Revisiting John Portman's Peachtree Center Complex in Atlanta:

A Study of the Effects of the Spatial Configuration of the Off-Grade Pedestrian Movement System on Downtown Urbanism

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Keywords: configuration, movement, multi-level, retail, urban

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0 Abstract

Using space syntax techniques, the paper studies the spatial configuration and its effects on the distribution of movement densities in the multi-level off-grade pedestrian movement system of the Peachtree Center Complex in Atlanta. Based on the study, it suggests that conventional ideas, like the idea of *magnets* or *attractor landuses*, provide a very partial explanation of the observed patterns of use of the off-grade pedestrian movement system in this complex. It shows that the configuration of the spatial layout of the main activity levels in the off-grade system of the complex itself has a powerful effect on the distribution of movement densities in this system. These research findings should have clear implications for urban design, suggesting that a proper spatial structuring of the main activity levels of an off-grade movement system is extremely important for creating a more desirable impact on the local and global orders of the urban system.

1 Introduction: The Peachtree Center Complex in Atlanta

The Peachtree Center Complex is an open-ended urban complex of about 15 million square feet, designed and developed by John Portman & Associates, in downtown Atlanta. This urban complex includes five office towers completed between 1965 and 1992, a series of hotels—the Atlanta Hyatt Regency, the Atlanta Marriott Marquis and the Westin Peachtree Plaza, and the Atlanta Market Center that includes the Merchandise Mart, Apparel Mart, Gift Mart and INFORUM Technology Mart. The urban complex also includes conference facilities, a retail mall, restaurants, an athletic club, an urban plaza, and parking facilities.

The Peachtree Center Complex is almost like a *city within a city.* The basic aim ofn it was to develop an urban complex which would contain all necessary facilities of urban life within a walkable distance, which Portman defines as a *coordinate unit* (Portman & Barnett, 1976). Several urban blocks of the complex are connected with bridges and skyways to facilitate movement and to relieve the congestion at the street level of downtown Atlanta. Huge atriums and lobby spaces, decorated with natural elements, ensure a humane environment within the complex. Its controlled environment ensures safety, security and comfort for its users. Moreover, this complex is conveniently located on an underground train station, and at the intersection of major highways and traffic routes of the city to ensure an easy accessibility for all classes of population.

Portman's Peachtree Center Complex becomes an important urban design concept, when one considers present shifts in the demographic pattern of the United States. Every year more and more people are moving out of the central cities of the country. This trend has been facilitated by the incredibly advanced telecommunications and

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Figure 1. A map of Atlanta with downtown at the center. (Major highways are marked in thick line.)

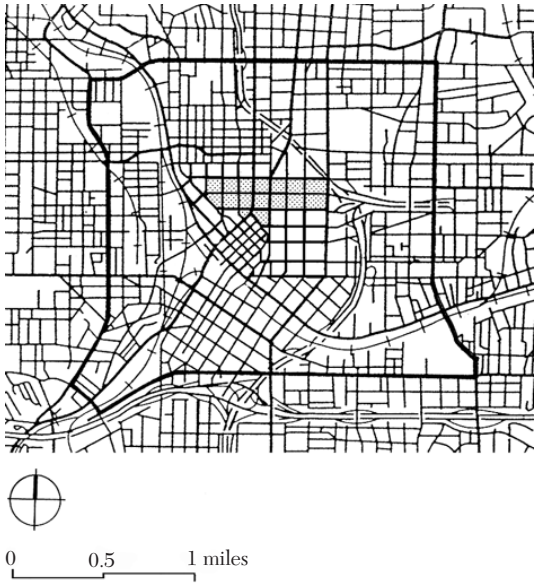


Figure 2. A map of downtown Atlanta with the Peachtree Center Complex at the Center. (The area used for syntax analysis is marked in thick line.)

traffic engineering. Portman tries to respond to these changing urban phenomena with his *coordinate unit*. The Peachtree Center complex provides for enough service facilities and job opportunities in downtown Atlanta. It generates a traffic flow from suburbs to the central city, which supports the existing traffic network of the city. It also tries to keep the middle-class population in the downtown by providing a livable environment.

A survey of the existing literature on John Portman, however, shows that criticisms about his architecture are very inconsistent. According to Sorkin, Portman's urban complexes, like the Peachtree Center, is without any sense of urbanism (Sorkin, 1982: 31); according to Will, they are disorienting (Will, 1982: C7; also see Jameson, 1984); according to Gratz, these complexes kill the street-life of the city (Gratz, 1989: 332); according to Whyte, these megastructures create their own profitable environment disregarding the existing urban context (Whyte, 1988: 206-208). In contrast, *Interiors*, described Portman's architecture as heaven under the sky (*Interiors*, July 1967; also see Gueft, 1976); Riani describes it as an appropriate response to the fragmented urban context of the 20th century (Riani, 1990: 17); Goldberger and Bernett describe Portman's architecture as economically successful popular venture (Barnett, 1976; Goldberger, 1981).

*Architects dismiss Portman by calling him a developer, and developers dismiss him as an architect,"*writes Riani (Riani in *Portman*, 1990). It is rather hard to find somebody who really tries to understand Portman's urban project within its proper context. Even if somebody has done so, their emphasis basically remains on the issues of traditional urbanism characterized by a fascination for the architectural imagery of a bygone era, and a lack of interest in more intrinsic urban design issues about the Peachtree Center Complex. None of the critics has asked: why should an urban complex kill the urban-life when its basic aim was to enhance it; why should the spaces in it appear disorienting while people are consistently using them; why is the

urban complex 'without a sense of urbanism' while it sits right in the heart of downtown? It is easy to say that people do not use the streets because of the blank walls (which, however, is not correct in the case of the Peachtree Center Complex), but it hides the basic issues of urbanism, which is the relationship between the patterns of movement and the local and global morphological properties of the urban system.

Everybody tried to understand and explain John Portman's architecture in terms of usable spaces but not as a pattern of relationships between spaces. Thus, an understanding and criticism of Portman's Peachtree Complex within an appropriate context is still lacking. It is in this context one should underscore further necessities to evaluate John Portman's Peachtree Center Complex.

Figure 3. A view of downtown Atlanta. The Peachtree Center Complex forms a major part in its skyline. (Photo: Dr. John Peponis)

Figure 4. A view of the Peachtree Center Complex. (Photo: Dr. John Peponis).

