# Design Enabled: The Everyday Refuge for a Neuro-Inclusive City

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
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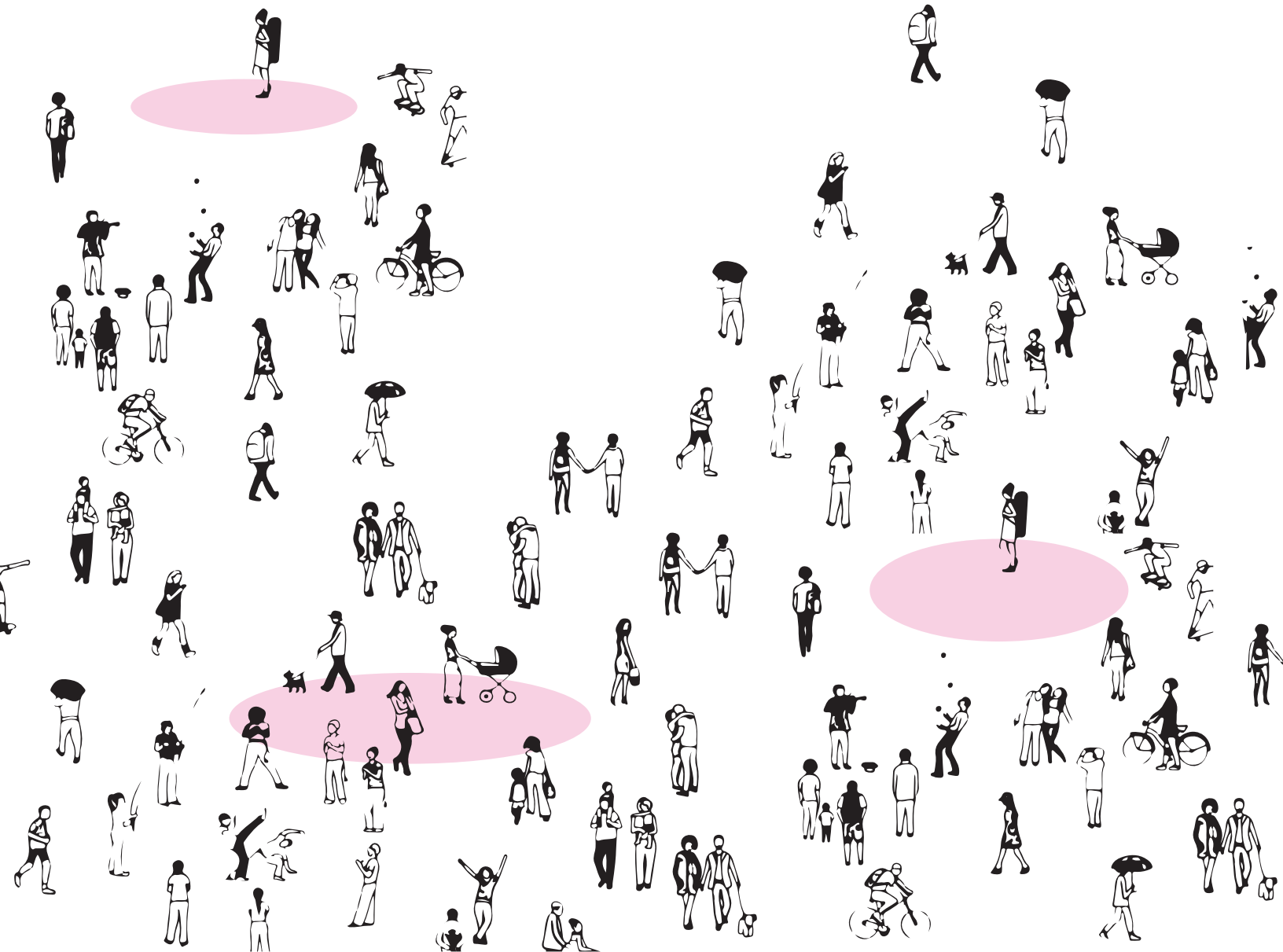

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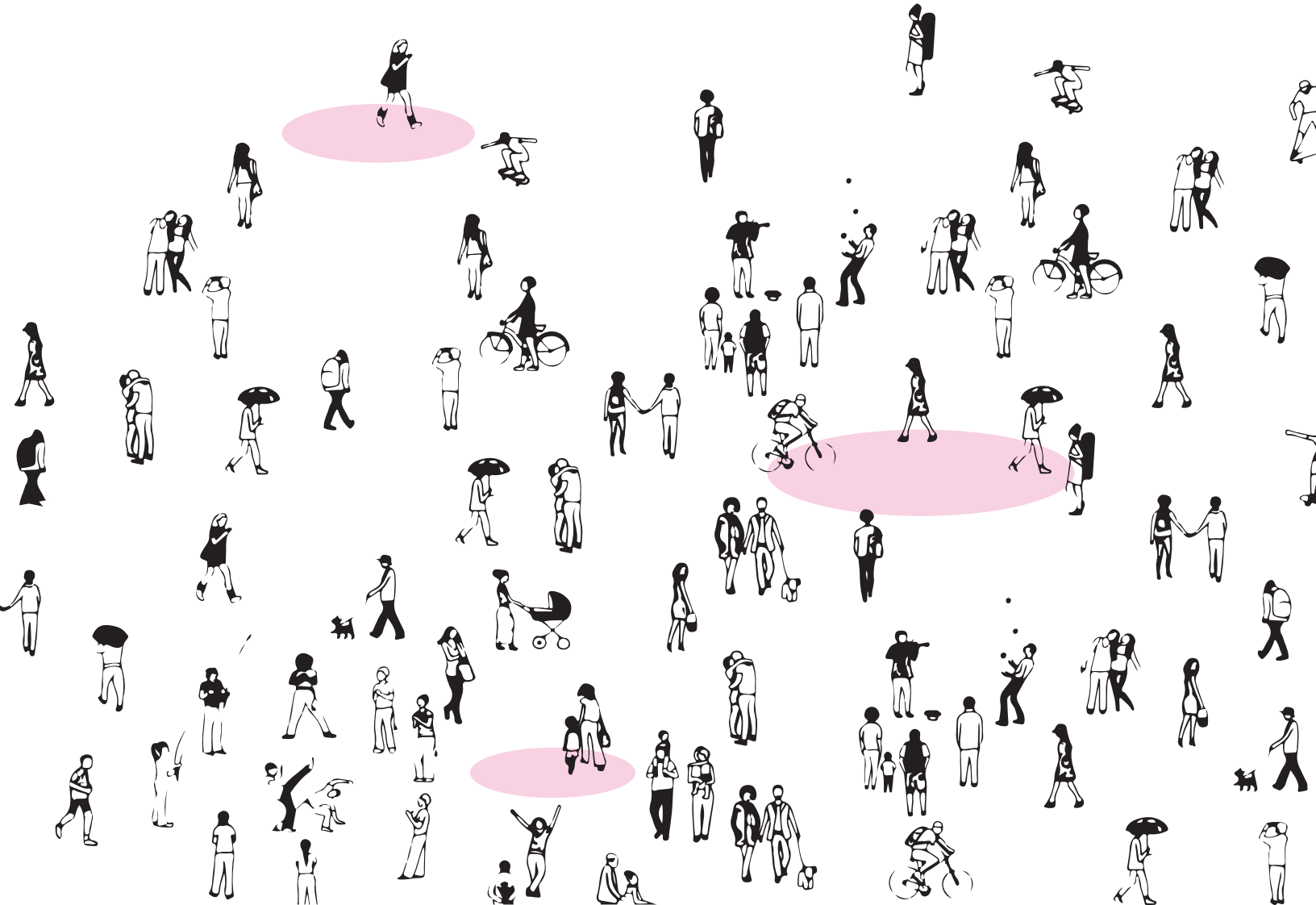

# Abstract

Keywords:

*visible disabilities, invisible disabilities, accessibility, inclusive design, universal design, enabling design, neurodiversity, neuro-inclusion*

One of the most pressing issues within the built environment is the ever-evolving conversation of accessibility and its relationship to obsolete building standards from the past. Standards such as the Ontario Building Code and the Accessibility for Ontarians with Disabilities Act (AODA) provide insufficient solutions to users with invisible disabilities, particularly the under-recognized realm of neurodiversity. This thesis explores the possibility for a new set of design guidelines, adopting principles to enable the users' senses and, in turn, create a neuro-inclusive environment. It also presents the design of a neuro-inclusive library centre with a secondary urban park to mitigate the challenges neurodivergents experience at both a human and city-wide scale. By designing a community-oriented project within the already-established arts and cultural hub of downtown Sudbury, this thesis creates a network of inclusive, user-centered, and sensorial design that can begin to decode the issue of accessibility.

# Acknowledgments

I would like to send my warmest regards and thanks to my thesis advisor, Dr. Kai Wood Mah, for supporting me throughout my Masters degree at the McEwen School of Architecture. You have significantly impacted my understanding of architecture, specifically how architecture can create difference by combating societal norms. You have truly made this thesis project possible. Thank you for allowing me to grow as an architecture student and always providing your expertise and feedback.

I would also like to express my gratitude to Jennifer Carpenter for providing me with invaluable insight into the specialty of neurodiverse design. Your feedback and architectural suggestions have contributed greatly to the development of this thesis project.

To my family and friends, thank you for offering me support and confidence throughout my journey as an architecture student. I would not have been able to do this without you. To my brother and sister, thank you for flourishing my understanding of neurodiversity and allowing me to find passion in creating meaningful and enabling architecture. To my parents and grandparents, thank you for the constant support, for always being my cheerleaders, and for proving to me what it means to be hardworking.

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# Preface

I began the Masters of Architecture program with a need to create inclusive design. This interest started with a study of public feature staircases and how much of a building's circulation revolves around the staircase. Many of these staircases have a great experiential factor connected to them. However, when one is physically impaired, they do not receive the same experience as those who are not physically impaired. This arose a new way of thinking about architecture, by designing spaces that enable the users' experience rather than disabling them.

In my first year of the Masters program, I developed a strong critique that current building standards only account for visible disabilities. As visible disabilities are immediately apparent on the human body, they are addressed most within architecture. This, however, leaves out many of the invisible disability types, specifically neurodivergencies. Many people live with neurodivergencies, and it affects them in many different ways throughout their daily lives. I believe that architecture should be able to mitigate the triggers that neurodivergent users experience.

I am pleased to say that my Masters degree has been devoted to enabling users and creating inclusive architecture. Designing environments with a specific user group in mind can begin to create beneficial environments for all. I look forward to what is to come in my future studies with this interdisciplinary interest in bringing forth change.

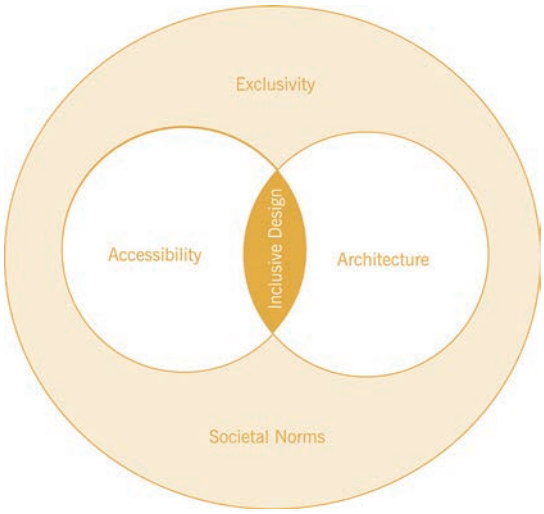
# Introduction

The concept of "architecture and difference" battles against societal norms; it is a dictation of designing and creating differences within society. It allows designers to create change, raise awareness and reverse design issues into design solutions [01]. Ultimately, it enables the creation of inclusive environments that welcome and are equitable to all users. The issue of accessibility within architecture stems from its relationship to outdated building standards. The Ontario Building Code (OBC) and the Accessibility for Ontarians with Disabilities Act (AODA) both concern a relationship to normative standards and do not account for the infinite amount of differences between disability types.

Although the Ontario Building Code and the Accessibility for Ontarians with Disabilities Act begin to acknowledge the daily challenges users with physical differences encounter, they mitigate only surface-level accessibility concerns. In 1975, Ontario introduced its first building code act, which included technical requirements for the construction and demolition of buildings. However, this edition did not include any accessibility requirements. In 2012, the OBC was updated to define a set of accessibility standards involving basic guidelines of barrier-free access paths of travel, fire safety devices, public washrooms, access to pools and saunas, and seating in public spaces.[1] Despite the updated and progressive editions of the OBC, there still exists an absence of designing for inclusivity that cannot be solved simply by removing barriers like staircases or providing more extensive washroom facilities for those using wheelchair devices.

In 2005 Ontario passed the Accessibility for Ontarians with Disabilities Act which enforced the development of accessibility standards to better equip users with mobility, visual, and hearing differences. Respectively, the act also includes accessible services, communication, employment, transportation, and public spaces. For example, under the "design of public spaces" section, there are accessibility acknowledgments involving pedestrian sidewalks and crosswalks, curb ramps, parking spaces, trails, and outdoor eating areas or play spaces.[2] Although these regulations do

[1] Ontario.ca. Accessibility in Ontario's Building Code (2021).
[2] Ontario.ca. About Accessibility Laws (Ontario.ca) (2021).




Left
**01 | Architecture + Exclusivity Venn Diagram**
Representing how accessibility in architecture can create inclusive design and break the overall exclusivity of societal norms

recognize the daily challenges users with visible disabilities encounter, they do not propose solutions for users with invisible disabilities and only provide baseline architecture to mitigate the barriers users are experiencing.

The Universal and Inclusive Design guidelines introduce ways to reach greater accessibility. Published in 1985, The Universal Design Guideline "denotes the importance of adapting the built environment to meet the needs of disabled people." As noted in its title, the term universal signifies a one-size-fits-all solution. However, "universal" is unrealistic in the realm of accessibility due to the infinite amount of differences. Instead, the guideline proposes principles that can aid in the mitigation of a diversity of needs. Similarly, the Inclusive Design Guideline which was produced in 2006 aims to promote inclusivity by designing for the users and allowing for choice, flexibility, adaptability, and diversity within architecture.[3] Both sets of guidelines suggest innovative thinking towards accessibility and consider users with visible disabilities. However, in most cases, the principles lack direction for users with invisible disabilities.

As stated by Statistics Canada in 2017, "6.2 million Canadians over the age of 15 live with at least one individual disability limiting their daily activities."[4] Disability types can range from visible; ones that are physically seen on the human body (mobility, vision, hearing differences), and invisible; ones that are not physically seen on the human body (autism, cognitive, mental, learning differences.)[5] Many visible disabilities have been addressed throughout design as they are physically seen on the human body and are therefore mitigated with physically built solutions such as ramps, elevators, textiles, and wayfinding. However, since invisible disabilities are not physically seen or immediately apparent on the human body, they do not get addressed enough within design standards, guidelines, and

[3] Manley, Sandra. Inclusive Design In The Built Environment: Who Do We Design For? (2016), 39.

[4] Government of Canada, Statistics Canada. Canadian Survey on Disability (2018).
[5] 24 Hour Home Care. Invisible vs. Visible Disabilities (2021).

architecture.

One of the fastest-growing types of invisible disabilities is the category of cognitive and learning differences. Research reports that "1 in 10 Canadians live with the challenges of learning differences." These can range from autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), dyslexia, dyscalculia, and dysgraphia which all fall under an umbrella term known as "neurodivergents."[6] Typically, neurodivergents are persons who have a variation in human neurocognition and whose neurological states are atypical. In fact, "1 in 8 people are considered as neurodivergents, yet fewer than 50% are aware of it".[7] Learning and neurological differences affect not only one's ability to learn in a typical manner but also creates many barriers within their everyday lives and spaces they encounter on a day-to-day basis. These spaces may range from one's home, occupational environments, leisure or recreational spaces, and health or wellness centres. Most users of the built environment are neurodiverse as "the way people learn is as unique as their fingerprint" meaning that there is no standard or typical way of learning or being.[8] Therefore, the question for architects is: *how can an architectural node of refuge within the cityscape allow neurodivergents to be enabled, rather than alienated through surface-level accessibility requirements and guidelines?*

This thesis proposes a new set of design guidelines developed through an analysis of case studies at varying scales. It offers a design intervention of a neurodiverse architectural node within the cityscape that begins to mitigate mental, emotional and physical barriers neurodivergents experience within their everyday lives.

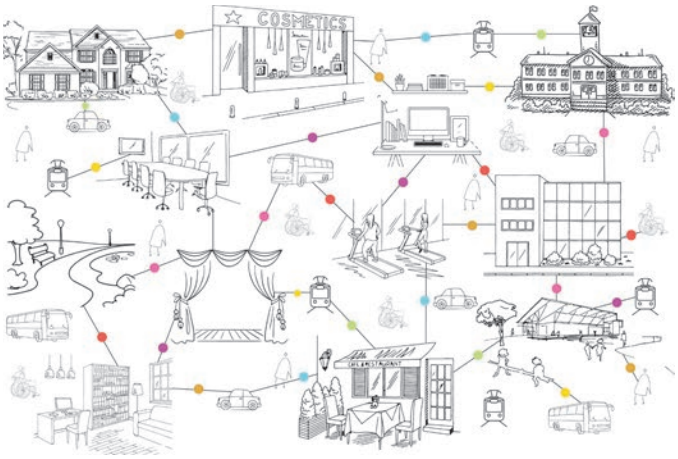
To determine a new set of design guidelines, this thesis uses a comparative analysis between the Universal and Inclusive Design Guidelines. By understanding what has and has not been addressed through these guidelines, I propose a new set of design directives known as the Enabling Design Guidelines. This new guideline offers principles that address the diversity of neurological differences through the creation of micro-environments. It also provides a framework with elements such as spatial organization, spatial character, lighting, acoustic and thermal quality, ease of transition, sensory grouping and escape or reset zones.[9]

Additionally, this thesis conducts a number of case studies pertaining to neurodiverse design to fully understand the needs of neurodivergents within the built environment. Some examples include the K-12 School for Neurodiverse Learners designed by Verona Carpenter Architects, the publication "Designing For A Neurodiverse Workplace" by HOK Architects and Restorative Ground by WIP Collaborative. By studying architectural solutions to neurodiversity at varying scales; learning-oriented, workplace, and urban environments, this thesis suggests that there should be several mutually-supporting programs to accomodate the well-being of neurodiverse users.

A study of a typical daily routine is used to explore the experiences of neurodivergents throughout their day-to-day lives by examining the many locations and spaces they endure [02]. This study is then used to inform the spatial programming within a neuro-inclusive district within the city. This thesis implements the research findings by designing a primary library facility with a secondary urban park. These programs aim to mitigate the challenges neurodivergent users

[6] Walden University. *Seven-Learning-Disabilities-Every-Psychology-Professional-Should-Study* (2021).
[7] HOK Architects. *Designing For A Neurodiverse Workplace* (2021).
[8] Verona Carpenter Architects, YouTube. "Understanding Neurodiversity" (2021).

[9] HOK Architects. *Designing For A Neurodiverse Workplace* (2021), 7-13.
[10] ScienceDaily. *Every Person Has a Unique Brain Anatomy* (2018).
[11] Verona Carpenter Architects, YouTube. "Why School Design Matters" (2021).




Right
**02 | Network-Like System of Neuro-Inclusion**
Representing a network-like system of neuro-inclusion through a typical daily lifestyle routine

experience at both a human and city-wide scale. I have selected the library program as a way to endorse a public and communal facility acting as a catalyst for future neurodiverse learning environments. I have also selected the program of an urban park to create a point of refuge as part of the experience of arrival or departure from the library centre.

The site of this project is located within the downtown core of Sudbury and continues to promote a community-driven lifestyle. It will incorporate neurodiverse design elements such as sensory gardens, exterior escape zones, gathering areas, and occuptional therapy zones. The surrounding urban park will bleed from the building's site into two existing municipal parking lots and connects to the current Memorial Park.

The library centre is found between two existing art-inspired facilities, The Sudbury Theatre Centre and The Sudbury Multicultural and Folk Arts Association, creating a learning and cultural hub. Additional programmatic spaces within the library centre are a cafe, marketplace, makerspace, innovation lab, reading zones, studios, occupational therapy, flex spaces, and escape zones.

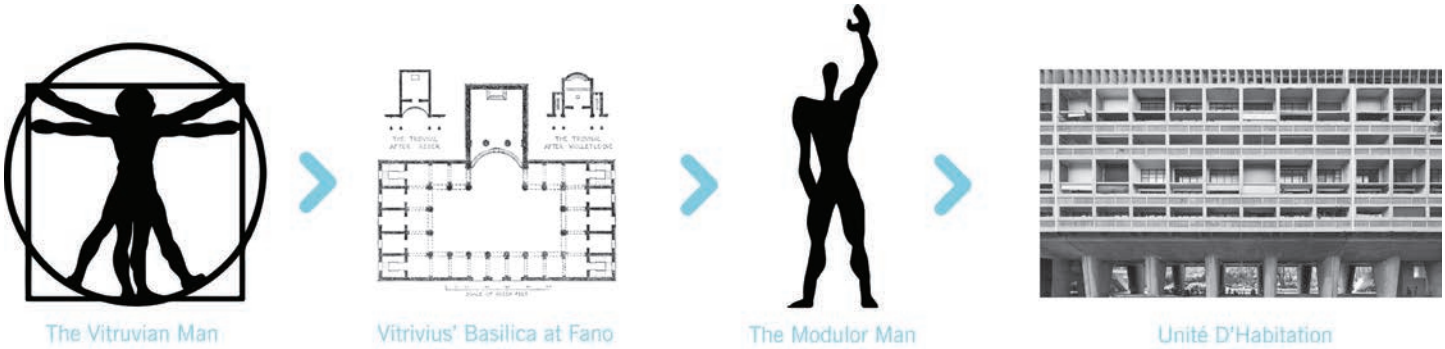
By designing a community-oriented project within Sudbury, this thesis creates a network of inclusive, user-centered, and sensorial design. This project aims to bring change, awareness, and most importantly solutions to users who are in need of enabling design. It intends on promoting a positive impact on users who are not always considered by architects. "No two brains are alike"[10]; therefore, all users are neurodiverse in one way or another.

Architectural solutions for users with neurological differences will also enhance and impact the environment for all of its users - neurotypical or neurodivergent.[11] In turn, the end goal of this project is to reintroduce the meaning of inclusive design through enabling the users. Ultimately, the proposed library centre aims to act as a catalyst for future learning environments and informs a new standard of inclusive design.

# 1.0
# The Inaccessibility of Architecture

*Chapter 1.0: The Inaccessibility of Architecture* explores the existing accessibility standards and their relationship to architecture. It begins with a critique of the Vitruvian Man and the Modulor Man modules. This critique acknowledges how the normative standards are presented through these historical references, and how they are concerning and biased. This chapter also analyzes the current building and provincial regulations: The Ontario Building Code and the Accessibility for Ontarians with Disabilities Act. This chapter argues that these standards provide accessibility solutions at the surface-level and do not account for the microscopic amount of differences. Lastly, this chapter concludes that accessibility standards in Ontario are inadequate, suggesting that solutions must go beyond their current state to achieve inclusive design.

# 1.1 Ableism in Architecture




Above
**03 | The Vitruvian + Modulor Man In Relation to Architecture**
Representing how these modules were translated into architectural expressions: perfectly proportioned and symmetrical

Leonardo da Vinci's Vitruvian Man module may be argued as a fifteenth-century idea of ableist architecture.[12] Da Vinci used the Vitruvian Man to symbolize the perfectly proportioned and symmetrical human body. Beyond measuring the proportions of the human body, the circle and square had symbolic meaning. The circular shapes were linked to the "cosmic and divine," while squares represented what was "earth and secular."[13] By imposing the human body into these shapes, the Vitruvian Man examined how the human body could fit into both of these worlds. Ultimately, the Vitruvian Man translated a way to study the perfection of the universe and how it could be carried over into the realm of architecture.[14]

Architects of the Renaissance era believed that "man is the measure of all things" meaning that the human body's size, scale, and proportions would create a perfect design.[15] As the human body was seen as a representation of symmetry, they believed that architecture must also depict symmetry. An example of this is shown in the Basilica at Fano, where the buildings' proportions were taken directly from the Vitruvian Man module, creating a perfectly balanced ratio of width to length, height to width, and placement of columns [03].[16]

In tradition of da Vinci's Vitruvian Man, Le Corbusier developed the Modulor Man. The Modulor Man was used as a discovery tool for mathematics in relation to the human body, and was applied to the appearance and function of

[12] Motyer, Amanda. "My Other Eyes That See, My Other Ears That Hear" (2014), 55.
[13] Richman, Kelly. My Modern Met. *The Significance of Leonardo Da Vinci's Famous 'Vitruvian Man' Drawing* (2018).
[14] Ibid.
[15] Dewani, Sneha. The Arch Insider. *Vitruvian Man: The Guide to Proportion and Symmetry."* The Arch Insider (2021).
[16] Ibid.


Above
**04 | The Vitruvian + Modulor Man In Relation to Architecture and Disabilities**
Representing how the human body cannot be translated into perfectly proportioned and symmetrical architecture as there are a variety of disabiltiy types and bodily differences

architecture.[17] It is described by Le Corbusier as "a range of harmonious measurements to suit the human scale, universally applicable to architecture."[18]

Many of Le Corbusier's designs were based on the Modulor Man, including L'Unité D'Habitation, a modernist residential housing project. The proportions of the Modulor Man were applied to the plans, sections, elevations, and the grid of each apartment unit.[19] As a result, this building represents a perfectly proportioned and symmetrical modular design [03].

Although these historical modules were celebrated in the past with no regard to accessibility, we can understand today that both theories demonstrate an extremely exclusive bias. A universal standard cannot be based on the proportions of the human body as all bodies are of differing shapes, sizes, forms, genders, and differences.[20] To date, architects design with specific standards that are presumed to advocate for accessibility. However, these modules are speculations of the human body, and in the case of users with invisible disabilities, this results in hostile architecture failing to position inclusivity [04].[21]

[17] ICON Magazine. *Modulor Man by Le Corbusier* (2009).
[18] Modernism101.Com. *Le Corbusier: The Modulor* (2021).
[19] Frearson, Amy. *"Brutalist Buildings: Unité D'habitation by Le Corbusier."* Dezeen, September 15, 2014.
[20] Motyer, Amanda. "My Other Eyes That See, My Other Ears That Hear" (2014), 59.
[21] Ibid.

# 1.2 The Insufficient Building / Provincial Regulations

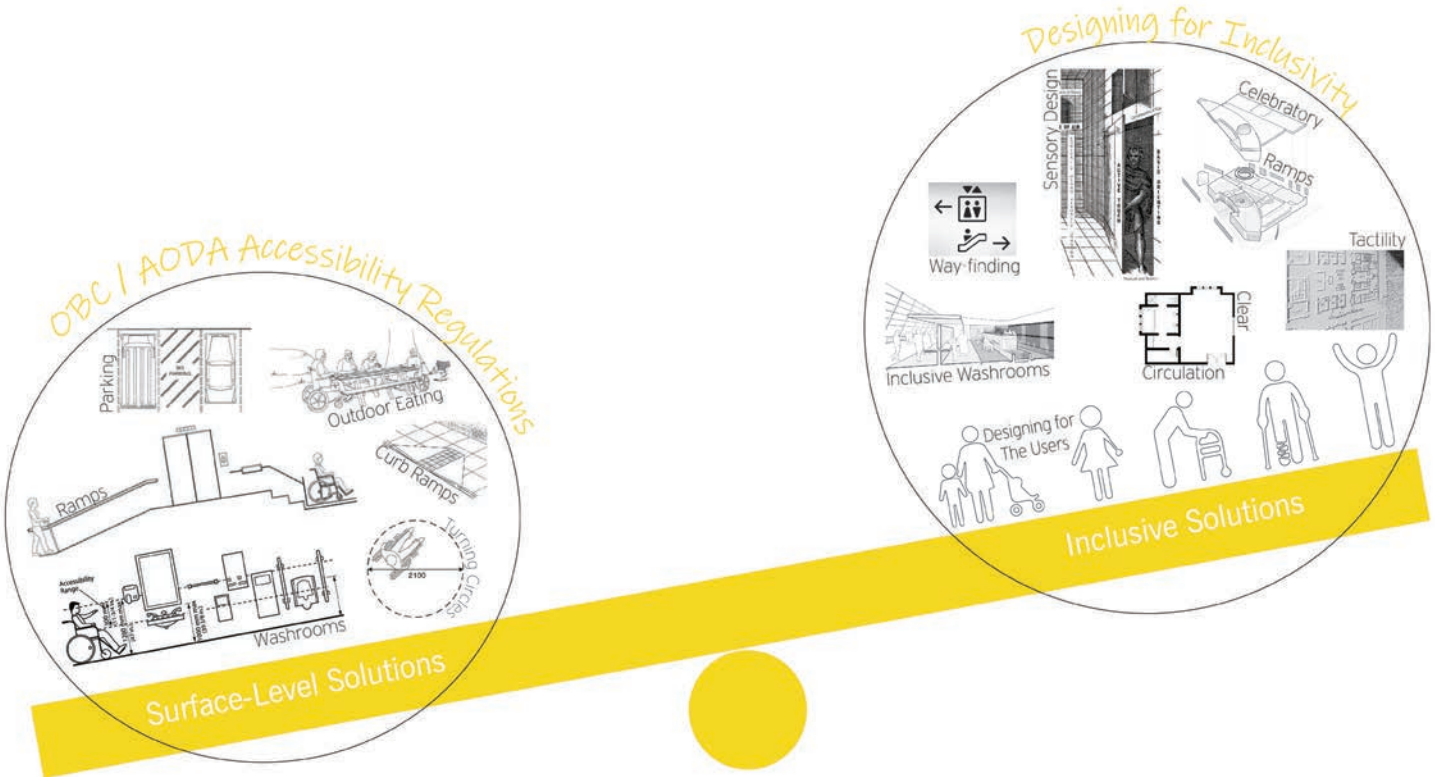
In 1975, Ontario implemented its first building code act: The Ontario Building Code. This building code included only technical requirements for the construction and demolition of buildings. It did not include any accessibility requirements and was based on the promotion of public safety through uniform building standards. The code was updated in 2012 to define requirements regarding accessibility for new construction and extensive renovation projects. The accessibility portions of the OBC cover architectural areas involving barrier-free access paths of travel, fire safety devices, public washrooms, access to pools and saunas, and seating in public spaces.[22] Although the OBC was updated with accessibility in mind, there still exists an absence of designing for inclusivity. The issue of accessibility cannot be solved by removing barriers like staircases, providing larger washroom facilities, or implementing wider corridors.

In 2005, Ontario introduced the Accessibility for Ontarians with Disabilities Act which enforced the development and implementation of accessibility standards and rules to better equip users with mobility, visual and hearing differences. Under this act, there are five main principles; one of which includes the design of public spaces and allows for communal outdoor spaces to become more accessible.[23] In affiliation to the OBC, the AODA standard acknowledges the daily challenges users with disabilities encounter, yet does not propose innovative solutions. The AODA is simply proposing surface-level solutions such as accessible crosswalks, curb cuts and public seating options.

To reach greater accessibility, beyond the current OBC and AODA standards, we must propose solutions that look past the assistive devices users with disabilities utilize, such as wheelchairs, white canes, and hearing accessories, to accomplish inclusive design [05]. Neither of the standards delve into the underlying concerns of inclusivity in relation to communal and public spaces. They provide only baseline architecture such as accessible ramps, larger washroom facilities, accessible sidewalks, and parking spaces.

[22] Ontario.ca. *Accessibility in Ontario's Building Code* (2021).

[23] Ontario.ca. *About Accessibility Laws* (Ontario.ca). (2021).




Above
**05 | The Insufficiency of Provincial + Building Regulations**
Representing how The Ontario Building Code and The Accessibility for Ontarians with Disabilities Act provide only surface-level solutions to accessibility, whereas inclusive design surpasses these regulations by acknowledging the users

# 2.0
# The Movement Towards Accessibility in Architecture

*Chapter 2.0: The Movements Towards Accessibility in Architecture* analyzes the Universal and Inclusive Design Guidelines. The analysis beings by illustrating each principle and applying them to spatial settings. Through this study, it became clear that similar to the OBC and the AODA, these guidelines propose only baseline requirements for accessibility. This chapter then presents a comparative study of the Universal and Inclusive Design guidelines to understand what is currently being addressed, and what is not. This chapter raises the opportunity to propose a new set of design guidelines targeting many principles lacking within the existing frameworks. This chapter settles on a preliminary set of guidelines targeted towards users with invisible disabilities, as they are under-addressed. This new set of guidelines proposes principles including designing for spatial organization, spatial character, lighting, thermal and acoustic qualities, ease of transition, sensory grouping and escape or reset zones.

# 2.1 Analysis of Universal Design Guidelines

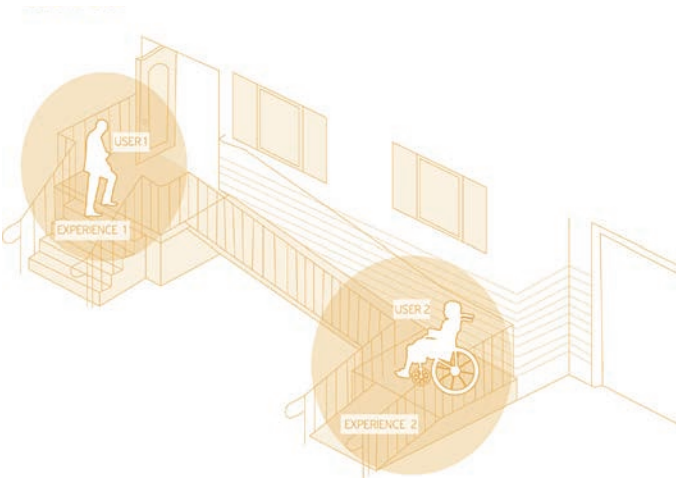
Design guidelines that implement greater accessibility standards include the Universal and Inclusive Design Guidelines. Published in 1985, The Universal Design Guideline "denotes the importance of adapting the built environment to meet the needs of disabled people."[24] The term "universal" signifies a one-size-fits-all solution. However, the guideline proposes principles that are highly binary in nature straying away from the underlying concepts of universal design [06].

[24] Manley, Sandra. "Inclusive Design In The Built Environment: Who Do We Design For?" (2016), 34-37.

Right
**06 | Summary of Universal Design Guideline Principles**
Representing a visual description of each of the seven defining design principles

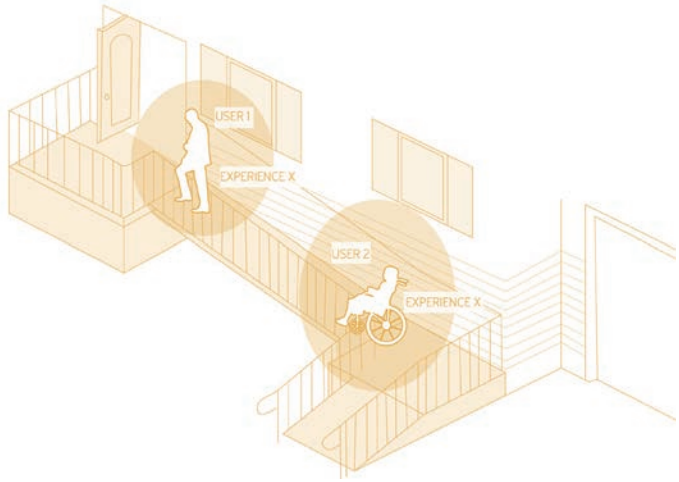

Principle 1
Equitable Use
Principle 2
Flexibility In Use
Principle 3
Simple & Intuitive Use
Principle 4
Perceptible Information
Principle 5
Tolerance For Error
Principle 6
Low Physical Effort
Principle 7
Size & Space for Approach and Use

# Principle 1
# Equitable Use




Above
**07 | Equal Use**
Representing a visual description of equal use, highlighting two separate experiences entering a building

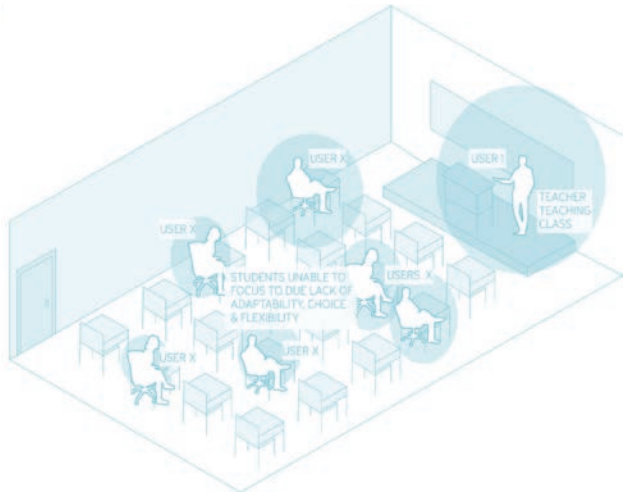
Equitable and equal are two words that often get used interchangeably. Equal can be defined as "alike in quality, nature or status," whereas equitable is described as "fair or impartial."[25] When placing the principle of equitable use into architectural space, one may refer to the entrance of a building. When approaching a building, there are typically stairs accompanied by a secondary ramp or a lift to access the door entry. Without thinking of the users' experience, this may seem like an "equal" entry into the building. However, by providing two alternative methods of entering a building, it creates a sense of segregation between the users. An "equitable" solution would reinforce the idea that users with different abilities should not experience different modes of access to enter a building [07].[26]




Above
**07 | Equitable Use**
Representing a visual description of equitable use, highlighting one combined experience entering a building

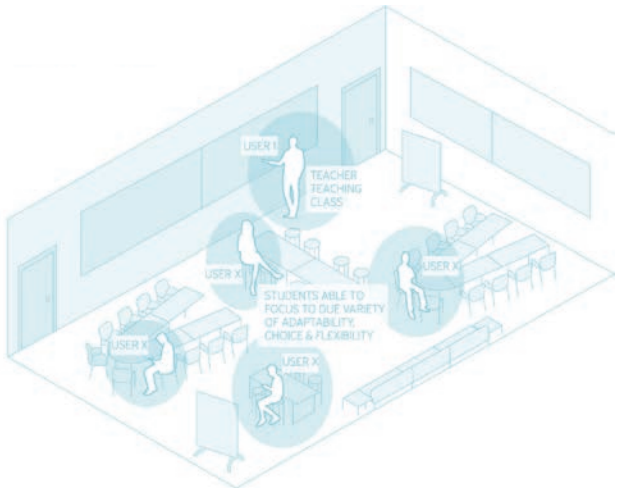
[25] Zver, Will and Name. *Universal Design: The Basics*. Kilo Lima Code (2021).
[26] Ibid.

# Principle 2
# Flexibility In Use




Above
**08 | Inflexible Use**
Representing a visual description of inflexible use, highlighting a lack of adaptability and flexibility within a classroom

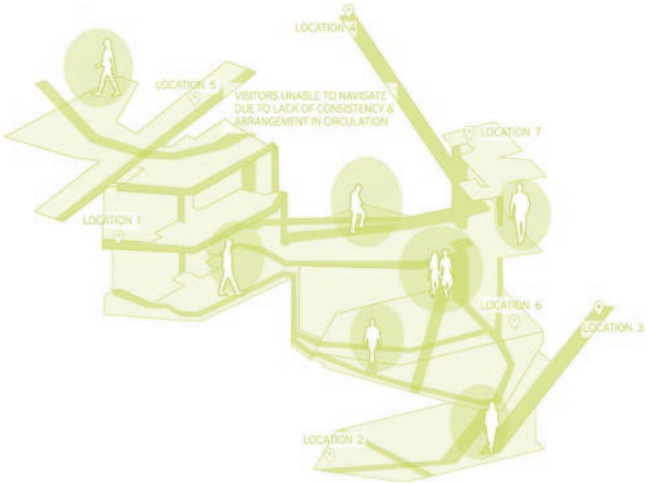
Flexibility in use refers to a design that is adaptable and supports the users' individual needs. This idea can be related to learning-oriented environments where students learn best while being most comfortable and focused. With a variety of different seating choices, formal and informal spaces, and alternative classroom options, students can choose their preferred arrangements. As noted in the first principle, if every option were to be the same, the options would not be useful. The meaning of "equal" does not always mean equitable or fair. By allowing for adaptability, the design can begin to accommodate all users [08].[27]




Above
**08 | Flexible Use**
Representing a visual description of flexible use, highlighting a variety of adaptability and flexibility within a classroom

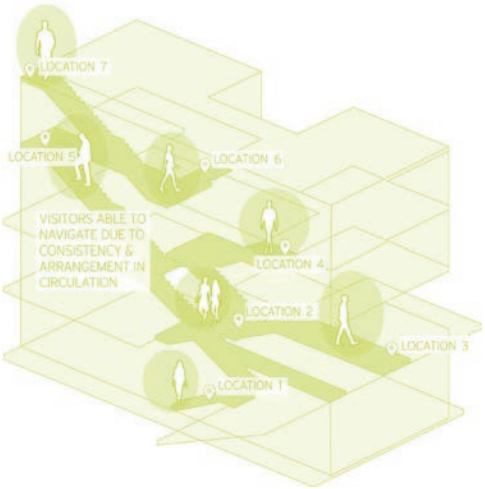
[27] Ibid.

# Principle 3
# Simple + Intuitive Use




Above
**09 | Unsimple Use**
Representing a visual description of unsimple use, highlighting a lack of consistency and arrangement in a building's circulation

The meaning of simple and intuitive use defines one's experience through design to be clear for all users. One's experience within a building should inform simplicity and a natural flow of movement. Creating spaces that are consistent in their arrangement allows for users to navigate through the building without any additional support. Wayfinding is a simple tactic that is often used to permit users to meander through the circulation flow of the building. Additionally, programmatic planning in an organized manner is an essential part of creating a simple and intuitive building circulation [09].[28]




Above
**09 | Simple Use**
Representing a visual description of simple use, highlighting consistency and arrangement in a building's circulation

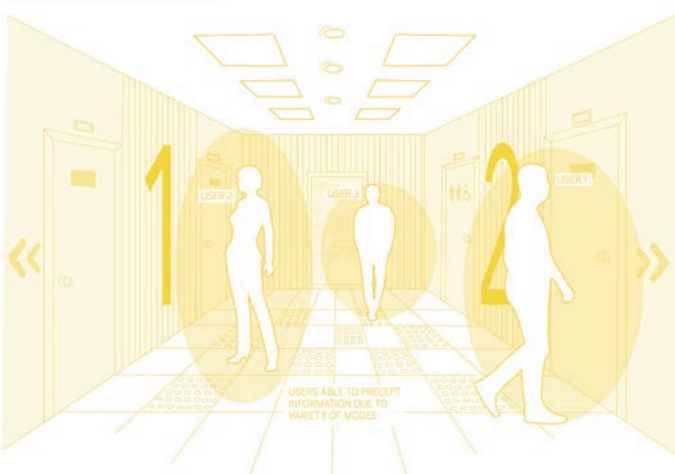
[28] Ibid.

# Principle 4
# Perceptible Information




Above
**10 | Imperceptible Information**
Representing a visual description of imperceptible information, highlighting a lack of variety of communication modes

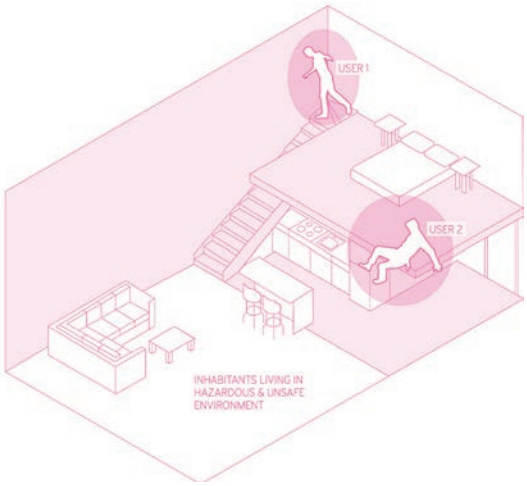
Perceiving information within the built environment generates many different experiences for all users. These challenges can be aided by introducing varying modes of communication through visual, tactile, and audible design approaches. Visual communication is often displayed by directional signage, globally-known symbols, and strong coloring contrasts which typically enhance the users' experience. Tactile communication is another form of designing for perceptible information and can include indicators on the floors or walls. Audible communication can also aid in perceiving information differently through sound and speaking systems [10].[29]




Above
**10 | Perceptible Information**
Representing a visual description of perceptible information, highlighting a variety of communication modes

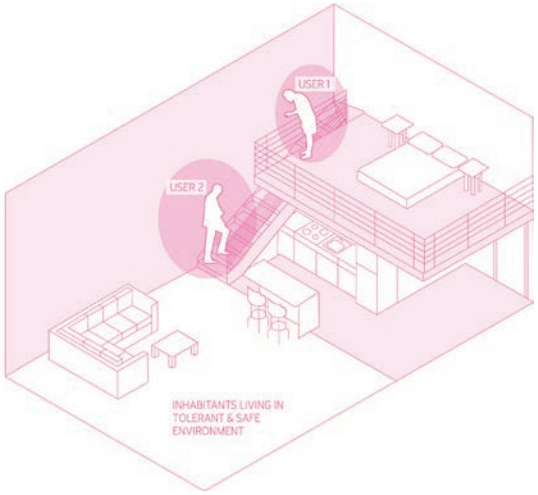
[29] Ibid.

# Principle 5
# Tolerance For Error




Above
**11 | Intolerance For Error**
Representing a visual description of intolerance for error, highlighting a hazardous and unsafe environment

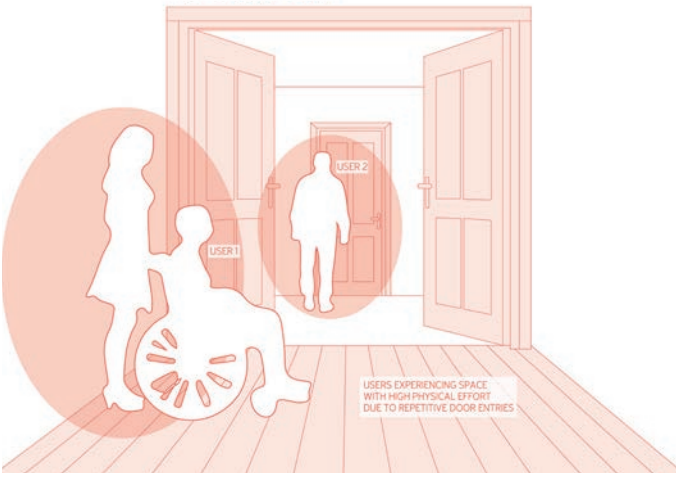
Tolerance for error indicates that the design of a building is safe and without any complications, concerns, or risks. This means that the building will not cause harm to any of its users. This can include smaller detail components such as a sensor to a power-operated door or, at the larger scale, the structural members of a building, re-iterating fail-safe measures. Regarding accessibility, the tolerance for error principle is related closely to handrails, curb cuts, and barricades [11].[30]




Above
**11 | Tolerance For Error**
Representing a visual description of tolerance for error, highlighting a tolerant and safe environment

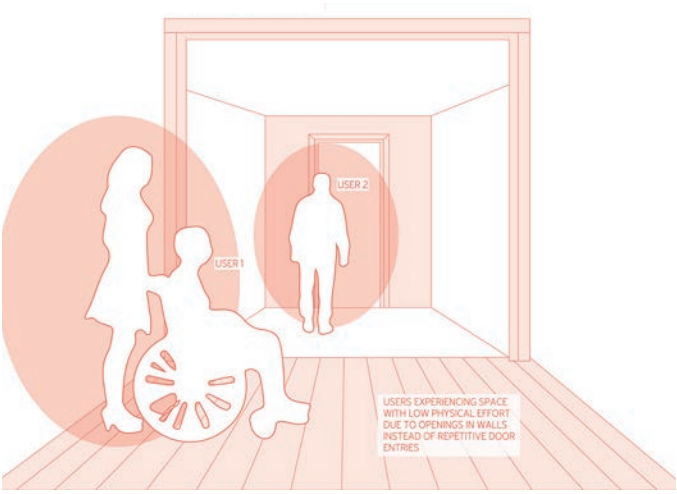
[30] Ibid.

