BEYOND WAYFINDING : Sensory Focused Design for the Non-Sighted

by

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Author’s Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

While visually oriented architectural design has long been used to enhance the perceptions that shape the world of an existing ocular-centric norm, this has led to a less than satisfactory experience for users with less-than-optimal visual abilities. Today's urban environments have evolved to become sensorially overloaded resulting in a chaotic and overwhelming situation that is difficult for wayfinding in the absence of sightedness. Existing code-based requirements are barely sufficient for most spatial applications but tend to be seen as the maximum requirement by architects and urban designers.

This thesis explores the potential of carefully adding other sensory means to enhance the overall spatial experience of the sight challenged population, with a broad focus on wayfinding. The thesis proposes possible approaches for designing architecturally enhanced sensory experiences. The research is aimed toward providing new design strategies for architects and urban designers as methods of engaging a non-sighted or partially sighted user alongside the sighted users to experience the space more clearly and deeply with their senses. While the universal language principles and existing techniques of traditional touching and tapping are studied as initial references, the final research comprises the integration of senses dealing with qualities of tactility, hapticity, auditory, olfactory and navigation related instances of architecture that can be globally applied.

The thesis proposes a set of design strategies that have been developed through personal experiences that when applied to smaller-scale scenarios give rise to a predictive language. The strategic design layers are referenced from personal sensorial experiences and are illustrated within two smaller-scale integrated spaces of a pop-up market and a park with gardens, non-contextual in nature. It would be intended that these two scenarios would form a base point to demonstrate the potential effectiveness of the strategies to form a departure point for more global application in other scenarios.

Key words: architectural design, visually impaired, blindness, non-sighted, partially sighted, design for all, accessibility, disability, navigation, orientation, sensory enhanced design, multisensory design.

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My unending gratitude to my parents and brother for their relentless support and love. I am blessed in many ways. My closest friends and relatives who lovingly accommodated me during turbulent times. My daughter for being patient as her mama continued her education being away from her.

Dedication

To my aunt, Molly Jacob who lost her vision when she was eight and who never ceases to pray for my health and well-being.

To my daughter - the spark in my life, Anaida Grace. You push me to better myself every day.

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List of Abbreviations

ABA	Architectural Barriers Act 1968
ADA	ADA
ADAAG	Americans with Disabilities Accessibility Guidelines
AODA	Accessibility for the Ontarians with Disabilities Act
CNIB	Canadian Institute of National Blind
ft	Feet
m	Meters
mm	Millimetres
NDA	National Disability Authority
RNIB	Royal National Institute for the Blind
UD	Universal Design
UDP	Universal Design Principals
WHO	World Health Organization

Thesis Abbreviations	
NS	Non-Sighted (Includes individuals with extreme issues of vision: primarily focusing on blindness and partial sightedness) Note: This term is used as an alternative to “visually impaired people or blind” advocating a recommended term in accordance to stand in solidarity with the NS to avoid reinforcing stereotyping their ability to contribute to society in any way possible
S	Sighted (Includes individuals with no extreme issues of vision) Note: This term refers to all individuals excluding the NS.
DS	Design Strategies
B	Buddy

Preface

An account of Mary Jacob, my aunt who lost her sight when she was eight

| Below instances are a combination of past and recent personal conversations and experiences with Mary Jacob, my mother, her cousins and her niece and nephews |

Above: Mary Jacob (My Aunt in Kerala, India)

She touches the fabric. *Cotton*. As she swiftly throws the bedsheet across the uncovered mattress, the fragrance of the detergent hits her. Her olfactory senses, ever so sharp detects that her cousin has changed the washing powder from the ever-famous crowd's choice "Wheel" to "Tide". She prefers the local brand's green lemon and jasmine fragrance over Tide's conventional scent. She firmly lifts the mattress. Tucking the sheet in each corner. Her left-hand bears the weight of the mattress while her right-hand tucks in the smooth cotton fabric underneath firmly pulled avoiding all wrinkles. Her nephew had slid another candy wrapper underneath her bed. She smiles. She continues to adjust the freshly baked fabric - crisp from the sun's rays, still carrying a warm temperature as her cousin, Susan, had a minute ago handed it to her from the backyard.

"It would be cozy if you try sleeping on it", she said.

She lays down in her bedroom, it's 3 in the afternoon. Time for her nephew and niece to come back from school. As she hears the seconds strut on the clock, she spreads both her arms around her feeling the lukewarm temperature of the sheet again. Her body adjusts to it.

er

bag

She finds great comfort in the simple pleasures of life. Her fingertips, start drawing patterns on the sheet. *Smooth*. She recalls in her eighth grade, her homeroom teacher talking about the cotton textile industry in India and wonders whether this cotton comes from Maharashtra, Andhra Pradesh or Gujarat. *Cotton Basket* (covers India's main cotton production states) – a term that kept resonating in her brain when she overheard her 10-year-old nephew study repeating the term aloud for his preliminary written test on geography.

Her fingertips still imagine the cellulose fiber felt against her thumb and forefinger as she would open a cotton seed bud and feel the fluffy ball against her palm. The last time she walked to school when she was fourteen.

A fond dream takes her back.

"Let's return home, it's getting dark", a voice whispered from the banks of the stream. Her aunt signaled. The buoyancy of the water made her body afloat as the gentle current swayed her fragile body back and forth. Relaxed. She could sense the tiny guppies playing under her body's casted shadow as the sun's rays outlined her silhouette. Calmness. As she backstroked to her normal posture, she couldn't find her aunt. A sudden propulsion pulled her downwards where her wise fingers couldn't sustain her weight. She heard the church bells ring in a particular manner. Wasn't this the rhythm when someone was taken up to heaven?

Mary praying in her bedroom

Unfazed and nonchalant. Mary recognized the 5:30 am morning church bell. It's been two years since her aunt passed away, also she barely knew to swim. Dreams can evoke impossibilities. But the water felt serene and calm.

After losing vision in her left eye, she understood her days of experiencing the vivid scenic beauty that surrounds her were limited to her right eye. It can't be cured, the ophthalmologist said.

She misses seeing the daylight's delight. She misses running around on her feet - levitating in wonderment of where it takes her next. She misses witnessing dragonflies flutter across the stream that reflected the nature's greenery in its wonder. She misses seeing the summer grass dance in rhythm with the music of the breeze. She misses her heart beating each moment while she saw a rainbow in the sky.

Mary adjusting her radio

Now seventy-four, Mary Jacob recalls memories. Her playtime during the long summer days, laying on her back in the sun and watching the clouds. All different shapes. *Cumulus and Stratus and Nimbostratus,* she later remembers from a show on the radio she keeps listening to thrice on a daily basis.

Rain and Mary have a special bond.

"The clouds whisper, I hear them murmur when they want to pour out their welcoming spring".

A pure bliss. The occasional showers at the end of summer and the warm earthly aroma that it brings along. She perceives the non-threatening sounds of rain as she comes out of the front door of the house into the verandah and leans onto the column as she is

greeted by the little droplets of water that touch her skin. The droplets have clattered from the edges of the tropical hip roof. It has a specific weight to it as it splashes on her palm. The sounds of the rainwater hitting the ground. Drop after drop brings about the spatial contours of what vibrates around her. The children are back.

Mary in her kitchen

As Sally washed the meat with vinegar and salt, Mary could hear Sally's wet hands carefully drain the freshly minced meat, ready to be marinated with the spices. She could only imagine how the traditional south Indian dish would feel on her tastebuds for that was her favorite dish cooking in the process. She recalled her teacher's emphasis on how spices formed an integral part of her culture as they traded across different worlds in the past. That was seventh grade.

"Is *Kappa Biryani* ready?" an eager nephew asks.

As she dices the Tapioca into perfect pieces, the used cutting board with its leftover scars guide her fingertips into perfectly positioning each cube of the Tapioca. Each time her left forefinger and thumb acknowledging the knife as it chops off a segment with her right hand.

"The way you cut your food affects the flavor" she affirms to herself.

Her nose tingles as she senses the coriander, chilly, ginger and garlic and curry leaves fizzing in the hot coconut oil.

The television plays a traditional wedding tune. She zones back.

Yet another marriage proposal rejected. Not by the potential groom.

"it doesn't matter", he said. "I will take care of her".

"it matters", she said. "I do not want to be taken care of."

"Darkness hasn't claimed my life. Nor does it define it"

Mary had never opted for a cane in her life. A woman of instinct, she trusts her body more than the verbal guidance she gets from her relatives for navigating any indoor space. “Walk through the edges of the walls” – her niece would say. Susan, always being concerned that she may trip and fall down the flight of stairs. But Mary existed way before her nieces and nephews were born. This house is her favorite place on earth (her paternal house), her wise fingers have studied each nook and corner. Within the confines of all four walls, she feels the house. When the edge of paint reaches another. The cold wet plaster during monsoons. Her feet have massaged the terracotta floors and her arms have comforted the wooden door jambs.

Mary with a goat cub

She goes back to washing her niece’s and nephew’s uniforms, currently soiled in ways she can imagine why. They must have taken the alternate route and jumped on some muddy puddles while exiting their school-bus back home. She prefers handwashing to the washing machine. She engages herself in tasks that keep her occupied throughout the day.

Mary washing clothes

To all those who feel her impairment makes her distant as the sun’s rays she can barely see. She would say, “my life might be a lesson for many aimless minds who have turned blind to their surroundings” one phrase amongst all her positive responses when I would interrogate her. *Delight within darkness*.

As I bid her goodbye, I hug her a last time. My nose ably catching the scent of her night-gown. Green-lemons and jasmine. She managed to cajole Susan in using “Wheel” again.

Chapter 1
Introduction

This thesis is an invitation to all architects to re-address their approach towards conceiving and designing spaces more intentionally and equitably, focusing on imagining more experiential spaces for the non-sighted individuals. When architects synonymously relate accessibility to simple code compliance, the resulting design gives rise to an urban environment that encourages and in fact strictly abides by all the standards set out. While one common notion that comes out of associating code and disability together might deal in our creativity being challenged, another deals with the stringent following of code up to the point where the space loses its experiential quality. And while accepting these notions, as architects we may fundamentally question the very nature of our practice of creating spaces that function to the whole level. For Non-Sighted (NS) individuals and users, the very essence of understanding space lies different from the sighted users.

1.1 Context

Vision loss amongst the NS refers to either a complete or partial loss of vision (Fig. 1.1). According to the World Health Organization (WHO), at least 2.2 billion people globally have vision impairment and in half of the cases, vision impairment is caused by a wide variety of factors ranging from Presbyopia (826 million), unaddressed refractive error (88.4 million), cataract (94 million), glaucoma (7.7 million), corneal opacities (4.2 million), diabetic retinopathy (3.9 million), and trachoma (2 million) (Fig. 1.2).[1] Vision impairment poses an enormous impact on personal and economic levels associated with global loss in productivity level.

[1] "Vision Impairment and Blindness." World Health Organization. World Health Organization. October 14, 2021. https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment.

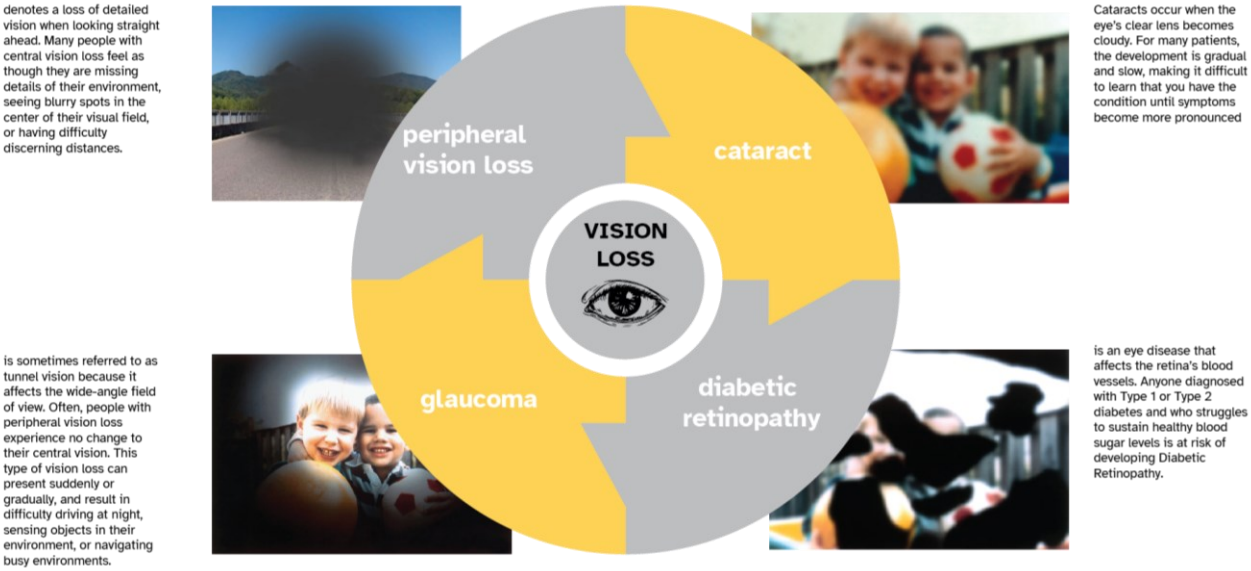

Figure 1.1 Types of Vision Loss

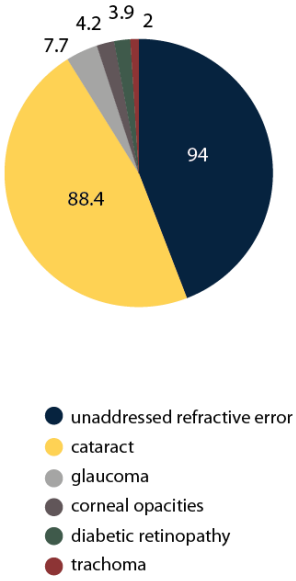

Figure 1.2 WHO Statistics on Global Vision Loss Population

doesn't include near vision impairment caused by unaddressed presbyopia (826 million)

Figure 1.3 Hurdles faced by Non-Sighted at New York Street (Photo by Sara Krulwich)

On a personal level for an individual, it contributes to difficulty in navigating, and social isolation that severely affects their quality of life. This fact is further exacerbated by the increasingly ocular-centric world we live in today, filled with sensory overload. New York, once known for its accessibility, has undergone several sweeping changes over the past few years making it harder for pedestrians to navigate (Fig.1.3). The sprawling construction plazas are inevitably creating more hurdles. Moreover, the technological advancements in the form of hybrid cars and the creation of bicycle lanes have made subtle cues such as listening to the hum and rattle of cars impractical, cues essential to a non-sighted traveler.[2]

[2] Flegenheimer, "With changes in New York's Streets, More hurdles for the City's Blind Pedestrians", 2012, accessed August 20,2020, https://www.nytimes.com/2012/07/30/nyregion/with-changes-in-new-yorks-streets-more-hurdles-for-the-citys-blind-pedestrians.html

Navigating or wayfinding through the space around is crucial and it is imperative to design spaces that help them understand the function of space with other senses. Though accessibility is regulated by acts such as the Accessibility for Ontarians with Disability Act (AODA) the enforcement is weak due to the disparity between the theory and its practical application. Freedom and creativity are constricted while associating disability with accessibility [3]. For this reason, it is imperative for designers to design spaces that enforce universal design principles. The universal design principles then are a stark contrast to retrofitting that just seems to accommodate disability as per the specifications where disability is just an afterthought. Take for instance the curb cuts (Fig.1.4) and the absurd ramps at Brunel University, that prove how half-heartedness of retrofitting makes accessible design facile.[4] *This was the typical outline for addressing accessibility, designing a space, and then providing add-ons to it, to make it "accessible".* Universal Design Principles (UDP) were conceptualized by the American architect, Ronald Mace in 1985 as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design". It is argued that disability and diversity are to be viewed as fundamental elements to the design process rather than accommodating temporary adjustments. The seven principles of universal design are laid out as a criterion that spaces or product should adapt to: they must be equitable, flexible, and intuitive to use, cater perceptible information effectively, have low tolerance for error, demand low physical effort, and provide size and space for approach and use.[5]

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[3] Ann Heylighen, "Challenging prevailing ways of understanding and designing space," 2012

[4] Jay Dolmage, "From steep steps to retrofit to universal design, from collapse to austerity: Neo-liberal spaces of disability," (2017).

[5] B.R. Connell, M. Jones, R. Mace, J. Mueller, A. Mullick, E. Ostroff, J. Sanford, E. Steinfeld, M. Story, G. Vanderheiden, The Principles of Universal Design, NC State University, Center for Universal Design, College of Design, Raleigh (NC), 1997. Available at: http://www.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm.

Figure 1.4 Stairs at Brunel University, UK (Photo by Ken MacLeod)

One of the approaches that considers people's ability and surroundings right from the design phase is Inclusive design, a broader term that includes universal design and design for all.[6] Inclusive design can tackle challenges in a sustainable way, as the design would involve decisions that would reduce the need for subsequent adaptations. An inclusive society does not merely cater to people with impairments. The baby boomer generation, or often referred to as boomers, represents a generation that is wealthiest in terms of disposable income. The transition of this generation into the retirement phase has led to the demand for the prevalence of many accessible services to accommodate their needs.[7] Improved access thus provides the impetus for a more inclusive society. By considering diverse human capabilities, inclusive design transforms and designs spaces that strike an ideal balance between the needs of various user groups, be it the elderly, people who need assistance, or the population at large.

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[6] Ann Heylighen, Valerie Van der Linden, and Iris Van Steenwinkel. "Ten Questions Concerning Inclusive Design of the Built Environment." *Building and Environment* 114 (2017): 507–17. https://doi.org/10.1016/j.buildenv.2016.12.008.

[7] Deane Simpson, Young-Old: Urban Utopias of an Aging Society. Lars Müller Publishers, 2015

1.2 Addressing other senses over the ocular centric “eye”

Vision played a pivotal role in modernist thought. The dominance and the hegemony of vision can be traced back to the Renaissance era when the five senses formed a stratum starting from vision at the highest to touch at the end of the ladder.[8] The ocular-centric culture has paved the way for the contemporary architecture we see today. This provides us with an experience that separates us from the world, making us mere spectators rather than uniting us with it, and leads to architecture becoming merely flat, immaterial, inconsequential, and unreal.[9] This disengagement makes us oblivious to our surroundings, eventually leading to a loss of sense of embodiment and depth. Juhani Pallasmaa[10] refers to the shift to control of vision, as a loss of plasticity and intimacy. This tactile ingredient, often overlooked today, is what prevented Le Corbusier's work from turning into sensory reductivism.[11] The sense of touch complements the lack of sensuality and brings back the sense of engagement. The quality of space, matter, scale, and various other aspects of a building that one experiences are inherently multisensory.[12] The attention to non-visual aspects drawn from the perspective of the non-sighted (NS) user helps us to better understand the experience associated with conceiving space. The collaboration of the eye with other senses puts one in the realm of a multisensory experience. A multisensory environment enables the user to pay attention to tactile, haptic, auditory, and olfactory elements. The creation of such an environment entails the user can get simulated by their whole body, as a result, visual purity has less emphasis than tactile wellbeing.[13]

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[8] Juhani Pallasmaa, The Eyes of the Skin, (Wiley, 2005).
[9] Ibid, 31.
[10] Ibid, 26.
[11] Ibid, 27.
[12] Ibid, 41.
[13] Vermeersch, Peter-Willem & Heylighen, Ann. Blindness and multi-sensoriality in architecture. The case of Carlos Mourão Pereira. (2012).

1.3 Notion of Architecture as a Visual Endeavour – Research Questions to consider

Some questions to consider while reading the thesis are:

- While visually oriented architectural design has long been used to enhance the perceptions that shape the world of an existing ocular-centric norm, has this led to a less than satisfactory experience for users with less-than-optimal visual abilities.
- Has the urban environment evolved to become sensorially overloaded?
- Has code interviewed within architecture to be seen as the maximum requirement by architects and urban designers?
- Can a potential of carefully adding other sensory means be developed to enhance the overall spatial experience of the sight challenged population, with a broad focus on wayfinding?
- It becomes imperative that I start with myself as a vehicle through some spatial experiences and make informed decisions drawn from that to propose design strategies that can later be tested out to form a predictive language.

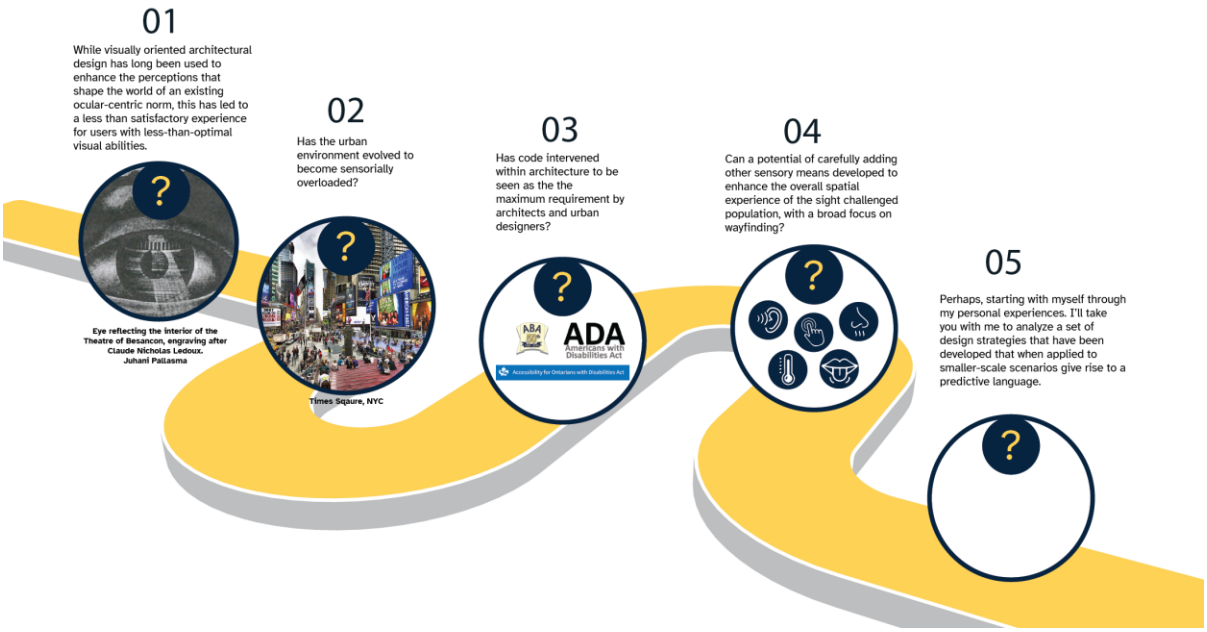


Figure 1.5 Some questions to consider

1.4 Thesis Structure

What will this thesis explore and be built upon?

- Chapters 1 and 2 set a context and background for the consequent chapters. The introduction covers the design questions which is explored through research and a description of what is to be expected is laid out. Current theoretical thinking from related authors is analyzed within the Literature review which is later addressed within contemporary design too.
- Chapter 3 will cover analyses of projects and details that have either successfully attempted or failed addressing the research question by further listing critical points obtained from the studies.
- Chapter 4 is an exploration of personal spatial experiences done through using myself as a vehicle to garner insights on how my non-visual senses played a role in helping me navigate and way find my circulation at four different locations involving a trail, supermarket, a farmer's market, and a public park.
- Chapter 5 proposes design strategies that attempts to answer the research question and aims to make design decisions informed from Chapter 4.
- Chapter 6 takes a step further and creates two test-case scenarios – a pop-up market and a park and garden, where the design strategies from the previous chapter are applied and discussed.
- Chapter 7 is a self-reflection of my learning through this entire journey. It focuses on my personal reflections as an architect who has been practicing for a brief five years and aims to provide feedback within the architectural discourse. Brief feedback from the design review is also included.

Who is this thesis for?

On a particular note, this paper is proposing design strategies primarily concerning individuals facing disabilities visually, i.e., will be referred as “non-sighted” as well as maintaining an equitable outlook while executed. The paper targets “sighted” readers from many areas of design who may be academicians, architectural designers, or working in related fields.

Apart from the above stated, it is important to convey that throughout the development of this thesis, as a sighted person who once experienced myopia (short-sightedness) for a prolonged 10 years and later underwent an eye-correction surgery that changed my life, my personal endeavors to accumulate a critical analysis on the research topic is limited to or perhaps lean toward a visually biased perception.

As a sighted individual currently, I am limited in my abilities to garner or associate myself with a person experiencing visual difficulties. Like any other undergraduate courses globally, the formative years in my architectural education in Bangkok too has molded me with a bias towards designing spaces that please the noble eye. Surely, my aunt who lost her vision when she was eight drives the desire to write this thesis. But overall, I believe a shift in attitude is required to correct the stigma towards individuals with disabilities within the architectural discourse. The intention is to create awareness surrounding the circumstances of a non-sighted individual experiencing a space that we design and moreover promote architecturally enhanced scenarios in the simplest manner to benefit joy and delight to all. It is our responsibility then, to re-discover spaces as creative opportunities of laying a balanced platform equitable to all.

Chapter 2
Sensory enhanced design: a response to Ocular-centric architecture

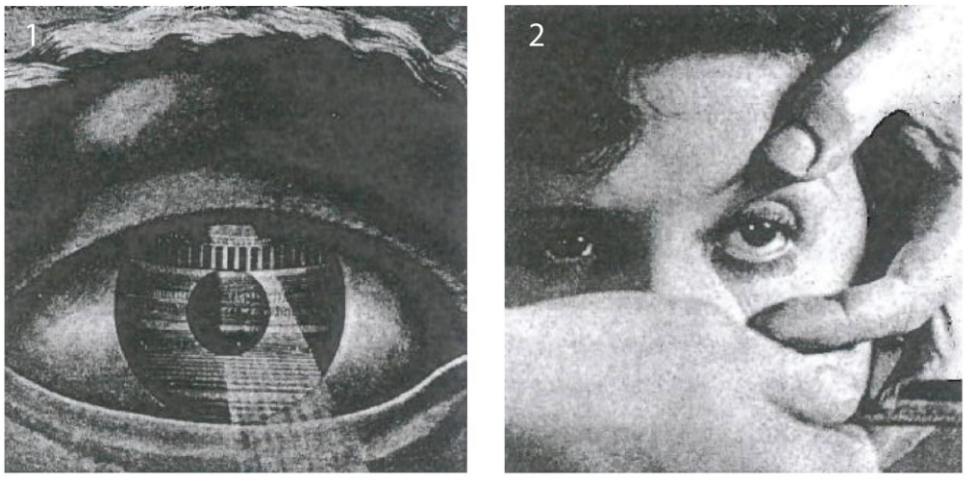
In case of the non-sighted, the spike of their heightened other sensory organs come to play embedding a completely different approach to spatial wayfinding while navigating themselves through an urban fabric. The outreach for educating and creating an urban fabric that caters inclusiveness towards the non-sighted becomes essential towards transforming individuals in the perception of their environment using other heightened sensory cues.

2.1 Architecture and Ocular centrism

"In the intoxicating world of the image, it is argued, the aesthetics of architecture threatens to become the anesthetics of architecture. The intoxication of the aesthetic leads to an aesthetics of intoxication, and a consequent lowering of critical awareness. What results is a culture of mindless consumption where there is no longer any possibility of meaningful discourse. In such a culture the only effective strategy is one of seduction. Architectural design is reduced to the superficial play of empty, seductive forms, and philosophy is appropriated as an intellectual veneer to justify these forms"[14]

Our rich ocular-centric culture (Fig. 2.1) has paved the way for the anatomy of architecture we see today. We discover the impact of reality through our eyes, which are flat and unified. When one is separated from it, we are oblivious to our surroundings and thereby we lose the richness of daily experiences that can be captured because architecture does not provide a spatial reality that consolidates all the senses.

[14] Neil Leach, "The Anaesthetics of Architecture".



1
Architecture has been regarded as an art form of the eye.

Eye Reflecting the Interior of the Theatre of Besançon, engraving after Claude-Nicholas Ledoux. The theatre was built from 1775 to 1784. Detail.

2
Vision is regarded as the most noble of the senses, and the loss of eyesight as the ultimate physical loss.

Luis Buñuel and Salvador Dali, *Un Chien Andalou (Andalusian Dog)*, 1929. The shocking scene in which the heroine's eye is sliced with a razor blade.

Aito Mäkinin/Finnish Film Archive.

Figure 2.1 The Narcissistic and Nihilistic Eye – Juhani Pallasmaa

A bogus sense of reality is created with the overuse of glass and synthetic materials, typically associated with modernism. The contemporary architecture thus created becomes resistant to wear and diminishes the sense of time and scale.

Physiologically, psychologically, and perceptually, vision is regarded as the most important of all senses, but however the neutralizing of other senses cannot be attributed to vision alone.[15] Negligence of the human body and the senses is evident in the contemporary architecture we see today. The dominance of vision and superiority of sight above other senses has been prevalent. Morton Heilig, the inventor of multisensory virtual reality

[15] Juhani Pallasmaa, The Eyes of the Skin, (Wiley, 2005).

apparatus, ranked the various senses according to the attention captured by each of them (Fig. 2.2): Vision (70%), audition (20%), Olfaction (5%), touch (4%) and taste (1%).[16] Historically vision has been associated with power, knowledge, ethics, and ontology.[17] The hegemony of vision was associated with ocular centric paradigm of knowledge, truth, and reality.[18] This view can be traced back to Greek culture and subsequently western culture. The development of technological culture further corroborated and widened the gap between vision and other senses. Vision and hearing are entitled senses socially compared to the remaining senses. Sight is the only sense that can keep up with the pace of technological innovations but however is causing us to live in a flattened world.[19] It is weakening the essence for participation and empathy with the world. The increased detachment and alienation are resulting from the suppression of other senses along with the isolation of the eye with body and other senses.

[16] Kornbongkoch Harnpinijsak, "An Exploration of Sensory Design: how Sensory Interaction Affects Perceptual Experience in an Immersive Artwork", accessed 20 August 2002, http://www.interactivearchitecture.org/an-exploration-of-sensory-design-how-sensory-interaction-affects-perceptual-experience-in-an-immersive-artwork.html

[17] David Michael Kleinberg-Levin, Modernity and the Hegemony of Vision. Berkeley: University of California Press, 1993

[18] Ibid, 10.

[19] Juhani Pallasmaa, The Eyes of the Skin (Wiley, 2005).

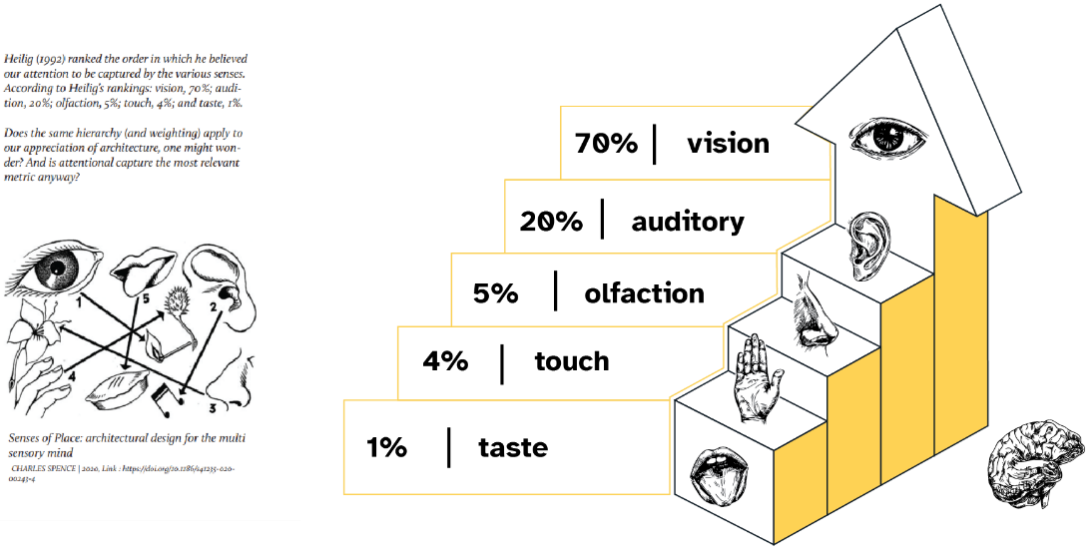


Figure 2.2 Morton Heilig's ranking of different senses according to attention captured by each

Juhani Pallasmaa comments on this problem, stating that "as buildings lose their plasticity and their connection with the language and wisdom of the body, they become isolated in the cool and distant realm of vision. With the loss of tactility and the scale and details crafted for the human body and hand, our structures become repulsively flat, sharp-edged, immaterial, and unreal." Disengaging construction from the essence of the substance (material) applied or molded, masks architecture into a podium dominated and viewed primarily by the eye, devoid of the authenticity of material and tectonic logic." [20] The discourse between body and space must thus be restarted to counteract the disintegration of contemporary architecture into distressing images that taint the eye.

