the research in terms of the importance of visual and spatial quality of residential squares to quality of life experience, and the residential square as a research and design problem (*problématique*). Chapter 1 also describes the approach, method of research, and scope of the study.

Chapter 2 is divided into two parts. Part 1 provides a detailed definition of urban space and in particular the town square, and offers a comprehensive introduction to the morphological study and classification of town squares based on their aesthetic aspects. Part 2 provides a chronological review of the evolution of town squares throughout history with an emphasis on their physical aspects. Finally, a table identifying the major elements (physical and perceptual) of the structure of town squares is provided that can be used to analyze the case studies of residential squares in Chapter 3.

Chapter 3 concentrates on the case studies of two residential squares and one small-scale residential unit (cul-de-sac)[6] in Montreal that play a significant role in the everyday lives of residents. This chapter summarizes all data collected (observations, sketches, photography) from three case studies and analyzes them according to the main elements introduced in the table offered in Chapter 2. By consolidating the findings and relating them to the issues thus identified, the important constituent parameters of such spaces are analyzed.

Finally, Chapter 4 brings the findings thus obtained together to provide design strategies that could be applied to improve the spatial and visual quality of residential squares in Montréal.

6- Refer to the footnote in Chapter 3.

CHAPTER II - PART I

MORPHOLOGICAL ANALYSIS OF URBAN SQUARES

2.1 Background

Urban space is one of the major elements of the structure of any given city and is always shaped by the history of the area involved (Krier, 1979; Madanipour, 2003; Tavassoli, 2016). This spatial element of a city is always, along with the city's various social, cultural, economic and political activities, at the heart of its identity (Tavassoli, 2016). Because many people today have lost sight of the traditional meaning and importance of urban space, the best way to understand it is to look back at space design throughout history (Krier, 1979; Zucker, 1970; Tavassoli, 2016). Most urban spaces deemed valuable were designed in the past, and they should not be assumed to be obsolete and inefficient elements of their cities (Krier, 1979; Tavassoli, 2016). On the contrary, they sometimes offer the best opportunities for understanding the essence of space design. By comparing the theory and practice of past and present urban spaces, one can better understand the basics and the achievements of urban design.

The urban space design of modern cities faces serious problems in terms of rapidly growing populations and fast construction (Friedman, 2015; Madanipour, 2003; Tavassoli, 2016). The advent of new technologies has also led to people spending most of their time using telecommunication devices at home or at work rather than spending time in shared urban spaces, which has contributed to the death of urban life (Krier, 1979; Friedman, 2015; Tavassoli, 2016). The result is a lack of the kind of awareness and understanding of urban spaces one finds in the past (Krier, 1979). A comparison between a traditional city and a modern city in terms of urban spaces is indicative here. The cohesive urban structure of the traditional city is based on a spatial continuum bringing together the major elements of the city through spatial "barriers" such as streets and squares. A modern city is, on the other hand, often composed of "forlorn" and "isolated

sections" divided by "barriers" that supply little in the way of public *"meaningful activity"* or *"orientation"* (Krier, 1979).

2.2 The concept of urban space and its features

To better understand the concept of urban space and more precisely the meaning of the urban square, this study draws primarily upon the works of Krier (1979), Zucker (1970), and Webb (1990). In theory, urban space is of course an integral part of the urban spatial structure (Madanipour, 2003; Krier, 1979; Tavassoli, 2016). However, not just any space in the city can be considered an urban space. According to Krier (1979), the two main constitutive elements of urban spatial structure are the "street" and the "square." These elements are constituted not only by the dimensions of their surrounding boundaries but also by the patterns of "function" and "circulation" distinctive to these urban spaces involved (Fig. 2.1).

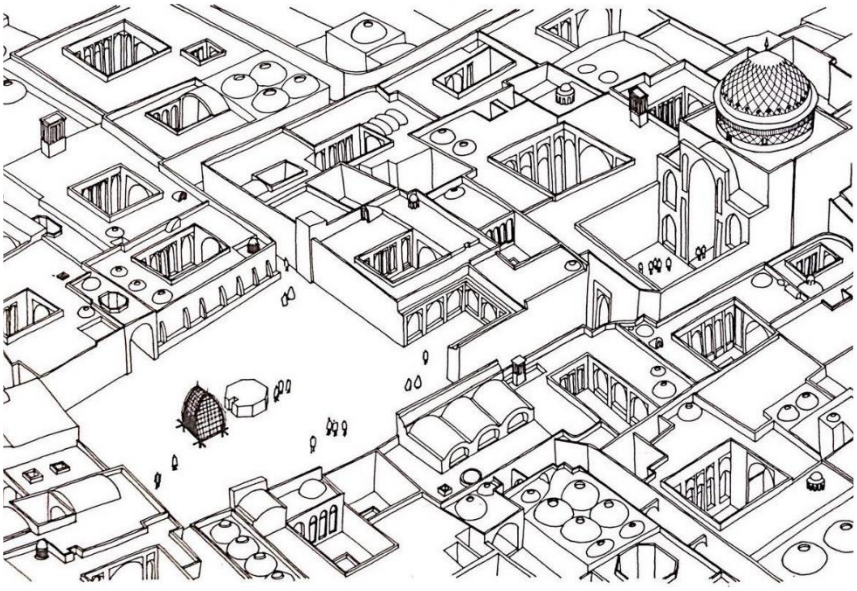


Fig. 2.1. Sa-at neighborhood square, Yazd, Iran. Source: Tavassoli, 2016

According to Krier (1979), the only thing that helps us understand an "external space" as an urban space is its obvious "geometrical" and "aesthetic" aspects. In his book *Urban Space,* he attempts to illustrate the distinction between the "aesthetic" and "emotional factors" involved, but this question is beyond the scope of this study[7]. Other scholars such as Bacon (1967) argue instead

7- To understand the distinction between "aesthetic" and "confused emotional factors" refer to *Urban Space* by Rob Krier, 1979, page 15.

that “form” and “function” are the main characteristics of urban space. Bacon locates the concept of architectural “form” at the juncture of mass and space. Another important aspect - not distinct from space - is “time”, since the spatial perceptions of any given observer will vary over time (Bacon, 1976). For this reason, the conceptual perception of an urban space varies greatly throughout history (Tavassoli, 2016; Bacon, 1976).

2.3 The concept of the square and its characteristics

The square or public courtyard of the city or neighborhood has been, from ancient times to today, been one of the important uses of urban space (Krier, 1979; Tavassoli, 2016). The role of a square in urban structure is to collect houses or other urban elements around an open space. This configuration of space not only provides a high level of interior spatial control, but also makes it more feasible to protect against external encroachment by reducing the external boundaries exposed to attack (Krier, 1979). Urban squares often have symbolic significance, were used early on in constructing sacred places such as the Agora, the Forum, the cloister, and the mosque courtyard (Krier, 1979; Tavassoli, 2016) (Fig. 2.2).

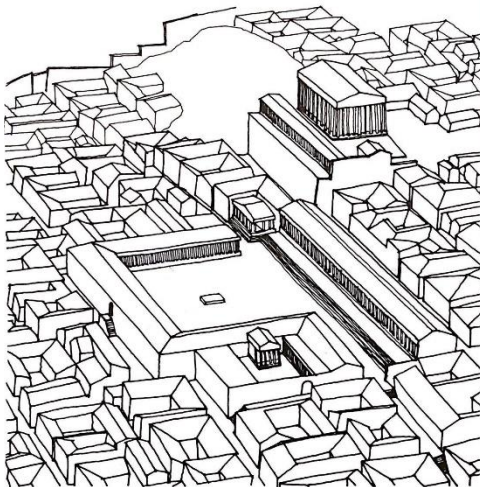


Fig. 2.2. Prien Agora, Greece. Source: Tavassoli, 2016

Zucker (1970) considers the square a vibrant and dynamic part of the city which is constantly changing based on social and economic conditions. Unlike a painting which is finished with the last brush stroke, a square changes over time (Zucker, 1970). According to Zucker, a square is defined by three major “space-confining” components: “the surrounding structures,” the

dimensions of the "floor," and the conceptual "sphere of the sky" overhead. The relationships between these elements offer the user of such a space a unique emotional experience related to the particular aesthetic aspects involved (Fig. 2.3). Changes in any of these three constitutive elements may alter the appearance of the square. The aspects at work include the elements of height, proportion, the design of the "surrounding structure"; the "expansion" and "texture" of the area, and the slope or ground level differences (such as steps) of the "floor." The outlines of "eaves" and "gables," "chimneys" and "towers" also affect the perceived height of the "sky" (Krier, 1979). Another significant factor relied upon in determining the proper relations between these elements that define a square is the important principle of architecture and planning known as "*human scale*[8]*"* (Krier, 1979; Tavassoli, 2016). Any failure to treat human scale as a main guiding principle will result in lack of visual perception for a spectator in the squares (Krier, 1979).

Fig. 2.3. Sopron, Hungary. Source: www.afar.com

The role of human scale in spatial perception leads Zucker (1970) to note further that a space is perceived by the visualization of its boundaries in a "kinesthetic experience." If a space has visual appeal, the observer's sense of movement in space and his visual perceptions work together (Tavassoli, 1997 & 2016). The movement of the observer is influenced and directed by the boundaries of the three-dimensional composition of the space and its structural lines (Krier,

8- The definition of human scale in urban design, in a simple sense, that is, the dimensions of space have a desirable relation to the dimensions of the human body (Burke, 2016; Tavassoli, 1997).

1979). The term "space" means in this case the three-dimensional organization of a given place, based on the "uniformity" and "variety" of the surrounding buildings, their "dimension" and "proportionality," the "streets' angle", and the positions of "monuments" and "fountains" (Zucker, 1970).

Studying urban squares shows that the planning and experience of recently constructed public squares can hardly be compared with past design and experience (Krier, 1979; Friedman, 2015; Tavassoli, 2016). Today's squares are in comparison "plain voids": empty spaces within networks of streets. The only thing that marks them as different from other spaces is that they are "nude spaces" devoid of structures (Zucker, 1970). As mentioned before, two important factors in making a square meaningful are appropriate "function" and appropriate "form" – these can distinguish a square as being in the "right location" within the city (Krier, 1979). Heidegger (1971) in his article "*Building Dwelling Thinking*" similarly stresses the importance of location: "*spaces receive their being from locations and not from space."*

Meaningful "function" relates to the commercial and cultural activities that can give rise to the vitality of a square, making it valuable for residential use (Krier, 1979). For this reason, the fact that the square has survived over the centuries points the social being of humanity as expressed in the cultural and economic activities in such spaces (Tavassoli, 1997 & 2016).

2.4 Typology and morphology of urban square

The typological and morphological study of urban squares can help in understanding the main essence of such spaces (Tavassoli, 2016). This study makes use of the results of the morphological studies undertaken by Krier (1979) and Zucker (1970). The most extensive morphological survey of built squares in history was carried out by Krier (1979). His study shows that a variety of spatial shapes have been used by designers to give new spatial values to the square in every historical period. Two basic types of urban squares are recognized: "regular" or planned squares, and "irregular" or organic squares (Krier, 1979). "Regular" squares with their obvious and precise geometric shapes demand highly elegant and precise architecture. Any architectural "bugs" present are highly visible, and noticeably affect the overall visual perception of the square (Fig. 2.4). In "irregular" forms, diversity is the outstanding aspect. Imperfect architectural details in their structure are not conspicuously visible (Krier, 1979) (Fig. 2.5). Organically developed

squares in “Hellenistic” and “late medieval” towns in European countries provide some of the best examples of “irregular” squares. These spaces are the result of years of urban evolution. In contrast, the squares of ancient Greece are more often based on deliberately developed plans. The gridiron method of planning ascribed to Hippodamus led, for example, to the creation of many such squares (Krier, 1979).

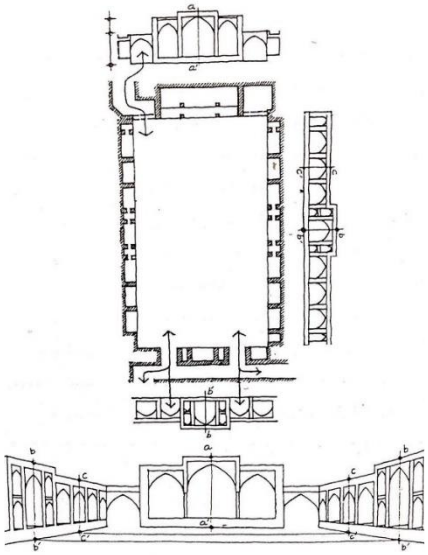


Fig. 2.4. An enclosed space of Vali-Sultan Square, Kashan Iran. Source: Tavassoli, 2016

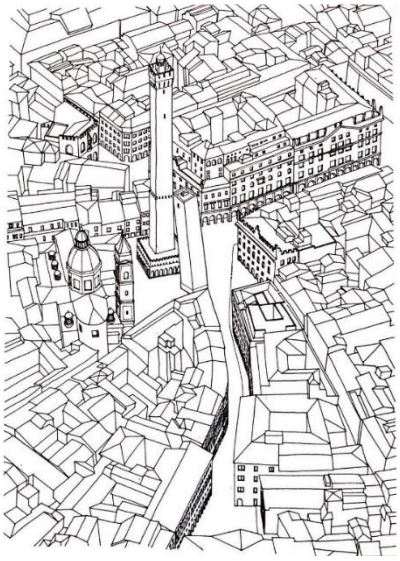


Fig. 2.5. Bologna, Italy. Source: Tavassoli & Bonyadi, 1992

In both types of squares - “regular” and “irregular” - major elements of the square such as the “surrounding structures,” the “individual monuments,” or the “fountains” may change over time; they may disappear, be demolished, or be displaced by new elements (Krier, 1979). Thus, the “form” of the square involved may change fundamentally. These changes in their appearance might occur “physically” due to the growth of new buildings and the transformation or demolition of old ones, or “psychologically” with users’ experiences and reactions to the proportionality and distance within the space in each generation, in line with new approaches to interpreting spatial relations (Krier, 1979). The combination of these “subjective” and “objective” elements affects the perception of the square in question, making the same space appear different to each generation (Krier, 1979).

The “spatial form” of the square can be impacted by several geometrical factors, such as building “sections,” “elevation,” street “intersection,” “scale,” and various “architectural styles” (Krier, 1979). According to Krier, urban squares can be divided into three groups in terms of the

resulting “spatial forms.” Based on the geometrical pattern of the ground floor, these groups are derived from the square, the circle, or the triangle (Krier, 1979) (Fig. 2.6). Each of these primitive geometric shapes can be altered in distinct ways. Any changes in the internal angle, external dimension or both angle and dimension can lead to significant transfiguration. Such changes in their geometric forms make them either a “regular” or an “irregular” square (Krier, 1979).

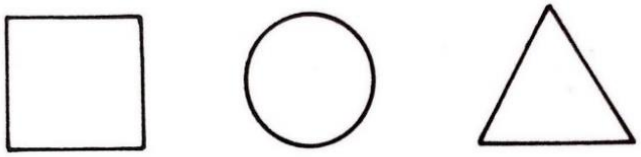


Fig. 2.6. Basic geometrical square shapes. Source: Krier, 1979

2.5 Classification[9] based on aesthetic aspects of squares

Another classification of squares was offered twenty years before Krier by Zucker, who studied the spatial analysis of the square throughout history by considering its aesthetic aspects. He classified squares into five different categories which are non-deterministic and mutable: the “closed square,” the “dominated square,” the “nuclear square,” “grouped squares,” and the “amorphous square.”

2.5.1 Closed square

A “closed square” is a completely enclosed space surrounded by walls, accessible only by a few streets leading in and out. This is the “purest” form of the square, and expresses a desire to avoid getting lost in the space. Two important aspects characteristic to a “closed square” are its “layout” and the reiteration of “identical houses.” The most beautiful architecture is usually located in the corners or in the middle of each side, with a marked emphasis on the entrances. The location of monuments and fountains, the “scale” of individual buildings within the square, the diversification of architectural ornaments, and the proportion between the width and breadth of the place all affect the perception of its spatial organization. The realization of spatial balance depends heavily upon the balance of “horizontal” and “vertical” lines. Colonnades and arched arcades have therefore been used successfully since the Hellenistic era to tie such spaces together visually (Zucker, 1970).

9- The classification of square presented here follows Zuker description in *Town and Square*, 1970.

One of most important features of the “closed square” is its “enclosure” (Krier, 1979). The geometrical outline is of utmost importance in creating the local sense of “enclosure” (Fig. 2.7). Any interruption in the border lines of the space will result in the loss of the sense of a coherent geometrical outline (Krier, 1979).

Fig. 2.7. Left & Right: Piazza del Campo, Siena, Italy. Source: Tavassoli, 1992

2.5.2 The dominated square

In the “dominated square,” one building or group of buildings dominate the open space and the surrounding buildings, directing the visual spatial relations at work in the open area. The “spatial tension” pointing toward the dominant building makes the square more dynamic than the “closed square” which has more of a static balance. The parvis of medieval churches is a good example of this. Whereas the short distance from the church and the limited perspective cause the church façade to be perceived in two dimensions in such squares, Renaissance and baroque squares use greater distance make the dominant built element visible in three dimensions (Fig. 2.8). The space is thereby “*subordinated*” or “*coordinated*” to a dominant building (Zucker, 1970).

Fig. 2.8. Left & Right: Piazza San Marco, Venice, Italy. Source: dissolve.com

2.5.3 The nuclear square

The “nuclear square” is built around a nucleus which is visually strong enough to bring the surrounding space to order and provide a tension that integrates the whole space. The nucleus element could be a fountain, a monument, or an obelisk that can create visual movement toward itself from the surrounding buildings (Fig. 2.9). The size of the square, the nucleus element, and the surrounding structures all affect the creation of this visual tension. Typically, this type of square belongs to the Renaissance (Zucker, 1970).

Fig. 2.9. Jan Hus Monument, Prague, Czech Republic. Source: www.prague.net

2.5.4 The grouped square

In this arrangement, a group of squares are connected either directly or indirectly (Fig. 2.10). Each square is, despite having unique features that provide “individuation,” a part of a higher order or “unity.” Such a combination of squares is mostly found in four types: a series of squares arranged along a straight axis, a group of squares connected at the sides in a “non-axial organization,” a combination of differently shaped squares around a dominant building, or a combination of individual squares which are not connected by definite physical elements but nevertheless show some kind of connectivity in a perceptible spatial continuum between them. The most important characteristic of grouped squares is that their influence on the observer, visually and aesthetically, is based on the mental appreciation of the sequential images of this continuum of spaces (Zucker, 1970).

Fig. 2.10. Nancy grouped urban squares, 1- Place Stanislas; 2- Place Vaudémon; 3- Place de la Carriere and its extension Place d'Alliance; 4- Place Saint-Epreve with one more connected square traffic circle Place Malval. Nancy, France. Source for text and photo: www.urbansquares.com

2.5.5 Amorphous squares

As its name implies, this group represents a "formless," "unorganized," non-unified, shapeless, and relatively aesthetically worthless arrangement. Since every such square displays at least one of the qualities associated with the other types of squares, however, it can not be said to lack all aesthetic value. The disproportionate scales and spaces nevertheless generally spoil the aesthetic value of such a square. This type of square is typical of a nineteenth-century tendency to ignore the three-dimensional aspects involved in favour of building nothing but "crossroads" or "*carrefours*." Another typical nineteenth-century phenomenon was the "stylistic purification" that simply demolished the structures surrounding a dominant building within a square to create an open area that did not actually contribute to any particular cohesive three-dimensional perception (Zucker, 1970).

CHAPTER II - PART II

HISTORICAL ANALYSIS OF URBAN SQUARES[10]

2.6 Ancient time

The gridiron system of urban planning in ancient civilizations served to provide "order" and "regularity" in a time of potentially chaotic growth (Zucker, 1970). This system provided orientation in the face of uncertain environments (Schulz, 1979; Zucker, 1970). For these reasons, it is impossible to attribute this system to one particular dwelling area in the world. Ancient Indian civilization was the first known place that the gridiron system of planning appeared, without anything like a town square area (Zucker, 1970). Evidence from the archaeological excavations of Indian towns like Mohenjo-Daro and Harappa testify to the presence of planned cities as far back as 2500 B.C (Fig. 2.11). Only few open spaces can be found within these entire cities, and none of them show signs of being designed as a square.

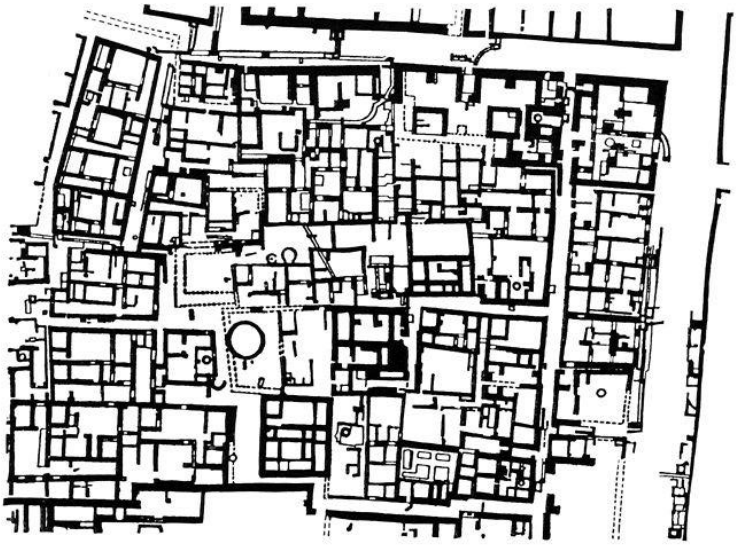


Fig. 2.11. Plan of Mohenjo-daro. Source: www.ancientindia.co.uk

10- Historical analysis presented here follows Zuker description in *Town and Square*, 1970.

In the Mesopotamian era, from Sumer to Babylon, there were no squares found in towns. There existed only open spaces between palaces and houses in some towns such as Assur with its topographical pattern of streets – there is no sign of a public space or town square. Fig. 2.12 gives a schematic three-dimensional image of the town of Assur. The square shape does not often appear in Egyptian towns either, and when it does it is neither architecturally defined nor functionally specific (Zucker, 1970).

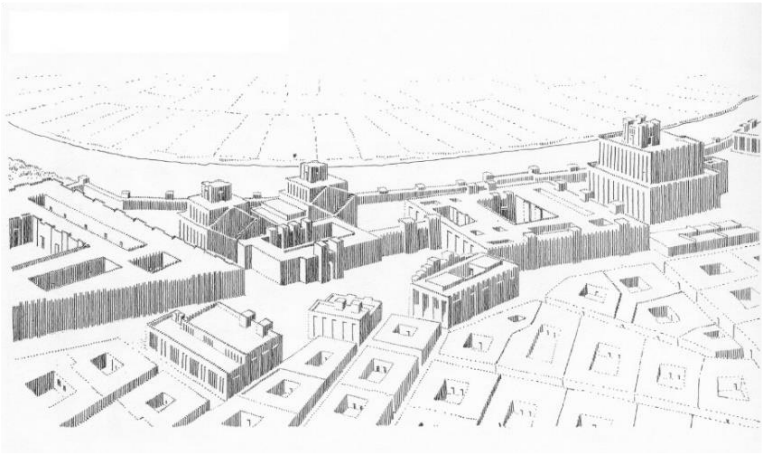


Fig. 2.12. Schematic three-dimensional image of the Assur. Source: topsimages.com

2.7 Ancient Greek squares

Early Greek cities developed from the integration of several pre-existing villages in a process called “synoecism” (Zucker, 1970). Main streets were built on rows of verandas that were later changed into squares. However, they do not seem designed to give any deliberate feeling of space - they were mostly provided to protect inhabitants from rain and sun. Zucker (1979) believes that the two main characteristics of irregular early Greek towns were the acropolis, the nucleus of the town, and connected larger settlements along with a void of irregular shape which later became the agora. The acropolis was known as gathering place but because of its status as a sacred area it cannot be defined as a fully town square (Fig. 2.13). A conscious effort toward the beautification and decoration of these places is obvious, but the design characteristics of spatial structures like human scale and spatial unity seem absent: only the mass and volume of a given structure or statue appears to have been of interest to the artists involved (Zucker, 1970). Over time, acropolis lost its importance as a gathering place to the agora, as population increased.

2.7.1 Summary of characteristics

- No spatial organization
- No clear understanding of space
- Design focus is only on beautification and decoration
- Spatial irregularity in sacred area

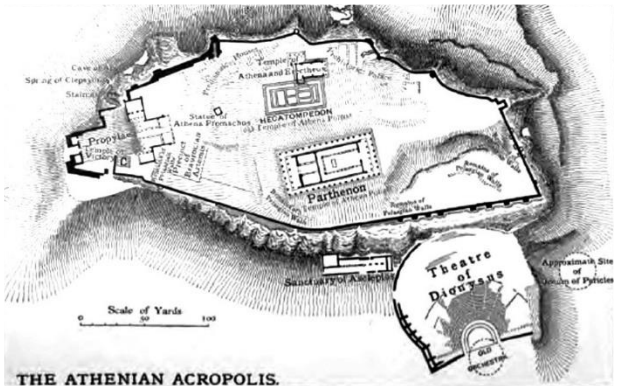


Fig. 2.13. Athens, plan of the Acropolis. Source: www.bible-history.com

2.8 The pre-Hippodamic agora

As the main element and the focal point of a town and the public element that makes it a *polis*[11], the agora was always located in the centre, close to the port in harbor cities, or near the city gate in the early Greek period (Zucker, 1970). In essence, it was first a place for the establishment of political parties and legislative councils, but its function changed over time to serve more as a marketing place, and the agora eventually became solely commercial. This alteration in function of a given agora does not, however, determine the changes in its shape. As Zucker (1970) points out, "it is impossible to deduce its morphological development from social and economic conditions." Architectural elements such as buildings and monuments were designed individually in isolation, and the space formed by the gathering of the several buildings involved was not treated as important. The buildings' visuality and the visibility of their architectural motifs from the point of view of the inner-city routes - based on the principles of perspective - were the top priority. None of the buildings were carefully coordinated, in terms of

11- Zuker (1970) argues that the *polis* represented sociological and architectural aspects of Greeks civilization which was based on democracy.

either direction or any potentially complementary architectural motifs. The driving design factor was simply the practical matter of the directions of the streets (Zucker, 1970).

2.8.1 Summary of characteristics

- Irregular layout
- Defined by topological condition
- As open as possible (no sense of enclosure; not yet defined as an enclosed space)
- Connected and fitted to the road system (the design hierarchy system of the town)
- No connection between enclosing elements and no sense of unity in the three-dimensional organization of the space.

2.9 The post-Hippodamic agora

A gridiron system attributed to the "half-legendary Homer" of city planning, Hippodamus, provided a decisive step toward more regularity in ancient Greece. Two major factors were considered at that time: the economic advantages of a gridiron system; and the context of topological and climatological factors (Zucker, 1970). Accordingly, the structure of the agora within this regular kind of town planning was changed from an open space to an almost enclosed space, and its size depended on the size of the town (Fig. 2.14). Through time, its function changed gradually from political to commercial. Its space was shaped by regular confines perceived as an organized and distinct configuration (*Gestalt principles*). In contrast to the peristyle space within Greek houses, which was completely enclosed and designated for women’s use, the agora was not enclosed entirely (Zucker, 1970).

2.9.1 Summary of characteristics

- Aesthetic aspects (proportionality, enclosure, rhythm, etc.)
- Pre-Socratic concept of human scale
- Regular shape (horseshoe shape)
- Not enclosed completely
- Unity of form (Surrounded by colonnades)

- Porticos as unifying elements
- Change in the height of unifying elements to accentuate and dramatize the architectural elements.
- Proportionality in the organization of the space
- Connection with adjacent streets through porticos
- Steps as means of overcoming differences in level and subdividing open space.

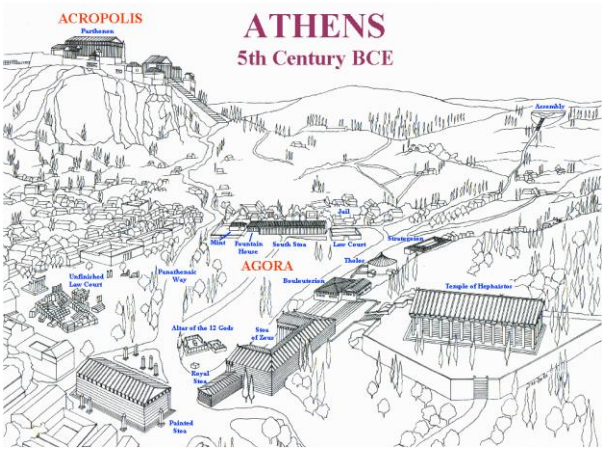


Fig. 2.14. Athens, The Agora. Source: Agathe.gr

In time, stoas or trees were used to break the large scale of the agora and also to hide discrepancies in direction of earlier structures and individual monuments (Zucker, 1970).

2.10 Roman squares

The creation of space during the Roman era was conscious, and three-dimensional design became a decisive method of planning (Zucker, 1970). Both Roman towns and post-Hippodamic towns share the gridiron scheme. However, their public spaces differ in terms of their characteristics. Romans considered the shape of empty space in terms of artistic meaning (the closed space was the main purpose of artistic creation), specific proportion, and superhuman scale – as opposed to the Greek tendency to use organic forms for their proportions and a relatively human scale. The castrum scheme of the Romans towns includes two main streets perpendicular to each other, namely the *cardo maximus* and the *decumanus maximus.* The other streets built

around these also cross each other at 90˚. Empty areas at the intersections were treated as important (Zucker, 1970).

2.10.1 Summary of characteristics

- Unified space with axial relationships surrounding elements
- Connection to streets from centre at 90°
- Rhythm
- Strictly symmetrical in main axis
- Completely enclosed
- Uninterrupted continuation of portico (tying together inharmonious edifices and covering the entrance of streets which led to the forum, with a resulting spatial unification)
- Presence of a temple or an element such as a sculpture (not yet a “dominated square”)
- Rectangular in shape (strictly isolated and clearly shaped)
- Part of the spatial hierarchy of the town (connecting to other small squares through streets or definite correspondence between civic centres, in an axial connection when possible)
- Marked height difference between the main open space of the square and the surrounding porticos to highlight any architectural elements in the centre

The ideal example of the Italian forum square is the Imperial Fora, in which the spatial unity of each forum is preserved and axial connections link the entire complex (Fig. 2.15).

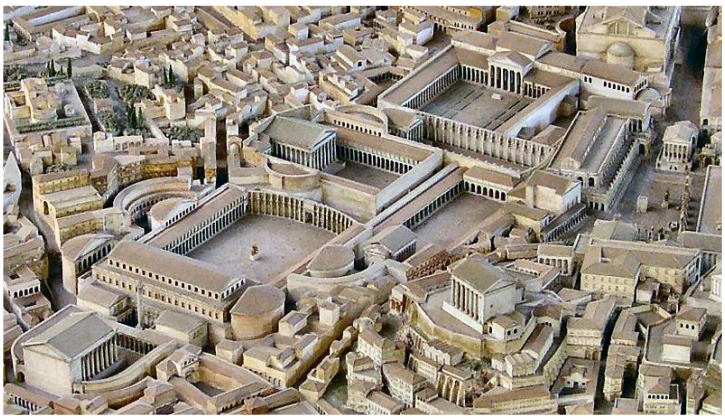


Fig. 2.15. Rome, The Imperial Fora. Source: thinglink.com

2.11 Medieval squares

Considering the evolution of the towns squares from the Greek *polis* and Roman the *urbs* to the new approaches of medieval towns requires that the design problems of both town and square be considered in both "sociological" and "visual" terms (Zucker, 1970). In the medieval era, the spatial organisation of the town was never considered as a whole. Medieval towns, the result of centuries of growth, were shaped irregularly and haphazardly (Zucker, 1970; Krier, 1979). The resulting irregularity and excessive narrowness of streets and squares are key characteristics. The only open space to be found was in front of a dominating building, such as the parvis of a church (Fig. 2.16). However, churches were approached as isolated structures with no deliberate relation to their surroundings (Zucker, 1970). The only noticeable pattern is that the small houses attached to the huge building mass of the local create a contrast between the human scale of daily life and the importance suggested by the massive structure of the church. The differences between the orientations of churches and the directions of the neighboring streets clearly show that churches were imagined as isolated buildings with no deliberate spatial relation to their surroundings (Zucker, 1970).

