Wayfinding Analysis of Accessibility

to the Skywalk System in Des Moines, IA

by

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CHAPTER 1. INTRODUCTION

Skywalks

Newcomers to Midwestern American cities are puzzled by seeing transparent glass tubes which span downtown streets. These tubes are referred to as "Skywalks[1]". What is a skywalk? In North American cities, a skywalk means a steel-framed, glass-enclosed, 10 to 12-foot wide rectangular chute that joins two buildings, usually in the central business district, on the second floor level (Williams, September 1985).

A skywalk system is a network of bridges and climate controlled corridors through buildings. The bridges usually cross the street at midblock and the walkways pass through the center core of the buildings. Within these structures, the network is lined with banks, shops and other services. In office buildings, access via elevators is provided to the office floors from both skywalks and building lobbies. In certain buildings, the network engages midblock atria of various sizes and characters. Any skywalk system can join and/or pass through virtually any kind of building- including department stores, urban shopping centers, hotels, apartment blocks, office buildings, government centers and parking garages. An

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[1]Skywalks are also referred as Skyways. The word skyway is used in the field of aviation. Although both words, skywalks and skyways, are suitable to represent the system, the word 'Skywalks' is used in the thesis to maintain consistency.

all-weather network is created to facilitate pedestrian circulation within a dense

urban center (See Figure 1.1) (Bedner, 1989). The skywalk system, in technical

language is referred to as an above-grade pedestrian system, whereas traditional

sidewalks and pedestrian precincts are referred to as at-grade pedestrian systems.

Although the individual skywalk bridge may be found throughout history, a

modern skywalk system was introduced first in the city of Minneapolis. During the

late fifties, downtown Minneapolis was losing retail business to suburban shopping

malls. Although there were no earlier efforts to establish a system, skywalks were

introduced as a partial solution to the problem. The first skywalk was constructed

in 1962 for the convenience of a private corporation and its immediate success

encouraged developers to construct other skywalks forming the present day

network. Other Northern and Midwestern cities followed the Minneapolis

prototype and introduced climate controlled above-grade systems as a tool for the

downtown revitalization. Today many North American cities have developed

skywalk systems[2] (Wright, March 1981).

This thesis explores important skywalk related issues and concentrates on the

accessibility of the skywalk system. The thesis also reviews historical background of

skywalk systems to understand the concept of the grade-separated pedestrian

system. A wayfinding methodology, which is proposed by Prof. Passini (Passini,

1984), is adopted to measure wayfinding difficulties at skywalk entrances. The

results of the method are then analyzed and design recommendations are proposed

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[2]Skywalk networks are already established in the cities such as Calgary, Des Moines, Edmonton, Milwaukee, Minneapolis, Spokane, St.Paul and Winnipeg, Cedar Rapids, Duluth, Fargo, Lincoln(Nebraska), Omaha and Sioux City (IA). Systems are also developed in cities with moderate climates such as Charlotte, Cincinnati, Dallas and Portland (The City of St. Paul, December 1986).
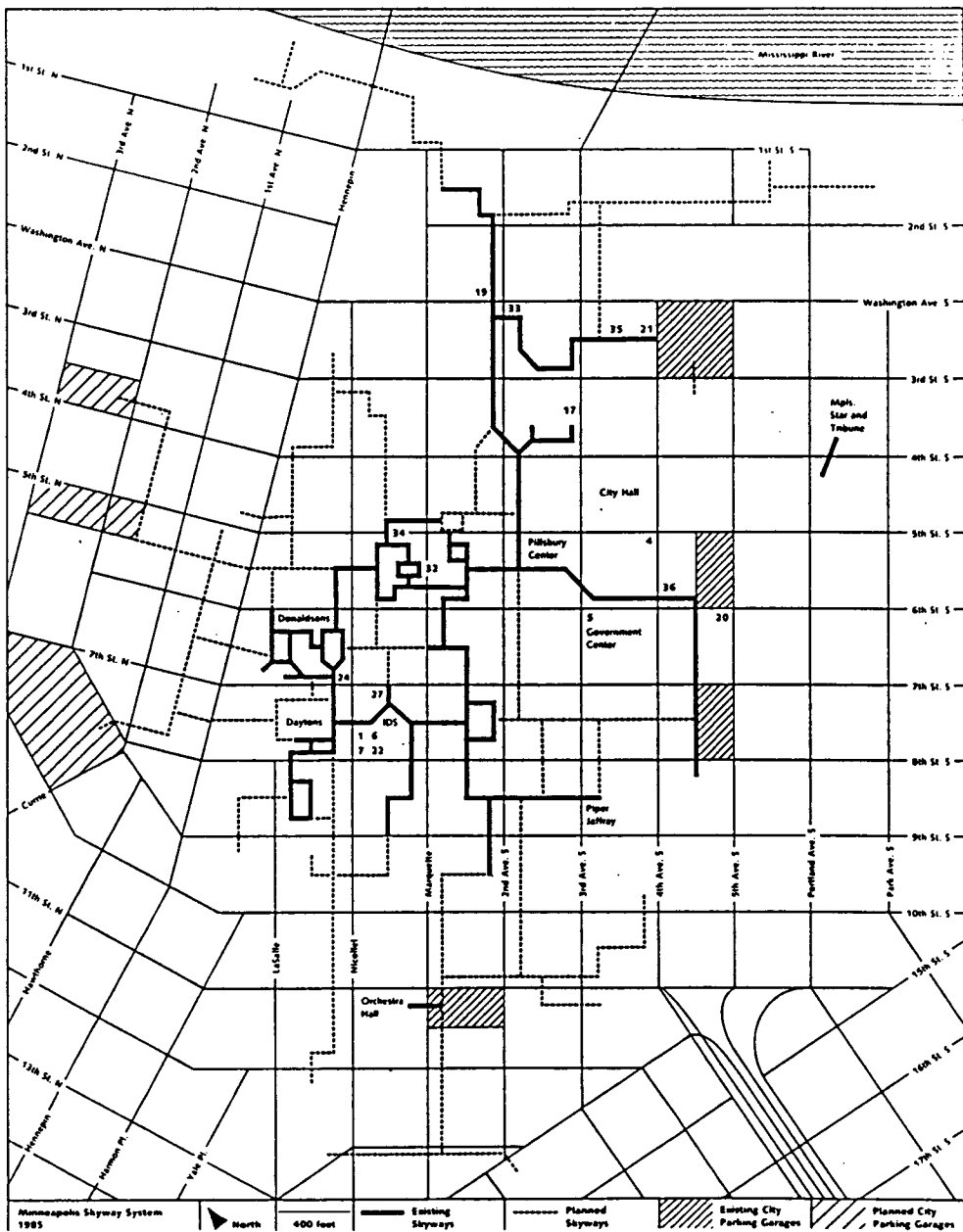
Figure 1.1:   Skywalk System in Minneapolis (Warner, 1985, 18)

to conclude the thesis.

Problem Statement

Skywalk systems, which were planned for economic development in downtown areas, have worked very well to generate retail activities (Lassar, February 1988). They have separated people from harsh climates, automobile congestion and pollution. They have reduced accident rates and improved both automobile and pedestrian flows in the central business district (CBD) (Heglund, January 1982). They have also helped to make the CBD more compact and dense as many developers are aware of the fact that to build anything that is connected to the system enhances the chances for economic success. Skywalks are popular with downtown workers, shoppers, and visitors, who welcome protection from unpleasant weather. In a survey, conducted by Prof. Kent Robertson, 97 percent of skywalk users said that they would like more skywalks in their downtowns (Robertson, 1987).

Although above-grade systems are becoming popular among users, one cannot escape noticing their negative impacts. The literature devoted to the subject is also very critical. The skywalk systems are criticized for their social, economic and aesthetic impacts on the city. Some important issues are briefly discussed here.

Stratification

Economic stratification In the quest for retail activity at the second level, skywalks removed the street level retail activities as businesses and shoppers moved to the second level. The skywalk system has created an above-grade city at the

cost of the grade level city. This phenomenon is not very critical in the larger cities such as Minneapolis, where skywalks as well as a transit mall enjoy pedestrian activity. But in smaller cities, such as Des Moines, skywalks have caused the removal and relocation of sidewalk shops (Ballard, June 1986). Thus, even if buildings and skywalks are full of people, the lack of human activity on the street level creates the impression of a barren city center. Kent Robertson advocates that the impression of an inactive city center contradicts the essence of a vital downtown, and streetscapes without humans, no matter how well designed, are incomplete (Robertson, 1987). Loss of retail and pedestrian activity at the street level indicates that if the present trend continues, the sidewalks may be eliminated altogether within a few years.

Social stratification In a normal city, people from all walks of life use sidewalks. Mixed uses of buildings and the variety of people, who use them, give a desired urban character to the city. Skywalks have always attracted only those who could afford retail services provided by the second level city. Most of them can park their cars in fringe garages and walk to their destination through skywalks without touching the ground. Others, who use public transportation and could less afford retail services, get a feeling of alienation in the environment and remain at grade. Thus skywalks are often criticized for causing economic stratification. Some authors have criticized that the economic stratification coincides with the racial stratification, resulting in more whites using skywalks whereas more blacks walk on the streets below. Although statistical data is not available to prove racial stratification, few critcs have observed the problem as follows:

In Charlotte, North Carolina, a city of incessantly mild climate and
racially integrated populus, the skyways have separated the races.
Blacks are on the street where the buses run; whites up above on the
Overstreet Mall of up-scale shops which they enter from parking ramps.
(Mack, July/August 1985, 17)

Richard Maschal, an architecture critic of the Charlotte Observer also

complained that "the introduction of a skywalk system has altered downtown

Charlotte's once vigorous street life, with the skywalks remaining mostly white, the

streets and sidewalks mostly black, and very little interaction between them"

(Dillon, June 1985).

In order to solve the issue of stratification, the city should encourage people

from both pedestrian systems to use both systems. This will help to create a mixed

user group for both systems. The exclusive attitude of skywalks should be changed

to one which will welcome a broader range of people.

Visual damage

When skywalk bridges span streets, they sometimes cut through important

views and vistas. Prof. Kent Robertson studied five skywalk cities and found that

in all five cities, skywalks block or cut across important vistas. From certain

vantage points, views of the renowned fountain square in Cincinnati, the city hall in

Minneapolis, and the aerial bridge and scenic lake-front in Duluth are interrupted

by skywalks. Prof. Robertson considered Des Moines as having the worst problem

as skywalks intrude on a spectacular view of the Iowa State Capitol from Locust

Street (Robertson, 1987). On the other hand, one can also argue that skywalks

subdivide or segment the infinite views associated with street grid patterns and also

bring down the scale of large buildings.

Privatization

In the process of downtown revitalization, off-grade pedestrian systems turned

city centers into large suburban style shopping malls. Indoor pedestrian systems

are privately controlled in many cities. In Des Moines, the skywalk system was to

be a public system (Blunck, 1984), but survey results and on-site observations have

revealed that the Des Moines skywalk system fails to fully serve as a public space in

many respects (Lee, 1989). Publicness of any space is measured by the mixed use,

openness of environment, and accessibility for people from all walks of life.

Skywalk systems do not welcome people from the streets. A study, which was

conducted by Prof. Robertson, states that some users may get the feeling that they

are treading on private space if they have to walk far into the building's interior to

locate the skywalk (Robertson, July 1988). He also states:

> As a space becomes more private, either perceived or real, it becomes
> more restricted and the individual is able to extend less control over
> his/her actions, environment and behavior. This obviously is a major
> concern for the privately owned skywalks of Minneapolis, and is most
> troublesome as well for the four public systems due to restrictive
> ordinances and the skywalk's perceived exclusiveness. (Robertson, 1987,
> 483)

The privatization issue can be effectively resolved by making skywalks more

open, visible, and accessible. In Des Moines, the skywalk authority has decided to

keep the skywalk system open from 6 am. to 2 am. Byung Soo Lee's thesis

recommends that skywalks should provide visible access to and from other places

such as bus stops and streets. (Lee, 1989).

Pedestrianization

Pedestrianization of downtown areas gives preference to people on foot. Pedestrian movement in downtowns, which is the most flexible and the least expensive form of transportation, helps to reduce automobile traffic and save time and energy. Pedestrianization creates an environment where people can come together and enjoy urban life. Although skywalks encourage people to walk, they keep them at the upper level, leaving streets empty. Minneapolis and Des Moines have tried to introduce pedestrian transit malls to attract people from skywalks. Even after the introduction of malls, skywalks are still keeping people at the second floor level (Ballard, June 16, 1986) (Robertson, August 1987). In Des Moines, an attempt to pedestrianize low-activity areas did not succeed due to the simultaneous construction of skywalks and the transit mall as isolated projects in the same area (Findlay, 1990).

Weatherization

Protection from the harsh climate is necessary in North American cities. Many attempts were made to make downtown a warm place. A skywalk system is considered as a device for climate protection (Lasser, December 1988). Enclosed skywalks, with controlled air circulation, attract pedestrians as they can leave their winter clothing behind and walk to their destinations. The climate protection in skywalks is either total or not at all. People are either inside the skywalk or outside on streets. The present skywalk system does not provide an easy opportunity to go

in or out whenever weather permits. Gradation in climate protection and spatial continuity between inside and outside are advocated (Findlay, 1990).

Transportation

Urban renewal projects have modified American downtowns for private car convenience. Introduction of freeways allowed people to live far in the suburbs and to work downtown. Parking lots were added inside the central area to serve parking needs. Parking lots and freeways have destroyed the earlier dense urban fabric of the central city. Trancik describes them as lost spaces (Trancik, 1986). The skywalk system is connected to parking structures. Prof. Robertson observes that none of the U.S. skywalk cities have rail transit, and their bus systems are not well integrated with the skywalks (Robertson, August 1987).

Today cities are concentrating on the use of mass transit for environmental and energy reasons, skywalks should promote mass transit by extending links with the mass transit network.

Critics of skywalks, who are not aware of the importance of the skywalk system in downtown revitalization, recommend that skywalks should be removed to force people on to streets. Such a solution would simply make suburban alternatives more attractive. Therefore it is very important to modify the present system in order to solve skywalk related issues without losing advantages of the skywalk system.

Figure 1.2 classifies the issues discussed above as follows:

- Generic issue

GENERIC ISSUE	LOCALIZED ISSUE	OBJECTIVE/SOLUTION	ACTION

STRATIFICATION → Second level city Retail activity on skywalks & streets declining → Integration of the skywalk system and the street pedestrian system.

Accessibility

Visible entrances

PRIVATIZATION → A public skywalk system connectsprivate spaces and appears as a private pedestrian system → Increase publicness of skywalks → Access for general public

PEDESTRIANIZATION → Although people use skywalks, the streets are empty → Encourage street level activities → Connections from the sky-walk level to the street level

Easy entrances and exits

WEATHERIZATION → Skywalks protect people from very cold & very hot climate but they keep people inside even in the moderate climate → Flexible environment and opportunities to go in and out

Connection of the skywalk system and the bus service

TRANSPORTATION → The skywalk system encourages auto-mobiles and do not welcome people from mass transit. → Connect skywalks to mass transit system

Figure 1.2:   Issue chart

- Localized issue

- Objectives

- Action

Skywalk related issues are integrated with each other. A part of one issue is actually a subset of some other issues. The issues need some design, social, as well as political solutions. Design solutions are incomplete without political and social solutions. Success of design solutions would depend on the resolution of social and political issues.

Accessibility

The Figure 1.2 displays possible generic solutions to important skywalk related issues. All generic solutions have a number of possible specific solutions. For example to achieve street level pedestrianization we can say that the street level activities should be encouraged. To increase street level activities one may come up with a number of action plans. One of the possible action plans could be the provision of direct access from one pedestrian level to another. A direct access would certainly encourage people to take advantage of the other system. These specific action plans fall under the issue of accessibility. It is true that one may not be able to achieve a successful pedestrianization of the streets by enhancing accessibility, as the pedestrianization depends on the success of all other action plans. But improvement in accessibility would certainly help to improve pedestrian activity at the street level. This logic is applicable to all other skywalk related issues as action plans of all issues fall under the accessibility of both pedestrian systems. Improved accessibility would integrate both systems instead of separate entities.

Is integration of the system really necessary? Many researchers and urban designers say "yes". David Bannett advocates connections between two systems. He writes that the mall of small shops at street level has withered not because of the skywalks but because the last link was missing. He feels that once people come down by using the link they will continue to walk at the lower level (Bannett, July/August 1988). Some studies have commented on the difficulty of locating skywalk entrances, especially those found within buildings. Anne Willette describes the accessibility and orientation problem in the Des Moines skywalk system as follows:

> Seen from the street, there seems to be no way in. Once in, it's difficult
> to find a way out. And navigating the two miles of elevated walkways
> can be hollowing. (Willette, May 1987, 1M)

Prof. Robertson confirms that accessibility problem is the reason for the privatization of the skywalk system (Robertson, July 1988). Prof. Findlay advocates the idea of gateway buildings, which can provide access to multiple level pedestrian movement systems and support broad public accommodation (Findlay, Winter 1991).

A study, which was prepared by W.G. Scott and L.S. Kagan for the Federal Highway Administration, confirmed the accessibility problem of the skywalk system in Minneapolis (Scott and Kagan, 1973). Urban researchers have argued that the integration of the at-grade and above-grade pedestrian systems would help to solve some important problems of the system (Mack, 1985). Problems such as developing a second level city, stratification and privatization can be solved by integrating both pedestrian systems. Frequent points of access from skywalks to

sidewalks and vice versa will play an important role in the integration of systems. The report, "A comparison of costs and benefits of facilities for pedestrians" by W.G.Scott and L.S.Kagan, states that no skywalk in Minneapolis is accessible directly from the street right of way. The report also states that each skywalk is accessible only by first entering a building and then using the vertical movement system within that building (Scott and Kagan, 1973). In order to address the issues of integration and accessibility, in this thesis, connections from at-grade to above-grade, pedestrian systems in Des Moines will be studied and analyzed. A method of wayfinding, which was prepared by Passini (Passini, 1984), will be used to assess the degree of difficulty in wayfinding.

Organization of Thesis

The thesis is divided into six chapters. The organization of thesis is as follows:

1. The first chapter provides an introduction to the thesis and discusses skywalk related issues.

2. The second chapter explores the history of above-grade pedestrian systems. The study concentrates on the origin of the above-grade system, its development through history and the role of various socio-economic forces in the construction and the development pattern of above-grade systems.

3. The third chapter describes the origin and evolution of the skywalk system in Des Moines. It also describes the present day system and also its situation in comparison with other cities.

4. The fourth chapter evaluates previous accessibility studies to form a methodology for the thesis. It explains the method selected by Passini as well the terminology used in the method (Passini, 1984).

5. The fifth chapter applies the method to the existing skywalk system in Des Moines. The central core area skywalks are studied to form typology of wayfinding difficulties from sidewalks to skywalks. The chapter analyzes data to present results and observations.

6. The sixth and the last chapter proposes design recommendations. Earlier efforts for design interventions are studied and the chapter concludes with design recommendations for the Des Moines skywalk system.

CHAPTER 2. HISTORICAL BACKGROUND

Introduction

Although the history of the modern skywalk system is as recent as thirty

years, the history of the off-grade pathway is ancient. Throughout history,

architects, designers and planners, were fascinated by the idea of physical

separation of people from hostile elements, both natural and man made.

Architecture by definition is an art and science of designing buildings and enclosed

spaces. Protection from nature and other elements is always an important part of

architecture. The protection factor reduces gradually from a house, where it is

maximum, to a public building where it is minimum. But when architecture tries

to overprotect people in public spaces then it becomes an issue. Whereas

protection from natural elements is necessary, protection from other people, such as

the poor, is a issue of segregation. This attitude generates a concept of escape and

refuge. Thus, the historical background of these concepts is very important to

understand in the development and popularity of modern skywalk systems.

Literature Review

Historical study of grade separated systems is very small compared with other

building types. Prof. Rowe, professor of architecture at Cornell University, is

probably the only person who has written on the subject. He refers to the quality of skywalk precedents and complains that the quality of space in the skywalk system could never be strictly comparable to its precedents (Rowe, 1985).

Early antecedents

Prof. Rowe (Rowe, 1985) reviews early skywalk precedents to discover and to compare their qualities with modern skywalk systems. Grade separated ways, particularly below-grade, were often constructed by kings and rulers during the medieval period to escape from possible enemy attack. One of the earliest examples of elevated passageways was that leading from the Vatican to the Castello Sant'Angelo. This elevated pathway, which was unprotected from rain or sun, was used by the Pope Clement VII, in May 1527, to save himself from the international army that was about to invade the city. The other important example is Cosimo's passage in Florence, which was constructed about thirty years later. Cosimo de Medici, first grand duke of Tuscany, felt the need for an *corridio*. Cosimo's passage, (See Figure 2.1) begins at Palazzo Vecchio, and forms an upper level of an arcade along the river Arno. It then crosses the river, penetrates a number of houses, becomes the facade of the church of Santa Felicita, and finally terminates into at Palazzo Pitti, from where further escape to the Fortezza del Belvedere was always available. This early skywalk is a classic example of the concept of refuge as it can carry people from one point to another in the city without any connection to or any entrance from the outside world (Rowe, 1985).
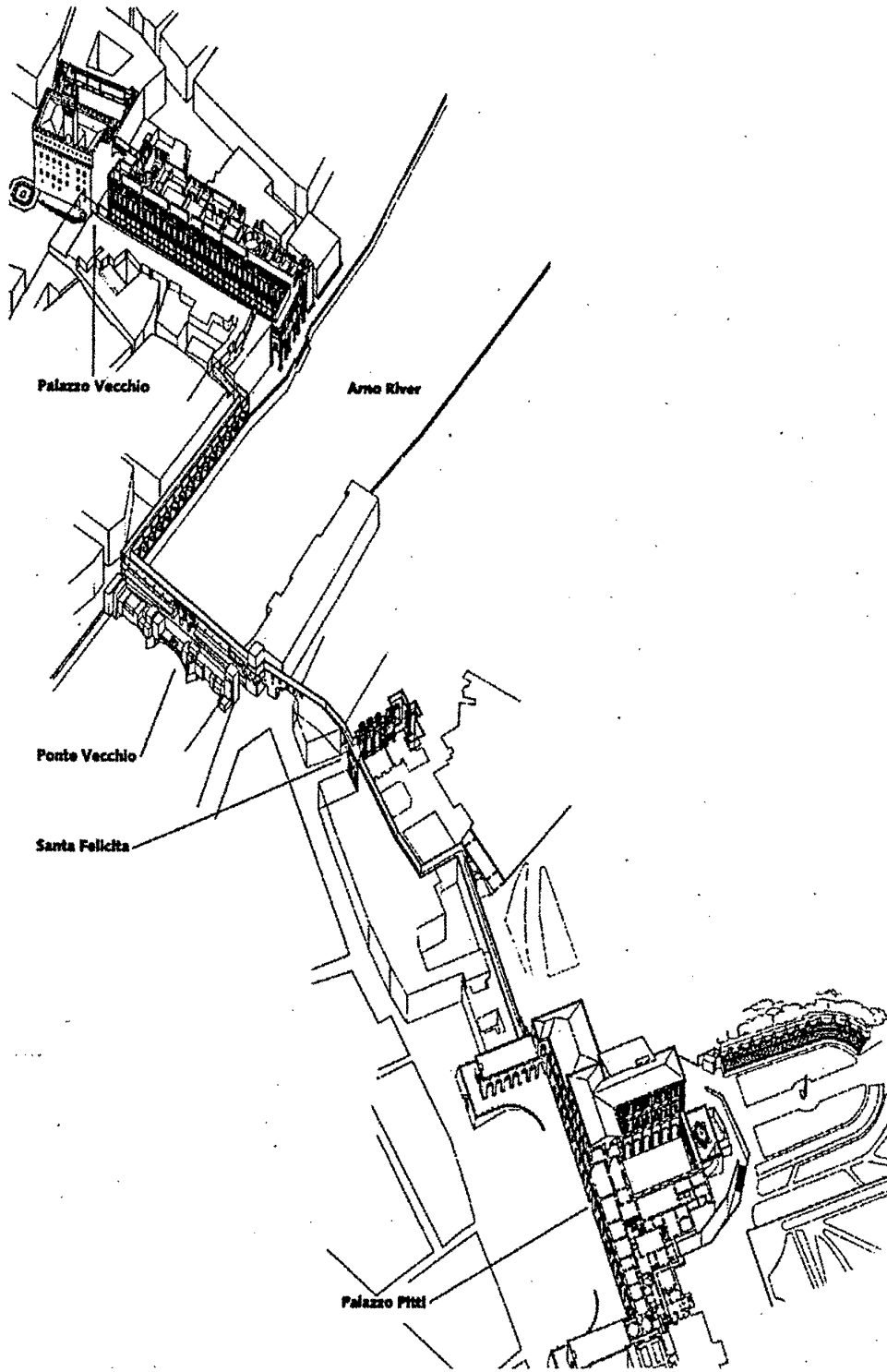
Figure 2.1: Cosimo's *corridio* in Florence (Rowe, 1985, 10)

Leonardo and "The Ideal City" Any single skywalk bridge provides a refuge from the outside world whereas the system of these bridges provides a different world of their own by opening another level of circulation. This concept was probably first conceived by Leonardo da Vinci. Leonardo was preoccupied with a city of great complexity in his last years in Milan. The plague of 1485 made evident the overcrowding and unhealthy living conditions in Milan. Leonardo was attracted to a functional solution that will improve the city's health. In his ideal city plan, which is dated 1490, Leonardo proposed the two level circulation to achieve ideal circulation in the city. Though he did not propose his concepts in the official plan form, one can learn about his ideal city concepts from his sketches (See Figure 2.2). Guillaume describes the ideal city as follows:

> Leonardo proposed another system with two street levels. The streets used to transport goods were located at the ground level, along with the service entrances to the palaces, water-drainage ditches and, no doubt buried somewhat, sewers. Six *braccia* higher (as in the preceding system), the streets reserved for "persons of quality", which were twenty *braccia* (12 meters) wide, were built on walls and vaults. They give access to palaces, which had their main entrances on this level. Their porticoed courtyards, visible in the drawing, dominated the service yard (or garden ?) which was connected to the street meant for carriages. The drawing next to this one shows an overall view of the city: ramps lead to the noble, upper level, through monumental gates, while lower streets end in doors that open in the wall, near the ditches. (Guillaume, 1987, 257)

Leonardo's concept clearly shows the idea of escape from the bad elements of the city. He wanted to keep people away from the dirt, sewers and vehicles. He designed various stairs to connect both levels in his city to lessen the strict
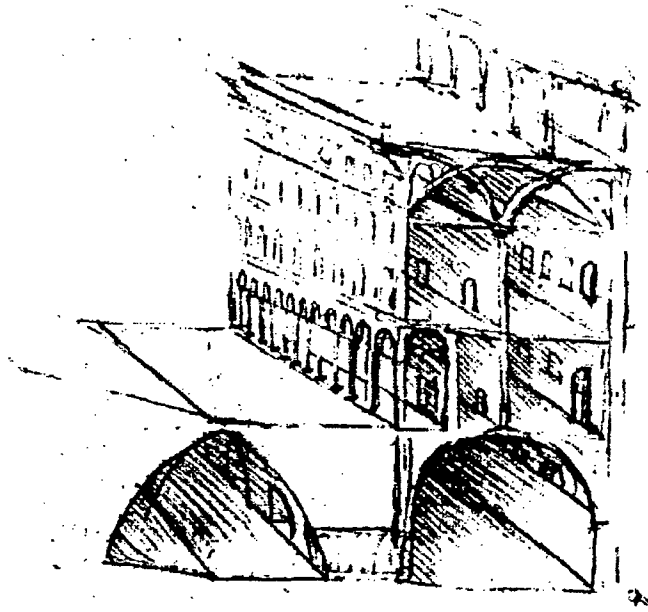
Figure 2.2:   Leonardo da Vinci's Sketch of Multilevel City (Guillaume, 1987, 258)

hierarchy of the urban organization. The two level city concept did not attract much attention until the present century.

Present century antecedents

Early modern examples   In the present century, with the industrialization of cities, the concept of separation was resurrected in the mind of architects and planners. New York City, at the beginning of the century, probably played an important role in the revival of multilevel circulation systems. Introduction of motor cars had created conflict with pedestrian and other vehicular systems. Developing technology helped rational thinkers of the modern movement to introduce concepts which would surgically treat our cities.

Rowe cites Warren & Wetmore's Grand Central Station as a heroic synthesis. This station with its underground concourse and grand scale gives it a character of the city in a crypt. Although this crypto-city was no longer sufficiently appreciated, its impact lingered on (Rowe, 1985). The underground concourse of Montreal can also be viewed as an example of the crypto-city. A similar multilevel system can be found in illustrations of "King's Views of New York". Rowe describes them as follows:

> A famous New York fantasy of 1908, called King's Views of New York, shows the same preoccupation with multilevel circulation as Grand Central. The bottom level is a street with an elevated railroad running along it and miscellaneous low level bridges. Above the street is a high-level bridge with a train running across it. Then, infinitely elevated, there is a variety of curved approaches (railroads or primitive autostrade). And, finally, not so far above, but in the sky, a frightening,

disorderly collection of peculiar old airplanes is flying around. (Rowe, 1985, 12)

Influenced by King's "Views of New York", the 1926 Regional plan of New York had explored the possibility of a new pedestrian walkway system, one level above the street (Barnett, 1986). Another milestone in the development of the multilevel system is the utopian model of the city of Sant' Elia by Mario Chiattone. The philosophy of Sant' Elia was based on Hegel's historicism , French scientism and social Darwinism. Sant' Elia had conceived as a city where static conceptions have vanished and where freedom has become the recognition of necessity, where the machine has become spirit or spirit machine and a moment of history has become the index of destiny (Rowe and Koetter, 1978). The stepped tower structures with above grade and below grade tubular ducts was an integral part of the city.

Modern examples In the modern era, separation from vehicular traffic was one of the prime concerns of architects. Le Corbusier was the leading advocate of multilevel systems. He criticized traditional street patterns as he associated them with choking fumes and diseased areas of nineteenth century slums. In his proposed designs of *Ville Contemporaine* and *Ville Radieuse*, Le Corbusier elevated vehicular streets and buildings on *pilotis* and left the ground below for gardens and pedestrian movement, a similar concept to Leonardo's. The illustration of the *Immeubles Villas* in the *Ville Contemporaine* shows skywalks spanning streets to connect all floor levels on opposite sides of street (See Figure 2.3) (Curtis, 1987). Even though the city on *pilotis* could not become reality, it influenced many architects in the Modern and the Late Modern period.
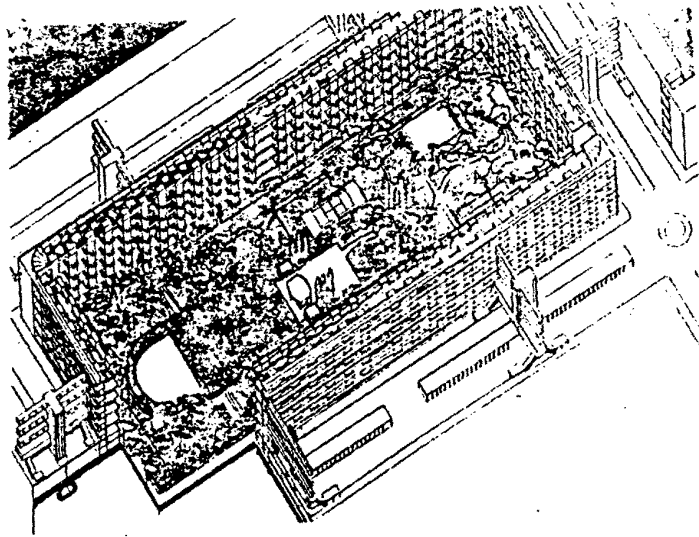
Figure 2.3: The *Immeubles Villas, Ville Contemporaine* (Curtis, 1987,112)

Late modern examples In the 1960s, the environmental crisis, the growing unpopularity of modern housing estates, and the boredom with modern aesthetics lead architects away from the strict rationalism of modern architecture. Some of them have taken the theories and style of modern architecture to extremes with futuristic designs. This movement is classified as the "Late Modern Architecture" (Jencks, 1980).

In the late modern era, some architects and planners believed that in the future, the imperfection of modern cities would be swept away by the force of new technology. This futuristic vision, which was flourished in 1950s to 70s, took modern concepts to generate megastructure cities. In the megastructure, it is believed that the sidewalk would become a weather protected corridor or a bridge, the plaza an interior atrium and the building an incident within a larger framework.

The proposed plan for the Hook New Town in England, shows the idea of megastructure with the influence of the functional separation concept of modern city planning. The project, which was designed in 1961 by the London County Council architects, was an important step in the development of the skywalk system. London county council architects were interested in solving difficult problems of servicing, delivery and dispatch of goods, of people arriving and departing by buses, cars or on foot. Architects believed that the separation of vehicular and pedestrian movement would solve their problems. They proposed all pedestrian movement on a platform, raised to sufficient height to enable a network of roads to service the area from beneath and to cover the necessary car-parks (See Figure 2.4). All shopping and retail activities would be on the platform whereas all services are at grade level (London County Council, 1961).
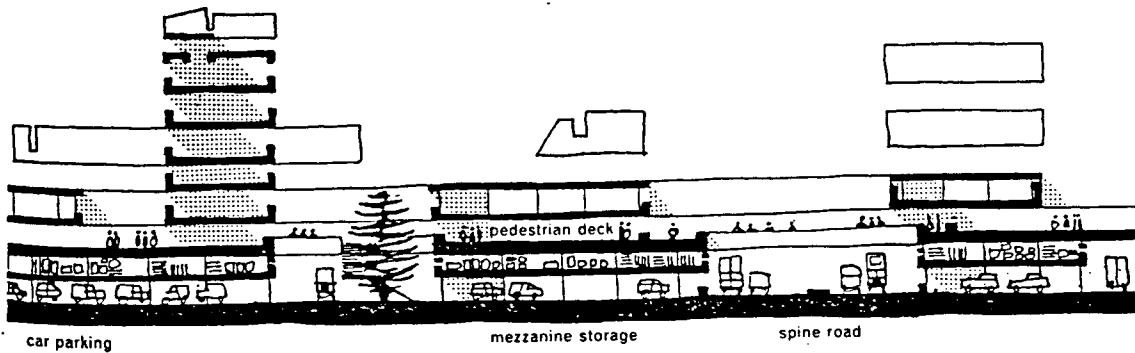
Figure 2.4: Section of Proposed City Center at Hook, England (London County
Council, 1961, 55)

Development of the modern skywalk system

Minneapolis is an important city in the development of modern skywalk

systems. Minneapolis is very famous for its cold winter. Although average snowfall

in the city is less than that of Chicago, Montreal and Syracuse, the temperature

does get very cold. Also the Minnesota weather changes dramatically as it can go

from $+30^o$ F to $- 20^o$ F (at night) in just a 24 hour period (Architectural Record,

February 1968).

Efforts were made to make downtown Minneapolis warmer. A warm

downtown, which would stimulate retail and business activities, was envisaged as a

counter magnet to the development of shopping malls along the fringe of the city.

Many attempts were made to cope with the winter climate. Electric heating of

downtown sidewalks was tried in the late 1960s. Developers decided to include

sidewalk heating as a buyer attracting amenity. The snow melting equipment comprised of 5,000 electric heating coils of various wattages, was installed 1.5 to 2in. below the sidewalk surface (Architectural Record, February 1968). The heating system was turned off recently due to technical problems.

The concept of the grade separated pedestrian system was considered in the 1950s. Leslie G. Park (Architectural FORUM, July 1956) presented a proposal that would give the central downtown area a new type of "appeal". The proposal consist of an elevated, enclosed, heated and air-conditioned "shoppers' plaza" extending for blocks along busy Nicollet Avenue, with entrances to buildings on each side of the avenue at the second floor level. Multistory department stores occupy three full blockfronts of the proposed "Minneapolis Plaza". All buses would be routed through Nicollet Avenue, making it a sheltered mass transportation loading and unloading concourse. Ground level shops would get the benefit of increased bus traffic. The covered Nicollet Avenue would be lit by the overhead lighting as powerful as daylight (Architectural Forum, July 1956). This and some other concepts, which introduced the idea of the grade separated system to Minneapolis, could not turn into reality due to merchants' concern for potential loss from street-level stores. However, in 1962, the first skywalk was constructed between Northwestern National Bank and the Northstar Center complex. The skywalk was funded by a private developer for private convenience. Although there was no attempt to establish a system, the success of the first skywalk lead to the construction of other skywalks and the system evolved. Many other cities took Minneapolis as a model skywalk city and used it in their downtowns. Today we find well established systems in many North American cities.

Conclusion

As we have seen, throughout the history of architecture and planning, architects and planners were interested in the physical separation of pedestrians from vehicular traffic. Although Leonardo first introduced this concept, it was not used in the public realm until the present century. With the process of industrialization and the introduction of the car as a mode of private transportation, architects and planners gradually turned to physical separation. The concept of a multilevel city could not be turned into reality due to financial constraints and lack of technology. But today, economic forces and technological advancement have made the construction of megastructures possible. Skyway systems, private atria, and underground concourses are already turning downtowns into megastructures.

CHAPTER 3. SKYWALK SYSTEM IN DES MOINES

Introduction

Introduction of the skywalk system in Des Moines is a recent past. In 1981,
when the construction of the Des Moines skywalk system began, skywalk systems in
other major cities were already in place[1]. The Des Moines skywalk system grew
rapidly within the last decade and had a tremendous impact on the character of the
downtown business district. Today, the system has over 28 bridges connecting
various downtown blocks.

Evolution of the Skywalk System

The following information explains the concept and the evolution of the Des
Moines skywalk system. It is extracted from a report, which was prepared by
Barton-Aschman Associates, Inc. and Brooks, Borg and Skiles, Architects.

In the 1960s and 70s, planners, developers as well as citizens have began to
recognize the potential of downtown business districts in American cities. The need
of downtown revitalization was expressed to make them compete with the growing

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[1]Skywalk systems, in other North American cities, date long before Des Moines
skywalk system. Opening dates of some other systems are as follows: Minneapo-
lis(1962), St.Paul(1967), Cincinnati(1970), Duluth(1974), Milwaukee (1961), and
Calgary (1970) (Lassar, December 1988).

suburban development. A compact business district is considered competitive as it can provide an easy accessibility between various uses. The compact business district can be effectively served by pedestrian travel, the most flexible and the least expensive form of transportation (Heglund, 1982).