2.2 Stigma attached to Vision Loss

Since a wide range of visual impairments can be constituted to earn the title of "legally blind", there is a lot of misconception among sighted people regarding Blindness. They

[20] Ibid, 24.

consider that blind individuals do not see anything. For instance, while others can see the focal point and no irrelevant information, the "legally blind" have trouble locating the focal point of the information they are focusing on. There exists a process in place currently that can establish whether an individual would qualify for the term "legally blind".

The World Health Organization (WHO) estimates that in the United States alone, there are about 26.9 million adults that experience some form of low vision, legal or total blindness.[21] The "Snellen eye chart" is used to categorize and report blindness into three categories namely low vision, legal blindness, and total blindness by testing the visual acuity of an individual by measuring the sharpness of their vision with respect to their distance from the chart. The test is a definite way to define visual impairments such like- Cataracts, Glaucoma, Macular Degeneration, and Diabetic Retinopathy which constitute the most common eye conditions that cause individuals to see the world in a contrasting way.

Designing for the NS does not necessitate that the designing aspect must eliminate visual elements completely but an increasing need for a design with multi-sensory cues to help those in need. A multi-sensory approach with a notable focus on the senses of touch, sound, and smell to give them a perception of the world around them should be advocated.

2.3 Perception and Senses

When designing for the NS it is crucial to understand how we perceive the world. As we are dependent on our vision for day-to-day activities, most people assume vision and perception refer to the same thing. Vision materializes when light and pictures are absorbed by the eyes whereas how the brain construes those light signals constitutes perception. Hence, vision is not like perception. The stimulus that is picked up by the eyes is passed on to the brain to process it further to make sense of it. Thus, perceiving our surroundings is a combined activity of all the senses and not just the eyes to construct the entire picture.

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[21] "Vision Impairment and Blindness." World Health Organization. World Health Organization. October 14, 2021. https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment.

Gestalt theory gives us one of the earliest understandings of perception and a distinctive idea is that an understanding of the environment is processed through a figure-ground process.[22] Reading the fringes of an object and classifying the rest as the background is how the brain perceives an object. The notion of distance is gauged from the size of the profiles. "The whole is greater than the sum" is a phrase that holds true to understanding the holistic approach that the brain employs to process the individual figures. The brain can piece together information to understand it in cases wherein the element we perceive appears either to be unfinished or incomplete. The brain can achieve this by establishing patterns and referencing cues from past perceptions. This is one of the key ideas in Gestalt theory.

Piaget's theory, one of the later theories, perception is a result of the individual's own built-up experience.[23] Since people have distinct perceptions, it is not a comprehensive way to understand perception but certainly helps to explain the process. According to Piaget, to understand the nature around us, the world is appropriated through the body's senses processed through the brain, and then re-conferred into the perceived elements' own category.[24]

When designing for people with visual disabilities, it is key to understand the spaces through edges and profiles. Articulation of these edges and profiles through color, texture, and materiality produces a sense of certainty for depth and the physical environment. The symmetry and asymmetry of sounds and smells as pleasant or unpleasant plays a crucial role in this endeavor as people attach ideas and definitions to all sensory intakes. These simple yet important strategies will be seen to form the basis for the development of the design proposed in Chapter 5.

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[22] Cameron Chapman, "Exploring the Gestalt's Principles of Design," Totpal, Accessed 19 August 2022, https://www.toptal.com/designers/ui/gestalt-principles-of-design

[23] Pierre R. Dasen," Culture and cognitive development from a Piagetian perspective," in Psychology and culture, ed. W .J. Lonner & R.S. Malpass (Boston: Allyn and Bacon, 1994), 145–150.

[24] Ibid.

2.4 Towards a sensory enhanced architecture

A haptic and multisensory aspect of architecture would reveal capabilities of vision that assist the search for sensory equity. The musing vision of ocular-centric architecture that makes us impartial spectators and confronts one without approval can be overcome by hapticity, which would point us towards the realm of unfocussed "peripheral vision that envelops us in the flesh of the world" so that we may engage closely with our surroundings. In Pallasmaa's book, "The Eyes of the Skin", he speaks about the critical role of the body and tactile sense to highlight the importance of the architecture of hapticity.

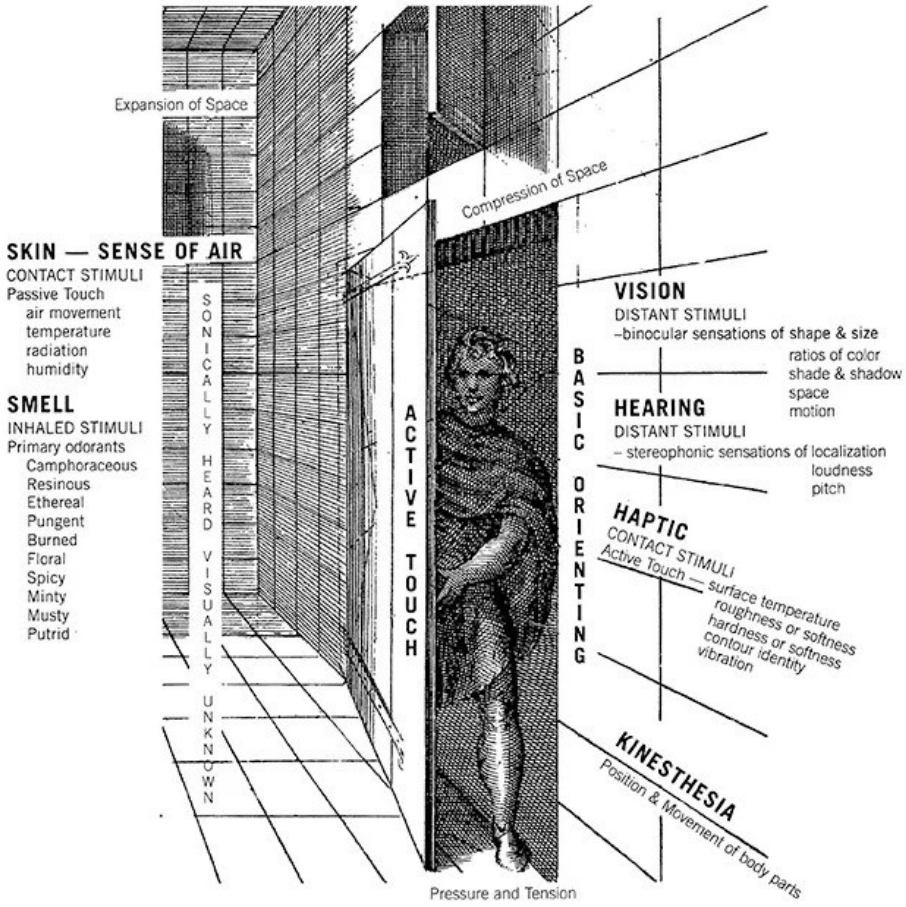

Figure 2.3 Sensory Experience (Joy Monice Malnar and Frank Vodvarke, Ranges of the senses, from Sensory Design, University of Minnesota Press;2004)

According to Pallasmaa, our actual movement through a building does not only help us see it better but it enhances the architectural experience by touching its contours and surfaces, paying heed to the echoes. The auditory and tactile properties of the space contribute to the wholesome experience.[25] It is thus imperative that architecture appeals to the body and how

[25] JENEFER ROBINSON, "On Being Moved by Architecture," *The Journal of Aesthetics and Art Criticism* 70 (4): 337–53 (2012), https://doi.org/10.1111/j.1540-6245.2012.01526.x.

one feels occupying it along with engaging the vision and intellect. A mere visual awareness of a space is not passable to have an aesthetic appreciation of it without the regard for the appreciation of the other senses (Fig. 2.4).

Architectural design for the multisensory environment revolves around the senses of vision, auditory, touch, smell, taste, skeleton, and muscle. Architects must be aware of how each of these senses function in isolation and how they interact from the viewpoint of the environment.[26] A full range of senses is activated when people are engaged in the environment. “Every significant experience of architecture is multi-sensory; qualities of matter, space and scale are measured by the eye, ear, nose, skin, tongue, skeleton and muscle.” [27] The sense of touch is activated when an individual encounters the building. Touching is a mode of sensory perception as the senses are a specialization of skin tissue.[28] Through hapticity the NS experience the building, thus materiality, temperature, ergonomics including ingress and egress must be carefully considered while designing for the skin. Olfactory design is pivotal while designing, as scent is directly correlated with strong memory of a space.[29] Sound on the other hand, supports further understanding of space and is a powerful mechanism for uniting us with space. It gives us an understanding of the distance, volume and even the materiality of the space through acoustics. And as per Pallasmaa’s insight, every spatial quality is associated with contrasting features – either intimate or monumental, inviting or rejecting, hospitable or hostile.[30]

George Berkley, (a philosopher, and clergyman associated vision with touch) observed that “sight detached from touch could not have any idea of distance, outness, or profundity, nor

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[26] Charles Spence, “Senses of Place: Architectural Design for the Multisensory Mind.” Cognitive Research: Principles and Implications 5 (1), 2020. https://doi.org/10.1186/s41235-020-00243-4.

[27] Juhani Pallasmaa, Hapticity and Time, 78.

[28] Juhani Pallasmaa, The Eyes of the Skin (Wiley, 2005), 10.

[29] Ibid, 54.

[30] Ibid, 50.

consequently of space or body." [31] To which Pallasmaa has a similar conclusion that vision is an extension of touch, and the former confirms what the latter already knows.

To understand and conceive space and to ensure that designers are moving in the right direction for building space intrinsically multisensory in nature, it is essential to incorporate the perspective of the NS and their prevailing understanding of space which we as architects may not necessarily appreciate qualities in a space that they are more accustomed to. This leads to restructuring and redefining frontiers that constitute space or even unraveling new spatial boundaries that are unconventional.[32] To enhance the overall standard of architecture, we as designers must conceive the experiential aspect of all the senses working in unison to reinforce our being in this world. While designing, it is imperative that we design with an understanding of our body and surroundings, this helps us design spaces that promote sensory engagement and development rather than hindering it.[33]

The task of architecture is to reaffirm our being in the world. This reunion between us and the world materializes through our senses.[34] True architectural appreciation is manifested from moving around the building through which our bodies experience feelings of delight and comfort.[35] While Heylighen in her paper advocates and demonstrates inclusive and multisensorial design as a response to enhance the NS individuals experience of the space,[36] this can be seen as opportunities for architects to revisit spatial boundaries in terms of conceiving space without the nihilistic eye.

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[31] David Michael Kleinberg-Levin, Modernity and the Hegemony of Vision. Berkeley: University of California Press, 1993

[32] Ann Heylighen, "Challenging Prevailing Ways of understanding Design and Space", (2012): 26.

[33] Ibid, 37.

[34] Juhani Pallasmaa, "Hapticity and Time," (2000): 37

[35] JENEFER ROBINSON, "On Being Moved by Architecture," *The Journal of Aesthetics and Art Criticism* 70 (4): 337–53 (2012), https://doi.org/10.1111/j.1540-6245.2012.01526.x.

[36] Ann Heylighen, "Challenging Prevailing Ways of understanding Design and Space", (2012): 15.

Chapter 3
Shortcomings of Architecture

While visually oriented architectural design has long been used to enhance the perceptions that shape the world of an existing ocular-centric norm, this has led to a less than satisfactory experience for users with less-than-optimal visual abilities. Today's urban environments have evolved to become sensorially overloaded resulting in a chaotic and overwhelming situation that is difficult for wayfinding in the absence of sight.

The previous chapter discussed on how architectural design should theoretically focus on a relation of *being* between the user and the built world through promoting multi-sensorial enhancements in unison to the experiential quality of the designed spaces for the NS. However, in this chapter, we would look at the practical exigencies that architecture has provided in its potential to address the challenges for the same.

Have existing code-based requirements become barely sufficient for most of the spatial applications? And do the same, tend to be seen as the maximum requirement by architects and urban designers to imply that standards are followed to solve navigation for the NS? We will therefore look at the existing design principles that have been in use within the architectural discipline, mainly touching upon the Universal Design Principles (UDP) and the American Disabilities Act (ADA), both that originally form the basis of urban architecture towards garnering equity amongst all users.

3.1 Standard Policies in Design: UDP

Tracing back the history of accessibility, consequences of war had brought injured troops home which necessitated shelters to be re-thought concerning careful design, accomodating and supporting veterans for a prolonged quality of lifestyle as they aged. While the field of medicine saw intense advancements in the longevity of people treated with physical

impairments, this compelled awareness and reflection from the design fraternity to account for accomodations to the growing demands of such lifestyles.[37]

The nudge for equal rights in the government constitution gave rise to the concepts of user centric design, barrier-free and disability specific design.[38] As a result, the limelight was on the design community to create accessible and practical products and environments. When the 1970's saw barrier-free environments acting as a benchmark to meet the growing needs of people in wheelchairs, soon all products along with spatial design elements were designed keeping usability in mind where designers accounted for it from the fundamental stages of the design process. The seven principles of UDP were laid out by Ron Mace and the committee at the North Carolina State University in 1997.[39] UDP was used to take measure of current designs and were meant to act as guidelines to those working within the architecture, product and communications industry.

One of the core approaches taken by UDP designers is to understand if the design is appropriate in terms of its ease of use but this thesis maintains that it's also important to understand whether it provides the fundamental accountability of delight within the same as one of the promoted ideas. Through UDP, a varied group of people can be benefitted as the design strategy laid out pushes good designs that are likely to meet the needs of all the stakeholders that would eventually use it. It allows for appropriate use, and access irrespective of categories pertaining to abilities, age or gender.[40]

The Center for Universal Design and the National Disability Authority (NDA) classifies the seven principles of UDP [41] [42] as:

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[37] "History of UD," Universal Design, accessed August 28, 2022, https://universaldesign.ie/what-is-universal-design/history-of-ud/

[38] Elaine Ostroff, "Universal design: an evolving paradigm," *Universal design handbook* 2 (2011): 34-42.

[39] Ibid, 36.

[40] "What is Universal Design?" Center for Inclusive Design and Environmental Access, accessed September 1, 2022, https://idea.ap.buffalo.edu/about/universal-design/

[41] B.R. Connell, M. Jones, R. Mace, J. Mueller, A. Mullick, E. Ostroff, J. Sanford, E. Steinfeld, M. Story, G. Vanderheiden, The Principles of Universal Design, NC State University, Center for Universal Design, College of

- equitable use – evades segregation and stigmatization of users and promotes equal usage or access
- flexibility in use – endorses adaptability and accomodation with regard to the user's various conditions and needs
- simple and intuitive use – a basic and not so complex design that allows easy intuition when used
- perceptible information – guides the user to immediately navigate through little effort from the pictorial,tactile or verbal cues exhibited
- tolerance for error – Minimizes any accidental or hazardous consequences
- low physical effort – Sustains minimal effort to avoid fatigue through reptitive actions
- size and space for approach and use – supports ease of access to use the design for navigation regardless of the user's mobility

In addition to the UDP that implements equitable design for all, the ADA clearly standardizes guidelines designed for individuals facing disabilities and specifically lays out accessibility standards to be implemented. The ADA's aim was to accomplish an end to the isolation and segregation to individuals with conditions related to various user disabilities such like agedness, mobility difficulties, blindness, deafness in order to combat discrimination and elimination of their civic rights to equal participation.[43] Although prior to the ADA (passed in 1990), there were many more Acts that were passed prior to this such like the Civil Rights Act of 1964, 1968 Architectural Barriers Act (ABA), 1973 Rehabilitation Act, 1984 Uniform

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Design, Raleigh (NC), 1997. Available at:

http://www.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm.

[42] "History of UD," Universal Design, accessed August 28, 2022, https://universaldesign.ie/what-is-universal-design/history-of-ud/

[43] Miranda Oshige McGowan, "Reconsidering the Americans with Disabilities Act," Georgia Law Review 35, no. 1 (Fall 2000): 27-160

Federal Accessibility Standards (UFAS)[44] which all indicated the government's concern of people with disabilities and their civic rights. However, while all the Acts had a common scope of advocating providing fair access to building facilities, public spaces, institutions and guaranteed no tolerance for discrimination against individuals with any form of disabilities, the question revolves around "were these manuals strong enough to address the NS users too or (Fig.3.1) does a gap exist?" Did the Acts implement strong accessible environments only in terms of individuals facing mobility issues? As architects, how has it shifted our perspective towards implementing accessibility within the urban environment? Does the term "accessibility" only resonate with wheelchair-users?

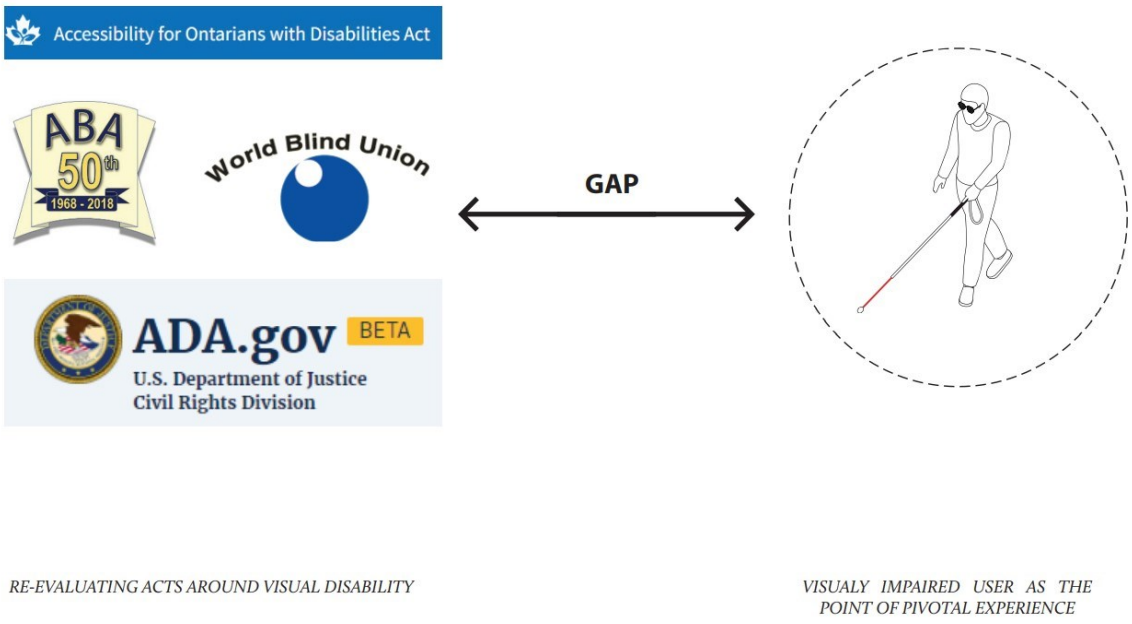

Figure 3.1 Addressing the gap between existing architecture and user

However, the IDEA Center (Center for Inclusive Design and Environmental Access) at the School of Planning from Buffalo University, have developed upon the UDP's ideas and has

[44] Aldousari, Ahmed, Abdulaziz Alghamdi, and Hassan Alwadei. "The 1991 Americans with Disabilities Act (ADA) standards for accessible design." *Am. Res. J. Humanit. Soc. Sci* 4 (2021): 59-62, https://www.arjhss.com/wp-content/uploads/2021/01/I415962.pdf.

added eight participatory goals (stated below)[45] in addition to targeting an approach promoting the need for a social, health and wellness-oriented design:

- Accommodation of all Body Sizes
- Comfort within a desirable and confined bodily function
- Awareness and ease of information being perceived
- Ease of understanding the methods employed
- Promoting Wellness and protection from diseases
- Social integration of all groups with respect
- Personalization through accepting and providing individual preferences
- Cultural Appropriateness

The above approach can be seen as adding supplementary layers that promote or compliment a more inclusive nature of design problem solving in accordance with the context of time. With old-dated principles and laws, one must ensure re-visiting them for constantly updating it based on its testing and gathered evidence. And for the NS users, we need to ensure how these policies have developed their architectural elements.

3.2 Standard Policies in Architecture: ADA

Below discussed are some approaches and policies listed as per the information provided on Chapter 7 titled *Communication Elements and Features* for the non-sighted of the ADA Standards from the U.S. Access Board's official website.[46]

- Section *703 Signs* mandates compliance with visual and tactile elements being provided and installed in a certain way. In terms of typography, section *703.2* lists

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[45] "What is Universal Design?" The 8 Goals of Universal Design, accessed September 1, 2022, http://idea.ap.buffalo.edu/wp-content/uploads/sites/110/2019/10/UDGoals_DigitalDistribution.pdf

[46] Americans with Disabilities Act Accessibility Standards," U.S. Access Board, accessed August 25, 2022, https://www.access-board.gov/ada/.

Raised Characters having a certain depth, case, style, character proportions, character height, stroke thickness, character spacing, and line spacing. *The Section of Braille 703.3* consists of braille instructions regarding the dimensions and capitalization of braille dots (Fig. 3.2) and rules on the usage of braille dimensions as shown in Figures 3.3,3.4 and 3.5.

Measurement Range	Minimum in Inches Maximum in Inches
Dot base diameter	0.059 (1.5 mm) to 0.063 (1.6 mm)
Distance between two dots in the same cell [1]	0.090 (2.3 mm) to 0.100 (2.5 mm)
Distance between corresponding dots in adjacent cells [1]	0.241 (6.1 mm) to 0.300 (7.6 mm)
Dot height	0.025 (0.6 mm) to 0.037 (0.9 mm)
Distance between corresponding dots from one cell directly below [1]	0.395 (10 mm) to 0.400 (10.2 mm)

Figure 3.2 Braille Dimensions (https://www.access-board.gov/ada/)

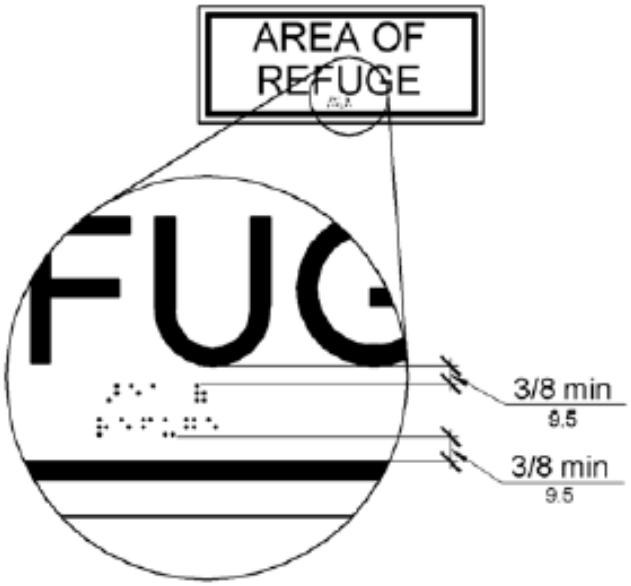

Figure 3.3 Position of Braille (https://www.access-board.gov/ada/)

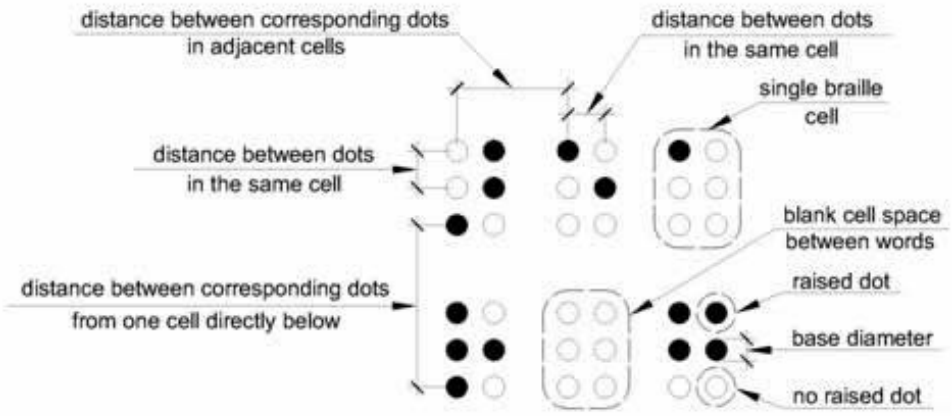

Figure 3.4 Braille Measurement (https://www.access-board.gov/ada/)

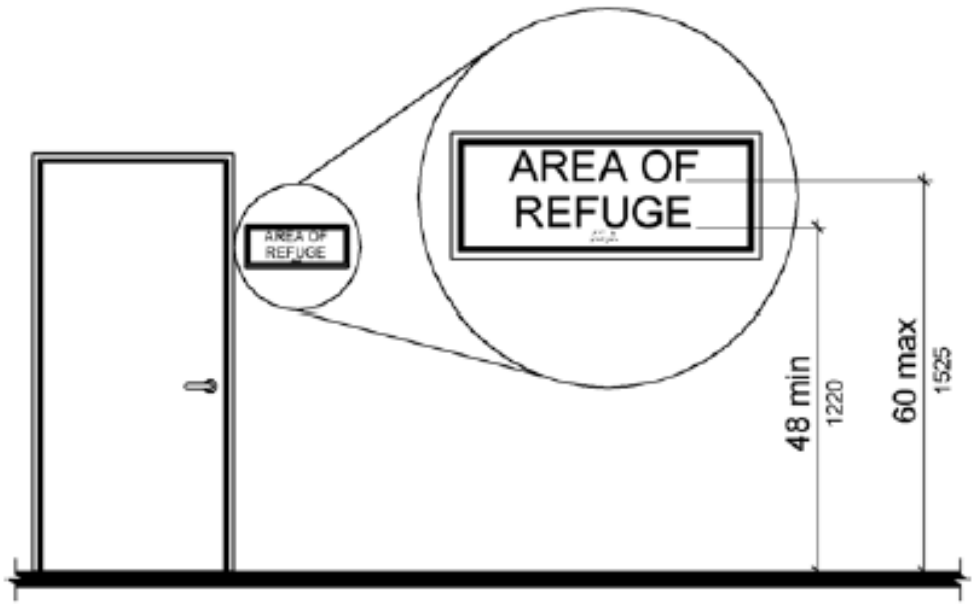

Figure 3.5 Height of Tactile Characters above Finish Floor (https://www.access-board.gov/ada/)

- Under Section 705 of Detectable Warnings, the sections 705.1.1 to 705.2 consist of measurements (Fig. 3.6) related to the dome size, dome spacing, contrasting of the domes (on light-on-dark or vice versa) and platform edges regarding the pavers installed.

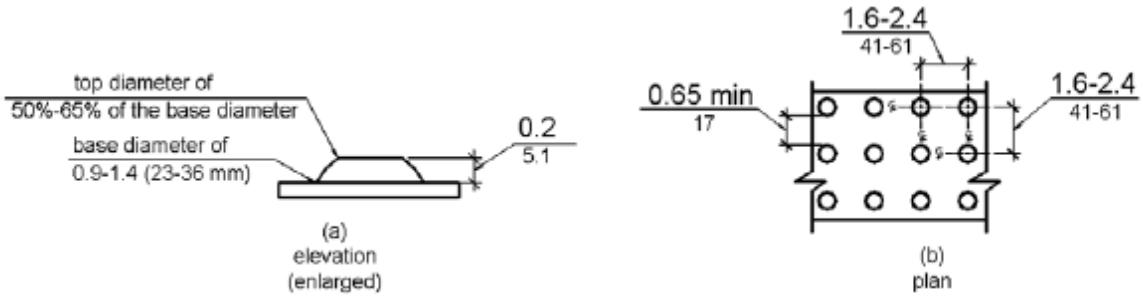

Figure 3.6 Size and Spacing of Truncated Domes (https://www.access-board.gov/ada/)

- Under Automatic Teller Machines and Fare Machines, a section discussing numerical function keys on machines lists *section 707.6.3.1* that covers about *Contrast* where the keys are to be made contrastingly visually evident from the base surfaces targeting a light-on-dark or dark-on-light design. Section *707.6.3.2 Tactile Symbols however have stated to add tactile symbols* to the keys for enter, clear, cancel and so on.

The ADA acts as a fitting standard for accomplishing code-compliant spaces for people experiencing disabilities. However, given within the context of the NS, the standards lean towards avoiding unwanted projections, extrusions, rapid elevation changes, slip-free floors, indication of hazards and obstacles, and other interferences that can possibly harm a NS user. NS users within the partially sighted section also do benefit from the standards by having high contrast signages against a backdrop as stated within Section 705 and 706.

3.2.1 Existing Navigation Aids for the NS

The existing navigation aids (Fig.3.7) shows the scenario of the present aids with concern to the NS's navigation within an urban environment.[47] [48] [49]

- Human Guide - a person who provides travel assistance to a NS person by helping them to navigate safely from one place to another. The human guides use a variety of orientation and mobility skills to help the NS user navigate.
- Guide Dog - Professionally trained to guide NS people to navigate their destination by avoiding obstacles and indicating hazards. They are also known to impart independence and enhance confidence.

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[47] Hellen Keller Services. "Human Guide Techniques." Accessed August 31, 2022. https://www.helenkeller.org/hks/human-guide-techniques

[48] Braille Institute. "Human Guide Techniques." Accessed August 31, 2022. https://www.brailleinstitute.org/wp-content/uploads/2020/06/Braille-Institute-Human-Guide-Techniques-Accessible-Final-2020-0612.pdf.

[49] CNIB. "Getting around." Accessed August 25, 2022. https://cnib.ca/en/getting-around?region=on.

- Assistive technology – There is a widespread use of the Global Positioning System (GPS) and navigation among the NS for wayfinding. It is, however, used in conjunction with a cane or guide dog. Screen readers, braille-enabled devices, and voice recorders enable them to enhance their quality of life.[50]
- Cane – primarily used by NS to navigate through their surroundings. They aid in detecting obstacles, depth perception, and changes in terrain to safely navigate their way through. Typically used canes by the NS include the identification canes, long, canes, and support canes.
- Tactile Tiles – Originally known as Tenji blocks developed by Japanese inventor Seiichi Miyake in 1965, [51] these textured ground surface units are detectable surfaces used to warn the non-sighted user.[52]

[50] American Foundation for the Blind. "Technology Resources for People with Vision Loss". Blindness and Low vision. Accessed August 31, 2022. https://www.afb.org/blindness-and-low-vision/using-technology.

[51] Perkins School for the blind. "Fast Facts About Tactile Pavement." Accessed August 31, 2022. https://www.perkins.org/resource/fast-facts-about-tactile-pavement/

[52] Henshaws. "What do tactile pavements tell us?" Last modified March 29, 2017. https://www.henshaws.org.uk/tactile-pavements-tell-us.