2 Spatial configuration, natural movement and Space Syntax

This paper uses various techniques of "space syntax," developed at University College London, in order to study the configurational properties and their effects on the patterns of movement in the off-grade movement system of the Peachtree Center Complex. It has already proved possible to apply these techniques in order to successfully describe and quantify both the local and global properties of spatial configuration as well as the relationships of these properties to movement pattern in "on-grade" urban systems (Hillier, 1993; Hillier, 1989; Hillier, Burdett, Peponis, & Penn, 1987; Hillier, Hanson, & Graham, 1987; Hillier & Hanson, 1984, Hillier, Hanson, & Peponis, 1984). On the basis of the analysis of several European cities, Bill Hillier, John Peponis and others have argued that spatial configuration is the primary aspect of urban form which accounts for a preference for certain spaces over others as paths of *through* movement. This is opposed to existing urban theories which tend to explain the patterns of pedestrian and vehicular movement more in terms of flows *to* and *from* 'attractor' land uses (Hillier et al., 1993, Hillier et al., 1987a & 1987b; Peponis et al., 1989).

Natural movement, which Hillier et al. (1993) define as the proportion of urban pedestrian movement determined by the configuration itself, also has come to light as a formal and empirical phenomenon through the application of space syntax techniques of analysis. Hillier et al. (1993) suggest that the configuration of the urban form is the primary generator and modulator of patterns of natural movement in space, and that land uses locate themselves on particular spaces to take advantage of the opportunities offered by that configuration, thereby acting as multipliers operating upon the basic pattern of natural movement.

The aim of this paper, to put in simple words, then is to study the spatial logic of movement, put forward by Hillier and others, in the case of the off-grade movement system in the Peachtree Center Complex using the techniques of space syntax. This study is performed in three different sections: First, a syntactic analysis is performed in order to understand the properties of the spatial configuration of the system; second, patterns of pedestrian movement are studied in order to find out whether the system causes a reduction of pedestrian movement in its vicinity; and third, the correlations between the syntactic properties and movement pattern are studied in order to understand the effects of the spatial configuration on movement pattern in the system.

3 The spatial configuration of the off-grade movement system in the Peachtree Center Complex

3.1 Some preliminary observations

At present, the Peachtree Center Complex occupies about twelve blocks of downtown Atlanta. It is bisected by Peachtree Street, the most important street in the Metropolitan Atlanta area. However, this street doesn't have the maximum interface with the urban complex. Only three out of twelve blocks of the urban complex interface with Peachtree Street. In contrast, about eight blocks of the complex interface with Harris Street. But in the existing layout of the complex Harris Street is not given any particular importance. Only few buildings have their main public entries along this street. In addition, there exists no hierarchy in the way the streets are used in the complex. All of these streets are simultaneously used as main as well as service access (Figure 5).

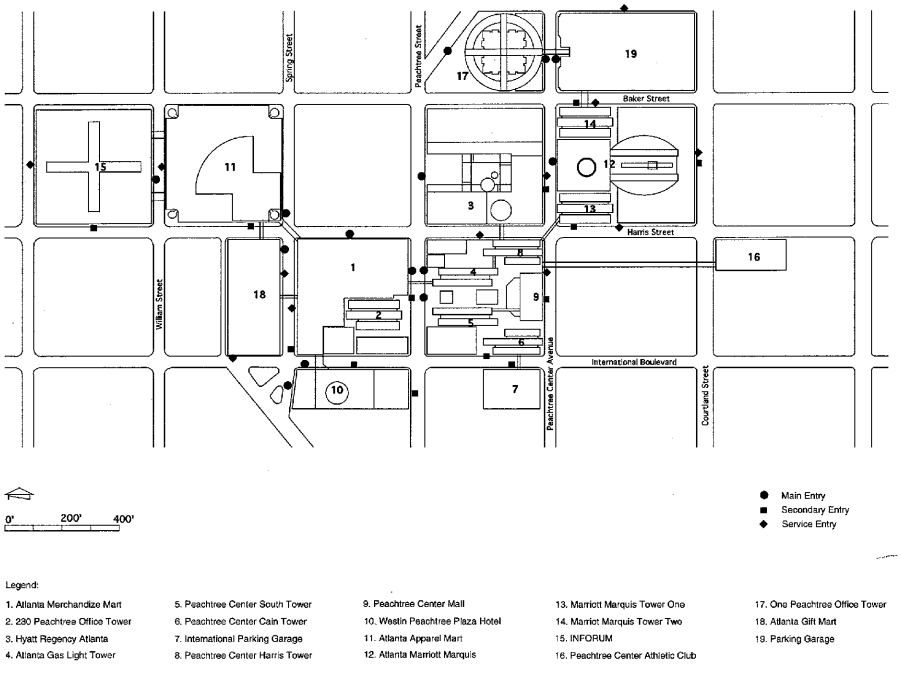


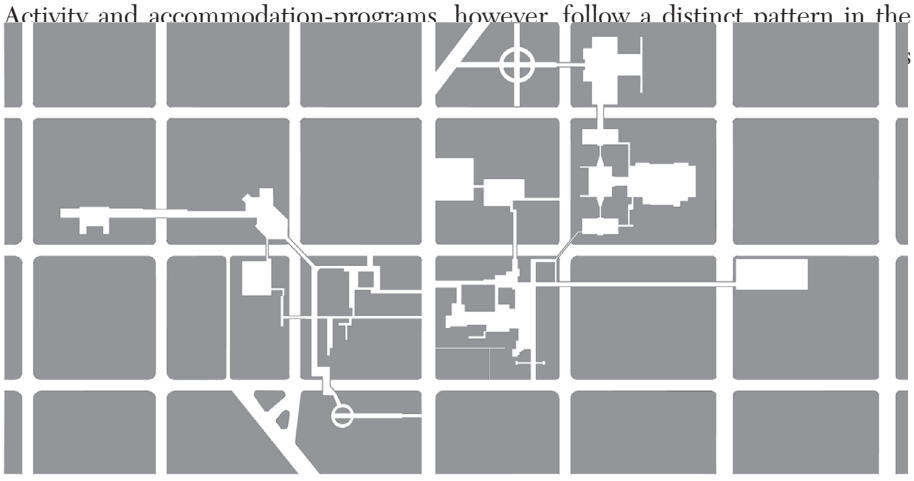
Figure 5. The Peachtree Center Complex.

Connections between parking garages and the internal off-grade movement system of the complex are complicated. For example, if one uses the internal movement system of the complex from the Courtland garage to Peachtree Street, one has to take a 550' long bridge which is located at the seventh level of the garage to go to the Peachtree Center mall, where he has to change direction and levels a couple of times to get to the street. However, he could get to Peachtree Street from the Courtland garage far more comfortably if he had taken the street outside.

Access to the internal movement system of the complex has problems too. Every building or block has several accesses. For example, for the Peachtree Center Mall, there are at least ten entrances, seven from the surrounding streets and three from surrounding buildings *via* bridges. The existence of a high number of connections between the interior and exterior of the complex without any particular order suggests that the urban complex has remained extremely *under-structured*—a strategy that could perhaps be interpreted as an attempt by the architect to meet the various potential demands of a changing future.