But compact downtowns can also cause automobile congestion and pollution problems. In order to achieve compactness without congestion as well as to make downtowns more competitive, skywalk system was proposed in 1974, by the City of Des Moines. It was decided to follow established models of other skywalk cities. In 1978, the City submitted an application to the Federal Highway Administration (FHWA) and the Iowa Department of Transportation (IDOT) requesting the pedestrian skywalk system to be declared eligible for Federal Aid Urban funds (Heglund, 1982). The City also commissioned a study to anticipate the pedestrian volume and a cost benefit study of the proposed skywalk system. Barton-Aschman Associates, Inc. of Minneapolis were assigned for the study. The study looked into skywalk systems in Minneapolis and St.Paul and concluded as follows.

> skywalk flows exceed at-grade pedestrian flows about nine months of the year in those blocks where skywalks were provided as an alternative. At-grade pedestrian flows moderately exceed skywalk flows in only three months. From this analysis it can be concluded that in only those areas where year-round temperatures and precipitation levels are near ideal would at-grade pedestrian traffic equal or exceed skywalk system traffic when an extensive and well-planned skywalk system is provided as an alternative. (Heglund, 1982, 5)

The study looked into costs and benefits of the system and justified public investment in terms of fuel and time saving as well as better pedestrian environment. The study analyzed different locations for proposed skywalks and

recommended them at the center of the block. The study also looked into the issue of private verses public ownership and suggested a combination. It was recommended that the City of Des Moines and private owners together should bear the construction cost and private owners should bear maintenance costs (Des Moines, 1980).

Skywalk ordinance

On June 23, 1980, the Des Moines City Council adopted a skywalk ordinance to coordinate, regulate and integrate the development and the operation of the proposed skywalk system. The skywalk ordinance is a set of rules and regulations which are designed to control development, maintenance, and other activities in the system. The ordinance clearly states that the skywalk system is a public pedestrian system and the city is responsible to control it.

Skywalk commission

The ordinance created the skywalk commission to look after the system. It consist of five members. One member represents property owners connected to the system and another one represents a leasehold interest traversed by the system. The remaining three members serve at large. The commission was given certain advisory powers including advising city council on any changes in the skywalk ordinance. In addition, they were granted certain decision making powers including establishing minimum operation and maintenance standards etc.

The first skywalk was constructed in 1971 to link the new J.C. Penney store with a parking garage. The construction of the skywalk system started in 1981 and

the system was opened to public in 1982.

Description of the Skywalk System

The Des Moines skywalk system is located in the central business district
(CBD). Within the CBD a skywalk district has been established outside of which
no skywalks can be built (See Figure 3.1). The district comprises a nine block core
area bounded by Mulberry Street, Eighth Street, Grand Avenue, and Fifth Street.
Major important buildings are located inside the nine-block core. Skywalks not
only serve this area but also extend their services to other outside buildings such as
the Capital Square, the Plaza, and the Convention Center. Recently two tentacles
were added to the system to link the Veteran's Auditorium and the 801 Grand.
These tentacles extend the system to the threshold of the skywalk district. In
addition to retail and business activities, the skywalk system also links other uses
such as hotels, condominiums and auditoriums. Ten parking ramps, which are
located along the fringe of the system, serve as entrance gates of the system. The
system, although pre-planned, has a character of typical piecemeal development as
it has been implanted on the existing urban fabric of downtown.

Most bridges are funded by the city. They vary in size and character as city
does not impose any unified design criteria. The length of bridges vary from 5.03m
to 35.05m. All bridges are carpeted and ceilings are finished with acoustic tiles.
Walls are decorated with metal or sheetrock or plaster. The system is ventilated to
maintain certain accepted internal temperature. Entrances to bridges are provided
with automatic doors. The ordinance specifies minimum one connection to the
street level per block but does not specify its location (Skywalk Ordinance, 1986).
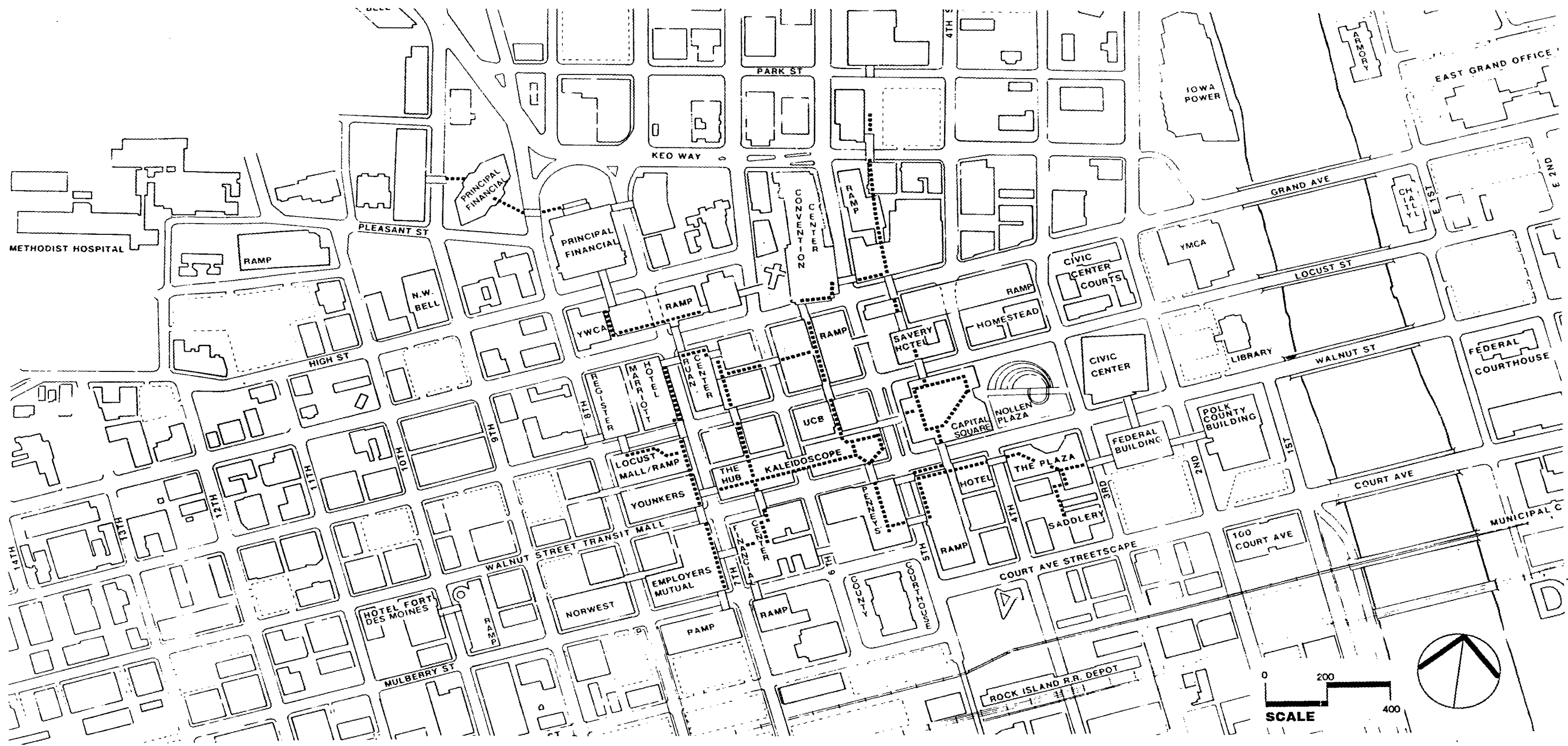
Figure 3.1:   Downtown Des Moines

The focal point of the skywalk system is located inside the "Kaleidoscope at the Hub" which sits parallel to the Walnut Street Mall in between Fifth Street and Seventh Street. The Kaleidoscope Mall, which was designed with the skywalk system, is the hub of the skywalk level retail activity. Capital Square and the Locust Mall serve as secondary nodes whereas J. C. Penney's and Younkers department stores serve as major retail attractions. As the nine block core is relatively flat there are very few elevation differences in the system with exception of the connection to the Veteran's Auditorium.

Skywalk Related Issues and Des Moines

Skywalk related issues, discussed in Chapter One, also affect the Des Moines skywalk system. Some issues are more applicable to Des Moines than others. Some important issues are as follows.

Stratification

Although the skywalk system helped to revitalize downtown Des Moines by attracting suburban retail business, it simultaneously removed retail shops from the street level. This phenomenon is confirmed by the city in an answer to a survey questionnaire (The City of St.Paul, 1988). Economic stratification in Minneapolis, although present, is not as critical as in Des Moines, thanks to more dense and populous downtown. Des Moines just does not have enough people to support two separate pedestrian systems. Thus the difference is striking. On the other hand social stratification issue is not critical in Des Moines.

Privatization

Des Moines used the Minneapolis model to develop the skywalk system. But the important difference between the two systems is that the Minneapolis skywalks are totally private whereas Des Moines skywalks are public. When designed, the IDS Crystal Court in Minneapolis was praised as a great private contribution of public space. But later, the change in the management transformed it into just another corporate atrium (Findlay, 1988). In Des Moines, bridges are constructed by the City whereas interior corridors and spaces by private owners. Thus, even though the skywalk system is public, it creates an image of a private system. The skywalk commission tried to enhance the publicness of the system by extending open hours of the system, but with limited success.

Pedestrianization

Like Minneapolis, Des Moines also tried to introduce a pedestrian mall by developing the Walnut Street Transit Mall. But, due to the strong pulling power of skywalks, Walnut Mall could not achieve expected results (Ballard, June 1986).

Weatherization

Weatherization issue is also critical in Des Moines, like most of the North American skywalk cities. Even on the Walnut Mall one cannot find many opportunities of weather protection. Similarly from skywalks one has very few alternatives which would allow one to go outdoors. The lack of opportunities to go indoor or outdoor forces people to remain out when outside and in when inside. People should have more flexibility to select environment when weather permits.

Transportation

Des Moines is a typical example of mid-sized, Midwestern city. The only public mass transit available is the Metro Bus Service. It is not used by many people as they prefer to drive down and park in fringe parking ramps. The bus service does serve downtown but cannot serve skywalk users as there are no proper connections for bus travellers. Many cities are thinking of reintroducing the mass transit system such as light rail and Des Moines is one of them. The mass transit system, in order to attract people, has to link itself with the skywalk system.

Conclusion

This Chapter discusses evolution of the brief history of the skywalk system in Des Moines. The chapter also explains skywalk related issues and their context in Des Moines. The discussion is an important step in the study as it provides necessary background information of the Des Moines skywalk system before which helps in this study.

CHAPTER 4. METHODOLOGY

Introduction

This chapter reviews the literature to formulate a research method, which will be used to determine the degree of accessibility in skywalk systems. The term accessibility has been used in the literature to describe the relative ease in locating an object and also parts within it. As a part of our daily activities, we go from one place to another. In that process we encounter numerous objects in nature with different degrees of accessibility. Some are easily accessible while others are impossible. We usually have a task to reach a destination. Passini, in his book "Wayfinding in Architecture", refers to this task as a wayfinding task. He studies the process of wayfinding and forms a test method. This chapter summarizes the process as well as the test method.

Wayfinding

Wayfinding is defined as a task to find one's way through the environment so as to reach a desired destination. The wayfinding task is completed when the person concerned reaches a desired destination (Passini, 1984). The wayfinding task can be measured on a scale from a very easy to very difficult. The degree of difficulty for a person depends on two major factors. The first one is a wayfinding

ability of the person and the second is accessibility of the environment.

Wayfinding ability

Wayfinding ability varies from person to person. Some people can easily find their way in a new setting whereas others get confused. Wayfinding ability depends on person's spatial orientation. Passini describes the term as follows:

> Spatial orientation could, therefore, be described as a *person's ability to mentally determine his position within a representation of environment made possible by cognitive maps.* In this first definition, therefore, spatial orientation is equated with '*knowing where one is*' and with '*having an adequate cognitive map*'. (Passini, 1984, 35)

Tolman's experiments   In 1948, Edward Tolman studied spatial orientation among rats in the University of California (Tolman, July 1948). He used Apparatus I (See Figure 4.1) for few days on a group of rats. The entry to the apparatus was from "A" whereas food was kept at "G". After the initial search rats found the way and within a few days started running from "A" to "G" without hesitation. After a few days, Tolman changed to Apparatus II where the starting point and the table remained unchanged but path "C" was blocked and a series of radiating paths were added. The rats once again started at "A" and ran towards "C". After realizing the blocked path, they started to search their way in the maze. Tolman reports that about 36% of the examined rats chose path "6" which took them directly to the food chamber location. Tolman concludes the result of the experiments as follows:
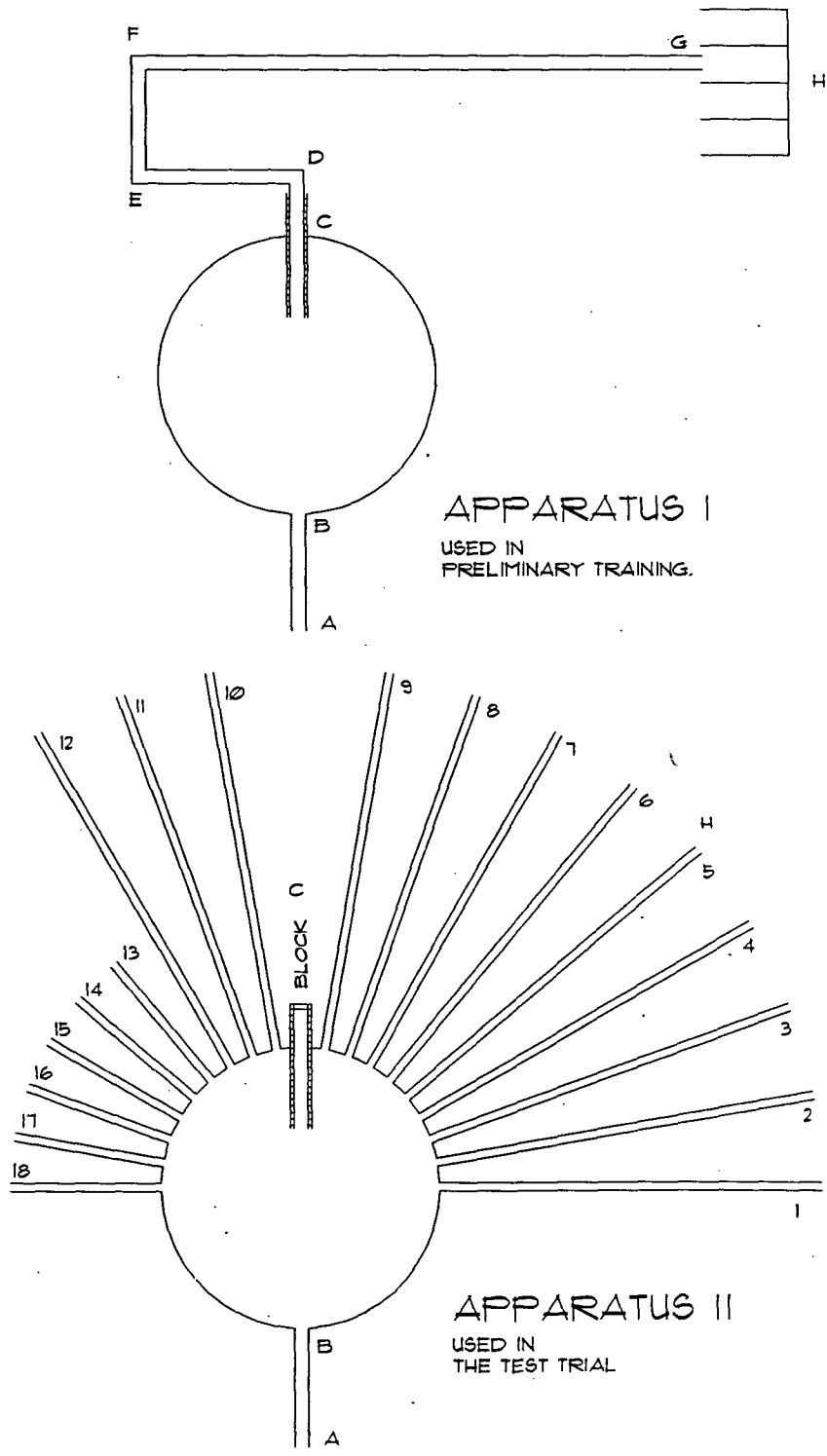
Figure 4.1: Tolman's apparatus for learning experiments with rats (Tolman, July 1948, 202, 203)

As a result of their original training the rats had, it would seem,
acquired not merely a strip-map to the effect that the original
specifically trained on path lead to the food but, rather, a wider
comprehensive map to the effect that the food was located in such and
such direction of the room. (Tolman, July 1948, 204)

Tolman also conducted some other experiments and proposed the notion of
the cognitive map as a wider comprehensive map drawn in mind.

Accessibility of the environment

When we say an environment is accessible, we mean that a person can not only
find the environment but also parts within it. When we talk about the accessibility
of a public environment, we think that the public should have easy access to it.

Accessibility of any environment varies greatly. Some are more accessible than
others. Environments help people in the wayfinding process by providing necessary
information to solve the task.

Types of information   A person, who is solving a wayfinding task uses
following two types of information.

1. Known information of the environment.
2. Information given by the environment.

Known information   Knowledge of information varies from person to
person as well as from environment to environment. When we have sufficient
information about a place, it becomes a familiar place. We are always more
comfortable in a familiar environment as we have a cognitive map of that

environment in mind. Whenever we visit a unfamiliar place we become more cautious, trying to extract needed information.

Perceived information   It is a type of information, which can be extracted from the environment. It depends mostly on the type of environment. Some places are easy to comprehend while others are difficult. Comprehensiveness of a place is referred to as legibility or imageability.

Imageability

Kevin Lynch presented his studies on the image quality of cities in his book "The Image of the City".

> Imageability is that quality in a physical object which gives it a high probability of evoking a strong image in any given observer. (Lynch, 1960, 9)

A cognitive map is a way to study the imageability of an object. Since researchers cannot observe cognitive maps directly, they have to rely on others to represent their cognitive maps in visible forms. These visible forms can be sketch maps, pictorial drawings, verbal descriptions, modelling, and other forms of spatial manipulations.

Kevin Lynch has used the method to analyze central areas of three major North American cities – Boston, Massachusetts; Jersey City, New Jersey; and Los Angeles, California. In each of these cities, two basic analyses were carried out. The first one was a systematic field reconnaissance of the selected area by a trained observer, who mapped the presence of various elements, their visibility, their image

strength and weakness. The second analysis was by interviewing small samples of the city residents. Interviews included requests for descriptions, locations, and sketches (Lynch, 1960).

In this study, Lynch found out that a public image of any given city is an overlap or a series of many individual images. A public image for a person is unique. Images of paths, edges, districts, nodes and landmarks constitute a personal image of the city and many such images constitute the public image of the city. He believes that by physically reconstructing imageable parts of the city, a designer can make cities more imageable (Lynch, 1960).

Passini applied Lynch's method to study Bonaventure, a commercial center in downtown Montreal (Passini, 1984). He found out that, like an urban form, a structure can also be remembered as a cognitive map, which is comprised of images such as paths, edges, districts, nodes and landmarks inside the building.

Wayfinding: An Act of Solving Spatial Problems.

Decision hierarchy

The wayfinding task is a task of making series of decisions. We can construct a decision-sequence from behavioral actions by observing them. We can also observe a serial or a hierarchical order in the decision-sequence. Some decisions are taken only after the earlier decision whereas some decisions are taken in order to fulfill requirements of the earlier decision. Passini explains the concept with an illustration of south sea navigation (Passini, 1984). A navigator sails from one island in the south seas to the island of Turtle Atoll. He follows a path which runs along the coral reef to the Big Dip and then turns left to Turtle Atoll (See
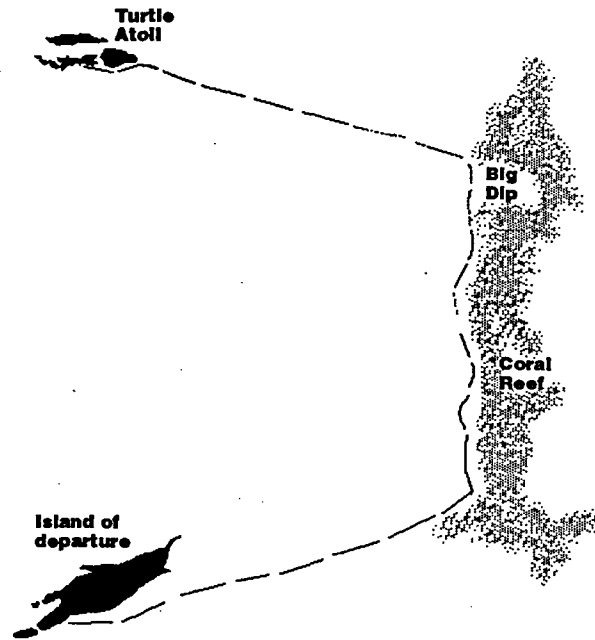
Figure 4.2: The voyage to Turtle Atoll (Passini, 1984, 63)

Figure 4.2). Passini plots the decision sequence of the navigator against time (See

Figure 4.3) and explains it as follows:

> The Figure represents the same south sea sailing scenario. In the second
> column from the left, we can see that 'to sail to coral reef' is part of a
> set of general decisions that includes 'to follow coral reef to 'Big Dip'
> and 'to home on Turtle Atoll'. This set indicates in the most general
> terms how the task 'to go to Turtle Atoll' will be completed. The three
> decisions in the order given represent the decision plan for the task. Had
> the three decisions led directly to behavioral actions, the plan would
> have been executed and the problem solved. As can be appreciated from
> the diagram, the task could not be completed on the basis of the three
> decisions only. The decision 'to follow reef to Big Dip', for example,
> could not lead directly to a behavioral action. It became a subtask in
> itself and required a plan to solve it. The plan this time consisted of two
> decisions: 'to set canoe on new course' and 'to sail according to reef
> outline'. The decision 'to set canoe on new course' required a plan
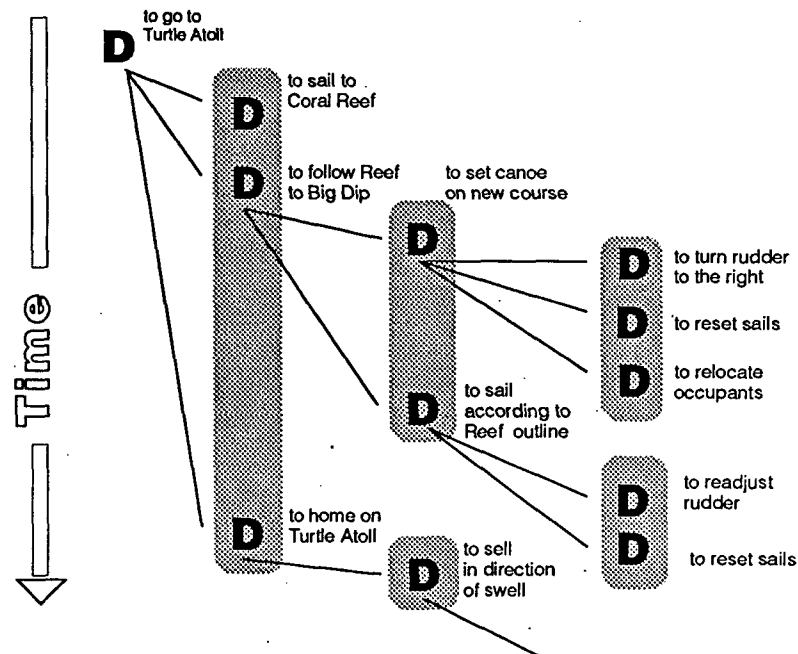
Figure 4.3: Decision plans on the way to Turtle Atoll (Passini, 1984, 65)

composed of three decisions 'to turn rudder', to 'reset sail', and 'to relocate people', These three decisions were finally executed, and the subtask 'to set canoe on new course' was completed.

A distinction should be made between the logical and the temporal organization of decisions. The hierarchical links, that is, the 'in-order-to relation' represent the logical organization; the vertical axis in the diagram corresponds to the time sequence. A plan for a given subtask emphasizes the sequential order to decisions at that level of analysis. A proper sequence can be a prerequisite to the successful execution of a plan. Setting the canoe on a new course is only possible if the three actions composing its plans are effected in a given order.

The structural characteristics of decision plans provide for an insight into how decisions fit together into meaningful sets. An analogy to plans used in the design profession is possible to a certain point. The contract to build a house can be seen as the equivalent of the original decision and task to reach a destination. The general design plan may correspond to the general wayfinding plans of the intermediary decisions, while the working drawings correspond to the lowest plans in

the hierarchy leading to the wayfinding behaviors. (Passini, 1984, 65)

The example of navigator is very clear to set decisions in the hierarchical order but many times decision plans are not clear. People may have a vague initial decision plan and then they can pick environmental information to clarify the sequential order. In these cases, new decisions are worked out only after a previous plan is carried out or plans of two decisions can overlap on each other.

Executing decision plans

Wayfinding decisions such as "to go to Welch Avenue" or "to take a red Cy-Ride" brings a clear image of the Welch Avenue or the Cy-Ride bus system for residents of Ames, Iowa. Similarly, the known information about the environment also creates an image which is called an expected image. Such images create an expectancy of finding, at the appropriate time, a corresponding counterpart in the physical environment. More often an expected image is accompanied by a decision strategy. If the counterpart is found in the environment, then the decision can be executed. If no counterpart is found then the decision cannot be executed and the decision becomes a wayfinding task.

When operating in the familiar environment, a person continuously associates expected images (I^{ex}) with perceived images or representing setting (I^{re}) and executes decisions (See Figure 4.4). This process is an unconscious process as a person can remain unaware of his or her actions and even get absorbed into other thoughts. But when a mismatch occurs, i.e. some familiar landmark is missing, then typically that person will react with surprise. The mismatch forces a shift from an unconscious decision execution process to a conscious decision making process.
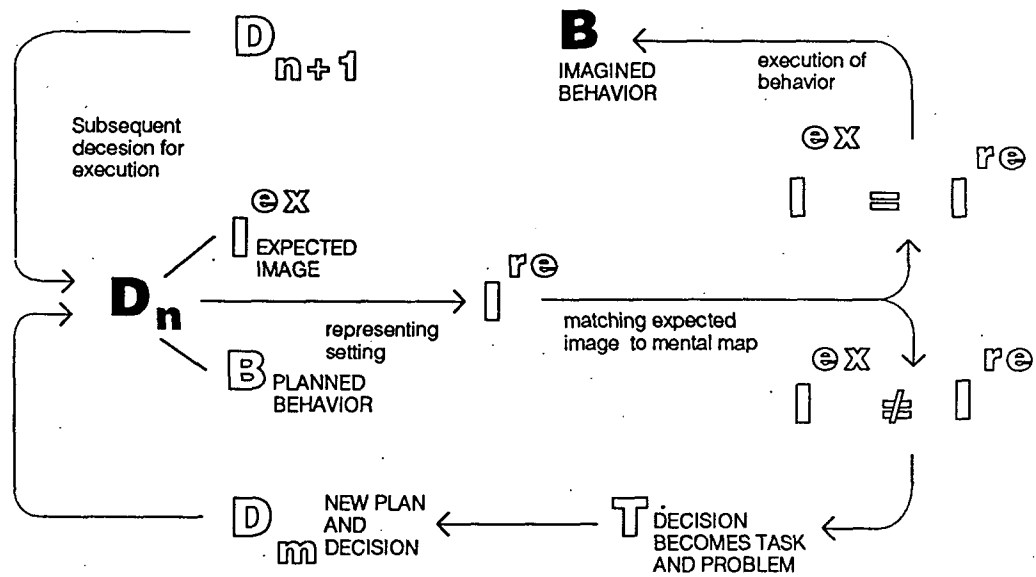
Figure 4.4:   Execution of a decision (Passini, 1984, 74)

Wayfinding styles

Wayfinding methods can be divided into two styles. In the first style, each and every piece of information is obtained from the sign system, whereas in the second style, information is obtained from the setting itself. The sign system is a linear system as a person gets related information from signs or matching expected images with signs in a linear order. The other system is a spatial system. When employing the spatial system, a person depends on the total cognitive map and messages from the spatial settings.

In his experiments, Passini found out that people adhering to the spatial system may find a setting difficult even if the signs are adequate. He has also observed that people who adhere to the linear system may find a setting difficult even if spatial settings are adequate. Sometimes people shift from one system to another or use both systems at the same time to solve wayfinding problems. Passini suggests that designers should take both systems into considerations when designing for information systems.

Visual Notation

In order to apply the knowledge of wayfinding, Passini proposes the use of a notation system. The system of visual notation has been developed to standardize the reporting of behavioral events.

> The perception of the visual world is a dynamic process. Spaces, surfaces, events and their meanings cannot be experienced simultaneously, but must be experienced in some sequence of time. Systematic methods of recording the dynamic organization of space in

buildings and in cities is the principal reason for the development of notation systems. (Sanoff, 1991, 107)

Lynch used visual notations in the study for Image of the City. This notation system has influenced many researchers, designers and planners. In order to understand the sequential experience of architectural and urban spaces, Philip Thiel developed a sequence-experience notation system (Thiel, 1961). The work was stimulated by the discontinuous nature of sketches and photographs. Sketches and photographs, as they represent a static view of any environment, are remote from the actual experience. Therefore to record the continuity of space sequence experiences, Thiel proposed a graphic notation system (Thiel, 1961).

Thiel, therefore, proposed a graphic notation system for recording the continuity of space sequence experience. Based on the concept of visual clues which are environmental qualities that suggest three-dimensionality. Thiel proposed that all cues exist in terms of the visual qualities and quantities of *surfaces, screens,* and *objects.* The experience of space results from the visual perception of light- defined relationships between positions and qualities of surfaces, screens, and objects. The attributes of these space-establishing elements are: position, size, direction, number, shape, color, and texture. Surfaces, screens, and objects categorized in three basic positions; over, side, and defined form (See Figure 4.5). (Sanoff, 1991, 109)

Motation

Motation, which is devised by Halprin in 1965, is another form of the notation system. Motation, which is notation in movement, is derived from dance and helps to understand the environment as we move through it. Motation is also related to animation, where individual pictures are related in time to form apparent

Figure 4.5:   Space-form notation for orthogonal surfaces (Sanoff, 1991, 110)

movement (Halprin, 1965). The motation system, like an animation technique, uses a standardized form. The standardized form, called a frame, can be joined to form a series. Frames, when read vertically from bottom to top, are noted with a series of symbols. These symbols represent forms in landscape such as hills and mountains. Thiel introduced a detailed notation of the perceptual experience that users of the setting have while moving through it (Passini, 1984). The notation system can provide a tool which represents an order according to sequence or time rather than a static view. Halprin argues that the motation system is not a substitute for traditional visual plans and elevations as it produces abstract representations of three dimensional visual experience.

Notation System and Wayfinding

Using Passini's wayfinding method to test or to design an environment, one would need to consider a sequence of decision making during a journey and information sought to make those decisions. Passini proposes a notation system composed of two complementary parts, one reflecting the behavioral, the other the cognitive components.

Behavioral notation

Behavioral notation indicates physical manifestation of the wayfinding route. Behavioral notation gives information about the route of a decision sequence and the locations where decisions are made. An example of a person looking for a restroom in a shopping center illustrates behavioral notation. In order to find a restroom, which is on the lower level of a shopping center, the person must make a

series of decisions which is illustrated in the notation diagram (See Figure 4.6).

Cognitive notation

Cognitive notation, unlike behavioral notation, looks into the prerequisites of behavioral actions. It tries to form an account of behavioral actions. It is also responsible for defining relations among decisions. Cognitive notation represents decision hierarchy and the type of information used to form wayfinding decisions. The cognitive notation chart (See Figure 4.7) illustrates the cognitive notations for the restroom wayfinding problem.

Guidelines to Wayfinding Design

The wayfinding method is described in detail by Passini. He considers it as a complementary method to the traditional design process. The wayfinding guideline is divided into seven parts. The first four steps of the guide are analytical whereas steps five to seven are intended to stimulate the necessary reflection to arrive at a design solution. The seven steps of the guide are as follows:

1. Identification of wayfinding tasks.

2. Identification of a user profile.

3. Identification of wayfinding conditions.

4. Formulating the design requirements (design problems).

5. Planning wayfinding solutions.

6. Identifying environmental information.

7. Synthesis, information system, and optimal location.
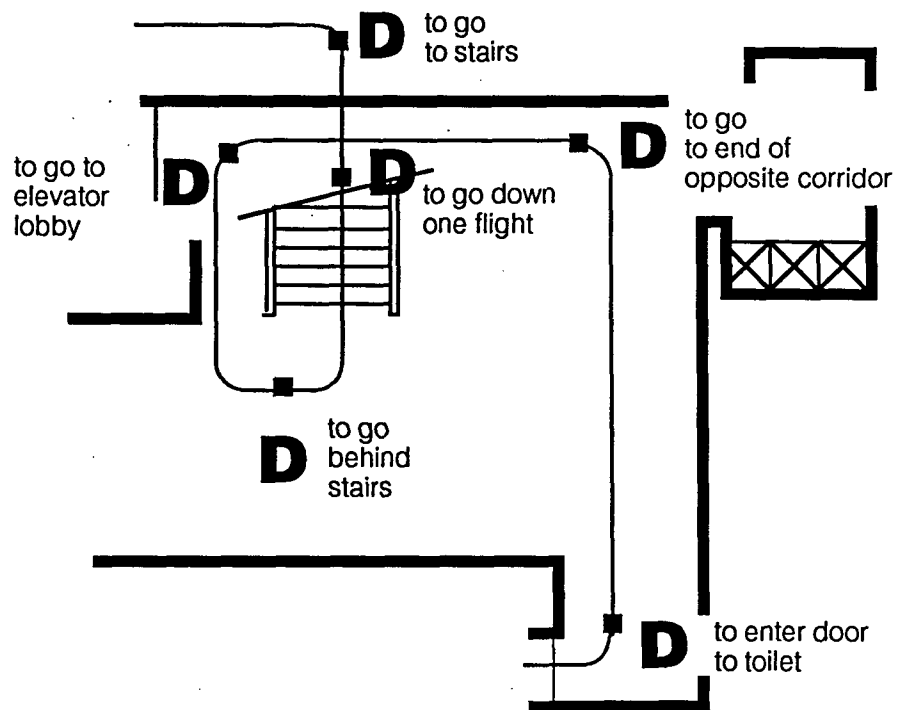
Figure 4.6: An illustration of behavioral notation diagram (Passini, 1984, 167)
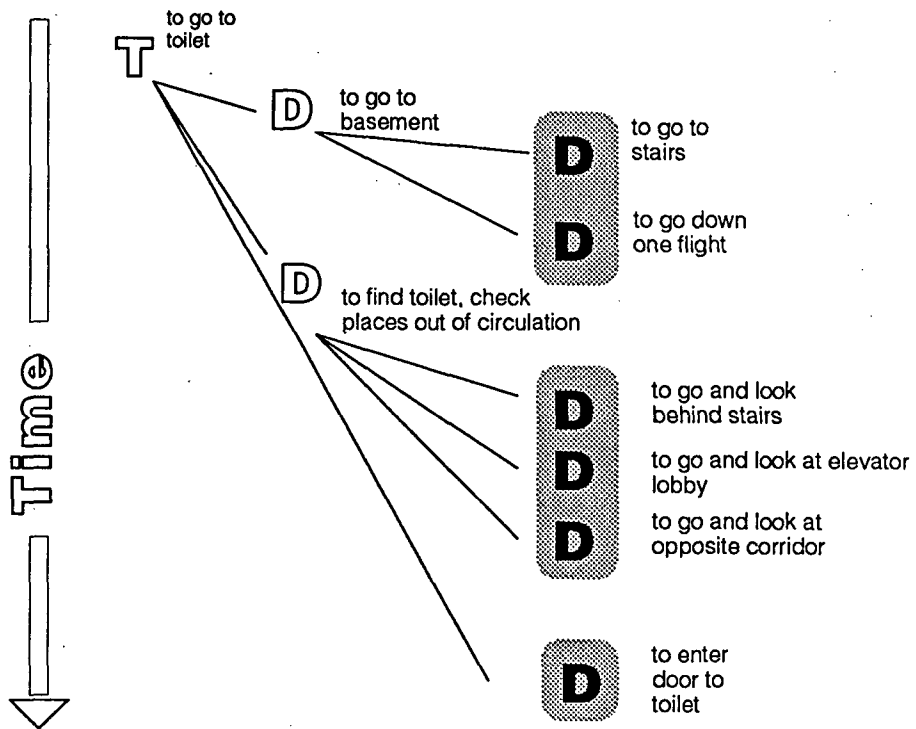
Figure 4.7:   An illustration of cognitive notation diagram (Passini, 1984, 168)

Identification of wayfinding tasks

In any setting there can be infinite wayfinding tasks. It is particularly true in the urban setting. It is almost impossible to account for each and every task, thus they should be regrouped. A designer should identify various districts, paths, and landmarks in the setting. Having identified destination zones of a setting and its major entrances and exits one can formulate the following tasks:

- Reaching one zone from the key access to the setting.
- Reaching one zone from the other.
- Reaching places within the zone.

Identification of user profiles

Since the wayfinding ability varies from person to person, a designer has to identify the type of people solving the wayfinding problem. Knowledge of the setting and the wayfinding ability are key factors in consideration. The wayfinding design would change drastically from the experienced user type to total unknown user type.

Identification of wayfinding conditions

Wayfinding conditions can be broadly characterized as recreational, resolute, and emergency. A designer has to understand the characteristics of a wayfinding condition as the wayfinding design may change for each wayfinding condition. In the recreational wayfinding such as strolling, where pleasure is gained from experiencing the setting, a complex form of setting is required. On the other hand,

in the emergency wayfinding condition, where the time is very critical and reaching the destination is important, the setting should be very simple.

Formulation of design requirements

This step combines wayfinding tasks, user type and wayfinding conditions from previous three steps. A designer identifies relationships between wayfinding tasks (T1,T2,....,Tn), user groups (U1,U2,....,Un), and wayfinding conditions (C1,C2,....,Cn) and formulates design requirements for that zone (See Figure 4.8).