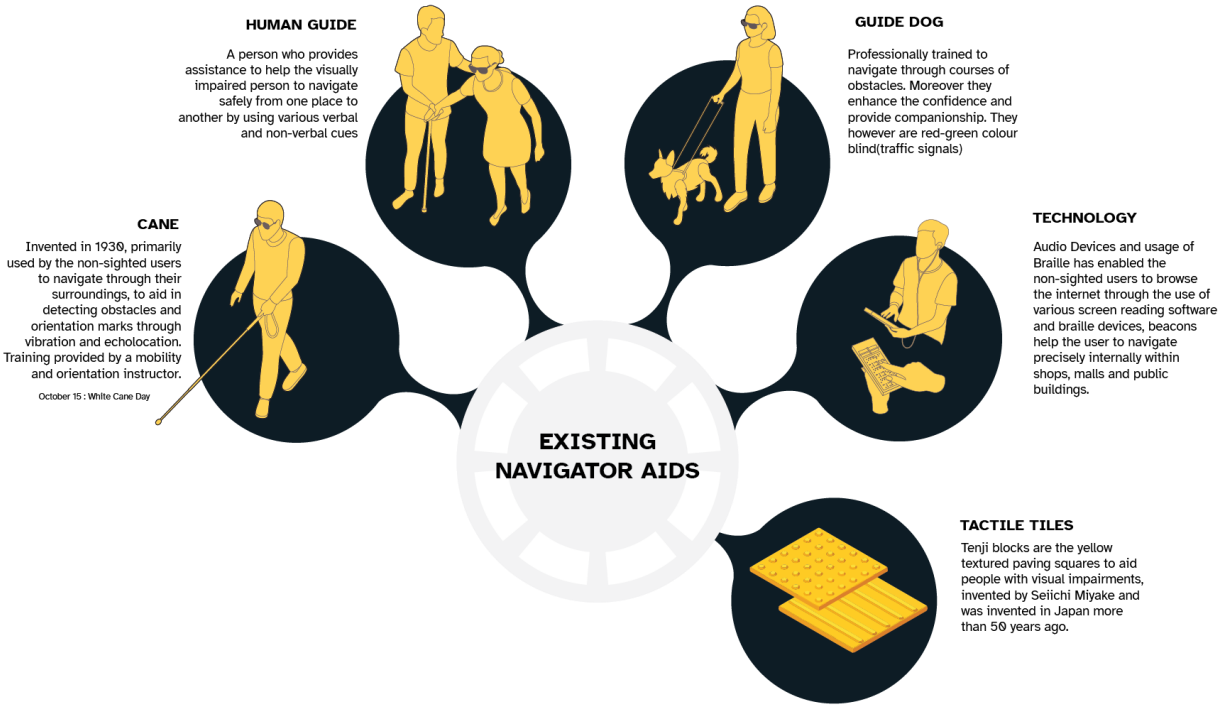

Figure 3.7 Existing Navigator Aids for the Non-Sighted

3.3 Tactile Pavers and Uses in Urban Infrastructure

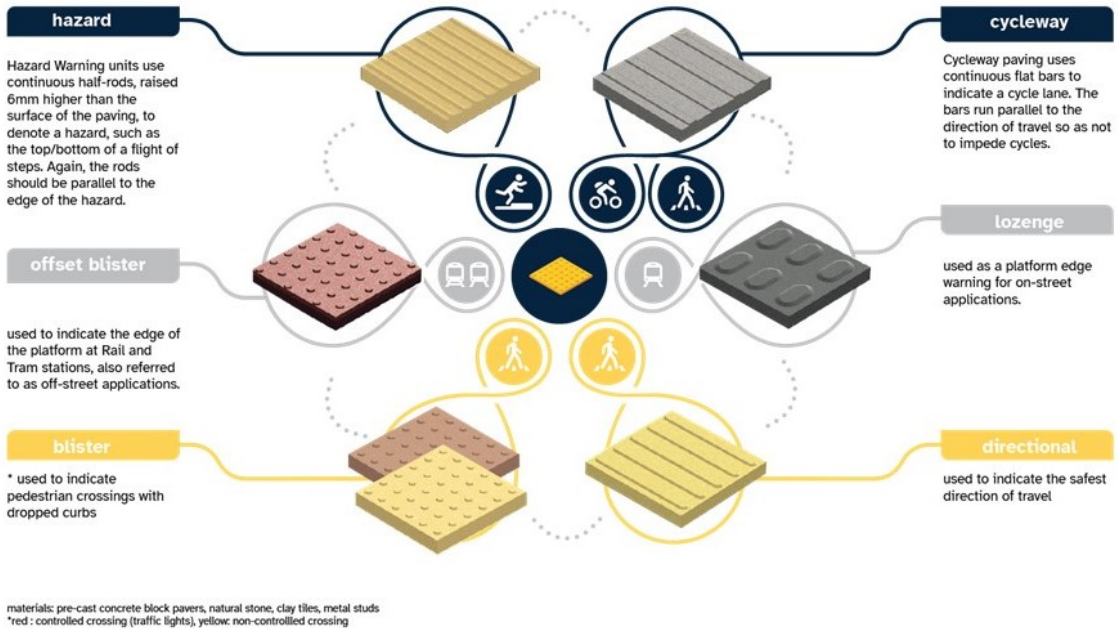

Figure 3.8 Adapted from Existing Tactile Pavers Typology (https://www.pavingexpert.com)

Considering the catalog of all the existing pavers (Fig. 3.8) provided by a paver block company based in England, there exists six basic types of paver blocks[53]:

1. *Blister* – These circular patterned pavers are used to indicate pedestrian crossings with dropped curbs. Blisters are usually made from concrete, stone, or clay and can even have metal studs on them.
2. *Directional* - Used to indicate the safest direction of travel parallel to the walking route on a footpath. The raised flat bars on the paving have rounded ends that run along the surface of the tile.
3. *Offset Blister* – Similar to Blister Pavers, the offset blisters indicate platform edges at Rail and tram stations and the row of blisters on the pavement must be parallel to the

[53] Pavingexpert. "Tactile Paving." Accessed August 31, 2022, https://www.pavingexpert.com/tactile01.

platform edge, hence their orientation is critical. They are laid at an offset of about 500mm from the platform edge.

4. *Lozenge* – used to denote platform edges for on-street applications. Each strip of tile is ideally 400 mm wide and the lozenge shape on the tiles are 150 * 25 mm.
5. *Hazard* – denotes hazards, used to indicate top/bottom of stairs. The rods which are raised 6mm (about 0.24 in) above the surface of the paving must be aligned parallel to the edge of the hazard.
6. *Cycleway* – This pavement denotes a cycle lane and uses flat bars that run parallel to the direction of travel. Each flat bar is about 30 mm wide and there is a gap of 70 mm between the two adjacent ones. They are aligned parallelly to not impede cyclists. Sometimes the cycleways are used in combination with directional pavers too to separate walkers from bikers.

Fig. 3.9 shows some examples where the pavers are used. Blister paving is used in controlled crossing environments. Pedestrian crossings on the highway that are light controlled often tend to use red blisters whereas the non-controlled crossings use either a buff or a natural grey variant. Offset Blister paving, a derivative of blister paving is extensively used in Railway station platform edges. While blister tiles are used in station applications, Lozenge tiles, on the other hand, are increasingly used in non-station applications like Bus Stops and Light Rapid transit (LRT) platforms e.g., trams. Besides these standard tactile pavers, certain others are primarily used for wayfinding and navigation. For instance, the directional tactile pavers serve as guidance units and are often used to guide people in public places along sidewalks. Their alignment reflects the direction of travel. The hazard warning paving, also known as Corduroy paving, is used for flights of steps, and positioned at the top/bottom of the stairs. They warn the users of potential hazards in the adjacent vicinity. Cycleway paving is used in projects where there is a frail demarcation between the cycleway and footpath. They indicate, as the name implies, cycle lane can also be used to denote a pedestrian section if the tiles are placed transversely.

Figure 3.9 Spaces where tactile pavers are used (https://www.pavingexpert.com)

It is understood from the above examples that tactile pavers are constantly used for warning obstacles in the path of travel and indicate changes in orientation. They functionally warn the NS users and convey information regarding navigating the environment around them. However, such tactile pavers, as is evident from their deployment in various locations above suggests their installation normalized for navigation within an urban architectural infrastructure solely seen within transit, road crossing, accommodations, and footpath areas. The Title II of the ADA does state that the NS should enjoy complete access to "goods, services, facilities, privileges, advantages, or accommodations" [54] that are set in provision by the government or public property. As an architect, when it comes to recalling the installation of these pavers within places of leisure and recreation, one may not be able to list as many

[54] "Disability Rights Resources for People with Vision Loss," American Foundation for the Blind, accessed August 25, 2022, https://www.afb.org/blindness-and-low-vision/disability-rights/advocacy-resources/disability-rights-resources.

examples. Thus, it questions the limitations of the NS users' access to parks, gardens, waterfronts, boardwalks, and markets. The question of exploring and addressing the barriers faced by the NS users within these typologies are crucial since besides navigating through the city via public transit, we may question "are they able to enjoy areas like parks or markets without any hesitation for navigation" and "are there simpler strategies within architecture that may be used to bring delight for them?". Besides the ADAAG (Americans with Disabilities Accessibility Guidelines) stating all the facilities mandating access for the NS by imposing braille signages in terms of its design and contrast,[55] are these misleading architects into thinking the code as 1) either an optional, add-on requirement OR 2) as the bare minimum to be satisfied to check accessibility standards for the NS?

Stuart Knoop in his paper titled "Architecture for the Low Vision" presented at a symposium to the National Institute of Building Sciences Low Vision Design Committee concludes that both the ADA and ABA do ensure guidelines in terms of the NS. However, the built environment caters more to the S users compared to the NS, where the NS navigates through the listed few accommodations that may or may not in some cases work for the partially NS users.[56] As an example, he further highlights the case of glare created by light due to reflective surfaces which hinders circulation for the partially NS users.

The existing ways of how pavers are used in a code compliant way can be a starting observation on how the *Sighted* designs for the *non-Sighted*. As Heylighen mentions, "disabled people are able to appreciate spatial qualities that architects—or other designers—are not always attuned to".[57]

We may perhaps start answering this by introducing a set of basic inclusive design strategies for the NS that complement the existing architectural typologies and use the same

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[55] Ibid.

[56] Knoop, Stuart L. "Architecture for low vision: *Site, Building and Interior Design".* Low Vision Design Committee (2013): 1-6, https://www.brikbase.org/sites/default/files/Architecture%20for%20Low%20Vision%2011-28-12.pdf.

[57] Ann Heylighen, "Challenging prevailing ways of understanding and designing space," in Spatial Cognition for Architectural Design SCAD 2011 Symposium Proceedings, ed. Bhatt, M et al (2012), 23.

as a starting point to create a new language that is predictable enough for easy navigation. At the same time, nod in affirmation to Pallaasma's recommendation of evoking the *being* in relation to the whole spatial environment through awakening our senses.

3.4 Case Studies

In this section the thesis will look at several existing buildings and implementation strategies to understand the shortcomings of the simple application of current code-based design decisions more fully. These examples will be seen to highlight the gaps in this basic approach to design for the NS that will be used to examine opportunities for interventions to improve the overall situation for the NS.

3.4.1 Accessibility Problems at Toronto Metropolitan University by David Lepofsky

In Ontario, The Accessibility law governs the design of public spaces and was passed by the Ontario Government in the year 2005 with the goal of making Ontario accessible by 2025 (A Guide to the Integrated Accessibility Standards Regulation – Ontario, 2014). These standards mandate the identification, prevention, and removal of barriers to ensure that people with disabilities have more active participation and opportunities in daily life. These regulations are to be enforced by businesses and organizations that provide goods, services, or facilities in general to the public.

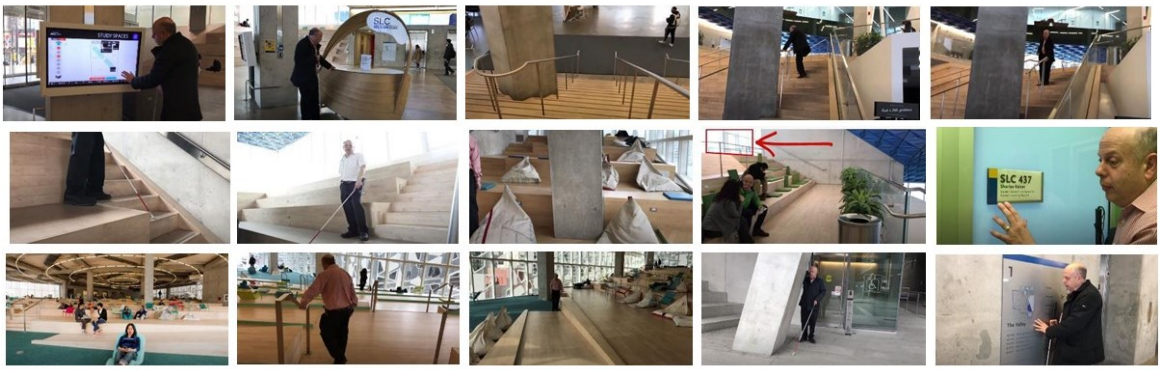

Figure 3.10 Collage of accessibility issues at Toronto Metropolitan University by David Lepofsky

The Accessibility laws, however, becomes insufficient compared to the standards required to ensure the creation of barrier-free public spaces. Also, the design professionals lack the essential information to ensure that the recurrent accessibility problems are addressed effectively. Accessibility takes a back seat while designing and is evident in the indifferent approach to including accessibility features. For instance, the Student Learning Centre at Toronto Metropolitan University (formerly Ryerson University) has several accessibility problems as pointed out by David Lepofsky, a prominent lawyer, and a disability advocate.[58]

Some of the issues as Lepofsky points out are (Fig. 3.10), the main lobby in the building has an angled staircase (Fig.3.11 left), hangouts steps that are inaccessible, and an electronic kiosk lacking essential accessibility features. The sixth floor, also designated as the beach area, has a confounding route to navigate (Fig.3.11 right), and a maze-like ramp with no railings (Fig.3.12 left), the same pattern is even followed at the building's front facade. Navigating or directional wayfinding is non-existent in the building, moreover there is a lack of directional signage in the building to indicate the availability of a washroom or an elevator. No braille signage to tell apart the men's and the woman's washrooms. Another significant design pitfall is the presence of columns at the seating areas or entrance (Fig.3.11 right), angled pillars, and trashcans in ramps which violates even the rudimentary requirement of avoiding obstacles at any height in the path of travel. Inconsistent positioning of power doors throughout the building premises also adds to the confusion.[59]

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[58] "Accessibility Problems at Ryerson University Student Learning Centre (Long Version)," AODAalliance, October 29, 2017, video, 31:57, https://www.youtube.com/watch?v=uqUZ6gK9N9k&t=1429s&ab_channel=aodaalliance.

[59] Ibid.

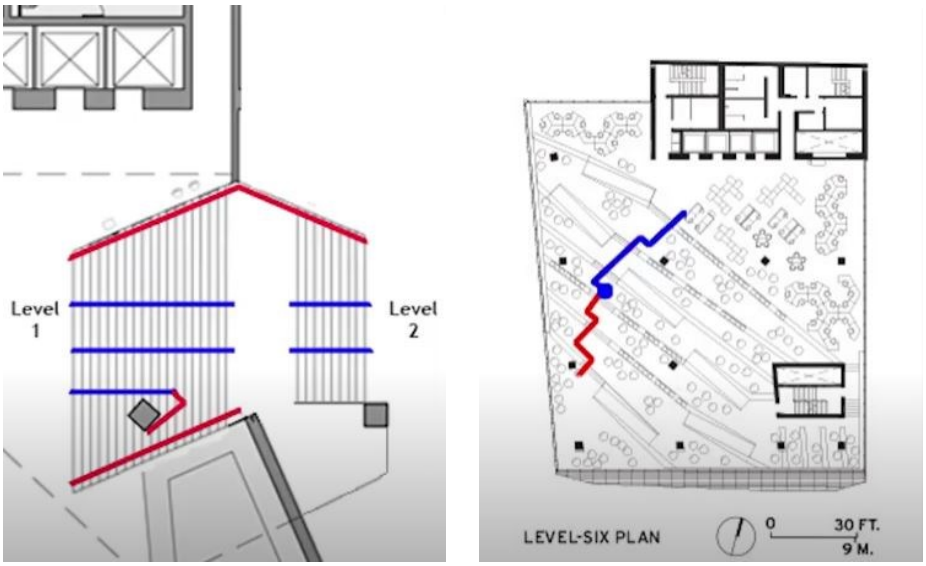

Figure 3.11 (left) Non- ergonomic Angularity on side walls causing staggered treading upward and downward for an NS using handrail (right) beach area on 6th floor shows a confounding route

Figure 3.12 (left) Beach Area ramp on 6th floor shows a prolonged ramp route for an NS user (right) unwanted columns at the Beach seating area acting as a hindrance for the NS

The building, despite all its drawbacks, won the 2011 Canadian Architect award of Excellence, Lepofsky mentions. This questions the motto behind architects adhering code as a measure of ensuring order but not to the extent of guaranteeing equitable access to the NS as per the Ontario Human Rights code. This may beg the difficult question “should some buildings be exempt from creating a quality experience for the NS?” The odd geometries for which some architectural practices have become famous pose greater challenges than more standard approaches to design.

3.4.2 Is Code an Extra Fix?

Most of the accessibility “fixes” are not only substandard but ends up counteracting the architectural identity of the building.[60] The stairs at the Brunel University (Fig. 3.13) for instance, reveal the indifferent approach to addressing accessibility. They do not ensure easy accessibility to the green space around the campus. The retrofits to address the inequity have led to the creation of absurd ramps and curb cuts. This highlights that though accessibility codes exist in place, disability is still viewed as an unforeseen and an uninvited presence.[61] The ramps here have several drawbacks, first, they lead directly to the base of a tree. Secondly, they are arranged crossways, which leads to a part of the staircase (about 25 feet wide) being made unusable and finally, the ramps themselves are made of steel and seem like a stopgap arrangement against the concrete steps.[62] Instances of ramps being added to the side or the back of a building, to meet the requirements of various specifications, lead to buildings being retrofitted to accommodate disability. This indicates the reality that disability is merely an afterthought.[63]

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[60] Jay Dolmage, “From steep steps to retrofit to universal design, from collapse to austerity: Neo-liberal spaces of disability,” in Disability, Space, Architecture (2017), 108.

[61] Ibid,108.
[62] Ibid, 107.
[63] Ibid, 105.

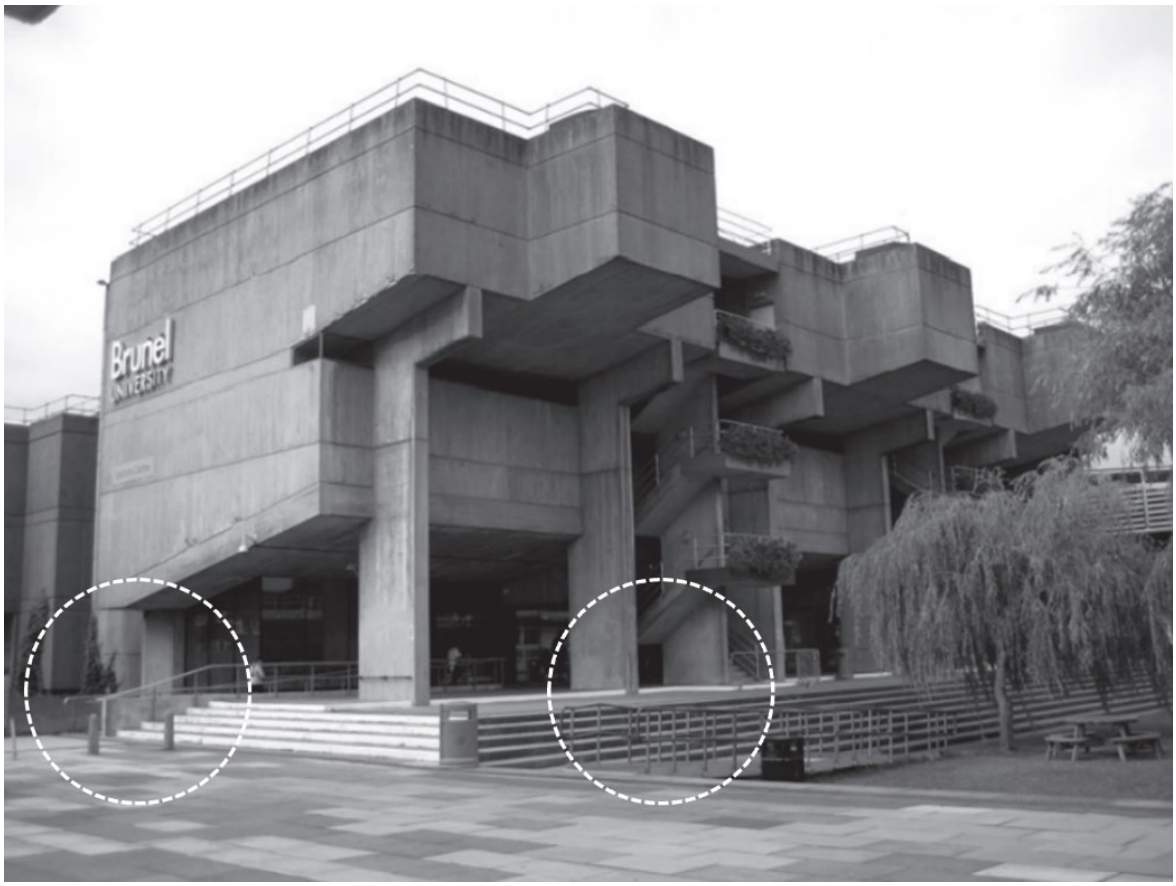


Figure 3.13 Stairs at Brunel University, UK

The access to the M Leuven Museum in Leuven (Belgium), designed by a Belgian architect firm, Stephane Beel, is an illustration for the challenges faced during inclusive design. This is an instance of a disabling situation for NS users created by the built environment. The main entrance (Fig. 3.14) was designed in such a way that designers must descend to enter the museum.[64] The design symbolizes accessibility to all people by integrating stairs and ramps that cross each other. The design strives to strike a balance between the able-bodied

[64] Ann Heylighen, "Challenging prevailing ways of understanding and designing space," in Spatial Cognition for Architectural Design SCAD 2011 Symposium Proceedings, ed. Bhatt, M et al (2012), 31.

and wheelchair users. Heylighen however, concludes that the implementation results in the design being a hindrance to users with visual impairments.[65] The ramps cut across the flight of stairs resulting in the handrail being interrupted, which confounds the NS user to find the next banister. This coupled with the light-colored stones of the stairs makes it difficult to distinguish the adjacent stairs. During sunny weather, the stairs give a perception of a "white inclined plane".[66] It is evident that though the architects adhere to the accessibility standards, their innovative approaches often may fall short of the benchmark in practical situations.

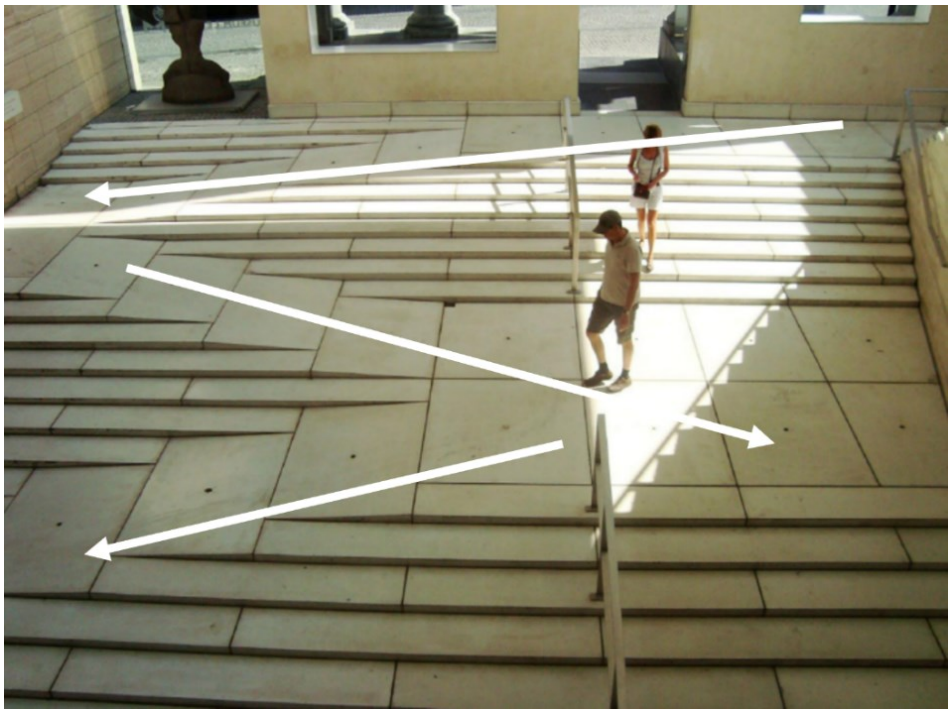


Figure 3.14 Entrance to Museum in Leuven, Belgium

[65] Ibid, 32.

[66] Ann Heylighen, Valerie Van der Linden, and Iris Van Steenwinkel. "Ten Questions Concerning Inclusive Design of the Built Environment," *Building and Environment* 114 (2017): 512. https://doi.org/10.1016/j.buildenv.2016.12.008.

A 2005 survey conducted in England, undertaken by the government, reveal that in about 58 percent of the cases, there were installation problems relating to either the wrong color, or incorrect warning pattern being detected on the tactile pavements.[67] In 2001, the central government of China passed a regulation that mandated 'blind paths' to be built across major cities.[68] Their aim was to facilitate the NS users navigate safely around the city using textured tiles. Their implementation, however, was inconsistent with the pavers being misused (Fig. 3.15).

[67] Marianne Loo-Morrey, "Tactile Paving Survey," Health and Safety Laboratory, January 28, 2005, https://www.hse.gov.uk/research/hsl_pdf/2005/hsl0507.pdf

[68] Colin Rowan, "Blind lanes in China," *Transplant*, July 27, 2012, https://psuchina.wordpress.com/2012/07/27/blind-lanes-in-china.

Figure 3.15 Examples of Compliance becoming Inconsistent with introduction of code in China

Various decorative patterns and zig zag paths were created using tactile pavers.[69] This defeats the entire purpose of the installation of such tiles. Illicit use of such initiatives can be outright deleterious, especially in scenarios where path of travel coincides with immovable objects like ledges and trees. In this example, we see code being introduced instantaneously outputting a mishap where code becomes inconsistent. Purely adhering to building codes and accessibility standards will not help attain the desired outcome of a refined UDP. This could be attributed to differences in perception of a space among the S

[69] Kurt Kohlstedt, "Death by Tactile Paving: China's Precarious Paths for the Visually Impaired," 99% invisible, March 2, 2017, https://99percentinvisible.org/article/death-tactile-paving-chinas-precarious-paths-visually-impaired/

and their NS counterparts. It thus becomes important to create a better understanding of how diverse groups interact with and experience the environment. Awareness of the same should be promoted within the architectural industry. It is apparent through the examples of misused tactile pavers that neither their purpose nor unique meanings have been understood as they were incorporated into the design.

Could design strategies be improved and made more straightforward that could work in conjunction with the code? While code importantly accommodates the NS in a pragmatic manner within navigating through the urban environment, there seems to be a missing spatial quality that is lost for the users, which is- lacking delight, this unfolds in executing the bare minimum to achieve access.

3.5 Possible Approach

3.5.1 Implementing a Sensory Enhanced Design

The intervention of enhancing space through the usage of contrasting colors, atmospheric qualities, textural differences, undulating surfaces and different materials, give rise to conscious spatial decisions that encompass and promote a social and emotional dialogue amongst the users and their engagement with the space. These add layers of dimensionalities that can have a positive impact on the participation of the NS and S users together. And by architecturally integrating all the senses, the atmospheric quality of a space can indeed impacts a positive participatory experience for a NS as well as a S user.

Some examples can be seen in (Fig. 3.16). The warm reds and cool blues within the painting by Bramblitt (a NS painter) takes contrasting colors into account which contributes having a strong control over how one experiences the space visually and emotionally. In the case of NS users, individuals with partial sightedness can differentiate the contrast easily. The Hazelwood school (designed by Alan Dunlop) for the NS and individuals with hearing difficulties incorporates a trail route through its textural corridor walls to guide the students

for navigation and orientation.[70] As an alternative for railing, the design adds a tactile quality of the wall cladded in cork which provides warmth and comfort while touched at the same time informing the user of their location due to textural variations. The sports complex by Alvaro Siza incorporates thermal cues through punctured holes within the roof of the pool thereby allowing sunlight to penetrate to the interiors.[71] The feeling of light upon the skin and likewise with the temperature of water allows an experiential quality for the swimmer. Smell, another important sense is highlighted within the project of the Chocolate Room designed by Edward Ruscha[72] where users could associate a melting chocolate almost easily upon entering the room. And the most highlighted sense for an NS, the sense of sound within architecture is played within the Anechoic Chamber where the walls contain angular modules protruding throughout the room that make the slightest bodily movement evident.

[70] Marco Rinaldi, "Hazelwood School Glasgow by Alan Dunlop Architect." Aasarchitecture, September 30, 2016. https://aasarchitecture.com/2016/09/hazelwood-school-glasgow-alan-dunlop-architect/

[71] "The Sport Center in Panticosa by Álvaro Siza: Images of Abandonment," Arch Daily, accessed August 25, 2022, https://www.archdaily.com/962376/the-sport-center-in-panticosa-by-alvaro-siza-images-of-abandonment.

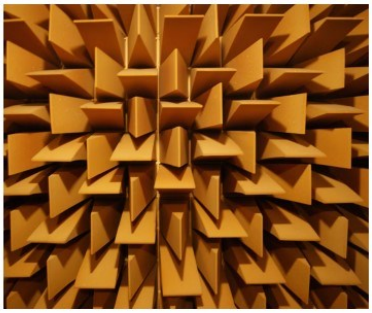
[72] "5 Architectural Spaces Designed to Stimulate Your Senses," Architizer, accessed August 25, 2022, https://architizer.com/blog/inspiration/collections/the-architecture-of-perception/.

A Painting by blind Artist JOHN BRAMBLITT

Hazelwood School, Glasgow, ALAN DUNLOP

Chocolate Room, American Pavilion,Venice 1970 EDWARD RUSCHA

Sports Compelx,, Spain| ALVARO SIZA



Anechoic Chamber, South Bank University, London

Figure 3.16 Intervention of enhancing space through Colors, Illumination, Textures, Heat, Sound and Balance

Figure 3.17 Image of student and consultant from Raymond Lifchez's class. Rethinking Architecture: Design Students and Physically Disabled People.

3.5.2 Learning from the users

One such instance of a daring initiative to consider the aspects of people who experience space differently was introduced by Raymond Lifchez, a professor of architecture at the University of Berkley, who developed a course in the 1970's that was a collaboration between people with disabilities, including students, instructors, and guest visitors. This program (Fig.3.17) facilitated the students to gain insight into the world experienced by the people with disabilities and in turn transformed the people with disabilities into experts.[73]

In conclusion, the built environmental community has undergone development of various targeted design schemes accounting disability studies and related circumstances of its users within architecture. With UDP and ADA forming as initial standards described to

[73] Wanda Katja Liebermann, "Teaching embodiment: disability, subjectivity, and architectural education," The Journal of Architecture 24, no. 6 (2019): 803-828. https://doi.org/10.1080/13602365.2019.1684974.

combat equity for all, they do give us an understanding of the existing and developing policies in terms of the approaches made within the built environment. The code compliancy has made it possible to venture an initiative directed towards accessibility, but this thesis specifically questions and narrows down the concern of whether has the NS benefitted with interacting these design solutions at all. If yes, to what degree?

Although architects have long been charged with the design of programs that may lie beyond their range of personal experiences, this may have inadvertently resulted in a biased route of designing for the Non-Sighted by the Sighted (for the NS by the S). Where architects have valued the experiential in design, it has been highly skewed towards visual aesthetics and experiences. In the process however, we must have forgotten to envision the quality of space that would be perceived by a non-ocular-centric view. We may have taken visions that are utilitarian in nature and imposed it onto design, expecting it to work its capability by not primarily evidencing from the NS users and secondarily *through us* as our own channel of communication. We may have lost the inspiration to provide delight for the NS users, and it is imperative we understand how by simpler methods it might be possible to accommodate the same in conjunction with the existing practices within the urban infrastructure. This becomes necessary and a set of design strategies will be discussed in Chapter 5 that takes its inspiration from my own personal experiences which would be listed in Chapter 4.

Chapter 4
Personal Spatial Experiences

For various reasons the methodology used in this thesis chose to use my personal experiences as the basis for the exploration of the thesis problem. It was not possible due to constraints of the COVID-19 pandemic to otherwise engage or interview non-sighted people. As much as stated before within the introduction, the experiences noted below come from my limited abilities to garner or associate myself with a person experiencing visual difficulties. A little exposure to my aunt's experiences and conversations has been the driving force but the experience of navigating the below sites would allow me to imagine a world from a different vantage point.

As an architect and reflecting upon the design decisions made by us through our design approaches, it became important to use myself as the user or rather a vehicle to address the question of "what type of design brings delight to myself as I navigate through mundane places within the urban archetypes?". I transformed myself into an altered personality stripped off my visual ability, and walked through sites within Waterloo, Ontario, only holding on to my Buddy's (B) arm.

The sites chosen to navigate focused on the outdoors as well as more complicated interior environments that provide wayfinding challenges to the non-sighted often to the point of excluding use. It excluded the more standard situations of entrance/exit and situations already the primary focus of existing code requirements.

4.1 Laurel Trail

Dubious at my first encounter of navigating through a trail with closed eyes, I grasp my B's arm casually in the confidence that I do have human guide. As I tread upon different levels of uneven footpath (Fig 4.1), my feet sensed various tactility beneath my feet cushioned by my shoes.