The layout of the internal movement system of the complex seems to be a product of forced connections between various main activity levels in different buildings within the complex. Its configuration is very fragmented. Shapes of the spaces do not follow any consistent order: Somewhere they are very narrow, while at other places they are very wide (Figure 6). The scale of these interior spaces varies not only significantly but also abruptly: Huge atriums are frequently connected by short and narrow channels of space. In addition, the main activity datum of the complex constantly changes its levels which do not conform to the topography of the site.

Activity and accommodation-programs, however, follow a distinct pattern in the



introduced between *weak program* and *strong program* buildings. Weak program buildings are defined as those which allow for multi-purpose uses of spaces, and do not require and depend upon rigid schedules. Strong program buildings are defined, by contrast, as those which allow for varied types of space use, and heavily depend on schedules. The buildings on the east side of Peachtree Street of the complex—the Peachtree Center Mall and Towers, Hyatt Regency and Marriott Marquis Hotels—can be characterized as weak program buildings at the pedestrian level. They allow for functions like food courts, shopping malls, restaurants, conference facilities, office spaces, and hotels. In contrast, the west side has a strong program, because it basically accommodates offices, and conference and exhibition spaces related only to wholesale marketing functions. These are the Merchandise Mart, Apparel Mart, Gift Mart and INFORUM.

Figure 6: A simplified diagram of the internal space layout of the off-grade movement system in the Peachtree Center Complex.

3.2 The syntactic analysis of the spatial layout of the complex

In order to understand the configurational issues of the complex more thoroughly, an analysis of the spatial layout of the main activity levels is performed using various space syntax techniques. This syntactic analysis considers only the main levels of the complex, represented in Figure 7, that allow for a free pedestrian movement.

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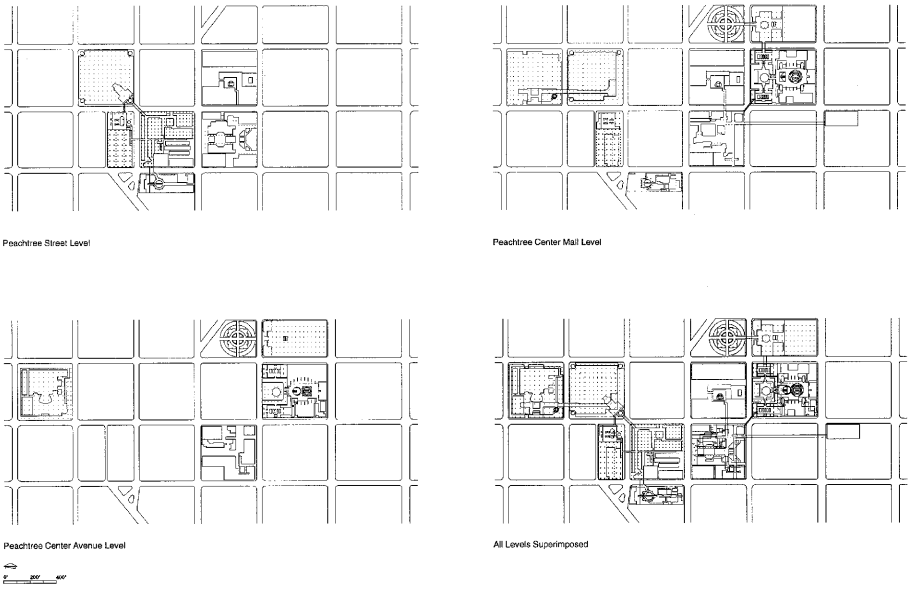

Figure 7. Pedestrian movement levels in the Peachtree Center Complex.

3.2.1. The integration pattern of the Peachtree Center Complex as an urban system

To begin with, the location and nature of the integration cores in the urban complex are studied. In order to ensure that the context of the urban complex is adequately represented, and that conclusions are not biased as a result of an arbitrary choice of the boundary of the system under analysis, first, the complex is analyzed within the local street grid; then, it is analyzed within the context of the downtown area; and lastly, the complex is analyzed as an internal system of connections, disregarding all streets except Peachtree which is indispensable as a connection between the western and eastern parts of the complex.

When embedded in the local street grid, the integration core of the Peachtree Center Complex corresponds to the external grid. The syntactic structure of the complex forms a distinct cluster which is poorly integrated with this external grid (Figure 8). The syntactic analysis of the complex embedded in the downtown grid also confirms its relatively segregated nature. It is possible that due to a large number of redundant axial spaces, which have a fragmented pattern of connections within the complex, the syntactic structure is distinctly separated from the surrounding streets within which it is located.

In addition, at both levels of analysis, i. e. the Peachtree Center Complex embedded in the local grid and in the downtown grid, the nature of the internal structure remains unchanged: There is a hierarchical pattern with a relatively more integrated block interior comprising the Peachtree Center Mall and increasingly segregated block interiors as one moves east and west of Peachtree Street. The independence of the pattern of interior integration from the pattern of spaces around the Peachtree Center

Mall also is clearly supported by the fact that the syntactic structure of the interior of the Peachtree Center Complex (i. e., without any grid) shows a definite bias towards the Mall area where the core clustered forming a short local ring (Figure 8). Thus, syntactically the interior of the system does not establish any kind of continuity with the external world. This *isolated* syntactic structure suggests that, as a sub-area, the complex is more definable in terms of *containment, enclosure* and *hierarchy* than in terms of *openness and continuity.*

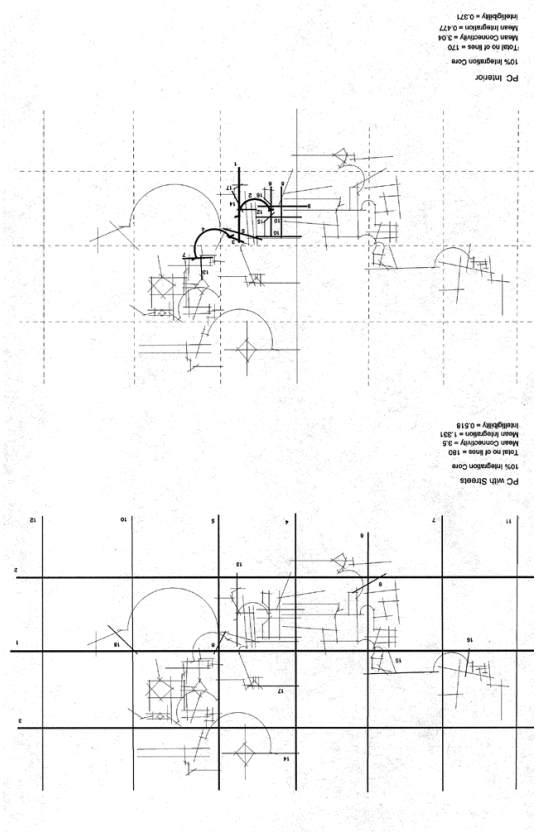

Figure 8. The 10% integration cores of the Peachtree Center Complex.

