# INTERIOR WAYFINDING

# AND SIGN SYSTEMS

# FOR THE VISUALLY IMPAIRED PEOPLE

**By**

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**THESIS**

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**Abstract:**

The purpose of this research was to study wayfinding by the people with visually impairment and the blinds. This study was carried out in Ankara, the Capital of Turkey that is rebuilt to remove barriers in order to welfare the impaired transportation and especially the research site was Besevler station. As total number of visually impaired people in Turkey is 216.077 individuals, of them 10000 live in Ankara, so the necessity of performing such study is clearly obvious. Data was collected by interview with responsible staffs, the municipality, the performer of this design, consultants of the management of the impaired in the ministry of social policies, family welfare and the impaired and elders, close observation of the place of Tactile Paving Surfaces design performance and take photos of its operational processes, and also theoretical studies related to this subject through internet, the existing resources and library studies, to get familiar with visually impaired people, their needs and the extent Tactile Paving Surfaces referred to their community place in Ankara, Alti Nokta Korler located in Demirtepe. Then the researcher had a travel to Iran and Tabriz city to get familiar with the method of Tactile Paving Surfaces design performing and interviewed with those responsible for performing it in this city. In this study, the following issues were examined in different sections of the thesis: Tactile Paving Surfaces all over the world, wayfinding and sign systems, indoor wayfinding systems for visually impaired. Generally, it became clear that performing Tactile Paving Surfaces design in Iran is similar to other countries and Turkey with this difference that in outdoors they prefer rocky sample to the plastic one that is in contrast to Turkey, i.e. in Turkey even in outdoors they prefer plastic sheets to perform Tactile Paving Surfaces design. Also, in this research, it was found that unfortunately developing countries do not pay attention to needed standards in producing the sheets and necessary materials and on the other hand, in performing it, they use non-expertise staff without considering standards while setting the sheets that lead to many problems. Important implications were proposed regarding Tactile Paving Surfaces rout to be performed according to standards.

**Keywords**: wayfinding, visually impairment people, Tactile Paving Surfaces, Turkey

**Özet:**

Bu araştırmanın amacı, görme bozukluğu olan veya hiç görmeyen kişilerde yön bulma yöntemlerini araştırmaktır. Çalışmamız engelli insanların ulaşımlarını kolaylaştırmak amacı ile bütün bariyerler kaldırılmış olan ve Türkiye'nin başkenti olan Ankara'da ve özelliklede araştırma konumuz olan Beşevler'de gerçekleştirilmiştir.

Türkiye'de yaşayan 216.077 engelli kişiden, 10000 kişi Ankara'da yaşamaktadır. Bu yüzden bu çalışma ve benzer çalışmaların ne kadar gerekli olduğu çok belirgin şekilde görülmektedir. Kullandığımız veriler, Belediye, tasarımcı personel, sosyal politikalar bakanlığındaki engelliler yönetiminde olan danışmanlar, aile refah sorumluları, engelliler ve yaşlılardan araştırma yaparak toplanmıştır.Ayrıca çalışmada algılanabilir uyarı yüzeyler ve kaldırılmalar, yakından gözlem altına alınmıştır ve bütün işlem süreçlerinden fotoğraf çekilmiştir. Çalışmanın bir kısmı, internet üzerinden yapılarak bu konu ile ilgili bütün teorik çalışmalar ve mevcut olan kaynaklar ve literatürler araştırılmış ve kütüphane çalışmaları gerçekleştirilmiştir. Çalışmanın devamında, Görme engel olan kişilerin ziyaretine gidilmiştir ve bu insanların ihtiyaçlarını yakından takip edilmiştir. Algılanabilir uyarı yüzeyler ve kaldırılmalar bu insanların evlerinin yakınlığında geliştirmek, için kadro ve personel ile mülakat yoluyla Demir tepe'de bulunan ALTINOKTA KÖRLER' da veri toplanmıştır.

Daha sonra araştırmacı, İran' ın Tebriz kentine yolculuk ederek Tebriz şehrinde algılanabilir uyarı yüzeyler ve kaldırılmaların tasarımı ile ilgili, kullanılan metodları araştırıp bu konuyla ilgili sorumlu insanlardan bilgi toplamıştır.Bu çalışmada aşağıdaki sorunlar incelenmiştir algılanabilir uyarı yüzeyler ve kaldırımaların tüm dünyada yön ve yol bulmak ve işaret sistemleri ve görme engelliler için kapalı ortamlarda yön bulma sistemleri.

Genel olarak İranda'ki algılanabilir uyarı yüzeyler ve kaldırmların tasarımları Türkiye ve dünyanın diğer ülkelerinde olduğu gibidir. Bu tasarımlarla ilgili İran ve Türkiye'de bulunan tek bir fark bulunmaktadır. İran'da Türkiye'nin aksine dış ortamlarda kaya örneklerini plastik örneklerine tercih vermekteler. Türkiyede dış ortamlarda algılanabilir uyarı yüzeyler ve kaldırımaların disiğn ve tasarımlarında plastik levhaları tercih ediyorlar.

Bu araştırmanın sonuçlarına göre maalesef gelişmekte olan ülkeler bu plastik levhaların üretiminde gereken standartalar ve gerekli olan maddelerin sağlanmasına dikkat etmiyorlar. Ayrıca bu ürünlerin üretimi ile ilgili, az tecrübesi olan ve uzman olmayan personel işe alınması ile gereken standartları göz önüne almadan çok ciddi problemler ortaya koymaktalar.

**Anahtar kelimeler:** Yol bulmak, görme problemi olan kişiler, algılanabilir uyarıcı yüzeyler, Türkiye.

*“One day I’ll be successful and people will ask me which college I went to. I'll say, ‘it doesn't matter because it is my parents who made me what I am today’, I love you, mom and dad, Thanks for everything”*

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# 1. INTRODUCTION

Today, healthy environment for human life is of utmost importance. Therefore, it is necessary that the designers, authorities, and experts design it in such a way that the life and living condition in it is usually of needed order, logic and beauty.

Now, the world cities is full of signs, symbols and other informative graphics that are considered as the factor of creating order and assisting the managers and administratives to perform guidelines and tools of economic development. The main cities of the world are competing with each other on commerce and tourism and continuously they are finding methods and signs attractive for guiding the visitors. Meanwhile, many buildings and centers are being built all over the world every year that because of the same reasons they present newer and more creative environmental graphics. Service imaginary signs, traffic signs, imaginary and written systems for public and private places, promotions and tens of others have very important and undeniable role in presenting services, and facilitating transportation and urban traffic and information. Designers of environmental graphics could work besides architects, urban makers, and other authorities of design and build of urban environments in proper organizations of environment graphical elements.

It is suitable for environmental graphic elements to be designed and created using aesthetic and psychological aspects besides having proper quality in application and present services that lead to welfare, calmness, tolerance, happiness, of human beings in today's industrial environments and machinery life.

Applied areas of the environment graphics are familiarity with the society culture and normality recognition, values, customs and its rules have the most importance in the environment graphical design. When the designer has deep familiarity with the people's culture and spirituality, s/he could communicate with the addressee with simple and clear expression. Environmental graphic is a science in which it is studied how to use several kinds forms, colors, figures, in a skillful, and planned way to have better and simpler relations, information and reach and also beauties of public environments.

In this regard, the applied domain of environmental graphics is so wide:

* Signs, symbols, and figures that allocate to public places like airports and hospitals.

* Traffic signs

* Information tablous on hours of trains and airplanes entrance and exit and flight, guidance tablous of passengers rout, place of getting on and taking down,

* Graphical designs and head writings of stores, buildings symbols, and writings on tracks and other means of transportations.

In many of today's modern educational institutions, architects have designed spaces that are disconnected and difficult for users to navigate. The underdevelopment of directional guides more accurately describes common issues of wayfinding. Wayfinding is a big part of our daily lives, although generally do not notice it until we get lost. Good wayfinding is particularly important in educational centers where many users are unfamiliar with the setting, and many have reduced way finding capabilities due to stress or worry to miss a departure *(Finkel, 1994)*. Therefore, this study focuses at the wayfinding processes and how wayfinding design can be implemented to improve intuitive navigation through the area and interior architecture. This master thesis is an investigative and descriptive study which focuses at answering the following research question: How visually impaired people can find their way in the interior space of.

A secondary aim is to raise the question of wayfinding within the discourse of architecture, and highlight the importance of considering wayfinding throughout the lifespan of a building. In this thesis i am trying to research in this field compare different wayfinding signs from around the world, introduce the best and most successful cases of them and then suggest new graphical symbols to guide people in an easier and faster way in interior places for disable people like the visually impaired.

## 1.1. Scope of the Study and The focus of this Thesis

In any building, especially public spaces, people need continual ‘direction ‘so they can find the way to their destination. The same is true for outdoor spaces such as pedestrian malls, parks and even roadways. The science of the design, manufacture and installation of these ‘sensory cues’ is called wayfinding, and it involves a discipline called ‘environmental graphic design’.

Arthur and Passini, (1992) defined wayfinding as the ability to find one's way to predetermined destination. Az Finkel, (1994) says, it involves perceptual and cognitive processes including the way a person relates to the spatial environment and to destinations *(Passini, 1984)*. People with visual impairments are limited not by their physical condition, but by the built environment in which they exist. There is much knowledge to be gained from the perspective of people with disabilities. In order to define how people with visual impairments related to the interior environment it was determined that a comprehensive study of their perceptions and wayfinding experiences was critical. The result should lead to a better understanding of how the environment affects the impaired in general.

Interior sign type categories include building, lobby, floor identification, directory and directional signage and regulatory signage.A key element of interior signage is the directory sign which provides even more details about the space as a visitor walks up to the sign.

Successful directory signage is based on the designer's ability to depict complex elements of an environment in a simple and universally understandable manner. In summary, environmental graphic and wayfinding design is a very involved process requiring a great deal of thought, teamwork, research, planning and a knowledge of branding.

So, the thesis focuses on research and comparisons of way finding and sign systems gathered from studies around the world. Using this information, it is intended to propose a new way finding system that will guide especially the visually impaired in a faster and easier way to their destination.

The term “wayfinding” covers everything to do with how people find their way round environments *(TSO, 2005)*. It requires intellectual abilities including decision making, decision executing, and information processing. Among many wayfinding aids, signage is considered to be a critical component to help in wayfinding. Sounds (words) and images (symbols) are two

basic ways to communicate. While people can communicate complex ideas effectively with words, signs are used across language barriers *(Wyman and Berger, 2005)*.

So, the present thesis deals with this important issue, Wayfinding and Signage in interior architecture especially for 'Blind people' (ibid).

Any visual wayfinding system is more than just signs - that is, it encompasses architecture, landscape architecture, lighting, and landmarks and orientation points. The design of spaces should help users with spatial problem-solving by offering consistent clues for them *(Apelt, Crawford and Hogan, 2007).*

The term "way finding" was first used in 1960 by architect Kevin Lynch. This narrow description may explain the current misunderstanding that wayfinding is essentially the same as "signage."

The two terms are not synonymous. Sign makers deal with designing, fabricating and installing signs. However, wayfinding that is used to navigate unfamiliar environments, doesn't rely exclusively on signs *(Muhlhausen, 2006)*.

Muhlhausen, (2006) has explained in his article that this distinction was accepted in the early '70s when researchers discovered that, to understand how people find their way, they first need to understand the basic process. Architect and environmental psychologist Romedi Passini articulated spatial problem-solving in his books, "Wayfinding in Architecture and Wayfinding, People, Signs and Architecture", which he has wrote with wayfinding planner Paul Arthur. Passini and Arthur described wayfinding as a two-stage process during which people must solve various problems in architectural and urban spaces that involve both "decision making" (formulating an action plan) and "decision executing" (implementing the plan).

When people enter an unfamiliar environments they should know where they actually are, they should know the complex, the layout of the complex, and the location of their destination in order to formulate their action plans. En route to their chosen destinations, people are helped or hindered prior to their visit, the building's architecture and signage. The physical environment includes positive effect in how users perceive the wayfinding system-if it seems easy to use or not *(Muhlhausen, 2006).*

Incorrect sign design can lead to navigation problems in unfamiliar environments. Some signs are not obvious," and visible, because lettering lacks legibility when they are viewed from a distance. Others contain inaccurate, ambiguous or unfamiliar messages; many signages are not

clear because of obstructions or contain reflective surfaces, which prevent comprehension. Consequently, many people don't read signs-often it's easier to ask for directions. Because wayfinding problems aren't limited to signs alone, they typically can't be solved by adding more signs. Instead, such problems can be removed by designing an environment that identifies logical traffic patterns that allow people to move easily from one spot to another without any confusion. Though it should be considered that, signs cannot be a panacea for poor architecture and illogical space planning *(Muhlhausen, 2006, p. 1).*

The size of the symbol and the height of lettering used for signage play an important role to ensure that the information can be presented clearly. The height of letters varies based on viewing distance. Signs with Braille or embossed lettering will be very helpful to the blind or those with low vision. In addition to this, as reported by Wurm et al. (1993), color differences enable people to get more reliable 282 Fairouz Ana Ahmad Padzi, and Fuziah Ibrahim information about the object. Therefore, the background of the signage compared to the lettering should be contrasting in color to especially help those with low vision.

**Braille** A system of writing and printing for individuals with vision impairments. Braille employs a pattern of raised dots, representing letters and numerals, which are read by touch.

**Map** A diagrammed representation of an area, showing physical features and pathways.

**Navigation** The process of ascertaining one’s position and establishing a route.

**Signage** The use of signs as a means of providing direction and/or instruction.

**Symbol** A shape used to represent something else or to convey information without the use of written language. Synonymous with the term graphic in this work.

A key element of interior signage is the directory sign which provides even more details about the space as a visitor walks up to the sign.

Successful directory signage is based on the designer's ability to depict complex elements of an environment in a simple and universally understandable manner.

In summary, environmental graphic and wayfinding design is a very involved process requiring a great deal of thought, teamwork, research, planning and a knowledge of branding.

## 1.2. Wayfinding systems for all users

As we saw, wayfinding is the methodology of arranging indicators to guide people to their destinations. Architectural indicator such as light, color, materials, and pathways also play a large role in wayfinding. A successful wayfinding program is intuitive and self-navigable, and it protects the overall visual integrity of the site. Beneicke, Biesek, and Brandon, (2003) believe that wayfinding is specific to its place and visitors. Signs improve and are most times integral to a clearly designed wayfinding program. Identifying, informing, directing, honoring, restricting or permitting are the function of a sign. A good sign system recedes into the background while it offers clear information when needed. *(Beneicke, Biesek, and Brandon, 2003).*

In addition, sign codes, life safety issues and disabled access guidelines need to be included to meet national and state requirements. Successfully designed signage helps visitors find their way, makes information accessible, provides an enhanced experience and honors donor recognition. In addition, an inclusive assessment of the environment and issues that affect orientation for first time visitors is imperative to a successful signage and wayfinding program. People tend to use landmarks, entry portals and pathways to help orient themselves and navigate public spaces. Most buildings have clearly designed pathways to destinations. In complex environments and when floor plans are discontinuous or confusing, signage may not always be sufficient. The following principles can help visitors navigate large environment.

Wayfinding systems are measured by how users experience an environment and how the communicative elements facilitate getting from point A to point B. Wayfinding systems should reassure users, create a welcoming and enjoyable environment and, ideally, provide answers to potential queries before users have to ask for assistance. Wayfinding systems can also indicate where users should not go. A successful wayfinding system should provide information for users to:

1. Confirm they are at the correct start or finish point of an individual journey
2. Identify their location within a building or an external space
3. Reinforce they are travelling in the right direction
4. Orient themselves within a building or an external space
5. Understand the location and any potential hazards
6. Identify their destination on arrival
7. Escape safely in an emergency *(Apelt, Crawford and Hogan, 2007, p 1).*

## 1.3. Wayfinding system for the visually impaired

There are approximately 135 million visually impaired people worldwide. In recent years, a plethora of orientation and wayfinding technologies have been designed to enhance and maintain the independence of this community.

In recent years, there has been an escalation of orientation and wayfinding technologies and systems for visually impaired people. These technological advancements, however, have not been matched by a suitable investigation of human computer interaction. The aim of this study was to how the new wayfinding help visually impaired people to find their way easily.

Signs with text play a significantly important role in identification of bathrooms, exits, office doors and elevators. Challenges associated with independent mobility are well known to reduce quality of life and compromise the safety of individuals with severe vision impairment *(Tian, Yi, and Ardit, 2010, p. 255).*

Researchers *(like Golledge, 1991)* come to this conclusion that environmental designers, architects, and urban planners can play a major role in overcoming challenges of wayfinding without sight by designing inclusive environments, accessible transportation, efficient guidance systems and effective spatial representation for the blind. These designs should be based on comprehensive awareness of spatial cognition, cognitive mapping, and way finding without sight. People who are blind or severely visually impaired rely heavily on their tactile/kinesthetic, auditory, and olfactory senses to navigate the environment. They use their cognitive abilities, especially logic and memory, to acquire spatial knowledge and negotiate the built environment. Through these sensory processes the blind face several challenges such as: limitation in previewing and preprocessing of spatial information; difficulty in avoiding obstacles and detecting hazards; loss of distant landmarks; and no access to spatial representation. Wayfinding and cognitive mapping is a combination of intensive multiple tasks including but not limited to: avoiding hazards and obstacles; monitoring locations in relation to the other features of the environment; learning object-to-object relationships; associating environmental information with major decision points; and, finding the destination without access to distant landmarks and signs. Under these conditions, the blind limit their movement habits to the selected learned routes between known places *(Golledge, 1993).*

Geographers, psychologists, mobility specialists and scientists have investigated spatial cognition and navigation without sight for several decades. They have tried to facilitate

navigation of visually impaired and blind individuals through the construction of technical navigational aids; generate tactile maps; install tactile and auditory signs; and, modify the built environment.

Most of these navigational support systems have focused on orientation and mobility devices aimed at detecting hazards and obstacles within the next few steps (for example, long cane, laser cane, and sonic pathfinder). These tools provide no frame of reference or general layout information required for planning travel. As obstacle and hazard identifiers they are valuable resources in the movement process, but they are not designed to assist in acquiring spatial knowledge. Since the 1970s, there has been more interest in the development of way finding and navigational aids. These supports can be categorized into six groups:

1. Environmental modification for preventing hazards and tactile warning surfaces;
2. Directional paths;
3. Auditory traffic signals;
4. Tactile and Braille signs;
5. Audible Signage; and
6. Remotely activated orientation systems.

All of these systems work as location and hazard identifiers or guide short distance directions.

Tactile warning surfaces have been used on curb ramps and the edge of rail platforms to assist blind persons to detect hazards along their path of travel. Tactile directional path surfaces assist and improve navigation without sight in large open spaces. Providing the environmental information needed to make way finding decisions is the main function of signs *(Arthur and Passini, 1992)*. But graphic information and current signage systems are designed for normal visual perception, which consist of a visual scanning and glancing process. Blind wayfinders should know where the sign is located before they are able to use it. In the United States, ADAAG 4.30.4 required 24-point size grade 2 Braille where permanent signs identify the rooms. Then we can use these signs as room identification tools for the visually impaired people. Any person moving through a building needs to have general layout information and a signage system to make appropriate spatial decisions; recognize choice points; use short cuts; survive in emergency situations; and, to resolve disorientation. Unlike sighted travelers who have access to various spatial representations, such as maps, blind travelers are at a serious disadvantage by not having any spatial representations available to them *(Kiisk, 2003)*.

An appropriate methodology can be a foundation for future design of spatial representations and wayfinding supports for the blind and will make a considerable improvement in blind people's travel activities and as a result in their daily life activities. Kiisk (2003) also suggests that architects, planners and designers can make a significant improvement in spatial learning, wayfinding and navigation without sight by implementing relatively simple measures in buildings.

These measures include:

1. Incorporating feasible navigational reference points;
2. Integrating tactile directional guides in flooring of large places such as lobbies, airports and metro stations;
3. Designing tactile auditory spatial representation for learning the layout of buildings;
4. And, installing appropriate tactile auditory spatial representation and guidance systems throughout the building (ibid, p 3-6).

Over the past years, some researches have focused on the issue of way finding. Among them, Willis and Helal (2005) have conducted a research to examine "RFID Information Grid for Blind Navigation and Wayfinding". They describe a navigation and location determination system for the blind using an RFID tag grid. Each RFID tag is programmed upon installation with spatial coordinates and information describing the surroundings. This allows for a self-describing, localized information system with no dependency on a centralized database or wireless infrastructure for communications.

Hashim, Salem Khamis and Bharwani (2013), in their study, have dealt with the interpretation of way-finding symbols for healthcare facilities in a multicultural community was assessed in a cross-sectional study. One hundred participants recruited from Al Ain city in the United Arab Emirates were asked to interpret 28 healthcare symbols developed at Hablamos Juntos (such as vaccinations and laboratory) as well as 18 general-purpose symbols (such as elevators and restrooms). The mean age was 27.6 years (16–55 years) of whom 84 (84%) were females. Healthcare symbols were more difficult to comprehend than general-purpose signs. Symbols referring to abstract concepts were the most misinterpreted including oncology, diabetes education, outpatient clinic, interpretive services, pharmacy, internal medicine, registration, social services, obstetrics and gynecology, pediatrics and infectious diseases. Interpretation rates varied across cultural backgrounds and increased with higher education and younger age. They

believe that signage within healthcare facilities should be tested among older persons, those with limited literacy and across a wide range of cultures.

Kusumarini, de Yong, Thamrin (2012) tended to examine and identify problems of the application of signage System of Malls in Surabaya: Universal Interior Design Applications and Suggestions for Solution *(Kusumarini, and et al. 2012)*.

Also, Kiisk (2003) studied "Perspectives on Diversity and Design", especially tactile method and indicated that tactile directional surfaces provide a guide for trailing and following a route to specific location in large spaces like airports and metro stations.

Cooper and Berger (2009) considered wayfinding in the interior architecture of health care centers and new developments in wayfinding including green design, hand held technologies, high definition displays, limited English proficiency (LEP) and limited reading ability, maps and user guides, touch-screen kiosk units, online information. They believe that Given their complicated medical terminologies, endless supply of abbreviations and maze like traffic patterns, it's no wonder that complex medical facilities often cause patients and visitors to get lost, frustrated and resentful. Today's health care design is driven by sustainability, new technologies and user-friendly environments. But many hospitals utilize the same basic signage systems that have been in place for decades. However, there are many areas where health care wayfinding can be updated and improved to close the gap on advances in overall hospital design.

Tian, Yi, and Ardit (2010) in their paper present an effective and robust method of text extraction and recognition to improve computer vision-based indoor wayfinding. First, they extract regions containing text information from indoor signage with multiple colors and complex background and then identify text characters in the extracted regions by using the features of size, aspect ratio and nested edge boundaries. Based on the consistence of distances between two neighboring characters in a text string, the identified text characters have been normalized before they are recognized by using off-the shelf optical character recognition (OCR) software products and output as speech for blind users.

# 2. Wayfinding System

Getting people from A to B may sound straightforward but creating visible and consistent wayfinding can be a complex task. How do we ensure that wayfinding strategy and design collaborate to successfully reflect the customer journey?

Most of us only notice wayfinding when done badly. Almost by definition, the best wayfinding goes largely unnoticed because the audience are guided effortlessly and effectively around a building, environment or destination. They enjoy a positive brand experience which increases the likelihood of a return visit.

Our approach to wayfinding is centred upon the user's experience. It's about reducing complexity, making life easier and enhancing the physical environment. In essence, a successful wayfinding strategy should minimise the need for signage, not increase it.

For Endpoint, understanding context is crucial. Our wayfinding systems involve knowledge of the particular space, the anticipated traffic, the movement within that space, the destinations and the overall purpose. It's a highly considered approach resulting in a unified and effective solution.

Wayfinding is a multi-sensory task. The four senses used for wayfinding. When people are finding their way to a destination they use four of their senses (sight, sound, touch and smell) to varying degrees and sometimes subconsciously *(TSO, 2005)*. The effectiveness of wayfinding system can be increased if sites pay attention to how people use all their senses when wayfinding. Four senses used in wayfinding can be described as follows:

**Sight**

People with good vision glance around looking for information with which to make the next wayfinding decision. They do not generally look at the environment in a systematic way. Their attention may be caught by:

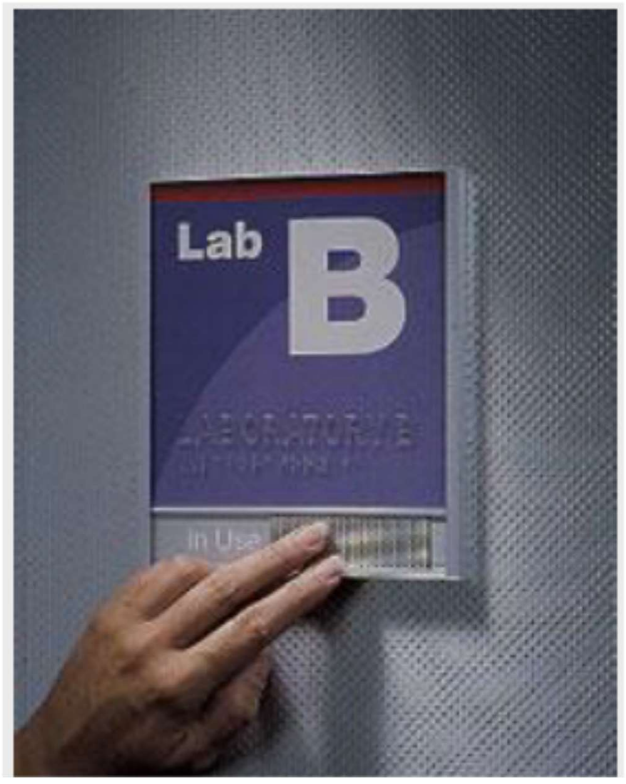
• Something that is very prominent or eye-catching;
• Something that looks interesting;
• Something that looks as if it may be, or may lead to their destination;
• A person who looks as if they know the site, to ask for directions;
• A map to locate a destination on;

• A directional or locational sign.

