Morphology, Sustainable Evolution of Inner-urban Neighborhoods in San Francisco

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Abstract
This research identifies the roles and processes of a traditional mixed-use inner-urban neighborhood, the South of Market Area district in San Francisco, in providing adaptable physical settings and flexible functional mixtures for livable urban communities. Using typo-morphological analyses, it investigates spatial types and functional attributes of elements with regard to how they form physically adaptable and functionally flexible places, and in what way they affect neighborhood evolution. The first part of the research identifies distinct spatial structures and functional patterns of the South of Market Area at an area-wide scale. The second part investigates fundamental components which form diverse neighborhood spaces through an extensive typological study. The third part analyzes evolutionary processes of neighborhoods by means of a morphological analysis for three historical periods beginning in the mid-nineteenth century and continuing into the late 1980s. The fourth part investigates mechanisms of evolutionary patterns which lead to particularly adaptable neighborhood environments. The research concludes that adaptable neighborhoods are formed based on the integration of fine-grained traditional mixed-use neighborhood spaces and individually-planned new small-scale building developments in an incremental and dispersed manner of evolution.

Keywords: morphology; mixed-use inner-urban neighborhood; gridiron street; sustainability; San Francisco

1. Introduction
In traditional city centers, various types of building spaces incorporating diverse functions form mixed-use inner-urban neighborhoods. Mixed-use inner-urban neighborhoods have been physical and functional foundations based on which a variety of urban activities take place. Over history, they have undergone various physical evolution and functional transformations in order to accommodate changing economic needs, socio-cultural values and infrastructural conditions. Thus, present physical forms and functional patterns of neighborhoods are considered the consequence of processes in which individual elements of neighborhoods evolve in a way they relate with each other as a whole. Today, these mixed-use inner-urban neighborhoods provide spatial and functional bases for a sustainable live-work community to grow. Sustainability, in this research, refers to the characteristics and abilities of a neighborhood, which are capable of providing physically adaptable and functionally flexible spaces for various people’s activities while maintaining the richness of socio-cultural contexts.

2. Purpose and Organization of the Research
The purpose of this research is to examine the roles and processes of traditional mixed-use inner-urban neighborhoods in providing adaptable physical settings and sustainable functional mixtures for multi-functional live-work communities. The research investigates types and characteristics of individual physical elements and functional clusters with regard to how they form a physically adaptable and functionally flexible inner-urban neighborhood, and in what way they affect on a subsequent process in which the neighborhood evolves. A neighborhood is considered as a socio-physical entity which is formed based on a various physical elements and functional components. Each physical element and functional cluster is distinct in its scale, form, dimensions and functions, and thus which conceivably defines a manner of the neighborhood’s evolutionary process. Thus, the research focuses its scope on the following objectives:

a) To identify distinct spatial structures and functional patterns of South of Market Area.
b) To develop morphological classifications of physical elements and functional clusters by which each neighborhood is analyzed with regard to what are the evolving factors and what are the permanent.
c) To examine processes in which the neighborhood evolves based on individual physical elements and functional clusters.
d) To find out distinct evolutionary patterns which result
in sustainable multi-functional inner-urban neighborhoods.

This research is organized into four parts. The first part of the research identifies spatial structures and functional patterns which shape multi-functional urban communities of San Francisco’s South of Market Area at an area-wide scale. Attention is given to examining relationships between the checkerboard grid street system associated with rectangular city blocks and built-out conditions incorporating diverse land uses. The second part investigates fundamental components which form diverse neighborhoods’ spaces through an extensive morphological study. A neighborhood’s components include both physical elements and functional clusters. The third part surveys distinct processes of physical evolution and functional transformations of a neighborhood by means of a historical morphological analysis. In this survey, three distinguished time periods are identified with regard to the events and subsequent impacts on physical form and functional patterns of the area as follows:

1) 1877: the early explosive urbanization period after the California’s Gold Rush in 1848,
2) 1913: the restoration period after the San Francisco’s great earthquake in 1906, and
3) 1988: the revitalization period based on urban redevelopments and, new and emerging live-work neighborhoods.

The fourth part investigates evolutionary patterns which lead to particularly adaptable neighborhood environments.