Planning wayfinding solutions

> Wayfinding design can be described as an act of conceiving information systems that allow the user in a setting to reach destinations within acceptable expenditure of time and energy. (Passini, 1984, 177)

In order to identify the required information, a designer has to foresee the wayfinding behavior and determine corresponding decision plans. This process is similar to the standard design process where a designer foresees future activities and plans for them.

The first step is to select the paths a user should take. The selection is preliminary and can be changed later in the process. The designer can then apply the notation system to locate possible decision points. Passini suggests two complementary approaches for the process.

> The first approach may be referred to as being a behavior-driven simulation. We start with the identified behavior and ask ourselves which is the higher order decision leading to that behavior. The second

DESIGN REQUIREMENTS

Major wayfinding tasks   User groups   Wayfinding conditions
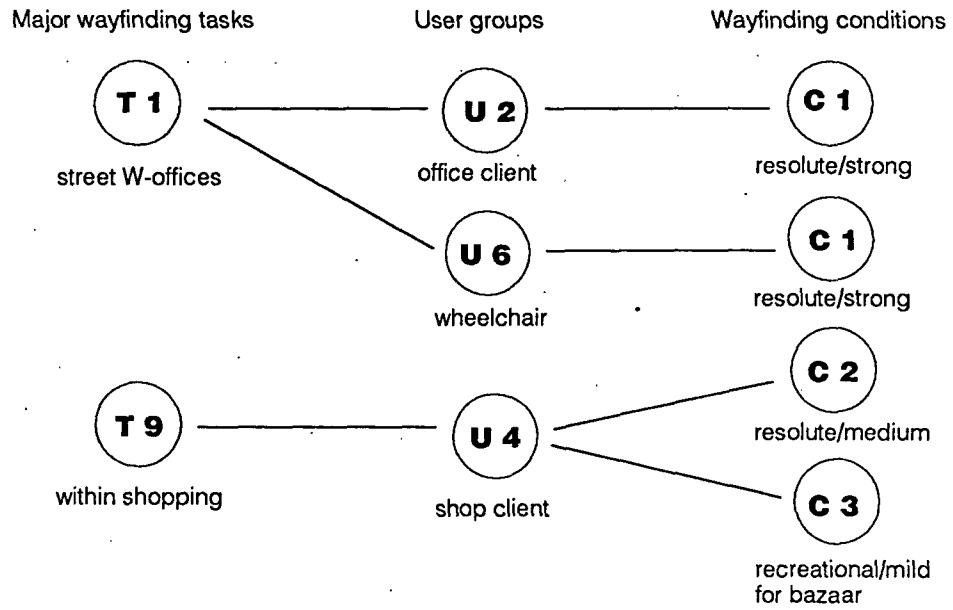
Figure 4.8:   Figure illustrating formulation of design requirements (Passini, 1984, 176)

approach may be called concept-driven simulation. Here we start with the general idea, a 'pre-designed' concept, and conclude from it the appropriate way for the user to go about solving wayfinding problems. (Passini, 1984, 180)

Identifying environmental information

The sixth step plans the supportive environmental information that will help in wayfinding. This information can be presented with two distinct objectives in mind. One is to give the entire plan spaced along the route and the other is to provide a basic plan which will force user to produce his or her own wayfinding strategy. The first objective is important in emergency wayfinding conditions. The second objective can be used in wayfinding conditions other than emergency where people may undertake a wayfinding task to experience the setting. A designer has to judge wayfinding conditions and select which objective is more suitable for the situation.

A designer has to identify whether the information is directly perceived, whether it is a part of collective memory or whether it is an inferred information. In order to be able to describe the necessary information for each decision, Passini proposes a table that differentiates the following information.

1. The no choice situation.

2. The information that can be assumed part of collective knowledge, easily inferred, or memory information (I_m).

3. The sensory information contained in architectural elements and the spatial configuration (I_{Space}).

4. The sensory information accessible through signs, maps, models, information booths, etc. (I_{Signs}).

The actual process of identifying that information is also based on the form of simulation in which designers ask themselves what information would make the user make a given decision (Passini, 1984).

Synthesis, information system, and optimal location

In this step, the designer overlays the information from different wayfinding tasks in order to get a total design picture. The overlay shows which information helps in wayfinding and which routes could be altered to simplify wayfinding. The overlay also shows where that information is needed.

Conclusion

This chapter gives a brief view about the concept of wayfinding and the wayfinding method. The wayfinding method is divided into seven chronological steps. In the process of design, a designer can rotate the process in cyclical manner to get the best results. The method is flexible and can be modified to adapt the design criteria.

In the following chapters, the thesis will apply the method to the selected part of the skywalk system. It will formalize design criteria by defining tasks, user type, and wayfinding conditions. Then the existing setting will be tested to look for drawbacks. Information collected will be used for the design recommendations. Both, the linear and spatial ways of wayfinding will be employed in the method in order to support both types of wayfinding.

CHAPTER 5. APPLICATION OF THE METHOD

Introduction

This chapter explains the test procedure which is used to assess wayfinding difficulties in the skywalk system. The test procedure uses the method described in the Chapter Four. The first three steps of the method are as follows:

- Identification of wayfinding tasks.
- Identification of user profiles.
- Identification of wayfinding conditions.

Identification of Wayfinding Tasks

Wayfinding methodology can be applied to each and every wayfinding task. The study examines the accessibility of the skywalk system and looks only into entrances and exits of the system. Three major ways to get in or to get out of the system are:

1. **To and from fringe parking ramps:** Fringe parking ramps are frequently used by those who prefer to drive. In Des Moines, the skywalk system is well connected with fringe parking ramps. One can park a car in a

parking ramp and use an elevator to reach the skywalk level and then walk from one point in downtown to another without being exposed to the outside climate.

2. **To and from skywalk linked buildings:**   People, who are already inside buildings, which are linked with the system, enter the system by using internal connections. In most skywalk linked buildings the interior corridor passes either through or close to the internal vertical transport of buildings.

3. **To and from sidewalks:**   This way is ventured by those who do not use the other two ways. People from sidewalks, from buildings that are not linked with skywalks, and from Metro Bus service, enter the system from the street level.

Since the study concentrates only on the connection of skywalks with sidewalks, the method is applied to the wayfinding task from the sidewalk level to the skywalk level. Although it is important to study accessibility from skywalks to sidewalks, the study limits itself to the former condition.

Study area

For the purpose of the study, an area was defined inside the skywalk district. Each bridge in the study area is examined by applying the wayfinding method. The study area is defined as the area between Mulberry Street, Grand Avenue, the riverfront, and Eighth Street (See Figure 5.1).

The study area contains major bridges in the skywalk system as well as major commercial buildings, important streets, retail and pedestrian activities. Although
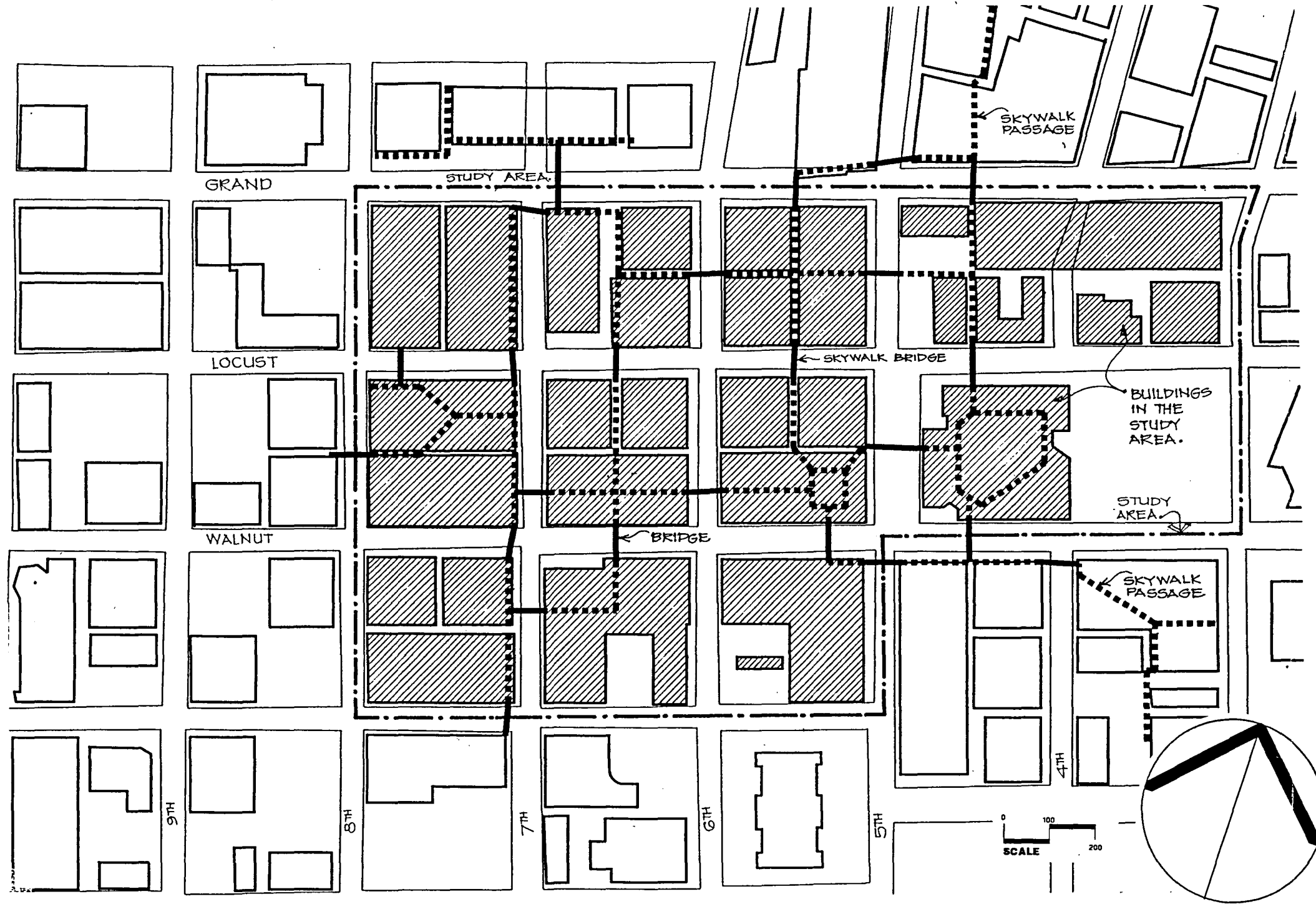
Figure 5.1: Map indicating the study area in Des Moines

some tentacles of the skywalk system run out of the study area, 21 bridges are located inside its boundary.

Bridge identification system

To identify each bridge, an identification code system, referred to as the Bridge Identification System (BIS), was developed by the Des Moines Plan and Zoning department. BIS system helps to identify and locate each bridge in relation to the block in which it exists. Each block in the skywalk system district has been assigned an alpha-numerical identification. This is based on the southern boundary of the district and the river on the East. The numbers, which are referred as block reference numbers, allow potential growth towards the North and the East of downtown (See Figure 5.2). The system is based on the following rules.

- South to North alpha identification begins with "A" at Vine Street, "B" at Cherry Street, "C" at Court Avenue/Mulberry Street and runs towards the Northern area of the skywalk district.

- East to West numerical identification begins with "1" at First Street, "2" at Second Street and runs towards the West as system continues.

The bridge numbers are derived from the block reference numbers and define their span from one block to another. Thus the bridge connecting blocks 5C and 5D is referred to as "5C-5D". In instances where there are more than one bridge connecting any two blocks, it is differentiated by an indication of direction (N,S,E,W) in conjunction with their physical locations on the block. (Des Moines Plan, 1988).

61
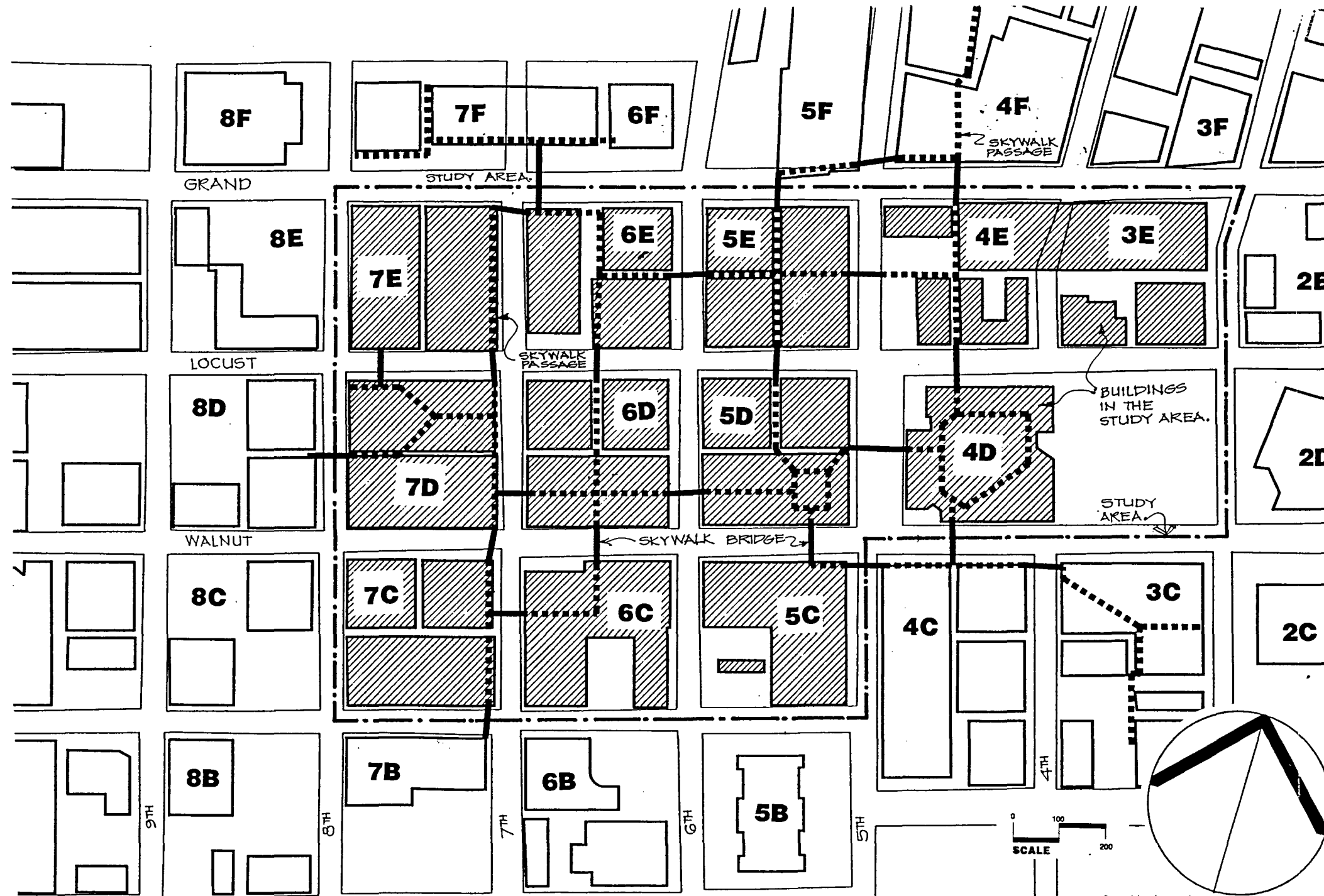
Figure 5.2: Map of study area with block reference numbers

To identify each side of the bridge it was decided to use the block name to which the bridge-end connects and the name of the bridge in the bracket. Thus the side 6D of the bridge 6D-5D was marked as 6D(6D-5D) and the side 5D was marked as 5D(6D-5D).

Identification of User Profiles

Wayfinding ability varies from person to person. Different types of people visit downtowns for different purposes. They can be either from downtown, or other parts of the city, region, country and world. Due to the diversity of user profiles, it is difficult to identify user profile of each and every person. However, they can be classified into three broad groups based upon level of experience with the Des Moines skywalk system.

U1. Expert user

The expert user type is well conversant with the skywalk system. Users in the category know almost all parts of the system. If left in an unknown part of the system, they can easily figure a way out. Users depend more on memory information (I_m) than on spatial information (I_s) as they know the setting well. If questioned about accessibility problems, they might answer that the system is easily accessible. People who work in skywalk system or use the system extensively, can be considered in the category. The expert user has fully developed cognitive maps of the system with all expected images. In the process of wayfinding, the expert user matches all expected images with actual images without much conscious effort.

U2. Acquainted user

People in this group have some knowledge about the skywalk system, as they have used the system before. This user group also contains people who are used to a part of the system. People who work in the downtown area or visit sometimes for shopping or business, may fall in this category. The acquainted user has partially developed cognitive maps and sketchy expected images. He or she relies on both memory and spatial information and in the process require some conscious effort to find their way in the environment.

U3. New user

People in this group usually are visiting downtown for the first time. They might have little or no knowledge of the system. Newcomers to a setting experience difficulties since they do not have a coherent cognitive map. If the setting is completely unfamiliar, then the users will neither be able to rely on pre-established images in their search for information nor will they be able to rely on plan schemata to guide initial behavior. The users might have gained some information about the system from information brochures. This information can be transformed into an expected image by the process of visualization. Since expected images are in abstract forms, this group depends more on spatial information to make correct wayfinding decisions. The wayfinding process can create mental fatigue and force the new user to abolish the process as they are doing a conscious effort to match their expected images with the settings.

Other user types

Certain user types, such as elderly, may have specific information processing difficulties, which can stem from reduced visual acuity, unfocused attention, and memory loss. Some elderly as well as children may pay less attention to conventional signs. On the other hand, some other types, such as physically handicapped people, may have enormous physical difficulty in the wayfinding process.

It is important to test the accessibility of the system for user group U3 as this group builds cognitive images of the system by going through the conscious wayfinding procedure. Also, we can assume that if the skywalk system is accessible for the new user group then it can be easily accessible to other user types. Although we recognize that study of wayfinding difficulties for physically handicapped, elderly and children is also important, this study limits itself to the user type U3.

Identification of Wayfinding Conditions

Wayfinding conditions can be broadly classified as recreational, resolute and emergency. Trekking and hiking are two examples of the recreational wayfinding whereas fire-escapes and freeway driving are examples of the emergency wayfinding. In recreational wayfinding, a person depends more on spatial information as he or she has more time to explore different alternatives by trying them. In recreational wayfinding, pleasure is gained from the experience of the setting and it is more important than to reach the destination. On the contrary, in the emergency wayfinding condition, all that counts is to reach a destination easily and in shortest possible time and wayfinder depends more on directional information to save time.

Wayfinding condition in the skywalk system can be considered as a resolute

condition. Although getting in or out of the system is not an emergency procedure, it is important to find the desired destination within a certain amount of time. It is possible that one may lose interest in wayfinding and give it up after initial failures. On the other hand, the system should give suitable opportunities to the wayfinder to generate cognitive maps and images. One can also enjoy an urban setting by exploring it. Thus the importance of spatial wayfinding as well as sign information is essential in the skywalk wayfinding. This study attempts to evaluate both, the spatial and sign information types.

Test Case

It was decided to try the method on one of the bridges to test the method itself before testing the remaining bridges. The test case helped to understand and to refine the test method. The following part of the section explains the test procedure in detail.

Location

The skywalk bridge 6D-5D was selected for the initial test. The bridge connects two blocks of the 'Kaleidoscope at the Hub' building. The bridge is an important step in the development of the Des Moines skywalk system for its use and location as well as its design. It runs parallel to the Walnut Street Mall and crosses over Sixth Street (See Figure 5.3).

The skywalk bridge, which is designed by Cal Lewis of Charles Herbert and Associates, is forty-five feet wide. It contains two 10-foot-wide aisles and between them, a 25-foot-wide kiosk occupied by Valley Florist and Gift Shoppe. Lewis
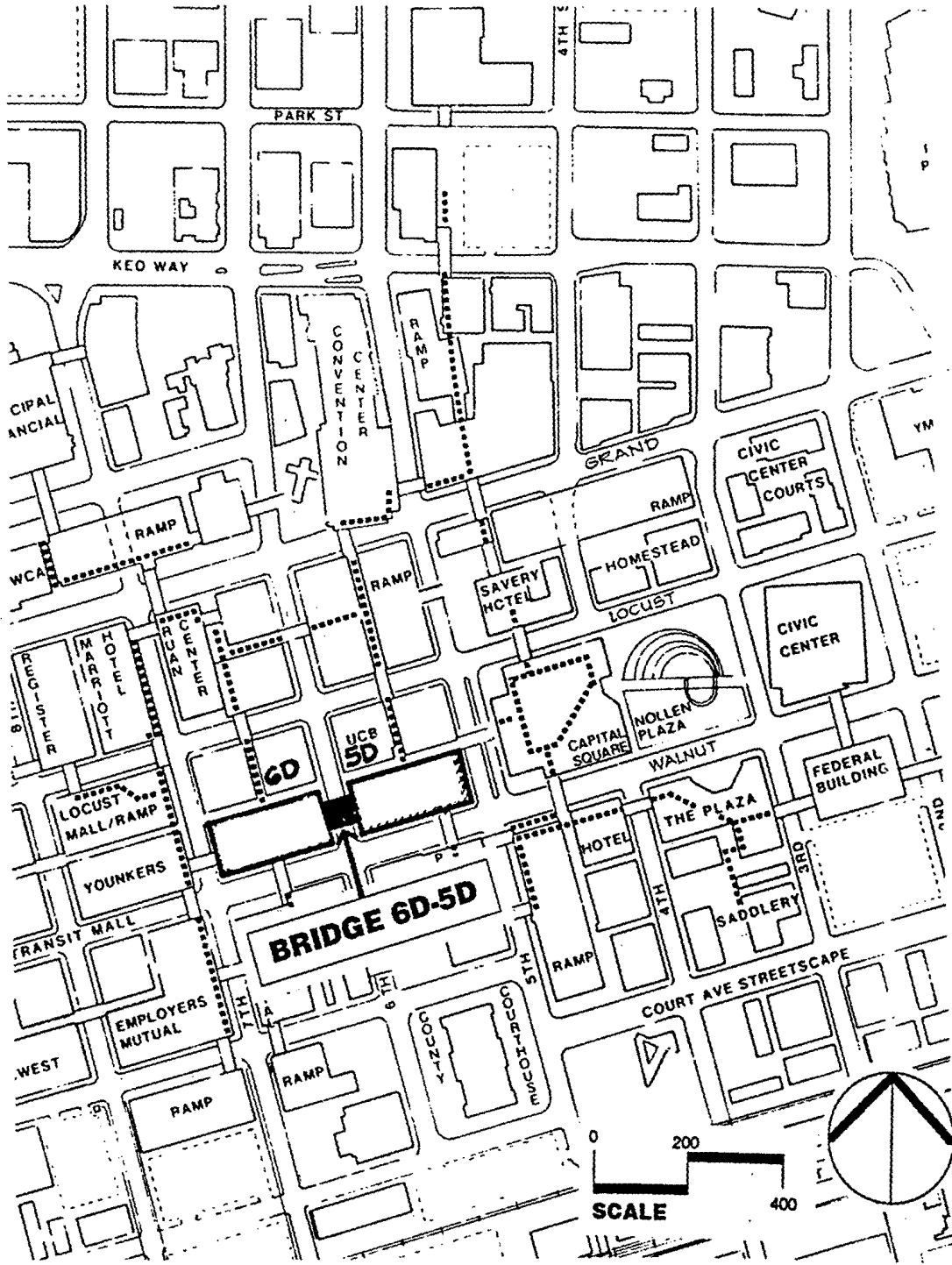
Figure 5.3: Location of bridge 6D-5D

designed four brick-faced towers to visually support the horizontal mass of the bridge. The towers are designed to celebrate the intersection of building and pathway as they mark the center of the downtown (Kamin, October 1985).

Observer type

It was decided to test the bridge by simulating a possible wayfinding process which one might undertake when looking for the way to get in. The author decided to undertake the procedure by assuming the role of a visitor in the process. The author is familiar with the skywalk system. He decided to simulate the way of thinking of the user type U3. He posed questions such as "what the user type U3 would decide in this situation?" or "what type of information was the environment giving?". The description of the simulation process explains settings for the decision, type of the decision and the influence of memory (I_m) or spatial (I_s) information on the decision.

Wayfinding process

The task "T" is "to go to the skywalk level" from the sidewalk level (See Figure 5.4). In order to go to the skywalk level, the visitor has to locate the skywalk system. Hence the visitor makes the first decision D_1–to locate the skywalk system.

First decision loop The first decision is taken with help of memory information (I_m) that the skywalk system is situated in the particular area of the downtown. As the visitor makes decision D_1 and looks around, an expected image of the skywalk system has already formed in his/her mind. The expected image is

6D-5D KALEIDOSCOPE AT THE HUB.

TIME

T — to go to skywalk system.

D 1 — to locate the skywalk system

D 1.1 — to go near the bridge

D 2 — to find vertical connection (VtC)

D 2.1 — to look for a VtC from sidewalks

D 2.2 — to look for a VtC from building

D 2.2.1 — to go inside the building

D 2.3 — to go to the stair

D 3 — to go upto the skywalk level

H 1 — No Action No sign of any access from the street or sidewalks.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	View of the entry door below bridge.	
	View of the stair going up.	
	View of the Skywalk passage at upper level.	

Figure 5.4: Decision chart for the bridge '6D-5D'

N

SCALE
0   100   200

WAYFINDING AT BRIDGE '6D-5D' (SKYWALK LVL.)

WALNUT STREET

6D
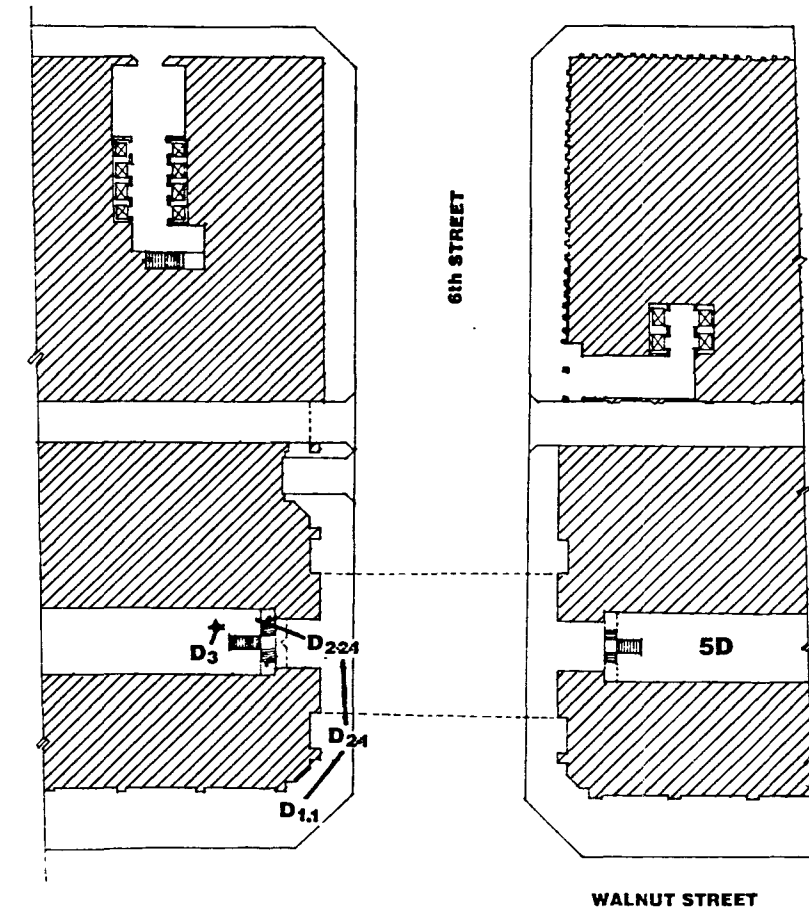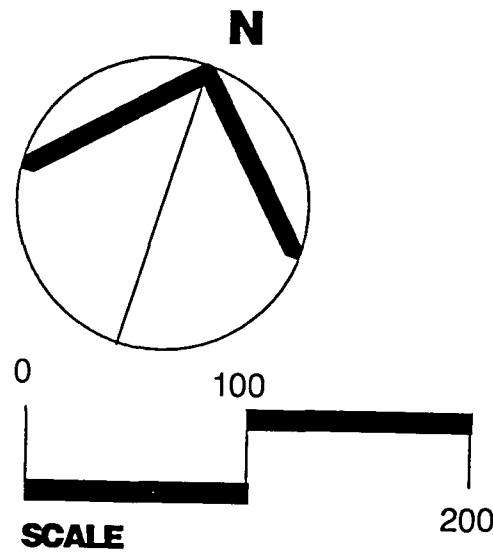
WAYFINDING AT BRIDGE '6D-5D' (STREET LVL.)

6th STREET

WALNUT STREET

D3   D2.2.1   D2.1   D1.1   5D

formulated with the help of I_m. As the visitor locates the skywalk bridge, both images, expected as well as perceived image, are matched. The visitor proceeds to the next decision, $D_{1.1}$, to go near the bridge. As the visitor implements the decision by walking towards the bridge, all the requirements for D_1 as well as the first decision loop are completed.

The first decision loop takes place because the author simulated user type U3. It is also possible that visitor may spot the bridge first and then decide to go up to the skywalk level. In this scenario the first loop will not occur.

Second decision loop   In order to complete the task "to go to the skywalk level", the visitor must find a vertical connection from the sidewalk level to the skywalk level. Therefore, the visitor makes the third decision "to find a vertical connection". This decision is a second primary decision hence denoted as 'D_2'. The decision D_2 is influenced by the fact that skywalks run one floor above the street level. At this time the visitor has expected images of some common forms of vertical connection, such as a stair, an elevator, an escalator, or a ramp.

The first thing that comes to visitor's mind is to look for a direct connection from the street itself. Common knowledge tells that an access to a public space or a public way is usually located from another public space. This information leads the visitor to take a secondary level decision, $D_{2.1}$, to look for a vertical connection from the sidewalks. At this point the visitor refines the expected image by incorporating some more information and now expects a vertical connection directly from the street.

In the case of the bridge 6D-5D, the visitor fails to locate any vertical

connection which is visible and accessible from the sidewalk (See Figure 5.5 and Figure 5.6). The towers of the skywalk bridge symbolically suggest vertical movement, but does not provide a physical connection. Since expected images and perceived images do not match, the visitor cannot make any decision to go up. Instead of making the decision, which could have been executed to end the search, the visitor must go back to memory information and looks for a different approach. This situation is referred to as an architectural barrier by Prof. Passini (Passini, 1984).

The visitor then decides to look for a vertical connection inside the building. The decision is marked as $D_{2.2}$ because it is another secondary decision made in order to implement D_2. This decision is influenced by the memory information that since the skywalk bridge penetrates the building and also buildings have some kind of vertical connection, one can use them to reach the skywalk level.

To execute the decision $D_{2.2}$, the visitor must go inside the building. Thus, another tertiary decision, $D_{2.2.1}$, to go inside the building, is made. This decision is executed immediately as the visitor can now locate an entrance door of the Kaleidoscope Mall right below the skywalk bridge. The visitor goes inside the mall with expected images of vertical connection. But instead of expecting it outside the building, he/she now expects it inside the building. The visitor enters the mall building and looks for matching actual image.

When the visitor enters the building, a staircase located next to the entrance door is visible. At this point, the expected image of the vertical connection matches with the perceived image of the staircase and requirements for the decision $D_{2.2}$ are accomplished. The visitor makes the next obvious decision, $D_{2.3}$, to go to the stair.

Figure 5.5:   View of the bridge 6D-5D from the street level
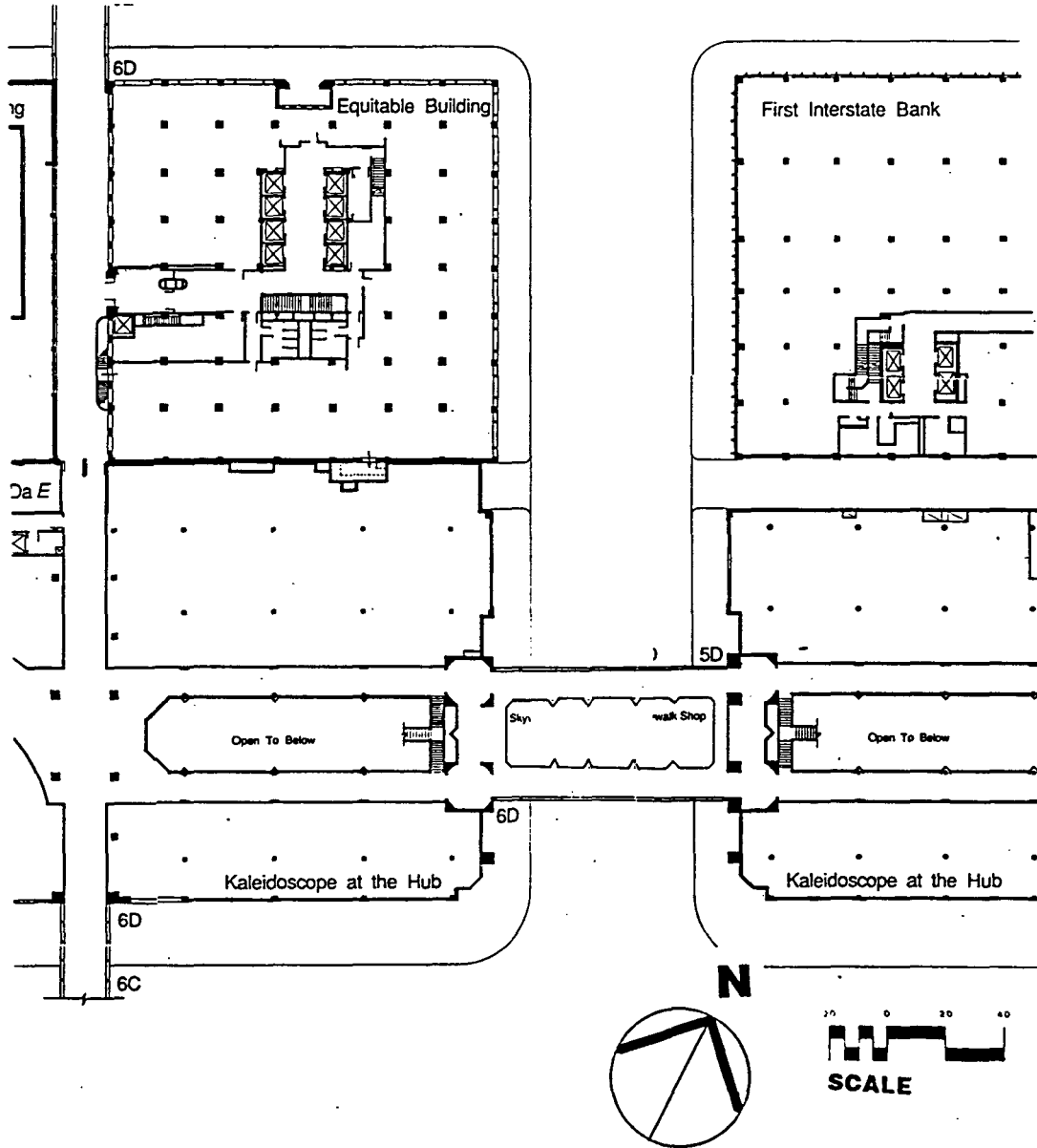
Figure 5.6: Skywalk level floor plans at '6D-5D' (Des Moines Plan, 1989)

When the visitor goes near the staircase, all requirements of the decision D_2, to find a vertical connection, as well as the second loop are completed.

Third decision loop   At this point, the visitor can see the upper level of the Kaleidoscope Mall as well as shops, retail activities. Since the visitor has already completed the second loop, the last primary level decision D_3 "to go up to the skywalk level" is taken. After executing the last decision the visitor arrives on the skywalk level and the task T, "to go to skywalk system", is completed.

Architectural Barrier

When the visitor encounters a situation where the decision is not implemented due to the inability of the designed environment to provide necessary spatial information, then the situation is referred to as an architectural barrier. The architectural barrier forces the wayfinder back to their memory information and to use an alternate wayfinding strategy (Passini, 1984).

An architectural barrier is a hurdle in the wayfinding process and it can force people to abandon the wayfinding process itself. Whether anyone will stop looking for an alternative or not will depend on the user and the wayfinding conditions. The probability of abandoning the process is likely to be found more in the user type U3 than in either types U1 or U2. In an emergency wayfinding condition, a person will look for an alternative, as reaching the destination is critical. Whereas in recreational wayfinding, a person will not seek for alternates as reaching the destination is not very critical. In order to save wayfinding time and the wayfinder's energy, it is important to reduce architectural barriers.

Although, in the test method we encountered only one architectural barrier, the other bridge-ends have more than one barrier. Architectural barriers are also called hurdles as they complicate the wayfinding process. Some hurdles are too difficult to overcome whereas others confuse wayfinders. Hurdles are denoted as H_1, H_2, H_3,...., H_n.

Decision Charts

Decision charts explain the wayfinding process undertaken by the visitor. One chart is used for one side of a bridge. A typical decision chart plots all decisions in the wayfinding process against time. The chart also indicates the hierarchy of decisions. The hierarchical pattern is based on the logic of an "in order to" relationship among decisions. Some decisions, which do not initiate physical actions, are indicated as hollow or outlined characters. On the other hand, some decisions are indicated as bold and filled characters as visitor executed them in the form of some physical action (See Figure 5.7). For example, in the case of the bridge 6D-5D, the visitor makes decision D_1 first and then $D_{1.1}$. Thus $D_{1.1}$ is marked below D_1 as variable time moves from top to bottom. $D_{1.1}$ is made in order to fulfill requirements of D_1 thus it is linked with D_1. Since the visitor acts and executes $D_{1.1}$, it is indicated as a bold character whereas D_1 is indicated as an outlined character. All those decisions, which are shown in bold characters, are indicated in the schematic floor plans.

Each chart is identified with the bridge name, the relevant side, and the name of the attached structure. The bold characters in the bridge-name identify the relevant side and outlined characters indicate opposite side. In the sample case of

GRAPHIC SYMBOLS USED IN DECISION MAKING CHARTS.

1. Bridge-end identification:

4F - 4E = 4F(4F-4E) Side 4F of the bridge 4F-4E.

4F - **4E** = 4E(4F-4E) Side 4E of the bridge 4F-4E.