# Principle 6
# Low Physical Effort




Above
**12 | High Physical Effort**
Representing a visual description of high physical effort, highlighting a repetition in door entries requiring physical effort

Users with mobility differences who experience weakness or fatigue should be able to experience buildings without straining their bodies. The design of a building should inform a clear circulation route with minimal amounts of sloping to allow for easy movement. The minimization of repetitive actions can also be implemented for users to maintain a neutral body positioning, and to remain at low energy and force levels. If considered within the design of public buildings, removing barriers such as repetitive doors can allow for effortless entry and egress to avoid users going into physical discomfort [12].[31]



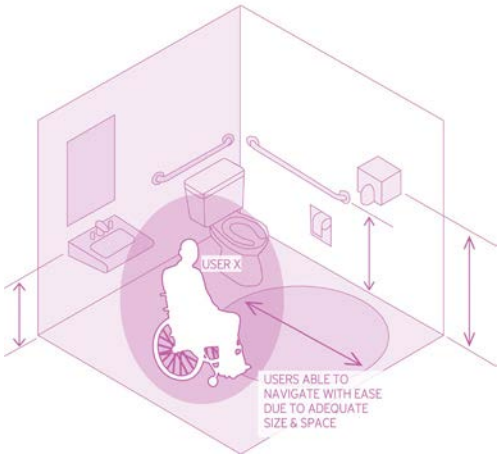

Above
**12 | Low Physical Effort**
Representing a visual description of low physical effort, highlighting openings as door entries to reduce physical effort

[31] Ibid.

# Principle 7
# Size + Space For Approach And Use

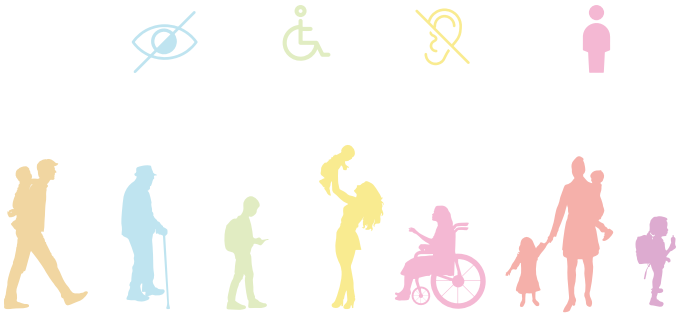

Above
**13 | Insufficient Size + Space**
Representing a visual description of insufficient size and space, highlighting inadequate space for users with mobility devices

Clear floor space and easy reach are essential factors in providing users with mobility differences an ease of use while utilizing their mobility devices. Some examples include the height of work surfaces, maneuvering space around fixed furniture and plumbing fixtures, and operable device mounting heights. It is challenging for a user navigating with a mobility device to experience a building independently and comfortably without adequate space [13].[32]




Above
**13 | Sufficient Size + Space**
Representing a visual description of sufficient size and space, highlighting adequate space for users with mobility devices

[32] Ibid.



Right
**14 | Conclusions Drawn From Universal Design Guidelines Study**
Representing the diversity of abilities and disabilities

In conclusion, the Universal Design Guidelines present an approach to designing that can be applied to any form of architecture. It is a fundamental step in the design process that begins with considering the needs of the users. The Universal Design Guidelines promote applicability, not only to users with disabilities but to everyone regardless of age, size, ability, or disability [14]. Although the Universal Design Guidelines cater to a certain binary of a one-size-fits-all solution, the reality is that architecture should render endless options and choices for its users. [33]

[33] University of Waterloo. Accessibility for Ontarians with Disabilities Act Toolkit (2021).

# 2.2 Analysis of Inclusive Design Guidelines

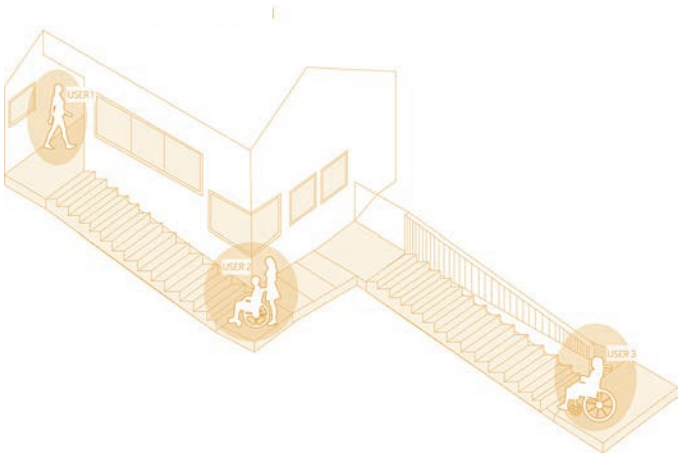
The Inclusive Design Guideline produced in 2006 aims to promote inclusivity by designing for the users and allows for flexibility, adaptability, choice, and diversity within architecture [15].[34] Similar to the Universal Design Guidelines, the Inclusive Design Guidelines advocates towards accessibility and considers users with visible disabilities. However, the suggested principles lack direction for users with any type of invisible disability; reinforcing binaries, and opposing the culture of inclusivity.

[34] Manley, Sandra. "Inclusive Design In The Built Environment: Who Do We Design For?" (2016), 39-40.

Right
**15 | Summary of Inclusive Design Guideline Principles**
Representing a visual description of each of the five defining design principles

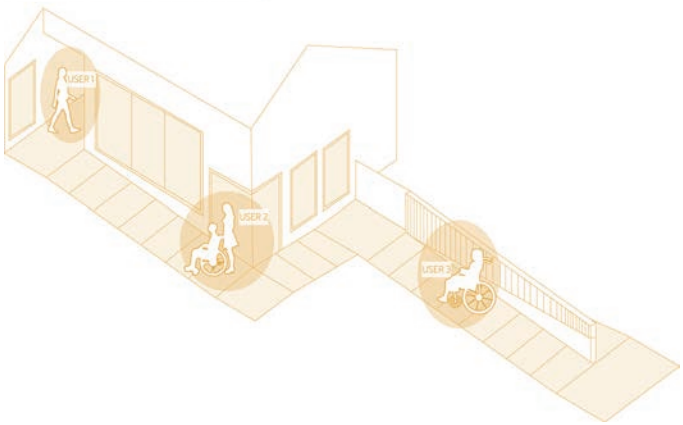

Principle 1
Placing People at the Heart of Design
Principle 2
Acknowledging Diversity & Difference
Principle 3
Offering Choice for Users & Acknowledging that 1 Single Solution Will Not Fit All
Principle 4
Flexibility in Use
Principle 5
Convenient & Enjoyable Places for All

# Principle 1
# Placing People At The Heart of Design




Above
**16 | Displacing People**
Representing a visual description of displacing people, highlighting the inaccessibility of the staircase

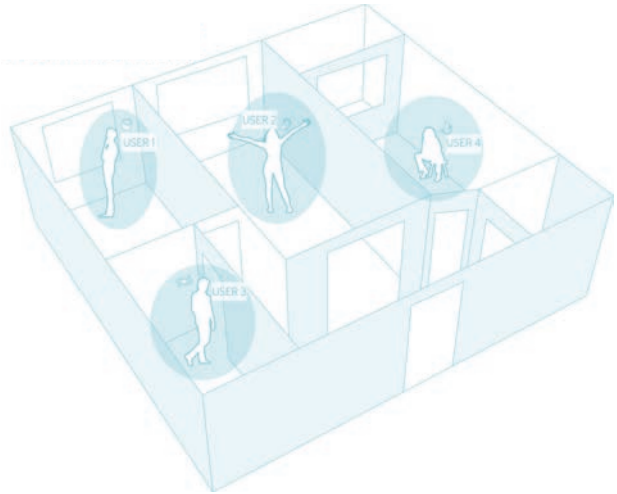
All designs should create spaces and environments in which users can feel empowered. By introducing equitable entries to a building, the users do not feel displaced as the design has been conceptualized with them in mind. By using sloped ramps and low window sills, users with mobility differences can receive the same experience as someone who does not require a mobility device [16].[35]




Above
**16 | Placing People**
Representing a visual description of placing people, highlighting the accessibility of the ramp

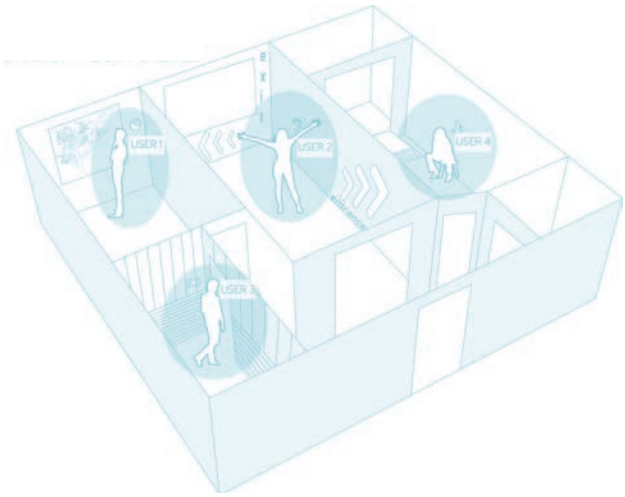
[35] CABE. "The Principles of Inclusive Design: They Include You" (2006), 7-8.

# Principle 2
# Acknowledges Diversity + Difference




Above
**17 | Unacknowledgement of Diversity**
Representing a visual description of unacknowledgement of diversity, highlighting the lack of diversity within the spaces

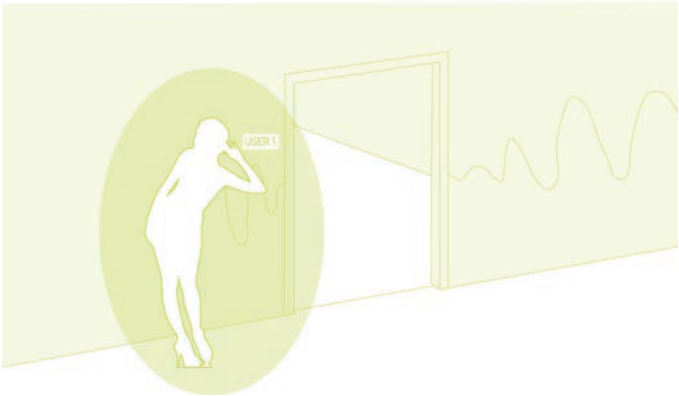
As inclusive design acknowledges the diversity of people and their differences, removing disabling barriers such as stairs, heavy doors, and unconventional circulation paths is crucial. Understanding and accounting for the barriers experienced by users with many different forms of differences; learning, cognitive, mobility, visual, and hearing exemplifies the basic requirements of inclusive design [17].[36]




Above
**17 | Acknowledgement of Diversity**
Representing a visual description of acknowledgement of diversity, highlighting the diversity within the spaces

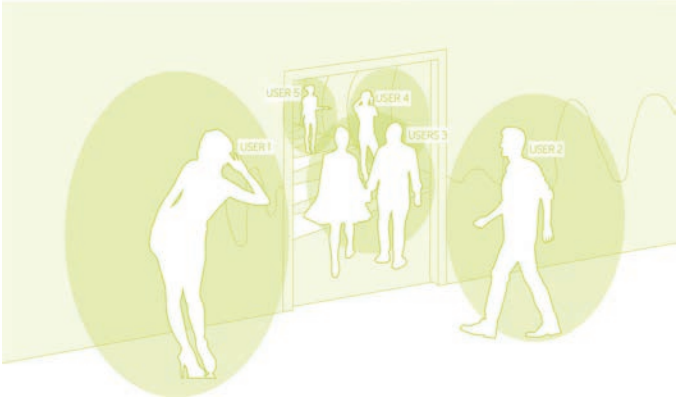
[36] Ibid, 9.

# Principle 3
# Offering Choice for Users + Acknowledging that 1 Single Solution Will Not Fit All




Above
**18 | Offering Choice**
Representing a visual description of offering choice, highlighting the lack of choice within the space

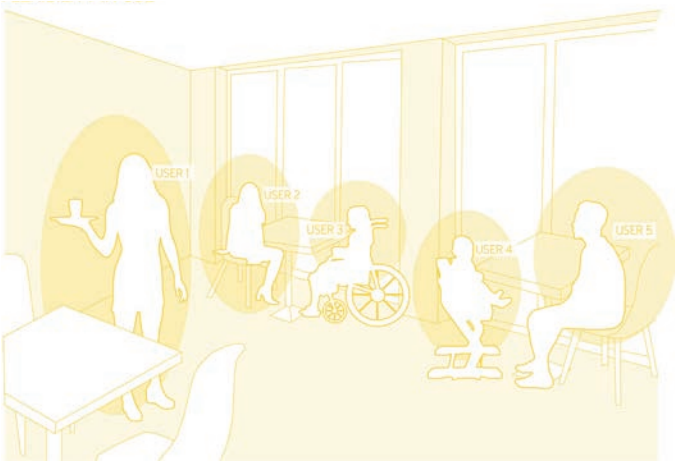
By valuing users' diversity and differences, we break down social and physical exclusion and barriers, and raise design solutions to benefit all. A solution for someone with physical differences can also influence the experience of someone without physical differences. By adopting a higher standard of design so most users can access, we establish design that celebrates equality within diversity. At the minimum, an inclusive environment should exceed baseline standards and propose innovative solutions [18].[37]




Above
**18 | Offering Choice - Beneficial To All**
Representing a visual description of offering choice, highlighting the choices within the space which benefit all

[37] Ibid, 10-11.

# Principle 4
# Flexibility In Use




Above
**19 | Inflexibility In Use**
Representing a visual description of inflexibility in use, highlighting the lack of flexibility within the space

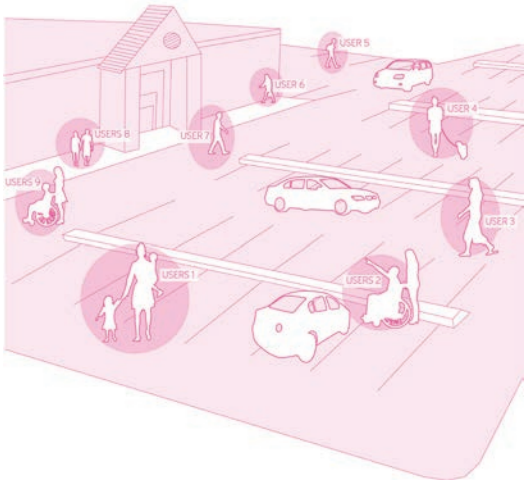
Inclusive design requires creating spaces that different people with different abilities use. Thus, adaptability within the design is a critical factor in creating inclusive spaces. The adaptability of changing certain aspects of a design to meet the needs and demands of different users at different times allows for flexible and responsive design solutions [19].[38]




Above
**19 | Flexibility In Use**
Representing a visual description of flexibility in use, highlighting the flexibility within the space

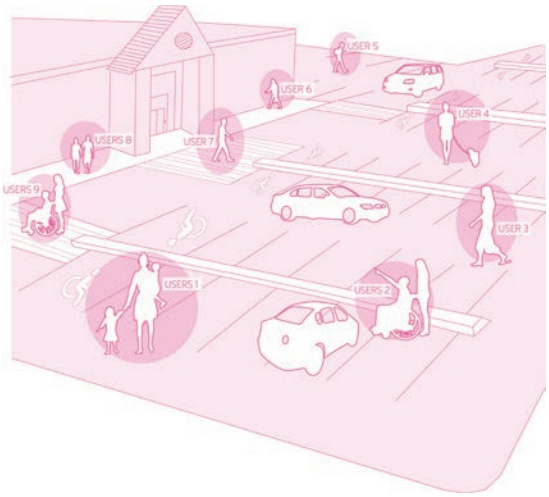
[38] Ibid, 12-14.

# Principle 5
# Convenient + Enjoyable Places For Everyone



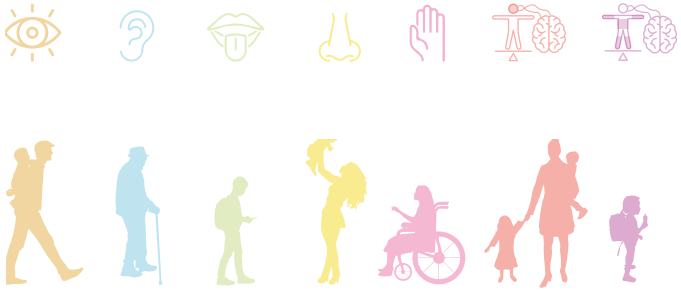

Above
**20 | Inconvenient + Unenjoyable Use**
Representing a visual description of incovenient / unenjoyable use, highlighting the lack of inclusivity

Creating environments that are easy to use for all users allows for intellectual and emotional access. This typically considers design elements like signage, lighting, visual contrast, and materials. Access to buildings also includes the method of reaching the building itself; roads, parking, walkways, routes, and entrances are all characteristics that add to the overall inclusivity of one's experience. The opportunity for users to utilize all interior and exterior components is vital to creating convenient and enjoyable spaces [20].[39]




Above
**20 | Convenient + Enjoyable Use**
Representing a visual description of covenient / enjoyable use, highlighting the inclusivity

[39] Ibid, 15.



Right
**21 | Conclusions Drawn From Inclusive Design Guidelines Study**
Representing the diversity of abilities and disabilities in relation to the body's senses

Overall, the Inclusive Design Guidelines present principles leading to creating architecture that everyone can use. It aims to eliminate any barriers that may form exclusion and enables everyone to participate equally and independently. A successful inclusive design reflects the diversity of users which establishes an advantageous environment for all. Although the Inclusive Design Guidelines do promote inclusivity and aim to create solutions for all, many of the existing principles do not account for invisible disability types. The guidelines could instead promote architectural frameworks relating to the body's senses, as the way spaces are designed directly affects the body's ability to navigate, see, hear and communicate effectively [21].[40]

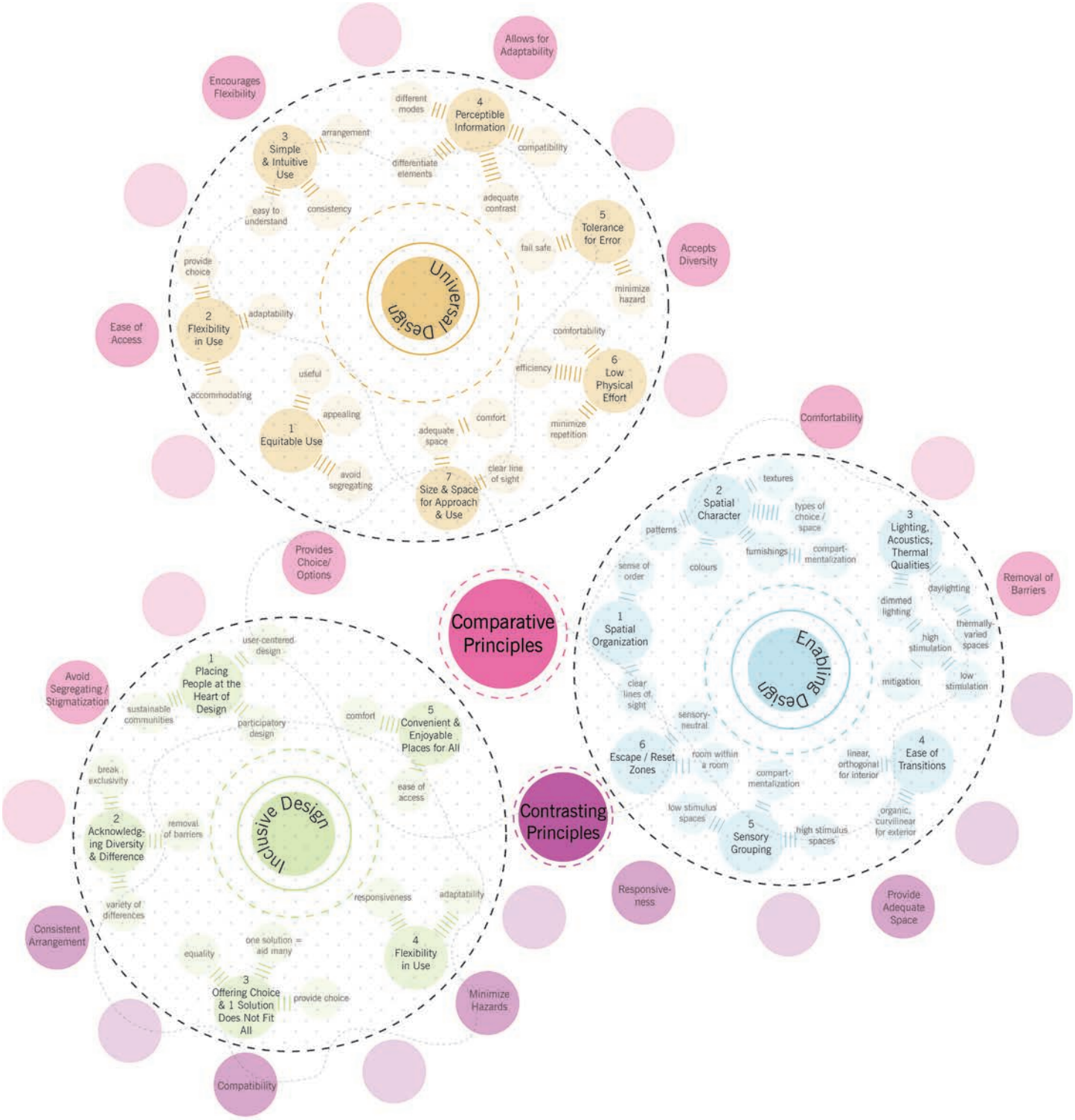
[40] Ibid, 16.

# 2.3 Opportunity For Advanced Guidelines

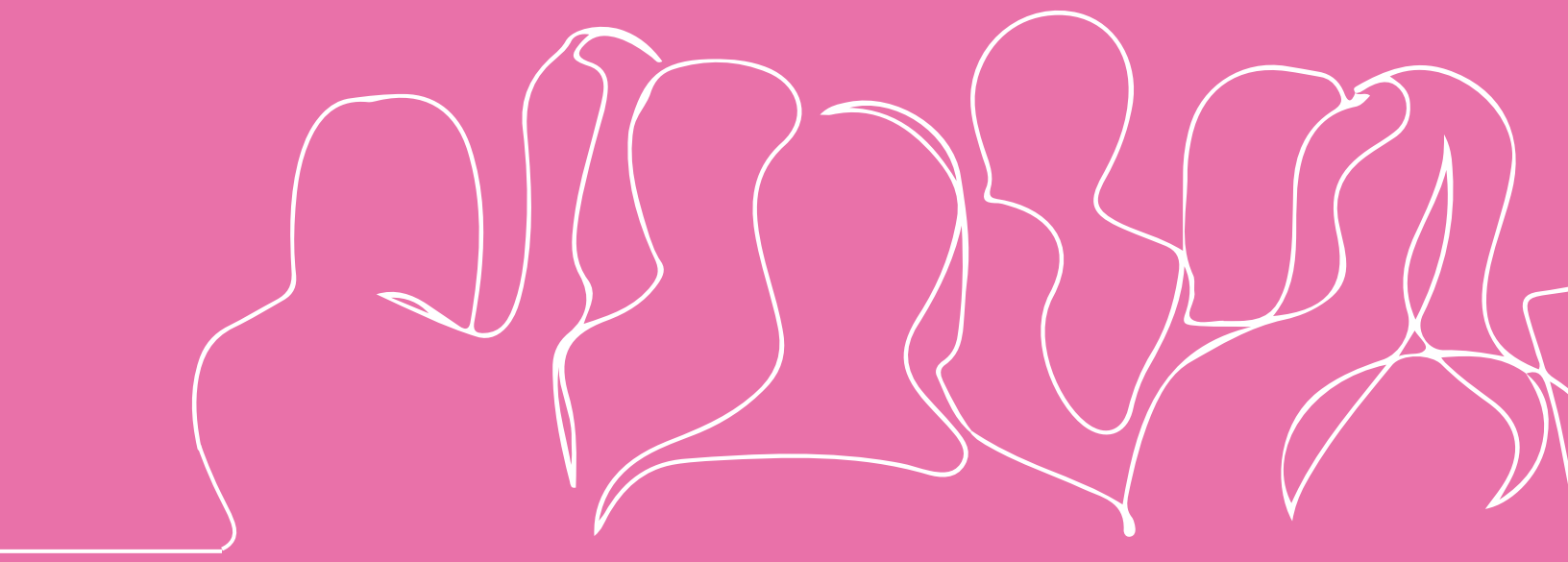
Once diagramming each of the two Universal and Inclusive Design Guidelines, it was essential to form a comparative and contrasting analysis. It is noted that both sets of guidelines provide movement towards accessibility and consider users with visible disabilities. However, the principles lack direction for users with invisible disabilities. By understanding what is currently being done through these existing guidelines, the opportunity to propose a new set of design guidelines targeted towards those with invisible disabilities seemed unquestionable. This new set of design guidelines offers principles that acknowledge the diversity of invisible disability types, particularly neurodivergents. This is accomplished through spatial organization, spatial character, lighting, acoustics and thermal quality, ease of transitions, sensory grouping and escape or reset zones [22].

As The Universal and Inclusive Design Guidelines both promote binaries within their individual principles, the proposed guidelines will aim to break away from the culture of binaries. It proposes principles in which are complementary to the spirit of accessibility, inclusion, and the diversity of disability types. An extensive version of the proposed guidelines will be presented once grasping a greater understanding of neurodiversity and neurodiverse design typologies in Chapter 5.0 of this thesis.

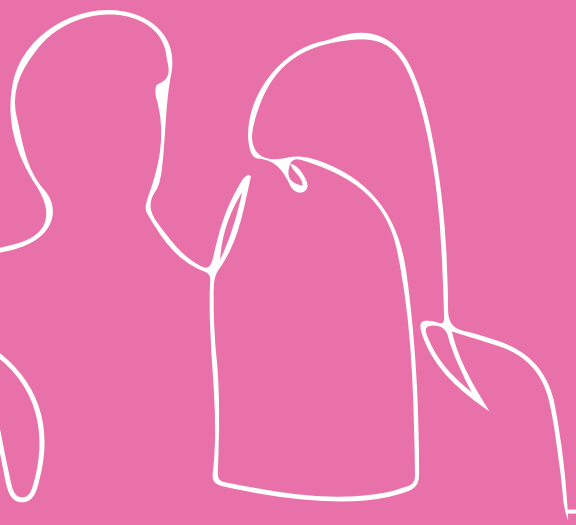
Right
**22 | Comparative + Contrasting Analysis of Universal/Inclusive Design Guidelines**
Representing the comparative and contrasting principles of the Universal and Inclusive Design Guidelines, raising the opportunity for an advanced set of guidelines: The Enabling Design Guidelines


Universal Design
1 Equitable Use
2 Flexibility in Use
3 Simple & Intuitive Use
4 Perceptible Information
5 Tolerance for Error
6 Low Physical Effort
7 Size & Space for Approach & Use
Encourages Flexibility
Allows for Adaptability
Accepts Diversity
Ease of Access
Provides Choice/ Options
Avoid Segregating / Stigmatization
Comparative Principles
Contrasting Principles
Enabling Design
1 Spatial Organization
2 Spatial Character
3 Lighting, Acoustics, Thermal Qualities
4 Ease of Transitions
5 Sensory Grouping
6 Escape / Reset Zones
Comfortability
Removal of Barriers
Responsive-ness
Provide Adequate Space
Inclusive Design
1 Placing People at the Heart of Design
2 Acknowledg-ing Diversity & Difference
3 Offering Choice & 1 Solution Does Not Fit All
4 Flexibility in Use
5 Convenient & Enjoyable Places for All
Consistent Arrangement
Minimize Hazards
Compatibility

# 3.0
# Acknowledging The Diversity of Disabilities



*Chapter 3.0: Acknowledging The Diversity of Disabilities* inquires the diversity of disability types, mainly categorized by visible and invisible differences. This chapter presents the argument that many visible disability types are currently being addressed within architecture due to the existing standards and guidelines. This is exemplified through the baseline mitigations of ramps, elevators, textiles, and wayfinding. Due to the hidden nature of invisible disabilities, as they are not physically seen or immediately apparent on the human body, they do not get addressed enough within architecture. This chapter also explores a specific category of invisible disabilities: neurodiversity. Neurodiversity is recognized as an umbrella term of neurological differences and creates many barriers within the users' everyday lives and spaces they encounter. A video testimony methodology is developed to reinforce the concept of participatory design in a modified manner. The users living with neurodivergencies describe their triggering feelings that apply directly to spatial settings, and are then translated into architectural design solutions. In this chapter, the thesis question is raised in which the following chapters aim at providing a solution to.



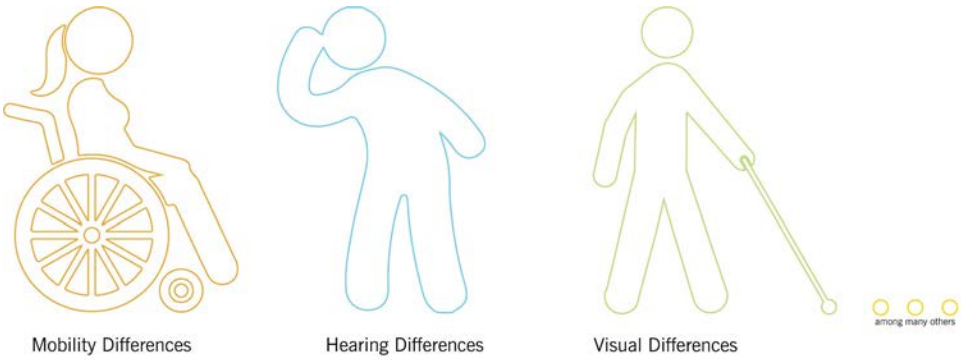
# 3.1 Visible Vs. Invisible Disabilities

As stated by Statistics Canada in 2017, "6.2 million Canadians over the age of 15 live with at least one individual disability limiting their daily activities." Among the same population, invisible disabilities such as mental health-related differences represent 2 million Canadians.[41]

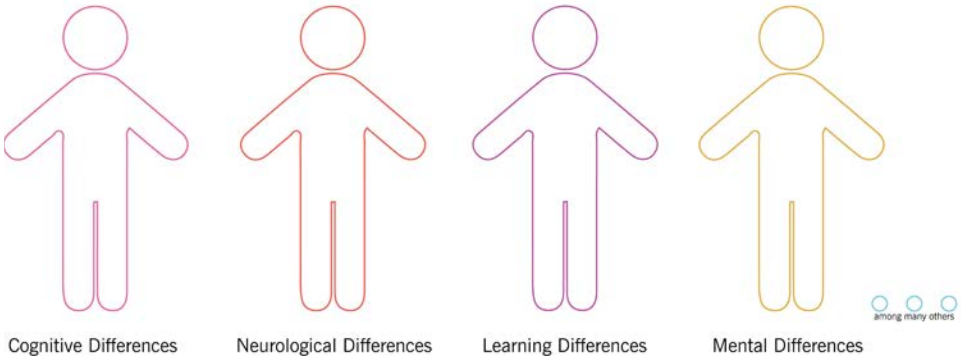
Disability types can range from visible; ones that are physically seen on the human body such as mobility, vision, hearing differences [23] and invisible; ones that are not physically seen on the human body such as cognitive, neurological, learning and mental differences [24].[42] Many visible disabilities have been addressed throughout design as they are physically seen on the human body and are therefore mitigated with physically built solutions such as ramps, elevators, textiles and wayfinding. However, since invisible disabilities are not physically seen or immediately apparent on the human body, they do not get addressed enough within design standards, guidelines or architecture.

One of the fastest-growing types of invisible disabilities is the category of cognitive or learning differences. As research suggests, "1 in 10 Canadians live with the challenges of learning differences." These can range from autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), dyslexia, dyscalculia, dysgraphia and fall under an umbrella term known as "neurodivergents" [25].[43]

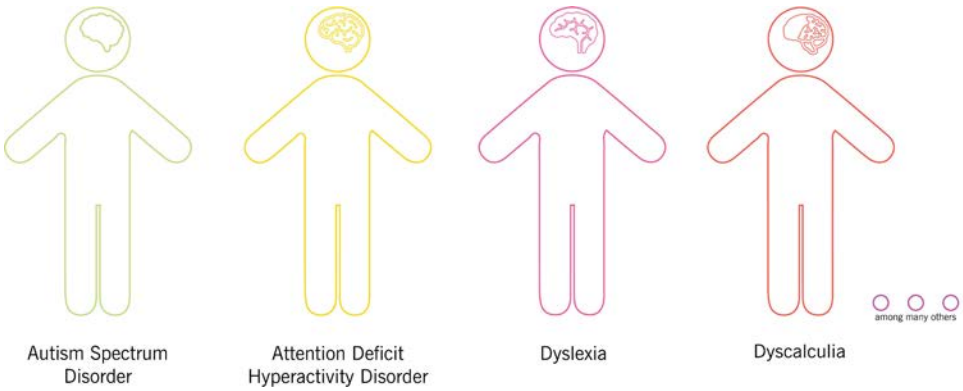
[41] Government of Canada, Statistics Canada. *Canadian Survey on Disability* (2018).
[42] 24 Hour Home Care. *Invisible vs. Visible Disabilities* (2021).
[43] Walden University. *Seven-Learning-Disabilities-Every-Psychology-Professional-Should-Study* (2021).




Left
**23 | Visible Disability Types**
Representing the visible disability types, those physically seen on the human body




Right
**24 | Invisible Disability Types**
Representing the invisible disability types, those not physically seen on the human body




Left
**25 | Neurodiversity**
Representing the types of neurodiversity

# 3.2 What Is Neurodiversity?

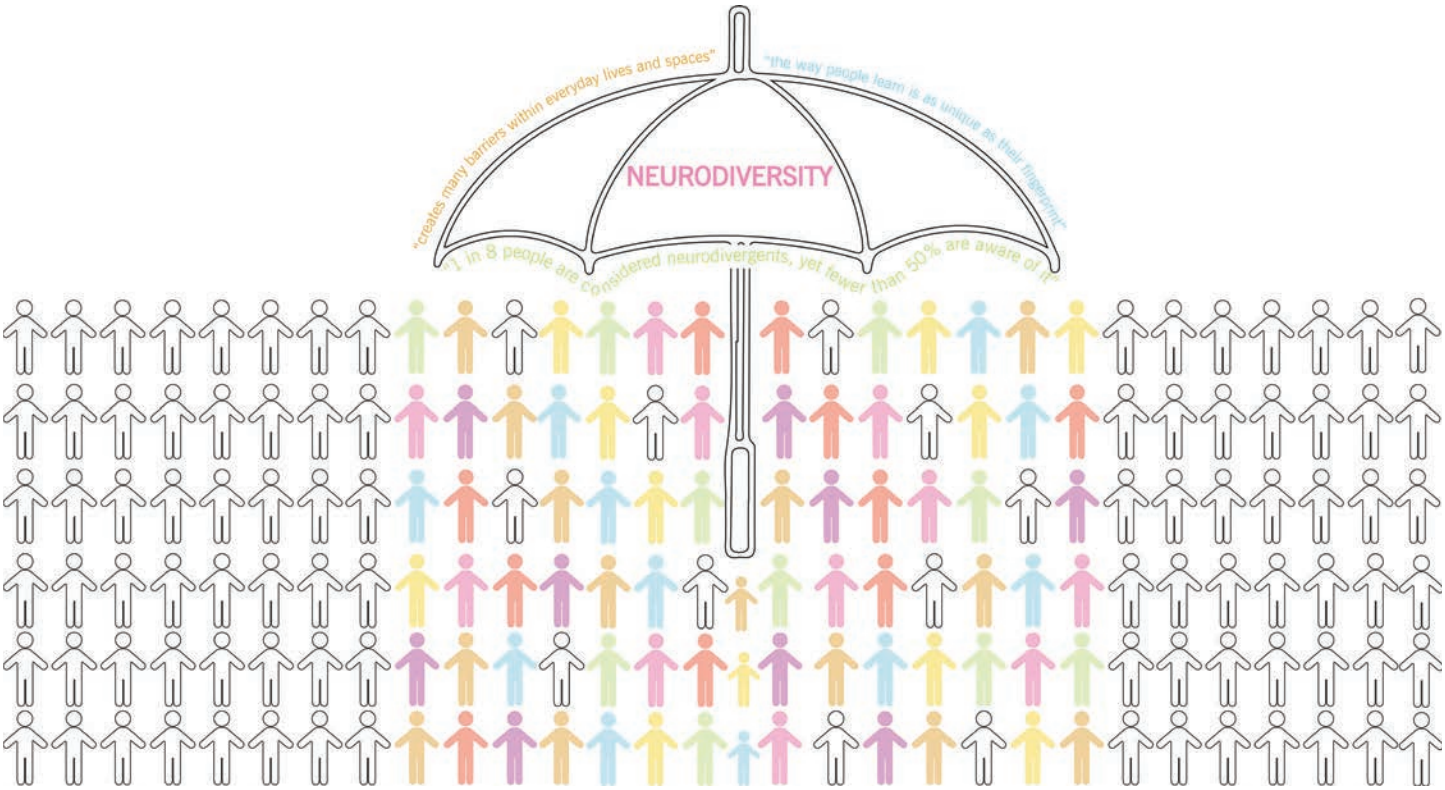
Typically, neurodivergents vary in human neurocognition and whose neurological states are atypical. In fact, "1 in 8 people are considered neurodivergents, yet fewer than 50% are aware of it".[44] Learning and neurological differences affect not only one's ability to learn in a typical manner but also create many barriers within their everyday lives. Most users of the built environment are neurodiverse as "the way people learn is as unique as their fingerprint," meaning that there is no average way to learning or being [26].[45]

*"Why not appropriate metaphors based on biodiversity, for instance, to advance the causes of people with disabilities? Why not propose that just as biodiversity is essential to ecosystem stability, so neurodiversity may be essential for cultural stability? Why not strategically argue that the nurturing of neurodiversity gives society a repository of types who may come into their own under unforeseeable circumstances, or as Blume puts it: Who can say what form of wiring will prove best at any given moment?" - Judy Singer* [46]

As neurodiversity is amongst one of the fastest-growing types of invisible disabilities, it is deemed essential to address within architecture. Stated by Judy Singer, neurodiversity is crucial to cultural stability as neurodivergent persons make up a large portion of the population. They arise a new sense of creativity and knowledge of society's standards. Singer also argues that "nurturing neurodiversity gives society a repository of types". The aspect of nurturing neurodiversity can be associated with architecture as the design of buildings can relieve, recalibrate and alleviate mental, emotional and physical barriers neurodivergents may experience.

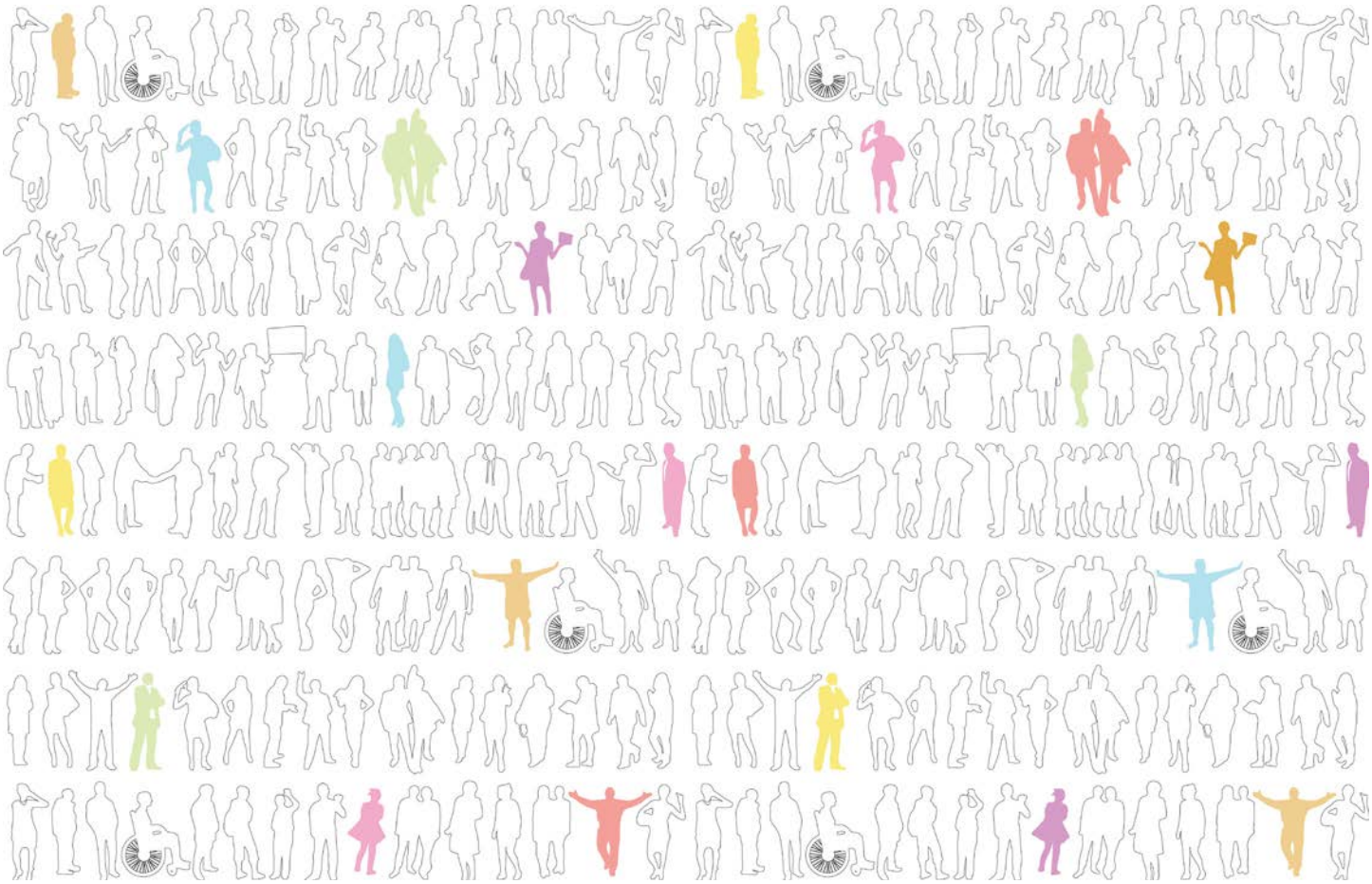
[44] HOK Architects. *Designing For A Neurodiverse Workplace* (2021).
[45] Verona Carpenter Architects, YouTube. "Understanding Neurodiversity" (2021).

[46] Singer, Judy. *Odd People In, The Birth of Community Amongst People on the "Autistic Spectrum"* (1998), 48.




Above
**26 | Umbrella Term: Neurodiversity**
Representing the scale of neurodiversity and, how it is under-addressed and under-recognized

# 3.3 Addressing Neurodiversity in Architecture



Above
**27 | Microscopic Levels of Differences within Disabilities**
Representing the infinite amount of differences within a singular disability type

As this thesis relates to a group of users being affected by insufficient accessibility standards and building regulations, a modified version of a participatory design approach seemed essential. I decided to pursue a testimony study where users speak of their lived experiences with neurodivergencies [27].

While each user studied lives with a different type of neurodivergency, there is a common element between all. Each user is triggered by certain sounds, textures, orientations, lighting, lack of navigation and the need to release excess energy. As each user experienced barriers within architectural environments, design solutions can begin to resolve some of these existing triggers [28]. For example:

1. Users living with autism

*Triggering Feeling:* "When there's too many people standing around talking. Too many noises."[47]
*Design Solution:* Enclosed space such as an escape zone which is acoustically controlled and fitted to human size for comfort and ease.

*Triggering Feeling:* "Lights and sounds usually do it for me." It's like the entire world is pressuring you and crunching onto you - and there's not really much you can do about it except just getting out of there."[48]
*Design Solution:* The lighting and acoustical control is managed by the users for ease, comfort, choice and adaptability depending on the users' preferences. If the space is not equipped for the user, escape zones are dispersed throughout the building for users to remove themselves from the triggering environment and release any feeling of overstimulation.

*Triggering Feeling:* "I remember very early on - watching someone scratching at the carpet, the feeling sticks when it's really awful."[49]
*Design Solution:* In spaces that require a high-level of focus such as low stimulation zones, there should not be any carpet treatments for the flooring. Carpet should be used only in zones that are meant for single-use purposes such as the escape, reset or retreat zones.

2. Attention Deficit Hyperacitivity Disorder

*Triggering Feeling:* "I'm constantly misplacing things around the house. I definitely fidget alot, but those micro-movements really help ADHD brains focus because it helps offload some of the excess energy that we have - for me that can look like using a bouncy ball at work, or knitting while I'm trying to focus on something stationary and it just helps my brain zoom in on what's happening infront of me."[50]
*Design Solution:* The flex space and occupational therapy zone are spaces where users can go to to decompress and offload any excess energy they may be experiencing. These rooms are equipped with exercise balls, yoga mats, climbing stair towers, and monkey bars so that users can provoke occupational therapy if needed.

*Triggering Feeling:* "Things that are exciting, new and in-line with our interests are what helps us release dopamine and feel rewarded. Actively engaging activities for the brain are most rewarding and beneficial to ADHD brains."[51]
*Design Solution:* Interests may vary from person to person, however this library centre occupies many complementary program spaces to reading, writing and high-focus level rooms. This includes

[47] Mass General Giving, YouTube. "Five Questions about Autism" (2018).
[48] Ibid.
[49] Ibid.
[50] Goodful, YouTube. "What It's Actually Like Living with ADHD" (2021).
[51] Ibid.

an innovation lab, flex space, occupational therapy, makerspace, marketplace, and accessibility services such as communication, planning, organizing studios. These spaces will help allow users to actively engage in additional activities rather than the typical library programs.

3. Dyslexia

*Triggering Feeling:* "I could not take tests in the same room as other children. I would get so frustrated, overwhelmed and distracted by wrestling papers and people sniffling or tapping their pencil or foot that I could not even finish the test."[52]
*Design Solution:* The studio spaces are single-use high-focus level rooms intended for users to study, read and write. Within each overall reading zone; whether it may be in the children's, teen or adult sections, there are computer stations and reading nooks. These zones may be used as needed, and the studios are provided for escape or removal if users are having difficulty focusing in an open environment.

4. Dyspraxia

*Triggering Feeling:* "It affects me in ways that I don't notice - I find parking really difficult, I fall over alot more."[53]
*Design Solution:* There are many adjacent parking spaces directly connected to the building's pedestrian pathways. All of the parking spaces found on the building's site are sized for accessibility leaving no inequalities to users that require the accessible parking space.