Sight is the most versatile sense for wayfinding because it can be used to see things both at a distance, and near to, unlike sound, which generally requires people to be near to the sound in order to use it effectively. Although sight is not the only sense people use to decide which way to go, but in wayfinding people mostly rely on sight. This is very apparent when someone loses their sight, or experiences reduced acuity *(Health Facilities Scotland, 2007).*

**Touch**

Environmental factors, such as changes in internal floor and external pathway texture to delineate different areas, are useful to all users. All people use their sense of touch to help them find their way, but those with visual impairments are especially reliant on tactile wayfinding aids. For blind people, on the other hand, access to a tactile street map that is detailed enough to use for travel within any particular area is an extreme rarity. The dearth of tactile maps has far reaching implications, well beyond the orientation and mobility domain *(Golledge, 1993).*




*2.1. Cooper and Berger, 2009*

**Smell**

Smell is not often included as part of a wayfinding strategy, but people will use it to identify and remember places: for example, people will identify a café by the smell of food and coffee. Smells can affect people's emotional state in either a positive or a negative way, so should always consider the smells in an environment, though smells are usually not specific enough for wayfinding to enable people to literally 'follow their nose' *(TSO, 2005).*

**Sound**

People use noises, sometimes subconsciously, to help them find their way. For example, a lift that is out of sight (through a closed door or round a corner) but which has a bell when the doors open, signals the lift is there. Spoken announcements inside the lifts, saying the floor number and perhaps other information too, are increasingly used. This type of audible wayfinding system can also be used effectively elsewhere, such as at pedestrian crossings or at pedestrian exits to car parks, telling people the name of the car park and that they need to pay for parking.People often prefer to ask someone for spoken directions, reassurance and information rather than using signs and other wayfinding aids *(TSO, 2005)*.

It is often necessary to screen out irrelevant sounds in order to hear a person speaking. Screening out sounds is harder than ignoring irrelevant sights, but people are generally accustomed to doing this.

As with sight, people's hearing deteriorates with age, so sites must always consider how to help people who are deaf or hearing impaired find their way around. There are some specific considerations, but having a clear and effective signage system is crucial *(Health Facilities Scotland, 2007; p. 17-19).*

Wayfinding, according to Arthur and Passini (1992), is the process of reaching a destination, whether in a familiar or unfamiliar environment. It is regarded as spatial problem solving and is comprised of three specific, but interrelated processes:

**Information processing** including environmental perception and cognition that permits two decision processes.

**Decision making**, which leads to a plan of action (or decision plan) to reach a given destination.

**Decision execution**, which transforms the plan into overt behavior and movement at the right place

According to Carpman and Grant, (2002), most designers give wayfinding low priority, and consider it as prevention to good design or a problem to be solved with signage. By knowing the effect of wayfinding on all aspects of human psychology, occupant satisfaction, health, longterm performance, and the financial bottom line, inattention to wayfinding leads to lowered inclusiveness of buildings for everyone.

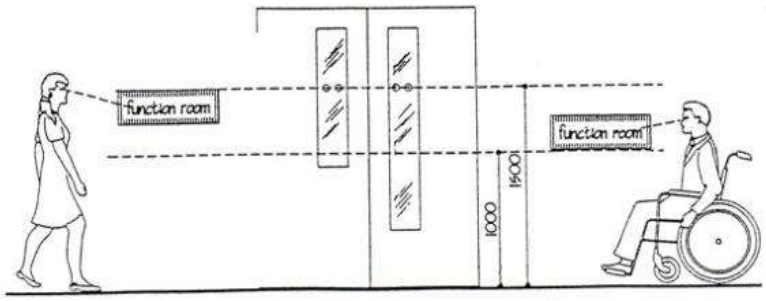
Authors suggest that understanding a few fundamental principles of architectural wayfinding design can help designers to improve building performance and to provide more inclusive solutions. They say that good architectural wayfinding design is important to universal design because it facilitates user access, increases their satisfaction, and reduces stigma and impaired users' being loneliness *(Evans and McCoy, 1998)*.

Evans and McCoy (1998) believe that good architectural wayfinding design leads to decreased confusion of visitors and mistakes by employees, saving time and money and prevention of accidents. They say it also lowers stress, improves health, and productivity "The ability to find one's way into, through and out of a building is clearly a prerequisite for the satisfaction of higher goals", according to designer Jerry Weissman in 1981 *(Hunter, 2010, p 2)*.

Weisman (1981) argued that "legibility of an environment" – the extent to which it facilitates the process of way-finding" has significant behavioral consequences. He also indicates its effects on the happiness of elderly residents in group housing settings as an example *(Weisman, 1981)*. He believes that people using the environment have unique abilities, limitations, and memories about navigating, which must be adapted by the wayfinding plan. Within the blind community, for example, some people prefer the term" visually impaired" or "a person with a visual impairment." But the National Federation of the Blind (NFB) says people who cannot see should simply call themselves blind. So explain which term you will use throughout the work (ibid).

In Passini's, (1988) view, special needs populations, cultural and ethnic minorities and the elderly all must be able to use the facility almost independently. When developing a wayfinding plan, designers should consider and pay attention to the number of repeat visitors, sight and mobility limitations and whether the facility is new or a renovation. In visually impaired people, mobility has to be gained through training, patience, courage, and hard-earned personal experience. These individuals who wants to live an active life, though has no choice. Not to be

mobile by his or her own means leads to a loss of personal, social and professional independence. Our architectural and urban environments have not been thought out with the needs of the visually impaired in mind. In fact, our knowledge about these needs is so little; we know very little about the wayfinding abilities of the visually impaired and their natural limitations, if indeed they there are any.



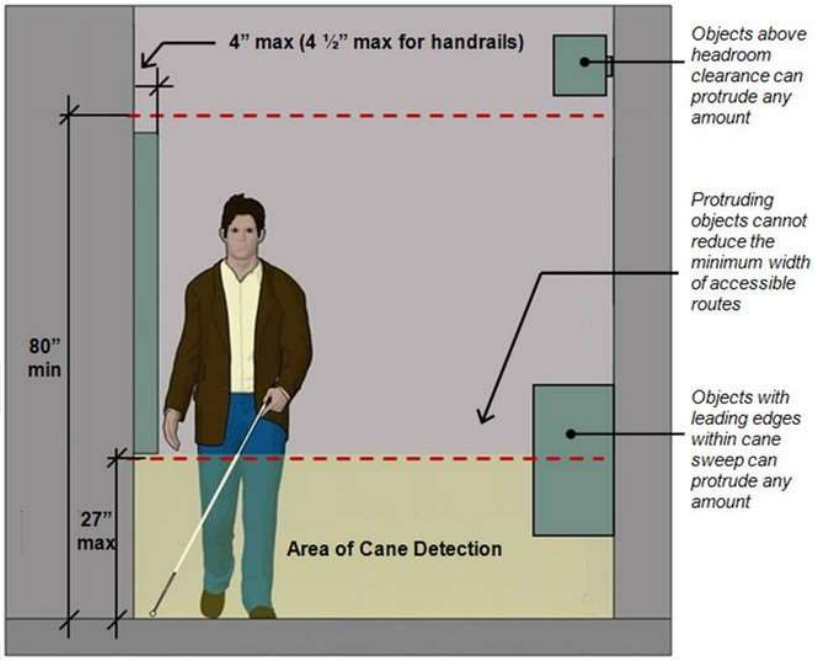

*2.2. TSO, 2005*

## 2.1. Wayfinding: People, Signs, and Architecture

Designers must consider planning the best (safest) possible crossing facilities for your particular location. Poorly designed, inaccessible and unsafe crossings are the most important wayfinding barriers and the main cause of many injuries and deaths. Audible beeps at crossings are very helpful for people who are visually impaired. In some places, they have put pedestrian control boxes with a vibration device or spinning cone as a tactile solution to let users know when to cross. Timing of signals is also of critical importance, especially for pedestrians with mobility limitations or who walk at a slower pace than the average person *(Hunter et al,2013, p. 17)*.

If people get lost, they will be unsure of the route for much of their journey, feel like they have walked further than necessary, or if they ask for directions but receive instructions which conflict with the actual environment, they are very likely to have a negative opinion of your site. People will complain to friends about getting lost and how difficult they found their journey, and this can have a negative effect on many other people's attitudes to the site. A good wayfinding system is such that it will avoid these negative effects. However, it's not likely to get talked about. People do not tend to notice a good wayfinding system; they simply use it.

An ineffective wayfinding system which leads to people getting lost will waste time. People will be late for appointments. Staff will spend more time providing directions to people who are lost, have arrived at the wrong destination, or people who simply need reassurance that they are going in the right direction *(TSO, 2005)*.




*2.1.1. TSO, 2005*

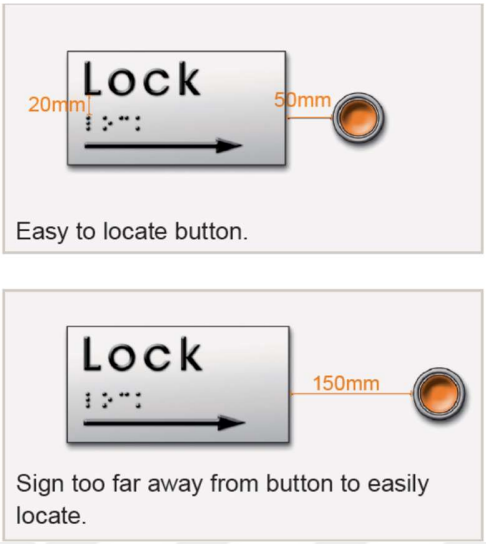
Most sites expect staff to help people who appear to be lost, and at some sites staff are expected to take them to their destinations. This is an indication that the signs, landmarks and other wayfinding information at these sites are not clear. For most staff, escorting people is inefficient use of their time, especially at larger sites, but for some healthcare facility users, particularly those who are frail and elderly, it should be encouraged. Volunteers are sometimes available to escort people, and this is an important role, but it is an unreliable system as volunteers are usually only available for short periods of time. If it is necessary at your site to take people to their destination, you should employ people as escorts. The problem with relying on all staff to direct people, not just those who know the site and have been trained to provide clear directions, is that visitors may receive unclear or inaccurate directions.

Designers should consider to:

• Place signs at a consistent height and location around a building or facility.

• Place tactile signage where it can be reached easily without obstruction.

• Place signs logically and as close as possible to the object they are indicating. (e.g. Place "push" near the door opening for easy location) *(Royal New Zealand Foundation of the Blind, 2010)*




*2.1.2.Royal New Zealand Foundation of the Blind 2010*

## 2.2. Stages of a Successful Wayfinding System

Any successful wayfinding project designed to improve an existing wayfinding system will involve several stages. An audit of your site should identify key wayfinding problems. It is then important to get together the relevant people to develop a workable wayfinding strategy and then effective wayfinding solutions for your site, within your budget *(TSO, 2005)*.

* Analyse audit findings

* Identify wayfinding problems

* Priorities wayfinding problems

* Produce wayfinding business case

* Contact appropriate people and companies

* Develop strategy for improving wayfinding system

* Discuss problems and develop solutions

* Implement solutions

* Evaluate and refine solutions

* Maintain wayfindin

**Analyse audit findings**

- You can use your own database software, or the tally sheet in section 5, to collate the questionnaire responses
- Highlight problems recorded on the site survey response sheets

**Identify wayfinding problems**

- Lock through the questionnaire responses and site survey sheets to identify areas, routes and decision points at your site where people experienced problems finding their way

**Priorities wayfinding problems**

- Draw up a list of where at your site people experienced wayfinding problems, and the types of problem
- Priorities the list, starting with potentially dangerous areas, then areas that are causing a large number of problems and areas that are not sufficiently accessible for people with disabilities

**Produce wayfinding business case**

- Guidance on wayfinding business cases is given on the next page

**Contact appropriate people and companies**

- Wayfinding is a multi- disciplinary task requiring a range of expertise

**Develop strategy for improving wayfinding system**

- A wayfinding strategy is essential for developing a consistent and effective wayfinding system

**Discuss problems and develop solutions**

- Create a working group of people with varied experience and knowledge of your site to discuss and solve wayfinding problems
- Work closely with appropriate companies

**Implement solutions**

- Whilst new systems are being installed, use temporary signs where necessary and warm people in pre visit information of the wayfinding changes

**Evaluate and refine solutions**

- Carry out further site surveys and get questionnaires completed to ensure the solutions are effective and the wayfinding system at your site has been improved Refine the system as necessary

**Maintain wayfinding solutions**

- Produce a strategy for auditing and maintaining your wayfinding system
- Carry out regular audits of the signs, directions given by staff, appointment letters and other pre-visit information
- Ensure all wayfinding information is consistent and provide staff training where nec essary

Wayfinding is a problem-solving process. Studies show that people make a series of decisions when wayfinding. The first is the decision to make a journey to a particular destination; the second and third are how they are going to get there (by car, bus, taxi, etc.), and the route they will take. As researches suggests, the subsequent decisions are based on a various factors related to the person making the journey, the environment they journey through and the information they have. All wayfinding decisions are under the influenced of the previous decision, so they are considered interrelated *(TSOI, 2005)*.

If people successfully solve a wayfinding problem on their first visit and can remember the solution, they should not have a problem on their subsequent visits. This is also relevant for the return journey people have to make to get back out of a building and out of the site. People have to be able to follow a route in reverse *(TSOI, 2005)*. Problems with the decision process arise when:

• People have never visited a site before and cannot understand the information available

• People cannot remember or recognize the route they took last time

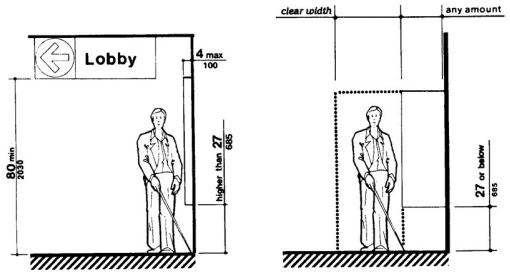
• The environment and wayfinding system at the site have changed.

Arthur and Passini (1992) identify three key processes in the wayfinding process:

**Decision making** – decide to make a journey, and develop a plan of action to get there by making a series of connected decisions.

**Decision executing** – put the plan into action by setting out on the journey. Factors along the route may produce a change in the plan of action and affect decisions made along the route. People will look for information in order to create a mental model of the route and layout of the site.

**Information processing**– process the information using all available senses. Need to understand the information, including spatial information, and be able to utilize it in context. (ibid).




*2.2.2: TSO, 2005*

## 2.3. Wayfinding for People with Impairments

**Inaccessibility for people with disabilities**

The Disability Discrimination Act (DDA) states that "sites and buildings must be accessible to all people". For example, healthcare facilities, by their very nature, have a large proportion of people with many types of temporary or permanent disability.

If the site is not accessible to everyone, people are being discriminated against and may feel, literally, excluded from the environment. Equally, if the wayfinding information is not legible for people with sensory impairments, the information is of little use to them.

If a route has stairs – which means that wheelchair users, people with pushchairs and those with limited mobility need to use a different route – this should be made clear before people reach the flight of stairs and find no obvious alternative route *(TSO, 2005).*

People who are blind or vision impaired, use multiple senses to navigate spaces. Therefore, reducing excessive noise by locating service and maintenance functions away from public areas can assist navigation *(Apelt, Crawford and Hogan, 2007, p.9).*

A major challenge faced by the visually impaired people is that of wayfinding – the ability of a person to find his or her way to a given destination. Well-established orientation and mobility techniques using a cane or guide dog are effective for following paths and avoiding obstacles, but are less helpful for finding specific locations or objects *(Coughlan, Manduchi, and Shen, 2006)*.

Less use of sight in wayfinding is not just dedicated for the blinds. Many people cannot rely on their sight to locate and read wayfinding information – not only people who are registered blind or visually impaired but also elders whose clarity of vision has gradually deteriorated with age, or people who have forgotten their glasses or who do not realize they need them, or who have a temporary visual impairment such as a migraine headache.

How people will find their way depends on person's type of visual impairment (there are huge variations in what people see), and their degree of visual acuity. As the statistics indicate, only 4% of registered blind people are completely of no sight. Many of those who called blind will be able to make out shapes, or contrasts in color, and many will rely more heavily on their other senses, especially hearing and touch, to find their way *(Health Facilities Scotland,2007 , p. 19-20)*.

Tactile street maps are beneficial to blind pedestrians across a wide range of age groups from elementary school-age, well into late adulthood *(Espinosa and OchaÄta, 1998)*. Although

some early studies questioned the cognitive ability of blind individuals to interpret maps, most recent results indicate that with some training, they can and do make use of maps to inform their internal cognitive representation of space *(Uttal, 2000)*. Compared to control participants, blind and visually impaired people who are able to feel tactile diagrams, and who have had the opportunity to study a tactile map of an area of interest, show improved ability to independently navigate within that area *(Ungar , Blades and Spencer, 1993)*.

Wayfinding aids for people with visual impairments to enable people with severe visual impairment to find their way unaided. In this regard sites should consider providing:

• Audio information – particularly in lifts but also in other locations;

• Escorts to take people to their destination;

• Braille and embossed (tactile) signs – though the number of Braille readers is estimated to be only 1.2% of the estimated 1.7 million people who are partially sighted;

• If Braille and tactile signs are appropriate for your site users, people have to know where the signs are located, and they need to contrast with the surface they are attached to and be placed consistently at a height where people can touch them. There must be no obstructions in front of signs;

• Tactile maps showing the site layout and main routes can be useful, but as with tactile signs, people have to learn to use them.

Braille signs and embossed or tactile signs are often seen as the standard solution for providing wayfinding aids for visually impaired people and are used by people with no, or very little, sight. However, only a very small number of people can read Braille, so sites should pay attention to this point that whether Braille and tactile signs are the most appropriate solution or whether other wayfinding aids, such as escorts to take people to their destination, or audio information, would be more effective *(Health Facilities Scotland,2007, p. 19-20)***.**

On the other hand, new assistive technology systems are helpful to aid in wayfinding based on a camera cell phone, which is held by the user to find and read aloud specially designed signs in the environment. These signs consist of barcodes placed adjacent to special landmark symbols. The symbols are designed to be easily detected and located by a computer vision algorithm running on the cell phone; their function is to point to the barcode to make it easy to find without having to segment it from the entire image *(Coughlan, Manduchi, and Shen, 2006)*.


*2.3.1. Coughlan, Manduchi, and Shen, 2006*

Research has been undertaken on computer vision algorithms to aid in wayfinding for such applications as navigation in traffic intersections *(Uddin and Shioyama. 2005)* and sign reading *(Silapachote, et al 2005)*. The obvious advantage of computer vision is that it is designed to work with little or no infrastructure or modification to the environment. However, none of it is yet practical for commercial use because of issues such as insufficient reliability and prohibitive computational complexity (which is especially problematic when using the kind of portable hardware that these applications require).

It is important that designers better understand how blind people actually use touch screens *(Kane et al., 2011)*. Furthermore, a designer who wishes to provide motions in their application must consider whether the gestures will be appropriate for blind users or not. Although people with disabilities may use the same hardware as their peers, it is possible that they prefer to use different gestures, or that they will perform the same gestures differently than a user without disabilities *(Tinwala and MacKenzie, 2010)*. A context evaluation of an audio-tactile interactive tourist guide is reported by Szymczak et al. *(Szymczak et al., 2012)*. This project allows blind people to be guided along a historical trail and experience
sounds from the past. However, the applications reproduce the information using a sound file. The problem is that this solution is not scalable and dynamic.

# 3. Signs System

Communications of the present age includes several forms from satellite to watches, but new sciences could not replace the old forms of Communications such as writings and signs… in any case, regarding that the society becomes complicated all the time, the signs improve accordingly that the presence of more signs creates kind of imaginary pollution and today we try to avide visual disturbances.

The environmental graphic designing is not an art by itself or a science, but includes both aspects. Designing should be a mix of creative influential effects as a logical examination and technique and how it should work. The result of such a combination leads to some signs that communicate with people effectively. In the environmental graphic it is attempted to make a proper condition for the contemporary human life by relying and using artistic creative experiences. In the environmental graphic, the bond of human with the environment is corrected, its improper and unneeded points are emphasized. In the environmental graphic, informing, simplifying and acceptability of the human communications abd new and proper aesthetics are considered.

The environmental graphic is the science in which it is studied how to use several forms, colors, figures, in a planned and skillful way in order to make communication, relations, traffic better and simple, and also make the public environment aesthetic complete.

When a graphical structure is in a close relation with different classes of an urban community and its goal is to create a pleasant life space and harmonize with age and culture and mood of the people in that society, it is called the environmental graphic. It is clear that if the authorities in several aspects do not consider necessary tact on proper designing elements of the environmental graphic, the citizens' lives and environment will become a space that could not be bearable. For by creating proper complexes regarding form and color it could provide the means of hope and attraction of the society's people living and public enthusiastic and give a new spirituality to the community. Color in the environmental graphic has much effect for it causes to face establishment. For example by seeing a 2 stories, red bus we remember London and in such a city or in our northern cities that have more green spaces, green color should be used very much and its supplementary color is stimulating. Therefore, the environmental coloring that pay

attention to territorial considerations, is natural for those who live in hot places should not use hot colors but it's better to use cool colors as is seen in light blue domes in the old pleasant desert contexts.

The purpose of the environmental graphic is that:

1.To guide people in a most simple way.
2.Making beautiful place by applying form, design principles and their harmony with each other and its surrounding environment.
3.Increasing the society's cultural level in the framework of cultural and commercial advertisements purposes through promotions, banners, etc.
The environmental graphic tries to harmonize among the designs that presents and whatever exists in the environment.

Wayfinding can be defined as spatial problem solving *(Arthur and Passini, 1992)*. It requires intellectual abilities including decision making, decision executing, and information processing. Among many wayfinding aids, signage is considered to be a critical component to help in wayfinding. Sounds (words) and images (symbols) are two basic ways to communicate. While people can communicate complex ideas effectively with words, signs are used across language barriers *(Wyman and Berger, 2005)*. Signs carry words, symbols, or both. Signs direct people to destinations to which they desire to go. Settings such as hospitals are visited by people of diverse backgrounds. Therefore, it is crucial that the signage is designed to be comprehended universally *(Salmi, 2007)*. However, because signs are not interactive communication tools, people cannot ask questions when they do not understand them clearly. Thus, it is important that the messages on signs are easily understood without any further explanation and clarification *(Carpman and Grant, 1993)*. People can navigate through hospital space easily when signs and pictograms are legible and can be clearly, quickly, and easily understandable *(Gakopoulos, 2009)*. Kendler (2012) highlighted the role of abstraction in signage design, as it simplifies the message and speeds up the cognitive process of comprehending the meaning by communicating the most important aspects of the referent. Simple, abstract line drawings are less distracting than a realistic representation of the referent.
However, as Olmstead (1999) indicated, understanding the meaning of such abstract symbols depends on the viewer's familiarity with culturally learned symbols. Cultural differences

between the sender and receiver of signs can cause misinterpretation *(Olmstead, 1999)*. Cowgill and Bolek (2003) suggested that a graphic symbol should utilize the essential facts about the referent, that the design of the sign should be uniform throughout the graphic and graphic system, that the symbols should be visually simple, that silhouette or side views should be preferred since they are easier to understand compared to frontal views, and that a symbol should be designed to be distinct from other signs to prevent confusion.

However, Brugger (1999) claimed that symbols can be misinterpreted across cultures. Foster and Afzalnia (2005) explained that the differences found in cross-cultural data would depend on the "cultural specificity of the symbol or referent." A form that has a specific meaning or association with a specific object or person according to a cultural group may not denote or connote the same meaning in another cultural group. According to Foster and Afzalnia (2005), it is difficult to conclude whether or not a symbol interpretation can be culturally limited because it depends on the symbol.

**Typeface and Type Style**

With all the font types now available, signage designers need to pay close attention to font selection. In general, users prefer text with a serif, a heavy stroke (boldface), font that is distinguishable between characters and letters and text that have a substantial width *(Schwier and Misanchuk,1993)*. Good writing style dictates that the use of unusual styles should be strictly limited and that different fonts should be used to emphasize warnings *(Bailey and Milheim, 1991)*. Varying the size of the font can also be used to attract attention *(Garner, 1990; Braun et al., 1992; Silver and Braun, 1993; Smither and Braun, 1994)*. Large font sizes can be used as attention getters, however research has shown that more densely packed characters require less ocular (and cognitive) work *(Harrell, 1999)*. Hospitals have a wide range of visitors and patients with different levels of eye impairments and disabilities, making readable font type essential in regards to improving signage readability.

*3.1. Bailey and Milheim, 1991*

**Type Size**

Minimum sign requirements are as follows:

Permanent Rooms and Spaces:

1. Tactile and Braille Characters, raised minimum 0.8 mm (1/32 in). Characters shall be accompanied by 1/4" Grade 2 Translated Raster Braille.
2. Type Styles: Characters shall be raised 1/32 in, uppercase, Helvetica Medium, Helvetica Bold and Helvetica Bold Condensed. Characters shall be sans serif. Characters shall not be italic, oblique, script, highly decorative, or of other unusual forms.
3. Character Height: Minimum 16 mm (5/8 in) high, Maximum 50 mm (2 in).
4. Symbols (Pictograms): Equivalent written description shall be placed directly below symbol, outside of symbol's background field. Border dimensions of symbol background shall be minimum 150 mm (6 in) high.
5. Finish and Contrast: Characters and background shall be eggshell, matte or other non-glare finish with a minimum 70% contrast between characters and background as measured by a spectral reflectometer.
6. Mounting Location and Height: As shown *(Illustrations A-E, pages 86-90)*. Where a tactile sign is provided at a door, the sign shall be alongside the door at the latch side. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf. Where a tactile sign is provided at double doors with two active leaves, the sign shall be to the right of the right hand door. Where there is no wall space on the latch side of a single door, or to the right side of double doors, signs shall be on the nearest adjacent wall. Signs containing tactile characters shall be located so that a clear floor area 18 inches (455 mm) minimum by 18 inches (455 mm) minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

SIGN TYPE 100 – ROOM IDENTIFICATION SIGNS

All permanent rooms must be identified by the MINIMUM Type 100 - 2” X 6” room number sign. These rooms include all assignable and non-assignable (excluding spaces designated by the prefix F, G, O, Q, U, V, X and Y) spaces.

**Text Layout and Grouping**

Researches (e.g. RNIB, 2006) indicate that letters and numbers in signs should be considered as the following:

_ Characters should be embossed so that they have a depth of between 1mm–1.5mm. They should not be engraved.

_ Characters should be between 15mm and 50mm high.