3. Research Framework and Methodology

A study of mixed-use inner-urban neighborhoods, with regard to how their individual spatial elements structure a collective form of the neighborhood and in what way functional clusters evolve to adapt to changing conditions, is accomplished through an extensive morphological analysis. Morphology is considered as classification systems made up of categories that divide some aspects of the world into parts. In this research, the theoretical purpose of the morphological approach is to identify and clarify the types of spaces which synthesize diverse individual spatial elements, and in turn examine the evolutionary process of neighborhoods. Buildings and their associated neighborhood spaces can be classified according to the similarity of their purposes and their formal structure.

Among recent studies concerning urban form and the spatial elements, the rationalist view to explain collective form of a city based on the morphological approach provides a notion that morphology has the potential to be the animating force of a city’s design process (Rossi, 1982). For instance, Moudon’s substantial study (1986) of San Francisco’s traditional residential neighborhoods underscores the sustainable manner in which local residents have modified their properties for accommodating changing lifestyles and needs without bulldozing unique spatial characteristics of the Victorian style architecture. The study provides an important lesson that the incremental and dispersed manner of individual spatial improvement can sustain the human-scale physical environments and a livable socio-cultural identity inherent to the neighborhood.

At the outset of this research, a morphological analysis focuses on three hierarchical scales of information encompassing: 1) an area-wide scale, 2) a block scale, and 3) a building lot scale. A planning map (1"=400'0", 1:4,800) illustrates the area’s infrastructures and built-out conditions. A series of detailed insurance maps, Sanborn map (1"=50'0", 1:600), provide information including block dimensions, subdivision and alley way patterns, lot dimensions, building structures and forms, and even building uses at a city block and building lot scale. Based on the cross-scale information, morphological classifications of physical elements and functional clusters of neighborhoods are developed to sort out intricate correlation between building types and overall neighborhoods’ functions.

4. Grid Street System and Functional Clusters of South Of Market Area

The first part of this research investigates distinct spatial structures and unique functional clusters of South Of Market Area. The area is an approximately 1,100 acre, 445 ha, of traditional industrial, commercial, business and residential mixed-use area occupying the south part of San Francisco’s downtown district, that is bounded by Market street at north, the Embarcadero at east, Berry street at south and 13th street at west. The case study area of this research incorporates fifteen city blocks in this South Of Market Area, bounded by Market, 4th, Folsom and 9th streets (Figs. 1 and 2). The area demonstrates distinct patterns of physical infrastructure based on the grid street system and large rectangular city blocks. They affect a variety of people’s interplay with urban spaces by dictating the means of access between one point and another. Street patterns determine where buildings can be built, how people interact with the community, and thus, in what way neighborhoods can take shape.

South of Market Area’s physical infrastructure is rather a simple one (Fig. 1). It is based on a simple grid street system associated with rectangular city blocks, which was originally laid out in 1847 as a part of the officially surveyed land plotting for a booming city, San Francisco, to accommodate an explosive population growth and expanding port-related land uses such as manufactories, warehouses, laundromat, lodgings, restaurants and clubs, and various types of residential buildings. Streets and blocks in South Of Market Area were laid out in varas, a variable Spanish colonial measurement which in California equaled 33 inches (83.82cm). The city blocks situated in South Of Market Area measure 200 by 300 varas (5500” by 825”, 167.64m by 251.52m), with the long dimension of the block in parallel with Market
street, which are as four times large as those of the North of Market Street. It was an attempt to house more industrial and port-related land uses than residential or commercial in South Of Market Area. Although the simple grid street system and large rectangular city blocks are suitable for bulky building structures to accommodate industrial and port-related business needs, at the same time, this physical structure is easily subdivided into smaller parcels with narrow alley ways to provide finer-grain of neighborhood spaces for livable pedestrian-oriented activities to take place. In this regard, the checkerboard grid street system with rectangular blocks is considered an adaptable physical structure by which South Of Market Area accommodates the great mixture of lifestyles and work conditions as a sustainable urban community.

