The Human-Nature Connection:

Biophilic Design in a Mixed-use, Multi-unit Residential Development

by

Natalie Rogers Foidart

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University of Manitoba

Winnipeg

Abstract

The current human-created division between the natural and built environments has exacerbated environmental problems because nature has been designed as and, consequently, is seen as an Other to be utilized and manipulated at will. Exploring this disconnected relationship between humans and nature, as well as its origin and its effect on building occupants and the environment, is thus a necessary part of this project. The primary concern, however, centers on how we can establish a relationship with the natural environment through interior design to help foster ecological design practices and positive environmental behaviors that move beyond sustainability, resulting in a positive human-nature relation while supporting a coevolutionary perspective. Specifically, this investigation utilizes biophilic design as a solution to the division. The product is an adaptively reused structure that houses a mixed-use, multi-unit residential development, which explores the creation of human-nature connections through direct, indirect, and symbolic means.

Keywords: biophilic design, ecological design, sustainable design, adaptive reuse, mixed-use, sensory systems, experiential learning, Other, place

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1. Introduction

1.1. Project Rationale and Description

The fundamental relationship between humans and nature in the industrialized world is not one of harmony and adaptation; instead, it is one of division, with humans seeking control and domination. Nature is not seen as an entity with which we coexist, but rather as the *Other*, something which can be dominated and shaped with little regard to consequence. Stephen R. Kellert (2005), a Yale social ecologist whose work centers on the relationship between human and natural systems, describes the impact of this phenomenon as it relates to the practice of design and the effect of the built environment on the end user:

> The great design and development fallacy of our time is the presumption that the human built environment can exist independent of the natural environment... The result of this presumption has been buildings and landscapes that routinely abuse and degrade people's experience of nature, fostering alienation and destructive environmental practices. (p.92)

It follows, then, that the implications of this compartmentalized mindset on our current environmental crisis are devastating since that kind of mindset facilitates behaviors that are non-contextual, shortsighted, and irrational (Oelschlaeger, 2007).

If the current human-nature relation is erroneous, a conclusion that can easily be reached through an assessment of the factors contributing to the environmental crisis as presented by the Intergovernmental Panel on Climate Change [IPCC], then this certainly highlights the need to change course away from environmentally exploitive behaviors through sustainability (2007). However, sustainability as called for by the IPCC, and as generally practiced by the design community, focuses on efficiency and technical performance as the answer to this problem. This solution is inherently flawed because the underlying cause of the problem, estrangement from the natural world, is not dealt with (Kellert, 2005, 2008). Therefore, through my design exploration, I investigate how interior design can engage with the natural environment in a

manner that moves beyond sustainability, creating a positive human-nature relation while supporting a coevolutionary perspective.

The project herein, titled *The Human-Nature Connection: Biophilic Design in a Mixed-use, Multi-unit Residential Development*, explores the concept of *biophilic design* as a practice that can bridge the gap between humans and nature with the goal of enriching and supporting sustainable design practice. The investigation interweaves biophilic design principles within the design of a mixed-use, multi-unit residential development that adaptively reuses an existing structure, originally built and utilized as a school. In brief, the facility is family-oriented and includes a daycare and a café (with greenhouse and garden plots for growing food), as well as private and communal residential spaces.

Further, the objective of this facility beyond enriching sustainable design practice is to investigate biophilic design principles, with the goal of interweaving the interior environment and nature in a manner that ties into the vernacular characteristics of place. In order to achieve this objective, *the senses* and *attributes of nature* are explored as design criteria. These concepts, as well as their relation to the human-nature relationship and this project, will be further explained shortly. It must be clarified, however, that the objective of this investigation is not solely to frame nature in isolation but to respect and integrate with it while creating a heightened awareness of interdependence. The interior is designed as an instrument of learning and discovery to this end, which the user can engage with and reflect on, the goal being personal growth or awareness. By integrating nature with the built environment in this manner, the resulting effects have the potential to ripple out, facilitating larger scale difference. As psychologist Raymond S. Nickerson (2003) maintains in his work, *Psychology and Environmental Change*, it is “what individuals do – directly or indirectly through the organizations they comprise or control – that matters” (p.49). A consciousness in interior design

that speaks to the world situation outside of the walls that contain it is the desire. The exploration of the designer as facilitator must be explored to this end. The following points summarize the objectives of my work:

- To identify strategies that can facilitate a strengthened connection between people and nature.
- To identify strategies that enable the interior environment to engage with the full sensory spectrum of users.
- To identify strategies that can enrich current sustainable design methodologies in the interior environment.

It should be noted that the issue of disconnect between humans and nature, which this project is concerned with, is not solely an interior design issue, but is applicable across design fields. Interior design, however, is particularly poised to deal with this issue, as increasingly human activity is taking place in the interior environment. In fact, approximately 87 to 89 percent of the average North American's time is spent indoors (Klepeis et al., 2001; Leech, Wilby, McMullen, & Laporte, 1997). Moreover, interior design is mandated with protecting and enhancing the health, safety, and welfare of the public (International Interior Design Association, 2009; National Council for Interior Design Qualification, 2009). By ignoring the role that contemporary interior design practice is playing in magnifying the gap between humans and nature is ignoring this directive. To facilitate the social change necessary for widespread sustainable efforts to proliferate in all areas of society, our physiological and physical relationship with nature must be reestablished.

Indeed, the importance of establishing an affective connection and identification with nature has been shown by psychologists Hinds and Sparks (2008), who in their work, *Engaging with the Natural Environment: The Role of Affective Connection and Identity*, positively

correlate the formation of favorable attitudes and behaviors toward the environment. More importantly, however, a study completed by Kahn et al (2008), titled *A Plasma Display Window? – The Shifting Baseline Problem in a Technologically Mediated Natural World*, raises the concern that nature cannot be wholly substituted with technologically mediated nature representations, such as digital imaging, as alone these do not provide restorative physical and psychological benefits (from low-level stressors) obtained from direct nature experiences (such as interior daylighting and views to exterior park-like settings). In fact, these representations pose a barrier to establishing a meaningful connection with the actual environment when utilized in isolation as a substitution. Kellert (2005) supports the importance of direct nature experiences stating that learning through exposure is essential in engendering a greater relationship with, and empathy toward, nature. Further, he stresses the importance of supporting a connection with nature in the built environment through diverse biophilic design measures that engage with nature and symbolically elicit it.

To clarify the intent of this project, the definition of two terms must be understood: *biophilia* and *nature*. Biophilia refers to people's biologically driven need for a personal connection to living-systems. The concept was brought into prominence by Harvard biologist Edward O. Wilson in 1984 in his book, *Biophilia: The Human Bond with Other Species*. It was then notably applied to the built environment, a process termed biophilic design, through the work of Wilson's collaborator, Stephen R. Kellert. Two of Kellert's books, *Building for Life: Designing and Understanding the Human-Nature Connection*, published in 2005, and *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life*, published in 2008 (co-edited with Judith H. Heerwagen and Martin L. Mador), both center on the notion of harmonizing the natural and human built environments with the use of biophilic design. Essentially, the works speak to the need to create design that reflects the inherent value of

nature, culture, and place in concert. This relationship promotes well being and has the ability to enliven a desire to protect the natural environment. In addition, it attaches people emotionally and intellectually to built form and nature. This creation of attachment is due to the neurological nourishment that comes from biophilic interactions both in nature and the built environment (Kellert, 2005, 2008; see also Salingaros & Masden, 2008).

Accordingly, nature as it is utilized here must be understood as the meaning can vary markedly. The breadth of the term could extend from those areas that have remained untouched, or not manipulated by human activity, to a potted plant seen in isolation. For the purpose of this design project, I adopt Stephen Kellert's (2005) definition of nature, being "any form of direct, indirect, or symbolic expression of the nonhuman world..." (p.11). To expand, direct contact is concerned with experiencing "self-sustaining" natural elements and processes such as trees, plants, rivers, passage of time, and weather. The elements do not have to be untouched nature but rather nature that does not require constant human intervention to proliferate, as in the case of a potted plant. Indirect contact, alternatively, does require this constant care and as such, produces a more engaged relationship. Symbolic or vicarious contact, on the other hand, involves metaphorical representation, the presentation of an image, an abstraction, or mimicking (Kellert, 2005). My design exploration deals with nature on these three levels with the symbolic being utilized to support direct and indirect experience.

To begin my exploration, a real-world design investigation site is required. Subsection 1.4, "Overview of Design Program," and section 2, "Design Investigation Site," outline the process and criteria utilized to find a suitable neighborhood, site, and building, which is then utilized as the hypothetical location of the exploration. The site and building are subsequently analyzed for their opportunities and constraints in relation to the investigation of biophilic design and the requirements of section 5, "Functional and Aesthetic Program," which details the

access and life safety, the mechanical and electrical, the security, the plumbing, and the spatial and aesthetic requirements needed for the design.

Secondly, I look back through recent history to determine the reason for society's estrangement from the natural world. In subsection 3.1.1, "The Great Divide, Materialism, and Egocentrism," I illustrate the cultural and social dimensions that have acted together to create the current environmental crisis. Combined with a theoretical analysis, the underlying cause of the problem, nature seen as Other, is brought to light. Other is utilized in the phenomenological manner of Sartre and Merleau-Ponty, building on the work of Husserl, who asserts that the Other exists in relation to the subject. As presented by these theorists, the subject is egocentric and exists for itself. Alternatively, the Other, is to be dominated or controlled so that it does not threaten the autonomy of the subject (Merleau-Ponty, 1962/1945; Sartre, 1966/1943).

Martin Buber's theory of *Ich-Es (I-It)* and *Ich-Du (I-Thou or I-You)*, and Emmanuel Levinas's theory of *face-to-face*, are examined at this point as a means of finding a resolution to the human-nature dualism, which is appropriate to the application of biophilic design in the interior environment. These theorists, both working in an existential manner centering on dialogic ethics and engagement with alterity, which are of prime interest to this design project, highlight an important aspect in the task of eliminating Otherness. Buber's theory illustrates interdependence (Buber, 1970/1923; see also Wood, 1969), which as utilized here refers to a mutually beneficial, coevolving relation between the biotic (living) environment and humans. Respectively, Levinas's work, dealing with face-to-face, exhibits the importance of presentation, which is understood literally as direct exposure, in nullifying dualistic relations (Levinas, 1969/1961; see also Peperzak, 1993). Therefore, presentation as employed in my work investigates nature being integrated in the design and engaging with the human *sensory systems*

creating a place that is between the I and Thou and the two faces. These concepts and their importance to the design are further explained in subsections 3.1.1 and 3.2.2.

Following this theoretical groundwork, three design methodologies that aim to reduce environmental impacts – biophilic design, ecological design, and sustainable design – are compared, contrasted, and examined as they relate to the human-nature connection. It is here that the driving force behind the design investigation, biophilic design, is revealed as complementary and an essential companion to *low environmental impact design,* also referred to as sustainable design. The pairing of biophilic design and sustainable design principles is essential because biophilic design notably ensures the inclusion of nature, culture, and place considerations and their interrelations in the architectural environment. This tripartite relationship is unfortunately not an essential component of the overarching methodologies guiding sustainable design practice today. The resulting deficiency is crippling as it stunts the ability of design to enrich people physically, mentally, and spiritually (Kellert, 2005). Alternatively, biophilic design creates the capacity to change a methodology from a band-aid solution to one that is proactive and deals with estrangement from the natural world and place. Kellert (2005) refers to the marriage of low environmental impact design and biophilic design as *restorative environmental design*. It is in this pairing that the gap between humans and nature can be bridged, as nature and self are seen as interconnected, and the relationship between user and space becomes a very personal experience, enlivening stewardship. For the purposes of this design project, however, biophilic design is the focus of attention.

The final component in subsection 3.1, 3.1.3, “Design and Nature Retrospective – The Impact of Ornament and Transition,” places the practice of biophilic design in context with the history of formal design, or more precisely highlights the varying human-nature relations that design has facilitated. Consequently, existing precursors or methodologies that are beneficial to

this design project are revealed, as well as design practices that have acted to widen the human-nature connection. Additionally, this section acts to create a frame of reference from which the projects covered in section 4, “Precedents – Investigation and Analysis,” can be understood. Architecture from the industrial revolution to the present is the focus of the retrospective, with works predating the revolution being analyzed to demonstrate the changing relation. The revolution is utilized as a starting point for the retrospective because during that time building technologies and methods vastly changed, with a predominantly rural way of life becoming urban and industrialized. The result was, for the most part, a marked decline in human-nature relations with several succeeding design movements endeavoring to rekindle the lost connection.

Beginning the process of applying biophilic design in the interior, subsection 3.2, “Bridging the Natural and Built Environments,” deals with how to disable nature seen as Other. The methodology to achieve this merger, which stems from and expands on both Buber’s and Levinas’s theories, is threefold. The process begins with focusing on how the designer can present the user with qualities found in nature. Next, it must be discerned how the presentation can make the user more aware of, and engage with, their surroundings. Finally, opportunities for interconnection must be readily apparent to create an awareness of nature and our relationship with it, an understanding that has the potential to influence day-to-day behaviors. Essentially, the process that is examined can be broken down into encounter/presentation, experience/interaction, and internalization/awareness. This succession, which provides the overall framework for the design investigation, is based on the adult-learning methodology *Transformation Theory*. As this methodology is centered on experiential teaching and learning, which enables a change in frame-of-reference or worldview (Mezirow, 2000), it provides a strong framework that can be adapted and utilized as a guide for the interior investigation.

Although the design investigation utilizes the basic structure of Transformation Theory, it varies from the methodology in that there is not a traditional educator or structured reflective process with a mentoring community, a component of internalization/awareness. Instead, I (the designer) act as the educator, creating an interior environment that reveals and interprets ecological phenomena, processes, and relationships to create awareness, while at the same time providing opportunities for the users to engage with nature, conducive to facilitating a greater understanding of mutual impacts. Finally, the multi-unit nature of the facility, communal spaces, and the community-oriented nature of the entire facility, creates the opportunity for established support networks, an important component of internalization/awareness.

Additionally, as the design is oriented towards family housing and contains a daycare, the design investigation is not limited to adults. The inclusion of children as a user group in this project is important because, as Wells and Lekies show (2006), "wild" and "domesticated" nature experiences, particularly in childhood, positively affect the chance of environmental stewardship later in life. Their study, entitled *Nature and the Life Course: Pathways from Childhood Nature Experiences to Adult Environmentalism*, utilized a large representative sample of urban-dwelling adults to examine the long-term influence of engagement with nature. The closest association with biophilic design in this study is the impact of "domesticated nature," which includes picking flowers or produce, planting trees or seeds, and caring for plants. This is representative of Kellert's (2005) definition of indirect nature exposure. Although this does not perfectly reflect the full application of biophilic design, it follows suit that a built environment, which fosters a positive interconnected relation with nature, will increase environmental behaviors through creating internalization/awareness that fosters understanding, emotional connection, and respect.

Further, subsection 3.2.2, “The Sensory Systems and Experiential Learning,” investigates the application of the Transformation Theory process with the interior acting as the intermediary point between people and nature. The interior viewed in this regard exhibits the encounter/presentation through the direct, indirect, and symbolic expressions of the natural world, termed *organic design*. Organic design is the first component of biophilic design that connects built form to nature. Essentially, the term refers to design features that elicit a perceived connection to nature (Kellert, 2005). The second component, *vernacular design*, will be explained shortly.

To guide the design investigation process in the utilization of organic design, I look to the work of esteemed psychologist and specialist of environmental human factors, Judith Heerwagen, and her collaborator, sustainability expert and architect Bert Gregory (2008). In their work, *Biophilia and Sensory Aesthetics*, they present seven “attributes of nature,” derived from human sensory experiences of nature that elicit pleasure, well-being, and engagement. The list, which includes *sensory richness*, *motion*, *serendipity*, *variations on a theme*, *resilience*, *sense of freeness*, and *prospect and refuge*, are meant to be translated into design that does not copy nature but evokes it. As such, the list becomes a set of criteria to ensure a multifaceted connection between design and nature, which will be further explained in subsection 3.2.2, “The Sensory Systems and Experiential Learning.”

Following encounter/presentation, experience/interaction is then created through the stimulation of the body through all of the sensory systems, conveying or impressing a flow or connection between the user and nature and heightening awareness. The blurring of culturally manufactured and physical boundaries between humans and nature is integral to this component; as such, the design interventions that interact with the building shell, notably transitional points and windows, are of prime importance.

Further, internalization/awareness is explored through hands-on involvement with indirect nature expressions (for example, edible and non-edible gardens) and design attributes that highlight how the building and its occupants engage with nature (for example, a system that shows grey water usage and recycling and compost centers). This design approach reveals the process of interaction and interconnection between the user and nature. Essentially, in the design the sensory systems and experience are utilized as a gateway to create explicit and subtle experience in the interior environment that can be internalized, reflected on, and learned from. It is through this process that the user can create a new frame of reference from which to relate to the world.

The final part of section 3, 3.3, "Site-Specific Place – A Sensory and Critical Study," presents a visual and critical analysis of the aspects of the site that enable vernacular design, the encounter/presentation that is tied to culture, place, and locale. Vernacular design, as previously stated, is the second and final component of biophilic design, with organic design, discussed earlier, being the other. Here, the use of the term vernacular design refers to buildings and landscapes which are ecologically, culturally, socially, and historically relevant to the place where they occur, contributing to distinctive identity. This connection is an integral component of the successful employment of biophilic design as it creates culturally relevant design that enables an emotional and intellectual connection to, and respect for, the designed environment (Kellert, 2005). It is essential that the definition of the term vernacular, as utilized here, is understood since it has varying definitions, particularly as it relates to the built environment. Thus, for the purpose of specificity I must stress that the vernacular refers to the regional characteristics of the site or place extending from the common or indigenous to aspects that have a broader origin (for example, adapted academic and historic architectural styles), which over time have become part of the unique local identity. To further explain, what I am

concerned with, and what Kellert (2005) discusses, relates more broadly to the characteristic customs, traditions, buildings, and landscape features relevant to site and their utilization in an adaptive relation to one another. Thus, the fusion of these vernacular, ecological, and cultural characteristics with the designed environment is integral to biophilic design because it weaves the built form into local fabric and identity.

Vernacular design, therefore, acts to create a built environment that avoids *placelessness,* enabling a personal connection between the user and space, thus creating place. Placelessness, as defined by Kellert (2005), "diminishes distinctive local and regional identities, often replacing them with uniformity and anonymity" (p.170). The result of this nondescript design, which, unfortunately, is often the result in many contemporary buildings, is apathy towards the built environment. This result is counterproductive to biophilic design and sustainability (Kellert, 2005). Tim Cresswell (2004), a human geographer whose work draws on the original proponents of place from the 1970's, such as Yi-Fu Tuan and Edward Relph, adds to this argument, stating that place is linked to the phenomenological experience of the world, meaning it is dependent on the particular sensory experiences that define the essence of a place. Specifically, place is not location, but largely made up of layers of distinct experiences connected to dwelling, which is wrapped up with emotion. When individuals are engaged in this way, space, a largely abstract concept, becomes place. The sensory experience of ecologically, culturally, socially, and historically specific attributes in the interior is thus the means to accomplish this connection.

Adapting criteria set out by Kellert (2005) to achieve vernacular design, the regional investigation analyzes the following elements in relation to the cultural, social, and historic qualities of the site through photography: regular and repeated events (characteristic artifacts and designs); familiar and valued surroundings; and predictable customs and norms. Kellert

(2005) also lists distinctive narrative and storytelling traditions as an important consideration; however, these will not be dealt with as a part of this practicum as a proper investigation would require a study of its own. In addition, the ecological investigation, concerned with organic site-specific qualities, explored the following in relation to characteristic landscapes: shapes and forms that mimic natural features and processes; material qualities (color, texture, etc.); and plasticity (variability). Those ecological qualities that are not conducive to exploration in the photographic manner (for example, landscape features, sun movement, and wind patterns) are investigated in subsection 2.1, "Site Selection and Analysis."

Following the photographic documentation of the site, the resulting images are further explored utilizing a combination of graphic and written analysis. The graphic analysis involves the creation of image compilations that synthesize the chromatic and material character of the neighborhood. Further, these studies distill prominent patterns and forms. The written analysis then supplements the graphic work utilizing both *descriptive* and *interpretive criticism*, discussed by Barrett (2000) in his book, *Criticizing Photographs: An Introduction to Understanding Images*. To explain further, descriptive criticism closely describes what is seen in the photo, naming and characterizing its contents, which in this case relates back to the previously mentioned criteria for taking the photographs. Alternatively, interpretive criticism is analytic in nature, offering both interpretations and judgments. The purpose of this process is to utilize the studies as a bridging mechanism to relate the photographs to the design methodology, creating building forms, materiality, coloration, and ornamentation that directly, indirectly, or symbolically elicit culture and nature relevant to place. As a means of engaging with the physicality and sensual qualities of place, the process of photographing and interpreting presents a way of actively looking, describing, classifying and communicating findings. Schwartz and Ryan (2003) in their book, *Picturing Place: Photography and the Geographical*

Imagination, describe this type of procedure as a "mechanism by which people come to know and situate themselves in space and time" (p. 6). They refer to this method of understanding as the creation of imaginative geographies.

Continuing the exploratory process, section 4, "Precedents – Investigation and Analysis," examines three design projects that are informative to the design investigation. Together, these projects represent a diverse set of approaches relating to varying aspects of biophilic design: direct, indirect, and symbolic organic design (sensory richness, motion, serendipity, variations on a theme, resilience, sense of freeness, and prospect and refuge); and the two aspects of vernacular design, ecological attributes (shapes and forms of vegetation, natural features and processes, material qualities, and plasticity) and cultural attributes (regular and repeated events, familiar and valued surroundings, and characteristic artifacts and designs).

To begin the analysis, subsection 4.1, "Precedent Overview," details each project in regards to location, building type, year of completion, design concept, design goals (implicit and explicit), and its relationship to biophilic design. Furthermore, the projects are analyzed as they relate to the three criteria that synthesize the findings of the theoretical investigation, and thus the design approach of this project, encounter/presentation, experience/interaction, and internalization/awareness. The following subsection, 4.2, "Summary – How Precedents Inform the Design Inquiry," then compares and contrasts the three projects and relates them back to their application in the design.

Following the precedent section, section 5, "Functional and Aesthetic Program," expands on subsections 1.4 through 2.4, which detail the overall program, site, and building analysis findings. Specifically, important design criteria including functional, technological, life safety/access, spatial/aesthetic, and human factors requirements are detailed.

The final section, 6, “Design Application,” summarizes the design practicum. This section details the design that resulted from the literary and visual investigation and analysis through a series of two- and three-dimensional drawings coupled with written descriptions. It then draws conclusions and critical considerations for the design project, looking specifically at lessons learned, limitations, and future research directions.

In summary, the biosphere is at the brink of seeing significant negative impacts on food security, human health, settlements and society, water resources, and ecosystems (IPCC, 2007). The need to realign ourselves with the natural environment and its processes is pressing. Sim Van der Ryn and Stuart Cowan (2007) succinctly describe the situation in relation to design:

> In many ways, the environmental crisis is a design crisis. It is a consequence of how things are made, buildings are constructed, and landscapes used. Design manifests culture, and culture rests firmly on the foundations of what we believe to be true about the world... It is clear that we have not given design a rich enough context. We have used design cleverly in the service of narrowly defined human interests, but have neglected its relationship with our fellow creatures. Such myopic design cannot fail to degrade the living world, and, by extension, our own health. (pp. 24-25)

Accordingly, for the purposes of this design project, I look to biophilic design as the missing integer in the sustainable design equation. Biophilic design moves beyond the management of resources and skillful application of rating systems to create a relationship with, and an appreciation of, the world around us. People need to be engaged with the natural environment in everyday life to be cognizant of our impact on the biosphere, and ultimately, on ourselves. Otherwise, the old adage “out of sight, out of mind” becomes particularly poignant.

1.2. Summary of Research Strategy

The research strategy that has been used to substantiate and support the design process for this project utilizes an evidence-based methodology. The strategy employs qualitative research dependant on a literature review, with a particular emphasis on theoretical principles. This work is followed by a precedent study and a programming inquiry, which further structures the design investigation by building upon the lessons learned through the review and inquiry process.

To break down the purpose of each section, the literature review is utilized to establish theoretical grounds, supporting data, and a rationale to support the design project. The precedent review contributes by providing examples of building phenomenon in a real-life context to expose strategies and processes, which can be analyzed for their potential to add to interior design's body of knowledge. Finally, the program incorporates the site and building analysis as well as the functional, spatial, and aesthetic requirements of the design. Together, these components determine the parameters and methodologies for the design investigation while providing criteria to assess the resulting work.

1.3. Summary of Opposing Cognitive Orientation Models

The following chart is a graphic summary of the opposing cognitive orientations and ideas explored in this design practicum. These orientations and their interrelation were discussed in the preceding subsection, 1.1, “Project Rationale and Description,” and each are further explained in their respective sections as previously outlined. The left box in the figure, originating with “Humans” and following a linear path down, illustrates the conceptual thinking behind the division between humans and nature. The result of this relation is technological sustainability that originates from an overridingly human-centered perspective. This type of sustainability utilizes control, domination, and power to attempt to correct the environmental crisis. Alternatively, the right box in the figure demonstrates the conceptual thinking that originates from an enmeshed relation, or coevolutionary perspective, between nature and culture. This second box illustrates the conceptual thinking behind the creation of the between, a space explored in this design investigation that is a part of both the realms of nature and humans.

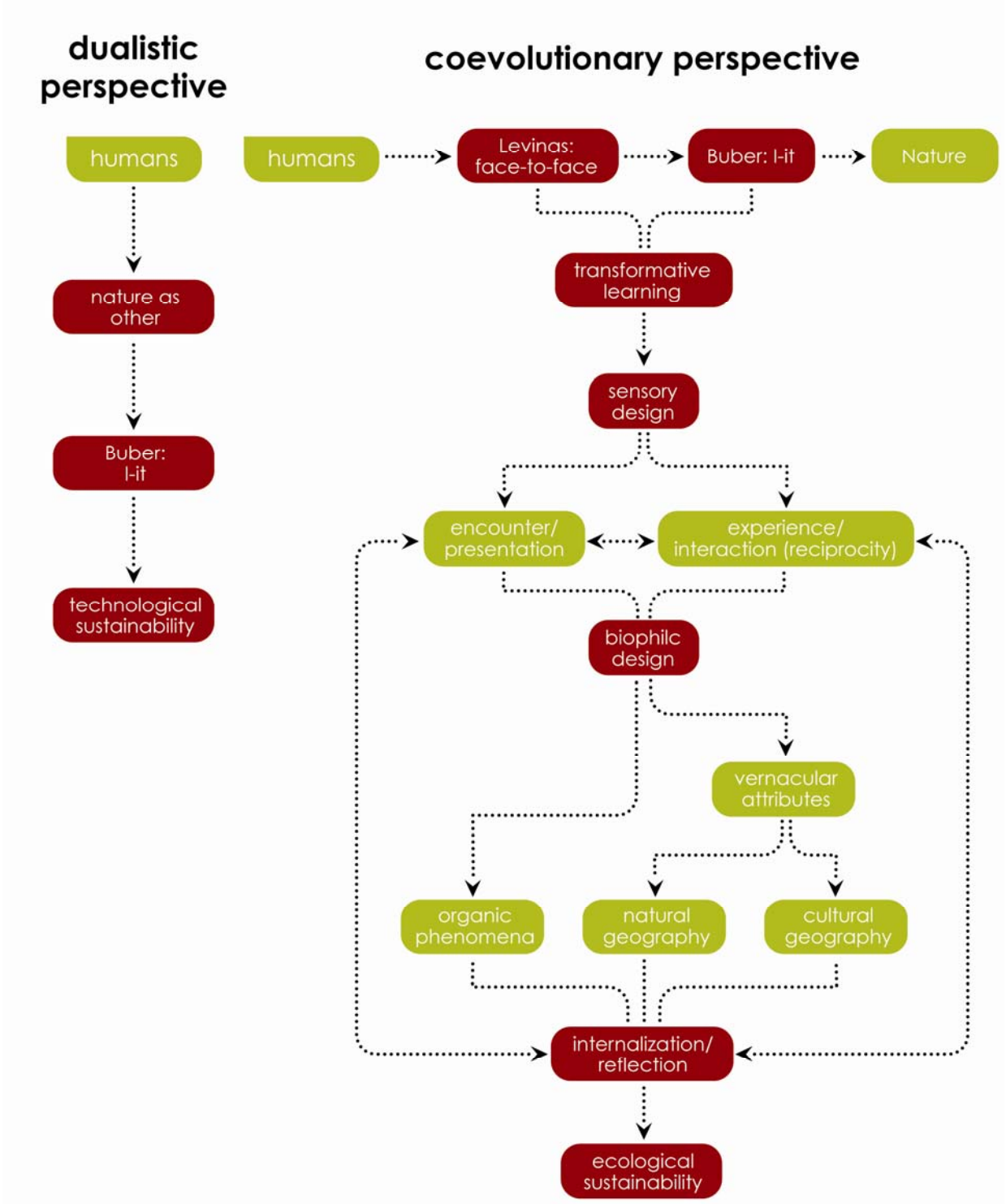


Figure 1.1. Opposing cognitive orientation models, depicting the concepts and theories explored, which divide and unite humans and nature, resulting in different types of sustainability.

1.4. Overview of Design Program

The design exploration utilized for this practicum speculates on a mixed-use, multi-unit residential development that is family and community-oriented. Succinctly, the objective of this facility is to create a unique interior environment that intermingles with the non-human world through biophilic elements drawn from organic natural phenomena and place. The purpose is to provide residents with opportunities to engage with nature in ways that promote physical and physiological health; create emotional, spiritual, and cultural meaning; and foster ecological behaviors. This strategy aims to enrich current sustainable design practice by bridging the human-nature divide through the creation of a holistic ecological approach rooted in the sensory systems and experience. The cognitive change, which this design project aims to achieve, is environmental consciousness based in an awareness of nature and place.

Starting from a broad perspective and working in, the design language utilized in this exploration enmeshes nature and community with the mixed-use development. Interconnecting these components is integral to creating a facility that is relevant to the vernacular attributes of place and the organic components of biophilic design. The facility is comprised of 10 private living units designed for young families with garden rooms, communal spaces (kitchen, multi-purpose room, gardening lounge, hall, laundry room, and organic summer food gardens), a daycare (with organic summer food gardens and exterior play area), and a café (with organic summer food gardens and greenhouse) that uses organic, on-site, and local food stuffs to as much of an extent as possible. Figure 1.2 demonstrates the relationship between these occupancies and the facility, community, and nature. This relationship is demonstrated by the proximity of each occupancy bubble to each area of the facility-community-nature matrix, the closer the proximity the stronger the connection created in the design exploration. Further, the

size of the occupancy bubbles relates to primary and secondary occupancies, with primary having the larger bubble.

The residential component of the facility, which is of primary concern to the design investigation, operates in a manner comparable to the co-housing model, with privately owned units supplemented by shared spaces. As in co-housing, residents of the facility are expected to take an active role in the planning and management of the residential component of the facility. This model has been utilized because it increases interaction between neighbors and between the users and the facility. A high level of involvement is important because it elicits emotional investment in the facility and fosters the development of support networks, which enable personal growth, as explained in subsection 2.2.1, "The Transformative Process." Further, the inclusion of shared spaces allows the floor space for each personal unit to be reduced to encourage a frame of reference that looks outward to the facility's community, to the broader community, and to nature. The reduction of personal space also facilitates engagement with the biophilic design elements, as they are predominantly in the communal and public spaces for optimal exposure. In contrast to this outward looking perspective, the daycare and café have been included in the program because they act to bring the broader community into the facility to enable a wider impact and a stronger sense of community affiliation. Further, the café is designed in a manner to promote community interaction. The relationship between nature, the internal and external community, and the facility is thus that of mutual enveloping and enfolding.

Indeed, this program was chosen because it combines the very personal aspect of home with hands-on nature experience (agricultural spaces) and community components (daycare and café). The involvement of children occurs because of the close correlation between engagement with nature at an early age and environmental stewardship later in life, as revealed by Wells and

Lekies (2006) previously mentioned research in subsection 1.1, “Project Rationale and Description.” The café, daycare, and food growing spaces, on the other hand, provide interesting opportunities to explore the indirect experience of nature as it relates to the taste/smell and kinesthetic sensory systems. Furthermore, the inclusion of food growing and composting spaces helps to create a direct and obvious cause and effect relation between human behaviors and nature.

Together, these occupancies respond to the issue of declining neighborhoods and communities, discussed by Kellert (2005) as affecting a sense of place. In addition, they deal with factors outlined in subsection 2.2, “Bridging the Natural and Built Environment,” which highlight the importance of experience that engages all of the senses in creating an awareness that enables a changed frame of reference.

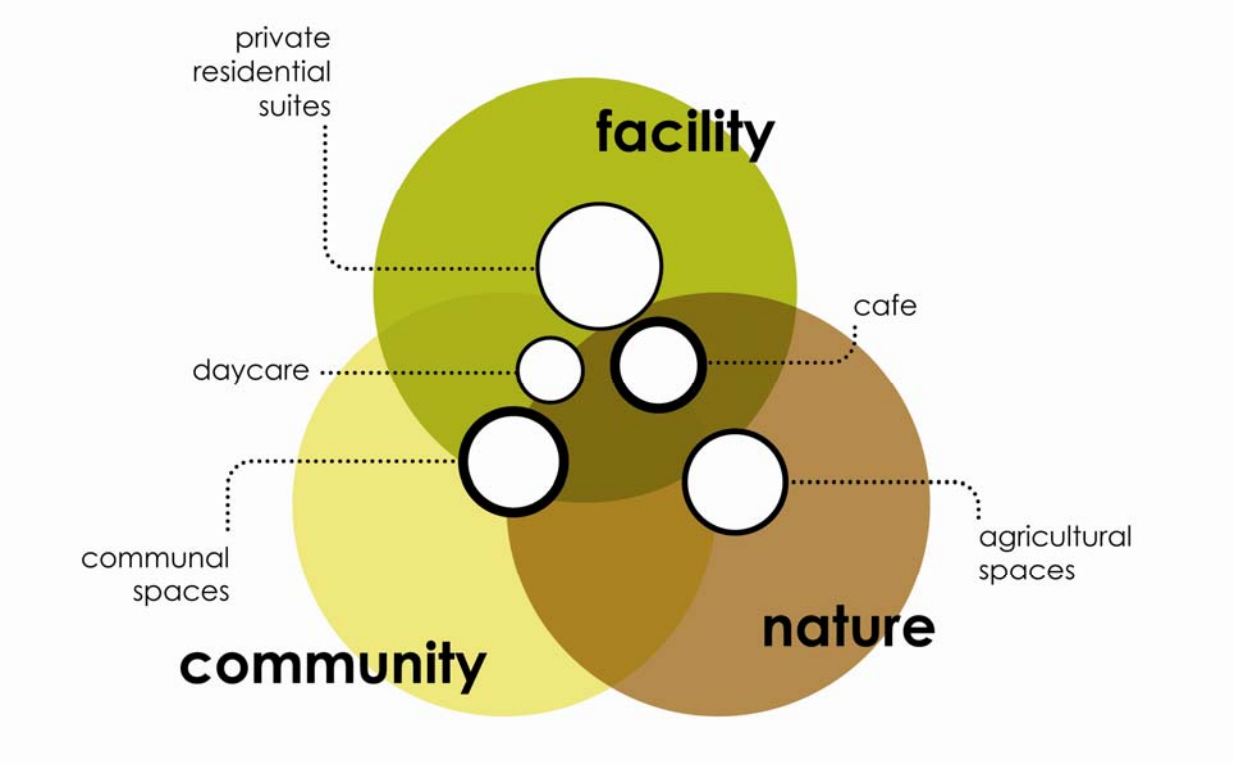


Figure 1.2. Programmatic conceptual framework depicting the relationship between the design facility, its occupancies, and the broader community and nature.

2. Design Investigation Site

2.1. Site Selection and Analysis

In selecting a site for my design practicum, I looked to Kellert's (2005) listing of contemporary factors that have exacerbated the human-nature divide, including the disassociation of people from place and the communities and landscapes where they live and work. From these factors, I distilled characteristics that were used in a process of eliminating non-prospective areas of the city, which include declining neighborhoods and communities; rapid social and geographic mobility; urban and suburban sprawl; loss of open space; and environmental degradation. Thus, as this practicum is concerned with the interior, I sought an existing urban community in Winnipeg that best avoids these land-use and design problems, while providing features that support the harmonizing of people and place, allowing a dialogue between the design and the site. Deduced from Kellert's (2005) work, *Building for Life: Designing and Understanding the Human-Nature Connection*, the harmonizing characteristics include these: a strong sense of place; overall good environmental quality; aesthetically pleasing roads; regional uniqueness; pedestrian-friendly streets; availability of amenities (for example, schools, post office, restaurants, and shops); close proximity to green spaces and open space; and abundance of diverse natural features (for example, waterways and mature trees) and preferred wildlife (for example, songbirds and squirrels).

Further, current issues relating to climate change were considered. These issues include the ever-deteriorating state of ecosystems, water resources, food security, settlements and society, and human health (Intergovernmental Panel on Climate Change [IPCC], 2007). The IPCC (2007) states that the increase in greenhouse gases, namely carbon dioxide (CO2), is the primary reason for the environmental crisis, and hence, declining environmental systems. In fact, CO2 emissions have increased between 1970 and 2004 by about 80%, from 21 to 38

gigatonnes, with amounts increasing almost every year. Thus, a location was sought that would enable the reduction of CO2 emissions through reducing dependency on single vehicular travel. In addition, the site needed to be located in or near the city center, ideally reusing an existing building in order to reduce sprawl, the use of virgin materials, and the use of green space.

Based on the preceding criteria, 210 rue Masson in Saint-Boniface, Winnipeg, Manitoba, Canada, was determined to be the most suited site for this design practicum (see Figures 2.1 – 2.3). The characteristics of the community that factored in this decision include the following: the abundance of public green space and parks (see Figure 2.1); streets lined with mature trees; close proximity and access to waterways, including the Red River skirting the north and west perimeters of the community and the Seine River to the east; the close proximity of many amenities such as grocery stores, shops, businesses, services, a hospital, a post office, and a community center (see Figure 2.1); the number of schools in the area, including several primary and elementary schools (English and French) and a university campus (see Figure 2.1); and the architectural distinctness and pedestrian-friendly quality of boulevard Provencher, which runs east-west through the center of the community and is lined with local shops and businesses (see Figures 2.4 – 2.7). Further, the community has a strong sense of place and regional uniqueness created by the vibrant Franco-Manitoban culture (determined by the prominence of historic buildings [see Figures 2.8 – 2.12], cultural artifacts, French-language schools, and cultural programming), which knits the community together. Finally, the pedestrian and vehicular accesses to the site are appealing as the community itself is not only walkable, due to factors mentioned above, but is central to Winnipeg's downtown center. In fact, the major downtown intersection of Portage Avenue and Main Street is only approximately 1.5 kilometers (0.9 miles) away. Public transportation is also highly accessible, as the area is serviced by multiple bus routes on main and secondary roads throughout (see Figure 2.13).

Figure 2.1. Land use surrounding the design investigation site located in Saint-Boniface, Winnipeg. Aerial image, 2005, property of ATLIS Geomatics Inc., used and modified with permission from the City of Winnipeg.

Figure 2.2. View of the north façade of the design investigation building, taken from the far north end of rue Aulneau near its intersection with boulevard Provencher. Image by Natalie Foidart.

Figure 2.3. View of the north-east corner of the design investigation building, taken from the east end of rue Masson. Image by Natalie Foidart.

From left to right: Figure 2.4. Sign demarking entrance into Saint-Boniface, Winnipeg, on the west end of boulevard Provencher. Image by Natalie Foidart.

Figure 2.5. Shops on the south-west corner of boulevard Provencher. Image by Natalie Foidart.

Figure 2.6. Mixed-use building on the north-west end of boulevard Provencher. Image by Natalie Foidart.

Figure 2.7. Buildings lining the west end of boulevard Provencher in Saint-Boniface, Winnipeg. Image by Natalie Foidart.

Figure 2.8. Original City Hall of Saint-Boniface built in 1905, located on boulevard Provencher at the north entrance of rue Aulneau. Presently the home of municipal offices and an art gallery. Image by Natalie Foidart.

Figure 2.9. Original Saint-Boniface Post Office built in 1909, located on boulevard Provencher. Image by Natalie Foidart.

Figures 2.10 – 2.11. Remnants of the 1906 Saint-Boniface Cathedral located on avenue Taché, designed by the Montreal architectural firm of Marchand and Haskell. Images by Natalie Foidart.

Figure 2.12. Saint-Boniface College established in 1818, located on avenue Cathedral. Image by Natalie Foidart.

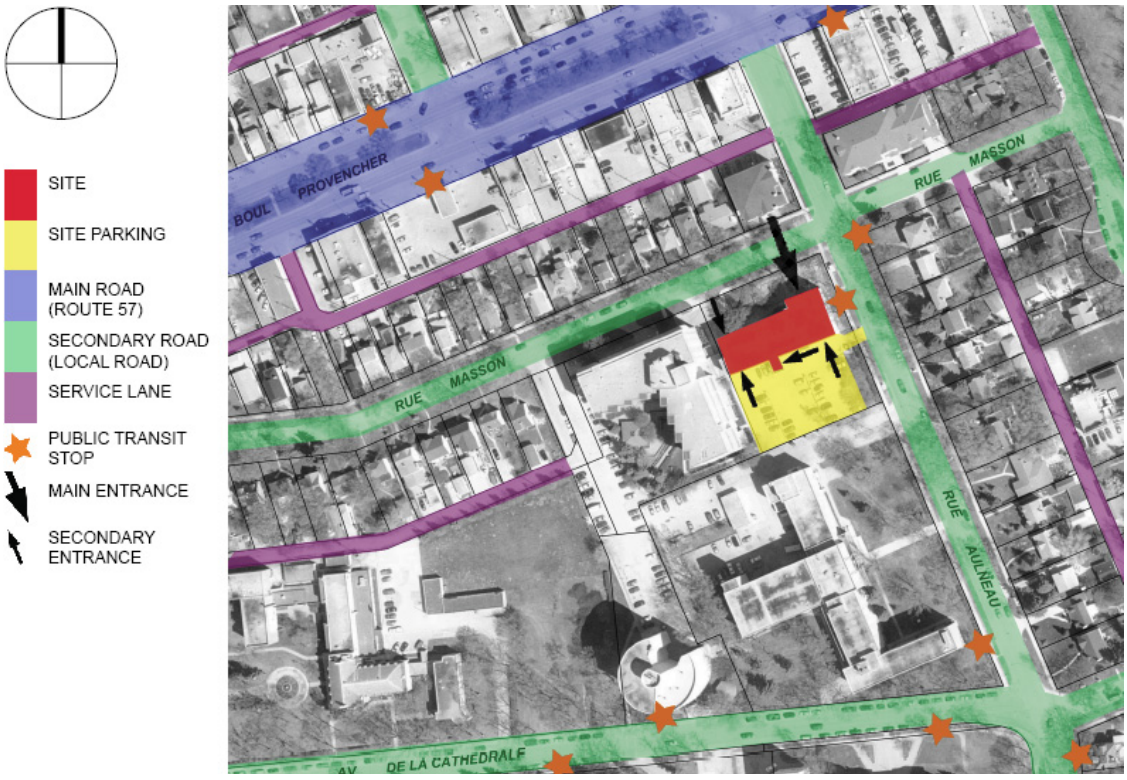


Figure 2.13. Circulation patterns surrounding the design investigation site located in Saint-Boniface, Winnipeg. Aerial image, 2005, property of ATLIS Geomatics Inc., used and modified with permission from the City of Winnipeg.

In further exploring the historic aspects of the site, Saint-Boniface is seen to have a rich cultural and religious background with many homes and buildings dating to the turn of the nineteenth century. Not only was this area a major trading centre, being located at the junction of the Red and Assiniboine Rivers, but it also was originally developed separate from Winnipeg, achieving city status in 1908. At its beginning, the area saw the development of the first Catholic Mission in the Northwest and developed into the leading French-language urban centre and capital of the Roman Catholic faith in Western Canada. In addition, the Grey Nuns set up schools, an orphanage, a hospital, an industrial school, and a home for the aged here (Saint-Boniface Museum, n.d.).

Today this area forms the French-speaking quarter of Winnipeg, a predominantly residential community mixed with low-rise commercial, cultural, and mixed-use buildings. The variety of zoning types around the 210 rue Masson site demonstrates this diversity in the neighborhood (see Figures 2.14). In regards to zoning, the proposed site for this design investigation is already coded a residential multi-family district. Although this is suitable for the residential component of the design project, a permit to change the zoning would be necessary because of the commercial café and daycare components of the program. It is highly probable that this change would be approved, as the site has commercial districts within one block to the north and west and the building currently houses a daycare.

Despite the diversity of building occupancies in the three-block radius of the site, the area still has a predominantly human scale, with few buildings above two-stories. Those that are above three-stories, with few exceptions, either have been significantly set back from the sidewalk or are fully or partially tiered, with the higher level floors recessed from the façade of the lower levels (see Figures 2.4 – 2.7). This is not only true of older structures but also includes those recently built, and in the planning stages, which include a number of new

commercial and multi-unit developments. Together these developments not only contribute to the area by increasing foot-traffic and bringing jobs into the community but they signal its revitalization and joie de vivre.

Figure 2.14. Zoning surrounding the design investigation site located in Saint-Boniface, Winnipeg. Aerial image, 2005, property of ATLIS Geomatics Inc., used and modified with permission from the City of Winnipeg.

Residential projects completed in the last few years include a mixed-use development called Place Joseph Royal on boulevard Provencher, offering commercial space on grade and 58 residential units on the six floors above; in addition, 500 avenue Taché is a 79-unit Knights of Columbus condominium complex for age-50-plus (McNeill, 2009). In the pre-construction selling phase is Verve Taché Condominiums, a four-story, 62-unit development located at the corner of avenue Taché and rue Aubert (StreetSide Development Corporation, 2009), which also has a second phase in the planning stages for a lot across rue Aubert (McNeill, 2009).

On the non-residential side of development, the new, highly anticipated national Canadian Museum for Human Rights has begun construction and is scheduled for completion in

2012 (McNeill, 2009). This project is located on the western side of the L'esplanade Riel, north of the Forks Market. Furthermore, the oldest running Canadian theater company, Le Cercle Molière, is also in the process of building its new 125-seat theater on boulevard Provencher (Cercle Molière, n.d.). In addition, Caisse Saint-Boniface has begun work on its new corporate headquarters scheduled for completion in late 2010. This building will be an office and retail development that will be located on three building lots on boulevard Provencher (McNeill, 2009). Finally, in the very early conception stages are a multistory office/retail complex for a empty parcel of land on the south side of boulevard Provencher and either another office/retail complex or a hotel for an empty lot on the north side (McNeill, 2009).

On another point, looking more specifically at the exact building site for the project, 210 rue Masson was chosen as the location for the design investigation since the property and structure have many characteristics that are favorable to the project. The remainder of this section will look at the site characteristics affecting the lot and the building's exterior, with the structural and interior building characteristics to follow in the next subsection.

In particular, when the site was examined, three features were observed that are highly favorable to the design project as they are linked to biophilic design. These qualities are the existence of mature vegetation, abundance of natural light, and proximity to open space. To begin, favorable views exist around the building due to the variety and density of mature vegetation (or direct nature as it is referred to in the biophilic design process) outside the building on the north and east sides, skirting the parking lot to the south, and lining the streets of all of the adjacent roadways (see Figures 2.15 – 2.21). Furthermore, pleasing vistas are offered with the canopy of branches and well-kept single-detached residential buildings with local character, framing the views (see Figures 2.19 – 2.20). Neighboring large-scale buildings to the site include the Oblates Soeurs de Saint-Boniface, a nunnery to the south of the parking

lot (see Figure 2.22). Directly across the street to the north is a small condominium complex with six units (see Figure 2.23). Across the intersection on the northeast corner of rue Masson and rue Aulneau is another larger condominium complex (see Figure 2.24). Finally, L'Accueil Colombien, a retirement home complex, neighbors the site to the west (see Figure 2.25).

From left to right: Figure 2.15. North garden of design building looking east. Image by Natalie Foidart.

Figure 2.16. South parking lot behind design building. Image by Natalie Foidart.

From left to right: Figure 2.17. North garden of design building looking west. Image by Natalie Foidart.

Figure 2.18. East façade of design building looking north toward boulevard Provencher. Image by Natalie Foidart.

From left to right: Figure 2.19. View on the north-east side of the design building. Image by Natalie Foidart.

Figure 2.20. View on the east side of design building. Image by Natalie Foidart.