Figure 4.1 Typology of inconsistent footpath found

It is interesting to notice how unlike a casual walk, my feet's receptivity to each surface sent signals to my mind intermittently questioning my B about the quality of the footpath. At times, the unevenness caused me to stumble or disorient my navigation with an automatic reflex of opening my eyes. It was not easy as I initially thought. A difference of 5 mm caused the hesitation of walking straight. My biased confidence from my visual perception had started to play its role already.

Before we turned left on my affirmative nod to my B upon entering the Laurel Trail in Waterloo, I smelled wet wood confirming the humid quality of the temperature. An olfactory clue? I heard a signal beep. An auditory landmark?

Could the smell's asymmetrical presence guide me towards my destination? But without my B's nudge of pushing me left, I would never know the presence of this delightful trail. My feet

caught no information of a trail besides the bumpy tiles on the right that indicated a controlled pedestrian crossing. There was an immediate atmospheric alteration as I walked deeper into the trail. The rev produced from the vehicles' engine and its tires constantly clashing against the manholes on the road became distant. The sounds became replaced with the presence of the stream on my right – its ripples were clear to my ears. I could sense the trees heavily rooted on my left side as the wind's gush felt more harsher on my exposed right hand and there was no obstruction whatsoever hindering its flow on my skin. The sensation beneath my feet was a mixture of - a sturdy grip that contained confidence when stepped on concrete, the confidence reduced when stepped on grass and uncertainty when stepped on dry grass. Besides the path leading me to walk straight, the presence and proximity from the foliage indicated a certain directionality. A biker swept past me immediately, moments before my B pushed my arm treading right to avoid being hit. Again, no tactile indication of a biking trail. I heard a goose cross my way of walking. My B corrected me that was a family of geese who later enjoyed a swim in the stream. Although the presence of water, the birds chirping and the wetness of the foliage had brought a sense of calm within me, I questioned my quality of navigation, moreover its safety. I mapped my experiences within a schematic diagram (Fig. 4.2) followed by the photos in Fig 4.3.

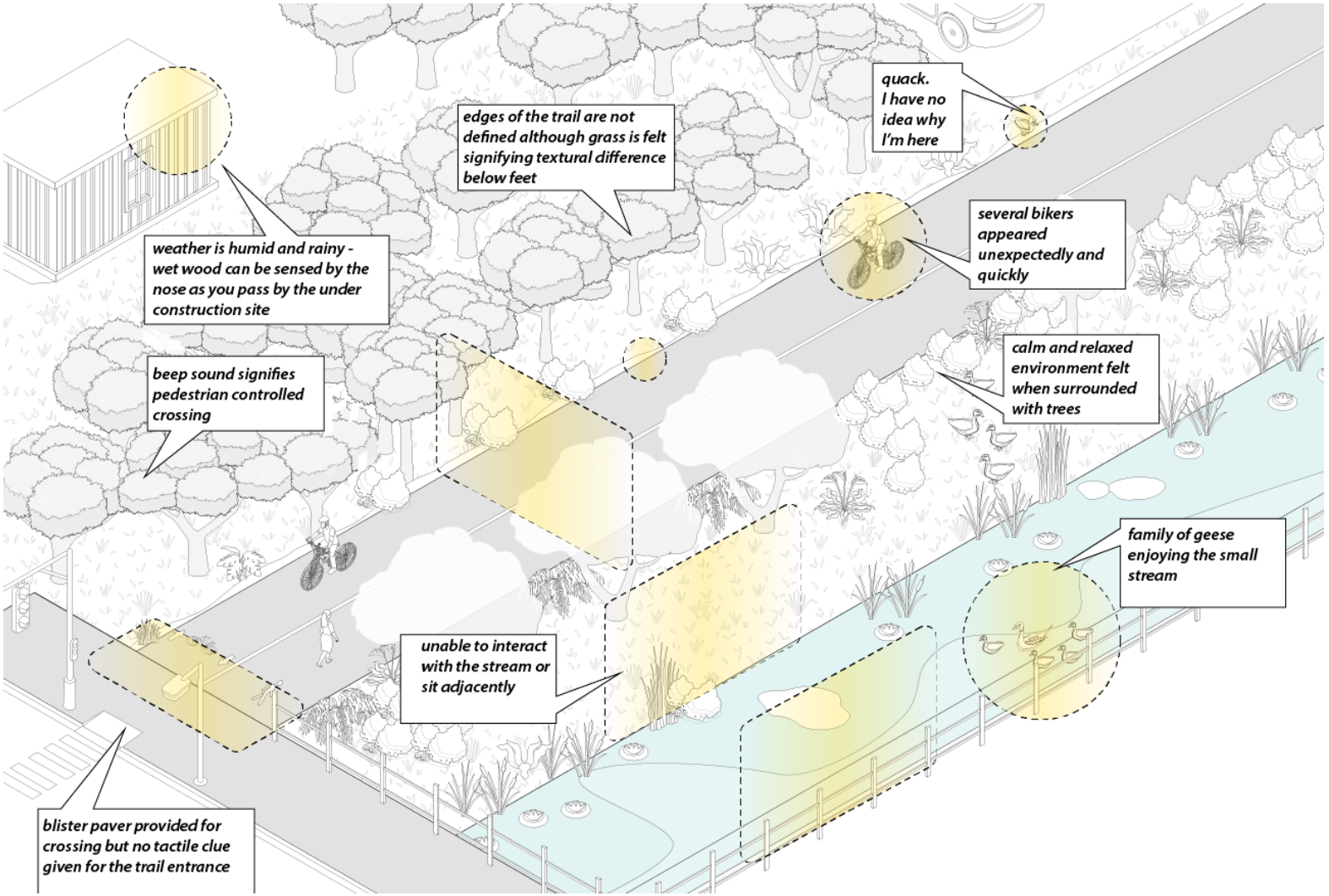


Figure 4.2 My interaction with Laurel Trail

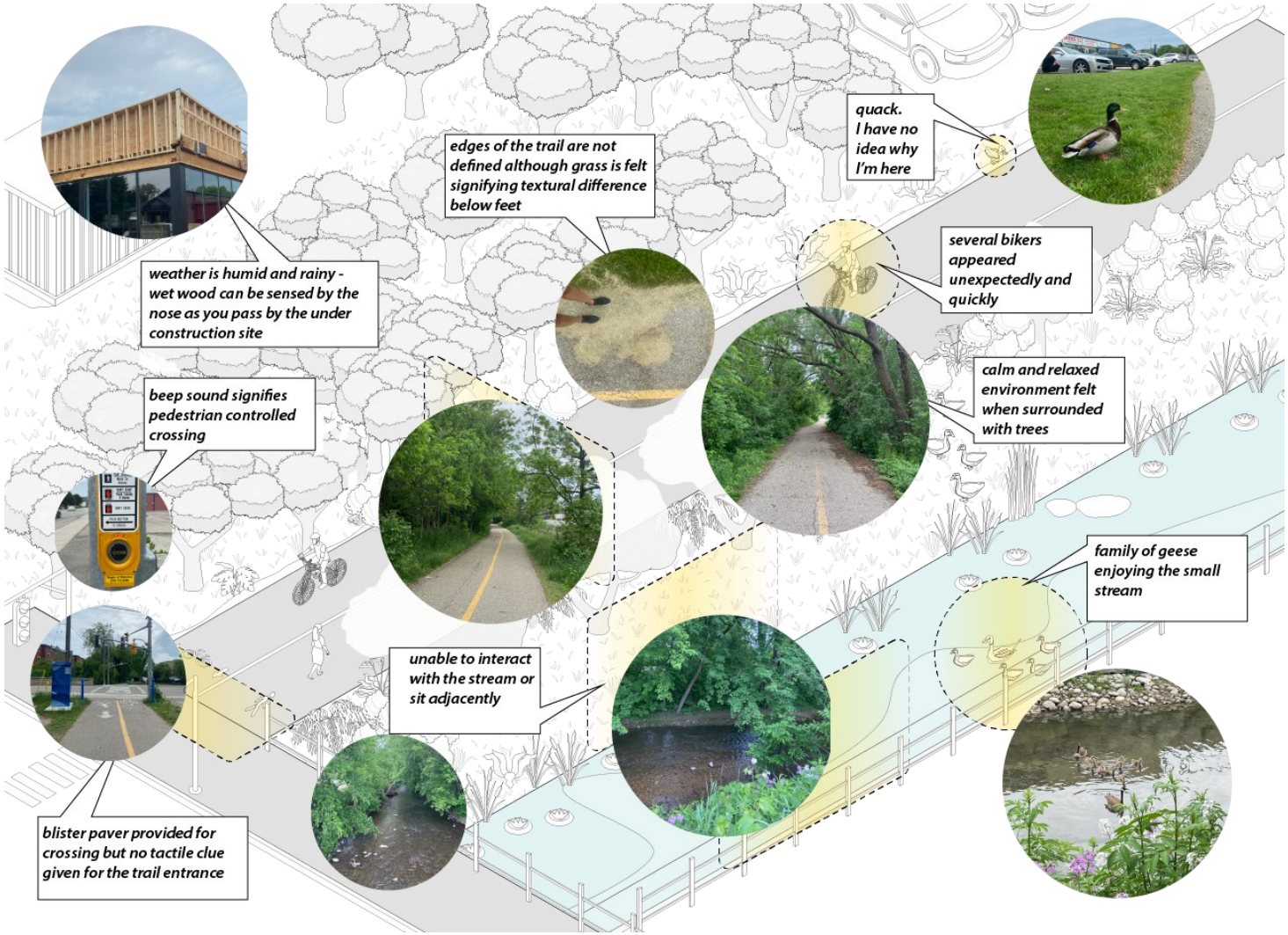


Figure 4.3 Collage of pictures around Laurel Trail

4.2 Walmart Supercenter

As I continued walking on a straight footpath, gravity meandered me towards the road. Little did I realize the slope meant for vehicular entry towards the supermarket's parking lot had thrown me off balance. While walking through the parking lot, my body sensed the familiar temperature hike registering in my mind "it is a hot summer day of 20 degree." My usual inclination as a sighted self would hunt for shadowed areas immediately although now to orient myself in relation to the whole place was challenging since there was no sense of directionality whatsoever. I followed my B who proceeded to a shadowed area that provided relief from the heat. I felt my hair sway across my cheeks; the wind felt sharper on certain junctions before entering the store. I heard a goose. Although this time it was above my head. My friend corrected me yet another time, "geese – flying in a V-formation." My dress fluttered in a certain direction due to the steep directionality of wind produced by the complex's presence of other stores. The ubiquity of people was evident. Conversations about loading and unloading, laughter, light footsteps, jiggling of keychains, trolley wheels sweeping across the parking lot amidst moving cars. But then again, I realized I was compounded by my previous memories of a space that I am very habitual to. Almost immediately, I attached former storylines of my visits to the store and created a mental map of what is to be expected. A synopsis of a habitual circulation to prevent unwanted surprises.

I clenched my B's right arm tightly upon entering the Walmart Supercenter's transitionary space where the fans above cool the customers down before entering the main shopping area. Fear of confinement swept me as the wind was absent and I heard people chat clearly, cashiers beeping heavily within the air-conditioned environment. A part of my brain quickly altered its preferences of navigation where I became aware that henceforth it is no more a trail or an open space. An architectural conventional taxonomy of aisles, trolleys, carts, columns, shelves with sharp edges accompanied with people roaming in different walking speeds hammered me (Fig.4.4). I stood still but my B guided me starting with the fruit's aisle. Apart from several sounds created by fidgeting with the packeted products, I could hardly confirm the product exhibited within. With the experience being so different from the trail's wet grass, mud and freedom of movement, I schematized and conceptualized the store in an undelightful mode beforehand. As my fingers continued exploring the vegetable section, the wetness sprinkled on certain leaves soothed me as I related it to touching dewy grass. But again, my body became cautious as I became aware of a metal trolley stacked with empty cardboard

boxes being left unattended in midst of an aisleway as my B described it to me. Although a cautionary yellow board was put beside it, it hardly helped anyone but with little vision to notice it. How many more were stranded across the other aisles?

On numerous occasions, the aluminum panels draped around the columns appearing midway of the aisles challenged my traditional walking speed. Although technically draped to prevent the carts and trolleys smashing into the columns, the sudden cold sensation on my skin while I bumped into one made me think why not drape it with a not so cold material. I felt free-er and confident walking at the wider aisles that contained pet food and toilet rolls rather than the narrow aisles stacked with products in boxes and jars that were impossible to differentiate, let alone the non-tactile price tags. The frozen food, meat and detergent aisles emitted olfactory signals, my mind forming a scent trail for my course of exploration.

Another scent added within my trail- the footwear section's leathery materiality and hapticity. My mind automatically integrated a path, rather calculated, and forced an ability to form a record of these olfactory landmarks added on with its tactile qualities. This helped me orient my positional relation to the entire store (Fig. 4.6).

The worries continued though. It ranged from being cautious to not knocking anything off the shelves, not bumping into S people with trolleys or shopping carts or making the Walmart staff question my presence while they busily stocked aisles with newer products. The stigma of embarrassingly causing a scene flashed my head. My independence of navigation vanished gradually as the only source of communicative navigation was through my B's voice and arm. As I exited an aisle, I barged into another column again. I realized my dependence on my visual sense was hugely accounted for. In my previous sighted circulations, my conscious attentive mode was directly proportional to my eyes as the leading organ of directionality.

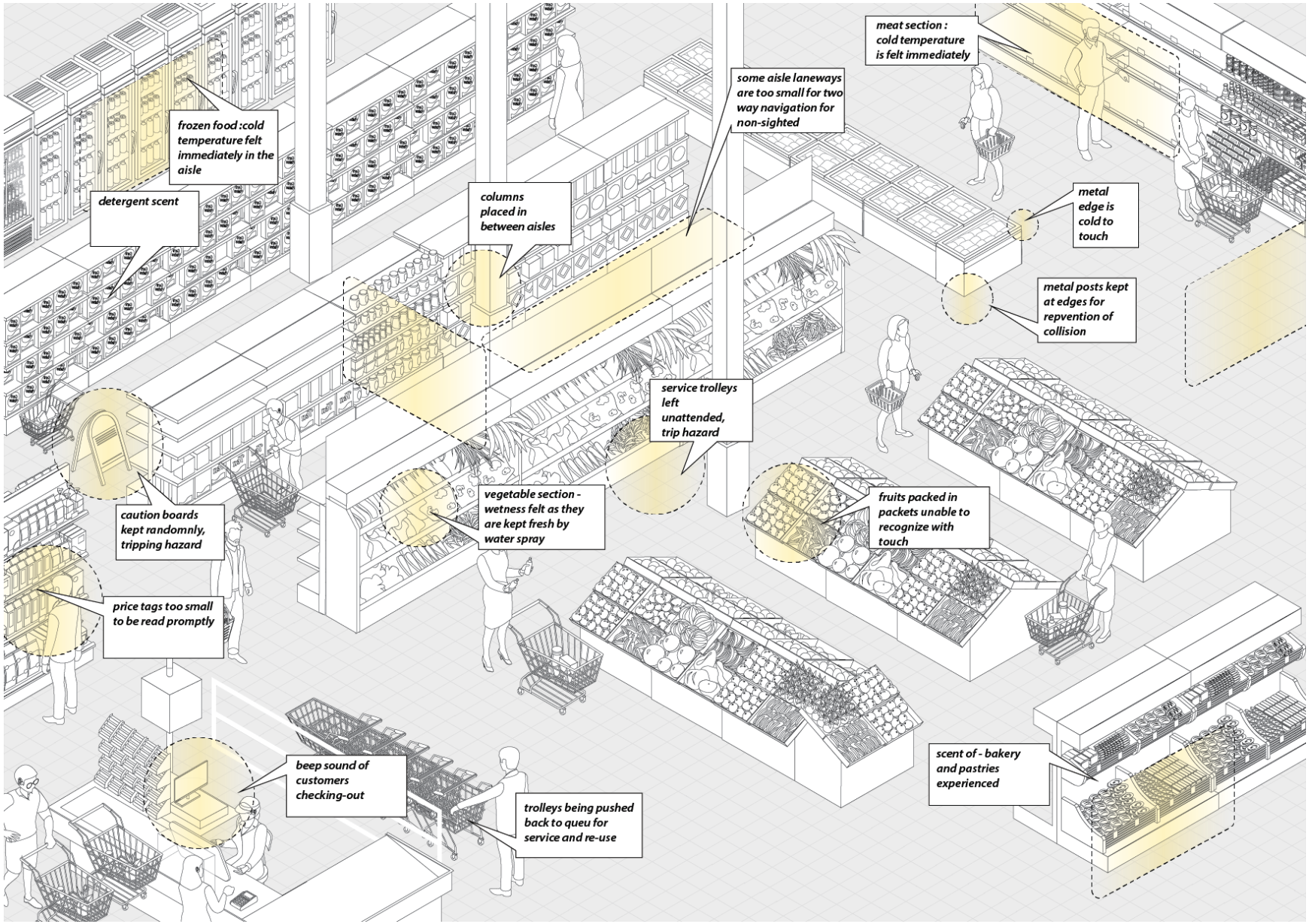


Figure 4.4 My interaction with Walmart

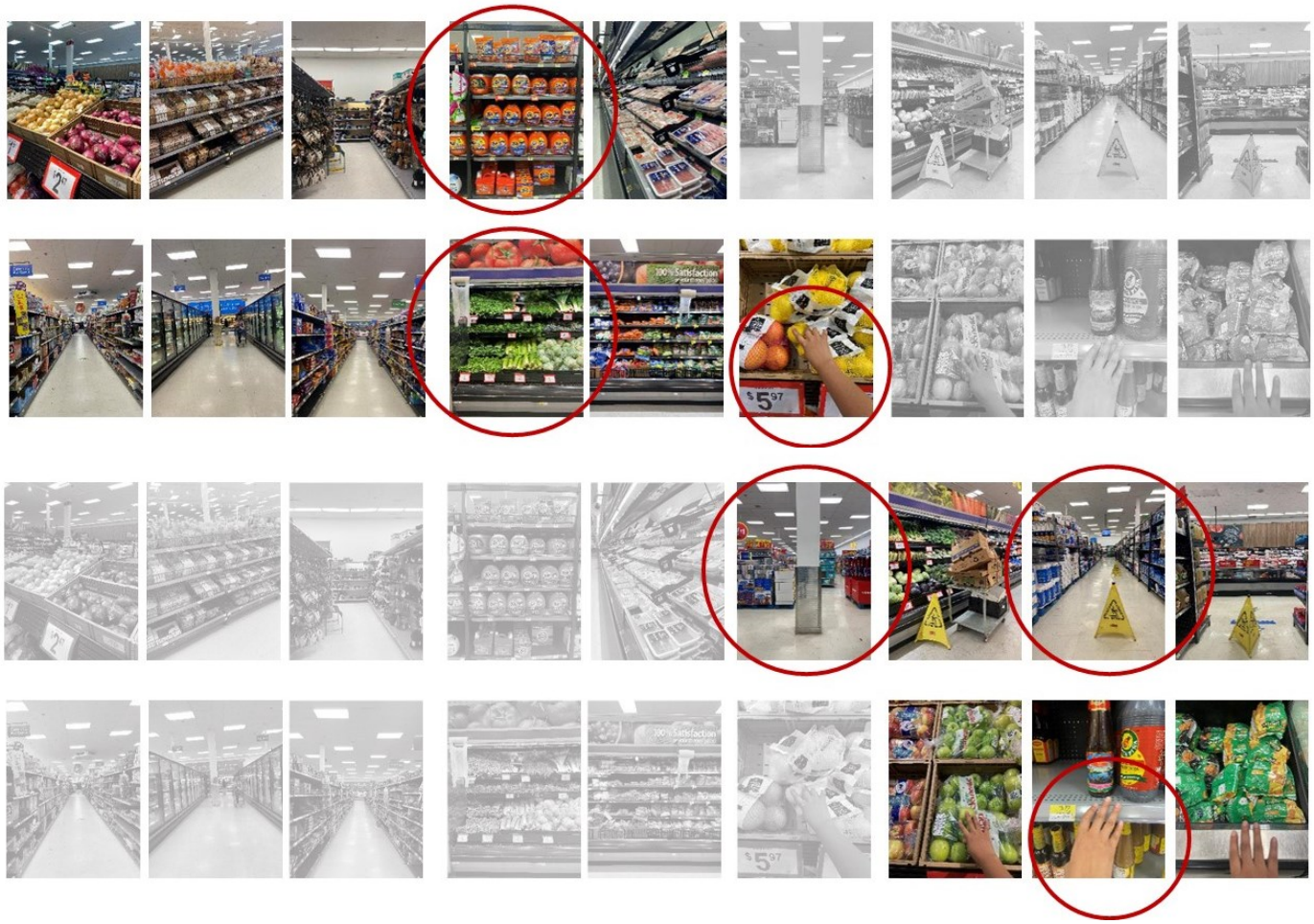


Figure 4.5 Collage of pictures around Walmart that stood out to me

4.3 St. Jacobs Farmer's Market

Once I arrived at the Farmer's market with my B, we decided to first explore the open market before stepping into the enclosed markets. We walked among multiple kiosks laid across the huge ground, oriented in a grid like axis. Being an open space, unlike the previous Walmart experience, I did not feel terrified in walking and exploring the market.

My mind felt uncluttered aware of the wide circulation corridors with the stalls arranged adjacently with the products exhibited on the edges of each kiosk.

Multiple scents tingled my nose. The strongest being the strawberries, raspberries, blueberries and peaches with potatoes being the least scented. Being placed in quantities allowed the scent to accumulate and travel when the wind blew. This market was an unexplored territory for me. However, with the price tags mostly being written down on placards, the illegibility forced a viewer to step closer to decide to buy it or not. Although I sensed a faint scent of plants and flowers, them being elevated at only 1 foot made my interaction limited and negligible as I had to bend down and examine it by touch. After wandering for half an hour, the meat and cold storage of dairy products again brought forth a déjà vu of my experience with Walmart. The wind brought forth occasional sounds of fluttering flags and the scent of leather bags and jackets. Additionally, my umami taste buds enticed to the aroma of melted cheese, quesadilla and chicken served in the food court. Misty droplets from squeezed oranges drizzled in the atmosphere as a corner kiosk served fresh orange juice. Preparation of meals in the food court and the scent of exhibited food within the kiosks reinforced my sensorial intimacy to the space bringing back memories of togetherness with family. The architectural elements within the market were formed out of food, clothing and random products as I treaded in my avatar stripped of my vision.

Upon entering the air-conditioned enclosed section of the farmer's market, an immediate familiarity of my previous memory overlapped with the remarkably similar feeling in Walmart while going through the double entrance. I felt disoriented again as though the atmosphere had an immediate emotional response to my body. I held on to my B's arm tighter. Voices were clearer, not muffled. The wind's humidity became absent. The floor became smoother devoid of textural differences. An absence of atmospheric clues made me confused of my next direction. As I followed my B's direction, he kept asking me excitedly about each product as it immediately reminded him of his childhood experiences of pure olfactory delights. Popcorns and cotton candy stalls were packaged and hence weren't olfactible. I reminded I could not resonate with

him as he connected his visual memories with his sense of smell and taste. This made me think that how often S users pulled visual synapses associated with its related sense of olfaction and taste. I further contemplated how the NS associated their memories through their other senses except their sense of vision or limited vision (in the case of partially sighted). Did the absence of visual cues make their memories “more” or “less” intimate?

As I followed to the second level of the market through the tactile pavers located below, the cold steel railing guided me upstairs. However, the lack of any tactile pavers on the landing or upon reaching the second level left my option of navigation to the only handrail that was available. Although looped at the edge, it ended abruptly leaving me stranded; I tested the stairs without my B’s arm. If only there was a connected spine of some sort. He guided me again. This level was much more crowded than downstairs making me uncomfortable to explore smaller stalls. Although navigation was impossible with the amount of people, I felt comforted by my fingers as I touched fabrics of fur coats, soft hats, silk shawls and rugs (Fig.4.7). While touching a wooden showpiece, my palm experienced a relaxed sensation with the materiality, temperature, and shape of it in retrospect to the previous cold handrail. I bumped into many onlookers. My olfactory map registered fresh bread, cocoa, coffee, bath bombs, incensed lavender oils, leather jackets, cold storages of meat as landmarks within the market. As I exited the enclosed market, the temperature felt wet as I experienced some residual moisture on my B’s arm and my face, his skin’s thermal conductivity disclosing it was raining outside.

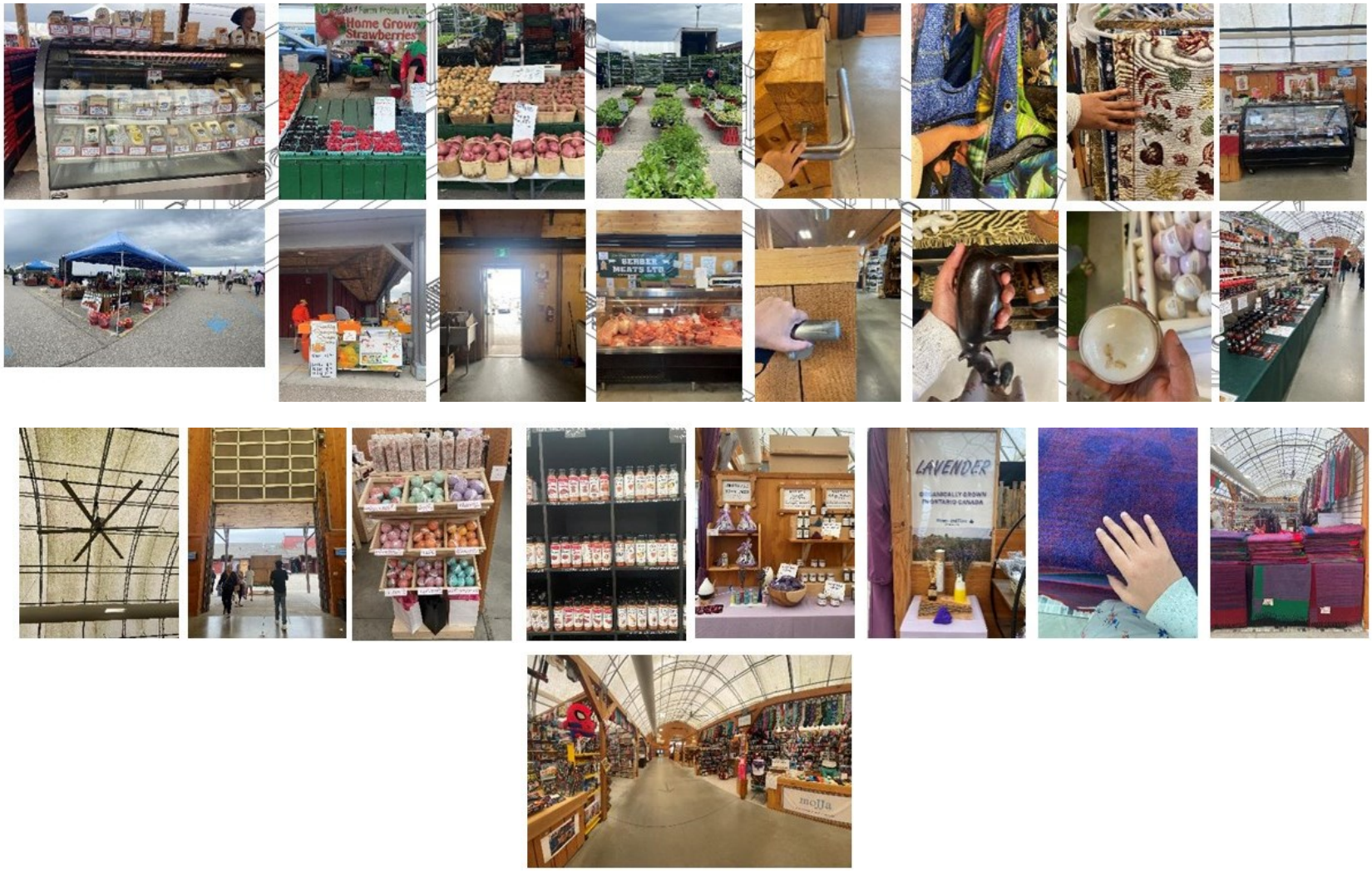


Figure 4.6 Collage of pictures around St. Jacob's Market

4.4 Waterloo Park

The next voyage took place at a public park. This journey within the park was an attempt to understand the effect of various design elements (Fig.4.7) in a public park and its aesthetic experience in terms of understanding a garden/park's purpose in providing delight. While I walked on sturdy concrete roads within the park, it was challenging to determine whether I continued my embarkment on a regular footpath or driveways that connected to a parking lot. The cars revving from certain directions confused my progression to walk. Another interesting aspect is that unlike my previous experiences at the Laurel Trail, Walmart Supercenter, and the Farmer's Market where the entrances of each routes had tactile pavers installed, the Park did not possess this. Perhaps there was no key direction of circulation because of its organic planning or were parks limited to only Sighted (S) users?

Upon entering a pocket garden within the park, there was a need to carefully grip my walk as I felt my shoes slide across the path's refined gravel. Occasionally, I felt some prickly hedges that were planted continuously along the 1-meter inner curved paths that slowed my pace of walking. I recalled my experience at the Laurel Trail, curved paths call for uncertainty rather than straight circulatory paths that makes one reach the destination quicker. Upon questioning my B, he responded that we were walking through a symmetrically designed small garden. I wondered whether some heighted curbs would have been beneficial to indicate a directionality as these provide a tapping point for a cane. I got startled as some foliage hit on my face unexpectedly. My B chuckled. Apparently, there were trees with branches extending and overlapping the pathway. As we continued our walk, my B intimated me the presence of flowers on the hedges although they had a very faint scent unless it was plucked and brought closer to my nose. I almost tripped as I felt a 6-inch level change. We stepped within a stone gazebo. A small coverage from the sun felt relieving as I touched the walls of the stone gazebo and sat quietly for few minutes.

The experience when walking closer to greener environments is that sounds created by us like footsteps, players shouting on a soccer field, tend to merge with other nature created sounds like the humming and chirping of birds, rustling of the trees, water moving by a stream and the gush of wind. We relate memories of our previous encounters with forests and other green landscapes more intimately, resonating with feelings of calmness and delight. These emotions get tied to these typologies of locations, even though unvisited.

As we exited the garden, we came across some construction metal fences. Again, another obstacle on my way without any intimation. I gravitated towards a steep slope that brought me to a cluster of farm animals. I could hear a pony. My B exclaimed that the animal caretakers had shredded all the llamas. Llamas were extraordinarily silent. I hadn't seen one and was provoked to open my eyes. As I observed the llama, I noticed that the animal shelters were caged making it impossible to interact with them. How unfortunate, if only I could pet it.

I went back to my altered self and held my B's arm again to continue the journey. As we crossed over the South side of the park, the front part of my feet got stuck within the track of the LRT. Besides the sound of the warning signal of the LRT, there weren't any tactile pavers indicating the start of the track. We headed to a skatepark next. The sounds created from the skateboarder's wheels on the ramps and metal rails along with their exclamations reacting to their friends' stunts gave a sense of excitement to me. As my B guided me to sit over an unpolished stone seat which was rather uncomfortable to sit on, my fingers were able to engage with the texture and materiality of it. It would have been interesting to engage with some stone sculptures within the park if they had any! Few moments before, I had passed across a sidewalk where I had bumped into huge flower vases that were placed at the edges. The proximity of the flowers to my waist had allowed me touch and bend down to smell them.

Moving further, the presence of many textural patterns on the ground made it confusing to orient my pathway. I unexpectedly sensed some directional pavers. It led to a bathroom facility; my B informed me. But then again how does a NS user reach there? There was no connection from the main walking path to the bathroom to let a NS user know of its existence. Not being able to have a continuous navigation pathway led to slower directional decisions within the park. Apart from this, while stepping on a children's playground, the buoyancy caused in my feet felt safe as the ground was covered in wooden chips. I touched the chips sitting down and became glad it was not a rubberized mat. Adjacent to this, another pocketed garden had wooden barks erected as seats which again helped me engage with the bark's rough texture encouraging me to wander and play with the space.