_ There are two broad categories of typeface: serif typefaces, which have little “feet” (serifs) at the ends of the letters and sans serif, which do not. A sans serif typeface such as Helvetica, Arial, or something similarly uncomplicated, is recommended.

_ The character strokes should be narrow enough that you can feel both sides of the embossed letter or number by passing your finger once over it.

_ Symbols and pictures should be of standard design, if possible, and should be easy to understand.

_ The spacing between characters should be increased by between 20 and 30 per cent compared to the standard typeface, depending upon the chosen font.

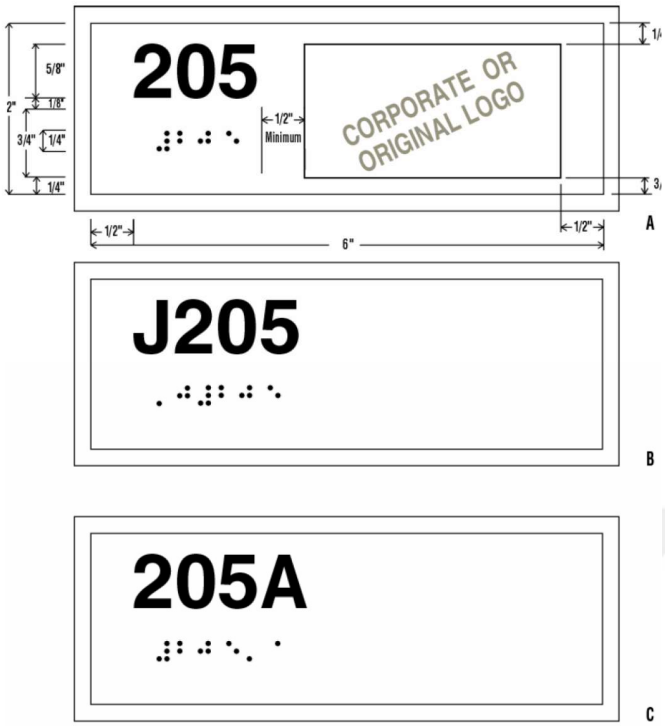
_ The spacing between words should be increased from the standard typeface by around 25 per cent.

_ A mixture of upper case and lower case text should be used in preference to all upper case. Text set in capitals is harder to read as it is more difficult to identify word shapes if the letters are all the same height.

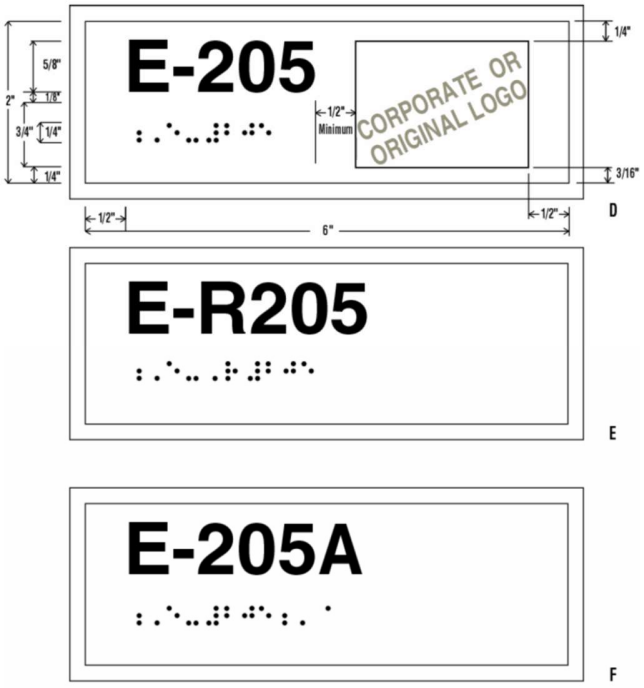
_ The character color should contrast with the sign board color and the characters should be in a non-reflective material or finish.

_ The characters should not have any sharp edges, but should be clearly defined by being slightly rounded or chamfered.

The spacing between characters should be increased by between 20 and 30 per cent compared to the standard typeface *(RNIB , 2006).*



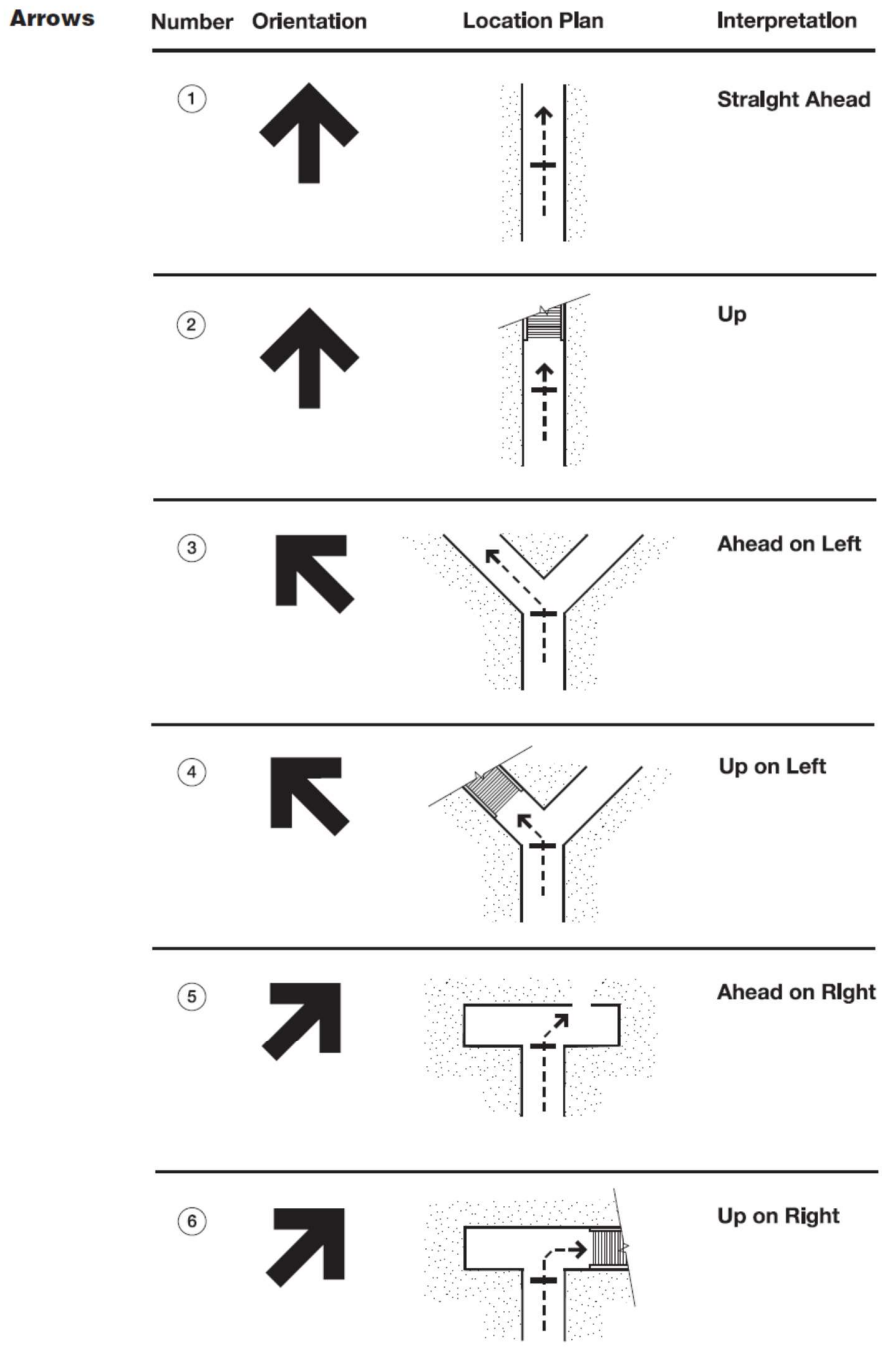

*3.2. Facilities Signage & Graphics Standards 2008*




*3.3. Facilities Signage & Graphics Standards 2008*

**Text and Arrow Alignment**

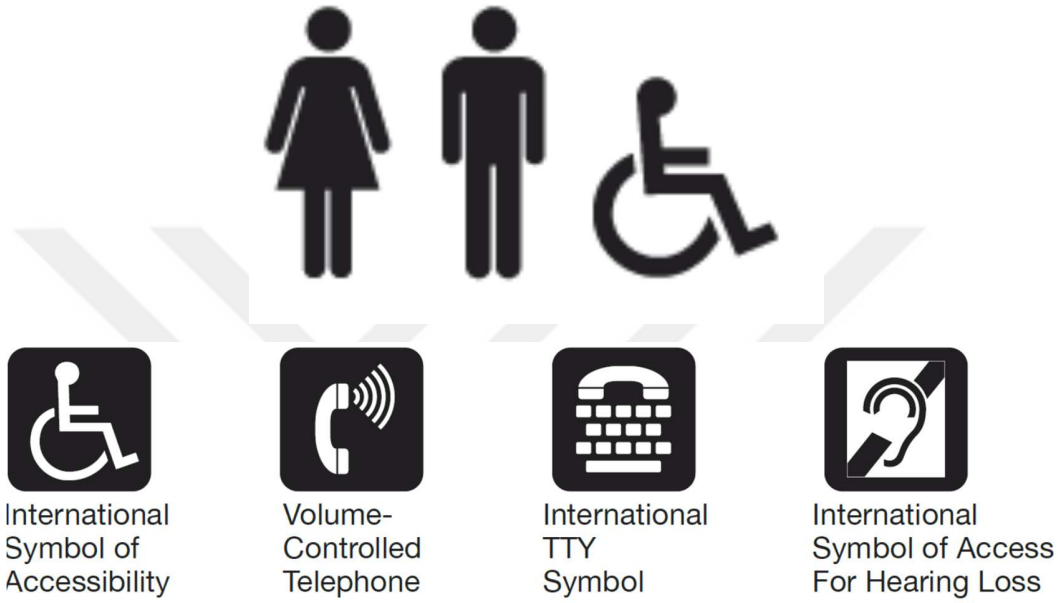
The standard arrow is a square tip arrow that is reversed out of a circular field as shown below. The arrow is to be justified left and may precede the copy to which it applies *(Facilities Signage & Graphics Standards 2008).*

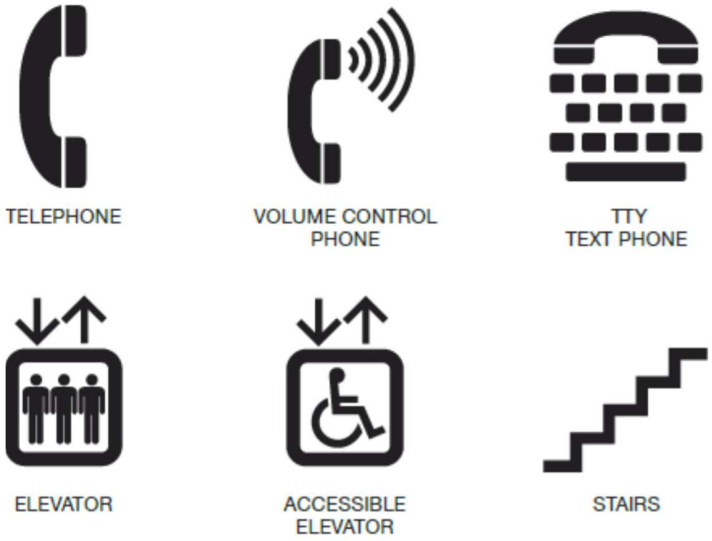



*3.4. Facilities Signage & Graphics Standards 2008*

**Symbols**

Pictograms or symbols must be located on a field of at least 6 inches in height. Symbols of accessibility shall have a non-glare finish and contrast with their backgrounds. These international symbols should be used to identify the following: *(Facilities Signage & Graphics Standards, 2008)*




*3.5. Health Facilities Scotland, 2007*

**Summary of Sign Types**

There are several types of signs, as follows:

**Graphic communication**

Graphics, such as signs, color coding, maps, banners, brochures and Websites, provide orientation, direction, identification and regulatory information. To achieve effective graphic communication:

* Standardize names for all buildings, services and destinations, and display them consistently on all graphics applications.
* Use easily understood "plain" language.
* Size messages and signs appropriately for viewing distances.
* Select letterforms and color combinations that comply with Americans with Disabilities Act (ADA) Accessibility Guidelines
* Furnish generous spacing between letters, words and message lines.
* Provide standardized "you are here" maps of the project that include an overall map of the complex and more detailed maps of specific areas.
* Train attendants to mark individualized paths on hand-held maps for lost or disoriented visitors.
* Place maps at all parking exits, building entrances and major interior decision points.
* Orient maps with building layouts, such as denoting on maps that "up is ahead."
* Establish consistency in sign placements and graphics layouts.
* Code areas by using color and memorable graphics.
* Use established pictographs with words to facilitate comprehension of written messages.
* Establish a floor numbering system that relates to a building's main entry and indicate on directories which floors are above and below grade.

**Audible communication**

Audible communication, as interpreted through verbal instructions, PA systems, elevator chimes and water fountains, plays an important role in wayfinding. Recognizing that 50% of the American population is functionally illiterate (according to a recent study published by the U.S. Department of Education) and that another 15% possess other perceptual or cognitive impairments,

audible communication fills an important role in any wayfinding solution. To establish effective audible communication:

* Install audible sounds at signaled intersections to indicate safe times to cross the street.
* At all public entries and information desks, provide attendants trained as professional greeters who are thoroughly familiar with the facility.
* Furnish self-help telephones at all information desks.
* Provide patient-transport personnel whose purpose is to guide visitors to their destinations.
* Standardize names for all buildings, services and destinations, and use them consistently in verbal communication.
* Equip elevators with audible chimes.
* Position audible landmarks, such as water fountains, at waiting areas.
* Employ audible signs to help locate information desks, elevators, rest rooms and other key destinations.

- Tactile communication

Tactile communication, achieved by raised letters, Braille, knurled door knobs and textured floor coverings assists all visitors, not only the disabled. To incorporate tactual devices into a wayfinding system:

* Establish "shorelines" and "trails" between major destinations and information areas using materials having differing resiliency's, such as concrete and carpet.
* Install "rumble strips" at the landings of stairs and escalators.
* Furnish knurled door knobs at all non-public doors.
* Provide a raised star symbol on elevator control panels to indicated the ground floor.
* Supply raised letters and Grade 2 Braille at elevators and on signs identifying permanent destinations.
* Install interactive audio-tactile maps at public entrance lobbies (Muhlhausen, 2006).

## 3.1. Interior Signage

On-premise signage provides both an invitation to the potential customer to stop, as well as enabling consumer memory and recall for future use. Effective signage can result in a competitive advantage. The design of effective signs is rooted in science, and is the stuff of numerous studies. The best signs take this research into consideration, and convey much more than what you see at a casual first glance *(Wyman and Berger, 2005).*

Knowledge of design factors and how to apply them to the kind of sign that is just right for any business is the primary function of many sign companies*(The New York State Small Business Development Center, 2004)*.

Accessible signs should be provided for any features of a building that would normally be given a print sign.

a) Informative - advising about availability of facility or service;

b) Directional - directing to a specific facility;

c) Locational - identifying the place where the facility is provided *(Royal New Zealand Foundation of the Blind, 2010)*.

A simple effect like adding a border around the viewing area is an economical way to dramatically improve your sign's effectiveness. Studies have shown that viewers can read and comprehend a sign that has a border around its message 26% faster than one that lacks this feature. If a sign is to be effective, then it must be legible at a distance sufficient enough to permit a driver to respond safely. Generally speaking, letters with a taller and wider "stroke" can be read from further away. This does not mean that all letters are equally legible from a distance. The letter height required to ensure legibility depends on type style, as well as conspicuity, and the eyesight of the user *(The New York State Small Business Development Center, 2004)*.

**Interior Sign Type Descriptions**

The development of an effective working interior sign program requires the coordination of several interlaced criteria. For an effective interior sign program you have to take in to account to the following:

1. Location of building entrances and elevators.
2. Character and configuration of the corridor system.
3. How do visitors currently walk around the building(s)?

4. What is the desired path of travel within the building for visitors and patients?
5. What is the desired path of travel within the building for employees?
6. Location of departments and clinics.
7. A simple clear room numbering system that follows a clear, understandable pattern.
8. Placement of signs in locations where people are expecting them to be.
9. Adequate light on and around directional signs.
10. Which signs can have permanent messages and which ones need to be changeable?

These elements help establish the basis of a clear sign program that communicates and informs in a direct and simple manner.

A sign program for a building, that works well, is one that has been planned as an integrated whole. This means signs are coordinated from the main entrance, to the directional signs and department identification and to room identification signs *(Department of Veterans Affairs, 2005)*.

For all this questions we must considerer the architectonic and ambient configuration to help user orientation and circulation. But this is not enough. The user needs to have a space intelligibility revealing a clear relation between space functionality and cognitive mapping.

Design projects have several levels of complexity and they demand a series of phases.

From the conception up to the achievement, passing through study and experimental phases to development, Design confirms the level and the capacity of answer of the project to the identified need.


*3.1.1. Graphic Design in Architecture,2011*

## 3.2. Wayfinding and Sign Systems

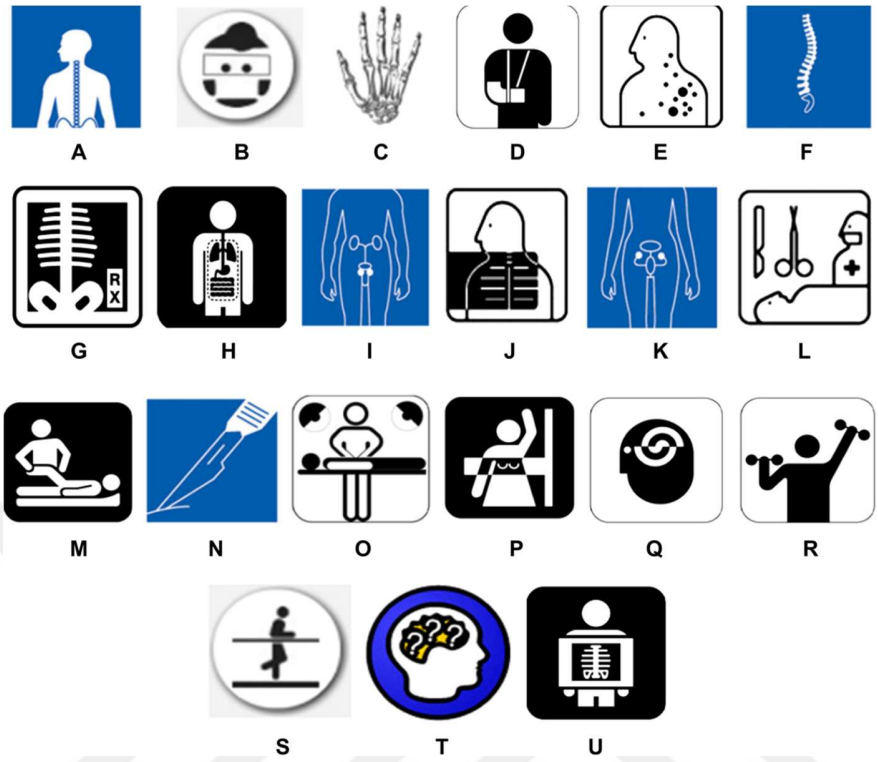
As the name "wayfinding" entails, wayfinding design is a practice of developing maps, signs and other signing artifacts that assist people in navigation. Physical spaces such as buildings, retail shops and other complex environments can be difficult to understand in their purpose or function, Wayfinding designers study these spaces and develop signing artifacts that help people know where they are and how to get to their desired destination. As a result wayfinding design helps to improve building efficiency and function by facilitating task-oriented behavior.

Design is any practice or activity that involves a process of conceiving, planning, shaping and ultimately executing an artificial form or idea that responds to a need. A narrower definition is designers create forms that communicate an idea, to which people assign their own meaning and value.

Historically, "design" has been perceived to mean "graphic design." This is inaccurate for much of design work. Design really covers a large number of different skill sets involved in the creative process. A designer acts as inventor, planner, negotiator and manager between possibility and reality, working to create something people find meaningful both in form and function.

So a designer can show our necessary information and help us to choose best wayfinding with suitable sign systems in any place.

Signs do more than provide directions; they reach out to the visitors and make them feel more comfortable with their navigating experience *(Harkness, 2008)*. Studies have shown that signage has a considerable impact upon wayfinding behavior that must be included in the overall plan configuration of a building *(Garling et al., 1986)*. Tang et al. (2009) conducted a wayfinding study involving emergency signs with three scenarios; one without signage, another with an old-version of signage (the word “exit” inside of large arrows next to a pictogram of a person running) and the third with a new-version of signage (the word “exit” outside of thin arrows next to a pictogram of a person running). The study found that the absence of signs resulted in significantly slower escape times (123.8 s) than either old signs (75.6 s) or new signs (84.8 s). However, the exit time for the old signage did produce faster, but non-significantly faster times compared to the new signage; possible explanations included larger text and past recognition of the old signage.




*3.2.1. Garling et al., 1986*

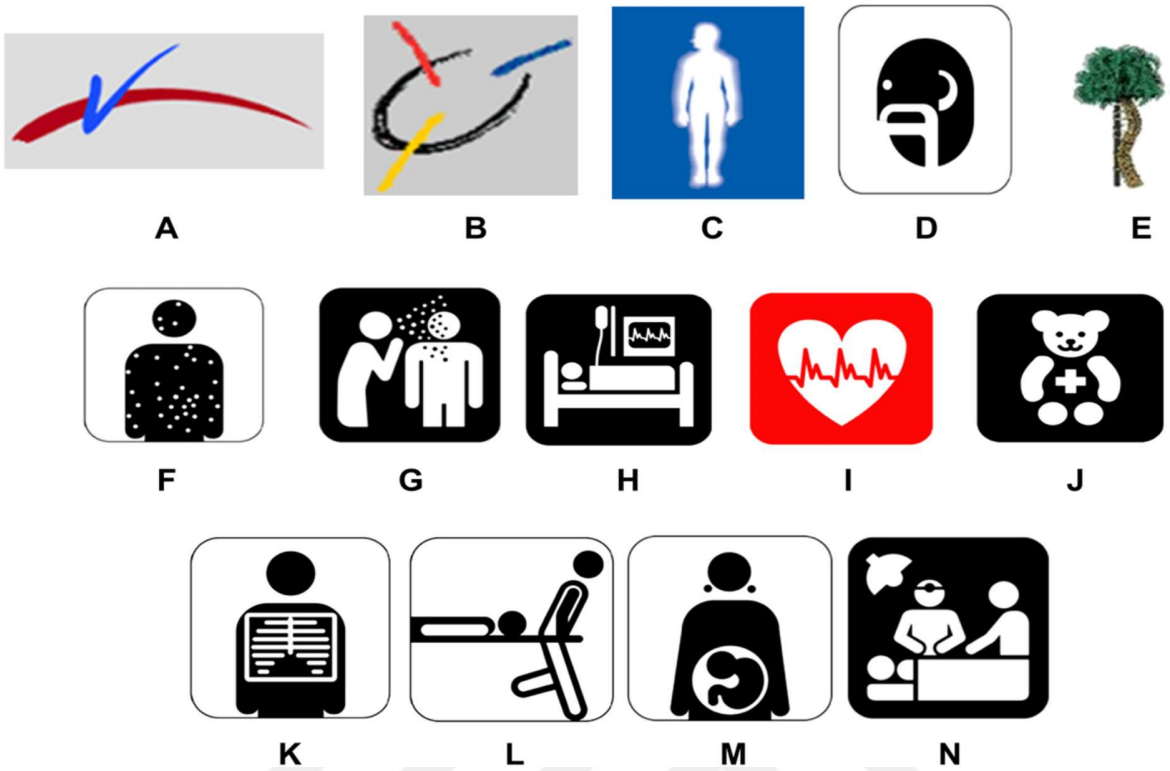
(A) Internal Medicine1 (Hirslanden); (B) Surgery3 (Innerface Design); (C) Radiology2 (MS Clipart); (D) Orthopedics2 (Poovaiah); (E) Dermatology2 (Nilamann); (F) Orthopedics3 (Hirslanden); (G) Radiology3 (various source); (H) Internal Medicine2 (HablamosJuntos); (I) Urology2 (Hirslanden); (J) Radiology4 (Nilamann); (K) Gynecology (Hirslanden); (L) Surgery4 (Nilamann); (M) Physical Therapy1 (HablamosJuntos); (N) Surgery5 (Poovaiah); (O) Surgery6 (Hirslanden); (P) Mammography (HablamosJuntos); (Q) Psychiatry1 (Poovaiah); (R) Physical Therapy2 (Poovaiah); (S) Physical Therapy3 (Innerface Design); (T) Psychiatry2 (MS Clipart); (U) Radiology5 (HablamosJuntos).

Scialfa et al. (2008) found that a significant improvement in signage comprehension was discovered when text was added.

However, simply implementing signage within facilities, such as hospitals, does not necessarily improve people's wayfinding experience.

It is true that wayfinding is more than just signage *(Arthur and Passini, 1992)*, but signage plays an important role. Faulty sign design can cause navigation problems in unfamiliar environments *(Muhlhausen, 2006)*. Cahill (1976) identified problems with the comprehension of complex pictograms, such as describing actions or combining a number of different meanings. Another

issue is that some signs lack conspicuity, or visibility, because lettering lacks legibility when viewed from a distance *(Salmi, 2007)*. Others contain inaccurate, ambiguous or unfamiliar messages; many are obscured by obstructions or contain reflective surfaces, which hinder comprehension. Consequently, many people often seek help with directions instead of wasting time with interpreting signage. Signs also tend to be ignored by people during the first encounter with them; however, they become increasingly aware of and compliant with signs the more times they are seen *(Tang et al, 2009)*. This behavior shows the importance of multiple, standardized signs at regular intervals throughout facilities. Several studies have been conducted on sign cognition, comprehensible symbols, directional indicators and the degree to which they are recognized *(Cahill, 1976; Collins, 1982, 1991; Collins and Lerner, 1983; Foster and Afzalnia, 2005; Lerner, 1981; Ng and Chan, 2009)*. Increasing the contrast of arrows, enlarging the area of the sign and changing the aspect ratio of the sign may increase the maximum distance at which effective identification can be attained *(Collins, 1991; Ng and Chan, 2009)*. Signage involving human forms has also been found to produce high comprehension results *(Lesch, 2008, 2004)*. It has also been found that both signage design and illumination conditions affect the visibility of signage *(Foster and Afzalnia, 2005)*. The changes in visibility that result from changes in sign and print size, luminance and the interactional effect of visual angle all need to be considered in signage design. Another current signage issue is abstract concepts for pictograms not being understood by many people when pictorially represented *(Foster and Afzalnia, 2005; Jones, 1978)*. Two comprehensive pictogram criteria standards are now currently being used to counteract and identify these poorly designed signs. The American National Standards (ANSI) Z535.1-5 (1991) criteria uses an 85% correct comprehension on recall-type tests and the International Standards Organization (ISO) 3864 (1984) criteria uses a 67% correct comprehension on similar tests. Muhlhausen (2006) suggested similar regulatory information to achieve effective graphic communication, such as establishing consistency in sign placements and graphic layouts, coding areas by using color and memorable signs, using easily understood “plain” language and using established pictographs with color and words to facilitate comprehension of written messages/signage.