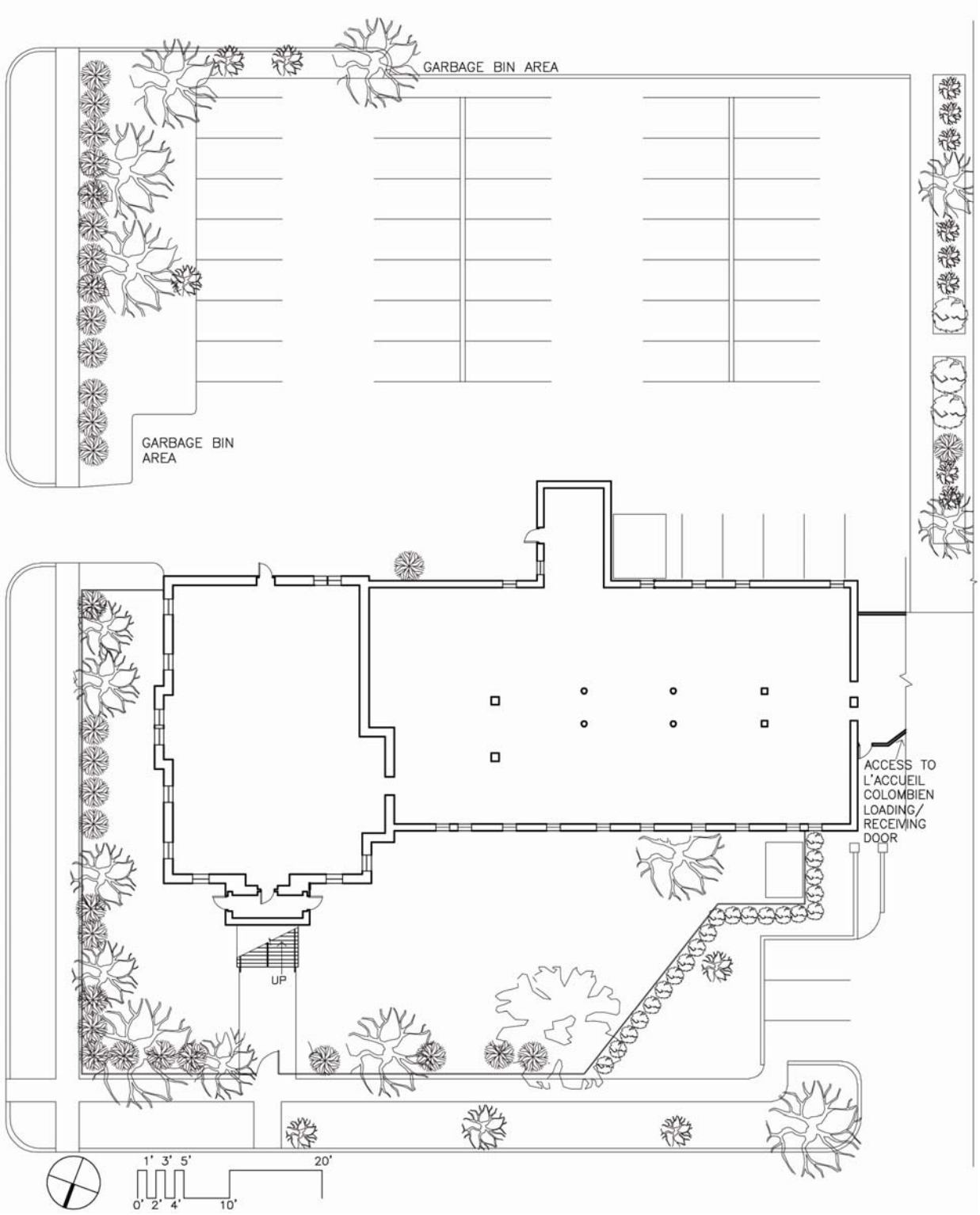


Figure 2.21. Site plan of design site depicting the existing parking lot and vegetation. Image by Natalie Foidart.

From left to right: Figure 2.22. Oblates Soeurs de Saint-Boniface, a nunnery to the south of the design site's parking lot. Image by Natalie Foidart.

Figure 2.23. Small condominium complex to the north of the design building. Image by Natalie Foidart.

Figure 2.24. Condominium complex to the north-east of the design building. Image by Natalie Foidart.

Secondly, in addition to the benefit of the parking lot for its typical use, its ample size, and its location on the property, the lot also allows ample south light to hit the building exterior and roof. In fact, there is approximately 114 feet (34.7 meters) of uninterrupted open space from the building to the property line on this side. However, when the sun is low in the western hemisphere, the closely neighboring building to the west, L'Accueil Colombien Inc. (see Figure 2.25), casts a shadow on the southwest corner of the building and the west side of the parking lot (see Figure 2.26). Despite this tall building, the amount of light hitting the south façade and roof is ample for the investigation of indirect nature, a component of biophilic design, in these areas. Important, too, to the availability of light is that the site is a corner lot and has substantial setbacks, 16.4 feet (11 meters) on the east side of the building to the property line, and 42.5 feet (13 meters) on the north side of the building to the property line, thus allowing ample light to hit and penetrate the building.

Figure 2.25. L'Accueil Colombien Inc., neighboring on the west side of the design building. Image by Natalie Foidart.

Figure 2.26. Shadow and light hitting the south façade of the design building. Image by Natalie Foidart.

Thirdly, the ample space outside the north, east, and south façades, because of the nature of the corner lot, neighboring low-rise and residential buildings, and the parking lot, allow ample room for the investigation of Heerwagen and Gregory's (2008) natural aesthetic principles of sense of freeness and prospect and refuge. Then too, this feature allows space for the exploration of transition points and design expressions that traverse the shell of the building.

In addition to the three points already discussed, other beneficial characteristics of the site include the ease of access, the availability of pedestrian foot traffic, limited noise, and the variety of micro-climatic conditions created by sun and wind patterns. On the first point, vehicular traffic can access the site by either rue Aulneau or rue Masson, both of which are secondary two-way streets that branch off main thoroughfares. Moreover, there is ample street parking for the building, located directly off rue Aulneau, as well as numerous access points to the building, two on the north side and three off the parking lot on the south side (see Figure 2.13). On the second point, as the site is located just off boulevard Provencher and minutes walk up the street from the university campus, there is foot and vehicular traffic from which to

draw on for the café. Next, although the site is prominently located close to busier streets, negligible noise can be heard throughout most of the day, since there is only light traffic on both rue Masson and rue Aulneau. The exception is the slight rise around the hours of 9:00 a.m., 3:00 p.m., and 5:00 p.m. due to the schools in the area and commuting business people. Lastly, in regards to the micro-climatic conditions, the building location and orientation enables the exploration of two distinct landscape spaces. The first space is a north facing sheltered area with dense mature vegetation and diffuse light. This area of the property is cut off from the prevailing south winds and secondary winds coming from the west (Environment Canada, 2004) by the building itself and the neighboring building to the west. The second space is the south facing exposed area with direct light and wind (Environment Canada, 2004), which is afforded some protection from the wind with the tall L'Accueil Colombien Inc. to the west and the deciduous tree-lined property edges to the south and east (see Figure 2.27).

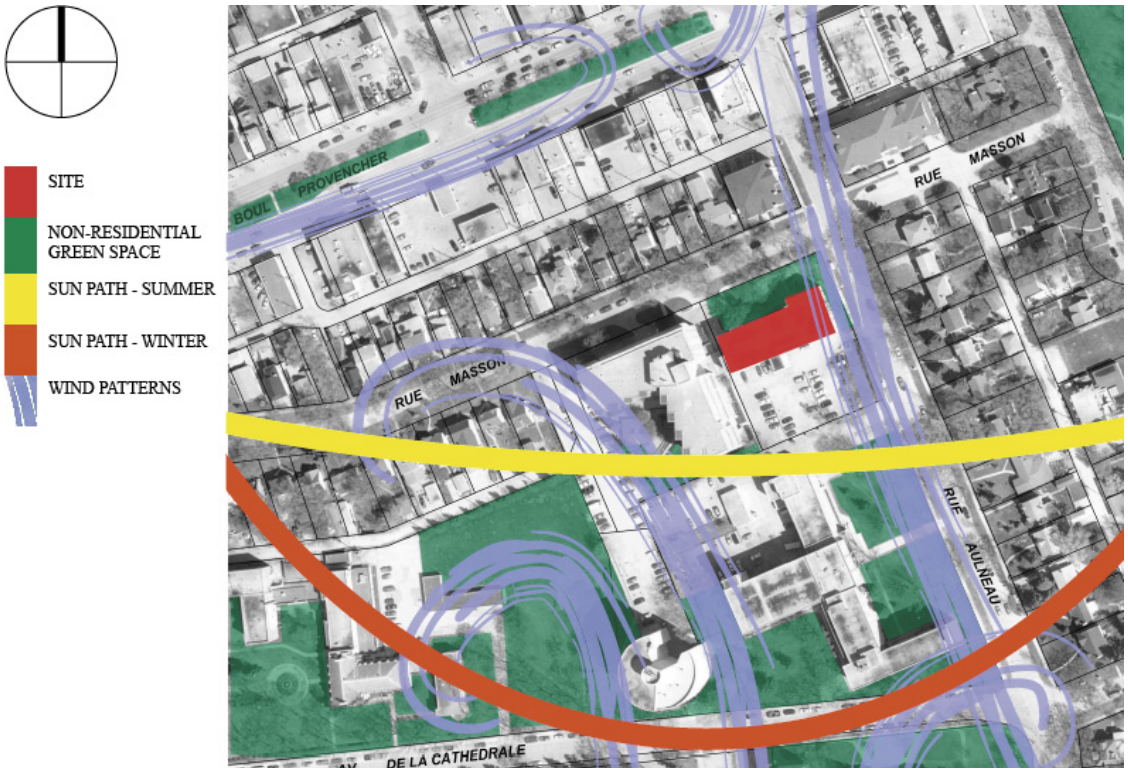


Figure 2.27. Environmental conditions of the design investigation site in Saint-Boniface, Winnipeg. Aerial image, 2005, property of ATLIS Geomatics Inc., used and modified with permission from the City of Winnipeg.

2.2. Summary of Opportunities and Constraints of Site Factors

The opportunities provided by the site include the following:

- Existing and to-be-built business, services, recreation facilities and cultural centers, and schools create a walkable community.
- Increased density created by new multi-unit developments in the area will facilitate the opening of more business and services in the area, further supporting the health of the community.
- Commercial developments and increased density created by mixed-use and multi-unit developments in area will provide foot traffic for the café component of the project.
- Diversity of the community enables the mixed-use component of the project to easily fit in and be viable.
- Close proximity to downtown does not detracted from the unique community feel.
- Diversity of the neighborhood in terms of facilities and services for all ages and groups easily allows people to stay in the area as they age.
- Public transportation is readily accessible.
- Ample parking is available with ease of access for users.
- Distance from the road allows increased safety and decreased noise and smell from traffic.
- The human scale of the community creates ease and a sense of warmth.
- A strong existing social and cultural fabric is present with which the project can interweave and draw on vernacular features.

- An abundance of heritage buildings provides a unique and interesting character to the neighborhood.
- Access and proximity to existing green spaces, parks, and streets lined with mature trees enable the design to draw from local direct nature external to the building.
- Ample south light is available on the exterior and interior to investigate indirect nature expressions.
- Ample space around the building provides opportunities for the exploration of transition points and design expressions that traverse the shell of the building.

Constraints created by the site include these:

- Neighboring L'Accueil Colombien Inc. has an imposing scale and partially blocks light during certain hours of the day.
- The strong French character of the neighborhood may be a deterrent for some potential users.
- The strong French character may make integration into the neighborhood more challenging for English users.
- New developments and increased density may create traffic and noise problems near the site.

2.3. Building Selection and Analysis

As discussed in the previous sub-section, within the Saint-Boniface community 210 rue Masson was chosen as the building for the design investigation (see Figures 2.28 – 2.33). The building selection process was guided by the programmatic size and layout requirements outlined in section 4, “Functional and Aesthetic Program,” and the vernacular component of biophilic design, defined by Kellert (2005) as “the tailoring of the built environment to the particular physical and cultural places where people live and work” (p. 165). With regards to the second point, the indicated building has been a significant part of the fabric of Saint-Boniface for over 100 years, being one of the oldest, prominent large-scale buildings in the area. The community has literally been built up around this structure, and as such, it has helped to shape the overall visual presence, material qualities, and sensory characteristics of the neighborhood.

Figure 2.28. Front (north façade) of the design site with front garden, located at 210 rue Masson, Winnipeg, Manitoba. Image by Natalie Foidart.

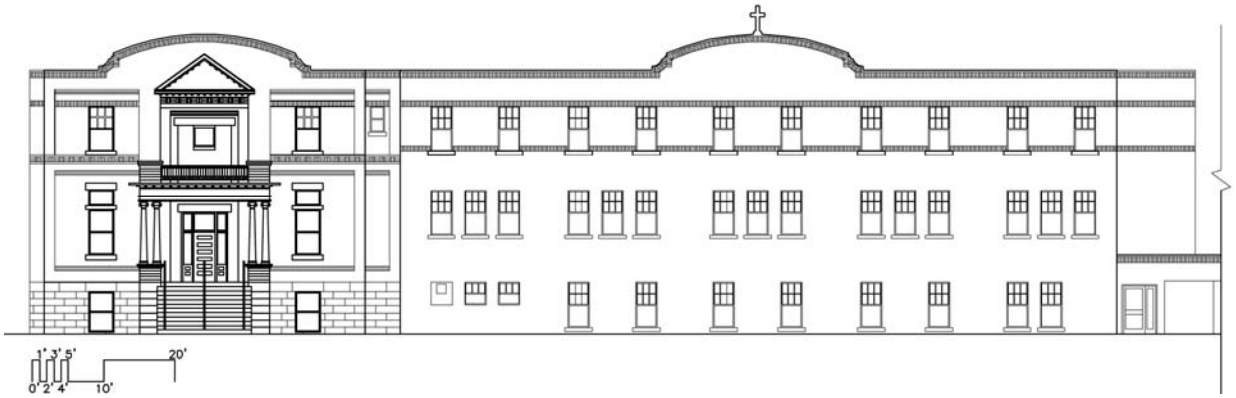


Figure 2.29. Elevation of the north façade of the design site. Image by Natalie Foidart.

Figure 2.30. Rear (south façade) of the design site with parking lot. Image by Natalie Foidart.

Figure 2.31. Elevation of the south façade of the design site. Image by Natalie Foidart.

Figure 2.32. Elevation of the east façade of the design site. Image by Natalie Foidart.

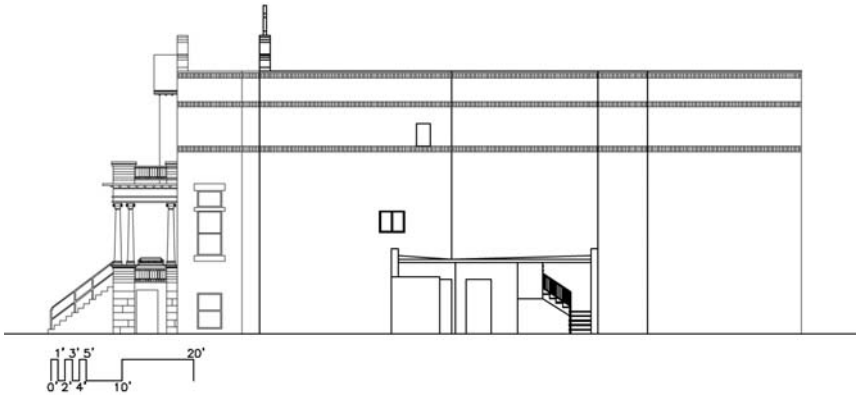


Figure 2.33. Elevation of the west façade of the design site. Image by Natalie Foidart.

Regarding the building's history, 210 rue Masson was originally the home of the Saint-Boniface Normal School and was utilized as a school (although changing names and programming several times) until 1972. After this original use, the building was converted into housing for elderly persons and was renamed Foyer Notre Dame and later Residence Langevin. Then, in 1980, it was sold to the Oblate Sisters and was utilized by L'Accueil Colombien, a retirement and life-care facility neighboring 210 rue Masson to the west. In recent history, it has been the home of offices, a childcare center, and residential units for elderly persons with physical challenges (City of Winnipeg, 1989).

Historical construction of 210 rue Masson was in three stages (see Figure 2.34). The eastern section of the building, designed by Henry Sandham Griffth and constructed by Joseph Azarie Senecal, was completed in 1902, with an addition of a similarly designed western section in 1928. Around 1980 a link, connecting 210 rue Masson to L'Accueil Colombien, was

also added (City of Winnipeg, 1989). This one-story link contains a stairwell and elevator that access all three levels of 210 rue Masson, as well as north and south on-grade entrances into 210 rue Masson (see Figures 2.35 – 2.36). L'Accueil Colombien can only access the interior of the link through the on-grade portion of the structure, which has a locked fire door between L'Accueil Colombien and the link. In addition, on the north side of the link there is an opening that accesses a loading/receiving door on the northeastern exterior wall of L'Accueil Colombien.

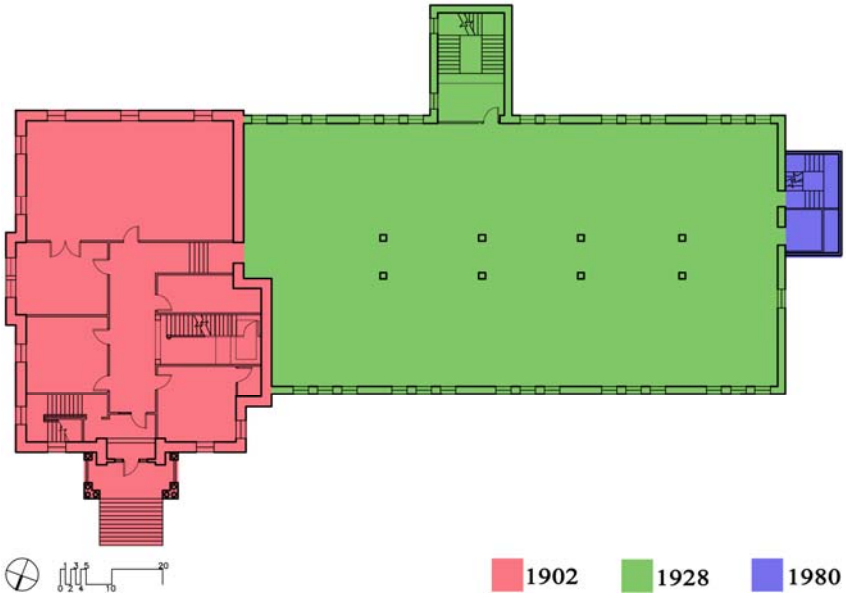


Figure 2.34. Main floor of 210 rue Masson showing the three stages of construction. Image by Natalie Foidart.

From left to right: Figure 2.35. North façade of the link connecting 210 rue Masson and L'Accueil Colombien. Image by Natalie Foidart.

Figure 2.36. South façade of the link connecting 210 rue Masson and L'Accueil Colombien. Image by Natalie Foidart.

The entire building is a two-story masonry structure with a raised basement, making three floor levels in total. Although a predominantly functional design, the eastern section exhibits more ornamentation with neoclassical detailing, mainly on its north façade, around the main entrance. Here, the façade is adorned with a portico, attached wooden ionic columns, an entablature and pediment with brackets and dentils, and a stone lintel (see Figure 2.37). Further, the raised basement is emphasized in the 1902 section by a local rough-cut Tyndall stone foundation contrasting against patterned yellow-buff Tyndall stone brick walls (see Figures 2.38 – 2.39). The 1902 section was originally even more ornamented as it had a truncated hip roof with side gables and a cupola that crowned the porch and frontispiece until the 1928 addition was added (see Figure 2.40). At this point, the roof was flattened and a parapet was used to integrate the two sections with matching segmental arches being added in the center of each section (City of Winnipeg, 1989). A similar looking brick was used to blend the visual appearance. However, the 1928 addition was built in a more utilitarian manner with only some brick patterning and smooth Tyndall stone sills for detailing (see Figure 2.41).

Figures 2.37 – 2.39. Design details from the north façade of 210 rue Masson. Images by Natalie Foidart.

Figure 2.40. 210 rue Masson (Normal School) shortly after the 1902 completion, before the 1928 addition. Public domain image from the Oblate Sister Archives, Winnipeg, Manitoba April 05, 2010.

Figure 2.41. 1928 addition with simple, utilitarian detailing. Image by Natalie Foidart.

In addition to the vernacular characteristics and local materiality, the building also provides adequate space for the program requirements of this design project. The footprint of the entire building is approximately 8,978 square feet (834 square meters), not including the link the on the west side and the enclosed stair on the south side. With these spaces, it is approximately 9,656 square feet (897 square meters). Respectively, each interior floor of the 1902 section has approximately 2,700 square feet (251 square meters), and each interior floor of the 1928 section (without the link and south stairwell) has approximately 5,266 square feet (489 square meters), totaling 7,966 square feet (740 square meters). The overall interior area of all the floors is thus approximately 23,898 square feet (2,220 square meters). For more specific spatial requirements for the design project, see section 4, “Functional an Aesthetic Program.”

Moreover, when considering the suitability of this building for the design project, several important structural and functional details were considered, including the existing column grid, structure of interior partitions, accessibility, and egress. With regards to the first point, the column structure of 210 rue Masson is well suited to a multi-unit residential layout since it was originally constructed for classroom use, with a typical east-west span between columns in the 1928 section being approximately 19 to 20 feet (5.8 to 6.0 meters), a north-south span being between around 21 to 22 feet (6.4 to 6.7 meters), and central corridor span of almost 6 feet (1.8 meters). Similarly, the 1902 section has large spans between columns, but the bays are more inconsistent in size with the east-west span being between 14 feet 9 inches (4.5 meters) and 19 feet 9 inches (6 meters) due to jogs in the exterior wall, with a central corridor of 9 feet 6 inches (2.9 meters). The north-south span is even more inconsistent with the spans being 23, 14, 8, and 15 feet (7, 4.3, 2.4, and 4.6 meters) respectively.

The structure of the interior partitions also pose problems for the project since the main and second floors of the 1928 section and all three levels of the 1902 section are currently

divided into small rooms, which are located off central hallways with no natural light (see Figures 2.42 – 2.44). In addition to the awkward size of the spaces, these walls are not sufficient for fire separation or security between living units. Furthermore, there has been significant damage to interior finishes in the second floor of the 1928 section due to a leak, as well as finishes in the northeast corner of the 1928 section due to fire. Thus, many of the interior walls, which are constructed of steel stud and gypsum board, are not adequate or sufficient for safety reasons and will need to be demolished to retrofit the structure. Many of the interior finishes too, particularly flooring and ceilings, have significant wear and tear due to age, thus requiring replacement. Exceptions include the masonry boiler room and exterior walls, and the terrazzo flooring in the main floor of the 1902 section. Further, the rooms on the main level of the 1902 section are in excellent shape and need to be protected due to a heritage designation that will be explained shortly. As a result, special care will need to be taken to ensure fire code requirements are met while conserving these features. The basement of the 1928 section will not require significant demolition either as it is already predominantly open (see Figure 2.45).

The next point to discuss is egress and accessibility to the building, the main access point being the above grade main entrance on the north side of the 1902 section, which is approximately 7 feet (2.1 meters) off the ground (see Figure 2.28 – 2.29). Other access points include a door off the parking lot on the south side of the building that enters into the partially above ground basement of the 1902 section, which has its floor 3 feet (0.9 meters) below grade (see Figure 2.46). There is also an east-facing door on the stairwell protrusion on the south side of the 1928 section. Upon entering this door, the user must immediately ascend or descent stairs. It must be mentioned too that there are two access points under the main entrance stairs on the east and west facing sides. These doors lead to interior stairs that access the above ground basement and resemble those on the south side of the basement. More importantly, though, as

these doors exist, they are not usable by the public because of insufficient height, being below 7 feet 8 inches (2.3 meters) tall, and the area under the stairs poses safety issues, since it is not properly finished. As they currently exist, then, these access points are unacceptable because they are not universally accessible, meaning persons with mobility issues cannot enter with ease.

On the other hand, the building has two points of access that are exceptions, the north and south facing on-grade entrances in the link. These doors are universally accessible because the link contains both stair and elevator access to all three floors of the 1928 section (see Figures 2.35 – 2.36). Although these doors are accessible, it must be noted that it is ethically important for all people to be able to access the main entrance of a building, a situation that is addressed in the design. Moreover, the link cannot exit in its present form in the new design because the connection to L'Accueil Colombien poses security risks and does not allow the required distance between neighboring buildings required by the fire code, making it unviable as a primary entrance.

In discussing access further, despite the two doors that are accessible, the building has problems regarding interior access to the whole building for those with mobility issues, which creates code related egress deficiencies. These deficiencies are created by the floor level changes between the 1902 and 1928 sections on the main and second levels (see Figures 2.47 – 2.48). Presently, a person with a mobility issue can access the whole 1928 section through the elevator in the link, but that person would not be able to get into the 1902 section through the inside of the building because stairs are the only means of travel (see Figures 2.49 – 2.50). These stairs present a significant problem for life-safety and egress from the 1902 section, as it does not have any refuge areas in its stairwells. Moreover, the basement in both of the sections does not have any refuge points, and the main level only has one refuge in the extension off the south side of the building. These pose significant problems that require attention in the design.

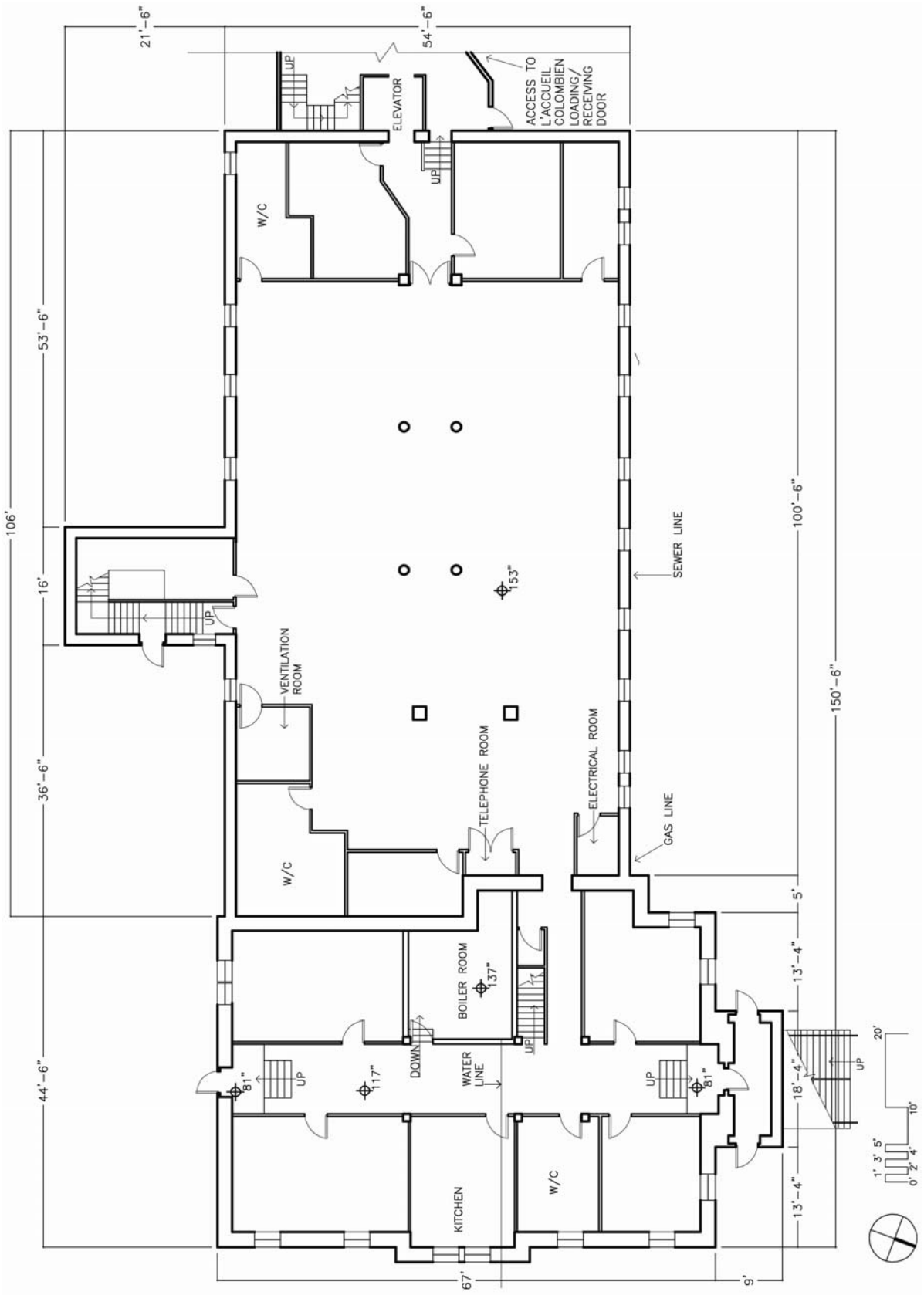


Figure 2.42. As built plan of the basement of 210 rue Masson. Image by Natalie Foidart.

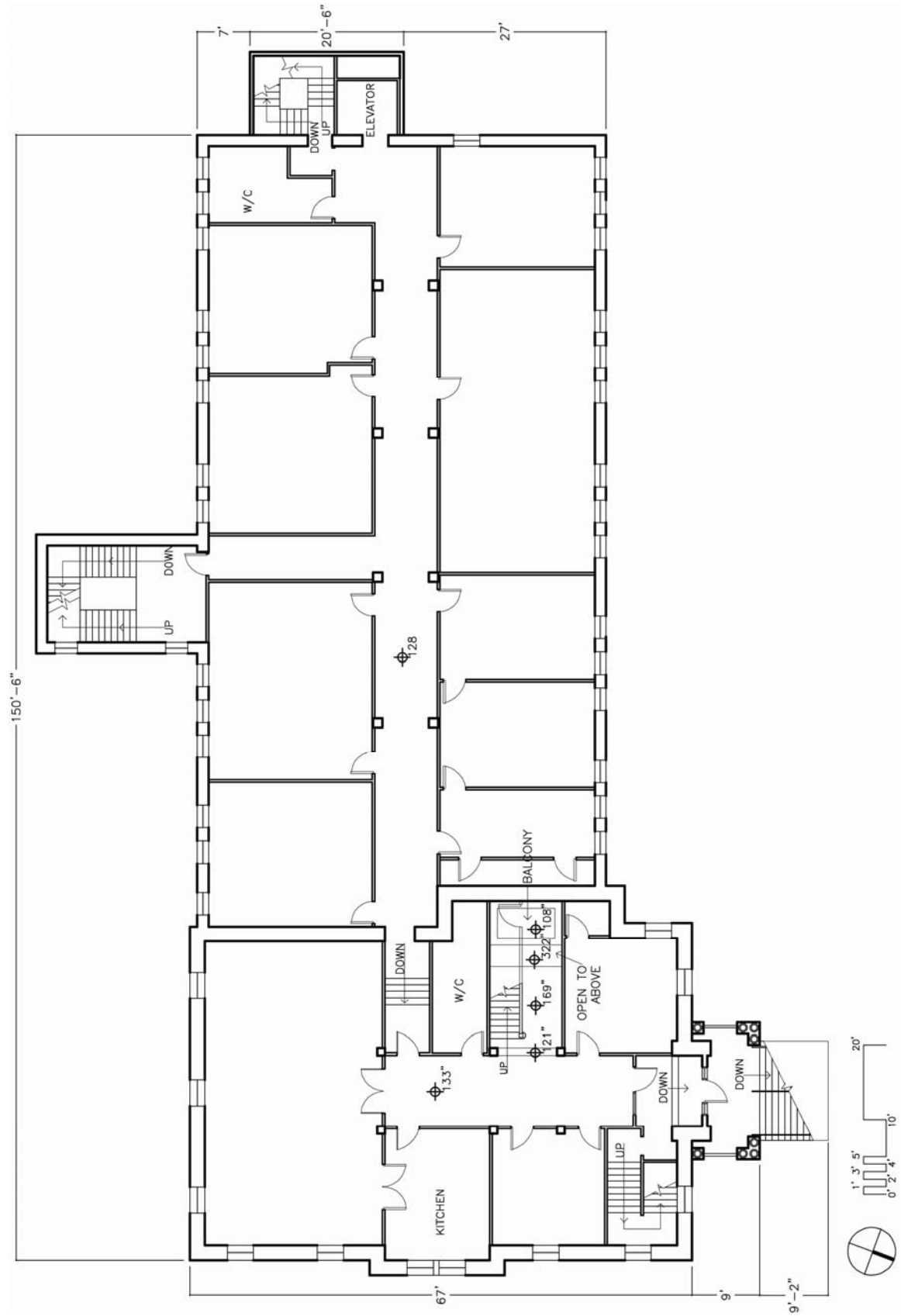


Figure 2.43. As built plan of the main floor of 210 rue Masson. Image by Natalie Foidart.

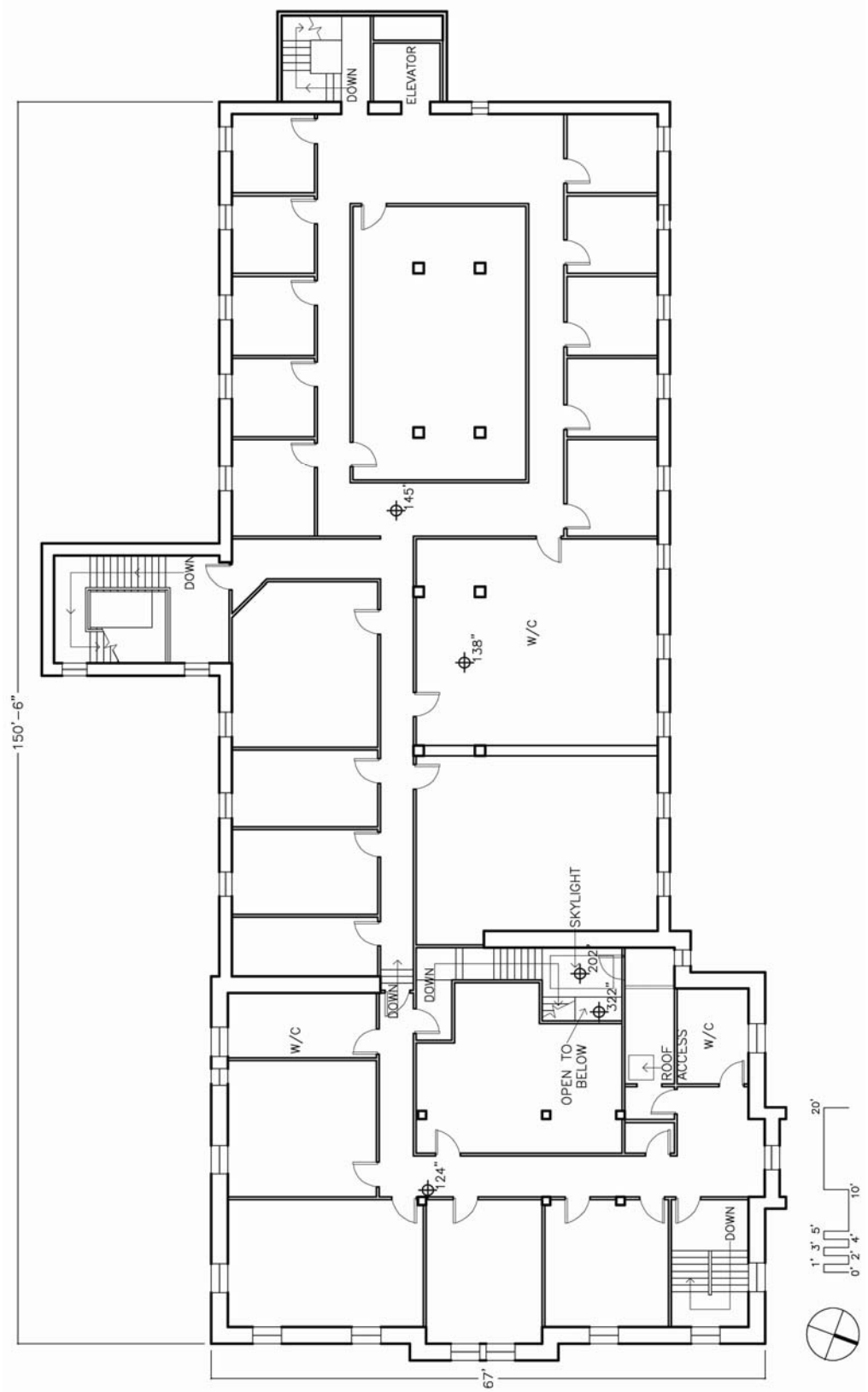


Figure 2.44. As built plan of the second floor of 210 rue Masson. Image by Natalie Foidart.

Figure 2.45. Existing open plan basement in the 1928 section of 210 rue Masson. Image by Natalie Foidart.

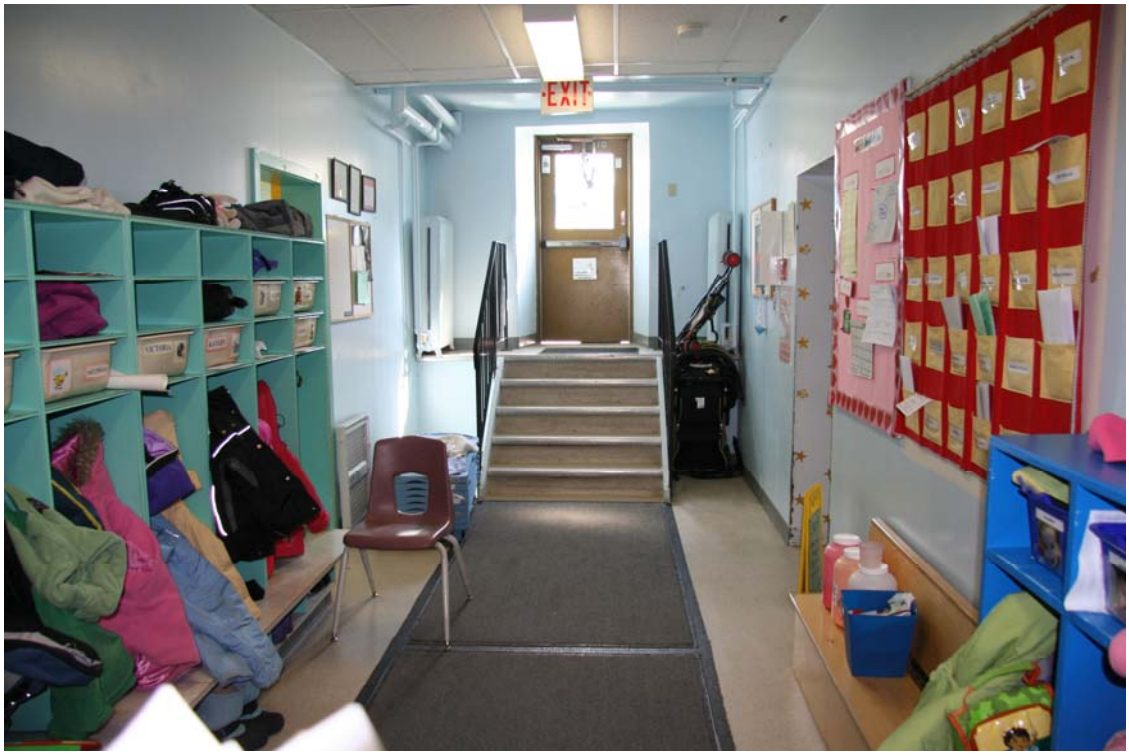


Figure 2.46. Existing entrance on the south side of the 1902 section of 210 rue Masson. Image by Natalie Foidart.

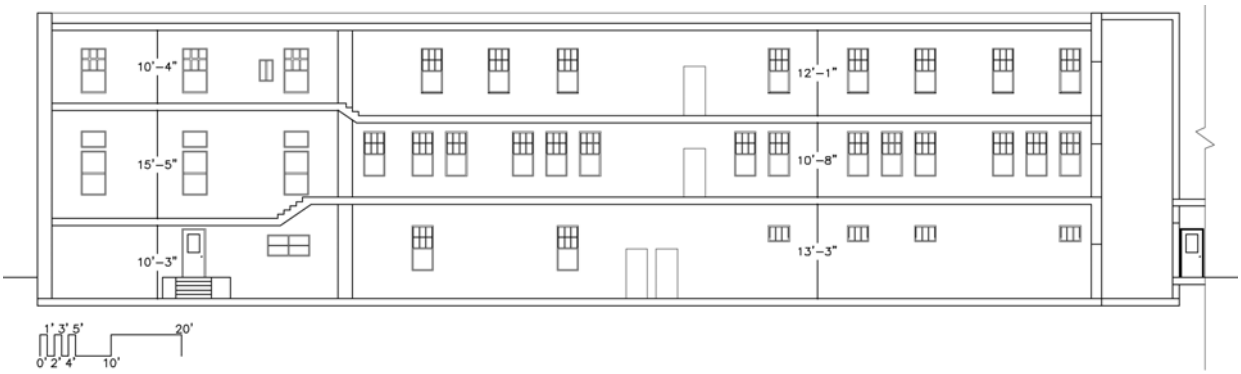


Figure 2.47. East-west section of 210 rue Masson looking south. Image by Natalie Foidart.

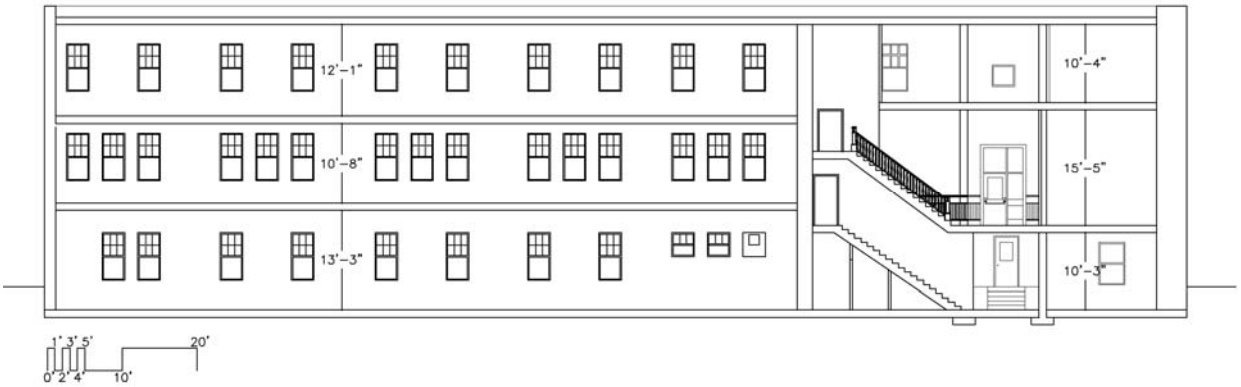


Figure 2.48. North-south section of 210 rue Masson looking north. Image by Natalie Foidart.

From left to right: Figure 2.49. Steps between the 1902 and 1928 building sections on the second floor. Image by Natalie Foidart.

Figure 2.50. Steps between the 1902 and 1928 building sections on the main floor. Image by Natalie Foidart.

In discussing the aesthetic qualities of the interior, significant characteristics and qualities that affect the design were examined. These include the impact of the previously mentioned heritage designation and the quality and penetration of natural light into the building. On the first point, 210 rue Masson was designated as a *Grade II Heritage Building* on September 11, 1989, by the city of Winnipeg's Historical Buildings Committee, creating a constraint in the design process. This designation essentially means that specified components of the building are of special architectural or historical interest and also means that these elements are protected from effacement or destruction. In this instance, the wooden chair railings, wainscoting, fireplace and mantel, and window moldings on the main floor of the 1902 building, as well as the wooden banister and staircase between the main and second floor of this building, are protected (see Figures 2.51 – 2.53). The building's shell and all other floors of the building have not been protected (City of Winnipeg, 1989). Thus, the designated components are only in a small section of the building, and in fact, add significant vernacular detail to the interior, which is predominantly functional and void of ornamentation.



Figures 2.51 – 2.53. Grade II heritage designated components in the 1902 section of 210 rue Masson on the main level. Images by Natalie Foidart.

Secondly, the quality and amount of daylight entering the building is of great importance to this project because of its importance to biophilic design, as was discussed in

subsection 1.1.1, “Theoretical Conceptual Framework.” Favorably to the design exploration, 210 rue Masson not only has the benefit of a significant amount of north, east, and south light entering the building but all three penetrate deeply into the structure as well. To demonstrate the south and east light, Figures 2.54 – 2.57 show images from various rooms in both the 1902 and 1928 sections, without interior lighting on. Not only do these images depict well-lit rooms in the day without the use of artificial light but also the direct light coming from the south is penetrating at least 20 feet (6 meters) into the building. Further, Figures 2.58 – 2.59 demonstrate the significant amount of diffuse light that enters from the windows on the north façade. Also of significance, the 1902 section has a large skylight above the heritage-designated stairs that penetrates light down into the central area of the main level (see Figures 2.60 – 2.61).

From left to right: Figure 2.54. South sunlight penetration in 1902 main floor. Image by Natalie Foidart.

Figure 2.55. South sunlight penetration in 1928 main floor. Image by Natalie Foidart.

From left to right: Figure 2.56. South and east sunlight penetration in 1902 second floor. Image by Natalie Foidart.

Figure 2.57. South sunlight penetration in 1902 main floor. Image by Natalie Foidart.

From left to right: Figure 2.58. Diffuse sunlight penetration from north facing main floor windows in the 1928 section. Image by Natalie Foidart.

Figure 2.59. Diffuse sunlight penetration from north facing second floor windows in the 1928 section. Image by Natalie Foidart.

From left to right: Figure 2.60. Skylight above the heritage-designated stairs in the 1902 section. Image by Natalie Foidart.

Figure 2.61. Sunlight penetration from the skylight into the central area of the main level of the 1902 section. Image by Natalie Foidart.

Lastly, the existing building systems were examined for their possible use in and impact on the design. To begin with, the building is heated by a natural gas-fired, hot water radiation system (see Figure 2.62). The pipes that feed the radiators are mostly exposed on the interior walls of the building, with the exception of the pipes in the heritage-designated areas, which are concealed within the walls. Further, most of the radiators are cast iron (see Figures 2.58 – 2.59),

although a couple of rooms with lower windows in the upper floor of the 1902 section have baseboard convectors (see Figure 2.56). The hot water boiler for this system is located in a fully masonry room on the first floor of the 1902 building, in the center of its western wall (see Figure 2.42). The hot water tank is also in this room (see Figure 2.63). The water line that feeds both of these systems branches off the main city lines on rue Aulneau and enters the building underground in the center of the eastern wall (see Figure 2.42). Conversely, the gas line enters the building on the western corner on the front façade of the 1902 section (see Figures 2.42 and 2.64). Turning to the cooling of the building, the only area with air conditioning in the whole building is the large room that takes up most of the above ground basement in the 1928 addition. This space has two condenser units, located in a closed room near its southeastern corner (see Figures 2.42 and 2.65). Next, the electrical panels for the building are in the northeastern corner of the 1928 addition (see Figures 2.42 and 2.66), the electrical line feeding the building being connected through the L'Accueil Colombien Inc. building. This line requires disconnection as the facility in the design investigation is a separate entity from this building, requiring a separate line that directly connects to the city grid. Lastly, the sewer lines connect to the building on the north façade at the center of the 1928 addition (see Figures 2.42 and 2.67).

Figure 2.62. Natural gas-fired, hot water radiation system located in the basement of the 1902 section. Image by Natalie Foidart.

From left to right: Figure 2.63. Hot water tank located in the basement of the 1902 section. Image by Natalie Foidart.

Figure 2.64. Gas line entering the building on the western corner on the front façade of the 1902 section. Image by Natalie Foidart.

Figure 2.65. Two air conditioning condenser units, located in a closed room near the southeastern corner of the 1928 addition. Image by Natalie Foidart.

Figure 2.66. Electrical panels for the building, located in the northeastern corner of the 1928 addition. Image by Natalie Foidart.

Figure 2.67. Sewer lines, located on the interior of the north façade at the center of the 1928 addition. Image by Natalie Foidart.

2.4. Summary of Opportunities and Constraints of Building Factors

Opportunities provided by the building include the following:

- Existing column structure provides large bay widths suitable to the requirements of the occupancies.
- Most existing interior partitions can be easily removed, making the building easily adaptable.
- Historic character of the building provides interest, charm, and vernacular attributes that can be utilized as part of the biophilic design investigation.
- The building angle allows deep direct and indirect daylight penetration.
- The existing number and the size of the windows allow the possibility of increasing daylight penetration through altering or enlarging the openings.
- The existing flat roof with parapet facilitates the installation of solar panels.
- The building has many existing options for entrance areas and transitional spaces that facilitate the division of the daycare, café, living units, and communal spaces.
- Existing entrances in the link provide universally accessible access points.
- The building contains an elevator, which possibly can be utilized as a component of universal accessibility.
- Existing enclosed stairwells, in the link at the south of the 1928 section and in the northeastern corner of the 1902 section, provide a circulation path that could be largely maintained with some adaptations such as the inclusion of refuge points.