2. Decision identification symbol:

D_i Decision D_i which do not initiate
any physical action.

$D_{1.1}$ Decision $D_{1.1}$ which is executed in the form
of a physical action. These decisions can be
traced on the map.

T Tast T

D_i Description of the
decision.

$D_{1.1}$ Description of the
decision.
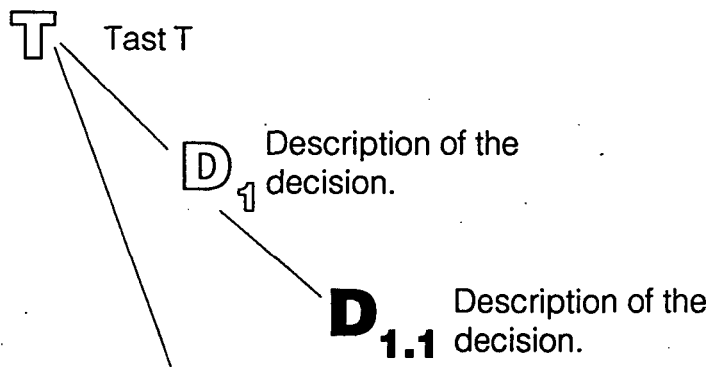
Typical form of decision chart.

Figure 5.7: Graphic explanation of decision charts

6D-5D, both sides are indicated with bold characters as the decision chart is applicable to both sides of the bridge. The side 5C(5C-4C) is indicated with the bold letter 5C and the hollow letter 4C.

Decision charts are accompanied by a table which give information about the type of information used in the decision making process. Information is categorized in three groups. They are memory information (I_{Memory}), spatial information (I_{Space}), and information from signs and maps ($I_{Signs,maps}$). When comparing a chart and a table, one can pick the necessary information by tracing the horizontal line of the decision. Architectural barriers are indicated next to the decision as H_1, H_2. A small note next to the barrier mark gives more information about the hurdle.

The sample test helped to modify the study. Although two other type of charts were considered for illustration of the method, Prof. Passini's way of representation was adapted for the rest of the study. The study area contains twenty skywalk bridges and the method is applied to both sides of all those bridges so as to generate forty wayfinding charts. The rest of this chapter briefly explains wayfinding procedures in all bridge-ends.

Results of the Wayfinding Method

Each bridge in the skywalk system connects two structures by spanning the road which separates them. The wayfinding method is applied to one side of a bridge at a time. Each side is then grouped according to the number of architectural barriers in the wayfinding process. These groups are as follows.

1. No barrier group

2. Single barrier group

3. Two barriers group

4. Three or four barriers group

5. 'n' barriers group

No barrier group

The no barrier group contains bridge-ends which do not have an architectural barrier in the wayfinding process. Bridge-ends 4C(5C-4C) and 6F(6F-6E) fall under this category.

1. **6F(6F-6E) Grand Avenue Parking Ramp:** (See Figure 5.8) In this case, block 6F houses the Grand Avenue Parking Ramp. As this parking ramp serves the entire downtown, connection to the skywalk system is essential. The bridge is perpendicular to the facade and to the internal passage. Two elevator shafts are located, near the junction of the facade and the bridge. Elevator shafts are built as an independent vertical structure. The skywalk bridge, first meets the elevator shaft and then the building.

   As the visitor undertakes the wayfinding process to complete the task T, to go to skywalk system, the first decision loop is completed. The decision $D_{1.1}$, to go near the bridge, is made and as a result, the visitor walks towards the bridge.

   The second decision loop starts with the decision D_2 "to find a vertical connection". This decision is made because the visitor has some knowledge

6F-6E GRAND AVE PARKING RAMP.

to go to skywalk system.

T

to locate the skywalk system

D
1

to go near the bridge

D
1.1

to find vertical connection (VtC)

D
2

to look for a VtC from sidewalks

D
2.1

to enter the glass door of the foyer

D
2.1.1

to go to elevator lobby

D
2.1.2

to go upto the skywalk level

D
3

TIME

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space		
	View of vertical mass with elevator shaft & door to foyer.	View of the skywalk sign on the door.
	View of elevator doors.	Skywalk entrance sign on elevator doors.
	Elevators going up.	Skywalk entrance sign on elevator doors.

Figure 5.8: The decision chart of bridge-end 6F(6F-6E)

N

0   100   200

SCALE

WAYFINDING AT BRIDGE '6F-6E' (SKYWALK LVL.)

GRAND

6F

6E

GRAND AVENUE

D 1.1

D 2.1.1

6F

D 2.1.2   D 3

6E

7th STREET

WAYFINDING AT BRIDGE '6F-6E' (STREET LVL.)

that the system runs at the second floor level. This decision is also supported by the view of the elevated skywalk bridge. At this point the first thing that comes to the visitor's mind is to look for a vertical connection from the sidewalks. Thus, the first secondary decision of the second loop, $D_{2.1}$, is made in order to fulfill requirements of D_2.

As the visitor looks around for a vertical connection, the vertical mass of elevator shafts is visible. Since the vertical mass connects sidewalks with the skywalk level, it is obvious that it provides an access to the skywalk bridge. The visitor also sees the glass door that leads to a glass foyer and a sign indicating the skywalk entrance. Since all these visual clues support the earlier decision $D_{2.1}$, the visitor makes another decision $D_{2.1.1}$ "to enter the glass door of the foyer". This decision is marked $D_{2.1.1}$ as it is a tertiary level decision which is made in order to fulfill the requirements of $D_{2.1}$.

Now the visitor, who is inside the foyer, can see elevator doors. Thus the second tertiary decision $D_{2.1.2}$, "to go to elevator lobby", is made in order to fulfill the requirements of $D_{2.1}$.

After executing the decision $D_{2.1.2}$, all requirements of $D_{2.1}$ as well as D_2 are fulfilled as the visitor locates a vertical connection with the skywalk level. The next decision D_3, to go up to the skywalk level, is made and executed since the visitor is in front of elevator doors and the skywalk entry sign is posted near the door. After executing this decision, the visitor reaches the skywalk bridge and the wayfinding task is complete.

In the above wayfinding process, the visitor does not encounter any architectural barrier as he/she gets all visual clues to support the decision sequence. Since the environment provides all necessary information, the visitor merely matches all images and executes the decision sequence. Thus we can say that the architectural barrier index or hurdle index in the wayfinding process is zero.

2. **4C(5C-4C) Parking Ramp:** In the case of bridge (5C-4C), the wayfinding process is similar to that of 6F(6F-6E). The only difference is after executing decision $D_{2.1.1}$, "to enter the door of foyer", the visitor arrives at a point close to the elevator. This avoids one more decision and completes the second decision loop so that the visitor can make the next decision D_3 "to go up to the skywalk level".

One barrier group

One barrier group is comprised of all those bridge-ends which have only one hurdle in the wayfinding process. Although all bridge-ends in the group contain one and only one hurdle, they are located in different parts of the wayfinding process. Therefore, bridge-ends are further classified into subgroups according to type of hurdles. The subgroups are confusion group and no action group.

Confusion group   The first subgroup contains five bridge-ends, 7C(7C-7D), 6C(6D-6C) 4E(4F-4E), 5E(5E-4E), and 5E(5E-5D). Hurdles in this group do not stop the wayfinding process but confuse people by providing contradictory information. Some people may get so confused that they may not continue with the

process whereas some may overcome these hurdles and march ahead.

1. **7C(7C-7D) Stearns Building:**   (See Figure 5.9)   The bridge 7C-7D spans the Walnut Mall and connects the Younkers store with the Stearns building.

   In this case, a vertical connection in the form of a stair is visible from the sidewalk. This spatial information helps the visitor after making the decision $D_{2.1}$, "to look for a vertical connection from sidewalks". The visitor, at this point locates the staircase as well as its access from a glass enclosed foyer. But in order to get inside the foyer, one has to go inside the neighboring shop's entrance lobby and then open the foyer door. Hence the next decision $D_{2.1.1}$, to go to stair by using shop door, is made. Access to the foyer, which is from the shop, is controlled by the shop management. For some people an entrance through a private property may not appear as a public entrance and they may not go inside. Since the entrance is controlled by shop owners, it may create confusion and become a hurdle in the wayfinding process. This hurdle does not stop the wayfinding process but creates confusion. Obviously this hurdle can stop the wayfinding process if the shop is closed.

2. **6C(6D-6C) Midland Financial:**   (See Figure 5.10)   In the case of 6C(6D-6C), the visitor locates the stair inside a bank foyer after making decision $D_{2.1}$. The stair, though visible from outside, is accessible only from the Midland Financial Building foyer. Thus the decision $D_{2.1.1}$, to enter the bank foyer, is made. The visitor makes the decision and looks for a way to get inside the bank foyer. The bank entrance door is the only entrance to the

7C-7D STEARNS BUILDING.

	Memory	Space	Signs, Maps
	Skywalk system is in downtown.	View of the Skywalk bridge.	
		View of the Skywalk bridge.	
	Skywalks run at second floor lvl.	View of the elevated bridge.	
	Public access from a public space.		
		View of a small stair inside glass room and its access from the shop.	
		Stair going up to skywalk level.	Skywalk entrance sign.

T — to go to skywalk system.

D$_1$ — to locate the skywalk system

D$_{1.1}$ — to go near the bridge

D$_2$ — to find vertical connection (VtC)

D$_{2.1}$ — to look for a VtC from sidewalks

D$_{2.1.1}$ — to go to stair by using shop door

H$_1$ — Confusion. Though stair is visible, one has to go through a shop door to get to it.

D$_3$ — to go upto the skywalk level

TIME

Figure 5.9: The decision chart of bridge-end 7C(7C-7D)

WAYFINDING AT BRIDGE '7C-7D' (SKYWALK LVL.)

WAYFINDING AT BRIDGE '7C-7D' (STREET LVL.)

WALNUT STREET

7th STREET

7C

7D

N

SCALE

0   100   200

6D-6C MIDLAND FINANCIAL.

TIME

T to go to skywalk system.

D₁ to locate the skywalk system

D 1.1 to go near the bridge

D₂ to find vertical connection (VtC)

D 2.1 to look for a VtC from sidewalks

D 2.1.1 to enter bank foyer

D 2.1.1.1 to enter bank door to go to the foyer

D 2.1.2 to go to the stair

H₁ Confusion. Bank door is away from the stair but visitor can see the stair from outside.

D₃ to go upto the skywalk level

∎ Memory	∎ Space	∎ Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
	View of the stair going to skywalk level.	
	Bank foyer is the only door to get in.	
	Stair is located inside the foyer.	
	Stair going up and connecting upper level.	Skywalk sign near the stair.

Figure 5.10:   The decision chart of bridge-end 6C(6D-6C)

N

0   100   200

SCALE

6C

6D

WALNUT STREET

7th STREET

WAYFINDING AT BRIDGE '6D-6C' (SKYWALK LVL.)

D₂₁₂

D₂₁₁₁

6C

D₃

6D

D₁₁

WALNUT STREET

7th STREET

WAYFINDING AT BRIDGE '6D-6C' (STREET LVL.)

foyer so the visitor makes another decision $D_{2.1.1.1}$, to enter the bank entrance door, and executes it. The decision $D_{2.1.1.1}$, which is a fourth level decision, is made in order to fulfill requirements of $D_{2.1.1}$ and $D_{2.1}$. Once inside the foyer, the rest of the process is simple.

In the above case we do not find "no access" situations, but the location of the bank door away from the bridge and the stair may create confusion. The visitor is aware of the staircase and can go through all the extra steps. If provided with a direct access, the visitor may complete the same task a lot faster and more effectively. Although the visual clue of the stair helps in the process, sign information is not available until the decision D_3.

3. **4E(4F-4E) 4th Street Parking Ramp:**   (See Figure 5.11)   In the case of the parking ramp connection, a staircase is visible from the sidewalks. A skywalk sign is also posted near the door which supports the decision making process. The staircase is located in between vehicular entrances and exits which may keep many pedestrians away. Also, the character of the staircase, which is designed as a fire-escape, may not necessarily invite pedestrians to use it. This may create a hurdle that may stop the wayfinding process but may create more confusion in the process.

4. **5E(5E-4E) Parking Ramp:**   (See Figure 5.12)   The wayfinding process is similar to that of 4E(4F-4E). Both the staircase and the elevator is located next to the bridge. Although, the visitor locates the vertical connection after making the decision $D_{2.1}$, the design as well as the placement of the staircase may create confusion. The staircase and the elevator are placed next to the

4F-4E 4th ST. PARKING RAMP.

T to go to skywalk system.

D$_1$ to locate the skywalk system

D$_{1.1}$ to go near the bridge

D$_2$ to find vertical connection (VtC)

D$_{2.1}$ to look for a VtC from sidewalks

D$_{2.1.1}$ to go to stair

D$_3$ to go upto the skywalk level

H$_1$ Confusion. Though stair is visible with signs, it is rather designed as a fire escape than skywalk entrance.

TIME

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
	View of a stair next to the bridge. Stair is visible thanks to glass curtain wall.	Skywalk entrance sign.
	Stair going up to skywalk level.	Skywalk entrance sign.

Figure 5.11: The decision chart of bridge-end 4E(4F-4E)

WAYFINDING AT BRIDGE '4F-4E' (SKYWALK LVL.)

WAYFINDING AT BRIDGE '4F-4E' (STREET LVL.)

N

SCALE 0 100 200

5E-4E PARKING RAMP.

TIME

T — to go to skywalk system.

D₁ — to locate the skywalk system

D 1.1 — to go near the bridge

D₂ — to find vertical connection (VtC)

D 2.1 — to look for a VtC from sidewalks

D 2.1.1 — to try to use the elevator.

H₁ — Confusion. Location of the stair is rather odd for a pedestrian entrance.

D 3 — to go upto the skywalk level

I Memory	I Space	I Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
	Vertical elevator shaft & View of the door in the alley.	Skywalk sign near the staircase door.
	Staircase going up.	Skywalk sign.
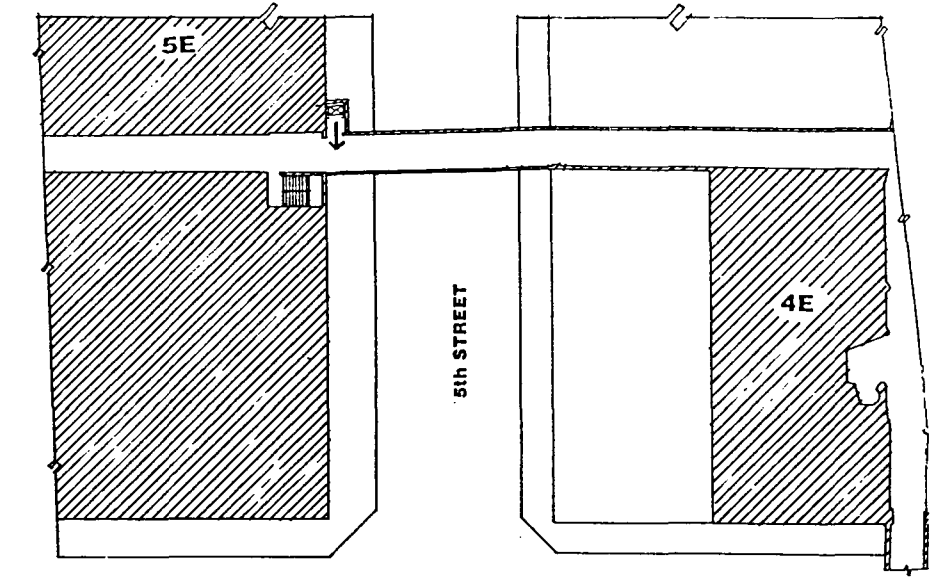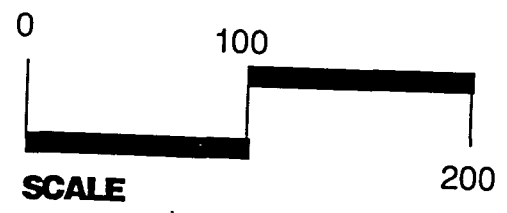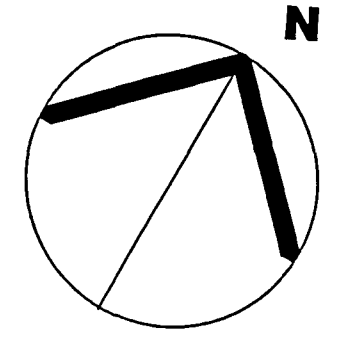
Figure 5.12:   The decision chart of bridge-end 5E(5E-4E)

N

0   100   200

SCALE

5E

5th STREET

4E

LOCUST STREET

WAYFINDING AT BRIDGE '5E-4E' (SKYWALK LVL.)

5E

D₃

D 2.1.1

D 1.1

5th STREET

4E

LOCUST STREET

WAYFINDING AT BRIDGE '5E-4E' (STREET LVL.)

alley and they are flanked by parking ramp vehicular entrances. Also this vertical connections are designed as a fire-escape staircase for the benefit of the parking ramp users rather than the pedestrians. The hurdle is categorized in the confusion group since it creates confusion in the process. The hurdle does not block the wayfinding process.

5. **5E(5E-5D) Parking Ramp:** (See Figure 5.13) The wayfinding process of the bridge-end is similar to that of bridge-end 5E(5E-4E).

No action group Architectural barriers in this category do not allow wayfinder any choice other than to go back one step to the memory information (I_m) and think about another strategy. Four bridge-ends, which are grouped in this category, are 6D & 5D(6D-5D), 5D(5D-5C), and 5F(5F-5E). The wayfinding process of the bridge 6D-5D is already explained as the sample test.

1. **5D(5D-5C) Kaleidoscope at the Hub:** (See Figure 5.14) In the wayfinding process of bridge-end 5D(5D-5C), where the skywalk bridge enters the Kaleidoscope at the hub after bridging the Walnut Transit Mall. The visitor successfully completes the first decision loop and enters the second loop after making the decision D_2 "to find a vertical connection".

   The first step is $D_{2.1}$ "to look for a vertical connection from the sidewalks". When the visitor looks at the connection between the Hub and the bridge, he/she could neither locate any form of a vertical connection nor any clue of where it might be. At this point, the expected image of the vertical connection does not match with the perceived image. Thus the first mismatch occurs. The architectural barrier, which causes the mismatch, forces the

5E-5D PARKING RAMP.

TIME

T — to go to skywalk system.

Ⓓ₁ — to locate the skywalk system

D1.1 — to go near the bridge

Ⓓ₂ — to find vertical connection (VtC)

Ⓓ₂.1 — to look for a VtC from sidewalks

D2.1.1 — to try to use the stair.

H₁ Confusion. Location of the stair is rather odd for a pedestrian entrance.

D2.2 — to open the staircase door

D₃ — to go upto the skywalk level

Memory	**Space**	**Signs, Maps**
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
	View of the door in the alley.	Skywalk sign near the staircase door.
		Skywalk sign near the staircase door.
	Staircase going up.	Skywalk sign.

Figure 5.13:   The decision chart of bridge-end 5E(5E-5D)

N

0   100   200

SCALE

WAYFINDING AT BRIDGE '5E-5D' (SKYWALK LVL.)

6th STREET

WAYFINDING AT BRIDGE '5E-5D' (STREET LVL.)

6th STREET

LOCUST STREET

5D-5C KALEIDOSCOPE AT THE HUB.

TIME

T — to go to skywalk system.

D₁ — to locate the skywalk system

D₁.₁ — to go near the bridge

D₂ — to find vertical connection (VtC)

D₂.₁ — to look for a VtC from sidewalks

D₂.₂ — to look for a VtC from building

D₂.₂.₁ — to go inside the building

D₂.₃ — to go to the escalator

D₃ — to go upto the skywalk level

H₁ — No Action
No sign of any access from the street or sidewalks.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	View of the entry door below bridge.	
	View of internal courtyard & escalator going up.	
	View of the Skywalk passage at upper level.	

Figure 5.14: The decision chart of bridge-end 5D(5D-5C)

WALNUT STREET

5D

5C

D₄

6th STREET

WAYFINDING AT BRIDGE '5D-5C' (SKYWALK LVL.)

5D   5C

D₂₃   D₂₂₁

D₂₁

D₃

D₁.₁

WALNUT STREET

6th STREET

WAYFINDING AT BRIDGE '5D-5C' (STREET LVL.)

N

0   100   200

SCALE

visitor to go back one step to the memory information and find another approach. Since the hurdle does not allow the process to continue, it is denoted as a 'no access' situation. In this case, the visitor makes another decision $D_{2.2}$ "to look for a vertical connection from the building". Since the door is located below the intersection of the bridge and the building, the visitor makes another decision, $D_{2.2.1}$ to go inside the building, in order to fulfill the requirements of $D_{2.2}$. As soon as the visitor enters the mall building, he/she can see the interior court and the escalator connecting ground level with the upper level. Since the perceived image of the escalator is matched with the expected image, all requirements of $D_{2.2}$ are fulfilled. But the visitor is not sure whether the escalator reaches the skywalk passage or not. Thus, the visitor makes another decision $D_{2.3}$, to go to the escalator, and executes it. As soon as the visitor goes close to the escalator, he/she can see skywalk passage and people walking at the upper level. Thus the visitor is now sure that the escalator goes to the skywalk level. It helps to fulfill all requirements of D_2 and the second decision loop.

The next obvious decision D_3 is to go to the skywalk level. The visitor executes it and completes the task. .

2. **5F(5F-5E) Convention Center:** (See Figure 5.15) The wayfinding process is similar to that of 5D(5D-5C) as the visitor makes similar wayfinding decisions. The one and the only hurdle occurs when the visitor looks for a vertical connection from the sidewalks. After changing the strategy, the design continuity of the building and the skywalk bridge helps the visitor in the process. The elevator is located in front of the entrance door

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5F-5E CONVENTION CENTER.

	Memory	Space	Signs, Maps
	Skywalk system is in downtown.	View of the Skywalk bridge.	
		View of the Skywalk bridge.	
	Skywalks run at second floor lvl.	View of the elevated bridge.	
	Public access from a public space.		
	Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering bldg. & design continuity.	
		View of the convention center entrance door.	
		View of a elevator next to the entrance door.	
			Skywalk level entrance signs.
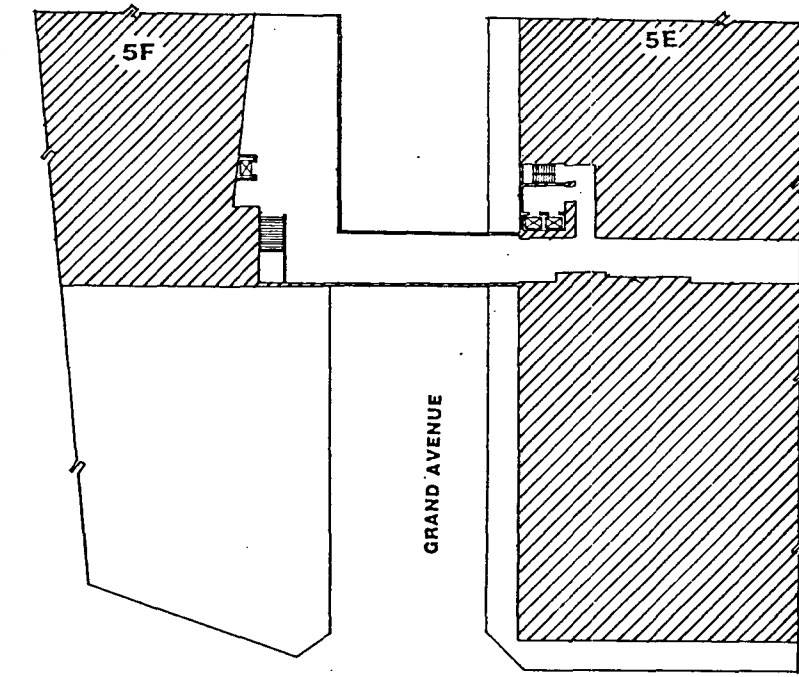
H₁ No action. No sign of any access from the street or sidewalks.

Here design continuity of the skywalk bridge and the transparency of the building help in taking this decision.
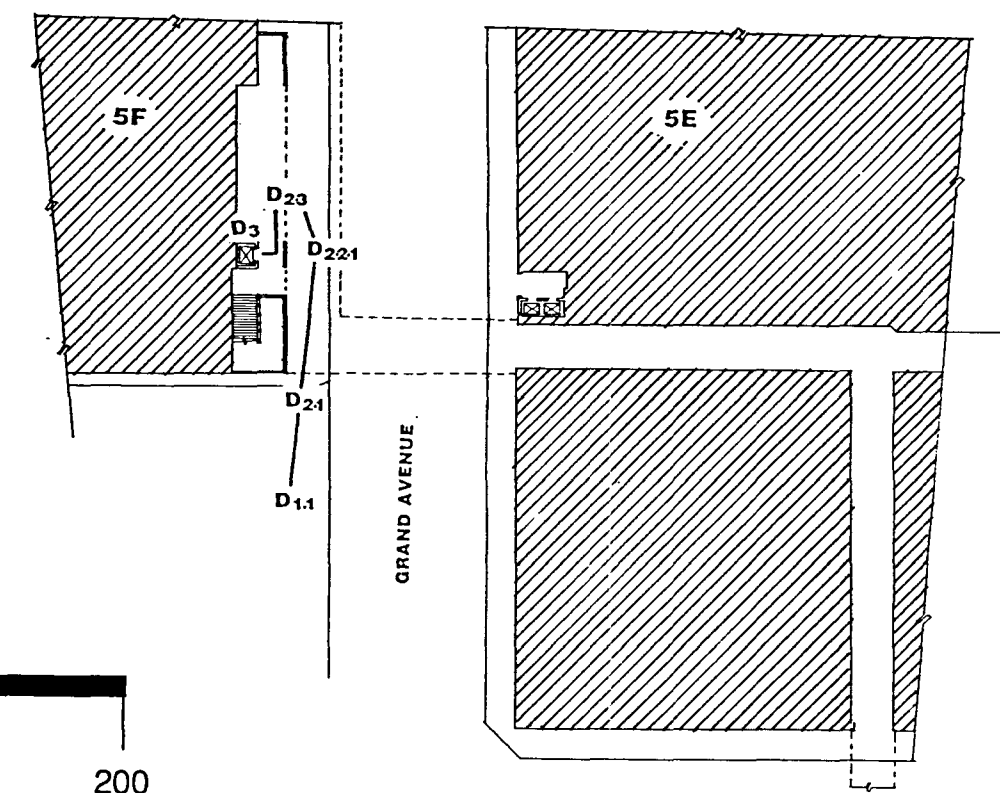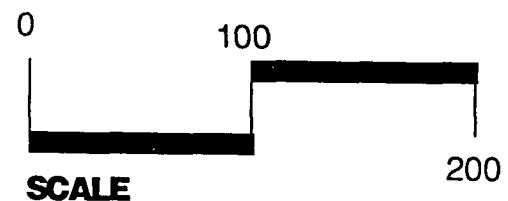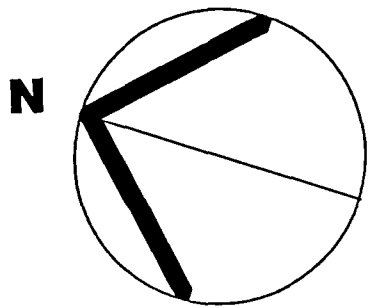
Figure 5.15: The decision chart of bridge-end 5F(5F-5E)

WAYFINDING AT BRIDGE '5F-5E' (SKYWALK LVL.)

WAYFINDING AT BRIDGE '5F-5E' (STREET LVL.)

N

0   100   200
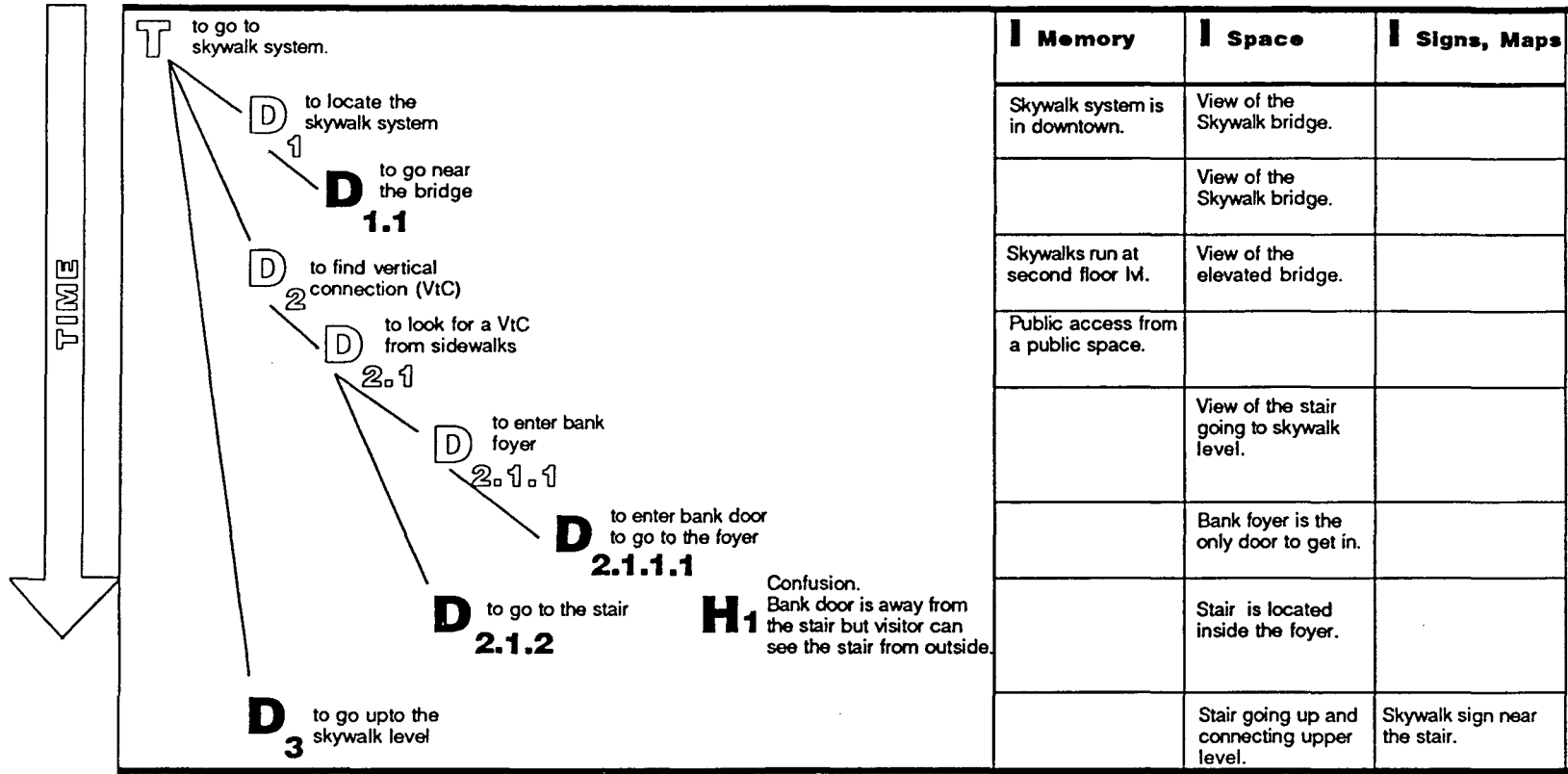
SCALE

which brings the visitor to the upper floor.

Two barriers group

This group contains all those bridge-ends which have two hurdles in the wayfinding process. Bridge-ends 4D(4D-4C) and 5E(5F-5E) fall in this category. Two hurdles make the wayfinding process more complicated. Both bridge-ends in the group have different wayfinding processes, hence they are explained separately.

1. **4D(4D-4C) Capitol Square:**   (See Figure 5.16)   The bridge 4D-4C bridges Walnut Street to connect a parking ramp to the Capitol Square. The bridge is designed along with the Capitol Square building and have a facade similar to that of the Capitol Square. The bridge appears as an extension of the Capitol Square building due to the design continuity.

   The visitor completes the first loop and enters the second loop after making the decision D_2 "to find a vertical connection". The visitor's first choice is to look for a connection from the sidewalks. Thus the second decision $D_{2.1}$ is made. Here, the visitor faces the first hurdle as he/she looks for a vertical connection from the sidewalks. The visitor neither can locate nor get any indication of a vertical connection. Since the expected image does not match with the perceived image, the visitor goes back to the memory information (I_m) to think about another strategy. The hurdle H_1 is classified in the "no action" group as it stops the wayfinding process.

   After making another decision $D_{2.2}$, to look for a vertical connection from the building, the visitor locates the entrance door of the building. The door is

4D-4C CAPITOL SQUARE.

TIME

T — to go to skywalk system.

D₁ — to locate the skywalk system

D₁.₁ — to go near the bridge

D₂ — to find vertical connection (VtC)

D₂.₁ — to look for a VtC from sidewalks

D₂.₂ — to look for a VtC from building

D₂.₂.₁ — to go inside the building

D₂.₃ — to go to the escalator

D₃ — to go upto the skywalk level

D₄ — to trace way back to the bridge.

H₁ — No action. No sign of any access from the street or sidewalks.

H₂ — Confusion. Though directional signs help in wayfinding. Frequent change of directions may disorient visitor.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	View of the capitol square entrance door.	
	View of internal courtyard & escalator going up.	
	View of the Skywalk passage at upper level.	
		Skywalk level directional signs.

Figure 5.16:   The decision chart of bridge-end 4D(4D-4C)

0   100   200

SCALE

D₄   4C   4D   1.1

WAYFINDING AT BRIDGE '4D-4C' (SKYWALK LVL.)

WALNUT STREET

D₁.₁   D₂.₄   4C

D₃   D₂.₃   4D   D₂.₄

D₂.₂.₁

WALNUT STREET

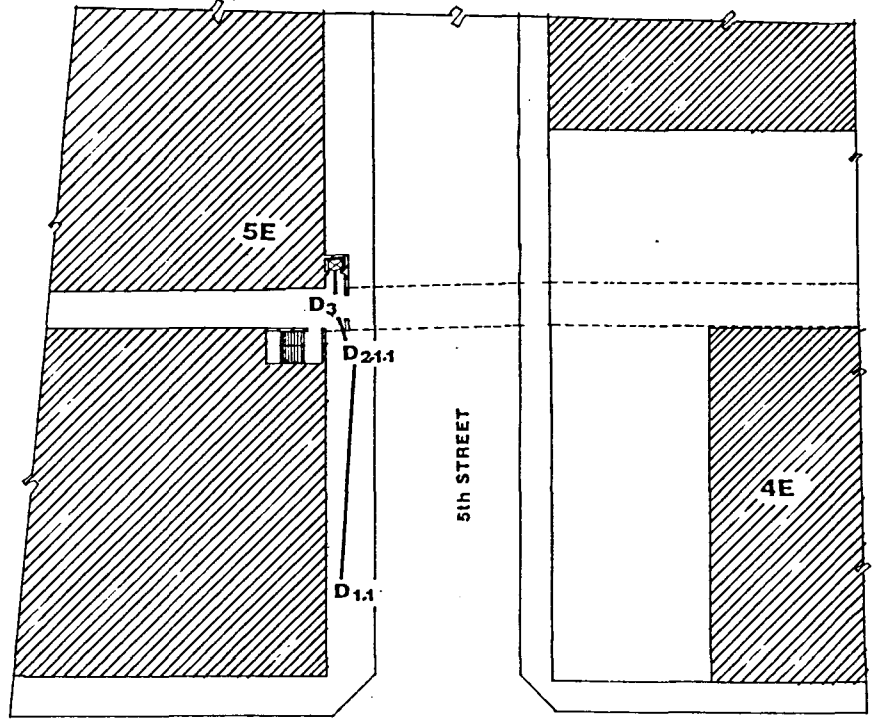5th STREET

WAYFINDING AT BRIDGE '4D-4C' (STREET LVL.)

visible so that the visitor can decide to go in. So the decision $D_{2.2.1}$, to go inside the building, is made. An interior court, a multilevel space, and an escalator connecting lower levels to the upper levels are visible inside the building. The image of the escalator matches with the expected image of the vertical connection and the sequence is complete. The next obvious decision is $D_{2.3}$ "to go to escalator". The visitor walks towards the escalator and sees the the escalator reaching the skywalk level passage. This perceived image supports earlier decisions and confirms the escalator as the vertical connection to the skywalk system. The confirmation helps to fulfill all requirements in the second loop.

After completing the second loop, the visitor makes the next decision D_3, to go up to the skywalk level, and executes it. The next problem is to trace a way back to the bridge. The visitor, in the process of wayfinding, travels some distance and often changes directions. Also, during the process the visitor is inside an unfamiliar environment. The visitor gets confused and disoriented. The degree of confusion may fluctuate from person to person but the problem remains. The confusion is considered as the second hurdle H2.

2. **5E(5F-5E) Parking Ramp:** (See Figure 5.17) The bridge 5F-5E connects the parking ramp with the Convention center by bridging Grand Avenue. The bridge, which is an integral part of the Convention center, meets block 5E above the alley in between the parking ramp and a building.

The visitor enters the second loop and makes the decision $D_{2.1}$ "to look for a vertical connection from the sidewalks". As no vertical connection is visible

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5F-5E PARKING RAMP.

TIME

T — to go to skywalk system.

D₁ — to locate the skywalk system

D₁.₁ — to go near the bridge

D₂ — to find vertical connection (VtC)

D₂.₁ — to look for a VtC from sidewalks

H₁ — No action. No sign of any access from the street or sidewalks.

D₂.₂ — to look for a VtC from building

D₂.₂.₁ — to go inside the building

H₂ — Confusion. Door appears to a shop or a theatrer.

D₃ — to go upto the skywalk level

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	Door located next to the alley.	
	Elevators inside the lobby.	Skywalk entrance sign on the elevator door.

Figure 5.17: The decision chart of bridge-end 5E(5F-5E)

N

0   100   200

SCALE

WAYFINDING AT BRIDGE '5F-5E' (SKYWALK LVL.)

WAYFINDING AT BRIDGE '5F-5E' (STREET LVL.)

5F   5E

GRAND AVENUE

6th STREET

and no clue is given by the setting, the visitor goes back to I_m. This hurdle, which is marked as H_1, is a "no action" type hurdle as the decision sequence stops and looks for another approach.