Table 1. Classification of Seven Functional Types (as also shown in Fig.1)

| Type One (T-1) | Corporate office buildings based on large building lots  --- the area bounded by Market, Stueart, Harrison, and 3rd streets  --- |
| Type Two (T-2) | Large convention building, hotel, museums, and apartment buildings based on the YBC redevelopment project  --- the area bounded by Market, 3rd, Folsom, and 4th streets  --- |
| Type Three (T-3) | Traditional mixed-use neighborhoods and emerging live-work communities  --- the area bounded by Market, 4th, Folsom, and 9th streets  --- |
| Type Four (T-4) | Traditional warehouses and manufactories based on large building lots  --- the area bounded by Folsom, 3rd, Harrison and 9th  --- |
| Type Five (T-5) | Emerging high-tech business services, artist studios, and manufactories based on large warehouses  --- the area bounded by Harrison, 3rd, Townsend, and 9th streets  --- |
| Type Six (T-6) | Mixed-use neighborhoods with home-based offices and upscale restaurants around South Park  --- the area bounded by Harrison, 2nd, Townsend, and 3rd streets  --- |
| Type Seven (T-7) | Large apartment buildings replacing warehouses and industries  --- the area bounded by Harrison, Spear, the Embarcadero, King, and 2nd streets  --- |

Despite simplicity of the checkerboard grid street system with large rectangular blocks, a variety of neighborhood spaces incorporating diverse functions are conceived in South Of Market Area (Fig. 1). As explained above, a basic spatial module of a city block is based on 555’0” by 825’2” (167.64m by 251.52m)
dimensions. Individual city blocks, however, are considered distinct for their types and patterns of subdivision parcels, alley ways, building scales, setbacks and back yards, and open spaces. The grid of wide, through streets is overlaid with a delicate web of narrow, short alleys, and much of the land is sub-divided into small parcels. In fact, the following seven distinct functional types are identified with regard to building types, land uses, lot patterns, and alley way patterns as shown in Table 1.

As shown in Fig. 1, each city block demonstrates different degree of land-use mixture, distinct grain of physical complexity, and unique patterns of built-out conditions. With regard to the physical adaptability and functional flexibility, the neighborhoods categorized in type three (T-3) provide the widest range of building lot types and functional clusters. This type is distinct from other clusters for the smallness, fineness, diversity, arrangements and orderliness of physical elements. These attributes are identified by measurements of physical variables including 1) the net ground floor area ratio (GFAR) of individual blocks, 2) the number of buildings per block, and 3) the average sizes of ground floor area (GFA) of buildings (Fig. 2). A typical difference of the spatial grain of neighborhoods is conceived, for instance, between the block #3703 and #3727, based on the figures of the ground floor area ratio (GFAR) and the number of buildings per block. GFAR of both blocks are 71.15% for the block #3703 and 73.51% for the block #3727; and this comparison shows that two blocks have almost the same amount of building coverage area per block. However, the major difference between two blocks is attributable to the number of buildings per block. It shows that the block #3703 has 41 building structures whereas the block #3727 has 89. This means that the block #3703 comprises as twice big building foot print as that of the block #3727. It illustrates that the block #3727 has finer-grain of physical patterns and more variations of building types than those of the block #3703, and thus the block #3727 can be more adaptable to various spatial changes and functional transformations taken place in an incremental and dispersed manner.

Based on these area-scale analyses, neighborhoods categorized in type three (T-3) demonstrate sustainable features of physical elements whereas the other types comprise large building developments or scrap-and-build type redevelopment projects. For this, the following part of this research focuses on the block #3727 categorized in type three (T-3) as an in-depth case study area. To understand complex forms and functional patterns of mixed-use inner-urban neighborhoods, the building types, layouts, juxtapositions, and functional cluster patterns are compared at the same scale in a same mapping format for three historical periods (Fig. 3).

5. Physical Elements and Functional Clusters of Neighborhoods

The second part of this research develops morphological classifications of physical elements and functional clusters based on an in-depth case study area, block #3727, bounded by Mission, 7th, Howard, and 8th streets. In order to identify what are the physical elements, how they shape the neighborhood’s collective form, and in what way they evolve to date, the area’s
Table 2. Classifications of Building Types and their Chronological Changes