Fig. 2.16. Prague, The medieval market square with a church on backdrop.
Source: www.holidaystoeurope.com

The exotic beauty of medieval squares stems from the combination of individual buildings and the growth over centuries of new and specific elements without any conscious planning in

evidence (Zucker, 1970; Tavassoli & Bonyadi, 1992). These additive elements were dealt with individually, apart from any relation to the square as a whole. Since the morphological evolution of medieval squares depends upon such addition over time, it is at times helpful to know the different origins of medieval towns, but the careful consideration of this issue is beyond the scope of this study, so only some important points are addressed here in each case. Considering the origins of medieval towns shows that the remnants of Roman towns did not determine the form of the later medieval squares. Towns with an ecclesiastical nucleus have two separate squares: the parvis of the church and a market square with an irregular shape and lack of spatial unity. Many medieval towns expanded around trading centres which then became market squares. Planned medieval towns use the strict schematism of the gridiron system and the regular shape of the square (Zucker, 1970). Zucker (1971) has identified six types of medieval squares in terms of their structural shape and visual appearance.

2.11.1 Six types of squares and their specifications

- Market square: broadening a street affects its traffic fluidity and creates a space to pause. This was considered as an opportunity for creating a market square in medieval era. The erection of architectural elements at the centre or both ends enhanced the three-dimensional impression of the space. The spatial continuum obtained from the organic composition of the street and square increases a sense of enclosure (Zucker, 1970) (Fig. 2.17).

Fig. 2.17. Sarlat, France, The market square. Source: northofthedordogne.com

- The market square as a lateral spatial expansion: this is a square closed in by three sides and open on one side. The main goal was to create a space to pause and to protect users from the traffic flow. The impression of spatial unity is increased by adding a building such

as a church or a city hall (creating an enclosed space). The continuity of identical facades was used to create a strong interior uniformity. In some cases, separating the square's open space from the traffic flow by creating steps or a slope toward the opposite side of the traffic flow enhanced the sense of enclosure (Zucker, 1970) (Fig. 2.18).

Fig. 2.18. Munich, Germany, The Marienplatz square. Source: en.munich.foravisit.com

- Square at the town gate: this type of square appeared mostly in triangular shapes in front of a gate inside the town. In most cases it was dominated by the large-scale gates and towers. Such squares were not completely closed due to various diverging streets, and their primary function was to split the traffic (Zucker, 1970) (Fig. 2.19).

Fig. 2.19. Tallinn, Estonia, The gate square. Source: www.visittallinn.ee

- Square at the centre of the town: the clear gridiron scheme of these towns created a well-defined market square. These squares as empty areas surrounded by houses. The surrounding arcades, despite their different shapes, tie together the houses and present a rhythm. Eaves and roofs are created with the same height. The direction of the houses and lots is toward the square (Fig. 2.20). To increase spatial proportionality in large squares a church and/or a town hall were located on the same side or on opposite sides, and sometimes one or both of them occupied the central open space. One of the most important characteristics of medieval squares is the spatial continuum between spaces. If there was a church square just behind a market square, the church roof and steeple were visible from the market square mostly as a backdrop (in the visual preponderance of church over the market square); this backdrop created a unified visual awareness resulting in a certain spatial continuum (Zucker, 1970).

Fig. 2.20. Monpazier, England, The medieval square. Source: vent.ouest.pagesperso-orange.fr

- The parvis: these areas create a distinct symbolic realm between this world and the divine world. These squares are dominated exclusively by a church and are part of its structure. They have irregular forms and are mostly closed (on three sides by houses and on the fourth side by the dominating west façade of the church with its elaborate design) (Zucker, 1970).

- Grouped squares: the spatial connection of a church square and a market square together creates a grouped square. Each square is not only valuable aesthetically in isolation, but is also part of a more comprehensive system and its unity. The spaces thus grouped are enclosed squares with spatial continuity throughout. The spatial correlations between architectural elements in each square creates a sense of unity. The connections between

these squares takes four various forms: axial connection (through small narrow streets), shared space, the connection of different sizes and shapes of squares by dominating architectural elements (church/townhall/fountain), and a spatial continuity that is perceptible despite that fact that the squares thus grouped have no physical correlation (Zucker, 1970) (Fig. 2.21).

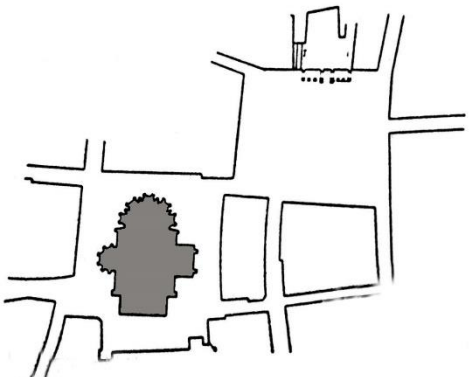


Fig. 2.21. Rostock, Germany, The grouped squares. Source: Zucker, 1970

Other characteristics of medieval squares are: a continuous and uninterrupted sequence of visual impressions (fragments of space and negative space often intensify and heighten the mass of a dominant structure), a unified spatial impression, the use of architectural elements such as pavement patterns, windows frames, and arcades (for protection against climate conditions, space for commercial activities, and adjustments in the proportionality of different pre-existing elements), fountains (with their stress on vertical form), monuments, and stairs (to provide access, overcome topographical conditions, and accentuate overall three-dimensional impressions). These elements served not only unify, separate, dramatize, and equalize the visual appearance of the square, but also to enhance its spatial impression (Zucker, 1970).

2.12 Renaissance squares

Renaissance squares, whether the developed medieval ones, or the newer planned ones, share certain features (Zucker, 1970). The Renaissance square was unified by all possible architectural means, and its visual articulation always referred back to the space. During the Renaissance, squares were created using conscious principles of city planning. The increasing consciousness of "spatial relations" led to the perceived importance of "structural clarity" and the consideration of

the city as a whole (Zucker, 1970). Particular architectural forms and aspects such as proportionality were of secondary importance (Fig. 2.22).

Fig. 2.22. The St. Mark's squares, Venice, Italy. Source: fac.hsu.edu

2.12.1 Summary of characteristics

- "Spatial unity" (continuous surface of the paved floor contributes further to this unity)
- The employment of identical arcades as a unifying element (arcades conceal the entrances).
- Rhythm
- The use of architectural elements to organize the space, such as monuments, fountains etc. (The erection of monuments within medieval squares during the Renaissance created highly organized squares).
- Perspective tricks used to enlarge the square as perceived, and to guide the spectator toward the dominating building.
- Continuity in facades, with identical elements such as windows and motifs.
- Axial symmetry and harmonious balance (with streets as axes running into the square at 90° - making the visual axis a pivotal centre of gravity).
- Completely enclosed space

- Proportionality
- Well-defined shape
- The orientation of houses toward the centre of the square
- Static balance (intensified by continuous repetition of arcades)
- The use of staircases and ramps between levels, to enhance the spatial impression

In the irregular square, the function of the monument at the centre of the square is to draw attention toward itself (unifying the space through the monument), to prevent the viewer from becoming aware of the irregularity of the facades (Zucker, 1970; Tavassoli, 1997). In this case, the axial location of the monument is of great importance. Fig. 2.23 illustrates a medieval square in which the addition of a monument in the Renaissance strengthened the spatial unity of the entire square.

Fig. 2.23. Bologna, Italy, Piazza Della Nettuno. Source: tripadvisor.es

2.13 Baroque squares

Unlike the static style of the Renaissance, the baroque style consists of "movement" and "dramatization" (Zucker, 1970). Background structures (architectural elements such as a church or a town hall) accelerate movement toward themselves. The surrounding arcades prompt the spectator to move toward these backdrops. All artistic means are employed to create a "dynamic motion in space," and thereby dramatize the entire square (Zucker, 1970). For instance, pavement patterns incorporated with arcades and architectural elements such as obliques add two-dimensional directions of importance. The combinations of these elements together create three-dimensional impressions (Fig. 2.24).

Fig. 2.24. The Piazza del Campidoglio, Rome, Italy. Source: en.wikiarquitectura.com

2.13.1 Summary of characteristics

- Repetition of identical motifs (arcades)
- Perspective principles to frame vistas using a sense of depth from both directions, to dramatize the backdrop (emphasis on directed movements).

- Rhythm
- The entire layout is mostly built on an oblique angle, to motivate movement toward the element providing depth (the dominating building).
- Proportionality (the contrast between the height of the colonnades and the dominating building is important)
- Axial symmetry
- Noticeable differences in the level of the open space (changes in level by stair or slope increase the spatial impression)
- Unified spatial shape
- Closed space

2.14 Classicist squares

Historically speaking, classicism cannot be treated as fully separated from the baroque. The classicistic style became pervasive during the 18th century in trends toward “rationalism” and “academic” concepts. It expressed itself in city planning by shifting the emphasis from three-dimensional impressions to two-dimensional forms. This two-dimensional design was directed by logical and functional approaches privileging “simplicity” over “richness” (Zucker, 1970) (Fig. 2.25).

Fig. 2.25. Prato della Valle, Padua, Italy. Source: gnixus.wordpress.com

2.14.1 Summary of characteristics

- Rectangular layout
- Two-dimensional concept (no stress on three-dimensional spatial interrelation)
- Using trees and plants in response to the influence of Rousseau's *Retournons à la nature* (*Back to Nature*)
- No definite boundaries (no spatial framework)
- No definite spatial impression
- Change in proportion (a tendency toward large-scale construction)
- Continuous movement
- No architectural elements on the axis

2.15 French squares of the 17th and 18th centuries

In the 17th century, a rigid formality of discipline and rational attitudes affected city planning in France. The new spatial organization of the square with its axes represents the baroque squares. "Gardening" and "landscaping" are an integral part of these squares. "Void" was as important as "volume" in the concept of the French square (Zucker, 1970) (Fig. 2.26).

2.15.1 Summary of characteristics of French squares during 17th-Century

- The importance of the three-dimension spatial effect of the square
- The importance of axes with vistas
- Square is embedded in gridiron system with straight streets running to it
- Closed space
- Mathematically regular layout
- Rhythm
- Continuity of the framing façade
- Uniformity

- Accentuation of the centre by monuments
- An accent on entrances (openness to streets which is located at the axial symmetry of the square): entrance-centre-entrance
- Basic pavements with sand or lawn (the combination of trees and plants with the square concept comes from the 18th century English concept of greenery).

Fig. 2.26. Place Ducale, Charleville-Mézières, France. Source: group.liegetourisme.be

However, during the 18th century in France the chief idea was to create and develop an "intra-urban" integration between the square and its surrounding setting – an attempt to create a spatial relationship between the square and the town as a whole (Zucker, 1970).

2.15.2 Summary of characteristics of French squares during 18th-Century

- The irrelevance of axial direction, with the architectural element (such as a monument) at the centre of the square
- Visual relation to vistas outside the square
- Perspective tricks used to create unlimited space and openness toward the outside
- Spatial unity
- Regular shape
- Rhythmical alteration of the size, height and proportion of architectural elements to increase spatial suspense.

2.16 English squares

The most typical English squares are known as residential squares. These squares are defined as a green space framed by architecture (Fig. 2.27). The idea of integrating nature with a free area became important during the 18th century for English city planners (Zucker, 1970). From the middle of the 18th century onward, central open space in London squares were enclosed by fences, and their paved areas were transformed into green spaces. It was after this point that residential squares played an important role in creating green areas in the urban layout. The transformation of these squares during the 18th and 19th century is accordingly considered a turning point in the history of London's squares. Grandeur and the scale remained important (marrying space and power), but during this period, such squares began to be closed to the public, to serve the social values of the aristocracy (Friedman, 2015).

Fig. 2.27. Bloomsbury square, London, England. Source: travelstay.com

2.16.1 Summary of characteristics

- The highest degree of privacy
- Fashionable (highlighting the importance of individual architecture)
- Low spatial impact (their importance is not defined by their spatial aspects, but by their potential to create visual charm and recreational space for inhabitants)
- Simple shape (rectangular or quadrangular)
- Intersection with neighboring streets at corners or in the middle of the sides

- Large houses located in the middle of the facades while the small ones are at the corners (rich architecture in the middle)
- Symmetrical in the distribution of streets
- Greenery in the shape of rectangle, oval, or circle
- Narrow sidewalks within the square
- Surrounding houses are relatively inconspicuous and despite their similarities they are not uniform (lack of spatial continuity)
- Closed space
- No axial connection

In the late 18th century new types of squares emerged with the integration of architecture and landscape (Zucker, 1970). No spatial impression is stressed in these squares. Individual volumes were isolated in space and the square was not treated as a major part of the town structure. During the 19th century, however, the Industrial Revolution led to a dramatic change in the urban setting (Krier, 1979). The broad development of rail transport networks resulted in rural-to-urban migration and population growth. New industrial areas emerged in cities and the labour class became new residents. The advent of new technology, led to important shifts in the social, economic, and political relationships of the city. The city fabric and its surrounding environment began to see construction on a vast scale (Krier, 1979). Within this period, concerns about environmental deterioration and human well-being grew. This study is not focused on these developments, but it will examine their effect on urban squares and specifically residential squares in Chapter Three. One important movement which had a great impact on the urban fabric was the park movement[12]. This movement stressed the importance of huge green areas treated as new public spaces over new streets and urban squares (Eisenman, 2013) (Fig. 2.28).

12- The *park movement* was an approach to urban planning that emphasize the importance of green areas in the cities. Frederick Law Olmsted was one of the pioneers of this movement (Beveridge, n.d.).

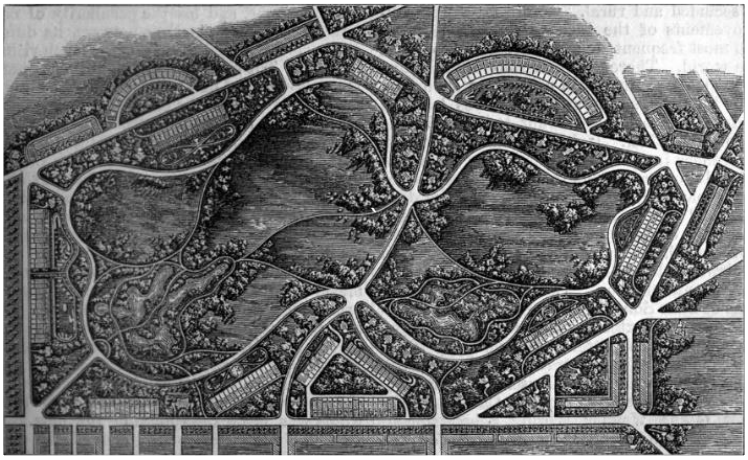


Fig. 2.28. Park movement in the USA. Source: alamy.com

During the modern period, regrettably, many of these urban squares have, since the emergence of the automobile, been turned into parking lots or traffic junctions. The wide openness of these squares made it easy for them to be transformed into parking lots (Fig. 2.29).

Fig. 2.29. Constitution Square (Plac Konstytucji), Warsaw, Poland. Source: www.commons.wikimedia.org

2.17 New England squares

Historically, the New England commons were used as “parade ground,” “marketplace,” and “cross roads” for the public (TCLF, 2018). By the 19th century, they had been transformed into more formal civic spaces with different shapes, and were considered a significant element of the city. They were located throughout the city and enclosed by surrounding streets and adjacent buildings. Their specific features include: formal and symmetrical design, simple planting, the

predominance of sculptural elements at the centre, and harmonious furniture such as benches along the paths. There are two significant types of these squares; the green squares and the enclosed squares. These types of squares became popular during the 1960s and 1970s, with centralized green spaces and multi-block large scale housing for their surroundings (TCLF, 2018).

2.18 New England green squares

The main characteristic of the New England green squares is their "openness" (Zucker, 1970). They are mostly geometric in shape, but those that are irregular or only somewhat geometric in plan achieve a comparable unity by having churches and meetinghouses carefully placed around them, well-defined geometric landscaping, and framing provided by single-family houses (Fig. 2.30). Many of these squares achieve unity through adopting a unique style of architecture, such as two-storey white houses that contrast with the green of the open space (Zucker, 1970).

2.18.1 Summary of characteristics

- Human scale
- Private gardens near houses
- Mostly regular
- Well-proportioned
- Regular eave or roof line
- Uniform setbacks
- Formal and regular planting
- In some cases, the entire green is planted with regular rows of trees to directing attention to the church or the meetinghouse, and to accent the entrance of the houses
- Filtered-sunlight space (semi-shaded spaces of delightful ambiance for residents)
- Church or town building at one end of the square (the narrow, high mass of these buildings create a contrast with the broad sides of the other buildings)

Fig. 2.30. Trowbridge residential square, New Haven, USA. Source: www.campuspress.yale.edu

2.19 New England enclosed squares

These spaces are most often surrounded by rows of apartments (two-storey), usually in brick (Fig. 2.31). In squares in smaller towns, facades are painted in various colors to create a contrast with the green space. Sidewalks are covered with brick and surrounding streets with stone. The green space with its statue is enclosed by an iron fence (Zucker, 1970) (Fig. 2.32).

2.19.1 Summary of characteristics

- Constant roof line
- Rectangular shape
- The seams between the houses are smaller than the thickness of the wall
- Well-proportioned

Fig. 2.31. Beacon Hill residential square, Boston, USA. Source: newengland.com

Fig. 2.32. Sidewalk covered with the brick, Beacon Hill residential square, Boston, USA. Source: newengland.com

2.20 Summary of historical review

The urban square is exceedingly rich in history and variety, and it is still one of the most important elements of the structure of the city (Moughtin, 2003). It is not only the urban setting of architectural elements including civic and religious buildings, residential buildings, sculptures and fountains – it is also a place of meeting and socializing. It can therefore be studied both in terms of its shape (aesthetic aspects) and in terms of its main functions. Aesthetically, according to Krier (1979), urban squares can be grouped under three basic geometrical shapes: the square, the circle, and the triangle. These basic shapes can be altered by "angling," "addition," "merging," "overlapping," and "distortion". The basic shapes involved can also be changed by adding various type of "sections," making them either "regular" or "irregular" (Krier, 1979). Another system for classifying urban squares offered by Zucker (1970) considers the given space's aesthetic aspects in terms of its shape, dividing the square into five different categories: the "closed square," the "dominated square," the "nuclear square," "grouped squares," and the "amorphous square." These most obvious dimensions of the urban square determine its visual appearance and spatial qualities when it comes to "unity," "proportion", "scale," enclosure, "harmony," "contrast," "balance and symmetry," and "rhythm" (Moughtin et al, 1999). Changes made at these levels of visual appearance might be altered from time to time.

The quality of the space in terms of its physical form, the influence of independent factors such as weather conditions and sun light, and the perceptual framework of the spectator create the overall impression of the spatial qualities of the square (Moughtin et al, 1999). Moreover, as mentioned at the beginning of the historical survey given above, Zucker (1970) adds that the urban square is defined by three major "space-confining" components: "the surrounding structures" such as façades and corners; the enlargement of the "floor" and objects on it such as green landscapes, furniture, sculptures and fountains; and the conceptual "sphere of the sky" overhead as defined by the skyline. The formal, functional, and symbolic qualities of each of these components have a considerable impact on the perceived visual impact of the square (Moughtin et al, 1999). In terms of its main functions, the urban square can be a civic square, a commercial square, or a residential square. The civic square is defined as a "tragic scene" by Vitruvius[13], accordingly delineated with classical elements to make an appropriate impression (Moughtin et al, 1999).

13- Refer to *The Ten Books on Architecture* by Vitruvius.

Achieving “unity” and “rhythm” is the main concern in designing this type of urban square. Vitruvius sees commercial squares, on the other hand, as examples of a “comic scene,” including private dwellings with variety of types and styles of motifs. These elements may be changed over time, and the square is often a mixed-use space, meeting both commercial and residential needs. From this point of view, residential squares tend to present a “tragic scene” where “unity” and “rhythm” are significant. In this type of square – such as New England green squares or London residential squares – the juxtaposition of trees and residential buildings in the surroundings creates the impression of a human scale (Moughtin et al, 1999). Overall, however, the review offered in this chapter has shown that the characteristics of all such urban squares within the city fabric tend to include the following:

- Location is at the heart of the town (at the intersection of main arteries), community-centred
- The existence of public gathering space within the square[14].
- Usually considered as part of the continuum of the structure of the city
- The place of diverse activities (political, religious, recreational, and commercial)
- In comparison with the urban street which is a dynamic space, an urban square is more static. It is therefore treated as a proper place for glorious architecture.

In the light of these observations, the following table offers a conclusion for this chapter’s historical study. It collects the major points of the historical study above, identifying the major elements (physical and perceptual) of the structure of urban squares that can be used to analyze the case studies – two residential squares and one small-scale residential unit in Montréal - in Chapter Three.

14- Different businesses can attract people toward themselves. The location of these businesses is considered as community-gathering places. People identify these areas as their favorite destination to meet and socialize with friends and neighbors.

PHYSICAL ELEMENTS	PERCEPTUAL ELEMENTS
Ground floor outline □ ○ △ (Regular or Irregular)	Unity
Façade (openings, form, material, color)	Proportion
Corners	Scale
Floor plane	Enclosure
Furniture (benches, fountains, and sculptures)	Harmony
Plot size	Contrast
Green space	Balance and Symmetry
Skyline and Eaves	Composition
Pathways and Traffic roads	Rhythm

Table 2.1. Main parameters of urban squares (the result of historical review)

CHAPTER III

VISUAL-QUALITATIVE ANALYSIS OF RESIDENTIAL SQUARES

THREE MONTRÉAL CASE STUDIES

3.1 Introduction

It has been argued that residential squares play a pivotal role in the quality-of-life experience of local urban inhabitants by fostering "life satisfaction" and the "individual's overall sense of well-being" (Banerjee & Baer, 1984). Unfortunately, the rapidly growing populations, changing styles of architecture, and rapid construction methods of recent decades have led to cultural amnesia regarding such factors in designing residential squares (Friedman, 2010). Identifying and analyzing the functional and aesthetic aspects of an urban residential squares can be achieved using a comprehensive consideration of the design of urban squares throughout history. Chapter Two above therefore chronologically studied the evolution of the urban square and its main elements in terms of its two main factors: shape (aesthetic aspects) and function. Its conclusions were presented in a table identifying the constituent elements (physical and perceptual) of the structure of an urban square. This chapter applies these findings to the analysis of residential squares, in the form of three case studies in the region of Montréal, selected from three different parts of the city: the old-town, the mid-town, and the suburban. In examining these spaces (two residential squares and one small-scale residential unit – cul-de-sac[15]) in the light of what has been documented above regarding town squares, this chapter elucidates the relationships between the physical elements and the spatial organization of the residential square on one hand, and on the other hand illustrates the influence of the relevant perceptual elements involved in the visual appearance of the residential square.

15- This research aims to examine three case studies in three different parts of the city of Montreal (the old town, the mid-town, and the suburban) with the following objectives:
1) Understanding the spatial and visual qualities in each part and use them as a paradigm for designing new residential squares as well as enhancing the quality of the spatial organization of past residential squares.
2) Awareness of the spatial demands of new residential squares.
As mentioned at the beginning of this study, the neighborhood concept, despite the fact of its imprecise aspects, was used widely as residential-design paradigm specially in suburbs of North American cities. Cul-de-sacs as semi-public spaces are part of the physical structure of the cities in suburbia. A "small-scale" residential unit with a circular end to give access to inhabitants. Since the residential development of the suburban is more in the form of cul-de-sac, this unit of settlement is considered in this study for the evaluation of its spatial organization. Thus, this study doesn't aim to introduce this small-scale residential unit as a residential square, rather, it aims to examine its spatial and visual quality.

3.2 Methodology

Since the late 19th century, residential squares have changed dramatically, toward a loss of their special identity (Friedman, 2015; Krier, 1979; Tavassoli, 2016). Examples found in historical parts of the city clearly record these changes. In the light of the foregoing considerations, this study scrutinizes three different case studies in Montréal. While considering a single case-study in the historical part of the city would be methodologically viable and illustrate spatial values of a given period of time, a multiple case study selecting residential squares formed in different parts of the city at different times can increase the value of the study by increasing the accuracy and credibility of the results (Shakir, 2002). The formation of each of these case studies represents a milestone in the history of Montréal's urbanization. The physical changes of urban fabrics in Canadian cities have been grouped into three basic periods of metropolitan growth and development: The era from the 1850s to 1920s is considered an "Urbanisation" period in which an increase in "rural-to-urban" migration is determinative; "Sub-urbanisation" followed from the 1920s onward with extensive population movement and extreme city expansion; and from the 1970s onward "Re-urbanisation" has seen the movement of populations from cities and suburbs into "periurban" or "exurban" areas (Filion & Bunting, 2015). In the following chapter, a residential square from each period in the city of Montreal will be analyzed in terms of their major elements. The first case study, Saint Louis Square, is in Plateau Mont-Royal, that is, in an area built during the "Urbanisation" period. The second case study, Square Jean-Rostand, is located in Bois Franc - a residential neighborhood[16] in the borough of Ville Saint-Laurent in Montréal - and represents a residential square built in "Suburbanisation" period. A small-scale residential cul-de-sac called Rue du Collège-Beaubois in the borough of Pierrefonds-Roxboro provides a third case study from the Re-urbanisation period. In order to best assess their physical and perceptual elements, the analysis relies on observation, a review of relevant historical and visual documents, and a spatial analysis of the three case studies.

3.2.1 Physical elements:

Regarding the physical elements of the spaces, each space-defining component is considered individually in detail with respect to its formal, functional, and symbolic qualities. The influence of independent factors such as weather conditions and light will be appraised for each component. The surrounding borders of the square are composed of buildings. In this regard their

16- The design of Bois Franc residential neighborhood represents the New Urbanism approach in the 90s.

most significant factors are façades, corners, and plot sizes. On the floor level, the outline of the ground floor, the floor plane, the green space, and everything on the floor such as sculpture, furniture and fountains are treated as important. In its upward orientation, the skyline and eaves define each square's limits. Particular attention is given in the analysis to spectator position and viewing angle in the square. The visual aspects of the spaces and their relationships to the spatial qualities of each square are assessed in several walk-bys conducted by the author at each study area. Croquis and photos are provided to help illustrate important spatial qualities related to physical elements.

3.2.2 Perceptual elements:

This part of the study examines the relationship between visual appearance and spatial qualities of unity, proportion, scale, enclosure, harmony, contrast, balance and symmetry; and rhythm in the squares. The spatial features of the square that are important for a spectator's spatial perception are recorded, with attention paid to the way the position of the spectator (including distance from the square's surrounding features) affects the visual perception of the square. Specific attentiveness is given to the analysis of square longitudinal and transverse sections. This part of the assessment is also developed by sketches and graphic diagrams and tables.

The purpose of applying this methodology is to document the spatial qualities of the given residential squares in urban and suburban areas, and to compare the results of the analysis to the set of factors identified in Chapter Two as able to influence the spatial perception of the spectator. The final goal is using the findings involved to create guidelines for designing residential squares that will have a direct positive impact on local inhabitants' level of "life satisfaction" and sense of "well-being". Since the form of the residential square undergoes physical changes in each period, based on inhabitants' needs, this study also aims, in addition to assessing these residential squares based on the physical and perceptual elements identified in Chapter Two, to identify new ways to meet new needs in terms of improving the spatial and visual quality of such residential squares.

3.3 An introduction to main elements of residential squares

The evaluation of the residential square contributes to its spatial qualities are considered here under two subdivisions, namely: physical elements and perceptual elements. Each group is

composed of a number of components by which the spatial quality of a square can be evaluated in depth. A brief definition of each of component is provided here for the benefit of the reader.

3.3.1 Physical elements

- Ground floor outline: the geometrical pattern of the ground plan, which is mainly divided into three basic shapes, the square, the circle, or the triangle. These basic shapes can be altered by altering edges or angles, and also by adding various types of sections. In such ways, the ground floor outline can have a regular or irregular layout (Krier, 1979).

- Façade: an important element of a building which presents a variety of visual experiences to the spectator. It is comprised of openings, architectural motifs, balconies, niches, and general saliency. The most significant quality of the façade is its "richness" (Bently *et al.,* 1985).

- Corner: the place where two lines, two planes, or two volumes intercept each other. There are two types of corner; the "internal corner" which is defined by an angle of less than 180 degrees, and the "external corner" where the edges create an angle of more than 180 degrees. In spatial terms, in general the most important aspect of the corner is its three-dimensional organisation (Moughtin et al, 1999).

- Floor plane: the surface of the ground floor of the square, covered by a specific material. It is divided into two types: the "hard pavement" and the "soft landscape area" (Moughtin et al, 1999). Any changes in the level (such as steps, ramps, platforms and long sloping planes), color, pattern, or material of the floor plane affect the spatial quality of the square.

- Furniture: any three-dimensional object built as a decorative element, such as a fountain or a monument, or as a more utiliterian element like a bench. Monuments and fountains within the spatial organization of the square are used to "articulate," "punctuate," and "accent" the layout (Moughtin et al, 1999).

- Plot size: a plot is a piece of land for the purpose of building or other construction. The term plot is arbitrarily used to illustrate a land division for any type of development (Carmona et al, 2003). In residential squares in Western countries, surrounding plots face the main open space, and their arrangement and size affect the spatial organization of the square. Urban squares in Islamic cities, however, due to privacy issue, are connected to

plots by subspaces such as vestibules, short narrow alleys, or small sub-squares called Husseinieh (Tavassoli, 1997).

- Green space: as an amenity of a residential squares, it has a useful function in ornamenting space. Planting trees can have a significant effect in creating semi-shaded areas which are considered favorable places for residents. Their combination with furnitures enhance the spatial quality of a square (Bently et al, 1985).

- Skyline and eaves: the line where mass and space meet is called the skyline. It is a silhouette seen from distance, with symbolic value. From a short distance at gound floor level, the roofline is the outline of roofs in contrast with the sky. There are four types of roofline: the plain crisp edge charactiristic of modernist buildings, a series of gables facing the square in medieval towns, the horizontal ornamental edge of building frontage facing the Renaissance squares, and baroque building rooflines which climb to a climax at the head of the plan from the opposing sides of the space (Moughtin et al, 1999).

- Pathways and traffic roads: part of the floor plane dedicated to moving pedestrians and riders. Its form, color, material, changes in level, and patterns can influence the spatial quality of the square.

3.3.2 Perceptual elements

- Unity: defined in the Oxford English Dictionary as “the state of forming a complete and harmonious whole.” Any work of art must be a complete whole composed of harmonic elements related to each other. The goal of urban design is, therefore, to present complete unity in the composition of its components. Normal ways to achieve unity are proximity, repetition, continuity, and enclosure (Moughtin et al, 1999).

- Proportion: an important feature of unity and a method of establishing visual order in any work of art. It is defined as the relationship between the dimensions of a space or an object; a relationship which is independent of size (Tavassoli, 1997).

- Scale: the comparative dimensions of the components of an object. Since urban design usually deals with a human scale, all dimensions in residential squares should be relevant to the size of a human being (Tavassoli, 1997).

- Enclosure: the most important property of any urban square is the sense of enclosure (Zucker, 1970; Krier, 1979; Tavassoli & Bonyadi, 1992). Zucker (1970) believes that just as a child can perceive a mountain as a cone in his imagination, the perception of an ordinary human being when it comes to a public square is an enclosed space that is interrupted only by the streets or paths that run through it.

- Harmony: recognized by many as an essential element of beauty found in the arrangement of objects or adjustment of things (Cesar, 2009). In architecture and urban design, harmony is the result of a pleasant combination of different elements also known as architectural identity (Tavassoli, 1997).

- Contrast: intensity and vitality created to derive more pleasure from a space. In architecture and urban design, contrast reduces the monotony of space (Moughtin et al, 1999). This can be achieved through various means, such as creating difference in color, material, level, volume, rhythm, direction, scale, and size.

- Balance and symmetry: the principle of arranging forms, shapes, or angles around a central line or point called axis. Visually well-adjusted and reasonably-distributed components are a means to achieve visual order (Moughtin et al, 1999).