Constraints created by the building are these:

- Heritage designated details need to be worked around in the new design.
- Narrow bay widths at the center of the 1902 and 1928 building section are constraining.
- Existing interior elevation changes need to be made universally accessible.
- The most prominent entrance is not on grade and presents challenges to making the building universally accessible.
- Most secondary entrances require a stair ascent or descent inside of the building, presenting challenges to making the building universally accessible.
- An existing stairwell to the roof does not exist.
- All existing stairways do not contain refuge spaces.
- The existing connection point between 210 rue Mason and L'Accueil Colombien needs to be severed while maintaining the access to L'Accueil Colombien's shipping/receiving door.

3. Literary Investigation and Analysis

3.1. The Human-Nature Connection

3.1.1. The Great Divide, Materialism, and Egocentrism

We live in a time where control over nature is sought after. It is a great accomplishment to conquer and impose order. Engineering and scientific feats are utilized in an attempt to mold nature to suit our every whim. Genetic engineering, bio-technology, climate control, swamp-drainage, and mono-cultures, right down to the domesticated lawn, are prime examples. Not a recent development, it has become part of the human condition, an artifact of language, ingrained in us as a result of our narratives (Kovel, 2007; Oelschlaeger, 2007). Leading environmental thinker and doctor of philosophy Max Oelschlaeger (2007) presents one theory to explain this estrangement called the Great Divide. Here, a post-Darwinian perspective of biological evolution is utilized, which speaks to the fact that species competition has been replaced by the domination of one species, Homo sapiens, over the whole of the biosphere. This dominance has resulted in an ever-growing separation between humans and nature, simply due to the perspective that human culture can control and manipulate nature, and that nature is malleable and inert. The horizontal spread of cultural evolution has replaced vertical biological evolution as the means of change. As is evident by North America's ever growing capitalist economy gouging the natural environment and creating growing environmental problems, these narratives we hold to, as Oelschlaeger (2007) states, "no longer fit with biophysically evolved realities" (p. 3).

Kovel (2007), distinguished professor of social studies at Bard College, implicates the present relationship with capital in capitalist economies, being its acquisition or its representation through commodities, taking priority over all else as the source of estrangement from nature. Corporations feverishly fuel these material desires so they become a part of the

human narrative. Thus, people are caught in a destructive cycle of profit seeking and material acquisition with domination over others, and nature being utilized as the means. Professors Csikszentmihalyi and Rochberg-Halton (1981), who have analyzed the ways people connect and create meaning with material possessions and their domestic environment, address the implications of this problem. They state that "the danger of focusing attention exclusively on a goal of physical consumption, or materialism, is that one does not attend enough to the cultivation of the self, to the relationship with others, or to the broader purposes that affect life" (p.53). In fact, in the same line of thinking, architect Christopher Alexander (1991) charged mainstream architecture with abandoning its role as a moral force and becoming a money-image machine with no conscience as to the long-term outcome. Essentially, when we consider our relationship to commodities, it becomes apparent that we are forging connections to objects that do not hold intrinsic value; rather they have been given value through the market. These objects distract us from our fundamental need for a relation with our communities, the environment, and our need for biophilic connections.

Capital and the acquisition of commodities, however, did not create the problem of disconnect, but have exacerbated it since the Industrial Revolution through the rise of modern capitalism. Although capitalism has allowed for an astounding, unprecedented level of material well being, it has come with a proportionate decline in *natural capital*. Defined by Hawken, Lovins, and Hunter Lovins (1999) in *Natural Capitalism: Creating the Next Industrial Revolution*, natural capital includes renewable and nonrenewable resources such as water, minerals, oil, trees, fish, soil, and air, but also includes living systems such as grasslands, savannas, wetlands, estuaries, oceans, coral reefs, riparian corridors, tundra, and rainforests.

Essentially, the Industrial Revolution set the tone for natural capital to be seen as an expendable instrument in the name of monetary and human gain. The revolution had such

strong impacts that it significantly affected the relationship between nature and buildings, in some cases eradicating any trace of a connection between the two, which will be examined in subsection 3.1.3, “Design and Nature Retrospective – The Impact of Ornament and Transition.” To counteract this destructive path, Hawken, Lovins, and Hunter Lovins (1999) argue that capitalism must attribute value to nature and recognize that humans and the world are interconnected.

On further examination of the cause of the environmental crisis, Neil Evernden (1993), a professor of environmental studies whose research centers on human perceptions of nature and their environmental implications, brings up the significant point that the crisis could not exist if the environment was not “made visible by the act of making it separate” (p.126). To explain, we have chosen to create a stage where humans are the main characters and the environment merely a backdrop molded by purposive thought. Our role in this “story” is likened by Evernden (1993) to be that of the locust, only “we seem to have maintained our plague phase so long that we threaten permanent destruction rather than a successional set-back” (p. 129). This has set into action a situation where “[people] *are* the environmental crisis” (Evernden, 1985, p.128). Oelschlaeger (2007) and Evernden (1993) provide hope, however, stating that our narratives are not fixed, meaning we have a conscious choice of which “story” we will be a part of, giving promise that we can adapt to our current and future conditions.

Accordingly, philosopher Martin Buber’s resolution to the dualistic mindset between humans and nature and nature as Other is accomplished through changing the frame of reference, or story, from Ich-Es (I-It) to Ich-Du (I-Thou or I-You). Ich-Du is an altruistic, holistic engagement that exists as a relation between two subjects and facilitates interdependence, whereas the latter is an egocentric view with the Other, or in his words You, being objectified (Buber, 1970/1923; see also Wood, 1969). Consequently, nature remains an

Other only because it remains invisible or separate, outside the realm of humans. The I-It relation essentially acts to reduce nature to its functional uses. Alternatively, the act of relation, of engaging, eliminates Otherness through the creation of the between, being interdependence. The contents of the world surrounding the I become a You and a part of the I through this coevolving relation.

Equally important, philosopher Emmanuel Levinas discusses how to achieve a relation of care for the Other in his phenomenological analysis of face-to-face. This theory was spawned from the creation of awareness through presentation, or "orientation" towards the Other, and is to be understood literally (Levinas, 1969/1961; see also Peperzak, 1993). I feel Levinas brings an important aspect to interdependence as it translates into how the condition, essential to the I-You relation, can be achieved.

Although Buber and Emmanuel Levinas have conflicted with each other in their writings on the I-You relation and the Other, these have been suggested to be more a result of misunderstandings and a failure of communication than wholly fundamental discrepancies in thought (Bernasconi, 1988; Lipari, 2004). Thus Levinas' theory, and interestingly Buber and Levinas' own relation, bring to the fore the importance of interdependence and presentation in understanding the Other. As Lipari (2004) states, "this failed dialogic engagement [between Buber and Levinas] suggests that the relation of alterity to responsibility may be enacted primarily through the process of listening – through the gifts of reception, attention, and presence to the other and through the concomitant renunciation of attempts to 'control and master' the other" (p. 123).

Thus, following Buber and Levinas's methodologies to eliminate otherness, the goal of this project is to create a situation where the edge between nature and the interior environment is blurred through the presentation of nature and the facilitation of interdependence. Enabling

listening through the senses is indispensable to heightening the awareness of a correlational existence between humans and nature. In this way, an opportunity is created for an emotional and spiritual connection to nature so it is seen as an entity of which we are a part.

On further examination of the importance of these theories to this design project, the underlying problem of human autonomy must be further explored. For example, Buber on his theory of Ich-Du (I-Thou or I-You) and Ich-Es (I-It) discusses the Ich-Du relationship as a means of opening up the sphere of between, beyond subjectivism and objectivism. The world is comprised of relations, and it is how one approaches these, or in the case of design, how these are presented, that can determine the overriding perspective. Buber illustrates this, pronouncing, "as I contemplate the tree I am drawn into a relation, and the tree ceases to be an It" (Buber, 1970/1923, p. 58). For nature to exist for people in the between space, it must be viewed free of objectification; that is, free of commercial, superfluous or self-indulgent purpose (Buber, 1970/1923). Over consumptive materialism sets the stage for an "It-humanity" relation, disallowing any meaningful connection to nature and the between space, which is required to create a truly sustainable relationship with the world. A protective sense of responsibility in the I for the You needs to be created. The creation of a relation, or care for the You by the I, is called a state of interdependence, which occurs between the pair (Buber, 1970/1923).

Phenomenological philosopher Maurice Merleau-Ponty's (1962/1945) concept of between space expands on interdependence. He discusses a state that overlaps or blurs spaces, facilitating an experience that is beyond physicality through perceptual experience. To him there is no separation between the body, mind, and the perceived. It is through this engagement that one becomes *in* the world. The object and the body thus form a "system" which can reveal the true form of an object through "lived-through" perceptual experience.

Language, then, which can be extended from the verbal to design language, frames how the human-nature relationship will be experienced. It follows that experience is an artifact of design language. Seen in this way, language largely determines behaviors that will be persistent. If design language presents nature as separate from human, and that nature is not connected to our bodies and minds, then nature will be used and exploited as if it has no bearing. However, if the human-nature connection is presented as seamless, our narratives will begin to change.

Linking Buber's concept of relation back to interior design, we must analyze how the user, or the individual, is viewed in space in relation to nature. Salingaros and Masden II (2008) discuss three conceptions of human behavior that determine the type of relations the built environment will create. The first is *abstract human being*, the second *biological human being*, and the third *transcendent human being*. The first of these has resulted in the manifestation of the Great Divide in built form. Here, the individual is a component in the design equation, which has not been, more than superficially, considered on a biological or spiritual level in relation to the world. Moreover, to this end the built environment, albeit the world, is treated as a mechanical entity, which can be molded by technology to suit any functional purpose. Formal criteria, specifications, ideologies, styles, trends, and such are often used to this end. People are treated as consumers, and products, machines, and industry define their environment. This perspective saw its beginnings at the time of the Industrial Revolution, as previously discussed, and evolved into sterile environments filled with products.

Secondly, the biological level acknowledges that people perceive and engage with the world through all of their sensory organs, which are tied to our evolution. This stage is the beginning of the creation of Ich-Du interdependence. Salingaros and Masden II (2008) assert, in fact, that qualities such as ornament, symmetry, fine detail, and visual connections found in vernacular building traditions, rooted in nature, provide neurological nourishment for building

occupants. It is these qualities that protect the user from neurophysiological and psychological degeneration. They go on to state that environments providing such stimuli and complexity are linked to overall well being. The benefits of these environmental stimuli are often perceived on a subconscious level, however, since conscious response to the built environment has been conditioned through the market. Sensory rich environments connected to nature are also critical to development because they condition learned response, which is just as critical as genetic response when it comes to facilitating an I-You relation in the built environment through biophilic design. Optimizing neurological engagement is essential to biophilic design. It is in informational coding, presented in the form of complex patterns tied to genetic and learned sensory response, where humans can relate to biological forms (Salingaros & Masden, 2008).

Finally, the third conception, transcendent human being, subscribes to the belief that built form can be instilled with a life or soul that transcends the material. This life or soul quality is one that already exists in nature and leads to the fulcrum of biophilic design, which is to establish a meaningful connection to actual aspects of nature and its fundamental structure in the built environment (Kellert, 2005; Salingaros and Masden, 2008). Christopher Alexander (1979) referred to this life or soul as the *quality without a name*. He looked to the carpet-weavers, artists, and builders of the past to discover the approach utilized to connect people to objects and space on a deep subconscious level. Alexander's theory that these traditional creative works tap into the inner subconscious forces of people draws on concepts from Primitivism. He holds that it is not through style or fashion but through the application of life and spirit in the built environment that we can achieve true happiness (Alexander, 1979, 1991). Indigenous and vernacular dwellings are perfect examples of this type of application. These buildings, which were, and in some places still are, built of local materials in such a way that closely responds to local ecology and culture, are early precursors to biophilic design.

Both the second and third conceptions presented here examine an engagement with nature. Although Levinas's philosophy of face-to-face refers to human relations, the concept can be extended to that of humans and nature. When a relation is drawn, the visibility of the Other neutralizes the otherness, breaks egocentrism, and is replaced by a quality of care. In essence, the encounter facilitates a change in perception, as the unknown, related to ignorance and fear, becomes the known. The Other becomes not the same, as this indicates appropriation, but an interdependent equal (Levinas, 1969/1961; Peperzak, 1993). Levinas (1969/1961) refers to the welcoming of the Other as *infinity*, whereas the alternative is *totality*. The concept of infinity essentially involves the Other and the subject standing in relation, but separate, enabling a moral consciousness. Biophilic design, therefore, allows this presentation of a *face* into the interior environment; only with this encounter can care result. Ignorance, on the other hand, results in environmental devastation.

3.1.2. Biophilic, Ecological, and Sustainable Design

Of late, nature has often appeared in storefronts, in glossy magazines, and on product labels as a commodity. Tag lines touting green, eco, and natural are often deceiving, and often are only environmental by perception. This use of nature by consumer culture does not honor the complexity and diversity of life. In fact, it hinders preservation and restoration of the biosphere as it turns the natural world into a thing, which is separate from the human world and is an abstraction (Ryn & Cowan, 2007). It is the act of making separate that biophilic design looks to defuse, bolstering sustainability.

The idea of a sustainable society, achieved through a balancing act between conservation and development, became publicly known through such writings as the International Union on the Conservation of Nature's *World Conservation Strategy*, published in 1980, and Lester Brown's *Building a Sustainable* Society, published in 1981. The term, then, gained firm international prominence in 1987 with the publication of *Our Common Future*, otherwise known as the Brundtland Report, written by The World Commission on Environment and Development [WCED]. This report defines sustainability/sustainable development as that which "meets the needs of the present without compromising the ability of future generations to meet their own needs (p. 43)." Essentially, the discussion focuses on enabling sustained human progress the world over, indefinitely. The report deals with imposing limits – defined as "not absolute" – so that the essential "needs" of all people are met without crossing the point at which the biosphere can no longer "absorb the effects" of our actions. All nations are called on to work together for the common good with governmental legislation structuring the process, without curtailing economic growth (WCED, 1987).

The particular mention of the human-nature relationship is explored in the Brundtland Report on ethical and scientific fronts. For example, one reason given for following sustainable

measures is that humans have a moral obligation towards other living species. Although it would seem that this morality is related to the intrinsic value of nature's diversity, which is supported in biophilic design, unfortunately, this obligation is only referred to in passing and is dwarfed by the message of protecting nature for its utility. On the scientific front, the goal of protecting biodiversity is enforced with the goal of harvesting an array of genetic materials for application in industry (agriculture, medical etc.) (WCED, 1987). These rationales present the egocentric view that humans can alter, use, or enhance nature to suit themselves, very different from the adaptive interaction between culture and nature supported by biophilic design (Kellert, 2005, 2008).

Furthermore, although "harmony" between humans and nature is mentioned in the document, it is more in the vein of finding equilibrium between the human use of nature and its ability to replenish itself, which is essentially based in development (WCED, 1987). The chapter entitled "Species and Ecosystems: Resources and Development" is, in fact, dedicated to the need to conserve and protect living and non-living aspects of the earth's ecosystems, since we depend on them for continued survival, but speaks of these aspects purely as resources. Importantly, throughout the document the value of nature is reduced to that of a "resource base." (WCED, 1987).

Although the utility of nature is important, albeit essential, to human existence, to view nature solely in this possessive light is counteractive to developing environmental stewardship. Essentially, sustainability as presented does not intrinsically value nature or promote a coevolutionary relation with it. Biophilic design, alternatively, supports environmental health, diversity, and an adaptive relation as these relationships foster quality of life, continually nurturing people's physical, mental, spiritual, and moral well-being (Kellert, 2005).

After the Brundtland Report, the concept of sustainability evolved and degrees or types of sustainability emerged. Although they can be utilized in varying proportions within each sustainability rating system or methodology, there are seven common themes as outlined by sustainability consultant Andres Edwards (2005) in his book *The Sustainability Revolution: Portrait of a Paradigm Shift*. These themes are stewardship, respect for limits, interdependent economic restructuring, fair distribution, intergenerational perspective, and nature as model and teacher. However, despite these similarities, not all sustainability is created equal, as sustainability expert Simon Dresner (2002) emphasizes with his distinction between sustainability and sustainable development. The difference arose out of the idea that we must impose limitations on growth for the betterment of the natural world enabling healthful longevity, which defines sustainability. The latter, alternatively, is a marriage between economic and environmental goals, much as seen in the Brundtland Report and the design industries standard rating system, Leadership in Energy and Environmental Design [LEED], developed by the US Green Building Council [USGBC]. The danger in this union is that the environmental aspect can be used as a marketing gimmick or guise to make unfettered economic growth or unsustainable practices seem more palatable to environmentalists and consumers alike. Essentially, Dresner (2002) discusses sustainability as a scale from weak to strong where person-made and natural capital (human and environmental) is traded-off for each other. Strong sustainability dictates no loss in natural capital. On this scale, any loss in natural capital will only be accepted if the capital gain will be used to contribute to long term environmental and human well being.

Alternatively, David Orr describes this scale as the difference between *technological sustainability* and *ecological sustainability* (Orr, 1992). Technological sustainability centers on utilizing a technological or market driven approach to create a solution to a given environmental

problem. Sustainable design utilized in this manner is attractive because it tells us that nothing has to change; we can still live in a large house and drive a big car. It will just be a more environmentally friendly version, again relating to the way that the Brundtland Report and LEED can be employed.

Similarly, ecological design experts Ryn and Cowan (2007) argue that sustainability exploited in this way has been used to justify "a wide variety of conventional large-scale development schemes." They go on to state,

> technological sustainability looks to a new group of experts to fine-tune the global interface between people and the biosphere, and in the process, it often neglects the details of culture and community [which are an integral aspect of biophilic design] while displaying a rather naive optimism concerning our ability to manage planetary systems. (p.22)

Ryn & Cowan's (2007) model of ecological design, which is supported by and akin to Orr's ecological sustainability, alternatively concentrates on finding methodologies that require limits to consumption, wants, scale, stress on the biosphere, and ultimately realigning with natural processes and place.

Importantly, David Orr (2002) argues for ecological over technological sustainability because the design issue at hand "is not about making greener widgets but how to make decent communities that fit their places with elegant frugality...The problem is not how to produce ecologically benign products for the consumer economy, but how to make decent communities in which people grow to be responsible citizens and whole people" (pp. 11-12). It is this understanding of sustainability, as a means to enable the healthful longevity of humans and nature in cohabitation, rather then simply sustained existence, which biophilic design imparts.

When assessing LEED as it relates to ecological sustainability, it becomes apparent that this current rating system neglects a holistic approach to environmental issues, an approach that would involve place, nature, and human-nature relations. To illustrate, the LEED credit system

creates a piecemeal approach to sustainability since the issue is broken down into a buffet of items that could result in disparate applications tacked on to a generic energy efficient structure. The checklist does not ensure an approach that is fully integrated into the character of the design and that relates to the landscape and culture where it resides.

The latest evolution of USGBC's LEED program, LEED for New Construction v3 (2009), has attempted to address this problem with the addition of a Regional Priority credit that addresses "geographically-specific environmental priorities" and is worth four possible points (U.S. Green Building Council [USGBC], 2009) with the added incentive of achieving bonus points for each Regional Priority credit achieved (USGBC, 2010). Nevertheless, these are not mandatory, and as such, they are not integral to the process. Further, these are not new credits, just existing credits deemed as being a greater priority by each region's USGBC regional council (USGBC, 2009, 2010). In actuality, this means that nothing has been added to LEED that addresses anything close to biophilic design. The full benefit of this collection of old credits disguised as a new credit remains unclear. The Canada Green Building Council has not yet stated if, or when, they will be adopting these changes (Canada Green Building Council, n.d.). In short, the LEED credit system could result in the application of some biophilic design attributes such as the use of daylighting, natural ventilation, operable windows, and a green roof, but without a more rigorous approach, these elements could be isolated inserts.

Further, on specific LEED credits that could relate to biophilia, the Regional Materials credit in the USGBC's v3 could include materials that are culturally and geographically appropriate, but the focus is more on the location of the final assembly of product components to determine locality. For instance, the place of final assembly for a carpet becomes its manufactured region even if all of its components are from far away. The idea is to spur the local economy rather then relate the choice of materials to the properties or characteristics of

place. In addition, the Building Reuse credits in USGBC's v3 could allow the project to respect the local culture, but based on the character of the original building and the new design, this may not be the case. The potential to address the human-nature relation is there, but it is not enforced or complete.

Let me be clear, I do feel LEED is an important tool as it provides a well-defined framework for sustainability, but it is currently not responding to the reasons why the environmental crisis exists. LEED can result in buildings that are estranged from their context, and it allows for unfettered technological sustainability. There is also nothing in the checklists that involve interdependence or the presentation of nature, which are integral to creating a relation of care and to engaging the natural environment. Moreover, it neglects to foster the potential of designers to enable positive environmental action and awareness in occupants.

Referring back to Edwards (2005) seven common themes in the sustainability movement, biophilic design can allow for a more rigorous involvement in all areas, however, most notably in stewardship, interdependence, intergenerational perspective, and nature as a model and teacher. Unfortunately, LEED predominantly focuses on a low environmental impact strategy, and it is in the hands of the designer to make it more than this. Although LEED is an important step towards ecological sustainability, which ultimately should be our goal, it needs to address the source of the crisis. Biophilic design is a means to help bridge technological and ecological sustainability.

Concisely, the key to ecological sustainability or moderate to high-end sustainability is the addition of biophilic design principles. If the underlying issues that have created our destructive behaviors, such as the great divide, are not dealt with, efforts will be muted (Kellert, 2005; Ryn & Cowan, 2007). While LEED does focus on some biophilic design characteristics, as previously mentioned, ultimately LEED and all green building rating systems need to

balance the efficiency of a building with the direct application of biophilic features to ensure the movement beyond just minimizing damage.

To expand on how biophilic design acts to enable longevity of the built environment and the natural environment through the personal connections that are established between nature, culture, and place, the composition and application of the design process must be analyzed. Two primary components make up biophilic design, being organic and vernacular design. Kellert (2005) discusses organic design as the use of direct, indirect, and symbolic experience of nature in the built environment. Natural lighting and ventilation, impression of change related to time and space, views to the exterior, and building orientation relate to a direct experience. Moreover, plants, soil, water, geological forms, fire, and animal life integrated into the interior environment as a natural system can also play a key role. The indirect experience of nature often requires the artistic use of natural elements and processes, such as the creative use of natural material, highlighting evidence of aging and adaptation (plasticity), and of significance, the application of natural landscape qualities to interior design. Furthermore, the symbolic experience of nature is evoked using natural expressions, archetypes, simulations, metaphorical gestures, and vicarious representations. This manner of design, utilizing nature directly, indirectly, and symbolically, creates opportunities for positive environmental experiences through the fluid interplay of exterior and interior with all of the senses being stimulated.

Further, organic design best speaks to biophilia when the expressions and species utilized stem from the locale through vernacular design, connecting the design to place. This connection to place is essential to the process because a situation is then created that bolsters environmental affinity through more personal or intimate connections. Vernacular design expressly has to do with the infusion of the particulars of a site, bringing the ecological,

physical, regional, social, and cultural spheres into a design (Kellert, 2005). It is this type of design that infuses a layer of emotive experience and personal attachment, increasing the chance that people will develop a long-term relationship with space, thus creating place. This quality has been referred to by many names. Dubos (1980), Kellert (2005), Olmsted (Fein, 1972; Beveridge & Rocheleau, 1995), and others have used *spirit of place*. Day (2004) utilizes the term *ensouling* buildings, while Alexander (1979) refers to it as the *quality without a name*. Whatever the terminology utilized, as Kellert (2005) states, this quality "suggests that when this relationship among culture, environment, and architecture is pronounced, these places become alive for us, a part of a collective consciousness and identity" (p.165). The means to connect people to place and nature is thus through the body with the senses and emotions acting as a powerful bridge.

The organic and vernacular components of biophilic design create a unique perspective from which designers can relate to the unique social, cultural, and environmental conditions of a site. It provides a strong human-nature connection that needs to be at the core of sustainable practice if the practice is to enable prosperity.

3.1.3. Design and Nature Retrospective – The Impact of Ornament and Transition

Subsection 3.1.1, "The Great Divide, Materialism, and Egocentrism," exposed the Industrial Revolution as a major crossroads in the human-nature connection, with separation and domination overridingly becoming the norm. Not only did urbanization take place at an unprecedented rate, fueling physical separation, but the acquisition of financial and manufactured capital began taking priority over nature and its ecosystems on a large-scale, with labor being the only limiting factor to production (Hawken, Lovins, and Hunter Lovins, 1999). Pre- and post-revolution, the relationship between humans and nature in design has varied markedly. Only through analysis and critical reflection of the dominant characteristics of these design movements can cause and effect relationships be properly be understood, in regards to both the distancing and union of humans and nature. Further, by understanding what has happened in the past, the implications of design decisions within the current design investigation will be more apparent.

Although it is an evolutionary biological part of human makeup to desire a connection to nature, design history has seen this natural process severed through socially created applied meaning, such as mythology, fashion, and advances in technology and industrialization, as mentioned above. These artificially overlaid meanings have acted to encumber biological sensibilities and a connection to nature (Salingaros & Masden, 2008). Historically, in vernacular buildings, it was not through this process, but a reversal of sensory input – a process of sensory intake, assimilation, and assembly – that people created their built environment. These types of built environments spoke to a fusion of local materiality and cognitive spatial ordering, used to make sense of nature and satisfy well-being (Salingaros & Masden, 2008).

Since the inception of more formal principles of design, five overriding expressions that speak to the varying human-nature relation have been dominant in the built environment, as will

be shown through the following examples. These design expressions result from culturally created worldviews such as anthropocentrism and biocentrism or, more specifically, language that stems from such views (as detailed in subsection 3.1.1, “The Great Divide, Materialism and Egocentrism” and illustrated in Figure 1.1). Found singularly or utilized in combination, these design expressions are framing/viewing (Bloomer, 2008; Kellert, 2005), domination/control (Bloomer, 2008; Kellert, 2005), imitating/transforming (Bloomer, 2000, 2006, 2008; Kellert, 2005), comingling (Bloomer, 2008; Kellert, 2005; Ryn & Cowan, 2007), and interdependence (Kellert, 2005; Ryn & Cowan, 2007). It is the latter two that a marriage between biophilic design and sustainability looks to achieve, but framing and imitating/transforming are important supporting characteristics to this end.

As previously stated, my paper will begin this retrospective around the nineteenth to early twentieth century when a changing social climate and a series of scientific discoveries overturned previously held beliefs, which had held strong since the Renaissance. Some of these discoveries created advancements in technology that significantly changed the face of architecture, and hence its relation to nature. One such technology was steel-frame construction, which allowed for the development of large windows and skyscrapers that became essential to the experience of nature in the Modern Movement (Bloomer, 2008; Hunter, Jacobus & Wheeler, 2000).

Joseph Paxton’s *Crystal Palace* (see Figure 3.1) at the Great Exhibition of 1851 in London was the first structure to employ the new glass and iron technologies on a grand scale. As a result, the structure demonstrated for the first time the extensive framing/viewing of exterior nature (Hunter, Jacobus & Wheeler, 2000; Ursprung, 2007). Paxton’s palace went a step beyond, however, its design containing water fountains and encompassing three old elm trees from the site, thus resulting in the imitation of nature (Ursprung, 2007). In spite of these

characteristics, the end product had more of a greenhouse quality, containing and framing rather than connecting to nature through form, details, materials, and the like. The language of the structure even suggests domination/control since the raw and rigid iron framing is strikingly juxtaposed with the natural elements. The trees even seem as if they are being caged.

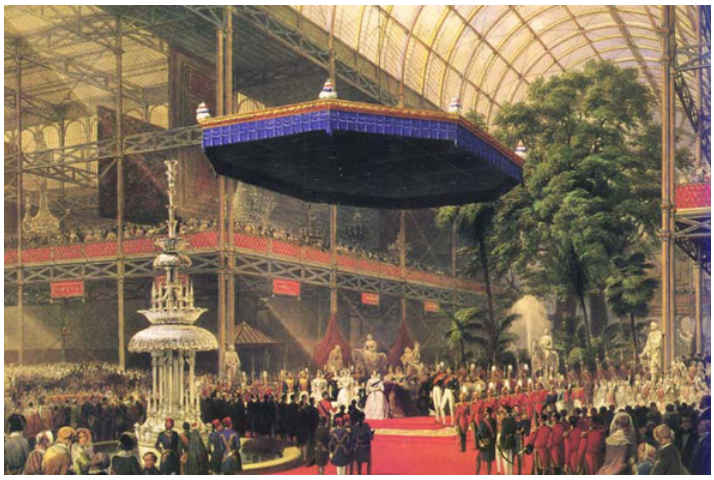


Figure 3.1. Joseph Paxton's Crystal Palace (1851) exhibiting new glass and iron technologies that allowed large windows and expansive interior spaces. Public domain image from Freebase. Retrieved August 9, 2009, from http://www.freebase.com/view/wikipedia/images/commons_id/543325

Moving ahead half a century or so, the far-reaching influence of the glass and iron technologies become readily apparent in Modernism, which saw two prominent strains evolve. Each of these strains had a different relation to nature created by the treatment of glazing, form, and interior finishes. The first, Rationalism, was about framing, control, order, sterility, and being set apart from nature. This style was exemplified by the work of Le Corbusier, Walter Gropius, and Ludwig Mies van der Rohe. The other strain was the development of plastic and organic structures, such as that of Frank Lloyd Wright and Alvar Aalto, who sought not only to frame nature but also to imitate and commingle with it (Fleming, 1995; Hunter, Jacobus & Wheeler, 2000). Here, organic is to be understood as a philosophy and approach to design that promotes integration and harmony between the built environment and the natural world.

On the first movement, the International Style expressed the essence of Rationalism, which was about rejecting the styles of the past and relying on concept and ideology too. The

machine aesthetic utilized was about pure functionalism with the eradication of ornament and the disposal of anything deemed superficial. The movement was essentially a reaction against highly elaborate ornamentation. Adolf Loos took this to an extreme with his works characterized by sparseness and an utter lack of ornament (Hunter, Jacobus & Wheeler, 2000). The Haus Scheu, built in 1912-13, is an example of such work stripped down to elemental form (see Figure 3.2). These types of structures, devoid of nature and its imitation in the interior and on the exterior, exacerbate division as they create a decidedly human world where nature acts only as a backdrop. Yale architecture professor Kent Bloomer (2008) highlights the correlation between the abandonment of ornament with the rise of the modernist project and the distinct division created at the point of the windowpane. In fact, he goes on to liken nature viewed through large expanses of glass to an animal seen behind bars at a zoo.

In demonstrating the division created between humans and nature at the point of the window, the stark and glossy interior and expanse of glazing in Mies van der Rohe's Neue Nationalgalerie at the Kulturforum, which opened in 1968, acts to create a purely visual distanced relationship with the site. Nothing in the interior, or at the point of transition, bears any relation to nature (see Figure 3.3). The manifestation is one of division with nature held away from the protected interior.

The monumentality of International Style buildings took the human-nature division a step further. Visually and physically, there was not just division from the stark interiors, but from the exterior, these buildings were also set apart from, and dominated, the landscape. Le Corbusier's Villa Savoye in Poissy, France, completed between 1928-30, displays this juxtaposition (see Figure 3.4). The building exemplifies the defiance of nature through its visual sterility, created by the unadorned geometry, and weightless form, created by the slim stilts that set the building apart from its surroundings (Fleming, 1995; Hunter, Jacobus & Wheeler, 2000).

Another example is Mies Van Der Rohe's Farnsworth house in Plano, Illinois, built between 1945-51. Here the window walls and simple interior direct the view out, framing nature (see Figure 3.5). The stark interior does little to create a flow between the inside and outside realms or to make the occupant feel a part of nature. The exception, however, is the tiered patio and extending roofline that gradually reaches out into nature. Notwithstanding the patio and roofline, the situation is rather a "technological statement" sitting in nature (Ryn and Cowan 2007). This language between design and landscape is similar to that of Classical temples, in that they were set apart from and dominated the landscape with their monolithic forms. Adolf Loos, as well as others in the Modern Movement, in fact, derived much inspiration from the mathematical equations used to develop these structures but, importantly, did not employ the detailed ornament that adorned the structures (Fleming, 1995; Hunter, Jacobus & Wheeler, 2000). It is this lack of imitative and transformative ornamentation, combined with a lack of transition, which creates the harsh division.

From left to right: Figure 3.2. Adolf Loos's Haus Scheu (1912-13) represents architecture with a lack of ornament. Public domain image from Wikimedia Commons, created by heardjoin. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Adolf_Loos,_1912-1913,_A1130_Wien,_Larochegasse_3,_Haus_Scheu,_p4.jpg

Figure 3.3. Mies van der Rohe's Neue Nationalgalerie at the Kulturforum (1968) demonstrates division between humans and nature at the point of the window. Image from Wikimedia Commons, created by K.lee, and used with permission under the GNU Free Documentation License. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Berlin_Neue_Nationalgalerie_June_2002.jpg

From left to right: Figure 3.4. Le Corbusier's Villa Savoye in Poissy, France (1928-30) shows physical and visual separation from the landscape it sits on. Image from Wikimedia Commons, created by Oikema 0, and used with permission under the GNU Free Documentation License. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Vila_Savoye_01.jpg

Figure 3.5. Mies Van Der Rohe's Farnsworth house in Plano, Illinois (1945-51) presents an overall divisive relationship with its landscape. Public domain image from Wikimedia Commons, created by a National Park Service employee. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Mies_van_der_Rohe_photo_Farnsworth_House_Plano_USA_9.jpg

It could be argued that the large expanses of glass and open interior spaces, which became prominent with the International Style, and have since remained significant expressions, allowed clear views to nature at all times, bringing the outside in. I would argue, however, that these features, utilized without biophilic design, act more as a division between two very different worlds, since the sterile interiors are not related to site, ecology, or the vernacular. Further, the language created by the sharp edged form of the buildings does not extend into nature or allow nature to reach into the interior, forming the between.

In contrast, the inclusion of biophilic design principles in the design process changes this divisive relationship because qualities from nature are brought into the interior, and vice versa, so as the two comingle. Bloomer (2008), in fact, holds that the injection of organic forms, or life, into hard interior spaces challenges the hard, unnatural structure by subverting the power of static "frozen geometry." The difference lies in the overall language utilized. While the International Style utilizes framing, combining it with sterility, domination, looking passively,

and disconnect, biophilic design combines framing with direct, indirect, and symbolic experiences of nature in the interior, establishing a flow between the interior and exterior.

Then, too, on facilitating a connected relationship with nature, Bloomer (2008) maintains that the treatment of the window glazing itself plays a huge role in the type of relationship created. He argues that glass, as a median between the interior and exterior, needs to involve a "visible and touchable moment" which belongs to both places. In short, mullions, colored glass, patterned window casings, patterned curtains, and ornament, which evoke nature's patterns through rhythmic detail, need to be utilized to involve other senses beyond the visual. This arousal of the senses acts to establish an experience that more closely resembles how we physically and physiologically relate to nature experiences.

Working in the more plastic and organic stream of Modernism, Frank Lloyd Wright spoke of nature before design. He conceived his designs to grow from the ground up and to intertwine with nature, developing an intimate relation. The most desired sites were wholly natural so that the designs could be a part of the processes of life – although biophilic, this is questionable ecologically. Both architecture and nature, then, would be all the better for their union. However, he did not use ready-made forms from the environment, as he felt abstractions endued designs with a new life that echoed, not copied, nature. In addition, he often employed a horizontal rhythm to express the mass of the structure in harmony with gravity and the landscape (Hoffman, 1986). This treatment of form resulted in transitional spaces created under extended overhangs, with a gradual progression between interior and exterior being echoed under foot.

Fallingwater, built in Pennsylvania in 1935, is one of Wright's natural expressions, seemingly growing from the site (see Figures 3.6 – 3.7), emerging out of the rock from which it sits. The design fuses with the surrounding forest, water, and rock ledge as they utilize the same

language in form, color, and materiality. Important elements of organic and ecological design, such as emphasis on natural materials, natural lighting, and sense of place have all been employed. In fact, the interior boldly connects to the exterior through a series of tactile experiences, such as the stone floors with rock outcroppings and the rich wood window mullions arranged in a rhythmic manner. Further, the building has a series of rooms that are neither fully exterior nor interior. These rooms are formed through large overhangs and the similarity or continuation of materials between in and out. Conversely to biophilic design, however, the structure lacks the cultural, social and historic aspect of the vernacular as outlined by Kellert (2005). These attributes include social and historic elements, regular and repeated events, familiar and valued surroundings, and characteristic artifacts and designs.

From left to right: Figure 3.6. Frank Lloyd Wright's Fallingwater in Pennsylvania (1935) demonstrates natural expression which grows from site and nature. Image from Wikimedia Commons, created by Figuura, and used with permission under the GNU Free Documentation License. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Falling_Water_01.jpg

Figure 3.7. Interior of Frank Lloyd Wright's Fallingwater, where natural materials and forms were employed. Image from Wikimedia Commons, created by Lykantrop, and used with permission under an unrestricted use clause. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Frank_Lloyd_Wright_-_Fallingwater_interior_7.JPG

In turning to Wright's urban designs, insight is gained into how a connection can be made with nature when there is little or no direct nature experiences from which to draw. In these instances, Wright weaved intricate, nature-inspired ornament throughout the interior,

reorienting the focus inward, while still expressing qualities of the earth (Hoffman, 1986). The Dana-Thomas House, built in Springfield, Illinois, between 1902-04, demonstrates the use of indirect nature and symbolic ornament in this regard (see Figures 3.8 – 3.9). Here, abstracted patterns derived from nature grace the windows, acting as light screens offering refracted light, much as light through tree leaves. Natural light penetrates deep into many rooms through skylights and clearstory windows. In addition to utilizing natural materials, Wright created an involved tactile relation with them through texture, detailing, and patterning. Finally, indirect nature (plants) was designed into the home, framed by the warmth of wood and brick as they grace the interior as designed components, not afterthoughts.

Figure 3.8. Interior of Frank Lloyd Wright's Dana-Thomas House in Springfield Illinois (1902-04) demonstrates the use of indirect nature with planters and symbolic ornament with light screens. Image used with permission, copyright Doug Carr, courtesy of the Illinois Historic Preservation, October 29, 2009. Available from http://www.dana-thomas.org/

Figure 3.9. Frank Lloyd Wright's Dana-Thomas House sumac windows create symbolic nature, juxtapose it with direct nature, and create interesting light and shadow patterns in the interior. Image used with permission, copyright Doug Carr, courtesy of the Illinois Historic Preservation, October 29, 2009. Available from http://www.dana-thomas.org/

In continuing any discussion on architecture that relates to nature, Alvar Aalto must be mentioned because he was concerned with holism, a mode of thought that looked to the whole (earth and site) to understand the component parts (design, users, and details). The humanization of space and form, which spoke to the relationship between nature, the human body, and spirit, was essential to his work (Quantrill, 1983). In contrast, he felt that the sterile works of Modernism were too much about experimentation with new materials and lacked any real human sensibility (Schildt, 1986).

The Villa Mairea (1937-39) in Noormarkku, Finland, is one of Aalto's structures that realized his philosophies and ideals in concrete form, as no element was created void of consideration of another (see Figures 3.10 – 3.13). To begin, the residence is married to the land as the teak and Finnish pine façades ebb and wane with the surrounding coniferous trees, while the horizontal, multilevel construction echoes the Finnish forest landscape (Alvar Aalto Museum, 2008; Quantrill, 1983). Initiating the connection between the exterior and interior, the entrance demonstrates how the treatment of the threshold is of particular importance (see Figure 3.10). Aalto designed this entrance area as a room that is neither interior nor exterior but a hybrid of the two, creating a strong statement of the overall relation of the home to nature on approach. This language is continued in small supporting details, such as the organic door handle, door of natural wood slats, and serendipitous small round windows (see Figure 3.11).

Further, the transition from exterior to interior is emphasized through the gradual change in floor finish, from the rough rock on the exterior path to large tile in the entrance and smaller, smoother ceramic tile on the main floor (see Figures 3.10 and 3.12). The entrance hall highlights the home's relation to nature as it has an exterior character created with brick and tree-like vertical timbers (Alvar Aalto Museum, 2008). These vertical timbers, as well as the large, wooden support columns and layers of vertical, slender wooden accents found throughout

the home, continuously relate back to the surrounding expanse of forest and its particular tactile qualities (see Figure 3.13). A curvilinear cut out on the side of the fireplace even heralds the erosion that is taking place in the world outside.

The notion of continuity, or unity of all components, has great evidence in the Villa Mairea, where site, overall design, and intricate detail were considered as a whole (Quantrill, 1983). To this end, the design engages what the window frames, intertwining instead of dominating the land as in the International Style. Relating the design to biophilic design, the overall language of the home combines symbolic and direct nature with elements from the Finnish vernacular building tradition. These elements were then blended seamlessly with modern building forms (Alvar Aalto Museum, 2008).

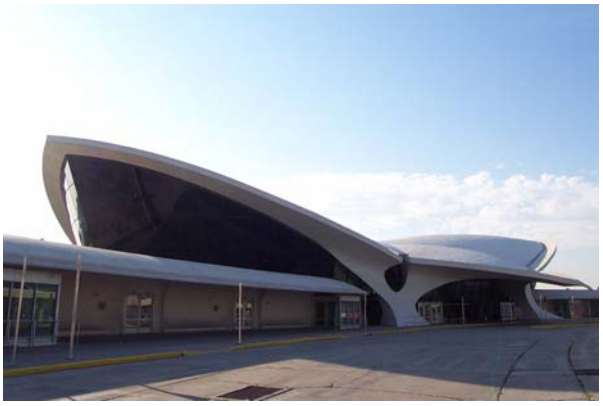
From left to right: Figure 3.10. Transitional exterior room at Alvar Aalto's Villa Mairea (1937-39) in Noormarkku, Finland. Image used with permission from the Alvar Aalto Museum, Jyväskylä, Finland, September 18, 2009. Available from http://www.alvaraalto.fi/museum/

Figure 3.11. Front door symbolic details at Alvar Aalto's Villa Mairea. Image used with permission from the Alvar Aalto Museum, Jyväskylä, Finland, September 18, 2009. Available from http://www.alvaraalto.fi/museum/

From left to right: Figure 3.12. Interior tree-like vertical timbers emphasize the gradual transition to the interior at Alvar Aalto's Villa Mairea. Image used with permission from the Alvar Aalto Museum, Jyväskylä, Finland, September 18, 2009. Available from http://www.alvaraalto.fi/museum/

Figure 3.13. Interior materials and forms relate to the surrounding expanse of forest at Alvar Aalto's Villa Mairea. Image used with permission from the Alvar Aalto Museum, Jyväskylä, Finland, September 18, 2009. Available from http://www.alvaraalto.fi/museum/

The plastic and organic stream of Modern design also represents nature in a macro manner. These structures, while imitating and transforming nature, often lost the human relation through grandness of scale and lack of supporting detail. Eero Saarinen's TWA Flight Center in the John F. Kennedy Airport, described by Ursprung (2007) as iconoclastic architecture which resembles a bird spreading its wings, exemplifies grand scale (see Figures 3.14 – 3.15). In fact, Hunter, Jacobus and Wheeler (2000) describe this sort of modern monumental design as having a "Promethean audacity." What is learned is that human scale and engaging detail at all scales is essential in biophilic design. Without these qualities, the sleek and austere interior of this structure seems more like a space station.



From left to right: Figure 3.14. Exterior of Eero Saarinen's TWA Terminal, Kennedy Airport, New York (1962) demonstrating macro symbolic nature representation. Image from flickr, created by Telstar Logistics, and used with permission under the Creative Commons License Deed: Attribution-Noncommercial 2.0 Generic. Retrieved September 9, 2009, from http://www.flickr.com/photos/telstar/44360811/

Figure 3.15. Interior of Eero Saarinen's TWA Terminal, Kennedy Airport, New York (1962) demonstrating a lack of micro supporting detail connecting the design to nature on a variety of scales. Image from flickr, created by Telstar Logistics, and used with permission under the Creative Commons License Deed: Attribution-Noncommercial 2.0 Generic. Retrieved September 9, 2009, from http://www.flickr.com/photos/telstar/44360886/

In contrast, before the Modern Period, symbolic nature (imitating/transforming) was utilized in several movements with designs alluding to the natural world beyond their structure. These realistic and abstract forms represented and fused nature into overall form, furnishings, and interior detailing, creating the lavishness that Rationalism and the International Style reacted against. This use of form and detail was most prominent in Gothic, Rococo, Romantic, Arts and Crafts, and Art Nouveau design. For example, the grand cathedrals of Gothic architecture had a structural form with intricate vaulting, columns, and colonnettes, resembling the stems and branches of trees (see Figure 3.16). Although these structures were more about looking to heaven than earth (Fleming, 1995), their form still appears to have taken root in the ground underfoot. In fact, in looking down the nave of a Gothic cathedral, the structural form combined with the constantly changing patterned light entering through the stained-glass windows to create the feeling of peering into an old growth forest.

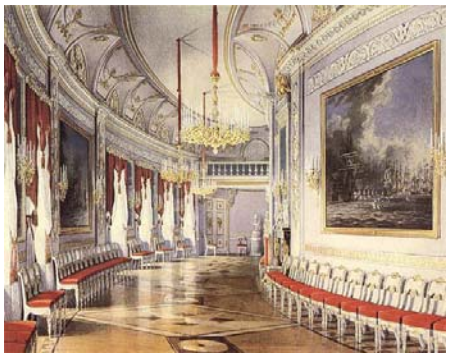
Figure 3.16. King's College Chapel, Cambridge, England (c. 1515) an example of Gothic English architecture, which is exemplified by a symbolic link to old growth forests and dynamic natural lighting effects. Public domain image from Wikimedia Commons, created by Agnete. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:F%C3%A4chergew%C3%B6lbe_KingsCollege.jpg

Alternatively, the Rococo Period (see Figure 3.17) utilized nature in another manner, nature representations being more applied as opposed to being structural. The style was highly ornate and heavily ornamented with abstracted and realistic nature patterns. The Rococo had lavish curvilinear, floral, rock, and shell forms as part of almost every interior surface. In addition, ceiling murals that depicted the sky and spiritual references were quite common in grand rooms and monumental buildings (Fleming, 1995).

After the Rococo Period came the Neoclassical Period, which heralded the designs of the Classical Period. Although greatly paired down in comparison to the Rococo, there was still symbolic nature found in column capitals, friezes, and cornice patterns, for example. However, the more paired down use of nature was overturned through the Romantic Period.

The Romantic Period drew its influence from a reinterpretation of the Gothic Period, qualities of the natural countryside, and influences coming from areas such as India and China (see Figure 3.18). This conglomeration resulted in lavishly ornamented interiors with abstracted and highly naturalistic nature patterns (Fleming, 1995). In fact, one of the prominent figures of the Romantic Movement, Frederick Law Olmsted, insisted that connecting to nature provided

people with healing benefits for the mind. The means suggested to accomplish this connection was through the senses (Biveridge and Rocheleau, 1995), as biophilic design contends.



From left to right: Figure 3.17. Painting of the Chesma Gallery in the Gatchina Palace in Gatchina town, Russia, by Edward Petrovich Hau (1877) demonstrating extensive use of symbolic nature. Public domain image from Wikimedia Commons, added by Ghirlandajo. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Gay1877.jpg

Figure 3.18. Painting of the banqueting room at the Royal Pavilion in Brighton from John Nash's *Views of the Royal Pavilion* (1826) demonstrating extensive use of symbolic nature. Public domain image from Wikimedia Commons, added by Merchbow. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Brighton_Banqueting_Room_Nash_edited.jpg

Offering an alternative to symbolic nature accomplished in a highly ornamented fashion, the Arts and Crafts Movement dealt with nature in a very controlled manner, often in the form of subtle three-dimensional or patterned two-dimensional ornament. Rejecting the conglomeration of styles that marked the Victorian era before, and the soulless quality created by the machine aesthetic of the Industrial Revolution, the Arts and Crafts instead supported design that enabled the physical and spiritual well-being of people. This was accomplished through the hand-made aesthetic, unity of form and function, functional simplicity, selective use of ornament and decoration – mostly in an applied fashion, and inspiration that is truthful to, and derived from, nature. For example, William Morris, one of the movement's proponents, studied natural vegetative growth patterns and structures to utilize in the interior as a symbol of the natural world beyond. His wallpaper (see Figure 3.19), carpet, stained glass, and textile patterns exemplified this process as they utilized nature's inspiration, which was then infused with a quality Morris called "rational growth." He utilized this process as he felt that the natural

world needed to be conventionalized by design principles for the imagination – and hence a connection to nature – to come into play (Lochnan, 1993).