*3.2.2. Garling et al., 1986*

(A) Surgery1 (Tuebingen, Germany); (B) Urology1 (Tuebingen, Germany); (C) Oncology (Hirslanden, Switzerland); (D) ENT (Poovaiah); (E) Orthopedics1 (Shands Hospital); (F) Dermatology (Poovaiah); (G) Infectious Diseases (HablamosJuntos); (H) ICU (HablamosJuntos); (I) Cardiology (HablamosJuntos); (J) Pediatrics (HablamosJuntos), (K) Radiology1 (Poovaiah); (L) ED/ER (Poovaiah); (M) OB/GYN (Poovaiah); (N) Surgery2 (HablamosJuntos).

**Emphasizing Information**

The architectural environments in which these intersections present themselves have an effect on a way finding program. Colors of walls, types of flooring and lighting also affect way finding both in a positive and a negative way.

One must look at the path of travel and the decision points that are necessary to reach the end point and where these decision points are located. At these decision points information must be communicated in a priority of need. Departments and destinations with heavy visitor and patient traffic have the highest priority of communication in way finding.

The priority of need is defined as those departments or services that have the highest percentage of people seeking them. This high demand for information then needs to be communicated with the highest priority on directional signs along the most direct path of travel.

Overhead signs, generally, provide emphasis to high priority directional information. However, with the aged VA population and wheelchair patients, care must be taken with overhead signs to insure that these signs can be seen from a distance. If the viewing distance is to short, those that walk stooped are in walkers or in wheelchairs will miss these signs.

Secondary information or information that applies to a small percentage of individuals needs to be evaluated in regard to its importance. Secondary information should be relegated to the bottom of the signs and not even be included if there is no room on the sign.

Typically a person only reads 4 to 8 messages on a directional sign. Any information that is beyond or greater than this is simply not read. Prioritization of communication of information would then in most cases cause the secondary or minor information to be left off the sign because it is not useful.

People that are walking have the opportunity to read more messages than an automobile driver so interior directional signs can contain more listings of information. But, more than 10 listings on a sign results in a sign so large that it is no longer readable and the viewer simply cannot sort through all the information presented, or won't stand there long enough to read everything. When a lot of information needs to be presented, break it down into smaller groups of information. Use 2 directional signs instead of 1. Place all the directional information for one direction on one sign and then use another sign to covey the other directional information *(Department of Veterans Affairs, 2005).*

Where detailed information is provided through signage, for example emergency evacuation instructions or building directories, designers should consider providing this information separately in alternative formats such as braille with tactile diagrams, large print, accessible electronic text and audio. This allows building users to read and refer to the information when they are not standing directly next to the sign *(Royal New Zealand Foundation of the Blind, 2010)*.

"You Are Here" maps can sometimes aide in the way finding process but care must be taken to make sure the map is very simple and configured in a manner which it makes very easy to understand. The orientation of these maps, and the amount of information on them, plays a critical role on the understanding of the viewer of what they are looking at.

It is important that “You Are Here” maps be placed in a strategic location where the viewer has a clear orientation to the building based upon the view of the map that they are seeing. Placement also needs to be at a location in the building where the viewer can make connection with major visuals objects like an atrium or large “art” or architectural feature.

Remember, once the viewer leaves the map, the visual image in their memory will quite quickly erode. And, once they make the first turn all their orientation will be gone *(Department of Veterans Affairs, 2005)*.

**Dual Language and Dual Term Signs**

Cowgill and Bolek (2003) stated that the lack of language skills creates health risks for that part of the population and adds a burden to the healthcare industry. They also concluded that language barriers can result in a lack of awareness of existing services and how to access them, difficulty in making appointments and low patient satisfaction *(Cowgill and Bolek, 2003)*. These issues stress the importance of universal signage that can be comprehended by multiple languages.

**Use of Color**

People need to know where they actually are in complex environments to feel themselves secure and safe. The difficulty of navigating in buildings suggests the need to support navigation with design elements. These design elements can either be architectural or informational. Informational design elements are anything from signage to digital information displays. Architectural design elements are the layout of a building and landmarks within.

Colour can be a powerful navigation tool to help people find their way around a building. For effective wayfinding people should be able to relate spaces to one another and see the basic underlying organisational principle of a building layout. The use of landmarks as mental anchors, provide unique points in space, which can also be helpful in wayfinding. Colour can contribute to the legibility of architectural spaces both with its application to emphasize prominent features of the layout and with its usage on landmarks. Due to its easy manipulation in a variety of design materials, colours become ideal design elements for creating environments that support user’s wayfinding abilities. Different colours have different meaning and understanding the different meanings can help immensely.

As Dalke et al (2002) say among the color design issues that are identified as priority are wayfinding and signage and the other issue could be visual impairment and color contrast.

Dalke (1998) believes that color can improve the definition of the environment, reinforcing hierarchy of prominent features , contribute to intuitive wayfinding.

In making signs more accessible, one of the points that should be considered, is to pay attention to its color. As it is indicated in RNIB *(SIGNAGE, ONE SIGN FOR ALL, 2006)* a sign should contrast with its background, for example the wall or door on which it is displayed. Similarly, letters should contrast well against the background color of the sign.

Many studies have researched the effects of signage design on comprehension. Harrell (1999) found that color enhances the effectiveness of different displays and highlights the importance of critical messages. Adding color to a warning can increase its ability to attract attention provided that the warning color is distinguishable from background and surrounding colors *(Gill et al., 1987)*. Kline et al. (1993) found that colored warning labels were perceived as being more readable and conveyed hazardousness better than achromatic labels. It has also been found that warnings printed in red (compared to black) led to improved noticeability *(Braun et al., 1995; Young, 1991)*. Although color is an important factor to consider in display design, it must be used with caution. For example, the use of red-blue combinations has been shown to cause eyestrain *(Venezky and Osin, 1991)*. This is due to the fact that these two colors are on the opposite end of the visible spectrum requiring different focusing levels of the human eye *(Harrell, 1999)*.

In the U.S., color coding has been developed to reduce confusion and aid in decision making by using population stereotypes: warning information is always displayed in red, caution information is always displayed in yellow or amber and advisory information is displayed in another color that is clearly discriminable from red and amber *(Wickens et al., 2004).* The ISO has also introduced similar universal color coding standards (ISO 3864-1), which include the use of green for safety measures and equipment and red for the ‘prohibition symbol’ or ‘no symbol,’ which is defined as a red circular band with a red slash going from the upper left to the lower right (ISO, 2002). These ISO standards for safety colors, signs and graphics are specifically designed to reduce accidents and injuries in public facilities, such as hospitals, worldwide.

**Positioning of Signs**

It is said that position the sign so that it is as easy and intuitive to find as possible. Correct placement of signs is required for all interior room identification signs. Correct placement of signs will usually mean fewer signs are required. Too many signs in one location can create a

cluttered appearance and increase the difficulty for a viewer to find the particular information they are seeking.

Interior lighting, wall colors and material finishes need to be taken into consideration as this impacts the visibility of signs. Locations of glass sidelights, and their width, can require blank glass back -ups or other solutions.

Coordination needs to take place with things like chart holders, bulletin boards, pictures and art work as these types of items may have to be relocated to meet the installation requirements of signs. Coordination needs to also take place with Life Safety and Code signs.

Care also needs to be taken to place signs in a manner that allow clear viewing. Placement of signs so they are not obscured by furniture or equipment is critical.

Refer to the detailed drawings and instructions covered in the Installation Section for each sign type showing the placement position required for its use.

Signs should, if at all possible, always be perpendicular to the intended viewer.

- Position signs with a clear line of sight from the viewing point to the sign face.
- Always evaluate the lighting at a sign's location. Lighting conditions can have a big effect on visibility possibly making a particular location unsuitable.
- All signs should be placed in a manner that will be clearly visible at all times.
- Be careful to coordinate ceiling mounted signs so they do not obstruct or block fire sprinkler systems and exit signs.
- Signs may be installed on glass because there is no available wall surface. A blank glass back up is then required to be placed on opposite side of glass exactly behind sign being installed *(Department of Veterans Affairs, 2005).*


*4.4.1. Graphic Design in Architecture,2011*

## 3.3. Interior Wayfinding Sign Systems

Human beings talks to its surrounding environment by environmental graphics and communicates with each other. The environmental graphics has effective role in creating pleasant role for the society's people.

Proper environment means a space in which the human could grow away from unwanted psychological stresses and flourishes and this is of rational logical and of any society. The environmental graphics is visual aesthetics and order and pleasant harmony of space.

The purpose of all graphical designs for interior and external environment is to create a space for happy and healthy and satisfying life. The environmental graphics could be divided into two types of two dimensional (even) and three dimension (volume).

Recognizing one place from the other, making a place so beautiful, and make urban space coherent and develop the realm of graphic art activity are of the purposes of the environmental graphics.

The environmental graphics could have several aspects:

*Aspect of informing or emphasizing on the subject

*Cultural aspect like urban promotions about theater and cinema, etc.

*Educational aspect.

*Advertisement aspect

*Social aspect like promotion against cigarette consumption in the city

*Aesthetic aspect and merely making the environment beautiful

*Equilibrium, proportion, emphasis, continuity, unity, and variety are principles of a correct organization. Color, light, shape, line, point, level, context, and space help them to make a pleasant and beautiful work.

**Equilibrium:**

Equilibrium is of the main artistic principles. Art seeks a kind of equilibrium in communicating with the addressee. Equilibrium in the art is formed by a proper division of the components. Color, light and context have role in maintaining equilibrium or vice versa. Of course, high emphasis on Equilibrium leads to lack of attraction in the work and makes it boring.

**Proportion:**

To design a store head writing, it should be noted that in some places that are wide and there is much extra space around the store or the public space, the designer is free to work and could change the ordinary proportions and for example make a public place head writing so higher than its normal level for because of the open place, the observer could see the whole environment and see the head easily and recognize it.

**Continuity in the environment:**

Repetition and proportion and progress are of three continuity components in the art. Proportion that is formed as repetition of one or two among several units, has more complexity and movement in it. Effectiveness of continuity depends on the properness of the subject and the skill of using them. Such that if a component repetition changes gradually, the work weight grows and progress could orient to the above, below or the lateral direct. Progress could be observed in the change of small and large in shape change of four angled, circle etc. and color change from light color to the dark ones.

**Emphasis on the environment:**

If by underestimating the components of a compound and distinguishing one of the elements, the observer's attention is attracted to one special section that is called emphasis point. Emphasis could be formed using color and context. Similar elements make the work emphasis weak. Clear figures have more blatancy in comparison to the simple objects. The way of categorizing the elements increases a complex emphasis.

The principle of emphasis could be used both for unity and variety. Emphasis on one of the elements has direct effect on attracting the addressee or the observer of a public place.

Creating unity in the environment:

Unity makes any work coherent. Without the element of unity, the elements of a combination will seem unrelated and spread. Unity leads to attract attention, it is an important factor in transmitting the message, makes the work understandable and helps the message be more simple.

**Variety in the environment:**

Variety is the result of difference and contradiction. Contrast among shape or color or the elements context form variety. Several elements move the eye around the factor of unity all over the work. Variety makes unity coherent. Unity tends to order and variety tends to stimulation.

Dot, line, and level have special expressing powers. Dots are different regarding their size, and the way of being used in the environment and makes different visual effect. Lines do so. Curve lines, broken lines, lateral lines and vertical lines each has different dimensional effect and is used in needed place.

Place recognizes situation and position of any objective phenomenon with other phenomena. Space makes it definite the existence of any objective creature in relation to the others and makes the interior and external and intermediate spaces perceivable.

**Context:**

Context is of other interior and external architecture elements. Context could be discussed from two points of view. One is form and shape that is perceived by sight power the other is physical and material of the context that is perceived by touch.

Degree of reflection or attraction of light by the objects having context has much importance. Contrast of matt surfaces besides clear surfaces has much attraction and makes visual manifestation. Coarse context has much power to attract attention and in contrast to them, clear glossy contexts are usually low lighted. Context is obtained by several materials like tree skin,

rock surface, animals' skin or its artifacts like brick, metal, plastic, etc. the intensity of light and the context being natural or artifact effect on its quality. Vision angle and the observer distance should be considered.

**Light:**

Light is of main element of environmental graphic and the interior and external architecture. Natural and artifact lights have different effects on the environment. The observer's sight point, light amount emitted on it and the observer's vision angle are of factors that should be considered in all the elements of the street inside and have beautiful combination with each other and good and standard design.

Traffic signs, lights, post box, garbage box, tablou of the streets, public phone, advertisements, and wall promotions in bus stations, store head writings all relate to each other and influence on public that should be pleasant and by considering proper aesthetic and combination helps the city be beautiful. For the urban environment needs this visual aesthetics to decrease psychological negative effects on the citizens. The environment al graphics makes the space and the life environment happier and gives the urban environment order and coherence.

Definite factors like the environment geography, climate, sun light, rain rate, heat fluctuation, plant coverage, and etc. are of natural and environmental factors and set of factors like architecture and elements and traffic spaces and rate of transportation are of artifacts factor resulted from the human presence that the designer should know them during his work and pay attention to.

Interior architecture is a set of knowledge, skill, and art that tries to optimize the spaces and reach efficiency and proper function besides meaning aesthetics and meanings with its elements related and belonging to it, such as form, color and context. Interior architecture by making a set of should and shouldn't s of deficiencies and plurals and placing form against form and space, nature against geometry (organic architecture), interior against exterior and also masculine power and logic on one hand and feminine feelings on the other hand (that reach to each other to in their peak existence) tries to conceptualize a meaning and formal relation. Indeed, interior architecture by this combination tries to reach to its intended purposes in space design. In the interior architecture by establishing rhythm in geometry it could awake human feelings , penetrate in all dimensions and make some movements other than vertical and horizontal ones. We deal with light frequencies that define length and width and height and when these three

happen in their shortest form, a set of geometric shapes are felt that have been defined in an objective and immediate form in two dimension space. Proportions, dimensions, density, and tonality of used colors and sensitive stimulations in any work indicate exact harmony in the elements. Graphics is a visual aesthetic environment and order and space pleasant harmony. The purpose of all the graphic designs for the interior and the exterior environment is to create a space for healthy and happy and satisfying life.

Interior architecture that is understood as a craft, art and skill in the world optimizes interior spaces of the buildings in order to perform routine activities  i.e life and work. Much part of our life is spent in internal spaces of the buildings. These spaces are responsible for basic needs like need for shelter, and many of our activities is done in it. Also what gives a building spirituality is its internal space. So, it could be said that the quality of interior architecture on one hand has direct effect on the way of our deeds in it and on the other hand our trend, mood and personality is influenced by it. In this regard, the purpose of Interior architecture is to improve physical and psychological performance of the space to ease the life in it.

The architecture without Interior architecture is not usable and in the case of being used, it won't have needed and optimal efficiency. The Interior architecture influences all the people lives and its effects are seen clearly. So, the subject of Interior architecture is by no means limited to wealthy class and buildings. Interior architecture could be helpful for the whole society and low-income class. If we know contentment the basic principle of today's society and decide to have easy life in 40 or 60 m apartment, then Interior architecture will be ineludible necessity. Interior architecture could show us how to live in this small space and with what households. As Interior architecture is in direct relation with the human's psychological-spiritual characteristics, it should consider human's behavioral characteristics carefully in the internal spaces including public or private in designing to reach a pleasant design.

So, the designer deals with two item in designing the interior space: applying that space and the feeling and influence that wants to have on the user. The interior architecture includes several spectrums of elements and components such as form, light, context, celling, floor, wall, functional and accessory elements, and furniture. These elements are tools of the designer's work that all should be in harmony and in proportion in a related and pleasant design. The interior architecture that intervene the architecture and designing, includes applied, structural and technical aspects as much as visual designing and aesthetic and visual aspects, too. So, interior

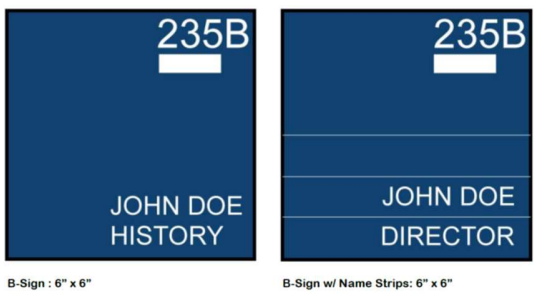
architecture is often considered visual arts and to be successful in it, it should be familiar with visual designing and visual literacy. Though interior architecture is now known as an expertise and includes wide limit, but as this field is in direct relation with the house internal space and routine life, understanding the alphabetic of interior architecture and explanation of it in a simple words and specially housewives leads to its understandability and scientific a trend with this phenomenon and finally it will have deep effect on the quality of life spaces of our society. So, we want to regard several subjects of interior architecture in different notes and by using visual designing principles and literacy and based on successful interior architecture examples all over the world, increase knowledge and information of the families on this issue.

The interior signs are used to identify different areas in the building such as rooms, departments, offices, etc. Each sign must indicate a room number and include Braille. Several different sign types are used to identify specific areas within a building and each have their own dimensions and guidelines as outlined hereafter:

- A-sign. This is used primarily for college, division or departmental offices. It is 12 inches by 6 inches and has room for supplemental text.

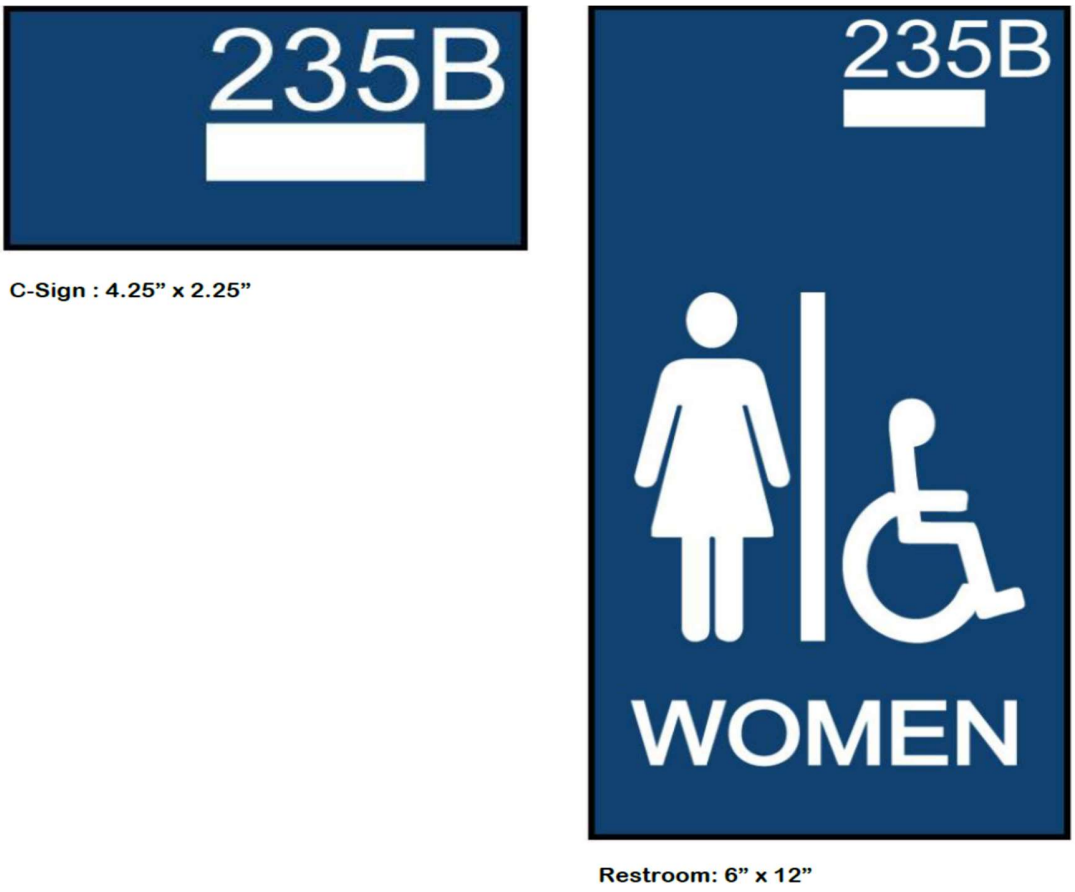

*3.3.1. Facilities Planning, Design & Construction, 2010*

- B-sign. This size is used for offices, classrooms, meeting spaces, etc., and is the most commonly used size. It is 6 inches by 6 inches and has room for limited supplemental text. This sign may also include removable name strips for occupant names.




*3.3.2.Facilities Planning, Design & Construction, 2010*

- C-sign. This is used only as a room number for mechanical closets, etc. It is 2 1/4 inches by 4 1/4 inches. No additional text can be used.
- Restroom sign. This is used to identify restrooms. It is 6 inches by 12 inches and has room for supplemental text.




*3.3.3. Facilities Planning, Design & Construction, 2010*

**Directional signs**

These direct users to destinations using arrows and can also include directional text. Corridors should have signs at each point of entry and at key decision points. Floor levels should be indicated adjacent to stairs and lifts *(RNIB, 2006).*

In many cases, blind users lack much of the information needed for planning routes around obstacles and hazards and have little information about distant landmarks, the direction they are

heading and the distance that remains between them and their destination. This kind of information is essential when they are traveling through unfamiliar environments with a basis of maps and verbal directions. Wall, soffit and ceiling mounted directional signs provide solutions for communicating way finding information in differing building conditions. Typically, ceiling or soffit mounted directional signs are used to display directional information for high traffic destinations like the Pharmacy or Clinics.

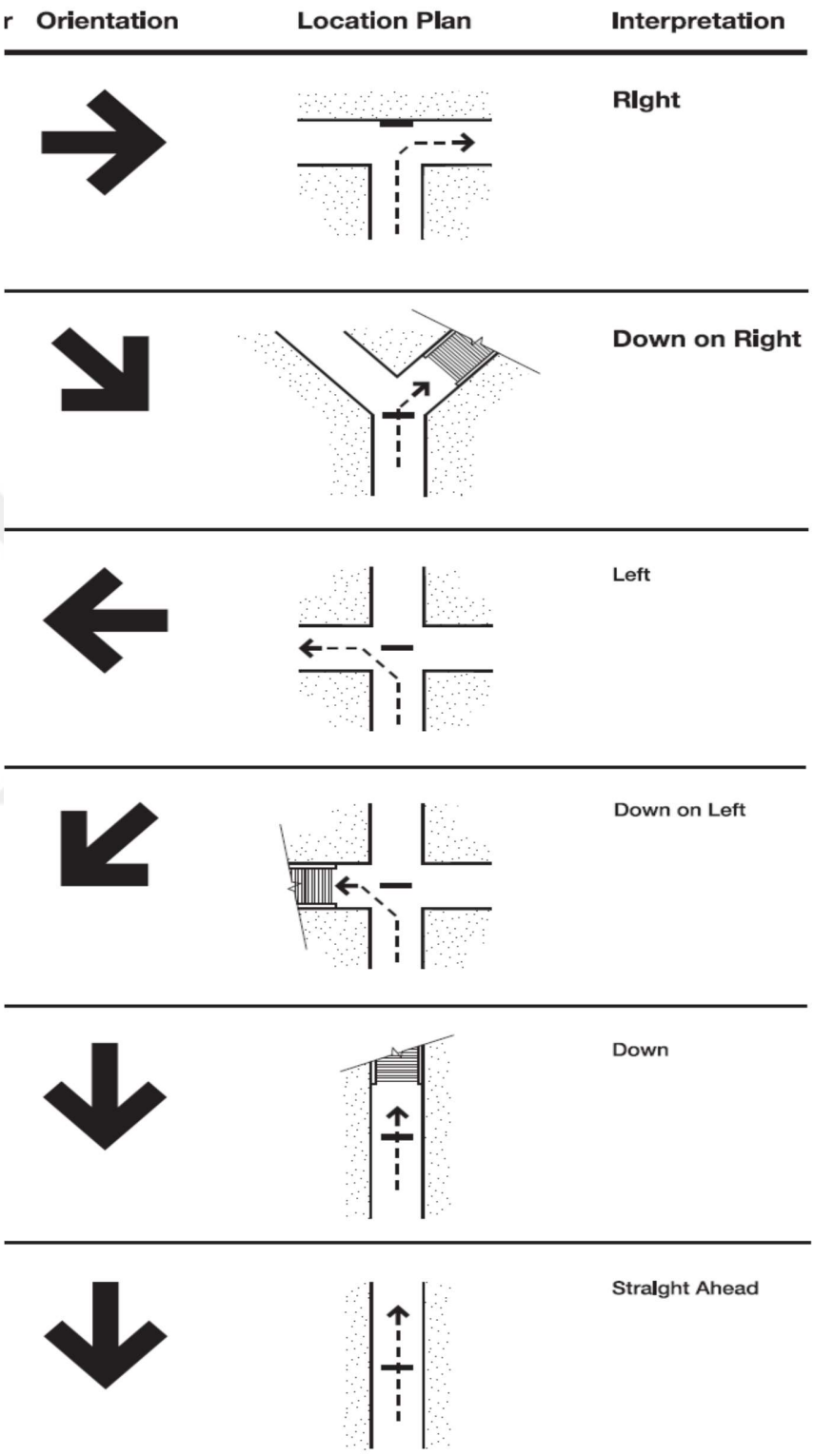
Directories in lobbies and at elevator landings serve to assist people in finding or confirming the location of services within a building or in other buildings. Directories, because of their capability to handle a large number of services listing, can include all of the departments or services within the facility.