The visitor changes strategy and decides to go inside the building. He/she looks for an entrance to the building and locates a door next to the alley at the sidewalk level. The door, however located close to the bridge, does not appear as a public entrance. On the contrary, it looks more like a door of a private shop or a theater. The appearance of the door may create confusion and causes the second hurdle H_2 in the wayfinding process. The visitor overcomes confusion and decides to go in. As soon as the visitor goes inside the door, he/she locates two elevators next to the door with a skywalk entry sign. At this point requirements of $D_{2.2}$ and D_2 are fulfilled and the second decision loop is complete. Now the visitor makes the next obvious decision D_3 and executes it to complete the task 'T'.

Although the vertical connection is located close to the bridge, confusion occurs due to the design of the setting. Also, like some other parking lots in downtown, the vertical connection is designed for the convenience of user type U1 and not for U3.

Three or four barriers group

This group contains all those bridge-ends which have three or four hurdles in the wayfinding process. Bridge-ends 6D(7D-6D) and 4D(4E-4D) have three hurdles whereas 5E(6E-5E), 6E(6F-6E), 4E(4E-4D), 4D(5D-4D), 6D(6D-6C), 6E(6E-6D), 6D(6E-6D), and 6E(6E-5E) have four hurdles in the wayfinding process.

Three hurdle group

1. **6D(7D-6D) Kaleidoscope at the Hub:** (See Figure 5.18) The bridge
   7D-6D connects the Yonkers store with the base of the Hub tower after
   crossing Seventh Street. The visitor completes the first decision loop and
   enters the second one to look for a vertical connection. The visitor makes
   decision $D_{2.1}$ "to look for a vertical connection from sidewalks". Here the
   visitor faces the first hurdle H_1 as he/she cannot locate any form of a vertical
   connection from the sidewalks. The hurdle H_1 forces the wayfinding process
   back to the memory information and the visitor makes another decision $D_{2.2}$
   "to look for a vertical connection from the building". In order to go in the
   building, the visitor looks for an entrance door and locates one below the
   skywalk bridge. The door is a typical mall entrance door and appears to be a
   public entrance. The visitor makes the next decision $D_{2.2.1}$ "to enter the
   building" and walks in to look for a vertical connection. But instead of a
   vertical connection only a corridor heading inside the building is visible. Once
   again a mismatch of the expected and the perceived image occurs. This may
   create confusion and some people may turn back instead of venturing further
   inside the building.

   In this case, the visitor goes back to the memory information that vertical
   connections are usually located in the building core. So he/she makes the
   next decision $D_{2.2.2}$ "to go further in". As the visitor walks through the
   corridor, he/she locates an escalator. At this point, the visitor has located a
   vertical connection in the building, but he/she is not very sure whether it will
   connect with the skywalk passage. In order to find that out the next decision,

7D-6D KALEIDOSCOPE AT THE HUB.

to go to
skywalk system.

D₁ to locate the
skywalk system

D₁.₁ to go near
the bridge

D₂ to find vertical
connection (VtC)

D₂.₁ to look for a VtC
from sidewalks

D₂.₂ to look for a VtC
from building

D₂.₂.₁ to enter the
building

D₂.₂.₂ to go further inside
the mall

D₂.₃ to go to escalator

D₃ to go upto the
skywalk level

H₁ No Action
No sign of any access from
the street or sidewalks.

H₂ Confusion
No vertical connection
visible at this point.

H₃ Confusion
Could not judge
whether the escalator
goes to the skywalk
lobby or not.

TIME

▌ Memory	▌ Space	▌ Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	View of the entry door below the bridge.	
Vert. connections are located in the core of the building.	View of the mall lobby going inside.	
	View of the escalator going up.	
Escalator should connect upper mall.	View of the above level mall.	

Figure 5.18:   The decision chart of bridge-end 6D(7D-6D)

N

0   100

SCALE   200

7D   **6D**

D₄

7th STREET

WALNUT STREET

WAYFINDING AT BRIDGE '7D-6D' (SKYWALK LVL.)

7D   **6D**

D₁.₁

D₂.₁   D₂₃

D₂.₂₁—D₂.₂₂

7th STREET

WALNUT STREET

WAYFINDING AT BRIDGE '7D-6D' (STREET LVL.)

to go to the escalator, is made. The visitor walks towards the escalator but cannot make up his/her mind as the setting does not give any indication of where the escalator goes. This confusion creates the third hurdle of the process. Some people may not try to go up and prefer to call the process off or continue walking through the corridor. In our case, the visitor decides to go up. As soon he/she goes up the skywalk passage and the skywalk level activities are visible.

This wayfinding process contains three hurdles. The first one is a "no access" type and it is more difficult to overcome than the rest. If we remove the first hurdle then the remaining hurdles may not occur.

2. **4D(4E-4D) Capitol Square:** (See Figure 5.19) The wayfinding process of this bridge-end is similar to that of 6D(7D-6D) except a little difference in the decision making process.

During the wayfinding process, the visitor completes the first loop and starts the second one. When the visitor looks for a vertical connection from the sidewalks, he/she meets with the first hurdle H_1 as no vertical connection is visible. Then the visitor decides to go inside the building. Since no door is visible on the side of the building, the visitor makes another decision $D_{2.2.2}$ "to look for an entrance door on the other side". The visitor locates the door of the Capitol Square building. Though the door appears as a public entrance point, it leads to the opposite direction of the bridge. The conflicting directions of the door and the bridge may create confusion in the visitor's mind. This is the second hurdle in the process which is marked as H_2.

4E-4D CAPITOL SQUARE.

T to go to skywalk system.

D1 to locate the skywalk system

D1.1 to go near the bridge

D2 to find vertical connection (VtC)

D2.1 to look for a VtC from sidewalks

H1 No Action
No sign of any access from the street or sidewalks.

D2.2 to look for a VtC from building

D2.2.1 to look for an entrance door

D2.2.2 to look for an entrance door on the other side

D2.2.3 to go inside the building
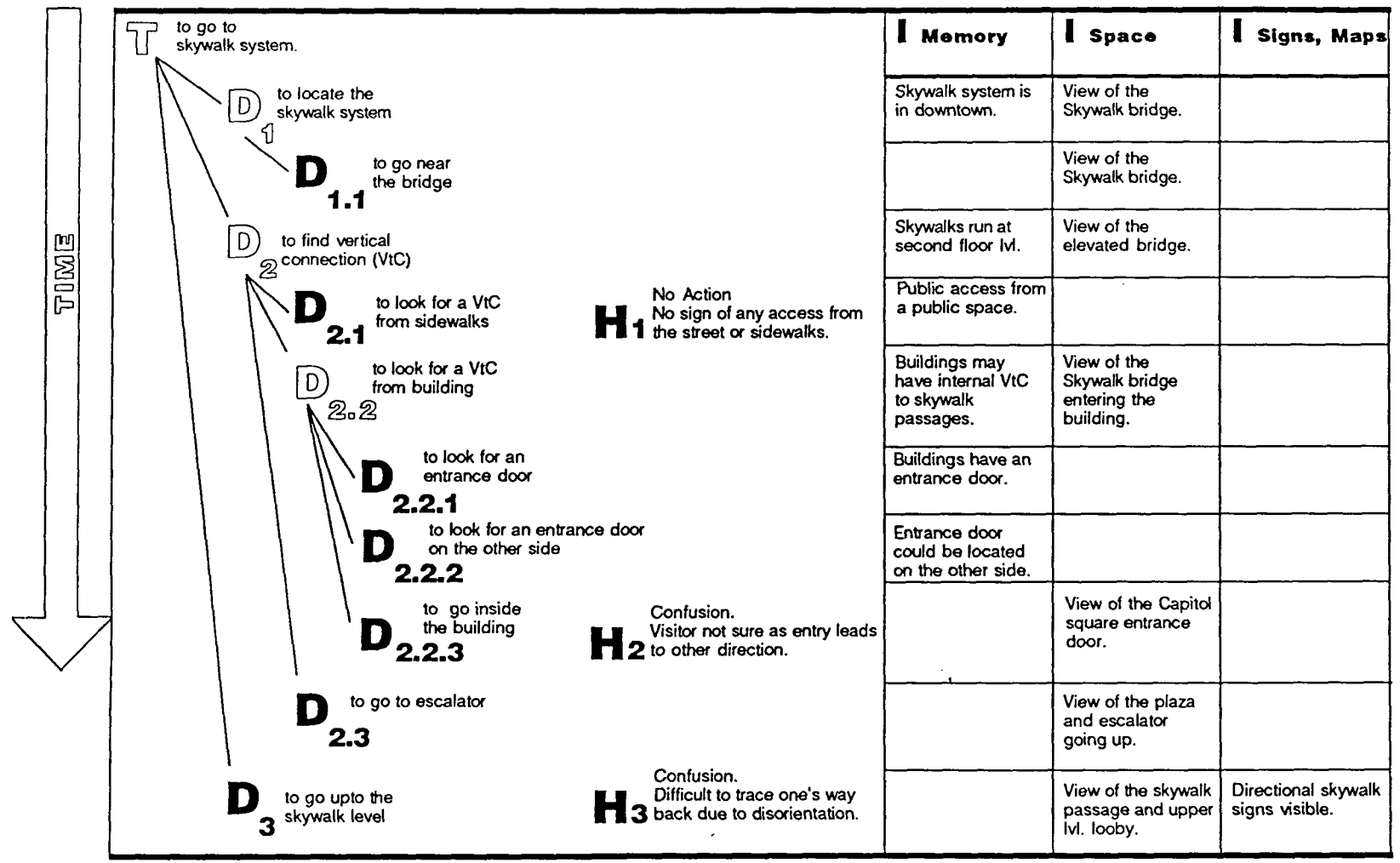
H2 Confusion.
Visitor not sure as entry leads to other direction.

D2.3 to go to escalator

D3 to go upto the skywalk level

H3 Confusion.
Difficult to trace one's way back due to disorientation.

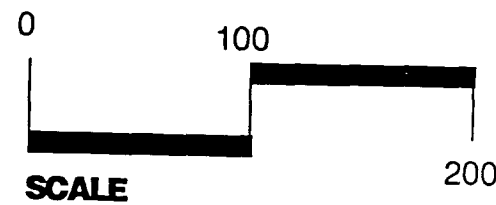| Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
Buildings have an entrance door.		
Entrance door could be located on the other side.		
	View of the Capitol square entrance door.	
	View of the plaza and escalator going up.	
	View of the skywalk passage and upper lvl. looby.	Directional skywalk signs visible.

N

Figure 5.19: The decision chart of bridge-end 4D(4E-4D)

SCALE
0   100   200

WAYFINDING AT BRIDGE '4E-4D' (SKYWALK LVL.)

4E

LOCUST STREET

5th STREET

D4

4D

D1.1

D2.1

D2.21

D3

D221

D222

D23

D223

LOCUST STREET

5th STREET

WAYFINDING AT BRIDGE '4E-4D' (STREET LVL.)

TIME

In this case, the visitor overcomes H_2 and makes another decision $D_{2.2.3}$ 'to go inside the building'. As soon as the visitor walks inside the building, he/she locates an escalator going up from the lower level to the skywalk level. The view of the escalator p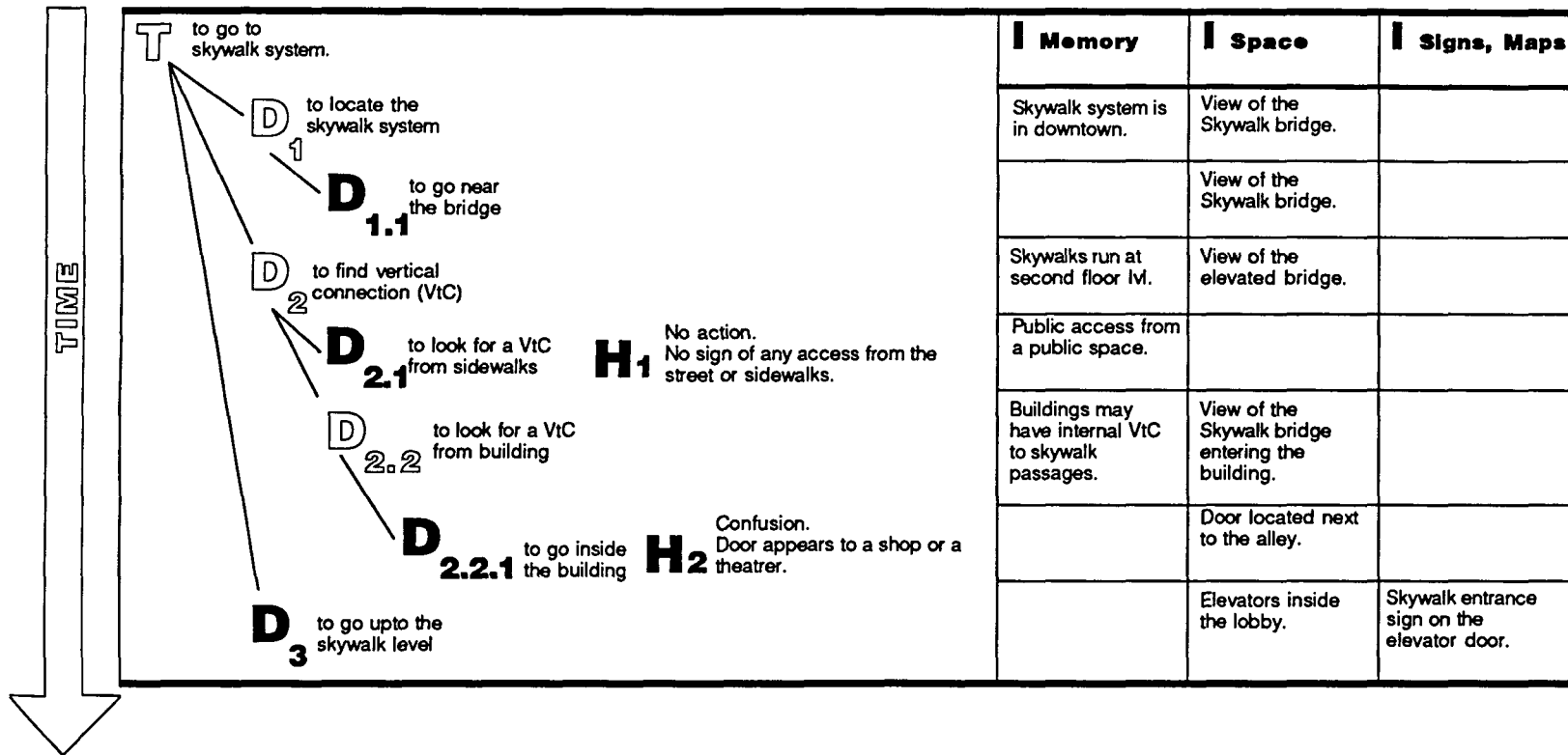rompts the next decision $D_{2.3}$, to go to the escalator, and the visitor executes it. Then the visitor sees the upper level skywalk corridor and skywalk signs. This view helps to confirm that the escalator is the vertical connection. Then the visitor makes the next obvious decision D_3, to go up to the skywalk level, and executes it. Once at the skywalk level the next hurdle is to trace a way back to the bridge. The confusion caused due to disorientation is the third hurdle H_3 of the process.

Four hurdle group

Most of the bridge-ends in this group are skywalk bridge connections to the existing buildings in Des Moines. Most of these buildings were built long before the introduction of the skywalk system. In most of the cases, skywalk bridges pass through alleys in between the buildings. Skywalk passages above alleys is common in Des Moines as it saves expensive remodeling of old buildings and serves all buildings within the block. Since no vertical connections are located close to alleys, people have to figure out their ways through the buildings. This complicates wayfinding processes. Bridge-ends 6E(6E-5E), 6E(6E-6D), 6D(6D-6C), 6E(6F-6E), 5E(6E-5E), 4E(4E-4D) and 6D(6E-6D) have similar wayfinding processes. The thesis explains the wayfinding process of 6D(6E-6D) to describe all processes. The wayfinding process of bridge-end 4D(5D-4D) is explained separately

1. **6D(6E-6D) Equitable Building:** (See Figure 5.20) In this case, the

6E-6D EQUITABLE BUILDING.

T — to go to skywalk system.

D₁ — to locate the skywalk system

D₁.₁ — to go near the bridge

D₂ — to find vertical connection (VtC)

D₂.₁ — to look for a VtC from sidewalks

D₂.₂ — to look for a VtC from building

D₂.₂.₁ — to try to use Equitable Bldg

D₂.₂.₂ — to go inside the Equitable lobby

D₂.₃ — to use elevator

D₃ — to go upto the skywalk level

H₁ — No Action. No sign of any access from the street or sidewalks.

H₂ — Confusion. No door is located near the bridge. Visitor has to make another decision to check the tower.

H₃ — Confusion. Interior lobby of a private office with security may discourage visitors.

H₄ — Confusion. Visitor faces difficulties to go back to skywalk bridge.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	Only Equitable door is visible.	
Vert. connections are located in the core of the building.	View of the Equitable Bldg. office lobby.	
	View of the elevators lobby.	Skywalk sign outside elevator lobby.
Elevators should connect upper mall.		Skywalk sign inside the elevator.

TIME

Figure 5.20: The decision chart of bridge-end 6D(6E-6D)

N

0   100   200

SCALE

WAYFINDING AT BRIDGE '6E-6D' (SKYWALK LVL.)

6E   6D   D₄

LOCUST STREET

WAYFINDING AT BRIDGE '6E-6D' (STREET LVL.)

6E   6D

D₂.₂.₂ — D₂.₃ — D₃

D₂.₂.₁

D₂.₁

D₁.₁

LOCUST STREET

7th STREET

Equitable Building, which was built before the introduction of the skywalk system in Des Moines, serves as a skywalk entrance. The bridge 6E-6D enters block 6D above an alley. The alley is used as a back-door service road where most of loading and unloading occurs. Such alleys are not designed for the pedestrian use and in most cases they scare pedestrians away. Also, due to the skywalk passages built over alleys, the alleys have become darker and risky to use.

In the wayfinding process of the bridge-end, the visitor completes the first decision loop and enters the second one. When the visitor makes decision $D_{2.1}$, to look for a vertical connection from the sidewalks, he/she has the expected image of a vertical connection in mind and looks for a perceived image to match. Since no vertical connection is visible, the mismatch of images creates the first hurdle H_1 of the process. The hurdle H_1 is a "no access" type which forces the visitor back to I_m. The visitor makes another decision $D_{2.2}$ 'to look for a vertical connection from the building'. As no door is located close to the alley, the visitor decides to use entrance door of the Equitable Building – decision $D_{2.2.1}$. The confusion caused by the location of the door may create another hurdle H_2.

The visitor, in order to execute $D_{2.2.1}$ walks down to the door of the building and looks inside. The door leads to an entrance lobby which is a typical office entrance lobby with security and reception area. The office entrance spaces do not necessarily invite people from the streets if they do not have business in the building. Security personnel are usually posted in the lobby to monitor and help strangers. The private lobby may turn some people back to look for

another entrance. This confusion is marked as the third hurdle H_3.

In this case, the visitor goes inside the building despite the hurdle and finds an elevator lobby from the entrance lobby. Also a skywalk entrance sign is posted on the wall. The setting helps the visitor to make the next decision $D_{2.3}$, to use elevator, and he/she walks to the elevator lobby. Now the visitor has found the vertical connection in the building and the second loop is complete. The next step is D_3 "to go up to the skywalk level". Once at the skywalk level, the next problem is to find the way back to the skywalk system. The visitor expects to follow a path which is similar to that at the lower level, but the upper level passage contradicts the expectation. This creates another confusion hurdle H_4. Also internal private passages are designed for internal circulation and a person may feel intruding on private property.

In the most buildings, visitors navigates through private environment. The private environment, is not designed for public, always create a sense of rejection from the environment. Most people do not like to encroach on private property and they may turn back. This may further complicate the wayfinding process.

The wayfinding processes of bridge-ends 6E(6E-5E), 6E(6E-6D), 6D(6D-6C), 6E(6F-6E), 5E(6E-5E), and 4E(4E-4D) are similar to the wayfinding process explained above. Although each process is not explained here, all decision charts are included as follows:

Figure 5.21: The decision chart of bridge-end 6E(6E-5E).

Figure 5.22: The decision chart of bridge-end 6E(6E-6D).

6E-5E LIBERTY BUILDING.

T to go to skywalk system.

D₁ to locate the skywalk system

D₁.₁ to go near the bridge

D₂ to find vertical connection (VtC)

D₂.₁ to look for a VtC from sidewalks

D₂.₂ to look for a VtC from building

D₂.₂.₁ to try to use Liberty Bldg

D₂.₂.₂ to go inside the Liberty bldg. lobby

D₂.₃ to use elevator

D₃ to go upto the skywalk level

H₁ No Action
No sign of any access from the street or sidewalks.

H₂ Confusion
No door is located near the bridge. Visitor has to make another decision to check the tower.

H₃ Confusion
Interior lobby of a private office with security may discourage visitors.

H₄ Confusion
Visitor faces difficulties to go back to skywalk bridge.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	Only Liberty Bldg. door is visible.	
Vert. connections are located in the core of the building.	View of the Liberty Bldg. office lobby.	
	View of the elevators lobby.	
Elevators should connect upper mall.		Skywalk sign inside the elevator.

TIME

N

SCALE
0   100   200

Figure 5.21: The decision chart of bridge-end 6E(6E-5E)

WAYFINDING AT BRIDGE '6E-5E' (SKYWALK LVL.)

6th STREET

5E

6E

D₄

WAYFINDING AT BRIDGE '6E-5E' (STREET LVL.)

6th STREET

5E

6E

D₃ — D₂₃ — D₂₂₂

D₂₂₁

D₂₁

D₁₁

6E-6D CARRIER'S BUILDING.

TIME

T — to go to skywalk system.

D — to locate the skywalk system
1

D — to go near the bridge
1.1

D — to find vertical connection (VtC)
2

D — to look for a VtC from sidewalks
2.1

D — to look for a VtC from building
2.2

D — to try to use Carrier's bldg
2.2.1

D — to go inside the building lobby
2.2.2

D — to use elevator
2.3

D — to go upto the skywalk level
3

H1 — No Action
No sign of any access from the street or sidewalks.

H2 — Confusion
No door is located near the bridge. Visitor has to make another decision to check the building.

H3 — Confusion
Interior lobby of a private office with security may discourage visitors.

H4 — Confusion
Visitor faces difficulties to go back to skywalk bridge.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	Only door of the Carrier's bldg. is visible.	
Vert. connections are located in the core of the building.	View of the office lobby.	
	View of the elevator lobby.	
Elevators should connect upper mall.		Skywalk sign inside the elevator.

N

0   100

SCALE   200

Figure 5.22:   The decision chart of bridge-end 6E(6E-6D)

WAYFINDING AT BRIDGE '6E-6D' (SKYWALK LVL.)

WAYFINDING AT BRIDGE '6E-6D' (STREET LVL.)

2. **4D(5D-4D) Capitol Square:** (See Figure 5.27) The bridge 5D-4D connects the Kaleidoscope Mall and the Capitol Square building. Both buildings contain interior atria which attract people from the entire downtown. These buildings are designed to adopt the skywalk system and serve as a hub of the system.

The visitor completes the first decision loop and stops at the hurdle H_1 as he/she fails to locate a vertical connection from the sidewalks. The hurdle H_1 forces another decision $D_{2.2}$ "to look for a vertical connection from the building". In order to get inside the building another decision $D_{2.2.1}$, to look for an entrance door, is made. Another hurdle H_2 stops the process as the visitor fails to locate the entrance door near the bridge or on the building facade. This hurdle is a "no action" type and forces visitor to look for an entrance door from the other side of the building- decision $D_{2.2.2}$. The visitor walks to the other side of the building and locates an entrance door of the Capitol Square building. The door leads to the opposite direction of that of the bridge which may confuse the visitor and creates the next hurdle H_3. The visitor overcomes the hurdle and makes the decision $D_{2.2.3}$ "to go inside the building". The escalator, which is located in the atrium, is visible from the entrance door and the visitor does not have any problem to go up to the

6D-6C HUB TOWER & KALEIDOSCOPE AT THE HUB.

TIME

T — to go to skywalk system.

D1 — to locate the skywalk system

D1.1 — to go near the bridge

D2 — to find vertical connection (VtC)

D2.1 — to look for a VtC from sidewalks

D2.2 — to look for a VtC from building

D2.2.1 — to try to use Hub tower

D2.2.2 — to go inside the Hub tower lobby

D2.3 — to use elevator

D3 — to go upto the skywalk level

H1 — No Action
No sign of any access from the street or sidewalks.

H2 — Confusion
No door is located near the bridge. Visitor has to make another decision to check the tower.

H3 — Confusion
Interior lobby of a private office with security may discourage visitors.

H4 — Confusion
Visitor faces difficulties to go back to skywalk bridge.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	Only Hub tower door is visible.	
Vert. connections are located in the core of the building.	View of the Hub tower office lobby.	
	View of the elevators lobby.	
Elevators should connect upper mall.		Skywalk sign inside the elevator.

Figure 5.23: The decision chart of bridge-end 6D(6D-6C)

N

SCALE   0   100   200

WAYFINDING AT BRIDGE '6D-6C' (SKYWALK LVL.)

WAYFINDING AT BRIDGE '6D-6C' (STREET LVL.)

6F-6E RUAN CENTER.

TIME

T — to go to skywalk system.

D₁ — to locate the skywalk system

D₁.₁ — to go near the bridge

D₂ — to find vertical connection (VtC)

D₂.₁ — to look for a VtC from sidewalks

D₂.₂ — to look for a VtC from building

D₂.₂.₁ — to enter Ruan Center

D₂.₂.₂ — to go further inside the building

D₂.₃ — to go to elevators

D₃ — to go upto the skywalk level

H₁ No Action
No sign of any access from the street or sidewalks.

H₂ Confusion
Interior lobby of a private office with security may discourage visitors.

H₃ Confusion.
Elevators are hidden in the lobby.

H₄ Confusion
Visitor faces difficulties to go back to skywalk bridge.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	Ruan Center door is below the bridge.	
Vert. connections are located in the core of the building.	View of the Ruan Center office lobby.	
	View of the elevators lobby.	
Elevators should connect upper mall.		Skywalk sign inside the elevator.

N

0   100   200

SCALE
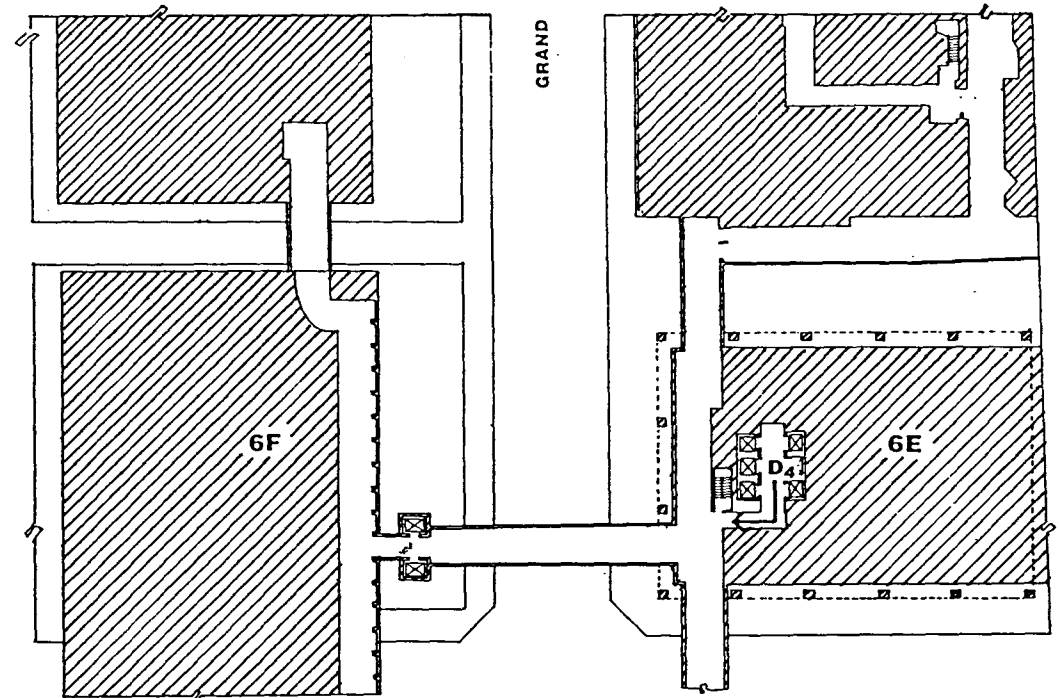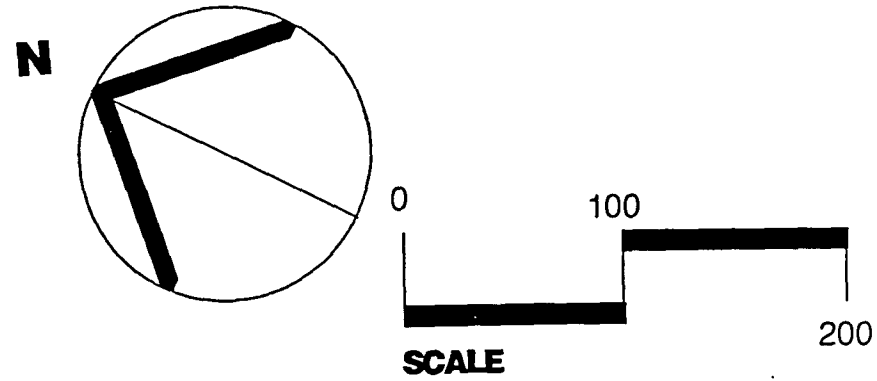
Figure 5.24:   The decision chart of bridge-end 6E(6F-6E)

GRAND

6F

6E

D₄

WAYFINDING AT BRIDGE '6F-6E' (SKYWALK LVL.)

GRAND AVENUE

6F

6E

D₁.₁

D₂.₁

D₃

D₂.₂₁ — D₂.₂₂   D₂.₃

7th STREET

WAYFINDING AT BRIDGE '6F-6E' (STREET LVL.)

6E-5E D.M. BUILDING.

TIME

T to go to skywalk system.

D1 to locate the skywalk system

D 1.1 to go near the bridge

D2 to find vertical connection (VtC)

D -2.1 to look for a VtC from sidewalks

D 2.2 to look for a VtC from building

D 2.2.1 to try to use D.M. Bldg

D 2.2.2 to go inside the D.M. lobby

D 2.3 to use elevator

D 3 to go upto the skywalk level

H1 No Action
No sign of any access from the street or sidewalks.

H2 Confusion
No door is located near the bridge. Visitor has to make another decision to check the tower.

H3 Confusion
Interior lobby of a private office with security may discourage visitors.

H4 Confusion
Visitor faces difficulties to go back to skywalk bridge.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	Only D.M. Bldg. door is visible.	
Vert. connections are located in the core of the building.	View of the D.M. Bldg. office lobby.	
	View of the elevators lobby.	
Elevators should connect upper mall.		Skywalk sign inside the elevator.

N

0 100 200
SCALE

Figure 5.25: The decision chart of bridge-end 5E(6E-5E)

6th STREET
6E
5E

D4.

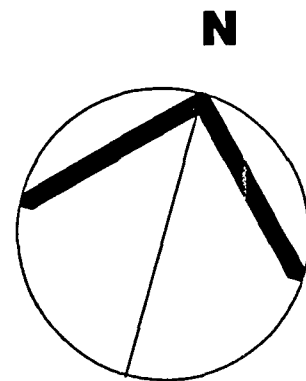**WAYFINDING AT BRIDGE '6E-5E' (SKYWALK LVL.)**

6th STREET
6E
5E

D1.1

D2.1

D2.2.1

D2.2.2—D2.3—D3

WAYFINDING AT BRIDGE '6E-5E' (STREET LVL.)

4E-4D HOTEL SAVERY.

to go to skywalk system.

T

to locate the skywalk system
D 1

to go near the bridge
D 1.1

to find vertical connection (VtC)
D 2

to look for a VtC from sidewalks
D 2.1

to look for a VtC from building
D 2.2

to try to use Hotel Bldg
D 2.2.1

to go inside the Hotel lobby
D 2.2.2

to use elevator
D 2.3

to go upto the skywalk level
D 3

No Action
No sign of any access from the street or sidewalks.
H 1

Confusion
No door is located near the bridge. Visitor has to make another decision to check the tower.
H 2

Confusion
Interior lobby of an expensive hotel with security may discourage visitors.
H 3

Confusion
Visitor faces difficulties to go back to skywalk bridge.
H 4

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	Only Hotel Savery door is visible.	
Vert. connections are located in the core of the building.	View of the Hotel savery reception lobby.	
	View of the elevators lobby.	
Elevators should connect upper mall.	.	Skywalk sign inside the elevator.

TIME

Figure 5.26: The decision chart of bridge-end 4E(4E-4D)

N

0   100   200

SCALE

WAYFINDING AT BRIDGE '4E-4D' (SKYWALK LVL.)

4E

D 4

LOCUST STREET

5th STREET

WAYFINDING AT BRIDGE '4E-4D' (STREET LVL.)

4E

4D

D 3   D 2.3   D 2.2.2

D 2.2.1

D 2.1

D 1.1

LOCUST STREET

5th STREET

5D-4D CAPITOL SQUARE.

T — to go to skywalk system.

D₁ — to locate the skywalk system

D 1.1 — to go near the bridge

D₂ — to find vertical connection (VtC)

D 2.1 — to look for a VtC from sidewalks H₁ — No Action No sign of any access from the street or sidewalks.

D 2.2 — to look for a VtC from building

D 2.2.1 — to look for an entrance door H₂ — No Action No sign of any entrance door on the side of the bldg.

D 2.2.2 — to look for an entrance door on the other side

D 2.2.3 — to go inside the building H₃ — Confusion. Entry door directs opposite direction.

D 2.3 — to go to escalator

D₃ — to go upto the skywalk level H₄ — Confusion. Difficulty in tracing back to skywalk bridge due to disorientation.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
Buildings have an entrance door.		
Entrance door could be located on the other side.		
	View of the Capitol square entrance door.	
	View of the plaza and escalator going up.	
	View of the skywalk passage and upper lvl. looby.	Directional skywalk signs visible.

TIME

Figure 5.27: The decision chart of bridge-end 4D(5D-4D)

N

SCALE   0   100   200

WALNUT STREET

WAYFINDING AT BRIDGE '5D-4D' (SKYWALK LVL.)

5th STREET

D4

WALNUT STREET

WAYFINDING AT BRIDGE '5D-4D' (STREET LVL.)

D₂₂₃   D₂₃   D₃

D₂₂₂

D₂₂₁

D₂₁

D 1.1

5D

5th STREET

skywalk level. Once at the skywalk level, the visitor faces another hurdle H_4 as he/she looks for a way back to the bridge. This hurdle confuses people as they change direc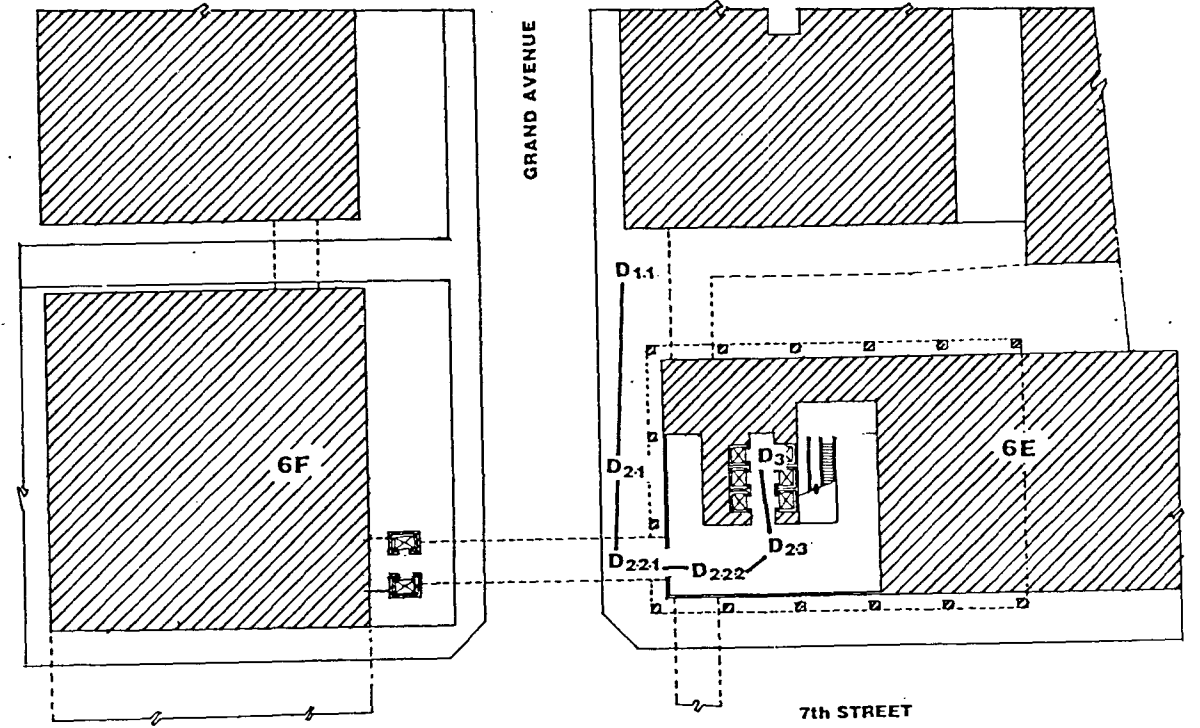tions frequently in the wayfinding process and get disoriented. Different environment at the upper level further complicates the process.

'n' barriers group

This group contains all those bridge-ends where wayfinding processes must be abandoned or transferred to some other bridge-end. The wayfinding process remains incomplete and one cannot determine the hurdle index, thus we say that the bridge-end has 'n' number of hurdles and the group is named as 'n' barriers group. Many bridge-ends in the Des Moines skywalk system fall in this group. These bridge-ends are then sub-grouped according to their wayfinding processes. Bridge-ends 5C(5C-4C), 7D(7D-6D), 7D(7C-7D), and 5C(5D-5C) are in one group which is represented by 5C(5C-4C). Bridge-ends 7C(7C-6C), 6C(7C-6C), 4C(4D-4C), 5D(5D-4D), 4E(5E-4E), and 4F(4F-4E) are grouped together and they are represented by 4F(4F-4E). The bridge-end 5D(5E-5D) is explained separately.