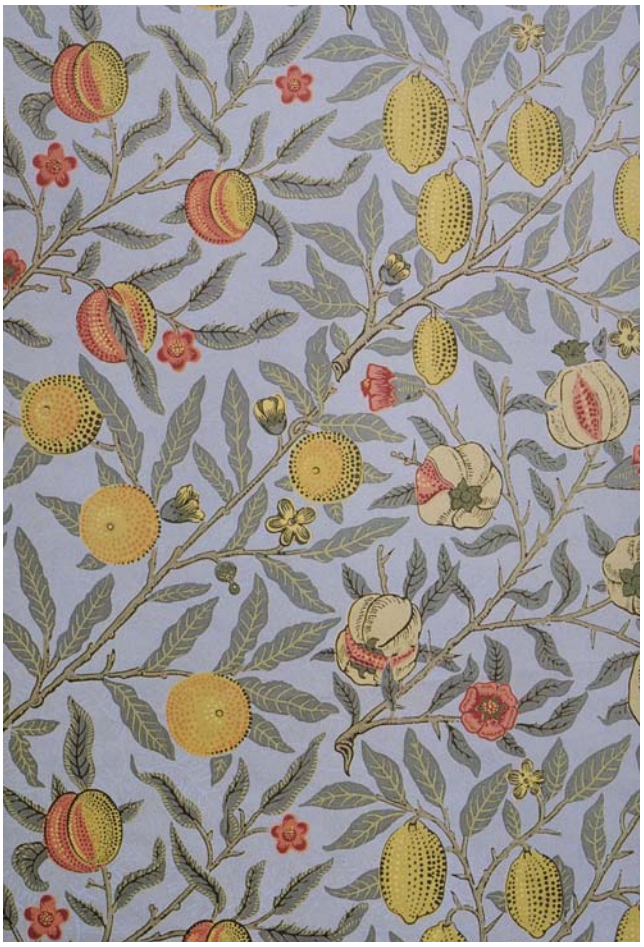


Figure 3.19. *Fruit* (or *Pomegranate*) wallpaper designed by William Morris (1866), which demonstrated the use of nature's inspiration in a more literal manner for interior ornamentation. Public domain image from Wikimedia Commons, added by PKM. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Morris_Fruit_wallpaper_c_1866.jpg

Appearing at around the same time, Art Nouveau took a unique alternative route to the relationship between buildings and nature. More along the lines of the Gothic, Art Nouveau saw buildings, furniture, and décor that seemed to sprout from the ground as a unified whole. Victor Horta's Hôtel Tassel is an example of this type of architecture (see Figure 3.20). Here, Horta not only utilized a similar language on all scales of the design, but he also created spatial continuity and fluidity between the floors and between the building's interior and furnishings by the use of a coiled line which weaved throughout (Duncan, 1994).

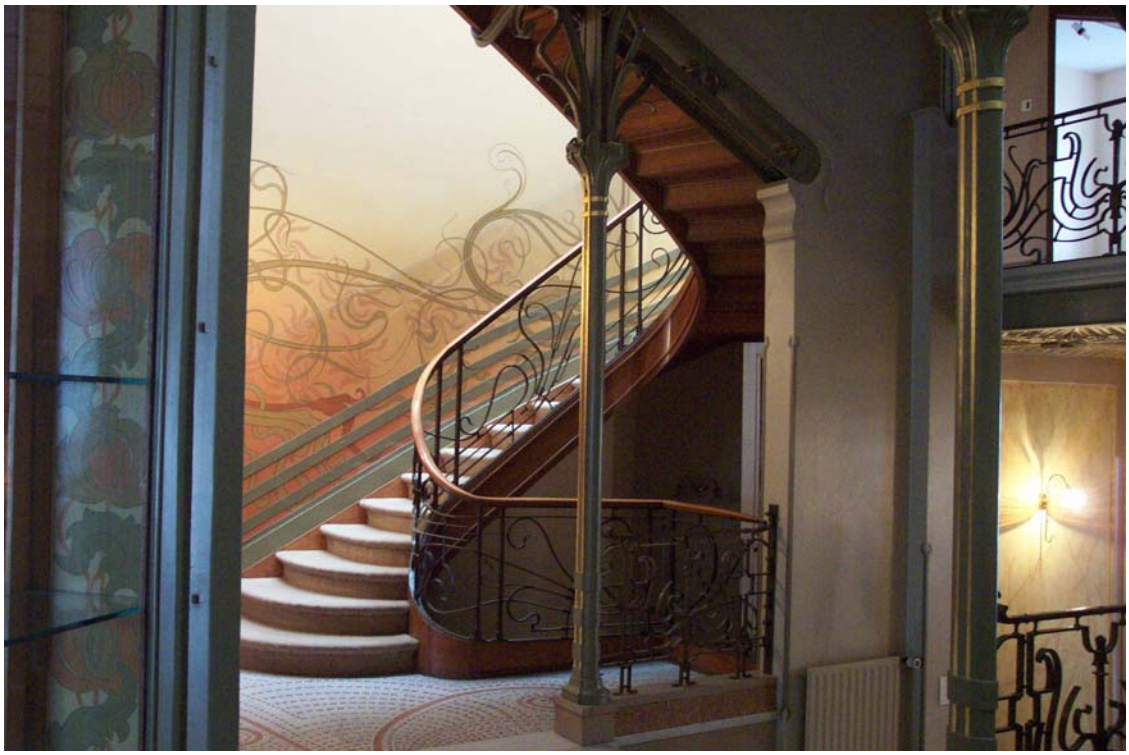


Figure 3.20. Victor Horta's Hôtel Tassel stairway in Brussels, Belgium (1893-1894), which demonstrated the use of nature's inspiration for abstracted interior ornamentation that unifies space. Public domain image from Wikimedia Commons, taken by Henry Townsend. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Tassel_House_stairway.JPG

Going a step further, Antoni Gaudí utilized the form of living organisms to develop the overall structure and details of his buildings. He employed very few, if any, straight lines as nature itself does not contain these. The Casa Batlló in Barcelona, built in 1904-06 (see Figure 3.21), demonstrates this influence with its biomorphic shapes and undulating walls (Duncan, 1994). As in the macro structures of Modernism, the result is overwhelming, and while relating to nature, does not relate to the specific nature of the site or to the vernacular.

Although the Gothic, Rococo, Romantic, Arts and Crafts, and Art Nouveau imitated and transformed nature, they only brushed the surface of biophilic design since the connection did not move past framing/viewing, imitating/transforming, and domination/control. However, of importance, they did not act to widen the human – nature divide by turning away from nature as the International Style did.

Figure 3.21. Antoni Gaudí Casa Batlló in Barcelona, Spain (1904-06), which demonstrates the symbolic use of nature on macro and micro levels. Image from Wikimedia Commons, created by Marku1988, and used with permission under the GNU Free Documentation License. Retrieved August 9, 2009, from http://commons.wikimedia.org/wiki/File:Facciata_esterna_di_Casa_Batll%C3%B2.jpg

Further, while comingling was explored with the Crystal Palace and became more evolved with work such as that of Alvar Aalto, it has not been until recent history that interdependence has become more apparent. This revelation has come after decades of generic, mass produced design that widened the human connection to nature dramatically. Such designs include big box stores, expanses of undifferentiated suburban housing, and glassy, sealed skyscrapers, which are unrelated to the organic, ecological, and cultural dimensions of place (Kellert, 2005).

One such building that demonstrates interdependence in design is the Adam Joseph Lewis Center for Environmental Studies in Oberlin, Ohio, designed by William McDonough + Partners Architecture and Community Planning, which was completed in 2001 (see Figure 3.22). This building, through indirect nature experiences, makes people aware of natural ecological processes by abstractly but intelligibly mimicking them. An example of this process is the water filtration system or ‘living machine,’ which is essentially a created wetland ecosystem, located in the northeastern section of the building (see Figure 3.23). In addition, on the exterior of the

building, there is the greenscreen (a solar shading device), a designed wetland, and hardwood forest microcosms (National Renewable Energy Laboratory, 2002). The greenscreen is of particular interest as it is an example of an architectural element, which subverts the "frozen geometry" of a building. As previously discussed, Bloomer (2008) maintains that this type of design application is an important use of ornamentation that injects "life" into architecture.

Further, the fixtures and lighting, plumbing, and air-conditioning systems in the Adam Joseph Lewis Center are energy efficient and passive whenever possible (Lee, 2008). Despite these low-impact features, however, it must be noted that the design does not exhibit supporting symbolic representation of nature or the vernacular, which has been shown through the preceding as being integral to biophilic design. In addition, the building minimally transitions between interior and exterior as it has a lack of detailing at threshold points, does not reach out in form to the exterior, and does not blur boundaries through materials and their application.

From left to right: Figure 3.22. Adam Joseph Lewis Center for Environmental Studies in Oberlin, Ohio, designed by William McDonough + Partners Architecture and Community Planning (2001), which creates an awareness of ecological process and connects users to direct and indirect nature. Image used with permission from William McDonough + Partners Architecture and Community Design, September 18, 2009. Available from http://www.mcdonough.com/architecture.htm

Figure 3.23. Interior of William McDonough + Partners Adam Joseph Lewis Center for Environmental Studies showing the water filtration system or 'living machine,' which heightens awareness of ecological processes. Image used with permission from William McDonough + Partners Architecture and Community Design, September 18, 2009. Available from http://www.mcdonough.com/architecture.htm

3.1.4. Summary

The Great Divide describes a cognitive orientation that has fostered an ever-growing separation between humans and nature since the Industrial Revolution. This situation has resulted in grave loses of natural capital due to a general feeling of domination and control, on behalf of humans, over the natural world. Biophilic design counters this notion by reconnecting the built environment and nature through design that traverses created boundaries and separations to create a new space, called the between. The between is created through a process of presentation and integration, which pulls nature from the background and into direct sensory experiences in the built environment making it an integral part of community and place.

The creation of the between is so important in the built environment because the represented relation between humans and nature in design has the ability to create a frame of reference that effects a user's perception. In fact, art historian Philip Ursprung (2007) expands on this line of thinking holding that nature and architecture determine each other. Distilling this concept further, it becomes apparent that our view of nature affects how we design, and further, nature is saturated in human projection, making the case for biophilic design as a means to instill environmental stewardship all the more pertinent. The recognition and use of design as a language, informing and revealing purpose and intent, is thus essential to the design process and more importantly, ecological sustainability.

Looking back through design history as it relates to the creation of the between, the significance of ornamentation and transition in enabling a connection between design and nature becomes apparent. Together, ornament and transition enable the between, or the coevolutionary perspective that is created in an Ich-Du (I-Thou or I-You) relation that rejects the dualistic human-nature orientation as discussed in subsection 3.3.1, "The Great Divide, Materialism, and Egocentrism."

Ornamentation also has the ability to support a continuation between interior and exterior whether applied or integral. Gradual transitions aid in the creation of extensions or hybrid between spaces, which are strengthened by a variety of perceptual experiences and the treatment of architectural form and materials. These perceptual experiences create an opportunity for perceived extension into adjacent space, whether in a concrete or inferred manner. Of importance, however, is the delicate balance that must be struck concerning the amount of ornament utilized (as both complete avoidance and lavish use of ornament have historically created strong opposing reactions). Further, the ornamentation and transitional forms must be related to the vernacular and ecologic characteristics of the site to create a relationship between the interior, nature, and culture.

In summary, the lessons learned from this section that can be utilized in the design investigation include the following:

- Framing must be supported with direct, indirect, and symbolic experiences of nature in the interior to establish the between and an interior-exterior reciprocal relation.
- Biophilic design expressions must be tied to place and culture.
- The threshold is the point where the integral moment of between holds the greatest influence.
- Gradual transitions supported by a variety of sensory experiences enable the creation of the between.
- Human scale is essential to the creation of an intimate sensory experience.
- Biophilic design details must be supported from micro to macro.
- Applied ornamentation is effective in connecting with nature where structural ornamentation cannot be utilized.

3.2. Bridging the Natural and Built Environments

3.2.1. The Transformative Process

Subsection 3.1, "The Human-Nature Connection," established that the overarching tendency of North Americans has been to understand and control nature through a reductive process that looks at isolated parts. This piecemeal approach is true of action (Selby, 2002) and built form (Kellert, 2005). The alternative presented to counteract this issue in the designed environment is biophilic design, which utilizes a holistic approach, focused on the integral relationship between nature, culture, and place. As discussed in the introduction, the framework for this biophilic design investigation is based on the experiential learning methodology Transformation Theory. The adapted utilization of this theory guides the exploration of the interior environment as an educational tool that reveals and interprets the human-nature connection through a series of events, which have desired outcomes. Although intended as a pedagogical methodology that utilizes an educational facilitator-student relationship, the Transformative Learning process, when adapted to the designer-user relationship, provides a structure that centers on the enriching capacity of the designer and growth of the user. As discussed in the introduction, this structure is based on the method of encounter/presentation and experience/interaction, with the objective of internalization/awareness.

To illustrate how Transformation Theory can be utilized in the design process, first the theory itself, and its relationship to the design goals, must be understood. Transformative Learning is a theory of adult education which questions education's focus on intellect in lieu of the physical, emotional, aesthetic, and spiritual (Clover, 2002; Miller, 2002). The concept originated in 1978 under Jack Mezirow, who emphasized the importance of contextual understanding, critical reflection, and assessing reason in creating new meaning and facilitating a change of perspective within an individual (Mezirow, 2000). Parks Daloz (2000), a widely

published author on adult education, describes Transformational Learning as a process that brings about a sense of social responsibility, or the formation of commitment to the larger good, being an identification and concern for the well-being of all life – outcomes that are akin to the design goals of fostering environmental behaviors and creating a connection to nature. He goes on to state that the key factor, which brings about commitment, is *constructive engagement with otherness*, defined as a situation where an empathetic connection to an Other occurs – relating back to Kellert's direct, indirect, and symbolic expressions of nature as a means of intimately engaging people with nature. Further, he stresses that the acknowledgement of differences and similarities are essential to the creation of this connection. Essentially, the basic premise of Transformational Theory is that action-oriented and life-centered learning can induce far-reaching change. The process is more about creating opportunities for development rooted in experience rather then explicitly teaching (Clover, 2002; Miller, 2002), making it appropriate for use in design.

Again, referring this educational process back to its investigation in design, the utilization of the framework not only highlights the importance of considering the larger-world impacts of a design, but also the effect of a design on users' psychological experience. Without considering this aspect, interior design is cutting its impact on environmental stewardship short. In fact, the application of this framework could act to shift interior design away from the materialist conception prominent in contemporary society, to one where design language points to a holistic perspective.

To explain further how Transformative Theory is appropriate to the goals of biophilic design, education professor David Selby's (2002) discussion of the place of Transformative Theory in environmental education is particularly poignant. In his writing, he likens our dynamic with nature not as a balancing act but as a dance where components ebb and wane in

relation. This metaphor speaks not just to the interconnectedness of everything but also to the mutual enfoldment of all. The methodology he asserts for disseminating this dance metaphor is through Transformative Learning's other-than-disciplinary means, which result in critical reflection and awareness. He goes on to stress that learning through experience and the senses is essential to this process as it is empathetic, embodied, spiritual, and slow, in contrast with the conventional, individualized, subject-based, and fast learning that North American society is accustomed to. It is these other-than-disciplinary factors of Transformative Learning that support the use of the interior environment as a means of informing, revealing, and educating. In fact, award winning environmental educator David Orr refers to this highly influential process of learning through the designed environment as a hidden curriculum, teaching through solidified pedagogy (1999). The environmental crisis, then, requires action placed in context, which creates critical reflection and is based in the dissemination of radical interconnectedness, embodied by the dance metaphor. Transformative Theory provides this framework.

3.2.2. The Sensory Systems and Experiential Learning

As detailed in the last subsection, "The Transformative Process," the sensory systems are integral to creating internalization/awareness, the objective of Transformation Theory. The senses are essential to the process because they enable a connection to context that contrasts with the mind-body separation that architecture, and hence interior design, acquired when it adopted a "scientific" grounding, which focused on formal aesthetics in the nineteenth century. The twentieth century only exacerbated the separation when formal aesthetics became associated with rationality and morality in the Modern Movement, to create what were deemed efficient and hygienic designs (Malnar & Vodvarka, 2004). Design with such a lack of sensory involvement has been charged with facilitating the gap between humans and nature (Kellert, 2005; Malnar & Vodvarka, 2004). In fact, Malnar & Vodvarka (2004) insist that

> [the] Cartesian view of typology that has existed for the past two centuries is not only fundamentally at odds with human experience but responsible for some of design's worst disasters. These are both the insidious sort, the gradual desensitizing of an entire culture to the sensuous content of design, and the rather more obvious dramatic housing failures that make the news. (p. x)

The solution presented, which is grounded in phenomenology, is to ensure that the design experience engages the user through an array of sensory experiences, capturing their imagination, and imprinting itself on their very being, the resulting place having meaning and personal significance (Malnar & Vodvarka, 2004).

What follows is an explanation of how a programming process, centered on the senses, and guided by learning outcomes, can engage the user with nature. These outcomes are derived from a combination of the organic and vernacular biophilic design components, the importance of which were discussed in subsection 1.1, "Project Rationale and Description."

To explain, organic design involves building forms that directly, indirectly, and symbolically relate to natural patterns and processes, such as Heerwagen and Gregory's (2008)

seven attributes of nature, which was explored in subsection 1.1, “Project Rationale and Description.” This list includes the expressions sensory richness, motion, serendipity, variations on a theme, resilience, sense of freeness, and prospect and refuge, which will be further explained shortly. Alternatively, the vernacular involves the findings of the visual and critical study of the site-specific cultural and ecological vernacular, found in subsection 3.3, “Site-Specific Place – A Visual and Critical Study.”

Once derived, these outcomes are then analyzed in regards to possible expressions in the design, which are also linked to the organic and vernacular design components. These expressions are then broken down into supporting primary and secondary sensory experiences. To this end, a series of charts, arranged by primary areas of the design, have been created as part of the programming process in subsection 5.2.1, “Biophilic Design Guidelines.” The purpose of these charts are to systematically organize how nature can be evoked through design language using light, materials, color, spatial definition, movement patterns, openings and enclosures, transitions, and the like.

An example of the organization of this chart is depicted in Figure 3.24, which presents the column headings. To simplify, each chart essentially initiates with the function and overall design language desired for each major area of the design. Appropriate outcomes are then formulated, which in turn informs the possible expressions that would be appropriate in the design. Finally, sensory systems are identified that will support the overall desired outcome of the designated area. These charts form the basis of my approach, which I will describe in more detail shortly. First, it is important to further define and explore the terms attributes of nature and the senses.

Area:			
Function(s):			
Overall Design Language:			
Outcomes	Possible Expressions in the Design	Sensory Systems	
		Primary	Secondary

Figure 3.24. Organization of biophilic design guideline chart that will be utilized in the programming process.

First, the term attributes of nature refers to perceived sensory aesthetics inherent in the natural environment that are utilized in the interior as part of biophilic design. Heerwagen and Gregory (2008) state that it is these natural aesthetics which endue the natural environment with its ability to engage people while creating pleasure and well-being. As previously stated, the utilization of sensory richness, motion, serendipity, variations on a theme, resilience, sense of freeness, and prospect and refuge are involved, each of which will now be explained.

To begin, sensory richness includes design that engages all of the sensory systems in a way that is appropriate to place while allowing for plasticity, or the liveliness of daily and seasonal variations. Secondly, motion – more particularly rhythmic ebb and flow patterns – involve providing elements that create calm, interest, and rejuvenation. Examples can be as diverse as fish swimming in a tank, people walking, and leaves rustling in the wind. Thirdly, serendipity involves happening upon the unexpected, or the creation of delightful surprise that arouses interest and a heightened engagement of the senses. This heightened experiential quality creates a switch in perception from the macro to the micro and often facilitates a closer inspection of the whole surrounding environment (Heerwagen & Gregory, 2008).

Fourthly, variation on a theme involves a more complex definition, revolving around the utilization of pattern and rhythm, which has similarities on various scales. Another term for this "self-similarity at different scales" is fractal structuring; a natural occurrence found in waves, tree branches, plant leaves, and wood grain, for example (Heerwagen & Gregory, 2008). The term fractal was coined by Benoît Mandelbrot in 1975 and was brought into prominence in

1982 in his book, *The Fractal Geometry of Nature,* which explored patterns found in non-smooth natural phenomena. The theory essentially describes an analysis of the irregular and fragmented patterns in nature to unearth a type of geometry. This geometry tends to involve chance (regularities and irregularities that are statistical) and scaling (identical qualities on various scales) (Mandelbrot, 1982). Salingaros and Masden II (2008) assert that fractal geometrical qualities provide an organized complexity to the built environment through their hierarchy of patterning on many distinct scales.

Next, resilience is described by Heerwagen and Gregory (2008) as a "web of relationships" that connect various components within an ecological community. It is as much the shared usage of space and resources as it is reuse or recycling. The term even extends to physical persistence against natural stresses. The sixth term, sense of freeness, involves the feeling of unhindered access or options of movement within a space and between spaces. Sensory connections between spaces, a flow or access from inside to outside, and the use of vistas increase this sense of freedom.

Finally, prospect and refuge, a theory that geographer Jay Appleton proposed in 1975, is based on biological need. To break the term down, prospect is a space that provides views or vistas, most notably to the horizon, while refuge is a space where the viewer cannot be seen or feels sheltered or protected. Appleton asserts that the most desirable spaces combine these two qualities, as the perceived safety increases aesthetic enjoyment. The experience of prospect and refuge is most significant when the dynamic quality of moving through a space is added. Utilized individually, prospect is more appropriate for social situations where one wants to see and be seen, while refuge provides a situation for privacy and physiological and psychological rejuvenation (Appleton, 1975; Heerwagen & Gregory 2008).

The second term to define, the senses, has changed and evolved over time. The traditional definition stems from Aristotle and involves five points of contact between the body and the outside world; these are sight, hearing, touch, taste, and smell. It is important to note that the senses were deemed inferior to cognition and abstract thought at this time, a view which continued through Plato, Descartes, Hegel, and into the Modern Movement (Malnar & Vodvarka, 2004).

Alternatively, in recent years the definition and breakdown of the senses, and their relation to each other, has expanded and evolved. For example, Pallasmaa (2005, 2006) argues for the treatment of all of the senses as equals. Further, he has included seven realms of experience in his theory, involving the eye, ear, nose, skin, tongue, skeleton, and muscle. Another example is that of psychologist James J. Gibson (1966), who offers an approach that provides a greater connection between the senses and their application in design. He discusses the senses as being involved with systems, being the visual system, auditory system, taste-smell system, basic-orienting system (horizontal ground plane in relation to vertical posture), and the haptic system (touch, temperature, pain, pressure, and kinesthesia). In fact, Malnar and Vodvarka (2004) hold that Gibson's last two systems enable spatial experience to be understood on a more involved level. Further, they ground their discussion of the experience of the senses in space on Gibson's work, the only exception being they break the haptic system down into touch, kinesthesia, plasticity, and temperature and humidity. In the design process, this latter definition, broken down into the visual, auditory, taste-smell, basic-orienting (horizontal ground plane in relation to vertical posture), haptic (touch, kinesthesia, plasticity, and temperature and humidity), will be used in the completion of the programming charts.

To elaborate on the impact of the full sensory experience in the interior environment, philosopher Maurice Merleau-Ponty (1962/1945) utilized a phenomenological approach,

describing the body and its perceptive mechanisms as the venue for being in the world and connected to space and time through embodied consciousness. In other words, the senses are the means through which space, a universal form of communication, relates to humans, creating place (see also Evernden, 1985; Lawson, 2001; Relph, 1976; Tuan, 1977). Through this process, or spatial language, built form has the ability to inspire, transform, and to allude to meaning beyond its physicality (Holl, 2006; Malnar & Vodvarka, 2004). Essentially, one encounters a sensory experience in space – which is filtered through memory, cultural and ethnic patterns, and personal experience – changing it, in the mind's eye, to place (Kaplan & Kaplan, 1989; Malnar & Vodvarka, 2004; Relph, 1976; Tuan, 1977).

The experience of place, it must be noted, resides in the evoked, in the verbs or actions created in the user through design language, not the built elements themselves. Pallasmaa (2006) likens the interaction with the sensory experience to a conversation that takes place between the designer and the user. It is in this conversation, in the understanding of intention or meaning behind the phenomenal experience based in the senses, that the experiential qualities of the built form become generative. Generative because both the outer and inner perceptions have been stimulated, resulting in a place which transcends physicality. Simply, the space engages the senses while also occupying the intellectual and spiritual cognitive space within the user (Holl, 2006). In this way, the interior is a tool of learning as it provides an experience to which the user engages and reflects. Pallasmaa (2006) follows this line of thought stating "a building is not an end to itself; it frames, articulates, restructures, gives significance, relates, separates and unites, facilitates and prohibits" (p. 35). A building in effect, through form and detail, creates verbs, meaning action, occurrences, or states of being.

Pérez-Gómez (2006) expands on the creation of a meaningful engagement between the user and built environment to speak of an ethical intention, which should be infused into

architecture as a “poetic vision” realized in space-time. Moreover, Pallasmaa (2006) asserts, “the timeless task of architecture is to create embodied existential metaphors that concretize and structure man’s being in the world” (p.37). Design utilized in this manner takes on the properties of a stage, requiring its components, or design intentions, to be linked to the response or behaviors that are desired. The interior becomes the stage on which the sensory systems, mediated by experience, culture, and context, shape response to space, or context (Malnar & Vodvarka, 2004).

To illustrate methodologies utilized to create design that is highly attuned to the senses – although, I stress, not necessarily biophilic design, my paper examines some features of traditional Japanese gardens, with special attention given to the tea garden and stroll garden. Although differing in purpose, these gardens all facilitate a marriage between nature and humans through the senses for the benefit of the mind and spirit (Itoh, 1998; Slawson, 1987). Slawson (1987), in fact, asserts that the gardens connect sensory perception to cognition, unlike the West, which has an overarching history of dividing the two. He goes on to liken Japanese landscape design to the arts (painting, photography, and poetry), as the composition of each has a powerful ability to evoke sensations and allude to human feelings. Elaborating, Slawson (1987) states:

> Without the landscape designer’s sensitivity to the effects of forms, textures, and colors relative to one another in the spatial composition, the created object would lack the concentrated power of art. Effects of scale, such as immensity and intimacy; effects of spacing and shape, such as rhythm and movement; effects of texture and color intensity, such as an enhanced sense of depth and luminescence – all these and more play an especially vital role in the art of the Japanese garden. They are at the heart of its power to create an illusion of physical reality by teasing our perceptual systems into belief.

Importantly, to re-create the quality of a mood and atmosphere, Japanese garden design guides the visitor on a human-made journey of sensation that reflects and honors the natural world, creating a connection, as opposed to being based on an imposed mathematical order or some

other purely cognitive procedure (Slawson, 1987). Because the gardens are composed of both human and natural elements, they are poised as a "median zone," or transitional space, which can act to bridge the two (Itoh, 1998). The same is true of an interior that incorporates biophilic principles.

Methodologies utilized in the Japanese garden to create an engaged sensory experience are varied. The principle of "aesthetic of discovery," for instance, uses the element of surprise to heighten sensation, and the principle of "borrowed scenery" produces awe as views and vistas become a part of the garden. Furthermore, "mutability as a quality of permanency" harnesses the plasticity of the passing of time and seasons and the formation of patinas, as signs of change that heighten attunement to nature's rhythms (Itoh, 1998).

The utilization of the senses in Japanese garden design particularly comes alive in the tea-ceremony garden and the stroll garden. Although on different scales, these gardens are both designed like a walking journey, which evokes a particular atmosphere and sensations. With each step, the senses are attuned to a specific feature. In one step, an elaborate array of stepping stones focuses the eyes, muscles, and skeleton downward to the earth, while the next step on a large stone reorients the focus up and around to a surprising experience. Speed of travel is slowed through elaborate sensory details and quickened in their absence. Due to the larger scale of the stroll garden, the manipulation of space and light is further explored through the opening (enlarging) and narrowing (enclosing) of space. Indeed, the sequence of sensory experiences are discovered through movement in space and designed to focus attention toward, as well as heighten sensory awareness (Itoh, 1998).

Adding to the lessons drawn from traditional Japanese garden design, I look to Malnar & Vodvarka (2004), who discuss important elements to consider in the process of enriching design with sensory experience. Of the foremost importance is the engagement of the senses on

multiple scale levels, the sensory experience thus needing to begin with the character and scale compatibilities of the whole design with the surrounding natural and architectural features. This respect for place is essential to maintain a sensory experience that is appropriate to the site and increases the chance of emotional investment on the part of the users. After the overall impression, the next concern is the importance of paths, doors, and gates to prepare a user for the physical realities of a space. In other words, meaning or content should be invested in transitional elements.

Moreover, the use of ornament, if done properly offers a vast array of sensory phenomenon. Malnar & Vodvarka (2004) elaborate, stating:

> ornament, far from being an embellishment of inherently deficient design or simple visual excess, serves a vital function. It serves to precisely identify a thing for what it is – its social and cultural function – and transmit that identity to an audience. It also controls our response to that which it ornaments through the sensory facilities of the observer. (p174)

Ornament thus serves the purpose of focusing attention and orienting behavior, much as seen in the Japanese tea and stroll gardens. To elaborate, areas that are highly ornamented can create a fixation pattern in the user, causing them to slow down, or stop and examine. The use of ornament also provides the opportunity to create intense symbolic and associative meaning to aid in understanding the design.

Finally, the importance of light and color are essential and often play off one another. In fact, Malnar & Vodvarka (2004) list natural daylight, with deficits made up by full spectrum lighting, as essential to a positive sensory experience. The only areas where this is not the case are those used for short-occupancy. Light has the ability to give meaningful metaphors and create sensory boundaries, highlighting the importance of shadow, contrast, and variations in lighting levels. Color in relation to light also becomes a means of expressing change and of engaging many of the senses, as it is closely linked to sense of time, temperature, taste, and

smell. This relationship between color and the senses is because hue, brightness (or value), and saturation link color closely to natural biological stimuli (Malnar & Vodvarka, 2004).

3.2.3. Summary

In summation, as previously stated, the formal aesthetics adopted by design in the west have severed the communicative capabilities of space, resulting in a design language that has become primarily visual with little involvement of the other senses. This has severed the possibility of a full connection to the user (Barbara & Perliss, 2006; Lawson, 2001; Pallasmaa, 2005, 2006) and thus the ability of a design to foster internalization/awareness (Kellert, 2005; Malnar & Vodvarka, 2004).

These types of designs convey, through their language, that disconnectedness with nature and place is normal. Accordingly, Orr (2002) charges visual design with being outside of our biology, evolutionary experience, and aesthetic sensibilities. Such buildings support ignorance and callousness toward nature because they do not convey a spirit of place or an understanding of the interconnections of life on earth (Kellert, 2005; Orr, 2002).

It is only through the utilization of all of the perceptual mechanisms that a relationship and response to the built environment is enabled. This response, if grounded in design that speaks to place and nature, acts to create connection instead of creating fabrications, which construe and sever people from reality (Pallasmaa, 2005). In the following section, this importance of place to connection is further explored as the specific qualities of the Saint-Boniface neighborhood are explored.

3.3. Site Specific Place – A Sensory and Critical Study

3.3.1. Creating Place

The importance of place in the process of biophilic design was established in subsection 1.1, "Project Rationale and Description," and further explored in subsection 3.2.2, "The Sensory Systems and Experiential Learning." How, then, does the designer interweave with place, or go about establishing a method to enable place making in the interior environment, while still ensuring a connection between people, site, and nature? In formulating an appropriate response, place and its inverse, placelessness, are defined to provide a framework that guides the strategic investigation of place, which, in turn, reveals and synthesizes the characteristics that can be translated into design. This strategy is employed in the succeeding three sub-sections to determine the defining qualities of the Saint-Boniface neighborhood. The findings of this study are then utilized to inform the spatial and aesthetic requirements in section 5, "Functional and Aesthetic Program," specifically the "Outcomes" and "Possible Expressions" columns, which ultimately guide the design process.

To begin, the creation of place, or a spirit of place, in the built environment, lies in the designed sensory connection and interaction between landscape and culture, which endows the designed environment with value, making space place (Malnar & Vodvarka, 2004). Essentially, the feeling of place is created by establishing a feeling of being *inside*, meaning being within an area or setting of any scale, defined by the intensity of the unique, significant experience of that location, as well as subsequent interaction and dwelling that occurs (Relph, 1976).

Thus, to establish a manner through which unique, significant experiences appropriate to place are enabled in the design investigation, as outlined in subsection 1.1, "Project Rationale and Description," a process of site documentation captured through photography is combined with graphic and written analysis. To further explain, Kellert's (2005) listing of vernacular

design characteristics were adapted as a guide for the photographic investigation, with the cultural aspect of the study capturing regular and repeated events (characteristic artifacts and designs), familiar and valued surroundings, and predictable customs and norms. Moreover, the ecological aspect captured shapes and forms of natural features, material qualities (color, texture, etc.), and plasticity (variability). Jean-Philippe Lenclos's (2004) concept of the geography of color and Michael Lancaster's (1996) work on color relating to context, then, were utilized as guides for the subsequent graphic analysis, which was then further explored through a process of descriptive and interpretive analysis as explained in subsection 1.1, "Project Rationale and Description."

Further illustrating the process, I will begin by explaining Jean-Philippe Lenclos's concept of the geography of color, which was conceived in the 1960's. This concept is explained and detailed in his co-authored book with Dominique Lenclos, *Colors of the World: The Geography of Color* (2004), which outlines a systematic study to determine the chromatic character, or identity, of a locale. Importantly, however, through the research and analysis, place characteristics beyond color, such as prominent materials, forms, rhythms, and façade characteristics are revealed.

The process begins with looking at the distinct qualities and dominant traits of buildings in their context (landscape) as seen from a distance, called *global perspective* (for example, tonal color contrasts, volumes and their proportions, architectural rhythms, value contrasts, and brightness). An *elemental perspective* is then utilized to look at the color of natural materials (for example, vegetation, wood, rock, and soil), engineered construction materials (for example, concrete and roofing material), textures, and paint. The pair also stresses the importance of considering all of the changing elements of the landscape through seasons, time of day, aging, and renovations. Essentially, the two-staged methodology documents the global perspective

through site pictures/drawings. Then a series of modular vignettes are created, reducing habitats to iconographic forms depicting the colors of the structure, roof, window frames, and doors. The second stage involves a detailed color analysis of relevant building materials, where colors are sampled from structures and represented in a combination of photographic images and collages. In addition to the colors of buildings, the Lencloses also analyzed colors from dominant cultural artifacts as part of their work. Although the Lencloses' exact process will not be utilized in this design investigation, the goal of determining the global and elemental characteristics of the site is the same and the basic concept is utilized, although photographic compositions and color sampling are the primary means.

Further, on determining regional color character in present day environments, which present a conglomeration of styles with diverse sources, Michael Lancaster (1996) in his book, *Colourscape*, focuses primarily on the importance of color as it relates to context, specifically nature. To Lancaster the color traditions of a place apply to both indigenous materials and applied color, and importantly, the latter is often derived from the former. Further, he stresses that local character is not stagnant in any particular time, but rather grows and develops. However, regional colors always work with the landscape and light qualities of an area, and are not those derived from the monotony and sameness of industrialization and standardization. These highly saturated colors, commonly found in commercial advertising, clash with landscape and indigenous materials. Further, they detract from and render regional colors dull, while working against and compromising a relation with nature. In addition, when found in mass, these colors act to create visual clutter, confusing messages, and feelings of inundation. In effect, a harmony must be created between architecture and the array of nature's colors, with chaotic and conflicting pigments being avoided where possible.

Accordingly, what this study aims to avoid is the placelessness of mass culture and generic built environments that are associated with apathy and disassociation (Kellert, 2005; Relph, 1976). This is of particular importance because, as geographer Edward Relph (1976) warned, cultural and geographic uniformity have never occurred at such a grand scale throughout history but now, too, with the virtual absence of adaptation to local conditions. Of course, placelessness has only worsened since his writing in 1976, with mass urbanization resulting in large-scale, cookie-cutter developments, further creating all-consuming similitude. The manifestations of this placelessness include commercial strips, entertainment districts, uniformity in instant new suburbs, and the lack of human scale in skyscrapers (Relph, 1976). The threat of such homogeneity is that connection to the land and the creation of place is becoming less and less possible, working against the goals of biophilic design, sustainability, and ecological design (Kellert, 2005).

3.3.2. The Cultural, Social, and Historic Vernacular

To begin the cultural vernacular analysis of the site, the community was photographed, with the resulting images being compiled into global and elemental groupings. These images were taken over the period of a year to best ascertain the feel of the community through the changing seasons. Further, the winter studies enable a closer look at the form of the buildings and the vegetation, while the spring, summer, and fall studies display the full array of cultural and ecological characteristics intermingling. What follows is a descriptive and critical assessment of each of these studies focusing on the prominent and most distinguishing features of the Saint-Boniface neighborhood.

First, the residential portion of the community was analyzed from a global perspective. Figures 3.25 and 3.26 deal particularly with the form of the buildings while Figure 3.27 relates these structures to the surrounding vegetation. The findings of these compilations lead to the following conclusions:

- The dominant building color is typically light in tone with punctuations of contrasting color on the primary entrance, eaves, roof, and window frames.
- Punctuating colors are typically deeper shades (hue with black added) or white
- Massing and voids are semi-regular with many housing clusters having houses of similar sizes with a distinct void between.
- Forms are overall rectilinear contrasting with the prominent ecological forms.
- Homes offer the feeling of penetrability with symbols of invitation offering a sense of contact with what lies beyond, including highlighted entranceways (such as front doors with small roofs, landings, and contrasting colors), transitional spaces (such as exterior porches and paths), large glazing at eye level, and undulating building façades.

- The abundance of surrounding vegetation creates permeable screens offering prospect and refuge.
- Branching patterns of tall, mature vegetation creates prominent patterns of light and shadow that dapples the generally strong penetrating light.
- The chromatic character of the cultural vernacular creates a subtle contrast with the ecological vernacular, which is typically comprised of brighter, purer tones.
- The chromatic character of the cultural vernacular recedes from the purer vibrant tones of the vegetation.

Next, for the elemental qualities of the neighborhood, Figure 3.28 depicts the material characteristics found in prominent buildings. This compilation's findings lead to the following conclusions:

- Natural materials, including Tindal stone, wood, brick, and stucco are prominent.
- Buildings are often comprised of smooth materials accentuated with rough accents or vise versa.
- Residential materials often allude to or are similar to natural finishes found in larger structures; specifically, Tindal stone colorations and textures (see also Figures 3.25 and 3.26).
- Building materials are more rusticated in nature, ranging from slightly course to highly textured.
- The copper utilized shows significant levels of patina, which is mimicked with accent paint hues in many structures, creating community unity.
- Red brick colorations are mimicked in many structures, also creating community unity (see also Figures 3.25, 3.26, and 3.27).

Figure 3.25. Residential cultural, social, and historic characteristics around the design site. Image by Natalie Foidart.

Figure 3.26. Residential cultural, social, and historic characteristics around the design site. Image by Natalie Foidart.

Figure 3.27. Residential cultural, social, and historic characteristics around the design site. Image by Natalie Foidart.

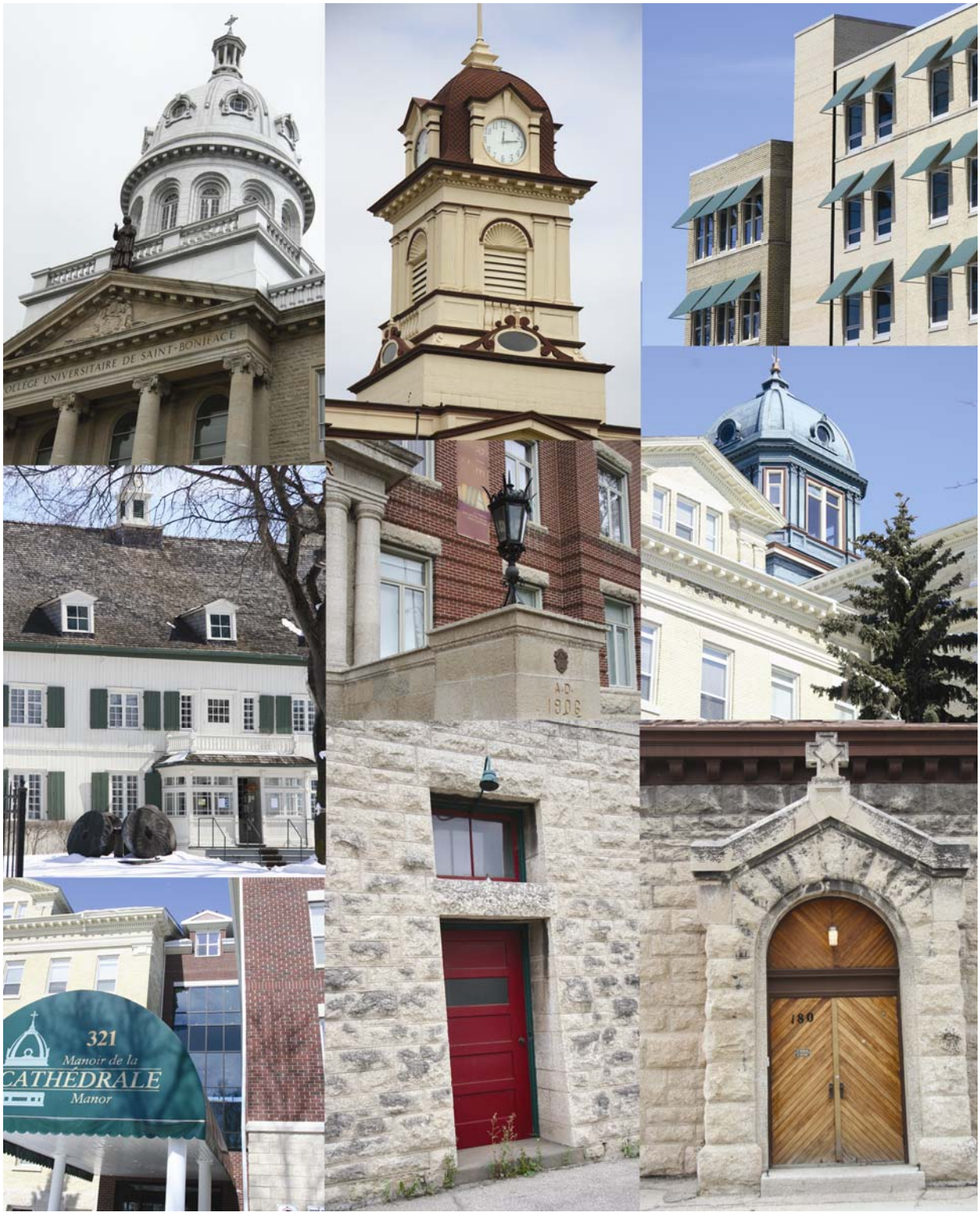


Figure 3.28. Cultural, social, and historic characteristics found in prominent large-scale buildings around the design site. Image by Natalie Foidart.

3.3.3. The Ecological Vernacular

Equally important, for the ecological vernacular analysis of the site, place specific vegetal characteristics were photographed, again with global and elemental perspectives. As with the cultural study, these images were taken over the period of a year to represent seasonal variations. What follows is a descriptive and critical assessment of each of these studies focusing on the prominent and most distinguishing features of the Saint-Boniface neighborhood.

The first image compilation, Figure 3.29, assesses the community from a global perspective. This compilation's findings lead to the following conclusions:

- Dominant vegetal forms create semi-regular patterns of mass and void.
- Dominant vegetal forms compose an arranged rhythmic movement.
- Repetition of dominant vegetal forms increases the sense of freeness and prospect through the creation of horizon-like points framed by receding and overlapping forms.
- Dominant vegetal forms create distinct silhouettes and light and shadow patterns that enliven the landscape in the winter.
- Dominant vegetal forms create catch and form snow, ice and frost creating interesting textural and visual changes in the landscape in the winter.
- The leaves of dominant vegetal forms hold dew and rainwater creating sensual interest and displaying the effect of weather changes.
- Low vegetation clusters skirt the edges of large masses and forms creating transitional cues from one type of space to the next (also see Figure 3.27).
- High, arching branching patterns and cascading foliage create a canopy that establishes human scale and the feeling of refuge.
- Dominant vegetal forms create distinct temporal patterns of light and shadow.

Further, the elemental qualities of the ecological vernacular in the Saint-Boniface neighborhood are presented in Figure 3.30. This compilations findings lead to the following conclusions:

- Textures are rich, distinct, and highly varied throughout the seasons ranging from coarse and jagged to fine and smooth.
- The dominant vegetation colors present subtle variations that are punctuated with distinct contrasting hues, bright colors against tones and shades of green and brown in the summer to bright and muted colors against tones and shades of white in the winter (also see Figure 3.27).
- Snow, ice, and frost blanket the forms creating interesting textural and visual changes in the landscape in the winter.
- Small animals bring life and activity in all seasons reorienting focus towards the landscape.
- The most interesting winter landscapes include those that are highly textured and patterned due to a variety of plant forms that are punctuated with color.

Figure 3.29. Ecological vernacular characteristics around the design site. Image by Natalie Foidart.

Figure 3.30. Ecological vernacular characteristics around the design site. Image by Natalie Foidart.

3.3.4. Vernacular Chromatic Character

Finally, the overall chromatic character of the site was determined through the assessment and sampling of hues from the dominant cultural and ecological vernacular characteristics in the Saint-Boniface neighborhood. Figure 3.31 presents these two color groupings, the left being cultural hues and the right being ecological hues. Both of these groupings are arranged according to the how the colors relate to one another in space, meaning colors that typically occur closer to the ground are represented closer to the bottom of the figure. For example, the cultural vernacular hues are arranged with the top third representing roof colorations, the middle third the main body of the buildings, and the bottom third trimming, doors, verandas, landings, and the like. However, the ecological vernacular is not as clear-cut with the levels blurring together due to vegetal growth patterns and size variations. Further, the ecological grouping displays seasonal variations in color.

Figure 3.31. Vernacular chromatic character around the design site derived from the cultural and ecological vernacular characteristics. Image by Natalie Foidart.

3.3.5. Summary

In conclusion, the Saint-Boniface community is rich with characteristics of place, which not only emphasize the unique feeling of being within the area but also merge the ecological and cultural through materials and color. Breaking down the experience of place into its global and elemental qualities allows the translation of the sensory experience of place into design outcomes, essential to weaving the design exploration into the site. This process enables emotional investment that comes from dwelling in a community with defined sense of place. In the next section, 4, “Precedents – Investigation and Analysis,” the impact of both the lack and presence of place defining characteristics is apparent in the analyzed designs.

4. Precedents – Investigation and Analysis

4.1. Precedent Overview

This subsection outlines three design projects: Knafo Klimor Architects' Agro-Housing, Fay Jones's Thorncrown Chapel, and Inside Outside's Radial View exhibition, which were chosen to analyze for their relevance and ability to inform this biophilic design investigation. In what follows, each project is described in terms of the site, design, program, and concept and goals (implicit and explicit). Further, the basis for the selection of each design is discussed, which is derived from the two components that comprise biophilic design, organic design (design features that elicit a perceived connection to nature as they are derived from characteristics of nature) and vernacular design (design that connects to the ecological, cultural, social, and historical attributes of place). While each project relates in some way to aspects of these two components, the evident biophilic design traits prove to be just as important to this analysis as those aspects of each design that do not enable a connection to nature.

To provide an outline for the analysis, it is necessary to go over the three overriding factors that represent the process and objective of investigating biophilic design in the interior environment in this design project: encounter/presentation, experience/interaction, and internalization/awareness. These word groupings, which originate from the Transformative Learning methodology, were found through subsection 3.2.1, "The Transformative Process," to be particularly pertinent to the design investigation as they summarize the process of how the interior can be utilized as a tool by the designer to foster environmental behaviors. To explain further, encounter/presentation, as utilized, relates to the direct exposure to organic design and regional design features. Experience/interaction brings the encounter to the next level through engaging the body's sensory systems and creating an experience that facilitates a relation and highlights interdependence between humans and nature. Of importance to the organic

experience/interaction are Heerwagen and Gregory's (2008) seven attributes of nature, which form the basis of sensory experience based in natural phenomena: sensory richness, motion, serendipity, variation on a theme, resilience, sense of freeness, and prospect and refuge. In addition, on the point of interaction, particular emphasis is placed on the creation of the between, as explained in subsection 3.1.1, and bridging the boundaries between interior and exterior through the treatment of thresholds and glazing. Furthermore, experience/interaction, which speaks to regional qualities, must reference and utilize shapes, forms, textures, materials, pattern, and ornamentation drawn from local features, processes, events, characteristic artifacts and designs, and valued surroundings. Finally, internalization/awareness is the goal of the whole process, aimed at enabling a change of reference or changed attitude towards nature through design.