| Building Type       | Year | Description                                                                                                                                 |
|---------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Detached House      | 1877 | A cluster of many detached houses is formed along Natoma street, resulted from an explosive population growth in the mid nineteenth century. Most of these detached houses are constructed based on the basic size of building lots, 250' by 750', and have large back yard spaces with them. |
|                     | 1913 | Although the original cluster of detached houses disappeared because of the earthquake devastation of 1906, two third of those building lots were restored in a short period with the Victorian style buildings. Building frontage becomes wider reaching to both sides of lot boundaries, and its depth extends replacing former back yard spaces. |
|                     | 1988 | Victorian town houses are lined along both sides of Natoma street. It presents little changes of physical patterns since 1913, and preserves a traditional street scape and cohesive residential environment today. |
| Semi-Detached House | 1877 | Semi-detached houses are located in a dispersed condition either on Mission, Minna, or Natoma streets. Popular building lot size for semi-detached houses is 250' by 750' which is similar to that of detached houses. A typical building floor pattern comprises two dwelling units adjoining a partition wall. |
|                     | 1913 | In a process of the earthquake restorations, the total number of semi-detached houses decreased. Some of those building lots are still vacant, or the others are replaced with commercial or retail uses. |
|                     | 1988 | The number of semi-detached houses increased. Vacant lots of 1913 are filled with new semi-detached houses. |
| Row House           | 1877 | There are five row houses in the block; two on Minna, and one on each Mission, Natoma and 7th streets. Building lot dimensions for row houses range from 550' by 480' to 800' by 800'. Individual houses comprise six to nine dwelling units and have back yard spaces. |
|                     | 1913 | Only two row houses are restored after the earthquake; one on Natoma and another on 8th streets. |
|                     | 1988 | Only one row house remains along Natoma street. The lot is 500' by 730' and composed of six dwelling units. |
| Apartment           | 1877 | No apartment building in the block.                                                                                                                                                                     |
|                     | 1913 | No apartment building in the block.                                                                                                                                                                     |
|                     | 1988 | One apartment building is built on a lot of 450' by 750' along Minna street. It houses twelve dwelling units and has back yard space.                                                                     |
| Commercial Building | 1877 | Large commercial buildings are lined along Mission and 7th streets whereas small one are located in a dispersed condition. The use of commercial buildings varies from a half to half combined with a row house. Building lot sizes vary form 250' by 300' at the smallest on Mission street to 740' by 820' at the largest on 7th street. |
|                     | 1913 | The restoration process of commercial buildings was slower than that of residential buildings. Only two buildings were rebuilt and their lot dimensions are 520' by 900' and 230' by 600'. |
|                     | 1988 | The number of commercial buildings increased to fourteen, and they are located over the block. Mission street has the widest variation of building scales ranging from 250' by 850' to 250' by 1630'. |
| Hotel and Lodging   | 1877 | Hotels and lodgings in this block are considered as an inexpensive to moderate class, and used mainly for the permanent residential purpose. One hotel is located on 7th street based on a 910' by 760' dimension lot. |
|                     | 1913 | Two large hotels are built on Mission streets and two medium size hotels are located on 8th and Howard streets. Lot dimensions are ranging from 540' by 900' to 520' by 1700' to 830' by 1270'. |
|                     | 1988 | Total four hotels and lodgings are concentrated along 7th and Mission streets. Their lot dimensions are 540' by 850', 750' by 1270' and 830' by 1270'. |
| Industrial Building | 1877 | No industrial building in the block.                                                                                                                                                                     |
|                     | 1913 | There are two manufactories on Mission street. Building lots vary from 250' by 900' to the one which has a L-shape with a short frontage of 250' by 1630' of depth, and a long frontage of 530' on the back. |
|                     | 1988 | There are a wide variety of fourteen industrial buildings in the block. Two large industrial buildings occupy one street corner of Natoma and 8th street, and are based on 750' by 2830' and 1670' by 2820'. Medium buildings are based on lots ranging from 520' by 750' to 520' by 1670'. Small manufactories are located in a dispersed condition and based on lots ranging from 260' by 750' to 260' by 940'. |
| Warehouse           | 1877 | Three warehouse buildings are identified along Minna and Howard streets. They are relatively small and based on building lots ranging from 260' by 910' to 390' by 740'. |
|                     | 1913 | Only one warehouse was rebuilt after the earthquake along Minna street. Building lot is 230' by 830'. |
|                     | 1988 | Two warehouse buildings are built along Natoma and Howard streets. Lot dimensions are 270' by 750' for a small warehouse and 1320' by 560' for another. Two loft buildings are built along Howard street and their scale are 510' by 940' and 530' by 940'. |
| Office Building     | 1877 | No office building in the block.                                                                                                                                                                     |
|                     | 1913 | No office building in the block.                                                                                                                                                                     |
|                     | 1988 | Only one office building is built on 8th street. Its lot presents L-shape dimensions with a 380' frontage facing to 8th street by 1280' of depth, and a 640' frontage facing to Minna street. |
categorized into seven distinct patterns (Figs. 4 and 5). Having defined the physical elements and functional clusters, the morphological classification is developed based on the case study block as in Table 2.