The priority of need is defined as those departments or services that have the highest percentage of people seeking them. This high demand for information then needs to be communicated with the highest priority on directional signs along the most direct path of travel.

Overhead signs, generally, provide emphasis to high priority directional information. However, with the aged VA population and wheelchair patients, care must be taken with overhead signs to insure that these signs can be seen from a distance. If the viewing distance is to short, those that walk, stooped, are in walkers or in wheelchairs will miss these signs.

Typically a person only reads 4 to 8 messages on a directional sign. Any information that is beyond or greater than this is simply not read. Prioritization of communication of information would then in most cases cause the secondary or minor information to be left off the sign because it is not useful.

People that are walking have the opportunity to read more messages than an automobile driver so interior directional signs can contain more listings of information. But, more than 10 listings on a sign results in a sign so large that it is no longer readable and the viewer simply cannot sort through all the information presented, or won't stand there long enough to read everything. When a lot of information needs to be presented, break it down into smaller groups of information. Use 2 directional signs instead of 1. Place all the directional information for one direction on one sign and then use another sign to covey the other directional information *(Department of Veterans Affairs, 2005)*.



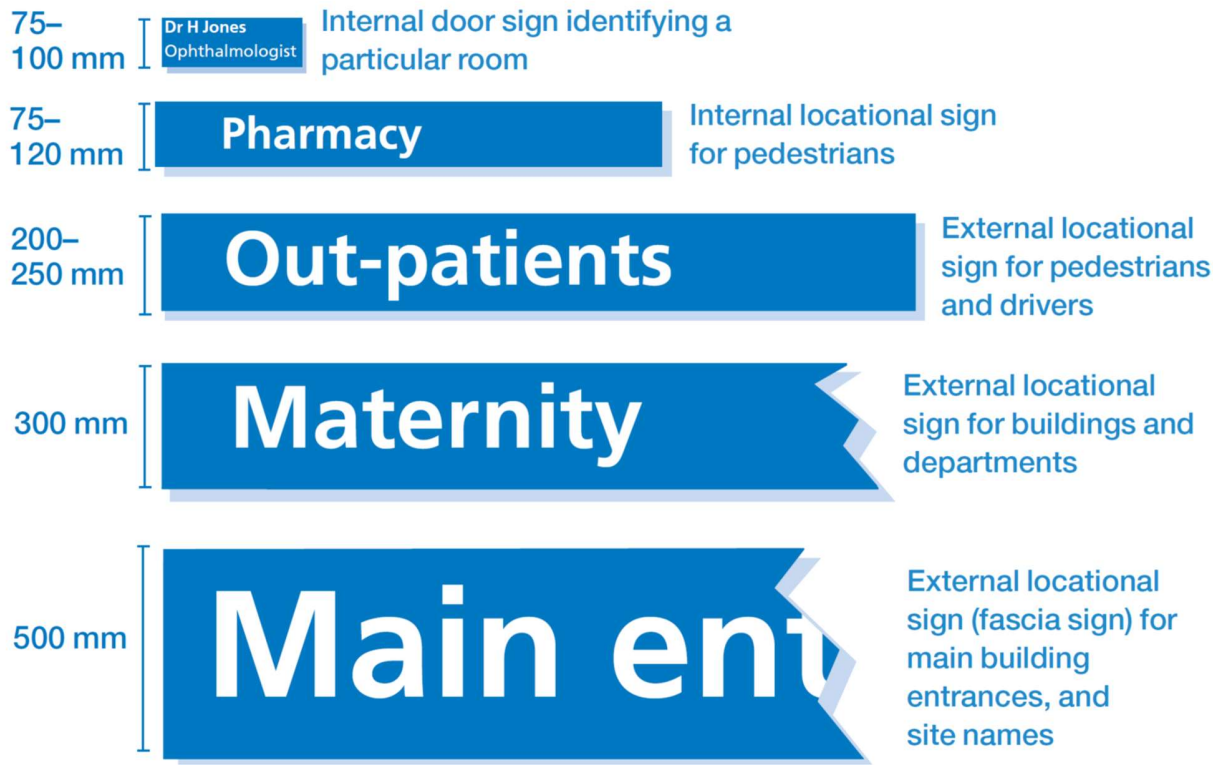

*3.3.4. Department of Veterans Affairs, 2005*

**Locational signs**

Locational signs are used to identify a location. They tell people where they are, or that they have arrived at their destination. As with directional signs, the intended viewing distance, and related type size determine the size of the sign. The sizes of locational signs range from very small door identity signs to very large external locational (fascia) signs to mark external main building entrances.

Factors that influence the effectiveness of locational signs

- The legibility of the typeface
- The type size used
- The color contrast between text and background
- The contrast between the color of the sign and the environmental background on which the sign is to be placed
- The amount of information on the sign and the speed at which people reading it are travelling
- The level of lighting where the sign is positioned.




*3.3.5. Health Facilities Scotland, 2007*

When trying to find their way, people need to:

• know when they have arrived at the site they are looking for

• find the correct building entrance

• recognize locations referred to in directional signs and spoken directions

• know when they have arrived at their destination.

Locational signs enable people to do this. They should clearly identify site and building entrances, and all destinations at your site.

**Directories**

People generally use directories to see whether their destination is located in the building they are in, and if so, which floor it is on. Directories are often positioned outside lifts or at building entrances. It is essential that directories show which floor the directory is located on, so that people reading them know whether they have to change floors. Once people have seen from a directory that they need to get to a different floor, they should be able to see where a lift or staircase is located.

If a lift or staircase is not clearly visible from the location of the directory, there should be a directional sign visible from the directory pointing to them.

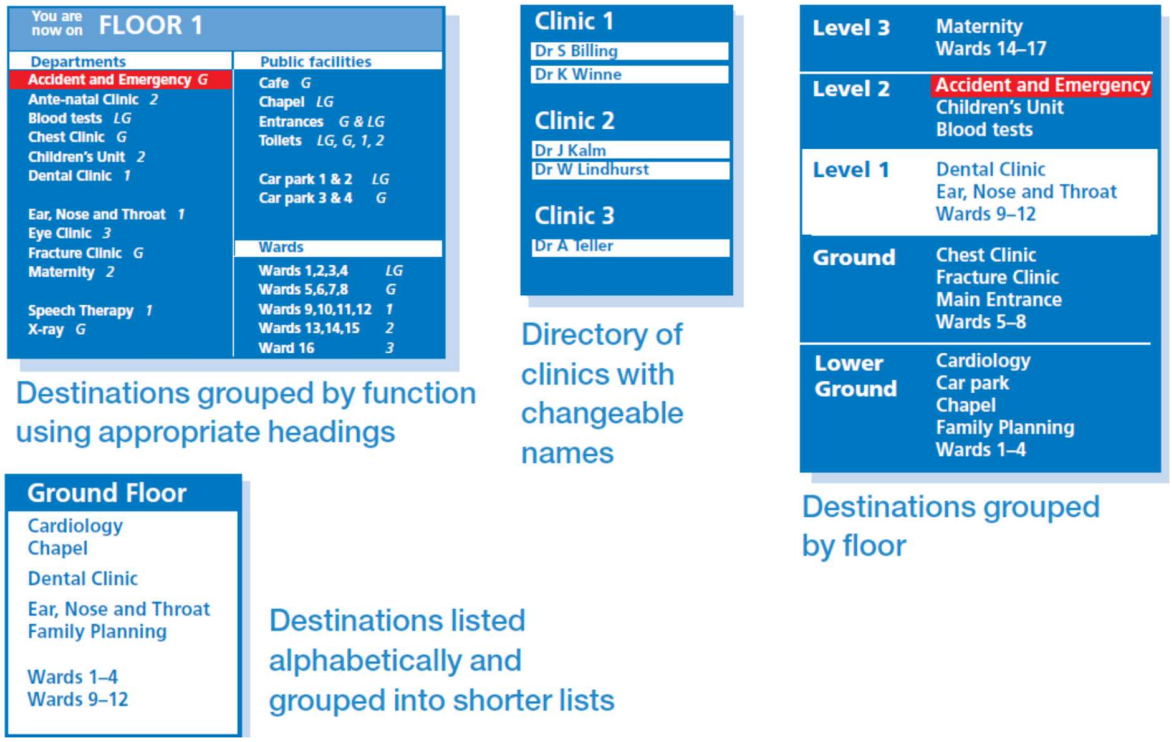
In large, multi-level buildings, directories are an important part of the wayfinding system. The amount of information on a directory is determined by the number of floors, and the departments on each floor. How easily people can find a destination is affected by the way in which the information on the directory is ordered, and whether graphic devices have been used effectively to group information.

If departments are often being relocated at your site, you should ensure that a flexible construction method is used for directories so that signs are as easy and inexpensive to update as possible.

Layout, grouping and ordering of directory information

Directories at healthcare facilities are most often grouped by floor, but most people are usually referring to the directory to find out which floor they need. Therefore, grouping the destinations by floor means that people will have to read through a number of lists of destinations before they find the destination they need. Grouping destinations by floor does enable people to see how many floors there are in the building and create a mental model of the building, seeing what is on each floor, but will often make it more difficult to quickly find out whether a destination is listed.

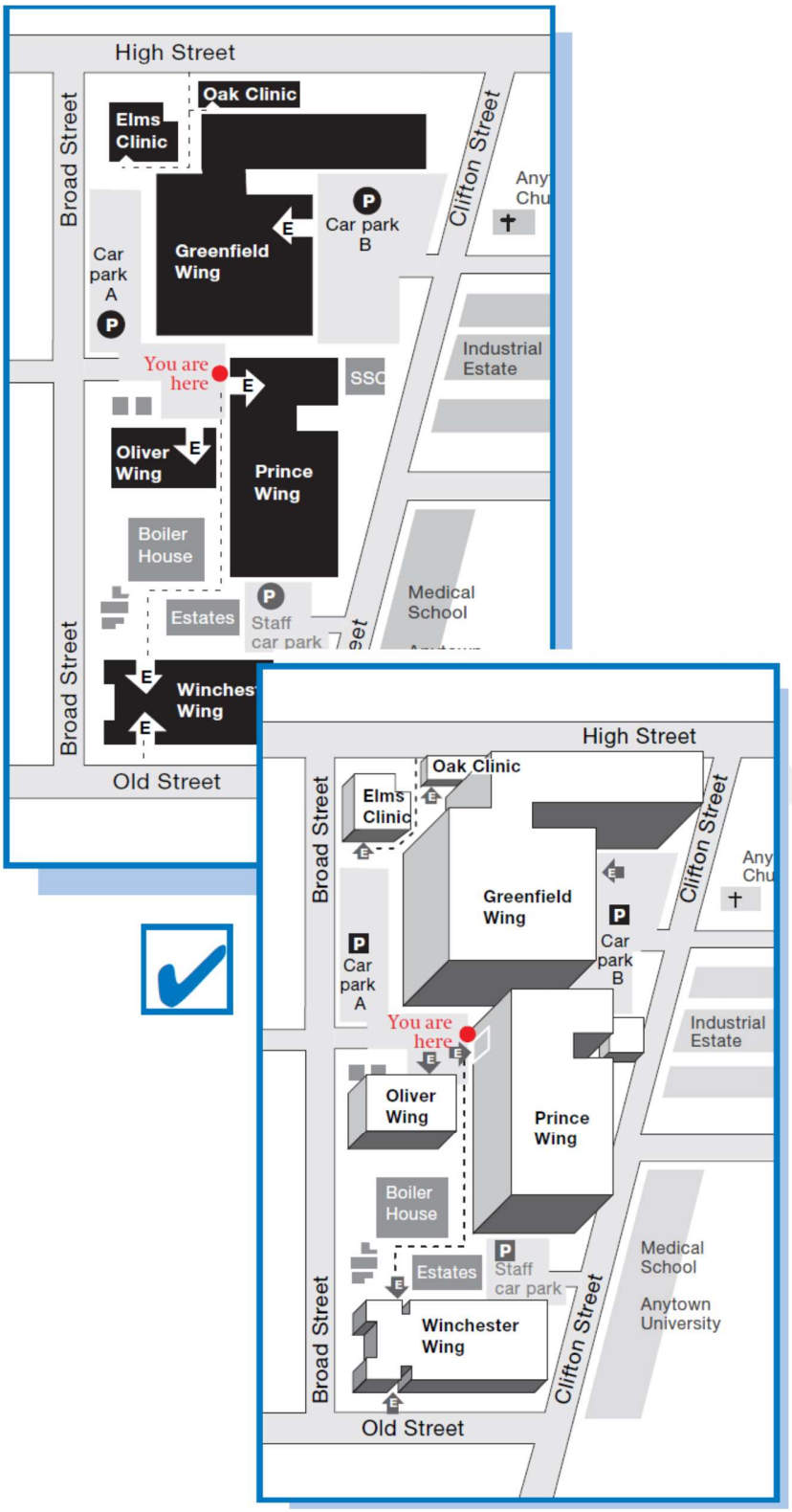
Ordering the destinations alphabetically would usually make finding a destination quicker and easier. However, it may be appropriate to order destinations by function, such as all wards grouped together, all departments together and all public facilities together. Clear headings above each grouping would explain the grouping method. The layout of directories can vary, but they must always clearly show which floor the directory is located on, and there should not be too much space between the destination and floor number.




*3.3.6. TSO, 2005*

**Site maps**

Framed maps located around your site are an important part of your wayfinding system. A well-designed, framed map can help site users to identify where they need to be and plan the best route to their destination. It is especially important for people with disabilities such as limited mobility to be able to identify the most direct route. Though some people find maps easy to use, others find them difficult to understand. The usefulness of a framed map is affected by how closely it relates to the actual environment, how it is drawn and reproduced, and whether it relates to pre-visit information.


High Street
Oak Clinic
Elms Clinic
Broad Street
Clifton Street
Car park A
Greenfield Wing
Car park B
You are here
Industrial Estate
Oliver Wing
Prince Wing
Boiler House
Estates
Staff car park
Medical School
Old Street
Winchester Wing
Anytown University

*3.3.7. TSO, 2005*

Site maps should enable people to create a simple mental model of the site and the main routes around it, so that they can orientate themselves and visualize the route that will get them to their destination.

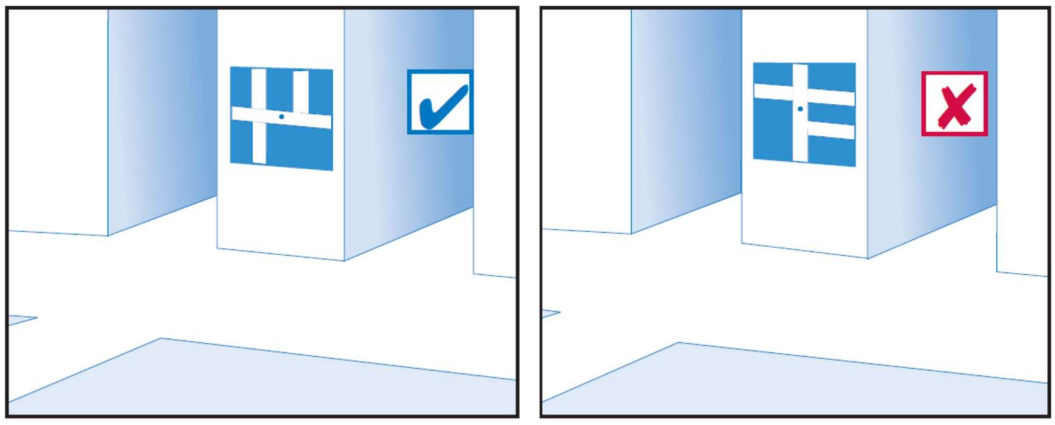
Framed maps located around your site should relate directly to maps sent with pre-visit information. However, framed maps are usually much larger than the printed maps sent out, so your site map should be designed to be legible and easy to use at both sizes. A map that is either too complex, or over-simplified, can be hard to understand.

Factors that affect the clarity and therefore the usefulness of framed maps

• Whether "you are here" is clearly marked
• The illustrative style
• The quality of reproduction
• The effective use of color
• The level of detail, the scale of the map and the size of text
• The inclusion of landmarks or prominent site features
• The level of illumination where the map is located.

Factors that affect how many people use maps at your site

• Whether the maps are noticeable, unobstructed and legible
• Whether the maps are located at appropriate points (decision points) along all public **circulation** routes
• Whether the maps are orientated so they relate to the actual environment. Orientation of maps



A This map is orientated to relate to the environment in which it is located

B This map is much more difficult to relate to the environment in which it is located

*3.3.8. TSO, 2005*

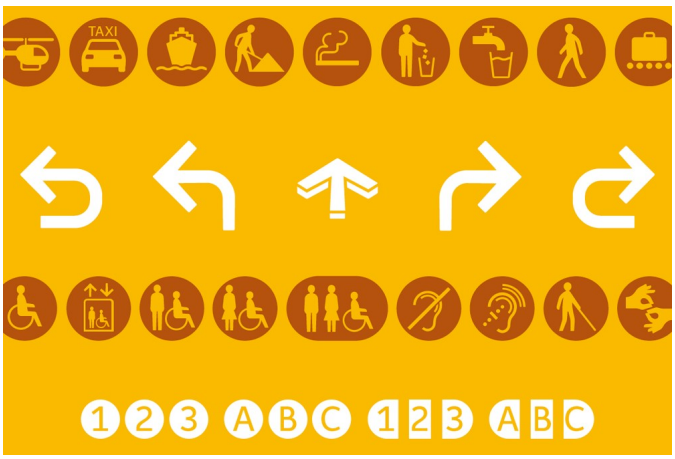
The orientation of framed site maps should be considered when positioning them. It is not usually feasible to redraw maps for different locations, so when positioning them, try to orientate the maps as in example A to avoid the confusion.Amount of detail on maps,It is important that you identify how maps are used as part of your wayfinding system, where they will be positioned, and what information people need to be able to get from maps. Your site map should then be designed to provide an appropriate level of detail.

An over-simplified map can be hard to understand. Similarly, a map that is too detailed and cluttered with information is often difficult to understand. A map should be designed to provide all information relevant to the user. At some sites, more than one map may be needed to avoid producing a site map that is cluttered.

If there are a variety of building styles and heights, and entrances on different floors, you could consider using a 3D diagram to explain the different levels of the buildings. It could also be used to show buildings as visual landmarks, particularly if some are prominent.

Directory Signs are used inside of buildings to direct traffic to major areas of the building through the use of directional arrows and a directory map. The design of the directory sign can be flexible and customized to each college or building as needed. Every sign must include the university logo and use the correct fonts and colors.

The sign below is a suggested directory design. The wall mounted sign consists of a tinted glass front with applied vinyl lettering. A piece of plastic or paint is applied to the wall behind, with the USU logo. The glass is stud mounted, allowing it to appear floating.




*3.3.9. Facilities Planning, Design & Construction, 2010*

**Safety signs**

Safety signs provide warnings and safety messages and inform people of emergency procedures. All healthcare facilities should have planned and practised evacuation procedures. They are required by law to provide information to warn people of potential hazards, to inform them of necessary precautions, and to guide them to where they will be safe in an emergency. There are standard signs for most types of safety and warning message. Mandatory fire and safety regulations ensure that all sites provide adequate safety systems, including signs. However, you should be aware that simply putting up a mass of brightly-coloured safety signs to comply with safety regulations will not necessarily make your site Safe .

It is essential that the intended meaning of a safety sign is quick and easy for all site users to understand.

Factors to consider when installing safety signs Having completed an assessment of your site and identified the safety messages required, you should:

- Use the appropriate color for the safety message and ensure that the color used for symbols and text is high-contrast (black on yellow signs, and white on blue, green or red signs)
- Use the appropriate sign shape for the safety message
- Use standard symbols that have been tested for understandability. If you need a symbol for which there is no standard design, you must test the suggested design to ensure it is easy to understand for all site users
- Never use the incorrect safety color, sign shape or symbol for a safety message for which it is not intended, as this will cause confusion
- Consider the positioning of safety messages in the environment to ensure signs are noticeable, legible and there is no possibility of confusion
- Consider the positioning of arrows on safety signs to ensure the direction for safe areas or emergency equipment is clear and relates to the actual environment.

**The meaning of safety colors and sign shapes**

There are standard safety colors, sign shapes with a specific meaning, and well-recognized symbols specified in BS 5378 (1980) and BS 5499 (1990) that should be used for all safety signs and information to ensure that a clear safety message is provided, with little scope for confusion.


*3.3.10. Health Facilities Scotland, 2007*

**Unclear meaning of standard safety signs and symbols**

It is essential that safety messages are clear and specific, and that people know what action or precaution to take if necessary. All British Standard symbols have been extensively tested for understandability, but in some cases bad positioning of safety signs can cause confusion, and there are a few standard safety signs and symbols that do not provide a clear safety message, including these general signs that have no specific safety message:


*3.3.11. Health Facilities Scotland, 2007*


*3.3.12. Health Facilities Scotland, 2007*

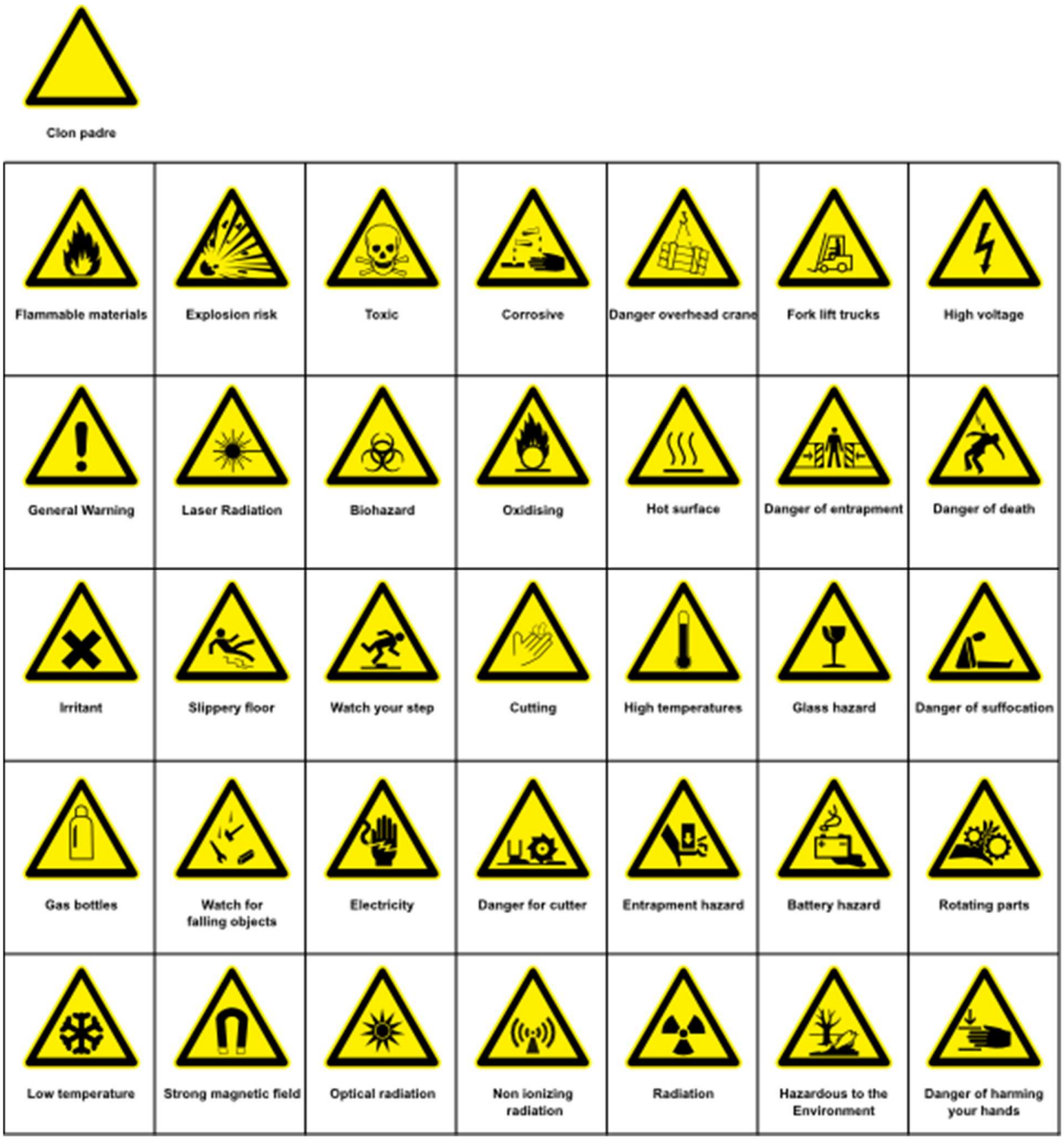
In warning research literature, there are several behavioral compliance studies that demonstrate the effects of sign type *(e.g., Wogalter et al., 1993;Wogalter and Young, 1991)*, and the presence (versus absence) of warnings *(Wogalter et al., 1987)*. In a review of the behavioral compliance literature, Silver and Braun (1999) concluded that the presence of a warning had a positive effect on behavioral intentions and compliance. Several other studies lead to the same conclusion *(e.g., Laughery et al., 1998; Wogalter et al., 1987, 1994)*. Another fairly strong finding is that dynamic presentations produce greater compliance than static presentations *(e.g., Wogalter et al., 1993)*.

One explanation for this finding, based on attention theory *(e.g., Kahneman, 1973; Wickens and McCarley, 2008)*, is that dynamic presentations are more likely to be noticed than static ones because of its prominence (also known as salience and conspicuousness) calls attention to itself; more prominent stimuli are better able to switch attention and break into consciousness when attention had been focused on other tasks.

| Health Hazard | Flame | Exclamation Mark |
|---|---|---|
|  |  |  |
| • Carcinogen<br>• Mutagenicity<br>• Reproductive Toxicity<br>• Respiratory Sensitizer<br>• Target Organ Toxicity<br>• Aspiration Toxicity | • Flammables<br>• Pyrophorics<br>• Self-Heating<br>• Emits Flammable Gas<br>• Self-Reactives<br>• Organic Peroxides | • Irritant (skin and eye)<br>• Skin Sensitizer<br>• Acute Toxicity (Harmful)<br>• Narcotic Effects<br>• Respiratory Tract Irritant<br>• Hazardous to Ozone Layer (Non-Mandatory) |
| **Gas Cylinder** | **Corrosive** | **Exploding Bomb** |
|  |  |  |
| • Gases Under Pressure | • Skin Corrosion/Burns<br>• Eye Damage<br>• Corrosive to Metals | • Explosives<br>• Self-Reactives<br>• Organic Peroxides |
| **Flame Over Circle** | **Environment** (Non-Mandatory) | **Skull and Crossbones** |
|  |  |  |
| • Oxidizers | • Aquatic Toxicity | • Acute Toxicity (Fatal or Toxic) |

*3.3.13. Health Facilities Scotland, 2007*

Effective warnings are an essential tool of hazard control for products and environments. They can help to maintain safety, reduce injury and limit property damage. Warnings effectiveness as a construct can be conceived and assessed in diverse ways. According to most information processing models, warning processing is described as involving the stages of noticing, encoding, comprehending and behaviorally complying *(see Rogers et al., 2000; Wogalter, 2006)*.