4.1.1. Agro-Housing in Wuhan, China, by Knafo Klimor Architects (intended completion 2011)

The Agro-Housing project, designed by Knafo Klimor Architects, was a wining entry into the 2007 international architecture competition for innovative, sustainable housing solutions, which was offered by Living Steel, a program of the international non-profit research organization World Steel Association [worldsteel] (Living Steel, n.d.). The inventive housing design combines agriculture and nature within a high-density, high-rise urban living environment through the incorporation of a vertical greenhouse and gardens throughout the design (see Figure 4.1). The intent of the project is to facilitate China's transition away from a rural way of life, while still upholding a connection to community, nature, and agricultural practices. The concept, as put forth by the firm, states that

> Agro-Housing is a housing program that will allow the formation of a new social and urban order and that can be replicated as it represents basic human values lost in the process of modernization and progress. Agro-Housing will reduce the need for commuting and the extra development of the transportation system and it will replace the urban zoning strategy by a more sustainable urban concept. (Knafo Klimor Architects, n.d., para 5)

Figure 4.1. Agro-Housing southwest exterior view showing vertical greenhouse. Image used with permission from Knafo Klimor Architects, Tel Aviv and Haifa, Israel, Septeber 17, 2009. Available from http://www.kkarc.com/

The building has 11 floors of apartments containing 150 units, a multi-storied greenhouse, interior gardens scattered throughout, a kindergarten and parking on the main floor, and a tenants' club and intensive garden on the roof. The footprint of the building, which is 32,808 square feet (3,048 square meters), was designed in a way to minimize the space occupied by the structure to allow ground surface for gardening and rainwater harvesting (Knafo Klimor Architects, n.d.).

The implicit and explicit goals for the Agro-Housing project were derived from a distillation of information provided by Knafo Klimor Architects (n.d.) in their design submission to Living Steel, an article written on the project in the Jerusalem Post (Levitt, 2007), and an interview with Mr. Knafo and Ms. Klimor in a Living Steel (2007) newsletter. Through a review of these sources, it is apparent that the design of Agro-Housing seeks to accomplish these goals:

- Enable families to produce organic and healthy food at home, both for personal consumption and to sell to the community, contributing to independence and freedom, less dependence on transportation systems and vehicles, extra income, and job creation.
- Create a sense of community within the building by enabling interaction through shared growing spaces, community spaces, and a community kindergarten.
- Preserve a part of the rural traditions and social order of an agricultural way of life through the incorporation of growing spaces into a high-density living environment, enabling a rural and urban merger.
- Allow for various and changing family structures and working from home in apartments through the use of non-load-bearing partitions made of light plaster panels that can be cost effectively and easily torn down, recycled, and replaced.

- Reduce the use of resources and the creation of pollution using passive solar orientation, operable windows, a thermal chimney, a forced solar collection system, an economic and simple building envelope, a grey water collection system, and a system that utilizes water from the existing high water table.
- Create public awareness of sustainable ideas and their benefits through positive exposure to nature in the vertical greenhouse and interior gardens, and exposure to energy reduction and water recycling systems.
- Enable alternate modes of transportation through urban location and allowance of room for bicycle parking.
- Utilize materials that are recyclable and/or sustainable as much as possible.
- Create housing that moves away from the modernist machine conception to one which speaks to nature and intrinsic human values, essentially defining a new relationship between nature and humanity, which moves toward an environmental consciousness and sustainability.

Agro-Housing was chosen as a precedent for this design investigation as it provides distinct examples of direct and indirect organic design in a multi-unit residential environment. Furthermore, the examples of each expression are integral to the building rather than superficially added. Direct organic design is evident through the employment of natural ventilation involving manually operable windows and a thermal chimney. Next, ample natural lighting created through building orientation, open interior spaces, and expanses of windows are utilized. Although these features are important, the most notable and novel design components of this project are the integral, indirect organic ones seen in the agricultural areas. These components, which include the vertical greenhouse (see Figure 4.2), intensive roof garden (see Figure 4.3), and interior gardens, are incorporated in a way that not only engages the users but

also creates a distinct experience/interaction through the sensory systems, opening up the possibility for internalization/awareness. Not only do these spaces require constant human interaction from most users but they are also visibly tied into a rainwater harvesting system, bringing to the fore a human-nature relation. Beyond providing a place to grow food in an urban environment, the close proximity to the vegetation itself and the agricultural relationship also provides a connection to regional design. This is because traditionally valued surroundings, customs, and exposure to natural processes are present, which provides an association to the lost rural way of life.

Additionally, when Agro-Housing is analyzed in relation to Heerwagen and Gregory's (2008) attributes of nature, several of these can be identified; namely, motion, serendipity, resilience, sense of freeness, and prospect and refuge. To begin, motion is present through hallways, balconies, elevators, and communal spaces that allow frequent exposure to the rhythmic pattern of people moving and to the ever-changing natural light and air currents that deeply penetrate the design through the large operable windows and the thermal chimney.

Second, serendipity is present through the unexpected encounter of the expanse of vegetation in the interior environment, in the vertical greenhouse, and in the garden spaces. These spaces provide the incentive to shift attention back and forth from the details of the plants and growing systems to the environment outside of the windows.

Resilience is present through the opportunities for a strong community that, to a degree, can operate in a self-sufficient manner through the diverse program (vertical greenhouse, interior gardens, communal spaces, kindergarten, roof garden, solar collector, grey water collector, etc.).

Next, a sense of freeness is created as the users are provided with choices and opportunities to support their behavioral and emotional needs. Although this is the case, the

perception of boundaries could be further reduced if strong sensory connections were created from all of the apartments into the internal community, particularly the vertical greenhouse. Unfortunately, as the design stands, some of the apartments do not even have visual access into the building's center.

Finally, prospect and refuge is apparent, although more a part of some apartments than others because of the stunted and non-existent internal sightlines. However, apartments with a two-floor layout (see Figure 4.4) have a greater sense of enclosure and prospect due to the varied ceiling height and internal and outward looking views. Additionally, apartments with glazing or balconies looking into the center of the building also have a greater sense of prospect and refuge than those that just look out towards the city (see Figure 4.5). Moreover, the communal areas and public spaces appear to be prospect dominant, as room height variation, wall deviation, and such appear to be non-existent.

In relation to the above, it is clear that an integral opportunity to allow for a more involved connection to nature and community is limited. This is because few apartments have any significant visual connection to the vertical greenhouse and the internal community with most windows facing out to the city. I feel that an important opportunity to provide a connection to nature and the community of the building was lost in this regard. Furthermore, metaphorical representation of nature through form, decoration, finishes, and such is virtually non-existent, creating a division between the spaces that contain nature and the rest of the building. Another point to make is that Agro-Housing has focused primarily on the creation of an economic building shell, albeit having simplicity and flexibility in its interior spaces, as well as functional sustainability. The outcome of this has meant that the firm largely ignored organic and regional design, with the exception of the vertical greenhouse and gardens. Thus, the end product is a structure that is a hybrid between technological sustainability and biophilic design.

The apartments reveal precisely this disconnect as the materiality does not create a relationship but rather a juxtaposition with nature (see Figure 4.4). The connection between the apartment spaces and the vegetated areas is thus dominantly visual, which is similar to the relationship between modern buildings and the framed exterior nature, as was discussed in subsection 3.1.3, “Design and Nature Retrospective – The Impact of Ornament and Transition.” The resulting dissonance between the spaces thus makes a strong case for a connection that is enabled through integrated materiality and a connected design language.

In summary, Agro-Housing is most successful, in regards to biophilic design, at interaction with indirect nature and direct natural processes. Although these attributes increase the chance of internalization and reflection due to direct physical effect on vegetation, they have not been supported with symbolic materiality or design language, limiting effect. Further, transitions between interior and exterior are virtually absent, making the building shell a division point rather then the space of between. The result is a structure with inserted vegetation.

Figure 4.2. Interior greenhouse view from an apartment patio. Image used with permission from Knafo Klimor Architects, Tel Aviv and Haifa, Israel, September 17, 2009. Available from http://www.kkarc.com/

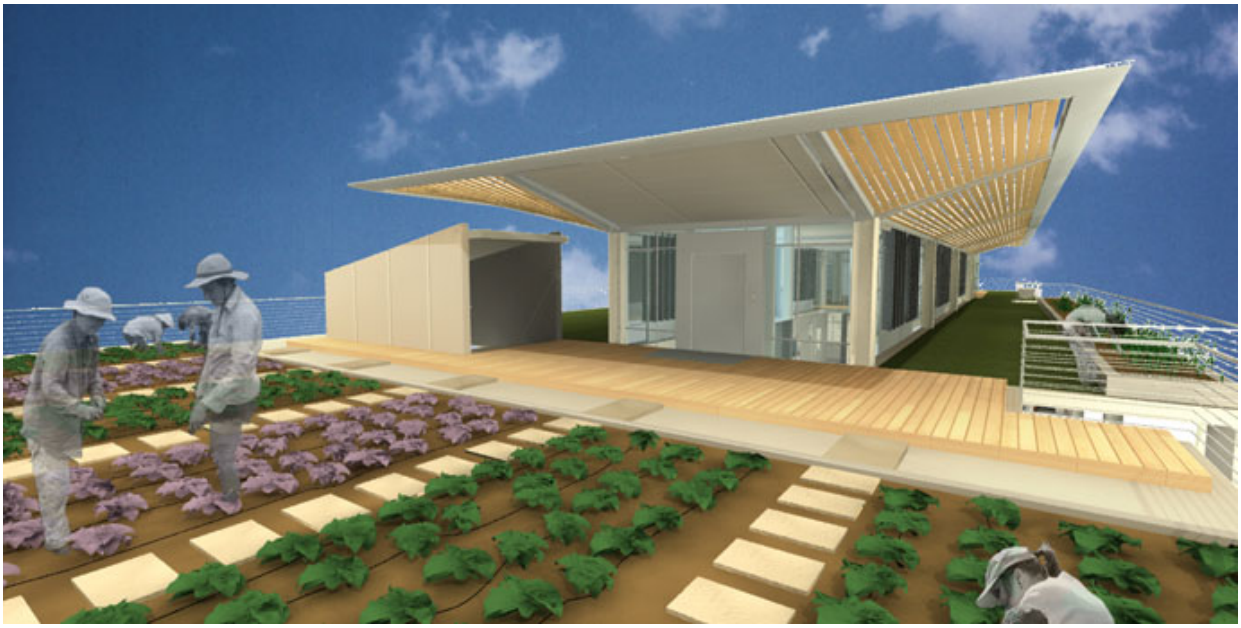


Figure 4.3. Roof garden with intensive food gardens and tenant's club. Image used with permission from Knafo Klimor Architects, Tel Aviv and Haifa, Israel, September 17, 2009. Available from http://www.kkarc.com/

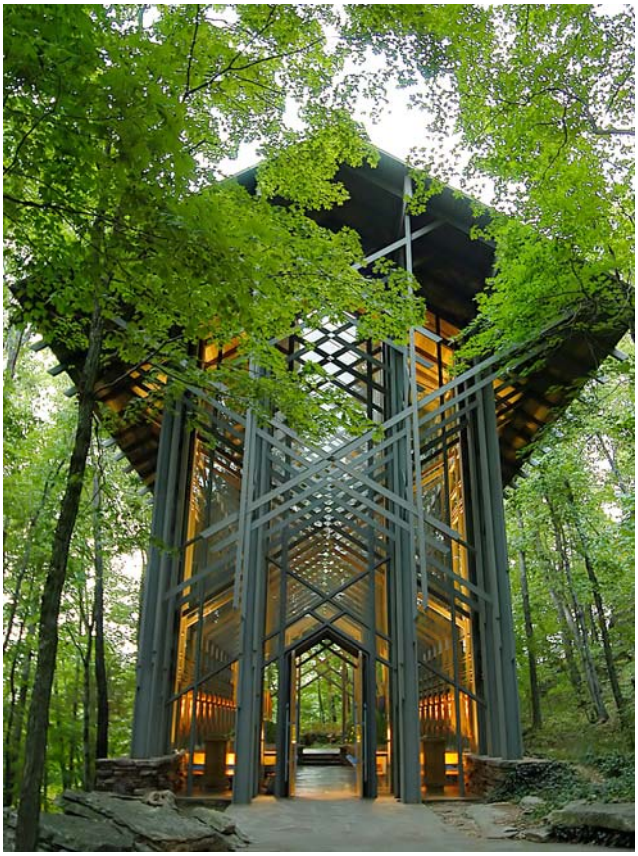
Figure 4.4. Interior of an apartment with loft depicting the stark interiors that do not create a connection to nature. Image used with permission from Knafo Klimor Architects, Tel Aviv and Haifa, Israel, September 17, 2009. Available from http://www.kkarc.com/

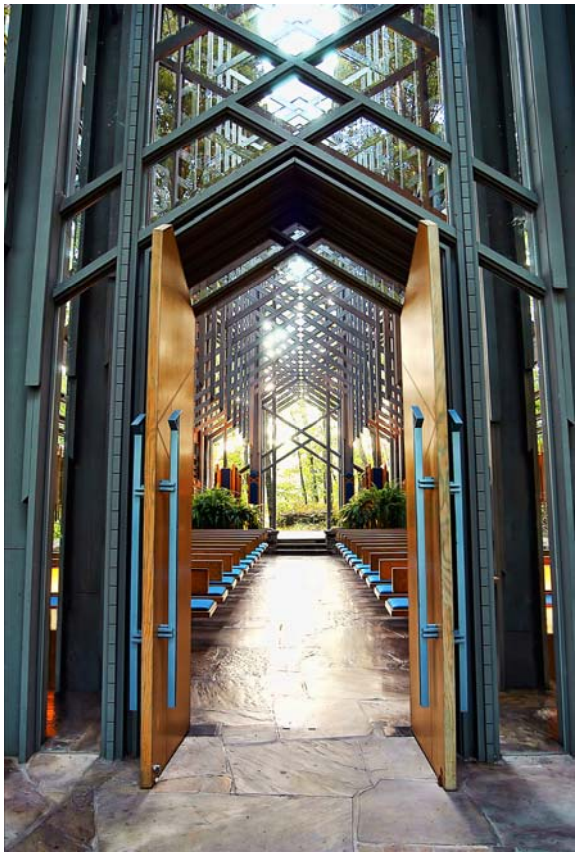
Figure 4.5. 6th (below) and 7th (above) floor plans. Image used with permission from Knafo Klimor Architects, Tel Aviv and Haifa, Israel, September 17, 2009. Available from http://www.kkarc.com/

4.1.2. Thorncrown Chapel in Eureka Springs, Arkansas, by Euine Fay Jones (completed 1980)

Thorncrown Chapel was described by Robert Adams Ivy Jr. (1992) as "elemental – a man-made temple married to the woodland" (p. 32). The design, inspired by Sainte Chappelle (1243-48), a light filled Gothic chapel in the heart of Paris, France, grows out of a rural densely wooded forest blurring the line between landscape and architecture. This link to the architectural past was essential for Jones, as to him the architect should engage any new building with the dominant themes or characteristics pertinent to building type. These qualities were not employed blindly though, requiring contemporary reinterpretation so the result was not semiotic but tied to time and place. The resulting space utilized an inverse of the upward and inward forcing Gothic flying buttresses in the form of outward forcing wooden tensile members ribbing the building (Gandee, 1981).

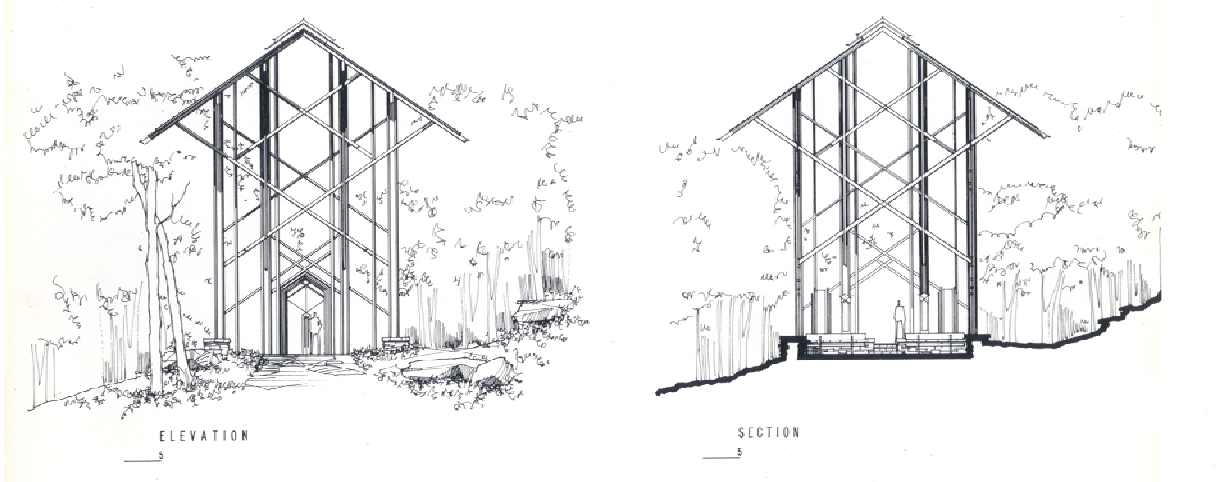
The simple one-room rectangular space of 24 feet (7.3 meters) by 60 feet (18.3 meters), totaling 1,440 square feet (134 square meters), achieves a grand effect through its 48 foot (14.6 meter) height which reaches into, and becomes part of, the tree canopy (see Figures 4.6 – 4.10). On the interior, the chapel has 11 rows of pews flanking a central isle with a dais at the back, raised by three steps (Ivy, 1992). Structurally, the building is comprised primarily of indigenous materials handled in a contextually sensitive manner. Southern pine two-by-fours, two-by-sixes, and two-by-twelves, hand-rubbed with gray stain, blend with the bark of surrounding trees while creating a structure that mimics the forest beyond. Additionally, local fieldstone is used as the flooring and perimeter walls, reminiscent of the rock outcroppings along the site contours and creating the impression that the building's foundation is carved out of the earth (Ivy, 1992).





From Left to right: Figure 4.6. Exterior front façade view of Thorncrown Chapel. Image used with permission from Whit Slemmons, courtesy of Thorncrown Chapel, Eureka Springs, Arkansas, September 7, 2009. Available from http://www.thorncrown.com/

Figure 4.7. Detail of Thorncrown Chapel's front entrance, which draws the eye in due to the continuation of the paver stones, linear view point, and dynamic light patterning. Image used with permission from Whit Slemmons, courtesy of Thorncrown Chapel, Eureka Springs, Arkansas, September 7, 2009. Available from http://www.thorncrown.com/



From left to right: Figure 4.8. Front elevation of Thorncrown chapel. Image used with permission from University of Arkansas Libraries, Eureka Springs, Arkansas, September 10, 2009.

Figure 4.9. Rear elevation of Thorncrown chapel. Image used with permission from University of Arkansas Libraries, Eureka Springs, Arkansas, September 10, 2009.

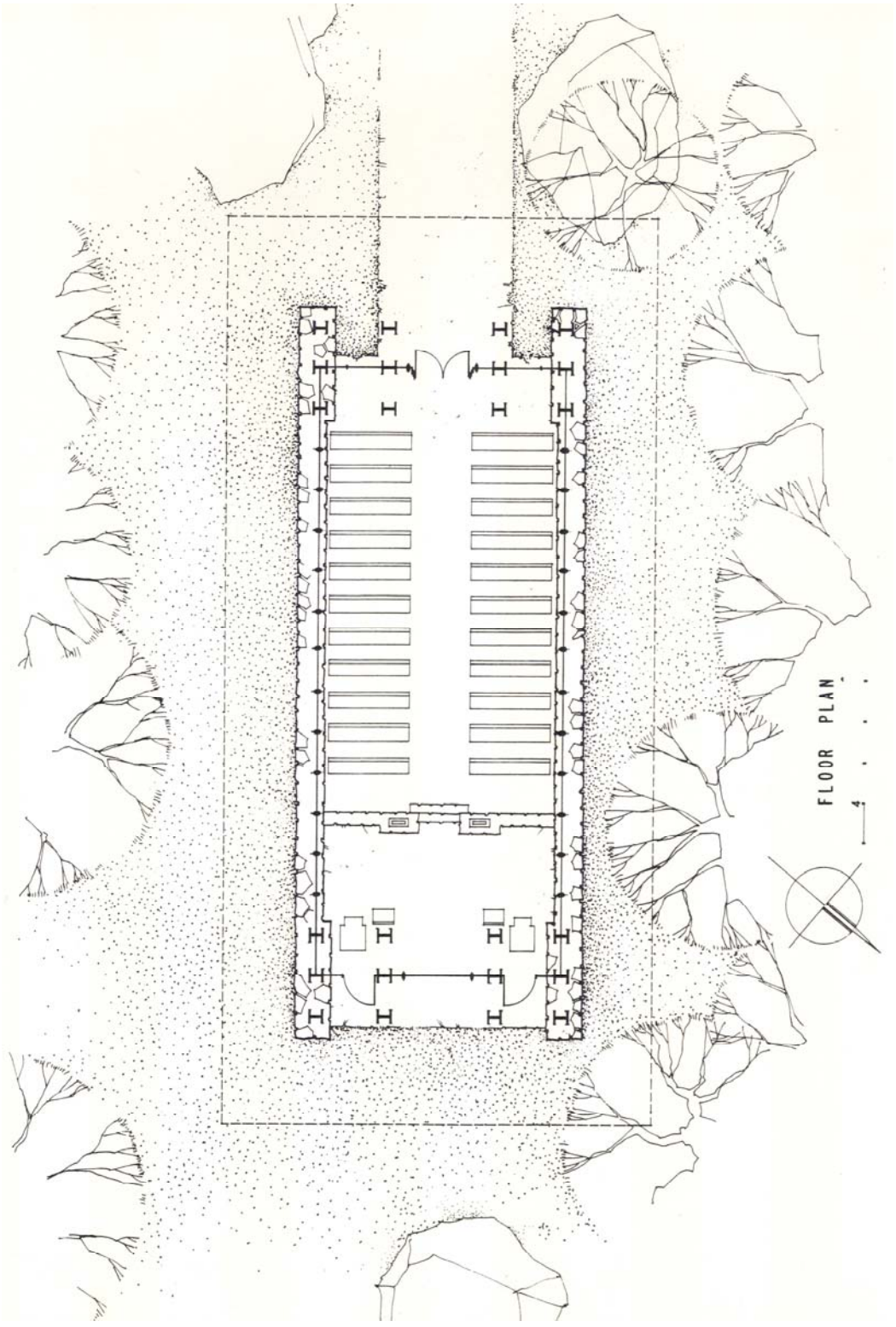


Figure 4.10. Floor plan of Thorncrown Chapel with surrounding site. Image used with permission from University of Arkansas Libraries, Eureka Springs, Arkansas, September 10, 2009.

In essence, Euine Fay Jones' aspiration for the pilgrimage chapel was for it to create a total and harmonious experience that spiritually and emotionally moves people (Ivy, 1992). Furthermore, he desired the design not only to connect and complement nature and site but also to participate in an architectural continuum based in the reinterpretation of elements that comprise historic typologies (Gandee, 1981; Ivy, 1992).

The project goals for Thorncrown Chapel were primarily implicit and derived from a distillation of information provided by Ivy (1992) in his book, *Fay Jones*, Paul Heyer (1993) in his book, *American Architecture: Ideas and Ideologies in the Late Twentieth Century*, and Charles K. Gandee's (1981) article, *A Wayfarer's Chapel by Fay Jones*. Through these sources and my personal analysis, it is apparent that Thorncrown chapel was designed to accomplish these goals:

- Enable a connection to nature and place through glass walls, which dematerialize through light and shadow, and a structural form and materiality that derives from, and blends with, the regional qualities of site and nature.
- Create a structure that references architectural history in a manner that provides a relevant and unique contemporary interpretation.
- Utilize local sensitivity to dictate construction methodology that minimally disrupts the nature of the site.
- Utilize regional design to symbolically link the form of the structure to massing representative of local rural covered bridges offering the image of shelter.
- Create the element of surprise and discovery through the layered detailing and complexity of the structure, which gradually reveals itself and is ever changing due to its utilization of reflection and natural light and shade.

- Create the element of awe and drama through the design of a high grand room with a large skylight at its apex, which acts to lead the eye upward through the designed complexity and order of the cross-latticed wooden members combined with elaborate light patterning.
- Create a total and harmonious aesthetic experience through the repetition of pattern on various scales and reinforcement of macro details with the micro, such as door pulls and lights.
- Create a unified whole through the integration of building with site, as well as ornament with structure.

Thorncrown Chapel was chosen as a precedent for this design investigation since it is an exemplary example of organic and vernacular design, not tacked on but seen throughout in form, material, detail, and decoration. Direct, indirect, and symbolic organic design are all seen in this chapel. The encounter/presentation of nature and direct experience/interaction between nature and the building are, in fact, featured aspects, as the building converges with the full sensory realm of the surrounding natural environment. The close proximity of nature and multitude of windows in the design enable encounter/presentation and the bridging of the interior and exterior. However, it is not just the presence of the window or of nature that creates this relation, as was discussed with reference to the modernist's large framing windows in subsection 3.1.3, "Design and Nature Retrospective – The Impact of Ornament and Transition," it is also the treatment of the window and the interior space that facilitates or inhibits the association.

In Thorncrown, Fay Jones utilized the window in a similar manner to his mentor, Frank Lloyd Wright, who felt that the use of fragmented glass (see Figure 4.11) enabled a rich mosaic of colors and reflections that complements and meets nature on equal terms (Blake, 1960; Hoffman, 1984). Although Jones did not utilize a symbolically embellished pane like Wright,

his use of the wood members artfully created a pattern of windows to a similar effect (see Figure 4.12). In addition to the views outside, reflections of the interior in the glass, more specifically, Jones's intriguing use of light, support the interplay and cohesion of interior and exterior.

This borrowing of space is supported by the use of local, natural materials in a manner that indirectly and symbolically represents the site's natural environment, demonstrating organic attributes of place. Moreover, the overhanging roof and extension of materials from the exterior to the interior, and vice versa, support this effect of shared space to create the between (see Figure 4.13). Of primary importance is the strong architectural language that flows from the exterior path straight down the nave and out over the altar, all the while pulling the senses back into the tree-canopy-like structure with its dynamic light patterning and dramatic fieldstone floor and perimeter wall resembling the rock outcroppings of the area. The result of this dynamic architectural language is the feeling of being within the building and within the forest at once. This single space reflects and relates two realms together creating the between, the goal of this design investigation.

Figure 4.11. Detail of Frank Lloyd Wright's Dana-Thomas House sumac windows, which create symbolic nature, juxtapose it with direct nature, and create interesting light and shadow patterns in the interior. Image used with permission, copyright Doug Carr, courtesy of the Illinois Historic Preservation, October 29, 2009. Available from http://www.dana-thomas.org/

When Thorncrown Chapel is related to Heerwagen and Gregory's (2008) seven attributes of nature, which enable a design that connects to biophilic desires, almost all are identified; namely, sensory richness, motion, serendipity, variations on a theme, sense of freeness, and prospect and refuge. Sensory richness is achieved through prominent natural light and shade patterning that changes the experience of the chapel on an hourly, daily, and seasonal basis. In addition, the diversity of natural textures in the space provide an array of haptic sensations, from the rough fieldstone perimeter walls and the polished interior floor to the oak pews and blue-upholstered cushions. Motion is enabled due to the extension of the building into nature. Change is, in fact, a constant feature of the design as it is at once nature and architecture. Serendipity is again encountered in the building's relationship to dynamic nature, always providing the unexpected and enticing shifts of attention from the overall to small details.

The design, however, moves beyond just borrowing from nature to creating unexpected light pattern reflections in the glass from the wall lights (see Figure 4.14) and shifts of attention from the overall space to carefully thought out details, as seen in the cross-wood bracing and the diamond-shaped, hollow-metal intersection bracing at their center. The building itself is, in fact, a serendipitous encounter, slowly revealed as one turns a winding path in the forest.

Variations on a theme are present in that Jones utilized organized patterning to create the overall form of the space right down to the details of the wall fixtures. The result is a dynamic simplicity that repeats the diamond and rectangular patterning with a harmonized effect. Sense of freeness is enabled by the ease of movement in between the interior and exterior and through the perceived expansion of the interior into the exterior. This is closely akin to prospect and refuge, as the prominence of views outside are balanced with the sense of shelter or reprieve created by Thorncrown's serene, protective rhythmic quality.

Furthermore, in addition to the organic design aspects of the site, the design also connects to the cultural vernacular attributes of the area as the overall form of the building plays a subtle homage to the rural covered bridges in the area. The chapel, in fact, in a similar manner to the covered bridges, creates a moment of pause on a journey.

In summary, Thorncrown Chapel represents a building that exemplifies the interaction between architecture and nature. This relation was achieved by a two-fold approach, through a relation with direct nature that was supported by the symbolic representation of nature in the interior environment. The respect and obvious high regard that the design of this structure shows toward nature creates an example that increases the chance of internalization and reflection on the human-nature relation.

Figure 4.12. Interior nave of Thorncrown Chapel, which connects directly and symbolically to the surrounding forest. Image used with permission from Whit Slemmons, courtesy of Thorncrown Chapel, Eureka Springs, Arkansas, September 7, 2009. Available from http://www.thorncrown.com/

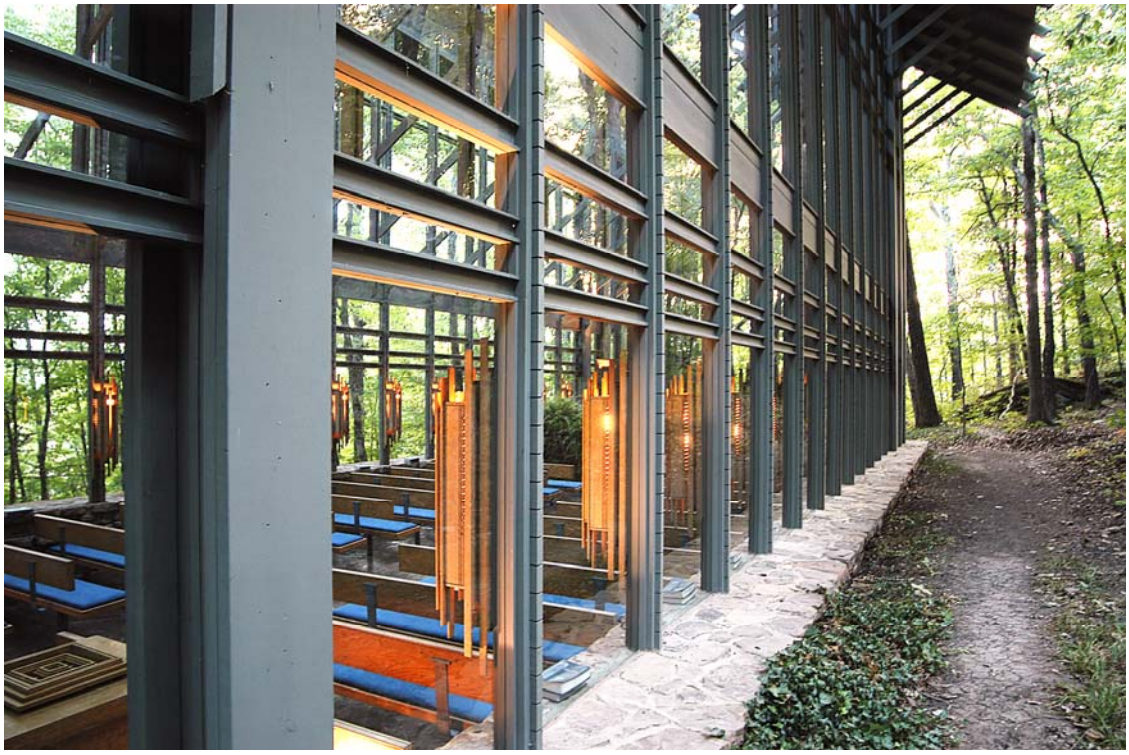


Figure 4.13. Transitional between space created outside of Thorncrown Chapel by the rock wall, extending roofline, sightlines, and window detailing. Image used with permission from Whit Slemmons, courtesy of Thorncrown Chapel, Eureka Springs, Arkansas, September 7, 2009. Available from http://www.thorncrown.com/

Figure 4.14. Dynamic light reflections created by wall sconces in Thorncrown Chapel. Image used with permission from Whit Slemmons, courtesy of Thorncrown Chapel, Eureka Springs, Arkansas, September 7, 2009. Available from http://www.thorncrown.com/

4.1.3. Radial View exhibition at deSingel in Antwerp, Belgium, by Team Inside Outside: Petra Blaisse with Marieke van den Heuvel and Rabia Zuberi (exhibited March 13 - May 25, 2008)

The Radial View exhibition, by Petra Blaisse's design firm Inside Outside, involved a series of interior and exterior interventions in an existing building and courtyard (see Figures 4.15 – 4.16). The concept behind the project was to utilize the "special character" of the building as a starting point and, in the firm's words, "propose a different view on the building and the gardens; the movement through the space and visual connections" (Inside Outside, n.d.). Essentially, the purpose of these interventions was to create a journey of experience, which breaks through boundaries and brings surrounding nature inside by utilizing interior treatments in the exterior environment and bringing symbolic representations of nature into the interior (Inside Outside, n.d.).

Figure 4.15. Plan of the Radial View exhibition at deSingel in Antwerp, Belgium. Image used with permission from Inside Outside: Petra Blaisse, Amsterdam, Netherlands, September 10, 2009. Available from http://www.insideoutside.nl/

Figure 4.16. Symbolic nature represented in the form of vegetative carpet in the Radial View exhibition. Image used with permission from Inside Outside: Petra Blaisse, Amsterdam, Netherlands, September 10, 2009. Available from http://www.insideoutside.nl/

The implicit and explicit goals for this exhibition have been derived and deduced from information provided on the project by Inside Outside (n.d.) and an essay appearing in Petra Blaisse's book, *Inside Outside: Petra Blaisse*, written by Dirk van den Heuvel in 2007, called "A Choreography of Reciprocities." Through these sources and my personal analysis, it is apparent that the intent of the Radial View exhibition was to accomplish these goals:

- Break through the spatial boundaries that separate inside and outside through symbolic spatial and material traversing.
- Create place through an unfolding narrative of events, inviting interaction and exploring an awareness of the relationship between people and nature.

- Explore the potential of interior dressings (carpet, upholstery, and such) as tools that define and direct experiences of place.
- Explore boundaries as screens, which are dynamic, shifting and changing, both creating differences and allowing continuities.

This exhibition was chosen as a precedent for my design investigation as it presents aspects of organic design. However, more important is the fact that the unexpected and unusual presentations of events throughout the exhibit create a distinct series of thought provoking experiences and, hence, the likelihood of facilitating internalization/awareness. Furthermore, the most essential aspect of the work to my design investigation is the relationship created between the interior and exterior through the creation of permeable boundaries and the between. Also of significance is the fact that the interventions take place in an existing structure, which is relevant to the building reuse in my project.

Through the implementation of a dialogue between nature and its metaphor, which relates to direct and symbolic organic design, this exhibit represents the dynamic awareness of relation that can occur between humans and nature. The strip of plant carpet running along the interior side of glazing represents this connection, with the vegetative patterning creating an interior extension of the garden below (see Figure 4.16). Not only does the placement of the carpet put it in a direct relationship with the grass outside but it also does not run the full width of the hall, bringing greater attention to the relation due to the unusual installation. The carpeting takes on a role of ornamentation rather than being purely functional. Further, the similarities and differences between the grass outside and the symbolic grass representation inside are highlighted through the enlarged abstraction of the carpet image and the glass reflections that blend the two together on the same plain of vision.

Inside Outside employed a similar language in the plant carpets they designed for the Seattle Public Library. In this space, Blaisse describes the carpets as becoming gardens and the gardens as becoming carpets (Blaisse, 2007). Essential to the success of this metaphoric relation is the layout of the carpet and its relation to living nature. In the case of the *Radial View* exhibition, the non-typical layout of the carpet, positioned next to a ribbon of floor-level glazing, enable the relation. Alternatively, the *Seattle Public Library* carpet design shows a loose (not wall-to-wall) layout that is strategically positioned intersecting a planter (see Figure 4.17). Further, on the ground level of the library, a layered experience is created combining loose planter-like carpet panels with an exterior planter, which is in a transitional space that is not quite exterior or interior (see Figure 4.18). This sequence acts to create a trajectory between the interior and exterior, with the latticed metalwork on the far exterior of the image forming a permeable edge that enables prospect and refuge and the between.

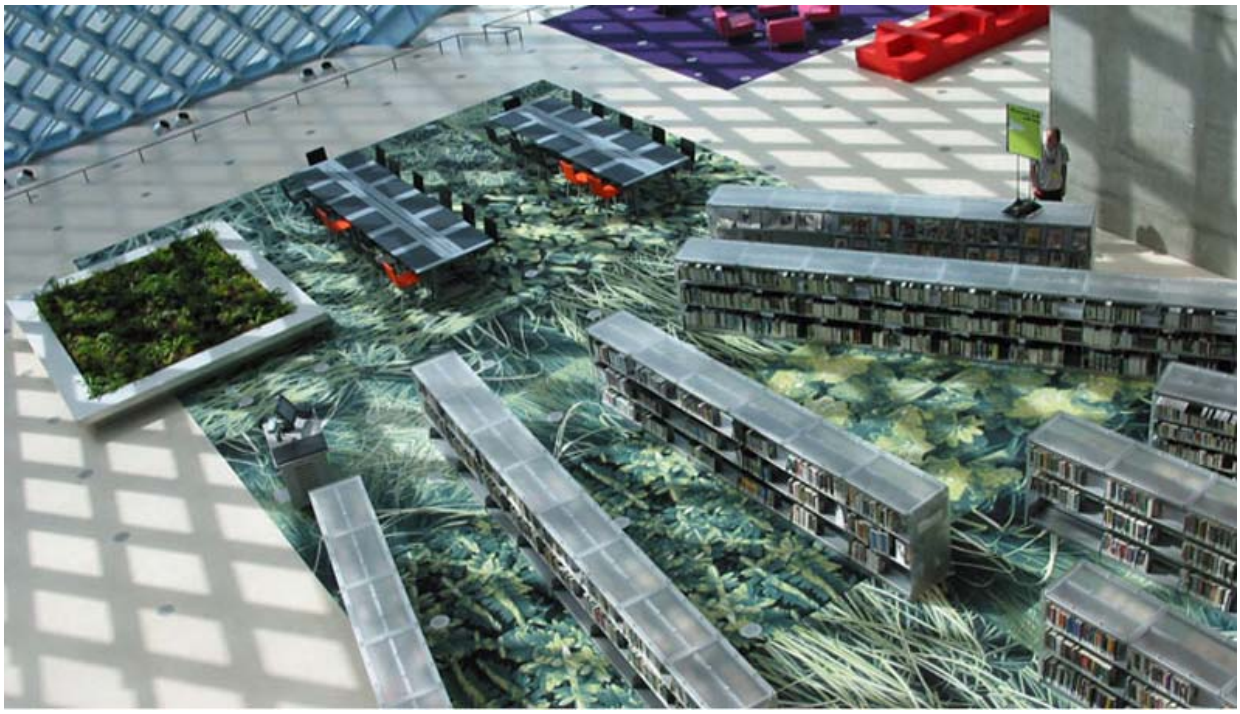


Figure 4.17. Symbolic nature compared and contrasted with indirect nature in Inside Outside's installation in the Seattle Public Library, Seattle, Washington. Image used with permission from Inside Outside: Petra Blaisse, Amsterdam, Netherlands, September 10, 2009. Available from http://www.insideoutside.nl/

Figure 4.18. Detail of symbolic nature compared and contrasted with indirect nature in Inside Outside's installation in the Seattle Public Library, Seattle, Washington. Image used with permission from Inside Outside: Petra Blaisse, Amsterdam, Netherlands, September 10, 2009. Available from http://www.insideoutside.nl/

Similarly to the expansion of space at the library, the curtains in the *Radial View* exhibition, printed with a vegetative pattern, create a dynamic transitional effect between the landscape and human-created symbolic nature (see Figure 4.19). In this instance, nature is actually seen through its symbol, making the relation even more pronounced. The act of viewing nature through its representation in this manner is analogous to Wright's employment of the patterned windowpane and Jones's tree-like framing of his windows.

Moreover, examining the exhibit in relation to Heerwagen and Gregory's (2008) seven attributes of nature, which relate to organic design, sensory richness, motion, serendipity, and sense of freeness are apparent. Sensory richness is prominent as the introductions into the existing environment provide irregular variation in the haptic and visual sensory systems. The curtains, carpet, and reflective materials utilized in the exhibit provide novel sensory information into the environment, which are prominent due to their distinctness from the surrounding environment. The reflective surfaces and curtains play a special role in this regard,

as they act to highlight motion, changes in air currents, natural lighting, and such (see Figures 4.19 – 4.20). Further, the very act of utilizing what are considered interior materials in the exterior and simulating nature in the interior, the very act of traversing the two realms, acts to perforate the boundaries that lie between them creating a sense of freeness. Beyond deconstructing boundaries, the dispersion of the exhibit's interventions in an unfolding narrative-like manner act to enable serendipity. As nature offers the unexpected, which switches attention from a broad perspective to small details, so too does the *Radial View* exhibit. For example, the staircase in Figure 4.20 has a cascade of reflective material flowing down under its stair nosings in a manner like a stream over rocks.

Figure 4.19. Direct nature viewed through symbolic nature at the Radial View exhibition. Image used with permission from Inside Outside: Petra Blaisse, Amsterdam, Netherlands, September 10, 2009. Available from http://www.insideoutside.nl/

Figure 4.20. Symbolic nature at the Radial View exhibition. Image used with permission from Inside Outside: Petra Blaisse, Amsterdam, Netherlands, September 10, 2009. Available from http://www.insideoutside.nl/

In summary, the *Radial View* exhibition exemplifies a distinct, thought-provoking relation between nature and its symbolic representation. Most notably, the narrative created by the exhibit establishes a language that continues through a series of unexpected or surprising encounters, heightening awareness and sensory experience. In this state of sensory stimulation, the layering, which compares and contrasts nature and its symbolic representations, become essential to the perception of each space extending into the other and the awareness of relation.

4.2. Summary – How Precedents Inform the Design Inquiry

In summation, the primary lessons derived from the precedent inquiry support a connection between nature and the built environment in these ways:

- Overlapping and layering symbolic representation with direct and/or indirect nature, which people can engage with in a meaningful way.
- Creating symbolic expressions that are integral (but not necessarily structural) to the design.
- Creating form that highlights points of spatial expansion and contraction.
- Creating a unified expression where details support the whole while relating to regional and organic attributes.
- Traversing boundaries with expressions that create spatial extensions and the between.
- Creating sight lines that extend the interior expressions outward.
- Creating exterior elements that support interior design language such as extending roof lines.
- Creating an architectural space that embodies the qualities of a natural space or natural aesthetics, such as the feeling of being with the forest.
- Creating an interplay between interior and exterior through the extension of interior space with such things as lighting and materials.

To understand the relationship between the precedent studies and this design inquiry, it is essential to relate these lessons to the realities of the site and structure. For instance, the adaptive reuse of an existing structure poses challenges to creating symbolic expressions that play the dual role of structural form and embellishment of the building, as its shell and structure are largely predetermined. This creates a circumstance where interior ornamentation can

become the unifying expression, if utilized in an integral or consistent manner. As well, the design must find ways to work with the exiting grid and egress of the structure, posing limitations to the manner in which direct and indirect nature can be employed. Furthermore, the paved parking lot to the south side of the building creates a large void between the building and direct nature, which needs to be overcome. However, while creating distinct challenges, the very act of reusing this historic structure ties the design into the site's vernacular identity, both in an ecological and cultural sense.

5. Functional and Aesthetic Program

5.1. Functional Requirements

5.1.1. Facility Client and Users

The client and users for this mixed-use, multi-unit residential facility are fictive, although realistic, and utilized to provide guidelines and structure for the design project. As the facility is comprised of several occupancies, which together have a mandate of creating community, fostering ecologic behaviors, and creating a connection to nature through biophilic design, the facility will have an umbrella owner/manager to provide cohesiveness. This owner/manager is interested in tying the development into the surrounding community fabric, supporting new families, promoting foot and public transportation, promoting eating organic and local, reconnecting people to food growing, promoting ecological behaviors, and protecting and revitalizing historic structures. Further, this person desires a facility that will support a degree of self-sufficiency through energy production, composting, grey water systems, and food gardens. Respect and reconnection with nature is the driving force behind the development.

The facility, which includes a daycare (with garden), a café (with greenhouse and garden plots for growing food), and private and communal residential spaces (including garden plots for growing food and a community multipurpose room), is oriented towards young families. The primary users are the owners of the living units while the secondary users of the facility include the staff of the café and the daycare, as well as the maintenance staff for the residential component, including the janitor and gardener. The tertiary users include the customers of the café, the daycare clients, and guests of the residents. The organizational structure of the facility as a whole is illustrated in Figure 5.1.

Essentially, the facility operates as a singular unit with sub-components. At the top of the chain, below the owner/manager, is the living unit owners, who purchase their residence from the owner/manager allowing for a greater level of personal investment with their space

and the facility. They contribute a monthly fee for the maintenance of the residential component of the building, and a living unit owners' board guides the building decisions. The demographic that is targeted for living unit ownership is young professionals either starting a family or with children. These people desire a close connection to the amenities of the city and a close proximity to work/clients (possibly working from home), but they also desire the advantages of a rich environment for their children to grow up in, which includes close proximity to nature, schools, recreation facilities, parks and cultural centers. Of prime importance to these users is the convenience of the facility, which offers multiple types of communal spaces, a daycare, and a café at their fingertips; however, they also exhibit the desire for, or have, strong social and environmental consciousness as well as valuing independence and self-reliance within a framework of a strong social community.

Additionally, the tertiary users for the daycare, the parents, desire a rich and healthy environment for their children, one which stimulates their sensory development through direct, indirect, and symbolic expressions of nature. Further, they will want their children to be instilled with an appreciation and respect for nature. The parents will also value the benefits of local and organic food, as the daycare is supplied with food by the café. Similarly, the tertiary users of the café, the customers, value the benefits of local and organic food as well.

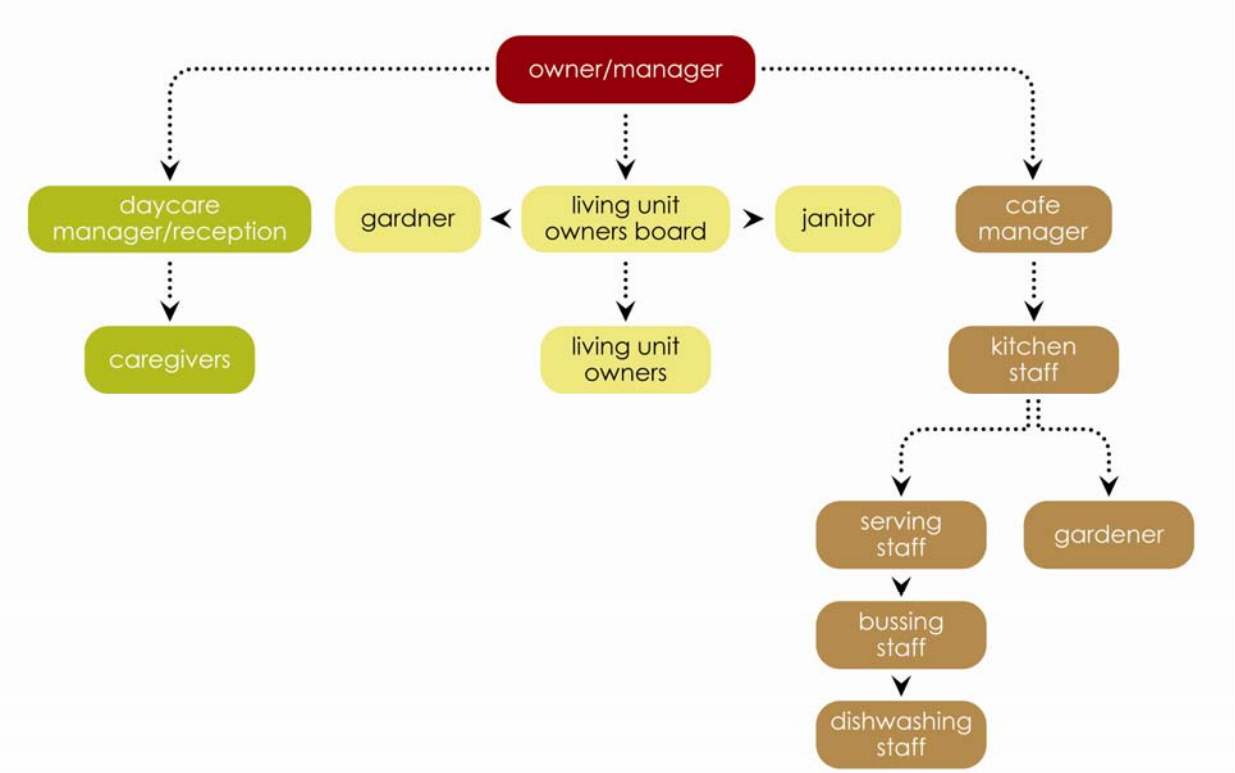


Figure 5.1. Organizational structure of overall facility and occupancies.