- Composition: the combination of spaces and surrounding structures. Composition in urban design, in principle, is the art of achieving visual unity. The composition of a distinct but harmonious space in urban design reduces the monotony of space (Tavassoli, 1997).

- Rhythm: defined by the Oxford English Dictionary as “a strong, regular repeated pattern of movement or sound,” rhythm is considered one of the important characteristics of residential squares in creating unity. There are, generally, five types of visual rhythm: “random rhythm,” “regular rhythm,” “alternating rhythm,” “flowing rhythm,” and “progressive rhythm” (Soegaard, 2018).

Awareness of space is considered the basic principle of spatial perception. For this reason, the essential elements of space merit study. In considering the definitions given above, though, it should be remembered that many of these individual concepts do not, and cannot, be understood or appreciated in isolation.

3.4 Squares in Montréal

Montréal is known as a city of squares (CHA, 2013). Inspired by the European cities, Montréal, in the nineteenth century, built many urban spaces such as squares, parks, and gardens. From the implementation of the « *Acte pour abattre les anciens Murs et Fortifications qui entourent la Cité de Montréal* » to the redevelopment of Philip Square in 1914, the square has been a dominant built form in Montreal (CHA, 2013). In early 20th century, it became the second greatest city in the world, after London, for urban squares, and the abundance of churches with squares in the early 20th century give it the name of "a city with steeples in the countryside"[17] (CHA, 2013).

In Montréal, squares were widely used as an urban and landscape form, from the mid-19th century to the first quarter of the 20th century; they helped build the city (CHA, 2013). Like nearly all North American cities, industrialisation induced "rural-to-urban" migration and led to a concentration of population in the early 20th century (Dufour, 2014; Filion & Bunting, 2015). The increased use of private automobiles as a primary means of transportation and intensive commercial activities led to the demolition of many urban squares and their transformation into parking lots. The majority of them still exist, though, and illustrate a remarkable heritage of urban space in Montréal (CHA, 2013). The term square was first defined by the *Office Québécois de la Langue Française* (*OQLF*) as a small public garden, usually located on a town square or in its middle, and surrounded by a grid (CHA, 2013). The OQLF notes that this term – small public garden - cannot be used to describe the surrounding streets or buildings. It does not have the meaning of the English word square and should not be confused with a town square. In Montréal, two terms are used with the same sense: "square" and "*carré*" or "*quarré*". These two terms with the same meaning indicate that the name of the square in Montréal has been taken from the British, and then French and American tradition. The "square" appellation in Montréal is usually applied to a built-up quadrilateral, with either a residential or other function, surrounding a space planted with trees (CHA, 2013). These gardens within the squares are surrounded by streets on all sides and are not inseparable from their immediate context as are their counterparts in Paris or London.

17- Refer to William H. Carre, *Art Work on Montréal*

A green space, fenced or not, in the middle of a square dominated by lawns and trees is characteristic of Montréal squares[18].

In Montréal, the square evolved from a decision to improve public health and the desire for civic beautification, to the service of memorials and greenery to enhance the grandeur and splendor of the urban space, and finally to the crystallization of the garden square in residential developments (CHA, 2013).

18- To study more on Victorian Squares of Montréal refer to Karim Wagih Fawzi Youssef, (2002), *'Le développement morphologique du square Victoria à Montréal'*, mémoire de maîtrise, Montréal, Université de Montréal.

3.5 Case study 1. Saint-Louis Square

3.5.1 Introduction

Saint-Louis Square is a residential square located in the Plateau Mont-Royal, the most densely populated residential borough in Montréal with a population of more than 100,000 people (Fig. 3.1). Its eastern edge is delimited by Saint Denis Street, and Square Saint Louis Street runs along both the square's northern and southern sides, while Laval Avenue runs along its western side (Fig. 3.2). The current location of Saint-Louis Square was once the city's water reservoir, and at the outset, in 1848, it was acquired as a logical solution for the growing town. However, by the "urbanisation" period in which "rural-to-urban" migration remarkably increased, dedicating the location to a reservoir did not respond to the population's needs. When the reservoir became obsolete, in 1879, the land was transformed into a beautiful public park and shortly after surrounded by magnificent residential buildings[19]. The inhabitants of these houses were middle-class French Canadians who could afford to build their own houses at a high cost. Over the years, these nineteenth-century Victorian style houses have become the favorite residences of artists, writers, poets, musicians, actors, and film makers (Ville De Montreal, 1995). Table 3.1 illustrates basic information regarding the Square.

Name	Neighborhood	Type	Housing style	Area	Date of establishment
Saint-Louis Square	Le Plateau Mont-Royal	Residential	Victorian	13,099 m^2 ≈ (185m × 70m)	19th Century (1879 AD)

Table 3.1. Basic information on Saint-Louis Square[20]

19- Refer to *"Les Rues De Montréal" Répertoire Historique*. Editions du Méridien: Ville de Montréal, 1995
20- Information extracted from the website of Ville De Montréal, ville.montreal.qc.ca.

Fig. 3.1. Situation plan, Saint-Louis Square. Source: Ville de Montréal

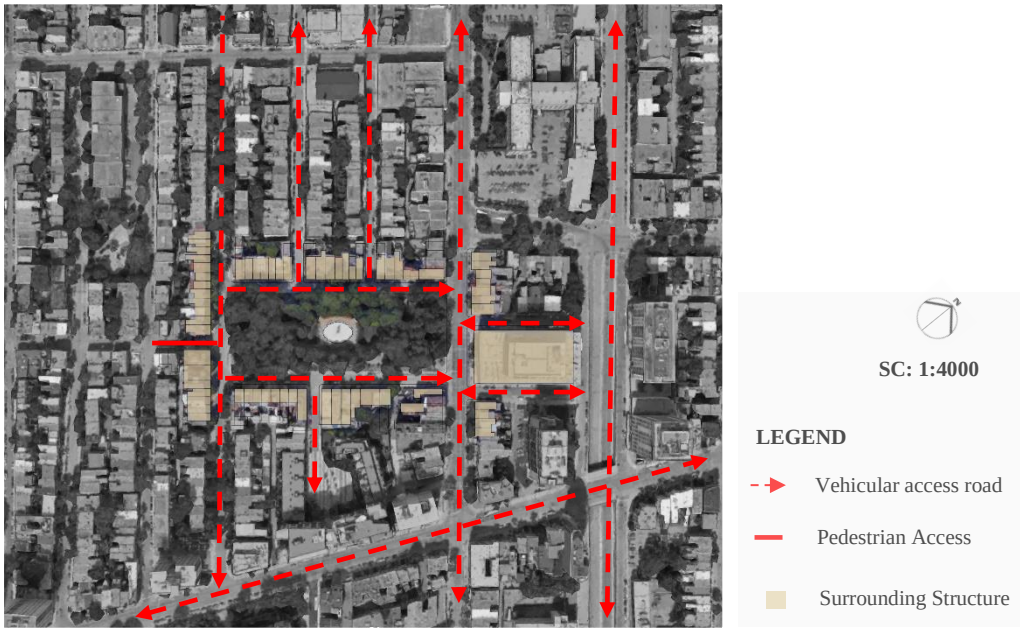


Fig. 3.2. Access road plan, Saint-Louis Square. Source: Google Earth

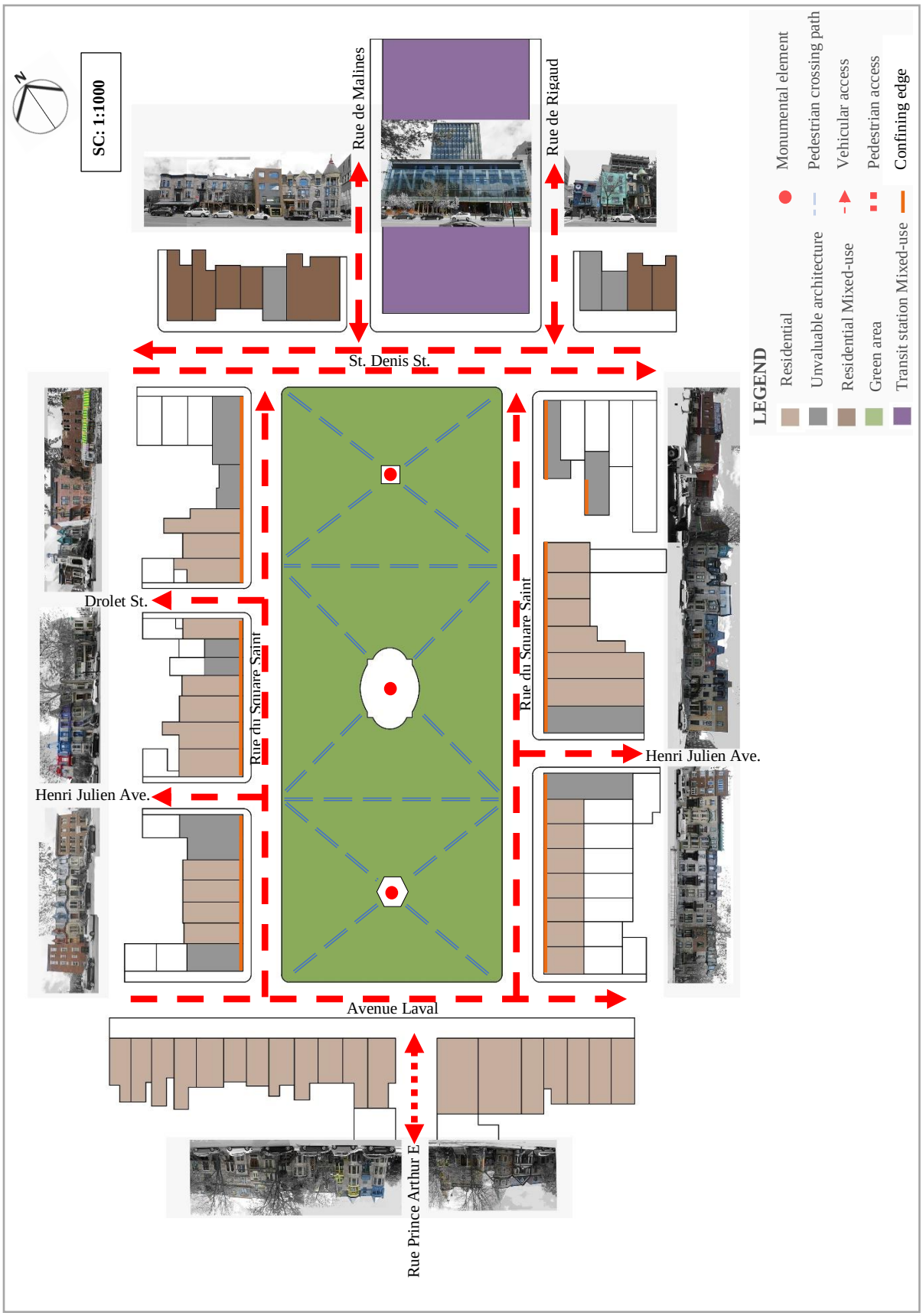


Fig. 3.3. Saint-Louis Square, Site Plan

3.5.2 Physical element analysis

3.5.2.1 Ground floor outline

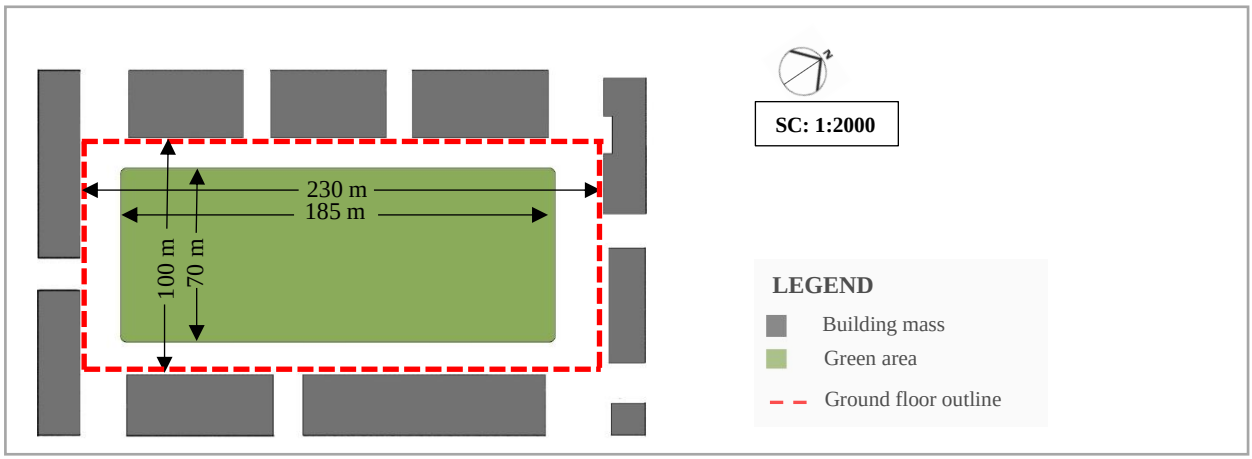


Fig. 3.4. Saint-Louis Square, Ground floor outline

Physical element	Legend	Measurement	Description	Photo
Ground floor outline		230m × 100m Green open space 185m × 70m	Regular rectangle surrounded by streets on all sides	

Table 3.2. Ground floor outline analysis

3.5.2.2 Façade

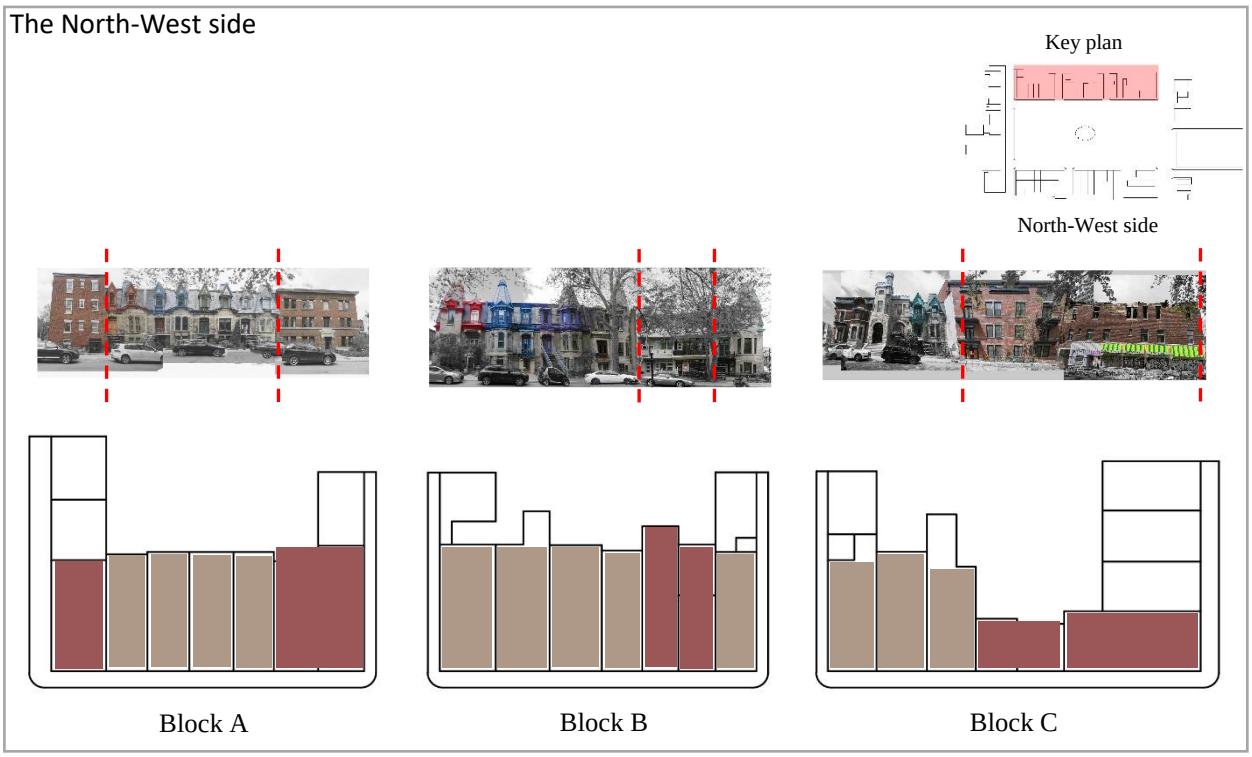


Fig. 3.5. Saint-Louis Square, North-West facade

Type	Block A	Block B	Block C
Valuable (Victorian)			
Unvaluable (Modern)			

Table 3.3. North-West façade data

Physical element	Type	Division	color	Material	Pattern	openness	Photo
Façade	Victorian	The base (podium)	Monotone light gray	Limestone	Smooth Limestone blocks featuring a strong horizontal striped pattern	Bay windows toward the green space, front doors are located in the niche of the wall connecting to road level	
		The middle zone (main floor)	Gray	Limestone	Rough Limestone blocks	Bay windows framed by smooth Limestone blocks. Front doors are located in the niche of the wall which is framed by smooth limestone and engraved lintels above them. They are connected to road level by a staircase	
		The upper zone (attic)	Monotone matte gray forms background and colorful frames form windows and edges	Metal	Striped horizontal texture mixed with squama-like pattern	The outward appearance of mansard roofs acts as background for dormer windows and bay windows	
	Modern	The base (podium)	Russet in brick building and creamy white in other building	Brick and concrete tile	Grid brick pattern	Simple rectangular shape windows framed by limestone lintels on the top or bottom part. The entire building entrance door is at road level	
		The middle zone (main floor)	Russet in brick building and creamy white in other building	Brick and concrete tile	Grid brick pattern	Simple rectangular shape windows framed by limestone lintels on the top or bottom part	
		The upper zone (attic)	Russet in brick building and creamy white in other building	Brick and concrete tile	Grid brick pattern	No opening and the façade ends in metal parapet flashing	

Table 3.4. North-West façade analysis

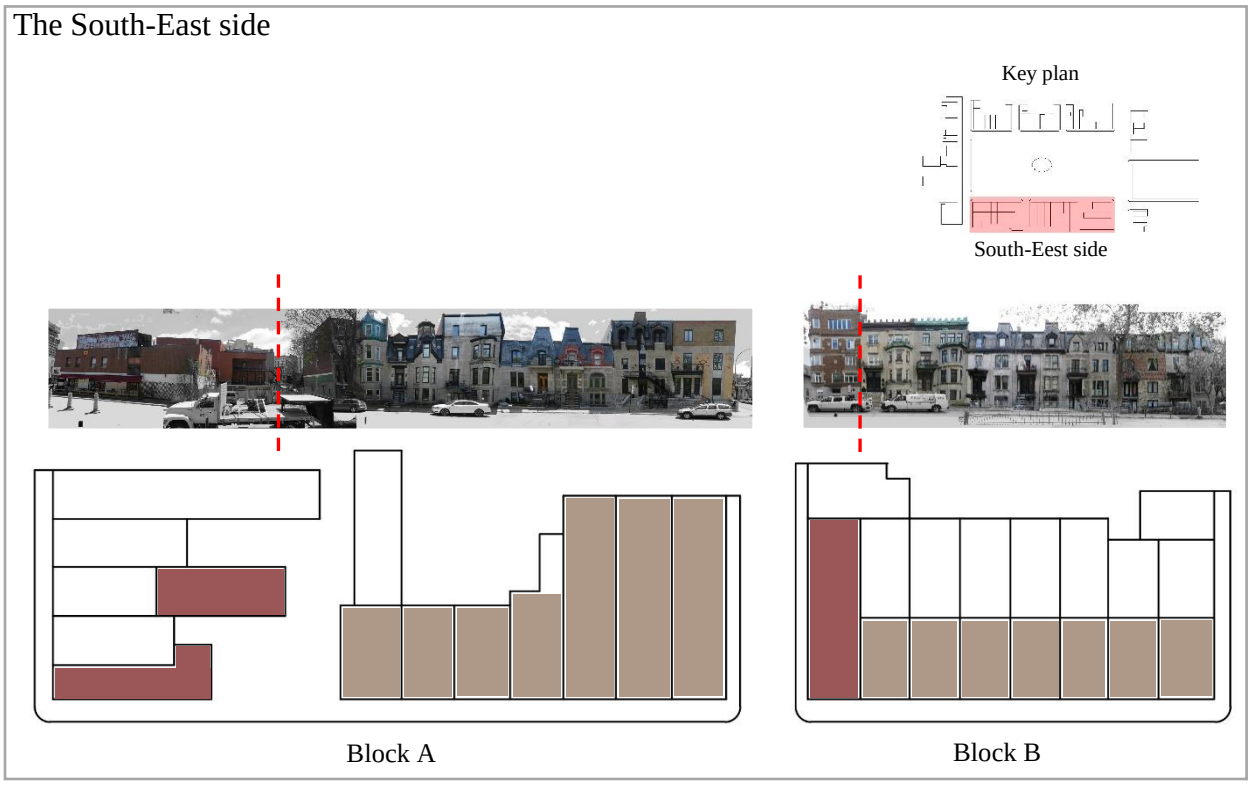


Fig. 3.6. Saint-Louis Square, South-East facade

Type	Block A	Block B
Valuable (Victorian)		
Unvaluable (Modern)		

Table 3.5. South-East façade data

Physical element	Type	Division	color	Material	Pattern	openness	Photo
Façade	Victorian	The base (podium)	Monotone light gray	Limestone	Smooth Limestone blocks featuring strong horizontal striped pattern	Bay windows toward the green space, front doors are located in the niche of the wall connecting to rod level	
		The middle zone (main floor)	Gray	Limestone	Rough Limestone blocks	Bay windows framed by smooth Limestone blocks, front doors are located in the niche of the wall which is framed by smooth limestone and engraved lintels above doors. They are connected to road level through staircase	
		The upper zone (attic)	Monotone matte gray forms background and colorful frames form windows and edges	Metal	striped horizontal texture mixed with squama-like pattern	The outward appearance of mansard roofs acts as background for dormer windows and bay windows	
	Modern	The base (podium)	Russet in brick building and creamy white in other building	Brick and Limestone blocks	Grid brick pattern	Simple rectangular shape windows framed by concrete on the top or bottom part. The entire building entrance door is at road level	
		The middle zone (main floor)	Russet in brick building and creamy white in other building	Brick	Grid brick pattern	Simple rectangular shape windows framed by concrete on the top or bottom part	
		The upper zone (attic)	Russet in brick building and creamy white in other building	Brick	Grid brick pattern	No opening and the façade ends in metal parapet flashing	

Table 3.6. South-East façade analysis

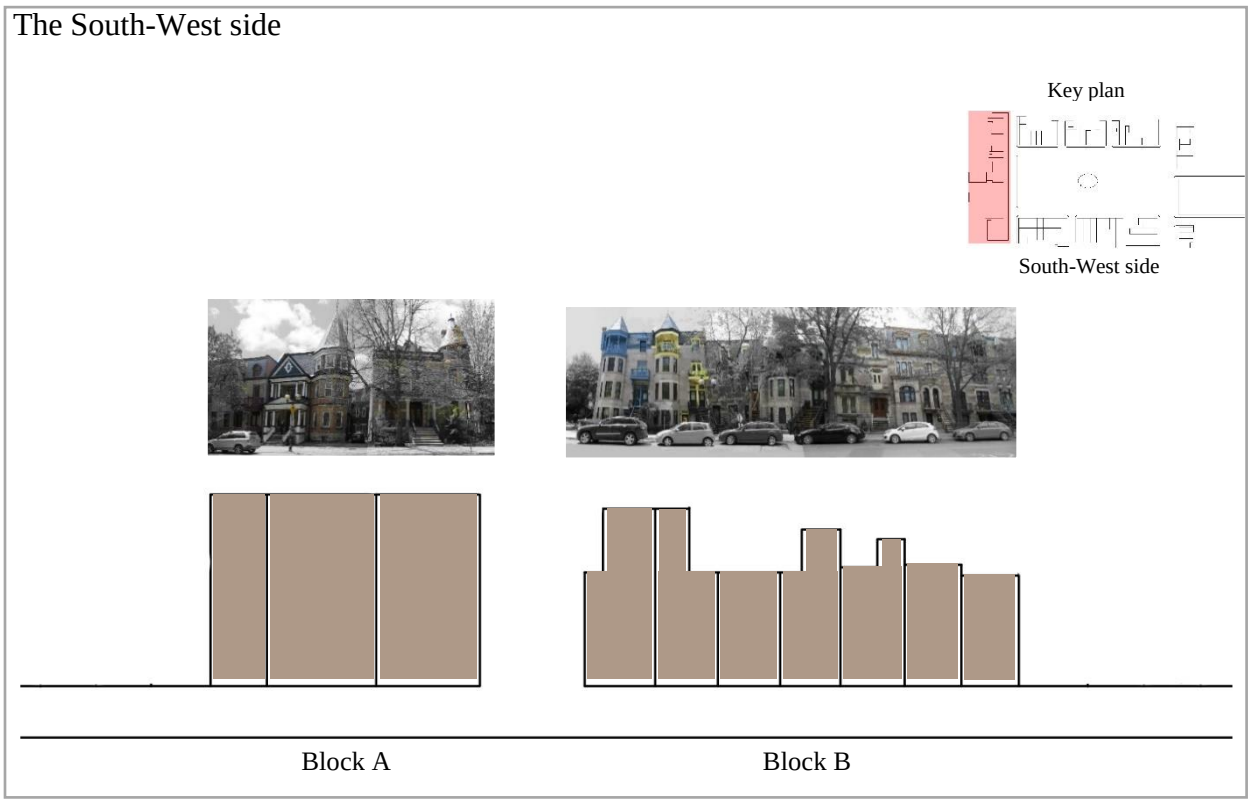


Fig. 3.7. Saint-Louis Square, South-West facade

Type	Block A	Block B
Valuable (Victorian)	 	  

Table 3.7. South-West façade data

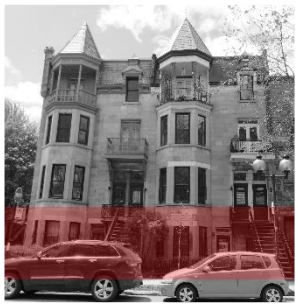
Physical element	Type	Division	color	Material	Pattern	openness	Photo
Façade	Victorian	The base (podium)	Monotone light gray	Limestone	Smooth Limestone blocks featuring a strong horizontal striped pattern	Bay windows toward the green space, front doors are located in the niche of the wall connecting to road level	
		The middle zone (main floor)	Gray	Limestone	Rough Limestone blocks	Bay windows framed by smooth Limestone blocks, front doors are located in the niche of the wall which is framed by smooth limestone and engraved lintels above doors. They are connected to road level through staircase	
		The upper zone (attic)	Monotone matte gray forms background and colorful frames form windows and edges	Metal	Striped horizontal texture mixed with squama-like pattern	The outward appearance of mansard roofs acts as background for dormer windows and bay windows. Corner buildings mostly feature turrets as corner towers.	

Table 3.8. South-West façade analysis

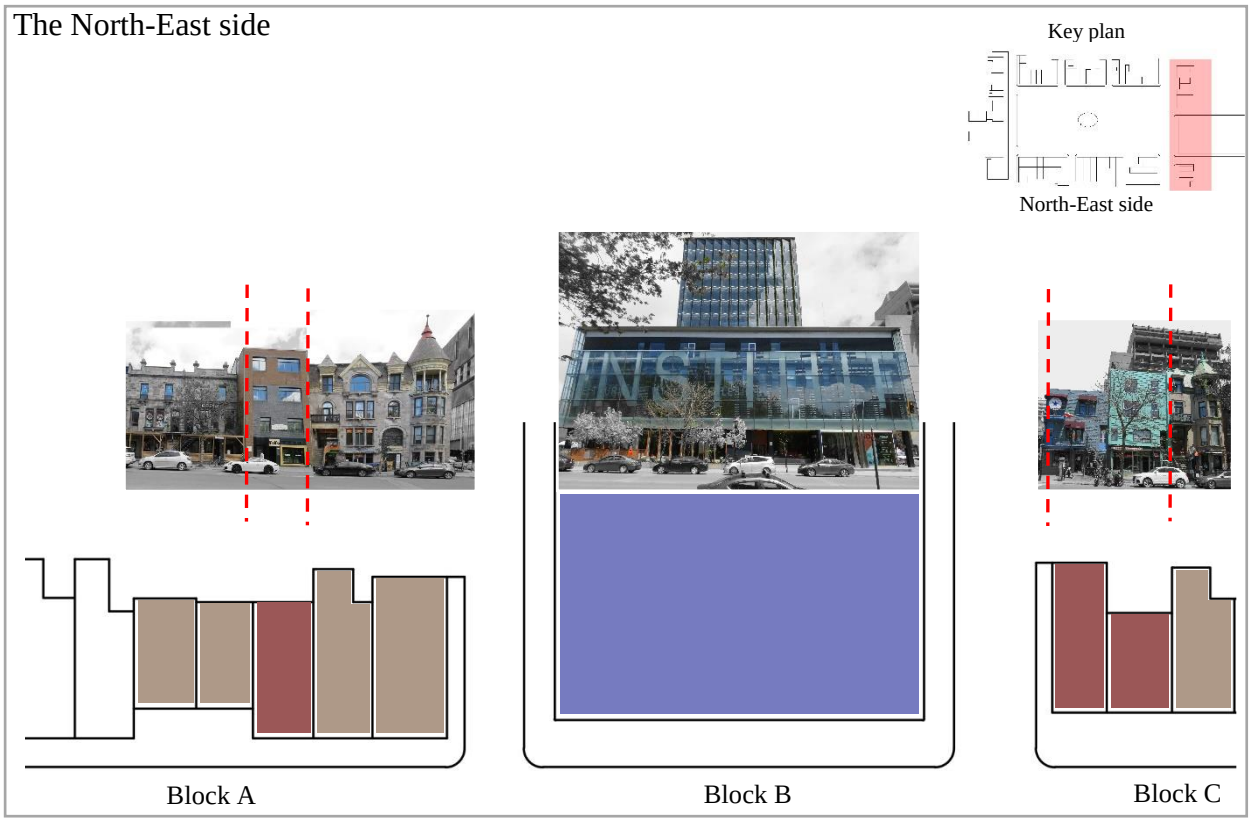


Fig. 3.8. Saint-Louis Square, North-East facade

Type	Block A	Block B	Block C
Valuable (Victorian)		----------	
Unvaluable (Modem)		----------	
Modern (Mega Structure)	--------		----------

Table 3.9. North-East façade data

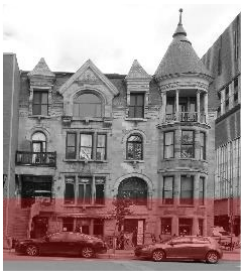
Physical element	Type	Division	color	Material	Pattern	openness	Photo
Façade	Victorian	The base (podium)	Monotone light gray	Limestone	Smooth Limestone blocks featuring strong horizontal striped pattern. Due to capitalisation, this part of façade is hardly recognizable today.	Bay windows toward the green space, front doors are located in the niche of the wall connecting to road level.	
		The middle zone (main floor)	Gray	Limestone	Rough Limestone blocks	Bay windows framed by smooth Limestone blocks. Front doors are located in the niche of the wall which is framed by smooth limestone and engraved lintels above doors. They are connected to road level through staircase.	
		The upper zone (attic)	Monotone matte gray forms background and colorful frames form windows and edges	Metal and/or Limestone block	Striped horizontal texture mixed with squama-like pattern	The fortress-like roofline conveys crenellated battlements and turrets. In some buildings, parapet is made of Limestone and metal flashing.	
	Modern	The base (podium)	Russet, in some cases bricks are painted in different color	Brick	Grid brick pattern	Simple rectangular shaped windows framed by concrete on the top or bottom part. The entire building entrance door is at road level	
		The middle zone (main floor)	Russet and gray	Brick	Grid brick pattern	Commercial sections are completely covered by windows, while simple rectangular shaped windows with concrete frames on the top or bottom cover residential buildings.	
		The upper zone (attic)	Russet	Brick and metal	Grid brick pattern	No opening and the façade ends in metal parapet flashing	