1. **5C(5D-5C) J. C. Penney Store:** (See Figure 5.28) Block 5C houses the J. C. Penney store. During the wayfinding process, the visitor comes across the first hurdle H_1 when decision $D_{2.1}$ is made. The visitor then looks for a vertical connection from the building. The visitor can locate an entrance door of the J. C. Penney store below the skywalk bridge and enters the store. The door leads to the interior of the J. C. Penney store. The storefront is designed to welcome shoppers and interior is designed in such a way that

5D-5C J.C. PENNEY STORE.

TIME

T — to go to skywalk system.

D₁ — to locate the skywalk system

D₁.₁ — to go near the bridge

D₂ — to find vertical connection (VtC)

D₂.₁ — to look for a VtC from sidewalks

D₂.₂ — to look for a VtC from building

D₂.₂.₁ — to enter the building

D₂.₃ — to go to escalator

D₃ — to go upto the skywalk level

H₁ No Action
No sign of any access from the street or sidewalks.

Hₙ Confusion
Wayfinding inside the store is difficult even for regular user as interior changes frequently . Thus it is difficult to measure the wayfinding difficulties.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	View of the entry door below the bridge.	

Figure 5.28:   The decision chart of bridge-end 5C(5D-5C)

WAYFINDING AT BRIDGE '5D-5C' (SKYWALK LVL.)
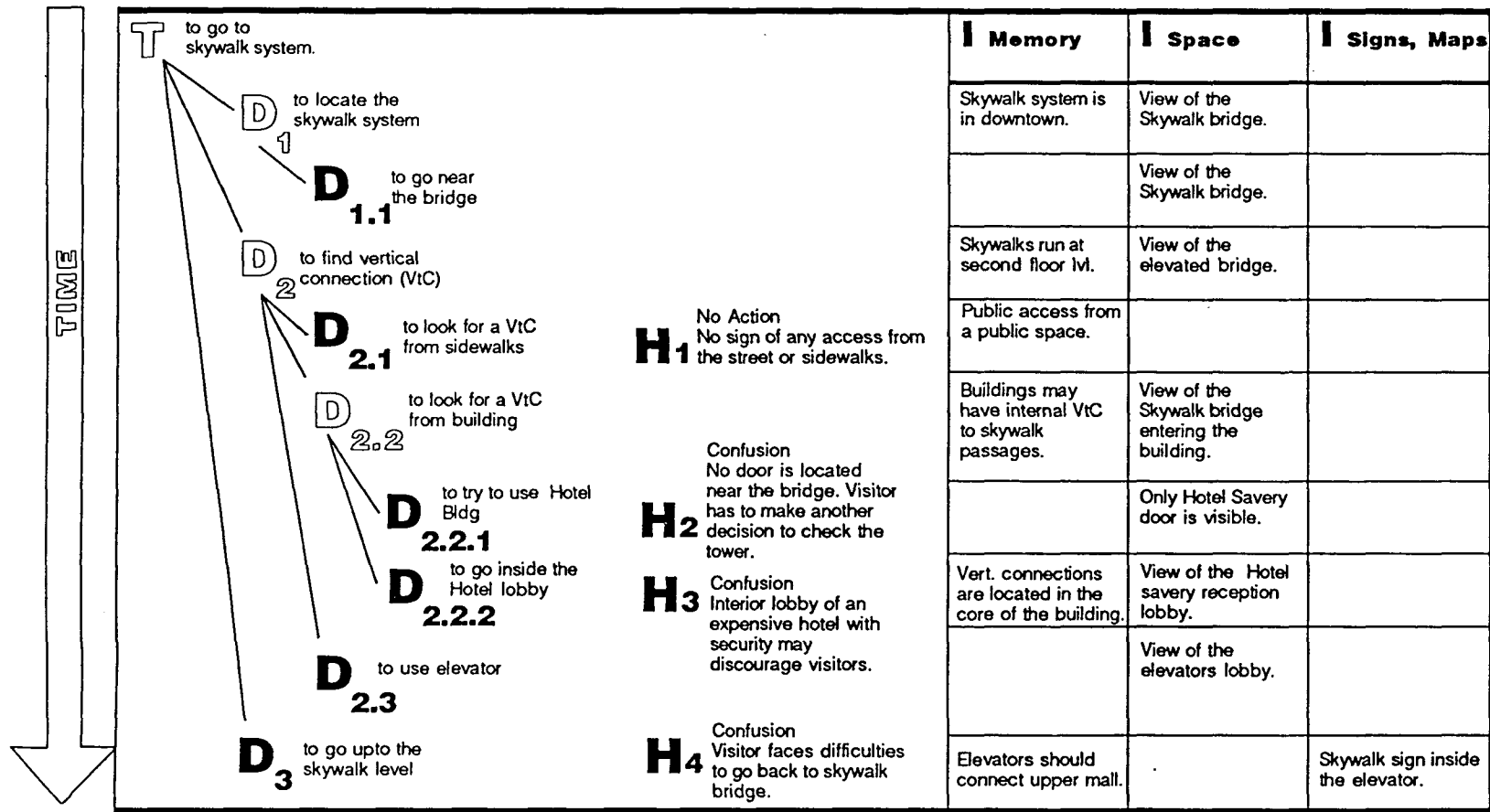
WAYFINDING AT BRIDGE '5D-5C' (STREET LVL.)

N

0   100   200
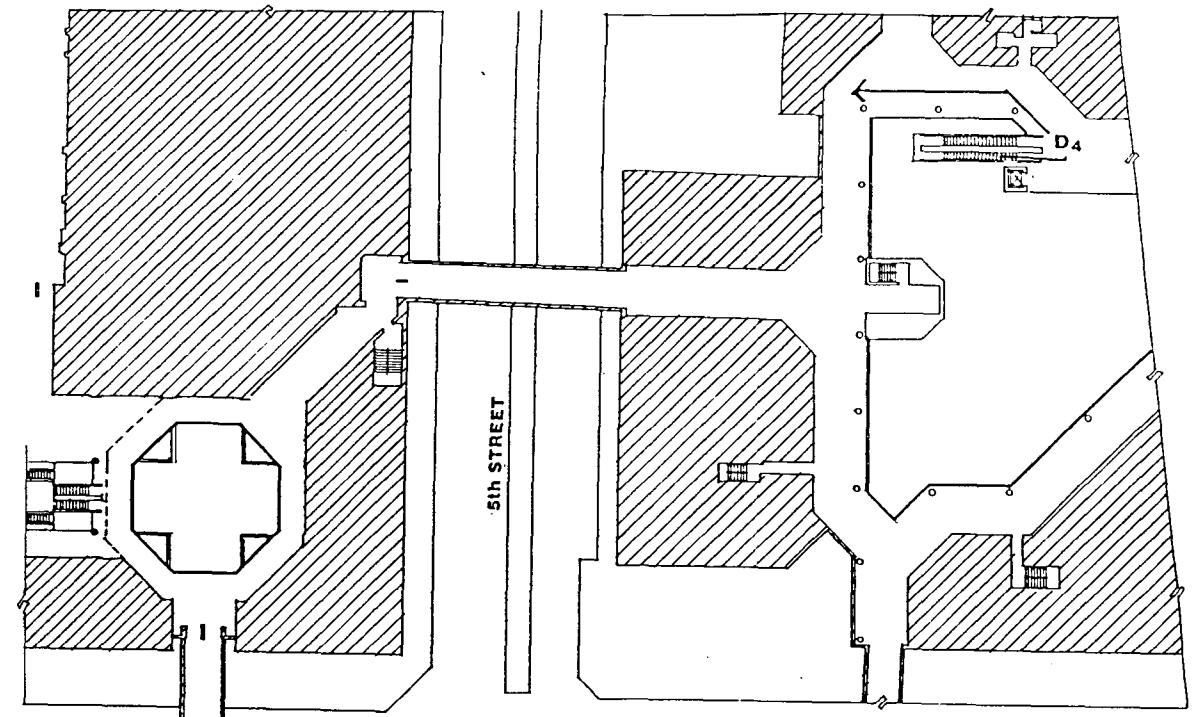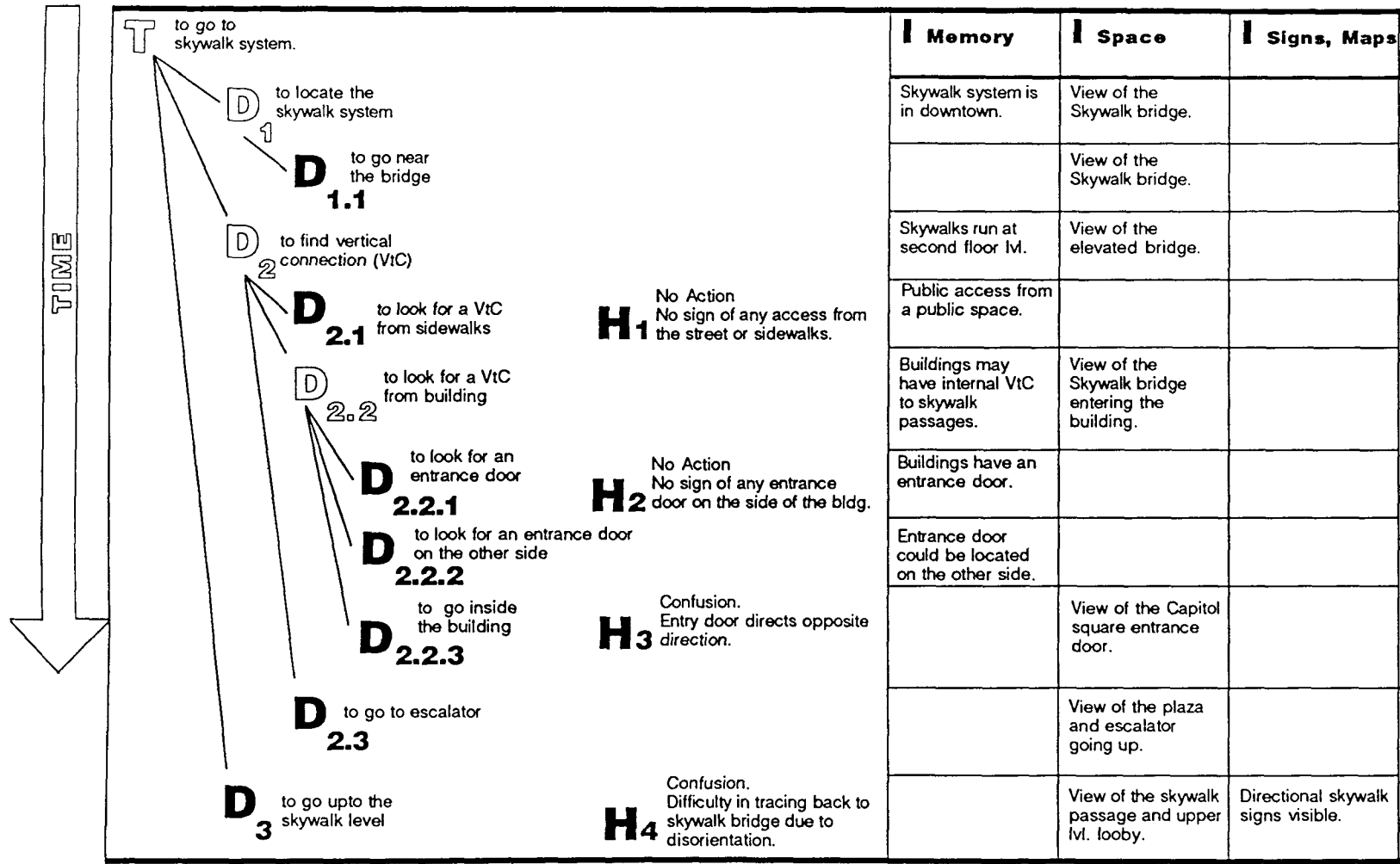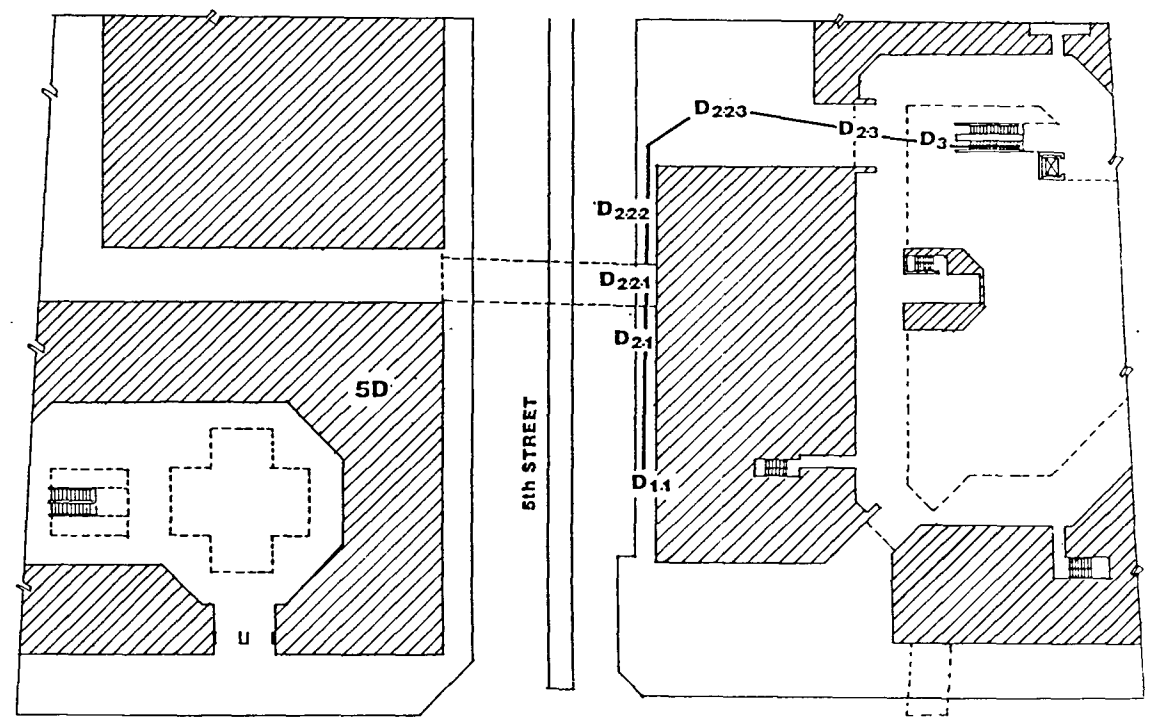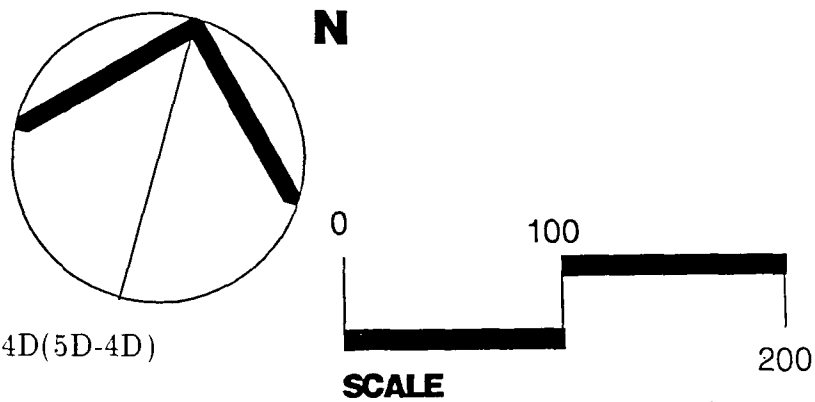
SCALE

WALNUT STREET

6th STREET

people would see merchandise and buy them. Above all the interior itself changes frequently so that even a familiar user may have trouble wayfinding. One can meander through the maze of display and sales-counters to locate the internal escalator and then come out of a similar maze at the upper level. But for the purpose of the study, it was decided that the wayfinding hurdles are impossible to estimate and the wayfinding is considered incomplete.

The wayfinding process is similar in all four bridge-ends in the group as the interior of both stores is similar. Figure 5.29 explains decision chart of the bridge-end 7D(7D-6D) and Figure 5.30 represents the bridge-end 7D(7C-7D).

2. **4F(4F-4E) Brown Garage:** (See Figure 5.31) This bridge-end represents the second sub-group where the visitor abandons the search and looks for another bridge-end. This group contains worst cases of wayfinding as hurdles stop the wayfinding process completely.

During the wayfinding process, the visitor completes the first loop and stops at the first hurdle H_1 when he/she makes the decision $D_{2.1}$ "to look for a vertical connection from the sidewalks". The hurdle, which is a "no action" type, forces the visitor to make another decision $D_{2.2}$ "to look for a vertical connection from the building". The visitor, in order to go inside the building, looks for an entrance door. Here second hurdle H_2 blocks the way as no door is located close to the bridge. The visitor then looks for a door on the block facade but fails to locate one. In the Brown Garage building there are many garage doors but none of them leads to a vertical connection. At this point, the visitor abandons the process and looks for other bridge-end.

7D-6D YOUNKERS STORE.

T — to go to skywalk system.

D₁ — to locate the skywalk system

$D_{1.1}$ — to go near the bridge

D₂ — to find vertical connection (VtC)

$D_{2.1}$ — to look for a VtC from sidewalks

$D_{2.2}$ — to look for a VtC from building

$D_{2.2.1}$ — to enter the building

$D_{2.3}$ — to go to escalator

D_3 — to go upto the skywalk level

H_1 — No Action. No sign of any access from the street or sidewalks.

H_n — Confusion. Wayfinding inside the store is difficult even for regular user as the interior changes frequently. Thus it is difficult to measure the wayfinding difficulties.

Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	View of the entry door below the bridge.	

N

Figure 5.29: The decision chart of bridge-end 7D(7D-6D)

SCALE
0   100   200

WAYFINDING AT BRIDGE '7D-6D' (SKYWALK LVL.)

WAYFINDING AT BRIDGE '7D-6D' (STREET LVL.)

7C-7D YOUNKERS STORE.

T to go to skywalk system.

D₁ to locate the skywalk system

D₁.₁ to go near the bridge

D₂ to find vertical connection (VtC)

D₂.₁ to look for a VtC from sidewalks

D₂.₂ to look for a VtC from building

D₂.₂.₁ to enter the building

D₂.₃ to go to escalator

D₃ to go upto the skywalk level

TIME

H₁ No Action
No sign of any access from the street or sidewalks.

Hₙ Confusion
Wayfinding inside the store is very difficult even for regular user as interior changes frequently . Thus it is difficult to measure the wayfinding difficulties.

I Memory	I Space	I Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
	View of the entry door below the bridge.	

N

| 0 | 100 | 200 |

SCALE

Figure 5.30:   The decision chart of bridge-end 7D(7C-7D)

WALNUT STREET

7C   7D

7th STREET

WAYFINDING AT BRIDGE '7C-7D' (SKYWALK LVL.)

WALNUT STREET

D₁.₁

D₂.₁

D₂.₂.₁

7C   7D

7th STREET

WAYFINDING AT BRIDGE '7C-7D' (STREET LVL.)

4F-4E BROWN GARAGE.

TIME

T — to go to skywalk system.

D1 — to locate the skywalk system

D1.1 — to go near the bridge

D2 — to find vertical connection (VtC)

D2.1 — to look for a VtC from sidewalks

D2.2 — to look for a VtC from building

D2.2.1 — to look for an entrance door

D2.2.2 — to look for an entrance door on the other side

H1 — No Action. No sign of any access from the street or sidewalks.

H2 — Confusion. No door near the bridge. Thus visitor has to make another decision to look for it.

H3 — No Action. No sign of any entrance door on the side of the bldg.

Hn — No door on the block facade. Visitor has to go to the next block to find a door. Thus we can say that this side of the skywalk is not accessible.

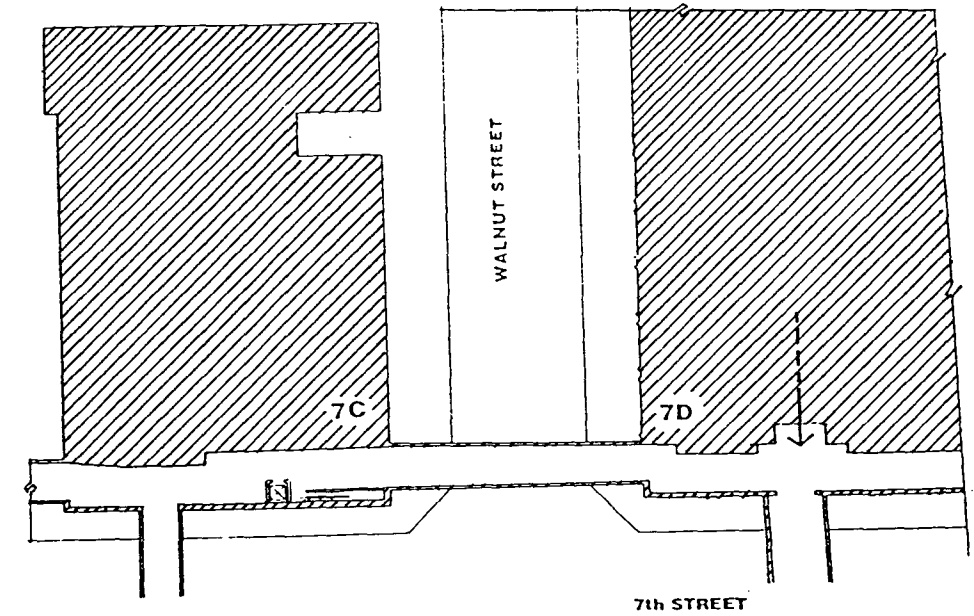| Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
Buildings have an entrance door.		
Entrance door could be located on the other side.		

Figure 5.31: The decision chart of bridge-end 4F(4F-4E)

N

SCALE
0   100   200

WAYFINDING AT BRIDGE '4F-4E' (SKYWALK LVL.)

4F   4E   GRAND AVENUE   5th STREET

WAYFINDING AT BRIDGE '4F-4E' (STREET LVL.)

4F   4E   GRAND AVENUE   5th STREET
$D_{1.1}$ $D_{2.1}$ $D_{2.2.1}$ $D_{2.2.2}$

Similar processes occur in bridge-ends 4E(5E-4E) (See Figure 5.32), 5D(5D-4D) (See Figure 5.33), 4C(4D-4C) (See Figure 5.34), 6C(7C-6C) (See Figure 5.35), and 7C(7C-6C) (See Figure 5.36). Except for the Kaleidoscope Mall all other buildings are designed before the introduction of the skywalk system so they do not have entrances near the skywalk bridge.

3. **5D(5E-5D) U. C. B.:**   (See Figure 5.37)   The bridge-end 5D(5E-5D) is also classified in the 'n' barriers group. Since the wayfinding process of this bridge-end is different than that of other bridges, it is explained separately.

In this case, the visitor faces H_1 in the second loop as he/she tries to locate a vertical connection from the sidewalks. The visitor then decides to look for a vertical connection from the building. The first decision of the subloop of $D_{2.2}$ is $D_{2.2.1}$ "to look for an entrance door". The visitor locates one door which appears to be an entrance door of the building and he/she takes another decision $D_{2.2.1.1}$ "to check the door". As soon as the visitor goes in he/she realizes that the door leads to a bank office which does not have skywalk connection. Then the visitor comes out and looks for another door but no other door is visible on the block facade. At this point, visitor decides to abandon the search and go to other skywalk bridge.

The 'n' barrier group contains the worst wayfinding cases. The designed environment neither provides any alternatives nor any clues. Unless desperate to go up, one would prefer to call the search off than to wander around.

5E-4E HOTEL SAVERY.

	Memory	Space	Signs, Maps
	Skywalk system is in downtown.	View of the Skywalk bridge.	
		View of the Skywalk bridge.	
	Skywalks run at second floor lvl.	View of the elevated bridge.	
H1 No Action No sign of any access from the street or sidewalks.	Public access from a public space.		
	Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
H2 No Action No sign of any entrance door on the side of the bldg.	Buildings have an entrance door.		
H3 No Action No sign of any entrance door on the other side of the building.	Entrance door could be located on the other side.		
Hn Skywalk enters into the back side of the bldg. No entry point thus visitor has to go to other side. Thus we can say that this side of the skywalk is not accessible.			

TIME

T — to go to skywalk system.

D1 — to locate the skywalk system

D1.1 — to go near the bridge

D2 — to find vertical connection (VtC)

D2.1 — to look for a VtC from sidewalks

D2.2 — to look for a VtC from building

D2.2.1 — to look for an entrance door

D2.2.2 — to look for an entrance door on the other side

N

SCALE

0   100   200

Figure 5.32:   The decision chart of bridge-end 4E(5E-4E)

WAYFINDING AT BRIDGE '5E-4E' (SKYWALK LVL.)

5E   5th STREET   4E

LOCUST STREET

D1.1

D2.1

D2.2.1

D2.2.2

5E   5th STREET   4E

LOCUST STREET

WAYFINDING AT BRIDGE '5E-4E' (STREET LVL.)

5D-4D KALEIDOSCOPE AT THE HUB.

TIME

T — to go to skywalk system.

D₁ — to locate the skywalk system

D₁.₁ — to go near the bridge

D₂ — to find vertical connection (VtC)

D₂.₁ — to look for a VtC from sidewalks

H₁ — No Action. No sign of any access from the street or sidewalks.

D₂.₂ — to look for a VtC from building

D₂.₂.₁ — to look for an entrance door

H₂ — No Action. No sign of any entrance door on the side of the bldg.

D₂.₂.₂ — to look for an entrance door on the other side

Hₙ — Since no door is visible at the block facade, visitor has to choose other alternatives. Thus we can say that this side of the bridge is not accessible.

	Memory		Space		Signs, Maps
	Skywalk system is in downtown.		View of the Skywalk bridge.		
			View of the Skywalk bridge.		
	Skywalks run at second floor lvl.		View of the elevated bridge.		
	Public access from a public space.				
	Buildings may have internal VtC to skywalk passages.		View of the Skywalk bridge entering the building.		
	Buildings have an entrance door.				
	Entrance door could be located on the other side.				
					View of the Capitol square entrance door.

N

0   100   200

SCALE

Figure 5.33: The decision chart of bridge-end 5D(5D-4D)

D₄

WALNUT STREET

WAYFINDING AT BRIDGE '5D-4D' (SKYWALK LVL.)

5th STREET

D₁.₁

D₂.₁

D₂.₂.₁

5D

D₂.₂.₂

5th STREET

WALNUT STREET

WAYFINDING AT BRIDGE '5D-4D' (STREET LVL.)

4D-4C KIRKWOOD HOTEL.

TIME

T — to go to skywalk system.

D₁ — to locate the skywalk system

D₁.₁ — to go near the bridge

D₂ — to find vertical connection (VtC)

D₂.₁ — to look for a VtC from sidewalks

H₁ No Action
No sign of any access from the street or sidewalks.

D₂.₂ — to look for a VtC from building

D₂.₂.₁ — to look for an entrance door

H₂ No Action
No sign of any entrance door on the side of the bldg.

D₂.₂.₂ — to look for an entrance door on the other side

Hₙ By the time visitor goes on the other side, the entrance for the skywalk 5C-4C is visible. Thus we can say that this side of the skywalk is not accessible.

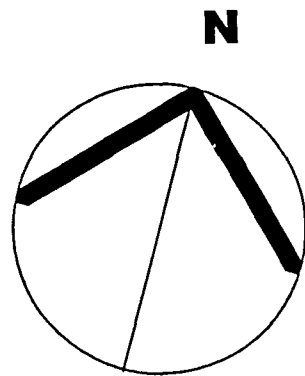| Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
Buildings have an entrance door.		
Entrance door could be located on the other side.		
	View of the entry door for the skywalk 5C-4C.	

N

SCALE 0   100   200

Figure 5.34: The decision chart of bridge-end 4C(4D-4C)

WALNUT STREET

4D

4C

WAYFINDING AT BRIDGE '4D-4C' (SKYWALK LVL.)

WALNUT STREET

D1.1

D2.1

4C

4D

D2.2.1

D2.2.2

5th STREET

WAYFINDING AT BRIDGE '4D-4C' (STREET LVL.)

7C-6C FINANCIAL CENTER.

TIME

- T — to go to skywalk system.
- D$_1$ — to locate the skywalk system
- D$_{1.1}$ — to go near the bridge
- D$_2$ — to find vertical connection (VtC)
- D$_{2.1}$ — to look for a VtC from sidewalks
- D$_{2.2}$ — to look for a VtC from building
- D$_{2.2.1}$ — to look for an entrance door
- D$_{2.2.2}$ — to look for an entrance door on the other side

- H$_1$ — No Action. No sign of any access from the street or sidewalks.
- H$_2$ — No Action. No sign of any entrance door on the side of the bldg.
- H$_3$ — No Action. No sign of any entrance door on the other side of the building.
- H$_n$ — Only one door on this side which leads into a bank office. Thus we can say that this side of the skywalk is not accessible.

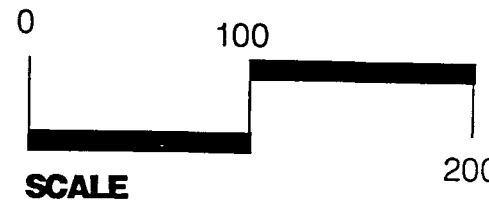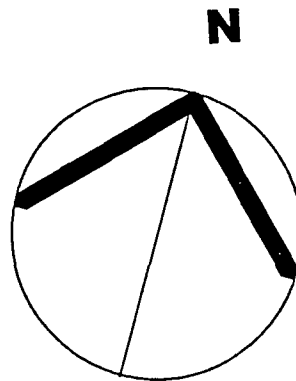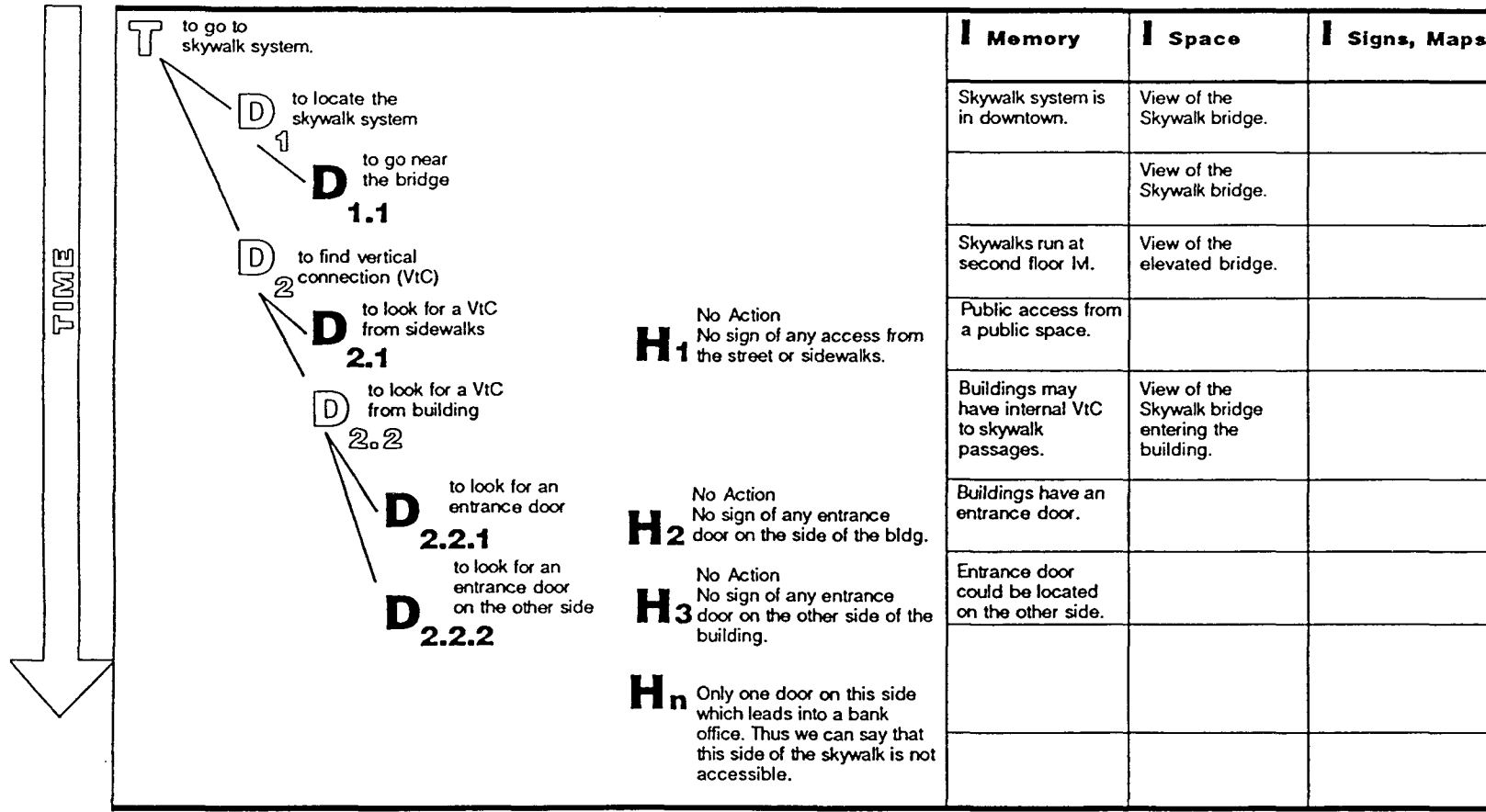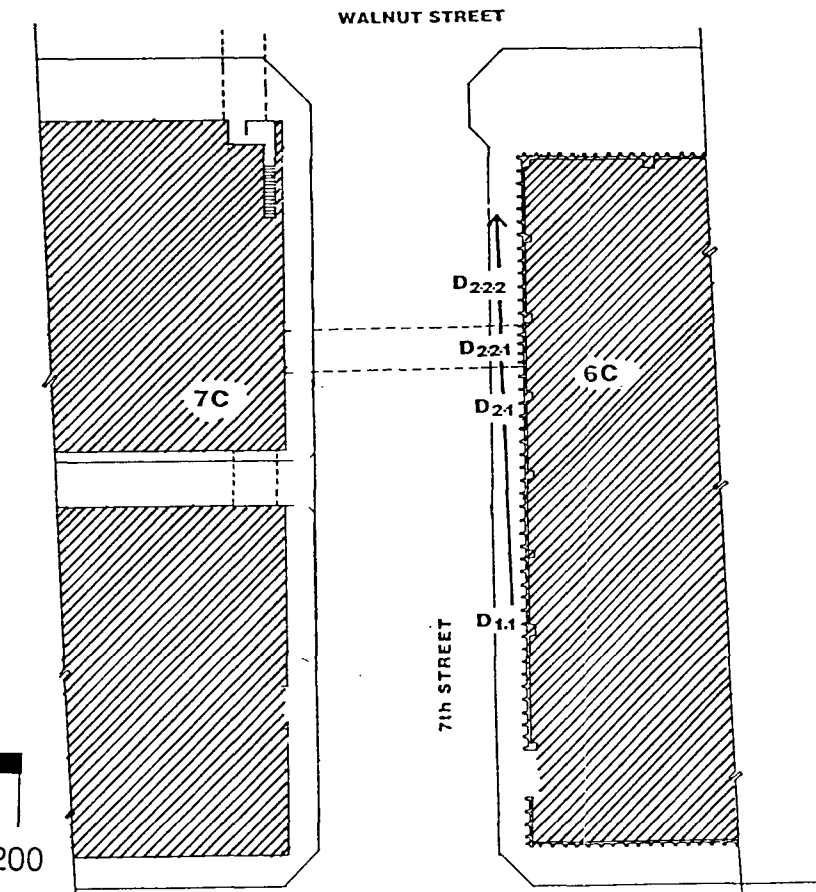| Memory	Space	Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
Buildings have an entrance door.		
Entrance door could be located on the other side.		

N

SCALE 0 100 200

Figure 5.35: The decision chart of bridge-end 6C(7C-6C)

WAYFINDING AT BRIDGE '7C-6C' (SKYWALK LVL.)

7C 6C 7th STREET

WALNUT STREET

7C 6C 7th STREET

D$_{2.2.2}$ D$_{2.2.1}$ D$_{2.1}$ D$_{1.1}$

WAYFINDING AT BRIDGE '7C-6C' (STREET LVL.)

7C-6C STEARNS BUILDING.

TIME

T to go to skywalk system.

D to locate the skywalk system
1

D to go near the bridge
1.1

D to find vertical connection (VtC)
2

D to look for a VtC from sidewalks
2.1

D to look for a VtC from building
2.2

D to look for an entrance door
2.2.1

D to look for an entrance door on the other side
2.2.2

H1 No Action
No sign of any access from the street or sidewalks.

H2 No Action
No sign of any entrance door on the side of the bldg.

H3 No Action
No sign of any entrance door on the other side of the building.

Hn Ther is no entrance door on the block facade. One door does not lead to skywalks. Thus this side of the bridge is not accessible.

I Memory	I Space	I Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
Buildings have an entrance door.		
Entrance door could be located on the other side.		

N

0   100   200

SCALE

Figure 5.36:   The decision chart of bridge-end 7C(7C-6C)

WAYFINDING AT BRIDGE '7C-6C' (SKYWALK LVL.)

WALNUT STREET

7C

6C

D1.1
D2.1
D2.2.1
D2.2.2

7th STREET

7C

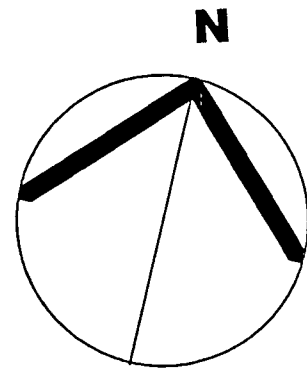6C

WAYFINDING AT BRIDGE '7C-6C' (STREET LVL.)

125

5E-5D UCB.

TIME

T	to go to skywalk system.
D₁	to locate the skywalk system
D 1.1	to go near the bridge
D₂	to find vertical connection (VtC)
D 2.1	to look for a VtC from sidewalks
D 2.2	to look for a VtC from building
D 2.2.1	to look for an entrance door
D 2.2.1.1	to check the door
D 2.2.1.2	to look for an entrance door on the other side.

H₁ No Action — No sign of any access from the street or sidewalks.

H₂ No Action — No sign of any entrance door near the bridge.