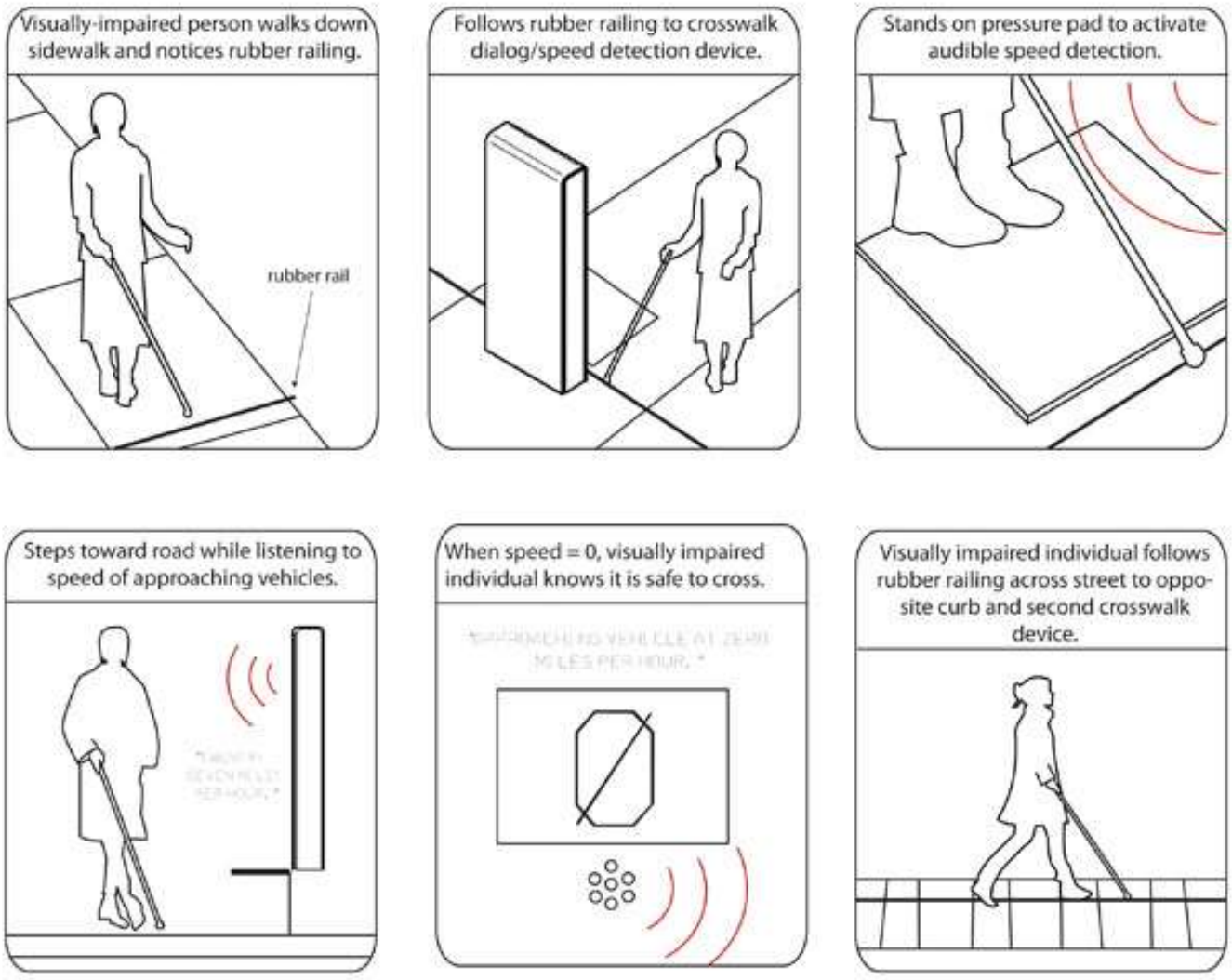

*3.3.14. Health Facilities Scotland, 2007*

Static signs are traditionally made of paper, metal or plastic and, generally, the method of communication is passive. In contrast, dynamic signs usually use more advanced technology, which allow them to be multimodal and customized. Recent articles suggest that technology-based warnings can be more effective than the traditional solutions *(e.g., Smith-Jackson and Wogalter, 2004; Wogalter and Conzola, 2002; Wogalter and Mayhorn, 2005)* since they have features that can enhance the warnings in a number of ways, such as making them more noticeable and more resistant to habituation.

*3.3.15.* Health Facilities Scotland, 2007

Duarte, et al (2014)'s study used an immersive virtual environment (IVE) to examine how dynamic features in signage affect behavioral compliance during a work-related task and an emergency egress. Ninety participants performed a work-related task followed by an emergency egress. Compliance with uncued and cued safety signs was assessed prior to an explosion/fire

involving egress with exit signs. Although dynamic presentation produced the highest compliance, the difference between dynamic and static presentation was only statistically significant for uncued signs. Uncued signs, both static and dynamic, were effective in changing behavior compared to no/minimal signs. Findings are explained based on sign salience and on task differences. If signs must capture attention while individuals are attending to other tasks, salient (e.g., dynamic) signs are useful in benefiting compliance.




*3.3.16. Facilities Planning, Design & Construction, 2010*

## 3.4. Indoor Wayfinding Systems For Visually Impaired

Visually impaired people will either move around independently or with the aid of a sighted person who will act as a guide.

Those who move around independently will do so either solely by using their residual sight or by using a mobility aid.

The most common mobility aid used by pedestrians with poor sight to facilitate their independent mobility is a long white cane. This is usedto scan the ground in front of the person.

The scanning takes the form of sweeping the cane in an arc from one side to the other to just beyond the width of the body. This technique will usually locate potential obstructions such as street furniture, provided that there is some element at ground level, and distinct changes in level such as a kerb upstand or a step.

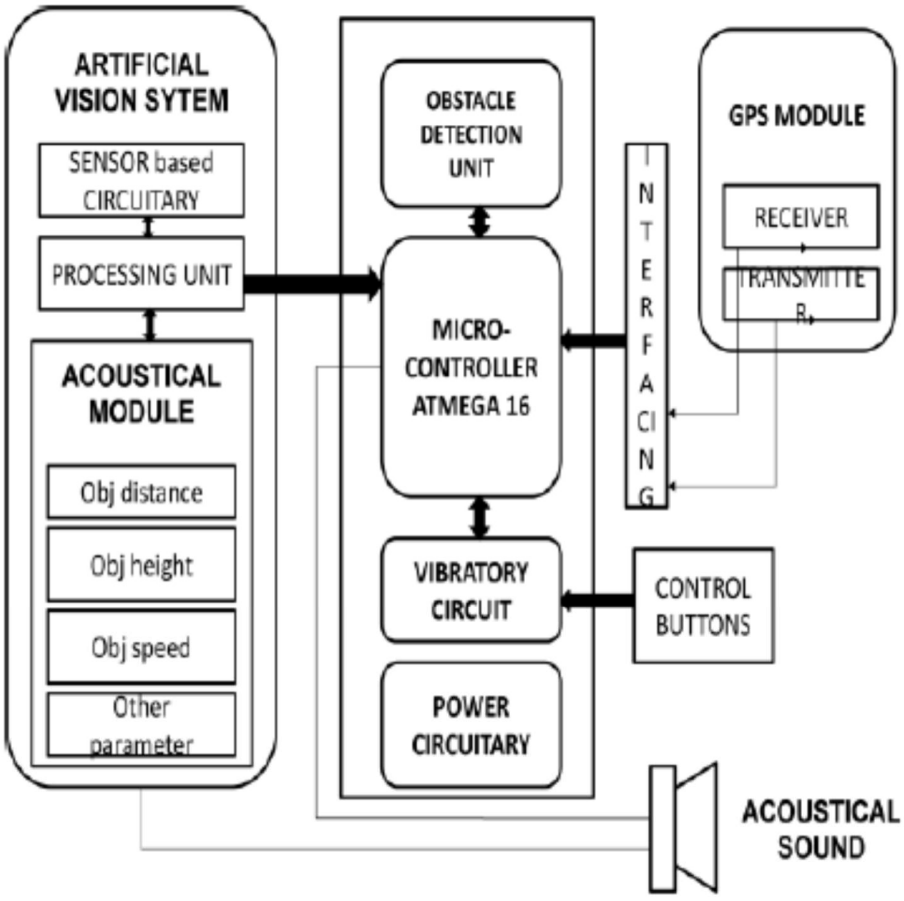
An increasing number of people are using a long cane with a roller tip.The roller tip maintains contact with the ground as the cane is swept and may indicate the presence of distinct changes in texture underfoot,as well as the features usually detected by the more traditional type
of long cane.

There are certain key design principles which, when applied, make it easier and safer for visually impaired pedestrians to move around. Layouts of all pedestrian areas should be simple, logical and consistent. This will enable people to memorise environments that they use regularly and predict and interpret environments that they are encountering for the first time. Contrasts in colour and tone should be used to accentuate the presence of certain key features. This will enable many people to use their residual vision to obtain information. Orientation and wayfinding information should be provided by the use of high visibility and, where appropriate, tactile signing. Many visually impaired people can read signs if they are properly positioned, and if the design incorporates contrasting colours and tones, adequately sized and styled text, and a matt finish. Lighting levels should be even and adequate and should minimise glare. Once again, this will enable effective use to be made of residual vision, especially to detect contrasts in colour and tone and read high visibility signs. Important information about the environment should be conveyed by the use of non-visual features, for example, audible and tactile features. A loss of sight is not accompanied by an increase in the effectiveness of other non-visual senses. However, visually impaired people generally place more emphasis on information received via other senses, for example the sense of touch.

## 3.5. Mobile Phones Equipped With Navigation

Efforts to develop using technology to assist the visually impaired with wayfinding have, until very recently, been limited to development of devices that help individuals avoid obstacles. Following adoption of the long cane by the blind community as the primary means of detecting obstacles, much effort has been expended to supplement or supplant the long cane with electronic travel aids such as the Laser Cane and ultrasonic obstacle avoiders *(Brabyn, 1985)*. Even with these devices, however, the blind traveler has lacked the freedom to travel without assistance, for efficient navigation through unfamiliar environments relies on information that goes beyond the sensing range of these devices. There are a multitude of methods for determining the traveler's current location. These vary in the extent to which they require sensing of the environment or reception of signals provided by external positioning systems. At one extreme, there is inertial navigation, which requires no external sensing. At the other extreme are methods involving the matching of perspective video images of the environment to 3D models stored in computer memory. In between are methods employing dead reckoning and a variety of local and global positioning systems *(e.g., GPS, Loran, VOR-DME)* in which the navigator determines current position using signals from transmitters at known locations. Because of the high degree of accuracy of its position fixes, the Global Positioning System (GPS) or its Russian equivalent (GLONASS) is the preferred choice for travel within terrestrial environments where obstructions of the sky and multipath distortion do not interfere with satellite reception. For environments in which GPS signals are only intermittently available, GPS needs to be supplemented by inertial navigation or dead reckoning. When GPS signals are unavailable *(e.g., indoor environments)*, either some form of local positioning system (analogous to GPS or Loran) or a network of location identifiers *(e.g., Talking Signs)* will be needed to assist blind persons with navigation *(Loomis, et al, 1998)*. Advances in mobile technology have made compact devices such as mobile phones, tablet PCs, and personal digital assistants (PDAs) capable of handling sophisticated user-oriented applications. The device used in this research is the iPAQ Pocket PC H3630 running on the Windows CE operating system (OS), preloaded with digital maps and a spatial database that models a user's environment. The geographic information system (GIS) data were developed on a desktop computer using ArcPad and ArcView, provided by Environmental Systems Research Institute (ESRI), and subsequently migrated onto the iPAQ. The PDA serves as a self-contained repository of location specific

information; it does not require an ongoing online connection with a central database or server, thus alleviating bandwidth, connectivity, and subscription cost problems. This stand-alone system is integrated with a Global Positioning System (GPS) receiver and audio earphones to optimize listening in an urban environment. The idea of using GPS to aid in the navigation of the visually impaired was proposed more than a decade ago, in 1985, by Loomis (J. M. Loomis, Digital Maps and Navigation System for the Visually Impaired, Department of Psychology, University of California– Santa Barbara). Today most GPS applications requiring real-time positioning accuracy better than 25 m use a differential Global Positioning System (DGPS). Correction signals from a GPS receiver at a known, fixed location are transmitted by radio link to the mobile receiver and allow the mobile receiver to determine its position with an absolute positional accuracy on the order of 1 m or better. This accuracy is vital to the safety of visually impaired pedestrians, who may have to travel on narrow walkways *(Huang and Liu, 2004).*




*3.5.1. Facilities Planning, Design & Construction, 2010*

## 3.6. New Stick For The Visually Impaired

According to *(Nurul Nadwan, 2009)*, technology can help in reducing many barriers that people with disabilities face. These kinds of technologies are referred to as assistive technology (AT). There are many types of disabilities, including physical disabilities, hearing-impaired, and visually-impaired. AT has been utilized in assisting them *(Ariffin & Maarof, 2010; Aziz , et al, 2010; Borenstein, et al, 2001)*. However, developing an AT is expensive *(Herman, 1999)*, making their selling price high.

According to Mazo and Rodriguez *(Mazo, et al, 1998)* the blind Cane is one of the assisting tools for the visually-impaired and it is really important. According to Herm (1999), one of the main problems of the visually-impaired, is that most of these people have lost their physical integrity. Also, they do not have confidence in themselves. This statement has been proven by Bouvrie (2007), in which an experiment name "Project Prakash" has been carried out. It was intended at testing the visually-impaired to utilize their brain to identify set of objects. According to Chang and Song (2000), this can also be applied to different situation. When the visually-impaired walk into a new environment, they will find it difficult to memorize the locations of the object or obstacles. These examples demonstrate the difficulties of visually-impaired people**.**

The Guide Cane *(Borenstein and Irich, 2001)* is designed to help the visually-impaired users navigate safely and quickly among obstacles and other hazards. Guide Cane is used like the widely used white cane, where the user holds the Guide Cane in front of the user while walking. The Guide Cane is considerably heavier than the white cane, because it uses a servo motor. The wheels are equipped with encoders to determine the relative motion. The servo motor, controlled by the built-in computer, can steer the wheels left and right relative to the cane. To detect obstacles, the Guide Cane is equipped with ten ultrasonic sensors. A mini joystick located at the handle allows the user to specify a desired direction of motion. Guide Cane is far heavier than the ordinary white cane and also it is hard to keep because it cannot be folded.

Smart Cane is one invention which was originally the creation of a common blind cane but it is equipped with a sensor system. This invention resembles Guide Cane where this invention has a number of ultrasonic sensors and servo motors. This invention is designed with the aim at helping the blind in navigating. Ultrasonic sensors need to detect and avoid obstacles or objects located in front of the user *(Abd Wahab, et al 2011)*.

*3.6.1. Abd Wahab, et al 2011*

Apart from the conventional navigation systems , a blind aid systems can be provided a new dimension of Real-time assistance and Artificial vision along with dedicated obstacle detection circuitry. This different units are discussed to implement the design of a 'Smart stick' for blind *(Dambhare and Sakhare, 2011)*

The figure above depicts the proposed design of an embedded smart stick. The system elements consist of various subsystems. The sensor based circuitry consisting of sensors such as proximity sensors, TSOP1738 sensor array, ultrasonic sensors, Led sensors. Vibratory circuitry consist of an array of mobile vibrators with logic designed to obtain different vibratory patterns. The feedback systems is dual with an additional auditory interface. The GPS system, microcontroller, control buttons and power circuitry (preferably battery-based) are the crucial systems.

The proposed system can be designed to take of form of an detachable and portable device,which can be unconditionally mounted on a simple white cane or blind stick . This requires a clear vision of the desired system goals. Various system parameters are thus needed to be evaluated based on the design to be practically implementable (ibid).

Meanwhile the fuzzy controller is required to determine the instructions that will be executed for example to turn right, left or stop. Like Guide Cane, this invention also has a control button on the handle, and the button has four different directions. This invention has the same weaknesses as the Guide Cane where there will be a problem to save space or to place the smart cane. Besides that, cost is also a weakness in this project as it uses ultrasonic sensors and a number of servo motors. If the cost is too high, users are not able to afford for it because the average income of the visually-impaired people is relatively small *(Abd Wahab, et al 2011)*.


*3.6.2.Graphic Designer in Architecture,2011*

# 4. Tactile Paving Surfaces

When moving around the pedestrian environment, visually impaired people will actively seek and make use of tactile information underfoot, particularly detectable contrasts in surface texture. The ability to detect contrasts in texture underfoot varies from one individual to another. For example, older visually impaired people and people who have lost their sight through certain medical conditions, such as diabetes, may well have reduced sensitivity in their feet. It is therefore important that textures warning of potential hazards, for example a road crossing or a staircase, are rigorous enough to be detectable by most people but without constituting a trip hazard or causing extreme discomfort. Some visually impaired people will receive training in mobility skills, especially those who are using a long cane or a guide dog. Increasingly, this training includes instruction in the interpretation of tactile paving.

Tactile paving surfaces can be used to convey important information to visually impaired pedestrians about their environment, for example, hazard warning, directional guidance, or the presence of an amenity. Research has determined that visually impaired people can reliably detect, distinguish and remember a limited number of different tactile paving surfaces and the distinct meanings assigned to them. The use of blister paving as a warning device at controlled and uncontrolled pedestrian crossing points is now well established. In this document, guidance is given on the use of a number of additional types of tactile surface to give warning of potential hazards and for amenity purposes to give guidance and information.

Shared space streetscapes are normally implemented by means of shared surfaces where the traditional cues – kerbs, tactile paving surfaces and controlled crossings – are removed to be replaced with environments where there is no vertical or other detectable means of delineating pedestrian and vehicle areas. Street users are intended to negotiate priority and movement through the use of ‘eye contact’, with obvious implications for blind and partially sighted people *(Shared Space – Safe Space, Carol Thomas)*.

The tactile surface has been developed in order to provide warning and guidance for visually impaired people where there is no kerb upstand. In the case of controlled crossings the tactile surface layout also acts as a guide to lead visually impaired people to the crossing point.

Tactile paving surfaces can be used to convey important information to visually impaired pedestrians about their environment, for example, hazard warning, directional guidance, or the

presence of an amenity. Research has determined that visually impaired people can reliably detect, distinguish and remember a limited number of different tactile paving surfaces and the distinct meanings assigned to them .

Recognising that the needs of people with physical and sensory disabilities could create potential conflicts, the research which led to the development of the tactile paving surfaces involved not only the target group, i.e. visually impaired people, but also others with a wide range of other disabilities including wheelchair users and people with walking difficulties.

Each type of tactile paving surface should be exclusively reserved for its intended use and consistently installed in accordance with these guidelines. Visually impaired people are becoming increasingly mobile, both within their local area and more widely, and it is,therefore, very important that conflicting and confusing information is not conveyed *(DETR, Guidance on the use of Tactile Paving Surfaces)*.

*4.1. DETR, Guidance on the use of Tactile Paving Surfaces*

'Tactile' is the term given to the range of paving units that bear a distinctive, raised surface profile that can be detected by both sighted and visually impaired pedestrians . The most common example to be seen on the streets of Britain and Ireland are the tactile pavings used at pedestrian crossings. As the implementation of tactile paving has progressed, new forms have been made available. When they were first introduced, back in the 1980s, the only readily available form was the 450x450mm pre-cast concrete flag, but they are now available as clays pavers and natural stone, as well as in bespoke formats, such as the units with steel or brass 'blisters'. Further, many of the concrete flag forms, are now manufactured as 400x400mm units *(F50s and F65s)* rather than 450mm *(E50 and E65)* units. The units are generally laid in the same manner as standard pre-cast concrete flags or block pavers, although many are now being laid on a full concrete bed to ensure accidental trafficking by cars, vans and lorries doesn't result in expensive breakages.

*4.2. Tactile Paving Surfaces*

The key element with tactile paving is that different surface profiles are intended to denote different hazards.

There are two types of Blister paving: the most common type features 6mm high 'blisters' in a square pattern and these are used to indicate pedestrian crossings with dropped kerbs. Normally, the red-colored units are used with light-controlled crossings, and buff for those crossings with no traffic lights. However, when natural stone units are used, this color-coding is disregarded.

The Offset Blister units are used to indicate the edge of the platform at Rail and Tram stations, also referred to as off-street applications. Note that the orientation of the offset blister units is critical - the rows of blisters MUST be parallel to the platform edge, and they are generally placed approximately 500mm back from the edge.

Hazard Warning units use continuous half-rods, raised 6mm higher than the surface of the paving, to denote a hazard, such as the top/bottom of a flight of steps. Again, the rods should be parallel to the edge of the hazard.
Cycle way paving uses continuous flat bars to indicate a cycle lane. The bars run parallel to the direction of travel so as not to impede cycles. Where a cycle way and a footpath are adjacent, these pavings may also be used for the pedestrian section, with the bars running transversely, and a demarcation strip between the two.
Directional or Guidance paving is used to indicate the safest direction of travel for the visually impaired. The raised flat bars have rounded ends.
Lozenge paving is used as a platform edge warning for on-street applications. As towns and cities rediscover the advantages of trams and Light Rail Transport (LRT), this type of paving will become more common.

For the concrete flag versions of the blister paving, the red, buff and 'Natural' grey are the three usual colors. At the discretion of the local highways department, the guidance that recommends red units for light-controlled crossings and buff or grey for other crossing can sometimes be over-ruled when there would be an aesthetic clash of materials or colors. For the concrete flag versions of the blister paving, the red, buff and 'Natural' grey are the three usual colors. .

*4.3. Tactile paving design guide 003*

Tactile paving refers to a range of surface textures to assist blind and partially sighted people in a variety of situations. Four types of tactile paving are likely to be used in the construction of cycle facilities in addition to the raised tactile delineators. These are: red or buff colored blister paving for areas adjacent to where pedestrians wish to cross vehicle ways (this can include cycle tracks); longitudinal & transverse ribbed paving to show cycle tracks and segregated shared surfaces plus the tactile marking [1049.1]; and corduory paving to warn pedestrians of hazards.

The needs of pedestrians must be considered in the design of cycle facilities, in particular the needs of those who are blind or partially sighted people or those who have a mobility impairment or other handicap. The layout of pedestrian facilities should be as simple and logical as possible and be consistent along a route. Documents that are available that give specific guidance in these areas are 'Guidance on the use of Tactile Paving Surfaces' DETR, 'Building Sight'- and 'Shared Facilities for Pedestrians and Cyclists' - (JCMBPS). Also Traffic Advisory Leaflet TAL 10/93 gives guidance on Toucan crossings but the 'T' shaped blister paving has been superseded by the 'L' shape. These recommendations have been followed in this manual where they are considered to be appropriate. However, there are number of areas where the design recommendations contained in the above documents do not give adequate consideration to the full range of situations, or the detail cycle design requirements that are encountered when designing shared use facilities *(London Cycle Network , 1998, p:139)*.

*4.4. Tactile paving design guide 003*

Large areas of tactile paving can be confusing to both blind and sighted people and this should be considered carefully in the design of installations. This is particularly so in urban areas where junctions are numerous and complex, and you may have to use your judgement in deciding the application of tactile. Where this is of concern, it is suggested that the TAL 4/90 and guidance for the use of Tactile Paving surfaces (DETR), recommendations are amended to reduced lead in lengths of longitudinal blister paving down to 1200 or even 800mm, and the possible omission of the ribbed paving on the pedestrian side. Remember that you may need to include both dimpled and ribbed tactile paving at the same site. Ribbed tactile will normally need to be set back from the kerbline by 2-3m to avoid confusion by blind people when they have crossed a carriageway, this will allow them to reach the comparative safety of a (shared) footway before having to determine on which side of the shared surface to proceed. Drawings LCN/D3 and D4 give suggested layouts for combined tactile paving and road/surface markings.

**Red Colored Blister Tactile Paving:**

This is for use on the footway at controlled crossings of the carriageway. A controlled crossing is defined where the pedestrian has some form of control over the crossing movement, thus including zebra crossings, toucan crossings and other signal crossings where there is a pedestrian aspect shown by an illuminated green man. This could include the signaling of a cycle track crossed by a footpath/way. Disability Unit Circular 1 (1991), supplemented by 'Guidance on the Use of Tactile Paving Surfaces' from the DETR gives guidance on the use of both red and buff colored tactile paving and Traffic Advisory Leaflet TAL 10/93 gives guidance on Toucan crossings, including the use of red tactile paving at them. The draft,

'Guidance on the use of Tactile Paving Services' of September 1997 from DETR gives further details for the recommended use, although there appear to be some problem areas that need further consideration.


*4.5. Tactile paving of a contrasting color, adopted from: Croydon Public realm design guide 2012*

They suggest that at toucan crossings the red blister tactile could lead in to the left push button posts, thereby encouraging crossing on the left side as per the normal rule of the road and thus reducing possible conflict between those crossing from opposite sides. The exception to this would be to reduce crossing over movements between cyclists and pedestrians, and to align users with their respective sides of shared paths, footways or cycle tracks.

**Buff Colored Blister Tactile Paving:**

This is for use at uncontrolled crossings on the footway adjacent to vehicle ways including cycle tracks. Sources of guidance for use are largely as for red blister tactile. Both red and buff colored tactile paving should be of a contrasting color to the surrounding paving. This is particularly difficult to achieve with buff color which does not contrast with grey paving and where a contrasting band or surrounding area of surfacing is required. (With the problems of obtaining this contrast, is there any real benefit in having buff tactile, maybe the Disability Unit should consider having it all red)

It is necessary to provide the blister paving in a variety of additional locations where pedestrians need to be warned, these will include dropped kerbs on shared surfaces and where cycle tracks cross pedestrian routes. Examples of details of these are shown below on drawings LCN D3/4.