5. Dyscalculia

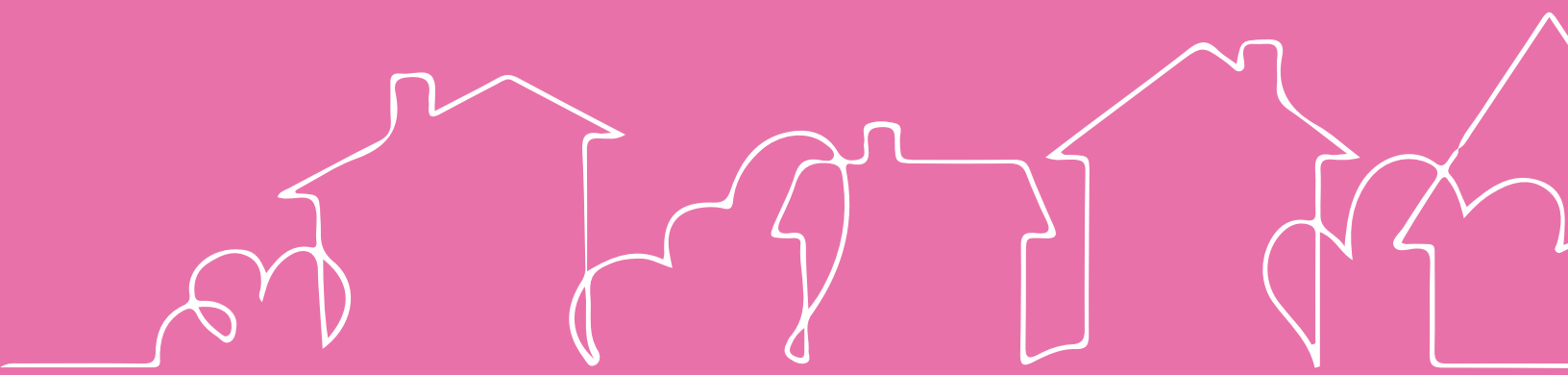
*Triggering Feeling:* "It affects other things such as your sense of direction, ability to read maps, your left from right and sense of time."[54]
*Design Solution:* Directional qualities will be mitigated with the use of wayfinding tools such as large numbers painted on the walls for different program spaces and activities. One-way circulation will be found throughout the building to reduce feelings of anxiety, getting lost or sensory overload.

Considering the significance of neurodiversity and its impact on neurodiverse populations, architectural solutions can begin to mitigate the barriers experienced within their everyday lives. The exclusivity of architecture to date, studied through the Vitruvian and Modulor Man, surface-level standards such as the Ontario Building Code and the Accessibility for Ontarians with Disabilities Act, and the Universal and Inclusive Design Guidelines, demonstrate that neurodivergents are in need of innovative architectural qualities. Therefore, the question for architects is: *how can an architectural node of refuge within the cityscape allow neurodivergents to be enabled, rather than alienated through surface-level accessibility requirements and guidelines?*

[52] Lydia Senn, YouTube. "What it's like living with dyslexia" (2018).
[53] Disabled Eliza, YouTube. "What It's Like Living With Dyspraxia" (2021).
[54] BBC The Social, YouTube. "Living With Dyscalculia (It's Not Just "Number Dyslexia")" (2019).


Above
**28 | Video Testimonials of Neurodivergents**
Representing lived experiences spoken by neurodivergents, emphasizing the relationship between triggering feelings and spatiality

# 4.0
# Neurodiverse Design



*Chapter 4.0: Neurodiverse Design* focuses on architectural solutions to mitigate the mental, emotional, and physical barriers neurodivergents experience within their everyday lives. This chapter presents an analysis of case studies at varying scales: primarily through learning-oriented workplace, and urban environments. First, the study of learning-oriented spaces is identified through Verona Carpenter Architects' school design work specializing in neurodiversity. Next, the consideration of workplace settings is studied through HOK Architects' work of hyper-and-hyposensitive micro-environments. Finally, the reflection of urban environments is applied by studying WIP Collaboratives' work at the public installation scale. Once analyzing each of the three design firms' architectural solutions, this chapter presents a comparative study of architectural qualities. Finally, this chapter establishes a design matrix with numerous architectural principles studied which is then used for the following design guidelines and interventions in Chapters 5.0 and 6.0 of this thesis.

# 4.1 Case Studies: Learning Oriented Spaces

Established on the concept of designing for the users' experience, Verona Carpenter Architects is one of the foundational architectural practices this thesis project has blossomed from. "With the community of users always in mind, we design with humanity and for resilience - and for inclusion, recognizing the neurodiverse world we live in."55

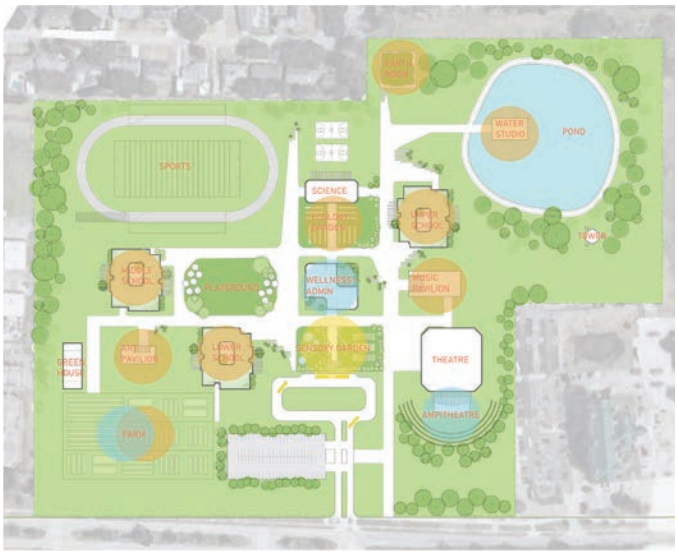
The firm defines the act of inclusion as a process that allows equal opportunities for users who may be typically excluded or marginalized, thereby characterizing inclusive design as "the unleashing of the generative power of difference."[56] Inclusive design should go beyond accommodating the users' differences and embrace those differences for the benefit of all.[57]

The K-12 School for Neurodiverse Learners is a learning-oriented campus that allows for most of its' programmatic planning to be within the landscape. At a macro scale, the sensory garden acts as a gateway to the campus. It allows for a transitional environment where the students can shift from their experience leading up to the arrival to school, to entering an outdoor space filled with sensory stimuli. One of the most important design principles of the K-12 School for Neurodiverse Learners was to create outdoor learning environments, both exposed and open, and sheltered and protected. Many of these outdoor learning spaces are adjacent to the indoor classrooms allowing for a smooth transition from one learning space to the next. The overall planning also incorporates a sense of community within the school and beyond. Spaces such as the farm, amphitheater, and wellness centre allow the community to engage with the schools' activities [29].[58]

At a micro-scale, the innovation lab acts as the core of the plan and promotes a hands-on learning experience. The ample space around the innovation lab represents the main circulation paths. It is also occupied by learning spaces,

[55] Verona Carpenter Architects. *About* (2021).
[56] Verona Carpenter Architects, Youtube. "Neuro-Inclusive Design Principals for Learning Spaces" (2021).
[57] Ibid.

[58] Verona Carpenter Architects, Youtube. "Landscape of Learning: A Case Study" (2021).

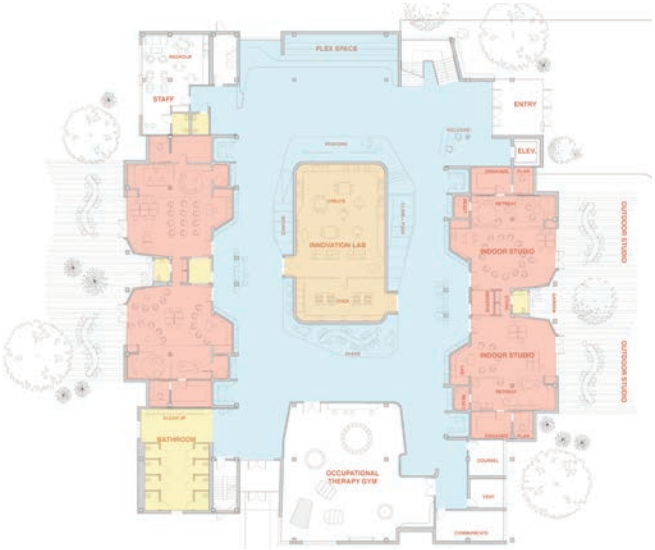



outdoor learning environments

community-oriented environments

transitional environments

Above
**29 | K-12 School for Neurodiverse Learners Site Plan**
Representing the site's programmatic planning, using transitional environments at the entry, and outdoor learning and community-oriented environments throughout



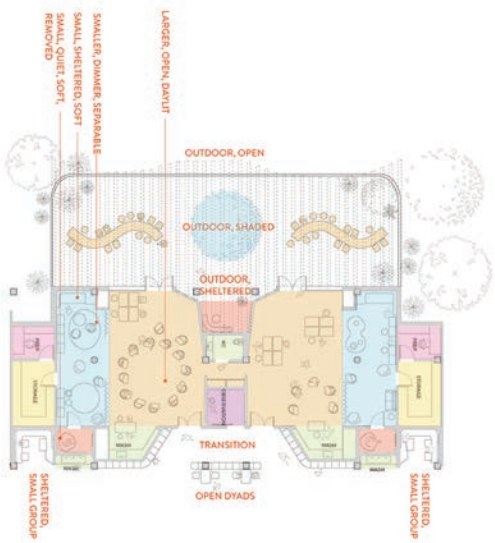

innovation lab

circulation

washrooms

studios

Above
**30 | K-12 School for Neurodiverse Learners Floor Plan**
Representing the overall planning of a learning-oriented environment, highlighting the importance of circulation and compartmentalization




gathering zones

retreat zones

reset zones

organizing zones

washrooms

play zones

observation zones

Above
**31 | K-12 School for Neurodiverse Learners Studio Floor Plan**
Representing the planning of a studio, highlighting the sensory grouping of gathering, retreat, reset, organizing, play and observation zones

incorporating both "dynamic and active zones" and "reflective and quiet zones." The washrooms were also important within the planning process as they are distributed throughout the circulation area to break the exclusivity and provide a comfortable, non-anxiety-induced space. The classrooms, otherwise termed as "studios," are divided into clusters as they are meant to promote learning throughout the entirety of the building. They are found primarily along the perimeter of the building to open up into the landscape and create an indoor-outdoor classroom setting [30].[59]

At an exceptionally smaller scale, the design of the studios are divided into many different areas with a variation of purposes. The observation areas found in the core of the studio plan are spaces for the teachers and parents to watch over the students without disrupting the learning. There are three main choices of gathering with adaptable furniture in which can be rearranged to create different environments depending on the circumstance. The areas of retreat function as an extension of the main gathering space and allow students to learn in various ways. These spaces include a visual barrier and lower lighting levels. The reset areas enable students to be physically and acoustically separated from the main studio but can remote in if needed. The outdoor learning space also reflects the same intentions; gathering, retreat and reset spaces [31]. The overall organization of the planning, both indoor and outdoor, is not by function but by sensory choice. Moreover, by providing various environments that embrace the diversity of learning modes, students can choose which spaces best suit their needs. "Kids do well when they can, not just when they feel like it."[60]

The K-12 School for Neurodiverse Learners can also be studied sectionally where many of the spatial elements listed are represented. These elements include outdoor learning, studios,

[59] Ibid.

[60] Ibid.

gathering zones, observational rooms, innovation lab, washrooms, and reset and retreat zones [32].[61] These spatial elements are then removed from the overall drawing to magnify the importance, their contribution to neurodiverse design, and their applicability to a variety of building typologies [33].

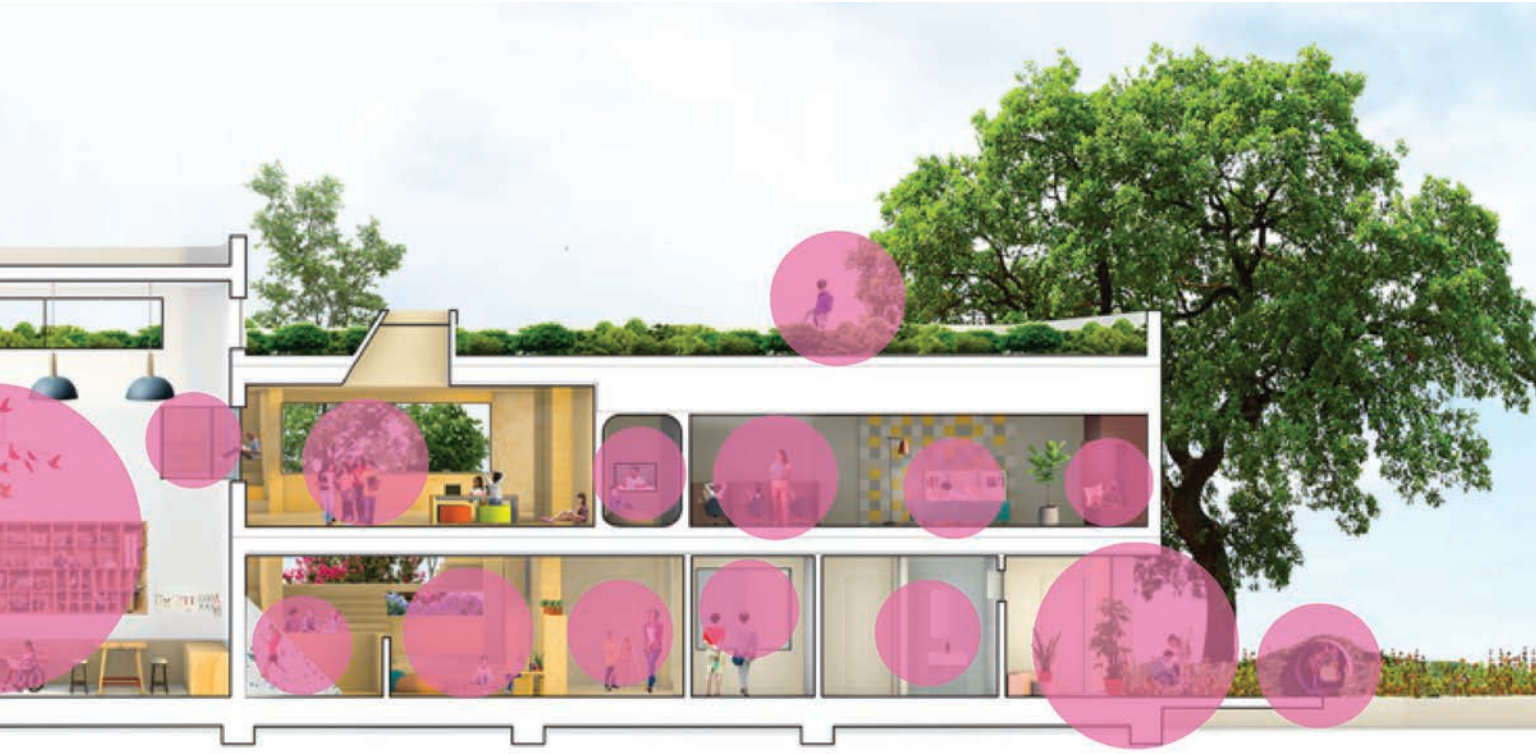
When studying the UL Lafayette K-12 School, it was imperative to understand the architectural gestures that allow neurodiverse users to succeed in learning environments. Highlighted within this school, elements of neurodiverse design include the interconnectivity of spaces, flexible seating, natural light, connection to nature, vibrant colors, comfortability, providing choice, and creating level differences such as elevated and depressed spaces [34]. The listed elements are then removed from the original drawing to extend the importance of these architectural qualities and how they can begin to inform the proposal of this thesis' design intervention [35]. By incorporating the design initiatives listed, the overall environment is considered neuro-inclusive through sensory design and offers choice, flexibility, and adaptability for diverse users and experiences.

The Quad Preparatory Lower School is another prime example of neurodiverse design within classroom settings. Highlighted within the original photos are architectural elements that introduce concepts of neurodiverse design [36]. In an attempt to interpret the design of this school, these architectural elements include the use of natural materials, open concept plans, textured flooring, variety of storage and the use of artworks [37].

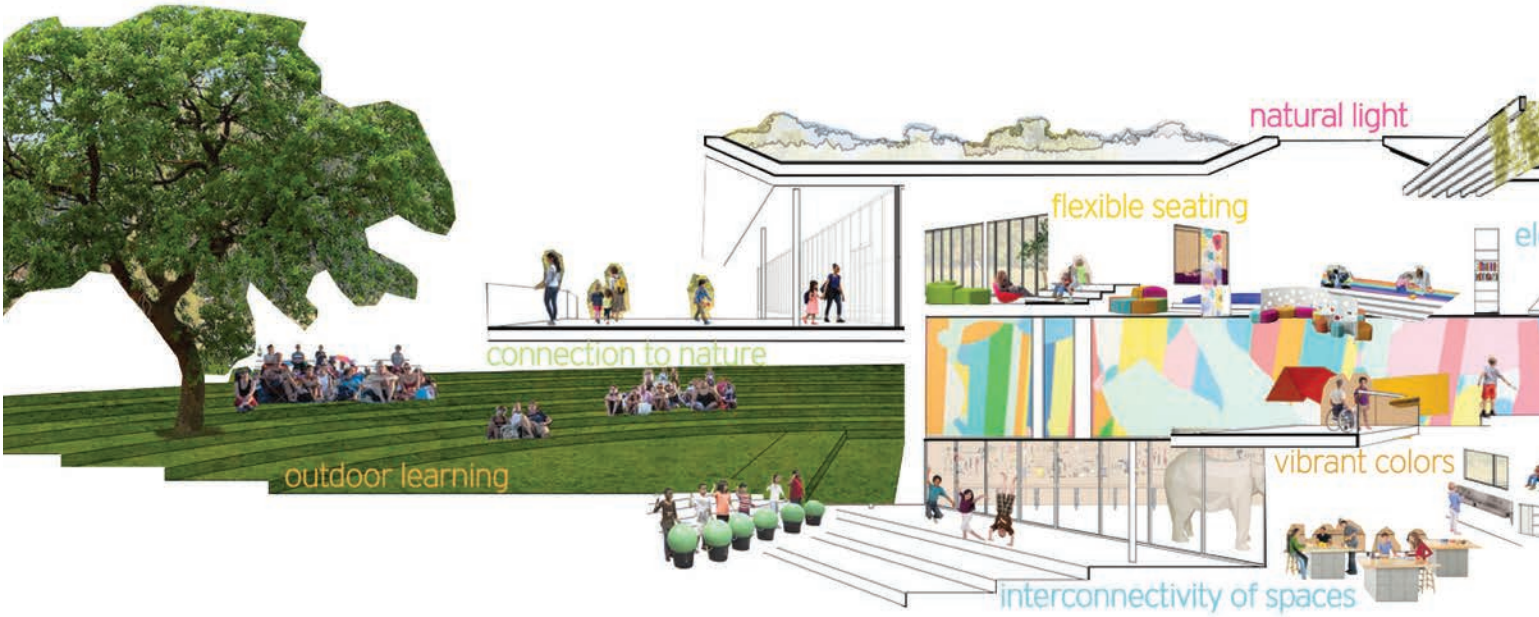
The Quad Preparatory Upper School also highlights many architectural qualities relating to neurodiverse design, including but not limited to those highlighted in the overall image [38]. These qualities are represented and intensified to reiterate the significance of exposed concrete flooring, bright colors and lighting, connectivity to spaces, concentration zones, wayfinding and signage, adaptive learning, and distinct areas for reset [39]. With all of these architectural principles, it is clear that the specificity of neurodiverse design lies in creating atmospheres that are diverse within particular spaces. Furthermore, the catering of choice within distinct areas allows many different users to utilize the space as needed.

[61] Ibid.

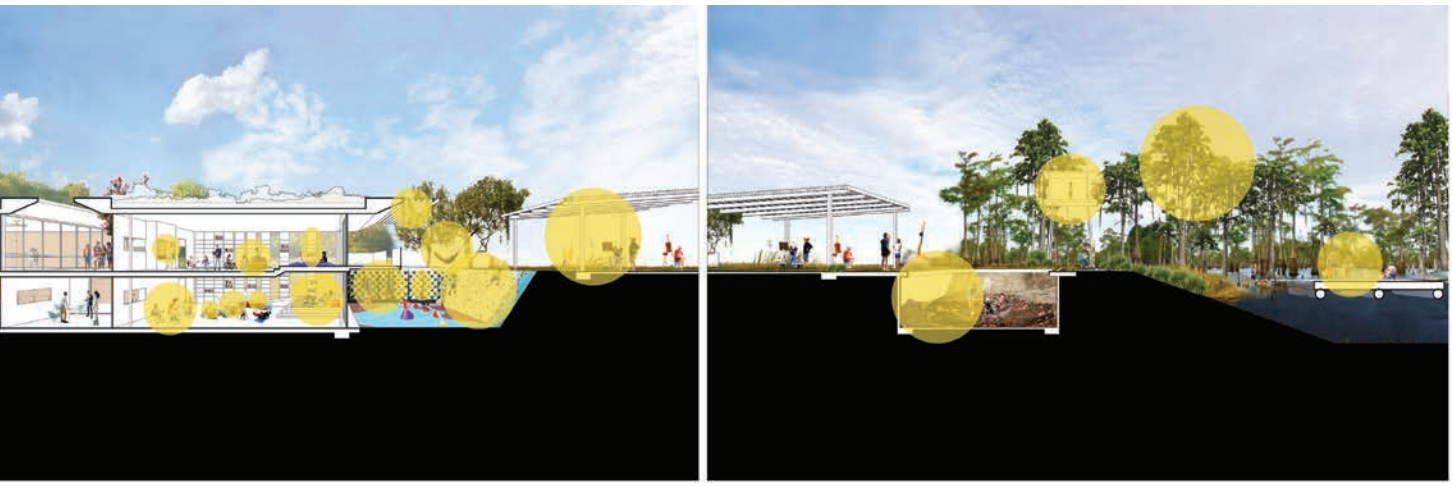

Above
**33 | Interpretation of Neuro-Inclusive Qualities: K-12 School for Neurodiverse Learners**
Representing the main neuro-inclusive design elements to form a collage-like interpretation



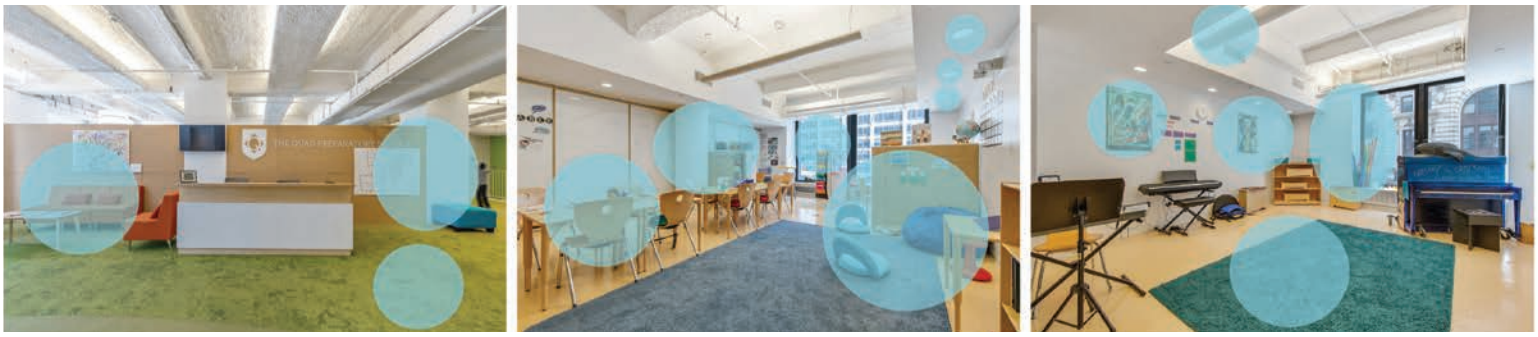
Above
**32 | K-12 School for Neurodiverse Learners Sectional Perspective**
Representing the main neuro-inclusive design elements




Above
**35 | Interpretation of Neuro-Inclusive Qualities: UL Lafayette K-12 School**
Representing the main neuro-inclusive design elements to form a collage-like interpretation



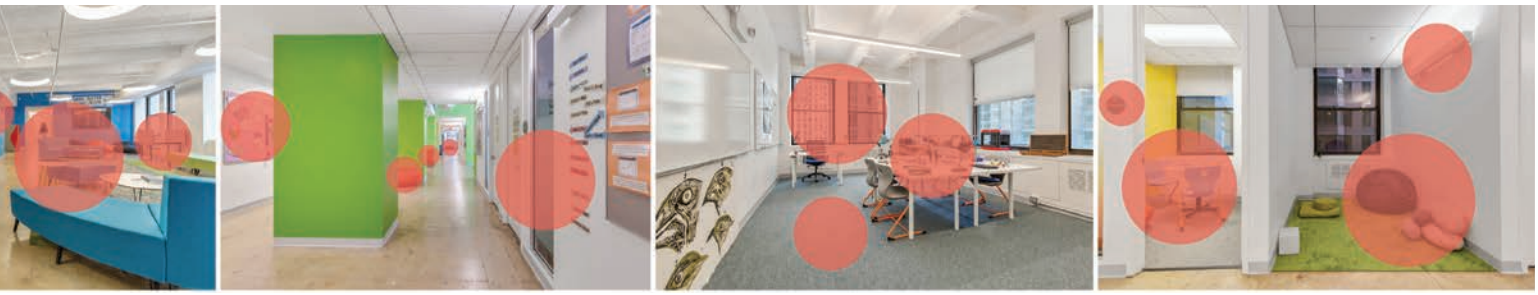
Above
**34 | UL Lafayette K-12 School Sectional Perspective**
Representing the main neuro-inclusive design elements




Above
**37 | Interpretation of Neuro-Inclusive Qualities: Quad Preparatory Lower School**
Representing the main neuro-inclusive design elements to form a collage-like interpretation

Above
**36 | Quad Preparatory Lower School**
Representing the main neuro-inclusive design elements


Above
**39 | Quad Preparatory Upper School**
Representing the main neuro-inclusive design elements to form a collage-like interpretation



Above
**38 | Quad Preparatory Upper School**
Representing the main neuro-inclusive design elements

# 4.2 Case Studies: Workplace Settings

Right
**40 | Hypersensitive Vs. Hyposensitive Environments**
Representing high and low sensitivities to sensory stimuli

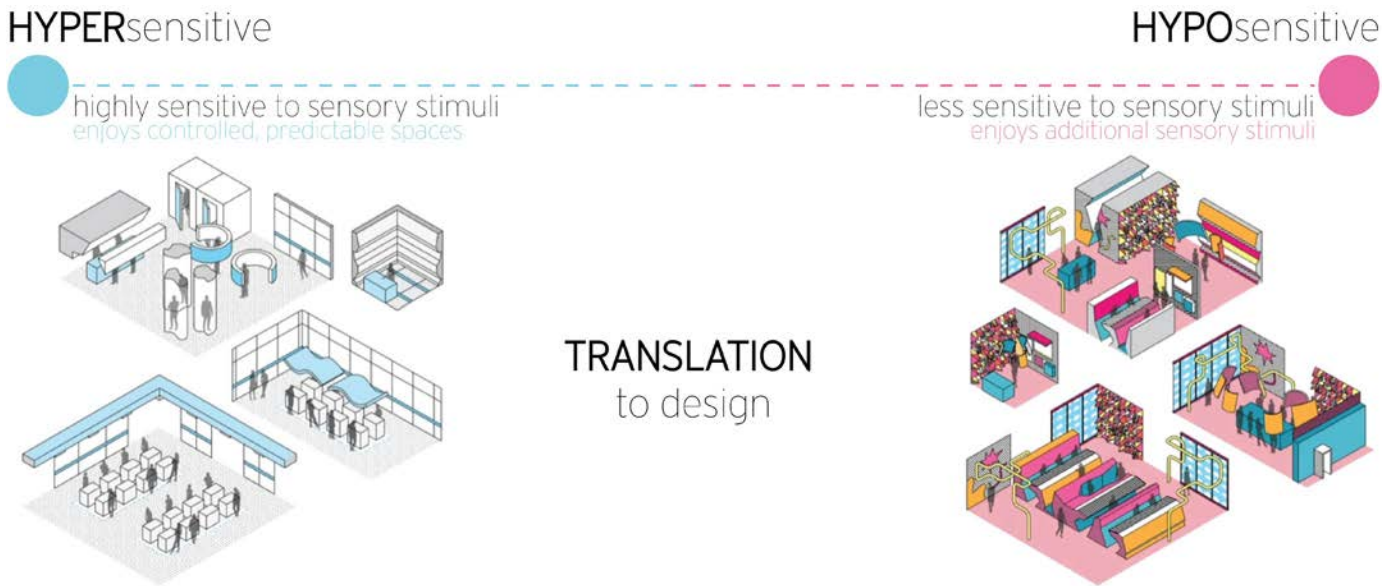
HOK Architects is an architectural-based practice with varying research fields, one being the relationship between neurodiversity and the workplace. This relationship allows the opportunity to challenge designers into thinking of inclusive environments as a well-balanced ecosystem that provides users with a range in choice of space.[62] "We are freshwater fish in saltwater. Put us in freshwater, and we function just fine. Put us in salt water, and we struggle to survive." - An Autistic Student.[63]

The firm defines architectural inclusivity as thoughtful and carefully designed environments that allow users to experience the space through several forms of sensory stimulation.[64]

As described by HOK Architects, most users are not aware of their relationship to the senses and how the senses are affected in particular working environments. Most users fall under the category of hyper-or-hypo-sensitive conditions in relation to sensory stimulation. Hypersensitive users "process the details of sensory stimuli in an overly magnified way." They prefer to be placed in predictable spaces with a controlled grasp to the stimulation they are receiving. It is noted that they dislike spaces with excessive amounts of stimuli such as bright lights, crowds, unfamiliar scents, textures and temperature fluctuations [40]. Hyposensitive users typically have difficulty seeing, hearing, and feeling intense sensory details and prefer overstimulating environments to successfully process sensory information [40].[65]

Furthermore, inclusive workplace environments must take advantage of all aspects of the three-dimensional space in ways that attract the users' auditory, visual, tactile, olfactory, and proprioceptive senses [41].[66] It is proposed that six modalities of work are translated into six types of spaces designed for both hyper-and-hypo-sensitive users.

[62] HOK Architects. "Kay Sargent Talks about Designing Neurodiverse-Friendly Workplaces on CRE Podcast" (2019).
[63] Youtube. "#FrameLive Presents: Agile Workplace 2.0 Virtual" (2021).
[64] HOK Architects. *Designing for an Increasingly Diverse Workforce* (2021).
[65] HOK Architects. *Enabling Choices in a More Inclusive Workplace Ecosystem* (2021).
[66] Ibid.




The six types of space are as follows:

1. Concentrating / Focusing Space:

The concentrating / focusing space is an environment that enables workers to execute individual and focused work. For hyposensitive users, this means a snug and personable space with the intent to feel orderly by using simple patterns, tactile elements. For hypersensitive users, this means a snug space, with a limitation to busy patterns and bright colors. Natural sounds, strong acoustic controls, and high-quality lighting should be incorporated [42].[67]

2. Communing / Processing Space:

The communing / processing space is meant to accommodate workers in doing everyday tasks. For hyposensitive users, the design should include saturated and contrasting colours, movement-oriented circulation paths, and access to additional sensory stimulation spaces. For hypersensitive users, simple patterns, light colours, sound masking systems, and the option to control distractions are critical elements of a comfortable working environment [42].[68]

3. Creating Space:

The creating space promotes creative thinking and brainstorming. For hyposensitive users, an ideal space would include open and airy areas, saturated colours, surfaces for doodling, and additional sensory-stimulating spaces with furniture for fidgeting and tactile elements. Low ceiling planes, warm colours, simple patterns, alcoves for reflection, and sound masking systems are essential for hypersensitive users [42].[69]

[67] Ibid.

[68] Ibid.
[69] Ibid.

4. Congregating / Meeting / Learning Space:

The congregating / meeting / learning space is an encouraging environment for workers to meet and collaborate. For hyposensitive users, it should include neutral colours, moderate background noise, organic patterns, surfaces for doodling, and an optimum space to move around in. For hypersensitive users, the ideal space would include neutral colours, limited patterns, orderly spaces, and enough room to allow for personal space [42].[70]

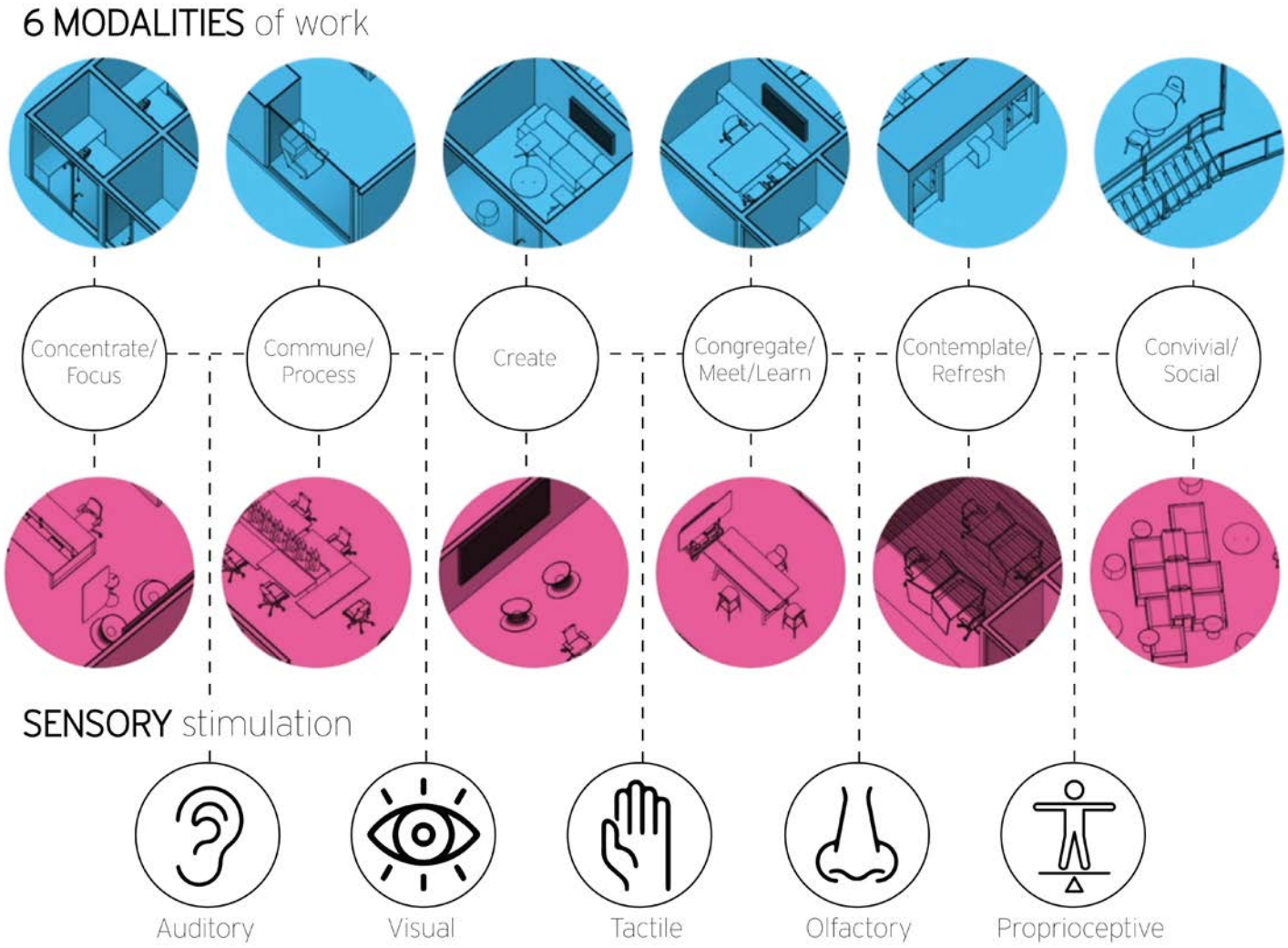
5. Contemplating / Refreshing Space:

The contemplating / refreshing space aids in the act of refreshing the workers' minds. For hyposensitive users, this requires an option of working individually or in small groups, geometric patterns, colour shades of blue and green, circulation paths that allow for organic intersectional points, and active spaces. For hypersensitive users, the space will include individual areas and clear personal boundaries, dropped ceilings, the ability to control distractions, organic patterns, and circulation paths that deter lingering [42].[71]

6. Convivial / Socializing Space:

The convivial / socializing space is intended for workers to make social connections. For hyposensitive users, this space should include warm saturated colours, a variety of seating choices, tactile and textural elements, and a moderate level of background noise. For hypersensitive users, it should include warm and neutral colors, natural materials, limited patterns, controlled noise, and should be in a low-traffic zone [42].[72]

[70] Ibid.
[71] Ibid.
[72] Ibid.




Above
**41 | Six Modalities of Work In Relation to Sensory Stimulation**
Representing the six modalities of work and how the body's senses are affected within each

## Concentrate/Focus

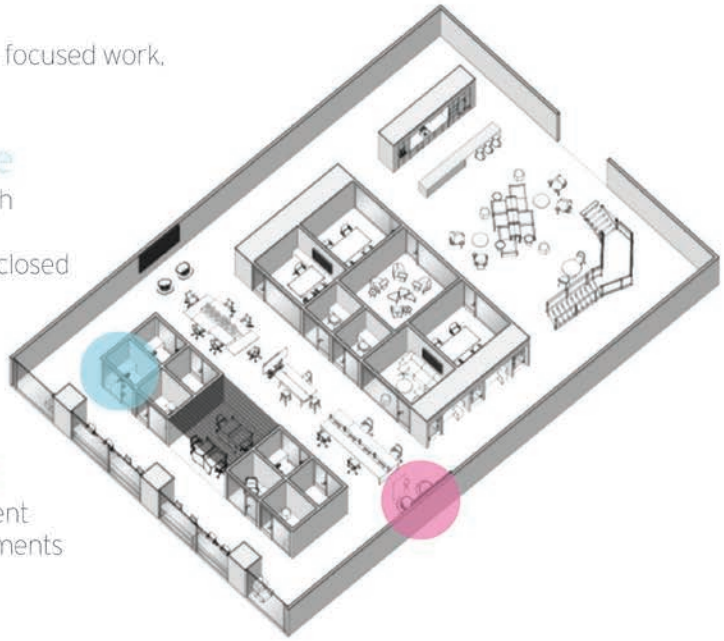
People doing individual, focused work, analytical reasoning

**HYPERsensitive**

- off the beaten path
- calming colours
- enclosed/semi-enclosed

**HYPOsensitive**

- space for movement
- ergonomic adjustments and control
- visual interest



## Commune/Process

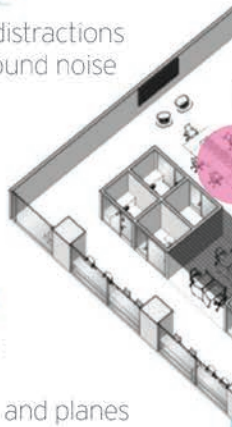
People doing everyday tasks

**HYPERsensitive**

- away from visual distractions
- moderate background noise
- natural daylight

**HYPOsensitive**

- enable movement
- visual interest
- layering of texture and planes



## Congregate/Meet

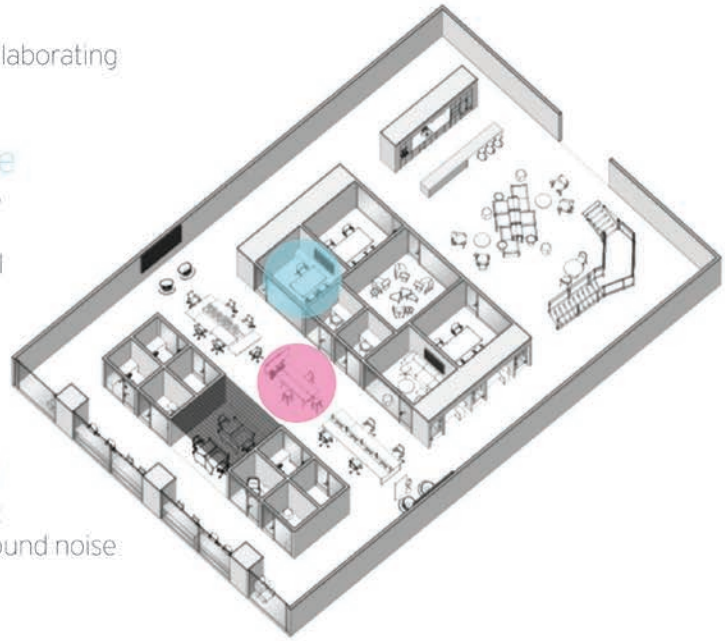
People meeting and collaborating

**HYPERsensitive**

- limit outside noise
- basic shapes
- room for personal space at the table

**HYPOsensitive**

- enable movement
- moderate background noise
- tactile elements



## Contemplate/Refresh

Space for people to refresh and be mindful

**HYPERsensitive**

- solo space
- free of culture
- snug with low ceiling

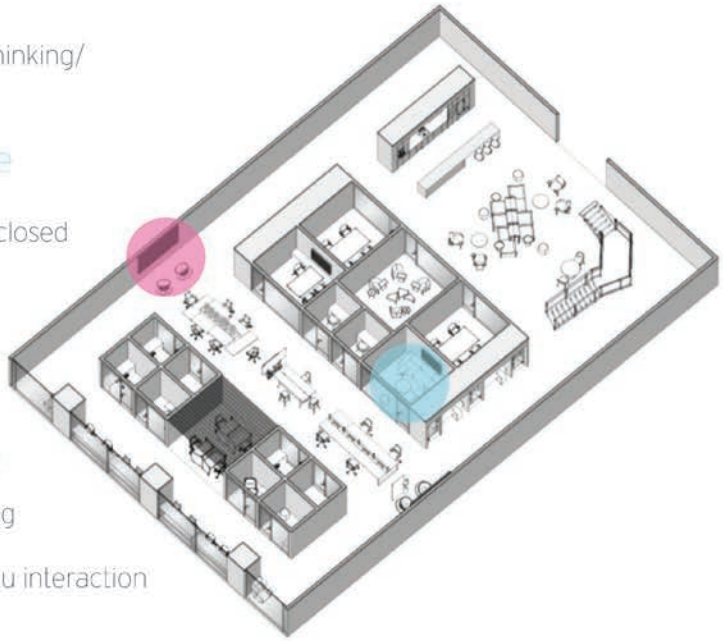
**HYPOsensitive**

- ability to be alone or in small groups
- furniture to lounge
- geometric patterns

Create
People doing creative thinking/
brainstorming

HYPERsensitive
- limited clutter
- enclosed/semi-enclosed
- warm colors

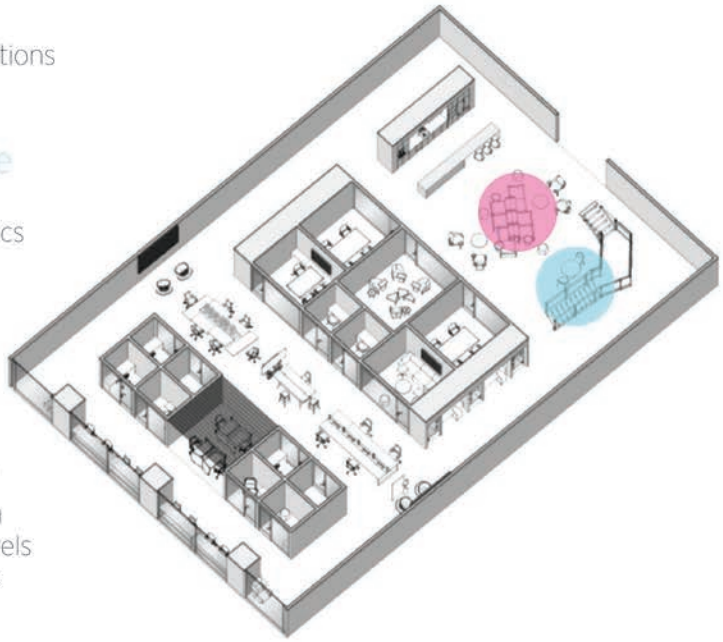
HYPOsensitive
- information sharing
- fidget furniture
- area for impromptu interaction



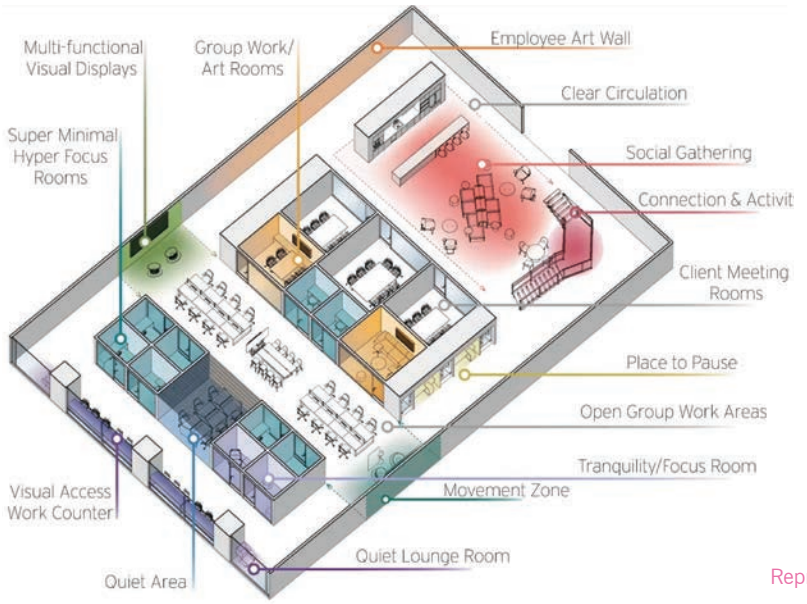
Convivial/Social
Space for social connections

HYPERsensitive
- semi-shielded
- thoughtful acoustics
- natural materials

HYPOsensitive
- active socialization
- various lighting levels
- energizing colours



Above
**42 | Six Types of Spaces Based on Work Modalities**
Representing the six types of spaces within a workplace setting in relation to the six types of work modalities




Left
**43 | Overall Working Environment**
Representing an overall working environment, meshing the six types of work modalities and six types of work spaces

When combining all elements of each type of space into an overall working environment, many zones and areas must be specifically organized and designed to provide a successful working experience for the users. Distinct architectural characteristics such as open group work areas, social gathering spaces, minimalistic hyper-focus rooms, quiet areas and clear circulation, will define hyper-sensitive and hypo-sensitive micro-environments for each user to choose the experience they wish for depending on the day [43].[73]

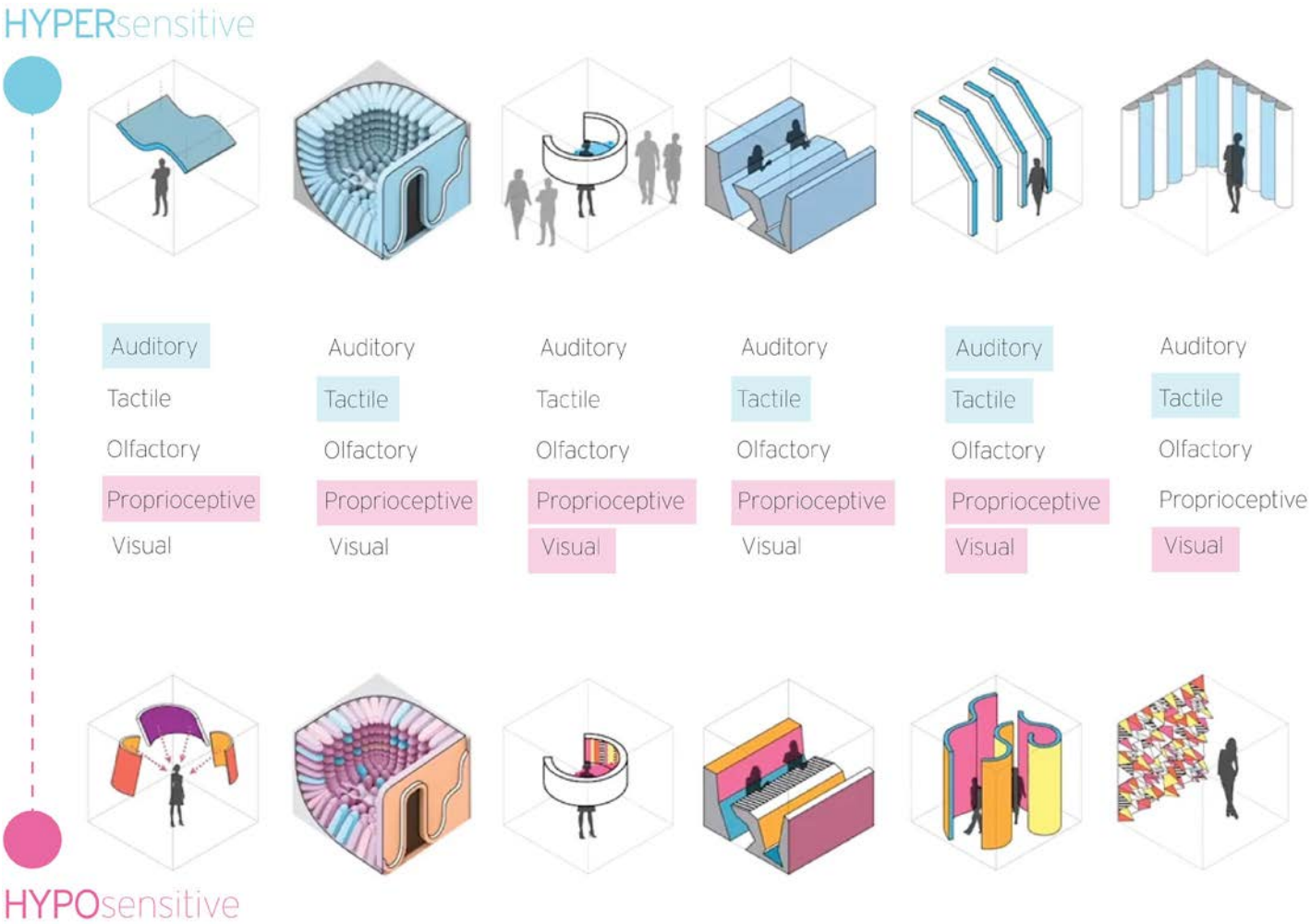
Many neurodivergent users feel the need to take a break midway through their workday at around 12:30 pm; this is where the multi-sensory zones are introduced. Multi-sensory zones are spaces where hyper-or-hypo-sensitive users can recharge their batteries and indulge in the correct amount of sensory stimulation needed to return to work and feel focused and productive for the remainder of the day.[74]

These zones can range from a variety of spaces and target a variety of sensory stimuli through the five senses. Depending on the user, they can choose which of the five senses they aim to address, and based on that decision, it can relieve the stress and fatigue from the beginning of the workday [44].[75]

Analyzing a multiplicity of spaces within the workplace was essential to differentiate between the hyper-and-hypo-sensitive micro-environments. Architectural principles highlighted in the overall images represent many of the conditions relating to neurodiverse design through the lens of hyper-and-hyposensitive users [45]. I have produced an interpretive collage to differentiate and pull out many of these qualities. For the hypersensitive users, these elements include a connection to nature, acoustic baffles, natural materials, isolated and separated workstations, textured flooring, comfortability, saturated lighting, low traffic zones, and a precise control to distraction and noise.