Table 3.10. North-East façade analysis

Façade	Modern (Mega Structure)	The base (podium)	Monotone light gray mixed with transparent colorless material	Mostly glass with metal and concrete	Patternless	The entire level is covered with transparent glass. Entrances are opened to street level.	
		The middle zone (main floor)	Transparent colorless material	Glass with metal frames	Rectangular Metal Grid	Completely transparent crust	
		The upper zone (attic)	Monotone light gray	Metal frame	Patternless solid metal	No opening	

Table 3.10. North-East façade analysis (continued)

3.5.2.3 Corner

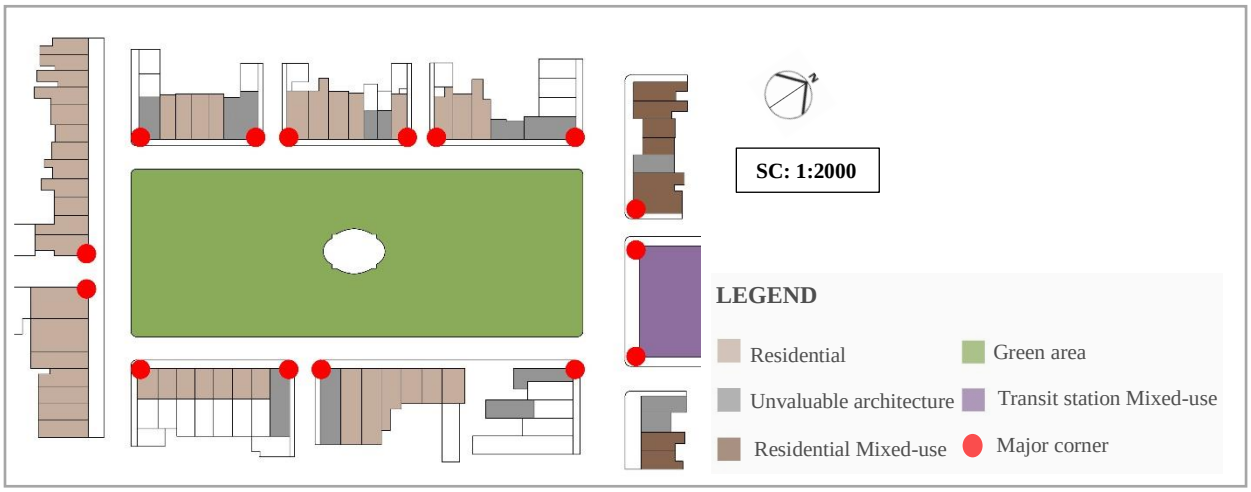


Fig. 3.9. Saint-Louis Square, Corner Building

Physical element	Category	Typology	Legend	Photo
Corner	Internal	Non-corner (Open square corner)		     
	External	-------	-------	-------

Table 3.11. Corner Building data

Physical element	Category	Typology	Building Style	form	Material	Description	Photo
Corner	Internal	Non-corner (Open square corner)	Victorian	Orthogonal	Limestone and/or brick	A- Façades at the corners of buildings meet simply with quoin details in materials which differ from the general façade. B- Attached tower corner (turret) with either rectangular or curved shape featuring bay windows	 A  B
			Modern	Orthogonal/ Cylindrical	Brick and/or concrete	A- Curved protrusions on the upper portion of the façade covering bay windows. B- Two plain façades meet without any significant detail	 A  B
			Modern (Mega structure)	Orthogonal	Glass (Transparent	A huge cube made of glass without any relationship to its surroundings	

Table 3.12. Corner building analysis

3.5.2.4 Floor plane

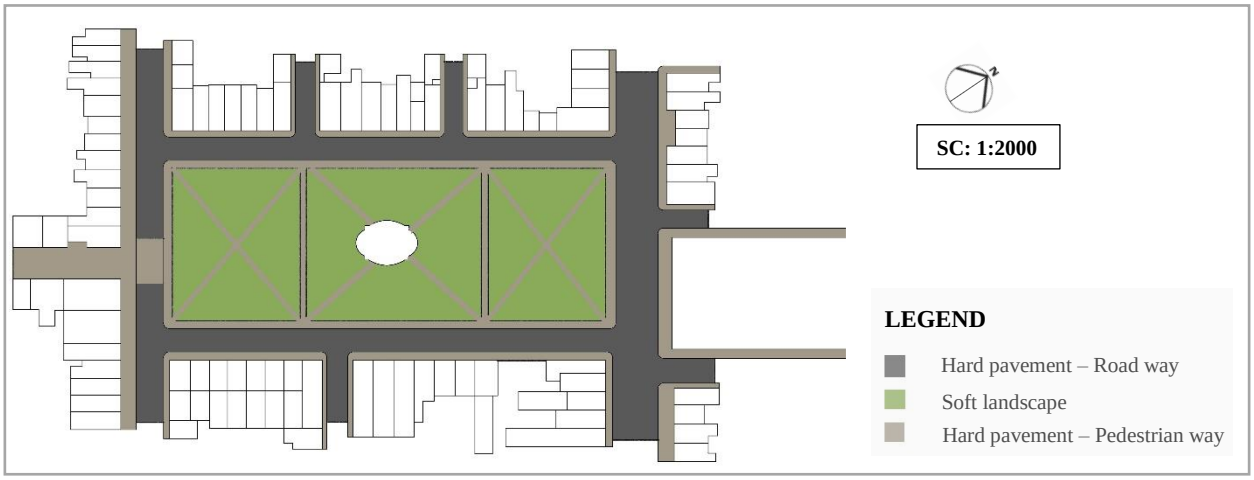


Fig. 3.10. Saint-Louis Square, Floor plane

Physical element	Type	Material	pattern	color	Description	Photo
Floor plane	Hard pavement (Pedestrian way)	Stone/concrete	Grid	Gray	Ranging from 1.5 m to 2 m width. Mostly flat, without any change in level	
	Hard pavement (Road way)	Asphalt	Plain	Dark gray	NE side 18 m width, SW side 10 m width, both NW and SE have 8 m width. Mostly flat.	
	Soft landscape	Lawn	Plain	Green	The green space at the central open space is mostly covered by lawn. Front yards are mainly covered by arbutus on NW side; however, on SE side they have been altered to hard pavement (walking side)	

Table 3.13. Floor plane analysis

3.5.2.5 Furniture

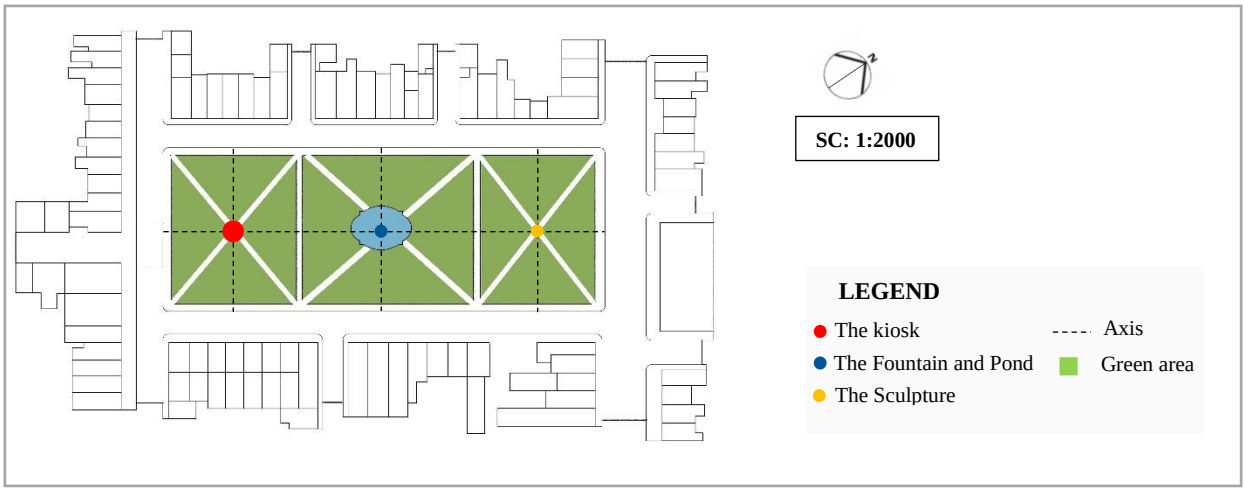


Fig. 3.11. Saint-Louis Square, Furniture

Physical element	Type	Placement	Visibility	Description	Photo
Furniture	Bench, light, trash cans,	On walking paths	Visible for spectators within the green area	The green area is well-equipped with benches, Victorian style lights are provided along pathways, bicycle racks are on the SE and SW sides.	
	Kiosk	On the Southwest longitudinal axis	Limited visibility for spectators within the green area	An octagonal stone building with large windows on all sides working as a cafeteria	
	Sculpture	On the Northeast longitudinal axis	Limited visibility for pedestrians on walking sides and spectators within the green area	Engraved stone with an obelisk in the center functions as a base for metal sculptures. The short obelisk doesn't form a stop or point of termination to the vista within the square	
	Pond and fountain	Symmetrically in the center of the green area	Visible for spectators within the green area. No visibility for surrounding houses	It is experienced visually and audibly by space users. Surrounded by multiple benches and canopy of trees, it creates a pleasant atmosphere.	

Table 3.14. Furniture analysis

3.5.2.6 Plot size

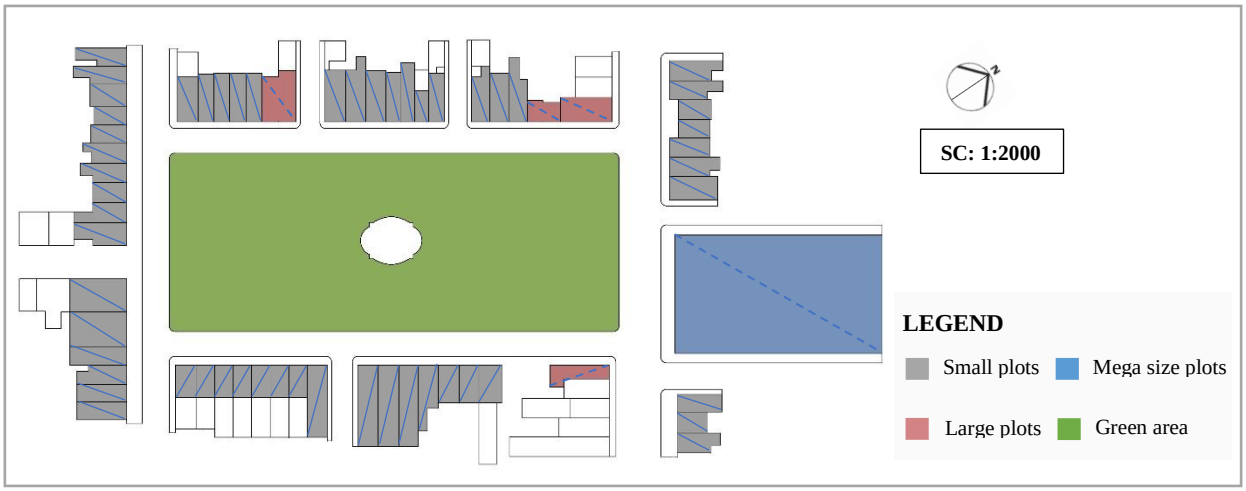


Fig. 3.12. Saint-Louis Square, Plot size

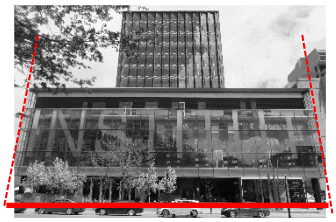
Physical element	Type	Legend	Width of plot	Description	Photo
Plot size	Small plot	d / w	9 m > w > 5 m	The width of small plots doesn't exceed 9 m; However, the depth of plots differs.	
	Large plot	d / w	26 m > w > 14 m	During Modernism, some plots were merged to create larger plots for apartmnts. They are mostly placed at corners.	
	Mega size plot	d / w	w ~ 50 m	The mega scale building has occupied an entire urban block, which in width is approximately equal to the width of eight plots.	

Table 3.15. Plot size analysis

3.5.2.7 Green space

Fig. 3.13. Saint-Louis Square, Green space

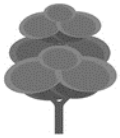
Physical element	Type	Legend	Density	Description	Photo
Green space	Lawn		High density in the main green area	The main green area is covered with lawn except walking paths. Along walking paths there are some bare spots.	
	Shrubs		Very low; only in some parts.	Only in front of houses and some areas around the pound.	
	Tree		High density within the main green area, and low density within front yards.	High density of old and semi-old trees which provide shaded and semi-shaded area for pedestrians.	

Table 3.16. Green space analysis

3.5.2.8 Roofline and eaves

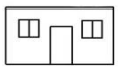
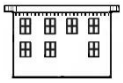
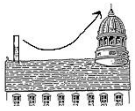
Physical element	Characteristic of land	Type of roofline	Legend	Material and color	Description	Photo
Roofline and eaves	Flat	Plain crisp edge (Modernist)		Dark red-orange brick with metal parapet flashing which is mostly dark brown or black	Simple type of roofline which is not ornamented at all. Some buildings have limited amount of detail around the eaves which is usually made of brick.	
		Gabled roof consisting series of gables (Medieval)		Red-orange brick or gray limestone blocks.	Covered with mansard roofs as a background for this type of roofline, creating a rhythm	
		Horizontal ornamental edge (Renaissance)		Gray limestone blocks covered with metal parapet flashing	They may have tooth cogged crests made by metal or limestone blocks, or they may have been ornamented by different sorts of eaves scrolls and cornices	
		Baroque building rooflines		Red-orange brick or gray limestone framed with metal.	The regular line of the roof is broken by towers and chimneys	

Table 3.17. Roofline and eaves analysis

3.5.2.9 Pathways and traffic roads

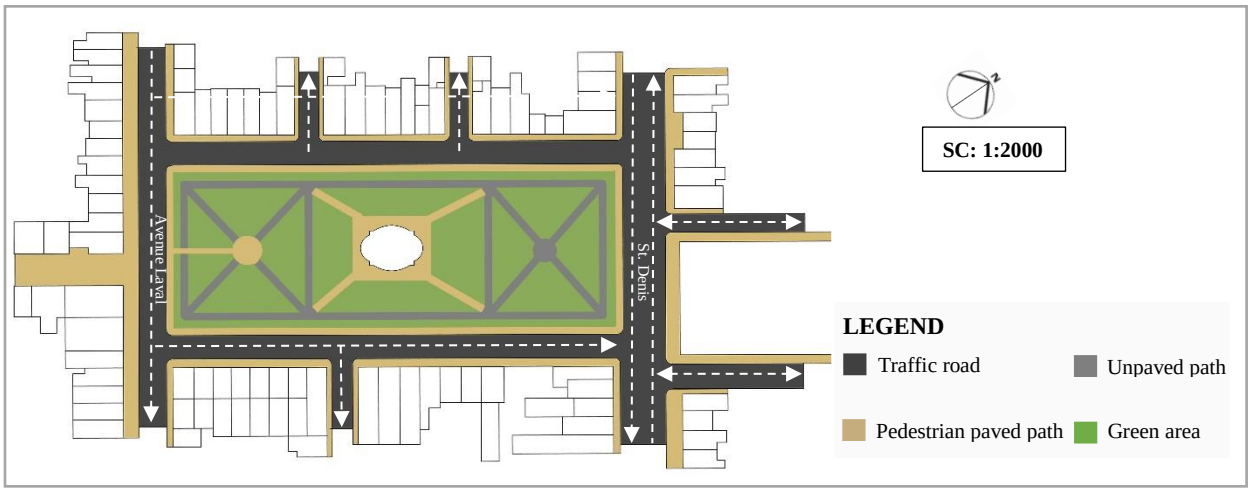


Fig. 3.14. Saint-Louis Square, Pathways and traffic roads

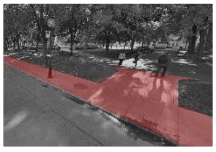
Physical element	Type	Material	Width	Description	Photo
Pathways and traffic roads	Traffic road	Asphalt	NE: 18 m SW: 10 m NW: 8m SE: 8m	The green area is surrounded by traffic roads. The widest road on the Northeast has two-way traffic (fast traffic), while others are one-way (slow traffic).	
	Pedestrian paved path	Gray stone block	1.5 m > w > 2 m	The pedestrian way is mostly flat without any changes in level.	 
		Concrete			
	Unpaved path	Gravel	1.5	Unpaved path is just in the green area to give access to furniture.	

Table 3.18. Pathways and traffic roads analysis

3.5.3 Perceptual element analysis

3.5.3.1 Unity

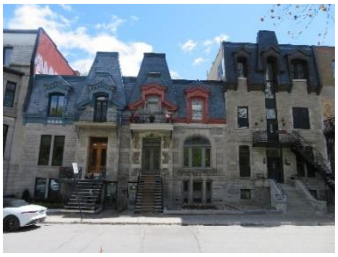
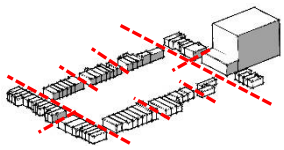
Perceptual element	Basic principles[21]	Legend	Description	Photo
Unity	Proximity		Houses (Victorian style) in SE, a part of NW, and a part of SE are placed in close proximity, while NE buildings are separated (lack of spectator comprehension) by the huge structure of the transit station (Metro)	 Houses with related elements in close proximity  Different architecture without any related elements.
	Repetition		Victorian style buildings (the majority of houses) have elements (such as metal staircases, stone façade, windows, and etc.) that are copied or mimicked numerous times. However, scattered modern style buildings haven't followed the same rule.	 Repetition of staircases, bay windows, stone facades.  Non-repeating and non-relating elements
	Continuity		Use of smooth Limestone blocks at the base of buildings featuring strong horizontal striped pattern.	
	Closure		The entire square is not well-enclosed, particularly the NE side.	

Table 3.19. Unity analysis

21- Basic principles here are defined by the author from different source. For the main source refer to Lovett, n.d., https://www.johnlovett.com/

3.5.3.2 Proportion

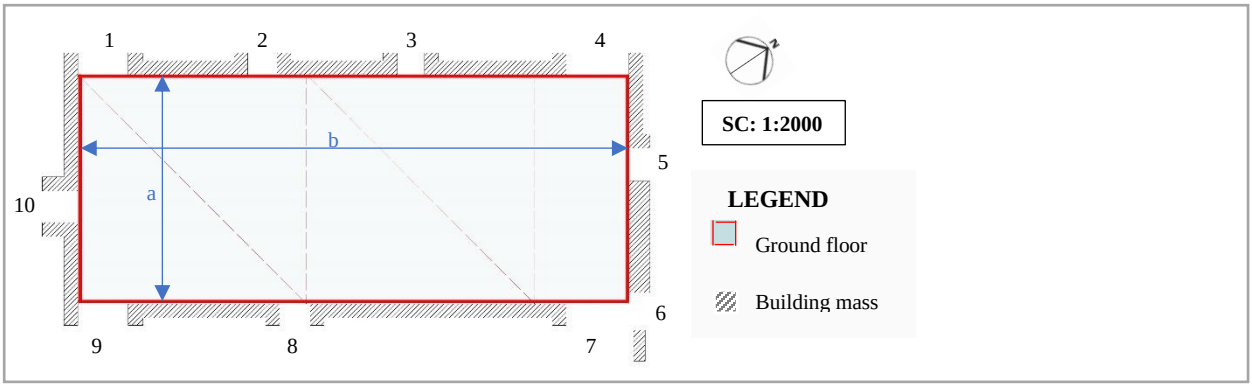


Fig. 3.15. Saint-Louis Square, Proportion

No	Section	Proportion	Photo	No	Section	Proportion	Photo
1		1:3		6		1:2	
2		1:1.5		7		1:3.5	
3		1:1.5		8		1:1.5	
4		1:3.5		9		1:3	
5		1:2		10		1:2	

Table 3.20. Visual proportion of adjacent streets analysis

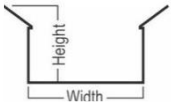
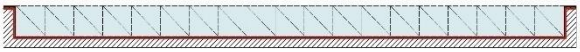
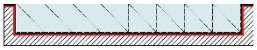
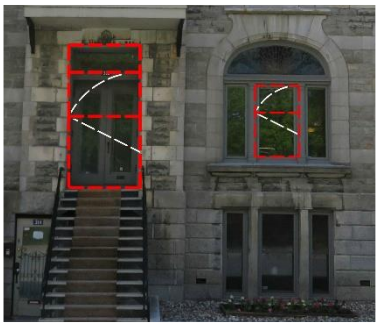
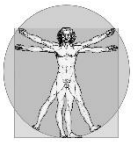
Perceptual element	Type	Legend	Description and Photo
Proportion	Entire space		 Proportion in longitudinal axis 1:19  Proportion in transverse axis 1:8
	Buildings and Elements		 Golden ratio is applied on the overall layout of Victorian façade. The width and height of the building are based on the rule of the Golden ratio
			 In Victorian style house every element on the façade is based on the Golden ratio. However, modern buildings don't conform to the same rule. Modern buildings, moreover, in terms of material, are completely different.

Table 3.21. Proportion analysis

3.5.3.3 Scale

Physical element	Legend	Type	Description	Photo
Scale		Space	The size of the space 230 (m) × 100 (m) in comparison with the size of human body is considered out of scale; however, trees within green area counterbalanced this effect by minifying the dimension of the space.	
		Building	Application of harmonizing color and texture on the façade, as well as the incorporation of Victorian style windows and doors lead to the creation of an appropriate scale in the space.	
Table 3.22. Scale analysis				

3.5.3.4 Enclosure

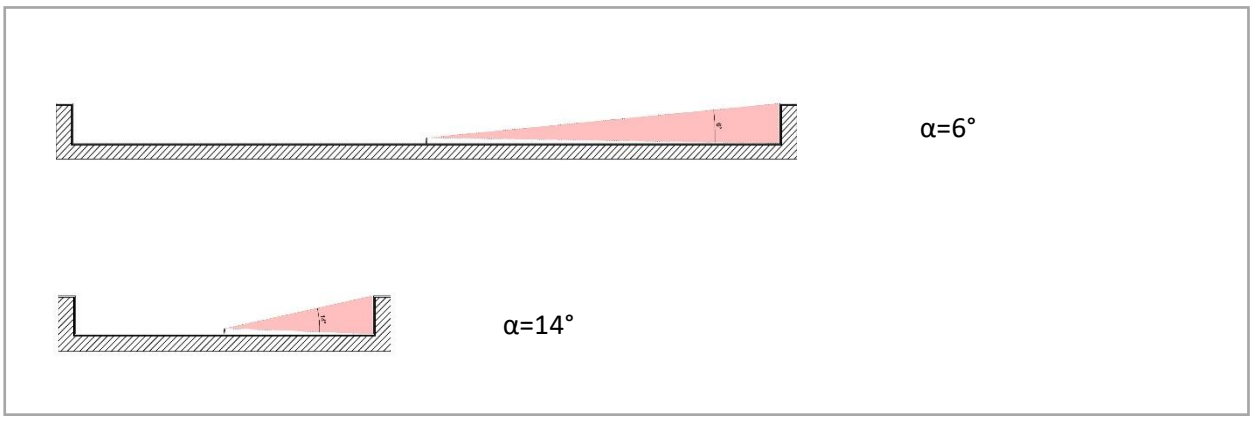


Fig. 3.16. Saint-Louis Square, Enclosure

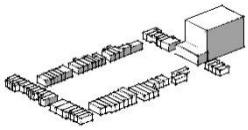
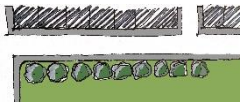
Physical element	Legend	Measurement	Description	Photo
Enclosure		230 (L) × 100 (W) × H 15 ≥ H ≥ 6.5	The square without trees and the green area is perceived as a space with loss of enclosure; however, the presence of trees within green area increase the sense of enclosure. The buildings facade along with a row of trees create a linear enclosed space within the square.	 Square without trees, loss of enclosure  Trees create an enclosed space

Table 3.23. Enclosure analysis

3.5.3.5 Harmony

Physical element	Legend	Main principles	Description	Photo
Harmony		Adjacent colors Similar shapes Related textures	Victorian style architecture demonstrates a harmony between buildings within the square. Most of the facades are built by gray limestone with different textures. Variety of exterior staircases in different shapes creates harmony within the space.	

Table 3.24. Harmony analysis

3.5.3.6 Contrast

Physical element	Legend	Main principles	Description	Photo
Contrast		Different colors Different directions Textural difference Tonal difference Difference in scale	The gray limestone façade as a background creates contrast with colorful rooflines, doors and windows. Moreover, different textures and tones of a similar material in Victorian houses exhibit a strong level of contrast. The difference in scale between the Transit station building and small Victorian houses creates more tension rather than contrast.	 Contrast  Tension

Table 3.25. Contrast analysis

3.5.3.7 Balance and symmetry

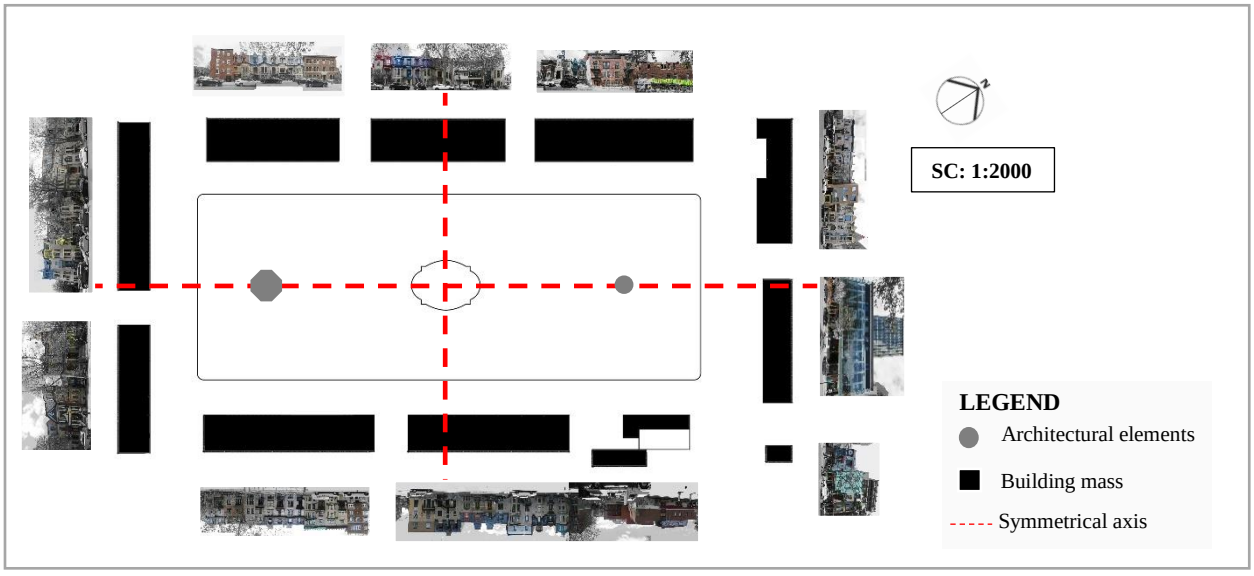


Fig. 3.17. Saint-Louis Square, Balance and symmetry

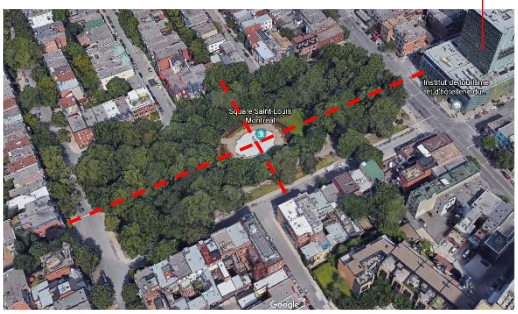
Physical element	Legend	Type	Description	Photo
Balance and symmetry		Formal (symmetrical balance)	The overall layout of the square is rectangular and shows a formal symmetrical balance in which the kiosk, fountain, and the sculpture are placed. However, in terms of distribution of buildings and main streets running through the square it shows a less formal approach to balance. The visual balance on both sides of the axis is eliminated by the massive structure of the Transit station.	Transit station building 
		Informal (asymmetrical)		

Table 3.26. Balance and symmetry analysis

3.5.3.8 Composition

Physical element	Legend	Measurement	Description	Photo
Composition		The placement or arrangement of visual elements	Mostly, the enclosing façade of the square consists of Victorian style architecture which creates a sense of unity. However, the inappropriate construction of modern buildings in contrast with the square identity causes a discrepancy in the shape of the enclosing crust of the square.	 Victorian houses with similar and harmonious elements.  Modern style of housing disturbs the architectural identity of the square.

Table 3.27. Composition analysis

3.5.3.9 Rhythm

Physical element	Legend	Measurement	Description	Photo
Rhythm		Patterns, alteration and repetition of elements	The pattern of gray limestone of Victorian façade, the repetition of bay windows, doors, staircases, etc., and the alteration of roofline and eaves color creates rhythm. However, this rhythm is disrupted by new modern buildings constructed during the 70s and 80s.	 Victorian architecture induces  Modern architecture disturbs rhythm

Table 3.28. Rhythm analysis

3.5.4 Conclusions on Saint-Louis Square

The main constituent physical and perceptual elements of Saint-Louis Square present problems and inefficiencies in terms of spatial structure. In the area of physical elements, the square façade consists of three- to five-storey buildings (mostly three-storey). The richness of Victorian style houses creates a highly decorative architecture, well-articulated, as opposed to the visual monotony of the Modern style buildings' façades made of burgundy bricks. Corners are a great place to introduce ornament and decoration into a square, but the design of corners in Saint-Louis Square is limited to the rotation of the mansard roofline and quoin details in the façade materials of the Victorian houses. Such details are diminished in Modern style houses and the corner treatment is stark and unadorned. The quality of the floor plane of the green area on the North-East is not appropriate for space users. During the period of modern architecture some plots were merged to create a larger plot; in contrast with other plots which are small in width, it increases the width of the building and eliminates the scale of space (the fairly narrow different facades have a rhythm that, though irregular, creates a unit of measurement for spectators in perceiving proportion and the scale of the space). The long, flat, and glassy Transit station building

does not provide an appropriate scale for spectators to measure the space. Setbacks of houses (front gardens) in the North-West, South-West and part of South-East have been planted with tall trees; the massive foliage of trees hides most of the Victorian buildings' details from a spectator. The monotone form of roofline in the new modern buildings without any decoration interrupts the continuity of Victorian well-articulated roofline and reduces the sense of unity. One of the major problems of the square regarding traffic roads is parking spots in front of the houses, which reduces the spatial quality of the space.

Turning next to consider the perceptual elements of Saint-Louis Square, it needs to be noted that the scattered growth of buildings in recent decades with different styles of architecture, materials, and colors reduces its spatial quality. The high-rise glass building of the Transit station with its mega-scale in comparison with small scale houses is out of proportion, and diminishes the harmony, balance and human scale of the square.

In conclusion, evaluation of the main parameters of Saint-Louis Square illustrates that both spatial and visual quality of the square that affects on its aesthetic aspects requires better integration of the square in terms of both physical and perceptual elements.

3.6 Case study 2. Square Jean-Rostand

3.6.1 Introduction

As part of the expansion of Victorian architecture in Montreal, Square Jean-Rostand is one of the small-scale neighborhoods of the new community of Bois Franc, located in the city of Saint Laurent, fifteen minutes from downtown (Fig. 3.3). The new middle-class residential development was designed by Louis Sauer, an American architect and design theorist, to house up to 10,000 housing units (20,000 to 25,000 people), retail space, offices, and recreational facilities. The designer's objective was to create a magnificent "signature" town by reconciling natural elements and water as basic principles (Sauer, 1994). After the Second World War, public tastes tended toward a more decorative public realm; to satisfy the public demand, urban designers often coped past styles. While history as an important source of urban design concepts can be rightly considered in any project, mindless copy-and-paste methods may cause an unfortunate "pastiche" effect (Moughtin et al, 1999). In the design[22] of Bois Franc, by injecting life and creating a large urban neighborhood with a strong identity, the designer intended to not just copy past styles of foreign architecture, or typical suburbs developed in Montreal. The approach to achieving this was creating small-scale neighborhoods with squares and short streets (Fig. 3.4). The designer referred to the Savannah Historic District's pattern as a proven planning design precedent in order to give focus to the composition of Bois Franc (Sauer, 1994). Accordingly, the square design approach includes streets, houses, and green combinations. These elements were designed to give the neighborhood a centre, to provide a distinct green area for recreational activities, and to enhance the sense of community among inhabitants.