5.1.2. Access and Life Safety Requirements – Building Code Analysis

The following is an analysis of the particulars of the 210 rue Masson and proposed occupancies as they relate to the access and life safety requirements outlined in the *National Building Code of Canada 2005 Volume1 and 2*. This analysis is broken down by section headings in the code.

Division B
Part 3 Fire Protection, Occupant Safety and Accessibility

Section 3.1. General:

Major Occupancy Classification (according to Table 3.1.2.1.):

C Residential Occupancies (multi-unit residences)

A-2 Assembly Occupancies not elsewhere classifies in group A (residential communal areas, café, and daycare)

F-3 Low-hazard Industrial Occupancy (café greenhouse)

3.1.3. Multiple Occupancy Requirements:

Major Occupancy Fire Separations (according to Table 3.1.3.1):

Major Occupancy	Minimum Fire-Resistance Rating of Fire Separation (hours)	
	Adjoining Major Occupancy	
	C	A-2
C	-	1
A-2	1	-
F-3	1	1

Maximum Openings in Fire Separations (according to Article 3.1.8.6.[2]):

- The size of an opening in an interior fire separation required to be protected with a closure shall be not more then 236.8 feet squared (22 meters squared), with no dimension more then 85.3 feet (6 meters), provided the fire compartments on both sides of the fire separation are sprinklered.

3.1.17.1. Occupant Load Determination:

Minimum Space Requirements for Occupancy Type (according to Table 3.1.17.1.):

Occupancy Classification	Type of Use	Minimum Area Per Person (ft^2 [m^2])
C (Residential)	Living units	Maximum of 2 persons per sleeping room in a dwelling unit
A-2 (Residential communal)	Space with non-fixed seats and tables (multi-purpose room)	10.2 (0.95)
A-2 (Residential communal)	Kitchen	100 (9.30)
A-2 (Residential communal)	Cleaning and repair goods (laundry)	49.5 (4.60)
A-2 (Residential communal)	Public corridors intended for occupancies in addition to pedestrian travel (lounge and hall)	39.8 (3.70)
A-2 (Café)	Dining, beverage and cafeteria space	12.9 (1.20)
A-2 (Café)	Kitchen	100 (9.30)
A-2 (Café)	Office	100 (9.30)
A-2 (Daycare)	Classrooms	19.9 (1.85)
F-3 (Café)	Greenhouse	49.5 (4.60)

Design Occupancy Load:

Area	Size (ft^2 [m^2])	Max. Allowable Occupancy Load	Design Occupancy Load
Communal multi-purpose room (Residential communal)	956.8 (88.9)	93	60
Kitchen (Residential communal)	243.3 (22.6)	2	2
Laundry (Residential communal)	140 (13)	2	2
Lounge and hall (Residential communal)	First floor – 1270 (118) Second floor – 1649 (153.2)	First floor – 31 Second floor – 41	First floor – 31 Second floor – 41
Café	Customer area – 1531 (142.2) Kitchen – 755 (70.1) Greenhouse – 1138.8 (105.8) Café office – 76.8 (7.1)	Customer area – 118 Kitchen – 7 Greenhouse – 23 Café office – 1	Customer area – 80 seats, 2 bussers, 5 servers Kitchen – 3 cooks, 1 dishwashers, 2 prep cooks Café office – 1 manager
Daycare	Preschool – 507 (47.1) Toddler – 516 (47.9) Infant – 446.2 (41.5)	Preschool – 25 Toddler – 25 Infant – 22	Preschool – 20 children and 3 staff Toddler – 20 children and 4 staff Infant – 16 children and 4 staff Reception – 1 staff (child-staff ratio based on recommendations in Olds [2001] Child Care Design Guide)

Section 3.2. Building Fire Safety:

Building Area(s):

Footprint	9620.7 ft^2 (893.8 m^2)
Number of floors	3
Interior area basement	8610.8 ft^2 (800 m^2)
Interior area main floor	8501.0 ft^2 (790.6 m^2)
Interior area second floor	8517.8 ft^2 (791.3 m^2)
Total interior area of project	25629.6 ft^2 (2381.0 m^2)
Building height from grade	37 ft (11.3 m)
Building sides facing a street	2

- Due to the above characteristics of 210 Rue Masson and the design project occupancies it is recommended that the building be sprinklered throughout.

3.2.2. Building Size and Construction Relative to Occupancy:

3.2.2.5. Applicable Building Height and Area:

- In determining the fire safety requirements of a building in relation to each of the major occupancies contained therein, the building height and building area of the entire building shall be used.

3.2.2.6. Multiple Major Occupancies:

- In a building containing more then one major occupancy, the requirements for the most restricted major occupancy contained shall apply to the whole building.

3.2.2.7. Superimposed Major Occupancies:

- If one major occupancy is located above another major occupancy, the fire-resistance rating of the floor assembly between occupancies shall be determined on the basis of the requirements for the lower major occupancy.

3.2.2.11. Exterior Balconies:

- An exterior balcony shall be constructed in accordance with the type of construction applicable to the occupancy classification of the building.

2.2.2.24. Group A, Division 2, Up to 6 Storeys, Any Area, Sprinklered:

- Sprinklered throughout
- Noncombustible Construction
- Floor Assemblies require a fire separation of one hour
- Mezzanines shall have a fire-resistance rating not less than one hour
- Loadbearing walls, columns and arches shall have a fire-resistance rating of one hour

3.2.2.43. Group C, up to 6 Storeys, Sprinklered:

- Sprinklered throughout
- Noncombustible Construction (with the exception of portions of the 1902 building, which it will be assumed will be grandfathered)
- Floor Assemblies require a fire separation of one hour
- Mezzanines shall have a fire-resistance rating not less than one hour
- Loadbearing walls, columns and arches shall have a fire-resistance rating of not less then that required for the supported assembly

3.2.2.77. Group F, Division 3, Up to 4 Storeys, Sprinklered:

- Combustible or non-combustible construction used singly or in combination, providing building is
- Sprinklered throughout
- Not more than 4 storeys in height, and
- Not more than 51666.8 feet squared (4800 meters squared) in building area
- Floor assemblies are to be fire-separations with a fire-resistance rating of 45 minutes
- Mezzanines shall have a fire-resistance rating of 45 minutes
- Load-bearing walls, columns, and arches must have a fire-resistance rating of no less than 45 minutes and be of non-combustible construction

As stated in “Article 3.2.2.6. Multiple Major Occupancies,” in a building containing more then one major occupancy, the requirements for the most restricted major occupancy contained shall apply to the whole building. Thus, due to the analysis in the preceding Articles 3.2.2.24, 3.2.2.43, and 3.2.2.77, the criteria for “Article 3.2.2.43. Group C, up to 6 Storeys, Sprinklered” shall be utilized throughout the building.

3.2.3. Spatial Separation and Exposure Protection:

Unprotected Opening Limits for a Building or Fire Compartment that is Sprinkled Throughout (according to Table 3.2.3.1.C.):

Exposed Building Face Area (ft^2 [m^2])	Limiting Distance (ft [m]) to Property Edge	Allowable Opening Limits (%)
North Wall 5689.5 (528.6)	42.5 (13.0)	100
East Wall 2479.0 (230.3)	16.4 (5.0)	40
South Wall 6012.9 (558.6)	114.0 (34.7)	100
West Wall 2442.0 (226.9)	16.4 (5.0)	40

3.2.3.6. Combustible Projections:

- Except for a building containing one or two dwelling units only, combustible projections on the exterior of a wall that could expose an adjacent building to fire spread and are more then 3.3 feet (1 meters) above ground level, including balconies, platforms, canopies, eve projections and stairs, shall not be permitted within
    a) 3.9 feet (1.2 meters) of a property line or the centerline of a public way, or
    b) 7.9 feet (2.4 meters) of a combustible projection on another building on the same property.

3.2.4. Fire Alarm and Detection Systems:

- Fire alarm and detection systems are required throughout the building for each occupancy.

3.2.4.2. Continuity of Fire Alarm System:

- If there are openings through a firewall, other than those for piping, tubing, wiring and totally enclosed noncombustible raceways, the following shall be implemented to the floor areas on both sides of the firewall as if they were in the same building.
- If a building contains more than one major occupancy and a fire alarm system is required, a single system shall serve all occupancies.
- If an alarm system is required in any portion of the building it shall be installed throughout the building.

3.2.4.3. Types of Fire Alarm Systems:

- As per the type of occupancies the alarm is to be a single or two staged system.

3.2.4.4. Description of Fire Alarm Systems:

- A single stage fire alarm system shall, upon the operation of any manual station, waterflow detection device, or fire detector, cause an alarm signal to sound on all audible signal devices in the system.
- A two stage fire alarm system shall
    a) cause an alert signal to sound upon the operation of any manual station, waterflow detection device, or fire detector,
    b) automatically cause an alarm signal to sound if the alert signal is not acknowledged within five minutes of its initiation, and
    c) have manual stations, each of which is equipped so that the use of a key or other similar device causes an alarm signal to sound that continues to sound upon the removal of the key or similar device from the manual station.

3.2.4.10. Smoke Detectors:

- Smoke detectors shall be installed in each public corridor in portions of a building classified as Group C major occupancy and each exit stair shaft.

3.2.5. Provisions for Fire Fighting:

3.2.5.4. Access Routes:

- A building which is more than three storeys in building height or more than 6458.3 feet squared (600 meters squared) in building area shall be provided with access routes for fire department vehicles to the building face having a principle entrance.

3.2.5.5. Location of Access Routes:

- The building does not have a fire department connection, therefore a fire department pumper vehicle requires location such that the length of the access route from a hydrant to the vehicle plus the unobstructed path of travel for the firefighter from the vehicle to the building of not more them 295.3 feet (90 meters).
- The unobstructed path of travel for the firefighter from the vehicle to the building must be not more than 147.6 feet (45 meters)

3.2.7. Lighting and Emergency Power Systems:

3.2.7.1. Minimum Lighting Requirements:

- According to Article 9.34.2.7. every public or service area in buildings shall be provided with lighting outlets with fixtures controlled by a wall switch or panel to illuminate every portion of such areas

- According to Article 9.34.2.7. illumination levels are to meet the incandescent requirements as listed below, if another type of lighting is used equivalent illumination must be provided.

Lighting for Public Areas (Table 9.34.2.7.):

Room or Space	Minimum Illumination (lx)	Minimum Lighting Power Density W/m^2 of floor area (incandescent lighting)
Storage Rooms	50	5
Service Rooms or Laundry Areas	200	20
Garages	50	5
Public Water Closet Rooms	100	10
Service Hallways and Stairways	50	5
Recreation Rooms	100	10

- According to Article 9.34.1.3. entrance switches, meters, panel boxes, splitter boxes, time clocks, and other similar equipment shall not be located in any public area unless adequate precautions are taken to prevent interference with the equipment.
- According to Article 9.34.1.4. recessed lighting fixtures shall not be located in insulated ceilings unless the fixtures are designed for such installations.
- According to Article 9.34.2.1. an exterior lighting outlet with fixture controlled by a wall switch located within the building shall be provided at every entrance to buildings of residential occupancy.
- According to Article 9.34.2.2. a lighting outlet with fixture controlled by a wall switch shall be provided in kitchens, bedrooms, living rooms, utility rooms, laundry rooms, dining rooms, bathrooms, water-closet rooms, vestibules, and hallways in dwelling units. Bedrooms or living rooms with a receptacle controlled by a wall switch do not need to conform to the previous statement.
- According to Article 9.34.2.3. all stairways are to be lighted. In dwelling units a three-way switch is to be located at the head and foot of every stairway with four or more risers.

3.2.7.3. Emergency Lighting:

- Emergency lighting shall be provided to an average level of illumination not less than 10 lx at floor or tread level in exits, principle routes providing access to exit in open floor areas and in service rooms, public corridors, areas where the public may congregate in Group A Division 2 having an occupant load of 60 or more, floor areas or parts thereof containing daycare centers, and food preparation areas in commercial kitchens.

3.2.7.4. Emergency Power for Lighting:

- Emergency power supply from batteries or a generator is required to assume the electrical load automatically for 30 minutes if the regular power supply to the building is interrupted.

3.2.7.8. Emergency Power for Fire Alarm Systems:

- Emergency power supply from batteries, a generator, or a combination of the two is to be provided for the fire alarm system immediately upon failure of the normal power supply without loss of information. It is to supply supervisory power for 24 hours. Immediately following this period, the emergency power is to provide power under a full load for a minimum of 30 minutes.

3.2.8. Mezzanines and Openings through Floor Assemblies:

3.2.8.1. Application:

- The portions of a floor area or a mezzanine that do not terminate at an exterior wall, a firewall, or a vertical shaft shall must either terminate at a vertical fire separation having a fire-resistance rating not less then that required for the floor assembly to the underside of the floor or roof assembly above, or shall
- Be of noncombustible construction (according to article 3.2.8.3), and
- Shall be sprinklered throughout if it contains an interconnected floor space (3.2.8.4).

3.2.8.5. Vestibules:

- An exit opening into an interconnected floor space shall be protected at each opening into the interconnected floor space by a vestibule
    a) with doors that are not less than 5.9 feet (1.8 meters) apart,
    b) that is separated from the remainder of the floor area by a fire separation that is not required to have a fire-resistance rating, and
    c) that is designed to limit the passage of smoke so that the level of contamination in the exit stair shaft serving storeys below the exit level does not exceed one percent by volume of contaminated air from the fire floor for a period of two hours after the start of a fire.
- An exit opening into an interconnected floor space shall have exit stairs that are cumulative in width (0.2 inches [6.1 millimeters] per person), unless the stairs provide not less then one foot squared (0.3 meters squared) of area of treads and landings for each occupant of the interconnected floor space (according to article 3.4.3.2.[6]).
- If an elevator or hoistway opens into an interconnected floor space and into storeys above the interconnected floor space, either the elevator doors opening in to the interconnected floor space or the elevator doors opening into the storeys above the interconnected floor space shall be protected by a vestibule.

Section 3.3. Safety within Floor Areas:

3.3.1. All Floor Areas:

3.3.1.1. Separation of Suites:

- Residential suite separation shall have a fire-resistance rating of one hour in accordance with section 3.3.4.2.

3.3.1.3. Means of Egress:

- Each suite in a floor area that contains more than one suite shall have an exterior exit doorway, or a doorway into a public corridor, or to an exterior passageway. This door shall allow egress in two opposite directions toward two separate exits.

3.3.1.4. Public Corridor Separations:

- A public corridor shall be separated from the remainder of a storey by a fire separation of not less than one hour in a residential occupancy (according to Article 3.3.4.2.[1]).
- If a storey is sprinklered throughout, no fire-resistance rating is required for a fire separation between a public corridor and the remainder of a storey provided the corridor does not serve a care or detention occupancy or a residential occupancy and the travel distance from any part of the floor area to an exit is not more that 147.6 feet (45 meters).

3.3.1.5. Egress Doorways:

- Two egress doorways are required.
- The exits shall be located so that the travel distance to at least one exit shall be not more than 147.6 feet (45 meters), provided the building is sprinklered throughout (according to Article 3.4.2.5.[1.c.]).
- Exits shall be located and arranged so that they are clearly visible or their locations are clearly indicated and they are accessible at all times (according to Article 3.4.2.5.[3]).

3.3.1.9. Corridors:

- The minimum width of a public corridor shall be 43.3 inches (1100 millimeters)
- Obstructions located within 78 inches (1980 millimeters) of the floor shall not project more than 4 inches (100 millimeters) horizontally into an exit passageway or a corridor used by the public.
- The horizontal projection of an obstruction is permitted to be more than 4 inches (100 millimeters) provided the clearance between the obstruction and the floor is less than 26.8 inches (680 millimeters).
- If a corridor contains an occupancy, the occupancy shall not reduce the unobstructed width to less then the required width above.

3.3.1.11. Door Swing:

- A door is to swing in the direction of the exit if the door opens into a corridor or other facility providing access to exit from a room or suite that is used or intended for an occupant load more that 60.
- If a pair of doors provides access to exit in both directions, the doors shall swing in opposite directions, with the door on the right hand side swinging in the direction to travel to the exit.

3.3.1.12. Sliding Doors:

- Sliding doors providing access to exits must swing on a vertical axis in the direction of travel when pressure is applied and be identified as a swinging door by means of a label or decal affixed to it.

3.3.1.13. Doors and Door Hardware:

- A door opening into or located within a public corridor or other facility that provides access to exit from a suite shall have a clear opening of not less that 31.5 inches (800 millimeters) and not open onto a step.
- A door in an access to exit shall be able to open without keys, special devices, or specialized knowledge.
- Door release hardware shall be operable with one hand and require only one releasing operation.
- An egress door from an individual dwelling unit or from a suite of residential occupancy is permitted to be provided with additional devices that require releasing operation additional to the main door release hardware.
- Door release hardware shall be installed not more than 47.2 inches (1200 millimeters) above the finished floor.

3.3.1.18. Guards:

- A guard, serving an exterior balcony, room, stairway, or space not within a suite of residential occupancy, shall have no opening that permits the passage of a sphere whose diameter is more than 3.9 inches (100 millimeters) through it.
- A guard shall be designed such that no member between 5.5 inches (140 millimeters) and 35.4 (900 millimeters) above the level protected by the guard will facilitate climbing.

3.3.1.19. Transparent Doors and Panels:

- A glass or transparent door shall be readily apparent by attaching non-transparent hardware, bars, or other permanent fixtures to it.
- A glass door shall be constructed of laminated tempered safety glass or wired glass.

- Glass in doors and in sidelights within the entrance to dwelling units or in public areas that are greater in width than 19.7 inches (500 millimeters) must be made of tempered, laminated, or wired glass.

3.3.1.21 Janitor's Rooms:

- This type of room is not required to have a fire-resistance rating if the floor area in which the room is located is sprinklered throughout.

3.3.1.22. Common Laundry Rooms:

- This type of room is not required to have a fire-resistance rating if the floor area in which the room is located is sprinklered throughout.

3.3.2. Assembly Occupancy:

3.3.2.8. Fixed Bench-Type Seats without Arms:

- The seat width per person on fixed bench-type seats shall be assumed to be 17.7 inches (450 millimeters).

3.3.4. Residential Occupancy:

3.3.4.4. Egress from Dwelling Units:

- Single storey dwelling units in an apartment building need not lead to a public corridor or exterior passageway on the same storey provided the dwelling units are served by private stairways leading directly to a public access to exit on the storey immediately above and immediately below.

3.3.4.5. Automatic Locking Prohibition:

- A door opening into a public corridor providing access to exit from a suite shall not be designed to lock automatically.

Section 3.4. Exits:

3.4.1. General:

3.4.1.4. Types of Exit:

- An exit from any floor shall be one of the following used singularly or in combination
    a) an exterior doorway
    b) an exterior passageway
    c) an exterior ramp
    d) an exterior stairway
    e) a fire escape

f) a horizontal exit
g) an interior passageway
h) an interior ramp, or
i) an interior stairway.

3.4.1.9. Mirrors near Exits:

- No mirror shall be placed in or adjacent to any exit in a manner that would confuse the direction of exit.

3.4.1.10. Combustible Glazing in Exits:

- Combustible glazing is not permitted in wall or ceiling assemblies or in closures used to construct an exit enclosure.

3.4.2. Number and Location of Exits from Floor Areas:

3.4.2.1. Minimum Number of Exits:

- Two exits are required from every floor.

3.4.2.3. Distance between Exits:

- The distance between two exits shall be
  a) one half the maximum diagonal dimension of the floor area, but need not be more than 29.5 feet (9 meters) for a floor area having a public corridor, or
  b) one half the maximum diagonal dimension of the floor area, but not less than 29.5 feet (9 meters) for all other floor areas.

3.4.2.4. Travel Distance:

- The travel distance from a suite or room not within a suite is permitted to be measured from an egress door of the room to the nearest exit provided

3.4.2.5. Location of Exits:

- Travel distance to at least one exit is to be no more than 147.6 feet (45 meters) provided the building is sprinklered throughout.
- Exits are to be clearly visible and locations clearly indicated.

3.4.3. Width and Height of Exits:

3.4.3.1. and 3.4.3.2. Exit Width Based on Occupant Load:

- 0.2 inches (6.1 millimeters) per occupant for ramps with a slope of not more than 1 in 8, doorways, corridors and passageways.

- Doorway, corridor and passageway width from the main floor (based on 62 second floor and 108 main floor occupants) = 40.8 inches (1037 millimeters)
- Doorway, corridor and passageway width from the second floor (based on 62 second floor occupants) = 14.9 inches (378.2 millimeters)
- Ramp and doorway width from café (based on 143 occupants) = 34.3 inches (872.3 millimeters)
- Ramp and doorway width from daycare (based on 68 occupants) = 16.3 inches (414.8 millimeters)
- Doorway, corridor, passageway width from the basement (based on 143 café and 68 daycare occupants) = 50.7 inches (1287.1 millimeters)

- 0.3 inches (8 millimeters) per occupant providing the exit stair rise is no more than 7 inches (180 millimeters) in height and the run is no less than 11 inches (280 millimeters)
    - Stair width from the main floor (based on 62 second floor and 108 main floor occupants) = 53.5 inches (1360 millimeters)
    - Stair width from the second floor (based on 62 second floor occupants) = 19.5 inches (496 millimeters)

- The width of the exit is to be no less than 43.3 inches (1100 millimeters) for corridors and passageways.
- The width for stairs, not serving patient's sleeping rooms, that serve not more than two storeys above the lowest exit level or not more than one storey below the lowest exit level is to be no less than 35.4 inches (900 millimeters)

3.4.3.3. Exit Width Reduction:

- No projection is to reduce the width of an exit
- Door swing shall not reduce required with of exit to less than 29.5 inches (750 millimeters)
- Handrails and construction below handrails cannot project into the required width of means of egress more than 3.9 inches (100 millimeters)

3.4.4. Fire Separation of Exits

3.4.4.1. Fire-Resistance Rating of Exit Separations

- The fire separation of every exit is to have a fire-resistance rating of 1 hour

3.4.5. Exit Signs

3.4.5.1. Exit Signs

- Every exit of the building shall have an illuminated exit sign placed over it or adjacent to it that is visible from the exit approach

3.4.6. Types of Exit Facilities

3.4.6.1. Slip Resistance of Ramps and Stairs

- Surfaces of ramps and stairs are to be slip-resistant with either a color or pattern contrast to demarcate the leading edge of treads, landing, and the beginning and end of ramps

3.4.6.2. Minimum number of Risers

- Except as permitted in food serving environments, every flight of interior stairs shall have not less than 3 risers

3.4.6.3. Landings and Maximum Vertical Rise of Stair Flights

- Maximum vertical rise of a flight of stairs between floors or landings is 12.1 feet (3.7 meters)
- Length and width of landing shall be at least the width of the stairway in which it occurs, except that in a straight run where the landing need not be more than 43.3 inches (1100 millimeters)
- A landing must be provided at the top and bottom of every flight of stairs or section of a ramp.

3.4.6.4. Handrails

- A stairway that is less than 43.3 inches (1100 millimeters) wide only requires one handrail, but if wider, a handrail is required on both sides
- If the required width of a ramp or flight of stairs is more than 86.6 inches (2200 millimeters), one or more intermediate handrails continuous between landings shall be provided, and located so that there will not be more than 65 inches (1650 millimeters) between handrails
- Handrails are to be not less then 34 inches (865 millimeters) and not more then 38 (965 millimeters) in height
- At least one handrail must extend not less then 11.8 inches (300 millimeters) beyond the top and bottom of stairway or ramp
- A ramp shall have handrails on both sides

3.4.6.6. Ramp Slope

- Maximum slope of an exterior ramp is 1 in 10

3.4.6.7. Treads and Risers

- Stair run is to be no less than 11 inches (280 millimeters) between successive steps, with a rise between 5 and 7 inches (125 and 180 millimeters)
- Treads and risers in every exit stair shall have uniform run and rise in successive flights in any stair system

3.4.6.10. Doors

- The distance between the edge of a door during its swing and a stair riser is to be no less than 11.8 inches (300 millimeters)

3.4.6.11. Direction of Door Swing

- Except as permitted by Article 3.4.6.13. exit doors must swing in direction of travel and on the vertical axis

3.4.6.13. Sliding Doors

- An exit door leading directly to the outdoors at ground level, and one that serves an impeded egress zone in other occupancies, is permitted to be a sliding door provided it be designed to swing on a vertical axis if pressure is applied and have a decal affixed to it that identifies this feature

Section 3.5. Vertical Transportation

3.5.3. Fire Separations

3.5.3.1. Fire Separations for Elevator Hoistways

- Fire separation of 1 hour is required according to Table 3.5.3.1.
- Passenger elevators may be present in interconnected floor spaces without being enclosed in a hoistway separated from the remainder of the building providing the elevator machinery is located in a room with a fire-resistance rating of at least 1 hour, and that it is separated from the rest of the building

3.5.4. Dimensions and Signs

3.5.4.1. Elevator Car Dimensions

- Interior dimensions of at least one elevator must be a minimum of 79.1 inches (2010 millimeters) by 24 inches (610 millimeters) to accommodate a stretcher
- The elevator referred to above must be clearly marked on the main entrance level and must access all floors

Section 3.7 – Health Requirements

3.7.2. Plumbing Facilities

3.7.2.2. Water Closets

Area	Occupancy Type	Maximum Design Occupant Load	Minimum Water Closet Requirements	Design Water Closets
Cafe	A-2	Customers – 80 Staff –14	Customers – 1 male, 2 female Staff – 1 universal toilet room	Customers – 1 w/c and 1 urinal male, 3 female (extra w/c added for male and female due to extra customers on patio area during the summer) Staff – 1 universal toilet room
Daycare	A-2	Preschool – 20 Toddler – 20 Staff – 12	Preschool – 1 Toddler – 1 Staff – 1 universal toilet room	Preschool – 4 Toddler – 4 (child-w/c ratio based on recommendations in Olds [2001] Child Care Design Guide) Staff – 1 universal toilet room
Multipurpose Room	A-2	60	1 male, 2 female	1 male, 2 female
Living Unit	C (Residential)	n/a	1 toilet room	1 toilet room

- Urinals may be substituted for two thirds of the number of water closets required for males, except that if only 2 water closets are required for males, one urinal is permitted to be substituted for one of the water closets

3.7.2.3. Lavatories

- At least 1 lavatory is to be provided in a room containing 2 water closets or urinals, and at least one additional lavatory shall be provided for each additional 2 water closets or urinals
- Faucets shall either operate automatically or have lever-type handles that do not close under spring action

Section 3.8. Barrier-Free Design

3.8.1. General

3.8.1.2. Entrances

- 50 percent of entrances into building are to be barrier-free

3.8.1.3. Barrier-Free Path of Travel

- Mercantile occupancy has at least one barrier-free entrance.
- Barrier-free access provided to all floors.
- Barrier-free access to upper floor(s) and basement by elevator.
- Public entrance doors equipped with power door operators.
- Barrier-free access is provided at service counters.
- Barrier-free washrooms are provided in all occupancies with a five foot (1524 millimeters) turning radius.
- A place of refuge is provided on all floors.
- A barrier free path of travel is provided between exterior parking and barrier-free entrance.
- All doorways are Barrier-free with a minimum opening of 31.2 feet (792.5 millimeters) when the door is open.

5.1.3. Mechanical, Electrical, Plumbing, and Security Requirements

The following chart outlines the mechanical, electrical, plumbing, and security functional requirements for the whole building and further breaks down the requirements into what is needed for the individual occupancies. This chart only outlines requirements beyond that which is required by provincial standards and code regulations. The chart is broken down by design investigation areas, with those that are related grouped together.

Occupancy	Functional Requirements			
	Mechanical	Electrical	Plumbing	Security
Building	-Forced air geothermal heating and cooling (2 ft. [0.6 m] space required above required head room on each floor for ducting)	- Solar panels on roof and standard electrical grid - Solar lighting on exterior pathways	- Low volume dual flush toilets - Reduced flow sinks and showers - Greywater sink/toilet combination where possible	- Secure residential access 24 hours a day. - Daycare and café access secure during non-operation hours - Secure access point between multipurpose area and living unit communal hall
Café	- Forced air geothermal heating and cooling (2 ft. [0.6 m] space required above required head room on each floor for ducting) - Additional direct to outside high volume exhaust required over stoves in kitchen - Additional direct to outside exhaust required for washrooms	- 220 volt grounded outlets required for fridges, stoves and dishwasher in kitchen - counter height outlets required every 4’ for built in kitchen counters - Voice data required for server station, office and in kitchen	- Low volume dual flush toilets - Reduced flow automatic sink taps in washrooms - Water usage gages on washroom sinks	- Locking access points to the exterior and to the other occupancies
Greenhouse	- Independent climactic controls (from rest of building) for forced air geothermal heating and cooling (2 ft. [0.6 m] space required above required head room on each floor for ducting)	-	- Overhead irrigation system	- Emergency exit only operable in the case of emergency

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Daycare	- Forced air geothermal heating and cooling (2 ft. [0.6 m] space required above required head room on each floor for ducting) - Manually controlled independent radiant electrical heat under all occupied floor areas not covered by permanent furniture in preschool, toddler, and infant rooms - Additional direct to outside exhaust required for washrooms	-	- Child size low volume dual flush toilets and sinks in toddler and preschool washrooms - Reduced flow automatic sink taps in washrooms - Water usage gages on washroom taps	- Locking access points to the exterior and to the other occupancies - Front desk reception required for check in
Living units	- Forced air geothermal heating and cooling (2 ft. [0.6 m] space required above required head room on each floor for ducting) - Manually controlled radiant electrical heat in kitchens and washrooms - Additional direct to outside manual exhaust required for kitchen stove and washroom - Voice data required for living rooms, kitchens, bedrooms, greenhouses, and office area (if applicable)	- 220 volt grounded outlets required behind stoves - 110 volt grounded outlets required behind fridge and dishwasher	- Greywater sink/toilet combination - Reduced flow washroom sink and shower with water usage gage - Water usage gage on kitchen sink	- Locking access required for hall entrance door, and for both the folding wall system at the living unit entry and at living unit green house entrance
Lounge and hall	- Forced air geothermal heating and cooling (2 ft. [0.6 m] space required above required head room on each floor for ducting)	- 110 volt grounded outlets required at counter height	- Water usage gage on gardening lounge sinks	- Secure residential access 24 hours a day at entry points into the lounge and hall areas.

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Multipurpose room and kitchen	- Forced air geothermal heating and cooling (2 ft. [0.6 m] space required above required head room on each floor for ducting) - Additional direct to outside high volume exhaust required over stoves in kitchen	- 220 volt grounded outlets required for fridge, stoves and dishwasher in kitchen - counter height outlets required every 4' - Voice data required for multipurpose room	- Water usage gages required on kitchen sinks	- Area must have lockable access points to separate it from the living unit lounge and hall areas when required
Laundry	- Forced air geothermal heating and cooling (2 ft. [0.6 m] space required above required head room on each floor for ducting) - Additional manually controlled exhaust required - exhaust ducting required for all dryers	- 220 volt grounded outlets required for washers and driers - 110 volt grounded outlets required at each counter	- Water usage gages required on sinks	- Secure residential access 24 hours a day
Male and female common w/c	- Forced air geothermal heating and cooling (2 ft. [0.6 m] space required above required head room on each floor for ducting) - Additional direct to outside exhaust	-	- Low volume dual flush toilets - Reduced flow automatic sink taps - Water usage gages on sinks	-

5.2. Spatial and Aesthetic Requirements

The following series of charts organize the design investigation, ensuring that each occupancy's design takes into account and expresses the transformational process and sensory and experiential learning, as explained in subsection 3.2.2, "The Sensory Systems and Experiential Learning."

5.2.1. Biophilic Design Guidelines

Area: Overall Facility			
Function(s): interacting, socializing, engaging, eating, playing, residing			
Overall Design Language: open, active, dynamic, interactive, extrovertive, extending, lively, warm, inviting			
Outcomes	Possible Expressions in the Design	Sensory Systems	
		Primary	Secondary
Awareness of temporal connections and impacts	Highlight original building materials	- Visual	- Haptic (touch)
	Draw on architectural language and history of the building as a formal school to create design language and inform space planning	- Visual	N/A
Compare and contrast feeling of openness and free movement to directed and constrained space	Utilize natural and artificial lighting, color, and spatial contraction to enclose areas	- Visual	- Auditory
	Utilize glazing, natural and artificial lighting, and spatial expansion to open up areas	- Haptic (temperature and humidity) - Visual	- Auditory
Compare and contrast feelings of prospect and refuge	Utilize sight lines and spatial language to emphasize the feeling of refuge juxtaposed with prospect and vise versa	- Visual	- Haptic (touch)
Awareness of the liveliness of plastic changing stimuli	Engage the interior with the exterior through operable openings And strategically placed glazing to engage people directly with nature	- Haptic (temperature and humidity) - Visual - Taste-Smell - Auditory	- Haptic (touch)
	Utilize vegetal interventions on the interior and exterior of the building to connect people indirectly to nature	- Taste-Smell - Haptic (touch) - Visual	- Haptic (touch) - Taste-Smell
	Utilize screening and overhead branching of vegetation to inform methods of daylighting and artificial lighting	- Visual - Haptic (touch)	- N/A

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Awareness of interconnections (shared usages, openness)	Create between spaces through shared usages, overlapping spaces, spatial projection, and such	- Visual - Haptic (touch) - Haptic (kinesthesia)	- Auditory - Taste-Smell
	Utilize material and color characteristics from the neighborhood to inform materiality, such as dominant light tones punctuated by deeper shades and vibrant vegetal hues	- Visual	- Taste-Smell
	Utilize form characteristics from the neighborhood to inform spatial characteristics, such as prominent rectilinear forms	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Create unity through variations of a consistent design language	- Visual - Haptic (touch)	- Haptic (kinesthesia)

Area: Common Hall			
Function(s): primary circulation, sitting, watching, interacting, relaxing, socializing			
Overall Design Language: open, active, dynamic, interactive, extrovertive, extending, lively, warm, inviting			
Outcomes	Possible Expressions in the Design	Sensory Systems	
		Primary	Secondary
Awareness of the liveliness of plastic changing stimuli	Utilize features which highlight weather and natural light changes	- Visual - Haptic (touch) - Auditory	- Haptic (temperature and humidity)
	Utilize materials that heighten the sense of interaction, such as texture changes	- Haptic (touch) - Visual	- Haptic (temperature and humidity)
	Engage the interior with the exterior through operable openings	- Auditory - Visual - Taste-Smell - Haptic (temperature and humidity)	- Haptic (touch)
Awareness of the passage of time	Highlight light and shadow changes with glazing interventions	- Visual - Haptic (touch)	- Haptic (temperature and humidity)
	Utilize features that grow/change, such as vegetation	- Visual - Taste-Smell - Haptic (touch)	- N/A
	Utilize features that change intensity temporally, such as water movement and lighting	- Auditory - Visual	- Taste-Smell - Haptic (temperature and humidity) - Haptic (touch)
	Compare and contrast the patina of original historic building materials with new materials	- Visual - Haptic (touch)	- N/A
Awareness of sensory variations and shifts	Highlight movement between areas with sensory changes, such as texture, sound, lighting, color	- Haptic (touch) - Haptic (kinesthesia) - Visual - Auditory	- Taste-Smell

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Awareness of motion and ebb and flow patterns	Create the ability to watch and engage with areas that experience cycles of daily change such as children's playgrounds, eating areas, and streets	- Visual - Auditory	- Haptic (touch) - Taste-Smell
Relate to the uncontrollable and unexpected quality of nature	Employ unique features to relay spatial language and concept, such as lighting fixtures, tables, connecting spaces, and such	- Visual - Auditory	- Haptic (temperature and humidity) - Haptic (touch)
Relate to the dynamic, organic scaled patterning and rhythms in nature	Employ ornamentation that speaks to the design concept of a tree	- Visual - Haptic (touch) - Haptic (kinesthesia)	- Taste-Smell
Awareness of interconnections (shared usages, openness)	Create between spaces through shared usages, overlapping spaces, spatial projection, and such	- Visual - Haptic (touch) - Haptic (kinesthesia)	- Auditory - Taste-Smell
	Utilize material and color characteristics from the neighborhood to inform materiality, such as dominant light tones punctuated by deeper shades and vibrant vegetal hues	- Visual	- Taste-Smell
	Utilize form characteristics from the neighborhood to inform spatial characteristics, such as the feeling of penetrability and invitation	- Visual - Haptic (touch)	- Haptic (kinesthesia)

Area: Living Units			
Function(s): sitting, watching, interacting, socializing, cooking, eating, relaxing, sleeping, working			
Overall Design Language: open to private, extending to outside, rejuvenating, inviting, warm, dynamic			
Outcomes	Possible Expressions in the Design	Sensory Systems	
		Primary	Secondary
Relate to residential vernacular qualities of penetrability and invitation	Utilize form characteristics from the neighborhood to inform spatial characteristics of entry area	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Compare and contrast feelings of prospect and refuge	Utilize sight lines and spatial language to emphasize the feeling of refuge juxtaposed with prospect and vise versa	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Create a space that gradually moves from private to public	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Compare and contrast feeling of openness and free movement to directed and constrained space	Create a space that has smaller defined areas for private use and open areas for more public use	- Visual - Haptic (touch)	- Haptic (kinesthesia) - Auditory

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Awareness of interconnections (shared usages, openness)	Create between spaces through shared usages, overlapping spaces, spatial projection, and such	- Visual - Haptic (touch)	- Haptic (kinesthesia) - Auditory
	Utilize material and color characteristics from the neighborhood to inform materiality, such as dominant light tones punctuated by deeper shades and vibrant vegetal hues	- Visual	- Taste-Smell
	Utilize form characteristics from the neighborhood to inform spatial characteristics, such as prominent rectilinear forms	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Create unity through the utilization of variations of a consistent design language	- Visual - Haptic (touch) - Haptic (kinesthesia)	- Taste-Smell - Auditory

Area: Common Multipurpose Room			
Function(s): eating, interacting, socializing, sitting, working			
Overall Design Language: formal, open, active, dynamic, extrovertive, lively, warm, inviting, extending to the outside			
Outcomes	Possible Expressions in the Design	Sensory Systems	
		Primary	Secondary
Relate to residential vernacular qualities of penetrability and invitation	Utilize form characteristics from the neighborhood to inform spatial characteristics of entry area	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of temporal connections and impacts (reuse and recycling)	Compare and contrast the patina of original historic building materials with new materials	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of motion and ebb and flow patterns	Create the ability to watch and engage with areas that experience cycles of daily change such as children's playgrounds, eating areas, and streets	- Auditory - Visual	- Taste-Smell - Haptic (touch)
Awareness of the liveliness of plastic changing stimuli	Highlight movement between areas with sensory changes, such as texture, sound, lighting, color	- Visual - Haptic (touch) - Haptic (kinesthesia)	- Auditory
	Utilize materials that heighten the sense of interaction, such as texture changes	- Visual - Haptic (touch)	- Haptic (temperature and humidity)
	Engage the interior with the exterior through operable openings	- Auditory - Visual - Taste-Smell	- Haptic (touch)

Area: Café			
Function(s): eating, sitting, watching, interacting, socializing, community interaction			
Overall Design Language: earthy, raw, dynamic, lively, interactive, expansive, extending to outside			
Outcomes	Possible Expressions in the Design	Sensory Systems	
		Primary	Secondary
Relate to vernacular qualities of penetrability and invitation	Utilize form characteristics from the neighborhood to inform spatial characteristics of entry area	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of temporal connections and impacts (reuse and recycling)	Highlight original building materials	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Draw on architectural language and history of the building as a formal school to create design language and inform space planning	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of interconnections (shared usages, openness)	Create between spaces through shared usages, overlapping spaces, spatial projection, and such	- Visual - Haptic (touch) - Auditory	- Taste-Smell
	Utilize material and color characteristics from the neighborhood to inform materiality, such as dominant light tones punctuated by deeper shades and vibrant vegetal hues	- Visual	- Taste-Smell
	Utilize form characteristics from the neighborhood to inform spatial characteristics, such as prominent rectilinear forms	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Create unity through the utilization of variations of a consistent design language	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Relate to the dynamic, organic scaled patterning and rhythms in nature	Employ ornamentation that speaks to the design concept of a tree (for example utilizing the language of being in the earth in the basement)	- Visual - Haptic (touch)	- Haptic (kinesthesia) - Haptic (temperature and humidity)
Relate to the uncontrollable and unexpected quality of nature	Employ unique features to relay spatial language and concept	- Visual - Haptic (touch) - Haptic (kinesthesia)	- Taste-Smell - Auditory
Awareness of motion and ebb and flow patterns	Create the ability to watch and engage with areas that experience cycles of daily change such as children's playgrounds, eating areas, and streets	- Auditory - Visual	- Taste-Smell - Haptic (touch)
Awareness of the liveliness of plastic changing stimuli	Highlight movement between areas with sensory changes, such as texture, sound, lighting, color	- Visual - Haptic (touch) - Haptic (kinesthesia)	- Auditory
	Utilize materials that heighten the sense of interaction, such as texture changes	- Visual - Haptic (touch)	- Haptic (temperature and humidity)
	Engage the interior with the exterior through operable openings	- Auditory - Visual - Taste-Smell	- Haptic (touch)

Area: Daycare			
Function(s): messy play, active play, quiet play, napping, sitting, watching, interacting			
Overall Design Language: expansion and contraction, active, dynamic, playful, structured, lively and quiet, interactive, extending to outside			
Outcomes	Possible Expressions in the Design	Sensory Systems	
		Primary	Secondary
Compare and contrast feelings of prospect and refuge	Utilize sight lines and spatial language to emphasize the feeling of refuge juxtaposed with prospect and vise versa	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Create a space that has pockets of private, quiet space intermixed with open active spaces	- Visual - Haptic (touch)	- Haptic (kinesthesia) - Haptic (temperature and humidity)
Compare and contrast feeling of openness and free movement to directed and constrained space	Create a comparison between interior structured space and exterior free-flowing spaces	- Visual - Haptic (touch)	- Haptic (kinesthesia) - Taste-Smell - Auditory
Awareness of interconnections (shared usages, openness)	Create between spaces through shared usages, overlapping spaces, spatial projection, and such	- Visual - Haptic (touch) - Auditory	- Taste-Smell
	Utilize material and color characteristics from the neighborhood to inform materiality, such as dominant light tones punctuated by deeper shades and vibrant vegetal hues	- Visual	- Taste-Smell
	Utilize form characteristics from the neighborhood to inform spatial characteristics, such as prominent rectilinear forms	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Create unity through the utilization of variations of a consistent design language	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Relate to the dynamic, organic scaled patterning and rhythms in nature	Employ ornamentation that speaks to the design concept of a tree	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of motion and ebb and flow patterns	Create the ability to watch and engage with areas that experience cycles of daily change such as children's playgrounds, eating areas, and streets	- Auditory - Visual	- Taste-Smell - Haptic (touch)
Awareness of sensory variations and shifts	Highlight movement between areas with sensory changes, such as texture, sound, lighting, color	- Haptic (touch) - Haptic (kinesthesia) - Visual - Auditory	- Taste-Smell
Awareness of the liveliness of plastic changing stimuli	Utilize materials that heighten the sense of interaction, such as texture changes	- Visual - Haptic (touch)	- Haptic (temperature and humidity)
	Engage the interior with the exterior through operable openings	- Auditory - Visual - Taste-Smell	- Haptic (touch)

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Awareness of the passage of time	Highlight light and shadow changes with glazing interventions	- Visual - Haptic (touch)	- Haptic (temperature and humidity)
	Utilize features that grow/change temporally, such as vegetation	- Visual - Taste-Smell - Haptic (touch)	- N/A
	Utilize features that change intensity temporally, such as water movement and lighting	- Auditory - Visual	- Taste-Smell - Haptic (temperature and humidity) - Haptic (touch)
	Compare and contrast the patina of original historic building materials with new materials	- Visual - Haptic (touch)	- N/A

Area: Original Entry			
Function(s): entering, connecting, transitioning, inviting			
Overall Design Language: formal, transitional, extending to multi-purpose room and outside, semi-enclosed			
Outcomes	Possible Expressions in the Design	Sensory Systems	
		Primary	Secondary
Relate to vernacular qualities of penetrability and invitation	Utilize form characteristics from the neighborhood to inform spatial characteristics of entry area	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of temporal connections and impacts (reuse and recycling)	Compare and contrast the patina of original historic building materials with new materials	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of the passage of time	Highlight light and shadow changes with glazing interventions	- Visual - Haptic (touch)	- Haptic (temperature and humidity)
	Utilize features that grow/change temporally, such as vegetation	- Visual - Taste-Smell - Haptic (touch)	- N/A
	Utilize features that change intensity temporally, such as water movement and lighting	- Auditory - Visual	- Taste-Smell - Haptic (temperature and humidity) - Haptic (touch)
	Compare and contrast the patina of original historic building materials with new materials	- Visual - Haptic (touch)	- N/A
Awareness of interconnections (shared usages, openness)	Create between spaces through shared usages, overlapping spaces, spatial projection, and such	- Visual - Haptic (touch) - Auditory	- Taste-Smell
	Utilize material and color characteristics from the neighborhood to inform materiality, such as dominant light tones punctuated by deeper shades and vibrant vegetal hues	- Visual	- Taste-Smell
	Utilize form characteristics from the neighborhood to inform spatial characteristics, such as prominent rectilinear forms	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Create unity through the utilization of variations of a consistent design language	- Visual - Haptic (touch)	- Haptic (kinesthesia)

Area: Accessible Entry			
Function(s): entering, connecting, transitioning, inviting			
Overall Design Language: transitional, extending to outside, open, extrovertive, lively, expansive, traversing			
Outcomes	Possible Expressions in the Design	Sensory Systems	
		Primary	Secondary
Relate to vernacular qualities of penetrability and invitation	Utilize form characteristics from the neighborhood to inform spatial characteristics of entry area	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of temporal connections and impacts (reuse and recycling)	Highlight original building materials	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Draw on architectural language and history of the building as a formal school to create design language and inform space planning	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of interconnections (shared usages, openness)	Create between spaces through shared usages, overlapping spaces, spatial projection, and such	- Visual - Haptic (touch) - Auditory	- Taste-Smell
	Utilize material and color characteristics from the neighborhood to inform materiality, such as dominant light tones punctuated by deeper shades and vibrant vegetal hues	- Visual	- Taste-Smell
	Utilize form characteristics from the neighborhood to inform spatial characteristics, such as prominent rectilinear forms	- Visual - Haptic (touch)	- Haptic (kinesthesia)
	Create unity through the utilization of variations of a consistent design language	- Visual - Haptic (touch)	- Haptic (kinesthesia)
Awareness of motion and ebb and flow patterns	Create the ability to watch and engage with areas that experience cycles of daily change such as children's playgrounds, eating areas, and streets	- Auditory - Visual	- Taste-Smell - Haptic (touch)
Awareness of sensory variations and shifts	Highlight movement between areas with sensory changes, such as texture, sound, lighting, color	- Haptic (touch) - Haptic (kinesthesia) - Visual - Auditory	- Taste-Smell
Awareness of the liveliness of plastic changing stimuli	Utilize materials that heighten the sense of interaction, such as texture changes	- Visual - Haptic (touch)	- Haptic (temperature and humidity)
	Engage the interior with the exterior through operable openings	- Auditory - Visual - Taste-Smell	- Haptic (touch)

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Awareness of the passage of time	Highlight light and shadow changes with glazing interventions	- Visual - Haptic (touch)	- Haptic (temperature and humidity)
	Utilize features that grow/change temporally, such as vegetation	- Visual - Taste-Smell - Haptic (touch)	- N/A
	Utilize features that change intensity temporally, such as water movement and lighting	- Auditory - Visual	- Taste-Smell - Haptic (temperature and humidity) - Haptic (touch)
	Compare and contrast the patina of original historic building materials with new materials	- Visual - Haptic (touch)	- N/A

5.2.2. Occupancy Requirements

The following chart outlines the requirements for the occupancies in the design investigation. The chart is divided by occupancy and then subdivided by the usage requirements. This chart will be further analyzed in terms of spatial proximity required in the next subsection, 5.2.3, “Adjacencies.”