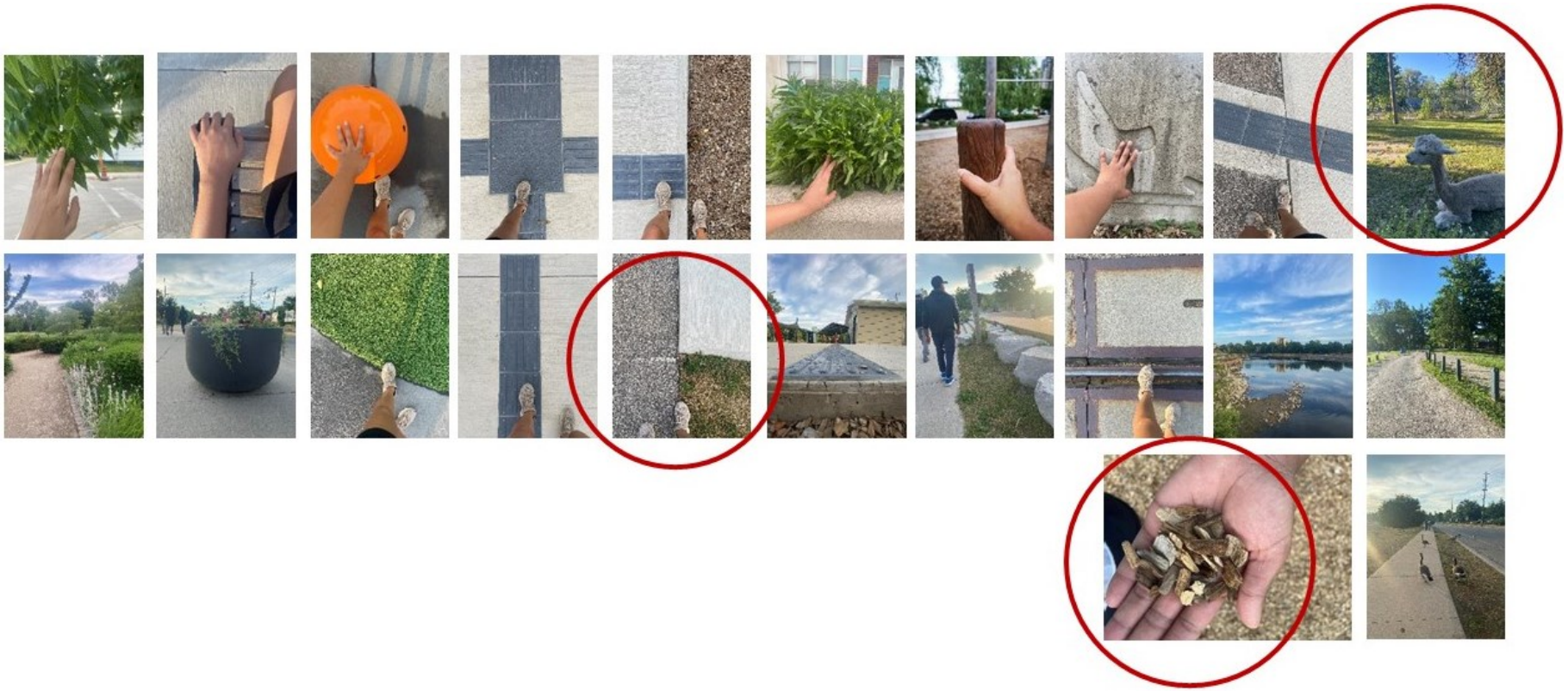


Figure 4.7 Collage of pictures around Waterloo Park

4.5 Altered sensory realities

How do we see our identity in relation to our surroundings? These experiences altered my thinking into powerful conclusions and narratives in terms of how I perceive the materiality of my surroundings in terms of qualities related to temperature, sound, auditory clues, tactility of surfaces within reach to my hands and feet and even my skin. I paid closer attention to his skin that communicates to me the intimacy of the surrounding atmosphere. I wondered how a slightest design decision can have a significant impact on making a left or right turn, treading, jumping, or taking long strides, the speed of my walk, or even stopping my walk entirely.

As I progressed through each walk, I become more interested in the psychogeography of the spaces I encounter and how it can be improved by bringing delight through design through insertions of delight through food and nature at the same time making them accessible for the NS. The collective experiences together made me reflect upon my personal endeavors questioning my search for individual reliance and dependency upon environmental cues to form a communicative language for navigation. With the next chapter, we take reference from the famous Canadian author Lucy Maud Montgomery (author of Anne of Green Gables and a resident of Norval) who through her writings inspired the creativity behind Norval's garden, the Children's Garden of the Senses in Ontario Canada. Further, the design strategies would be laid out in conjunction with existing architectural elements listed from Chapter 3 and a set of experiential informed decisions from Chapter 4.

Chapter 5
Sensory Focused Design Strategies

Some designers have chosen to focus on sensory experiences to provide an overall enhancement to the users' experiences of space. There are sparingly few examples where the issues of sightedness or lack thereof a primary motivating focus for the design has been. We shall look at one of the sensory enhanced gardens as a precedent before diving into the design strategies.

5.1 Lucy Maud Montgomery Garden, Ontario – A sensory-enhanced reference

A sensory-enhanced approach to architecture is key to designing spaces that promote the overall well-being of an individual rather than hindering it. This approach enables experiences to have more depth and fosters a better understanding of the environment around us. Take, for instance, The Lucy Maud Montgomery Children's Garden of the senses which evokes disparate senses of touch, sound, smell, sight, and hearing using a combination of architectural elements and plants that stimulate the senses.[74] Situated in Norval, Ontario, it appeases visitors of all age groups and is equally engaging to the sighted and the non-sighted users alike. It aims to revitalize the relationship between nature and self through various interactive programs and design elements.[75] This sensory garden promotes a sensory experience that engages all the senses through each of its pocket gardens that stimulate one or more of the senses.

Within the garden (refer to schematic plan Fig.5.1), the keyhole pocket garden for instance is designed to evoke a sense of smell. Low retailing walls are built for relaxing and enjoying the scent of various perennials planted alongside the walls. The butterfly garden and the hummingbird garden have a wide variety of shrubs and flowering plants that attract birds with their seeds and berries. This inundates the gardens with the pleasant sound of birds chirping and humming. Another pocket that stimulates the sense of sound is the waterfall garden, which creates a gratifying fulfillment for the visitors created by the cascading water from the upper deck of the fountain. Sound is also created by the grass field that sway as

[74] "Welcome to the Children's Garden of the Senses," Lucy Maud Montgomery, accessed August 26, 2022, http://gardenofthesenses.com/.
[75] Ibid.

the breeze sweeps through them. The sense of touch is incorporated into the garden using a variety of perennials with textured and contoured surfaces. Lambs Ear, a species of tactile perennial is part of the sundial garden that offers a velvety grey foliage.[76] The use of various interactive sculptures and textured surfaces also further encourages the sense of touch.

[76] "*The Lucy Maud Montgomery Garden– A Children's Garden of the Senses*," Three Dogs in a Garden, last modified 27, 2017, https://threedogsinagarden.blogspot.com/2017/08/the-lucy-maud-montgomery-garden.html.

Figure 5.1 Lucy Maud Montgomery – Children's Garden of the Senses in Norval, Ontario

5.2 Sensory Focused Design Strategies explained

Design strategies for the non-sighted and sighted as they are developed in this thesis will be shown to combine the strategies as characterized in Fig. 5.2. There must always be something at the hand level which is referred to as a tactility hand guide as this practice allows the strategies to build on current methods of wayfinding. Additionally, we are adding materiality as a means of highlighting variation thereby providing a sensory experience as well to feed into better methods of wayfinding. Atmospheric fluctuations (heat, cold, breeze, sun) can be used to orient the occupant. For users with some sight, highly contrasting colors help them to see whereas muted palettes impede their ability to discern.

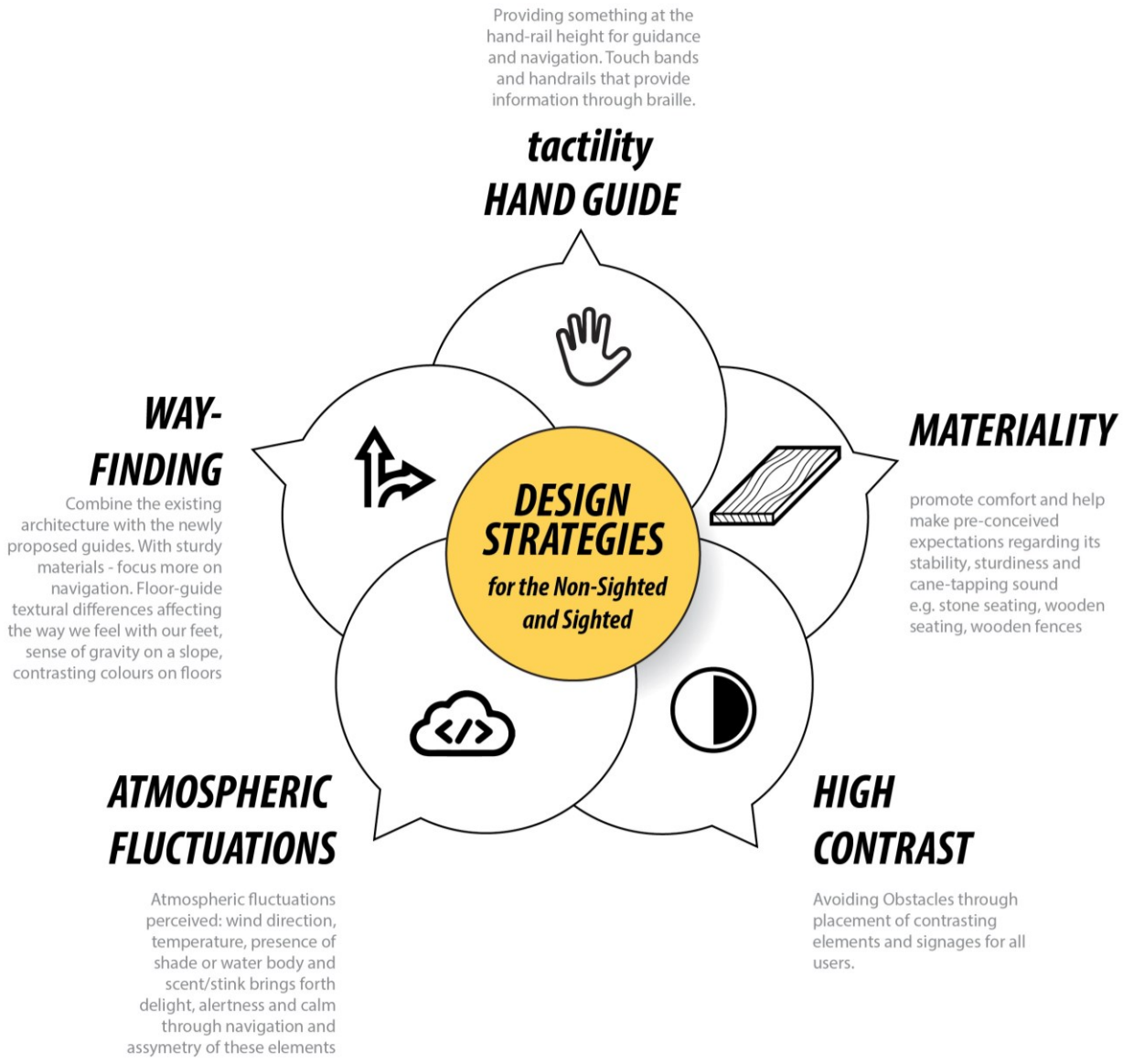


Figure 5.2 Sensory Focused Design Strategies (DS) for the Non-Sighted (NS) and Sighted Users (S)

5.2.1 Tactility- Hand Guide (Explain more on hand-guide)

The lack of tactile experience in design or the ineffective understanding of it in architecture has caused us to have a suboptimal experience of our surroundings. As Pallasmaa in his

book, “Eyes of the Skin” mentions, the loss of tactility in architecture has caused unrealistic, immaterial architectural structures that lack any depth to it.[77] The works of many prominent architects like Frank Lloyd Wright, Alvar Aalto, Louis Khan bear testimony to the importance of tactility in architecture. Numerous studies that have been undertaken have linked tactility to a person's comfort and enjoyment of the building.[78] Tactility thus is associated with the virtue of closeness and instills in the person a sense of belonging. It becomes essential that information for navigation needs to be provided at the handrail or waist height.

5.2.2 Materiality

Likewise, materiality is strongly associated with tactility. Contemporary architecture is falling short to facilitate the dimension of time with the overuse of glass and plastics which tend to exhibit less variation in their textures. Natural materials such as wood, stone and brick on the other hand can convey their epoch and buttress their origin and history.[79] It communicates the essence of time to the user and supplements the physical experience of an individual. NS users can orient and align themselves depending on the right materials used, thus enhancing the functionality of the space. Variations in the thermal properties of materials changes the interaction when a material is touched. Different textures can be used to create signals that enhance wayfinding, akin to the variation in textures used in paving control strips. The type of materials used play a pivotal role in the interaction of the user with the building. Wood, used in railings is comfortable to the touch compared to metals that rather feel cold on interaction.

5.2.3 Wayfinding

Wayfinding enables the user to efficiently navigate through a space and must be accessible to all individuals alike irrespective of their age and physical status. It enables one to navigate

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[77] Juhani Pallasmaa, The Eyes of the Skin (Wiley, 2005), 31.
[78] Christopher N Henry, “Tactile Architecture: Does it Matter?” *ArchDaily*, November 23, 2011, https://www.archdaily.com/186499/tactile-architecture-does-it-matter.

[79] Juhani Pallasmaa, The Eyes of the Skin (Wiley, 2005), 31.

through space, however, it is imperative to understand how swiftly one can orient and access the space that surrounds them. We as architects must cross-examine the ease of access of such spaces. UDP (Universal Design Principles) described in Chapter 3, section 3.1 highlights the importance of navigating through space with the least effort. Moreover, the usage of signs, symbols, fonts must not be confounding to the user. The use of tactile elements in design, especially tactile tiles are used to warn and navigate the users through a space. They have become a mainstream architectural element to aid the NS users. Safe outdoor access to nature trails is made possible using braille signs, guided ropes, and barrier free pathways.[80]

5.2.4 High Contrast

ADA standards expounded in Chapter 3; section 3.2 underlines the importance of contrast in designing for the NS user, especially the partially sighted user. High contrast is used to highlight differences in surface and denote obstructions. They can be used to indicate ledges and level changes. Bright yellow against a black background is the most effective for providing a sharp contrast.[81] The impetus being that a contrast between light and dark areas produce better visibility of the object being read. Sharp edges, improved lighting conditions and reflection are a few keyways to increase the accessibility of a space for the NS.

5.2.5 Atmospheric Fluctuations

Atmospheric fluctuations are perceived through the spatial experiences of the surroundings (like discussed in Chapter 4) with respect to changes in temperature, sound, auditory clues, and tactility of surfaces. This intimacy is established when the body as a whole situates its

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[80] "The Importance of Nature- Braille Trails and Sensory Gardens for the Blind," MaxiAIDS.com, last Modified August 26, 2022, https://www.maxiaids.com/the-importance-of-nature-braille-trails-and-sensory-gardens-for-the-blind.

[81] "Contrast and Color," Vision Aware, accessed August 28, 2022, https://visionaware.org/everyday-living/home-modification/contrast-and-color/.

proximity to the surrounding atmospheric qualities and develops a mental directionality of navigating the space.

5.3 Test Case Scenarios - Applying the proposed Design Strategies

From the experiences narrated in Chapter 4, my sense of delight was maximized while navigating through the Waterloo Park and the Farmer's Market open space garden. These scenarios led the thrust for deciding upon choosing two smaller case scenarios on which the previously stated design strategies (DS) can be applied, the cases being a) Pop-Up Market and b) a Garden + Park. Upon noticing the inaccessibility of the Waterloo Park and St. Jacob's Farmer's Market but at the same time extracting a sense of heightened delight through senses of smell, taste and other sensory modalities of the atmosphere, the intention of these two cases would be complementary. As a designer, it is further aimed that these give rise to exploratory scenarios that incorporate sensory clues for the NS that are otherwise challenged in a common urban setting.

Besides the pop-up markets becoming increasingly popular with experts suggesting a significant potential for their growth[82], the thrust of choosing this typology of outdoor place was that it can provide the NS and S users an opportunity of integrating and testing the previously proposed DS in a kit of parts format to be tested on. Being an outdoor market, Pop-Up markets allow for placing different kiosks containing foods and products that enhance the sense of smell and taste majorly, essentially providing delight to the NS and S. On the other hand, the typology of a sensory enhanced garden (like the Children's Garden of the Senses) offers a unique and convenient way for the NS users to interact with nature essentially providing delight in a minimal effort way. The aspiration is to create traditional

[82] Mario Toneguzzi, "Pop-Up Retail in Canada Grows Significantly Amid COVID-19: Experts," Retail Insider, October 6, 2020, https://retail-insider.com/retail-insider/2020/10/pop-up-retail-in-canada-grows-significantly-amid-covid-19-experts/

enhancements in conjunction with the existing architecture for the NS (tactile pavers and braille) that can later be globally applied regardless of a context.

Thus, the difficulty to navigate and inconvenience caused by less-than-optimal design processes that causes such public spaces to be inaccessible to the NS users can be worked upon.

The design strategies (DS) listed below for these two test case scenarios will be explained and further applied in Chapter 6. The DS for the pop-up market below are informed and build upon various sources like - the existing architecture (UDP, ADA and existing tactile floor typologies) from Chapter 3 and personal spatial experiences from Chapter 4. For the DS applied to the garden and park, in conjunction with the proposed DS for wayfinding (for the Pop-Up Market), other references like the factsheet on designing for garden and trails for the non-sighted from the Royal National Institute of Blind People (RNIB), [83] Braille Nature Directory (Nature for All) [84] and selection of plants, shrubs and trees from the Sheridan Nursery Ontario, [85] Lucy Maud Montgomery's Children's Garden of Senses (Ontario, Canada) [86] and Walter Reed Sensory Garden (Virginia, U.S) [87] are studied upon.

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[83] "Gardening," RNIB, accessed August 29, 2022, https://www.rnib.org.uk/information-everyday-living-home-and-leisure-leisure-activities-and-sports/gardening
RNIB. "Designing Garden and Nature Trails Fact Sheet." Accessed August 22, 2022. https://www.rnib.org.uk/information-everyday-living-home-and-leisure-leisure-activities-and-sports/gardening.

[84] "Trail Directory," Nature For All, Accessed August 29, 2022. http://www.natureforthеblind.com/directory-redirectory.

[85] Sheridan Nurseries. "Plant Guide." Accessed August 27, 2022. https://sheridannurseries.com/plant-finder.

[86] "Welcome to the Children's Garden of the Senses," Lucy Maud Montgomery, accessed August 26, 2022, http://gardenofthesenses.com/.

[87] Virtual Programs. "Walter Reed Sensory Garden Tour." Filmed July 19, 2020.

https://www.youtube.com/watch?v=hbLy1RgCk3Q&ab_channel=VirtualPrograms.

5.4 DS for Pop-Up Market

The pop-up market mainly focuses on building upon and proposing a modular kit-of parts through a template of adhesive tactile rubber pads (grade level), installations and easy to attach finishes that can be easily assembled and dismantled. This forms a predictive language for the NS to read and navigate and later the kit of parts may be applied and tested on similar temporary spatial typologies or public navigation scenarios.

The design strategies for the pop-up market test scenario are as below:

1. **Hand Guide Tactility** (Fig. 5.3): The tactility hand guide relates to the sensory mode of touch. The pop-up market has architectural elements that urge the user to come in close contact with the space, thus elevating the sense of touch. These instill in the user a sense of conviction and prediction of directionality while wayfinding within the market.

- ***Entrance map*** - Placed at a slightly inclined angle for the ease of touch and limited effort of straining the hand. It contains a cognitive map of the kiosks' plan in braille further providing a legend of the predictive language for the NS users to familiarize with to help navigate the market.

- ***Edge of product boxes and food crates, display tables, clothing rack*** – Information in braille related to the product type (e.g., apple/cloth), name (granny smith/pants) and price is inscribed on the edges of crates, boxes or display equipment allowing the user to independently interact and decide to buy.

- ***Braille stanchion bands*** – Once the floor wayfinding tactile pads lead the NS user to these stanchions with braille embedded onto the nylon bands, the NS user may touch and be informed on the kiosk type (food, plants, meat, cloth) that is perpendicular to their navigation and decide to deviate their direction towards the kiosk. These along with the tactile floor rubber pads act as the main spine for circulation throughout the market.

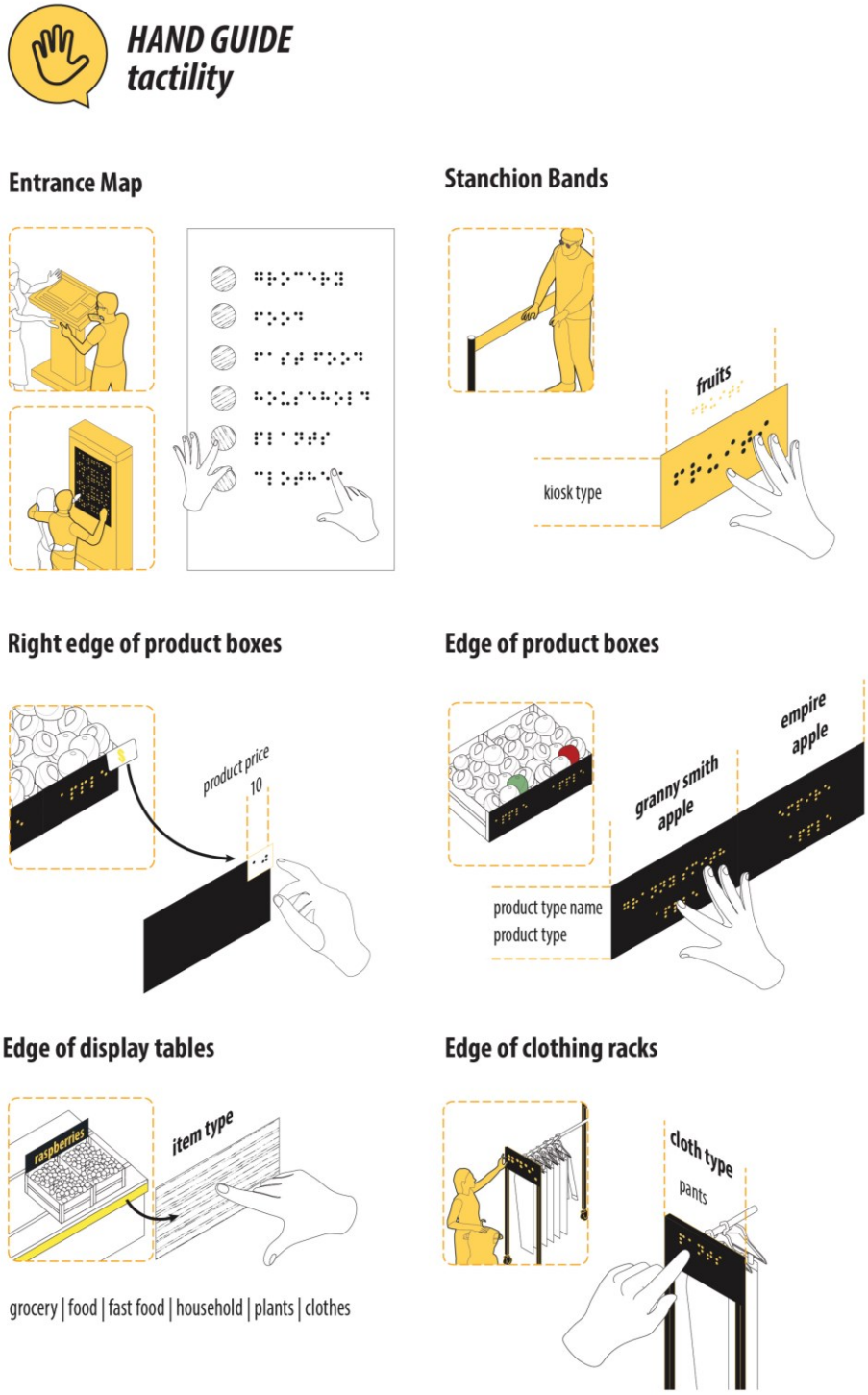


Figure 5.3 Hand Guide Tactility DS for Pop-Up Market

2. **Materiality** (Fig. 5.4): Careful consideration has been given to choosing the materials used to build the space since materials play a pivotal role in engaging the NS user's tactile experience within a space. Metal, steel, or any cold thermal conductors are avoided as finishes since it may deter the user from having a comfortable experience.

- ***Grade Wayfinding at the foot level*** – Materials of rubber, wood and nylon are used for the NS to interact with. While the rubber adhesive tactile pads are easy to deploy and are color coded yellow for the benefit of the partially sighted users, these are laid out in continuity so that the NS user does not get stranded midway. Yellow is contrasted against grey tones for the partially NS user. All tactile pads used at the ingress and egress points have minimal slope so as not to hamper the wheelchair-or walker-based users. The Stanchions bands with braille have a modified wooden base to keep it sturdy and while the NS user taps on it with a guided cane reflecting a particular sound. They are accompanied with curved wooden curbs placed at each edge of the stanchions as an indicator to warn the user of a heighted stanchion.

- ***Edge of display tables and shelves*** – Different profiles of wood (straight, curved, curved with metal inlay) and texturized rubber (straight with dotted texture, curved with dotted texture, curved with metal inlay profiles) are installed at the edges of display tables and shelves (at the handrail height) to inform the NS user of the type of kiosk (food, cloth, meat kiosks) they are at. Steel is only used as thin inlays for some profiles to create more variation of kiosk types.

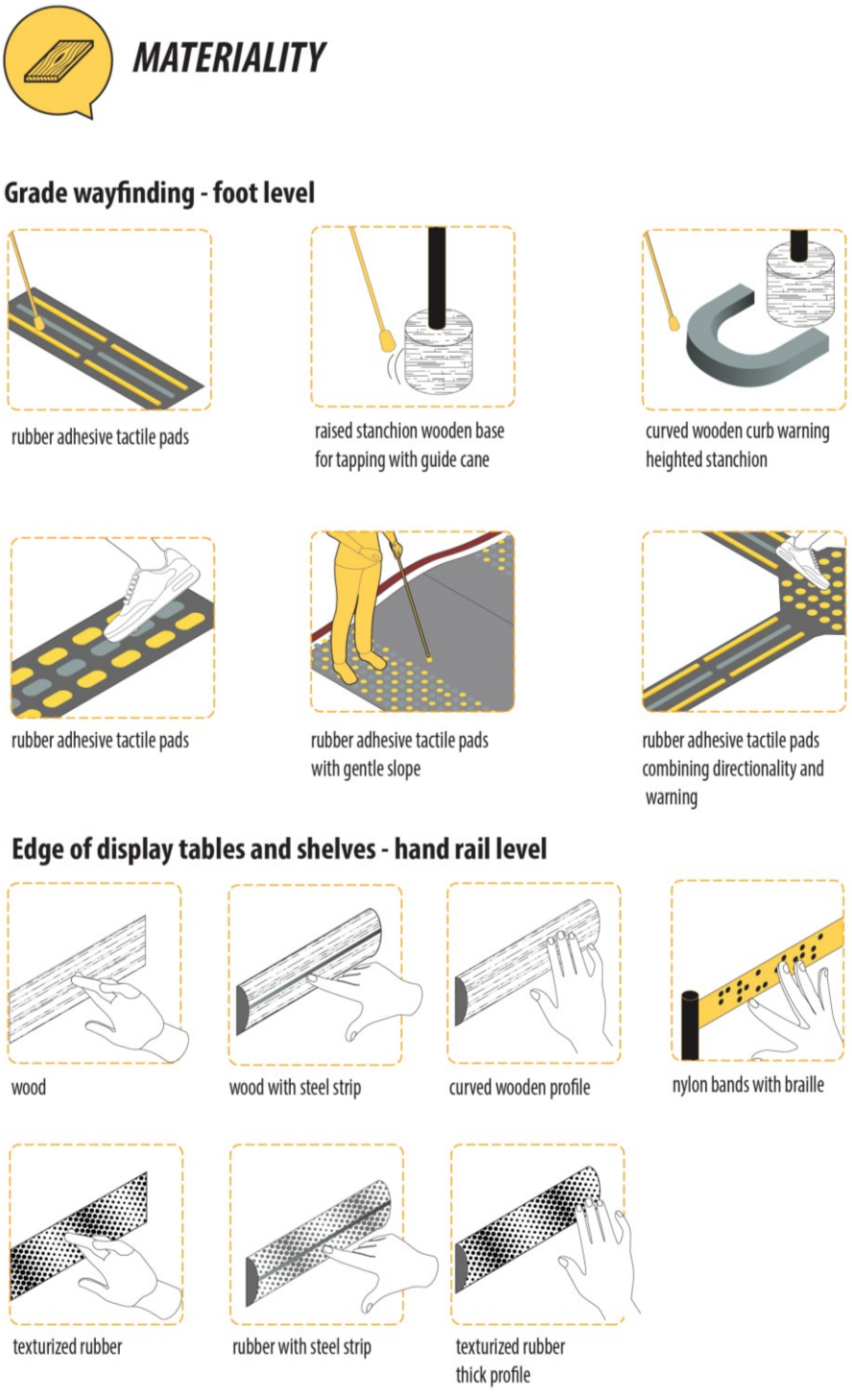


Figure 5.4 Materiality DS for Pop-up Market

3. **Wayfinding** (Fig.5.3): Outdoor spaces are often hard to navigate, especially for the NS users hence wayfinding becomes even more crucial in such situations. They must not be ambiguous and must in no way mislead the users and they must be able to get there as swiftly and efficiently as possible. Keeping this in mind, the pop-up market has been fit with well-thought-out tactile patterns to indicate to the user of every contingency that lies ahead. A blend of parallel, lozenge and blister tactile pads are used at every junction, periphery of the circulation and the periphery of a kiosk.

    - ***Stanchions with Braille*** – The stanchions form a major spine in providing information to the NS user to orient themselves in terms of which kiosk they are adjacent to while navigating. The kiosk type e.g., fruit, vegetables, cloth, etc. is mentioned on the nylon bands wherein the NS user gets to decide and take a turn to proceed with an interested kiosk. In conjunction with the stanchions, their height is warned by placing curved wooden curbs at the edges.
    - ***Directional tactile pad*** – Taking inspiration from the traditional yellow directional pavers, here the parallel pattern is minimized to using yellow at the outer two parallel bumpy strips leaving the central bumpy strip with a muted color.
    - ***Warning or destination blister tactile pad*** – Similar to the traditional yellow blister pattern, with the pattern being same, the color is however minimized here shading the yellow domes alternately. The position of this pad indicates the NS user of reaching either a destination or warning and these run parallel to the stanchions.
    - ***Lozenge edge tactile pad –*** The traditional lozenge pattern here is taken and the patterns are colored yellow at the boundaries. These are placed at the edge of a kiosk to notify the NS user that they have approached at the edge of a kiosk preceded by taking a perpendicular turn from the stanchion

bands.

- ***Junction tactile pad*** –Placed at every junction of the circulation within the grid of the pop-up market, the directional tactile pads come perpendicular to form a center that has offset blister patterns (a larger version of the warning or destination tactile pad in the center) to inform the NS user of their orientation within the market. They may decide to move in any axis of their choice here since they become aware of their position with respect to the grid of the market.
- ***Sloped tactile pad –*** These 1-meter-wide pads are placed at every ingress and egress inside the market to indicate that the NS user may start reading the predictive language and that here onwards, they may either find a wayfinding floor guide or tactility hand guide for their continuation of journey throughout the pop-up market and continue enjoying the products available at all kiosks. While the start of the slope is indicated with a blister pattern, the edges are warned with a red and white strip to warn other users of tripping. These further connect to directional tactile pads.