Name	Neighborhood	Type	Housing style	Area	Date of establishment
Square Jean-Rostand	Bois Franc, Saint-Laurent	Residential	Victorian	6,200 m2 ≈ (100m × 62m)	1994

Table 3.29. Basic information on Square Jean-Rostand[23]

22- New Urbanism approach was adopted in the design of Bois Franc neighborhood.
23- Information extracted from the website of Ville De Montréal, ville.montreal.qc.ca.

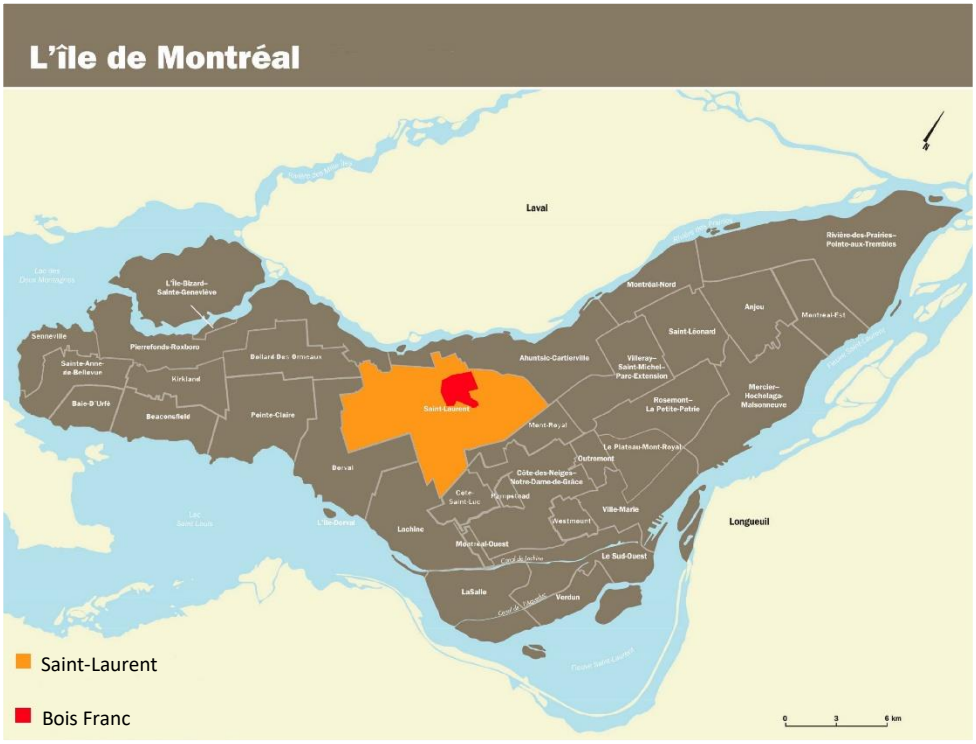


Fig. 3.18. Situation plan, Bois Franc, Square Jean-Rostand. Source: Ville de Montréal

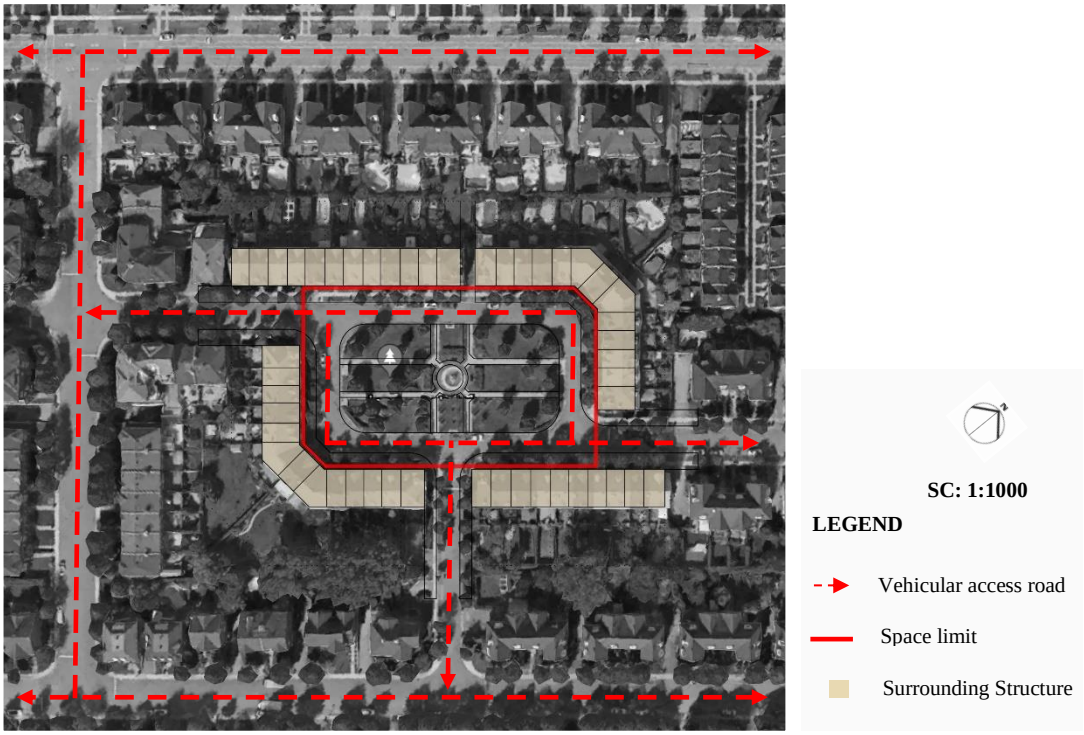


Fig. 3.19. Square Jean-Rostand, Access road plan. Source: Google Earth

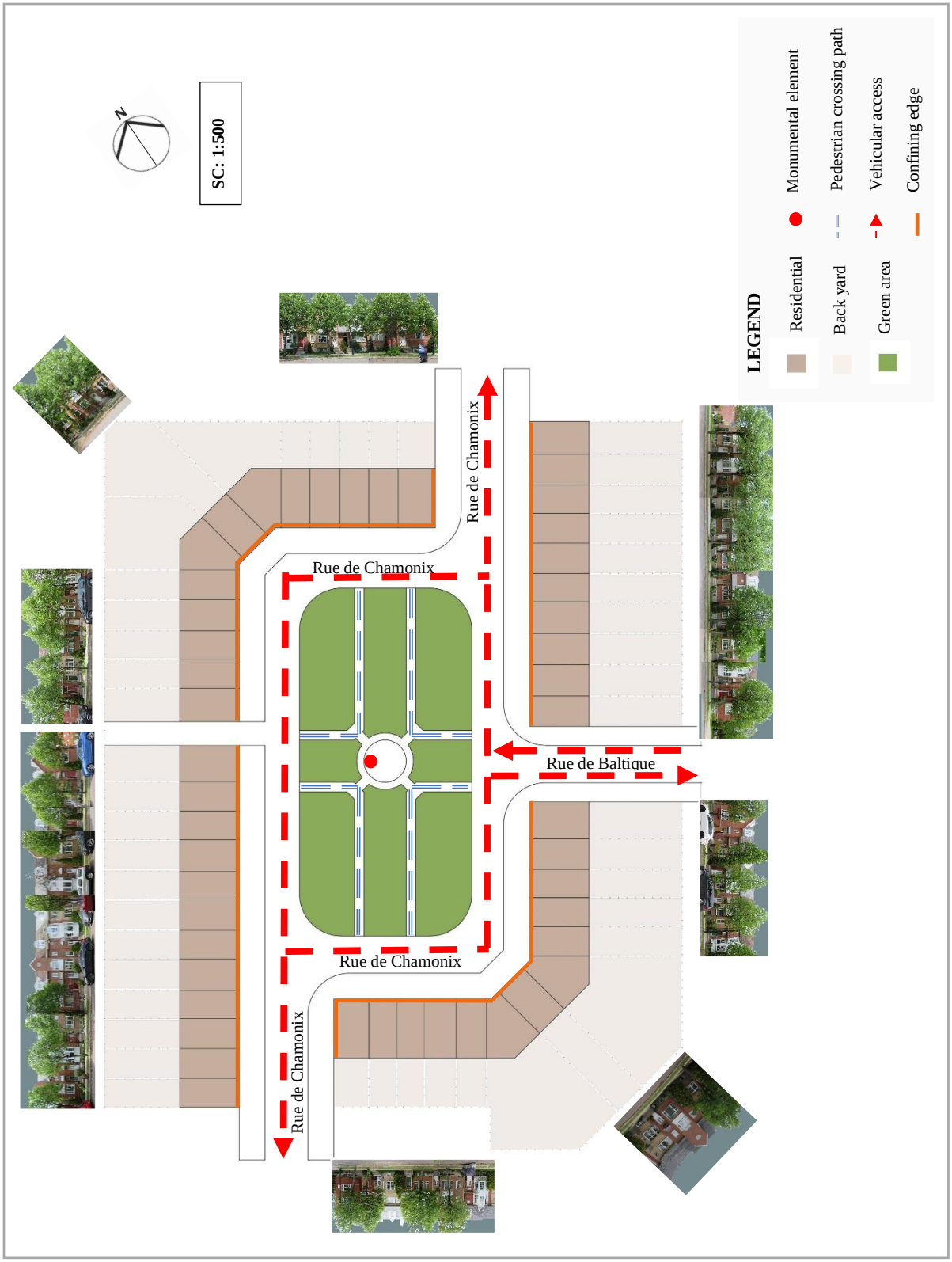


Fig. 3.20. Square Jean-Rostand, Site plan

3.6.2 Physical element analysis

3.6.2.1 Ground floor outline

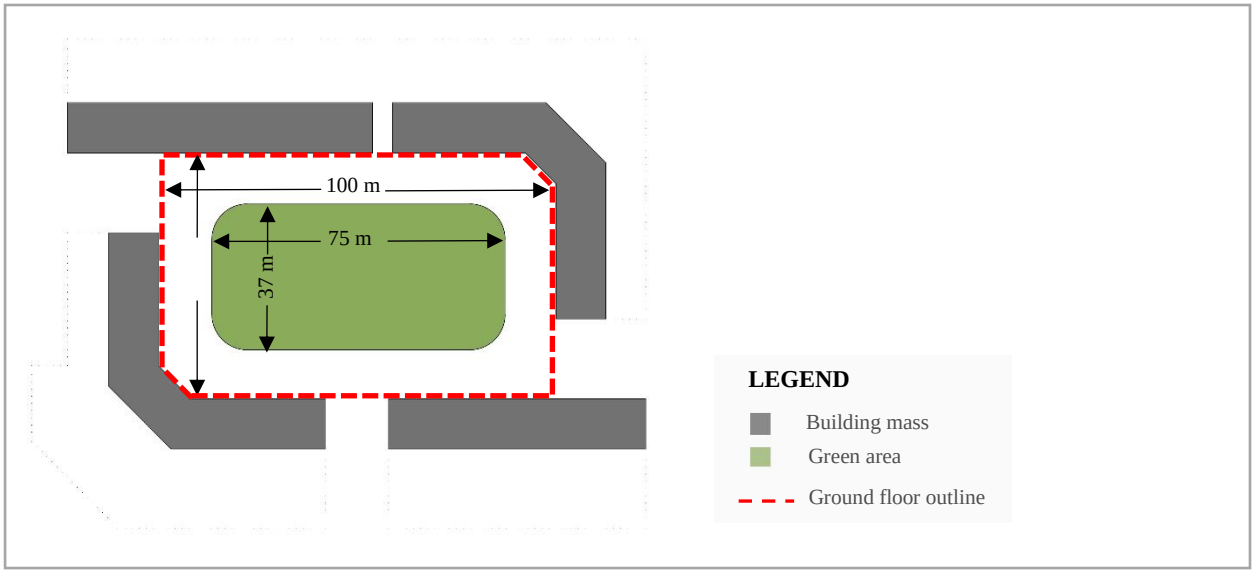


Fig. 3.21. Square Jean-Rostand, Ground floor outline

Physical element	Legend	Measurement	Description	Photo
Ground floor outline	□ ○ △	100m × 62m Green open space 75m × 37m	Regular rectangle with small chamfers on two corners. The ground floor is surrounded by streets on all sides	

Table 3.30. Ground floor outline analysis

3.6.2.2 Façade

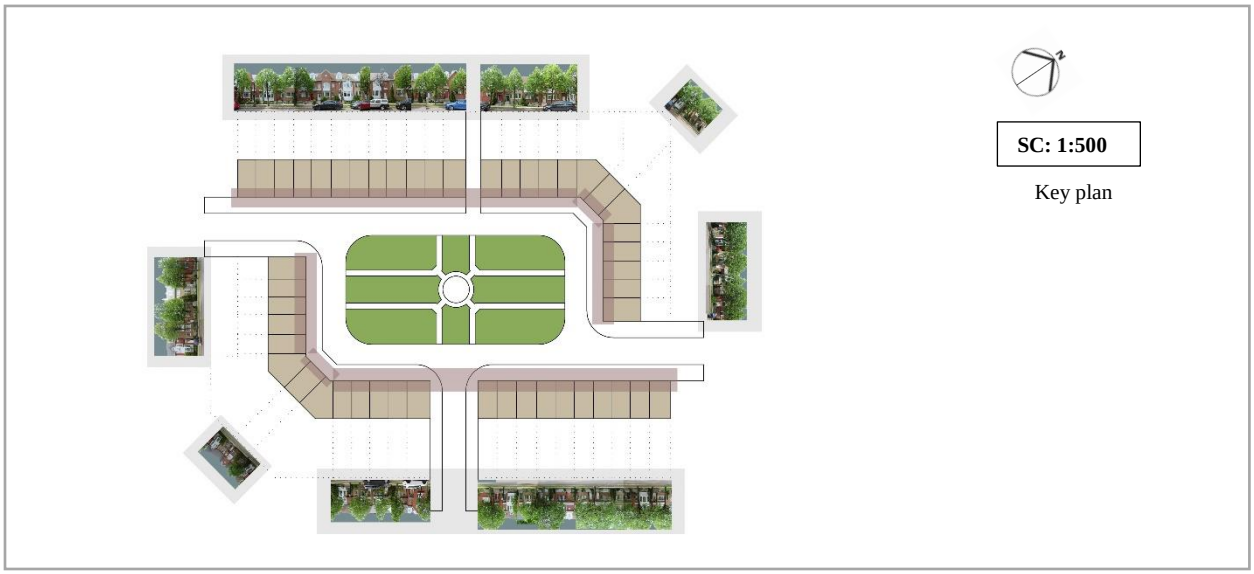


Fig. 3.22. Square Jean-Rostand, Key-plan, Façade

Type	Direction				
	North-West	North-East	South-East	South-West	Corners
Victorian					

Table 3.31. Façade data

Physical element	Type	Division	color	Material	Pattern	openness	Photo
Façade	Victorian	The base (podium)	Monotone light gray	Concrete	Smooth concrete without any striking pattern	Small windows of the basement toward the front yard and the green space	
		The middle zone (main floor)	Russet or light beige	brick	Grid brick pattern	Bay windows framed by smooth white concrete, front doors are located in the niche of the wall. They are connected to road level through concrete staircase. A small canopy held up over the front door.	
		The upper zone (attic)	Ranging from matte light gray to dark gray, beige, and russet	Rubber, clay, metal	Striped horizontal texture mixed with squama-like pattern	The outward appearance of pitched roofs acts as background for dormer windows and bay windows	

Table 3.32. Façade analysis

3.6.2.3 Corner

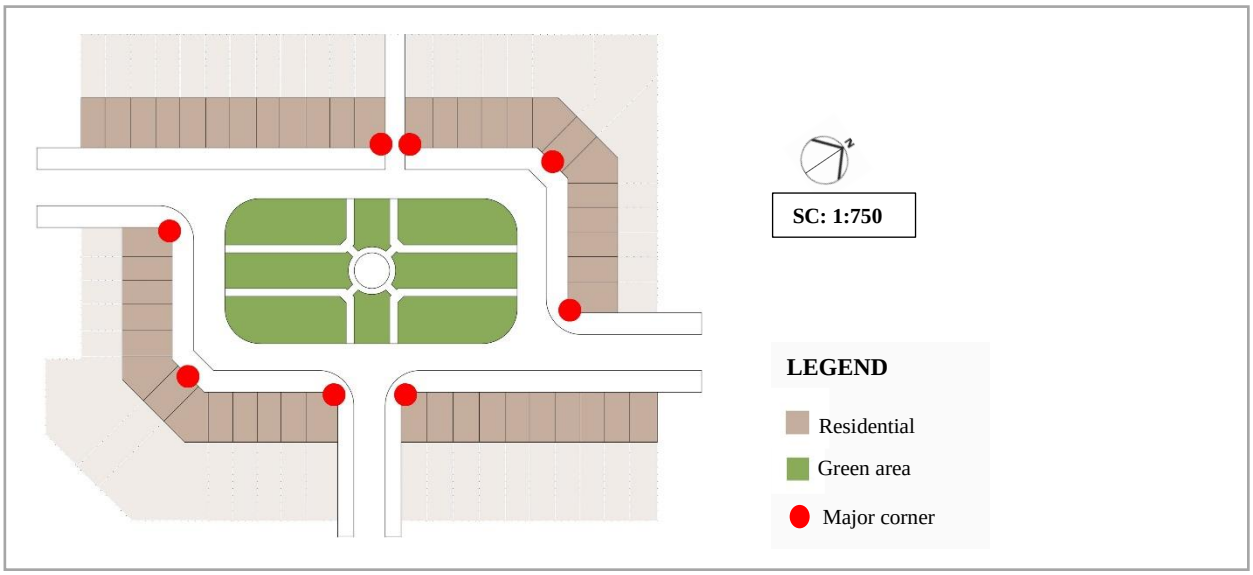


Fig. 3.23. Square Jean-Rostand, Corner building

Physical element	Category	Typology	Legend	Photo
Corner	Internal	Non-corner (Open square corner)		
		Angular corner (faceted corner)		
	External	----------	---------	----------

Table 3.33. Corner building data

Physical element	Category	Building Style	Typology	Material/Form	Description	Photo
Corner	Internal	Victorian	Non-corner (Open square corner)	Brick/Orthogonal	Façades at the corners of buildings meet simply without any significant detail. Also, attached tower corners (turrets) with rectangular shapes in white color show minimum decoration.	
			Angular corner (faceted corner)	Brick/Chamfered corner	No distinctive features over against other buildings, with only a slight difference in the level of the roof and an attached tower featuring bay and dormer windows.	

Table 3.34. Corner building analysis

3.6.2.4 Floor plane

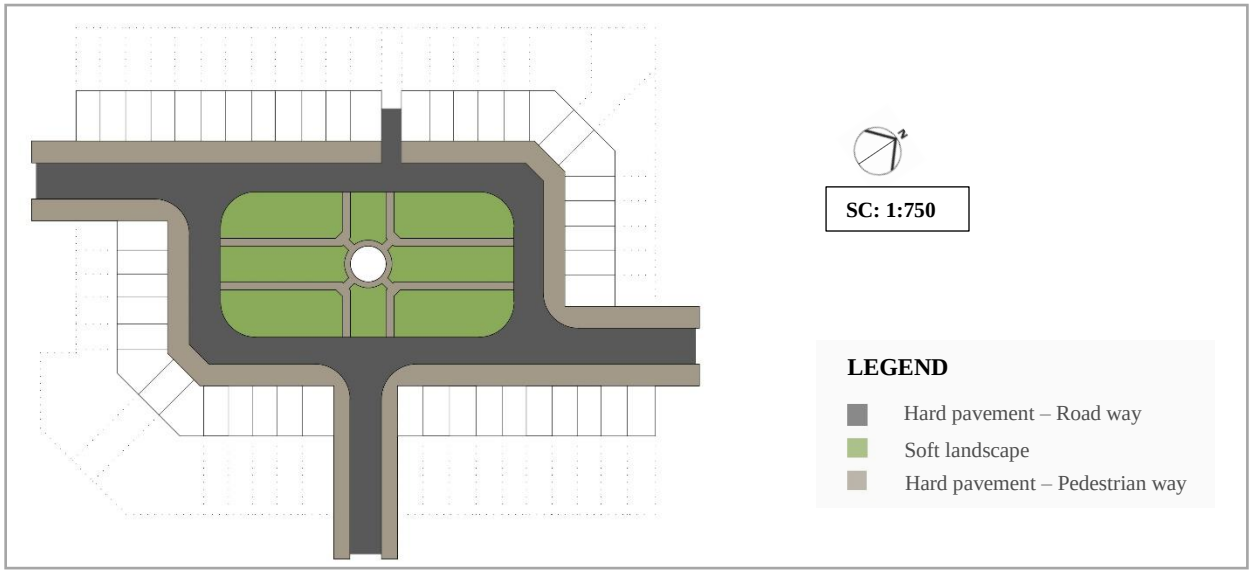


Fig. 3.24. Square Jean-Rostand, Floor plane

Physical element	Type	Material	pattern	color	Description	Photo
Floor plane	Hard pavement (Pedestrian way)	Concrete tile, smooth concrete, and gravel	Grid/Plain	Gray	Ranging from 1 m to 2 m in width. Mostly flat, without any change in level	 
	Hard pavement (Road way)	Asphalt	Plain	Dark gray	The width of streets running into the square is 9 m, while the width of the surrounding streets is reduced to 6.5 m.	
	Soft landscape	Lawn	Plain	Green	The green space at the central open space is mostly covered by lawn. Front yards are mainly planted with trees and arbutus.	

Table 3.35. Floor plane analysis

3.6.2.5 Furniture

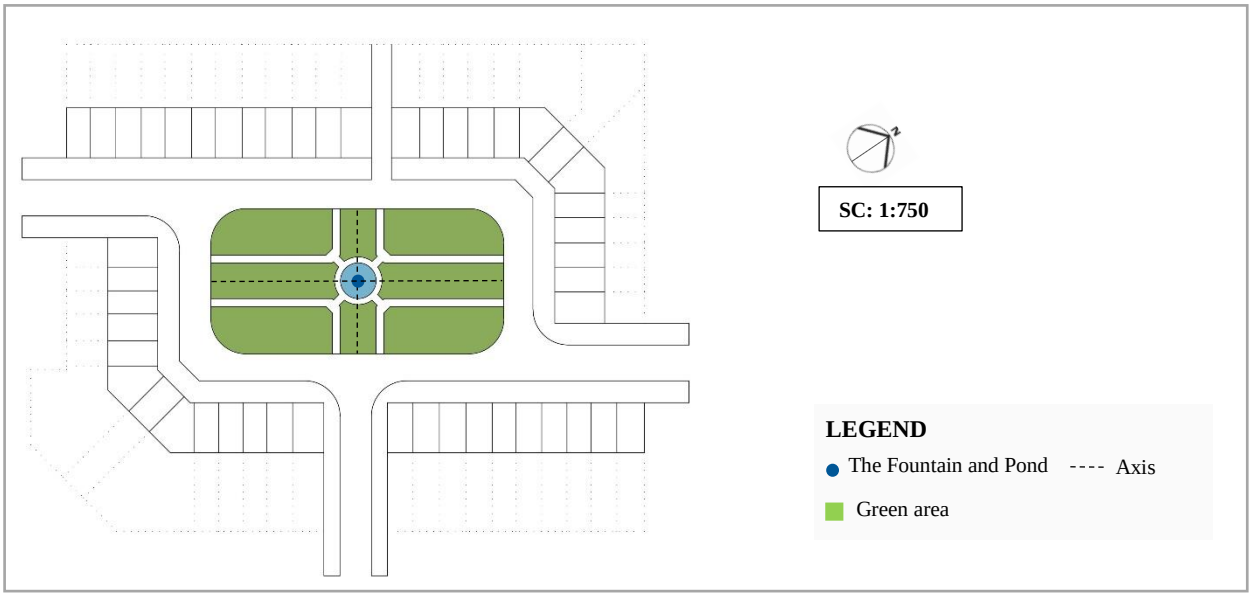


Fig. 3.25. Square Jean-Rostand, Furniture

Physical element	Type	Placement	Visibility	Description	Photo
Furniture	Bench, light, trash can, mailbox, Bicycle rack	On walking paths	Visible for spectators within the green area	The green area is well-equipped with benches, Victorian style lights are provided along pathways, there is no bicycle rack in the square. Mailboxes are located on the NE and SW.	 
	Pond and fountain	Symmetrically in the center of the green area	Visible to spectators within the green area. Average visibility for surrounding houses	It is experienced visually and audibly by space users. Surrounded by multiple benches, it creates a pleasant atmosphere.	

Table 3.36. Furniture analysis

3.6.2.6 Plot size

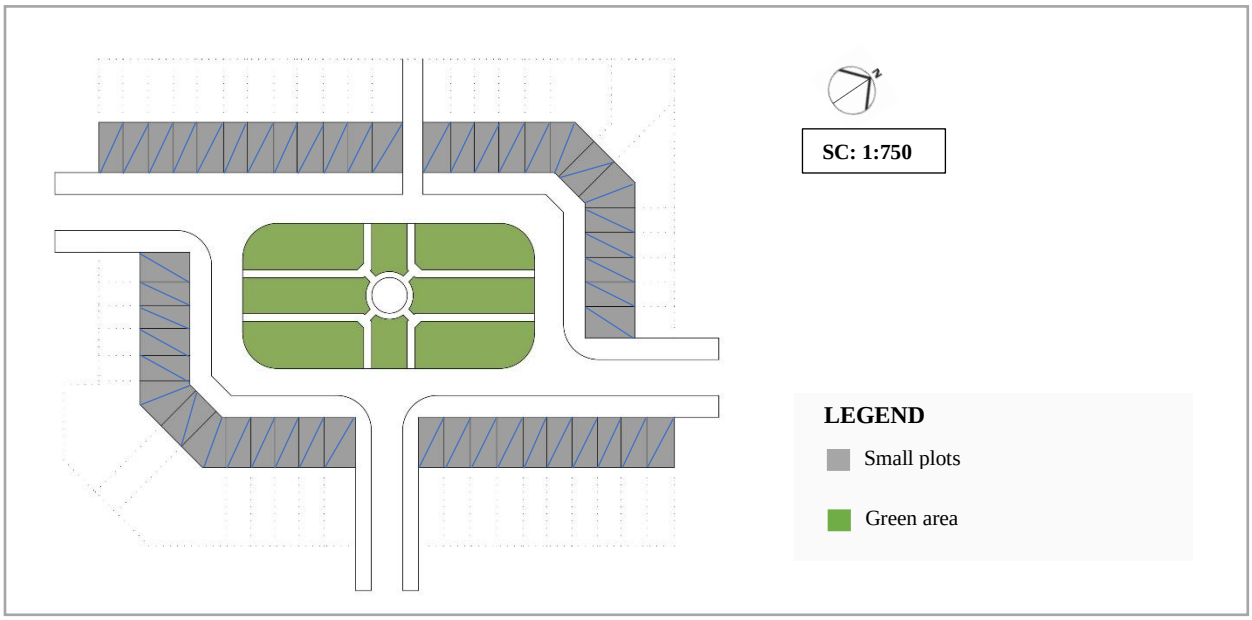


Fig. 3.26. Square Jean-Rostand, Plot size

Physical element	Type	Legend	Width of plot	Description	Photo
Plot size	Small plot	d w	9 m > w > 7.5 m	The width of small plots doesn't exceed 9 m and the depth of plots are equal.	

Table 3.37. Plot size analysis

3.6.2.7 Green space

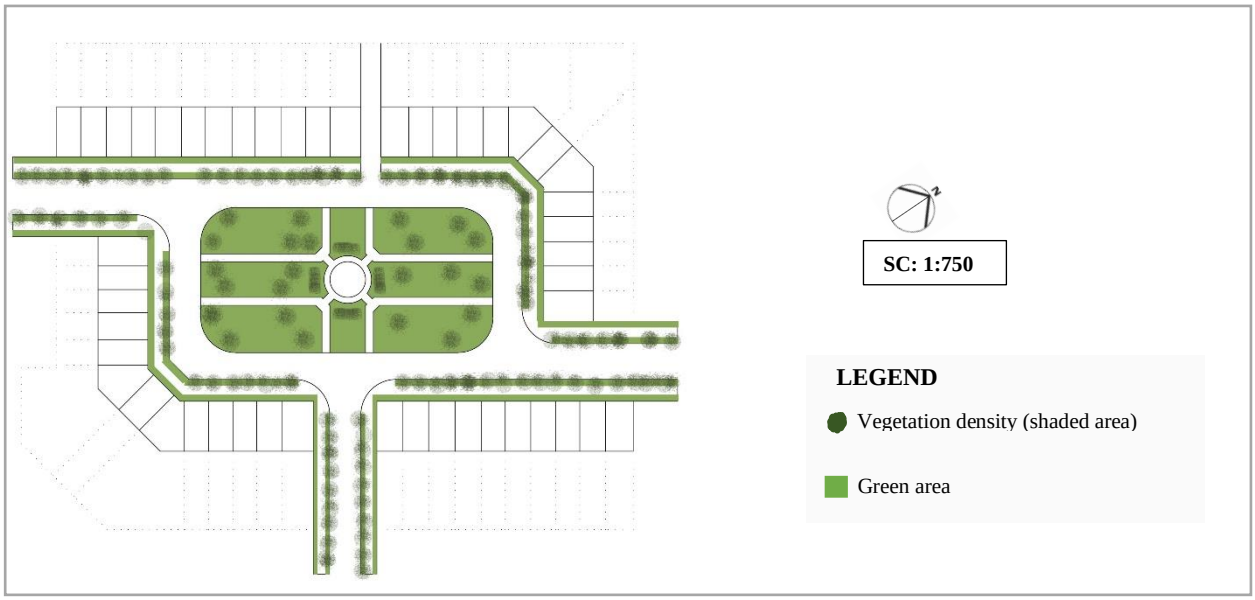


Fig. 3.27. Square Jean-Rostand, Green space

Physical element	Type	Legend	Density	Description	Photo
Green space	Lawn		High density in the main green area	The main green area and front yards are covered with lawn except walking paths. Along walking paths there are some bare spots.	
	Shrubs		Very low; only in some parts.	There are moslty planted on the front yard of houses and arround the pond.	 
	Tree		Low density within the main green area, and high density along the surrounding streets.	High density of trees along walking path of surrounding streets, which provide shaded and semi-shaded areas for pedestrians.	

Table 3.38. Green space analysis

3.6.2.8 Roofline and eaves

Physical element	Charact eristic of land	Type of roofline	Legend	Material and color	Description	Photo
Roofline and eaves	Flat	Gabled roof consisting series of gables (Medieval)		Made of rubber, clay and metal, in colours ranging from matte light gray to dark gray, beige, and russet	Simple type of gabled roof acts as a background for dormer windows. It creates a horizontal roof ridge which is slightly different in height along the length of the square. The regular roof ridge is broken by white turrets at the corners.	