**Ribbed Tactile Paving for Segregated Shared Cycle Tracks:**

The ribbed patterned tactile paving is for use on both the cycle and pedestrian sides of segregated shared surfaces.

It is layed longitudinally in ‘Tramline’ pattern on the cycle track that is aligned with the direction of movement. On the pedestrian side, it is layed transversly in ‘ladder pattern’ - that is across the direction of movement. Its use is dealt with by Traffic Advisory Leaflet TAL 4/90 and the draft guidance on the use of Tactile Paving surfaces (DETR),*(P: 140).*

The profiled slabs are available in the normal modular paving size of 400x400mm in grey or buff color. The need for a color contrast is not stipulated or required and so green or red slabs may be more appropriate for the cycle surface, if they become available, so that the cycle surface is of a consistent color and painted markings such as give way or cycle logos will be more visible.

**Corduoroy Tactile Paving:**

Corduoroy is a similar type of tactile paving but with a finer ribbing and is used in a variety of other locations where pedestrians need to be warned. This includes points where pedestrian routes cross or meet cycle tracks.

A set of drawings are included on the following pages showing how, in tight situations, tactile paving may be incorporated with the appropriate road/surface markings and signs. These drawings are based on similar layouts given in 'Guidance on the Use of Tactile Paving Surfaces' *(P:141).*

Tactile paving can help visually impaired people identify which surface to use. These measures are described in more detail below.

The recommended minimum footway width on local distributor roads in urban areas is 2.0m (DOT 1986 LTN 2/86) though 1.8m is often used on roads where pedestrian flows are low and retail uses are absent. The recommended width of a two-way cycle track is 3.0m.

However there will be situations where the lack of space or other constraints will prevent the provision of segregated facility with these widths (and, besides, the capacity of a cycle track is far in excess of any flow it is likely to carry – a width of 3.0 m allows up to 2,500 cyclists an hour).

Consequently, the footway width is necessary for conversion to textures or a combination of these. Segregation by white line [1049.1] is recommended for converting footways or footpaths with widths between 3.0m and 4.0m. This is because 3.0m is the practical minimum width for converting a footway/path to white line segregation. (i.e. 3.0m allows 1.8m for cyclists where cycle flows are moderate or high [or two-way] and 1.2m for pedestrians, or 1.5m for cyclists where the flows are low [or one-way] and the track is bounded by a wall or bushes, and 1.5m for pedestrians.

The DOT recommend an absolute minimum width of 2.5m can be used (1.3m for cyclists and 1.2m pedestrians) if the combined flows of cyclists and pedestrians are low (less than 180 cyclists and pedestrians per hour per meter width) or if the cycle flow is one-way or tidal, (DOT 1986 LTN 2/86). The raised tactile white line should always be of the profiled type [1049.1] unless there are specific reasons for not doing so. In addition, ladder and tramline tactile paving will probably be required.

*4.6. Croydon Public realm design guide, 2012*

Tactile paving areas enable blind and partially sighted people to position themselves on the correct side of such a shared route (DOT 1990 TAL 4/90) and Guidance on the use of Tactile Paving Surfaces DETR Sept 1997, particularly at the start and ends of the segregated shared use facility and at junctions with other footways. A 2.4m length of tactile paving is recommended to mark the start and end of a shared use facility. However, in practice this is normally found to be too long and 1.2 or 0.8 m is often used. A 0.8 m length can be used as a reminder tactile marking along the length of shared route, or before and after footway and footpath junctions. The ribbed surface is orientated to offer a 'ladder pattern' on the footway or footpath and a 'tramline pattern' on the cycle track.

Representatives of blind and partially sighted and disabled people should be involved in the consultation process at an early stage to ensure that account is taken of their needs. Publicity leaflets and enforcement help to ensure that the facility is used correctly by all users (p:65).
Short lengths of cycle track are normally needed between the bridge or subway and the road. Drop-kerbs should be used on approaches to or from the carriageway to the cycle track leading to the bridge or subway. Shared facilities should be clearly signed and marked (e.g. colored or textured surface and tactile paving should be considered) for pedestrians who may be blind or partially sighted or elderly (for more details see 2.7 and DOT 1990 TAL 4/90) *(P: 97)*.

Tactile paving indicates, through differences in the look and feel of underfoot surfaces, that pedestrians should expect a change in the street environment. I'DGO
has studied the two most common types of Tactile Ground Surface Indicators (TGSIs): blisters; and corduroys. Blisters are used on the footway side of pedestrian crossings (controlled and uncontrolled) to help blind and vision impaired people to both find the crossing and negotiate the hazard of using it. Corduroy paving is used to warn of other hazards:

- standard size of tactile paving: 400x400mm.
- at controlled crossings tactile paving should be applied in a contrasting colour with minimum 30 points of luminance difference and should be the same material as the surrounding paving.
- at uncontrolled crossings tactile paving must not be red and can match or be in a contrasting tone to the paving surface within which they are located, but should be the same material as the surrounding paving.
- Colors and materials that are more compatible to the character of the particular public realm scheme such as granite tactile paving or grey and charcoal concrete tactile paving should be used in the opportunity area, Conservation areas and district and local Centers.
- the use of metal stud tactile paving is discouraged. metal studs are uncomfortable to walk on and they become slippery when wet (Croydon Public realm design guide, 2012).

**Installations in Each Country and Their Characteristics**

Tactile ground surface indicators facilitate the safe movement of people with impaired vision. Since being devised in Japan in 1965 they have spread to other nations around the world. Because the visually impaired can use them with almost no modification to their normal way of walking, and because the cost of installation is low, tactile ground surface indicators are believed to be the most effective system for guiding people with impaired vision. In Japan, tactile ground surface indicators are installed in accordance with local ordinances based on the Ministry of Land, Infrastructure, Transport and Tourism's Guidelines for Installation of Tactile ground surface indicators for the Visually Impaired and Commentary.

There are two types of tactile ground surface indicators: warning blocks that indicate the location of hazards or destination facilities and directional blocks that indicate direction of travel. Standards are inconsistent overseas, with some countries using rules and blocks similar to those in Japan and others using their own rules and country-specific blocks.

Tactile ground surface indicators are designed to enable people with impaired vision to identify their own position, hazardous locations and the direction in which to walk. They must, therefore, be installed in safe locations in a consistent manner that facilitates identification by the visually impaired through contact with the feet. Nevertheless, numerous installations in Japan are dangerous, superfluous or create an obstacle for wheelchair users and others. Such situations are increasing overseas, as well. Although Japan exports tactile ground surface indicators, it has not adequately communicated to foreign countries the appropriate methods of installation and operation. As a consequence, people with impaired vision in many countries find it difficult to walk using tactile ground surface indicators as a guide, resulting in both accidents and confusion.

## 4.1. Tactile Paving Surfaces in Europe

**London, UK**

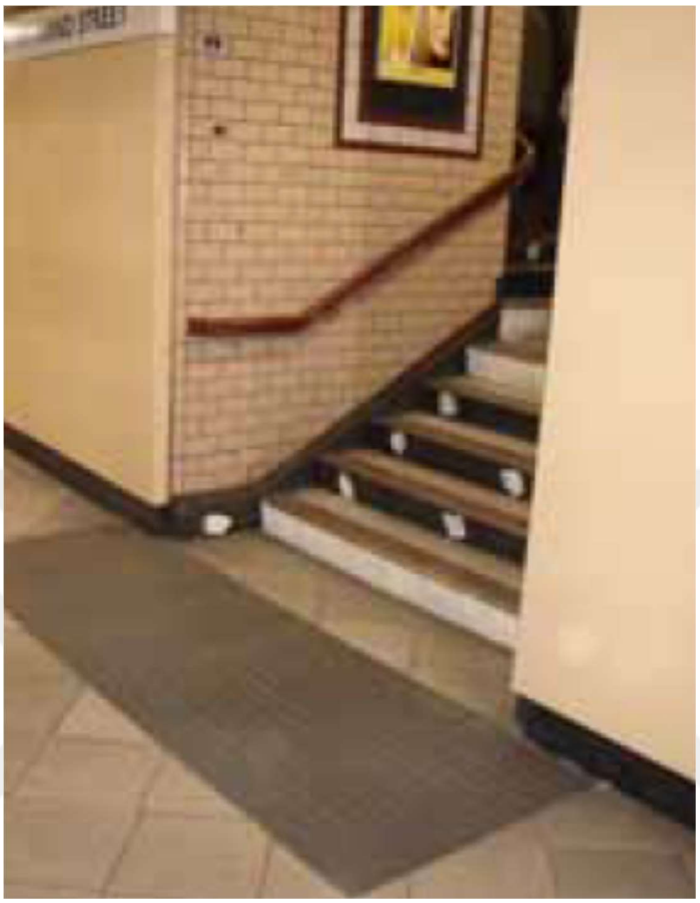
Tactile ground surface indicators are installed at many locations throughout the city, near historical buildings like Big Ben, Buckingham Palace and the British Museum as well as in downtown and residential areas. Tactile ground surface indicators are installed in accordance with unique standards established by the United Kingdom's Department for Transport. Blocks with dots and blocks with bars are used, but both types are intended as warning blocks; neither serves a directional function.

Blocks are mainly installed before crosswalks, at medians, at station platforms and at the top and bottom of stairways. Blocks with dots are for installations at crosswalks, medians and station platforms while blocks with bars are for installations at stairways. The color of blocks installed before crosswalks is also supposed to vary with crosswalk type: red blocks are to be used before zebra crossings (where pedestrians always have the right of way), pelican crossings (equipped with push-button traffic lights) and puffin crossings (with sensor-equipped push button traffic lights) while other colors (yellow, grey, etc.) are to be used at other crosswalks where automobiles have the right of way. The difference in color is intended to assist people with low vision navigate the crosswalk safely, but many locations do not conform to the established colors.

Different color blocks are also sometimes installed when repairs are made. Blocks are installed in an L-shaped configuration at crosswalks with push-button traffic signals, with the corner of the L marking the location of the push button.

Blocks with bars are installed at the top and bottom of stairways such that the direction of the bars is parallel to the long dimension of the treads

*4.1.1. L-Shaped Tactile ground surface indicator Installation (London, UK)*



*4.1.2. Blocks with Bars Marking the Bottom of a Stairway (London, UK)*

The most definitive source of guidance on tactile paving in the UK is Guidance on the use of tactile paving surfaces by the Department for Transport and the Scottish Executive (now the Scottish Government). First published in 2005, this document was revised in 2007. It addresses the purpose, definition, application, maintenance and layout of seven different types of tactile paving – including blister and corduroy – and provides guidance on which color (s) should be used where. Tactile paving made of precast concrete, clay or natural stone must comply with various British Standards.

The benefits of tactile paving for blind and vision impaired people have been well established through empirical research involving people with and without impairments. Yet many participants in early I'DGO studies expressed concerns about falling or feeling unstable on tactile surfaces. Falls risk is a key disincentive to going outdoors for older people, for whom fall-

related injuries are associated with loss of independence, morbidity and death. Our study of the effects of tactile paving on older people follows up a 2005 report by the Health and Safety Laboratory which suggested that there is a need to better understand the extent and implications of incorrectly designed and laid tactile paving and the toe clearance of an individual in negotiating paving 'blisters' and potential slip hazards.

Each type of tactile paving surface should be exclusively reserved for its intended use and consistently installed in accordance with these guidelines*(UK Department for Transport and Scottish Government, 2005, revised 2007)*.

In a research, just 61.9% of participants with reduced vision noticed the tactile paving compared to 66.6% with good vision. This shortfall could be because people with reduced vision may also have reduced sensation in their feet. It might also be due to poor color contrast on site or the inappropriate use of red road surfaces. They found that women were more likely to notice the tactile paving due to the blister profile, probably due to variation in typical footwear between genders, whereas men were more likely to notice it on the basis of color.

To answer this question that is tactile paving being correctly installed and maintained on Britain's streets**,** in a questionnaire survey, less confident pedestrians told that the correct configuration of tactile paving at a crossing gave them additional reassurance about both approaching and using the crossing safely. During field work, they found incorrect configuration to be widespread and several instances of blister paving being used at the top and bottom of steps or at the foot of a ramp, thus alerting pedestrians to the wrong hazard. In line with British Standards, blisters are designed to be 5mm high (±0.5mm) and the Department for Transport regards their effectiveness as 'significantly reduced' if they fall below 4.5mm. Of the 93 tactile paving sites I'DGO tested, 60% (52) had significantly reduced detectability, with an average blister height of 3.0mm to 4.49mm.

*4.1.3.UK Department for Transport and Scottish Government, 2005, revised 2007*

*4.1.4.UK Department for Transport and Scottish Government, 2005, revised 2007*

In the UK, less than 4% of people with serious sight loss are totally blind and color and tonal contrast are routinely used by people with reduced vision to differentiate, from a distance, between different parts of the footway and the carriageway. None of the 30 sites I'DGO studied for tonal (color) contrast met the Light Reflectance Value recommended in BS 8300:2009+A1:2010 (30 points), meaning that the tonal contrast difference between tactile and surrounding paving was insufficient, especially in wet conditions.

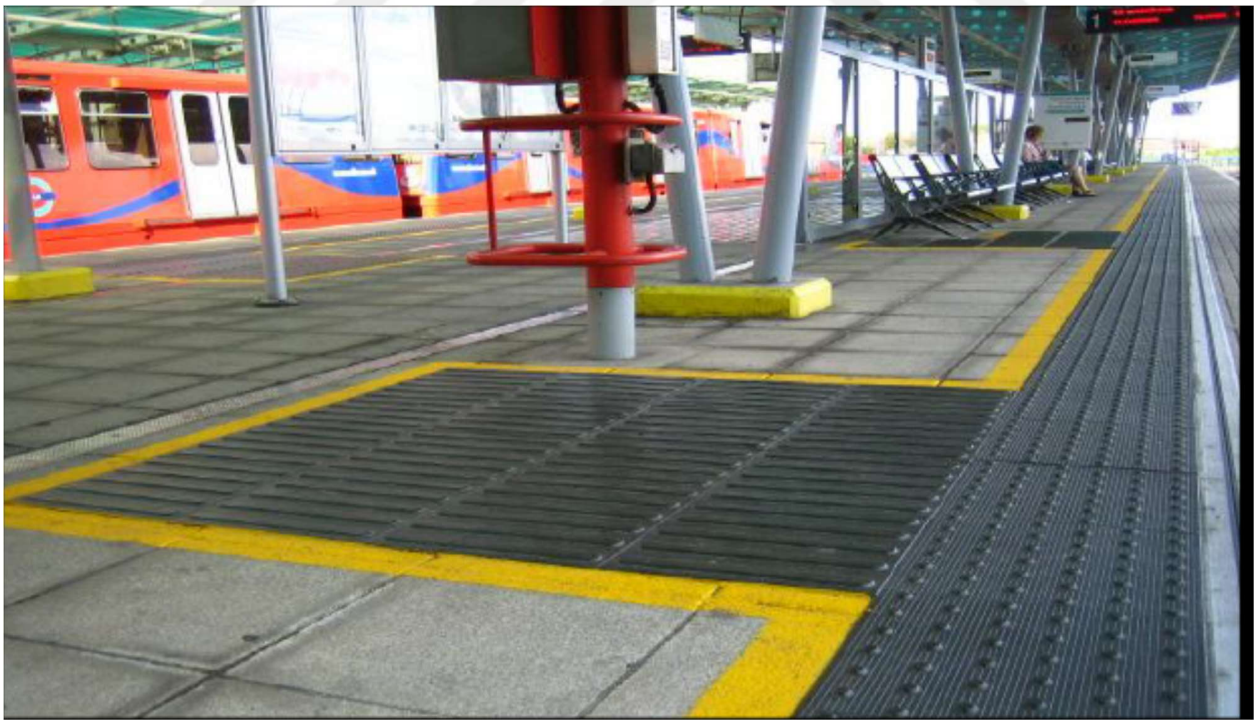
Additionally, it was common to see the wrong color of tactile paving laid at a particular type of crossing - e.g. buff instead of red at zebra crossings - or an arbitrary mix of colors used. Some local authorities used the same red color on the crossing area of the carriageway as on the waiting area pavement-side, without the contrasting border recommended in Guidance on the use of tactile paving surfaces *(DfT 2005, revised 2007).*

Using two scientific tests, I'DGO tested the slip resistance of 30 'real world' blister tactile paving sites under wet conditions. We used the UK Slip Resistance Group's classification system of Low, Moderate and High Slip Potential (UKSRG, 2011). Sites with Low Slip Potential (SP) were predominantly those paved in concrete, clay and sandstone, although some TGSIs, which

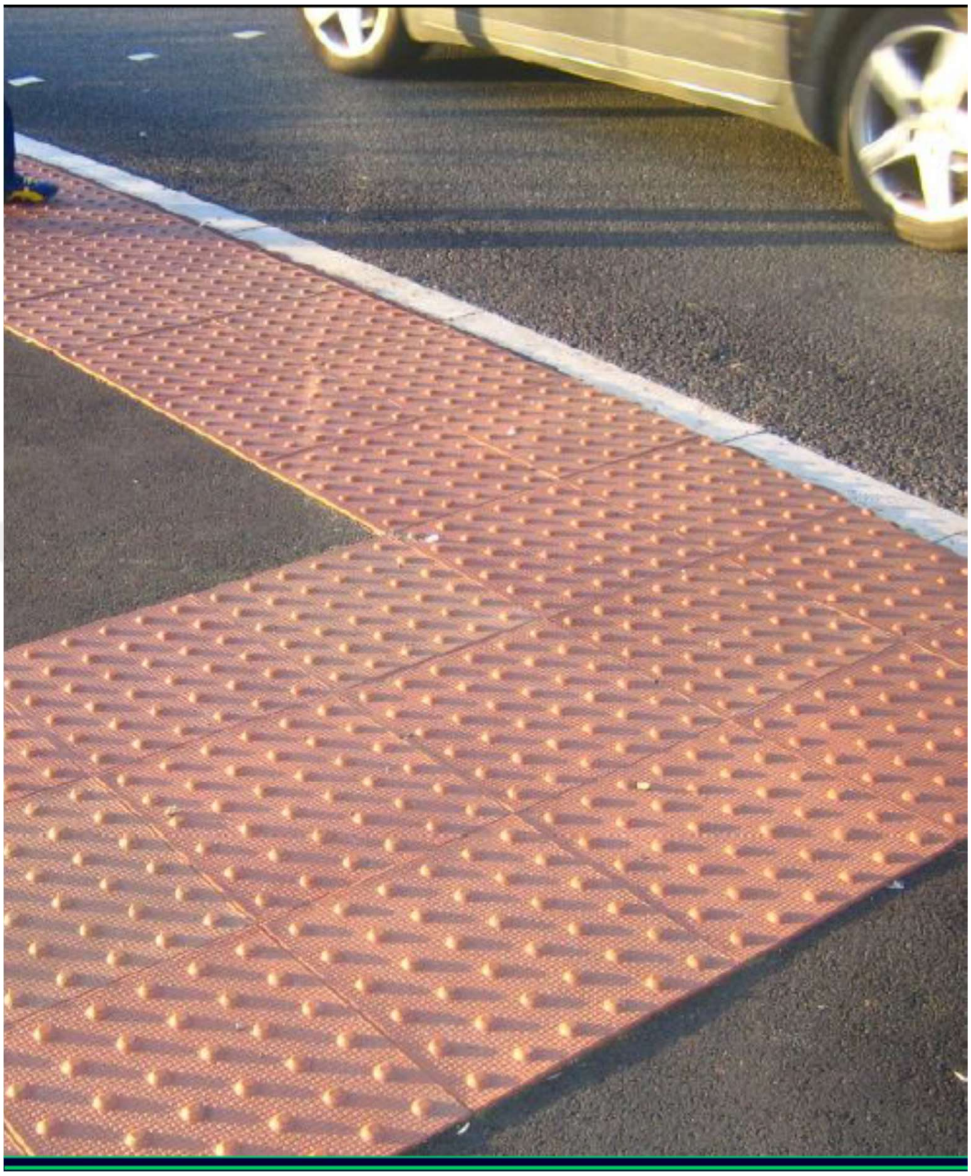
were in the same three materials but had a smoother finish, had a Moderate SP. Granite TGSIs ranged from Moderate to High SP and brass studs, stainless steel studs and thermoplastic sheets all had a High Slip Potential. In a human performance laboratory, they undertook biomechanical analysis on 32 healthy older adults walking along a simulated controlled pedestrian crossing with different types of paving, all laid according to guidelines. On tactile paving, as compared to smooth, people's rhythmic gait became more variable and the timing of their foot placement increased by 20%, indicating that their balance was challenged. Participants lifted their feet higher when walking on tactile paving, by as much as 9%, which takes physical effort if done repeatedly. When asked to stop by a 'red man' signal at the crossing, 28% of participants had more difficulty stopping on tactile paving than on smooth.

*4.1.5. DfT 2005, revised 2007*

*4.1.6. DfT 2005, revised 2007*



*4.1.7. DfT 2005, revised 2007*



*4.1.8. DfT 2005, revised 2007*

**Paris, France**

In Paris, warning blocks are installed before crosswalks, at the top and bottom of stairs leading in and out of subway stations and on subway and train platforms. In some areas, blocks serving a directional function are installed within crosswalks. Most blocks are white but black, grey and pale yellow are also used. To protect the scenery, subway station signs and other prominent manmade objects are not installed near historical sites such as the Arc de Triomphe, the Paris

National Opera, the Louvre or the Place de la Concorde but tactile ground surface indicators, in colors that stand out (white and yellow), are an exception.

Paris has recently been emphasizing barrier-free accessibility, including such experimental efforts as the uniquely configured blocks installed at the Montparnasse rail station.

*4.1.9. Directional Blocks within a Crosswalk (Paris, France)*

*4.1.10. Tactile Ground Surface Indicators near the Arc de Triomphe (Paris,France)*

*4.1.11. Tactile Ground Surface Indicators at Montparnasse Station (Paris, France)*

**Frankfurt, Germany**

In Frankfurt, blocks are installed inside rail and subway stations and on the platforms at rail, subway and tram stations. Many blocks are white, although some are grey. The warning blocks inside rail stations are of similar configuration to those used in Japan. The directional blocks used at train stations and the blocks used at subway and tram stations are uniquely German in configuration. Directional blocks at train stations are made up of thin linear protrusions.

Directional blocks are installed at rail station platforms but no warning blocks—only non-slip strips with small dot-shaped protrusions located at the edge of the platform. Tram stations use the same directional blocks as at rail stations but warning blocks are never used at platform edges or where blocks intersect.

*4.1.12. Directional Blocks Used at Rail Stations (Frankfurt, Germany)*

*4.1.13. Tactile Ground Surface Indicators at Tram Station (Frankfurt, Germany)*

**Brussels, Belgium**

In Brussels, blocks are installed before crosswalks, at bus stops and at subway and rail stations and platforms. Most blocks are grey, with yellow, silver and black blocks also used. Brussels has a mix of locations where the blocks (warning and directional) and installation methods are similar to those in Japan and locations where block configuration and installation methods are unique to Belgium. One of the Belgium-specific blocks uses metal disks of roughly 85mm in diameter and 8mm in

height (Fig. 10). In Japan, the prescribed size of warning block protrusions is 22mm in diameter (±1.5mm) and 5mm in height, a size designed to promote mobility by the visually impaired without impeding the movement of wheelchair users or elderly pedestrians. Given the large size, height and slipperiness of the metal disks used in the Belgian blocks, one suspects that they present a significant obstacle for wheelchair users, children and the elderly.

In one part of the city, metal bars are embedded in the road surface where one would expect to find warning blocks (at the top of stairs and escalators, for example). Being only 3mm in height, these protrusions create no obstacle for wheelchair users or elderly pedestrians but also seem likely to go unnoticed by the visually impaired. In some places, similar metal bars are embedded in the road surface and serve a directional function. Rubber warning blocks are also sometimes installed at bus stops where directional blocks intersect.

Brussels, therefore, presents a mix of block types and installation styles that may create confusion for people with impaired vision.

*4.1.14. Metal Disks Used in Belgium (Brussels, Belgium)*

*4.1.15. Embedded Metal Bars Marking the Top of a Stairway (Brussels, Belgium)*

*4.1.16. Embedded Directional Metal Bars (Brussels, Belgium)*

*4.1.17. Rubber Warning Blocks Where Directional Blocks Intersect (Brussels, Belgium)*

**Amsterdam, Netherlands**

In Amsterdam, blocks are installed before crosswalks, at medians and on tram and subway platforms. Both warning blocks and directional blocks are installed according to the same rules as in Japan. Netherlands-specific blocks are used in addition to blocks configured like those in Japan. Most directional blocks are white or grey while warning blocks are yellow or grey. Where directional and warning blocks are used together the color of the blocks is often not uniform.

Netherlands-specific blocks include some with thin recessed lines. With very little surface irregularity, such blocks are extremely difficult to detect with the feet or a white cane.

Grooves carved into the pavement at subway station platforms are also difficult for people with impaired vision to recognize.

*4.1.18. Grooves Carved into the Pavement(Amsterdam,Netherlands)*

*4.1.19. Netherlands-Style Warning Blocks(Amsterdam, Netherlands)*

## 4.2. Tactile Paving Surfaces in Americas

**USA (San Francisco, Los Angeles and San Diego, California)**

California uses distinctive landmarks to help the visually impaired cross the road safely. Rather than lay down tactile ground surface indicators before crosswalks, shallow grooves are cut into the pavement. These are more difficult to detect than tactile ground surface indicators when using feet or a cane. This installation method is uniform in San Francisco, Los Angeles and San Diego.

Although the number of locations is not large, warning blocks like those in Japan are also used before crosswalks, at rail and subway stations and at tram platforms. Directional blocks are also installed at rail station platforms. Blocks are yellow, black or white. Installations of blocks before crosswalks appear arbitrary, lacking consistent rules.

At rail station platforms, directional blocks are installed near train doorS. However, only one or two blocks (30–60cm) are installed as landmarks at each location; they do not serve to direct people toward stairways or ticket gates.