6. Morphological Classification of the Neighborhood Buildings and Spaces

First, morphology is constructed along the major categories of building structures, layouts, and functions based on three historical periods. Then, these categories are further divided into sub-types based on detail footprint patterns of buildings and their geometrical positions concerning patterns of spatial penetrations within individual building lots. Also, building lot patterns are overlaid with these building type classifications. Major categories are: 1) detached house, 2) semi-detached house, 3) row house, 4) apartment building, 5) commercial building, 6) hotels and lodging, 7) industrial building, 8) warehouse, and 9) office building (Table 2). A morphological classification of the physical elements indicates that a cluster of small residential buildings including detached, semi-detached and row houses forms a spatial and functional core which has been permanent in their physical conditions, and provided fine-grain spatial settings of the neighborhood. This core cluster contributes to maintaining cohesive neighborhood spaces where a livable inner-urban residential community can take shape. Based on this great mixture of building types, a variety of functions grow incrementally in response to changing economic needs and infrastructural conditions. The spatial complexity and functional diversity formed through the evolutionary process are considered as a major factor which results in adaptable and flexible neighborhood spaces.

7. Distinct Patterns of Spatial Evolution and Functional Transformation

In the previous part, physical elements and functional clusters are identified based on a morphological classification. In the process of the neighborhood evolution, seven distinct patterns of changes are identified with regard to the grain of evolving patterns, the manner of lot assemblies, and the degree of functional transformation. The seven patterns of physical evolution and functional transformation are considered as an

| Process One (P-1) | Physical | At the corner of Mission and 7th, many small lots (250’ by 690’ - 570’ by 830’) are merged into a large building parcel (1270’ by 1630’). |
| Process Two (P-2) | Physical | In the central part of the block facing Mission, a large number of small to medium size lots (230’ by 920’ - 760’ by 900’) are assembled with building lots adjoining their back boundaries into larger and deeper parcels (250’ by 1630’ - 790’ by 1630’). |
| Process Three (P-3) | Physical | At the corner, bounded by Mima and Natoma, facing to 8th, a lot of small building lots (220’ by 500’ - 190’ by 800’) are assembled into several medium size parcels (520’ by 700’ - 640’ by 700’). |
| Process Four (P-4) | Physical | A distinct cluster of basic module building lots (250’ by 830’) bounded by Mima, Natoma, and 7th, remains in almost the same condition for a long period. |
| Process Five (P-5) | Physical | A single large vacant lot (1670’ by 2820’) remains the same size with no subdivision in 1988 and is filled with one large and another medium size buildings. |
| Process Six (P-6) | Physical | A row of small to medium size building lots (220’ by 910’ - 760’ by 900’) bounded by 7th and Howard streets has undergone physical module changes based on parcel-assembly characteristics. Typically, two adjoining parcels (250’ by 910’) are merged into one wider lot (500’ by 910’). |
| Process Seven (P-7) | Physical | At the corner of Mission and 8th streets, various size of building lots (200’ by 790’, 250’ by 860’, 490’ by 790’, 740’ by 750’, and 800’ by 860’, etc.) form a distinct physical cluster. This cluster, however, becomes physically less diverse because of its lot-assembly and now consists of irregular-shaped medium scale lots (520’ by 1630’, 390’ and 820’ by 1630’, 640’ and 860’ by 1280’, etc.). |
important feature by which a sustainable neighborhood can take shape over time (Table 3). Through a combination of these seven distinct patterns of transformation processes, the neighborhood provides a wide range of building lots based on which various building types can fit in. They include not only residential spaces but also many work places such as small manufactories, warehouses, wholesale mart, retails, hotels and lodgings, and emerging loft spaces. This wide variation of functions promote people’s various interplay with neighborhood spaces in many ways, and in fact, that heterogeneous nature of individual development activities maintains the neighborhood’s physical adaptability and functional flexibility to changing economic needs, socio-cultural values, and technological breakthroughs. Among these characteristic evolutions of building types and their associated functions, the process Four (Table 3) is considered playing a major role which preserves traditional lot dimensions and determines the fine-grain neighborhood patterns.

8. Conclusion, Sustainable Elements and Structures of Inner-Urban Mixed-Use Neighborhoods

Through the morphological study of traditional mixed-use inner-urban neighborhoods of South Of Market Area, the physical elements and functional clusters which form adaptable and flexible neighborhood spaces are identified. Physical adaptability are assessed by examining the degree to which new types of buildings and their associated exterior spaces are integrated with existing neighborhood spaces and functions. They are identified by investigating changes of element types, scales and locations.