Table 3.39. Roofline and eaves analysis

3.6.2.9 Pathways and traffic roads

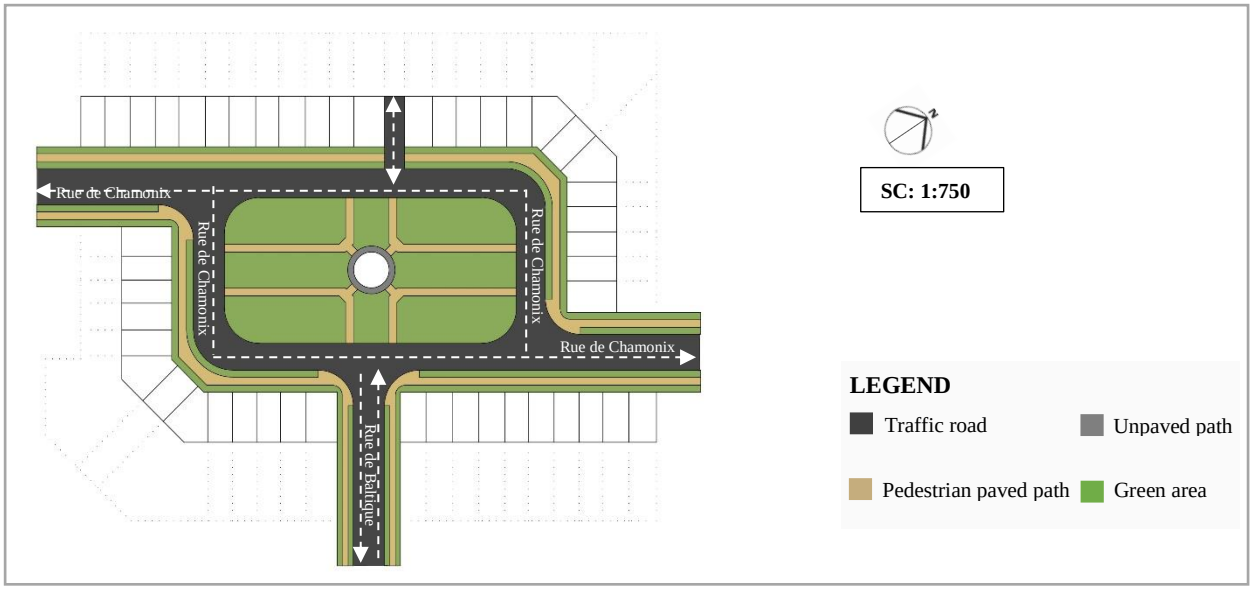


Fig. 3.28. Square Jean-Rostand, Pathways and traffic roads

Physical element	Type	Material	Width	Description	Photo
Pathways and traffic roads	Traffic road	Asphalt	1-All sides: 6.5 m 2- Streets running to the square: 9m	The green area is surrounded by traffic roads (two-way slow traffic).	
	Pedestrian paved path	Concrete tile	1.5 m > w > 2 m	The pedestrian path is mostly flat without any changes in level.	 
		Concrete			
	Unpaved path	Gravel	2 m	Unpaved path is only around the pond.	

Table 3.40. Pathways and traffic roads analysis

3.6.3 Perceptual element analysis

3.6.3.1 Unity

Perceptual element	Basic principles[24]	Legend	Description	Photo
Unity	Proximity		Victorian style houses are placed in close proximity	 Houses with related elements in a close proximity
	Repetition		Victorian style buildings have elements (such as concrete staircases, white bay and dormer windows, etc.) that are copied or mimicked numerous times. However, the repetition of similar elements creates a visual monotony.	 Repetition of staircases, bay windows, brick facades.
	Continuity		The use of smooth concrete at the base of buildings featuring strong horizontal line, and the use of a gabled roof with a slight change in level creates a sense of continuity.	 
	Closure		The square is surrounded on all four sides by a crust (façade) of buildings. However, the streets entering the area reduce the quality of enclosure.	

Table 3.41. Unity analysis

24- Basic principles here are defined by the author from different source. For the main source refer to Lovett, n.d., https://www.johnlovett.com/

3.6.3.2 Proportion

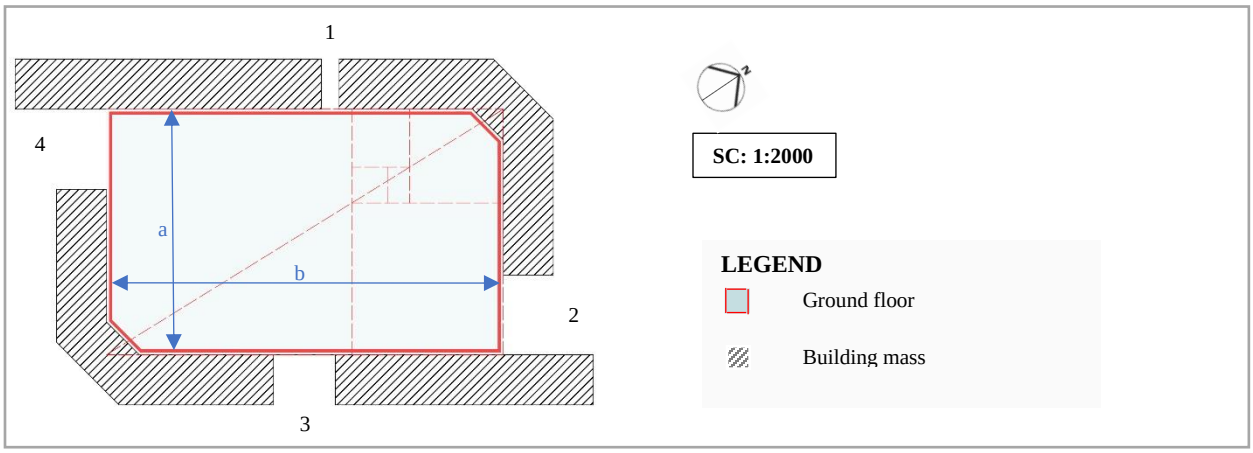


Fig. 3.29. Square Jean-Rostand, Proportion

No	Section	Proportion	Photo	No	Section	Proportion	Photo
1		1:1		3		1:3.5	
2		1:4.5		4		1:4.5	

Table 3.42. Visual proportion of adjacent streets analysis

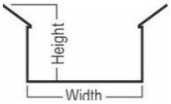
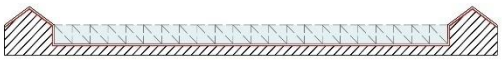
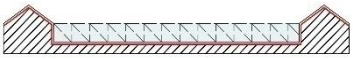
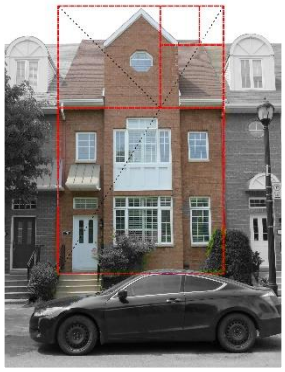
Perceptual element	Type	Legend	Description and Photo
Proportion	Entire space		 Proportion in longitudinal axis 1:22  Proportion in transverse axis 1:13.5
	Buildings and Elements		 Golden ratio is applied on the overall layout of Victorian façade. The width and height of the building are based on the rule of the Golden ratio
			 In general, all elements of the façade are proportioned and are based on the Golden ratio. In terms of materials, all buildings are of a kind and show proportion.

Table 3.43. Proportion analysis

3.6.3.3 Scale

Physical element	Legend	Type	Description	Photo
Scale		Space	The size of the space 100 (m) × 62 (m) in comparison with the size of human body is considered out of scale; moreover, the density of trees within green area is not adequate to minify the dimension of the space.	
		Building	The composition of proportional doors and windows along with the harmonizing color and texture of the façade lead to the creation of an appropriate scale in the space.	

Table 3.44. Scale analysis

3.6.3.4 Enclosure

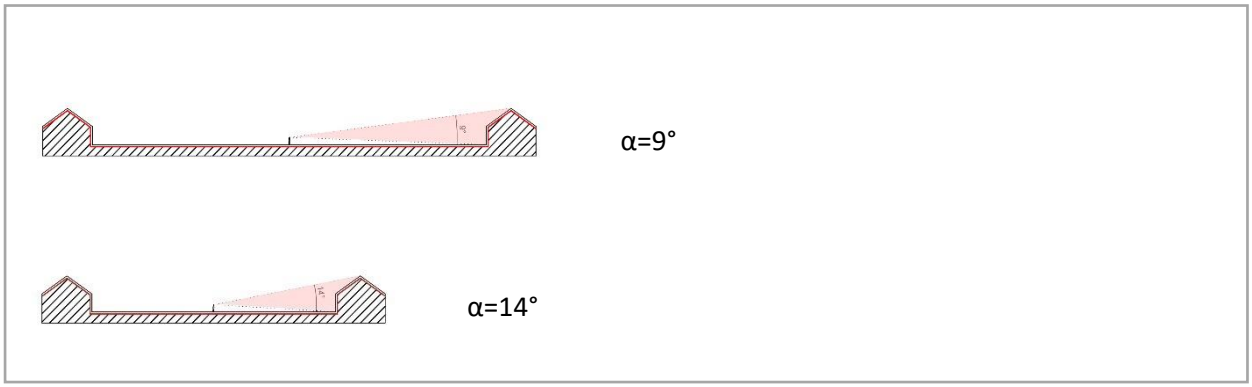


Fig. 3.30. Square Jean-Rostand, Enclosure

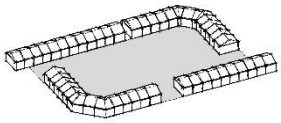
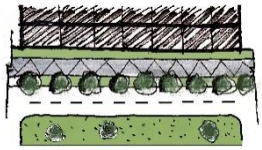
Physical element	Legend	Measurement	Description	Photo
Enclosure		100 (L) × 62 (W) × H H ~ 9m	The square without trees and the green area create a loss of enclosure; moreover, the presence of trees within the green area is not adequate to increase the sense of enclosure. The buildings' facades along with a row of trees along the pedestrian path create a linear enclosed space within the square.	 Square without trees, loss of enclosure  Trees create an enclosed space

Table 3.45. Enclosure analysis

3.6.3.5 Harmony

Physical element	Legend	Main principles	Description	Photo
Harmony		Adjacent colors Similar shapes Related textures	Victorian style architecture provides a harmony between buildings within the square. Surrounding facades (architectural envelope) are built in brick of a different color. Exterior staircases, white color of windows and similar shape of roof in different colors create harmony within the space.	

Table 3.46. Harmony analysis

3.6.3.6 Contrast

Physical element	Legend	Main principles	Description	Photo
Contrast		Different colors Different directions Textural difference Tonal difference Difference in scale	The russet and beige color of architectural envelope is somewhat in contrast with the white color of the windows. Moreover, a tangible change in the height and color of rooflines increases the contrast.	

Table 3.47. Contrast analysis

3.6.3.7 Balance and symmetry

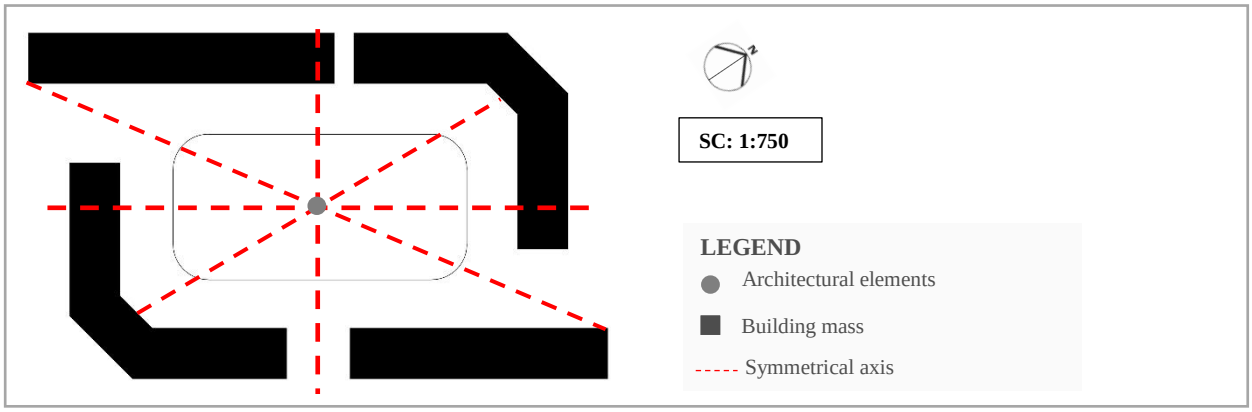


Fig. 3.31. Square Jean-Rostand, Balance and symmetry

Physical element	Legend	Type	Description	Photo
Balance and symmetry		Formal (symmetrical balance) Informal (asymmetrical)	The overall layout of the square is rectangular and shows formal symmetrical balance in which the pond and the fountain are placed. In terms of distribution of buildings and main streets running through the square it shows a high formal approach to balance: that is, the visual balance of one side of the axis is mirrored on the other side.	

Table 3.48. Balance and symmetry analysis

3.6.3.8 Composition

Physical element	Legend	Measurement	Description	Photo
Composition		The placement or arrangement of visual elements	The architectural envelope of the square consists of Victorian style architecture creating a sense of unity. Similar and harmonious units have led to the creation of a consistent and homogeneous composition. However, the inappropriate visual monotony of houses diminishes its richness, boring the viewer.	 Victorian houses with similar and harmonious elements.

Table 3.49. Composition analysis

3.6.3.9 Rhythm

Physical element	Legend	Measurement	Description	Photo
Rhythm		Patterns, alteration and repetition of elements	The pattern of brick in building façades, the repetition of bay windows, dormer windows, doors, staircases etc., along with the alteration of the color of roofline and eaves all create rhythm.	 Victorian architecture has rhythm

Table 3.50. Rhythm analysis

3.6.4 Conclusions on Jean-Rostand Square:

The second case study examined the spatial quality of Jean Rostand Square in the area of Bois Franc - a neighborhood located in Ville Saint-Laurent - focusing on its main constituent physical and perceptual elements. Bois Franc was designed (new urbanism approach) by architect Louis Sauer as Victorian-style architecture to house a middle-class community of Montréal during

90s. In the design of this project, genuine attempts were made to reconcile natural elements and water as basic principles (Sauer, 1994). Creating small-scale squares and short streets was the approach taken to achieve this. Jean Rostand Square consists of three-storey terrace housing surrounding a rectangular green space. After the Second World War, public attitudes changed dramatically in favour of a more decorative approach to urban space (Moughtin et al, 1999). In the design of Jean Rostand Square, the aim to consolidate identity by expressing the heritage of the community led to the use of Victorian-style architecture. Although effort was made to not to simply copy-and-paste past styles, the construction and replication of residential units in Jean Rostand Square led to the creation of a monotone urban space that is unfortunately characteristic of urban areas following World War II.

In terms of the evaluation of physical elements, there is a regular collection of houses that are nearly identical in detail, articulation and materials. The buildings use Victorian-style elements including the repetitive use of brick in russet and beige color, the employment of bay and dormer windows in white colours with simple decorations, and the utilization of a gabled roof which acts as a background for dormer windows. The corners at the North and South part of the square are well-articulated; however, at the entrance to the square they are defined only by gables and hipped roofs. The quality of the floor plane (hard pavement and soft pavement) is relatively appropriate and grass verges are employed to separate pedestrian areas from vehicle traffic. The plot width is small, which creates a unit of measurement for spectators to use in perceiving the proportion and scale of the space. The continuity of gabled roofs with only small changes in level increases the sense of unity. Green space is considered one of the key welcome features of residential squares, but the high density of trees in front of the houses around Jean Rostand Square hide the ornamentation and decoration of façades. Private garages reduce the number of parked cars in front of the houses, which enhances the spatial quality of the square.

The examination of the perceptual elements of Jean Rostand Square illustrates that repetition and a continuity of homogeneous and identical elements amplifies a sense of unity. The dominant visual elements of brick, gabled rooflines, and white bay and dormer windows contribute further to this augmentation of spatial quality. As mentioned above, enclosure is one of the most significant qualities of a collective space and the visible means of access to a given space affects

its level of enclosure. The deployment of streets on varying axes therefore increases the sense of enclosure in Jean Rostand Square.

Evaluating the key parameters of Jean Rostand Square shows that the spatial quality of the square is influenced by the uniformity and homogeneous architecture of the surrounding buildings which leads to the creation of visual monotony. However, the opportunity to enhance the visual quality should be created by the unity yet variety.

3.7 Case study 3. A residential cul-de-sac called Rue Du Collège-Beaubois[25]

3.7.1 Introduction

The small-scale residential cul-de-sac called Rue Du Collège-Beaubois is a middle- and upper-middle-class residential square located in the borough of Pierrefonds-Roxboro (Fig. 3.5 and Fig. 3.6) at the northern part of the island of Montreal (often called West Island). It is composed of single-family detached dwellings on spacious lots organized around a circular green space. Large well-organized tapered green spaces are dispensed between the houses. Most of houses are similar in size and follow the basic design principles of Victorian style houses. Hence, the residential cul-de-sac Rue Du Collège-Beaubois expresses a somewhat homogeneous architecture.

Name	Neighborhood	Type	Housing style	Area	Date of establishment
Cul-de-sac Rue Du Collège-Beaubois	Pierrefonds-Roxboro	Residential	Two-storey houses	3,963 m2 ≈ (65m × 62m)	n.d.

Table 3.51. Basic information on Rue Du Collège-Beaubois[26]

25- This study does not aim to address the disadvantages of residential cul-de-sac in urban planning, nor does it seek to introduce it as a residential square, but rather to examine its visual and spatial quality as small-scale residential unit in suburban. For more information refer to the footnote of the introduction of this chapter.

26- Information extracted from the website of Ville De Montréal, ville.montreal.qc.ca.

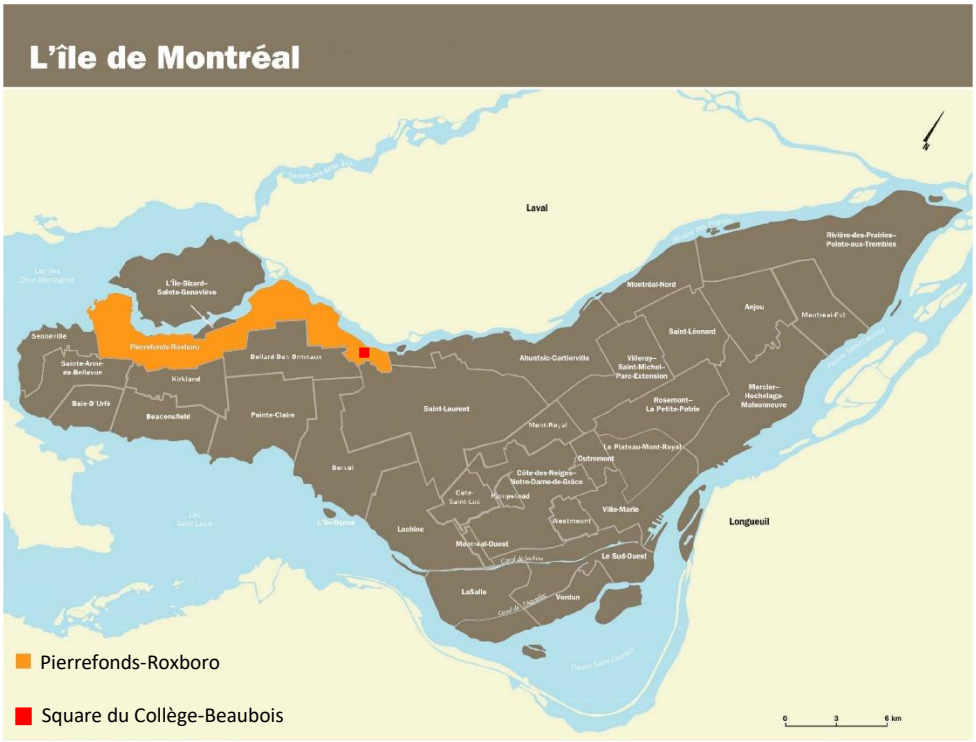


Fig. 3.32. Situation plan, Cul-de-sac Rue du Collège-Beaubois, Pierrefonds-Roxboro. Source: Ville de Montréal

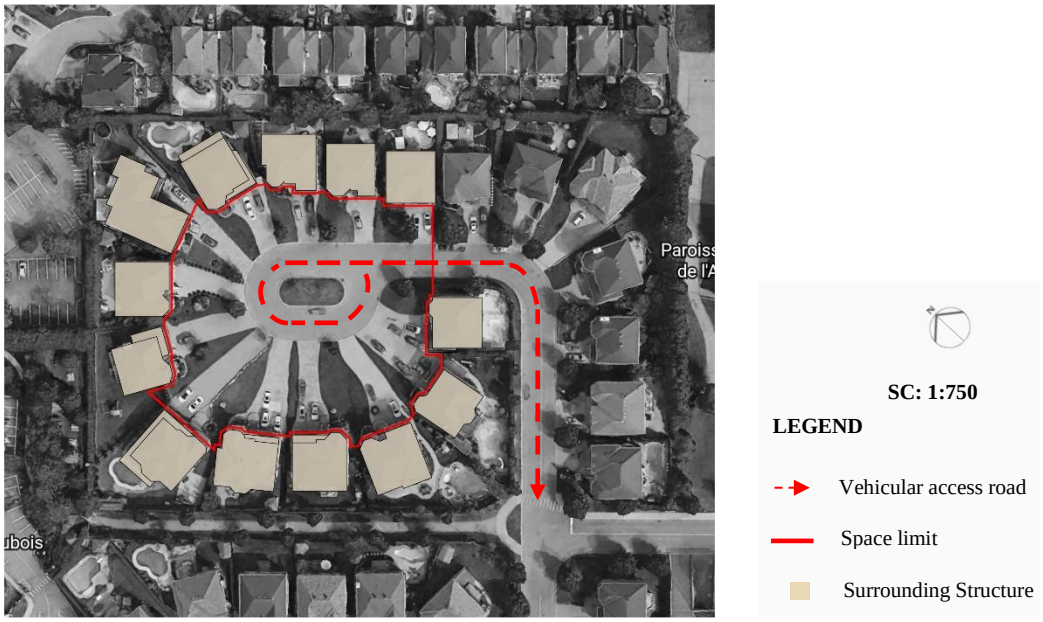


Fig. 3.33. Cul-de-sac Rue Du Collège-Beaubois, Access road plan. Source: Google Earth

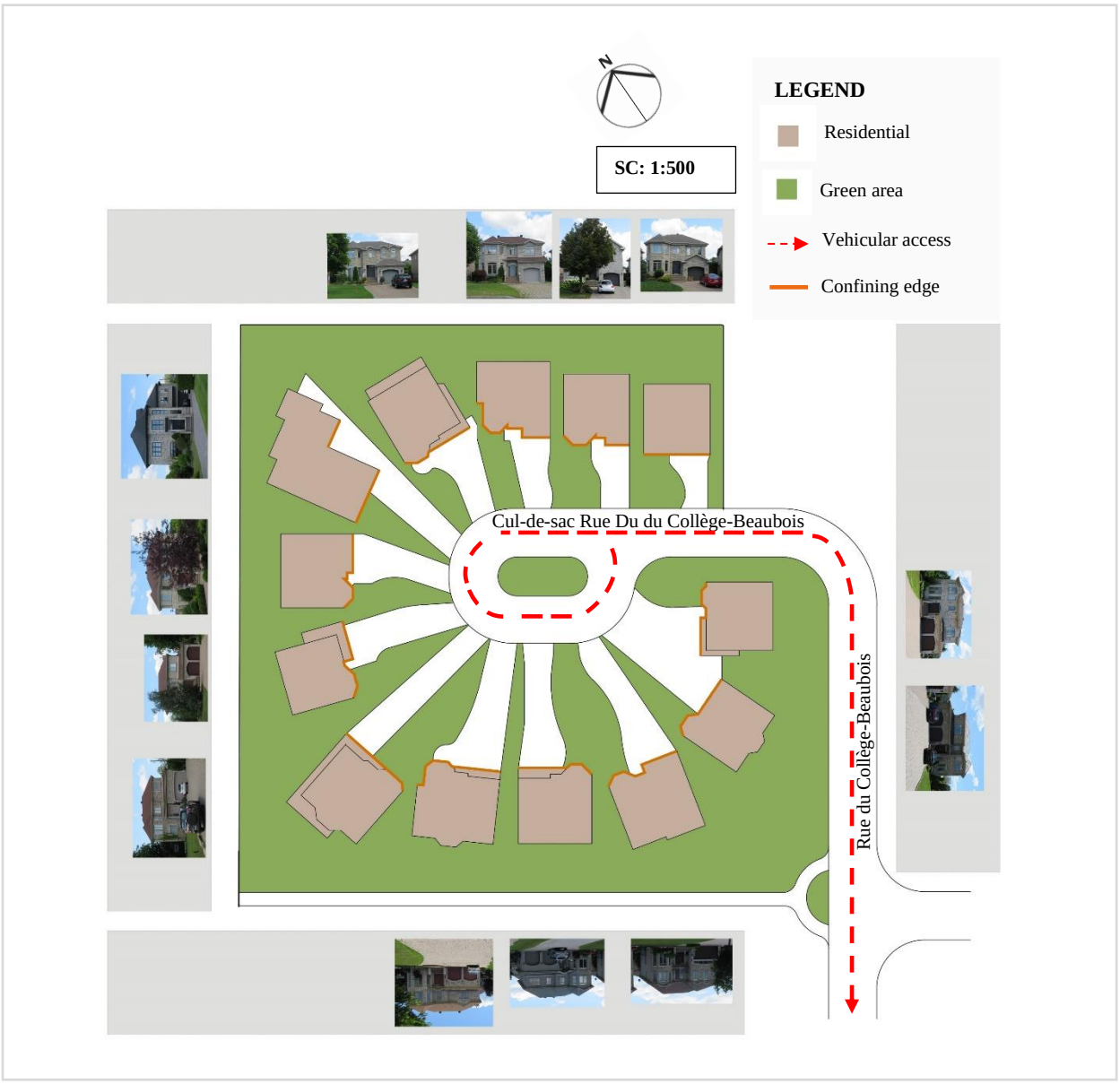


Fig. 3.34. Cul-de-sac Rue Du Collège-Beaubois, Site plan

3.7.2 Physical element analysis

3.7.2.1 Ground floor outline

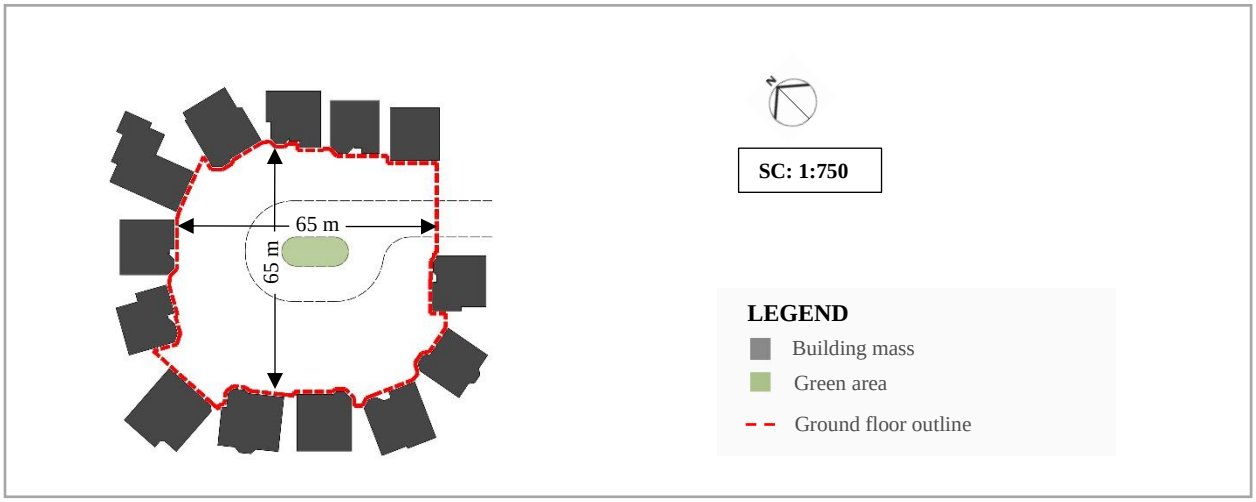


Fig. 3.35. Cul-de-sac Rue Du Collège-Beaubois , Ground floor outline

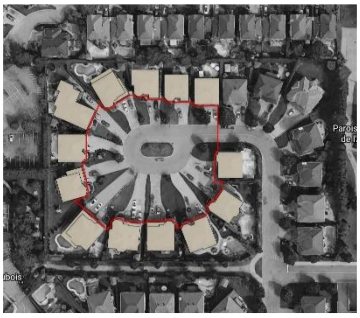
Physical element	Legend	Measurement	Description	Photo
Ground floor outline	□ ○ △	65 m × 65 m	Irregular rectangle surrounded by houses on all sides with small chamfers on three corners which is caused by the rotation of houses. Overall, the outline is not well-defined.	

Table 3.52. Ground floor outline analysis

3.7.2.2 Façade

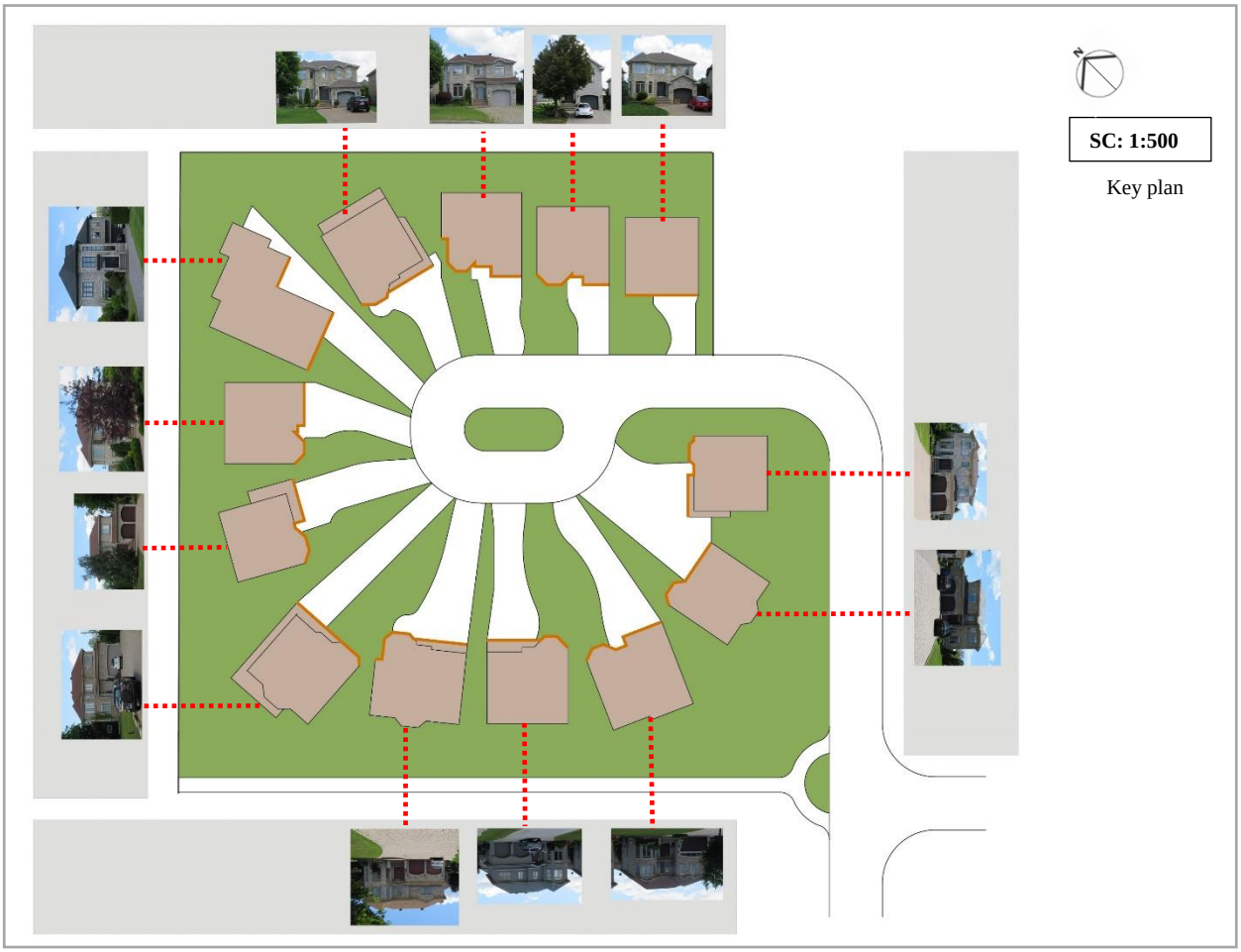


Fig. 3.36. Cul-de-sac Rue Du Collège-Beaubois, Façade, key plan

Type	Direction				
	North-West	North-East	South-East	South-West	Corners
Two-storey (Victorian style)					

Table 3.53. Façade data

Physical element	Type	Division	color	Material	Pattern	openness	Photo
Façade	Two-storey (Victorian style)	The base (podium)	Monotone light gray and beige	Limestone tile	Mostly grid pattern	Parking doors are opened toward the front yard and the green space. Stone steps give access to the exterior.	
		The middle zone (main floor)	Monotone light gray and beige	Limestone tile	Mostly grid pattern	Bay windows framed by smooth white limestone, front doors are located in the niche of the wall. They are connected to road level by stone steps. A small canopy hangs over the front door.	
		The upper zone (attic)	Ranging from matte light gray, dark gray, beige, and russet	Rubber, clay, metal	Striped horizontal texture mixed with squama-like pattern	No opening	

Table 3.54. Façade analysis

3.7.2.3 Corner

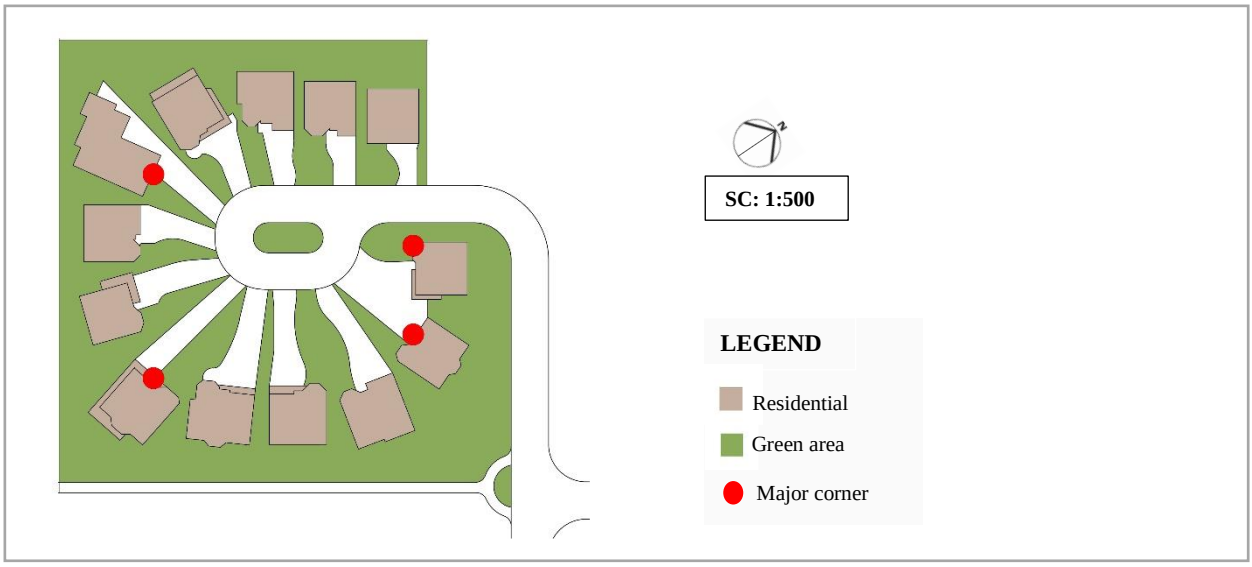


Fig. 3.37. Cul-de-sac Rue Du Collège-Beaubois, Corner building

Physical element	Category	Typology	Legend	Photo
Corner	Internal	Non-corner (Open square corner)		
		Angular corner (faceted corner)		
	External	----------	---------	----------

Table 3.55. Corner building data

Physical element	Category	Building Style	Typology	Material/Form	Description	Photo
Corner	Internal	Two-storey (Victorian style)	Non-corner (Open square corner)	Stone/Orthogonal	Nothing is defined as a corner, and façades at the corners of buildings meet simply without any significant detail.	
			Angular corner (faceted corner)	Stone/Chamfered corner	No distinctive features. The individual building's only feature is its rotation.	