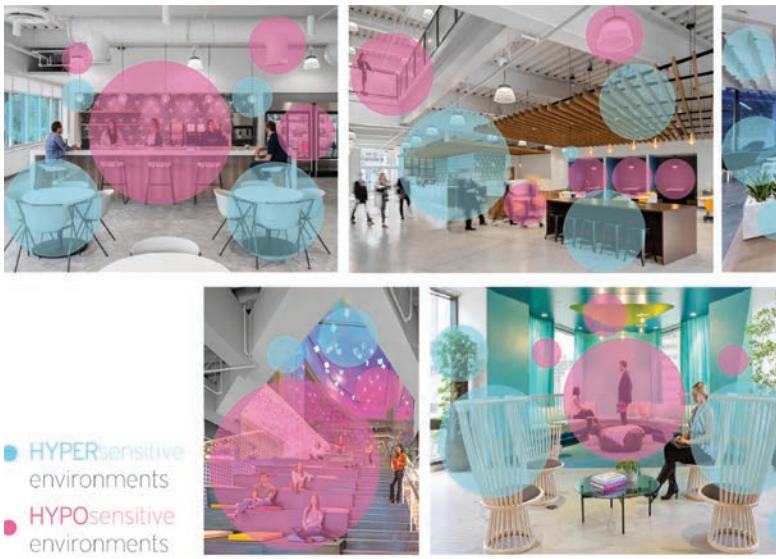
[73] Ibid.
[74] Ibid.

[75] Ibid.



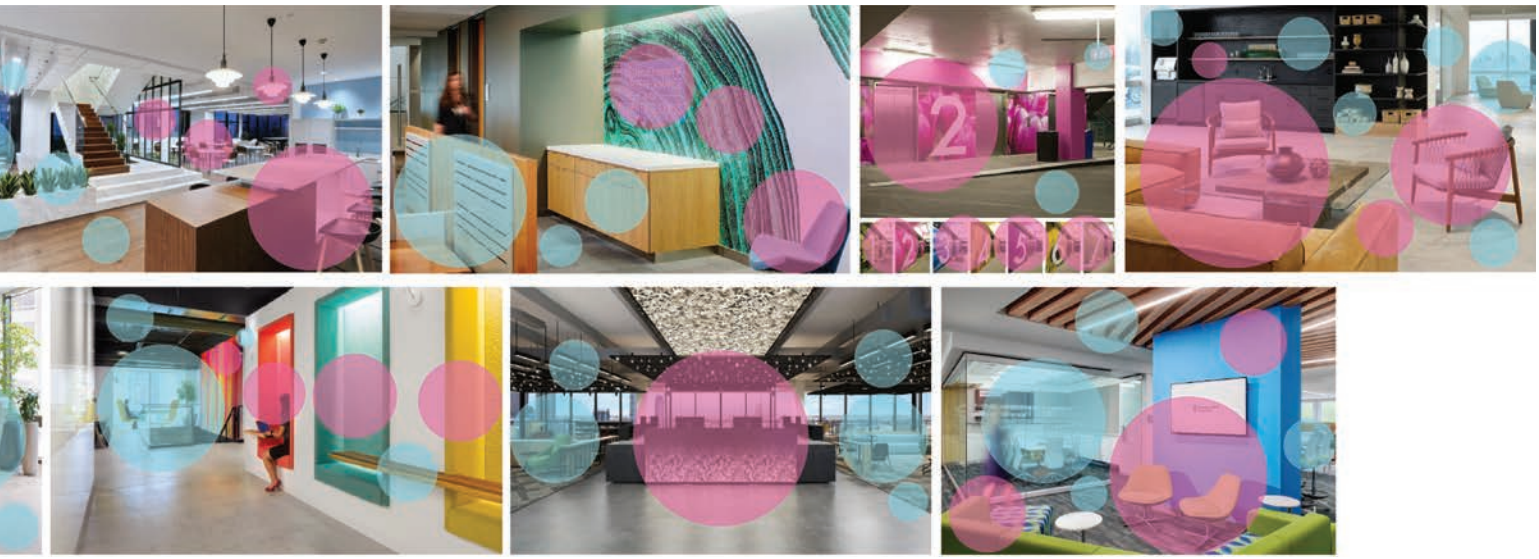

Above
**44 | Multi Sensory Zones**
Representing multi-sensory zones and their relationship to sensory stimulation

Right
**45 | Study of Hyper-Hyposensitive Environments**
Representing hyper and hyposensitive environments within overall workplace settings






On the other hand, hypo-sensitive environments involve architectural elements such as simple patterns, additional stimuli, background noise, active workstations, organic textures, open seating, repetitive geometry, and flexible workspaces [46].




Above
**46 | Interpretation of Hyper-Hyposensitive Environments**
Representing the main neuro-inclusive design elements to form a collage-like interpretation

# 4.3 Case Studies: Urban Environments

WIP Collaborative is a design studio based on public engagement. Their primary design intentions are to challenge and transform existing conditions of societal norms, primarily through the use of sensory stimulation for neurodiverse populations.[76]

Restorative Ground is a public streetscape installation that provides a range of spatial qualities, both high and low stimulation through tactile materials and textures. Highlighted within the noted images produced by WIP Collaborative, distinct zones are displayed: focused, active and calm to differentiate certain areas within the installation that provide collective engagement, recreation, and healing [47]. Within an interpretive collage methodology, it is highlighted that the focused zones encapsulate large tables within the landscape of the installation and promote concentration, creativity, collaboration, and community gathering [48]. The active zones consist of playscapes found at the peaks of the geometry and allow creative movement, spontaneity, high stimulation, and tactility [48]. Finally, the calming zones range from hammock areas to gently sloped platforms and encourage relaxation, lounging, and a place to restore oneself through low stimulation [48].[77]

Contributing to the ongoing research of neurodiverse design, WIP Collaborative explores the creation of sensorial environments through urban and public architecture. Addressing the differences neurodiverse users experience at a large scale complements designing small-scale programmatic spaces throughout a city. The experience leading up to the entry of a building relies on the urban and public spaces. By creating urban design for neurodivergent users, these types of installations can enable the users and ultimately create outdoor sensorial spaces within the cityscape.

[76] WIP Collaborative. *Studio* (2021).

[77] WIP Collaborative. *Projects* (2021).

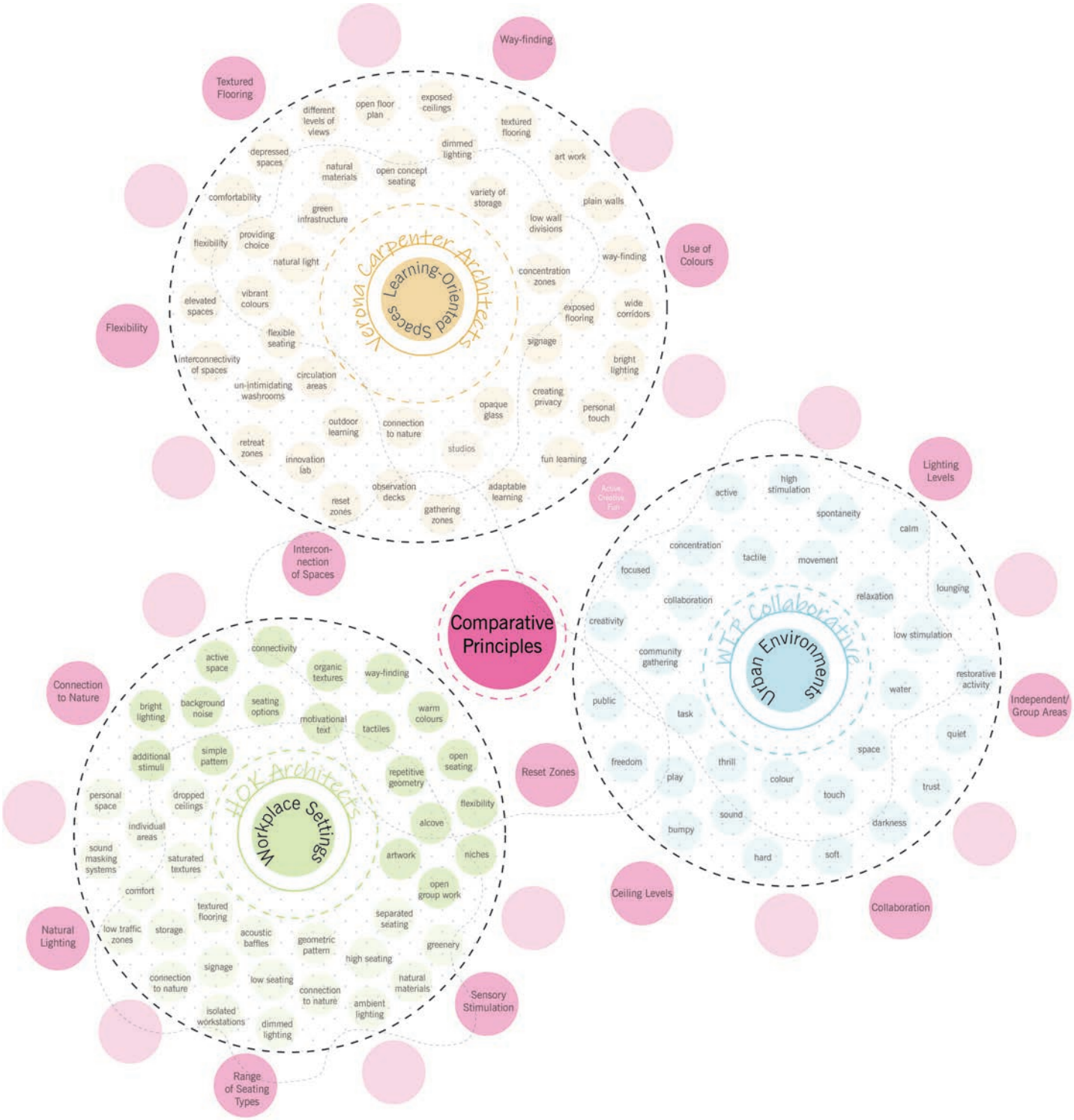
Above
**47 | Restorative Ground**
Representing a public installation project, highlighting images and perspective drawings


Above
**48 | Interpretation of Architectural Qualities: Restorative Ground**
Representing the main neuro-inclusive design elements to form a collage-like interpretation

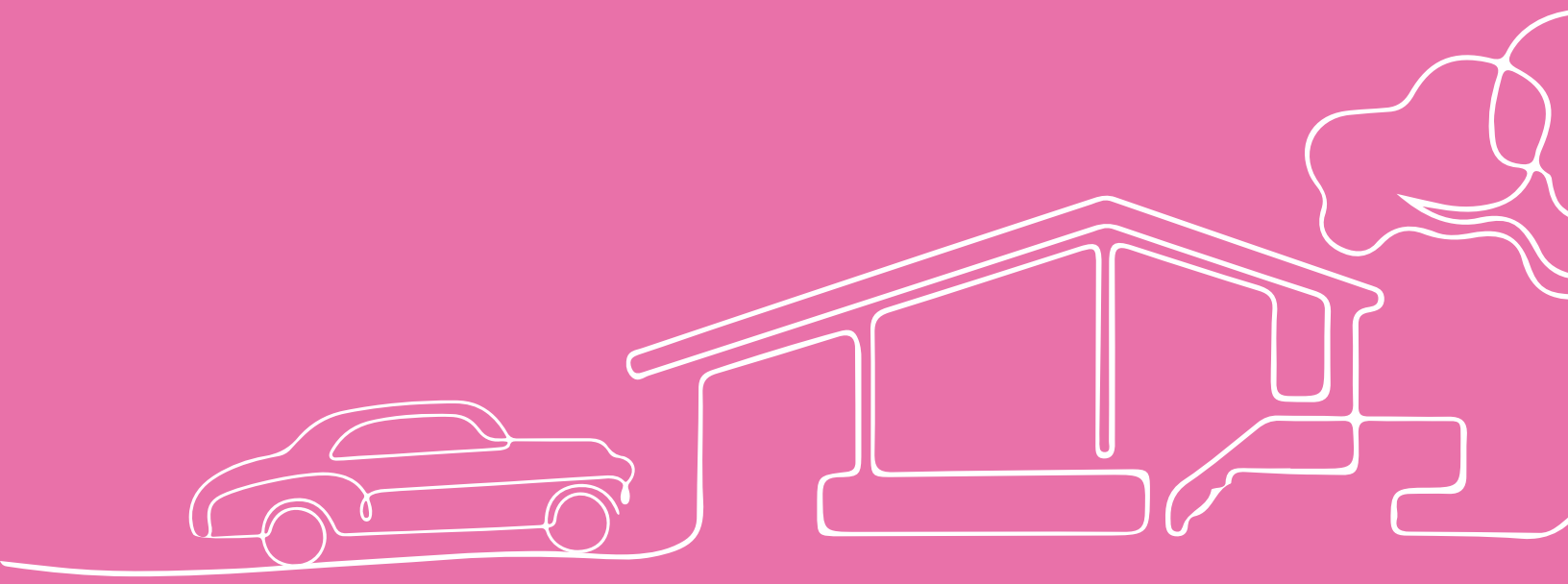
# 4.4 Design Matrix

In order to gain an appropriate understanding of neurodiverse design and the architectural qualities it is composed of, I carried out a comparative study of all three design firms. For the design intervention of this thesis project, this study will act as a design matrix to account for all of the architectural qualities provided through the case studies considered. The comparative principles which were found within all typologies and scales of neurodiverse design include the interconnection of spaces, flexibility, use of colours, creating active and creative spaces, a connection to nature, use of textured flooring, way-finding, natural lighting among many others [49]. These architectural qualities will be implemented within the proposed building to reinforce the detailed architectural elements necessary for neurodiverse users.

Right
**49 | Comparative + Contrasting Analysis of Case Studies**
Representing a comparative and contrasting analysis of case studies at a variety of scales: Verona Carpenter Architects, HOK Architects and WIP Collaborative


Comparative Principles
Verona Carpenter Architects
Learning-Oriented Spaces
Way-finding
Textured Flooring
Use of Colours
Flexibility
different levels of views
open floor plan
exposed ceilings
textured flooring
dimmed lighting
art work
depressed spaces
natural materials
open concept seating
variety of storage
plain walls
comfortability
green infrastructure
low wall divisions
flexibility
providing choice
way-finding
natural light
concentration zones
vibrant colours
elevated spaces
exposed flooring
wide corridors
flexible seating
signage
interconnectivity of spaces
bright lighting
circulation areas
un-intimidating washrooms
creating privacy
opaque glass
personal touch
outdoor learning
connection to nature
retreat zones
studios
innovation lab
fun learning
observation decks
adaptable learning
reset zones
gathering zones
Active, Creative, Fun
Lighting Levels
Interconnection of Spaces
WTP Collaborative
Urban Environments
active
high stimulation
spontaneity
calm
concentration
tactile
movement
focused
lounging
collaboration
relaxation
creativity
low stimulation
community gathering
restorative activity
water
public
task
Independent/ Group Areas
quiet
space
freedom
thrill
play
colour
trust
touch
sound
darkness
bumpy
hard
soft
Reset Zones
Ceiling Levels
Collaboration
Connection to Nature
HOK Architects
Workplace Settings
connectivity
active space
organic textures
way-finding
bright lighting
background noise
seating options
motivational text
tactiles
warm colours
additional stimuli
simple pattern
open seating
repetitive geometry
personal space
dropped ceilings
flexibility
individual areas
alcove
sound masking systems
saturated textures
artwork
niches
open group work
comfort
textured flooring
separated seating
Natural Lighting
low traffic zones
storage
acoustic baffles
geometric pattern
greenery
high seating
signage
connection to nature
low seating
natural materials
connection to nature
ambient lighting
isolated workstations
dimmed lighting
Sensory Stimulation
Range of Seating Types

# 5.0
# Enabling Design Guidelines



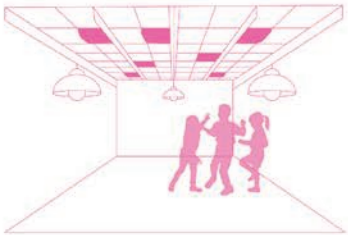
*Chapter 5.0: Enabling Design Guidelines* proposes an advanced set of design guidelines targeted towards neurodiversity. Once completing the comparative work of the existing design guidelines and the architectural solutions for neurodivergent populations, this chapter presents a new set of design guidelines that will inform neuro-inclusive design strategies. This chapter also studies concepts and architectural frameworks presented by Verona Carpenter Architects' theory of "Lessons From Schools", HOK Architects' "Designing for a Neurodiverse Workplace", and Magda Mostafa's work of The ASPECTSS Standards. These theories consider a variety of concepts including learning-oriented, workplace-oriented and autism-oriented frameworks. This chapter concludes by presenting the proposed Enabling Design Guidelines. This guideline introduces principles such as spatial organization, spatial character, lighting, thermal and acoustic quality, ease of transition, sensory grouping, and escape or reset zones.

# 5.1 Learning-Oriented Frameworks

A theory presented by Verona Carpenter Architects named “Why School Design Matters?” explores the layout of schools and their neurodiverse qualities through observational research. It is proposed that there are six lessons learned by studying the school’s architectural experiences [50].[78]

[78] Verona Carpenter Architects, Youtube. “Lessons From Schools (Observational Research)” (2021).

Right
**50 | Summary of Learning-Oriented Frameworks**
Representing Verona Carpenter Architects’ concepts of “Why School Design Matters?”

| | | |
|---|---|---|
| Lesson 1 |  | Put the Corridors to Work |
| Lesson 2 | Provide Escape Without Removal |  |
| Lesson 3 |  | Create Re-Set Space |
| Lesson 4 | Make Sitting Active & Provide Choice |  |
| Lesson 5 |  | Control Lighting + Acoustics |
| Lesson 6 | Make Spaces To Teach Adaptive Everyday Skills |  |

Corridors are usually known to serve as circulation paths, however, they can also be used as occupational therapy spaces. Occupational therapy such as movement breaks allows neurodiverse users to recalibrate themselves in times of need. Instead of designing the corridor to be dark and narrow, by widening the width, we can allow for movement and create spaces for learning outside of the classroom [51].[79]

Typically neurodiverse users are challenged with feelings of overwhelm, requiring a reduction of sensory input. In many cases, this can be mitigated by creating a "room within a room" where the users can remain inside the overall classroom, yet in their own personal space [51].[80]

Reset spaces are fundamental aspects of a thriving environment designed for neurodiverse users. Reset spaces allow users to safely reset sensory input by removing themselves from the triggering environment, and locating themselves elsewhere. These spaces can range from calming and soothing conditions, to settings that allow for safely lashing out on padded surfaces [51].[81]

Providing options for seating within the classroom allows neurodiverse users to choose which seating typology will best suit their needs daily. Many seating typologies are built with movement in mind, and can aid in the concentration levels of neurodiverse users. Some examples include exercise balls, rocking chairs, bouncy stools, or bike desks. Other examples of seating options that grant similar benefits include foot swings or weighted cardboard boxes, allowing fidgeting activities without distracting others in the classroom [51].[73]

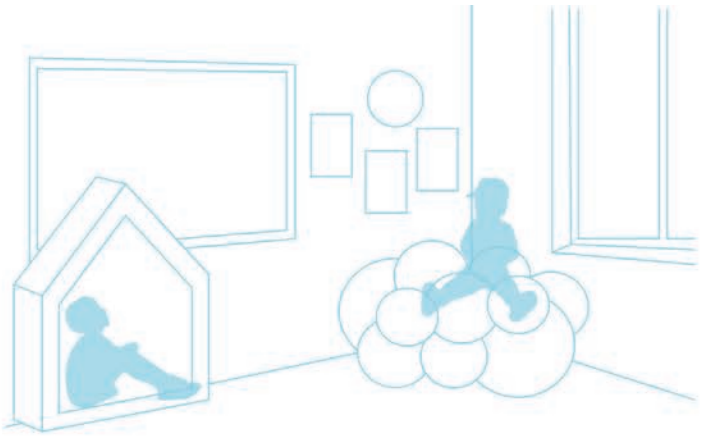
Bright fluorescent lighting and noisy, distracting acoustics are primary triggers to neurodiverse users. These conditions can be alleviated through design by placing fabric over harsh lighting as a diffuser and creating an overall ambiance with different textures and patterns. Acoustics can also be dampened by incorporating baffles to minimize the reverberation of unwanted sounds [51].[83]

Schooling should not only teach users functional skills such as Math, Science and English, but also everyday skills which can be applied to their everyday lives. These subjects can mix with one another, for example, learning everyday skills like cooking and the practical aspects of math intermingled into one space [51].[84]

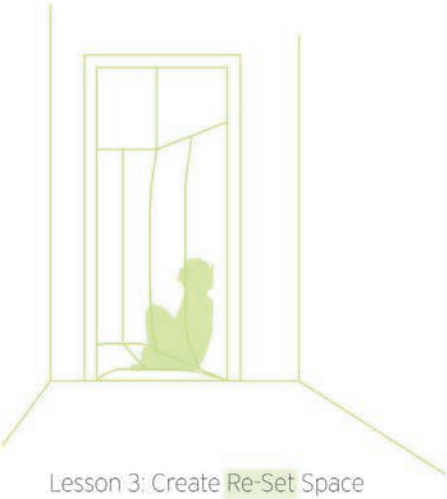
[79] Ibid.
[80] Ibid.
[81] Ibid.
[82] Ibid.
[83] Ibid.
[84] Ibid.

Right
**51 | Lessons Learnt From School Design**
Representing the lessons learnt from school design via observational research

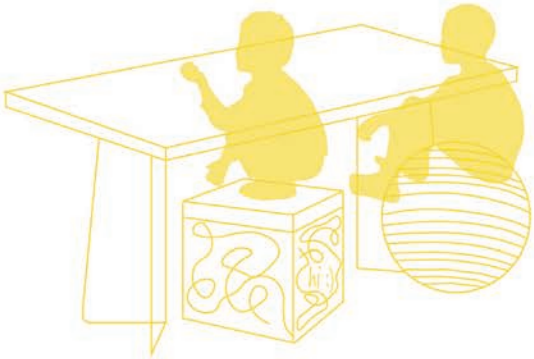
Lesson 1: Put the Corridors to Work



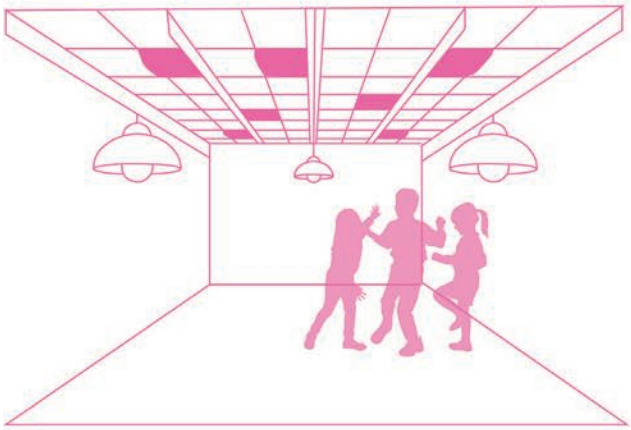
Lesson 2: Provide Escape Without Removal



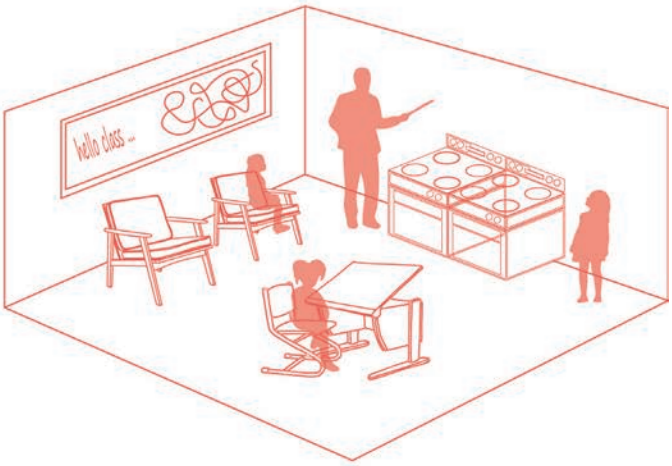
Lesson 3: Create Re-Set Space



Lesson 4: Make Sitting Active & Provide Choice



Lesson 5: Control Lighting & Acoustics



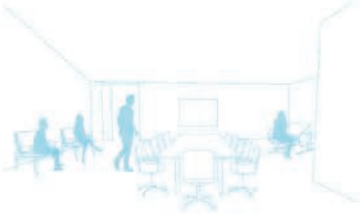

Lesson 6: Make Spaces to Teach Adaptive Everyday Skills

# 5.2 Workplace-Oriented Frameworks

As described in the text written by HOK Architects, "Designing For A Neurodiverse Workplace," it is highlighted that providing choice for various users allows them to feel enabled and manage their own needs with dignity. It is proposed that there are five impactful types of choice: spatial character, acoustic quality, thermal comfort, lighting, and degree of stimulation. However, since an environment is based on the overall sense of order, it is vital to recognize the importance of spatial organization [52].[85] The five most impactful types of choice are as follows:

[85] HOK Architects. *Designing for a Neurodiverse Workplace* (2021), 6.

Right
**52 | Summary of Workplace-Oriented Environments**
Representing HOK Architects' concepts of "Designing For A Neurodiverse Workplace"

| | | |
|---|---|---|
| Type of Choice 0 |  | Spatial Organization |
| Type of Choice 1 | Spatial Character |  |
| Type of Choice 2 |  | Acoustic Quality |
| Type of Choice 3 | Thermal Comfort |  |
| Type of Choice 4 |  | Lighting |
| Type of Choice 5 | Degree of Stimulation |  |

Effective spatial organization is derived by creating spaces that use a common element in repetition to provoke a sense of order. Focal points such as staircases and artworks, viewpoints such as the interconnection within mezzanine spaces, and clear lines of sight allow users to orient themselves within a building. Several lighting levels can also aid in spatial organization as users naturally walk towards well-lit spaces [53].[86]

Workplace environments that display diverse spaces enable the users to define which spaces are most appropriate for certain tasks. Spatial character can be provided by including nooks, alcoves, areas of refuge, clusters, and gathering spaces [53].[87]

On average, it takes around 20 minutes to settle into a state of steady focus, however, workplace interruptions often occur every 7 minutes. This means that adequate acoustic quality is fundamental to neurodiverse design in the workplace. Acoustic design can range from auditory settings supporting several tasks and locating them appropriately to define comfort within particular spaces and separations within others [53].[88]

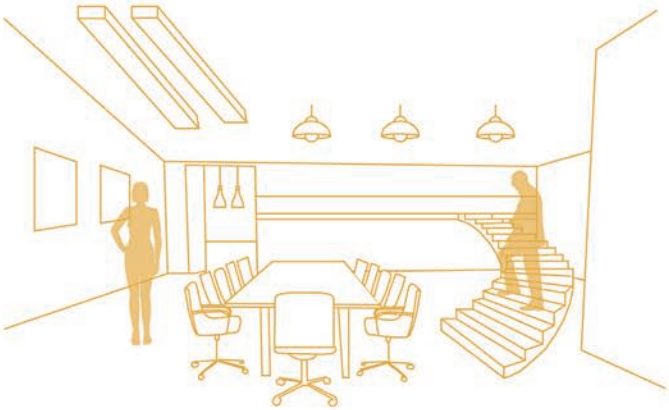
Similarly to acoustic quality, thermal comfort ranks highly among environmental workplace irritants. Thermal comfort can be mitigated through individual control such as operable windows or air diffusers, or at a larger scale of controlled solar gain, the performance of building envelope, and the design of thermally varied spaces such as naturally ventilated atriums or outdoor terraces [53].[89]

As suggested by the University of Toronto's lighting study, it is stated that lighting levels can intensify both positive and negative feelings. Dimmed lighting results in rational decision-making. Other studies have also found that changing the lighting color and intensity to mimic the natural diurnal changes can help reduce stress levels. Workplace-wide access to daylight can also increase physical well-being and productivity for its occupants [53].[90]

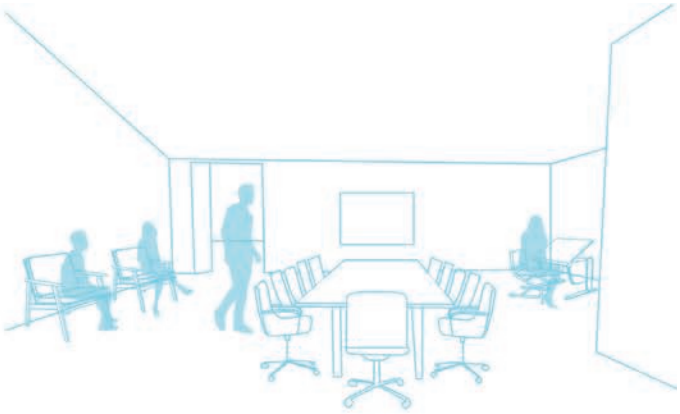
Visual, auditory, or scent-based stimulation can be overwhelming for hypersensitive users, resulting in the inability to focus. In contrast, hypo-sensitive users require stimulation to focus. Providing several micro-environments within one workplace setting is one approach to allow for choice. The use of colour is an important consideration; blues and greens tend to calm and reassure, whereas white, yellow, orange and red tend to stimulate and uplift. Patterns and textures can also grant sensory stimulation; predictable patterns with symmetry help users' navigation, and organic patterns with irregularity invite users to focus and engage. The use of textures can also stimulate the environment; natural elements such as water or views to the outdoors are calming and stimulating, and natural materials are calming and uplifting [53].[91]

[86] Ibid, 7-8.
[87] Ibid, 9.
[88] Ibid, 10-11.
[89] Ibid, 12.
[90] Ibid.
[91] Ibid, 13.

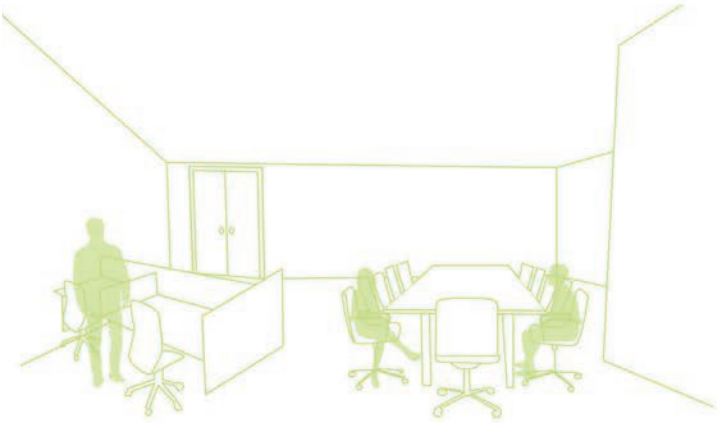
Right
**53 | Five Most Impactful Types of Choices**
Representing the five most impactful types of choices



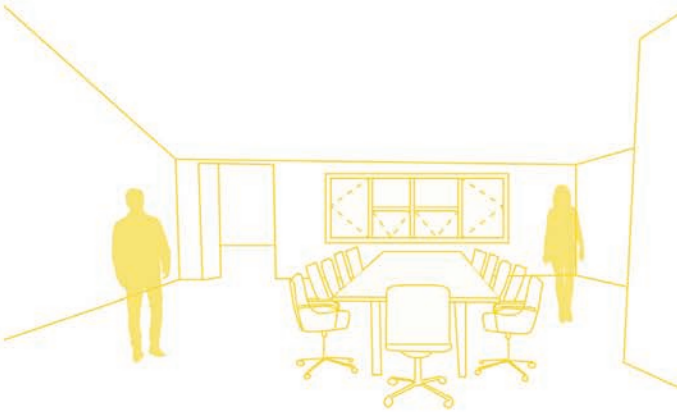
Type of Choice 0: Spatial Organization



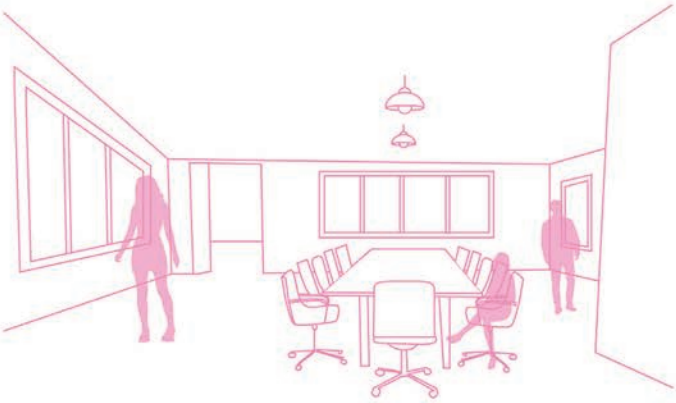
Type of Choice 1: Spatial Character



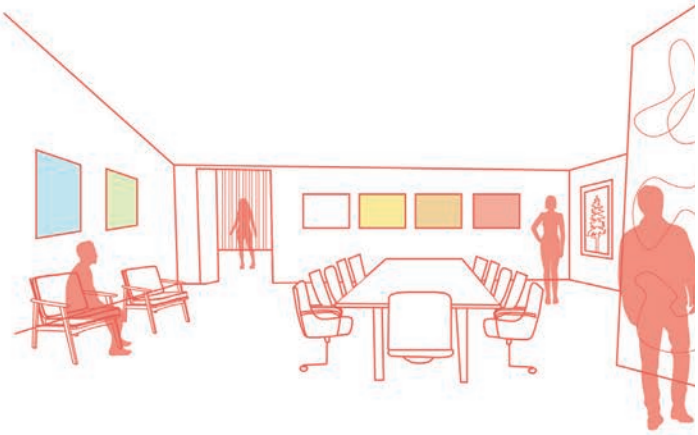
Type of Choice 2: Acoustic Quality



Type of Choice 3: Thermal Comfort



Type of Choice 4: Lighting



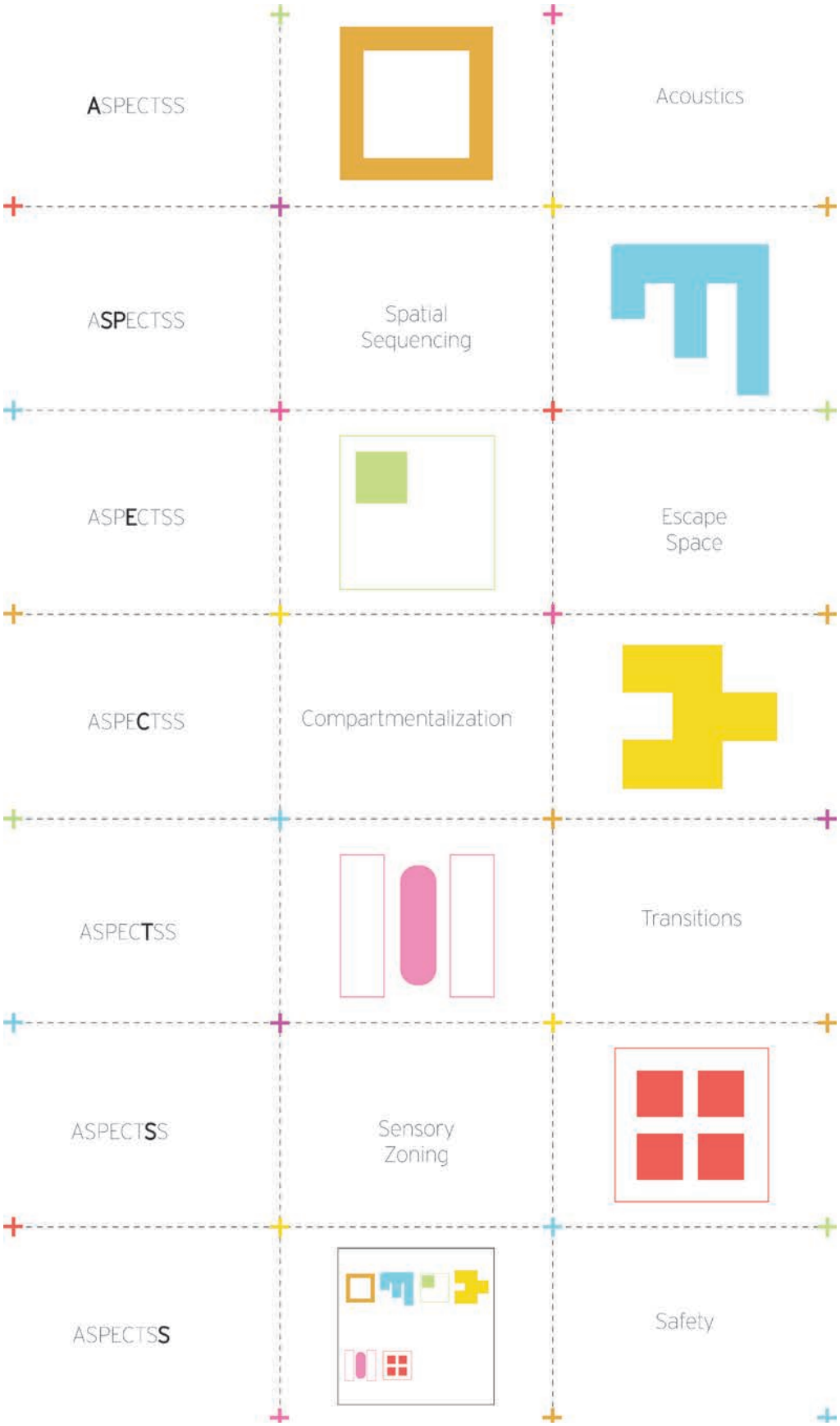
Type of Choice 5: Degree of Stimulation

# 5.3 Autism-Oriented Frameworks

The ASPECTSS Standards developed by Magda Mostafa is one of the first set of evidence-based design guidelines to address individuals with autism. The ASPECTSS Standards are used as an assessment tool for existing facilities as well as a design development tool during early design phases. The standard consists of seven underlying principles which all stem from neurodiversity and inclusion of those with autism [54].[92]

[92] Mostafa, Magda. *The Autism ASPECTSS Design Index* (2015).

Right
**54 | Summary of Autism-Oriented Frameworks**
Representing Magdas Mostafa's concepts of The ASPECTSS Standards


ASPECTSS
Acoustics
ASPECTSS
Spatial Sequencing
ASPECTSS
Escape Space
ASPECTSS
Compartmentalization
ASPECTSS
Transitions
ASPECTSS
Sensory Zoning
ASPECTSS
Safety

All environments should be acoustically controlled to minimize background noise, echoes and reverberation. The level of acoustics should vary depending on the level of user-focus and skill-level required per individual. For example, activities which demand a higher-level of focus should be accompanied by a higher-level of acoustical control. The levels of acoustical control should allow users to gradually step from one level to the next at a slow and consistent pace which would eventually lead to a typical acoustically controlled environment [55].[93]

Spatial sequencing is a significant element to consider when designing for autistic individuals as they prefer a sense of routine and predictability. Areas should be organized in a logical manner, generally based on the typical scheduled use of each space. This creates a consistent flow from one space programmed with a certain activity to the next. One-way circulation is also a key contributor to minimizing disruption, distraction and anxiety while navigating through a building. This criterion is commonly coupled with the sensory zoning criteria as transitional zones between sensory zoning is crucial [55].[94]

Escape spaces should be incorporated into the overall planning to provide respite and removal for users experiencing over-stimulation. The escape spaces are typically a sensory-neutral environment with minimal stimulation that can be customized by the user if necessary. It may also be a small partitioned area in a quiet section of the same space or can be found throughout the building [55].[95]

Compartmentalization can be done by defining a sensory environment for each compartment. This can also be done by clearly defining a certain function and sensory quality for each compartment. The separation between compartments should be subtle and can be accomplished with furniture arrangement, difference in floor covering, difference in level or through a variety of lighting qualities [55].[96]

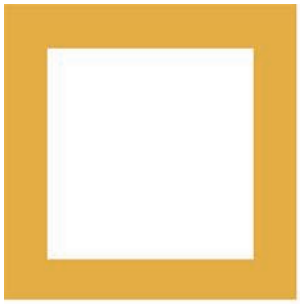
Transitional zones between sensory zones and compartments aid in recalibrating the users' senses as they navigate from one level of stimuli to the next. The transitional zones "can be a variety of forms and may be anything from a distinct node that indicates a shift to a full sensory room that allows sensory recalibration" [55].[97]

When classifying certain sensory zones together, the sensory quality should be considered in order to organize accordingly. Generally, high-stimulus zones are grouped into one section of the overall plan and low-stimulus zones are grouped in another, with a clear transitional zone in between [55].[98]

Finally, safety is another key principle when designing for autistic individuals as they may already have an altered sense of the built environment around them. As well, their anxiety may be heightened when an environment is overly stimulating which can cause a sense of vulnerability [55].[99]

Right
**55 | ASPECTSS Standards**
Representing the seven main criteria for the ASPECTSS Standards

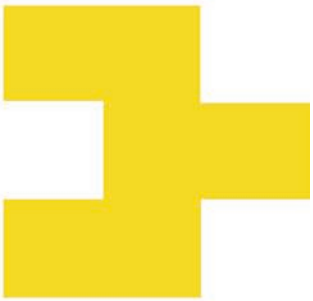
[93] Ibid.
[94] Ibid.
[95] Ibid.
[96] Ibid.
[97] Ibid.
[98] Ibid.
[99] Ibid.



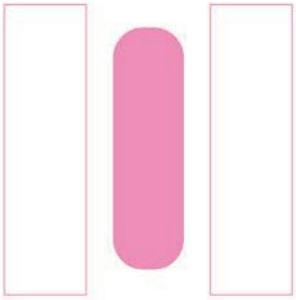
ASPECTSS: Acoustics

ASPECTSS: Spatial Sequencing

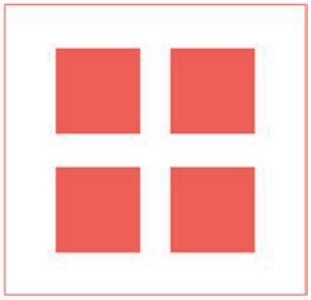
ASPECTSS: Escape Space



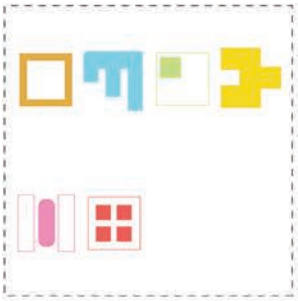
ASPECTSS: Compartmentalization



ASPECTSS: Transitions



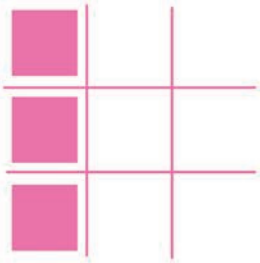
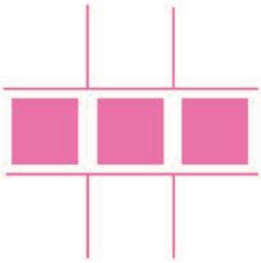
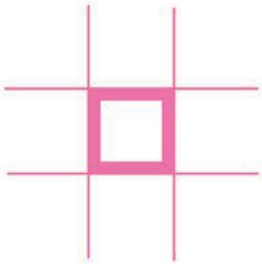
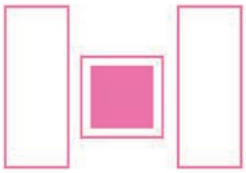
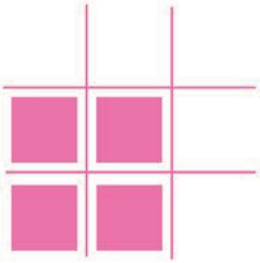
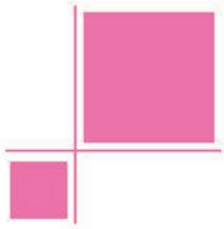
ASPECTSS: Sensory Zoning



# 5.4 The Enabling Design Guidelines

By studying the existing Universal and Inclusive Design Guidelines, a variety of case studies pertaining to neurodiverse design, and a careful consideration of architectural concepts and frameworks, I propose my own set of guidelines: The Enabling Design Guidelines. As shown in the analysis of the Universal and Inclusive Design Guidelines, many of the principles represented binaries. The Enabling Design Guidelines oppose the culture of binaries by proposing an acceptance and embracement of neurodiversity with an acknowledgment of difference. Each of these principles considers the need for enabling design by supporting existing architectural solutions as well as proposing new and innovative mitigations. The Enabling Design Guidelines consist of six principles specifically targeted towards neurodiverse users [56]. The six principles are as follows:

Right
**56 | Summary of The Enabling Design Guidelines**
Representing the six main neurodiversity frameworks

| | | |
|---|---|---|
| Neurodiversity Framework 1 |  | Spatial Organization |
| Neurodiversity Framework 2 | Spatial Character |  |
| Neurodiversity Framework 3 |  | Lighting, Acoustics, Thermal Quality |
| Neurodiversity Framework 4 | Ease of Transition |  |
| Neurodiversity Framework 5 |  | Sensory Grouping |
| Neurodiversity Framework 6 | Escape / Reset Zones |  |

1 SPATIAL ORGANIZATION

2 SPATIAL CHARACTER

3 LIGHTING, ACOUSTICS, THERMAL QUALITY

4 EASE OF TRANSITION

5 SENSORY GROUPING

6 ESCAPE / RESET ZONES

Spatial organization is an integral part of neurodiverse design as neurodivergents require a continuous and organized loop of circulation. The use of common and repetitive elements can provoke a sense of order which allows for neurodivergents to easily navigate through a building. Repetition within the design also promotes a point of predictability which allows for neurodivergents to feel at ease. Focal points such as staircases, viewpoints such as the interconnection of spaces, and clear lines of sight grant the users with a point of orientation to easily navigate through a building.[100] Areas should be organized in a logical order, generally based on a typical scheduled use of each space ranging from morning activities to nightly activities. Additionally, one-way circulation is a key factor in avoiding disruption, distraction, sensory overload, and any feelings of anxiety.[101]

[100] HOK Architects. *Designing for a Neurodiverse Workplace* (2021).