H₃ No Action — Door leads to a bank office.

Hₙ Only one door on this side which leads into a bank office. Thus we can say that this side of the skywalk is not accessible.

▮ Memory	▮ Space	▮ Signs, Maps
Skywalk system is in downtown.	View of the Skywalk bridge.	
	View of the Skywalk bridge.	
Skywalks run at second floor lvl.	View of the elevated bridge.	
Public access from a public space.		
Buildings may have internal VtC to skywalk passages.	View of the Skywalk bridge entering the building.	
Buildings have an entrance door.		
Entrance door could be located on the other side.		

Figure 5.37: The decision chart of bridge-end 5D(5E-5D)

N

SCALE 0 100 200

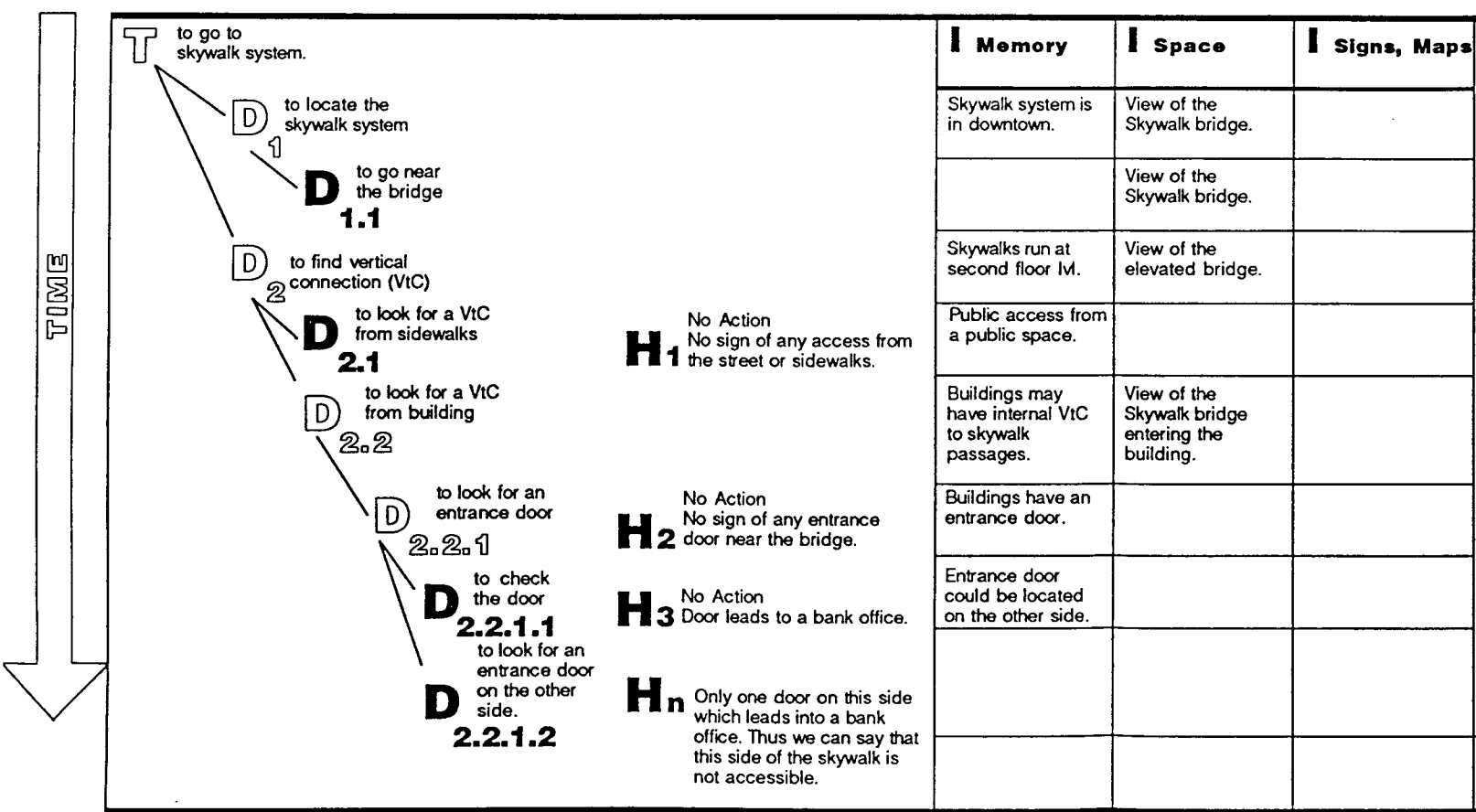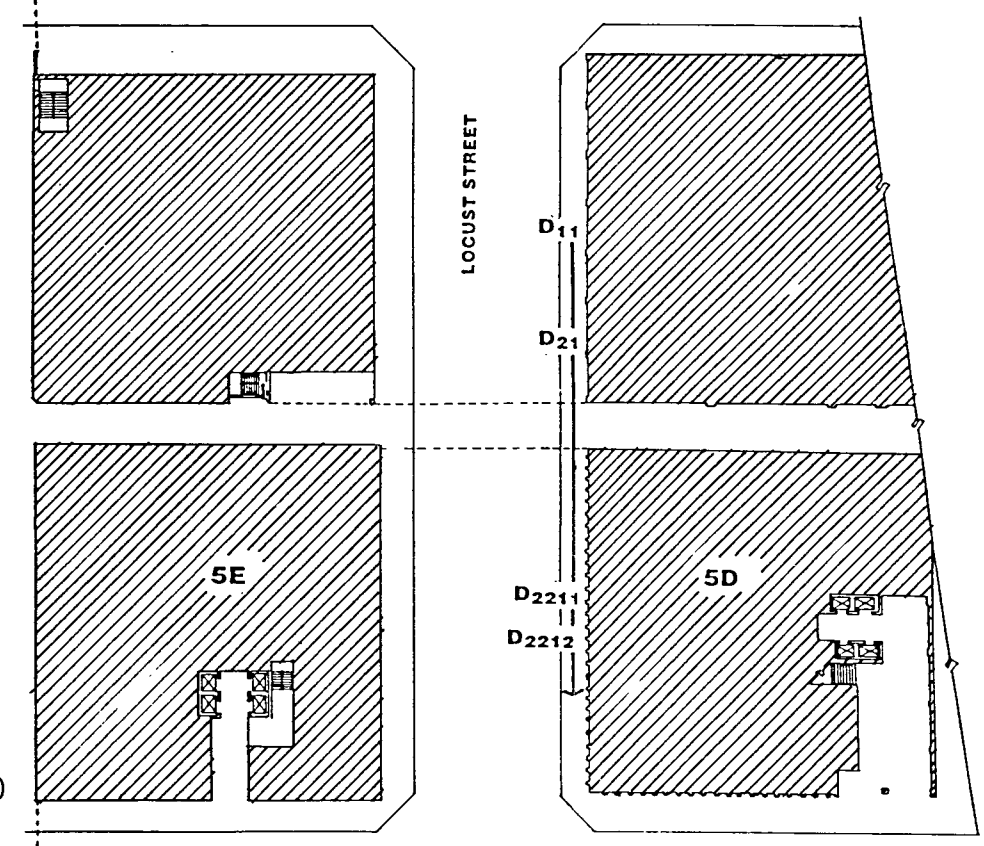WAYFINDING AT BRIDGE '5E-5D' (SKYWALK LVL.)

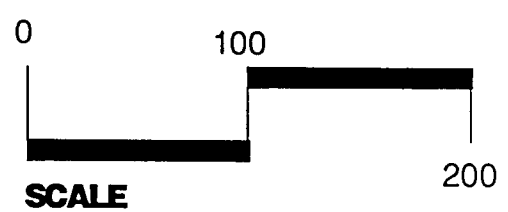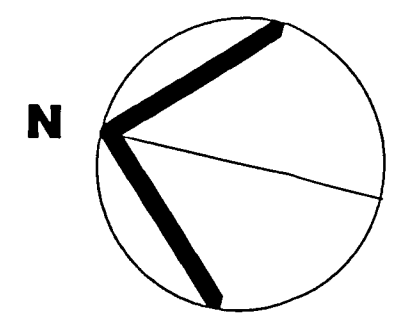WAYFINDING AT BRIDGE '5E-5D' (STREET LVL.)

Observations

The study results of twenty bridges are compiled in a chart (See Table 5.1).
The chart is then used for further analysis.

Table 5.1: Bridge chart with names and number of hurdles

Bridge-name	First side	Second side
4D-4C	2	N
4E-4D	4·	3
4F-4E	N	1
5C-4C	N	0
5D-4D	N	4
5D-5C	1	N
5E-4E	1	N
5E-5D	1	N
5F-5E	1	2
6D-5D	1	1
6D-6C	4	1
6E-5E	4	4
6E-6D	4	4
6F-6E	0	4
7C-6C	N	N.
7C-7D	1	N
7D-6D	N	3
7E-6E	N	4
7EW-7DW	4	3
7EE-7DE	N	1

The chart indicates the names of bridges and number of hurdles encountered
by the visitor during the wayfinding process. Each bridge corresponds with two
numbers which are marked as first side and second side at the top of the table. The
first side index indicates the number of hurdles in the wayfinding process of the first
block name whereas the second side index indicates the number of hurdles of the
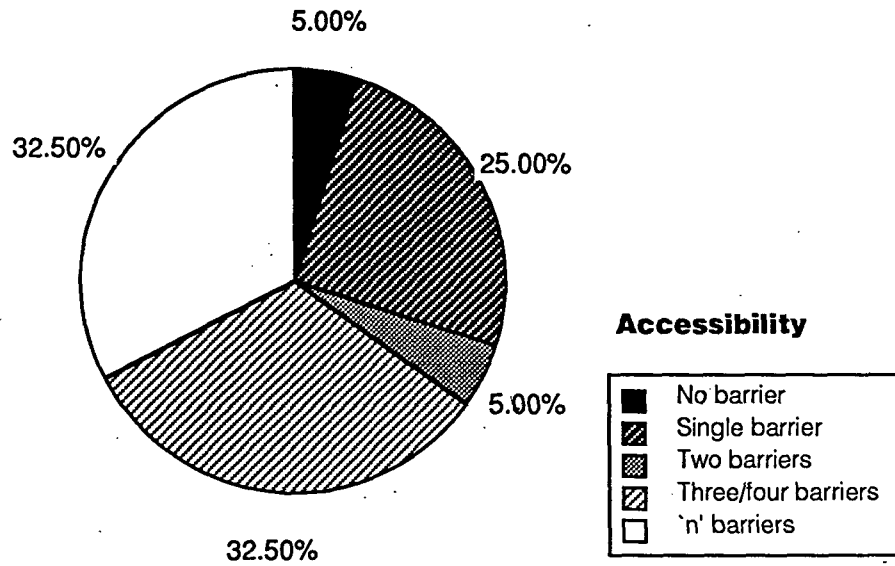
second block name. In the case of bridge 6F-6E, the first side index (0) corresponds with the bridge-end 6F(6F-6E) and the second side index (4) corresponds with the bridge-end 6E(6F-6E). The wayfinding hurdles of all bridges varies from 0 to n. In some bridges the index of first side is one and the second side is 'n'. This reflects that the number of hurdles is not the characteristic of the bridge but the characteristic of the building which it connects.

Accessibility of the skywalk system

The Figure 5.38 shows a table and a pie chart. The table organizes all 40 bridge-ends under groups according to wayfinding difficulties and the pie chart indicates proportional share of each group. The no barriers group contains only 2 bridge-ends out of 40 (5%) whereas the 'n' barriers group contains 13 (32.50%) bridge-ends. In order to be accessible, the environment of the skywalk entrance should give enough information for wayfinding. A successful skywalk entrance should not create even a single hurdle in the wayfinding process. Only two bridge-ends satisfy the requirement whereas remaining 38 (95%) do not. Contrast between no-barrier group and rest of the groups clearly demonstrates that a significant number of bridges pose wayfinding difficulties. Therefore it can be concluded that the skywalk system is not easily accessible from the sidewalks.

Publicness of the system

Des Moines skywalk ordinance states that the skywalk system is a public system. A public pedestrian system should be accessible from other public spaces without private control over movement of people. In order to analyze the degree of

5.00%

32.50%

25.00%

5.00%

32.50%

Accessibility

■	No barrier
▨	Single barrier
▦	Two barriers
▨	Three/four barriers
□	'n' barriers

Type of group	Number	Percent
No barriers	2	5.00%
Single barrier	10	25.00%
Two barriers	2	5.00%
Three/ four barriers	13	32.50%
n barriers	13	32.50%
Total	40	100.00%

Figure 5.38:   Accessibility of the skywalk system

publicness of skywalk entrances, bridge-ends were grouped under two categories as follows:

1. **Private:** In the wayfinding processes of some bridge-ends, the visitor travels through one or more spaces that are owned, controlled and used for private purposes or have a private character. Such bridge-ends are grouped in the "private" category.

2. **Public:** In the case of other bridge-ends, the visitor travels through spaces which are either publicly owned and managed or have a public character. Such bridge-ends are grouped under the "public" category.

Figure 5.39, which contains a table and a pie chart, differentiates public and private bridge-ends. The Figure indicates that 35 out of 40 bridge-ends (87.50%) are grouped under the private category whereas only 5 bridge-ends (12.50%) are listed under the public category.

We conclude that a significant number and proportion of entrances are under private control and thus the system may not appear as a public system to its users.
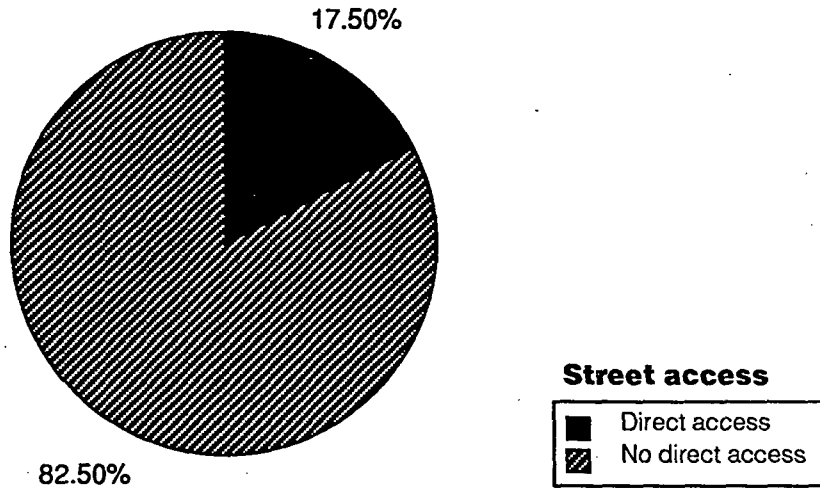
Street access

The wayfinding method tests accessibility of the skywalk system from the street level. In a wayfinding process the visitor looks for a vertical connection from the street level. If a vertical connection is located then the process proceeds ahead on the right path. On the other hand if a vertical connection is not located, the process stops and visitor looks for an alternative. The Figure 5.40 indicates that only seven bridge-ends out of 40 (17.50%) provide a vertical connection or give

12.50%

Publicness

■	Public access
▨	Private access
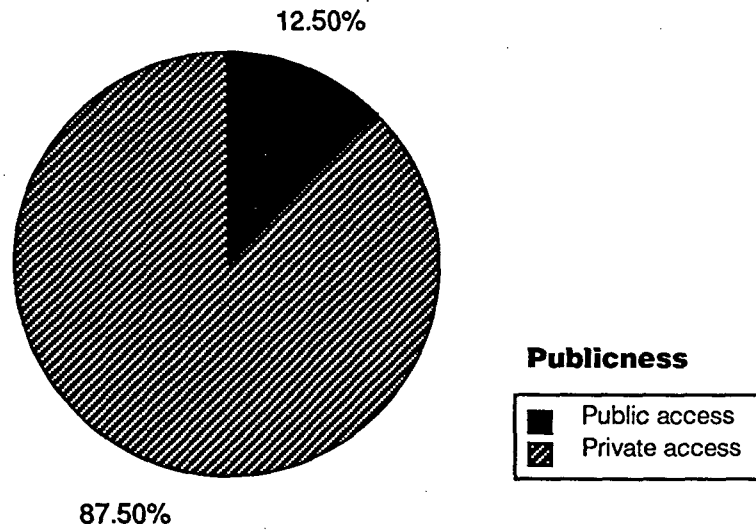
87.50%

Type of Bridge-end	Number	Percent
Public Access	5	12.50%
Private Access	35	87.50%
Total	40	100.00%

Figure 5.39: Publicness of the system

17.50%

82.50%

Street access

■ Direct access

▨ No direct access

Type of Bridge-end	Number	Percent
With Street Access	7	17.50%
Without Street Access	33	82.50%
Total	40	100.00%

Figure 5.40:   Street access of the system

some clue of locating it. The remaining 33 bridge-ends (82.50%) do not provide any information and block the process. As a result the visitor looks for an alternative and the process becomes complicated. Therefore it is concluded that a considerable number of bridge-ends do not have direct physical access from the street level to the skywalk system.

Building types and wayfinding difficulties

Wayfinding difficulties depend on the building type at the bridge-end. Some wayfinding characteristics of important building types in downtown Des Moines are as follows.

Office building Most of the buildings in the study area are office buildings. As most of them were built before the introduction of the skywalk system, they were not designed to adopt the skywalk system. Usually a block contains two to four such buildings with small alleys which separate them (See Figure 5.41). These alleys are used as service roads restricted for service vehicular access. When the skywalk system was introduced, it was decided to use the space above alleys to serve all buildings in a block without major alterations. Building entrances, however, tend to be located in the middle of the building facades. No effort has been made to provide vertical connections near the alley as internal building vertical connections satisfy the requirements of the skywalk ordinance. Therefore one has to look for a vertical connection by entering the building. Interiors of buildings are designed for their specific purposes and do not invite the general public to use them. Internal corridors, which are designed for internal

133

GRAND

LIBERTY
BLDG.

BRIDGE

7th STREET

RUAN
CENTER

CARRIERS
BLDG.

PASSAGE

6th STREET

LOCUST

SKYWALK LVL PLAN.

GRAND

LIBERTY
BLDG.

SERVICE
ALLEY

SERVICE ALLEY

7th STREET

RUAN
CENTER
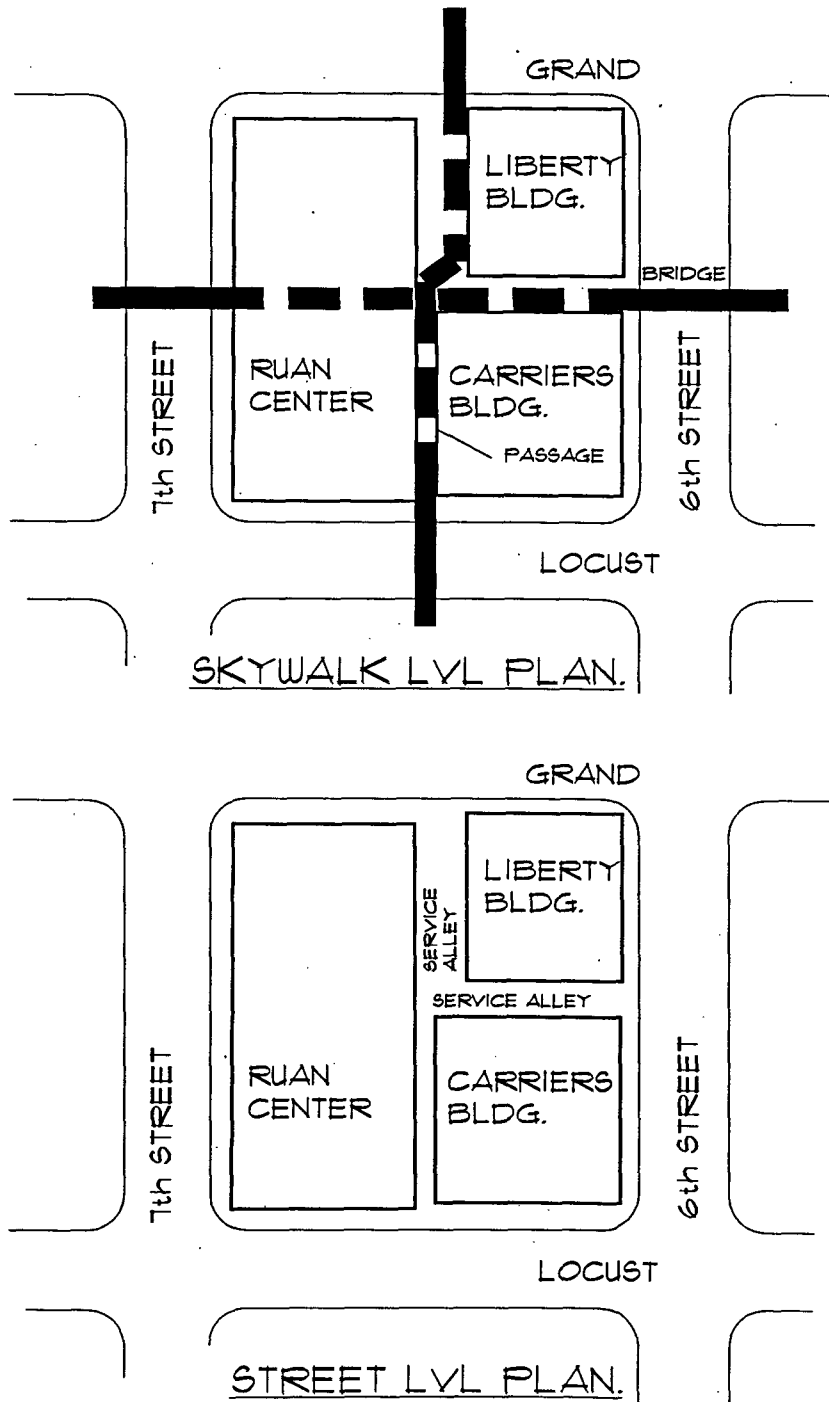
CARRIERS
BLDG.

6th STREET

LOCUST

STREET LVL PLAN.

Figure 5.41:   Schematic plan of a block with skywalks

communication, confuse the wayfinder who is not familiar with the environment. Above all, private corporate environments may discourage people to use it. As a result, the number of hurdles in office buildings range from two to infinity.

In some new buildings, vertical connections are not designed outside on the street. But skywalks and buildings are designed as one design theme. The design of a bridge when integrated with one building tend to contradict with others to which it connects. However an integrated design supports the assumption that since the bridge is a part of the building it should have an internal connection with the skywalk system.

Retail structures The Kaleidoscope at the Hub and the Locust mall are important retail structures in downtown Des Moines. They contain most of the retail activity found at the skywalk level. Retail structures helped to create important activity nodes in the system. Most retail structures are designed with the skywalk system and they adopt as well as support the system. Designers and owners of the retail structures ignored street activity and did not provide direct street connections. As a result the wayfinder has to go in the retail structure in order to locate a vertical connection. Once inside, the vertical connections are easy to locate due to multilevel spaces and visible stairs and escalators. Although interior spaces are controlled by private management, they are designed for public access. Retail spaces welcome those who like to shop. Usually vertical connections are located near entrance doors or inside multilevel spaces which help wayfinders to go up. Also views of upper level corridors from the lower level help in the decision making process. Wayfinding difficulty varies from one to infinity.

Department stores Two major department stores, J. C. Penney and Younkers, are linked with the skywalk system. These multistoried department stores are important in the economic development of downtown. The stores have huge internal spaces connected with stairs, escalators, and elevators which are usually located near the center of the store. Entrances and interiors of these shops are designed to sell merchandise as internal paths meander through a maze of displays and counters. The setting does not create the character which is expected of a public space. Also the interior is changed regularly by store marketing staff which makes formation of cognitive maps difficult. It is very difficult to measure wayfinding difficulty over time due to changing interiors. Thus we say that the process contains infinite hurdles.

Hotels Two hotels, Hotel Savery and Marriot Hotel, are connected with the skywalk system. Both buildings were constructed before the skywalk system and modified later to adopt skywalks. The hotels took advantage of the skywalk system without opening themselves to the system. A skywalk passage runs along the length of Marriot Hotel building. Lobby at the second floor is located right next to the passage but it is partitioned off. No vertical connections are located near the bridge-end and doors are located at the center of the building facade. The wayfinder has to enter hotel lobbies and use an internal stair or elevator to the upper level lobby and then find way to the skywalk passage. The process gets complicated and the difficulty index rises from four to infinity.

Parking ramps Parking ramps provide the best access available in the skywalk system, perhaps because they are built by the city. Wayfinding difficulty

varies from zero to two. Parking ramps are designed to serve only those who pay
and park in ramps. Vertical connections are provided for ramp users to go down to
the street and the skywalk level. Fortunately in many cases, vertical connections
are located near the bridge end. These stairs also act as fire-escape routes. When
wayfinder looks for a vertical connection he/she locates these stairs or elevators and
uses them to go up.

Conclusions

The following conclusions can be derived from the study.

- The skywalk system in Des Moines is not readily accessible from the sidewalk
  level as 95% of studied bridge-ends have one or more hurdles in the
  wayfinding process. Also a large number of them have three, four, or an
  infinite number of hurdles.

- Many entrances of the skywalk system are located in privately owned and
  managed spaces. These spaces are not designed as public entrances and
  reduce the publicness of the system.

- No direct access is available from the street level for approximately 82% of the
  bridge-ends.

- Office buildings, department stores and hotels have higher wayfinding indices
  than retail malls and parking ramps, indicating more wayfinding difficulty.

This chapter discussed the application of wayfinding method to 36 skywalk
bridge-ends and made observations. The next chapter analyzes some existing

bridge-ends as well as previous design proposals to formulate design recommendations.

CHAPTER 6. DESIGN INTERVENTIONS.

Introduction

In the Chapter Five, Passini's methodology was applied to the existing skywalk system in Des Moines. This chapter offers a set of design recommendations based on those observations. For this purpose, existing examples in Des Moines as well as in Cincinnati, Ohio and a proposed design in Minneapolis, Minnesota are discussed.

Study Observations

Chapter Five concluded with four observations:

1. The skywalk system is not accessible from the street.

2. Entrances are located in private spaces.

3. Direct access is not available from the street.

4. Certain building types have higher wayfinding indices (signifying more difficulty) than others.

At this point, we know that the skywalk system has accessibility problems at the entry points. The study suggests that means of direct access are not available

from the street and the available means of indirect access force people through private environments. Also, certain types of private environments create more hurdles, making the entry nearly impossible.

How should one solve these problems? Preliminary recommendations could be in response to above observations.

1. The skywalk system should be made accessible from the street.

2. Entrances of the skywalk system should be designed as public spaces.

3. Direct access to the skywalk level from the street or through a public space should be provided.

4. Skywalk entrances should not be located only inside office buildings, departmental stores, hotels and other private spaces.

Preliminary recommendations are linked with each other since the skywalk related issues are linked with each other. A direct access from the street will increase the publicness of the skywalk entrance. It will also reduce wayfinding hurdles and make the bridge-end easily accessible. Implementing one recommendation at a time without considering others may not help in solving the problem. For example in the bridge-end 7C(7C-7D) a direct access, a stair, is provided. One could see the stair going up to the skywalk level but it is accessed only from a store. The private control on the entrance creates a hurdle in the wayfinding process and the direct access is not effective.

It is decided to analyze existing skywalk connections to find out the elements that can help to satisfy preliminary recommendations. Also, other design solutions proposed in other cities are analyzed.

Existing Models

Only two bridge-ends in our study qualify the accessibility test as they do not have hurdles in the wayfinding process. Both bridge-ends are located near parking ramps which are built by the City after the introduction of the skywalk system.

The bridge-end 6F(6F-6E)

In the case of the bridge-end 6F(6F-6E), the skywalk bridge first connects a vertical tower and then the parking ramp (See Figure 6.1). The vertical tower is visible from the road as a distinct entity. It symbolizes a vertical connection due to its tower form. When looked at from a distance, at first the tower form is visible and then as one walks towards it the other details such as doors and signs become visible. The clarity and simplicity of the tower form helps to make proper decisions and also helps to form a distinct cognitive image.

The bridge-end 4C(5C-4C)

The second bridge-end, 4C(5C-4C), connects the J. C. Penney store with the parking ramp. The skywalk passage runs along the edge of the parking ramp which offers view of the skywalk level from the street level. A vertical connection in the form of an elevator is located behind the passage and near the bridge (See Figure 6.2). Although the tower form of the elevator is attached to the building, it clearly stands out due to the differences in its height, form and color. At the bottom of the tower, a glass partition exposes the interior of the foyer as well as the view of the elevators. The tower form, view of the skywalk passage and visibility of the entrance help in the decision process. Other visual clues such as signs are

Figure 6.1: The skywalk bridge 6F(6F-6E)

Figure 6.2:   The skywalk bridge 4C(5C-4C)

visible only when one gets close enough to the door. Other visual clues then acts as supportive information.

In both cases, the strong vertical tower form along with the presence of the skywalk bridge or passage and transparency of the entrance helps to make wayfinding decisions.

In some other cases, a view of the vertical connection through a glass curtain wall (See Figure 6.3) helps to locate the entrance. Although no distinct tower form is seen, the vertical form of the glass curtain wall stands out against horizontal bands of the ramp facade. In some cases, a staircase in the building is visible from outside and encourages the wayfinder to look for an entrance to the building.

From the above discussion of existing entrances, the following qualities of bridge-ends can be extracted:

1. **Verticality:** Vertical form of a tower or a curtain wall.

2. **Perceptibility:** View of the skywalk bridge near vertical connection.

3. **Transparency:** View of the vertical connection or its entrance.

A successful skywalk entrance should have all the three qualities mentioned above. Lack of any one quality may produce hurdles in the wayfinding process. The bridge-end 6D-5D, which connects two parts of the Kaleidoscope at the Hub mall, is a typical example where the presence of only two qualities could not solve the problem. Towers, which are located at four corners of the bridge, give verticality and view of the bridge increases perceptibility. But vertical connection is not visible which causes a wayfinding hurdle.

Figure 6.3: The skywalk bridge 4E(4F-4E)

Design Proposals

Architects and planners have proposed design solutions to the accessibility issue. One important proposal, which remained on the drawing board, is a proposed vertical connection in downtown Minneapolis, Minnesota. Another example is found in Cincinnati, Ohio.

Vertical skywalk connections in Minneapolis, Minnesota

Minneapolis has played an important role in the evolution of skywalk systems. The City introduced the skywalk system and now it serves as a model to other cities. Des Moines owes its skywalk system and other pedestrian development to the Minneapolis model.

In order to increase pedestrian activities in downtown Minneapolis, the City introduced the Nicollet Mall in 1967. The Nicollet Mall has been the main retail street in downtown Minneapolis but it no longer competed successfully with suburban shopping malls and the skywalk system. The Nicollet Mall Implementation Board hired the firm BRW Design Team to redesign the Nicollet Mall.

In their design, the BRW Design Team has proposed various solutions to improve the quality of the Mall. They proposed direct access from the Nicollet Mall to the skywalk system. The proposed design would connect the skywalks, which cross the Nicollet Mall directly, to the sidewalks in a highly visible way (See Figure 6.4). Glass towers, which contain stairs wrapped around an elevator, would be attached to the skywalks to encourage people to go from one system to the other. The proposed design has all three qualities of best connections–
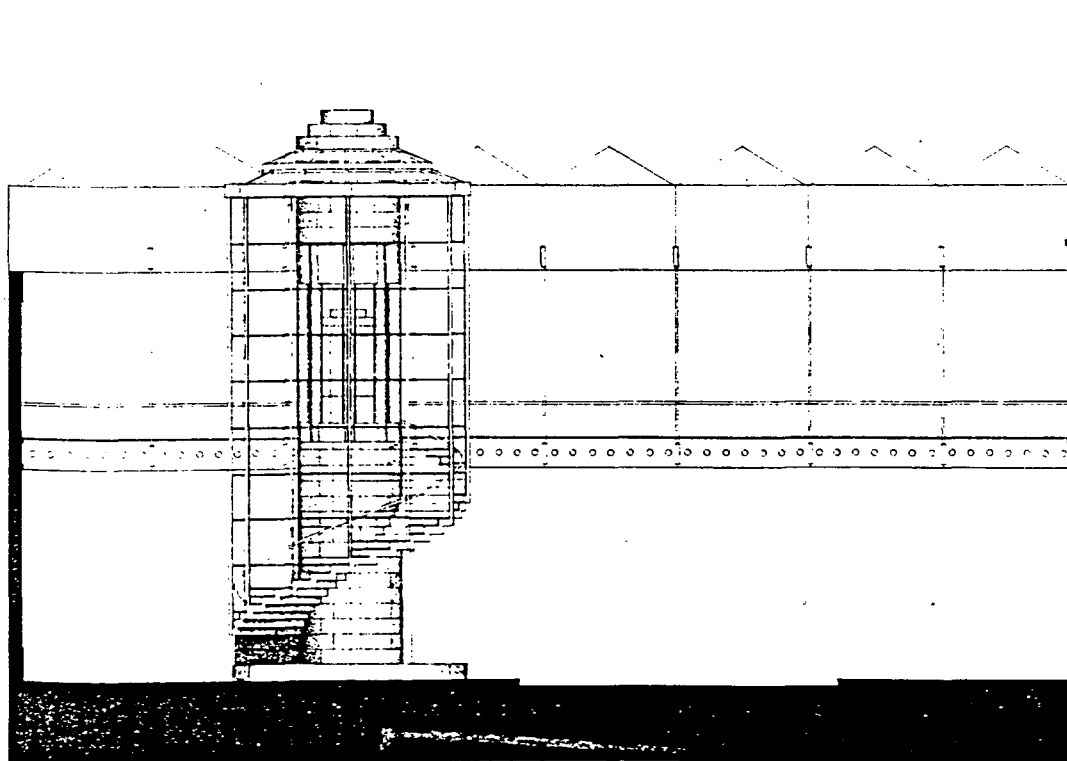
Figure 6.4: Proposed vertical connections in Minneapolis (Architecture Minnesota, March/April 1988, 5)

verticality, perceptibility, and transparency.

The design was not implemented, however, due to objections by building owners and managers. The skywalk system in Minneapolis is privately owned and owners and managers preferred controlled access to the above-grade skywalk system.

Cincinnati, Ohio

An example of direct skywalk access is found in Cincinnati, Ohio. Cincinnati is the only US skywalk city which provides direct access to the skywalk system from the street level. The direct access is possible due to numerous escalators and stairways leading directly to the skywalks (See Figure 6.5).

The study of design intervention helps to understand that good vertical connections can help solve skywalk related problems. The study also confirms that verticality, perceptibility and transparency are three qualities of a good vertical connection. The tower form and direct visual and physical access help to reduce the number of hurdles in the wayfinding process.

Recommendations

In concluding this thesis, recommendations are made which can be implemented to improve the skywalk related problems. In Chapter One, skywalk related issues and their links with each other were discussed. It was stated that the issues are integrated with each other. As the issues are interrelated, addressing only one issue may not give expected results. The study focussed on the accessibility issue and applied the wayfinding method to define the problem. As a preface to making recommendations on the basis of the study, the thesis goes back one step
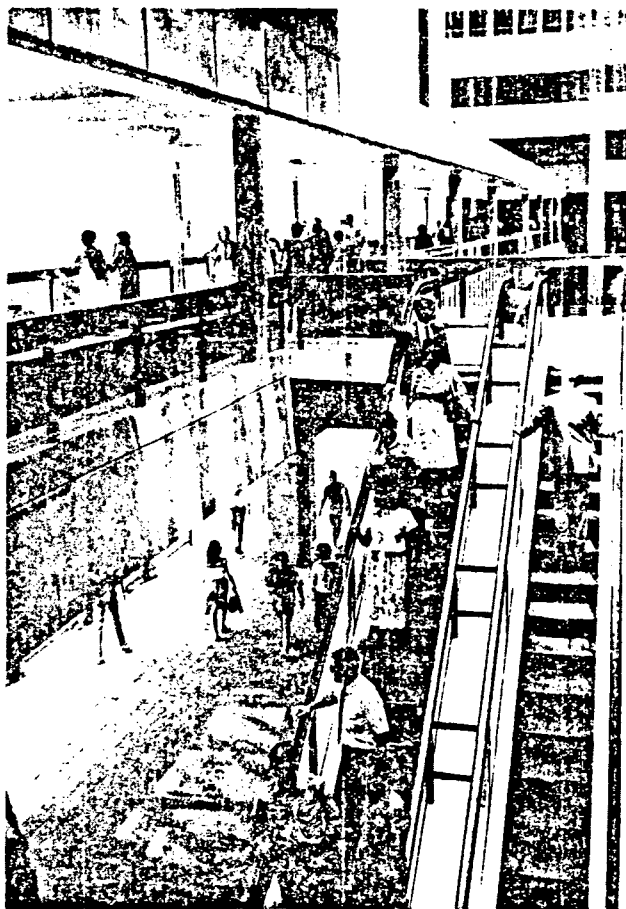
Figure 6.5:   Direct skywalk connections in Cincinnati, Ohio (Robertson, July 1988, 466)

and proposes some comprehensive recommendations for the entire system and then proposes design recommendations for accessibility of the skywalk system. This approach would help us build a comprehensive solution which will help to integrate the at-grade pedestrian system with the above-grade pedestrian system.

The proposed recommendations can be discussed with generic issues explained in the Chapter one. These issues are:

1. Privatization

2. Pedestrianization

3. Stratification

4. Transportation

5. Weatherization

Privatization

In Chapter Five the study reveals that about 87.50% of the bridge-ends, which were tested by the wayfinding method, were accessed through private spaces. Although private spaces may allow physical access, they are not suitable for an entry from one public system to another. The character of a private space may stop anyone from using it. Private spaces act as buffers between two public pedestrian systems inhibiting interaction, generating two isolated public pedestrian systems.

Since we want to integrate both pedestrian systems, we should make the link between two public systems as a part of the public system. In many cities public streets are considered as a public right of way. Although right of way may belong to the private property, it is acquired and maintained by the City. The skywalk system

in Des Moines, although owned and managed by private property owners, is considered as a public system; and the activities are controlled by a public body, the Skywalk Commission (See Figure 6.6). We can use the same principle of keeping public control over private property and propose that the vertical connections should be identified or designed to make them public access to the skywalk system (See Figure 6.7). Public access to the skywalk system should be managed by the City. The vertical connection should not depend on private space and should remain open during skywalk system hours. The space required for a vertical connection could be either owned by the City or leased out to the City by the property owner.