Table 3.56. Corner building analysis

3.7.2.4 Floor plane

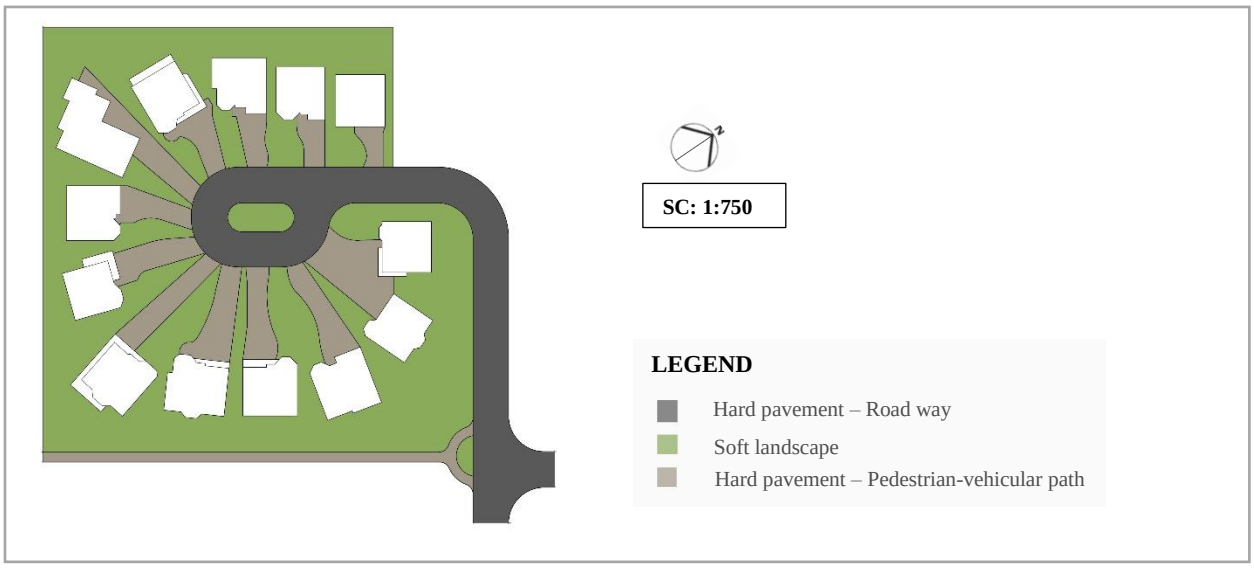


Fig. 3.38. Cul-de-sac Rue Du Collège-Beaubois, Floor plane

Physical element	Type	Material	pattern	color	Description	Photo
Floor plane	Hard pavement (Pedestrian-vehicular	Stone tile	Grid	Gray, beige	About 5 m in width, gently sloped toward the parking doors and main entrance of houses.	
	Hard pavement (Road way)	Asphalt	Plain	Dark gray	The width of streets running into the square and around it is 9 m.	
	Soft landscape	Lawn	Plain	Green	The small green space at the central open space is just covered by lawn. The distance between houses (taper shape) are mainly covered by lawns and planted with trees and arbutus.	

Table 3.57. Floor plane analysis

3.7.2.5 Furniture

Nothing is provided as furniture in this unit and the only prominent object is a bright double-headed post lamp at the center of the green area.

3.7.2.6 Plot size

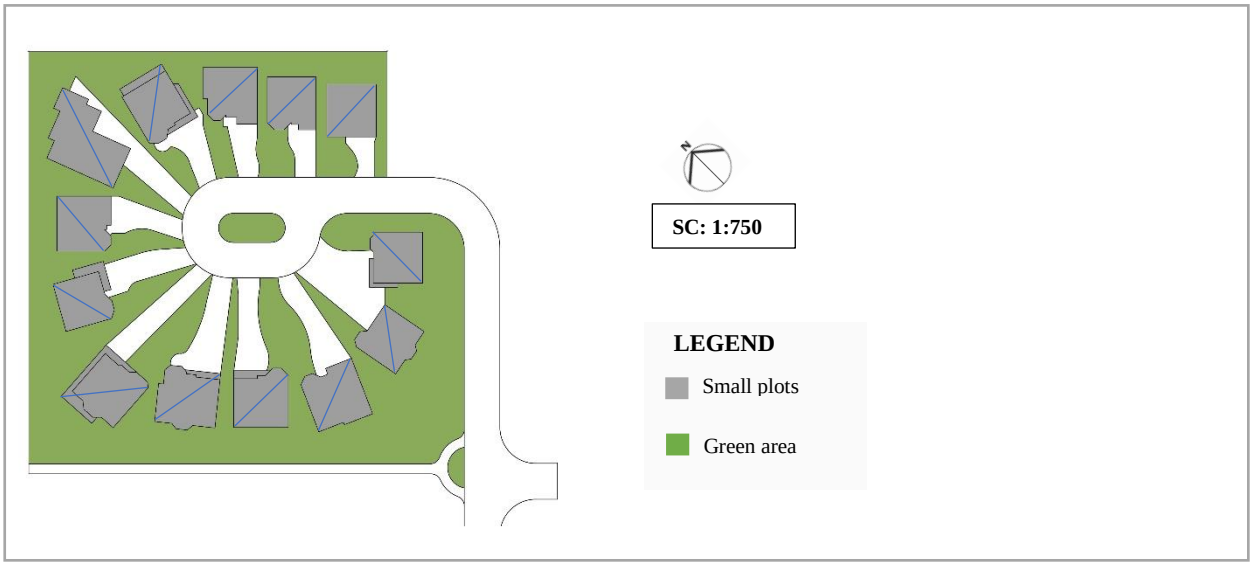


Fig. 3.39. Cul-de-sac Rue Du Collège-Beaubois, Plot size

Physical element	Type	Legend	Width of plot	Description	Photo
Plot size	Large plot	d / w	17 m > w > 13.5 m	The width of plots is mostly equal.	

Table 3.58. Plot size analysis

3.7.2.7 Green space

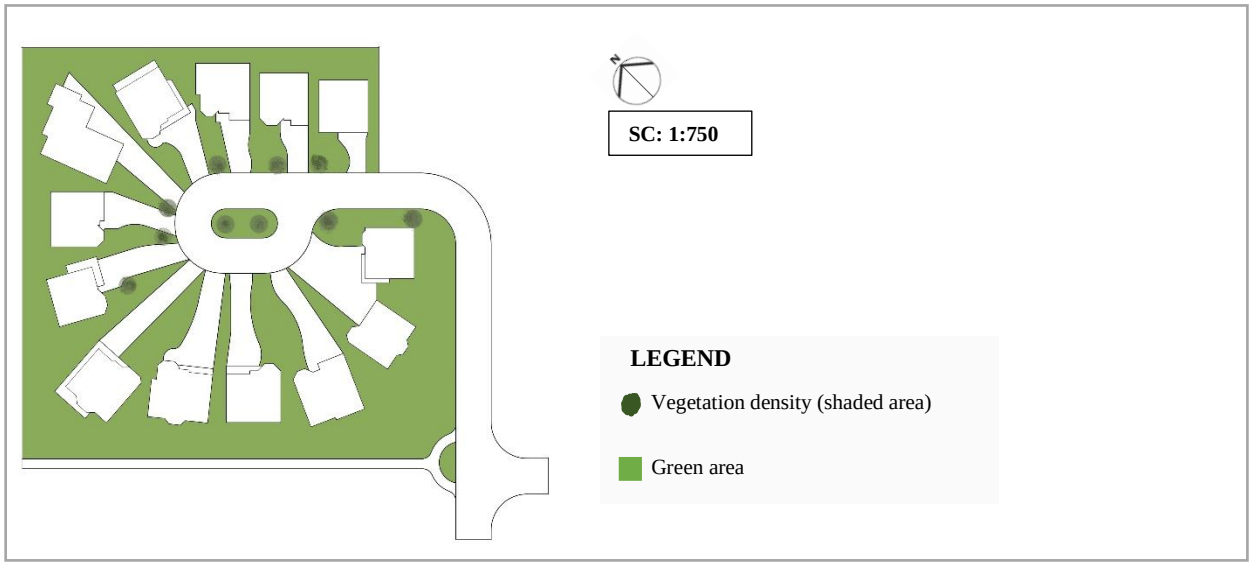


Fig. 3.40. Cul-de-sac Rue Du Collège-Beaubois, Green space

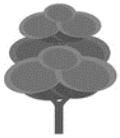
Physical element	Type	Legend	Density	Description	Photo
Green space	Lawn		High density in taper shapes between houses and in the main green area	The main green area and gaps between houses are covered with lawn except for walking paths in front of houses.	
	Shrubs		Very low; only in some parts.	Moslty planted in front of houses.	
	Tree		Low density	Only a few trees are planted within the square.	

Table 3.59. Green space analysis

3.7.2.8 Roofline and eaves

Physical element	Characteristic of land	Type of roofline	Legend	Material and color	Description	Photo
Roofline and eaves	Flat	Hipped roof		Made of rubber, clay and metal, in colors ranging from matte light gray to dark gray, beige, and russet	The simple type of hipped roof creates a horizontal roof ridge which varies slightly in height along the length of the square.	

Table 3.60. Roofline and eaves analysis

3.7.2.9 Pathways and traffic roads

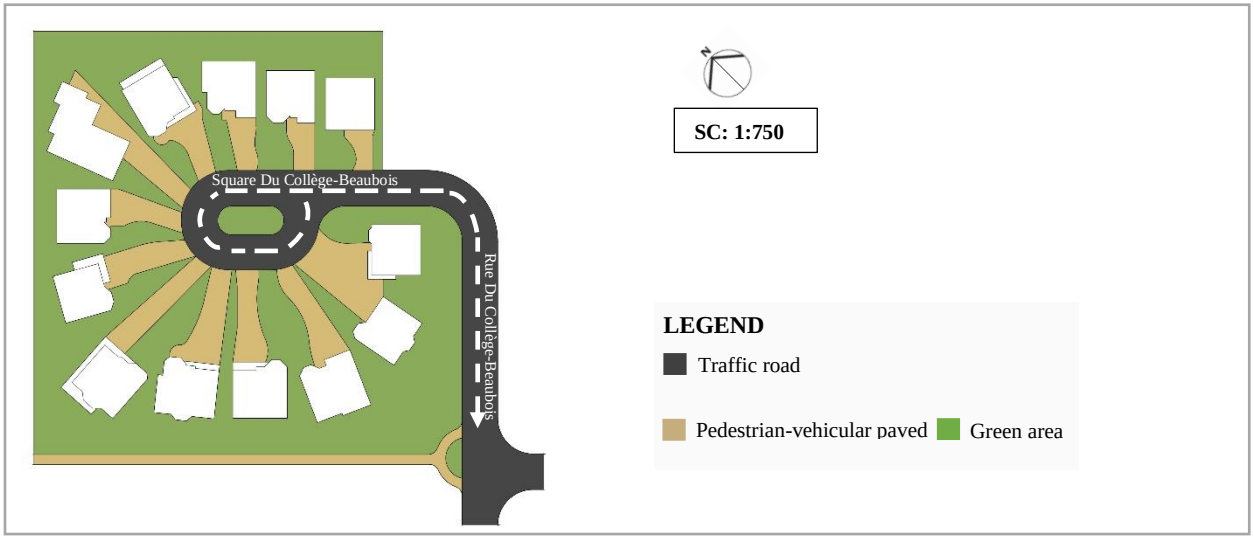


Fig. 3.41. Cul-de-sac Rue Du Collège-Beaubois, Pathways and traffic

Physical element	Type	Material	Width	Description	Photo
Pathways and traffic roads	Traffic road	Asphalt	1-All sides: 9 m 2- Streets running to the square: 9 m	The green area is like an island in being surrounded by a two-way car traffic road.	
	Pedestrian-vehicular paved path	Stone tile	w ~ 5 m	The pedestrian path is mostly flat without any changes in level.	

Table 3.61. Pathways and traffic roads analysis

3.7.3 Perceptual element analysis

3.7.3.1 Unity

Perceptual element	Basic principles[27]	Legend	Description	Photo
Unity	Proximity		Two-storey (Victorian style) houses are relatively placed in close proximity	
	Repetition		Buildings have elements (such as stone step staircases, bay windows, parking doors, etc.) that are copied or mimicked in most houses.	 Repetition of stone step staircases, bay windows, stone facades.
	Continuity		The distance between detached houses disturbs the continuity, and only the use of stone on façades and the use of hipped roof create a sense of continuity.	
	Closure		The square is surrounded on all four sides by detached houses and the distance between them has reduces the quality of the closure.	 Red color indicates the gaps between houses.

Table 3.62. Unity analysis

27- Basic principles here are defined by the author from different source. For the main source refer to Lovett, n.d., https://www.johnlovett.com/

3.7.3.2 Proportion

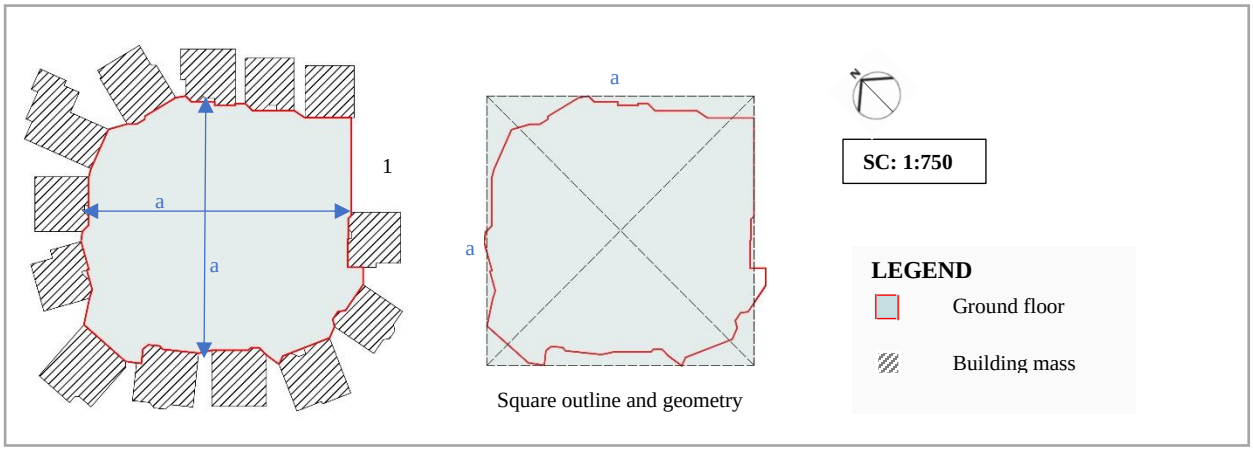


Fig. 3.42. Cul-de-sac Rue Du Collège-Beaubois, Proportion

No	Section	Proportion	Photo
1		1:1	

Table 3.63. Visual proportion of adjacent streets analysis

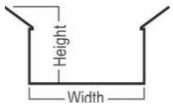
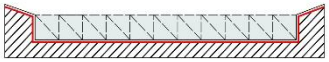
Perceptual element	Type	Legend	Description and Photo
Proportion	Entire space		 Proportion in both longitudinal and transverse axis 1:11
	Buildings and Elements		 Golden ratio is applied on the overall layout of the façade. The width and height of the building are based on the rule of the Golden ratio.
			 Most elements of the façade are proportioned and are based on the Golden ratio. In terms of material, all buildings are of a kind and show proportion.

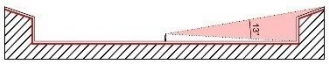
Table 3.64. Proportion analysis

3.7.3.3 Scale

Physical element	Legend	Type	Description	Photo
Scale		Space	The size of the space 65 (m) × 65 (m) in comparison with the size of human body is considered out of scale; moreover, the lack of trees within the green area helps magnify the dimensions of the space.	
		Building	The composition of proportional doors and windows along with the harmonizing color and texture of the façade lead to the creation of appropriate scale in the space.	

Table 3.65. Scale analysis

3.7.3.4 Enclosure



α=13°

Fig. 3.43. Cul-de-sac Rue Du Collège-Beaubois, Enclosure

Physical element	Legend	Measurement	Description	Photo
Enclosure		65 (L) × 65 (W) × H H ~ 9m	The gap in between buildings leads to a loss of enclosure.	

Table 3.66. Enclosure analysis

3.7.3.5 Harmony

Physical element	Legend	Main principles	Description	Photo
Harmony		Adjacent colors Similar shapes Related textures	The homogeneous architecture of Two-storey (Victorian style) houses creates harmony between buildings within the square. Surrounding facades (architectural envelope) are built of stone tile with different colours and textures. Exterior stone steps, the size of windows and the similar shapes of each hipped roof in different colours create harmony within the space.	

Table 3.67. Harmony analysis

3.7.3.6 Contrast

Physical element	Legend	Main principles	Description	Photo
Contrast		Different colors Different directions Textural difference Tonal difference Difference in scale	The most obvious contrast is created by the different colours of roofs.	

Table 3.68. Contrast analysis

3.7.3.7 Balance and symmetry

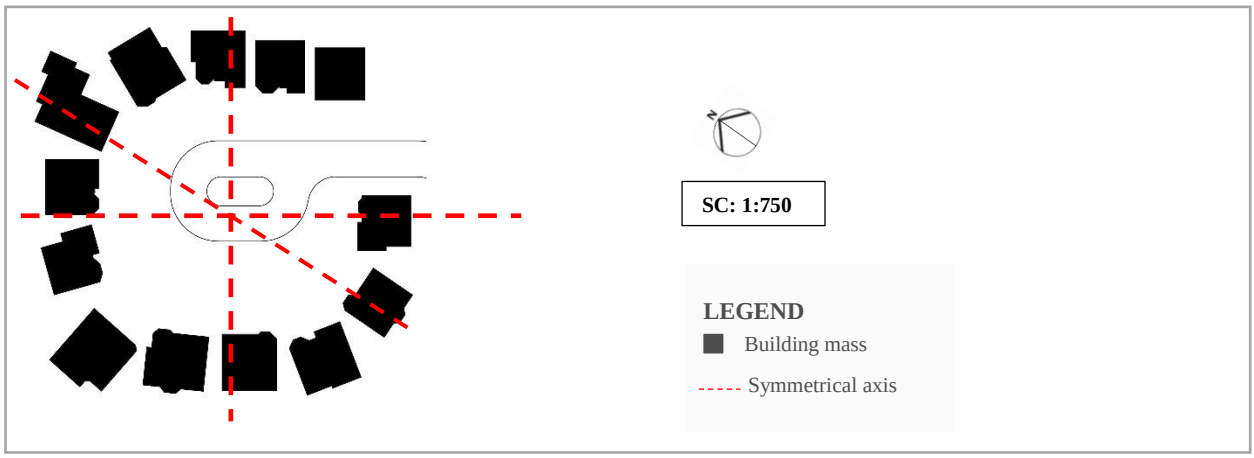


Fig. 3.44. Cul-de-sac Rue Du Collège-Beaubois, Balance and symmetry

Physical element	Legend	Type	Description	Photo
Balance and symmetry		Formal (symmetrical balance)	Due to the distribution of houses around a central point, the square apparently illustrates balance. However, on the symmetrical axis, the visual balance is weak. The central patch (green area in the middle of the square) is not at the intersection of symmetrical axis.	
		Informal (asymmetrical)		

Table 3.69. Balance and symmetry analysis

3.7.3.8 Composition

Physical element	Legend	Measurement	Description	Photo
Composition		The placement or arrangement of visual elements	The homogeneous architectural envelope of the square consists of two-storey houses, creating some sense of unity.	 The two-storey houses with Similar and harmonious elements.

Table 3.70. Composition analysis

3.7.3.9 Rhythm

Physical element	Legend	Measurement	Description	Photo
Rhythm		Patterns, alteration and repetition of elements	The patterns of stone in building façades, the repetition of bay windows, parking doors, stone steps, etc., along with the alteration of colour in the roofline all create rhythm.	

Table 3.71. Rhythm analysis

3.7.4 Conclusions on Square Du Collège-Beaubois:

As a typical urban development in a North American city in the "Re-urbanisation period," the residential unit called Rue Du Collège-Beaubois is a residential cul-de-sac surrounded by two-storey detached housings with a Victorian style of architecture. Examining the spatial characteristics of Rue Du Collège-Beaubois revealed that the basic principles on which urban spaces were formed were not always used effectively in designing this residential unit. The awareness of space is key to designing any urban space, and as previously mentioned, the two main elements in the composition of urban realm are the volume or mass of buildings and space. Unfortunately, space was not properly taken into account in the design of this unit: too much of it was simply given to the mass of its buildings.

In terms of the physical elements identified in Chapter Two, the outline of Rue Du Collège-Beaubois is not defined well. In considering the façades of the buildings, the parking doors which are not well-articulated occupy a disproportionately large area. Nothing specific is defined in the corners, and the homogeneous architecture of the square creates a visual monotony. The floor plane as a design bed plays an important role in the spatial quality of the residential square. Assigning space to vehicular traffic rather than allocating space to pedestrians leads inhabitants to focus more on individual backyards in lieu of concentrating on the center of the space. This failure

in design happened when dwelling units were placed on the land without considering design priorities such as green area, pedestrian path, and furniture.

The examination of perceptual elements in residential cul-de-sac Rue Du College-Beaubois demonstrates that although the residential unit expresses a somewhat homogeneous architecture, the overall unity of the space is hampered. In terms of spatial proportions, the golden ratio is more or less applied in the overall layout of the façade and its elements. In spite of this proportion and the homogeneous architecture of the houses, due to a lack of spatial correlation (a proper relation between mass and space), the square space in comparison with the size of human body is out of scale. The scattered building mass moreover creates an asymmetrical and discontinuous façade, to the detriment of the sense of enclosure in the entire space of the unit.

In revealing the problems and inefficiencies just listed, the evaluation of the main elements of Rue Du College-Beaubois indicates that the lack of integration of both physical and perceptual elements in the spatial organization of the square has exceedingly reduced both visual and spatial quality.

3.8 Conclusion of the outcomes of the case studies

Three case studies have been examined in terms of their visual and spatial qualities in this chapter. The evaluation of physical and perceptual elements pointed to the design successes and failures of two residential squares and one residential cul-de-sac[28] built in three distinct places and periods in the city of Montreal.

Residential squares in old-town Montreal are mainly characterized by a built-up quadrilateral surrounding a planted area of lawns and trees. This green area is circumscribed by streets on all sides. Considering the relationships between these physical elements and the spatial organization of the residential square illustrates that, in general, these characteristics are displayed by squares in Montreal. The old-city case study residential square is a built-up quadrilateral surrounded by Victorian style housing. A green area planted with lawns and trees plays a pivotal role in creating a charming ambience for inhabitants. The combination of water fountain, pond, and green space along with sculptures and furniture helps in creating a delightful setting within the densely populated neighborhood. The richness of the variety of Victorian style houses which represents a highly decorative architecture, and the well-articulated building façade show that the square, in terms of the perceptual elements of unity, proportion, and harmony, is well-integrated into the surrounding architecture. However, recent evolution in the Modern period, in the form of the growth of stark and unadorned buildings, has dramatically impaired the square's spatial qualities.

While old-town residential squares are commonly admired for their rich architecture (mostly in Victorian style) and spatial qualities, mid-town residential squares are often criticized for their homogeneous settings and stereotyped architecture (again, mostly in Victorian style). After the Second World War, the public demand for more articulated and decorated residential squares increased. Urban development in this period of "Sub-urbanisation" led to the creation of residential areas inspired by Victorian architecture. This unfortunately led in turn to the creation of a "visual monotony" known to be a typical characteristic of urban areas built at that time: residential squares consist of Victorian style housing built simultaneously and with identical schemes for reasons of market supply (Moughtin et al, 1999; Filion & Bunting, 2015). Considering the spatial quality of such residential squares shows that although they have been somewhat

28- Refer to the Introduction at the beginning of this chapter.

successful in creating spatial qualities, they are rightly criticized for their monotonous architecture which leads to a loss of richness and tends to bore the viewer. This kind of controlled planning creates visual monotony. In such contexts, finding opportunities for inhabitants to personalize their living environments is of great importance to visual and spatial quality.

Unlike the two urban settings examined (the two residential squares), residential cul-de-sacs in suburban areas encompass detached two-storey houses - Victorian style - in large lots surrounding a small green patch. The design of houses is often identical, which provides a somewhat homogeneous architecture. In most instances, though, there is no thoughtful visible relation between mass and space at all. Although the design of houses around a center aims to create a harmonious residential square, the result lacks spatial organization and appropriate visual appearance as a whole.

The detailed analysis of the key features of two residential squares and one residential cul-de-sac offered above confirms the urban design point that an identifiable[29] residential square requires the integration of both physical and perceptual elements. The spatial organization and visual appearance of a residential square are ameliorated when its main constituent elements – including physical and perceptual elements – are well-defined. The "visual pleasure" of spatial quality therefore requires attention to both physical and perceptual elements (Moughtin et al, 1999).

In this study, a set of physical and perceptual elements established from the chronological study of urban squares was employed in the analysis of two residential squares and one residential cul-de-sac in the city of Montreal. The outcomes of this chapter will be applied in the set of recommendations presented in the following chapter, with the aim of helping concerned experts create visually identifiable residential squares.

The intention of this study is therefore to understand the constituent parameters of the spatial organization of residential squares in order to enhance both spatial and visual quality of these units of settlement aesthetically.

29- Identifiable space here implies physical and spatial characteristics of a space which make the space unique.

CHAPTER IV

EPILOGUE

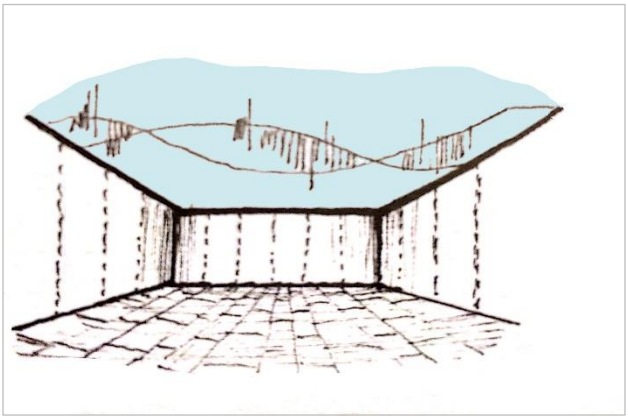
PRINCIPLES OF ORGANIZING RESIDENTIAL SQUARES

4.1 Introduction

In this chapter, suggestions for improving the spatial organization of residential squares are presented, in order to enhance their spatial quality and visual appearance, based on the analysis presented in the previous chapter, and the key elements identified above in meaningful collective spaces. The spatial patterns presented in this chapter as suggested guidelines are based, though, on observations and analysis of the three case studies in the city of Montreal investigated in Chapter 3. These guidelines therefore only address residential squares, not all urban squares; they could of course potentially be applied to residential squares in both urban and suburban areas.

4.2 Guidelines

4.2.1 Space limits



Description

Residential squares are considered outdoor living rooms for their inhabitants. The essential elements of the confined space of a residential square consist of a floor plane, embracing walls (architectural envelope) and sky. The floor is a continuous plane covered with a distinct material. The embracing wall is an important element by which the volume

of the square is enclosed. Walls give a definite shape to the space (defined as a relationship between mass and space). The sky can be considered the ceiling of the square, defined by buildings' roofline (Novotny, 1996).

Recommendation

- Space limits should be correctly and clearly defined. The form of a square should be able to be experienced from anywhere within it (Fig. 4.1). A simple form can be understood much more easily than an illegible form.
- The floor plane, in terms of its form, should be easily perceived. Also, it should be covered with proper material for its function.
- The architectural envelope (i.e., the embracing wall) should be well-enclosed to clearly communicate the form and volume of the square (Fig. 4.2). Large gaps between buildings will disrupt the continuity of the surrounding wall.
- An uninterrupted building roofline defined by the edge of buildings against the sky can complete the sense of being enclosed in a square.

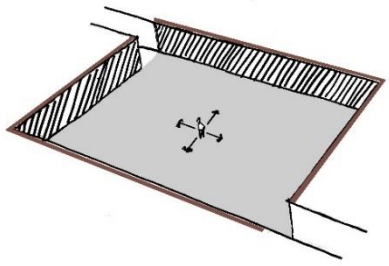


Fig. 4.1. An enclosed square. The spatial organization of the square should be perceptible from any direction in the square. Source: after Tavassoli, 1997

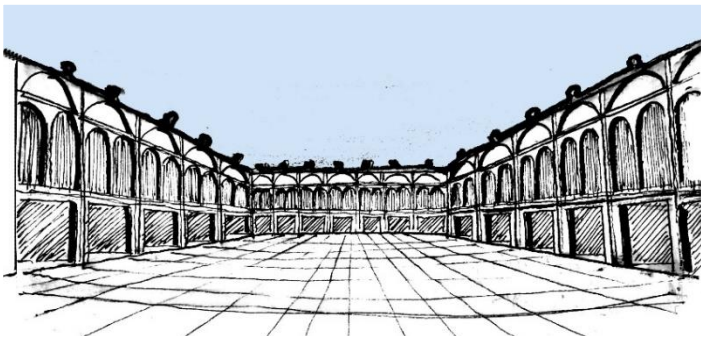


Fig. 4.2. Square limits. Articulation of the façade, uninterrupted roofline, and clear form of floor plane create the sense of enclosure in the square.