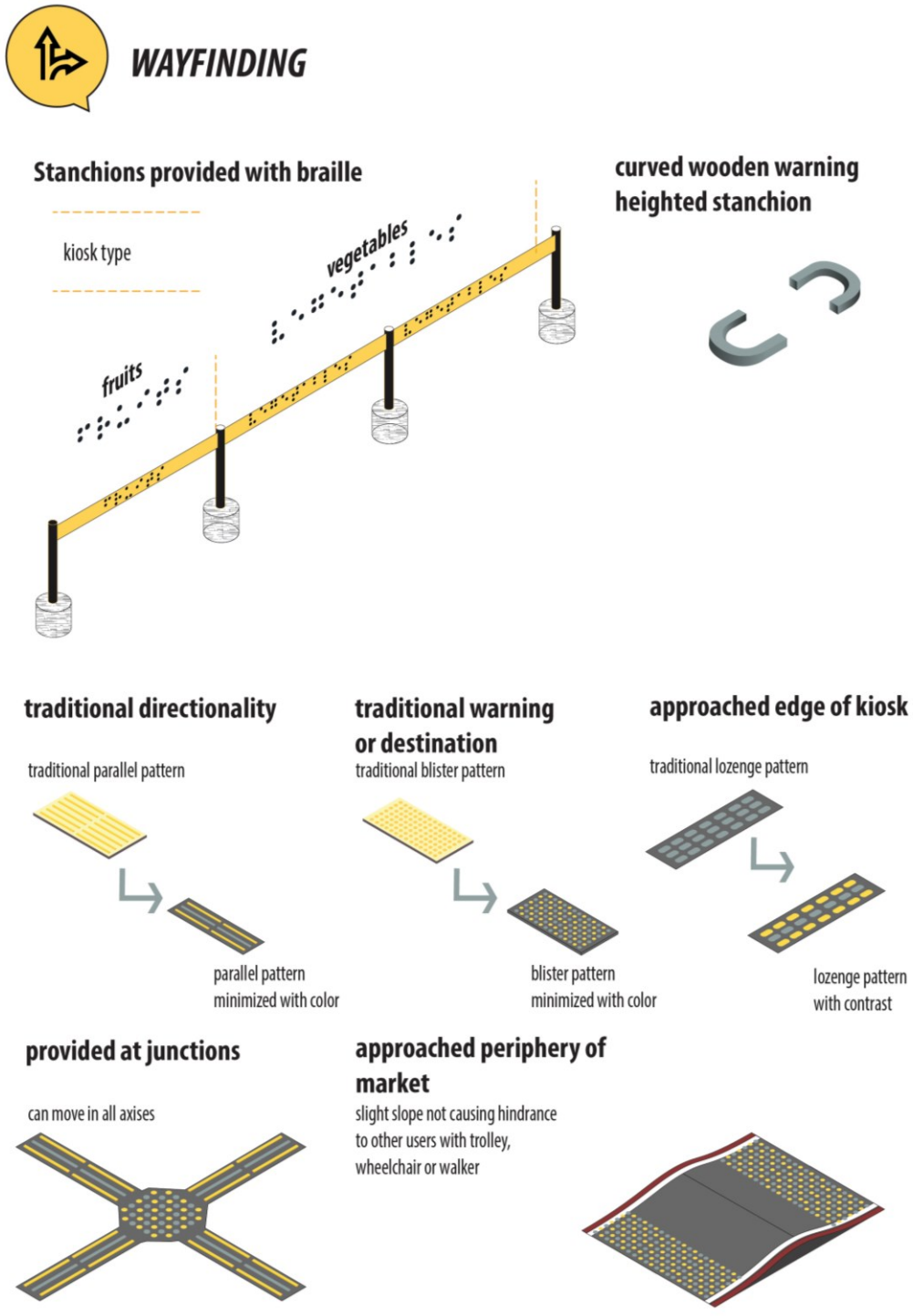


Figure 5.5 Wayfinding DS for Pop-Up Market

4. **High Contrast** (Fig. 5.4): High contrasting architectural elements help in warning the NS user, particularly the partially NS user. We may use these to notify of critical navigation points like junction, angles, and directionality. Additionally, inclusion of these elements for labelling kiosks and product boxes helps the user to efficiently delineate the object from its background. Bright yellow text against black is the most effective in providing a sharp contrast. The AODA standards often fall short of meeting the threshold in applications for the partially NS users, hence below states must be amended with the feedback from a NS user.

    - ***Angular end of kiosks*** – Any edges or posts that form the approaching corner of a kiosk is marked with black and yellow contrast stripes to warn the partially sighted users of an incoming junction or turn. Similarly, any elevated hazard should be contrasted against the background by highlighting the edges with the recommended contrast colors (as per the High Contrast DS)
    - ***Labelling kiosks*** – Light colors against dark backgrounds are used for labelling kiosks with capitalized letters at a height of 1 foot reading the kiosk's name. Examples include yellow on black (common food kiosks), white on red (meat kiosks) and white on green (plant/flowers kiosks) - each background color signifying a kiosk type.
    - ***Back of product boxes*** – The labels on the back of product boxes use the same concept of the kiosk labels but here labelling each food/product crate reading the product name. It is recommended that the product boxes are placed at a consistent height of 2 to 3 feet for the user to easily notice.

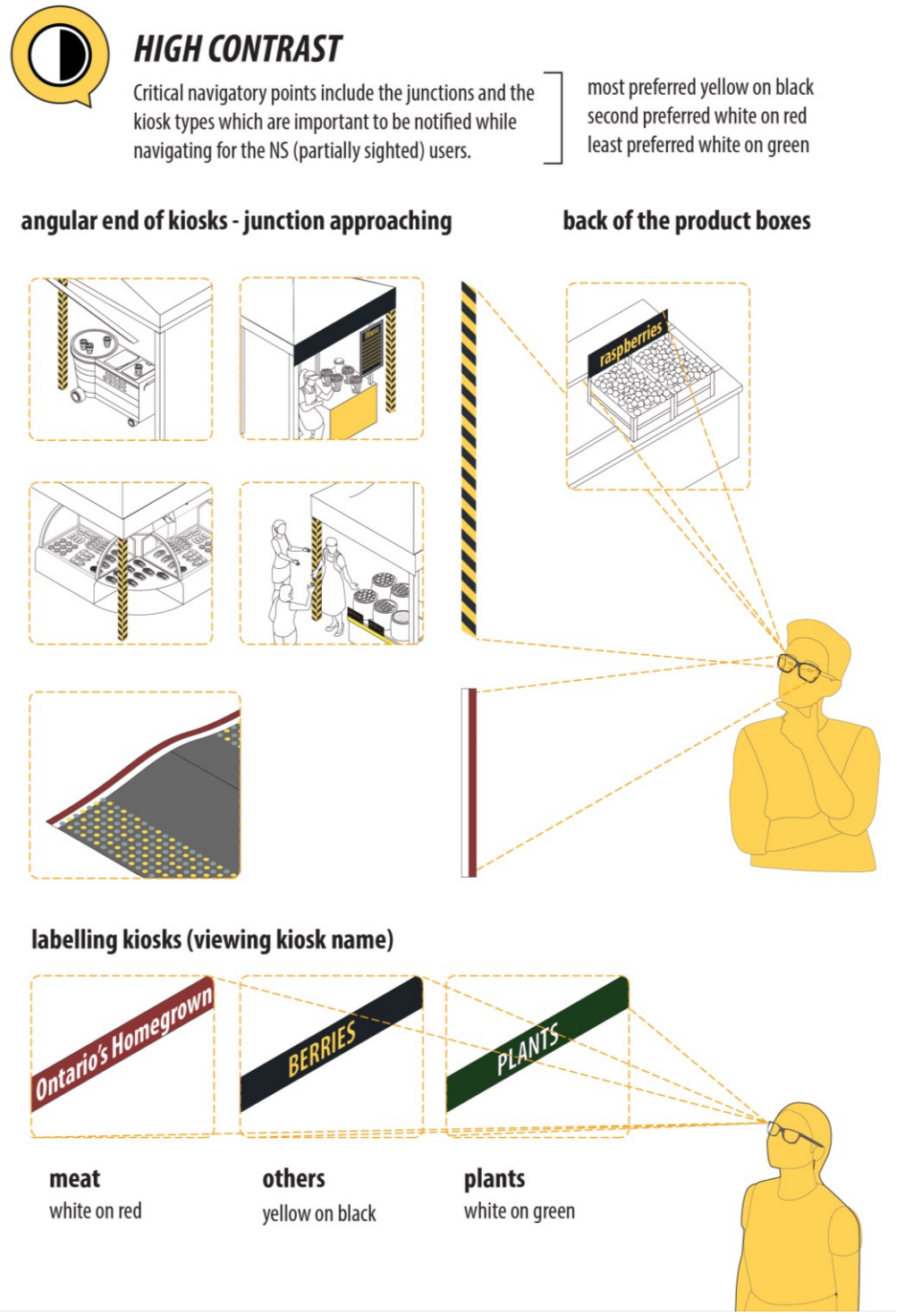


Figure 5.6 High Contrast DS for Pop-Up Market

5. **Atmospheric Fluctuations** (Fig. 5.5): Experienced when there is a stark feeling of contrasting changes in temperature, sound, auditory clues, and scent with respect to both the NS and S user. All the corner kiosks within the market are proposed to occupy highly aromatic or pleasant food products to enhance the user's overall sensory experience. The agenda is to encourage creating a mental map of location markers stored as pleasant or delightful memories to help orient the NS and S users of the kiosk they are at. Fig. 5.5 shows possible scenarios of users identifying these markers within the market further indicating the intensity of each elevated sense: hear, touch, smell, visual, temperature and taste. Suggestions of corner kiosks include:
    - ***Scent markers***: perfumes or incense, aromatic spices, freshly baked bread (bakery), live counters of popcorn or cotton candy, coffee or cocoa, fresh orange juice, pizza, strawberries.
    - ***Tactile markers***: textural fabrics, jute, handwoven bags, silk, wooden showpieces, fur jackets, wooden showpieces, textured plants, and flowers.
    - ***Temperature markers***: storages of meat and cheese.

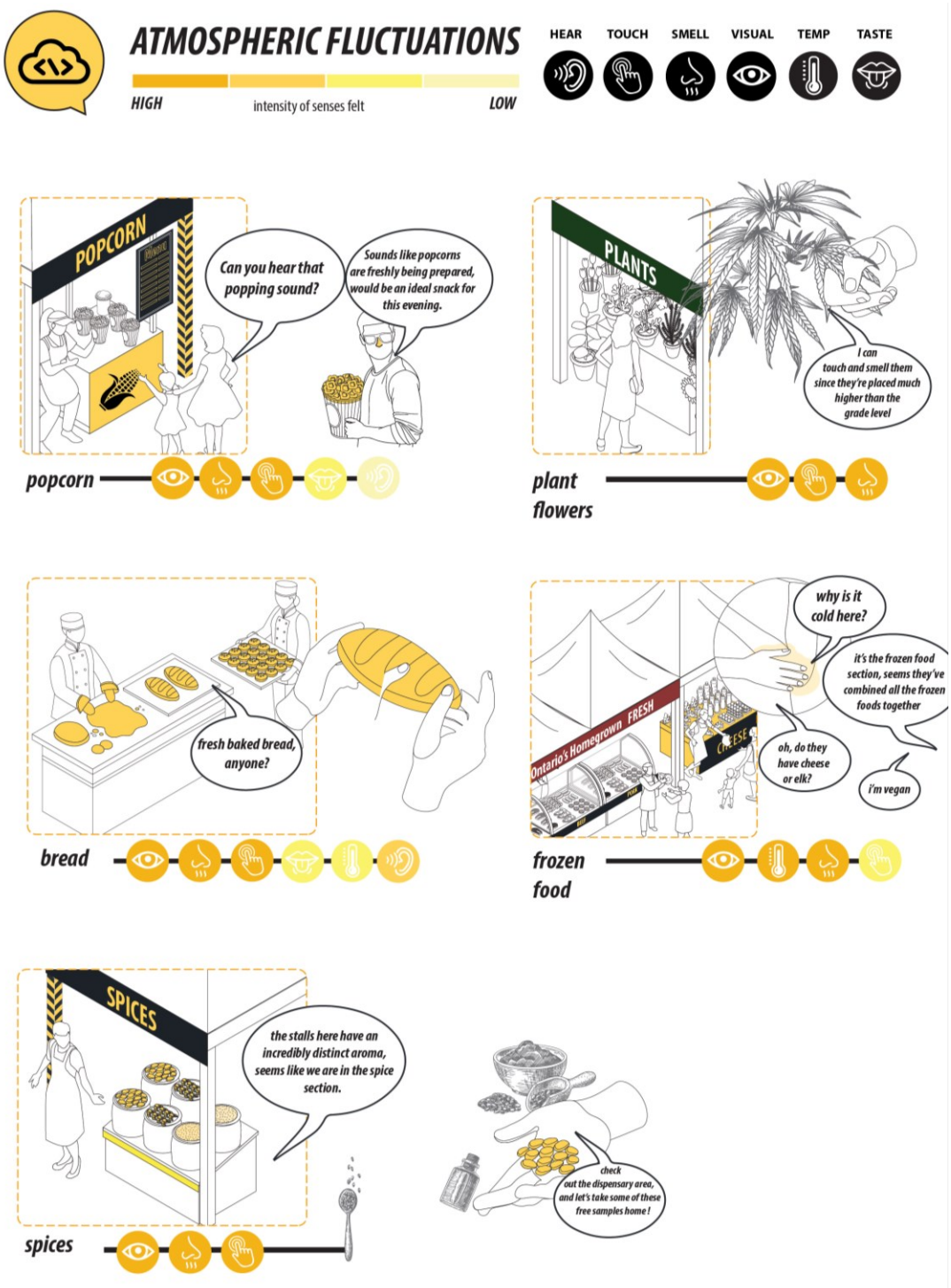


Figure 5.7 Atmospheric Fluctuations DS for Pop-Up Market

5.5 DS for Park and Garden

The design strategies for the garden can be classified under each type as follows:

1. **Hand Guide Tactility** (Fig. 5.8): Upon navigation from the entrance through the tactile pavers, the NS users are led to the handrail where it is essential that the tactility hand guide provides all the necessary information to have an effective understanding of the setting of such a space. The various elements in the hand guide are essential to provide guidance and warning when navigating through space.
    - ***Entrance map*** - Besides providing information on how to read the language within the garden, the map is supposed to have a plan of the entire park and the mini pocket gardens within it.
    - ***Vertical green walls with scented flowers*** – Besides being a visual aesthetic, these vertical elements encourage creepers with scented flowers to grow and are used to demarcate entrances at the park or mini pocket gardens.
    - ***Vertical fencing with creepers for boundary creation*** – These wooden fences have colorful and contrasting creepers grow on them and can be used as a transitory spatial marker (an alternative to when curbs can't be installed) indicating that the NS user is entering another pocket garden.
    - ***Interactive sculptures*** – Placed at certain locations to encourage participation from users to actively touch and engage with the sculpture's material.
    - ***Rope knots for guided trail–*** Used for independently navigating and exploring nature trails for the NS. Typology of the rope texture (normal or braided), thickness and knots in between the ropes can indicate a language for: steep slope or inclination ahead, turn left or right ahead.
    - ***Guided railing*** – The main spine of the park and runs parallel to the main straight pathway of the park. Communicates and notifies NS users on the locations of pocket gardens and other facilities available. A tap rail is provided at a height of 6 inches above the ground for cane users as a supplementary wayfinding.

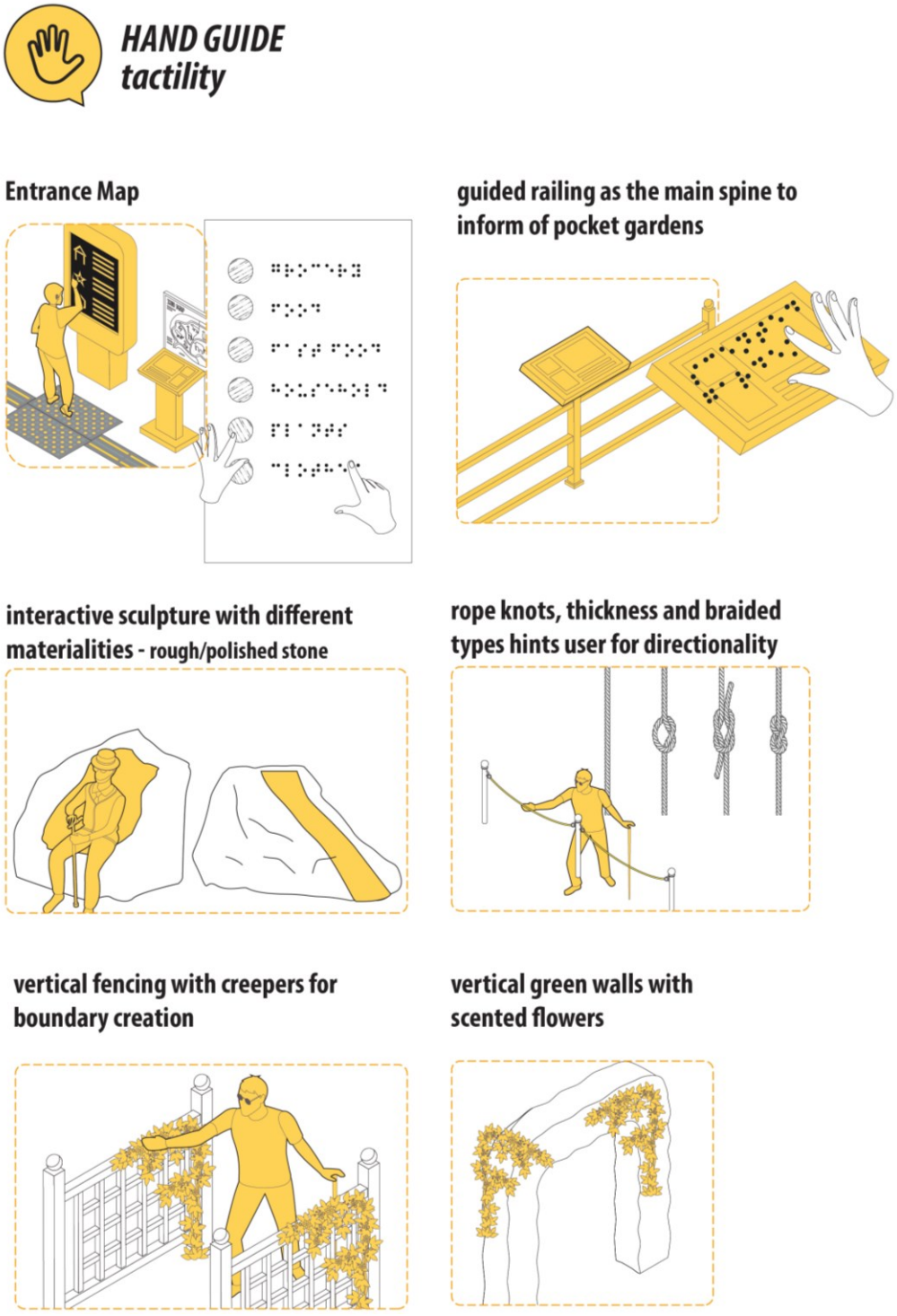


Figure 5.8 Tactility Hand guide DS for the Garden and Park

2. **Materiality** (Fig. 5.9): Tactility and materiality are inherently interconnected; materiality confirms the tactile properties of a space. The sense of touch and feel can either encourage or intimidate the users, materials of wood, concrete, rough or polished stone are used for hardscapes. The softscape whereas engages the users through different foliage of shrubs, trees, tree barks, herbs, flowers, and water.

    - ***Wood chips*** – Used mainly in kid's playgrounds, it provides a bouncy effect below the feet.
    - ***Cobble stones*** – Provide sturdiness while walking and provide a slight variation in the ground surface texture.
    - ***Pocket garden entrances*** – The entrances of each pocket gardens are installed with inclined rock surfaces that contain information (about the mini garden) in braille.
    - ***Interactive sculptures*** – The sculptures material can range from ceramic to rough or polished stone that contain various textures that the NS users can not only touch but also interact with, e.g., a water or a seat sculpture.
    - ***Wooden seating*** – Unlike metal seating, wooden benches, and gazebos give out a temperature that is comfortable to touch and engage with. The seating is provided at intervals along promenade and is usually surrounded with various lush perennials. Gazebos within the garden and deck are also provided as shaded seating areas.
    - ***Tactility of flowers and leaves*** – A myriad of plants, shrubs, perennials, trees, and herbs are planted along the gardens that possess tactile textures ranging from smooth, silky to rough, rubbery for the users to touch.

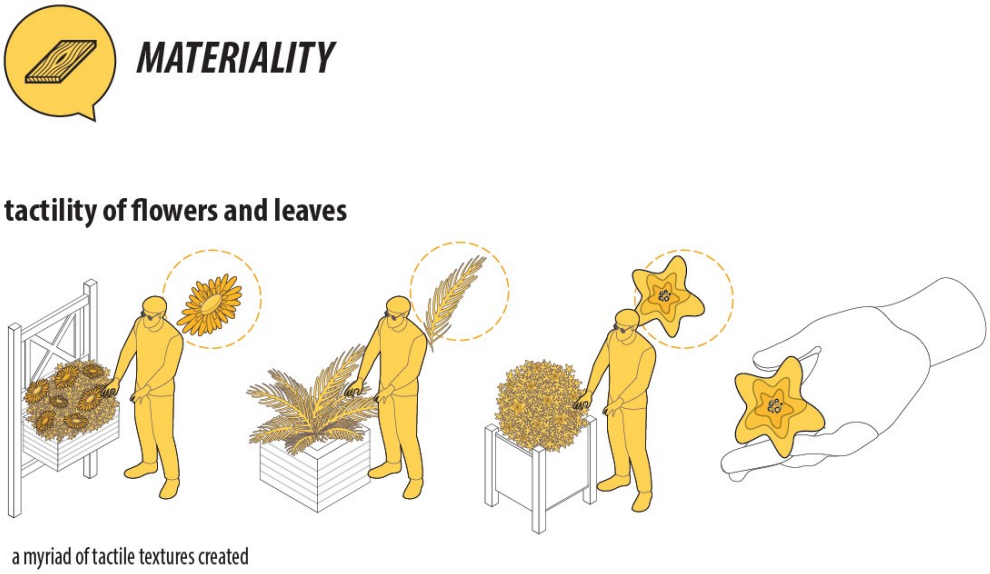


Figure 5.9 Materiality DS for Garden and Park

3. **Wayfinding** (Fig. 5.10): Navigating through space for the first time can be quite confounding for all users, especially for the NS. Even the layout and the boundaries of a garden can be attributed as ambiguous. Hence, for a space of delight like the Garden, it is essential that wayfinding must be scrupulous in such scenarios. Wayfinding involves identifying and approaching and understanding the overall layout of a space, but the difficulty in effective wayfinding hampers the desire to visit new spaces.[88] Various architectural elements are used to provide information. They are also used to create barriers for warning users.

    - ***Wooden information posts*** - These are placed along the handrails as information carriers to the NS users. Like the Stanchion bands in the pop-up market, here these posts allow the NS user to orient their position with relation to the whole park.
    - ***Bushes at a certain height*** – Can indicate an access point to other areas of the park. Bushes are also used as softscape periphery markers to provide structure and design organization of the inner gardens. The NS user can always tap their cane and recognize these boundaries.
    - ***Pocket garden entrances*** – These are placed with an inclined rocky that provides information about the mini pocket gardens within the park
    - ***Boulders*** – The use of boulders delineate the promenade from the walkways to inner pocket gardens. The walkways are textured and are slip-resistant. They prevent the users from venturing into inaccessible spaces.
    - ***Wooden fences*** – Used as a hardscape boundary creation and placed beside activities within the park that indicate a presence of an activity area like a baseball ground or a skatepark. The NS users would tap the wooden

[88] Kin Wai Michael Siu, "Accessible Park environments and facilities for the visually impaired," *Facilities* 31, no. 13/14 (2013): 590-609. https://doi.org/10.1108/f-10-2011-0079

fence and be informed that they would not be walking beside a garden anymore.

- ***Scented Trees*** – Planted along a demarcated walkway dedicated to the NS only.
- ***Guided Ropes*** – Can be used for demarcating a boundary. But mainly proposed for independent navigation through the nature trails for the NS.
- ***Guided Curbs*** – Curbs are raised at a height of about 6 inches above the ground. They are painted yellow for easy recognition by the partially sighted. They are used for inner garden pathways.

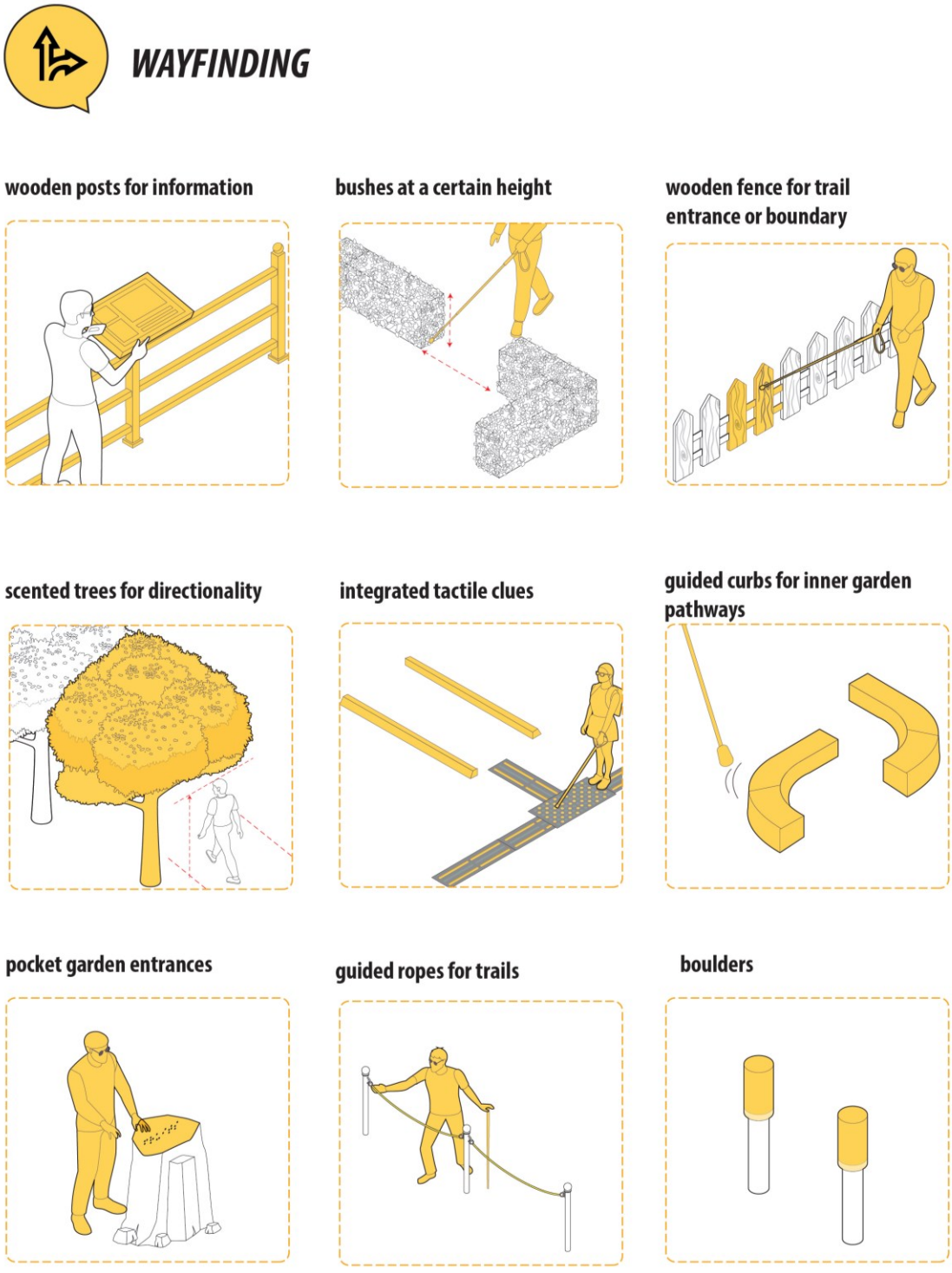


Figure 5.10 Wayfinding DS for Garden and Park

4. **High Contrast** (Fig. 5.11): Elements of high contrast are placed throughout the garden for the benefit of the partially sighted users. They are effective in providing a warning to delineate any peripheries, junctions or angles Sharp Contrasting colors are used to notify of warning, approaching junctions. A survey conducted in 2005 by Health and safety Laboratory identify that about 12 percent of tactile pavers had no tonal contrast with surrounding paving. The elements being used, needed to have even lighting and minimum glare.[89] Care and effort have been taken to assimilate this within the strategies.
    - ***Contrasting outdoor furniture*** – Helps partially sighted users to spot furniture contrasted against any green foliage from a long distance. Primary colors are suggested for paint finishes on the furniture like red, blue, and yellow.
    - ***Lozenge dots on pavers*** – Intimates the NS user that they have approached the edge of a footpath and a beginning of a pocket garden. The NS user may proceed ahead with a slight level difference of step down. These are colored yellow for the partially sighted users.
    - ***Contrasting flowers*** – Besides a visual appeal boost, certain plant selections provide flowers of bright colors that contrast against the green foliage. Different colored flowers can act as visual indicators for the partially sighted users as location markers.
    - ***Angular warning vases*** – The base of the vases and posts angular to reaching a deck have been marked in yellow and black to indicate approaching of a deck.

[89] Ormerod, Marcus, Rita Newton, Hamish MacLennan, Mohamed Faruk, Sibylle Thies, Laurence Kenney, David Howard, and Chris Nester. n.d. "Older People's Experiences of Using Tactile Paving." Proceedings of the Institution of Civil Engineers - Municipal Engineer. Accessed September 15, 2022. https://www.icevirtuallibrary.com/doi/10.1680/muen.14.00016.

- ***Contrasting colored fences*** – Acts as a boundary creator indicating adjacency of a leisure or outdoor activity within the park.

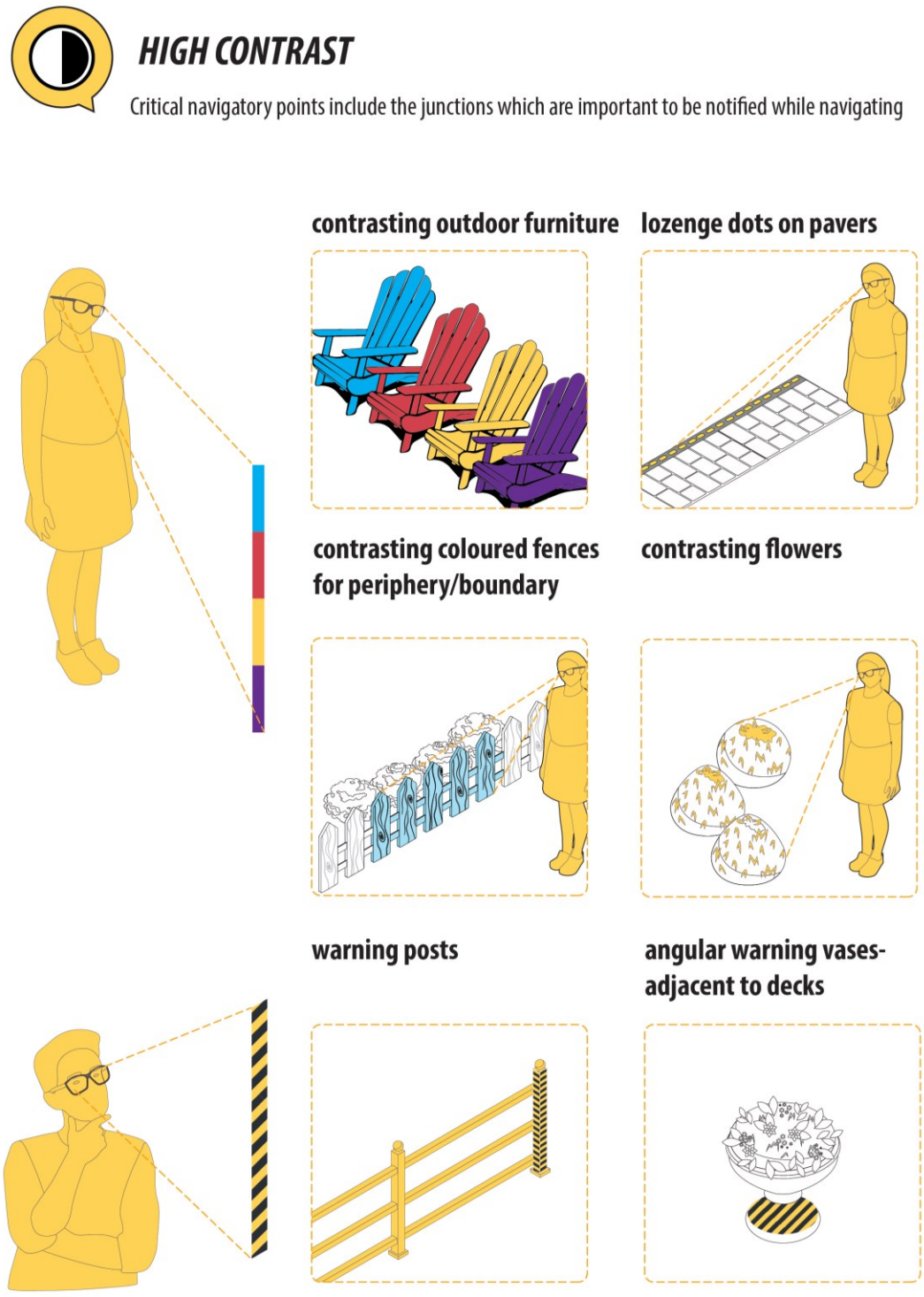


Figure 5.11 High Contrast DS for Garden and Park

5. **Atmospheric Fluctuations** (Fig. 5.12): Atmospheric fluctuations are quite typical in an outdoor space like a Garden. An ample amount of resting space with the use of gazebos, and the canopy of trees provides respite from the heat. The edible garden gives an opportunity for viewing and sampling plants. The herbs and perennials provide fragrant and aromatic scents. The waterfall as well as the splash pads produce a calming and refreshing sound to rejuvenate the users. Furthermore, the sound of birds chirping, and the hum of the bees adds to the overall sensual experience.
    - ***Pocket scented gardens*** – Inspired from the Children's Senses of Garden, a sensory garden with mini pocket gardens is proposed. These involve the butterfly and hummingbird garden, edible garden, touch garden, scent garden, waterfall garden and a splash pad garden.
    - ***Attracting wildlife*** – With careful selection of plants, the garden can be home to hummingbirds that are attracted to vibrant colors of solitary flowers and plants with berries and seeds. The sounds created by their calls, songs and hums add to the overall sensory experience.
    - ***Orchards*** – Provides an opportunity to learn about the various parts of a plant and the garden has a wide variety of vegetables and herbs that can be viewed, touched, and sampled.
    - ***Water elements*** – The waterfall fountain creates a stimulating and refreshing sound created by water cascading down the fountain base. Benches are placed near the waterfall so that visitors can read and enjoy a book whilst hearing it ripple. Water activities beside the trail are encouraged like fishing and boating.
    - ***Shaded seating*** – Provided through gazebos at the deck and park and also by careful planting of tree canopies to provide a sense of relaxation and create a cooling effect by the temperature drop in these areas.