3.2.2. The relationship between the internal and external syntactic orders

A qualitative difference also is observed in the syntactic analysis of the complex between a principle of integration that works from the outside inwards and a principle that works from the inside outwards. When we look at the Peachtree Center Complex from the point of view of the surrounding street system, integration proceeds from the streets to the interior with a secondary bias towards the Peachtree Center Mall hub. However, when the streets are eliminated, the Peachtree Mall integration hub takes over as the primary core (Figure 8). Thus, the system is spatially radically different depending on whether it is looked at from the outside or from the inside.

This property holds true not only for the whole but also for the parts of the complex. When the west and east part of Peachtree street of the complex are looked at as two different subsystems embedded within the local grid, no significant changes occur in the integration pattern of these subsystems compared to the system as a whole (Figure 9). But when they are considered without the streets, cores of definite shapes form toward the center of these subsystems as one would have expected**.** Again, in each of these cases it seems that internal system operates quite independently of the external system (Figure 9).

One might be tempted to reason that this discontinuity between the interior and the exterior is caused by the availability of too few connections between the off-grade and on-grade systems in the Peachtree Center Complex. This is definitely not the case here. On the contrary, as mentioned before, the off-grade and on-grade systems have too many connections at various levels. The syntactic contrast between the segregated exterior and the integrated surrounding streets must, therefore, be interpreted in terms of configuration rather than in terms of the mere availability of connections.

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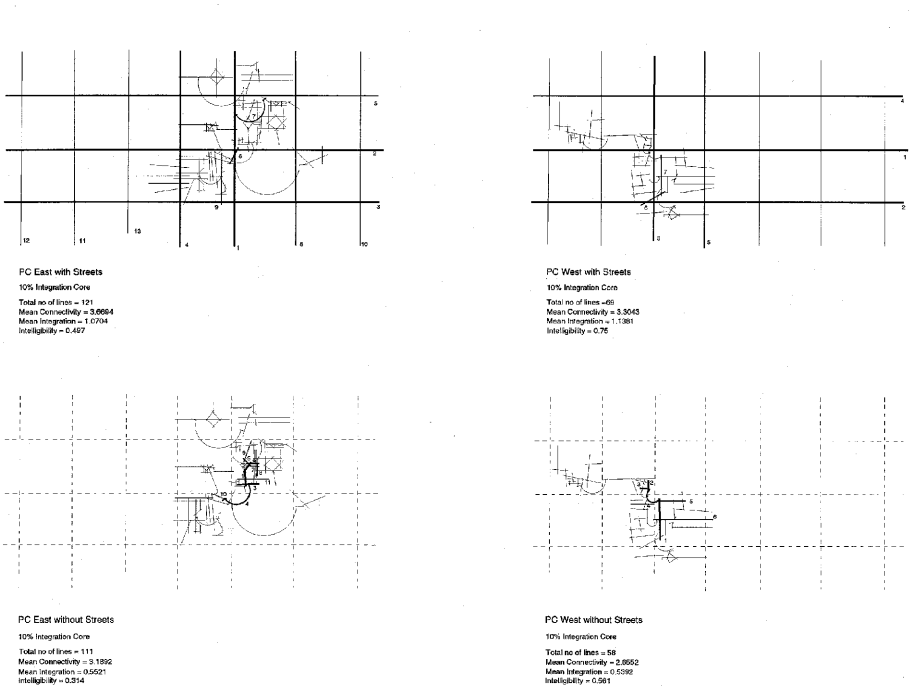

Figure 9. The 10% integration cores of the subsystems of the Peachtree Center Complex.

3.3.3. The internal syntactic order of the Peachtree Center Complex

In fact, the Peachtree Center Complex is not syntactically well-formed when considered in its own right. The mean integration of the internal system of the complex or any part of it is only as high as 0.5521 (Table 1). By contrast, the mean integration value of the Downtown area analyzed without the Peachtree Center Complex is 1.57. The difference between the two values is quite significant, given the fact that downtown itself is fragmented into several colliding grids (Figure 10).

As a consequence of the complicated organization of axial spaces, intelligibility of the Peachtree Center Complex is also very weak at all levels of analysis (Table 1). However, weak intelligibility may also result from the fact that the complex comprises several discontinuous activity levels with different kinds of spatial layout. Though the vertical connectors provide physical continuity, visual continuity is significantly impaired in the complex due to the changes in its levels. It is very difficult to acquire a proper understanding of the spatial layout of the complex from any particular space within it. *Pedestrians are constantly being exposed to a new set of spaces through escalators and stairs even before they could form an idea about the spatial pattern they occupied a moment ago.*

Syntactic analysis shows that the interior of the west part of the complex is more intelligible than the interior of the east part (Table 1). But, according to existing programs of the complex, the east part contains functions, like food courts, shopping

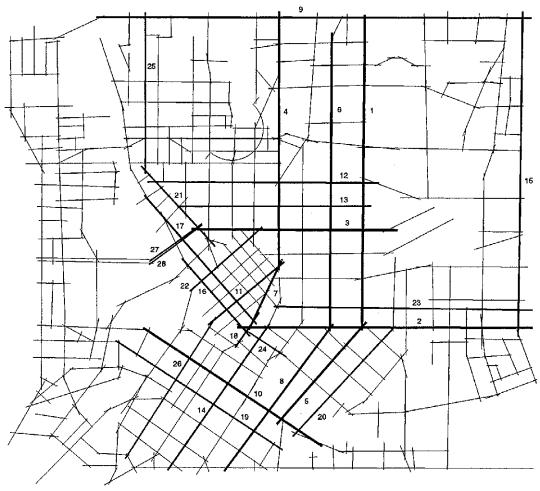

Figure 10: The 10% integration core of downtown Atlanta.

plaza, etc., which generate a random use pattern, and thus demands a more intelligible spatial layout for efficiency. In contrast, the west part contains functions, like conference and market functions, which cause a predictable use pattern based on schedules; hence, it should depend less on the spatial layout for efficiency. *The internal layout of the complex, however, suggests just the opposite of what the program requires. It does not follow the logic of the program of accommodation. Instead, it suggests an opposition between the concept of formal order and the functioning structure of space in the complex.*