Based on the results of these surveys, it is assumed that the adaptability is enhanced when the neighborhood comprises more small-scale buildings incorporating community-oriented functions in fine-grained spatial conditions. Despite some structural restorations after the 1906 earthquake, the evolutionary processes in which permanent elements remain to serve residential, local commercial and neighborhood industrial functions at the same time evolving elements provide flexible rooms for new building spaces and functions enhance the neighborhood’s spatial adaptability and functional flexibility.

As shown in Figs. 4 and 5, individual evolutionary patterns imply specific relationships to streets (wide main streets, secondary streets, or alleyways), and to subdivision blocks (large city blocks, medium-size rectangular blocks, or small-scale square subdivisions). Through a combination of these evolutionary processes, a neighborhood provides a wide range of lots based on which diverse functions can fit in. They include not only residential spaces but also many work places such as small manufactories, warehouses, wholesale outlets, shops, hotels and lodgings, and emerging live-work/loft spaces. These various functions promote a wide range of people’s interactions with neighborhoods in many different ways. In fact, the heterogeneous nature of individually planned, small-scale, and contextual development activities maintains the neighborhood’s physical adaptability and functional flexibility to changing needs.

In this sense, it is identified that a sustainable manner of evolution takes place mainly along several internal alleyways in the west side area of 6th street, and which maintains fine-grained neighborhood spaces based on which residential or residential-based mixed-use functions are formed. For instance, a district bounded by Minna, Folsom, Sixth and Eighth Streets is one of the areas where new buildings and their associated exterior spaces are well integrated with the existing neighborhood spaces. In the area, traditional Victorian style houses and new types of mixed-use and live-work style buildings coexist in a side-by-side manner. Thus, in the South of Market Area, physically adaptable and functionally flexible neighborhoods are formed based on the following attributes:

1) Permanent elements form cohesive residential-based neighborhood spaces along internal alleyways.
2) Evolving elements are located in peripheral subdivision blocks to provide “rooms” for new types of building spaces and functions.
3) Mixed-use neighborhoods evolve in a contextual manner maintaining traditional spatial types while accommodating innovative functions.
4) The following distinct spatial and functional characteristics are considered to represent the sustainable evolutionary processes of these neighborhoods.

Spatial Attributes
• Small-scale building lots (a typical size: 25'0" by 75'0") form fine-grained spatial conditions.
• Narrow and through alleyways define the physical extent of clusters.
• The rear-access to small buildings on alleyways provides public open spaces for local residents.
• The front-access to large-scale buildings on wide main streets allows the neighborhood to serve easily the city-wide needs and activities.
• No or a very few vacant lots or parking areas enhance the spatial continuity and functional integrity of the neighborhood.

Functional Attributes
• Residential or residential-based mixed-use buildings have maintained occupants, and that makes a neighborhood livable, diverse and safe.
• Local community-based business functions enhance a variety of interactions among the buildings, neighborhood spaces, people, and even information provided in the area.

All in all, several suggestions may apply to the urban improvement of traditional inner-urban neighborhoods. First, it is necessary to recapture the existing
neighborhood spaces with regard to their scales, types, and functions so that they can be combined, not scrapped, with new types of spaces. Second, new building developments need to take place individually in an incremental and dispersed manner because it avoids a concentration of monotonous spaces and homogeneous functions which are likely to discourage the neighborhood’s adaptability to changing conditions. Third, it is important to maintain fine-grained traditional spatial contexts with regard to the building sizes and spatial types. Small textured building spaces provide human-scale environments where various pedestrian activities can take place, and in turn they promote neighborhood livability. Finally, the functional diversity needs to be maintained because it encourages a variety of interest groups to interact with the neighborhood spaces and promotes diverse urban activities of heterogeneous groups.

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Notes
1) Rationalism is a set of thinking “preferring to work in logical steps from first principles.” Broadbendt, Geoffrey. Emerging concepts in urban space design. p. 79. New York : Van Nostrand Reinhold. 1990.

2) Rossi argues that the city is conceived as a structure and that this structure is revealed and can be recognized in the individual spatial element which involve their own values, principles, and roles. He defines the concept of type as “as something that is permanent and complex, a logical principle that is prior to form and that constitutes it.” Rossi, Aldo. The Architecture of the City. p.40. Cambridge : The MIT Press. 1982.

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