[101] Mostafa, Magda. *The Autism ASPECTSS Design Index* (2015).

1 SPATIAL ORGANIZATION

2 SPATIAL CHARACTER

3 LIGHTING, ACOUSTICS, THERMAL QUALITY

4 EASE OF TRANSITION

5 SENSORY GROUPING

6 ESCAPE / RESET ZONES

Spatial character is another important element to neurodiverse design. It describes how the space can begin to be experienced through the body's senses. It is essential to provide a variety of types of choices and spaces which can be classified as alcoves, nooks, refuge or clusters. The colours, patterns, and textures are also substantial to creating a sensorial environment. The use of neutral palettes with soft gradients and added accents can define space, support navigation, distinguish zones or indicate function. Blue to green spectrum of colours promote feelings of calmness and reassurance and should be used within learning-oriented spaces. White, yellow, orange, or red promote feelings of stimulation and upliftment. Predictable patterns with symmetry aid in navigation, and organic patterns with irregularity promote focus and engagement. Natural materials such as wood, stone, and cotton-based fabrics promote a calming and uplifting environment.[102] It is noted that if using textural stimulation within furnishings for over-stimulation, it should be against a neutral base colour palette.[103]

[102] HOK Architects. *Designing for a Neurodiverse Workplace* (2021).
[103] Mostafa, Magda. *The Autism Friendly University Design Guide* (2021).

1 SPATIAL ORGANIZATION

2 SPATIAL CHARACTER

3 LIGHTING, ACOUSTICS, THERMAL QUALITY

4 EASE OF TRANSITION

5 SENSORY GROUPING

6 ESCAPE / RESET ZONES

In terms of lighting, dimmed lighting should be utilized in low-stimulation zones which require a high-level of focus for rational decision-making. Lighting colours that mimic the natural diurnal changes can also aid in stress level reduction. Thermal qualities can be adjusted through a high-performance building envelope or thermally varied spaces such as naturally ventilated atriums or outdoor terraces.[104] For acoustics, low stimulation spaces such as reading spaces, study rooms, or classrooms require the highest level of focus meaning that there must be a high level of mitigation for acoustical control. High stimulation spaces such as occupational therapy rooms, innovation labs, or collaboration spaces require a moderate level of focus meaning that there must be a moderate level of mitigation for acoustical control. Mitigation of acoustical control can be accomplished through ceiling or floor mounted installations, free-standing seating or meeting/study pods, and acoustical paneling to configure adaptable spaces.[105]

[104] HOK Architects. *Designing for a Neurodiverse Workplace* (2021).

[105] Mostafa, Magda. *The Autism ASPECTSS Design Index* (2015).

1 SPATIAL ORGANIZATION

2 SPATIAL CHARACTER

3 LIGHTING, ACOUSTICS, THERMAL QUALITY

4 EASE OF TRANSITION

5 SENSORY GROUPING

6 ESCAPE / RESET ZONES

Transitional zones can be established through wide corridors as they can be used for occupational therapy and movement breaks. It is also important to provide enough space within the corridors for programmable seating options.[106] A clear, distinct, continuous circulation pathway is essential to reduce anxiety or lack of navigation. Soft corners are also required so users are able to predict what is to come. Linear and orthogonal pathways are recommended for interior circulation, whereas organic curvilinear pathways are suggested for exterior circulation. Throughout all corridors, it must be one-way circulation and must provide access to external views. Text and icons should be used as frequently as possible for wayfinding with large and visible text.[107]

[106] Verona Carpenter Architects, Youtube. "Lessons From Schools (Observational Research)" (2021).

[107] Mostafa, Magda. *The Autism Friendly University Design Guide* (2021).

1 SPATIAL ORGANIZATION

2 SPATIAL CHARACTER

3 LIGHTING, ACOUSTICS, THERMAL QUALITY

4 EASE OF TRANSITION

5 SENSORY GROUPING

6 ESCAPE / RESET ZONES

When grouping certain areas together, it is crucial to create discrete spaces for separate activities based on sensory stimulation. High stimulus zones such as the music room, makerspace, flex space, café, and marketplace should be grouped together. Low stimulus zones such as counseling centres, study rooms, collaboration spaces, meeting rooms, reading zones, and studios should be grouped together. Visual compartmentalization can also be accomplished by creating paving lines between pedestrian and vehicular spaces within the site, or corridors and programmable seating within the building.[108]

[108] Mostafa, Magda. *The Autism ASPECTSS Design Index* (2015).

1 SPATIAL ORGANIZATION

2 SPATIAL CHARACTER

3 LIGHTING, ACOUSTICS, THERMAL QUALITY

4 EASE OF TRANSITION

5 SENSORY GROUPING

6 ESCAPE / RESET ZONES

Escape zones such as reset, retreat, and alcoves are necessary to the overall planning of a neuro-inclusive building. These spaces are used to calm and soothe feelings of overwhelm when users feel as though they must remove themselves from a triggering environment. These spaces must provide a sensory-neutral environment with minimal and customizable stimulation.[109] They may also be considered as a "room within a room" by partitioning a small area in a quiet section of the same room to create a sense of belonging without completely removing oneself.[110]

[109] Ibid.

[110] Verona Carpenter Architects, Youtube. "Lessons From Schools (Observational Research)" (2021).

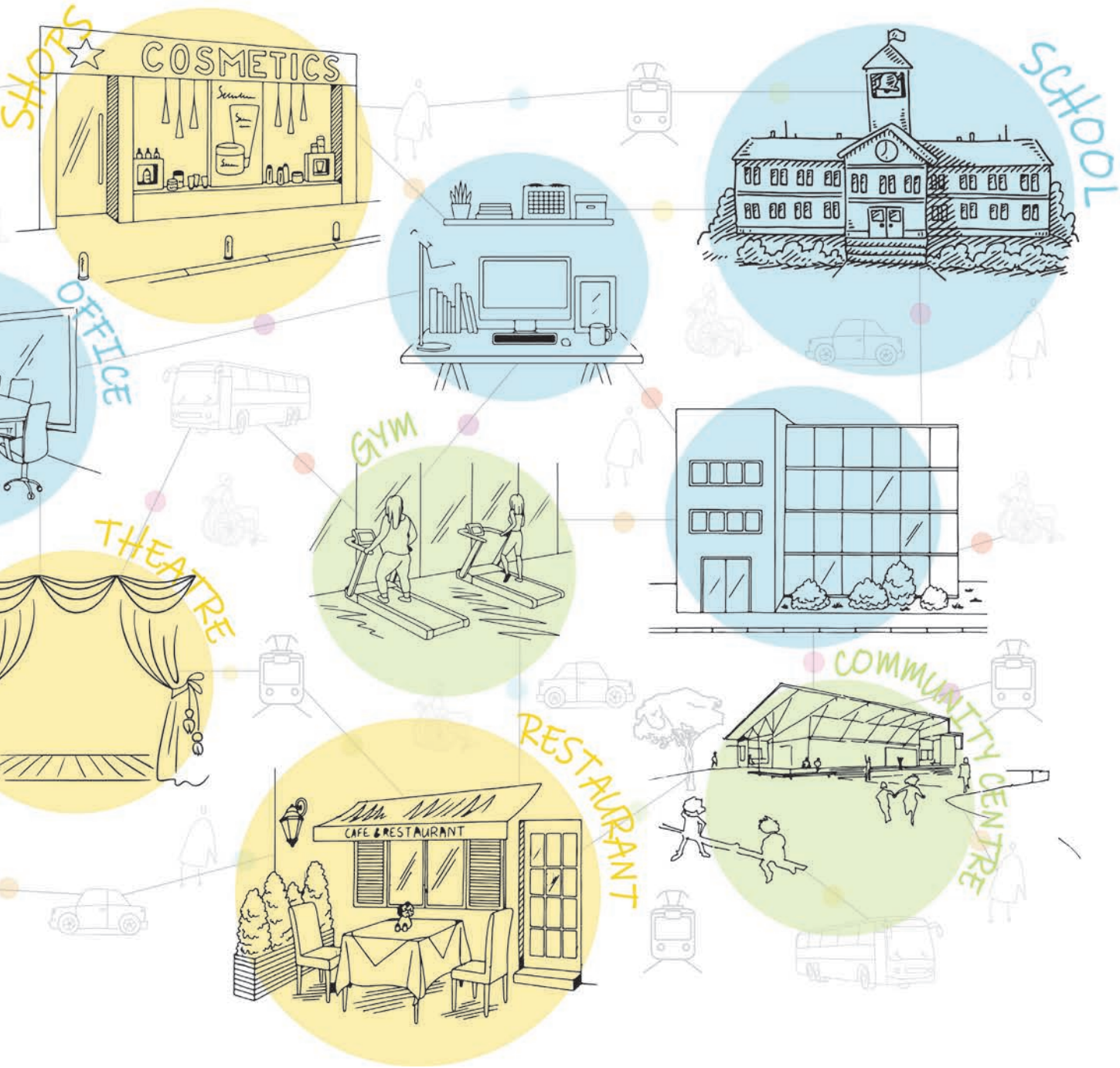
# 5.5 Application to Daily Life


As neurological differences affect every aspect of one's life, it would not be adequate to propose a solution to one particular programmatic building within one particular site. Instead, neurodiversity should be considered in all spaces, environments, and architectures. A typical daily routine is studied to inform the programmatic planning of a neuro-inclusive refuge within the city and looked at many of the typical spaces one encounters in their day-to-day life. This included occupational environments such as the office and school, health and wellness environments involving parks, gyms, and community centres as well as leisure and entertainment spaces like theatres, libraries, restaurants, shops, and parks [57].

Below

**57 | Neuro-Inclusive City: Highlighting Occupational, Health + Wellness and Leisure Environments**

Representing the study of a typical daily routine, highlighting occupational, health and wellness and leisure environments as they relate to communal and public space



# 6.0
# Neuro-Inclusive Architecture

*Chapter 6.0: Neuro-Inclusive Architecture* takes the reader through an investigative approach to a neuro-inclusive district within the city. Beginning with the program selection, this chapter identifies the importance of a public and communal aspect to realize a neuro-inclusive refuge point within the city. The selection of a library and urban park situated within a community and arts hub in downtown Sudbury is established. There exists a lack of updated and new library facilities within the region of Greater Sudbury, reinforcing the importance of inclusivity and community-driven buildings. This chapter then dives into the design portions of the neuro-inclusive library and its surrounding urban park conditions by presenting site plans, site axonometric views, floor plans, sections, and axonometric views of the building's amenities. Lastly, this chapter displays the main programmatic elements including the learning, gathering and refuge zones through detailed perspective views.

# 6.1 Program Selection

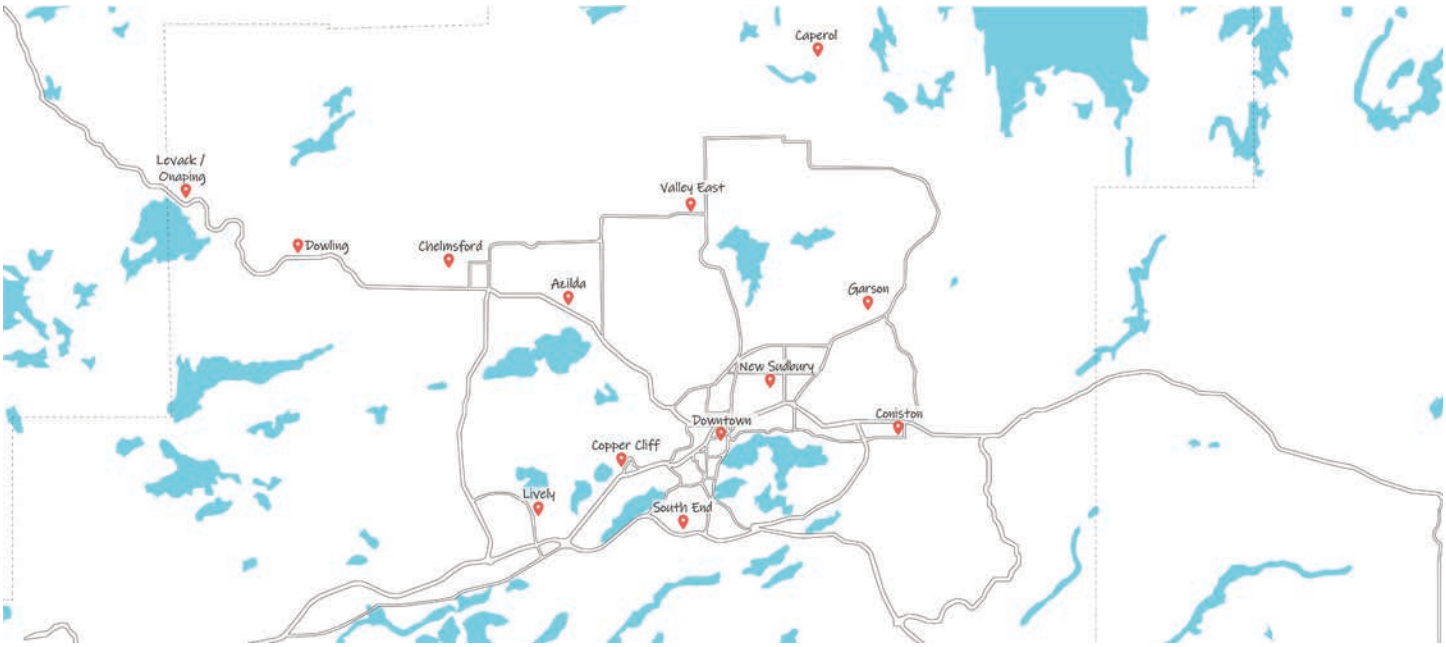
Due to the nature of this project, it became clear that the design intervention must account for a public and communal aspect which led me to the primary program selection of a library and the secondary program of an urban park to create an overall point of refuge within the city.

Additionally, there has been an ongoing conversation within the City of Sudbury for a new library facility located within the downtown core. This establishes a participatory design approach by "designing with" the community of Sudbury. The current library proposal is being designed by WZMH Architects and goes by the name of Junction East.[111] The Junction East project will provide vital public space for users to gather and connect, learn and share ideas, and inspire creativity within an already-established arts and multicultural hub of downtown Sudbury. As noted by Naomi Grant, the Chair Coalition for a Liveable Sudbury, "The New Central Library will be an important refuge for unsheltered residents, and hopefully a community hub for easy access to services."[112]

To provide some background on the existing library facilities, there are 13 branches spread throughout the region of Greater Sudbury [58]. Within closer proximity to the downtown core, there are 3 main branches; The Greater Sudbury Public Library, The New Sudbury Public Library, and The South End Public Library. All of these existing libraries are fairly and are not equipped for neurodiverse users [59].[113]

[111] Greater Sudbury. I*magine Junction East – The Project* (2022).

[112] Greater Sudbury Public Library. *About the New Central Library* (2022).
[113] Greater Sudbury Public Library. *Branch Services* (2022).




Above
**58 | Greater Sudbury Thirteen Library Branches**

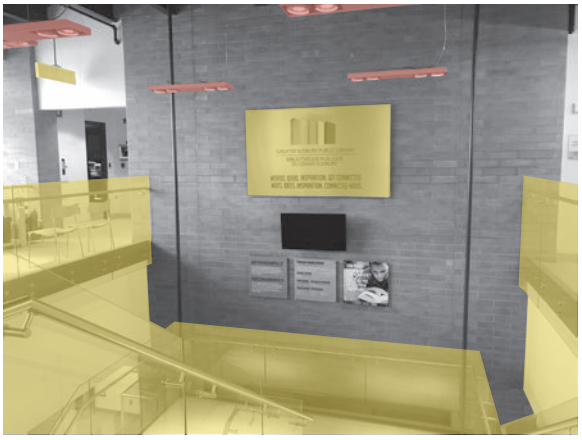
Representing the region of Greater Sudbury's thirteen library branches: Lively, Copper Cliff, South End, Downtown, New Sudbury, Conniston, Garson, Valley East, Azilda, Chelmsford, Dowling and Levack / Onaping


Above
**59 | Greater Sudbury Three Main Library Branches**

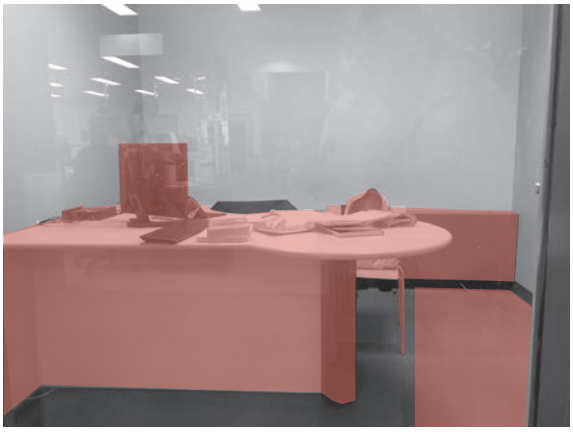
Representing the region of Greater Sudbury's three main library branches: South End, Greater Sudbury and New Sudbury Public Libraries

To analyze the current facilities further, I visited the newest of the three: The South End Public Library. Constructed in 2012, this library provides many updated architectural qualities, however, lacks many inclusive strategies. Favourable qualities for neurodiverse users include outdoor space, connection to nature, the interconnectivity of spaces, clear lines of sight, flexible furniture, and the use of private study rooms. On another note, common triggers to neurodiverse users include fluorescent lighting, high bookshelves which increases navigation loss, distracting signage or wayfinding, open-concept computer stations with little acoustic control, and glazing-enclosed study rooms [60].

Right
**60 | South End Public Library Analysis**
Representing a study of the South End Public Library through the lens of neurodiversity




Internet Café
Café Internet



# 6.2 Site Selection

With the program and site selected, the next steps were to execute an in-depth site analysis. Highlighted in pink is the proposed library site directly adjacent to many existing community service buildings such as The Sudbury Theatre Centre and The Multicultural Folk Arts Association. Also highlighted are the existing parks as this thesis project intends on taking over some of the current municipal public parking lots within the downtown to rejuvenate and bring an urban park component to the overall project. Existing bus stops are also highlighted to reinforce the idea of ease of access, as well as walking radiuses from the current bus terminal and the Greater Sudbury Public Library Main Branch [61].

The main access point to the building's entrance will be via Shaughnessy and Paris Street [62]. The urban park will take over the adjacent portion of the site with entry points from Shaughnessy, Minto and Brady Street [63].

existing bus stops

existing transit services

walking radiuses

existing library service

proposed library service

existing public parking

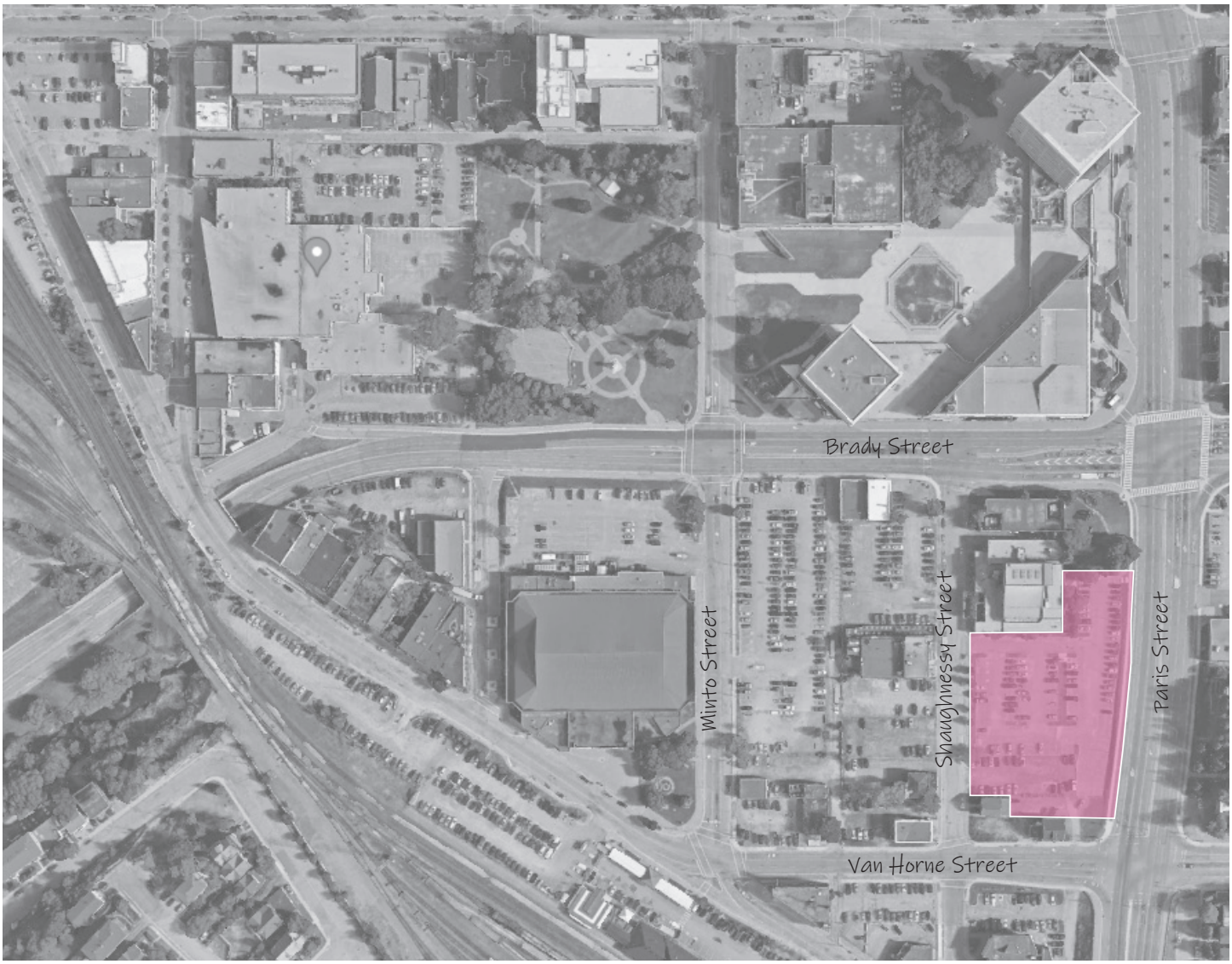
community services

parks

Right
**61 | Site Analysis**

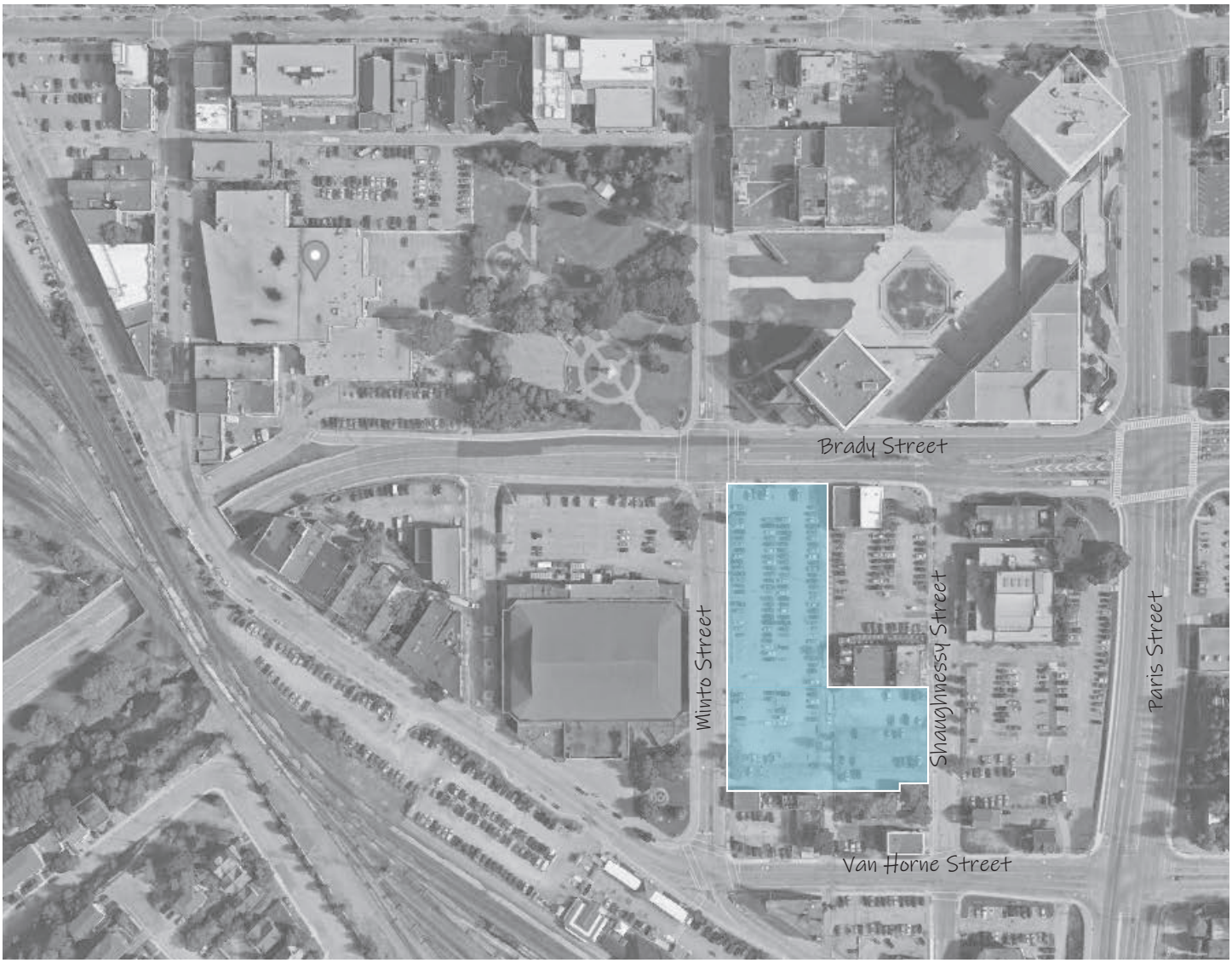
Representing the existing conditions of the site and its surronding context, with an emphasis on community-oriented buildings, parks, and pedestrian / vehicular access


Greater Sudbury Public Library - Main Library
McEwen School of Architecture
Sudbury Bus Terminal
Place Des Arts
17 minute walk
YMCA
Tom Davies Square
8 minute walk
Sudbury Theatre Centre
Sudbury Community Arena
Proposed Junction East Library Site
Sudbury Multicultural-Folk Arts Association
VIA Rail Station






Above
**62 | Site Images - Building Site**
Representing the existing conditions of the building's site and its main entry points from Shaughnessy and Paris Street

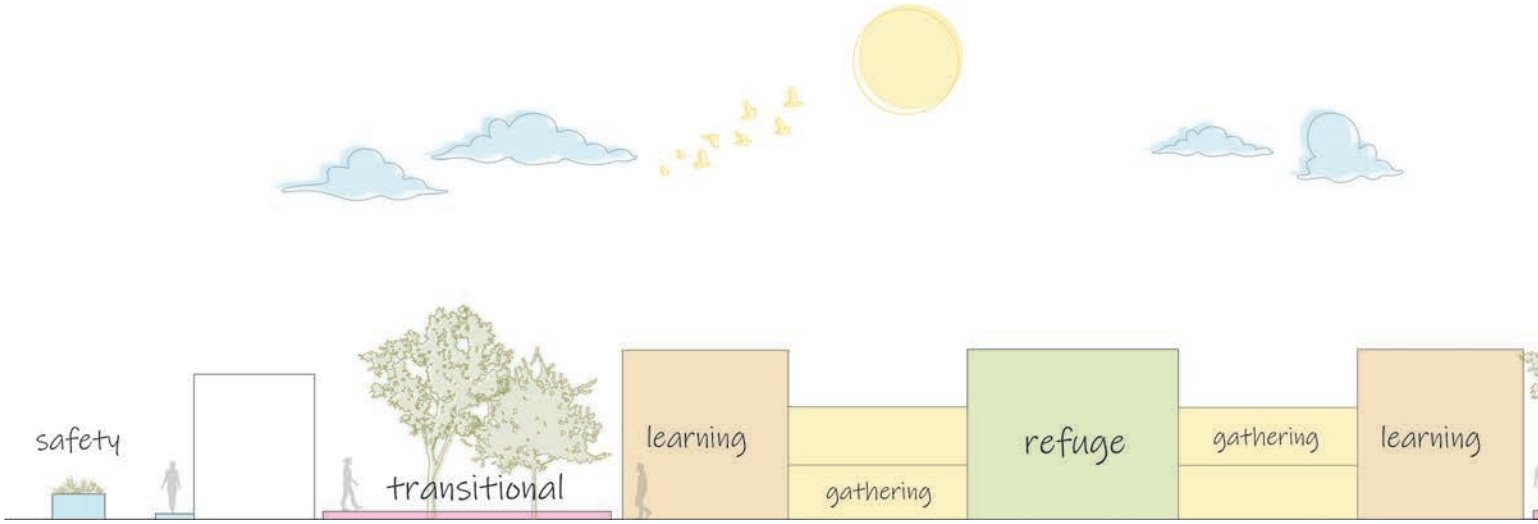





Above
**63 | Site Images - Urban Park Site**

Representing the existing conditions of the urban park's site and its main entry point from Minto Street and relationship to Memorial Park

# 6.3 The Neuro-Inclusive Learning Centre



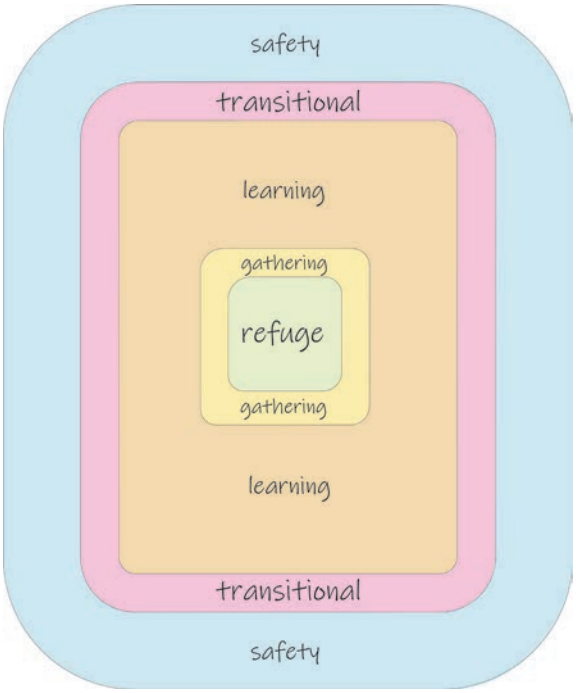

Moving into the design, I developed a concept that encompasses the urban, site, building and human scale. At the urban scale, the main design principles are safety. At the scale of the site, transitional programs are used to create an ease of transition from the streetscape to the building's site. The main building principles relate to learning, gathering, and refuge which reflect the scale of the human and how the human body interacts with the built environment around them [64].

This concept is demonstrated in both plan and sectional views to reiterate the notion of layers, beginning at the scale of the urban perspective, to the transitional site programming, to the building's foundational principles of learning, gathering, and refuge [65].

The layers of this concept can then be extrapolated to reflect the variety in scale and become further defined by design strategies.

Below
**65 | Conceptual Section**

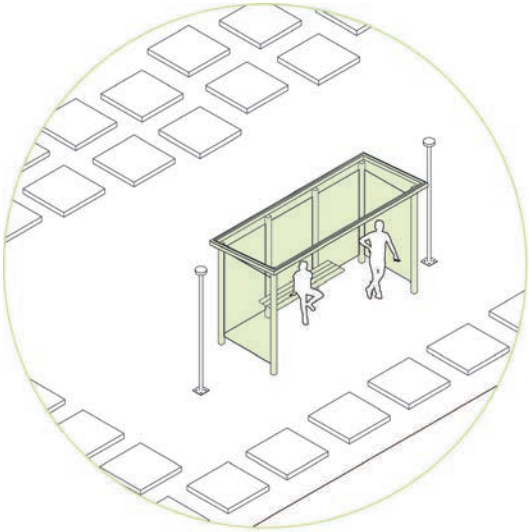
Representing the project's conceptual intentions of the urban (safety), site (transitional) and human (learning, gathering, refuge) scales

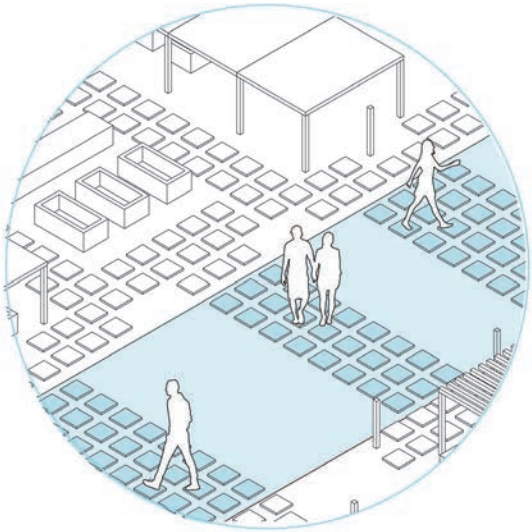

Right
**64 | Conceptual Plan**

Representing the project's conceptual intentions of the urban (safety), site (transitional) and human (learning, gathering, refuge) scales

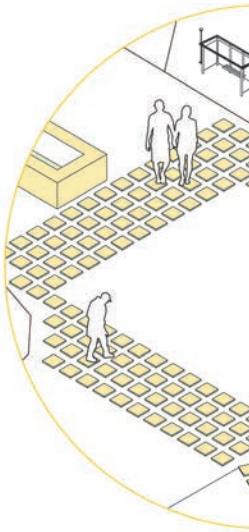
# 6.4 Urban Scale: Safety



access to and from site



pedestrian-friendly streets

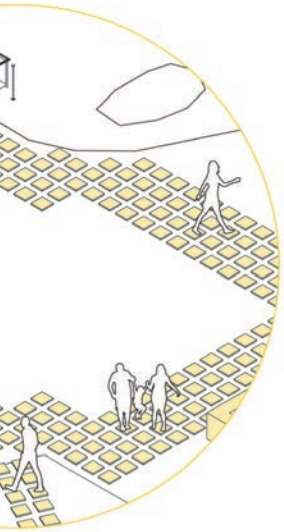


safe pedes
crosswalk: plan

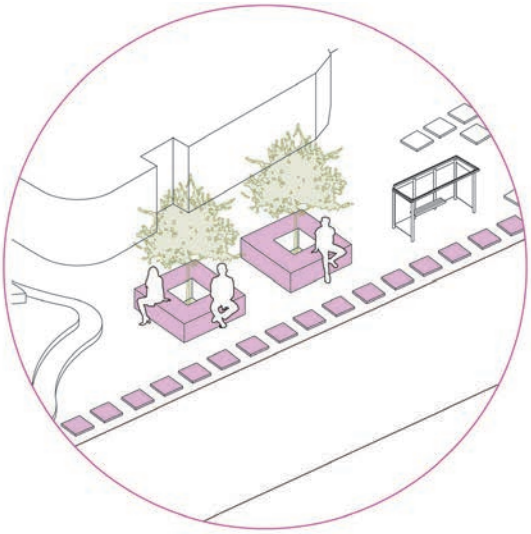
The first layer of this project's concept reflects the urban scale where the primary principle is to provide an overall sense of safety [66].

Some of the design elements that were considered in order to create a sense of safety include an ease of access to and from the site by implementing bus stops along the periphery of the site; Paris, Shaughnessy, Minto, Van Horne, and Brady Street. Another design consideration was to take over the majority of Shaughnessy Street to create a pedestrian-friendly path from the building's site to the urban park's site. Next, creating safe crosswalks, particularly at the corner of Brady Street to connect the proposed urban park to the existing Memorial Park. This corner utilizes navigational pavers to direct traffic as well as buffer zones such as planter beds to keep the flow of traffic at a safe and slow rate. Additionally, along the periphery of the site, an integration of seating and planter beds are used to create a buffer zone between the site and the streetscape. Finally, a lighting strategy is applied across the entirety of the site to create safe and comfortable spaces throughout all times of the day [67].

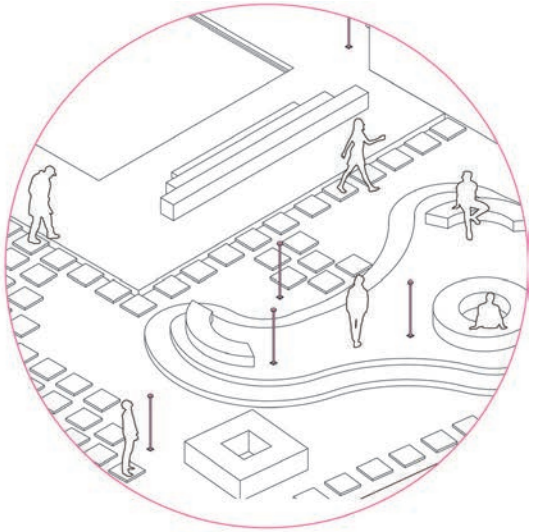
Below
**67 | Urban Strategies: Safety**
Representing the strategies developed at the urban scale, highlighting safety



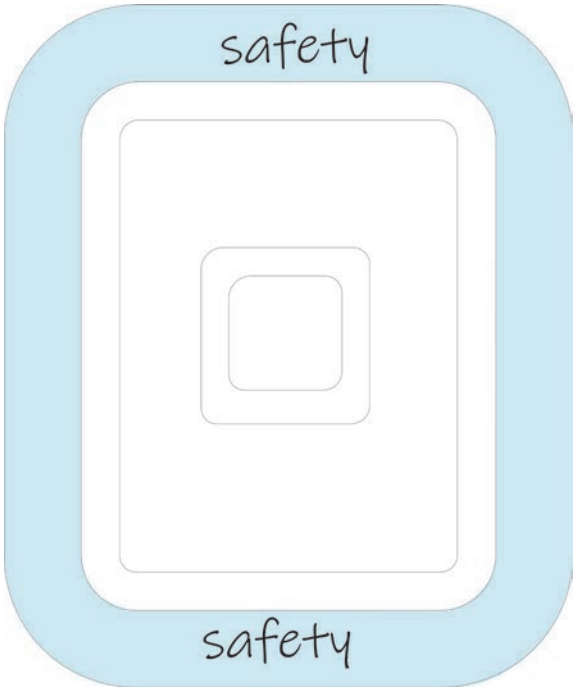
trian-friendly
ter to slow traffic



buffer from streetscape:
integrated seating

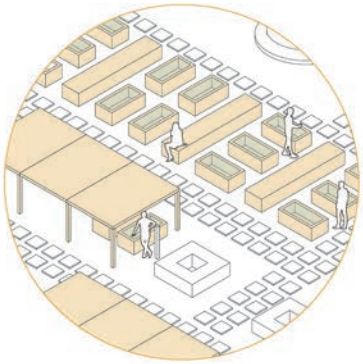


well-lit spaces: safety /
comfortability

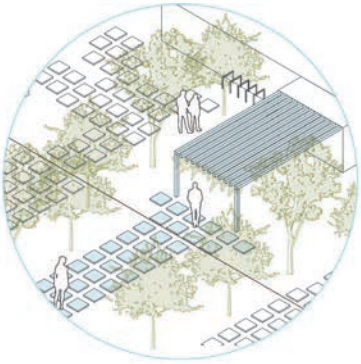



Right
**66 | Urban Scale Concept: Safety**
Representing the conceptual intentions at the urban scale, highlighting safety

# 6.5 Site Scale: Transitional



integrated parking / community garden



transitional gateway: building entrance

wayfinding: curvilinear exterior pathways

exterior o therapy:

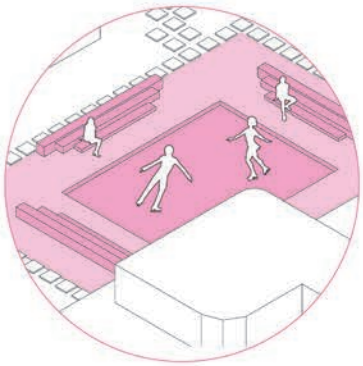
The second layer of this project's concept consists of a transitional zone from the urban scale to the scale of the building and urban park's site [68].

The design considerations at the scale of the site involve many transitional programs; an integrated parking and community garden system that allows for community-driven gardening, parking, and gathering. An occupational therapy zone such as an outdoor gym and outdoor ponds are found throughout the site to create transitional spaces from the interior of the building to the exterior. Additionally, exterior escape zones including sensory gardens and programmed gathering areas are utilized to create a connection between the interior spatial qualities, and to provide removal without escape within the exterior. There is also a clear wayfinding of curvilinear pavers to establish a direct transitional pathway which in turn reduces any feelings of being lost and instead promotes feelings of safety. Lastly, a transitional gateway to the building's entrance is developed through a point of refuge, particularly a forest-like experience, to reinforce an ease of transition from the streetscape to the site and eventually into the building itself [69].

Below
**69 | Site Strategies: Transitional**
Representing the strategies developed at the site scale, highlighting ease of transitions through programmatic elements

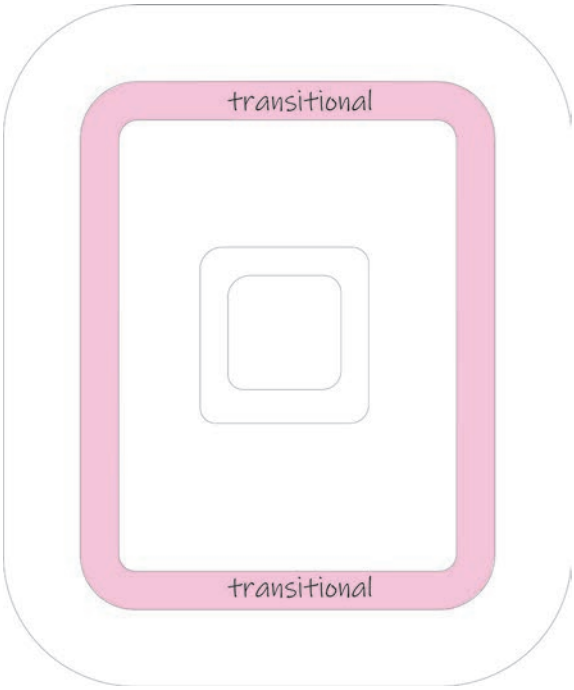
ccupational
gym area

exterior escape zone:
sensory garden



exterior occupational
therapy: pond

exterior gathering zone:
integrated seating



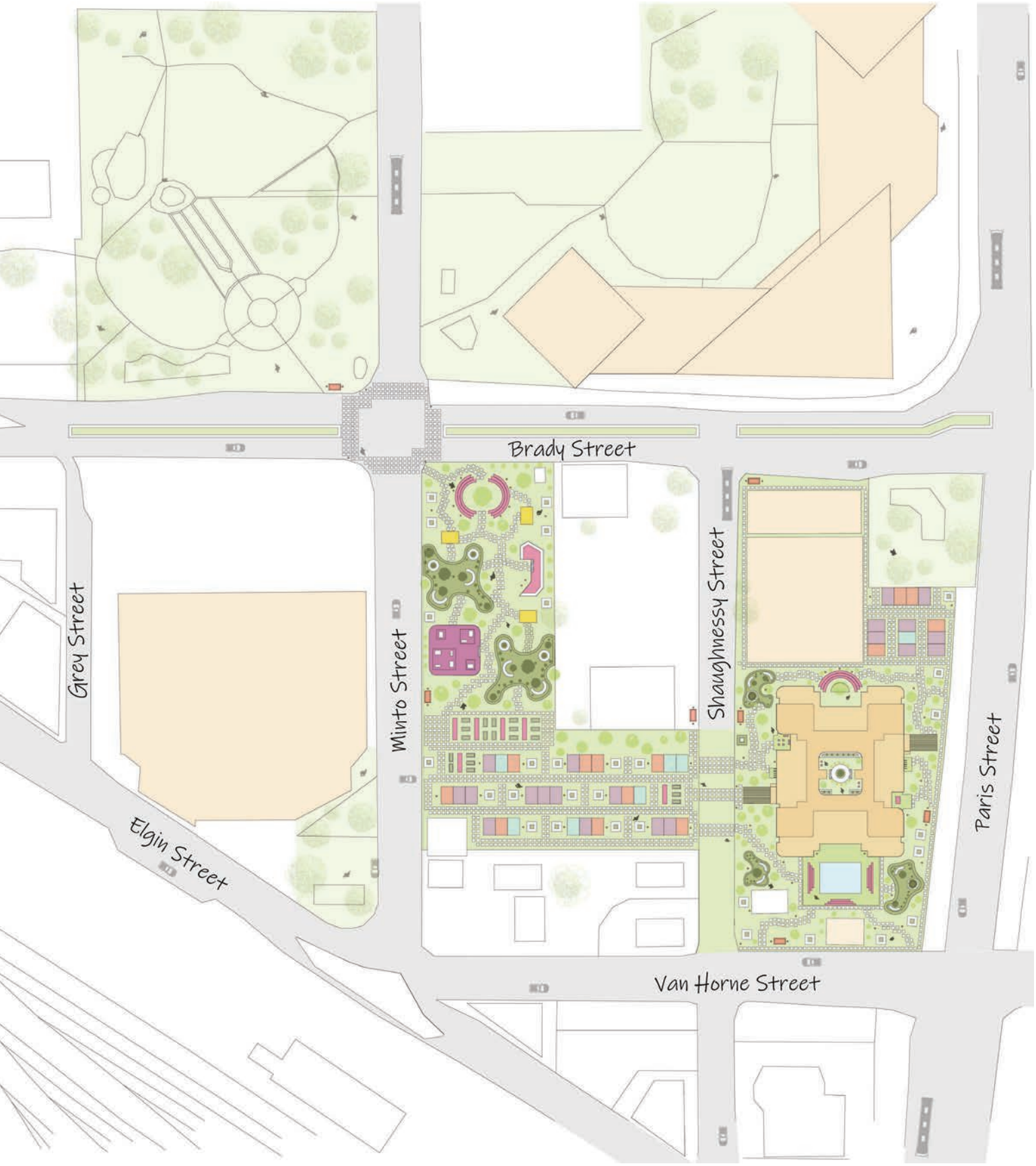

Right
**68 | Site Scale Concept: Transitional**
Representing the conceptual intentions at the site scale, highlighting an ease of transitions through programmatic elements

Right
**70 | Site Plan**

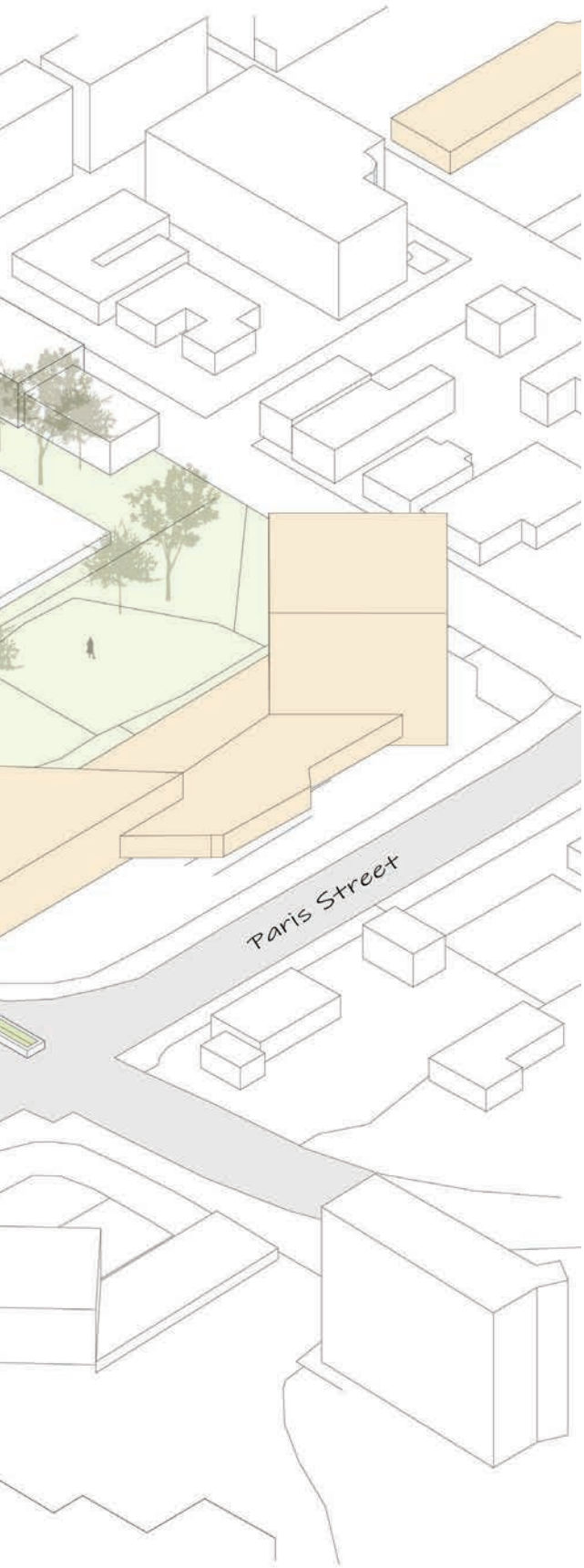
Representing the site plan proposal involving programs such as an community gardens, occupational therapy zones, sensory gardens, gathering areas, pavilions etc.