It is highly recommended that all the DS proposed within both test case scenarios during further research should be tested with NS participants to derive its effectiveness and shortfalls.

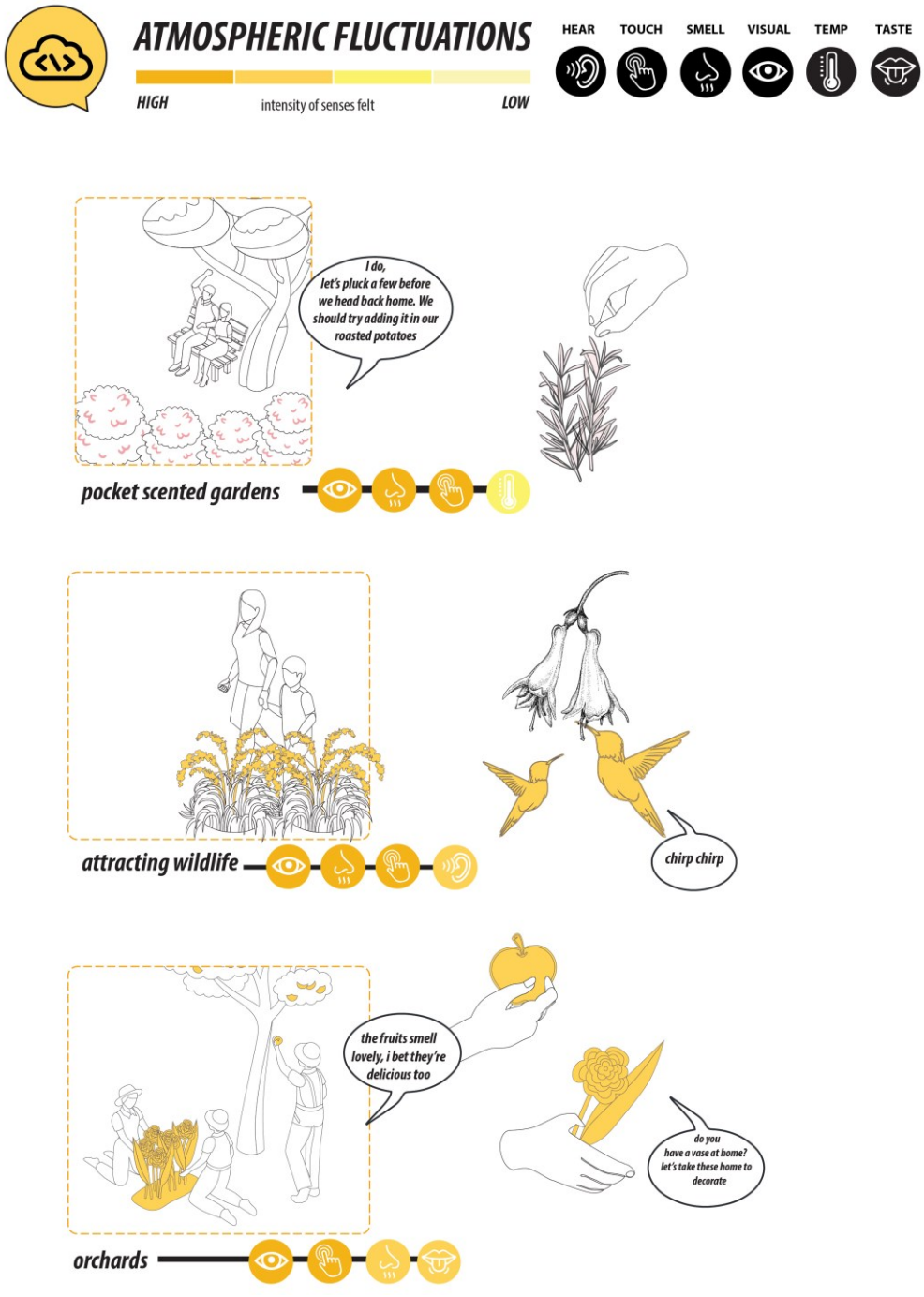
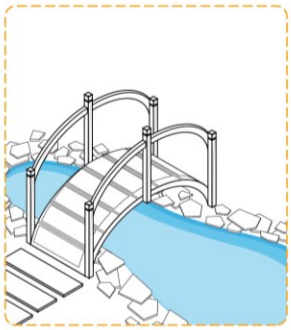
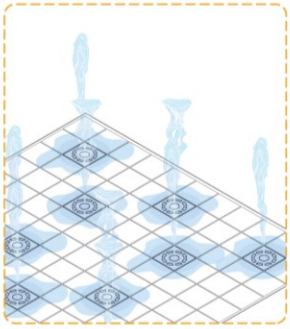


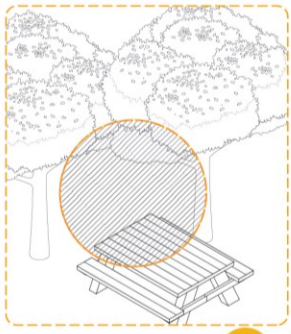
Figure 5.12 Atmospheric Fluctuations DS for Garden and Park (continued next page)





water elements

fountain | lake | splash pads



shaded seating

Chapter 6
Application of the Sensory Focused Design Strategies

The design strategies mentioned in the previous chapter will be illustrated for two cases: a pop-up market and a park with gardens through two comprehensive and detailed diagrams. The design layers referenced from chapters 3 to 5 are applied here to form a predictive language that is demonstrated in the following pages. It would be intended that these two scenarios would form a base point to demonstrate the potential effectiveness of the strategies to form a departure point for more global applications in other similar scenarios. The proposal is laid out based on an audience of practitioners within the design field to understand the effectiveness of the DS stated in Chapter 5. The below discussed is an attempt to visualize a non-sighted user's navigation within both the cases.

6.1 Application of Design Strategies on the Pop-Up Market

As the NS user approaches the entrance of the pop-up market, the flutter of the flags and chiming of the bells (Fig.6.1 - A) indicate that they have arrived at the entrance of the market. Care must be taken that the public path directional pavers are connected to this market entrance which would lead the NS towards reaching the entrance map. Upon studying the cognitive map provided at the entrance (Fig.6.1 - B), the predictive language is intimated to the user in braille and added textural legends explaining the wayfinding techniques to navigate successfully within the market for a delightful experience. As an added service, the market may decide to add a small information kiosk with a person for assistance.

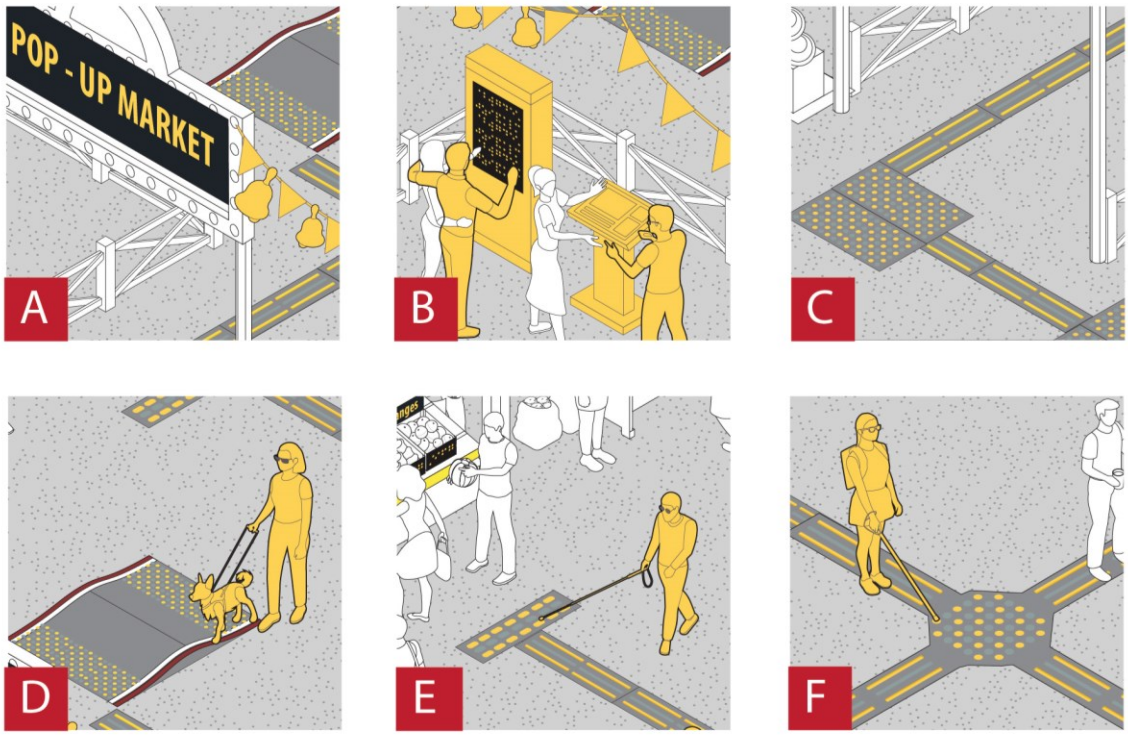


Figure 6.1 Wayfinding elements within the Pop-Up Market

At the foot level, the directional (Fig.6.1, C) and junction tactile pads (Fig.6.1, F) would lead and branch out to various circulatory options for reaching their destination but each limited to a grid like circulation. This is done in purpose to limit ease of effort and prevent the NS

users to tread upon unexpected or curved pathways of circulation. Upon stepping on the sloped tactile pad (Fig.6.1 - D), it is known that they are in proximity of all the available kiosks.

Figure 6.2 Highly aromatic kiosks placed in all corners of the market

The corner kiosks that are filled with highly aromatic products also indicates their proximity to the kiosks. A few steps ahead and it is expected that the NS user would be able to reach the braille stanchion bands by either tapping their guide cane and identifying the curved wooden curbs (Fig.6.3) or by walking and feeling the directional tactile pads beneath their feet.

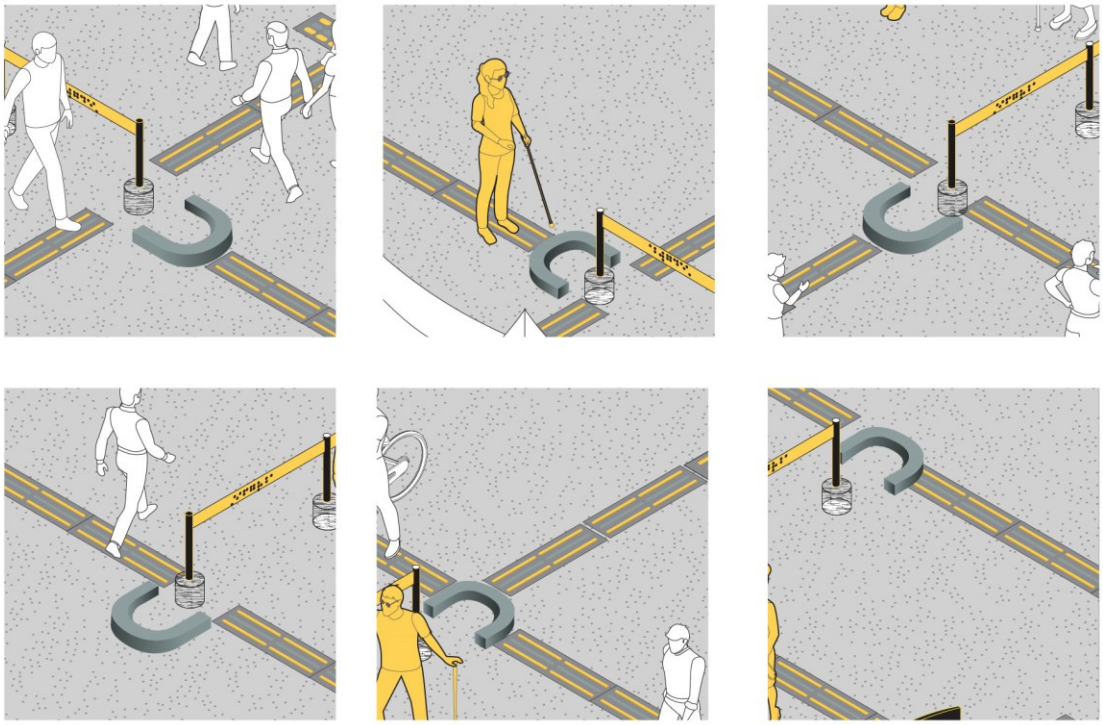


Figure 6.3 Curved wooden curbs to indicate braille stanchions

As the NS user's hands run through the stanchion bands integrated with braille, they gather information on the location of the adjacent kiosk type and may decide to either turn left or right or continue walking to their desired kiosk type. The NS users are therefore given time to make a calculated decision through the stanchion bands (Fig.6.4) as they continue walking adjacent to it, while other customers are walking and exploring the kiosks.

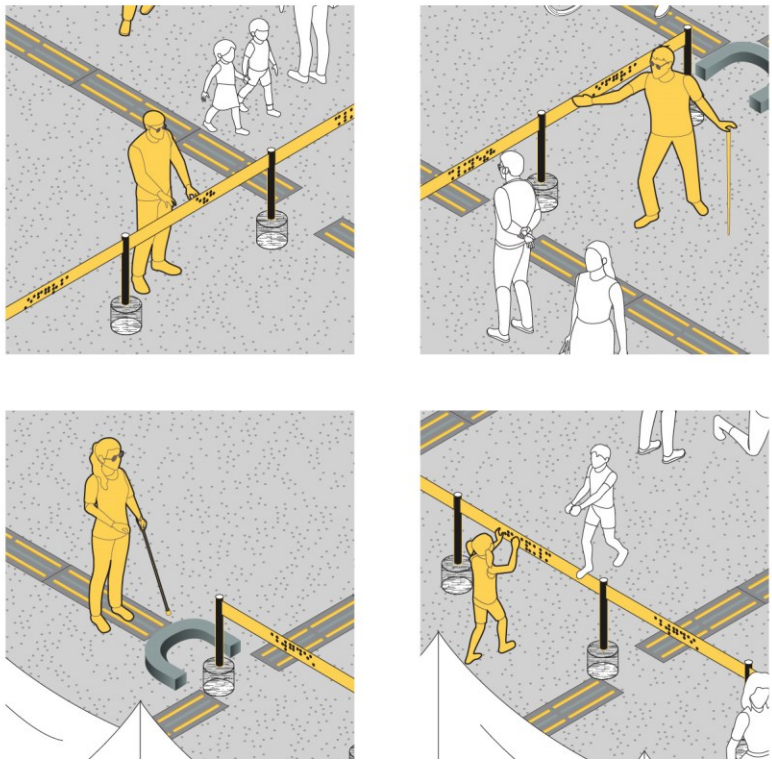


Figure 6.4 NS users interacting with the braille stanchions

Once a decision is made, and the NS user reaches a kiosk which is demarcated by stepping on the lozenge tactile pad (Fig.6.1, E), they are informed of reaching their destination. A 2-meter clear space is kept ahead of the kiosk for other users to engage with the products exhibited. Using the materiality DS for the pop-up market, the NS would be able to identify and confirm the kiosk type by touching the edge of the display table or shelf. Further, the NS user may read off the product names and prices through touching the product boxes and decide to buy or not.

Figure 6.5 Information on product types, prices displayed on product boxes, display table edges through braille, high contrast labels amd materality

Using a guided cane or their feet, the NS user may decide to return to the stanchion bands to continue their journey to the other kiosks. Once a junction approaches (Fig.6.1, F), the warning tactile pads in the center informs the user of their orientation within the market after they are done exploring various kiosks. They may then decide to navigate other areas of the market by creating memories of the kiosk locations either through 1) atmospheric qualities registered in their mind or 2) by the wayfinding architectural elements laid out or 3) both.

Figure 6.6 High contrast design strategies (DS) for the partially sighted

In terms of partially sighted users, the high contrast DS is applied in a way that they are informed of all kiosk types through their labels (Fig.6.6) and the circulation through the contrasting colors used for the tactile pads on the floor and the angular posts that act as vertical vision indicators (Fig.6.7). These along with the materiality and atmospheric fluctuations DS can be used in combination to help them navigate through the market.

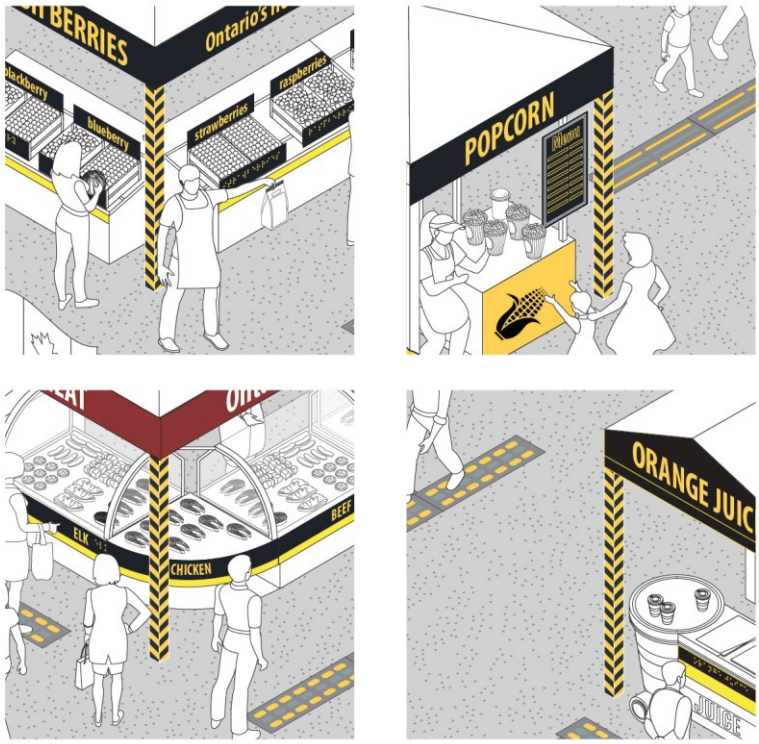


Figure 6.7 High contrast design strategies (DS) for the partially sighted within the Pop-Up market

The pop-up market's circulation is based on a standard grid that has 6 by 6 kiosks spanning 18 meters on each side. The central courts formed inwards by all kiosks are used as service areas (Fig.6.8) for loading and unloading goods and products. The circulation for the NS users starts at the entrance where common directional pavers connect from the public footpath and direct users to the entrance maps that have the predictive language embedded in it. The entrance map helps the user to have a cognitive understanding of the distinct types of kiosks available within the market.

The diagram (Fig. 6.9) showcases the culmination of all the design strategies (listed within Chapter 5, section 4) for the pop-up market.

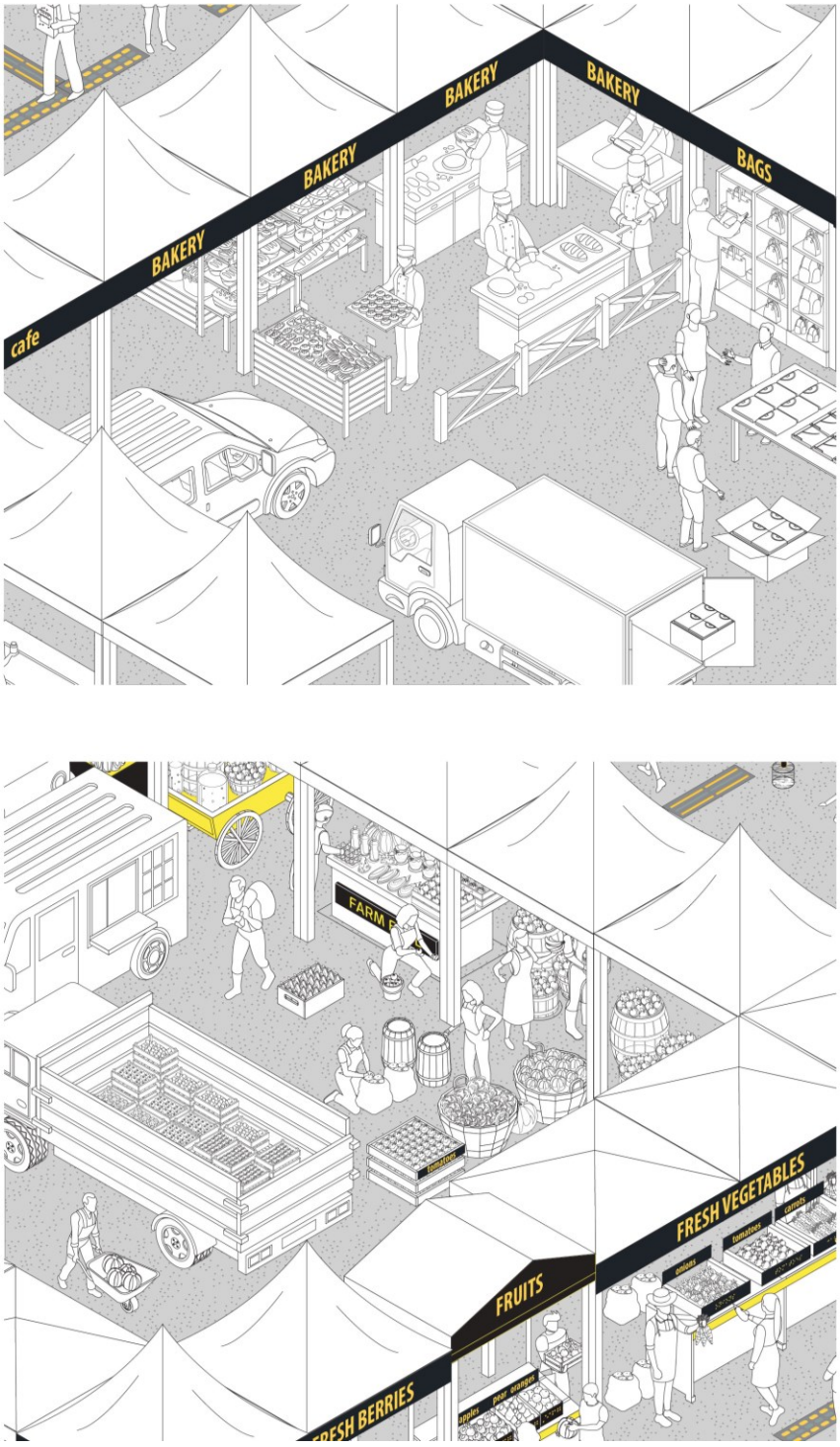


Figure 6.8 Service area courtyards within the Pop-Up Market

Figure 6.9 Pop-Up Market - Application of all DS

6.2 Application of Design Strategies on the Park and Garden

As a NS user enters the park, it is essential that the park's main entrance is connected to the common tactile directional pavers used in urban architecture. Once the NS user reaches the entrance of the park, the entrance map (a braille tactile map) provides - the schematic zoning of the park and inner gardens and mention the presence of tactile pavers throughout the park indicating to follow a particular navigation language (Fig.6.10).

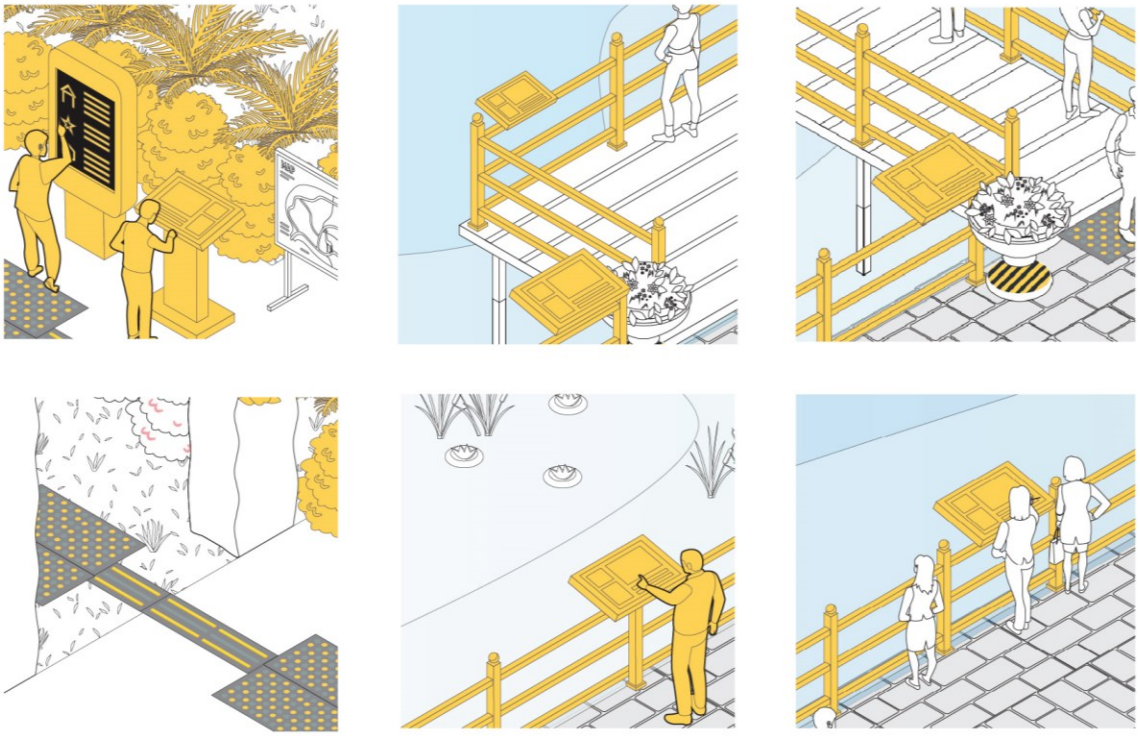


Figure 6.10 Entrance of the park, directional and junction paving at the entrance, information posts installed across the promenade, high-contrast DS of vase

The agenda is for the NS user to follow a strict circulation pattern that is always connected through the DS of wayfinding and tactility handguide. Upon entering, the directional tactile pads and junction pads (Fig.6.11) run parallel to the main circulation spine accompanied by a wooden handrail which is integrated with information at each interval posts. Like the nylon braille stanchion bands within the pop-up market that provided information on the type of kiosks adjacent to where the user stood, here, the circular handrail acts as the communication channel for the NS user to decide to: walk straight parallel to the waterfront, take left towards

the open-to sky decks and wooden gazebo or take right turns to available immersive pocket gardens and other activities within the park. The inclined information posts (Fig.6.10) are provided on the handrail to intimate the NS user the predictability of what is expected next and that they can independently make choice to tailor their journey throughout the park.

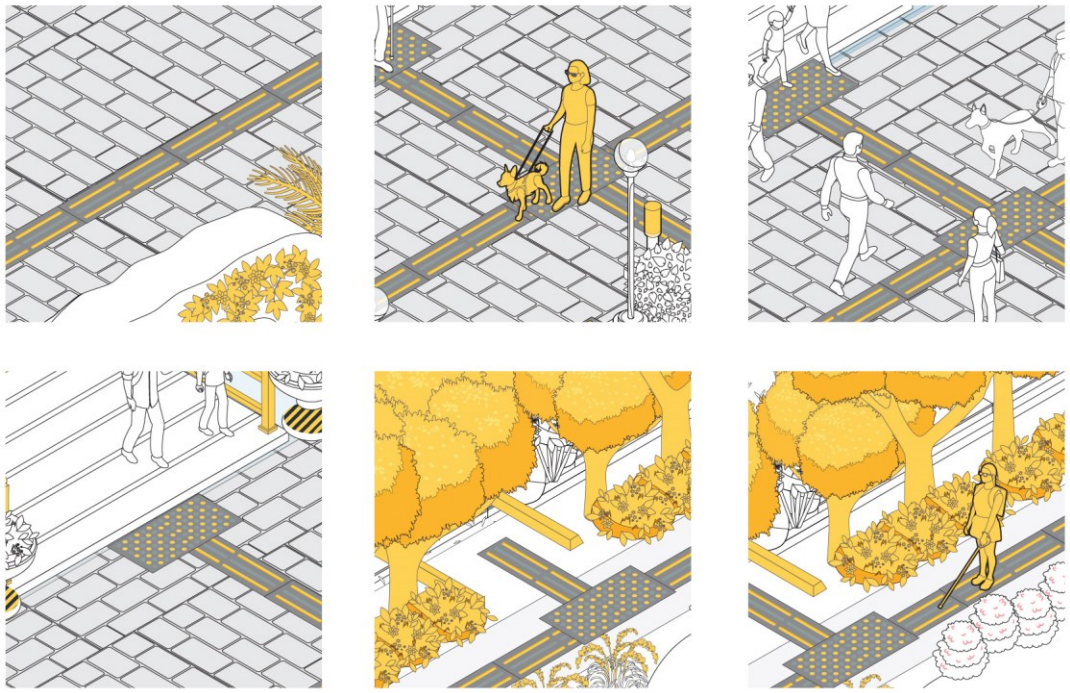


Figure 6.11 Navigation through tactile paving types

Once they leave the DS tactility handrail, navigation is mostly done using tapping their guide cane on the grade level, tactile pavers, curbs, and lozenge strips within the inner paths of gardens, heighted bushes, and wooden fences. the tactile pavers felt beneath their feet to venture further (Fig. 6.12).

Figure 6.12 Curbs and Lozenge strips within the internal circulation of the sensory garden

Figure 6.13 Parallel axes of the promenade, inner paths of the sensory garden, walking track dedicated to the NS and cycle track

The promenade, jogging track dedicated to the NS and the cycle tracks (Fig.6.12) run parallel to each other while the space created between them contain the sensory focused gardens and other activities including the skatepark, baseball playground, fishing area, boating and a farm shed (Fig.6.14).

The periphery of outdoor activities like the skatepark and baseball playground are installed with wooden fences to inform the NS users the presence of people playing adjacently, hence

more caution maybe taken while accessing those areas. While the quality of wood helps the NS users hear a certain sound through the tapping of their guide cane, the partially sighted people received this information by the visually by noticing the contrasting-colored fences and furniture.

Figure 6.14 Other activities present within the park includes skatepark, baseball playground, fishing area, boating and a farm shed

Regarding the promenade, the purpose of placing the main pedestrian walkway at one side is to understand the importance of separating the main circulatory spine from the other parts of the park that has smaller spill out garden areas. Mainly inclusive to all, the park on one side (the open turns warned through contrasting elements of vases and posts along with junction pavers on the floor) is adjacent to open-to-sky decks, a gazebo looking across the water body (Fig.6.15) while the other side (access indicated through lozenge strips) has access to wooden seats (Fig. 6.16) at intervals (facing both axes) and entry towards the pocket gardens.