Table 1

System	*Integration Mean*	*Intelligibility*
PCC with Downtown Grid	1.4468	0.558
PCC with Local Grid	1.1331	0.516
PCC Interior Only	0.4771	0.371
Sub-System - PCC-West		
PCC-West with Downtown Grid	1.5146	0.655
PCC-West with Local Grid	1.1381	0.75
PCC-West Interior Only	0.5392	0.561
Sub-System - PCC East		
PCC-East with Downtown Grid	1.439	0.570
PCC-East with Local Grid	1.0704	0.497
PCC-East Interior Only	0.5521	0.314

Table 1. Some syntactic variables for all axial spaces of the Peachtree Centre Complex (PCC) and its sub-systems at various levels of analysis

As opposed to these global properties, the local properties of the syntactic structure of the complex also vary significantly. For example, the number of axial lines within each block varies from as low as 7 in the Apparel Mart to as high as 54 in the Marriott Marquis Hotel. The number of spaces needs to be crossed and number of directions needs to changed from one interior space to the other also vary significantly from block to block. This spatial complexity of the urban complex is certainly amplified by the fact that these axial lines, which are located at various levels of the system of movement, do not follow any consistent organizational pattern. In fact, the organizations of the axial circulation spaces are not comparable across any two blocks or even across two different levels of the same block. Access to the *core* of the interior

also is very difficult. In sum, *complexities of the syntactic structure at the local level eliminates the possibility of any easy understanding of the Peachtree Center Complex.*

4 Analysis of pedestrian movements in the off-grade movement system

In order to find out how people may use the off-grade pedestrian movement system in the Peachtree Center Complex, a survey of space use and movement inside and outside the Peachtree Center Complex was done. The survey was done following the standard space-syntax study procedures (for details, see Hillier et al., 1993). A route covering a total of 58 axial spaces, was selected for the study as shown in Figure 11. The average of the moving and static population observed along each axial line during

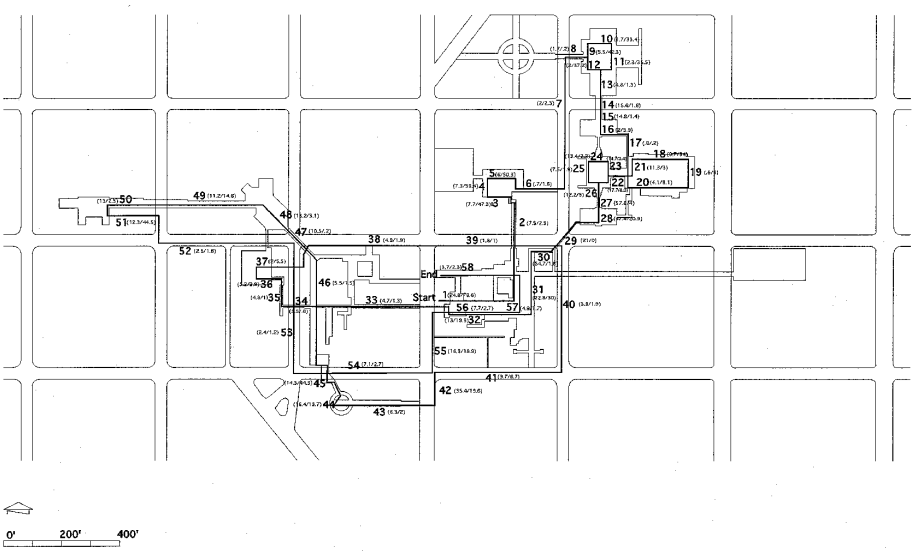

Figure 11. The pedestrian survey route in and out of the Peachtree Center Complex with moving/static counts per 100m.

4.1. Effects of the off-grade movement system on the external movement densities

In order to find out whether the streets in the vicinity of the complex are poorly used or not, first, the movement densities on the streets in the vicinity of the complex are compared with other streets of the city. However, in contrast to the literature, the comparison shows that streets around the Peachtree Center Complex are not under-used when compared to other streets in Atlanta. For example, studies done in the Buckhead area of the city show the average movement density to be less than 2 persons per hundred meters, and in the Five Points area of downtown Atlanta, 8 per hundred meters (Peponis, 1990). By contrast, in the Peachtree Center Complex area the average movement density is as high as 9.60 persons per hundred meters. So, *the density of movement in the streets around the Peachtree Center is quite high by Atlanta standards.* However, one must acknowledge that Atlanta has changed significantly since 1990, and movement densities in the mentioned areas also might have changed since then.

Likewise, a study by Georgia Tech Ph.D. students also shows that the Peachtree Center Complex area is still one of the most crowded place in downtown Atlanta (Tables 2 & 3). If one ranks the streets in downtown area according to the number of people on the street, it seems that the Peachtree Center segment of Peachtree Street compares only to Marietta Street in the Poplar area and Pryor Street in the Government Center area, followed by International Boulevard in the Peachtree Center Complex area.

Table 2

Street	*Area of Study*	*People/100m*
Marietta	Poplar District	11.544
Pryor Street	Government Center	10.633
Trinity Avenue	Government Center	4.950
Broad Street	Poplar District	4.927
M. L. King Jr. Street	Government Center	4.669
Lukie Street	Poplar Street	3.85
Walton Street	Poplar District	3.724
Baker Street	Peachtree Center	2.893
Williams Street	Peachtree Center	2.635
Central Street	Government Center	2.56
North Avenue	Civic Center	1.993
Techwood Drive	Techwood	1.976
Parker Street	Techwood	1.976
Cone Street	Poplar District	1.976
Washington Street	Government Center	1.65
Piedmont	Civic Center	1.19
Pine Street	Civic Center	0.687
Hunnicutt	Techwood	0.486
Bedford Place	Civic Center	0.4125
Pine Street	Techwood	0.229
Lukie	Techwood	0.229
Linden Avenue	Civic Center	0.183

Table 3

Axial Space No	*Street*	*Area*	*People/100m*
42,55	Peachtree Street	Peachtree Center	22.905
41,54	International Boulevard	Peachtree Center	8.44
52,38,39	Harris Street	Peachtree Center	3.06
7,40	Peachtree Center Avenue	Peachtree Center	2.955
53	Spring Street	Peachtree Center	2.38

Table 2. Observed densities on vatious streets in downtown Atlanta (Survey: Ph. D. Program, College of Architecture, Georgia Tech, 1990).

Table 3. Observed densities on various streets in the Peachtree Centre Complex Area.

Baker, Williams, Harris and Spring Street in the complex area also are well used when compared to other streets in the vicinity.