Occupancy	Requirements	
Café	Customer areas:	customer dining area male washroom female washroom exterior patio space
	Staff areas:	open kitchen (hot and cold food prep areas) preparation and dishwashing area dry storage cold storage office exterior food growing spaces exterior composting space rain collection area (experiential feature) food production greenhouse
Daycare	General areas:	entry foyer with storage for outerwear reception sickbay covered porch exterior play area
	Staff areas:	staff washroom staff room with kitchen space laundry/janitor room recycling and garbage area
	Preschool room:	preschool washroom messy zone (with sinks) active zone quiet zone kitchenette (sink, fridge, storage) storage
	Toddler room:	toddler washroom messy zone (with sinks) active zone quiet zone kitchenette (sink, fridge, storage) storage
	Infant room:	messy zone (with sinks) active zone quiet zone sleeping zone kitchenette (sink, fridge, storage) changing station (with sink)

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Common Areas	Facility and community:	multi-purpose room kitchen male washroom female washroom
	Facility:	laundry room recycling and garbage areas (each residential floor) gardening lounges (each residential floor) halls (each residential floor) storage
Living Unit	Public:	living room kitchen garden room
	Private:	washroom bedroom(s)
Building Service Areas	electrical room mechanical room staff washroom janitor rooms	

5.2.3. Adjacencies

The following series of charts define the relationship between the occupancies of the building. Further, within each occupancy the supporting functional spatial relationships are defined. These charts will be further analyzed as they relate to spatial planning in the next subsection, 5.2.4, "Proposed Zoning and Circulation."

Inter-floor:

Area	Daycare	CR/G	CH	CL	CW/C	CK	CM-P	Living Units	JR	Staff W/C	BR	Elec. Room
Cafe	A	O	O	O	O	O	O	O	O	A	O	O
Electrical Room	O	O	O	O	O	O	O	O	O	C	A	
Boiler Room [BR]	O	O	O	O	O	O	O	O	O	C		
Staff W/C	O	O	O	O	O	O	O	O	O			
Janitor Rooms [JR]	O	A	C	O	O	O	O	O				
Living Units	O	C	A	C	C	C	C					
Common Multi-purpose [CM-P]	O	C	C	C	A	A						
Common Kitchen [CK]	O	C	C	C	C							
Common W/C [CW/C]	O	C	C	C								
Common Laundry [CL]	O	C	C									
Common Hall [CH]	O	C										
Common Recycling/ Garbage [CR/G]	O											

Legend: Adjacent A Close Proximity C No Proximity Required O

Café:

Area	Kitchen	GH	W	Exterior Composting	Exterior Food Growing	Office	CS	DS	P/D	Patio	W/C
Dining	A	C	C	O	A	O	C	C	C	C	A
W/C	O	O	O	O	O	O	O	O	O	C	
Patio	C	C	C	O	A	O	O	O	O		
Prep/ Dishwashing [P/D]	A	A	O	O	O	C	A	A			
Dry Storage [DS]	C	O	O	O	O	O	A				
Cold Storage [CS]	C	O	O	O	O	O					
Office	C	O	O	O	O						
Exterior Food Growing	C	C	A	A							
Exterior Composting	O	C	A								
Experiential Water Feature [W]	O	C									
Greenhouse [GH]	A										

Legend: Adjacent A Close Proximity C No Proximity Required O

Daycare:

Area	Reception	Infant	Toddler	Preschool	R/G	L/J	Staff Room	Staff W/C	EP	Covered Porch	Sickbay
Entry Foyer	A	C	C	C	C	O	O	O	O	O	A
Sickbay	A	O	O	O	O	O	O	O	O	O	
Covered Porch	O	A	A	A	O	O	O	O	A		
Exterior Play [EP]	O	A	A	A	O	O	O	O			
Staff W/C	O	O	O	O	O	O	A				
Staff Room	O	C	C	C	O	O					
Laundry/ Janitor [L/J]	O	C	C	C	O						
Recycling/ Garbage [R/G]	C	C	C	C							
Preschool	O	O	C								
Toddler	O	C									
Infant	O										

Legend: Adjacent A Close Proximity C No Proximity Required O

Living Unit:

Area	Kitchen	Bedroom(s)	W/C	Garden Room	Hall/Gardening Lounge
Living Room	A	O	C	C	A
Hall/Gardening Lounge	O	O	C	A	
Garden Room	O	O	O		
W/C	C	A			
Bedroom(s)	O				

Legend: Adjacent A Close Proximity C No Proximity Required O

5.2.4. Proposed Zoning and Circulation

The following series of diagrams (Figures 5.2 to 5.5) present the proposed spatial arrangement and circulation for the occupancies based on the information in the last two subsections, 5.2.2, “Occupancy Requirements,” and 5.2.3, “Adjacencies.” Spatial language or sensory flow of space is indicated as the concept of the between as has been previously discussed throughout the document.

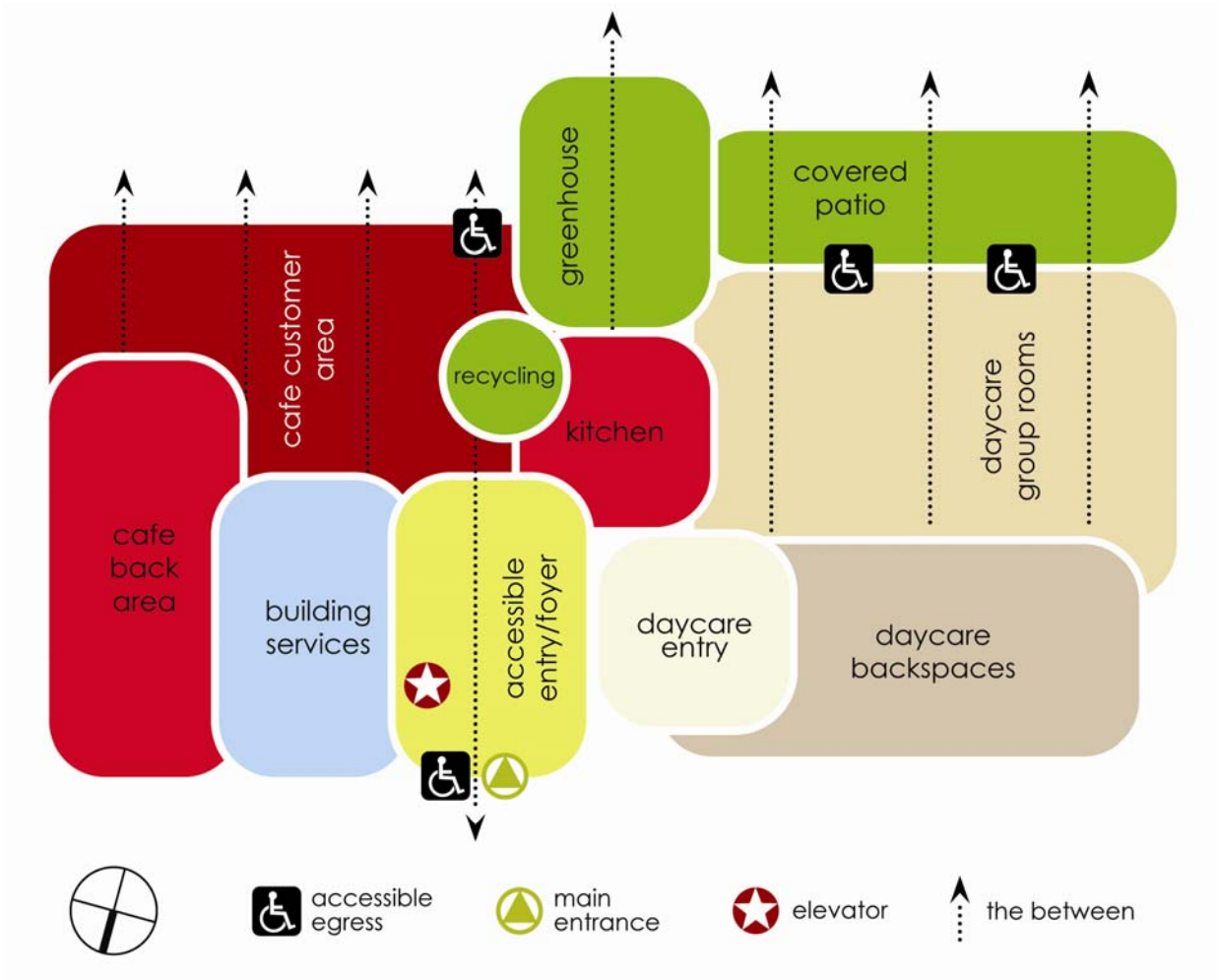


Figure 5.2. Basement spatial organization, flow, and circulation.

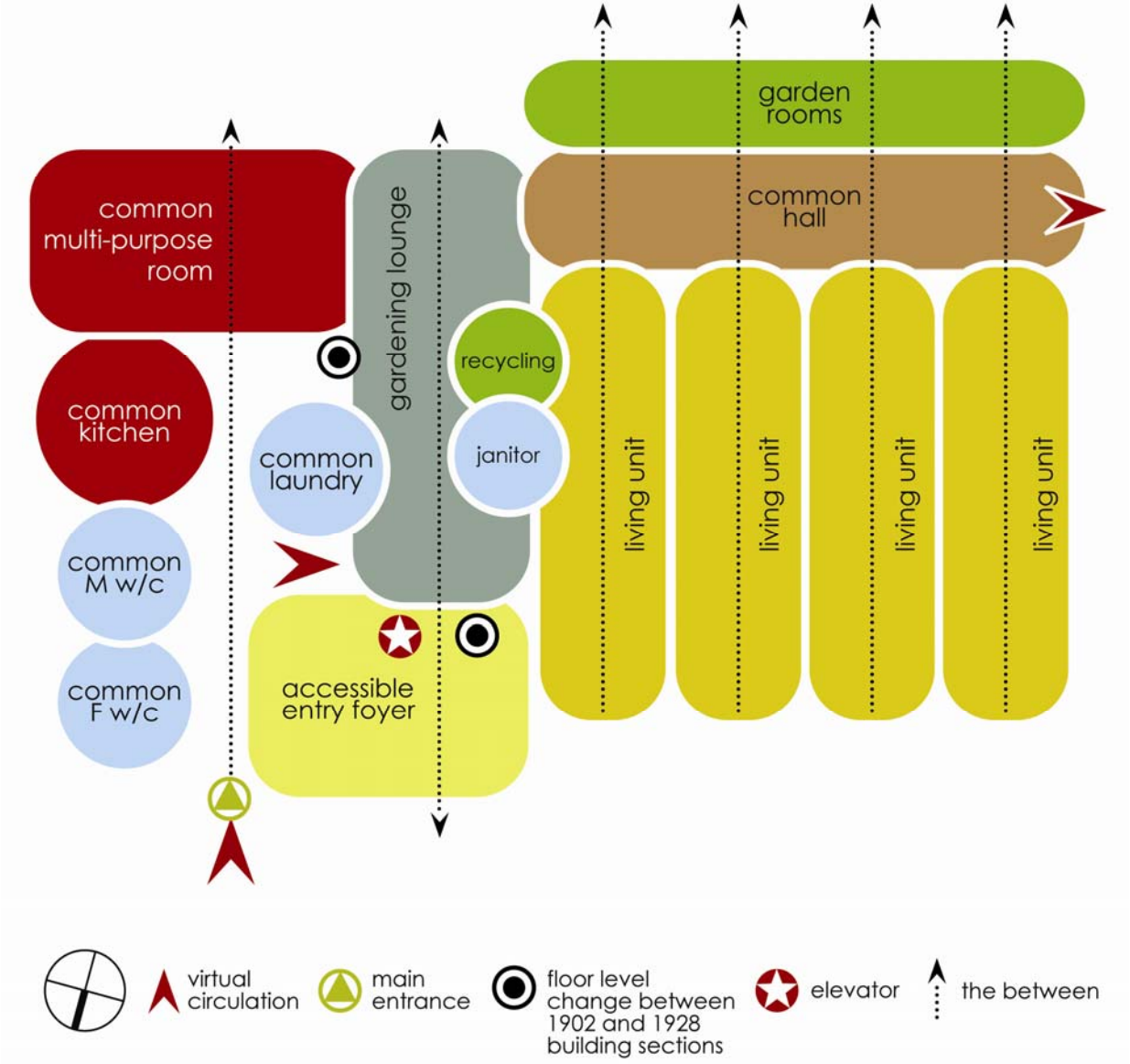


Figure 5.3. Main floor spatial organization, flow, and circulation.

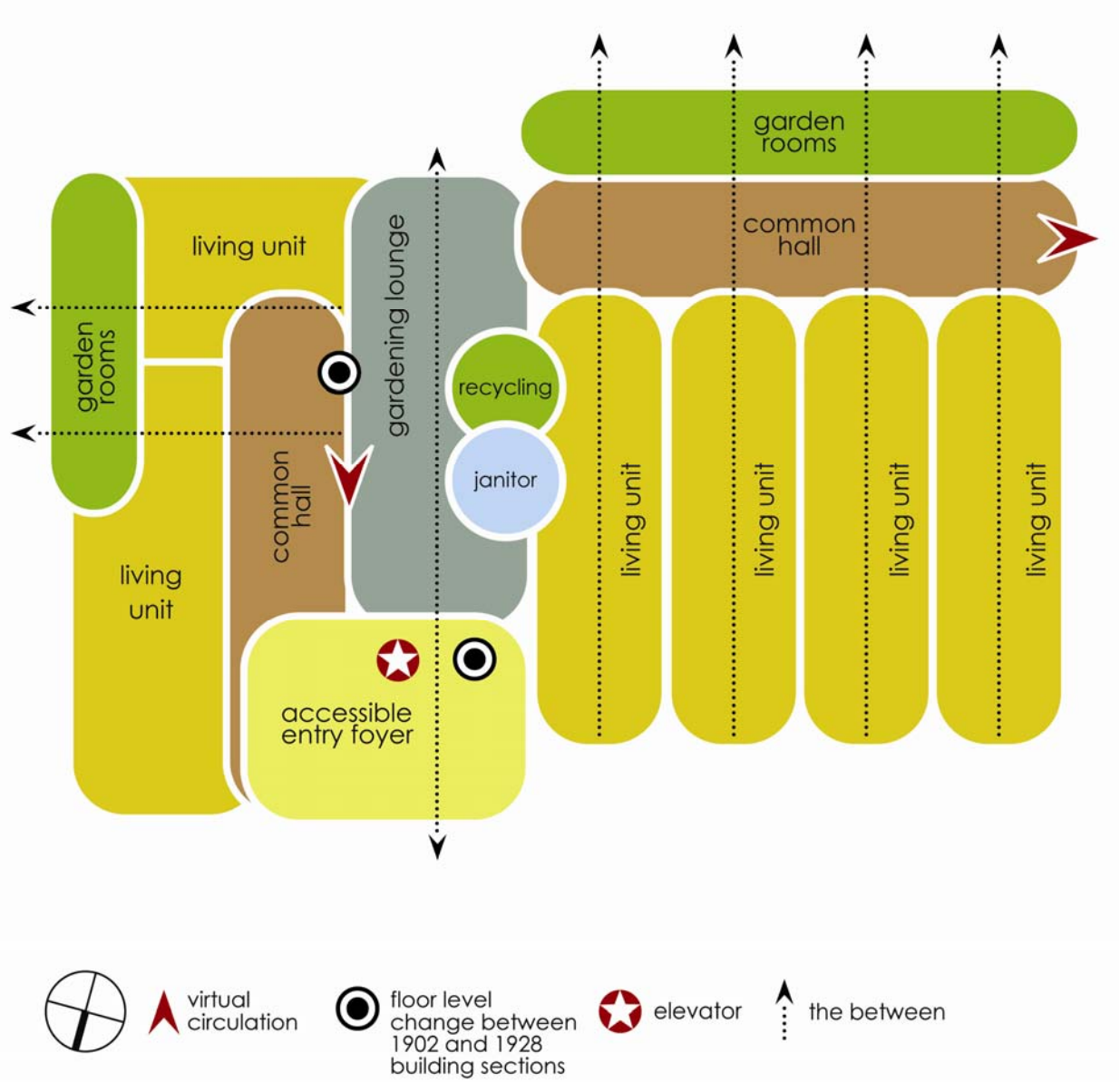


Figure 5.4. Second floor spatial organization, flow, and circulation.

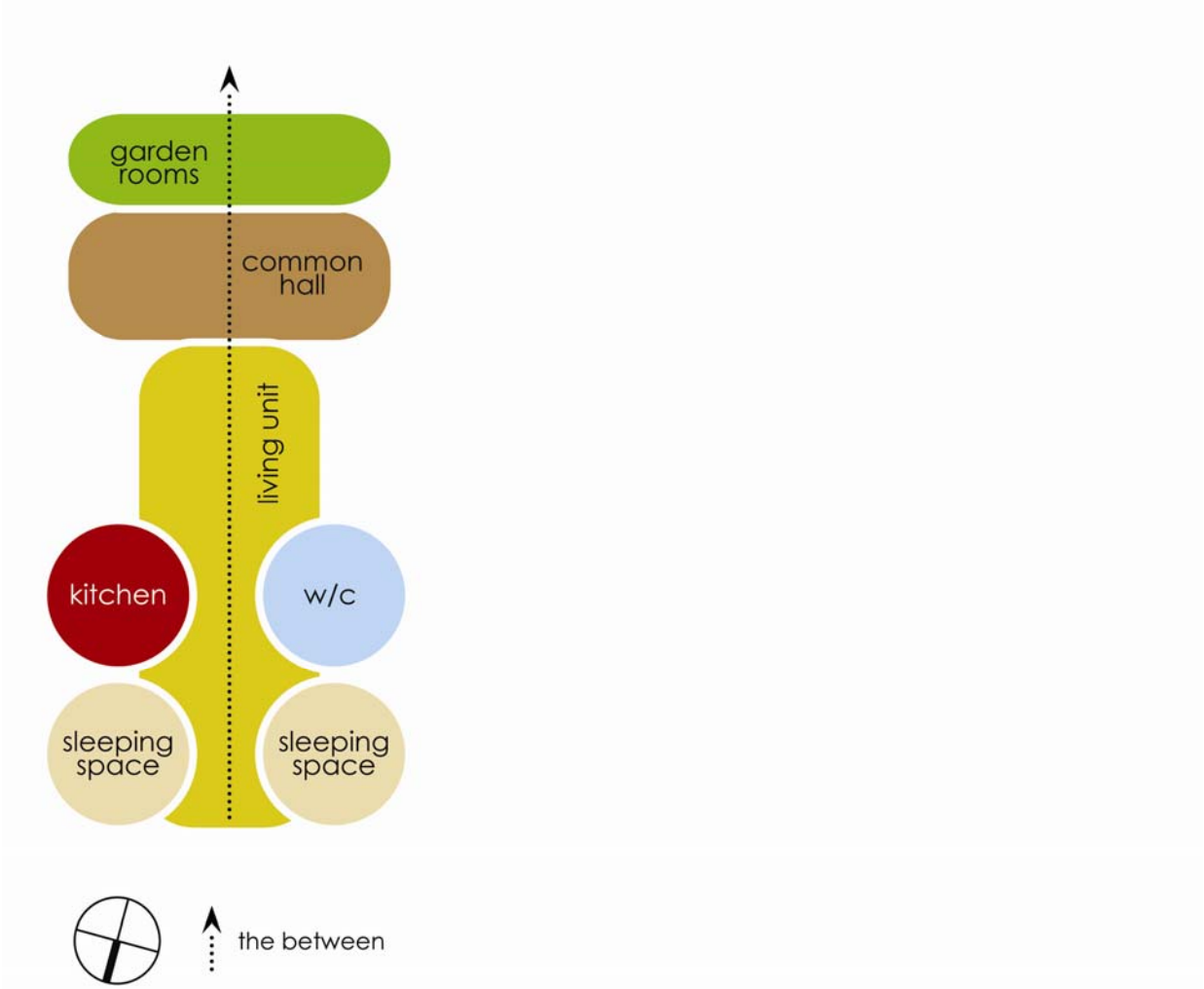


Figure 5.5. Living unit spatial organization, flow, and circulation.

6. Design Investigation of Biophilic Design

6.1. Design Strategy and Concept

The preceding inquiry in sections 3 and 4 of this project investigated how the built environment manifests a disconnected relationship between humans and nature, the origin of this divisive relationship, and its effect on building occupants and the environment. The primary concern of the project centers on how we can create a relationship with the natural environment through interior design to help foster ecological design practices and positive environmental behaviors. Specifically, this research centers on investigating biophilic design as a solution to the division.

To counteract the disconnection between humans and nature, the concepts and theories I have drawn from in this investigation explore how otherness is created and how it can be resolved. These theories were then enmeshed with Transformative Learning theory to obtain a process that could be utilized in the design investigation to facilitate learning and awareness of interconnections with nature through experience. The process derived, being encounter/presentation, experience/interaction, and internalization/awareness, relies on the stimulation and involvement of the full realm of the senses to create an experience with multiple layers of interaction involving direct, indirect, and symbolic connections to nature.

This sequence was then integrated with biophilic design, which stresses the importance of creating design that reflects the inherent value of nature, culture, and place in concert, as it has been found that this tripartite relationship promotes well being and has the ability to enliven a desire to protect the natural environment. In addition, it attaches people emotionally and intellectually to built form and nature.

Within this document section, a design solution is outlined, which proposes three-dimensional solutions that facilitate a human-nature connection. To begin, as previously

outlined in subsection 1.4, the investigation utilizes a mixed-use, multi-unit residential program that is family and community-oriented as its starting point. This facility contains 10 private living units designed for young families, a communal kitchen, multi-purpose room, gardening lounge, hall, laundry room, and organic food garden, a daycare, and a café. The site for this investigation is 210 rue Masson in Saint-Boniface, Winnipeg, Manitoba, detailed in section 2, "Design Investigation Site."

Finally, before I discuss the design, Figure 6.1 synthesizes the design investigation, graphically depicting how I am going to proceed in terms of a design concept and language that will tie the facility and nature together. This image relates the design of the facility to a tree and to the cyclical flow that represents people's interactions with nature in the facility. As a whole, the facility design speaks to a cycle of relations with nature by enabling interactions to take place, by creating situations where a positive relationship is nurtured, and by highlighting the byproducts of consumption.

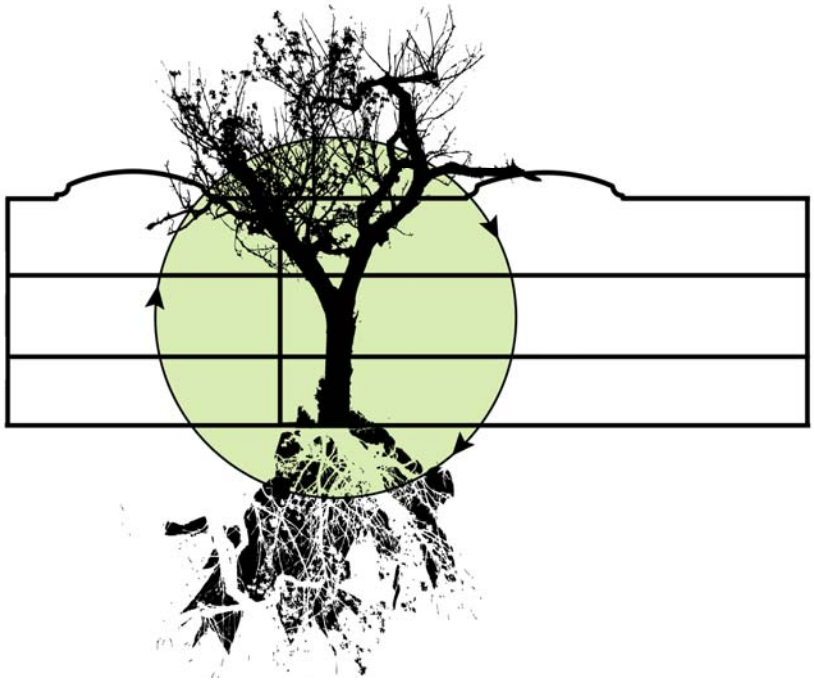


Figure 6.1. Design concept for the investigation, which highlights the overall language to be utilized in the design. For example, the space between the 1902 and 1928 sections acts as the building trunk, while the basement is the earth and the main and second floors are the tree canopy.

6.2. Spatial Development and the Building Trunk

The spatial development of the design begins with the tree concept. As represented by Figure 6.1, the primary vertical and horizontal circulation has been centralized forming the trunk or backbone of the building, located at the intersection of the 1902 and 1928 building sections. This area is indicated by brown in Figure 6.2. The trunk centralizes the major universal accessibility points within the building and acts as a major egress area as seen in Figure 6.3. Essentially, the trunk overcomes the accessibility, egress, and refuge issues in the original building, such as floor level changes, awkward dispersed vertical circulation, and inadequate stair widths that do not meet building code, as discussed in subsection 2.3, "Building Selection and Analysis." Additionally, this primary area of circulation also contains important human-nature connection points, which are essential to the cyclical flow of human-nature connection cycles in the building, such as recycling, composting, and gardening support areas.

The occupancies branch out from the building's trunk, the location of each occupancy being determined by the organization of the building on a privacy gradient. Essentially, the basement and exterior gardens are oriented towards community and public interactions with nature. In moving up through the building, these interactions become increasingly more intimate and personal as one enters the communal spaces and, then, the personal living units (see Figure 6.4).

The use of the trunk as a centralized axis with occupancies branching off it organizes the overall layout of the building and sets up a linear spatial organization that is repeated within each occupancy. Most importantly, the repetition of the linear spatial language throughout the design acts as a mechanism to connect the interior and exterior through sight lines, spatial projections, gradual transitions and symbolic details that blur the boundary between the interior and exterior to create between space (see Figure 6.5).

Figure 6.2. Three levels of the design depicting the vertical and horizontal location of the trunk area.

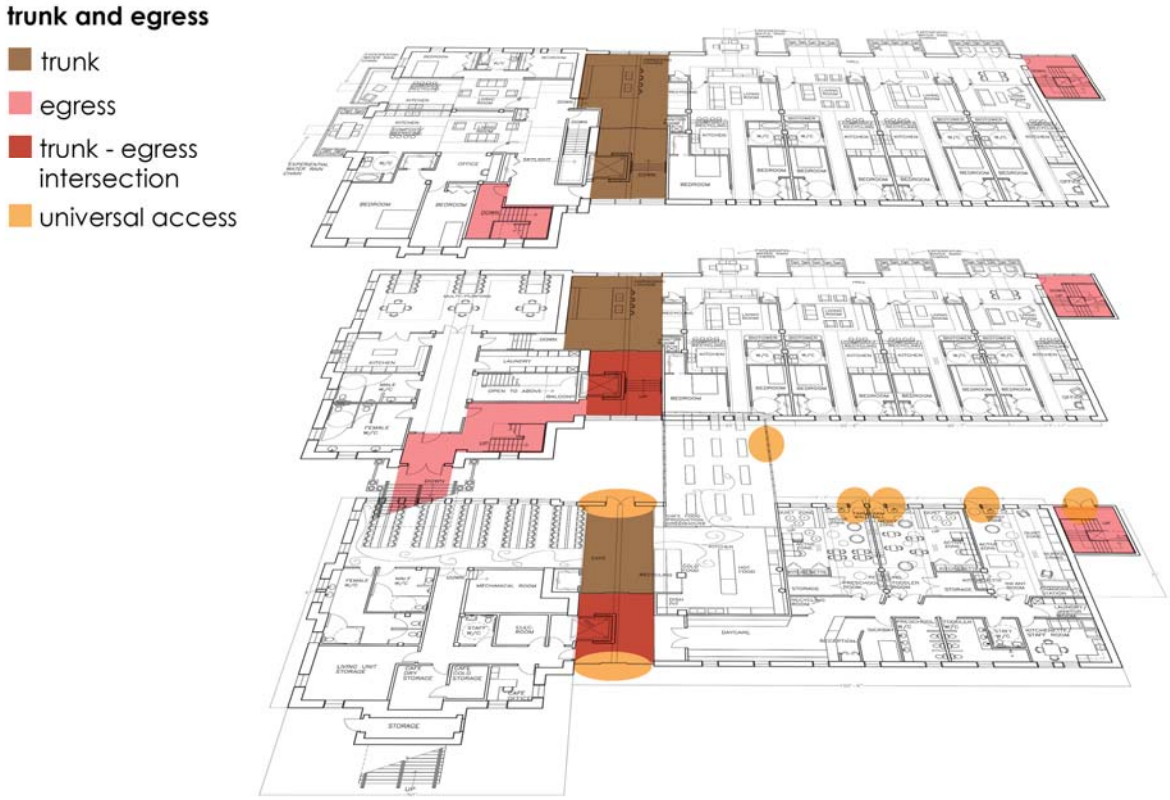


Figure 6.3. Three levels of the design depicting the location of the trunk area in relation to egress and access points.

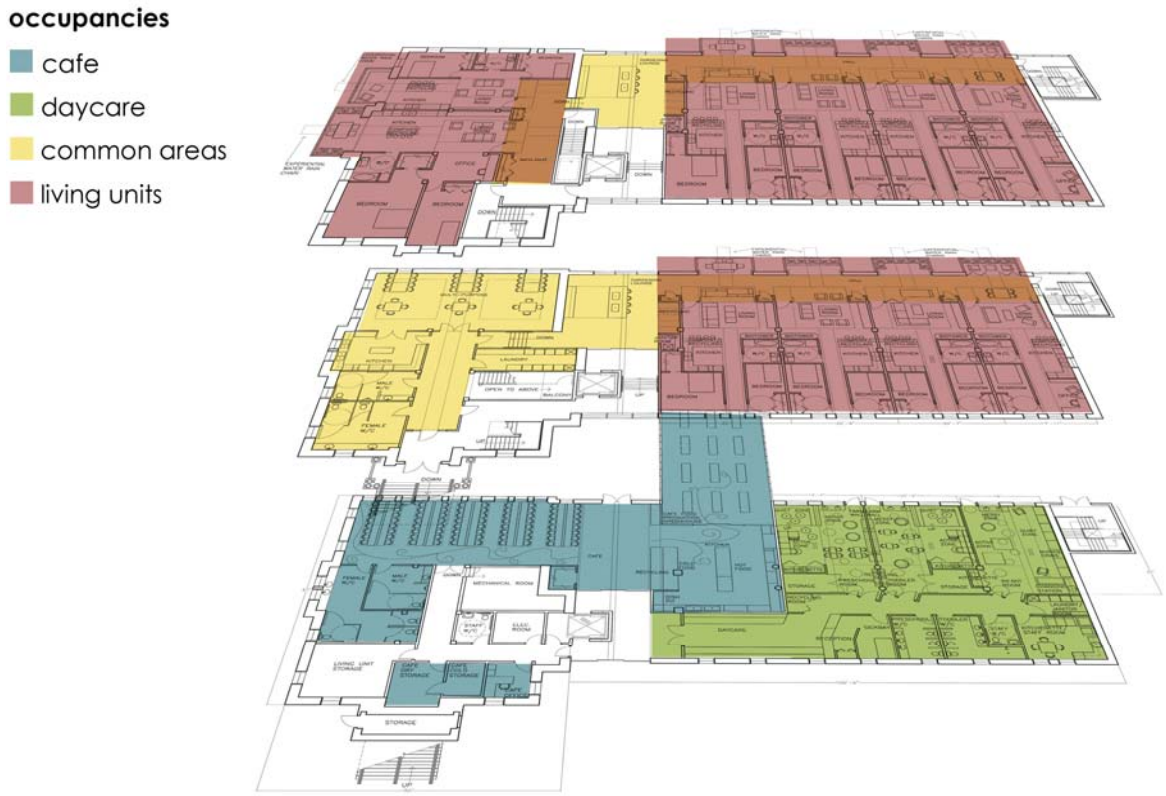


Figure 6.4. Three levels of the design depicting the location of the occupancies in relation to one another.

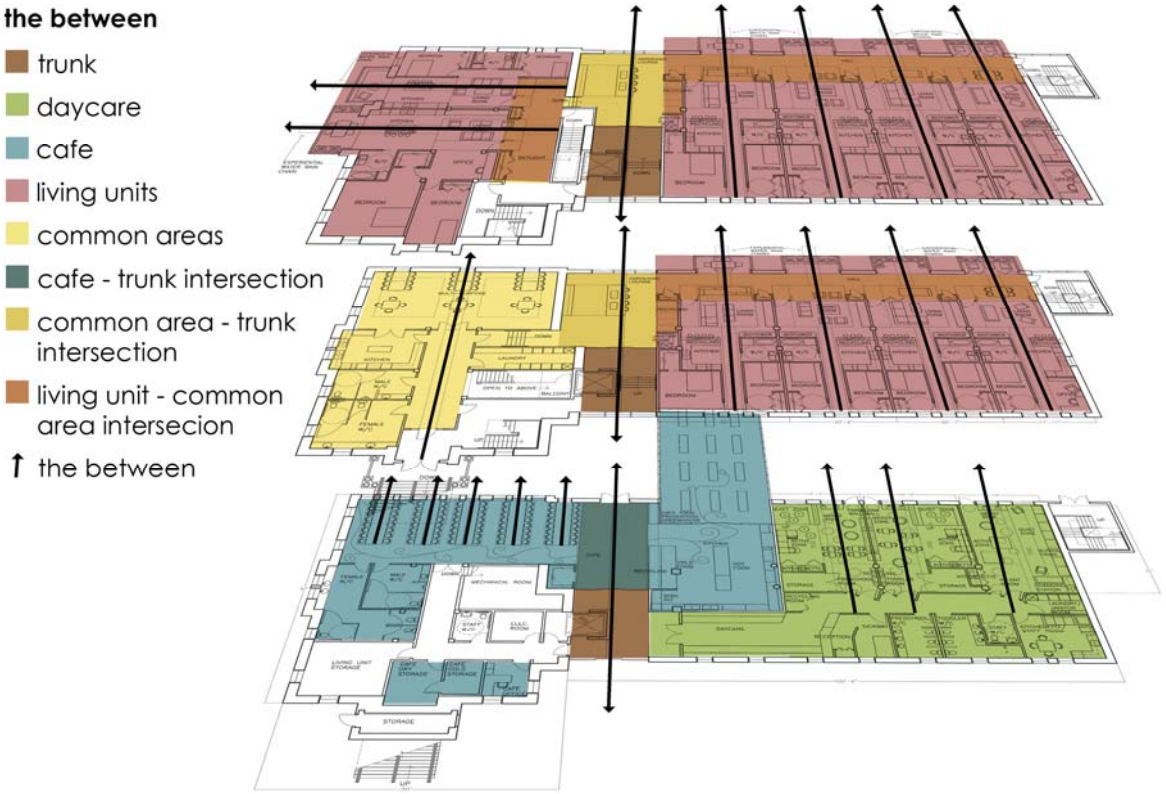


Figure 6.5. Three levels of the design depicting the relationship between the trunk, occupancies, and the between.

To define the trunk as an important area of the building and to indicate its relationship to nature on approach, the building is detailed on the front and rear façade with a living vertical wall of plants and large windows with tree-like mullion details (see Figures 6.6 and 6.7). The act of enabling spatial indications of the building's layout on the exterior connects to the idea of creating extensions and gradual transitions between the interior and exterior.

Figure 6.6. North building façade with exterior detail of the trunk area.

Figure 6.7. South building façade with exterior detail of the trunk area.

When one is approaching the building, two different experiences have been created with the north and south façades. The building's rear or south façade has been designed as a permeable lattice, ebbing and waning between the interior and exterior with various scales of operable openings, glazing, spatial projections, and material extensions (see Figure 6.7). The front façade, however, has remained largely untouched to maintain the building's strong vernacular connection in the community and to create a direct comparison to the experience of permeability created in the rear façade (see Figure 6.6). More importantly, though, the existing formal entry and the overall rhythm of the façade, which relates to the internal structure and layout of the building, has been maintained.

The relationship of the north and south gardens push this comparison further since the south garden incorporates many forms of casual, indirect nature experiences in the form of food gardens, experiential water features, vernacular plantings, and bird feeders (see Figure 6.8). Direct experiences have been maintained by incorporating almost all of the existing mature trees and plantings on the site into the new design (see Figure 6.9), and the experiences have been enhanced through the addition of vernacular plantings such as tall grass prairie gardens. Further, linear gestures bridge the interior and exterior, such as the café linear gardening plots, which extend from the café tables in the interior, and the linear axis, which extends from each living unit to the personal greenhouse spaces and to the exterior through a series of overlapping floor and ceiling planes. The café greenhouse also bridges the south façade wall, allowing maintained contact with indirect nature year round and a juxtaposition with the seasonal aspects of place, which have been enhanced through the inclusion of vernacular planting areas and varying terrain that add texture, color, and variety to the landscape in all seasons.

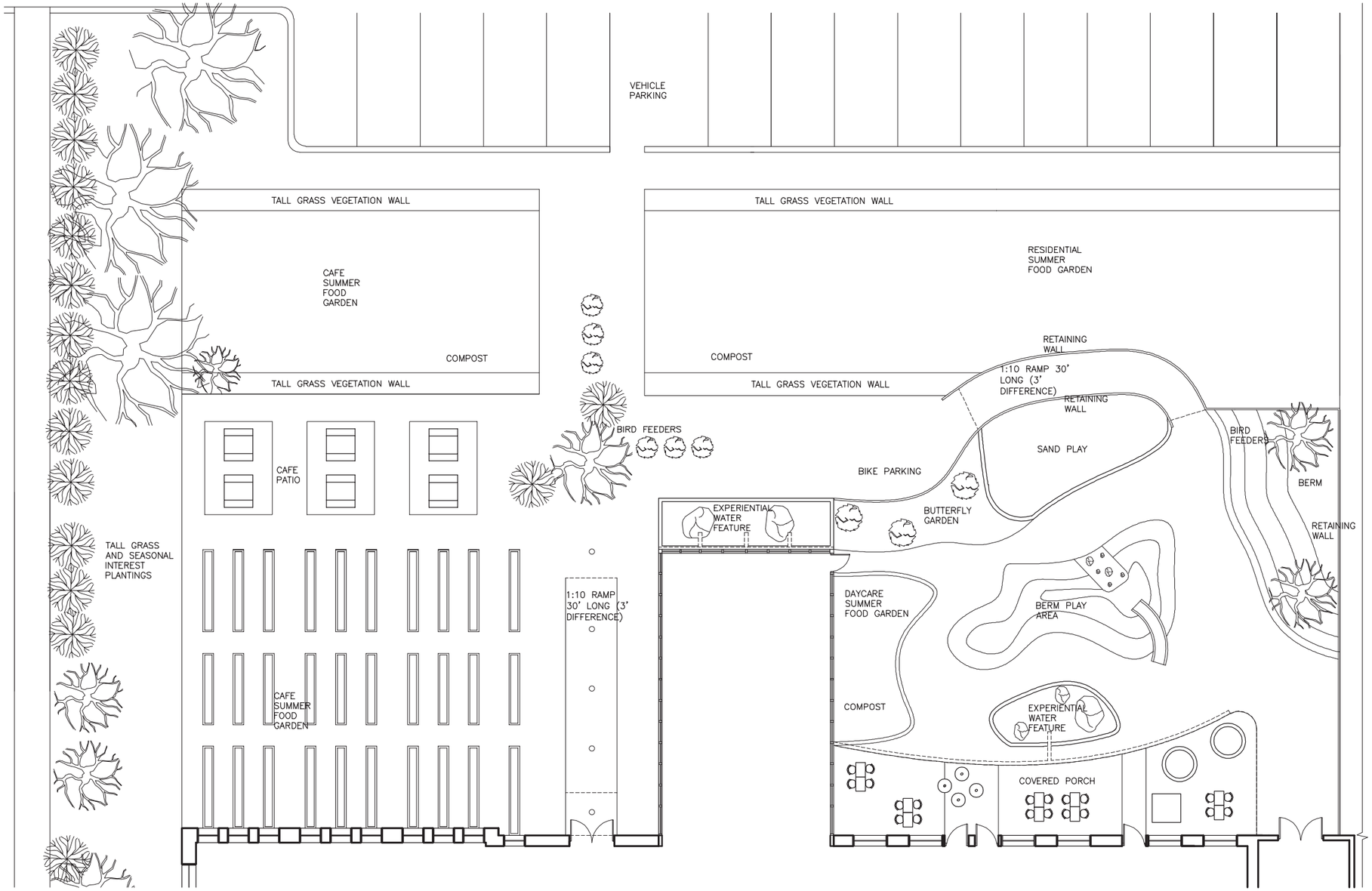
Alternatively, the north garden is formal in nature and largely maintained, relating it to the history of the building and site, but it does contain a gradual transition into the trunk space

through the creation of a ramped exterior room that extends into the interior (see Figures 6.10 – 6.11). Further, creating this gradual transition, the approach to the accessible entrance on the north façade is lined with formally cut hedges that draw the user to the right, down a gradual sloping path and into an exterior room partially covered by an awning. This space then blends into the entry vestibule through the continuation of the floor tile and rough-cut Tindal stone walls into the interior. A strong visual connection between both the north and south entrances further heightens this interior-exterior relation, with the south entrance moving through a series of similar gradual transitions.

The sections of the building shown in Figures 6.12 – 6.13 show the relationship between the exterior gardens and the design investigations interior occupancies. The inclusion of gradual transitions and universal access into the north and south façades of the trunk are visible with the addition of the ramped entryways that bridge a three-foot height difference between grade and the basement floor. In addition, behind the greenhouse in Figure 6.13, the new grade line for the exterior daycare play area is visible. The ground in this area has been excavated three feet to create direct universal access from the daycare and to create security for the children, since access to and from the exterior space is limited to a railed ramp.

To illustrate the process required to meld the design program, biophilic design, and the required building code with 210 rue Masson's existing structure, Figures 6.14 – 6.16 indicate that demolition is required. To provide safe solutions for the existing building's issues, including its lack of universal accessibility, proper egress, and its aged and damaged interior finishes and non-load bearing elements, much of the interior partitions and the stairwells attached onto the south and west façades of the building needed to be demolished. However, the eastern portion of the second floor was maintained, as was the column structure of the entire building, and most of the exterior shell. However, two important changes were made that speak

directly to the overall spatial development of the plan. The first was the addition of a center window within each bay on the second floor to mimic the window patterning on the main floor below and strengthen the overall rhythm of the façade. This change relates directly to important sight lines previously mentioned and the organization of the living units on this floor, which I will further explain in subsection 6.5, “Living Units and Communal Spaces.” The second change involves the creation of the trunk of the building, which required exterior wall demolition to include glazing on the main and second floors and access on the basement level. Further, floor demolition is required for the trunk’s elevator and stairs, while the building’s existing stairs on the south façade and those in the northeast corner of the building have been removed, as they do not meet code.



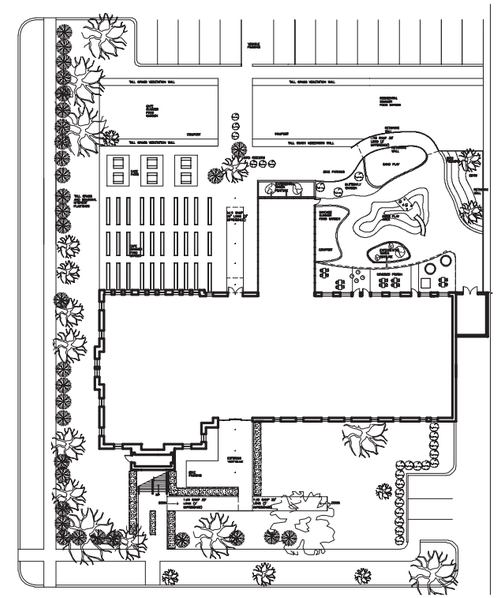
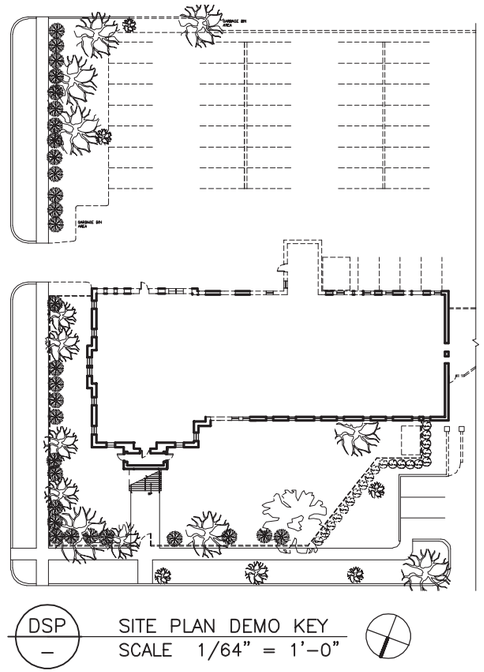


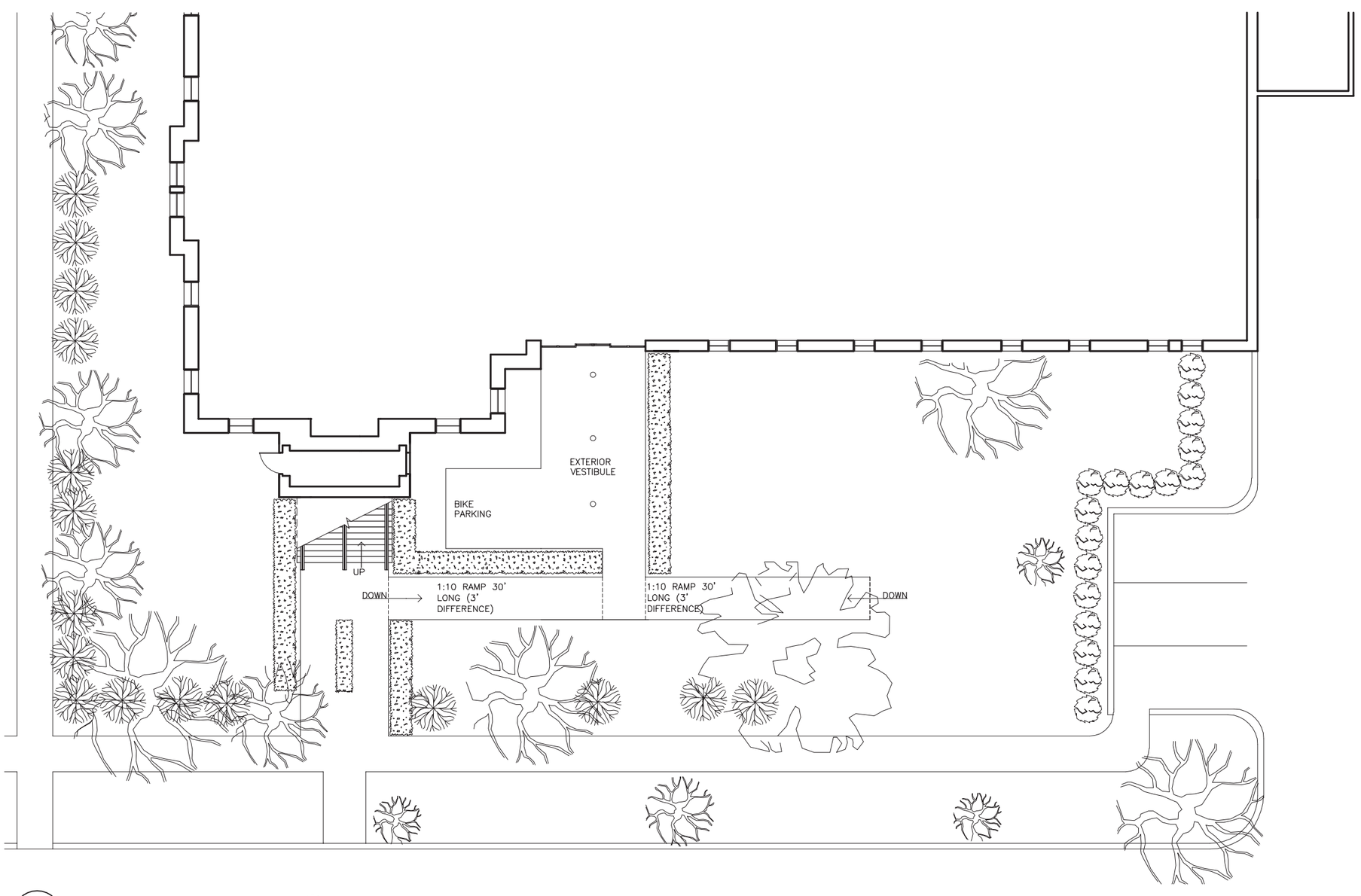
Figure 6.8. Detail of south garden.



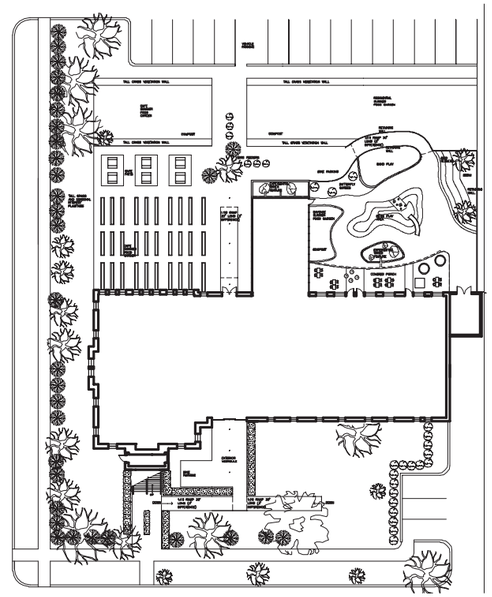
LEGEND

--- DEMO

Figure 6.9. Demolition detail of existing south parking lot.