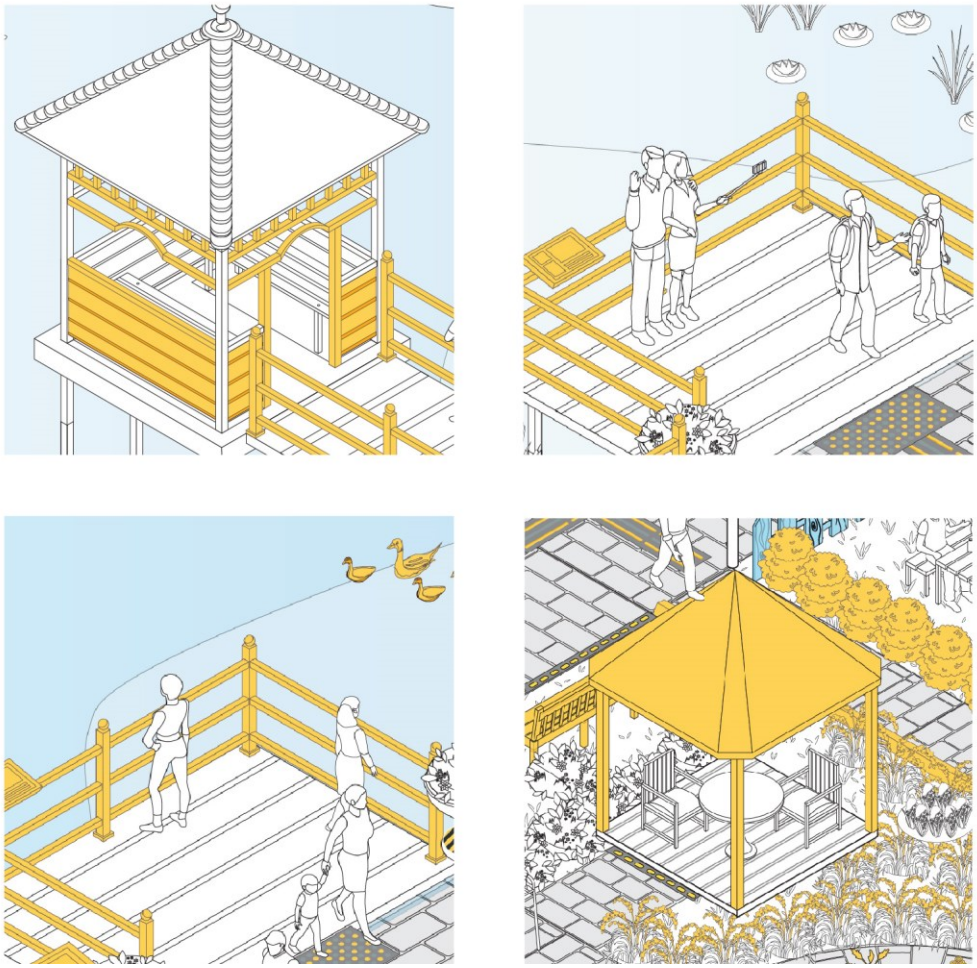


Figure 6.15 Decks and gazebos

The gardens further lead to dedicated tracks for walking for the NS (installed with directional and junction pavers) and bikers separately. The walking track is planted with scented evergreens on one side providing shade during the walks and the latter side is planted with perennials that create boundary from the adjacent cycling track. The usual double lane pedestrian and bikeway pathway (a prevalent architectural element found in urban footpaths) is avoided here by separating both tracks to avoid collision and promote safety for both users during circulation.

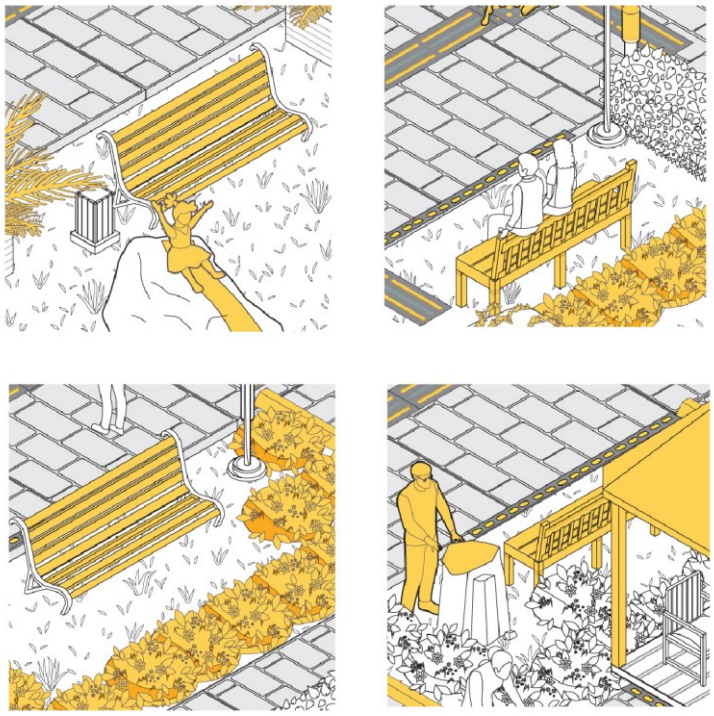


Figure 6.16 Wooden seating at the other side of the promenade

From the main promenade, the NS user may deviate to the sensory focused garden situated towards the right within the diagram (Fig.6.20) and determine their expected path of detours along these pocket gardens catering to a sensory delight in some form. The navigation is led from the handrail inclined posts that provide information on each pocket garden's eminent characteristic inspired from the Children's Garden of Senses. The sensory garden has entrances (Fig. 6.17) that convey information about each garden on their characteristics of how they attract wildlife and the type of plants and flowers they house.

Figure 6.17 Pocket Garden entrances with braille incorporated on stones and nature trail guide ropes for independent navigation

Collectively, the sensory garden (Fi.6.18) has spill out pocket gardens which include:

- ***Scent garden***: (Fig.6.18, B) This is placed strategically at the entrance marked with a sculpture. The users upon entering are greeted by the scents and fragrances of perennials like Sarah Bernhardt Garden peony, Hidcote Lavender and Wooly Thyme. A direct indication of entering the sensory garden is highlighted by using the sense of smell.
- ***Touch garden:*** (Fig.6.18, A) Contains a myriad of perennials with different tactile textures like Stachys lanata Lamb's ear that provides a velvety feel once touched. No furniture is placed since users are encouraged to sit down and touch the plants that surround them.
- ***Children's play area:*** (Fig.6.18, C) Consists of play areas dedicated to children primarily and the floor is finished with scattered wooden chips and not the conventional rubberized finish, The bouncy effect from the wooden chips is meant to encourage any user to sit down and feel the texture of the chips.
- ***Splash pad:*** (Fig.6.18, D) This is placed right adjacent to the interactive sculpture garden. The water sprouting from the surface and cascading overhead allows the sense of touch, temperature, and sound to be felt. While the ground surface here is made from anti-slippery, textured tiles, the other half space is left intentionally open for users to sit down and enjoy experiencing the play of water.

- ***Interactive sculpture garden:*** (Fig.6.18, E) The material of rough and polished stones is used within this garden to encourage installing more weather resistant materials throughout the park. The stone installations serve as sculpture at the same time transform to seating and a playground for kids. Contrasting flowers are planted around here like the Ivory Silk Japanese Lilac, Red baron Japanese blood grass, Dappled Willow, and Dwarf Hinoki false cypress. Care must be taken to ensure that all plants selected are safe and non-toxic.
- ***Edible Orchard Garden:*** (Fig.6.18, F) Meant to specifically engage the NS users with the opportunity to sample various offerings in the garden like carrot roots, lettuce, and broccoli florets. The users may interact with the orchardists and learn about gardening. This garden also consists of certain herbs like Origami mixed Columbine and Blue Ice Bog rosemary that emit strong scents when the leaves are crushed with one's fingers. Besides engaging almost all the senses for the users, this garden act as a source of food for the bees and butterflies too.
- ***Fountain garden:*** (Fig.6.18, G) Using water again as an element of attraction here, this garden is provided with seating of benches, a picnic table, and a gazebo specifically under shaded trees to encourage users to sit down, listen to the rippling water and perhaps read a book. An interactive sculpture is also placed merged with the fountain for users to interact with.
- ***Butterfly and hummingbird garden***: (Fig. 6.18, H) This garden is placed beside the *edible orchard garden* and is home to variety of flowers that are visually contrasting. The flowers planted are meant to attract butterflies and gives the opportunity for the visitors to view the larvae grow and turn into beautiful butterflies. The flutter and chirps of the butterflies and hummingbirds create a buzzing sound in the garden that can intimate the NS user of the presence of wildlife. Host plant choices include Milkweed, Blonde bombshell butterfly weed, Caradonna sage perennial, Little Goldstar black eyes Susan and Hidcote Lavender. For the hummingbirds, the host plants include a combination of Origami mixed Columbine, Dropmore Scarlet honeysuckle and Hall's honeysuckle. These are encouraged to be plants on the vertical green arches (Fig.6.19) at the entrances and fences too to attract hummingbirds.

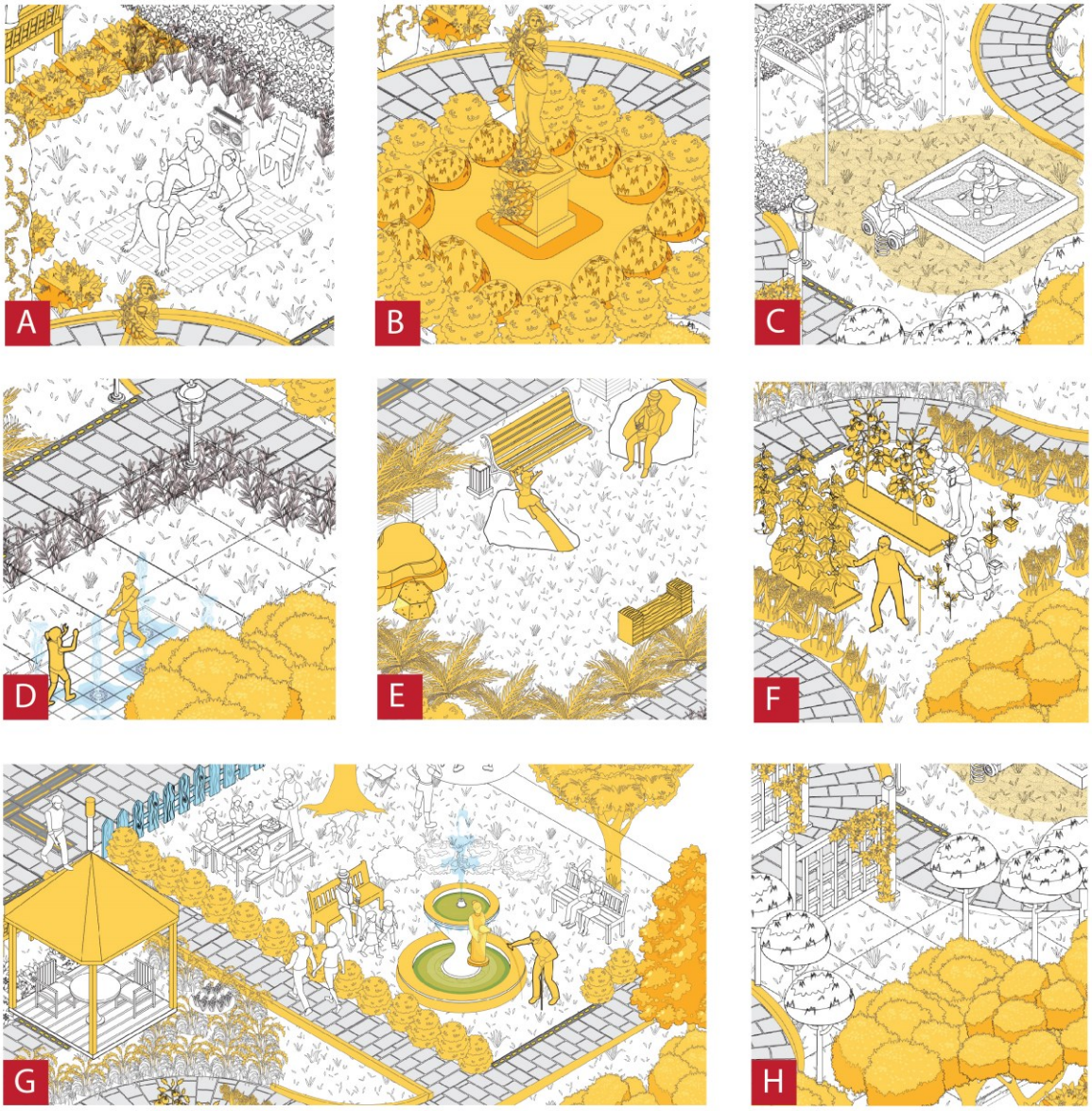


Figure 6.18 Sensory Garden consisting of - A. Touch Garden B. Scent Garden C. Children's play area D. Splash pad E. Interactive sculpture garden F. Edible Orchard Garden G. Fountain Garden H. Butterfly and Hummingbird Garden

Figure 6.19 Main entrance to park, and other vertical green walls planted with contrasting flowers

Other high contrast DS includes the softscape of contrasting foliage (Fig.6.19) and the hardscape of the yellow and black strips embedded on to the flower vases, handrail posts and boulders (Fig.20) indicating access to decks and other secondary paths

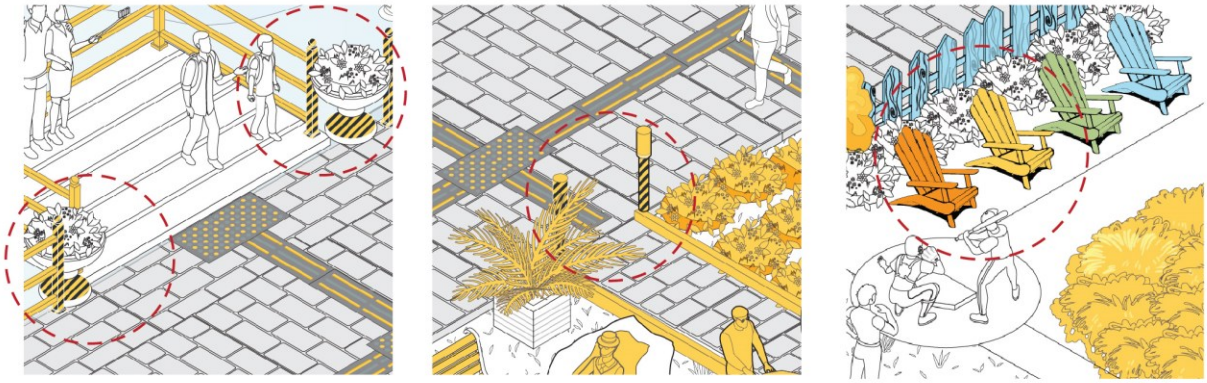


Figure 6.20 High contrast DS within the park

The diagram (Fig. 6.21) showcases the culmination of all the design strategies (listed within Chapter 5, section 5) for the park with gardens.

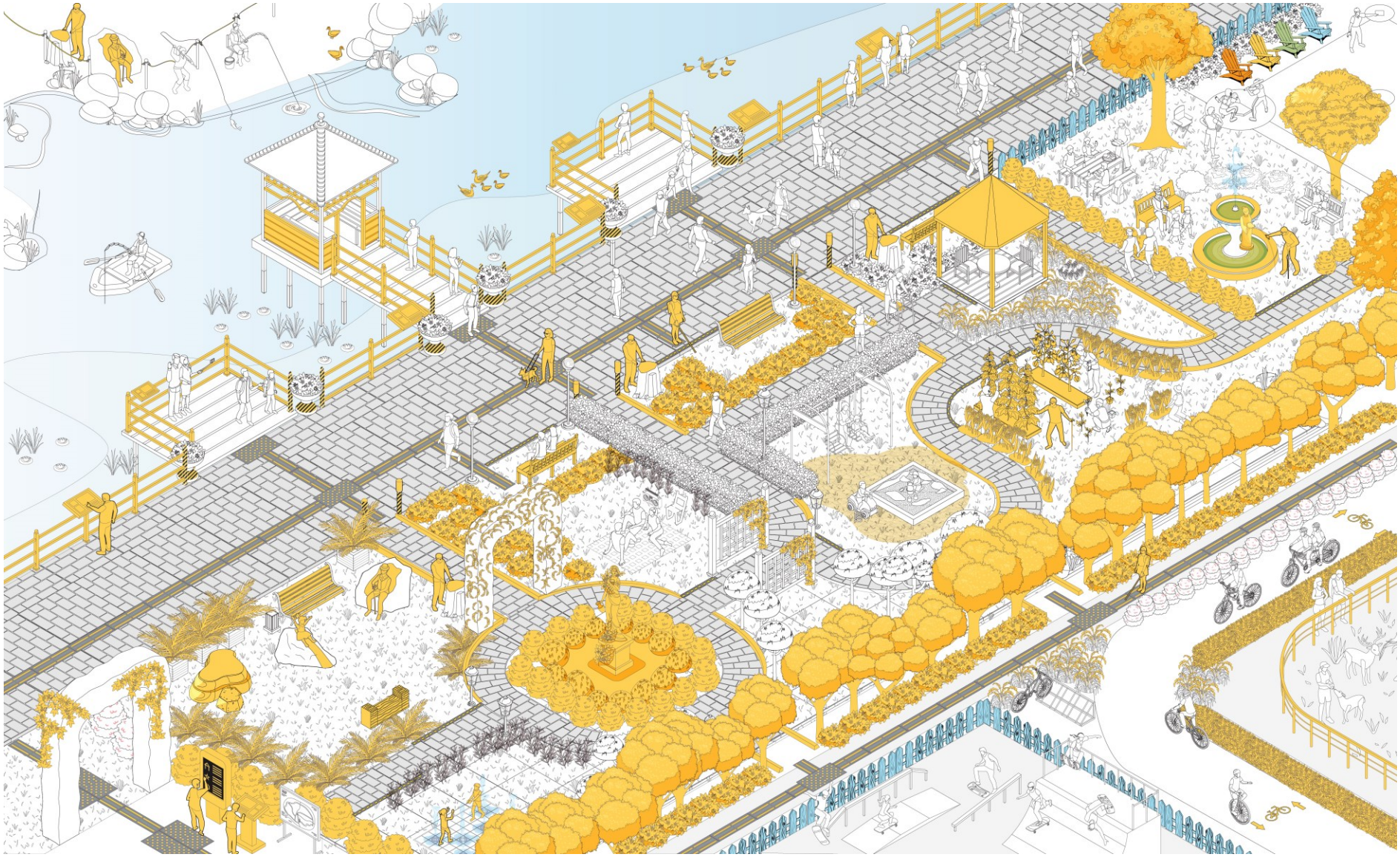


Figure 6.21 Park with gardens - Applied Scenario of all DS

Below is a compiled list of plants that maybe used for the sensory garden (Fig.6.22):

1. *Perennials*
    a. *Blonde bombshell butterfly weed*
    b. *Caradonna sage perennial*
    c. *Little goldstar black eyed susan*
    d. *`crazy cayenne sizzle & spice coreapsis*
    e. *Stachys lanata Lamb's ear*
    f. *Nothern maidenhair fern*
    g. *Red baron Japanese blood grass*
    h. *Sarah Bernhardt garden peony*
    i. *Intense orange kismet cone flower*
    j. *Sapphire blue oat grass*
    k. *Hidcote Lavender*
    l. *Sprite dwarf astilbe*
2. *Herbs*
    a. *Woolly Thyme*
    b. *Origami mixed Columbine*
    c. *Blue icebog rosemary*
3. *Shrubs*
    a. *Ivory Silk Japanese Lilac*
    b. *Dappled Willow*
4. *Evergreens*
    a. *Princeton sentry maidenhair tree*
    b. *Dwarf Hinaki false cypress*
5. *Creepers*
    a. *Dropmore Scarlet honeysuckle*
    b. *Hall's honeysuckle*

Figure 6.22 Suggested Perennials, Shrubs, Herbs, Evergreens and Creepers for the Park and Garden

6.3 Remarks

By illustrating both the test case scenarios of the design strategies when applied to the pop-up market and the park with gardens, it is concluded that for a NS user, a continuous uninterrupted navigation is required to encourage independent navigation to have open access to these typologies of spaces, which further allow them to enjoy experiences of joy and delight. When studying the existing architectural tactile urban elements (Chapter 3, as a designer it came across that the NS should not be limited to experiencing places of leisure and recreation which forms valid part of everyone's well-being. Both the cases showed possible methods of installing design strategies of wayfinding and directionality, by consciously avoiding any technologically adapted scenario through stripping architecture at its simplest form.

However, it is imperative that for further research these DS are to be tested with active participation from the NS users to draw informed improvements upon the methods used. Along with this, in terms of urban connectivity, policies must be made to ensure uninterrupted connection of transit and spatial typologies of recreation and markets. Ensuring this would allow for alterations and enhancements within code which when applied to urban architecture would further encourage the NS to live more independently.

The next chapter would reflect on my journey of this thesis and attempt to analyze how the spatial experiences have culminated my perspective on architecture, moreover towards architectural education and related discourse.

Chapter 7
Self-Reflection

"The hegemony of sight first brought forth glorious visions, in Heidegger's view, but it has turned increasingly nihilistic in modern times. Heidegger's observation of a nihilistic eye is particularly though provoking today; many of the architectural projects of the past 20 years. Celebrated by international architectural press, express both narcissism and nihilism."

-Juhani Pallasmaa, Eyes of the Skin

In the above quote, Pallasmaa attacks architecture's ocular centric nature by blaming the *hegemonic eye* where architectural projects were turned into exuberating a narcissistic self-expression rather than reflecting the core connection that forms out of intimacy from the atmosphere.[90] As stated in Chapter 2, architectural design is known to focus on its ocular centric qualities of manifestation, often leaving people with visual disabilities (NS), from experiencing a spatially rich experiential environment.

This thesis is an invitation to architects to test their capability to conceive these spaces as creative opportunities fundamentally sprouting from a shift of attitude, decision making, and addressing diverse people from different backgrounds to be included within architectural education itself.

The importance is of addressed within the thesis deals with vision loss that is labelled as an emergent crisis, according to a report by the Canadian Council of the Blind and the Canadian Association of Optometrists and the Canadian Ophthalmological Society. Stating out some facts, vision loss will cost Canada about $33 billion (about $100 per person) annually.[91] Furthermore, the Health Professions Regulatory Advisory Council (HPRAC) estimates that by 2030 the

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[90] Jenefer Robinson, "On Being Moved by Architecture," *The Journal of Aesthetics and Art Criticism* 70, no. 4 (2012): pp. 337, https://doi.org/10.1111/j.1540-6245.2012.01526.x.

[91] "NEW REPORT REVEALS VISION LOSS COSTS CANADA ALMOST $33 BILLION ANNUALLY," Fighting Blindness Canada, accessed August 29, 2022, https://www.fightingblindness.ca/news/new-report-reveals-vision-loss-costs-canada-almost-33-billion-annually

number of senior citizens will double to 3.7 million and this would introduce an array of vision-related problems, the number accommodating Ontarians alone.[92] This coupled with an upsurge in the baby boomer generation as referenced in Chapter 1, engenders the call for addressing design for an inclusive society. The onus is on architects to build spaces that are more inclusive and meet the needs of a diverse group. The task, however, is not just arduous but a challenging one. Drawing upon discussions and explorations from Chapters 1 to 6, that included studying code compliance, case studies, spatial experiences and strategies and applications, some of the reflection points are included as below:

7.1 Revisiting architectural discourse and education – a sensory enhanced approach

The task of architecture is to reinforce our being in this world.[93] Through this process, we unravel the true sense of reality and rediscover ourselves in the process. This realization, however, is being increasingly lost in the ocular-centric and fabricated world of today, where we account as mere spectators instead of being active participants. This proclivity towards vision can be attributed to the hegemony of the eye. This overarching dominance of the eye is prevalent in modernist thought, beginning with the Greeks. This trend has been widely adopted by western culture.[94] Pallasmaa vehemently attacks the visual emphasis in architecture today. It has resulted in architectural works being self-expressive of narcissism and has deviated from reflecting the intimacy that is established by our interaction with the world.[95] Through his works, he has necessitated the realm of addressing all senses in architecture. Filippo Brunelleschi, the pioneer of Renaissance architecture, had a contradictory view to the visual perspective. He

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[92] "University of Waterloo Selects HOK to Design New Eye Institute," Canadian Architect, accessed August 29, 2022, https://www.canadianarchitect.com/university-of-waterloo-selects-hok-to-design-new-eye-institute/

[93] Ibid, 25.

[94] David Michael Levin, Modernity and the Hegemony of Vision (Berkeley, Los Angeles & London: University of California Press, 1993),

[95] JENEFER ROBINSON, "On Being Moved by Architecture," *The Journal of Aesthetics and Art Criticism* 70, no. 4 (2012): pp. 337, https://doi.org/10.1111/j.1540-6245.2012.01526.x.

states that it causes the viewer to freeze in space and time.[96] All the senses of the human body are indispensable to ground our reality in this world and to fully experience the essence of architecture. Along with the five basic senses of sight (visual), hearing (auditory), taste (gustatory), smell (olfactory), and touch (somatosensory), the other sensory modalities of temperature, movement and position (kinesthesia and proprioception), pain, balance, vibration, and other stimuli are required to understand and perceive the world.[97] The way these senses interact with each other and imbue our understanding has a profound effect on our lives.

In the sensorial realm of architecture, it is imperative that a building or space needs to be experienced as an embodied experience rather than just a visual effect. Jenefer Robinson affirms with Pallasmaa on how there is a need to "move through the building, hear how it reverberates, smell its atmosphere, touch, and maybe even taste its surfaces" rather than look at it to appreciate architecture.[98] The work of architects like Alvar Aalto, for instance, was more oriented toward the body of the user and the encounter of the object.[99] This encounter is made possible by the integration of all senses. The visual bias in architecture can be overcome by incorporating multisensory education in course syllabus, the design process encompassing the participation of the body.[100] The design process must entail active involvement of people from varied backgrounds. This helps us to conceive a space from their perspective. As Jay Dolmage puts it, "disability is also produced, sometimes powerfully through the design of spaces".[101] The insight from a disabled person facilitates us to design spaces that emphasize inclusion.

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[96] Tom Porter, The Architect's Eye: Visualization and Depiction of Space in Architecture, (United Kingdom: E & FN Spon, 1997): 17.

[97] "Sense," Wikipedia, accessed August 29, 2022, https://en.wikipedia.org/wiki/Sense

[98] Jenefer Robinson, "On Being Moved by Architecture," *The Journal of Aesthetics and Art Criticism* 70, no. 4 (2012): pp. 337-353, https://doi.org/10.1111/j.1540-6245.2012.01526.x.

[99] Juhani Pallasmaa, The Eyes of the Skin (Wiley, 2005), 71.

[100] Arezou Monshizade, "Multisensory approach in architecture education: The basic courses of architecture in Iranian universities." in *Ambiances, tomorrow. Proceedings of 3rd International Congress on* Ambiances (Greece: International Network Ambiances, 2016): 360.

[101] Jay Dolmage, "From steep steps to retrofit to universal design, from collapse to austerity: Neo-liberal spaces of disability," in Disability, Space, Architecture (2017), 102.

7.2 Revisiting Code for the NS through a redefined UDP and inclusive approach

As outlined in Chapter 3 Shortcomings of Architecture, which touched upon the principles of UDP and ADA, it is essential to investigate to what extent are these principles benefiting the NS and S users for further research? And in the process of providing a solution, it is important to question the ramifications introduced in the process and its effectiveness for the NS users? Has it complicated standards deviating practicing architects to consider them as a maximum requirement and in the end as discardable options? Can delight through a sensory enhanced wayfinding within architecture supplement these standards?

Through Chapter 4 Personal Spatial Experiences, I drew on my own experience as a person stripped of visual abilities to be able to investigate upon the design decisions made by us architects. From all the walking explorations undertaken, I became increasingly aware of the psychogeography of spaces and had a limited glimpse of the issues a NS user may face in their quest for cues from the environment to navigate. Additionally, how we as architects can bring delight through design by applying a newly found sense of wayfinding through a sensorially enhanced available architecture. However, there are clear shortcomings of this approach which leads to my next point of the importance of including the NS within the architectural discourse and education.

7.3 Participation and Inclusion of the NS - Advisory committees within Architectural education

AODA attempts to address the issue of accessibility, but often they tend to be makeshift arrangements that are retrofitted to the original design decision. Moreover, architects defend themselves that this following set guidelines hamper their creative ability.[102] At the other end of the spectrum, this attitude labels the users as disabled. Though we provide access, we mark the users as different [103] and in the process of addressing accessibility, it creates an invisible barrier that creates a stigma for the community having disabilities which roots from the social

[102] Ann Heylighen, "Challenging prevailing ways of understanding and designing space," in Spatial Cognition for Architectural Design SCAD 2011 Symposium Proceedings, ed. Bhatt, M et al (2012), 23-40.

[103] Wanda Katja Liebermann, "Teaching embodiment: disability, subjectivity, and architectural education," The Journal of Architecture 24, no. 6 (2019): 814. https://doi.org/10.1080/13602365.2019.1684974.

perception the society possesses. To combat this, it becomes necessary to promote the NS within the advisory committee of architectural education so that we as architects can make well-informed decisions for an inclusive design approach as we climb our professionally honed practices and expertise. Facilitating involvement of NS users and striking a dialogue with them will set up further decision-making improvements from the S designers to avoid visual bias while designing in architecture. Approaches of spatial experiences (such like the one done in Chapter 4) can be tested and confirmed enabling us to come up with narratives that would benefit architectural education. By doing so, the barriers and stigma rooted towards people with disabilities can be successfully reduced and negated.

7.4 Informing architectural education through this thesis

Designing and creating a set of principles that are informed by research, evidenced through practice, and tested out in smaller scale scenarios tend to have desirable outcomes for the NS and S users. The reliance on my non-visual cues did help me be attentive to my spatial settings within the built environment. My notion dealing with perceptive responses was altered in a way that informed myself of my visually biased participation. It made me question on the formative training of architecture, and how that has mold me into making design decisions informed by my sighted perception. In terms of finding delight, I questioned why navigation is limited to transit circulation within urban architecture and is not extended to typology of spaces like parks, garden, or markets where opportunities to experience delight were abundant. Could the schools of architecture provide a platform where courses related to *NS and other participants of disabilities* can come and educate young architects from the foundational year about the existing code and its effectiveness of navigating cities to help students make informed decisions? How can this be integrated within our design studios? Can this encompass awareness of an interdisciplinary approach towards solving an ocular-centric norm of a nihilistic architecture? As sighted architects, it is important to create awareness informed by non-sighted users. Our limited knowledge would always provide biased designs. How better can we learn from the NS? And this can possibly extend to all groups of disabilities that fall under the AODA.

Going back to considering why my aunt never experienced or became comfortable with venturing outside, and instead resorted to her world of sensorial cues to navigate her life - could we reduce the fear within the NS and enable their venturing to find delight within the urban

environments through conscious design choices? Despite the advances of code compliancy, can insertions of delight through the Design Strategies (DS) explained in Chapter 6 during wayfinding be developed upon more to have a desirable experience for the NS and S together?

7.5 Conclusion and Remarks

The concept on materializing the design strategies into a kit of parts was discussed. The reference of Luke Anderson's 'StopGap Foundation' was given. Anderson's initiative in Toronto, Ontario is to make spaces accessible for everyone by addressing barriers created by the design of spaces and solving it with a simple innovation of building custom ramps for storefronts with different sized doorways. The review panel encouraged viewing the proposed DS within Chapter 6 as a trial-and-error opportunity to experiment its success and/or failure. Further recommendations on developing technical sections for the garden and park were also discussed, where a set of templates can be derived as a catalogue for S designers to help design a sensory enhanced park accompanied with the suggested appendix of plants.

Although the experiential spatial scenarios did convince me to follow design from a sensory enhanced view, it assisted me in decision making while listing the design strategies for the NS and S. While there evidently are shortcomings of my approach towards designing for the NS in particular, the architectural fraternity and the NS users can further benefit from an extended or improved version of this thesis through interviews from the NS, statistics gathered from the NS users around the city for code effectiveness, developing haptic material model studies for communication, exploring sensorial experiments with yourself and studying NS personalities lifestyle within the urban environment. And additionally, the aim is to delve into these issues not as mere add-ons, fixes, optional standards that are inclusions or exclusions but to raise awareness on the same to be added within the formative training years of architectural education to avoid a visually centered biased designing.

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