Furthermore, streets, such as Peachtree Street, perform even better than the interior space with the highest number of moving population in the complex. While one encounters about 26.25 persons per hundred meters on Peachtree Street, the highest number of moving population in any interior space of the complex is about 24.76 persons, which occurs in the Peachtree Center Food court. However, Peachtree Street also outperforms any other street in the vicinity by a big margin: The average of moving population of all other streets is only about 7.75 persons per hundred meters. This is about 17.01 persons per hundred meters less than Peachtree Street, and the difference is about 177% of the average of all 10 street segments observed (9.60 persons/100m). Thus, *a direct comparison between the streets in the vicinity of the complex and other streets of the city does not support the conclusion that streets in the vicinity of the complex are under-used.*

In the next stage, the interior movement densities are compared with the exterior in order to find out whether the Peachtree Center Complex is adversely affecting the street-life around it or not. According to the survey, while on the streets the observer encountered 9.60 persons per hundred meters on average, in the interior it was slightly

more than 12 persons per 100m. The difference is about 2.51 persons per hundred meters. This is about 23% of 10.81 persons per 100m, which is the average of all observed 58 spaces in and outside the complex. Thus, *the interior of the complex is more densely used than the exterior.*

That *the interior of the complex is more densely used than the exterior* in the Peachtree Center Complex is also supported by a more sophisticated pair-wise comparison

Table 4

Space type	*Axial Space no*	*Space Des.*	*Moving/100m*	*Average Moving*	*Ratio Moving Internal/External*
External	52	Harris St.(AMt)	2.54	2.54	4.39
Internal	49	AMt Corridor	11.16	11.16	4.39
External	38	Harris St(MMt)	4.88	6.01	0.91
	54	Intl Blvd.(WPH)	7.15	6.01	0.91
Internal	33	MMt Corridor	4.69	5.47	0.91
	43	WPH Corridor	6.25	5.47	0.91
External	53	Spring St. (GMt)	2.38	2.38	2.18
Internal	35	GMt Corridor	4.82	5.18	2.18
	46	MMt Corridor	5.54	5.18	2.18
External	55	Peachtree St.(PC)	26.25	15.09	1.50
	40	PC Av. (PC)	3.94	15.09	1.50
Internal	31	PC Corridor	22.79	22.79	1.50
External	41	Intl. Blvd. (PC)	9.73	10.61	1.78
	39	Harris St (PC)	1.76	10.61	1.78
Internal	1	PC Food Court	24.76	18.89	1.78
	32	PC Lounge	13.02	18.89	1.78

Table 4. Comparison between streets and internal linear spaces parallel to the streets (outside and inside the same block).

(AMt-Apparel Mart; MMt-Merchandise Mart; WPH-Westin Peachtree Hotel; GMt-Gift Mart; PC-Peachtree Center; Intl Blvd.-International Boulevard)

Table 5

Space type	*Axial Space no*	*Space Des.*	*Moving/100m*	*Average Moving*	*Ratio Moving Bridge/Street*
Bridge	47	AMt to MMt	10.52	10.52	3.23
Street	52	Harris St. AMt	2.54	3.26	3.23
	38	Harris St MMt	4.88	3.26	3.23
	53	Spring St. GMt	2.38	3.26	3.23
Bridge	29	PC to MM1	20.98	20.98	8.20
Street	39	Harris St (PC)	1.76	2.55	8.20
	7	PC Av. (HR & PG)	1.97	2.55	8.20
	40	PC Av. PC	3.94	2.55	8.20
Bridge	33	MMt to GMt	5.47	5.47	2.29
Street	53	Spring St (GMt)	2.38	2.38	2.29
Bridge	45	WPH to MMt	14.32	14.32	2.00
Street	54	Intl. Blvd. (WPH)	7.15	7.15	2.00
Bridge	2	PC to HR	7.51	.51	4.26
Street	39	Harris St (PC)	1.76	1.76	4.26

Table 5. Comparison between bridges and streets beneath the bridges.

(AMt-Apparel Mart; MMt-Merchandise Mart; WPH-Westin Peachtree Hotel; GMt-Gift Mart; PC-Peachtree Center; HR-Hyatt Regency Hotel; PG-Parking Garage; Intl Blvd.-International Boulevard)

between interior and exterior spaces of the complex. In this case, parallel 'linear' internal and external spaces situated next to each other in and out of the same block were compared (Table 4). In the five pairs of 'linear' spaces compared, the average of the ratios of the internal moving population to the external is 2.15. Similarly, a pair-wise comparison between the bridges and the average of the moving population on the streets below the bridges also shows a high difference between the internal and external moving population; it is even higher than the earlier pair-wise comparisons between the 'linear' spaces. The average ratio of the moving population of the five pairs of bridges and streets is as high as 4 (Table 5). Thus, the pair-wise comparisons show clear differences between the internal and external pedestrian densities for the Peachtree Center Complex, indicating that streets are less used than equivalent internal spaces. In other words, *the off-grade internal spaces and connections detract from the potential liveliness of the on-grade streets by a considerable margin.*

4.2. Effects of the internal space use on the movement densities

The study also shows relatively smaller differences between the average internal and external densities of movement in the complex in comparison to the differences between densities in the comparable spaces.This may be because, in the complex some of the interior spaces are densely used, while there are others which are extremely poorly used. The average movement density of all internal spaces might have been significantly reduced because of this polarization effect of the pattern of movement in the interior of the complex. There could be at least two reasons for such polarization. On the one hand, it could be the effect of different *attractor* functions like food courts, shopping mall, etc., located in the interior; on the other hand, it could also be caused by the complex configurational properties of the complex. In order to find out which one of these plays more significant role in determining the movement pattern, the relationships between the *attractors* or *magnets* and movement densities are studied.

Table 6

Name of the Street	*Axial Space No.*	*Street Section*	*Distance from the origin*	*Moving/100m*	*Static/100m*	*Total/100m*
Harris St	39	HR section	Adjacent (200')		1.76	1.05 2.81
	38	MMt section	1-step away (600')		4.88	1.91 6.79
	52	AMt section	2-step away (1000')		2.54	1.60 4.14
PC Avenue	40	PC section	Adjacent (200')		3.94	1.93 5.87
	7	HR section	1-step away (600')		1.97	2.29 4.26
Intl. Blvd.	41	PC section	Adjacent (200')		9.73	6.68 16.41
	54	WPH section	1-step away (600')		7.15	2.66 9.81

(AMt-Apparel Mart; MMt-Merchandise Mart; WPH-Westin Peachtree Hotel; GMt-Gift Mart; PC-*Peachtree Center; HR-Hyatt Regency Hotel; PG-Parking Garage; INF-INFORUM; MM-Marriott Marquis Central Tower; MM1-Marriott Marquis Tower 1; MM2-Marriott Marquis Tower 2)*

Table 6. Distance-decay effect along various streets in the Peachtree Center Area considering the Peachtree Center as the origin.