With these design principles in mind, the site plan highlights the existing community buildings and the proposed learning centre aiming to add to the already-established community hub. Also highlighted are the existing parks and the proposed urban park, including all of the transitional programming zones: the integrated parking, community gardens, and gathering system, the occupational therapy zones, the exterior escape zones, a clear wayfinding path, and many supporting pavilion spaces. It is also indicated where the proposed bus stops are found throughout the site to promote ease of access and predictability to the users, as well as an overall lighting strategy to reinforce a sense of safety [70].


- existing community buildings
- existing parks
- existing vegetation
- proposed urban park
- proposed vegetation
- proposed building
- proposed pond
- proposed gathering zones
- proposed sensory gardens
- proposed sensory garden vegetation
- proposed occupational therapy zones
- proposed pavilions
- proposed bus stops
- proposed gathering structure
- proposed community garden structure
- proposed parking storage
- proposed lighting


Brady Street
Grey Street
Minto Street
Shaughnessy Street
Paris Street
Elgin Street
Van Horne Street


Brady Street
Grey Street
Elgin Street
Minto Street
Minto Street
Shaughnessy Street
Brady Street
Paris Street



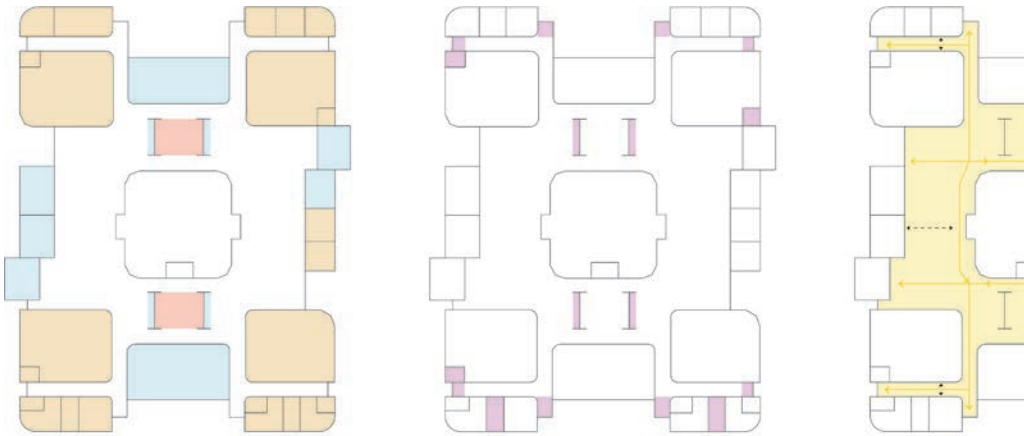

Left
**71 | Site Axonometric View**
Representing the relationship of the building's site to the urban park, meshing into the already-established community and arts downtown hub

The site axonometric view aims to show the overall connection to the downtown community, and how this learning centre can act as a point of refuge within the cityscape. The goal of this project is to reconnect the current existing parking lots to Memorial Park, an existing underused park. In turn, creating an urban oasis within the community hub of downtown Sudbury [71].

- existing community buildings
- existing parks
- existing vegetation
- proposed urban park
- proposed vegetation
- proposed building
- proposed pond
- proposed gathering zones
- proposed sensory gardens
- proposed sensory garden vegetation
- proposed occupational therapy zones
- proposed pavilions
- proposed bus stops
- proposed gathering structure
- proposed community garden structure
- proposed parking storage
- proposed lighting

Above
**72 | Urban Park Perspective**
Representing the integration of the urban park to the already-established community and arts downtown hub, highlighting the transitional programs leading to the building's site

# 6.6 Human Scale: Learning, Gathering, Refuge



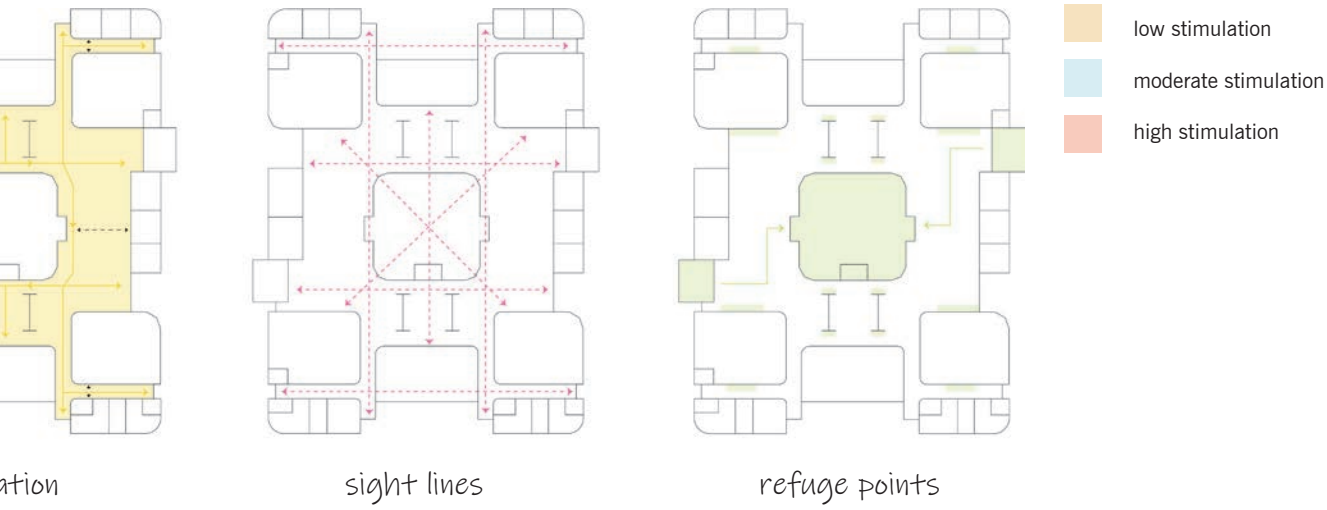
sensory grouping escape zones circula

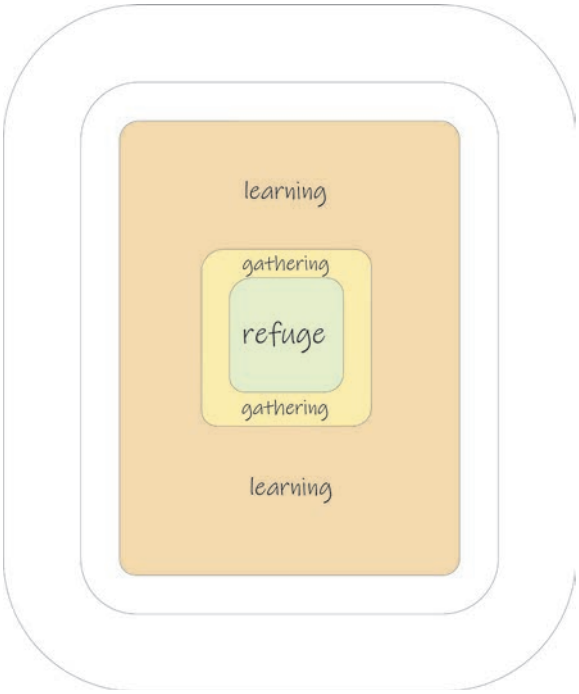
The third, fourth, and fifth layers of this project's concept represent the human scale through distinct learning, gathering and refuge zones [73].

I have taken the design principles from The Enabling Design Guidelines to create the general massing of the building. Firstly, I began by grouping particular programs into low, moderate, and high stimulation zones in order to compartmentalize the plan. The low stimulation zones consist of any programmatic elements which require a high level of focus. This includes the reading zones, offices, communication, organizing, and planning studios, meeting rooms, makerspace, music room, computer stations, and retreat or reset zones. The moderate stimulation zones consist of any programmatic elements that require a moderate level of focus which involves the occupational therapy zone, flex space, vestibules, washrooms, café, and marketplace as well as the alcoves within the circulation area. The high stimulation zones consist of any programmatic elements requiring a low level of focus which covers the gathering and lounge areas, welcome centre, workstations, accessibility service desk, and the general circulation areas [74].

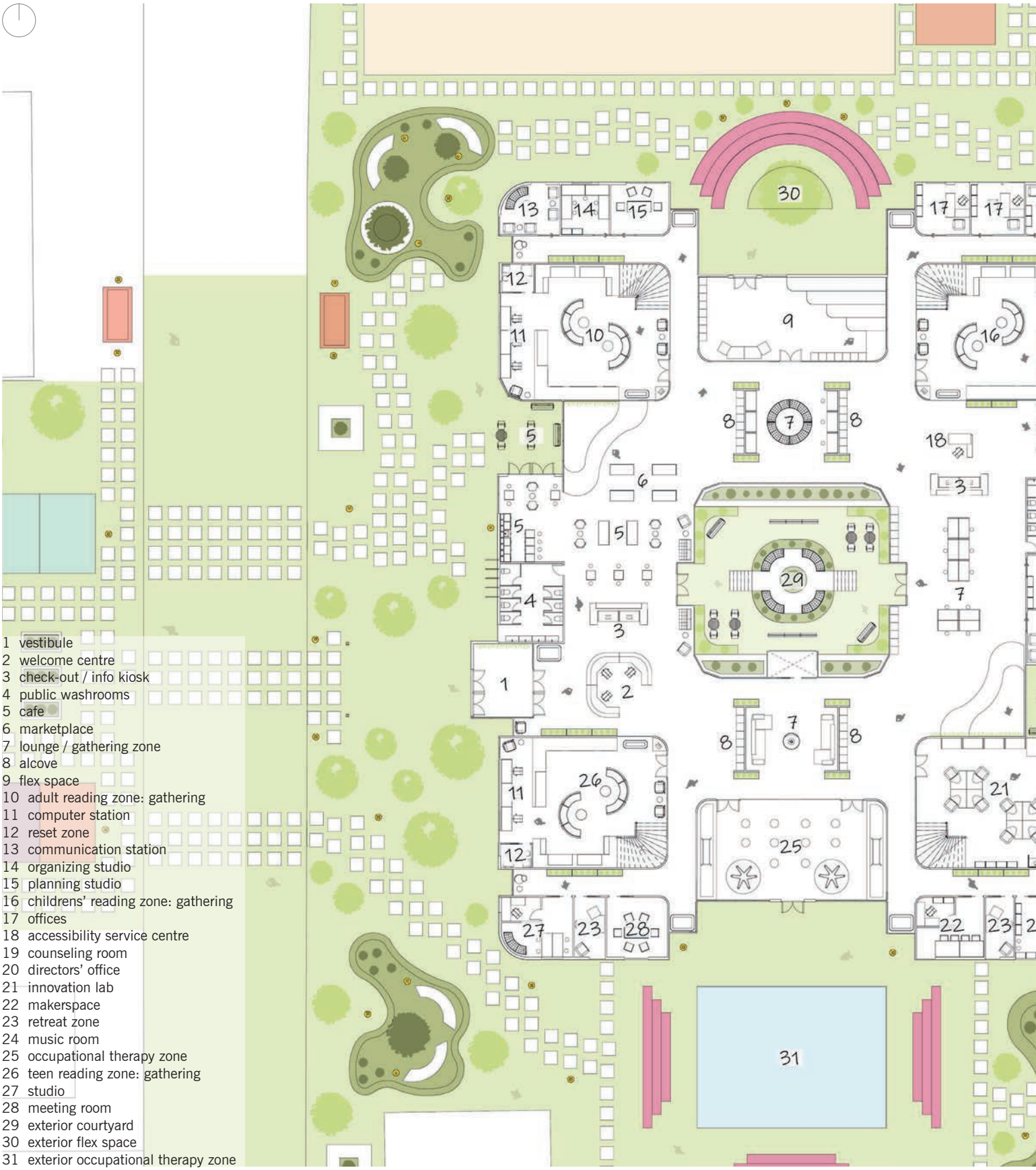
Secondly, the idea of injecting the plan with escape zones to provide removal for the users when and if needed. These escape zones are typically found within the general circulation path and within the low stimulation zones, specifically, the reading zone and in close proximity to the high-

Below
**74 | Level 1 Programming Strategies**
Representing the strategies developed at the human scale, highlighting the spatial programming of Level 1




Right
**73 | Human Scale Concept: Learning, Gathering, Refuge**
Representing the conceptual intentions at the human scale, highlighting learning, gathering and points of refuge



1 vestibule
2 welcome centre
3 check-out / info kiosk
4 public washrooms
5 cafe
6 marketplace
7 lounge / gathering zone
8 alcove
9 flex space
10 adult reading zone: gathering
11 computer station
12 reset zone
13 communication station
14 organizing studio
15 planning studio
16 childrens' reading zone: gathering
17 offices
18 accessibility service centre
19 counseling room
20 directors' office
21 innovation lab
22 makerspace
23 retreat zone
24 music room
25 occupational therapy zone
26 teen reading zone: gathering
27 studio
28 meeting room
29 exterior courtyard
30 exterior flex space
31 exterior occupational therapy zone

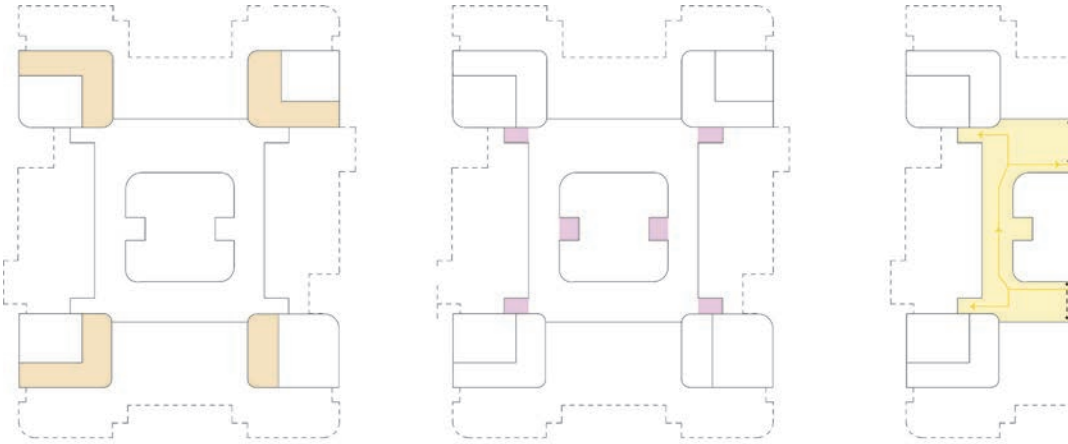

Left
**75 | Level 1 Floor Plan**
Representing the programming of Level 1, highlighting the integration to the surronding site and the many points of refuge

focused level studios, makerspace, and meeting room [74].

Next, creating an ease of transition and movement through the building by designing a one-way circulation path that centers around the main core of the building, the exterior courtyard. This allows users to be able to navigate the building easily as the corridors are wide and linear which creates clear lines of sight [74].

Finally, implementing a main point of refuge at the centre of the building to act as a point of orientation. The core of the building is the exterior courtyard encased with glazing to allow for natural daylighting, clear lines of sight, points of orientation, and biophilic design. There are also secondary points of refuge throughout the building which reflect biophilic design incorporating living walls and interior community gardens [74].

In this plan, we begin to see all of these concepts coming together. The main programs of Level 1 include the reading zones; adult, teen, and children's sections, the innovation lab, an occupational therapy zone, flex space, formal and informal gathering areas, and the exterior courtyard centering the building's plan. Additional programs include an integrated cafe and marketplace, accessibility services such as communication, planning and organizing studios, music room, makerspace, meeting rooms and studios. There are also escape zones found throughout the plan, typically in high stimulation areas which range from reset, retreat and alcoves [75].

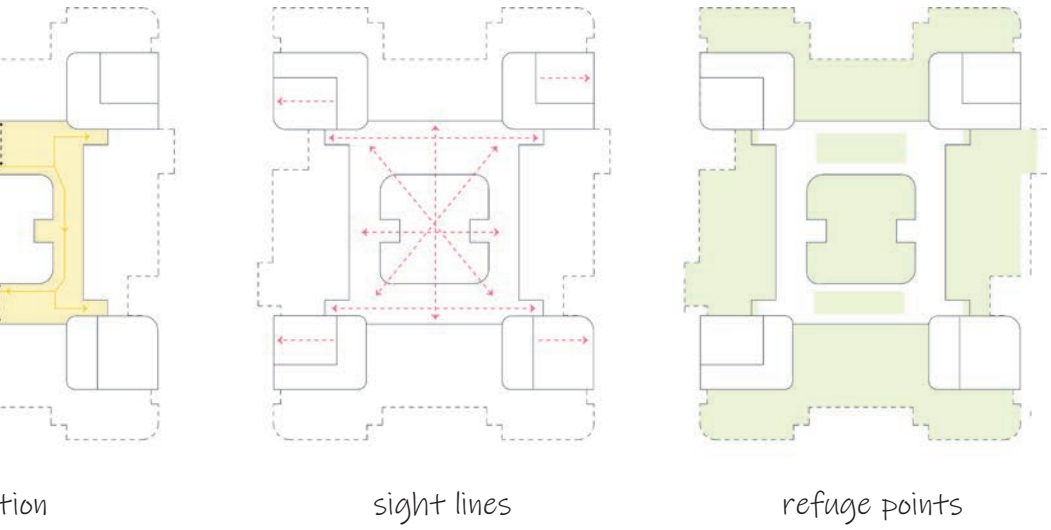


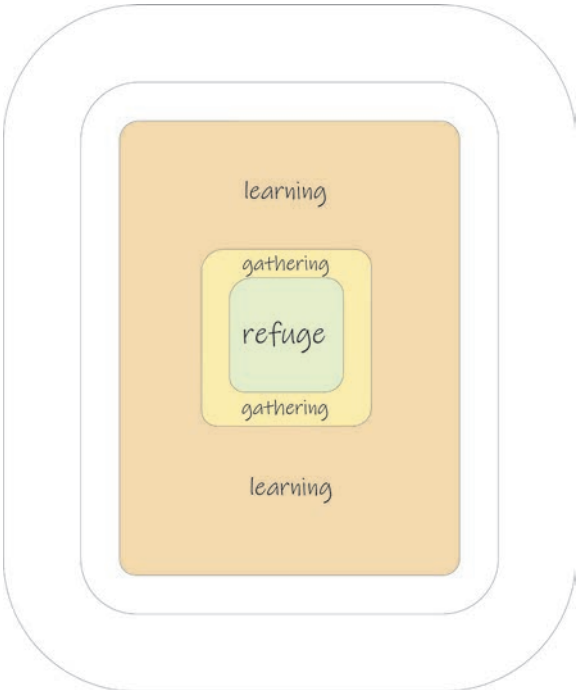
sensory grouping escape zones circula

Continuing with the layers of learning, gathering and refuge, Level 2 follows similar design principles [76].

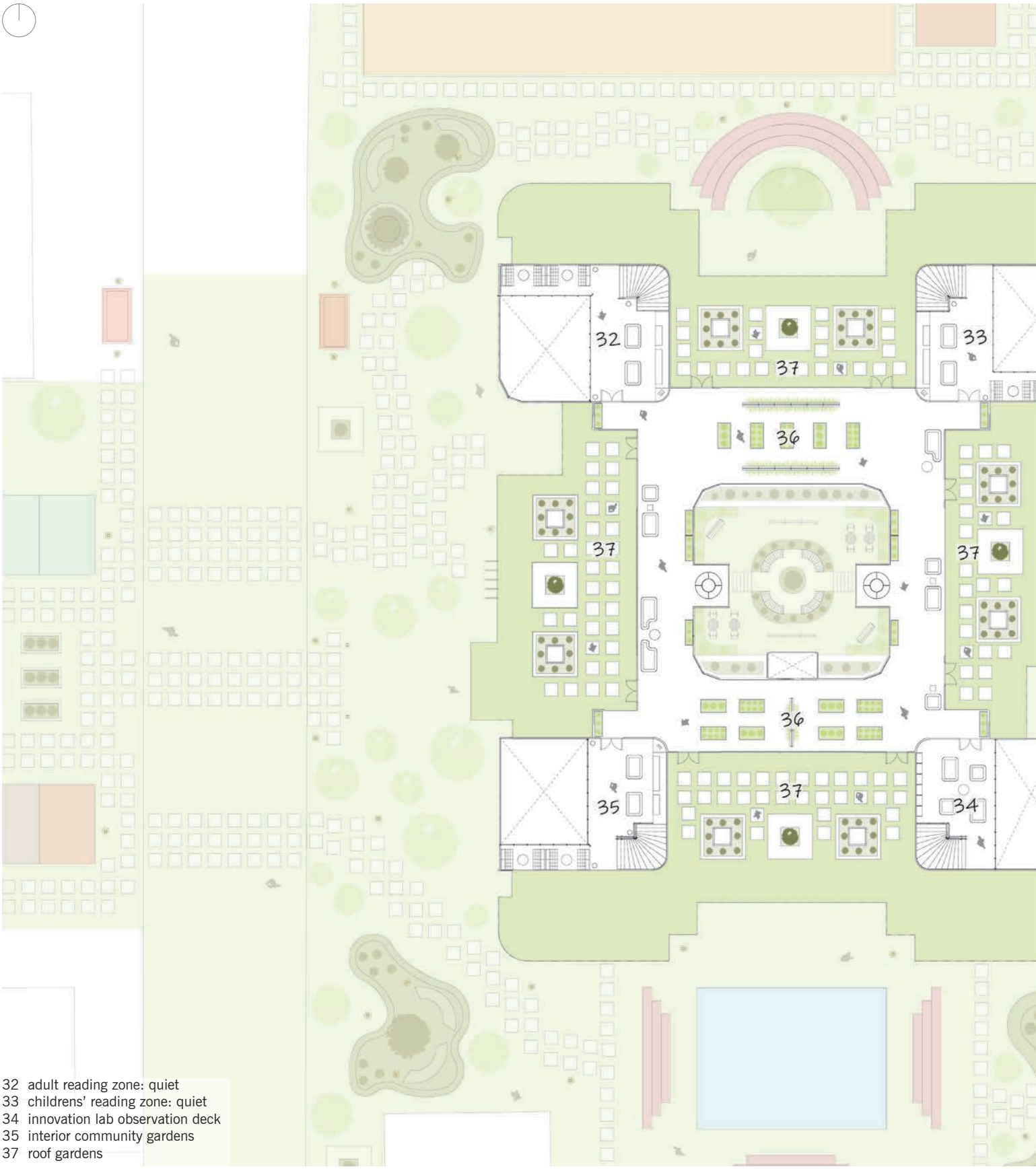
A key factor to the overall planning of Level 2 was the compartmentalization of low stimulation zones. The areas which follow through to Level 2 include the learning-oriented spaces, particularly the reading zones and innovation lab as they require the highest level of focus. These low stimulation zones are the only programs that are double-height spaces to further accentuate the idea of compartmentalization for high-focus areas. There are also escape zones found within the general circulation paths to provide escape without removal for the users. A one-way looped circulation with clear lines of sight is also implemented for ease of transition. Views to the exterior courtyard act as a point of orientation for the users while circulating this level. Within the general circulation paths, there are also many points of refuge including formal and informal interior community gardens as well as access to the roof gardens [77].

Below
**77 | Level 2 Programming Stategies**
Representing the strategies developed at the human scale, highlighting the spatial programming of Level 2

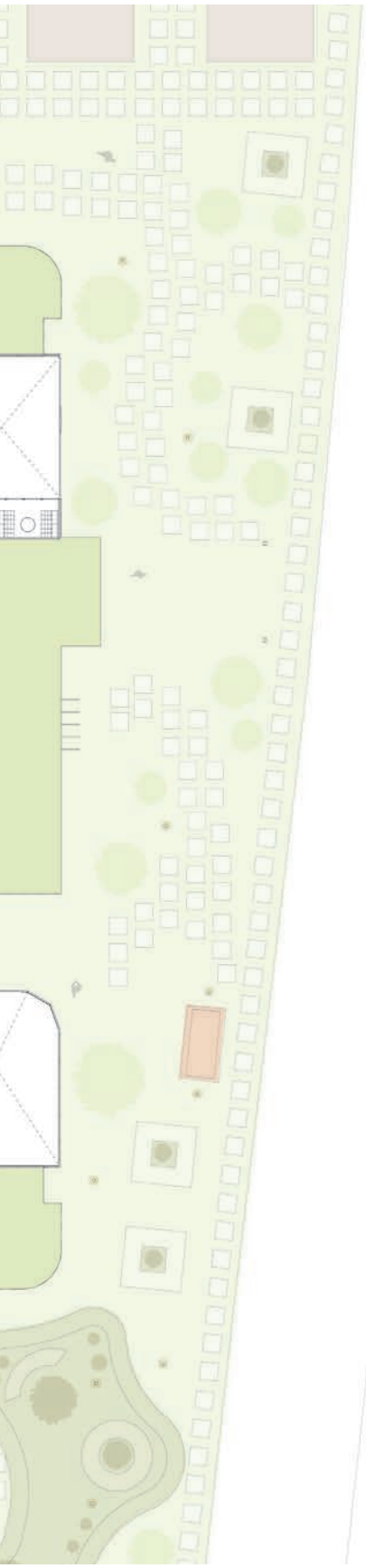



Right
**76 | Human Scale Concept: Learning, Gathering, Refuge**
Representing the conceptual intentions at the human scale, highlighting learning, gathering and points of refuge

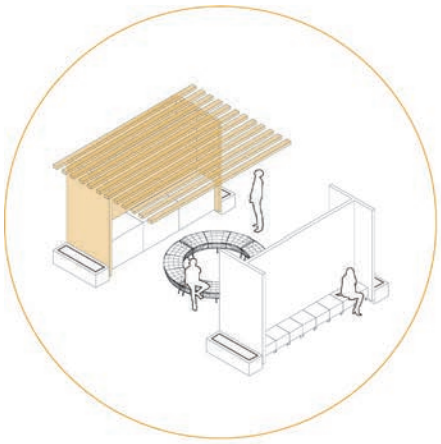



32 adult reading zone: quiet
33 childrens' reading zone: quiet
34 innovation lab observation deck
35 interior community gardens
37 roof gardens



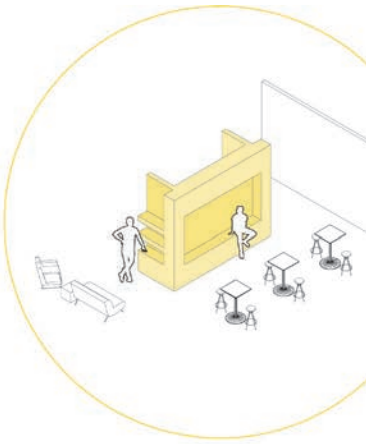
Left
**78 | Level 2 Floor Plan**
Representing the programming of Level 2, highlighting the interconnection of spaces and the many points of refuge

As noted, the low stimulation zones from Level 1 which are mainly learning-oriented environments such as the reading zones and the innovation lab, follow through to Level 2 to reinforce the idea of compartmentalization. These zones act as mezzanine spaces to create an interconnection between levels. As well, the circulation is programmed with interior community gardens and programmable seating which centers around and looks into the exterior courtyard reinstating the importance of clear lines of sight and natural daylight [78].

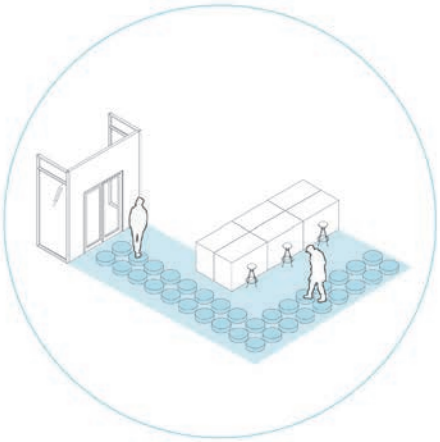


acoustical experience:
acoustic baffle system

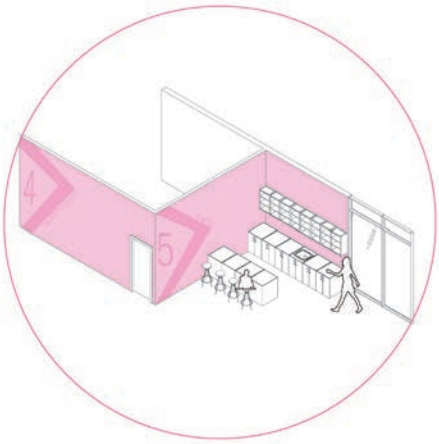
tactile experience:
integrated seating into
reading bookcase



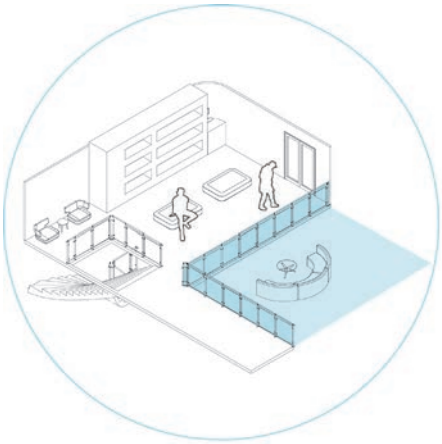
tactile experience:
integrated seating int
check-out bookcase



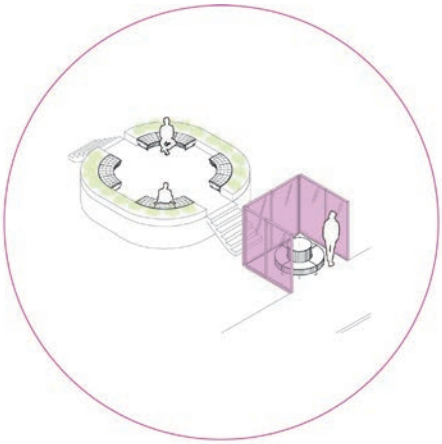
proprioceptive
experience: navigation
paths



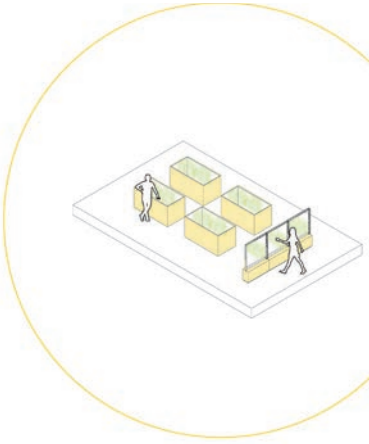
proprioceptive
experience: wayfinding



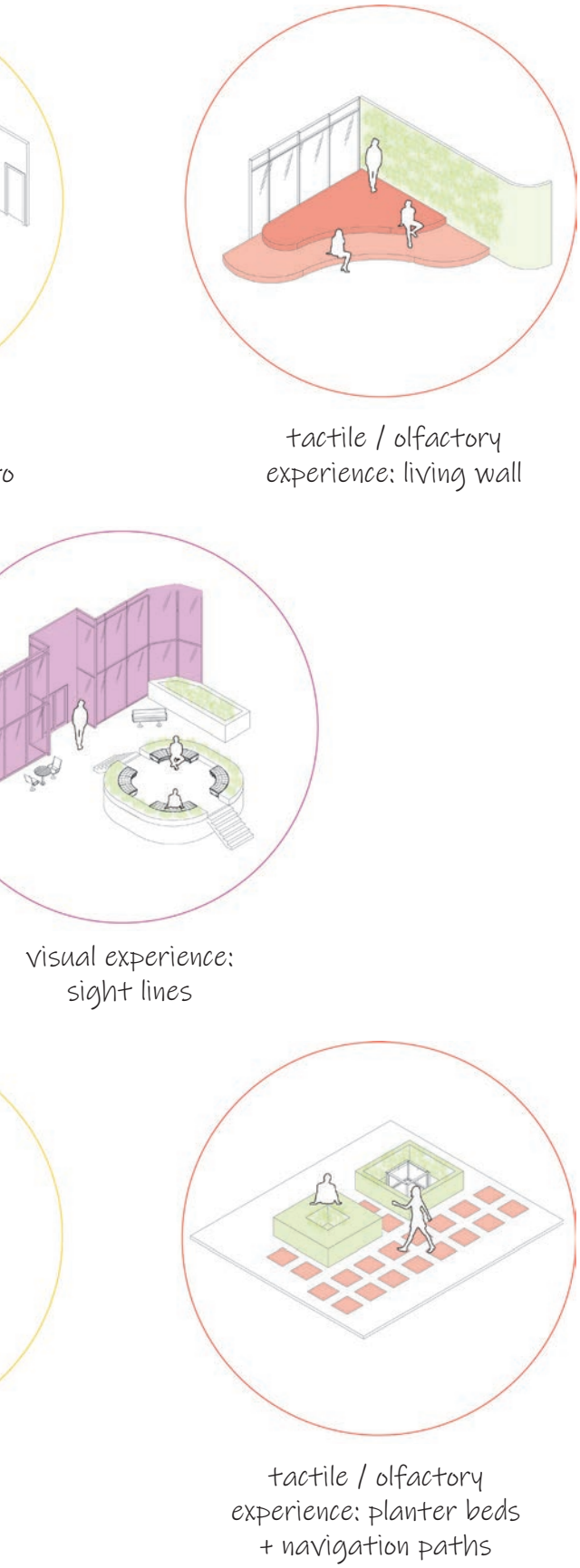
visual experience:
interconnection between
levels



visual experience:
sight lines

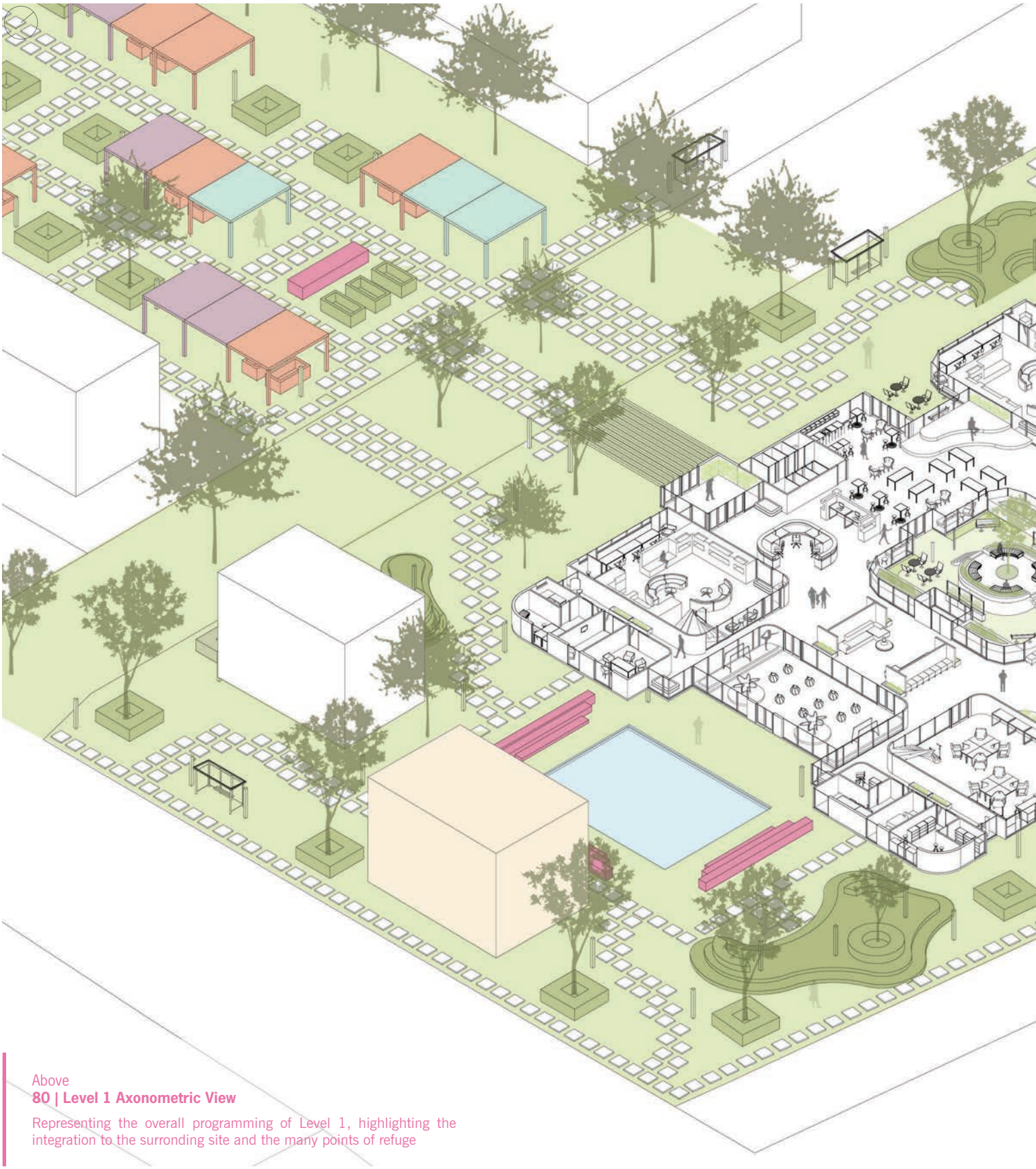


tactile / olfactory
experience: interior
community gardens




Left
**79 | Level 1 + 2 Sensorial Strategies**
Representing the strategies developed at the human scale, highlighting the sensorial aspects of Level 1 and Level 2

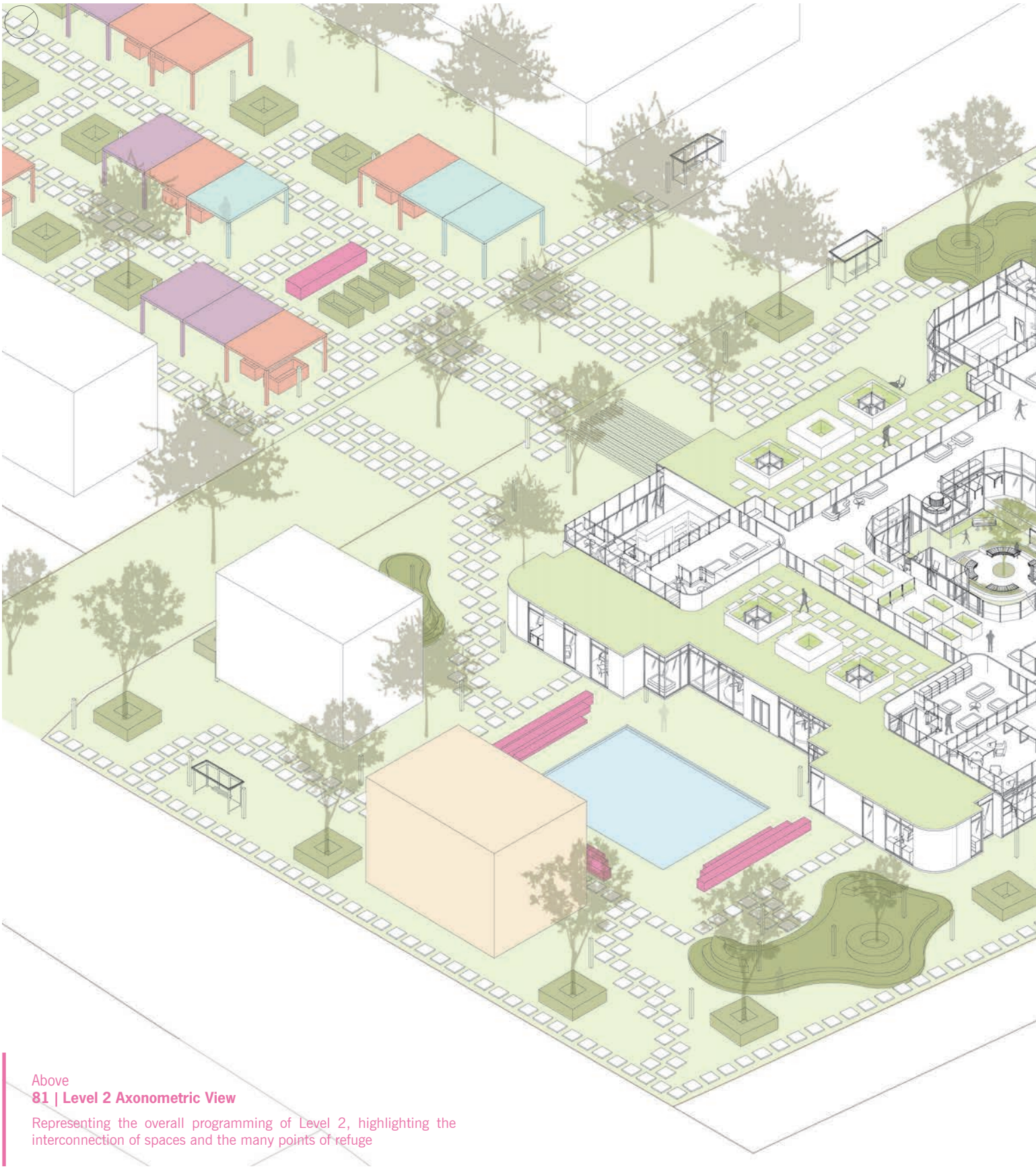
The building is experienced through the senses, primarily acoustical, tactile, olfactory, and proprioceptive. In terms of acoustical experience, the level of noise is mitigated by a baffle system allowing for low stimulation within the respective areas. A tactile experience is found within the integrated seating systems of millwork such as the bookcases and check-out areas. It is also experienced through the use of biophilic design where living walls and greenery are incorporated. The proprioceptive senses are heightened through the use of navigation paths applied to the flooring, and wayfinding applied to the walls. Finally, the design involves a visual experience that is demonstrated through sight lines and a connection to nature via glazing systems [79].



Above
**80 | Level 1 Axonometric View**

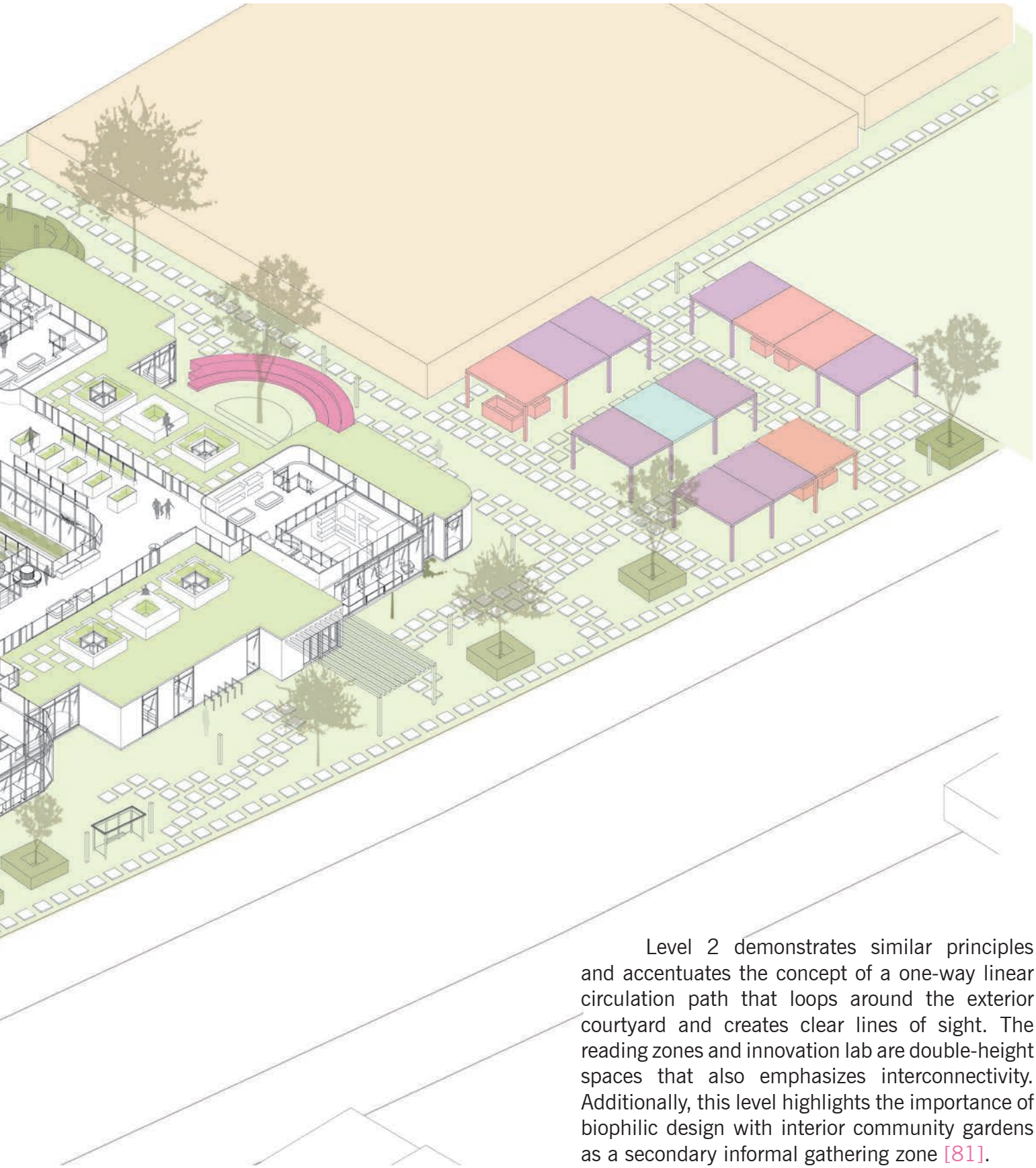
Representing the overall programming of Level 1, highlighting the integration to the surronding site and the many points of refuge

Through an axonometric view, we begin to see the programmatic planning with an emphasis on the refuge points found throughout the building. Furthermore, we can also see the layout of each low, moderate, and high stimulation zones, strategically placing them all along the perimeter of the building to provide natural daylighting and a connection to nature [80].