4.2.2 Unity with variety

Description

Variety means diversity or “the state of being different”, and unity means oneness or “the state of being united” ("Oxford English Dictionary", 2010). Undoubtedly, similarity leads to unity; however, excessive similarity leads to visual monotony. Hence, there is also a need for diversity. Unity and variety are in close relationship, that is, various and small components come together as a whole and create a sense of unity. The most important aspect of the unity is that the whole must dominate all components. In order to achieve this, the whole should be considered prior to everything, so that all components can be organized in an orderly way (Novotny, 1996).

Recommendation

Unity and integrity could be achieved by the following factors:

- Building roofline: the articulated, playful edge of the buildings against the sky, and the intricate form of sloping roofs, can be impressive (Fig. 4.3). Different shapes of roofs can achieve unity with a steep form (Novotny, 1996).

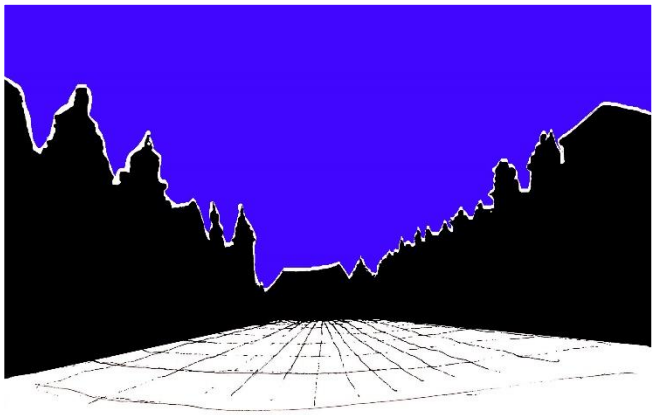


Fig. 4.3. Building roofline. Different shapes of rooflines tied together and creates a sense of unity. Source: after Novotny, 1996

- Gaps between buildings: If there is a gap between buildings, this gap should not be too large, or the sense of proximity will be lost. In detached buildings, the deep gap between the facades creates vertical shading lines, which could be perceived as a frame around each building, making it more distinct (Hedman & Jaszewski, 1984) (Fig. 4.4).

Fig. 4.4. Lafayette Square, St. Louis, Missouri, USA, Source : alamy.com

- Visual appropriateness (concerning windows, doors, ornaments and architectural elements on façades): Creating appropriate proportion in all components of the façade is of importance, that is, façade components with different designs can still have a common pattern (similar proportions) (Fig. 4.5).

Fig. 4.5. Proportion of the components of the façade. Saint-Louis Square, Montréal. Different elements on the façade have similar proportions.

- Form and outline of the building: Creating geometric three-dimensional forms in the volume of buildings could help achieve unity. Three-dimensional form has a significant impact on the composition of the entire façade (Hedman & Jaszewski, 1984) (Fig. 4.6).

Fig. 4.6. Façade form and outline. Saint-Louis Square, Montréal. The three-dimensional form of facades creates buildings that are visually noteworthy.

- Building entrances: The entrances of buildings have significant effects on the composition of the façade as a whole, and when the entrance doors on a façade share common characteristics (such as their place inside vestibules, subspaces, or porticos; their colour; their ornaments; and their height difference from street level), they have a great impact on the unity of the square (Fig. 4.7).

Fig. 4.7. Main entrance. Saint-Louis Square, Montréal.
Different design of entrance with common features.

- Depth of the façade: Shadow patterns can result from the volume of the façade and its decorative elements. The sense of depth is the result of a retreat from the edge of the land ownership line to create enough space for bay windows (Hedman & Jaszewski, 1984). These projections and recessions have profound effects on the definition of the entrance space (Fig. 4.8).

Fig. 4.8. Shadow pattern. Saint-Louis Square, Montréal. Vertical shadow patterns on the façade create frames for windows and entrances.

- Building material: The consistent use of similar materials has a great impact on the uniformity of the space (Fig. 4.9).

Fig. 4.9. Limestone façade. Saint-Louis Square, Montréal. Consistent use of stone blocks in covering the facade, increases the sense of unity.

- Scale and proportion: The proportional relationships in the square help the viewer to understand the square as an integral whole (Novotny, 1996). Buildings should be on the scale of the space of the square. A residential square without a dense planted area or a sculpture at the center can have a ratio of height to width ranging from 1/2 to 1/6 (Tavassoli,

1997). Bigger scales can be brought closer to human scale by effects with trees or sculptures (Fig. 4.10).

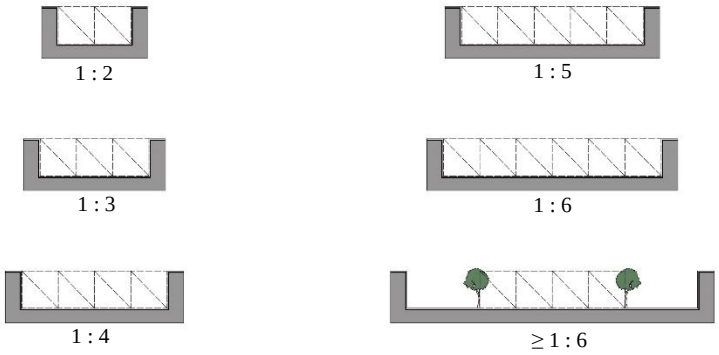


Fig. 4.10. Appropriate proportions for the enclosed space of a residential square. Source: after Tavassoli, 1997

- Landscaping at the edge of the space: This can create a border which preserves the privacy of indoor activities (Bentley et al, 1985). Also, it allows users to create a green edge (such as a flower box) or to add temporary furniture. Landscaping could be considered as an opportunity for inhabitants to put their own stamps on their living areas (Fig. 4.11). Depending on the size of the square and proportion of the space, landscaping width can vary from 1.5 m to 6 m.

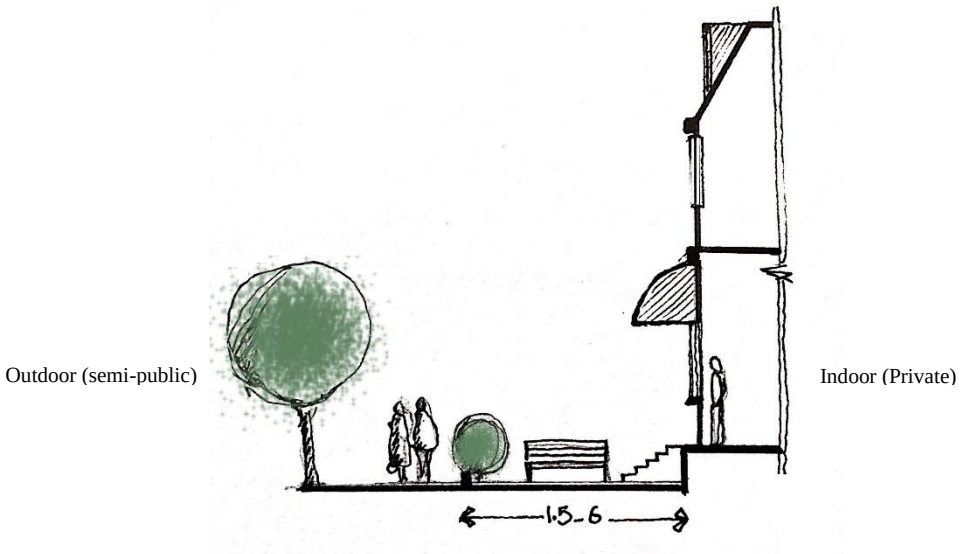
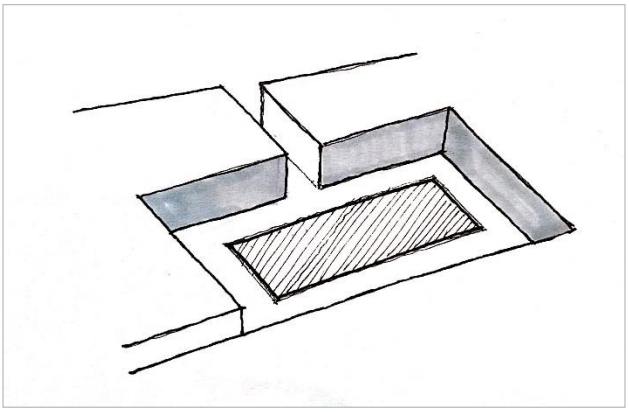


Fig. 4.11. Landscaping as an opportunity for personalization. Source: after Bentley et al, 1985.

4.2.3 Square centre



Description

The sense of a centre is important for any type of square. However, the centres of town squares are different from those of residential squares. In town squares, there is a tendency to leave the centre free of obstacles (such as trees, fountains, pond, or sculpture), to give the opportunity to users to occupy the centre in any activity (Novotny, 1996), while in residential squares it is recommended to fill up the centre with planters, fountains, and ponds. The reason is that a green area with a pond and fountain in a residential square is considered as an amenity which has a useful function in ornamenting the space.

Recommendation

- The size of the centre of a residential square should be designed according to proper spatial proportions.
- Vehicular access should be provided surrounding the green area.
- The green area should be covered by lawns and planted by trees and shrubs to create a comfortable environment for inhabitants. Also, furniture and equipment should be provided to enhance the quality of the space.
- A gradual slope toward the center of the green space (in a concave shape) is recommended to increase the sense of containment (Fig. 4.12). The green space in the centre of a square is a place where people can best experience the sense of being in the square.

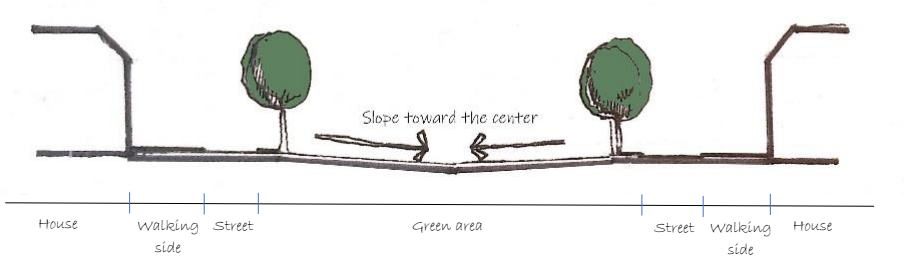


Fig. 4.12. A section of a residential square, illustrating the impact of the slop in creating the sense of containment.

4.2.4 Façade

Description

Façades define an explicit shape for the space which has a great impact on inhabitants' mental image of it. It also plays an important role in creating a unique composition of the square space. Vertical and horizontal rhythms of the façade enclose the space of the square like the warp and weft of fabric.

Recommendation

- Proximity is the key in creating uniform façade (Fig. 4.13). In this regard the juxtaposition of buildings is of utmost importance.

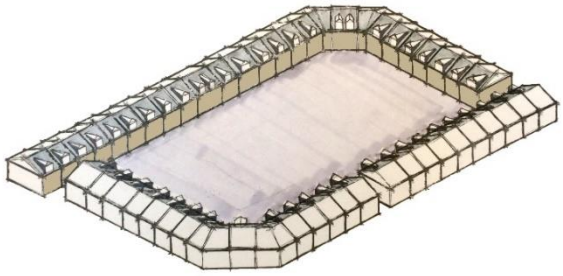


Fig. 4.13. A residential square. Extreme uniformity by proximity of residential units.

- Vertical and horizontal rhythms have an important role in the composition of the façade. Each building should adjust its rhythm to adjoining buildings (Bentley et al, 1985) (Fig. 4.14).

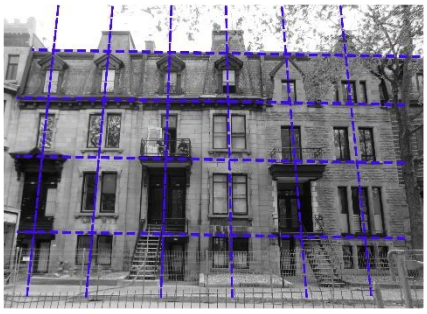


Fig. 4.14. Victorian houses. Saint-Louis Square, Montréal. Vertical and horizontal rhythms defined by the position of windows and doors.

- Continuous patterns (like striped patterns) of material could unite adjoining buildings with different characters and forms (Fig. 4.15).

Fig. 4.15. Victorian façade. Saint-Louis Square, Montréal. The limestone blocks featuring strong horizontal striped pattern.

- Hide changes in the level of the horizontal rhythms with the architectural composition of the building's form (Hedman & Jaszewski, 1984) (Fig. 4.16).

Fig. 4.16. Canal Herengracht, Amsterdam

- New building façades within the square should be adjusted to suit the details (architectural elements) of adjoining buildings (Fig. 4.17).

Fig. 4.17. Facade elements. New building façade is formed by similar elements of adjoining buildings. Source: after Bentley et al, 1985.

- Consistency in the materials used for façades enhances the identity of the square (Fig. 4.18).

Fig. 4.18. Square Jean-Rostand, Montréal.

- The width of façades should be almost the same size, following the proportion of the space. Wide façades that exceed the average width should be split into smaller units by vertical projections/recession, or ornamental elements (Fig. 4.19).

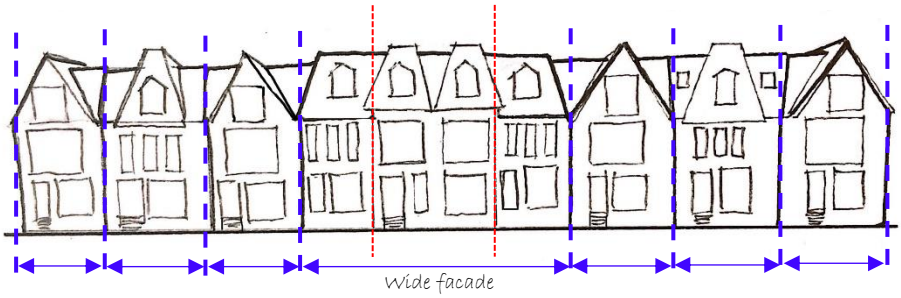


Fig. 4.19. Equal façade width. The wide facade is broken down by vertical recessions. Source: after Bentley et al, 1985

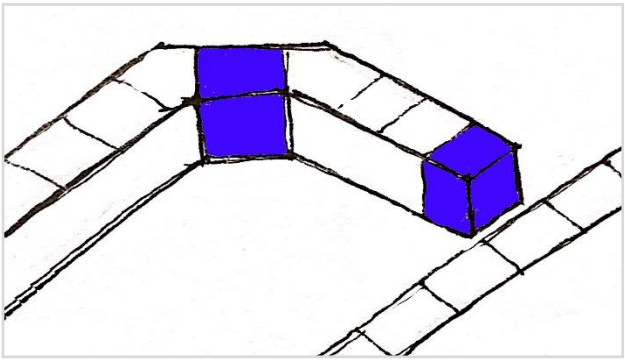
- The rhythm of narrow façades (due to plot width) could be employed as a unit of measurement for a spectator, if the width of façades is fairly predictable and objectively measurable (on a human scale),

- Façades should be well-articulated. They should provide an opportunity for residents to personalize their environments, for example in thresholds and windows.

- Small lot widths provide the opportunity for architectural variety, which in turn increases the potential intricacy of façades (Fig. 4.20).

Fig. 4.20. Saint-Louis Square, Montréal. Narrow façades of Victorian houses.

4.2.5 Corner



Description

Corners are considered accent points that can impact the three-dimensional organization of the space. In homogeneous buildings' façades they can create tension in order to diminish visual monotony. Also, they can define the territory of a residential square which is a semi-public urban realm.

Recommendation

- A corner should act with its distinct architectural features to demarcate a residential square (Fig. 4.21).

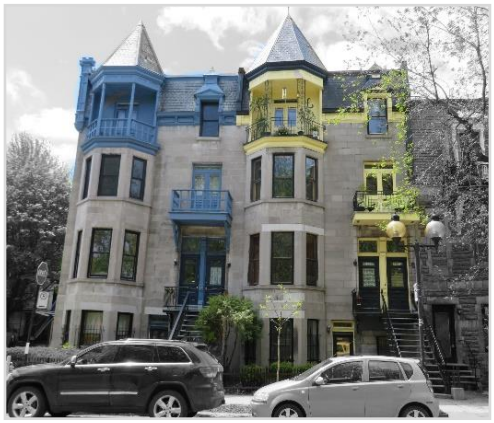


Fig. 4.21. Saint-Louis Square, Montréal. A highly visible corner building.

- Corners can adopt distinctive architectural features, such as projected balconies, bay windows, recessed entries, ornamental canopies, higher hipped-roofs, turrets, and decorative elements such as columns.
- Angular corners can create a sub-space (pause-space) for its adjoining buildings (Fig. 4.22). This can happen with a slight retreat of corner buildings.

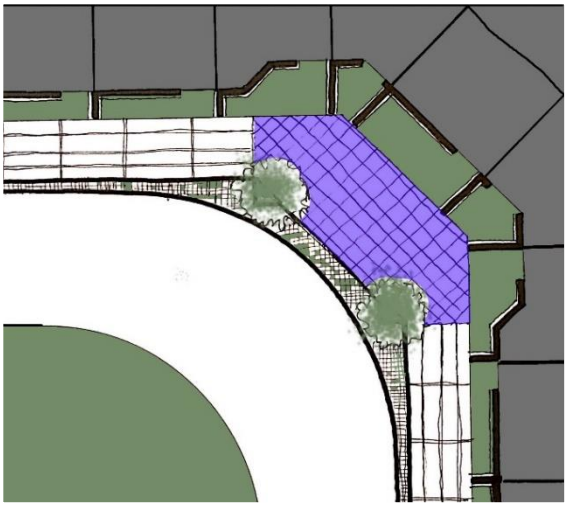
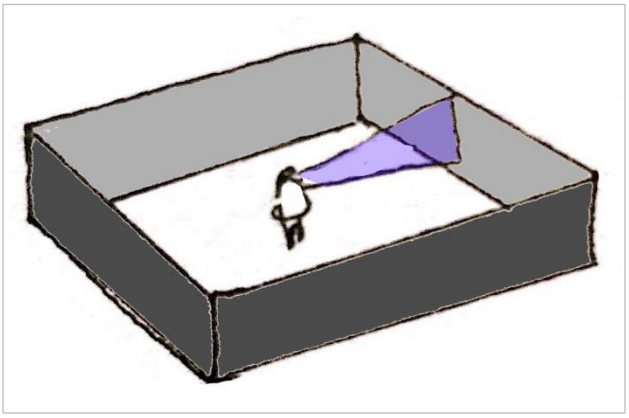


Fig. 4.22. Pause-space along the dynamic-sidewalk space, can create series of experiences for spectator in the square.

4.2.6 Enclosure



Description

The enclosure of space is referred to as the first principle governing the design of urban areas. If the space is not well-enclosed, the desired spatial quality in the square cannot be achieved. The sense of enclosure depends upon entries and gaps between the buildings of the square. When nearly three-quarters of the square is in the scope of view, a sense of enclosure emerges (Novotny, 1996). Methods to achieve an enclosed space differ in terms of size, shape, access, and architectural envelope. The enclosing elements in a residential square are

houses and to some extent trees. In any case, the enclosed space should have a human scale. Compared to urban squares, residential areas have a smaller scale. Maintaining a human scale is therefore very important.

Recommendation

- The composition of the embracing wall (architectural envelope) and its continuity affect the sense of enclosure (Fig. 4.23). Any gap between buildings, lack of connection in the buildings' façades, or sudden changes of the cornice in the base (podium) of buildings decrease the sense of enclosure in a residential square.

Fig. 4.23. Monpazier market square, France. A highly enclosed square. Source: after Delahaye, 2013

- Create a sense of enclosure with the use of trees in unenclosed residential squares (Fig. 4.24).

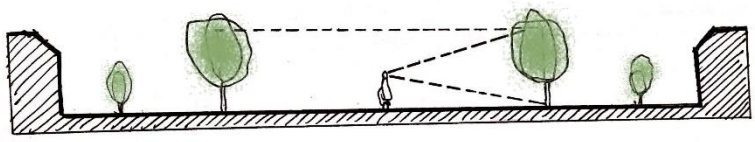


Fig. 4.24. The use of trees. The section shows the method of enclosing an unenclosed square, employing trees.

- Creating enclosed-compound spaces (enclosed sub-spaces) in the square in connection with the entire space enhances the spatial quality of the square (Fig. 4.25). This could also help to create a variety of spaces for pedestrians.

- Entrances to the square should be limited in number and minimized in width. Non-axial paths are recommended. Buildings should embrace the streets with narrow gaps (Fig. 4.26).

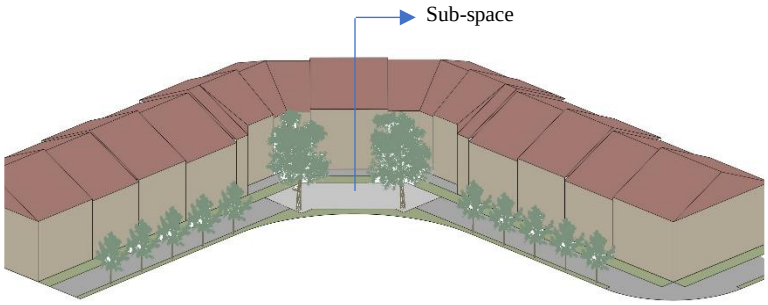


Fig. 4.25. An enclosed sub-space along the sidewalk.

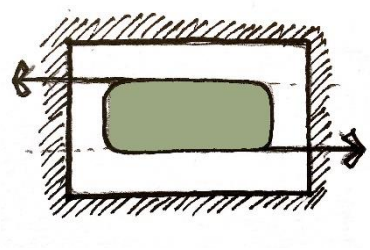
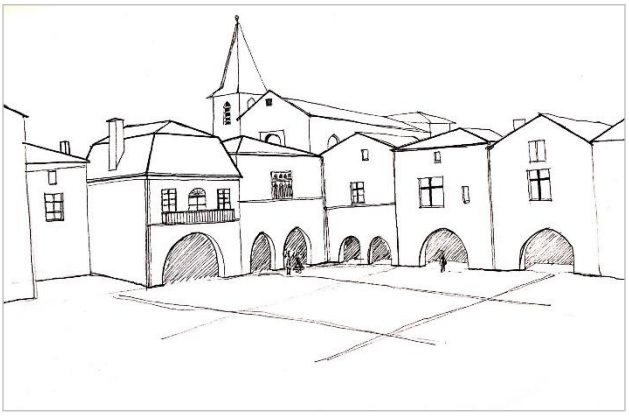


Fig. 4.26. Non-axial path.

- Streets running to the square should have one-way car width and accommodate two-way traffic to encourage slow traffic and keep the entry width small.

4.2.7 Territoriality



Description

The “territory” quality of the space in which human beings live is intrinsically crucial. It is known as "territoriality" in urban studies (Tavassoli, 1997). In residential squares, territoriality is identifiable in two ways: private (for a person or a family, the individual house) and public (for residents, the square). The significant issue is the gradual transition between these two spaces which is called the “intimacy gradient.” Transition spaces and thresholds modulate the large scale of the square into the small scale of the individual building (Novotny, 1996; Tavassoli, 1997).

Recommendation

The territoriality of a residential square could be defined in different ways:

- Corners defining the square’s territory with distinctive architecture
- Trees at the entrance to the square

- Changes in the level of pedestrian paths
- Changes in direction (creating a curve) or width of the streets running to the square (Fig. 4.27)

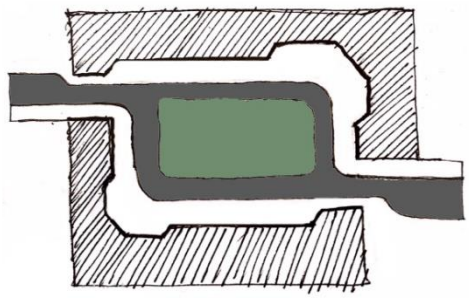


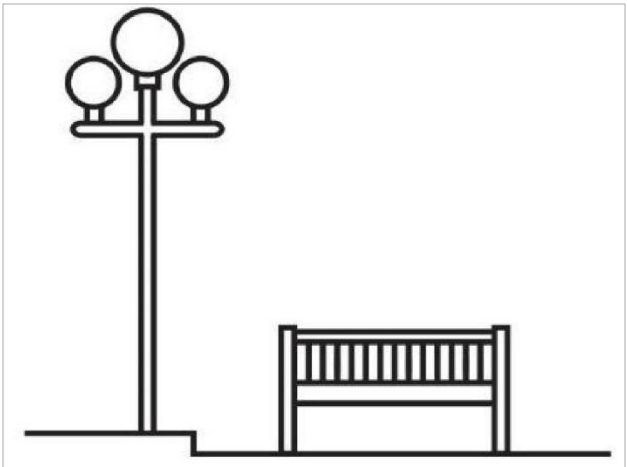
Fig. 4.27. territoriality in a residential square.

A gradual transition from a public space to the semi-private space of buildings happens at the edge of buildings (Fig. 4.28) through:

- Steep stairs
- Recessed entries with well-articulated frames.
- Landscaping
- Canopies
- Small trees or shrubs
- Distinctive furniture

Fig. 4.28. Saint-Louis Square, Montréal. Recessed entries create transition space.

4.2.8 Amenities



Description

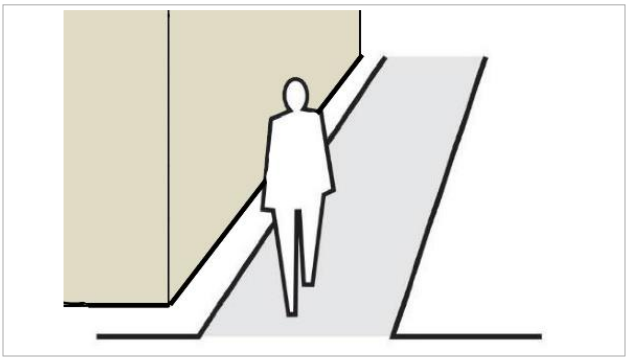
Amenities are considered desirable and have positive psychological effects on the inhabitants of a residential square. They may consist of a playground for children, furniture, lighting, ponds and fountains, or family gardens. Proper and in-scale facilities, as needed, enhance the aesthetic and sustainable aspects of residential environments.

Recommendation

- The need for amenities depends on the size of the square.
- They should be in a proper place that does not disturb other activity.
- Place ponds and fountains at the centres of squares where they can be part of the frame of view from everywhere in the square (Fig. 4.29).
- Furniture should be manufactured in proper materials.

Fig. 4.29. Saint-Louis Square, Montréal. The green area.

4.2.9 Pavement and texture



Description

Pavement is the surface of the floor of a square by which everything is connected on the ground. It is the part of the physical confinement of the square inhabitants immediately interface with. Much of their experience of texture is achieved through walking on their feet and sitting down on their Buttocks (Carmona et al, 2003). Therefore, the covering material of the pavement should be well-defined based on local needs and uses of a space.

Recommendation

- The pavement should be involved with the function, structure, and shape of the space, the type of traffic, the size and significance of the vehicle and the climate conditions.
- The pavement should be appropriate for all users and encourage smooth transition and maneuverability.
- The covering material should be safe for both pedestrians and vehicles, convenient, and in accordance with the space's character.
- Covering materials for road paths that encourages slow vehicle movement are recommended.
- Variation in color and texture helps to create contrast, richness and a sense of scale.

4.2.10 Parking spot

Description

Although the priority in residential square design is to increase walkability and reduce the presence of vehicles, the car is an integral part of everyday life of inhabitants and is inseparable from the square space. Therefore, assigning appropriate spots for vehicles is of utmost importance in any design. The parking spots should be such that the presence of vehicles does not reduce the visual quality of the square.

Recommendation

- Parking spots should be as limited as possible.
- Create appropriate recessions for parking spots according to the width of streets (an outer skirt is recommended) (Fig. 4.30).
- Hide parking spots with trees and shrubs.
- Avoid placing parking spots on loops.

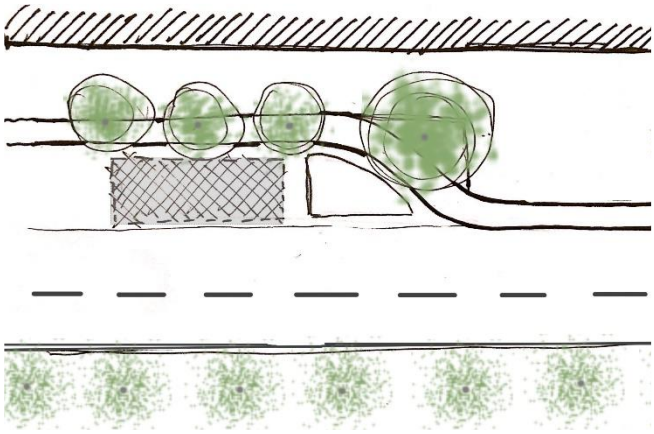


Fig. 4.30. Parking spots on the recession of roads.

4.3 Conclusion

The awareness of space, and, in particular the understanding and perception of the relationship between the two main elements of any urban space is the basic principle that should be considered in any urban design. Today, many designers are more concerned with building mass than with space, but urban design needs to involve mass, space, and the relationship between them.

The quality of the spatial organization of a residential square depends on the relationship between the mass (houses) and the space of the square; that is, in this study, the composition of the space and its enclosing walls. The harmonization and unification of the forms of houses around a residential square creates what is called architectural identity. This study began by identifying the main constituents of a square by examining town squares throughout history, and then examined the interplay of these elements in three residential squares in Montreal. Finally, it listed key elements for the spatial organization of residential squares, and made recommendations in this regard.

The main goal of this study was to identify and evaluate the principal physical and perceptual elements of a residential square. The spatial organization of residential squares, regardless of their appearance and characteristics, consists of certain variables that can improve both spatial and visual quality of the square. The failure in the design of successful residential squares in recent decades is due to the lack of understanding of these variables. Therefore, the spatial knowledge obtained in this study is presented to emphasize the significance of the variables, leading to enhance the spatial and visual quality of residential squares (make them a more identifiable unit of settlement). The common features presented here as principles of organizing physical and spatial structure of a residential square are intended to be a guide for designers, and might be employed either in developing new residential squares, or in evaluating the design success of existing residential squares.

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CHAPTER II

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Fig. 2.32: Source: newengland.com

CHAPTER III

Case study 1: Saint-Louis Square

Fig. 3.1: Source: Ville de Montréal

Fig. 3.2: Source: Google Earth

Fig. 3.3: Source: By the author

Fig. 3.4: Source: By the author

Fig. 3.5: Source: By the author

Fig. 3.6: Source: By the author

Fig. 3.7: Source: By the author

Fig. 3.8: Source: By the author

Fig. 3.9: Source: By the author

Fig. 3.10: Source: By the author

Fig. 3.11: Source: By the author

Fig. 3.12: Source: By the author

Fig. 3.13: Source: By the author

Fig. 3.14: Source: By the author

Fig. 3.15: Source: By the author

Fig. 3.16: Source: By the author

Fig. 3.17: Source: By the author

Case study 2: Square Jean-Rostand

Fig. 3.18: Source: Ville de Montréal

Fig. 3.19: Source: Google Earth

Fig. 3.20: Source: By the author

Fig. 3.21: Source: By the author

Fig. 3.22: Source: By the author

Fig. 3.23: Source: By the author

Fig. 3.24: Source: By the author

Fig. 3.25: Source: By the author

Fig. 3.26: Source: By the author

Fig. 3.27: Source: By the author

Fig. 3.28: Source: By the author

Fig. 3.29: Source: By the author

Fig. 3.30: Source: By the author

Fig. 3.31: Source: By the author

Case study 3: Cul-de-sac Rue du Collège-Beaubois

Fig. 3.32: Source: Ville de Montréal