Table 7

Point of Origin	*Distance*	*Axial Space No.*	*Description of spaces*	*Moving / 100m*	*Static/ 100m*	*Total/ 100m*	*Av. of Total/100m*
Peachtree Center	Adjacent (200')	39	Harris St. (HR)	1.76	1.05	2.81	17.54
		40	PC Av. (PC)	3.94	1.93	5.87	17.54
		41	Intl. Blvd.. (PC)	9.73	6.68	16.41	17.54
		55	PT St. (PC)	26.25	18.82	45.07	17.54
	1-step away (600')	7	PC Av. (HR)	1.97	2.29	4.26	6.95
		38	Harris St.(MMt)	4.88	1.91	6.79	6.95
		54	Intl. Blvd.(WPH)	7.15	2.66	9.81	6.95
	2-step away (1000')	53	Spring St. (GMt)	2.38	1.19	3.57	3.855
		52	Harris St.(AMt)	2.54	1.60	4.14	3.855

Table 7. Average movement densities at various distances from Peachtree Center.

(AMt-Apparel Mart; MMt-Merchandise Mart; WPH-Westin Peachtree Hotel; GMt-Gift Mart; PC-Peachtree Center; HR-Hyatt Regency Hotel; PG-Parking Garage; INF-INFORUM; MM-Marriott Marquis Central Tower; MM1-Marriott Marquis Tower 1; MM2-Marriott Marquis Tower 2)

Table 8

Point of Origin	*Distance*	*Axial Space no.*	*Description of spaces*	*Moving/ Count*	*Static/ Count*	*Total/ Count*	*Average of Total/Count*
Peachtree Center	Adjacent (200')	2	PC to HR	7.51	2.50	10.01	15.495
		29	PC to MM1	20.98	0	20.98	15.495
	1-block away (600')	14	FC to MM2	15.62	1.56	17.18	23.19
		34	MMt to GMt	5.47	0.78	6.25	23.19
		47	MMt to AMt	10.52	0.21	10.73	23.19
		45	MMt to WPH	14.32	44.28	58.6	23.19
	2-block away (1000')	50	AMt to INF	12.99	2.54	15.53	15.53

(AMt-Apparel Mart; MMt-Merchandise Mart; WPH-Westin Peachtree Hotel; GMt-Gift Mart; PC-Peachtree Center; HR-Hyatt Regency Hotel; PG-Parking Garage; INF-INFORUM; MM-Marriott Marquis Central Tower; MM1-Marriott Marquis Tower 1; MM2-Marriott Marquis Tower 2)

Table 8. Distance-decay effect on movement densities in the bridges considering the Peachtree Center as the origin.

One conventional way of calculating the effect of the *magnet*, such as a shopping mall, is the distance-decay effect, an axiom which suggests as the distance increases from the magnet, pedestrian spill-over will decay or decline (Lorch & Smith 1993, Weisbrod & Pollakowski 1984). In accordance with this, the effect for the Peachtree Center Complex is studied considering the Peachtree Center Mall as the main attractor. According to Table 6, out of the three streets, two streets show a distinct decline in the numbers of people along various segments of streets as a function of increasing metric distance from the center of the Mall. However, as Table 7 shows, there is a distinct decline in the average of the population as a function of increasing axial distance of the street from the Mall. But a comparison of the population in the bridges considering the Peachtree Center mall as the origin shows no definite pattern of decline in the pedestrian movement as can be seen in Table 8. Thus, *pedestrian counts do not show any definite relationship to the main "attractor" both on the exterior and in the interior of the Peachtree Center Complex.*

The absence of any definite pattern of decline can be attributed to the fact that when there are more than one magnets in an urban system such as the Peachtree Center Complex, it is quite difficult to calculate the distant-decay effect without considering

multiplier effects. Furthermore, the concept of distance-decay also undermines the importance of the configuration of the spatial layout of the whole system which, in fact, creates possibilities for people to move from one magnet to another.

5 Pedestrian movements and syntactic properties of the off-grade movement system

In order to see how far the syntactic properties described previously have empirically detectable consequences with regard to the movement and distribution of pedestrian inside and outside of the Peachtree Center Complex, the correlations between the syntactic properties and movement densities are studied in this section. Previous studies done by others have invariably shown that movement patterns are globally, not locally, determined, and for a better post-diction it is always better to put the study area in a larger context (Hillier et al, 1987b; Hillier et al, 1993; Peponis 1989). So, in this paper the correlations between movement densities and syntactic properties of the system and its subsystems are calculated at various levels of embedding for a more accurate understanding of the movement pattern from a syntactic point of view. The results of the analysis are given in Tables 9, 10, 11, & 12.

5.1. A spatially unpredictable movement pattern

The analysis shows no strong correlation between the configurational properties and movement densities at any level of embedding. The absence of any strong correlation between syntactic properties and movement densities when the local or global street context is included in the analysis, seems to support the previous claim that at present the complex might work better as an independent internal system than as a part of a larger urban framework. This also is consistent with the arguments made by the critics that the complex does not function as an integral part of the context.

Table 9

Levels of Embedding		*Integration+Movement Densities*	*Connectivity+Movement Densities*	*Control+Movement Densities*
With the Downtown Grid	r	0.112	0.007	0.03
	p	0.4469	0.9612	0.841
With the Local Grid	r	0.108	0.027	0.068
	p	0.4649	0.8568	0.647

(r= Pearson's Correlation Coefficient; p= Probability of Error)

Table 9. Different syntactic correlates of movement densities in the Peachtree Complex for all observed spaces (no. of spaces = 58).

Table 10

Levels of Embedding		*Integration+Movement Densities*	*Connectivity+Movement Densities*	*Control+Movement Densities*
With the Downtown Grid	r	0.201	0.02	0.037
	p	0.1972	0.8973	0.8118
With the Local Grid	r	0.139	0.063	0.135
	p	0.3756	0.6887	0.3889
Without the Local Grid	r	0.352	0.013	0.007
	p	0.0207	0.9332	0.9662

(r= Pearson's Correlation Coefficient; p= Probability of Error)

Table 10. Different syntactic correlates of movement densities in the Peachtree Complex for interior observed spaces (no. of spaces = 43).

Table 11

Levels of Embedding		Integration+Movement Densities	Connectivity+Movement Densities	Control+Movement Densities
With the Downtown Grid	r	0.274	0.421	0.219
	p	0.3656	0.1614	0.4732
With the Local Grid	r	0.223	0.279	0.565
	p	0.4632	0.3562	0.0443
Without the Local Grid	r	0.368	0.306	0.084
	p	0.2158	0.3097	0.7839

(r= Pearson's Correlation Coefficient; p= Probability of Error)

Table 11. Different syntactic correlates of movement densities in the Peachtree Center Complex for west part only; Westin Plaza Hotel, Merchandise mart, Gift Mart & Inforum (no. of spaces= 13).