Pedestrianization

In congested urban areas, pedestrianization gives preference to people on foot. People communicating between downtown blocks not only make cities vital and efficient but also make them livable. Traditionally, streets and plazas are used by pedestrians to walk, but when the skywalk system is introduced as an isolated above-grade pedestrian system, the isolation of the two systems forces them to compete with each other.

When we talk about integration of both pedestrian systems, we mean that instead of competing with each other both pedestrian systems should complement each other, and together they may compete against suburban development. In order to support each other, both pedestrian systems should share equal pedestrian movement. Although convenience, comfort, efficiency and controlled climate are the factors that promote development of the skywalk system, the at-grade pedestrian system should not be neglected. In Des Moines, the above-grade pedestrian system
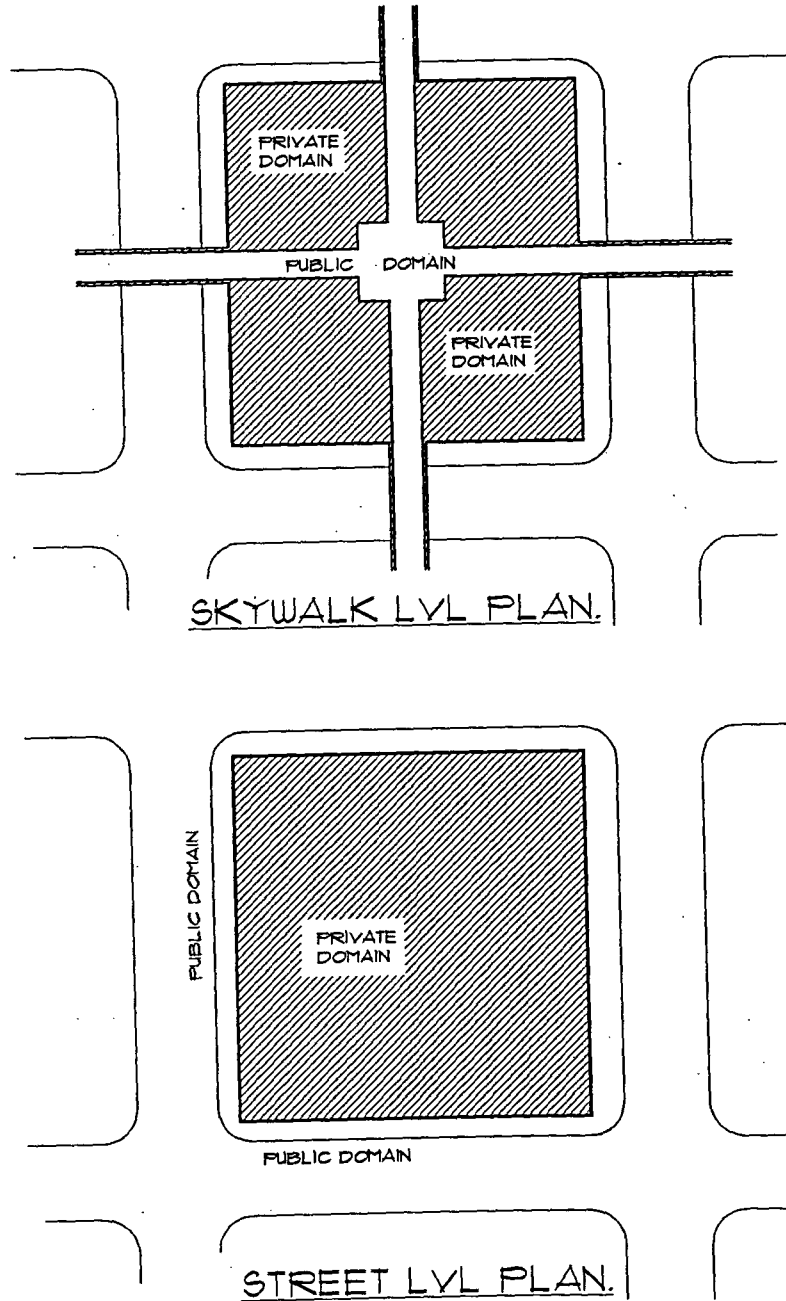
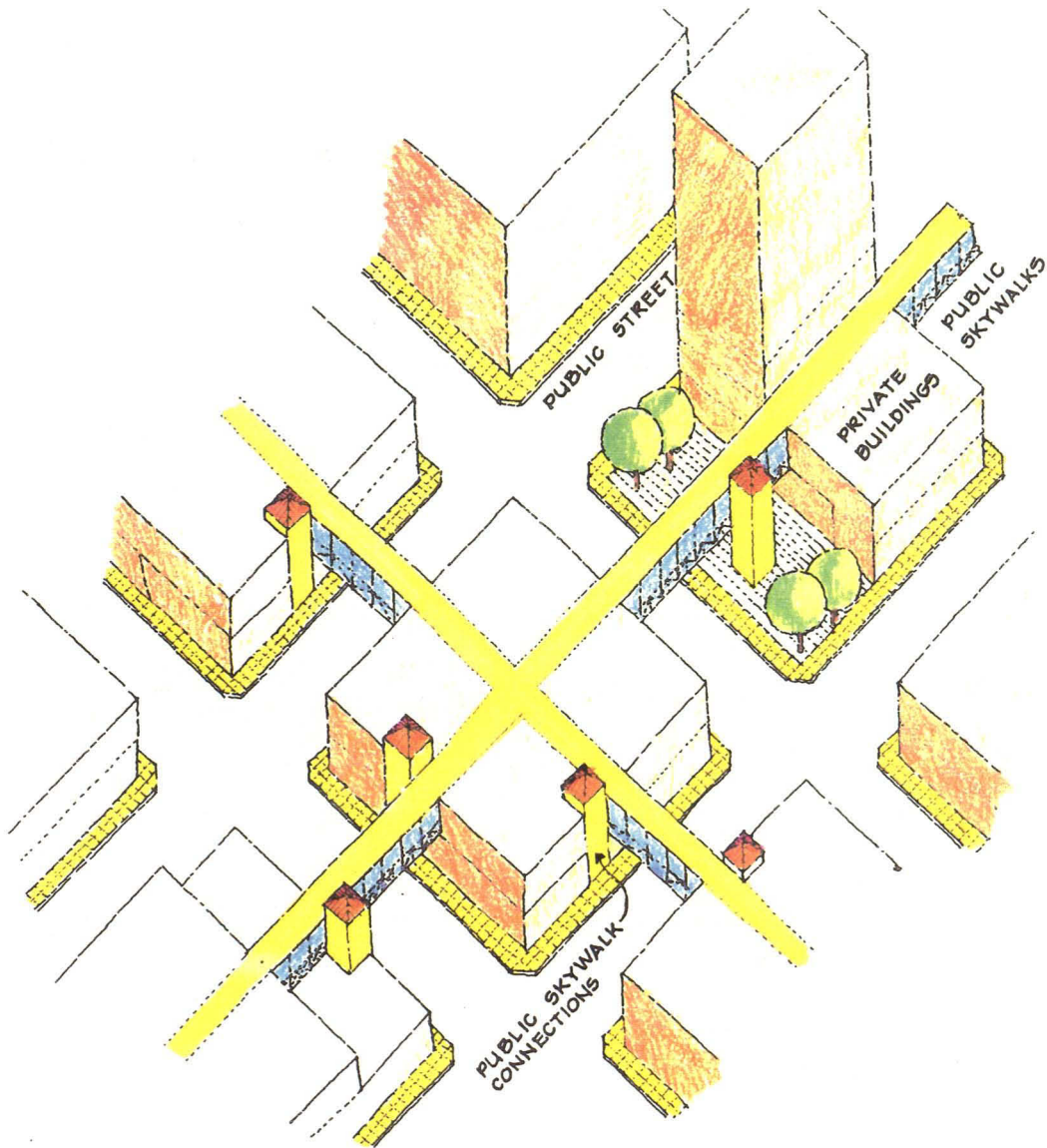Figure 6.6: Private - public relationship at the street and skywalk level

Figure 6.7: Publicness of the skywalk system

works very well and the at-grade system needs more attention.

The Walnut Street transit mall is developed by the City to augment pedestrian activity at the street level, but Walnut Street alone could not transform the entire downtown. A pedestrian system at the street level should be reintroduced to promote street level pedestrianization. Pedestrian streets would attract skywalkers back to the street level.

Stratification

Downtown Des Moines has two separate pedestrian systems layered on each other. Layering of pedestrian system causes stratification.

Enhancement of the accessibility from one pedestrian system to another would certainly help to reduce the effects of stratification. Reintroduction of street level retail activity would help to reduce economic stratification. Usually retail activity follows pedestrian activity. Thus, pedestrianization would help to increase street level retail. On the other hand, reintroduction of the retail may stimulate pedestrian activity.

Reintroduction of street level retail would open more opportunities to go from one level to another and in turn integrate both pedestrian systems. Instead of expanding retail growth laterally at the skywalk level, the City should promote street level retail by providing incentives. Probable retail growth nodes should be identified and incorporated in the plan. In the beginning, retail area should be located near the bridge-ends and vertical connections so they can support each other (See Figure 6.8).
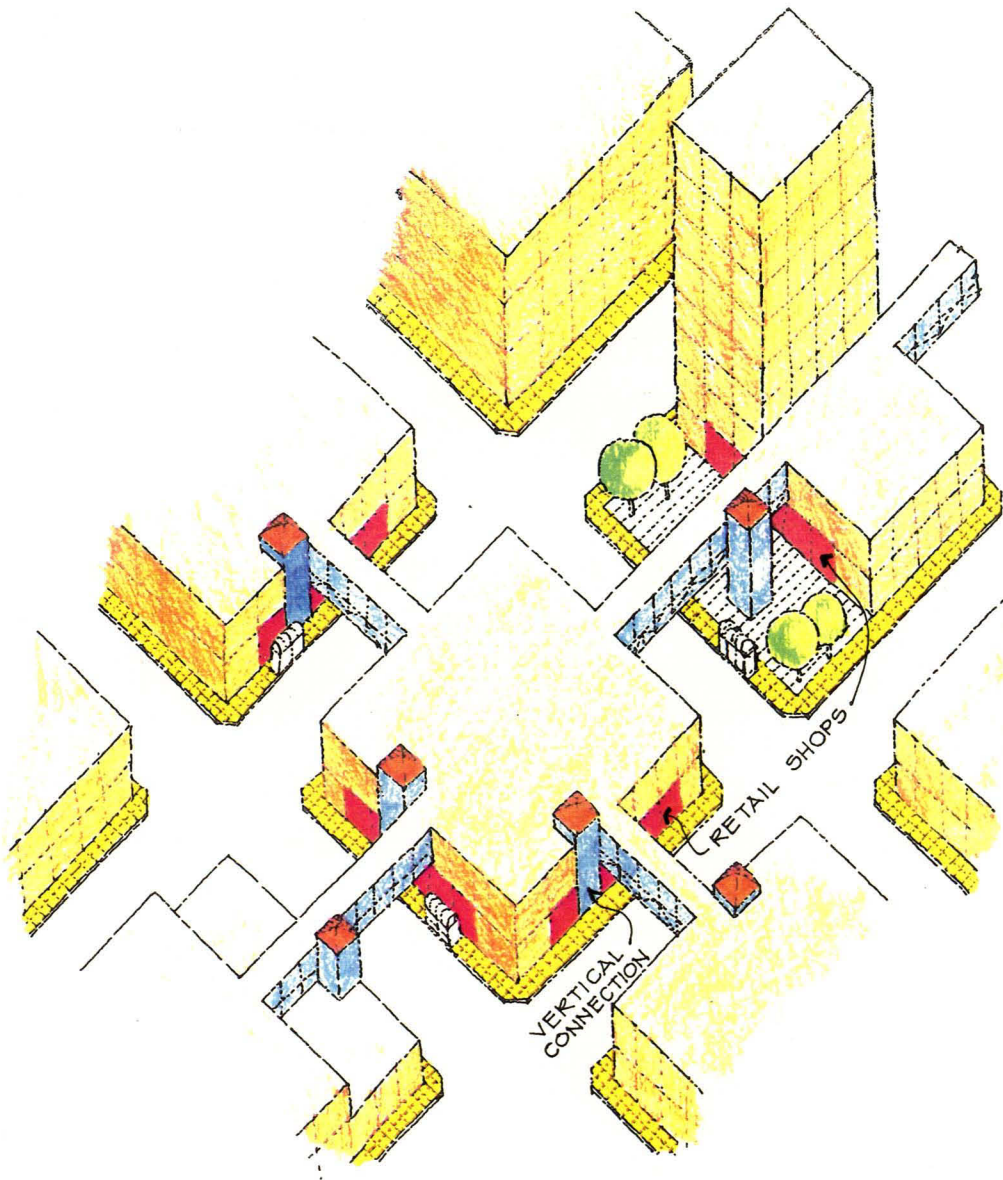
Figure 6.8: Reintroduction of retail at the street level

Transportation

The choice of modes of transportation influences the character, growth rate and pattern of city centers. In Des Moines, like other midwestern cities, the automobile is a principal mode of transportation. Efforts are made by the City to increase the use of mass transportation. The Metro Bus Service serves important parts of downtown. If linked with the skywalk and the sidewalk pedestrian systems, the bus service can provide a better alternative to automobiles. In order to integrate the mass transportation with pedestrian systems, all bus stops in the skywalk district should be located where the two systems meet or where vertical connections are located in downtown.

The City of Toronto serves as a successful example for integration of pedestrian and transportation systems. In Toronto, huge retail areas occupy lower levels of many office buildings along Yonge Street. These retail areas with multilevel spaces connect sidewalks with Toronto's underground pedestrian system. Underground rail stations are located just below retail spaces. At the ground level, buses and trams pick up people from the bus stops located just outside on the street. The entire transportation system is managed by the Toronto Transit Commission (TTC) which offers convenience of buying only one ticket and using any combination of transit.

In Des Moines, any new building within the skywalk district should be designed to integrate skywalks, sidewalks as well as the mass transit with multilevel spaces which can be used for retail or public activities. Bus stops should be located near vertical connections of the skywalk system (See Figure 6.9). Visual connections are more important as a view of the bus stop may encourage a person
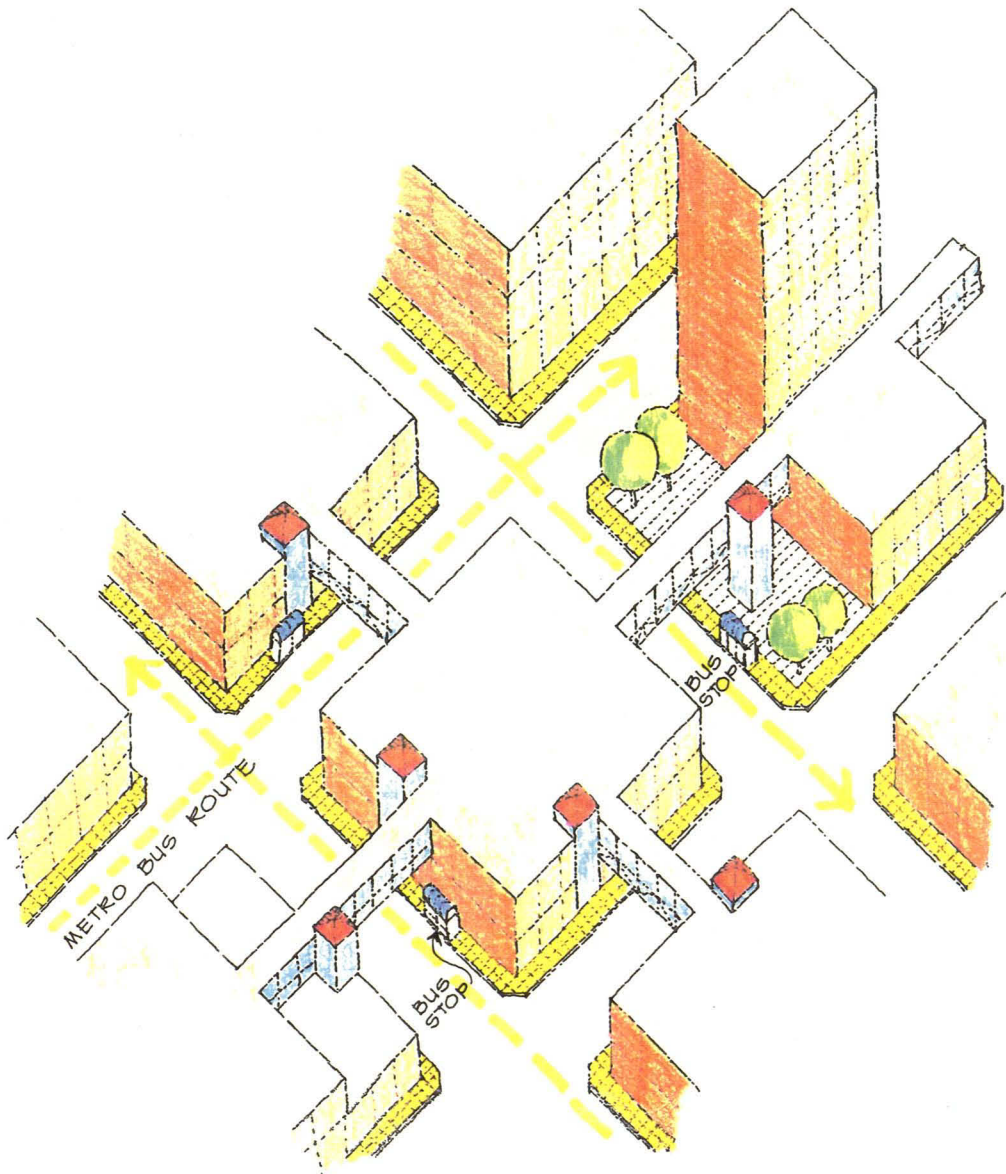
Figure 6.9: Connection of mass transit and pedestrian systems

to go down to the street.

Weatherization

An opportunity to go indoors or outdoors is advocated to allow people to choose the degree of climate protection rather than it being forced upon them by the designed environment. Vertical connections can be designed to have a gradation of enclosure from totally open to totally closed.

Design recommendations for vertical connections

In the following part of the chapter, the design criteria for a vertical connection is discussed. The design criteria includes the number of connections, location and type of connection.

1. **Number of vertical connections:** At present, the skywalk ordinance specifies a minimum of one vertical connection per block regardless of its location and type. The recommendation is that a minimum of one connection should be provided per bridge-end as has been legislated for Calgary's +15 system. One vertical connection per bridge-end would save wayfinders time and energy as they would neither have to cross the street nor would have to go to the other side of the block. If provided with a mid-block street crossing, the requirement can be reduced to one connection per bridge (See Figure 6.10). At the beginning, all important nodes should be identified and then they should be provided with vertical connections. Once all important nodes are provided with public vertical connections, the rest can be developed in the
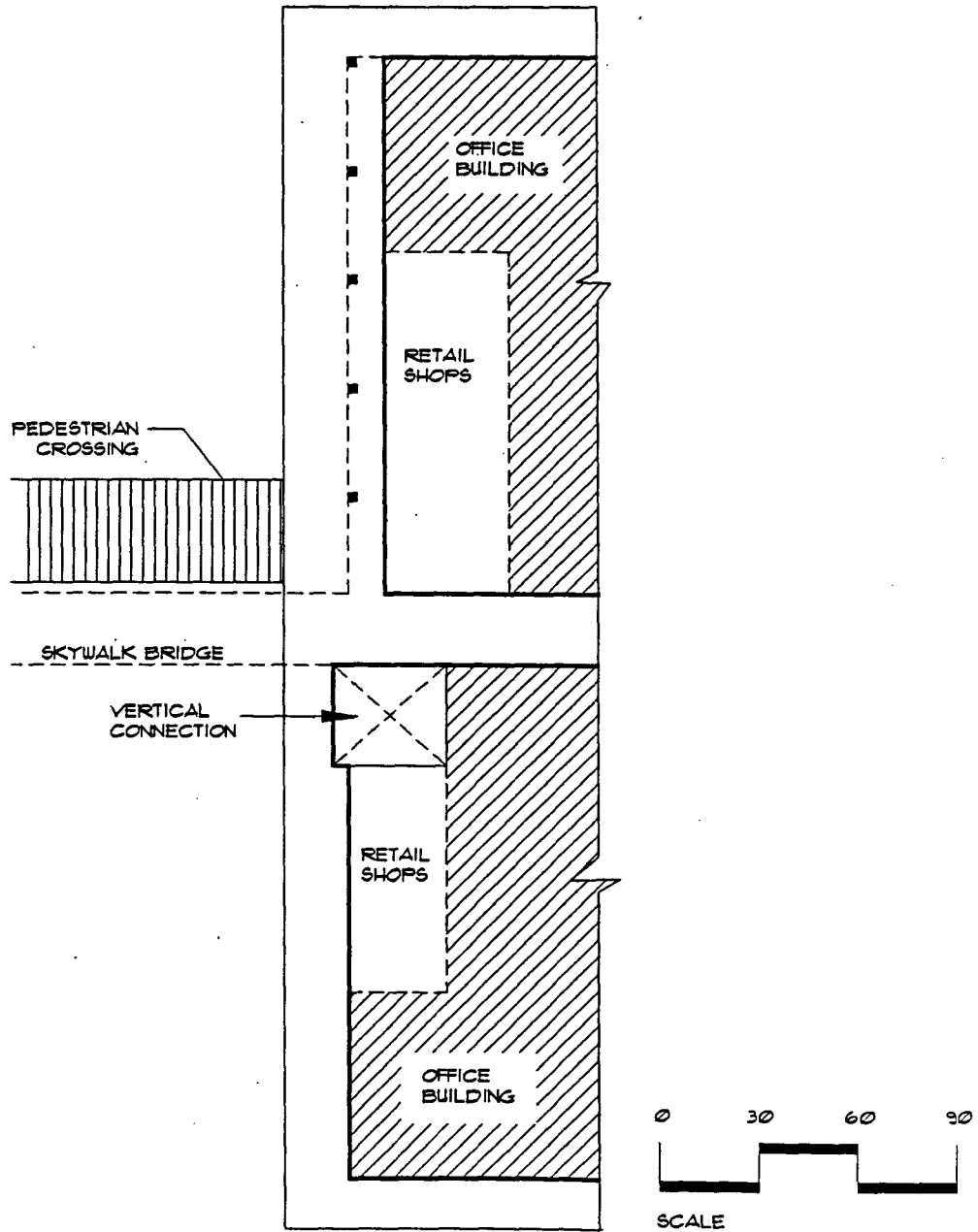
Figure 6.10: Mid-block street crossing and vertical connection

future. The City may adopt a plan to provide vertical connections in stages or it may give incentives to property owners to provide vertical connections.

2. **Location of vertical connection:** The vertical connection should be located very close to the bridge-end. The connection could be either a self standing structure or integrated within the facade of the building. It should be visible from the sidewalks. A clear visual connection would avoid the first 'no choice' hurdle in most wayfinding processes. Existing retail structures at the street level can also play an important role in the location of vertical connections. Street level retail activity may invite skywalk users to the street level.

3. **Type of vertical connections:** A staircase, an escalator, and an elevator are the accepted modes of vertical communication in public urban areas. Each type comes with its pros and cons. Staircases are the the most acceptable form of vertical connection as they are least expensive to install and they do not need maintenance. But they need more space than elevators and they do not provide any access for physically handicapped. Although escalators encourage people to use them by offering convenience, they need even more space than stairs, have limited access for physically handicapped persons and are expensive to install and maintain. Elevators too are expensive to install and maintain, but they need very little space and provide access to physically handicapped.

The City should project future user rates and decide which type of vertical connection is needed for a particular location. Staircases should be provided

as a basic mode and elevators can be added as needed for handicapped accessibility. In addition to above two modes, escalators may be provided as an incentive where vertical connections are located in multi-level spaces. In a large multi-level space escalators are more effective in moving people from one level to another.

4. **Design of a vertical connection:** Design of a vertical connection is the next step once the location and the type of vertical connection is determined. We have seen that the verticality, perceptibility, and transparency are the three design elements of a successful vertical connection. We propose that these design elements should be used as base for all vertical connections.

- **Verticality:** We have seen that the vertical tower form suggests a vertical connection from street to the skywalk system. The vertical form, like a column, supports lateral expansion of the skywalk system and, like an anchor, keeps skywalks attached to the ground. The vertical form can be identified from a distance, which can help in the decision making process.

  Skywalk bridges have become the symbol of the skywalk system. Although the skywalk system is more than the bridges, skywalk bridges are the only exposed part of the system. One locates the skywalk system at the first sight of a bridge. We propose to apply a similar logic to skywalk entrances and make the vertical form of vertical connections a symbol of the skywalk entrance. The recommendation is that the vertical tower should be employed in all designs of vertical connection. People

would look for the tower instead of looking for a stair or an elevator once they are exposed to the image of the vertical connection. The tower could be a separate structure or integrated with the building.

- **Perceptibility:** In a typical wayfinding process, the visitor locates a skywalk bridge and then looks for a vertical connection. The setting should give enough information so the visitor will be reassured. Perceptibility is a quality that gives information about a setting. In order to increase perceptibility, vertical connections should be located near the bridge-ends. The design of a vertical connection should be integrated itself with the bridge or building. The tower also helps build cognitive images which increases perceptibility.

- **Transparency:** Once a vertical connection is located, the visitor needs assurance that the connection would lead to the skywalk system. Transparency of the setting can not only give view of the connection but it also can reveal the skywalk level. The same is true from the skywalk level to the street level. A multi-level space is the best example where users on both levels can see the other level. Transparency can be achieved by using glass enclosures. Transparency can be improved by introducing observation spaces on the bridge. Observation spaces would give skywalk users an opportunity to stop and look outside to observe the street life. At the same time, pedestrians can see observation space and can become aware of the skywalk level. Observation galleries could be equipped with some information about the street and landmarks so that skywalk users can use the information to orient themselves. Future

skywalk bridges should be adaptable to weather changes so that they can open themselves to outdoor air whenever weather permits.

- **Architectural style:** When we talk about giving skywalk entrances an image, we think about uniformity in the skywalk entrance design. We believe that uniform design elements may help to ease the wayfinding process. How uniform should the design be? In order to address the issue, we need to look into the design of the skywalk bridges for precedents. Different skywalk cities use different methods to regulate the design of skywalk bridges. The City of Minneapolis allows different bridge designs whereas St. Paul allows only a typical bridge design. Although bridges in St. Paul inform that they belong to the one skywalk system, they are often criticized for lack of variety (Robertson, July 1988). Although Minneapolis bridges are designed with different architectural styles, the bridge form is same. The form gives uniformity whereas different designs remove repeatativeness.

Des Moines has followed Minneapolis model and allowed different design styles. The recommendation is that Des Moines should use the same concept and allow designers a free hand only by regulating basic form. The City may encourage uniform designs on some streets to create consistent urban street character. Primary pedestrian streets such as Walnut Street may have uniform vertical connections which may be designed as part of the street furniture.

- **Sign system:** The wayfinding study in Chapter Five revealed that the setting fails to provide spatial information as well as sign information. In

many cases, Signs appear in the last sector of the wayfinding process. Only in few cases, signs appear earlier in the wayfinding process to help the decision making process. Although the study concentrated more on providing spatial information, giving suitable sign information is also important. The sign system in the Des Moines skywalk system is considered as one of the better examples. In some of the bridge-ends, a wayfinding hurdle is caused due to lack of sufficient information to make a decision. If the necessary support information is provided then that hurdle may not occur. Signs may help to provide the information where spatial information has failed and reduce wayfinding difficulties. The City should extend the sign system to guide people from streets to skywalks and from skywalks to streets. The tower form, an icon of skywalk entrances, should be incorporated in the sign system. The sign system should compliment spatial information and should provide information where the setting fails to provide necessary information.

5. **Design approach to the Des Moines skywalk system:** Once design recommendations are formulated, we need to think about their implementation. Usually, urban design recommendations are used as design criteria for future development. The City gives legal basis to recommendations by converting them to regulations. These regulations, in turn, give the City legal authority to control future private development. In Des Moines, we need to implement design recommendations to the future development as well as existing structures.

- **New development:** New development gives opportunities to experiment with design concepts. New development in Des Moines will give us opportunities to change the way buildings meet with streets and skywalks. Any new building, which will be connected with the skywalk system, should integrate both pedestrian systems by providing multi-level spaces. These building should be open for general public and should house pedestrian oriented activities such as retail, museums, theaters, banks, and some type of offices in the lower two levels of the building. A multi-level space should be designed to adopt both pedestrian systems and it should have staircases and escalators to bring people from one level to another. Internal vertical transportation should be designed to bring people from office floors, from streets, from skywalks, and from underground parking to the multi-level spaces (See Figure 6.11). Multi-level spaces should be designed with outdoor spaces and should give people an opportunity to go outside whenever weather permits.

- **Existing buildings** In the case of existing buildings, implementation of design recommendations is rather difficult. The City may face legal problems, if it forces requirements on existing development. Also, alterations in buildings may create contradictions in design styles. We feel that instead of acting as a regulatory body, the City should act as a catalyst and encourage changes. To achieve the desired results, the City will have to act as a negotiating and stimulating body. In some cases, the City may have to buy spaces from building owners or build separate structures for vertical connections. In most old buildings, it is advisable
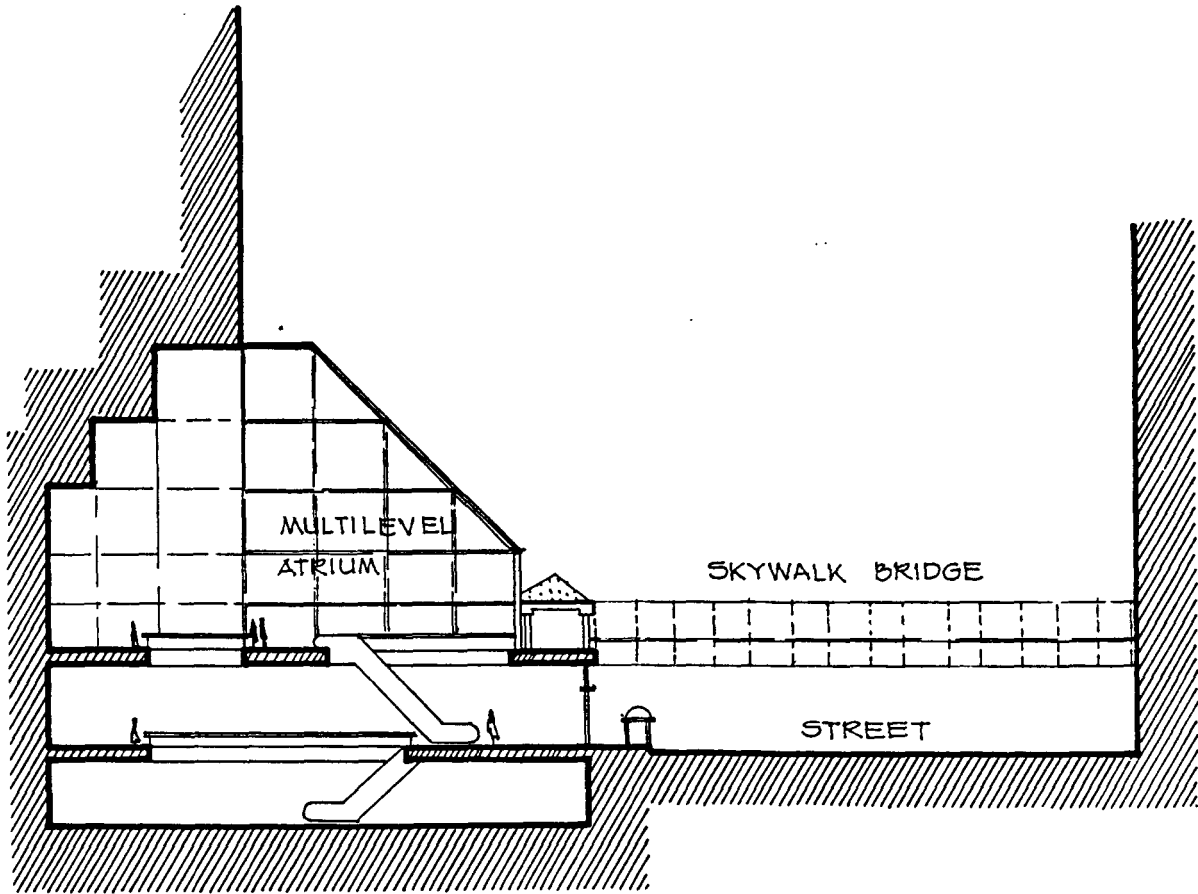
MULTILEVEL
ATRIUM

SKYWALK BRIDGE

STREET

Figure 6.11: Section through multi-level space

to keep vertical connection separate from the building. Required extra space can be obtained by encroaching on the parallel parking space (See Figure 6.12).

The construction of vertical connections would increase financial burden on the City. To reduce financial burden at one time, the City may implement changes in phases. At first, vertical connections could be designed only on selected nodes. These nodes can be selected by studying pedestrian activity and location analysis. Remaining bridge-ends could be improved by introducing a proper sign system which will try to reduce hurdles in wayfinding. This would not only save money but would also build an hierarchical order in the skywalk system. The City may reduce financial burden by giving incentives to building owners and make them build public skywalk entrances on their property.

Conclusions

n This thesis looked into accessibility problem of the skywalk system and developed a methodology to measure the degree of accessibility of the skywalk system. The results show that the system is not sufficiently accessible. The thesis also proposed some design recommendations to enhance the accessibility of the system.

Although the thesis offers a set of recommendations, further study is needed before these recommendations could be implemented. The thesis limited itself to the wayfinding process from the street level to the skywalk level, however, further study is recommended to measure accessibility problems from the skywalk level to

ROADSIDE PARKING

OFFICE
BUILDING

RETAIL
SHOPS

PEDESTRIAN
CROSSING

SKYWALK BRIDGE

VERTICAL
CONNECTION

BUS STOP

RETAIL
SHOPS

OFFICE
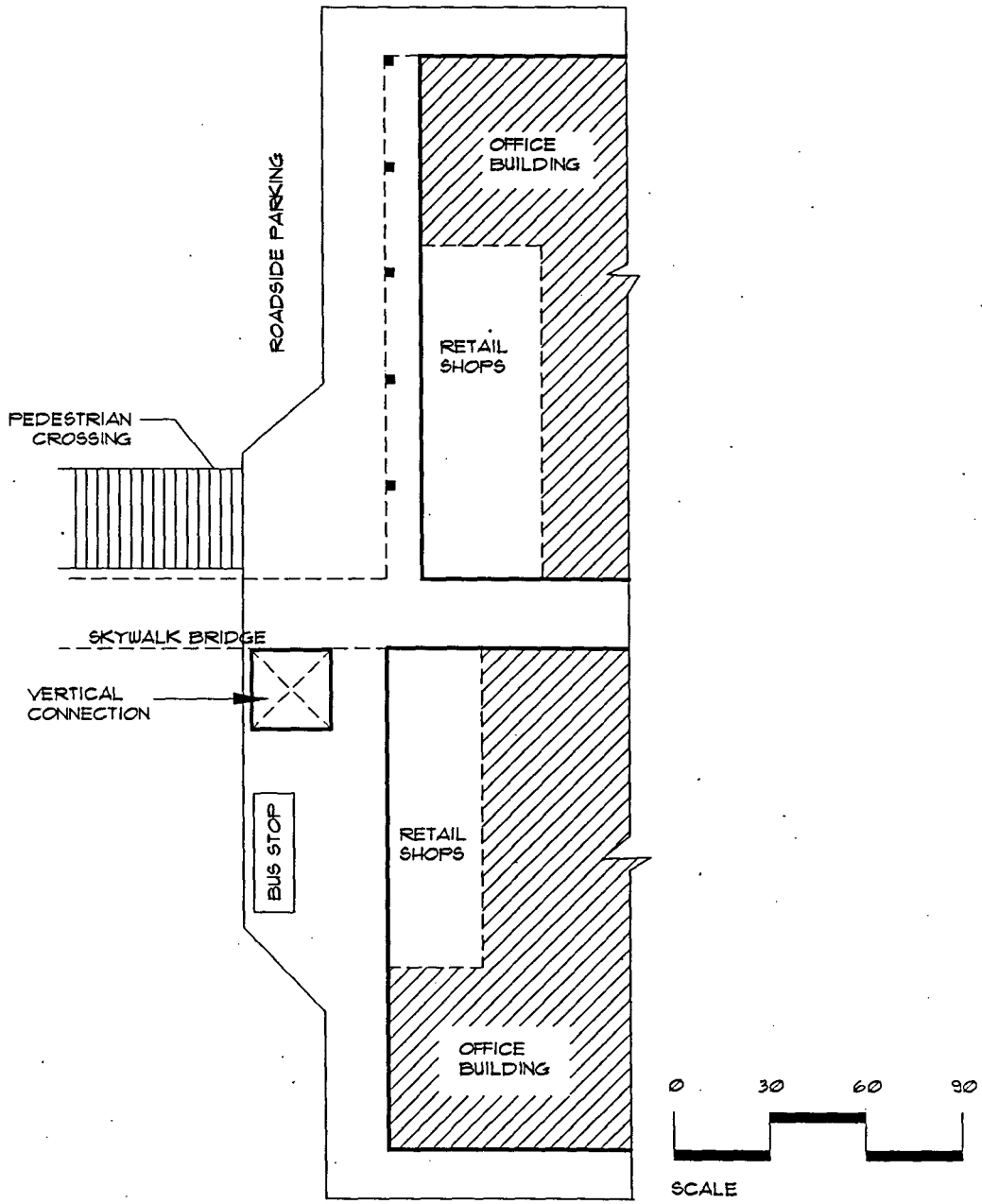BUILDING

0   30   60   90

SCALE

Figure 6.12:   Independent vertical connection

the street level. The thesis looked only into wayfinding problems to form recommendations. Further study is recommended to determine possible usage of any connection. The future studies can also look into possible usage and identify important nodes for possible design interventions. This thesis does not test the effect of design interventions. A computer simulation and visualization study is recommended to test the effectiveness of the design interventions. Compatible integration of both pedestrian systems in Des Moines would require continuous efforts in planning, architecture as well as political arenas. However, this thesis is one of the first steps in this direction.

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