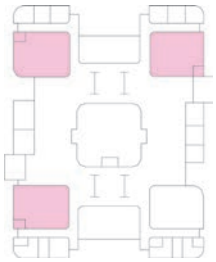
Above
**81 | Level 2 Axonometric View**

Representing the overall programming of Level 2, highlighting the interconnection of spaces and the many points of refuge

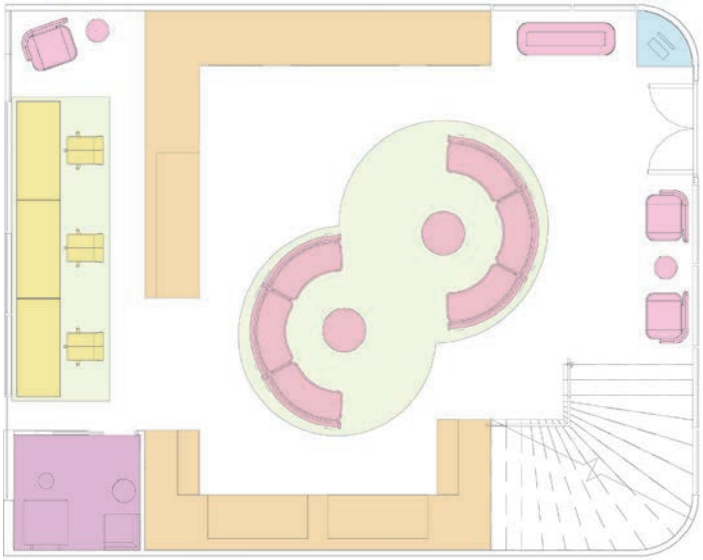


Level 2 demonstrates similar principles and accentuates the concept of a one-way linear circulation path that loops around the exterior courtyard and creates clear lines of sight. The reading zones and innovation lab are double-height spaces that also emphasizes interconnectivity. Additionally, this level highlights the importance of biophilic design with interior community gardens as a secondary informal gathering zone [81].

# 6.7 Learning: Reading Zones



key plan



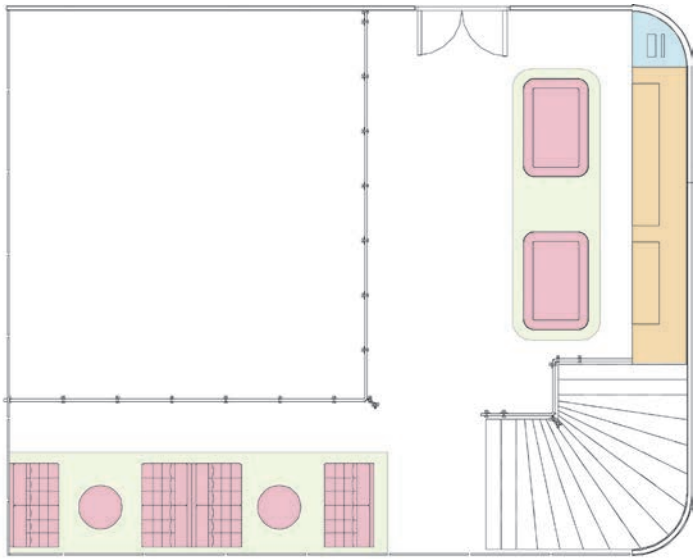
level 1 reading zone

As the three layers of the building's concept are classified through learning, gathering, and points of refuge, we can begin by focusing on the learning aspect of this concept [82].

The main point of learning within the building occurs in the reading zones. The first level of the reading zone is compartmentalized by using integrated bookcases, an info kiosk, flexible seating options, computer stations, and a private escape zone, specifically a reset space. It also promotes a sense of openness and gathering. In contrast, the second level of the reading zone is meant for a quieter reading environment with the use of flexible seating options. The layout of the reading zones are repeated throughout the building, in the children's, teens', and adults' sections to create a sense of predictability and repetition for the users [83].

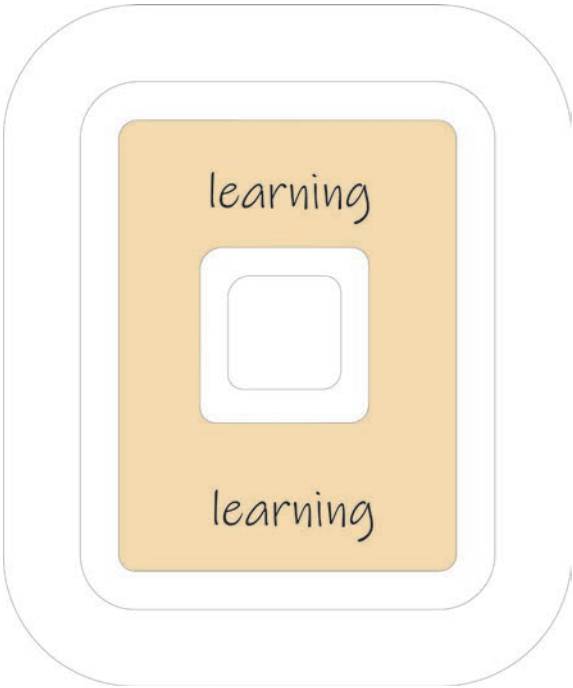
The bookcases are an integrated bookshelf along with tactile seating nooks to provide a sense of comfort and tactility. In the centre of the reading zone, there is an open and flexible reading space compartmentalized with a contrasting flooring texture to differentiate between zones. The use of wayfinding is also considered by implementing a navigational pathway applied to the flooring. The

Below
**83 | Reading Zone Plans**
Representing a learning-oriented environment, highlighting the spatial programming of the reading zone



level 2 reading zone

- integrated bookcases
- info kiosk
- flexible seating options
- computer station
- escape zone
- compartmentalization of zones




Right
**82 | Human Scale Concept: Learning**
Representing the conceptual intentions at the human scale, highlighting the learning-oriented environments

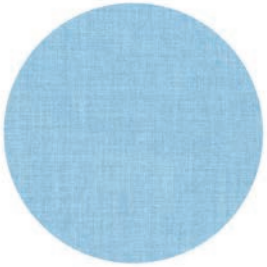



exterior wall finish - glazing for clear lins of sight and orientation



interior wall finish - natural material for feelings of calmness and upliftment

floor finish / acoustic baffle - natural material for feelings of calmness and upliftment



interior bookcase / navigational floor finish - blue cotton-based fabric for feelings of calmness and upliftment



interior bookcase / navigational floor finish - greenpaint for feelings of calmness and reassurance



furnishing finis
cotton-based fabri
of stimulation and

Right
**85 | Reading Zone Material Palette**

Representing the material palette of the reading zone, highlighting the use of natural materials and calming colouring choices for furnishings

Left
**84 | Reading Zone Perspective**
Representing the spatial qualities of the reading zone, highlighting the interconnection between levels and the compartmentalization of flexible seating options

texture and colouring of the path is associated with the compartmentalized zone. In addition to the navigational pathway, a numbering system is applied to the wall surface and directly relates to the room' activities. The space is also acoustically controlled by a baffling system allowing for low reverberation of external noise. There is a relationship between the level above, creating an interconnection of the spaces, with clear lines of sight directly connected to nature. Finally, there is an emphasis on flexible seating options found within the alcoves, reset zones, and in the open for choice, flexibility, and adaptability [84].

The selection of materials plays a significant role in reducing the level of overstimulation for users. Natural materials such as concrete, wood, and cotton-based fabrics are included to encourage a calming and uplifting environment. The use of colours is also an essential factor to consider as colours such as white and red can provoke feelings of stimulation. For example, the seating nooks are finished with a blue cotton-based fabric to aid in soothing and calming the users. Similarly, the bookshelves are finished with green paint to calm and uplift the users while reading. Specific patterns can also aid in sensory input. For example, organic patterns with irregularity can encourage feelings of focus and engagement [85].

compartmentalized floor finish - natural material for feelings of calmness and upliftment

navigational floor finish - natural material for feelings of calmness and upliftment

interior bookcase finish - natural material for feelings of calmness and upliftment

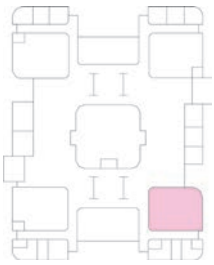


h - white
c for feelings
d upliftment

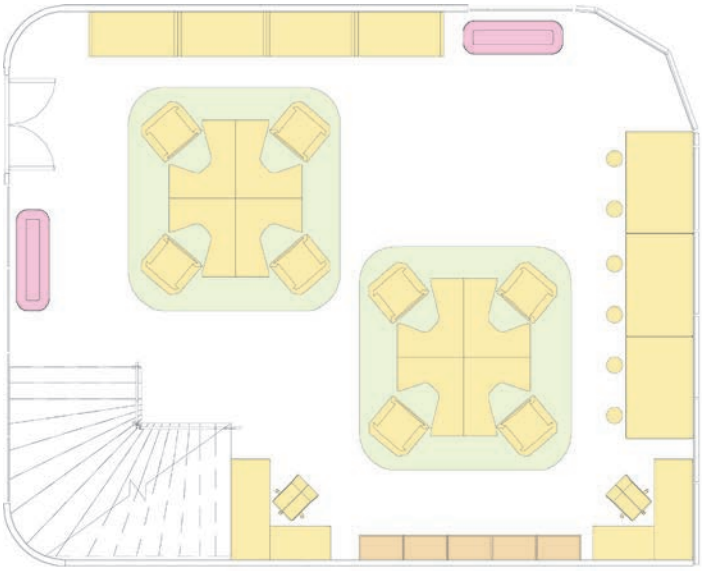
furnishing finish - red cotton-based fabric for feelings of stimulation and upliftment

furnishing finish - organic pattern with irregularity for feelings of focus and engagement

# 6.7 Learning: Innovation Lab



key plan



level 1 innovation lab

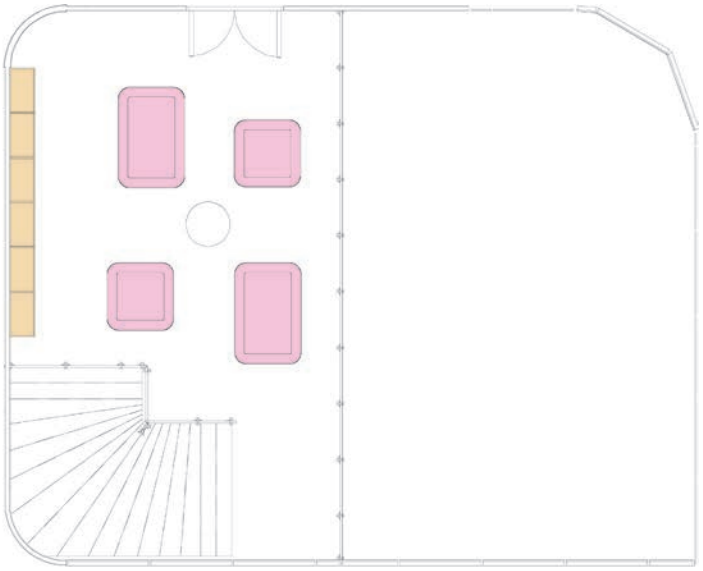
The innovation lab is a secondary point of learning within the neuro-inclusive learning centre [86].

The first level of this space is compartmentalized through a resource wall, flexible seating options, and workstations. The second level of the innovation lab includes an observation deck with seating, creating an interconnection between the learning occurring below. The observation deck is used primarily for a quieter learning experience, whereas the lower level of the innovation lab is used for open group work. There are compartmentalized zones for individual work allowing for choice and flexibility between users [87].

There are clear lines of sight to the adjacent corridor, interconnecting movement, and other programmatic elements within the innovation lab. There is also glazing along the perimeter of this space, allowing for a connection to nature. The innovation lab also considers lighting, thermal and acoustic qualities. Dimmed lighting is used near the reading wall for rational decision-making, acoustic baffles for mitigation of external noise, and the double-height space for thermal value. There are open tables at the centre of the innovation lab

Below
**87 | Innovation Lab Plans**

Representing a learning-oriented environment, highlighting the spatial programming of the innovation lab



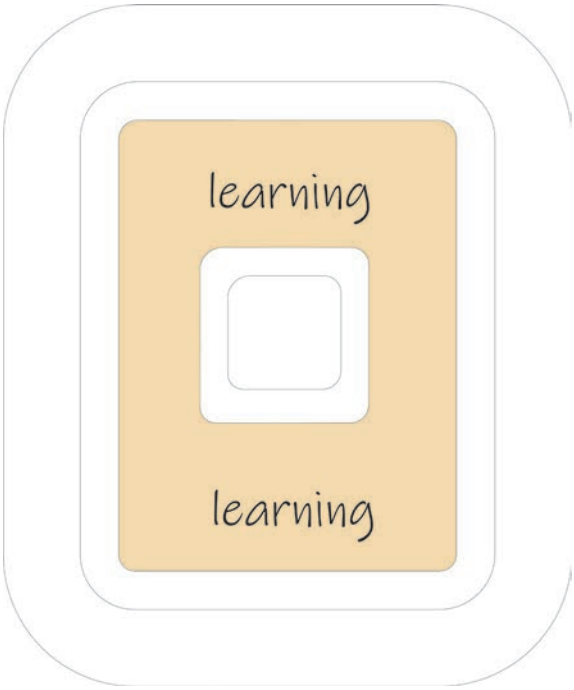
level 2 innovation lab

resources

flexible seating options

flexible workstations

compartmentalization of zones




Right
**86 | Human Scale Concept: Learning**

Representing the conceptual intentions at the human scale, highlighting the learning-oriented environments




exterior wall finish - glazing for clear lins of sight and orientation



interior wall finish - natural material for feelings of calmness and upliftment



floor finish / acoustic baffle - natural material for feelings of calmness and upliftment

interior bookcase / desk finish - natural material for feelings of calmness



furnishing / navigational floor finish - yellow material for feelings of stimulation and

Right
**89 | Innovation Lab Material Palette**

Representing the material palette of the innovation lab, highlighting the use of natural materials and stimulating colouring choices for furnishings

Left
**88 | Innovation Lab Perspective**
Representing the spatial qualities of the innovation lab, highlighting the interconnection between levels and the compartmentalization of flexible seating and workstation options

with comfortable seating options meant for group work. Furthermore, there are options for individual workstations made for quieter personal work along the perimeter walls. Flexible seating options programmed for reading can be found within alcoves, primarily under the stairwell, to provide a sense of escape for the users [88].

Similar principles are applied to the innovation lab as natural materials promote calmness and upliftment. A change in flooring texture is applied to compartmentalize the space, utilizing a light material. The color palette consists of yellow and red for furnishings, complementing the program of innovation. Lastly, an organic pattern is used for the seating within the alcoves to encourage focus and engagement [89].



compartmentalized floor finish - natural material for feelings of calmness and upliftment

navigational floor finish - natural material for feelings of calmness and upliftment



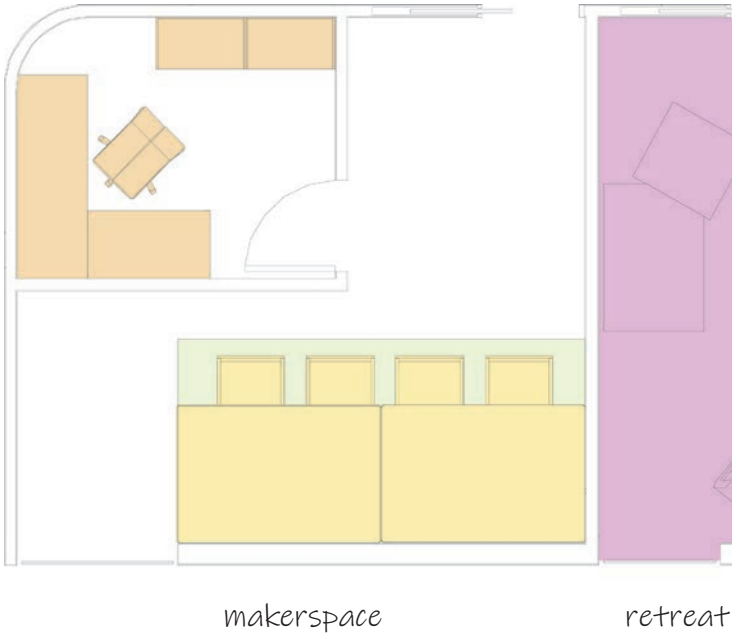
navigational floor finish - natural material for feelings of calmness and upliftment



furnishing finish - red cotton-based fabric for feelings of stimulation and upliftment

furnishing finish - organic pattern with irregularity for feelings of focus and engagement

# 6.7 Learning: Makerspace + Music Room

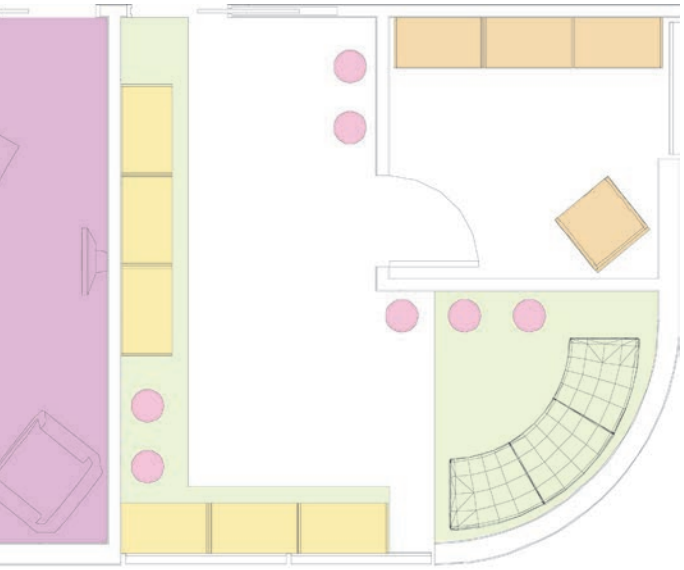



Another point of learning occurs within the makerspace and music rooms [90]. These spaces follow similar principles to the reading zone and innovation lab. These areas are compartmentalized through flexible seating options, workstations, and private rooms for individual work. Between the makerspace and the music room, a retreat zone allows users to escape and decompress from any triggering feelings. This concept is also applied to secondary learning zones, for example, the studio, meeting room, offices, organizing, planning, and communication studios [91].

The makerspace includes a private workstation along with group workstations facing the exterior to promote productivity. The music room contains a private music room allowing users to play and work independently, or a larger gathering area for group sessions. These spaces are acoustically controlled by a baffling system to minimize noise levels. A wayfinding system applied to the flooring and walls is also incorporated within these spaces to provoke easy navigation for the users. Found between the makerspace and the music room is a retreat zone that can be used as an escape or removal for users. This space includes flexible seating options, views of the exterior, and soothing qualities to help reduce any feelings of overstimulation [92].

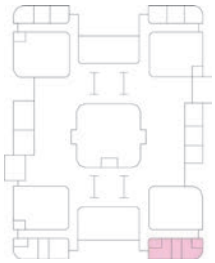
The material palette within these spaces includes wood cladding for the interior walls to aid in acoustical control and to provide an additional form of tactility. The primary color palettes for the makerspace and music room include a yellow floor finish for compartmentalized areas to promote feelings of stimulation, red furnishings for upliftment, and organic patterns for group work furnishings to encourage engagement. The retreat zone includes a carpeted texture for the flooring to add a soft element, and a blue to green spectrum of colours for the furnishings to promote relaxation [93].

Below
**91 | Makerspace, Retreat Zone, Music Room Plan**
Representing a learning-oriented environment, highlighting the spatial programming of the makerspace, retreat zone and music room

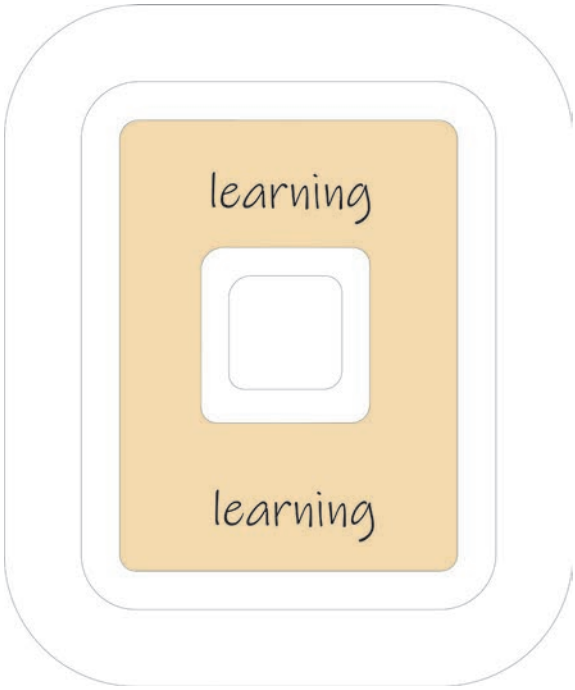


zone music room

individual workstations
flexible seating options
workstations
compartmentalization of zones
escape zone



key plan




Right
**90 | Human Scale Concept: Learning**
Representing the conceptual intentions at the human scale, highlighting the learning-oriented environments




exterior wall finish - glazing for clear lins of sight and orientation

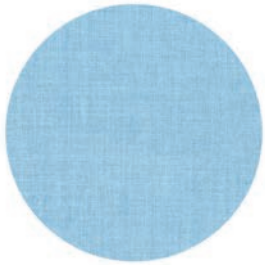


interior wall finish - natural material for feelings of calmness and upliftment

interior wall finish - natural material for feelings of calmness, upliftment and acoustical control

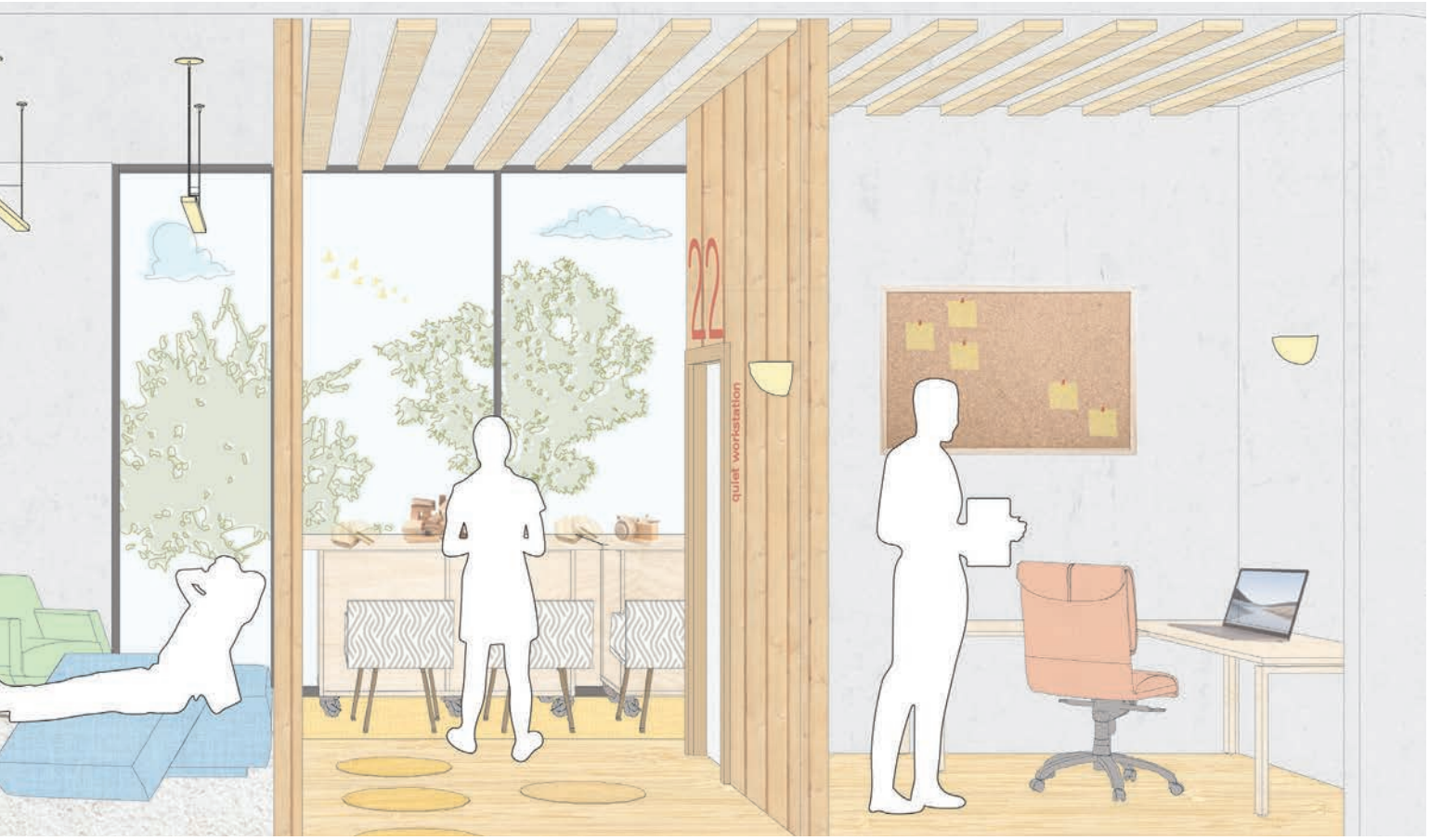
navigational floor finish - natural yellow material for feelings of stimulation and upliftment

casework finish - natural material for feelings of calmness and upliftment



furnishing finish - blue cotton-based fabric for feelings of calmness and upliftment

Right
**93 | Makerspace, Retreat Zone, Music Room Material Palette**
Representing the material palette of the makerspace, retreat zone and music room, highlighting the use of natural materials and stimulating / calming colouring choices for furnishings






floor finish /
acoustic baffle - natural
material for feelings of
calmness and upliftment



compartmentalized floor finish -
natural yellow material
for feelings of stimulation
and upliftment

navigational floor finish -
natural material
for feelings of calmness
and upliftment



furnishing finish - green cotton-
based fabric for feelings of
calmness and upliftment



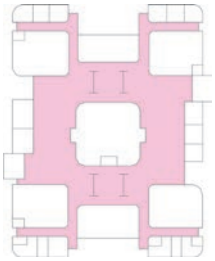
furnishing finish - red
cotton-based fabric for feelings
of stimulation and upliftment

furnishing finish - organic
pattern with irregularity
for feelings of focus and
engagement

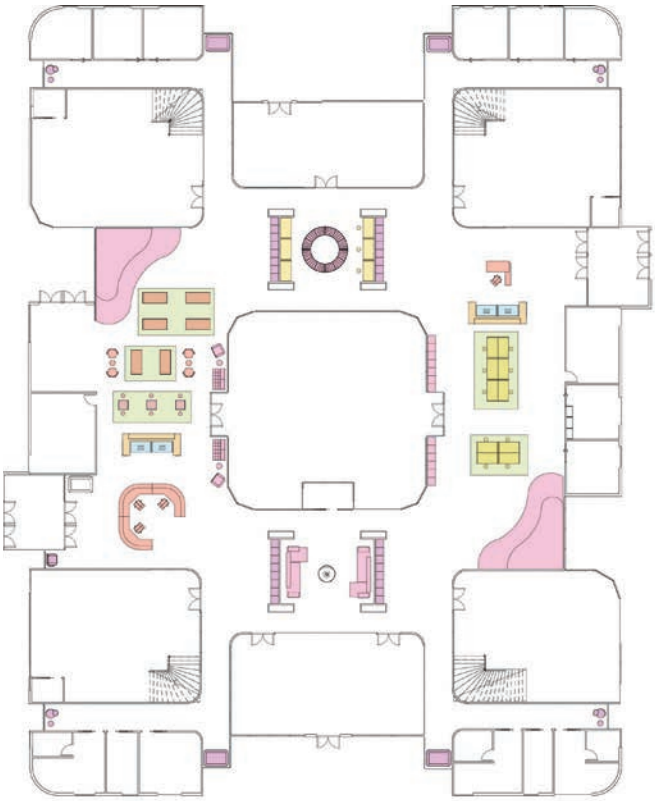
Above
**92 | Makerspace, Retreat Zone, Music Room Perspective**

Representing the spatial qualities of the makerspace, retreat zone and music room, highlighting the compartmentalization of flexible seating and workstation options

# 6.8 Gathering: Circulation



key plan



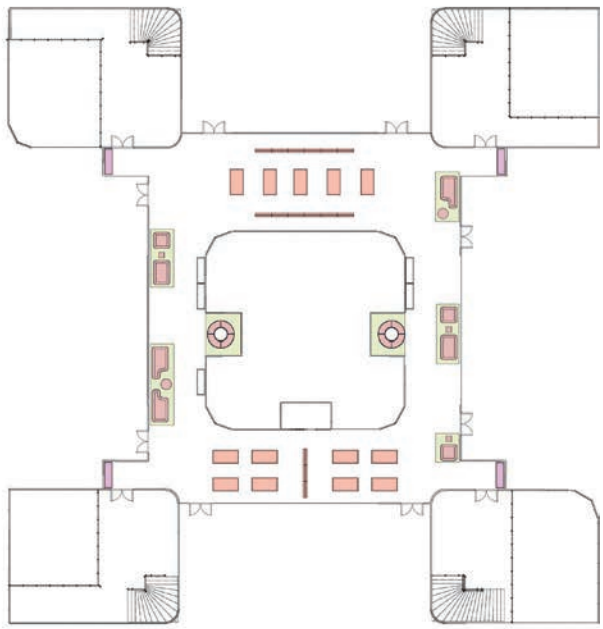
level 1 circulation

The second layer of the building's concept is categorized as gathering, which mainly involves the circulation areas, flex spaces, and gathering or lounge areas [94].

The circulation is compartmentalized into different zones highlighting flexible seating options, workstations, escape zones, and additional programming. It is crucial to provide programmable seating within the main circulation areas as it allows for choice and flexibility for the users. There are also formal and informal gathering spaces which include different seating options, varying workstations, and integrated bookcase seating. The circulation also incorporates many alcoves to allow for escape zones and additional programming such as a marketplace, welcome centre, and accessibility service desk [95].

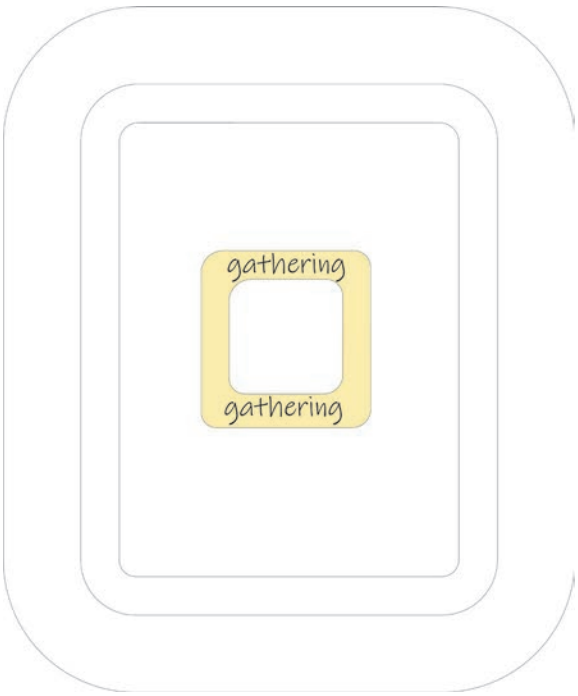
Below
**95 | Circulation Area Plans**

Representing a main gathering space, highlighting the spatial programming of the circulation areas



level 2 circulation

- integrated bookcases
- info kiosk / check-out
- flexible seating options
- workstations
- escape zones
- additional programs
- compartmentalization of zones




Right
**94 | Human Scale Concept: Gathering**

Representing the conceptual intentions at the human scale, highlighting the main gathering spaces


exterior wall finish - natural material for feelings of calmness and upliftment



exterior wall finish - glazing for clear lins of sight and orientation



interior wall finish - natural material for feelings of calmness and upliftment

interior wall finish - living wall emphasizing biophilic design

floor finish / acoustic baffle - natural material for feelings of calmness and upliftment

navigational floor finish - natural material for feelings of calmness and upliftment

casework finish - natural material for feelings of calmness and upliftment



furnishing finish - blue cotton-based fabric for feelings of calmness and upliftment



furnishing finish - green cotton-based fabric for feelings of calmness and upliftment



furnishing finish - yellow cotton-based fabric for feelings of stimulation and upliftment

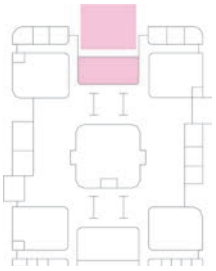
Left
**96 | Circulation Area Perspective**
Representing the spatial qualities of the circulation area, highlighting the compartmentalization of the marketplace, cafe and flexible seating options

Within the circulation, I have decided to highlight a formal gathering zone which includes the marketplace, café, and flexible seating options. The circulation features a connection to nature through the direct link to the exterior courtyard and the exterior site. It also incorporates biophilic design principles with a living wall located next to an elevated seating nook. A key factor within the circulation was to create an easy and efficient navigation. This is mitigated by applying a navigational path to the flooring for users to follow to reach their preferred destination. There is also wayfinding applied to the walls with a numbering system associated with each room and its designated activity. This perspective also accentuates the importance of creating open environments with choice, flexibility, and adaptability for the users' needs [96].

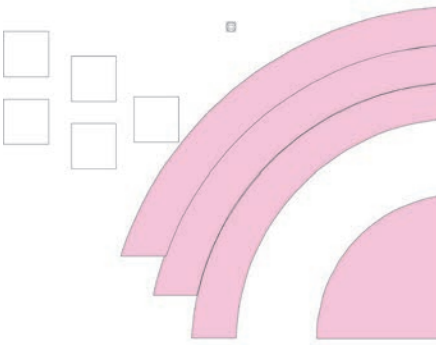
The material palette within the circulation areas follows many of the same principles mentioned. Natural materials, blue, green, red, and yellow colour palettes, and organic patterns are used to inform a calming, upliftting, stimulating, and engaging environment. Additionally, the living wall adds an extra dimension to the tactility and promotes a soothing effect to the general circulation areas [97].


Left
**97 | Circulation Area Material Palette**
Representing the material palette of the circulation area, highlighting the use of natural materials, biophilic design, and stimulating / calming colouring choices for furnishings

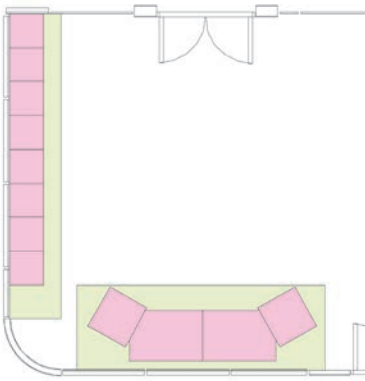
# 6.8 Gathering: Flex Space



key plan



exterio

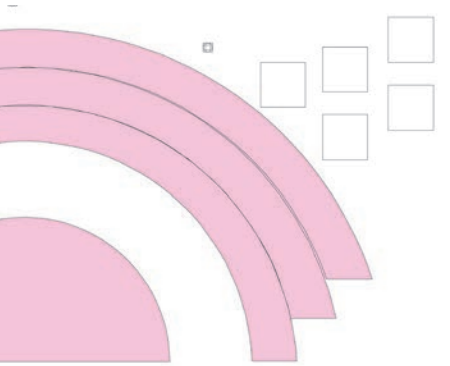


interio

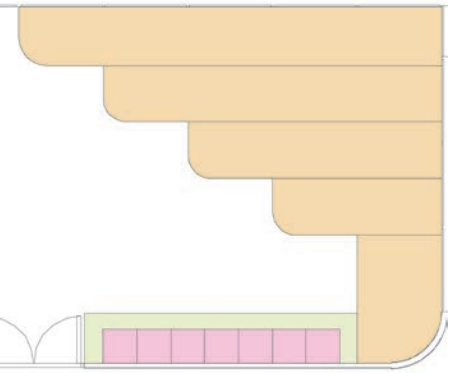
A secondary program within the gathering layer of the neuro-inclusive learning centre includes the interior and exterior flex spaces [98].

The flex spaces are compartmentalized through varying seating options and an integrated stair or seating tower. This space can be used in many different ways, primarily for gatherings and performances, art exhibitions, or classes. The seating options from interior to exterior represent similar conditions as they both create elevated viewpoints to emphasize the importance of views to nature [99].

Below
**99 | Flex Space Plan**
Representing a main gathering space, highlighting the spatial programming of the interior and exterior flex spaces

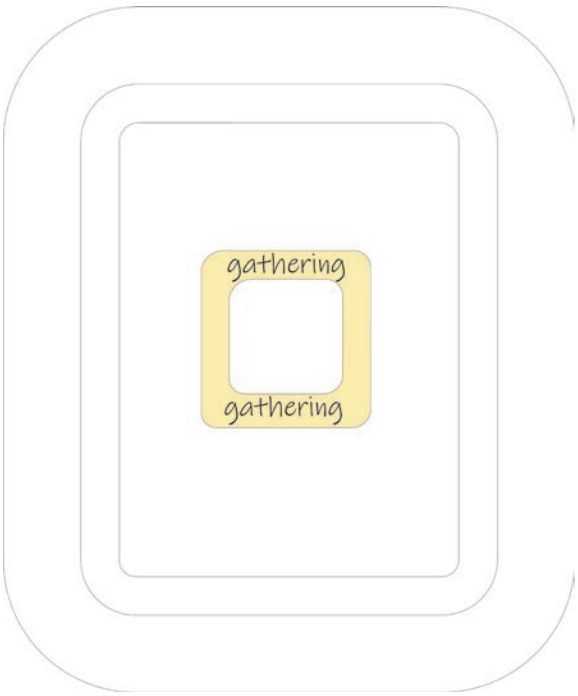


r flex space



r flex space

- integrated seating
- flexible seating options
- compartmentalization of zones




Right
**98 | Human Scale Concept: Gathering**
Representing the conceptual intentions at the human scale, highlighting the main gathering spaces




exterior wall finish - glazing for clear lins of sight and orientation



interior wall finish - natural material for feelings of calmness and upliftment



floor
acoustic ba
material f
calmness a

navigational floor finish - natural yellow material for feelings of stimulation and upliftment

interior / exterior seating - natural material for feelings of calmness and upliftment

Right
**101 | Flex Space Material Palette**

Representing the material palette of the flex space, highlighting the use of natural materials and calming colouring choices for furnishings


Left
**100 | Flex Space Perspective**
Representing the spatial qualities of the flex space, highlighting the interconnection of interior and exterior flex spaces and the compartmentalization of flexible seating options

Within the flex space, there is an emphasis on wayfinding and compartmentalized areas. Navigational pathways on the flooring create a direct circulation path to different choices of seating. Wayfinding on the walls is used to describe the type of seating choices throughout the space. Compartmentalization of the overall space is broken up by applying different flooring treatments to different zones. The acoustics are mitigated through a baffling system, the lighting is dimmed for rational decision-making, and the thermal value is controlled through access to natural daylight [100].

The material selection comprises of natural materials for the flooring and wall textures, promoting feelings of calmness and upliftment. The seating arrangements are finished with a blue cotton-based fabric to promote feelings of peace and upliftment. Altogether, the chosen materials and colours complement the program of a flex space by grounding the users and creating a calming atmosphere for gathering [101].

finish / affle - natural for feelings of nd upliftment

compartmentalized floor finish - natural yellow material for feelings of stimulation and upliftment

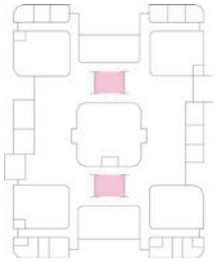
navigational floor finish - natural material for feelings of calmness and upliftment



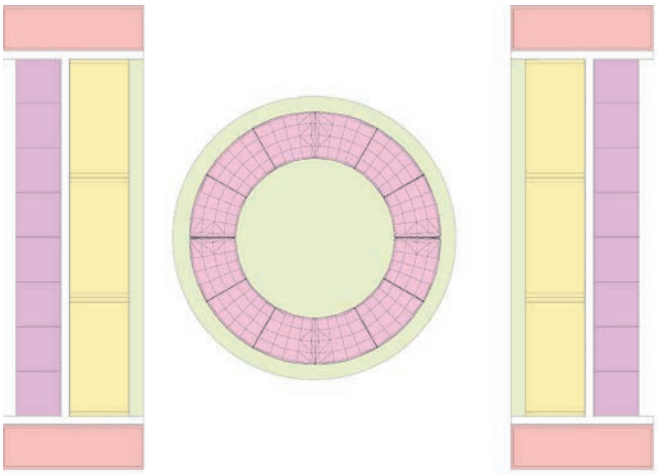
furnishing finish - blue cotton-based fabric for feelings of calmness and upliftment

furnishing finish - green cotton-based fabric for feelings of calmness and upliftment

# 6.8 Gathering: Gathering + Lounge Areas



key plan



gathering area

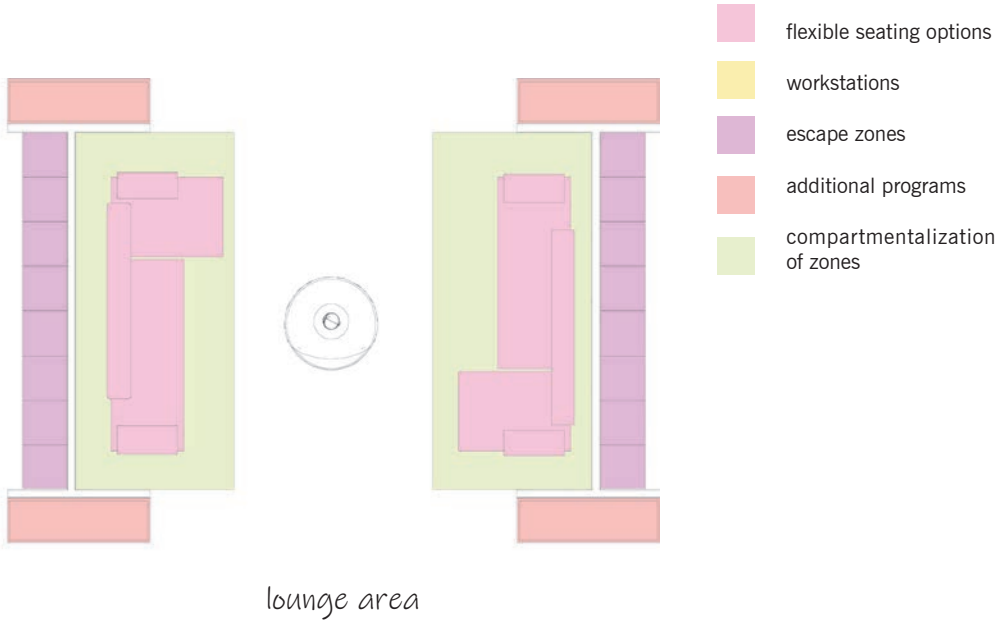
Lastly, the gathering and lounge areas adjacent to the exterior courtyard are additional forms of gathering within the neuro-inclusive learning centre [102].

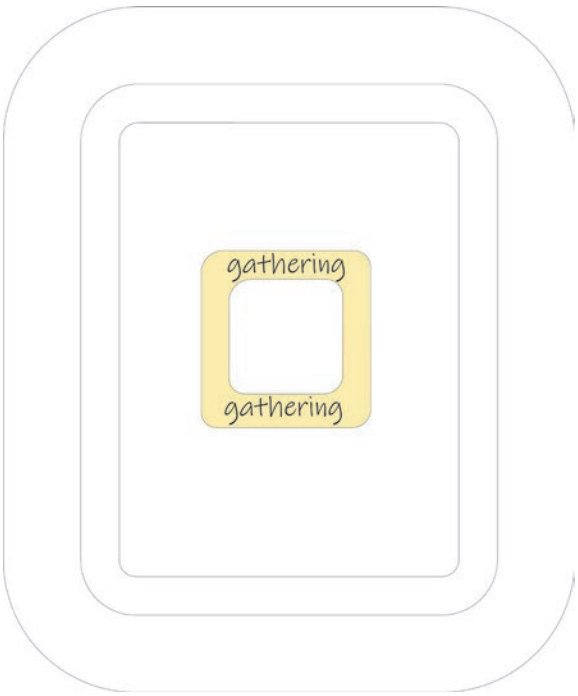
The gathering and lounge areas include flexible seating options, escape zones, particularly alcoves, and supplemental programming. The gathering area also contains workstations as a secondary option to work in an open environment. The seating areas are compartmentalized to differentiate between the workstations and the main circulation route through these spaces [103].

There is a seating space in the centre of the gathering area with workstations on either side to promote group work. Both seating areas and workstations are compartmentalized by applying different flooring treatments to highlight the difference in programs and zones. The use of wayfinding pushes the compartmentalization of zones further and classifies each zone by activity type. Acoustic baffles are used to acoustically control this space and to minimize external noise sources. The lighting is strategically placed near the workstations and community gardens to promote rational decision-making. The gathering area connects directly to the exterior courtyard allowing for clear lines of sight to nature and natural daylighting. There are also interior community gardens on the periphery of the gathering area to promote a collaborative refuge point [104].

The material palette reinforces the importance of natural materials to promote feelings of calmness and upliftment. Wood cladding is used

Below
**103 | Gathering + Lounge Area Plans**
Representing a main gathering space, highlighting the spatial programming of the gathering and lounge areas




Right
**102 | Human Scale Concept: Gathering**
Representing the conceptual intentions at the human scale, highlighting the main gathering spaces




exterior wall finish - glazing for clear lins of sight and orientation



interior wall finish - natural material for feelings of calmness and upliftment

interior wall
material f
calmness, u
acousti



compartmentalized floor finish - natural yellow material for feelings of stimulation and upliftment



navigational floor finish - natural white material for feelings of stimulation and upliftment

navigational f
natural m
for feelings o
and uplif

Right
**105 | Gathering Area Material Palette**

Representing the material palette of the gathering area, highlighting the use of natural materials and calming colouring choices for furnishings


Left
**104 | Gathering Area Perspective**
Representing the spatial qualities of the gathering area, highlighting the clear lines of sight to nature, a collaborative refuge point, and the compartmentalization of flexible seating and workstation options


on the interior walls, a yellow flooring treatment is used for workstation zones, and the furnishing finish is a blue cotton-based fabric to calm and reassure users [105].