Table 12

Levels of Embedding		Integration+Movement Densities	Connectivity+Movement Densities	Control+Movement Densities
With the Downtown Grid	r	0.288	0.06	0.013
	p	0.1368	0.7618	0.9479
With the Local Grid	r	0.24	0.037	0.051
	p	0.2196	0.8507	0.7973
Without the Local Grid	r	0.466	0.009	0.107
	p	0.108	0.9622	0.5797
Independently	r	0.472	0.019	0.09
	p	0.0112	0.9251	0.6494

(r= Pearson's Correlation Coefficient; p= Probability of Error)

Table 11. Different syntactic correlates of movement densities in the Peachtree Center Complex for east part only; Peachtree Center, Hyatt Ragency Hotel & Marriott Marquis Hotel (no. of spaces= 28).

The evidence presented, however, does not warrant the inference that the Peachtree Center works as a coherent internal and self-sufficient system. While correlations computed for the interior as an independent system are noticeably stronger than those taking the surrounding streets into account, they are still quite weak. Movement cannot be post-dicted on the basis of internal configuration. From the point of view of this analysis, therefore, the situation is more perplexing than envisaged by the critics. The system fails to generate any kind of spatial predictability whichever way it is analyzed.

In all cases but one multiple regression confirms that integration is a better post-dictor of movement densities than any other syntactic property, though the correlations, in most cases, are not statistically significant. This is consistent with the findings of previous syntactic studies done by others, pointing to integration as the most critical syntactic variable. The findings also pre-empt any suggestion that the complex may work better if considered as an aggregate of smaller regions rather than as a whole. Had this been the case, connectivity would have produced better correlations with movement than integration.

5.2. The latent influence of space: configuration and attraction in activity spaces. Given the general unpredictability of movement with respect to the spatial configuration, the observed sample of axial spaces are then divided into sub-samples of activity spaces and non-activity spaces in order to calculate the correlations between

integration and movement densities (Table 13). Surprisingly, the correlation between integration and movement density in the activity spaces is quite strong and significant (r = 0.635, p = 0.0147). And when only the food courts are considered, the correlation is even stronger (r = 0.791, p = .0342). These findings establish the presence of a latent effect whereby configuration influences the success of similar activity areas in attracting and sustaining movement. In addition, when correlation is computed for non-activity spaces as an independent sample, it is found to be low and insignificant (r = 0.147, p = 0.438). Only the bridges show a better correlation, but it is still not statistically significant (r = 0.652, p = 0.1125). All other internal spaces excluding the bridges as well as the activity spaces perform even worse (r = 0.114, p = 0.6053). These findings clearly pinpoint the configuration of circulation and connections as the cause of the lack of coherence and predictability of the pattern of space use. Thus, *it can be concluded that the overall complexities and the lack of predictability of movement in this urban complex are contributed mostly by the spaces and connections that do not accommodate any specific function.* That there may exist too many redundant and under-used spaces in the complex is also in accordance with the earlier observations made during the syntactic analysis of the complex.

Table 13

Space Type	*Total number of Axial Spaces*	*Integration and Movement Densities (r)*	*Probability of Error (p)*
All Activity Spaces	14	0.635	0.0147
Food Courts Only	7	0.791	.0342
All Non-Activity Spaces	30	0.147	0.438
Bridges Only	7	0.652	0.1125
All Non-Activity Spaces without Bridges	23	0.114	0.6053

Table 13. Correlations between integration and observed movement densities for activity and non-activity spaces.

6 Discussion

During the last few decades one of the most significant strategies for enhancing pedestrian activity in central cities in the United States has been the creation of multi-level off-grade pedestrian movement systems, like the Peachtree Center Complex. These enclosed multi-level urban systems have formed a distinct type on their own in downtown urbanism. However, the growing body of literature on these systems often appears to deal only with questions about social, political and economic issues such as: who should determine the location of the bridges or tunnels; who should pay for their construction and maintenance; who should control their hours of operation; who should control their design; how are the on-grade retail/economic activities being affected by the off-grade shops; do off-grade pedestrian ways radically affect on-grade street life; do they cause a class segregation? etc. (Gratz, 1981; Morphew, 1984; Weisbrod et al., 1984; Cranz, 1985; Dillon, 1985; Robertson, 1985; Warner, 1985; Milder, 1987; Anderson, 1988; Belkin, 1988; Lassar, 1988; Walker, 1988; Whyte, 1988; Lorch et al., 1993). Much less attention, however, is given to architectural and urban design related questions, such as: what should be the configuration of the spatial layout of these off-grade pedestrian movement systems as integral parts of the larger urban systems; what is there to be learned from the on-grade urban systems that could be effectively utilized in designing these off-grade systems, etc?

By contrast, this paper has concentrated on the architectural and urban design issues about the off-grade pedestrian movement system with an added emphasis on the following question: How can we explicitly formulate the configurational properties of the spatial layout of any off-grade pedestrian movement system that can bring about a better urban environment? The paper, on the basis of the space syntax analysis of the off-grade movement system in the Peachtree Center Complex, has raised at least two issues of fundamental importance to the system: 1) The issue of the interface between internal and external spatial orders, and 2) the issue of complexity and redundancy in the order of the internal spatial layout.

In its present condition, discontinuity between the internal and external orders of the Peachtree Center Complex is about the principles of organization of the system rather than about the lack of connections. There is a multitude of connections linking the exterior and the interior of the Peachtree Center Complex, and yet internal and external orders of the complex have a sharp discontinuity at their boundary. This qualitative discontinuity between interior and exterior implies that the complex does not form an integral part of the surrounding system and bears no intelligible relationship to it. The complex internal organization of the spatial layout also results in discontinuities within the off-grade movement system of the complex. Here, numerous changes of levels associated with too many fragmented and redundant spaces result in constant discontinuities in the spatial continuum of the movement system. These issues suggest that the significance of the spatial configuration of the internal off-grade movement system has not been properly understood in this complex.

But the major conclusion that can be drawn from the preceding analysis is that *mixed uses, density and accessibility to transportation do not in themselves produce a vibrant urban environment without a configurational realization which is appropriate*. Though movement densities are quite high both in the external and the internal movement systems of the Peachtree Center Complex, the paper shows that the internal system substantially detracts from the *potential liveliness* of the external system due to the configurational relationship between the two. It is conceivable that a proper configurational layout would provide for a condition where these systems would complement each other, and thus covey the interior liveliness to the external urban environment.

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