*4.2.1. Shallow Grooves Cut into the Pavement before a Crosswalk (SanFrancisco, USA)*

*4.2.2. Tactile Ground Surface Indicators before a Crosswalk (San Francisco,USA)*

*4.2.3. Tactile Ground Surface Indicators at a Rail Station Platform (San Francisco, USA)*

**Tijuana, Mexico**

Tijuana uses landmark installations before crosswalks that are similar to those used in California. There are, however, no installations of tactile ground surface indicators.

**Oceania**

Sydney, Australia

In Sydney, blocks are installed at rail, monorail and light rail station platforms, before exterior stairways, before exterior obstacles, at airports and at bus stops. Warning blocks and directional blocks are similar to those used in Japan, and installed in the same way, including at the Opera House and other well-known tourist spots. Unlike many other countries, however, blocks are not installed before crosswalks. As some rail, monorail and light rail stations, directional blocks lead from at or near the ticket gates to the platform. Blocks are yellow, silver, blue, green and grey. Blue blocks are frequently used at rail stations while yellow is often used at monorail and light rail stations.

**Auckland, New Zealand**

In Auckland, warning blocks are installed before crosswalks in the city center, at rails stations and platforms and before interior stairways at shopping centers and other large-scale facilities. In suburban areas, directional blocks and warning blocks are installed before crosswalks to create a T-shaped configuration of about 1–1.5m. In addition, directional and warning blocks are also installed in areas with facilities for people with disabilities. Such blocks are installed in the same manner as in Japan. Blocks are most often yellow, with silver and white also used.

## 4.3. Tactile Paving Surfaces in Asia

### Seoul, Busan and Daegu, Korea

In Korea, warning blocks and directional blocks are installed in accordance with Japanese rules in many locations including sidewalks, subway and rail stations and platforms, public facilities and large shopping centers. The configuration of the blocks, with the exception of some subway stations in Seoul, is the same. Blocks are yellow, silver, brown, white and grey. Because installation methods are adopted whole cloth from Japan, many of the same errors are found.

*4.3.1. Blocks Used in Some Seoul Subway Stations (Seoul, Korea)*

### Beijing, Shanghai, Dalian and Guangzhou, China

Tactile ground surface indicators are installed broadly in major cities such as Beijing, Shanghai, Dalian and Guangzhou. They can also be found winding through suburban areas surrounding major cities; the volume of blocks installed is second only to Japan. Both warning and directional blocks are used, and installed in a manner roughly the same as in Japan. Some areas have their own rules, however, such as in parts of Guangzhou where no blocks are installed where directional blocks intersect, a location where warning blocks would normally be installed. Block colors include yellow, grey, green, brown and beige. As in Korea, because installation methods are adopted whole cloth from Japan, many of the same errors are found. Maintenance is also inconsistent; here and there one sees broken blocks that have been left unrepaired.

### Taipei and Taichung, Taiwan

As in Korea and China, in Taiwan warning blocks and directional blocks are installed in accordance with rules nearly identical to those in Japan. Most blocks are yellow, with grey blocks also in use. Tactile ground surface indicators are frequently installed across the entire

sloped area leading to a crosswalk, creating an obstacle for wheelchair users and others. In addition, although there are many stepped areas on sidewalks in the city center, very few are marked with warning blocks. This is dangerous for people with impaired vision and fails to accommodate their needs.

**Hong Kong**

In Hong Kong, warning and directional blocks are found at and around rail stations and warning blocks are installed before crosswalks and at medians in the city center. Blocks are yellow, silver, black, grey, green and brown. Installation methods are roughly the same as in Japan.

**Singapore**

In Singapore, warning and directional blocks are installed primarily around subway stations. Installation rules are roughly the same as in Japan. Only a very few crosswalks in urban areas are equipped with warning blocks. Blocks are silver, yellow and grey.

**Kuala Lumpur, Malaysia**

In Kuala Lumpur, blocks are installed mainly at rail, subway, LRT and monorail stations and the surrounding sidewalks. In some locations warning and directional blocks are installed as in Japan while in other locations directional indicators are carved into the pavement and warning blocks are installed where directional markers intersect and where pedestrians are to stop. The latter practice is often followed at rail and LRT stations but the two types were found to coexist at one location. Blocks are yellow, silver and grey.

**Jakarta, Indonesia**

Warning blocks indicating the entrance to parking lots are installed on the sidewalks in Jakarta's Jalan Thamrin business area, an installation method unique to Indonesia.

Blocks of this type are installed at nearly every parking lot entrance, making for a great many installations. Warning blocks are also installed before some crosswalks in the Jalan Thamrin area.

No blocks are installed outside this area, however. Blocks are yellow in color.

**Bangkok, Thailand**

Warning and directional blocks are used on many sidewalks in central Bangkok. Warning blocks are also installed at the top and bottom of stairways at subway and monorail stations. Blocks are not, however, installed at rail stations or rail platforms. Installation rules are roughly the same as in Japan. Blocks are yellow or grey. Many damaged blocks seem to be left unrepaired. Bangkok

is a city with many vendors who set up shop on sidewalks; these frequently end up covering the blocks *(Guidebook for the Proper Installation of TactileGround Surface Indicators, 2008)*.

*4.3.2. No Blocks Used Where Directional Blocks Intersect (Guangzhou, China)*

*4.3.3. Blocks Installed Across the Sloped Area before a Crosswalk (Taipei,Taiwan)*

*4.3.4. Directional Indicators Carved Into the Pavement (Kuala Lumpur,Malaysia)*

*4.3.5. Tactile Ground Surface Indicators Used to Indicate Parking Lot Entrances (Jakarta,Indonesia)*

## 4.4. Tactile Paving Surfaces in AFRICA

In South Africa, TGSIs mainly serve the following two purposes and should therefore be consistently installed as per the guidelines:

* To direct people with a visual impairment (tactile or directional guidance)

* To warn people with a visual impairment of the presence of a potential hazard (warning tactiles).

BRT station with pedestrian crossings Visually impaired guided by ramp Wheelchair user negotiating ramp:

The use of tactile paving is important for individuals who have a visual impairment to alert them to a potential hazard. When moving about the pedestrian environment, some visually impaired individuals will actively seek and make use of tactile information underfoot, particularly detectable contrasts in surface texture. It is important that the correct warning paving is used:

– red blister surfaces should only be used at controlled crossings (Zebra, Pelican, Puffin, Toucan and traffic signal junctions with pedestrian phases)

– contrasting color usually buff but not red should be used at uncontrolled crossings (side road crossings, busy crossovers (vehicle crossings)), crossings away from junctions, kerb to kerb flat top road humps, signal controlled junctions without pedestrian phases

– corduroy surfaces should be used for any situation (except at pedestrian crossing points) where visually impaired individuals need to be warned of a hazard; top and bottom of steps, foot of or a ramp to an on-street light rapid transit (LRT) platform but not at any other ramps, level crossing, where a footway / footpath joins a shared surface route.

Routes of travel across grass or paved areas should be highlighted. This can be achieved by contrasting color, texture or by directional paving.

● Covers and gratings should be flush with pavings, the maximum gap being 18mm.

● Define footpath edges with either kerb, low rail or a surface change so that cane users can determine the route of travel. However, care should be taken that these elements do not become hazards.

● Low level bollard and chains are particularly Hazardous *(SCOTTISH ASSOCIATION OF BUILDING STANDARDS MANAGERS INCLUSIVE DESIGN HANDBOOK, 2009).*

# 5. RESEARCH: METRO STATION IN BEŞEVLER

Metro is among the most accessible public transit systems in the world. Our buses, trains and facilities are all equipped and ready to serve our customers withdisabilities.Metro offers a wide variety of services to help customers use public transportation easily, safely and effectively.

The population of the world is more than 7 billion people. Among them, more than 1 billion people suffer from a kind of impairment that of them more than 45 million individuals are visually impaired people.

This study talk about the use of tactile system in Besevler station. Its main purpose is to understand the existing space station for the effectiveness of passenger wayfinding,especially visually impaired ones .

According to the last formal census Turkish statistic ministry (Tuik) in 2013, the population of this country is 76667864 people of them 2537558 people live in Ankara.

The number of impaired persons living in Turkey is 1559222 (12.29%), i.e. of 8 people, one suffers from a kind of impairment. This number is one of the largest numbers in the world level because the impaired people mean in the world is 9.83. This high percent has several reasons but experts consider family marriages as one of its main reasons of this number, 90.707 people live in Ankara. Total number of visually impaired people in Turkey is 216.077 individuals of them 10000 live in Ankara.

According to formal statistics of Tuik, of visually impaired people, 8.4 percent of impaired people are totally illiterate and just 18 percent of them have reading and writing literacy 22% have elementary education, 10% have guidance school education and just 7 percent have high school and higher education.

**Site Description**

Ankara, the Capital of Turkey is rebuilt to remove barriers in order to welfare the impaired transportation. Due to the act approved in 2011 (in order to enter to European Union) Ankara municipality has opportunity to transform the city according to the European standards and like the world developed countries capital as a city without any barrier for the impaired.

In this regard, Ankara municipality is responsible to rebuild the avenues, bulvars, pedestrians, air bridges and underpasses, elevators stations, means of transportation and for this, in office building entrances, standard sloping surface for using impaired people with wheelchair have been made.

In roofed stations, tablous with braille writing have been assembled to guide the blinds. Also, in some of them speaking device to tell the needed information have been assembled. Some of buses have been assembled to easy use of the impaired due to the standards and in a number of them speaking device for broadcasting the name of stations have been assembled.

The streets, valleys, pedestrians and stations which the blinds use mostly have been recognized and covered according to Tactile Paving Surfaces standards that to date to tally 15 thousand Tactile Paving Surfaces surface assemblage have been carried cut.

In subway stations, information, guidance and emergency tablous with brail writing appropriate for the visually impaired people have been placed to guide and welfare them.

Also in each subway station at least one counter has been decreased to 86cm height to be used by the impaired people with wheelchair and rebuild.

Besides these, on 42 fixed stairs, Tactile Paving Surfaces had bean placed to visually impaired care.

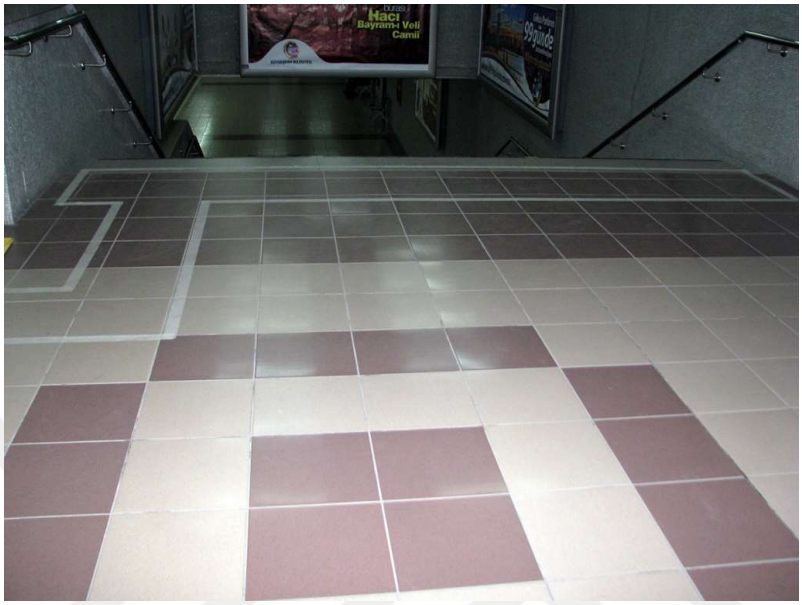
**Work Undertaken in Site**

After getting permission in 2013.1.4 to be present in the place of Tactile Paving Surfaces design performance and take photos of its operational processes at 12 A.M in the intended subway station. "Besevler".

Before performing any action, all the station entrances were closed for people's entering except for municipality's administrative stairs and subway watchmen and no one was allowed to be present in subway place.


*5.1. Photo by Mahsa*

At first the rout of Tactile Paving Surfaces design performing was recognized and its place was marked. This stage of the task is very important because the distance should be marked and performed according to the standards, for if there be an error in this stage, its repair would be difficult after complete performing of the design and needs more time and cost spending.




*5.2. Photo by Mahsa*

*5.3. Photo by Mahsa*

After marking on the each, it is time to cut kinds of special sheets proportional to the needed place.

*5. 4. Photo by Mahsa*

*5. 5. Photo by Mahsa*

Because the first and final points, cross- sections, warning signs, stairs and route to move each include several and different designs that in this stage their number and kind are recognized and be cut and prepared proportional to the used place. After measuring the cut sheets and preparing the needed sheets, they are put temporally in the needed place. Then it's time to stick these with special glue.


*5.6. Photos by Mahsa*

The used glue for this task is prepared of two different chemical material that are mixed well during performing the task in the place and after they reach to the needed.

Concentration, the give is ready to use. In this stage, there are some important points, one of them is the rate of combining two chemicals, the other is well mixing them and the most important on is that prepared glue should be used within 1 hour.

*5.7. Photos by Mahsa*

After the glue is poured in pre- determined rat it is time to make it homogeneous in the place. This task is performed with special finess and by special cutler. Then it is placement and sticking Tactile Paving Surfaces sheets turn in their own place. This task is also of special sensitivity because after placement and sticking the sheets in their own place their change possibility is very difficult so this task should be with height elegance and elegance and without any error.

*5.8. Photo by Mahsa*

After placement of Tactile Paving Surfaces in their own place, before the glue gets dry, one person is responsible to romance additional sticks that are projected from peripheral after sticking the sheets because of compress, this task is also done with special cutler in sheet and fast time before the glue drying.

*5.9. Photos by Mahsa*

After sticking the sheets in their routs, finally this turn to placement special metal weight special for this task that leads to stabilized and homology sticking all the sheet surfaces to the earth. A weight is placed horizontally on the surfaces in the other is placed vertically between two sheets.

*5.10. Photo by Mahsa*

This is the end of the work but in order to be used and it become possible to walk on them for complete drying Tactile Paving Surfaces rout at least 5 hours is needed.

*5.11. Photos by Mahsa*

*5.12. Photo by Mahsa*

After passing necessary time, these weights are collected and Tactile Paving Surfaces rout is ready to be used.

*5.13. Photos by Mahsa*

Drying this glue in hot weather is faster than cold weather, so in cold weather of that day, administrative staff waits for it drying till the morning, but I left the station after taking photographs and preparing reports at 2 A.M.

**Interviews and discussions:**

After theoretical studies related to this subject I decided to get familiar with Tactile Paving Surfaces rout operatory to do this, at first I decided to got familiar with visually impaired people, their needs and the extent Tactile Paving Surfaces way finding helps them in their daily lives, therefore in 2012.06.11 I referred to their community place in Ankara, Alti Nokta Korler located in Demirlax.

In this place, at first, I got familiar with the institution responsible staffs Mr. Hasan Tatar. He was a hospitable person and welcome me and guided me to the institute hall for more similarity with the blinds. The issue that surprised me most was that Mr. Hasan is himself blind but I did not recognized this until he wanted to walk and he himself said and explained that most of the institute responsible staffs are blind.

There I had friendly conversation with the visually impaired people. I asked their daily program and what their most barriers and difficulties are. Most of the blinds are illiterate are low educated or they recently began to study. They have no stable job and have many problems in their daily needs fulfillment and many of them face much financial problems in supplying their life needs.

A few number of the blinds had not only enough education, but also they were updating their knowledge using internet. But their number is almost 1%.

Most of the blinds living in Ankara accumulate in the institute place everyday and spend the whole day talking, group playing and sometimes spending educational periods.

Then I talked about Tactile Paving Surfaces. Though its performing was new, but all of them were familiar with it. Because the institute place distance with Ankara city square, kizilay is just 15 min by walking and most of them come to kizilay by subway and then walk the remaining rout to the institute. Generally they were satisfied with this design, but they had some complains about the way of its performing like:

In many place, the design has not been performed clean and Tactile Paving Surfaces extra sticking materials along the route was sicken that itself brothers and or sometimes because of not considering to standard principles some of the sheets were separated and the blinds confront with these barriers while using their cane to find the way and turning and moving it so this prevents them from finding the rout and moving on it.



*5.14. Photos by Mahsa*

Also some complains were about the people's unfamiliarity with this rout and not considering the proper culture of using it. Because according to their words, many people park their cars on Tactile Paving Surfaces rout and or even sometimes peddlers sell their goods on this rout.

These coplains, apparently simple, made basic problems for the blinds while walking.

Some group was satisfied of rocky Tactile Paving Surfaces rout performing and the other group liked the plastic one but totally they were satisfied of performing Tactile Paving Surfaces rout and wanted its development all over the city and buildings. One of their other recommendations that was of high emphysis was assembling speaking  device in elevators , traffic lights, bus stations and even inside the urban buses to inform the station name.


*5.15. Photo by Mahsa*

After this meeting my interest toward Tactile Paving Surfaces design became more than ever, so I went to the municipality, the performer of this design to get more familiar with this issue. After much research, at last in 29.11.2012 I succeeded to meet the main responsible performing Tactile Paving Surfaces design, i.e. Mr Ozgur Tarhan in Ankara municipality. He granted many books and sources related to this subject after explaining on the way of performing Tactile Paving Surfaces design. Also, he invited me to a meeting on introducing novel technology with the blinds wayfinding subject in 14.12.2012 held in the municipality place.


*5.16. Photos by Mahsa*

In this meeting, last project and new technologies of the world considered for the blinds way finding were introduced that unfortunately and at the end of the meeting none of these new projects were confirmed, because due to Ankara municipality policy foreign products are not used in Turkey even if the internal goods are produced with low quality and more expensive than them.

Following my research I had a travel to Iran and Tabriz city to get familiar with the method of Tactile Paving Surfaces design performing. For this, I met the engineer Mr Ali Ganbari, responsible for performing it in this city.

After explaining related to how this design is performed in Tabriz, he gave me a DVD in which the method of its performing is demonstrated and needed standards are explained. Performing Tactile Paving Surfaces design in Iran is similar to other countries and Turkey with this

difference that in outdoors they prefer rocky sample to the plastic one that is in contrast to Turkey, i.e. in Turkey even in outdoors they prefer plastic sheets to perform Tactile Paving Surfaces design.

*5.17. Photo by Mahsa*

After I returned from Iran, Following my research, I had appointments with two consultants of the management of the impaired in the ministry of social policies, family welfare and the impaired and elders, i.e Mr Ayhan Metin and Kenan Onalan. Mr Ayhan was himself impaired

from his leg and used cane while walking and Mr kenan was himself visually impaired. In this multi- hour and friendly meeting we discussed with each other. I talked about my meeting with the blinds, their needs, recommendations, complains of Tactile Paving Surfaces design deficiencies and they proposed the reasons of causing such problems and explained future tact. Also by more description and explanation related to Tactile Paving Surfaces design, grunting some books and resources, this ministry had valuable help in increasing my knowledge.

I acknowledge all those who helped me in this attachment, whether I mentioned their names or not.


*5.18. Photo by Mahsa*

# 6. CONCLUSION

In this thesis it was attempted to point out the importance of wayfinding in daily life. Though way finding is considered as an independent and very important field in developed countries, and unfortunately it is not well- known in developing countries and most of the people even do not know its name, if the engineers, architects, internal architects any graphists of these country even Turkey and Iran get familiar with wayfinding and apply it in their spaces, structures and buildings, the spaces will be more beautiful and life and transportation in them will be easier and faster and without barrier. Though way finding is an important principle for all the people of the society but our impaired compatriots need this principle more than any other people.

Mentioning all the kinds of way finding for all the impaired people is beyond the scope of this thesis.

Therefore in this thesis it was just pointed out to wayfinding for the issue of the people with visually impairment and the blinds.

According to my personal research and experiences on way finding, in today's life the best and cheapest way to guide the blinds in indoor and outdoor places to find their way is using Tactile Paving Surfaces, because this method if be performed in proper way by expertises of this task and it be used global quality and standard, after performing the design, for long years so many blinds will use it without any cost for many times. And if the standards needed for this task are considered, such as braille writing that is globule writing all around the world, this way finding method will be applied for all the blinds all over the world to find their way.

The only impressing issue in this research is that unfortunately developing countries do not pay attention to needed standards in producing the sheets and necessary materials and on the other hand in performing it they use non-expertise staff without considering standards while setting the sheets that lead to many problems.

For example ignoring quality standards in Tactile Paving Surfaces plastic kinds and the used stick by themselves lead to removing plastic sheets specially after changing each season (specially the winter) and not only helps the blinds but also bothers the other people of the society while walking on it.

On the other hand because in this kind of Tactile Paving Surfaces the used surface is not removed before performing the design, and the sheets are assembled on pre-performed surface, this issue leads to make higher surface that while walking on it bothers every one, this difficulty in the air ports and bus and train stations in which the passengers are usually in hurry and on the other hand pull their bags or other means on the earth is very sensible, because this height makes barrier for the bag wheel movement , while if in performing the design expertise work was done, they should dig the needed surface to the height of plastic sheets or lower than the peripheral surfaces should be carpeted and then the sheets be performed in the lower surface to Tactile Paving Surfaces design and be attached that in this case it becomes in the same level after final performing Tactile Paving Surfaces according to standards which as such why all the surfaces are balanced, no problem occurs in transportation. This issue should be considered in its rocky kind too, because in nonetheless besides making trouble while moving, the higher level of Tactile Paving Surfaces rout leads to collapsing the ceramics, though in developing countries except this issue, not considering the quality while its rocky products (ceramic, …) leads to decreased the life and quick damage of this rout specially after cold seasons and winter. But generally using Tactile Paving Surfaces rout according to standards and with high quality without making any trouble for the other people and making bad face in the environment and without the blinds spend extra expenses helps the blind considerably that without the others' assistance they could travel in the city alone, easier, and faster and now it is the most proper method of wayfinding for the blind population. Maybe correct performing of this method leads to the blinds movement for studying and working that in this case this design apparently leads to great evolutions in the blinds' lives and they live their natural lives beside the other people of the society and along with them without the minimum feeling of being impaired and deprivation that this important issue is the natural right of each human being and if we eliminate deprivation from the urban environment, so no impaired person is rejected from the environment for the barrier are in the environment and the impairment is not barrier by itself.

We should not forget that all the people are candidates of impairment and there is no guarantee that one day any of us need this Tactile Paving Surfaces rout design.

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# Appendix

The following Model Code contains provisions that are categorized by zoning district. Traditional zoning district nomenclature is used. Individual municipalities may have more zones, finer distinctions between zoning districts, and/or different terminology.

It is the intent of the Model to provide general zoning classifications and allow municipalities to then adapt the code language to fit local conditions and the format of each local zoning ordinance overall.

USSC Model On-Premise Sign Code

Section 1: Short Title

The On-Premise Sign Code of the Authority Having Jurisdiction (hereinafter referred to as AHJ).

**Section 2: Purpose**

These regulations balance the need to protect the public safety and welfare, the need for a well maintained and attractive community, and the need for adequate identification, communication and advertising. The regulations for signs have the following specific objectives:

A. To ensure that signs are designed, constructed, installed and maintained according to minimum standards to safeguard life, health, property and public welfare;

B. To allow and promote positive conditions for sign communication;

C. To reflect and support the desired ambience and development patterns of the various zones, overlay zones, and plan districts and promote an attractive environment;

D. To allow for adequate and effective signs whose dimensional characteristics further the interests of public safety and the needs of the motorist, where signs are viewed from a street or roadway.

E. To ensure that the constitutionally guaranteed right of free expression is protected.

**Section 3: Scope (Where These Regulations Apply)**

A. General. The requirements of this Code apply to all signs, sign structures, awnings, and other types of sign devices located within the AHJ, except as specified in Subsection B, below.

B. Signs and sign structures located in the AHJ that cannot be seen from a public roadway are not subject to the size, height, location and number regulations listed herein. These signs must however comply with safety and construction Building Code provisions in the AHJ.

**Section 4: Hierarchy of Regulations.**

A. Where there is a conflict between specific sign regulations and the base or general sign regulations of this Code, the specific sign regulations supersede the base sign regulations.

B. Other conflicts. Where there is a conflict between a land use regulation and a structural regulation, or other conflicts not otherwise addressed by this section, the most restrictive applies.

**Section 5: Severability**

If any word, sentence, section, chapter or any other provision or portion of this Code or rules adopted hereunder is invalidated by any court of competent jurisdiction, the remaining words, sentences, sections, chapters, provisions, or portions will not be affected and will continue in full force and effect.

**Section 6: Authority**

A. Responsibility. This Code will be administered and enforced by the AHJ
Code Officer as designated by the AHJ.

B. Administration. The AHJ Code Officer will administer the Code as set forth herein. The Code Officer may implement procedures, forms, and written policies for administering the provisions of this Code.

**Section 7: Definitions**

Abandoned Sign - A sign that no longer identifies or advertises an ongoing business, product, location, service, idea, or activity conducted on the premises on which the sign is located. Whether a sign has been abandoned or not shall be determined by the intent of the owner of the sign and shall be governed by applicable State Case Law and Statutory Law on abandoned structures.

Alteration – A change in the size or shape of an existing sign. Copy or color change of an existing sign is not an alteration. Changing or replacing a sign face or panel is not an alteration.

Animated Sign - A sign employing actual motion, the illusion of motion, or light and/or color changes achieved through mechanical, electrical, or electronic means.

Animated signs, which are differentiated from changeable signs as defined and regulated by this Code, include the following types:

1) Environmentally Activated: Animated signs or devices motivated by wind, thermal changes, or other natural environmental input. Includes spinners, pinwheels, pennant strings, and/or other devices or displays that respond to naturally occurring external motivation.

2) Mechanically Activated: Animated signs characterized by repetitive motion and/or rotation activated by a mechanical system powered by electric motors or other mechanically induced means.

3) Electrically Activated: Animated signs producing the illusion of movement by means of electronic, electrical, or electromechanical input and/or illumination capable of simulating movement through employment of the characteristics of one or both of the classifications noted below:

a) Flashing: Animated signs or animated portions of signs whose illumination is characterized by a repetitive cycle in which the period of illumination is either the same as or less than the period of non-illumination.

For the purposes of this ordinance, flashing will not be defined as occurring if the cyclical period between on-off phases of illumination exceeds four (4) seconds.

b) Patterned Illusionary Movement: Animated signs or animated portions of signs whose illumination is characterized by simulated movement through alternate or sequential activation of various illuminated elements for the purpose of producing repetitive light patterns designed to appear in some form of constant motion (Bertucci and Crawford).