The lounge area adopts similar principles to those highlighted within the gathering area. It features comfortable seating options with a central fireplace. The seating areas are compartmentalized by a contrasting floor treatment and the use of wayfinding to create distinct zones. Navigational pathways are also applied to the flooring to create an ease of transition through the lounge and into




exterior wall finish - glazing for clear lins of sight and orientation



interior wall finish - natural material for feelings of calmness and upliftment

interior wall
material fe
calmness, up
acoustic



compartmentalized floor finish - natural white material for feelings of stimulation and upliftment

navigational floor finish - natural white material for feelings of stimulation and upliftment

navigational f
natural m
for feelings o
and uplif

Right
**107 | Lounge Area Material Palette**

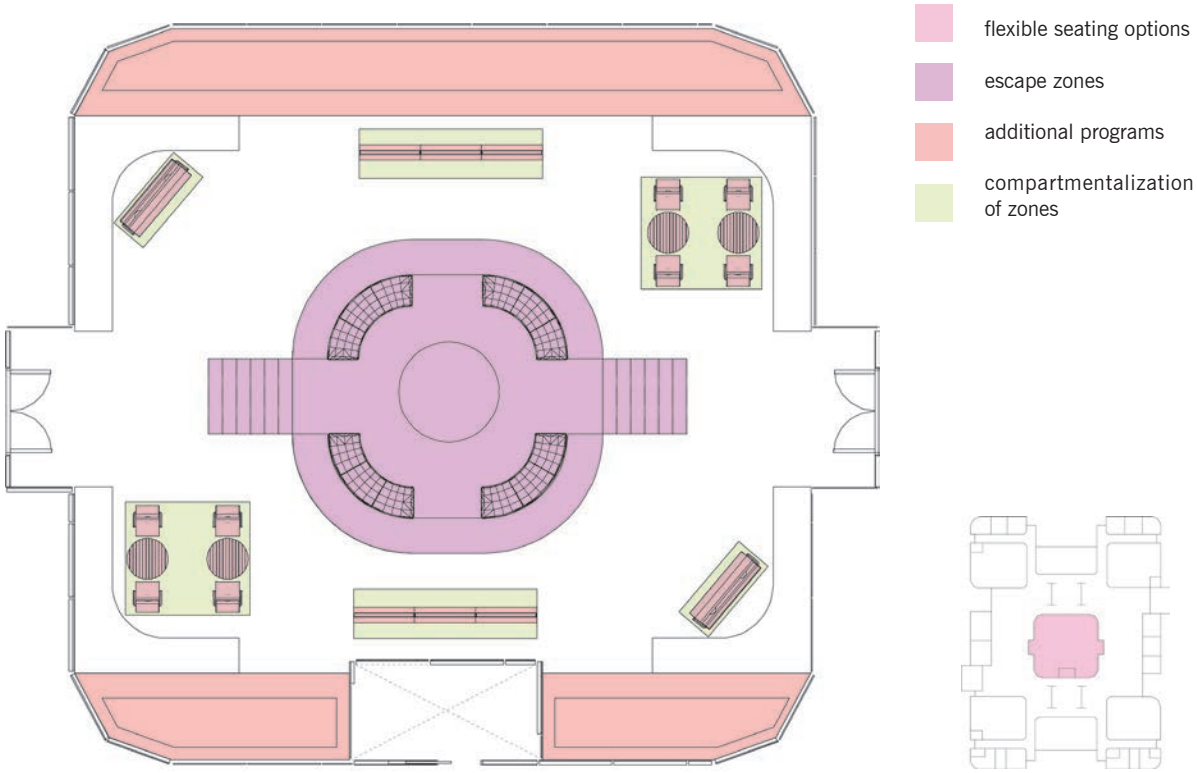
Representing the material palette of the lounge area, highlighting the use of natural materials and stimulating colouring choices for furnishings


Left
**106 | Lounge Area Perspective**
Representing the spatial qualities of the lounge area, highlighting the clear lines of sight to nature, a collaborative refuge point, and the compartmentalization of flexible seating options


the exterior courtyard, circulation, or the adjacent alcoves. Comparable to the gathering area, the lounge also connects directly to the exterior courtyard providing clear views to nature and enhanced natural daylighting [106].

Natural materials are applied to the flooring and walls allowing for a calming space. In addition, the seating finish utilizes a red colour palette to stimulate and uplift the users [107].

# 6.9 Refuge: Courtyard




level 1 courtyard

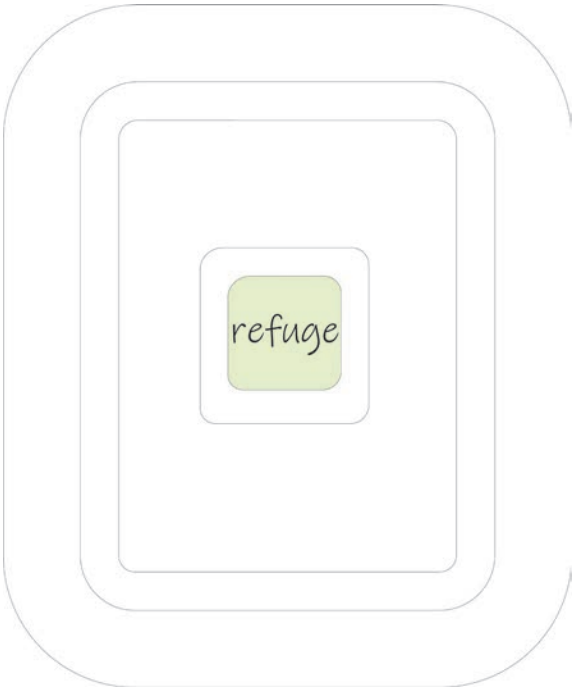
key plan

Below
**109 | Exterior Courtyard Plan**
Representing a point of refuge, highlighting the spatial programming of the exterior courtyard

The last layer of the building's concept is the point of refuge, which is found within the exterior courtyard, interior and exterior occupational therapy zones, and a variety of escape zones [108].

The courtyard is compartmentalized through flexible seating options, a primary escape zone within the centre, and additional programs such as community gardens along the periphery. The seating options and community gardens are compartmentalized to distinguish them from the main circulation [109].

The courtyard aims to show the integration of biophilic design by incorporating community garden planters and vegetation walls. It is also highlighted that clear lines of sight to the interior create an interconnection between circulation paths and the courtyard itself. This ultimately allows the courtyard to act as the main point of orientation within the building. The connection to nature and natural daylighting provides for the interior of the building to get an ample amount of daylighting throughout all times of the day. The elevated area represents the ultimate point of refuge as it can be used as an exterior escape




Right
**108 | Human Scale Concept: Refuge**
Representing the conceptual intentions at the human scale, highlighting the main points of refuge



exterior wall finish - glazing
for clear lins of sight and
orientation



elevated floor finish - natural
material for feelings of
calmness and upliftment

compartmentalized floor finish -
natural material
for feelings of calmness
and upliftment



navigational
natural
for feelings
and upli

Right
**111 | Exterior Courtyard Material Palette**
Representing the material palette of the exterior courtyard, highlighting the use of natural materials

Left
**110 | Exterior Courtyard Perspective**
Representing the spatial qualities of the exterior courtyard, highlighting the compartmentalization of flexible seating options, community gardens and an elevated escape zone

for the users. The compartmentalization between zones allows users to navigate the courtyard easily, and to clearly identify which zone you may be in. The courtyard is also lit with dimmed lighting along the elevated surface walls to reassure a sense of safety throughout all times of the day [110].

The materials used within the courtyard are all natural materials that enhance the users' experience through calming and uplifting them. This includes glazing, concrete and a variation of wood textures for seating, flooring and wall treatments. Additionally, the courtyard is encased with glazing to allow for clear lines of sight and orientation. Finally, the wood cladding enhances the compartmentalization of zones and adds additional tactility to the community garden and flexible seating options [111].

planter box finish - natural material for feelings of calmness and upliftment

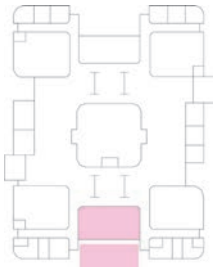
furnishing finish - natural material for feelings of calmness and upliftment



floor finish - material of calmness iftment

navigational floor finish - natural material for feelings of calmness and upliftment

# 6.9 Refuge: Occupational Therapy

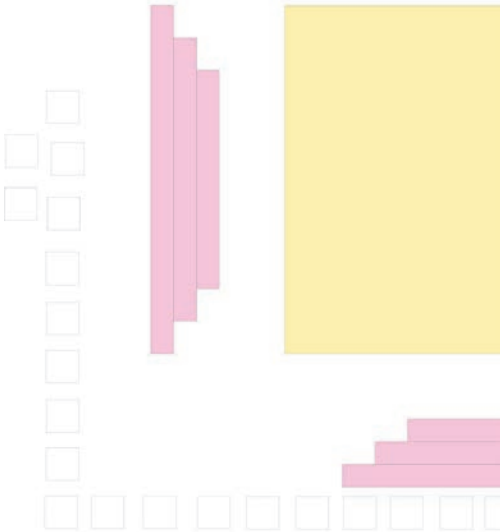


key plan

interior occupatio



exterior occupatio

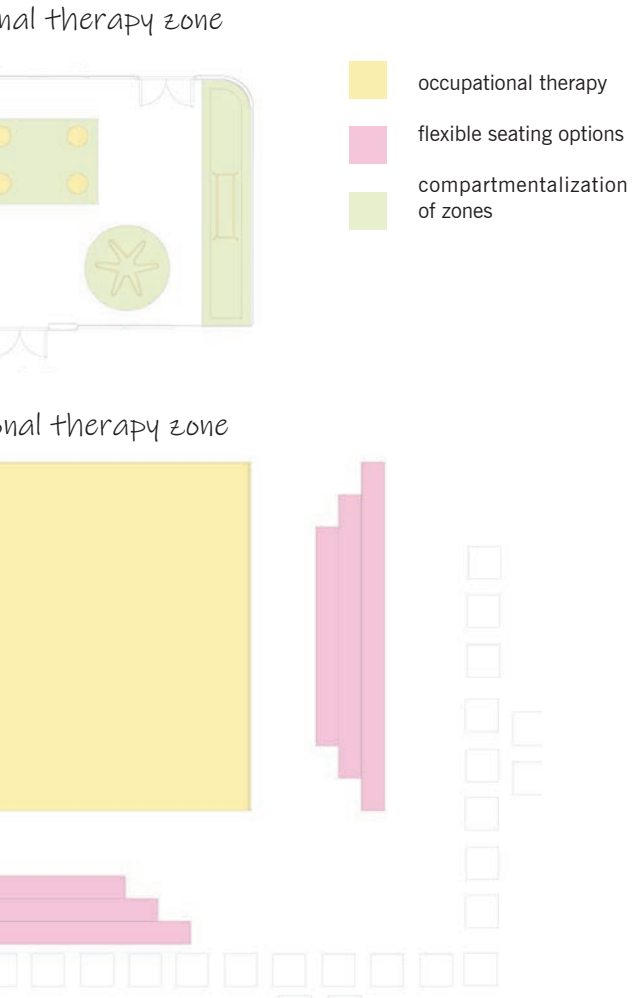


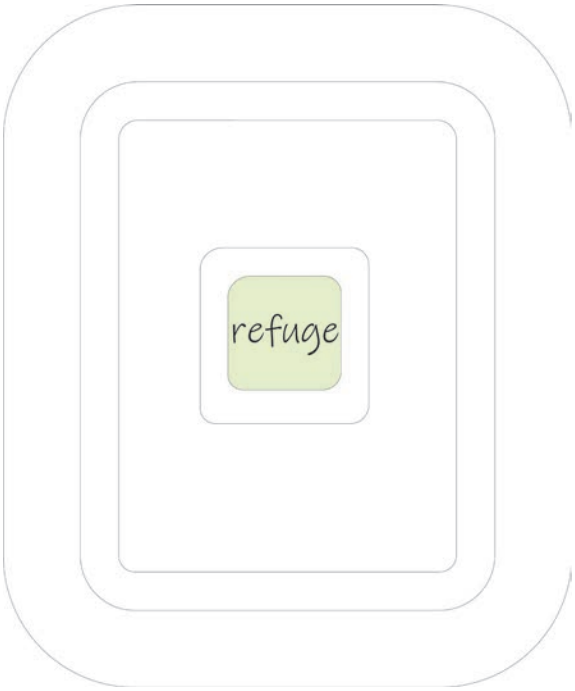
Another area of refuge within the neuro-inclusive learning centre is the interior and exterior occupational therapy zones [112].

These zones include flexible seating options and clear compartmentalization of different occupational therapy. In addition, the occupational therapy zone blends from interior to exterior to create a connection between the building and its surrounding site. This allows for both interior and exterior occupational therapy activities which provides choice and flexibility for users [113].

The occupational therapy zone features elevated surfaces to compartmentalize different occupational therapy movements and activities. The difference in flooring textures creates a distinct visual cue for users to easily navigate and understand when they are located in one zone from the next. Wayfinding is applied to the walls also to create a visual reference of which type of activity you may be within. An acoustic baffling system is used to eliminate external noise and to control the level of noise traveling from the occupation therapy zone itself. The perimeter walls of the occupational

Below
**113 | Occupational Therapy Zone Plan**
Representing a point of refuge, highlighting the spatial programming of the interior and exterior occupational therapy zones




Right
**112 | Human Scale Concept: Refuge**
Representing the conceptual intentions at the human scale, highlighting the main points of refuge



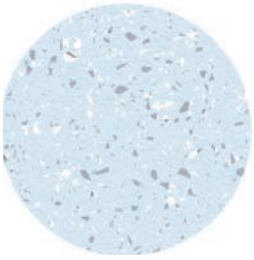

exterior wall finish - glazing for clear lins of sight and orientation



interior wall finish - natural material for feelings of calmness and upliftment



floor finish / acoustic baffle - natural material for feelings of calmness and upliftment



navigational floor finish - natural soft material for feelings of calmness and upliftment

navigational floor finish - natural material for feelings of calmness and upliftment

exterior seating finish - natural material for feelings of calmness and upliftment

Right
**115 | Occupational Therapy Zone Material Palette**

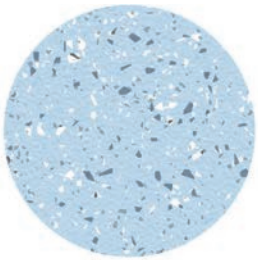
Representing the material palette of the lounge area, highlighting the use of natural materials, soft flooring treatments, and stimulating colouring choices for equipment

Left
**114 | Occupational Therapy Zone Perspective**
Representing the spatial qualities of the occupational therapy zone, highlighting the interconnection of interior and exterior zones and the compartmentalization of occupational therapy types

therapy zone are mainly glazed to provide access to natural daylight and an interconnection to the adjacent corridors and other programs [114].

The material selection for this space involves natural materials, highlighting the compartmentalized flooring finishes. These materials allow for a soft surface to provide safety and protection, and an additional layer of tactility. White and blue textures were chosen to promote feelings of calmness and upliftment. The equipment finishes follow a yellow, red, and green palette to promote feelings of stimulation that cater to the occupational therapy program [115].

compartmentalized floor finish - natural soft material for feelings of calmness and upliftment



compartmentalized floor finish - natural soft material for feelings of calmness and upliftment

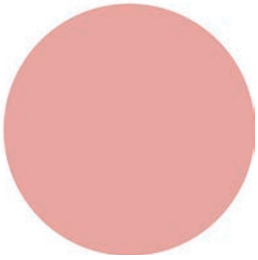
navigational floor finish - natural soft material for feelings of calmness and upliftment



furnishing finish - yellow rubber-based fabric for feelings of stimulation and upliftment



equipment finish - green steel for feelings of calmness and upliftment



equipment finish - red steel for feelings of stimulation and upliftment

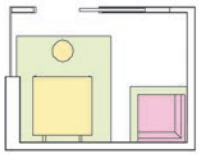
# 6.9 Refuge: Escape Zones

The final area of refuge consists of the escape zones, particularly reset, retreat zones and alcoves [116].

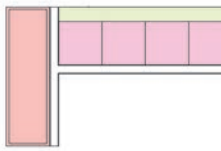
These escape zones include flexible seating options, compartmentalization of zones, and additional programming. The reset zone consists of a private workstation as it is located within the reading zone. The retreat zone includes flexible seating options and a television to remote into the adjacent music, makerspace, studio, or meeting rooms. The alcoves are all located within the overall circulation paths and include compartmentalized seating options [117].

These zones are meant for a feeling of "escape without removal" from the original environment a user may have felt triggered within. They are spaces that soothe feelings of overstimulation as they are fitted to the human body and provide comfortable seating options to decompress. They all have a connection to nature, whether it be through a clear line of sight to the exterior or with adjacent interior community gardens. They are acoustically controlled with a baffling system and provide dimmed lighting conditions for relaxation [118, 120].

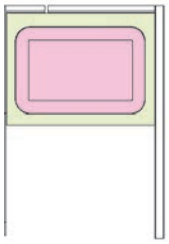
The material selection for all escape zones includes natural materials for the flooring and wall treatments. The colour palette for the reset, retreat, and main alcove consists of yellow, blue, and green to support a soothing and stimulating space. The colour palette for the alcoves found within the general circulation or underneath stairwells consists of yellow, blue, and red for feelings of calmness, motivation, and upliftment. Organic patterns are also utilized within the secondary alcoves to promote focus and engagement [119, 121].



reset zone



al

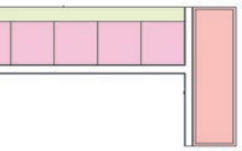


alcove

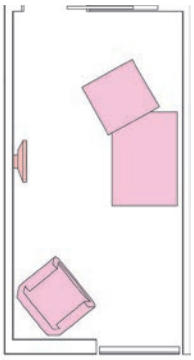
al

Below
**117 | Escape Zone Plans**

Representing a point of refuge, highlighting the spatial programming of the escape zones: reset, retreat zones and alcoves



cove



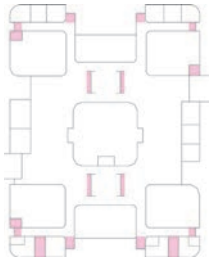
retreat zone

workstation

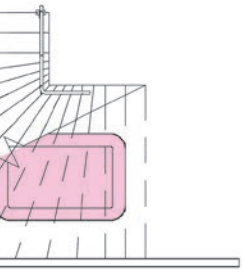
flexible seating options

compartmentalization of zones

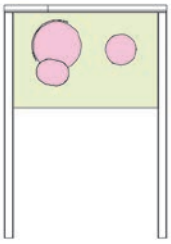
additional programs



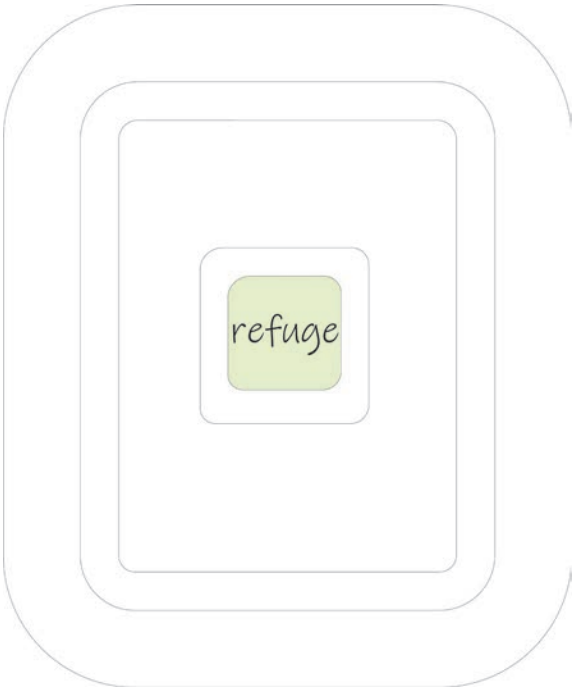
key plan



cove



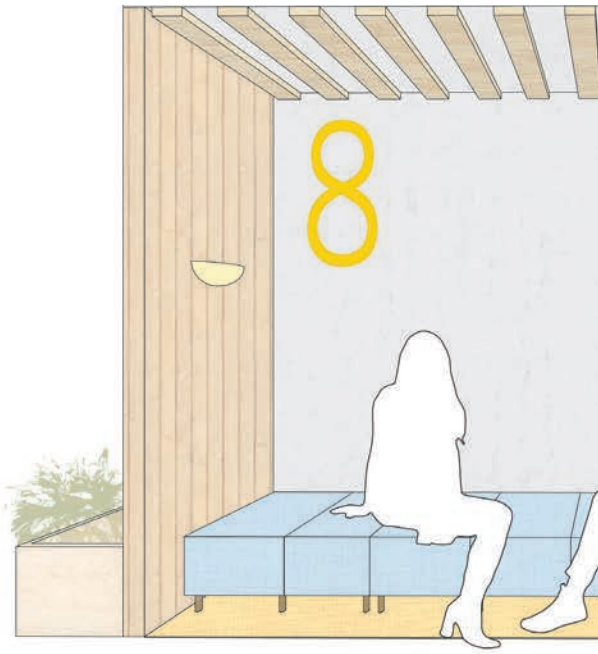
alcove




Right
**116 | Human Scale Concept: Refuge**

Representing the conceptual intentions at the human scale, highlighting the main points of refuge


reset zone




alco



exterior wall finish - glazing for clear lins of sight and orientation



interior wall finish - natural material for feelings of calmness and upliftment

interior wall finish - natural material for feelings of calmness, upliftment and acoustical control



compartmentalized floor finish - natural yellow material for feelings of stimulation and upliftment

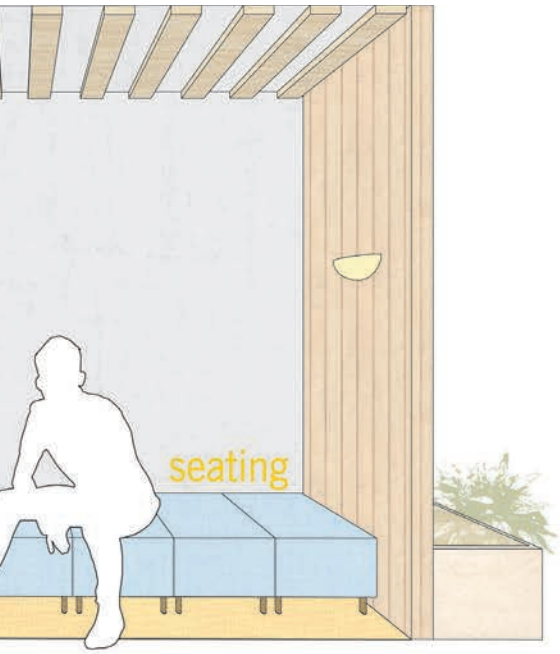
casework finish - natural material for feelings of calmness and upliftment



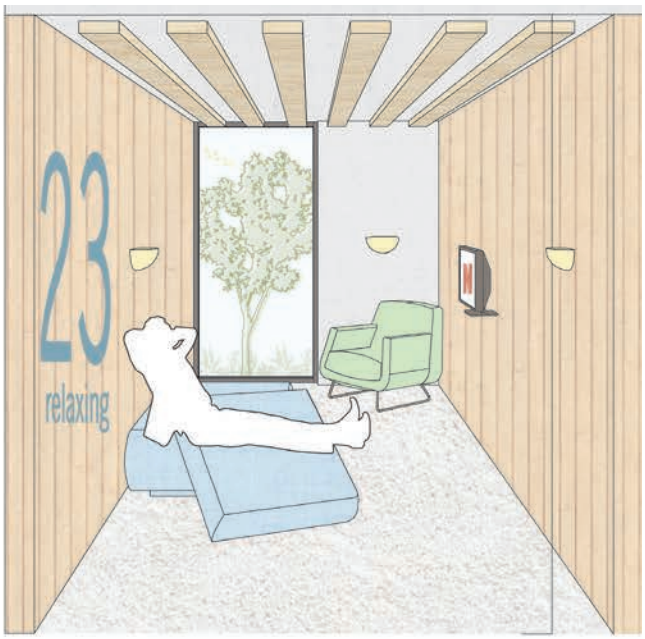
furnishing finish - blue cotton-based fabric for feelings of calmness and upliftment

Right
**119 | Reset Zone, Alcove, Retreat Zone Material Palette**

Representing the material palette of the escape zones, highlighting the use of natural materials and calming / stimulating colouring choices for furnishings




ove




retreat zone

floor finish / acoustic baffle - natural material for feelings of calmness and upliftment

floor finish - natural / soft material for feelings of calmness and upliftment



compartmentalized floor finish - natural white material for feelings of stimulation and upliftment



furnishing finish - green cotton-based fabric for feelings of calmness and upliftment

furnishing finish - red cotton-based fabric for feelings of stimulation and upliftment

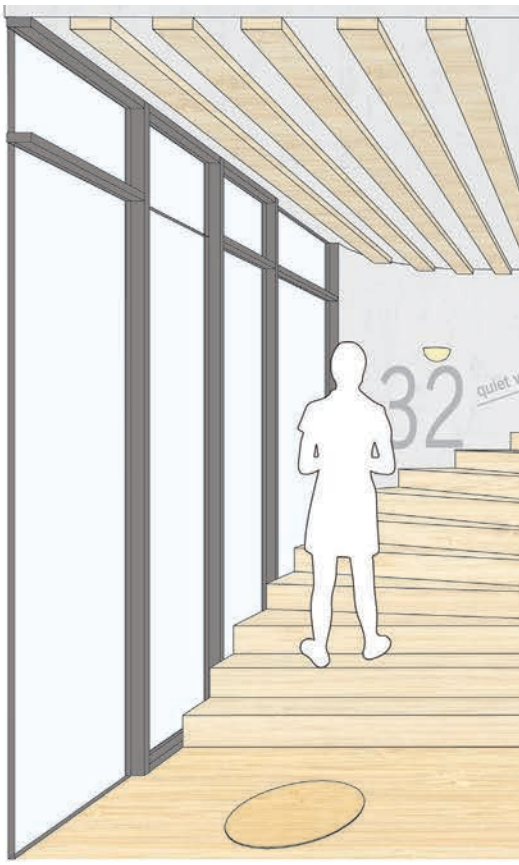
furnishing finish - organic pattern with irregularity for feelings of focus and engagement

Above

**118 | Reset Zone, Alcove, Retreat Zone Perspectives**

Representing the spatial qualities of the escape zones, highlighting the compartmentalization of flexible seating options and a comforting environment


alcove




alco



exterior wall finish - glazing for clear lins of sight and orientation



interior wall finish - natural material for feelings of calmness and upliftment

interior wall finish - natural material for feelings of calmness, upliftment and acoustical control

navigational floor finish - natural material for feelings of calmness and upliftment



navigational floor finish - natural white material for feelings of calmness and upliftment



furnishing f based fab calmness

Right
**121 | Alcove Material Palette**

Representing the material palette of the escape zones, highlighting the use of natural materials and calming / stimulating colouring choices for furnishings


ove


alcove

Above
**120 | Alcove Perspectives**

Representing the spatial qualities of the escape zones, highlighting the compartmentalization of flexible seating options and a comforting environment

floor finish / acoustic baffle - natural material for feelings of calmness and upliftment



compartmentalized floor finish - natural white material for feelings of stimulation and upliftment



compartmentalized floor finish - natural yellow material for feelings of stimulation and upliftment



inish - blue cotton-
ric for feelings of
and upliftment

furnishing finish - red cotton-based fabric for feelings of stimulation and upliftment

furnishing finish - organic pattern with irregularity for feelings of focus and engagement

Above
**122 | Entrance Perspective**

Representing the integration of the urban park, highlighting the transitional gateway leading to the building's entrance and the material palette for the exterior finishes

# Conclusion

Ableist architecture dates back to the fifteenth century with historical concepts of the Vitruvian and Modulor Man. These modules conceived the creation of predetermined standards and how they can be applied to architecture. In turn, promoting an exclusionary bias that does not fit the needs of all users. Standards that follow the same notion include the Ontario Building Code and the Accessibility for Ontarians with Disabilities Act. These documents advocate specific requirements for building standards that do not promote the need for accessible design. Instead, they present surface-level solutions to building accessibility.

Guidelines that go beyond surface-level solutions include the Universal and Inclusive Design guidelines. These guidelines promote ways to reach a greater degree of building accessibility catering to diverse needs. However, the suggested principles target only visible disability types. As a result, they do not account for invisible disability types, which ultimately creates a binary straying away from inclusive design.

As visible disabilities are physically seen on the human body, they tend to get addressed more within architecture. Invisible disabilities, specifically neurodiversity, are among the many under-recognized disability types within architecture. Since neurodiversity affects all aspects of one's life, the challenges these users are experiencing should be addressed within any given space, environment or architecture.

To address the issue of building standards and accessibility within architecture, this thesis asks: *how can an architectural node of refuge within the cityscape allow neurodivergents to be enabled rather than alienated through surface-level accessibility requirements and guidelines?*

The first part of this question is answered by analyzing neurodiverse design typologies. By studying a variety of scales, particularly learning-oriented, workplace, and urban environments, I understood how neurodiversity could be mitigated through architectural design responses. I reviewed many concepts and frameworks presented by Verona Carpenter Architects, HOK Architects, WIP Collaborative, and Magda Mostafa to inform the proposed Enabling Design Guidelines.

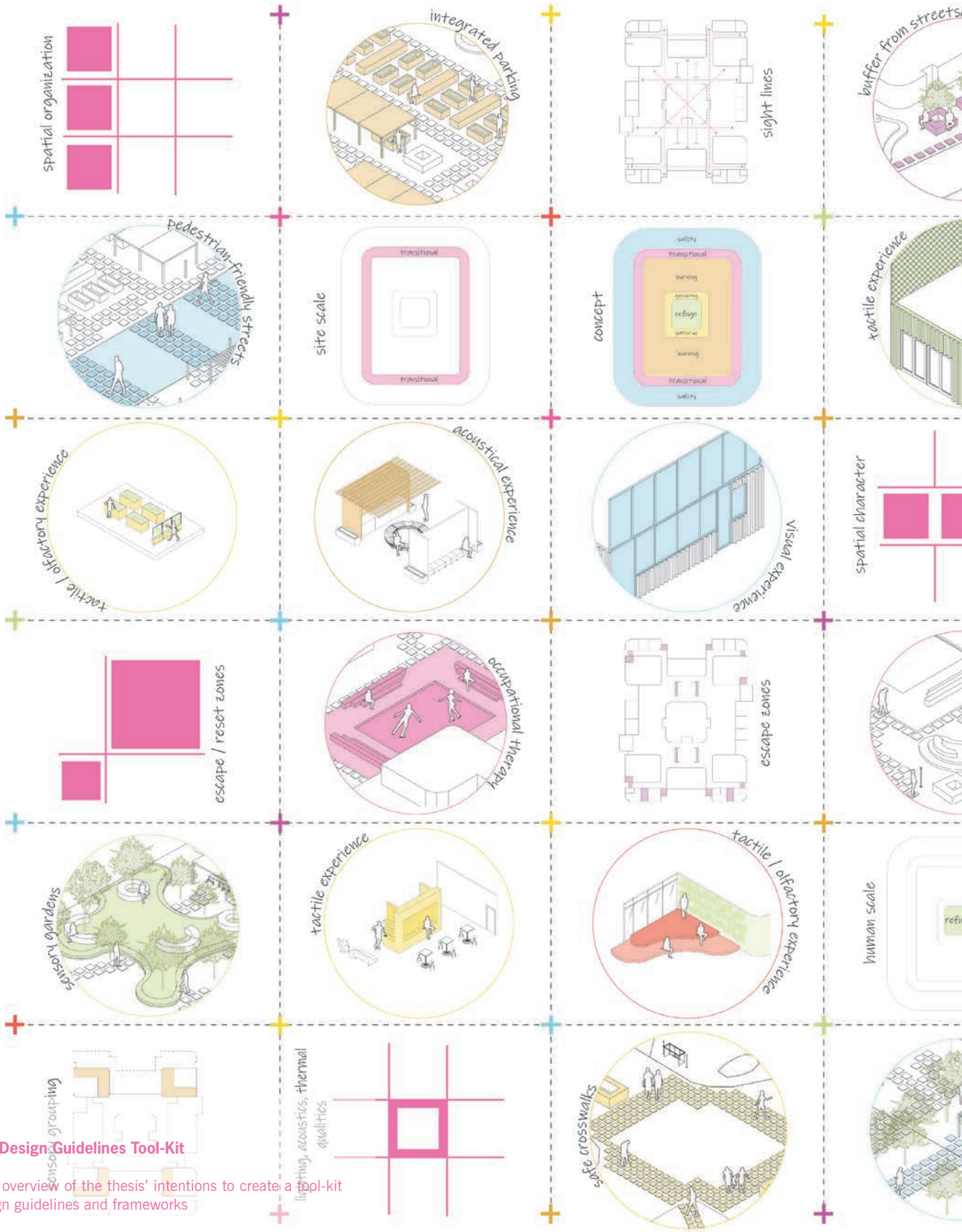
The Enabling Design Guidelines begin to respond to the overall thesis question by creating

an enabling set of design standards to inform the proposed design intervention. These guidelines consist of six foundational criteria, including spatial organization, spatial character, lighting, acoustics and thermal quality, ease of transition, sensory grouping, and the implementation of escape or reset zones. The spatial organization principle relates to creating a sense of order, the interconnectivity of spaces, clear lines of sight, and one-way circulation to reduce sensory overload. The spatial character principle speaks to details of colour palettes, patterns, textures, and furnishings to promote feelings of calmness, stimulation, focus, and engagement. The principle of lighting, acoustics and thermal qualities is essential to cut back the amount of stress and promote productivity within spaces. The ease of transitions principle suggests open and wide corridors with programmable seating options and soft corners to reduce anxiety. As well, linear and orthogonal pathways are advised for interior circulation, whereas organic and curvilinear pathways for exterior circulation. Sensory grouping proposes organizing high stimulus zones with one another, and low stimulus zones with one another to create a sense of compartmentalization. Lastly, the principle of escape and reset zones signifies the importance of providing sensory-neutral spaces throughout the building to soothe overwhelmed feelings so users can remove themselves from a triggering environment. Implementing my own set of design guidelines allowed for a flexible design solution with many points of investigation.

The second part of the thesis question is responded through an architectural design of a library centre. I selected the program of a library to reinforce the idea of public facilities acting as a connection point to the cityscape. The library centre also includes a secondary urban park component which aims to connect this project to the existing Memorial Park in Downtown Sudbury. The library centre is located between two existing art-inspired facilities to add a layer to the already-established community hub. The library centre consists of many typical and atypical programs, both interior and exterior. There are sensory gardens, escape zones, occupational therapy zones, gathering areas, and many pavilions found within the site. These programs complement the interior spatial programming of the library centre. Within the library, there are many typical programs which include the cafe, marketplace, makerspace, music room, reading zones, meeting rooms, and study rooms. The atypical library programs consist of an innovation lab, occupational therapy zone, flex space, studios, exterior courtyard, and interior community gardens. The overall design represents refuge in all of its interior and exterior programmatic spaces as each space is designed through the principles of the Enabling Design Guidelines. Each space targets various neurodiverse design elements to mitigate the triggers neurodivergents experience.

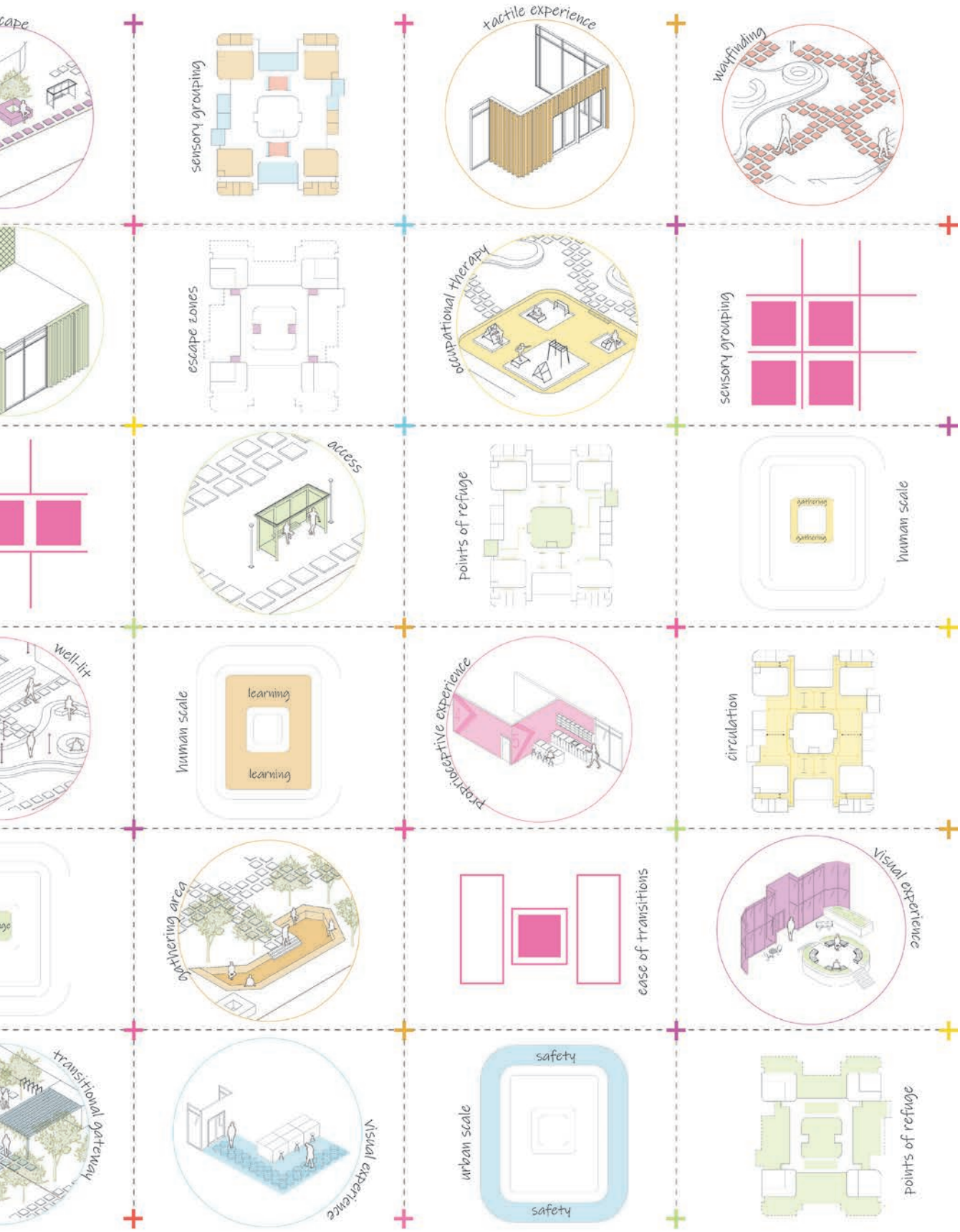
Although this thesis is situated within a specific site with a particular program, I imagine the Enabling Design Guidelines can be used for a number of building typologies and site locations. The proposed neuro-inclusive learning centre is one variable of many. This thesis is intended to be used as a tool-kit for the creation of neuro-inclusive environments [123]. As the main building concept revolves around a layered approach, beginning with the urban scale and ending with the human scale, I believe this way of thinking is flexible and adaptable to many variables within architecture. Finally, I would like to conclude that this thesis project does not try to solve the issue of accessibility. Rather, it aims to bring forth a guideline that can potentially aid in the mitigation of triggers neurodivergent users experience.

My hope is that this thesis can raise awareness to the unaddressed disability types that often go unnoticed when designing architecture. I anticipate that this thesis is a small contribution to developing a higher standard of inclusive design, or better yet, creating a new term of enabling design.




Above
**123 | Enabling Design Guidelines Tool-Kit**

Representing an overview of the thesis' intentions to create a tool-kit of enabling design guidelines and frameworks


tactile experience
wayfinding
sensory grouping
sensory grouping
occupational therapy
escape zones
points of refuge
human scale
gathering
gathering
access
circulation
proprioceptive experience
human scale
learning
learning
well-lit
visual experience
ease of transitions
gathering area
points of refuge
urban scale
safety
safety
visual experience
transitional gateway

# Bibliography


"*About Accessibility Laws*." Ontario.ca. Ontario, October 1, 2021.

"*Accessibility in Ontario's Building Code*." Ontario.ca. Ontario, July 21, 2021.

Alarcón, Jonathan. "*Orillia Public Library / Perkins+Will*." ArchDaily. ArchDaily, November 5, 2013.

"*Designing for an Increasingly Diverse Workforce*." HOK Architects, 2021.

"*Designing for Neurodiversity in Pediatric Healthcare Spaces*." HOK Architects, 2021.

"*Developed Tool Helps Tarkett Design for Neurodiversity*." HOK Architects, 2021.

Dewani, Sneha. "*Vitruvian Man: The Guide to Proportion and Symmetry.*" The Arch Insider, 2021.

"*Dublin City University.*" AccessAble. Accessed December 20, 2021.

Ontario.ca. Ontario, October 10, 2019.

"*Enabling Choices in a More Inclusive Workplace Ecosystem*." HOK Architects, 2021.

"*FAQs.*" Over To You Greater Sudbury. Accessed February 9, 2022.

Frame, HOK Architects. "*#FrameLive Presents: Agile Workplace 2.0 Virtual Workshop with HOK*." YouTube, 2020.

Government of Canada, Statistics Canada. "*Canadian Survey on Disability.*" 2018.

HOK Architects. "*Designing a Neurodiverse Workplace.*" 2021.

HOK Architects. "*Trends Affecting Neurodiversity Toward 2030.*" 2021.

"*HOK's Workplace Group Releases 'Designing a Neurodiverse Workplace' Report.*" HOK Architects, 2019.

ICON Magazine. "*Modulor Man by Le Corbusier.*" 2009.

"*Imagine Junction East.*" Over To You Greater Sudbury. Accessed February 9, 2022.

"*Kay Sargent Talks about Designing Neurodiverse-Friendly Workplaces on Cre Podcast.*" HOK Architects, 2019.

Lee, Teresa. "*Inclusive Design & Autism.*" 2020.

Manley, Sandra. "*Inclusive Design In The Built Environment: Who Do We Design For?*" 2016.

"*Mayor Bigger Is Calling on the Public to Assist in Shaping the Future of the Junction.*" Greater Sudbury. Accessed February 9, 2022.

Modernism101.Com. "*Le Corbusier: The Modulor.*" 2021.

Mostafa, Magda. "*An Architecture for Autism: Concepts of Design Intervention for the Autistic User*" 2, no. 1 (March 2008): 189–211.

Mostafa, Magda. "*Editorial: 'Expanding Normal: Towards a More Inclusive Approach to Designing the Built Environment.'*" Open House International. Open House International, March 1, 2013.

Mostafa, Magda. "*Aspectss.*" autism, 2015. https://www.autism.archi/aspectss.

Mostafa, Magda. "*Housing Adaptation for Adults with Autistic Spectrum Disorder.*" Open House International 35, no. 1 (2010): 37–48. https://doi.org/10.1108/ohi-01-2010-b0004.

Motyer, Amanda. "*My Other Eyes That See, My Other Ears That Hear.*" 2014.

Mpofu, Elias. "*Sustainable Community Health: Systems and Practices in Diverse Settings.*" Well Being of People with Neurodiverse Conditions, 2020.

"*New Central Library.*" Sudbury Library. Accessed February 9, 2022.

Richman, Kelly. "*The Significance of Leonardo Da Vinci's Famous 'Vitruvian Man' Drawing.*" My Modern Net, 2018.

Rojas, Cristobal. "*Vaughan Civic Centre Resource Library / ZAS Architects + Interiors.*" ArchDaily. ArchDaily, August 24, 2016.

ScienceDaily. "*Every Person Has a Unique Brain Anatomy.*" 2018.

Silberman, Steve, and Oliver W. Sacks. *Neurotribes: The Legacy of Autism and the Future of Neurodiversity.* London: Allen et Unwin, 2016.

Singer, Judy. *Neurodiversity: The Birth of an Idea.* J. Singer, 2017.

Singer, Judy. "*Odd People In: The Birth of Community Amongst People on the 'Autistic Spectrum'*" 1998.

Solomon, Andrew. *Far from the Tree: Parents, Children and the Search for Identity.* New York: Scribner Classics, 2014.

Tapia, Daniel. "*Albion Library / Perkins+Will Canada.*" ArchDaily. ArchDaily, July 7, 2017.

"*The Autism Friendly University Design Guide.*" Issuu, May 9, 2021. https://issuu.com/magdamostafa/docs/the_autism_friendly_design_guide.

To, Pui Yee Nikkie. "*Sensory Design Guidelines: Inclusive Children's Treatment Centres.*" 2020.

"*Toronto Public Library, Scarborough: LGA Architectural Partners.*" Archello. Accessed February 9, 2022.

"*Universal Design." Accessibility for Ontarians with Disabilities Act Toolkit.*" July 7, 2021. https://uwaterloo.ca/library/aoda-toolkit/universal-design.

Valenzuela, Karen. "*John M. Harper Branch Library & Stork Family YMCA / TEEPLE Architects.*" ArchDaily. ArchDaily, April 16, 2015.

Valenzuela, Karen. "*New Halifax Central Library / Schmidt Hammer Lassen Architects + Fowler Bauld & Mitchell.*" ArchDaily. ArchDaily, December 16, 2014.

Vega, Paola. "*Architecture: The Third Teacher.*" 2019.

Verona Carpenter Architects. "*A Call to Action.*" YouTube, 2021.

Verona Carpenter Architects. "*Graduation Address to Neurodiverse Students.*" YouTube, 2021.

Verona Carpenter Architects. "*Landscape of Learning: A Case Study.*" YouTube, 2021.

Verona Carpenter Architects. "*Neuro-Inclusive Design Principals for Learning Spaces.*" YouTube, 2021.

Verona Carpenter Architects. "*News, Neurodiverse City.*" 2021.

Verona Carpenter Architects. "*Projects, K-12 School for Neurodiverse Learners.*" 2021.

Verona Carpenter Architects. "*Sensory Processing.*" YouTube, 2021.

Verona Carpenter Architects. "*Understanding Neurodiversity.*" YouTube, 2021.

Verona Carpenter Architects. "*Why School Design Matters.*" YouTube, 2021.

Verona, Irina. "*Verona Carpenter Presents on Designing for Neurodiversity at 'Breakthroughs' Conference.*" Verona Carpenter Architects, 2020.

Walden University. "*Seven-Learning-Disabilities-Every-Psychology-Professional-Should-Study.*" 2021.

WIP. "*Collaborative Projects, Inclusive Play.*" 2020.

WIP. "*Collaborative Projects, Neurodiverse City.*" 2021.

WIP. "*Collaborative Projects, Restorative Ground.*" 2021.

WIP. "*Collaborative Projects, Valatie Pre-Design.*" 2020.

24 Hour Home Care. "*Invisible vs. Visible Disabilities.*" 2021.