SPD2 — NORTH SITE PLAN DETAIL
SCALE 1/16" = 1'-0"



PDK — PLAN DETAIL KEY
SCALE 1/64" = 1'-0"

Figure 6.10. Detail of north garden.

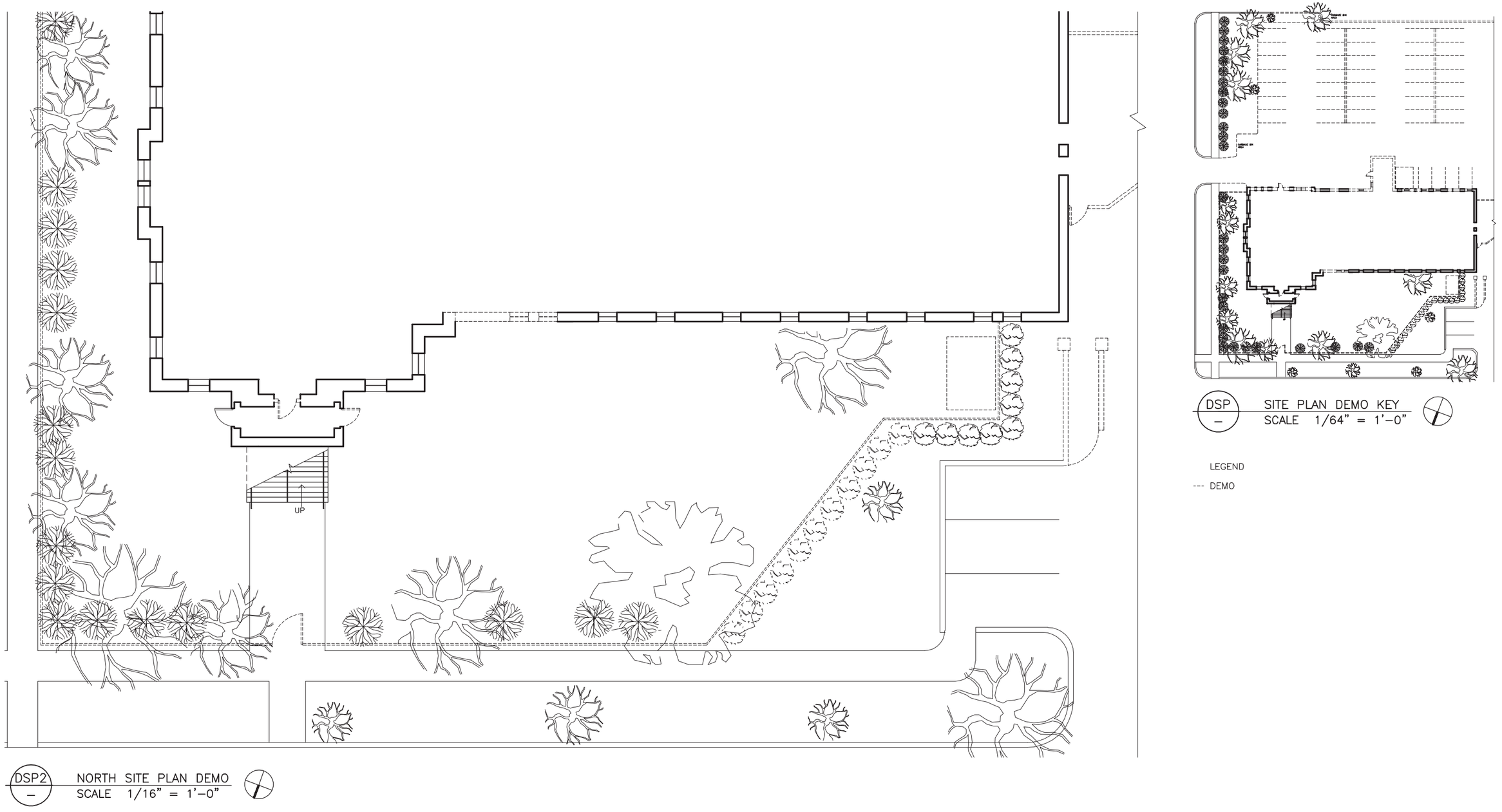


Figure 6.11. Demolition detail of existing north garden.

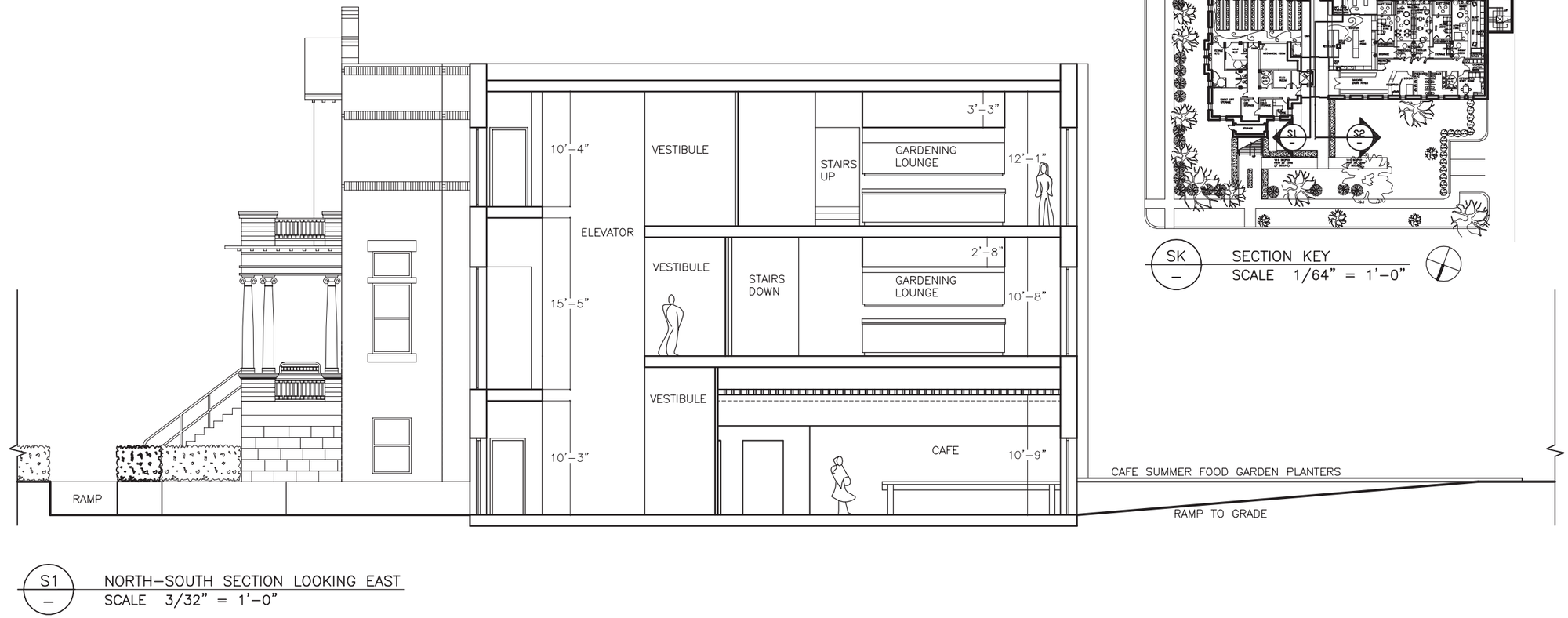


Figure 6.12. North-south building section of design looking east.

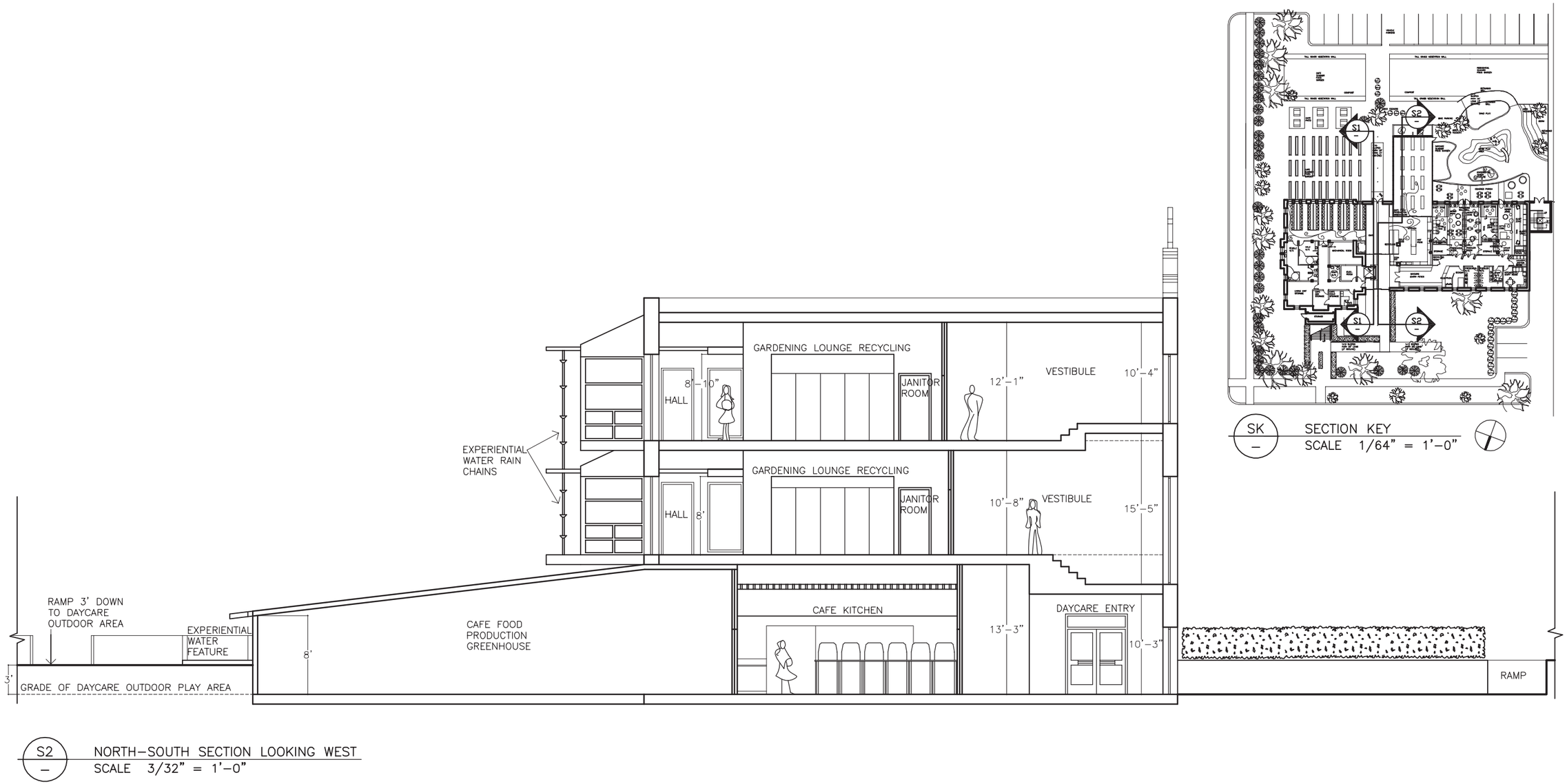


Figure 6.13. North-south building section of design looking west.

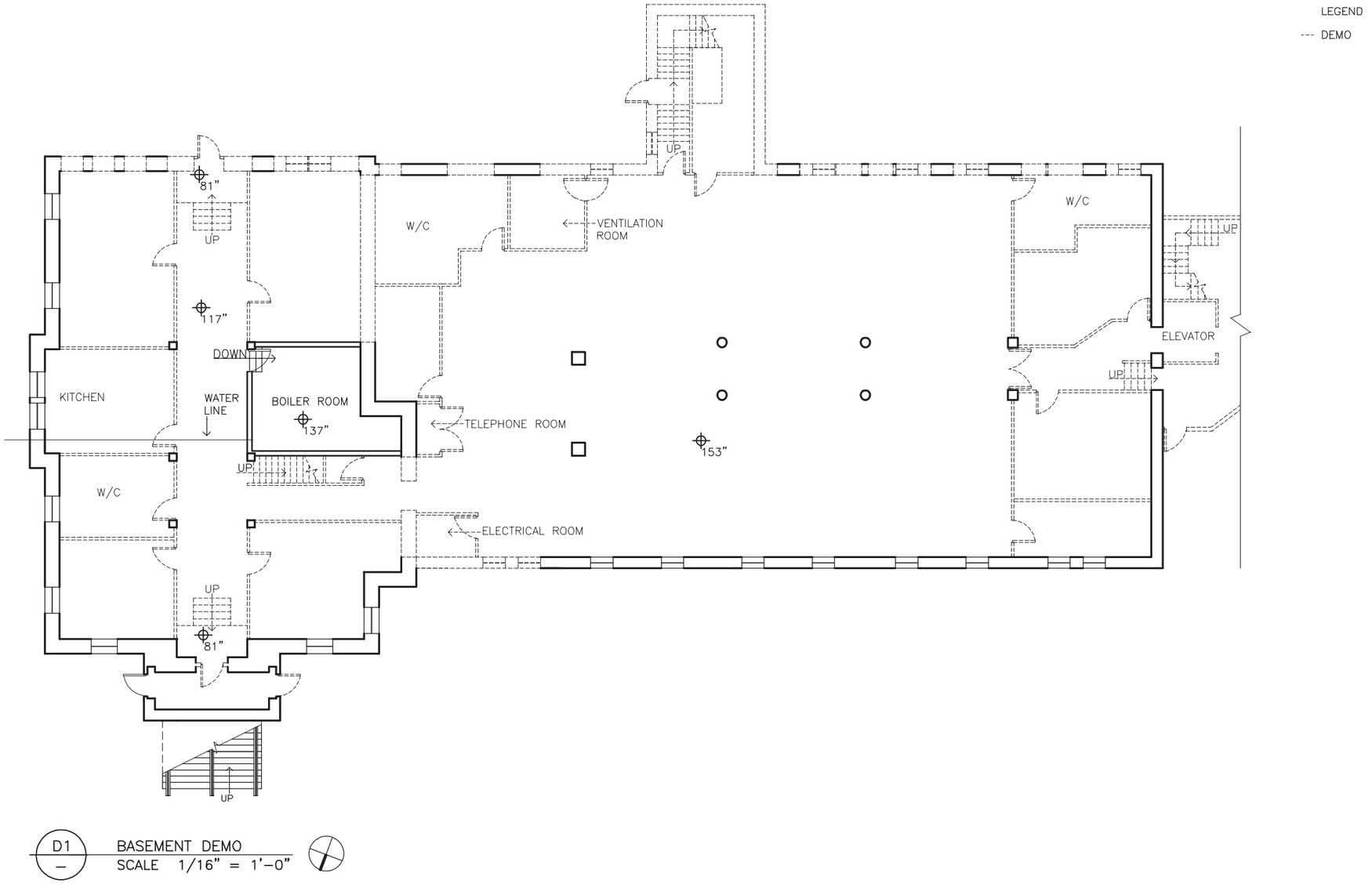


Figure 6.14. Basement demolition plan.

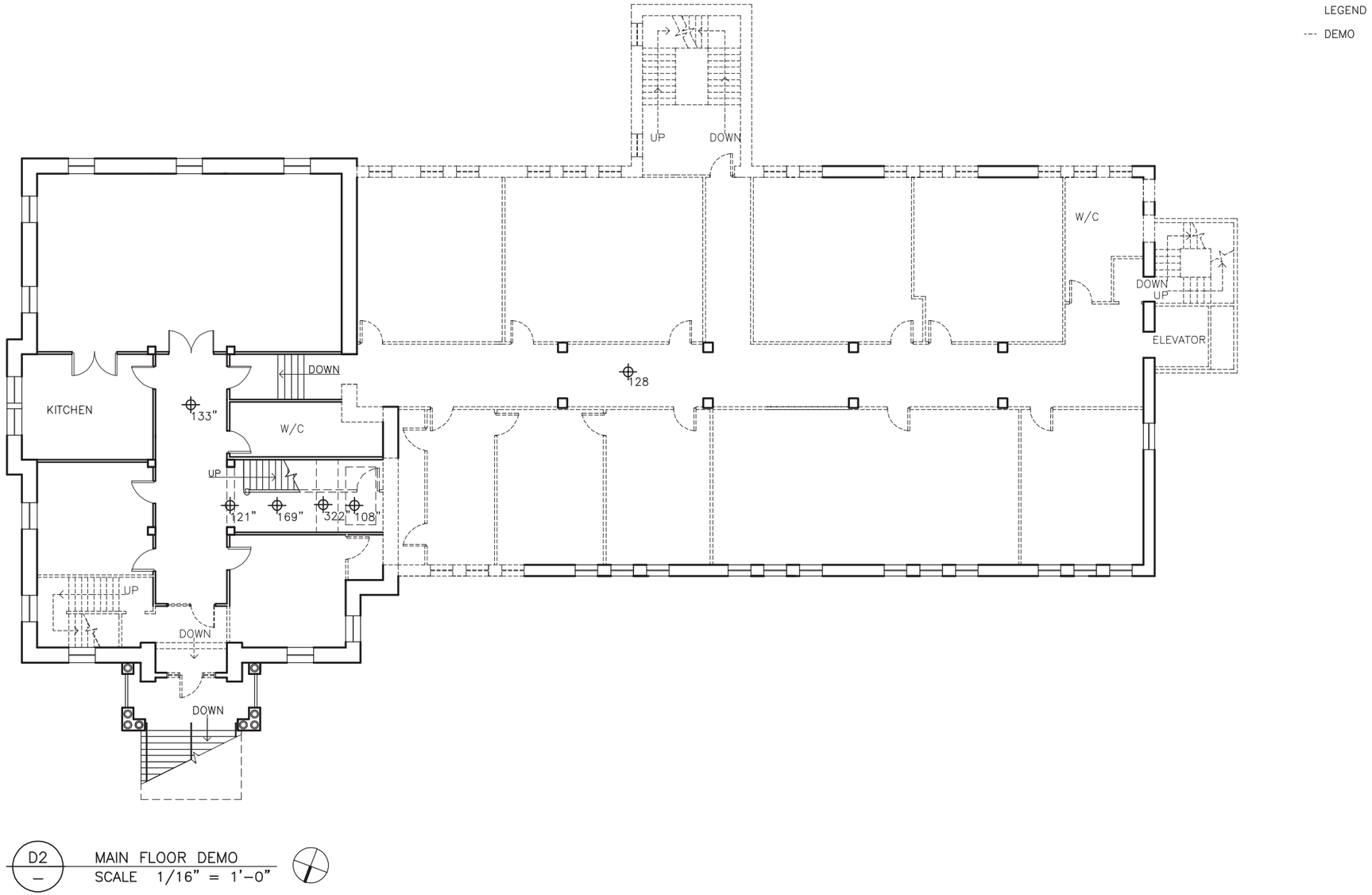


Figure 6.15. Main floor demolition plan.

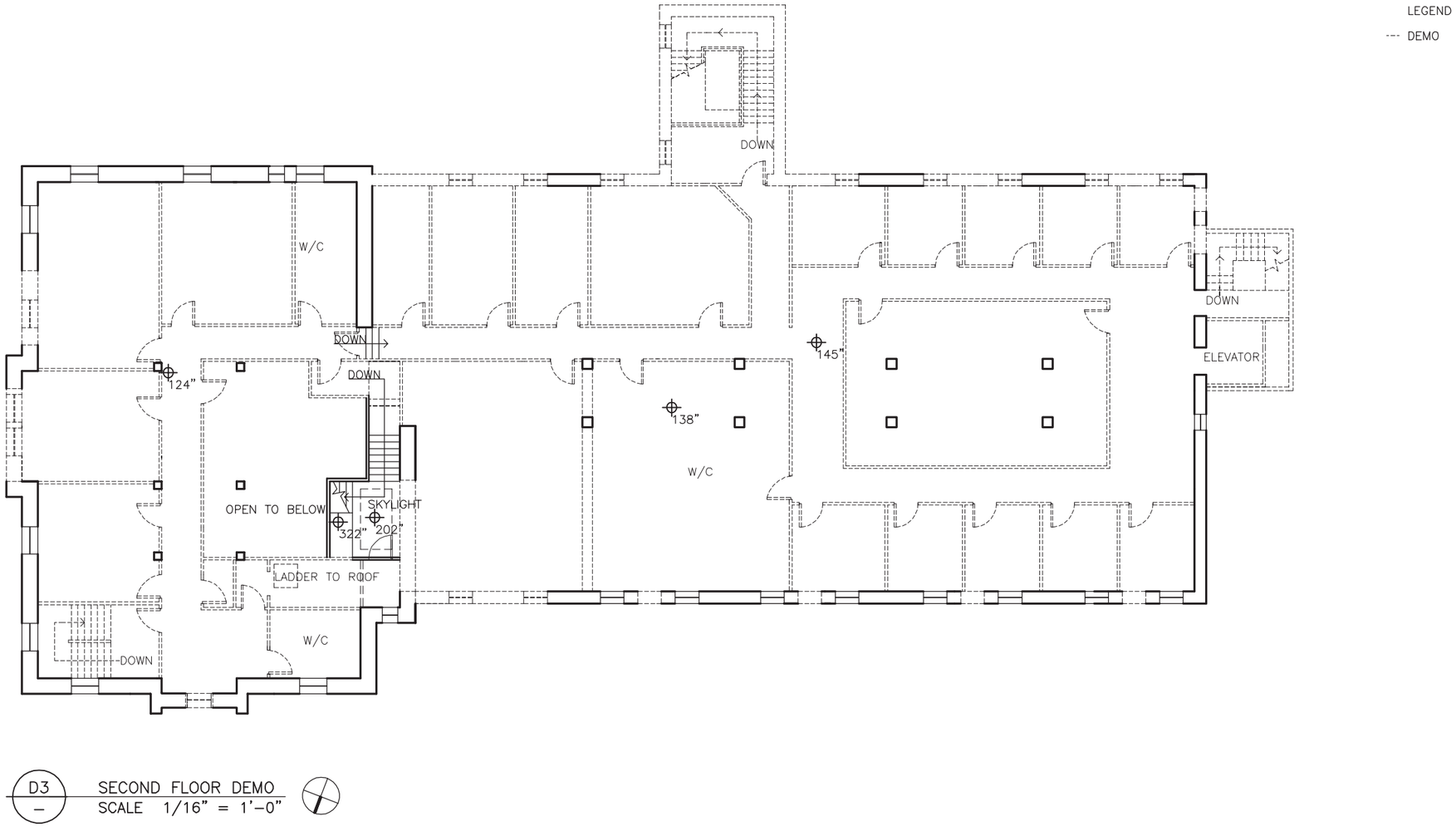


Figure 6.16. Second floor demolition plan.

6.3. Café

The discussion now turns to the design particulars of the café, whose occupancy is located on the basement southeast corner with direct access from the outside down a sloped path (see Figures 6.17 and 6.8). Since the café is the most public area of the design, its location overlaps the building's trunk area, the primary access into the building from the north and south. This intersection makes the café a focal point, connecting it to the other occupancies and to the exterior through its high level of visibility and prominence. Most importantly, the location supports the function of the café as a community oriented space, bringing the local community into the building and integrating them with the building's residents. Once exposed to the exterior and interior elements of the café design, users interact with the full food cycle – seasonal food grown outside, herbs grown in the greenhouse, food processing in the open kitchen, and eating in the customer areas. These areas are further supported with a compost collection node and an exterior composting area.

To enable the connection process between the interior and exterior in the café area, details have been added in line with lessons learned from Thorncrown Chapel, which is discussed in subsection 4.1.2, and Wright's and Aalto's architecture discussed in subsection 3.1.3. These designs point to the importance of gradual transitions, human scale expressions tied to place and culture, supporting details from macro to micro, and the creation of detailed thresholds. Accordingly, to create an environment that engages with users on a variety of sensory levels, compression and expansion of space, along with lighting, floor texture, and material changes, have been utilized to emphasize movement and connections between areas.

The front space of the café is divided spatially into four areas that overlap each other: the greenhouse, kitchen, trunk, and customer eating area (see Figure 6.17). The design of the flooring, ceiling, and lighting define this trunk area as separate from both the kitchen and

customer areas, thus helping to extend the space to the outside to create a gradual transition and spatial extension (see Figures 6.18 – 6.19). To support the spatial extension between the interior and exterior, the tiled floor in the trunk area extends to the sloped path and is accented by ground luminaries (see Figure 6.18). Further, a strip of thermo-reactive tile runs through the center of the trunk area, changing color with the amount of sun penetrating through the window and bringing attention to subtle weather changes (see Figure 6.19). The greenhouse complements the extension of the trunk area as it extends from the interior reaching out into the garden area, creating juxtaposition between vernacular direct and indirect seasonal nature and climate controlled indirect nature, while at the same time bringing to the fore varying levels and types of human interaction with nature.

In relating the café back to the concept of the tree presented in Figure 6.1, this space is designed to embody the sensation of being in the earth and, ultimately, draws from decomposition and new growth processes. To this end, many chosen materials are either aged-looking or comprised of recycled materials, such as the counters made of recycled glass and the lights from recycled plastic bottles, thus bringing to the forefront the idea of the cyclical relationship between humans and nature. (see Figure 6.20). Decomposition and regeneration is pushed further through the addition of a wall treatment made of metal with a rusted, aged patina. The in-the-earth language is continued in the space through tables that resemble tree roots and the lattice-like ceiling grid, which allows partial visual access to the above mechanical system and concrete ceiling, like peeking up through cracks in the earth from below. The overall palate in the café relates to the ecological vernacular and cultural chromatic and material characteristics of the site presented in subsection 3.3. To create this effect, the original Tindal stone material on the outer wall of the building is emphasized and paired with neutral colors

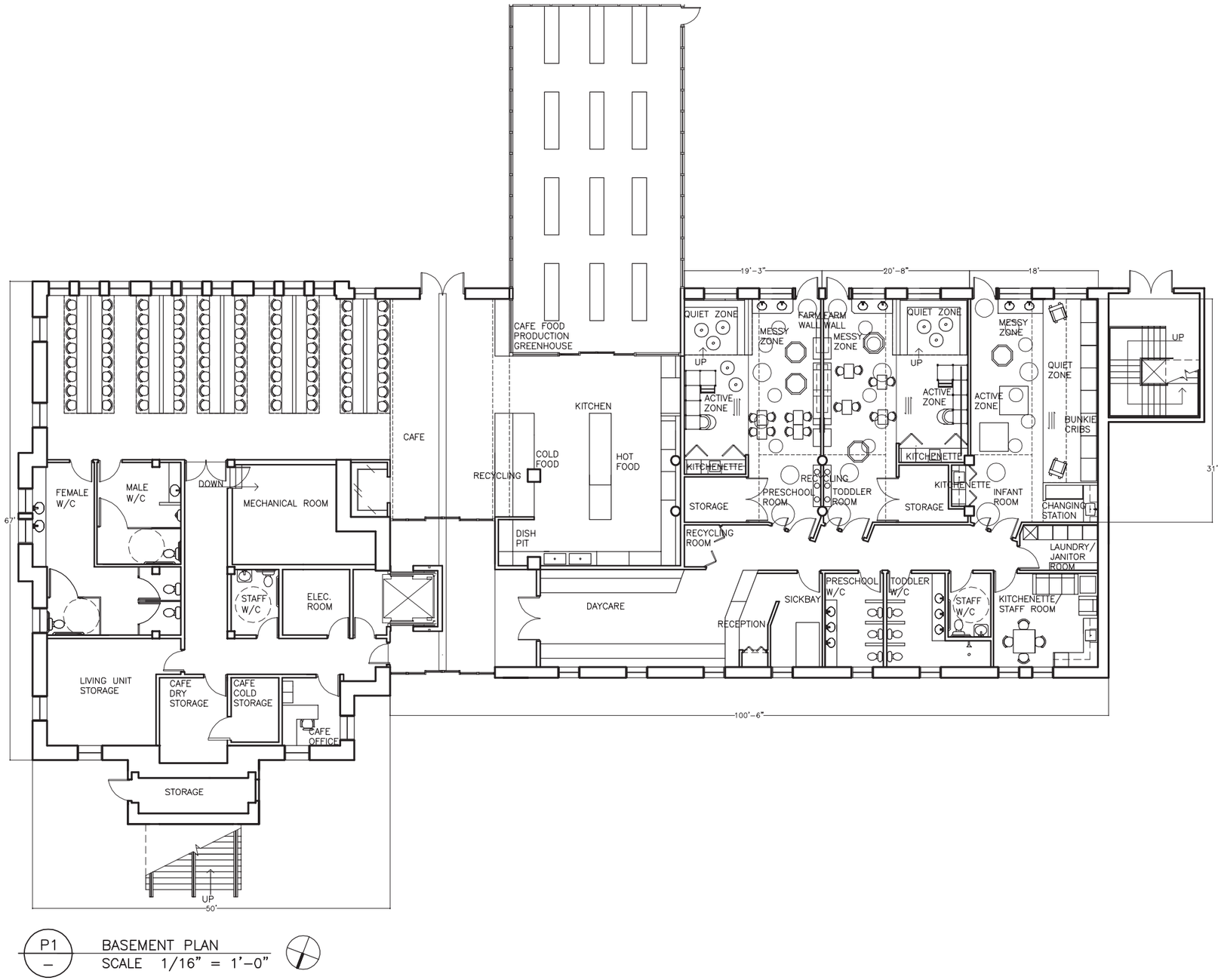
with punctuations of brighter shades, representing the relationship between the community architecture and the chromatic characteristics of the ecological vernacular.

Upon entering the café, the user is immediately presented with a prominent recycling and compost node, highlighting human-nature relations in regards to use and consumption and decomposition cycles (see Figure 6.21). Further, the addition of the greenhouse allows indirect nature contact year round. Sensory shifts in ceiling and floor planes, lighting, and materials mark the movement into the open kitchen area from the trunk (see Figures 6.22 and 6.23). Spatially, the kitchen blends into the greenhouse area and through its open design, allows sensory awareness of the growing and processing of food.

In the customer area, movement into the space is again defined by changes in floor texture, lighting, color, and ceiling changes (see Figures 6.22 and 6.23). Further, each table is spatially defined by a lowered bulkhead and a change in floor texture and pattern (see Figure 6.24). The fixtures in this area are made of recycled bottles and emit a warm glow, creating an intimate environment that opens up and extends through the operable window at the head of each table.

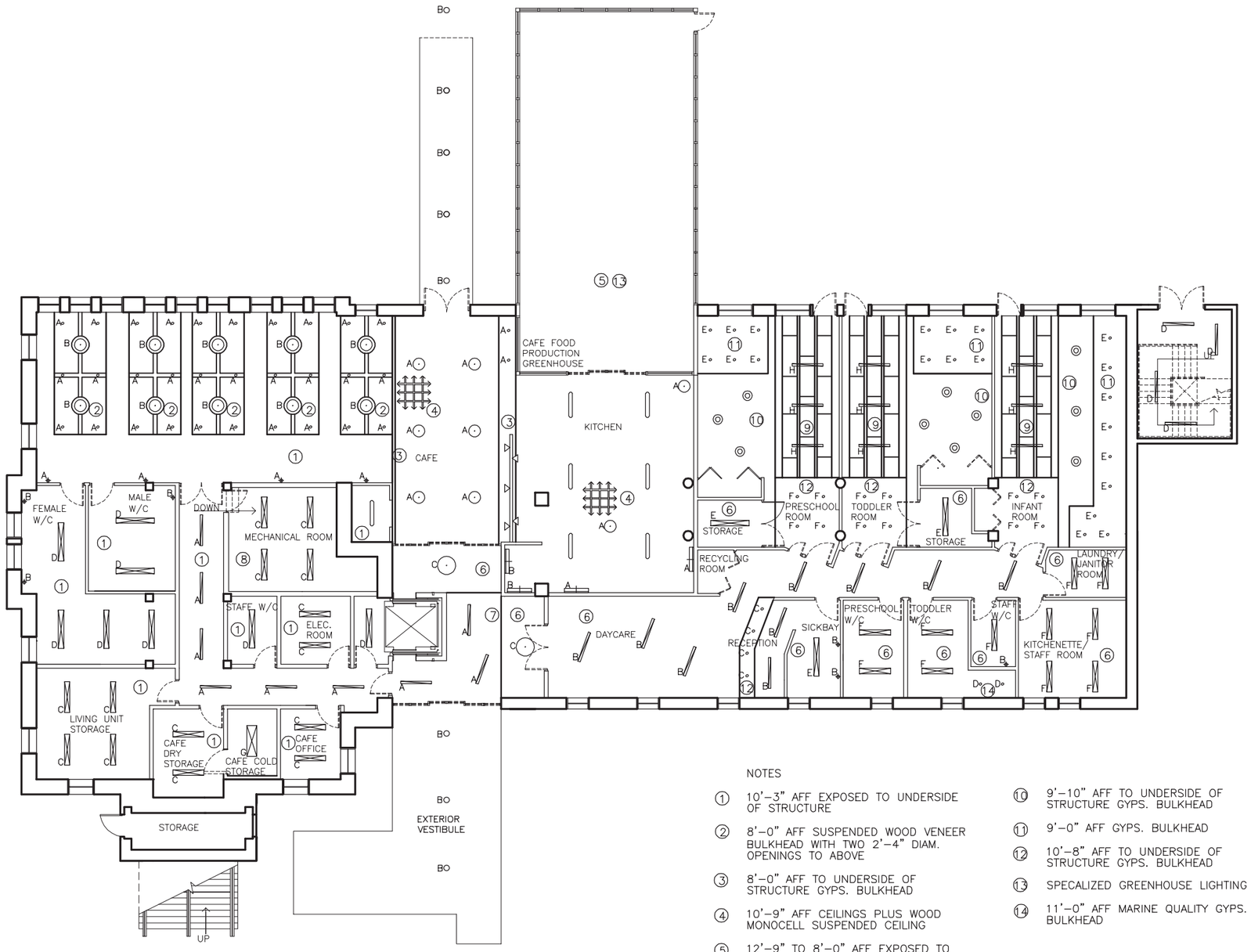
The tables in this area are designed to facilitate community and interaction with others as they are constructed to seat 16, encouraging conversation with fellow dining groups (see Figures 6.26 – 6.28). Furthermore, the form of these tables connects to long, linear bay widths, created by the structure of the building and the history of the building as a formal school. They also create a direct dialogue with the linear food planters directly outside of the café operable windows, creating an extension from the center planting channel in the table (see Figure 6.25). This planting channel is of particular importance, as it puts patrons into direct contact with the sensual qualities of indirect nature, which they can smell, touch, cut, and utilize in their meals. The glazing between the patron tables and the exterior linear food beds has been detailed with

mullions, reminiscent of those originally found in the building but shaped in a manner that further emphasizes the linear relationship flowing between the two spaces. These mullions bring attention to subtle weather changes and emphasize changing patterns of natural light.



P1 — BASEMENT PLAN
SCALE 1/16" = 1'-0"

Figure 6.17. Plan for basement design.



R1 / – BASEMENT REFLECTED CEILING PLAN
SCALE 1/16" = 1'–0"

NOTES

① 10'–3" AFF EXPOSED TO UNDERSIDE OF STRUCTURE

② 8'–0" AFF SUSPENDED WOOD VENEER BULKHEAD WITH TWO 2'–4" DIAM. OPENINGS TO ABOVE

③ 8'–0" AFF TO UNDERSIDE OF STRUCTURE GYPS. BULKHEAD

④ 10'–9" AFF CEILINGS PLUS WOOD MONOCELL SUSPENDED CEILING

⑤ 12'–9" TO 8'–0" AFF EXPOSED TO UNDERSIDE OF STRUCTURE

⑥ 13'–3" AFF EXPOSED TO UNDERSIDE OF STRUCTURE

⑦ 10'–3" AFF EXPOSED TO UNDERSIDE OF STRUCTURE

⑧ 11'–5" AFF EXPOSED TO UNDERSIDE OF STRUCTURE

⑨ 10'–10" AFF CEILINGS PLUS RADIANS ALUMINUM CURVING CEILING PANEL SYSTEM

⑩ 9'–10" AFF TO UNDERSIDE OF STRUCTURE GYPS. BULKHEAD

⑪ 9'–0" AFF GYPS. BULKHEAD

⑫ 10'–8" AFF TO UNDERSIDE OF STRUCTURE GYPS. BULKHEAD

⑬ SPECALIZED GREENHOUSE LIGHTING

⑭ 11'–0" AFF MARINE QUALITY GYPS. BULKHEAD

LIGHTING LEGEND

A MAXILITE MX2372 WOOD VANEER PENDANT FLUORESCENT (20" DIAM. X 5") 8'–6" AFF

B JOHANNA KEIMEYER LA ROUGE PETILLANTE PENDANT (25" X 20" X 20") 5'–8" AFF

C JOHANNA KEIMEYER TRASHURE I PENDANT (28" X 31" X 22") 8'–6" AFF

MAXILITE MXE2375 WOOD VANEER SUSPENDED FLUORESCENT TROFFER (43" X 6") 8'–6" AFF

A 4" ADJUSTABLE RECESSED DOWN LIGHT HALOGEN 8'–0" AFF

B CIVIC ZEUS RECESSED METAL HALIDE FLOOR LUMINAIRE (10" DIAM.) 0'–0" AFF

C 4" ADJUSTABLE RECESSED DOWN LIGHT HALOGEN 8'–10" AFF

D 4" RECESSED SHOWER DOWN LIGHT HALOGEN 11'–0" AFF

E CONTRAST LIGHTING A2010V 4" FLUORESCENT COBALT BLUE STEPPED GLASS DOWNLIGHT 9'–0" AFF

F CONTRAST LIGHTING A2010V 4" FLUORESCENT COBALT BLUE STEPPED GLASS DOWNLIGHT 8'–10" AFF

SURFACE MOUNTED TRACK LIGHT HALOGEN 8'–0" AFF

AL MAXILITE WALL MOUNTED MXE6221 FLUORESCENT DOWNLIGHT (39" X 5" X 7") 5'–0" AFF

BL MAXILITE WALL MOUNTED MXE6221 FLUORESCENT DOWNLIGHT (39" X 5" X 7") 7'–0" AFF

A MAXILITE 6050–37H UP AND DOWN LIGHTING WALL SCONCE (6" X 4.5" X 4") 5'–0" AFF

B MAXILITE MX 6595–40 FLUORESCENT WALL SCONCE (4.5" X 16" X 3") 4'–6" AFF

CIVIC CIAO SUSPENDED T5 UP AND DOWN LIGHTING FLUORESCENT TROFFER (50" X 4") 9'–0" AFF

CIVIC CIAO SUSPENDED T5 UP AND DOWN LIGHTING FLUORESCENT TROFFER (50" X 4") 11'–0" AFF

CIVIC AVIO SUSPENDED T5 DOWN LIGHTING FLUORESCENT TROFFER (8.6" X 50") 8'–3" AFF

DL CIVIC AVIO SUSPENDED T5 DOWN LIGHTING FLUORESCENT TROFFER (8.6" X 62") 8'–3" AFF

EL CIVIC AVIO SUSPENDED T5 DOWN LIGHTING FLUORESCENT TROFFER (8.6" X 62") 11'–0" AFF

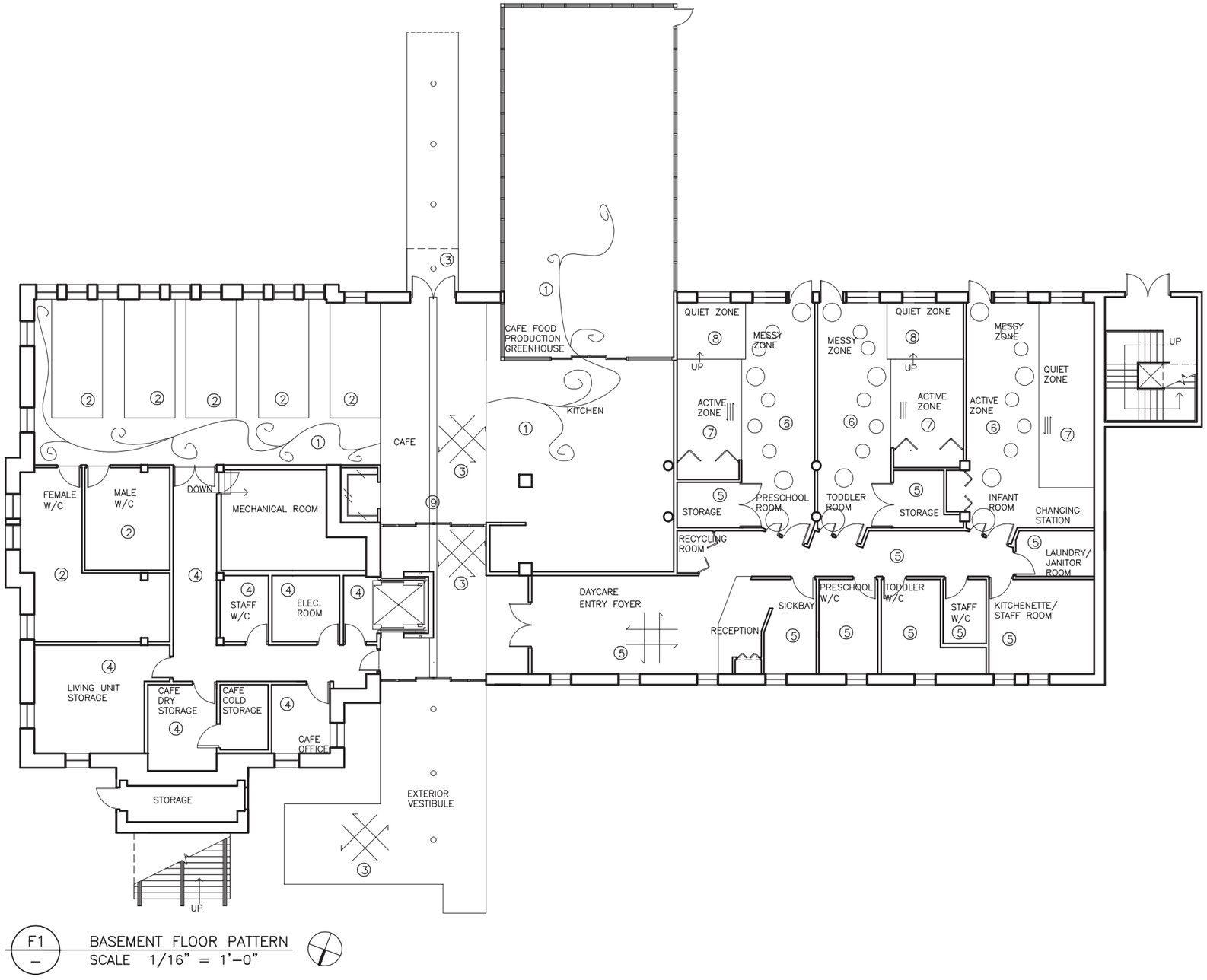
FL CIVIC AVIO SUSPENDED T5 DOWN LIGHTING FLUORESCENT TROFFER (8.6" X 50") 11'–0" AFF

GL AEI COLDSTORAGE COLDMAX T5 FLUORESCENT TROFFER (50" X 16")

HL CIVIC CIAO SUSPENDED T5 UP AND DOWN LIGHTING FLUORESCENT TROFFER (50" X 4") 10'–6" AFF

BESA SLIPSTREAM FLUSHMOUNT COSMIC SHADE WITH BRUSHED ALUMINUM (16.5 DIAM. X 6) 9'–4" AFF

Figure 6.18. Reflected ceiling plan for basement design.

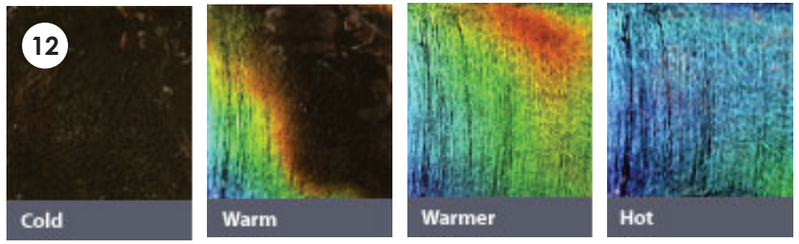


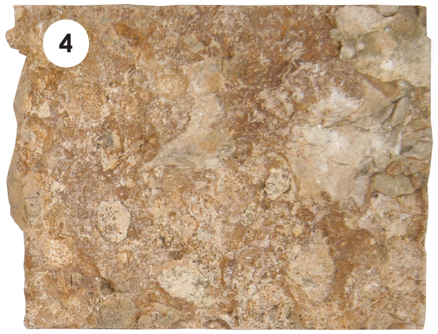
F1 — BASEMENT FLOOR PATTERN
SCALE 1/16" = 1'-0"

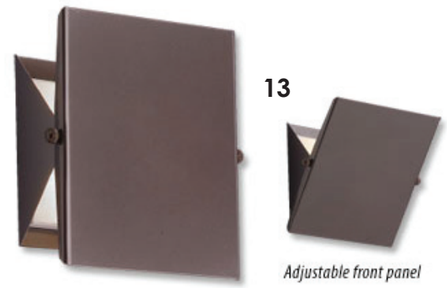
NOTES

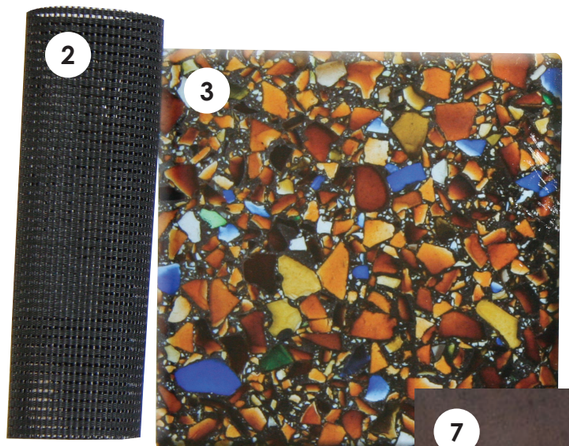
1. ACID STAINED AND ETCHED POLISHED CONCRETE
2. ACID STAINED POLISHED CONCRETE
3. JULIAN TILE PLATE SERIES PRU24 RUSTY 24" X 24"
4. POLISHED CONCRETE
5. NURAZZO TERRAZZO TILE CRYSTAL COLLECTION C503 MADE IN AMERICA 24" X 24"
6. NURAZZO TERRAZZO TILE C503 CRYSTAL COLLECTION MADE IN AMERICA 24" X 24" WITH INSET CIRCLE JOCKIMO LIVING SURFACES LIQUID LAVA TILES IN TWO COLOR SKY BLUE/BLUE AND RED/BLUE 23.6," 31.49," AND 39.37 DIAM.
7. PRAIRIE BARNWOOD RECLAIMED BARNWOOD FLOORING
8. FLOR MODULAR CARPET TILES NATURAL FIBRES LAMB CORD AND LOVE EWE IN GOTLAND GREY 19.7" X 19.7"
9. MOVING COLOR LIQUID BLACK TILE IN BLACK 4" X 4" (HEAT SENSITIVE COLOR CHANGING)

Figure 6.19. Floor pattern for basement design.









1. Maxilite MX 2372 – Walnut wood veneer pendant fixture 2. Jackson, Sheerweave, in Chocolate – Window light filter 3. Vetrazzo, in Charisma Blue with Patina – Made from recycled bottles 4. Sample representative of existing Tindal stone walls 5. Chemetal, in Aged Steel 6. Chemetal, in Granite Chief 7. Julian, Plate Series, in Rusty (23.75" x 23.75") – Ecological product 8. Maxilite MXE2375 – Walnut wood veneer pendant fixture 9. Johanna Keimeyer, Trashure I – Recycled plastic bottle pendant light 10. Johanna Keimeyer, La Rouge Pétillante (2006) – Recycled plastic bottle pendant light. 11. Example of acid stained concrete floor 12. Moving Color, Liquid, in Black (4" x 4") – Thermo-reactive tile 13. Maxilite, MX 6050-37H – Wall sconce 14. Richelieu, Roma chair, in Walnut 15. Color scheme based on vernacular chromatic character

Figure 6.20. Material board for café design.

Figure 6.21. Café entry with customer area on left and open kitchen on right.

Figure. 6.22. Café open kitchen looking toward customer area.

Figure. 6.23. Café customer area looking towards open kitchen.

Figure 6.24. Café community oriented customer table with integral herb trough.

Figure 6.25. Café food planters that continue the linear language from the customer tables to the exterior.

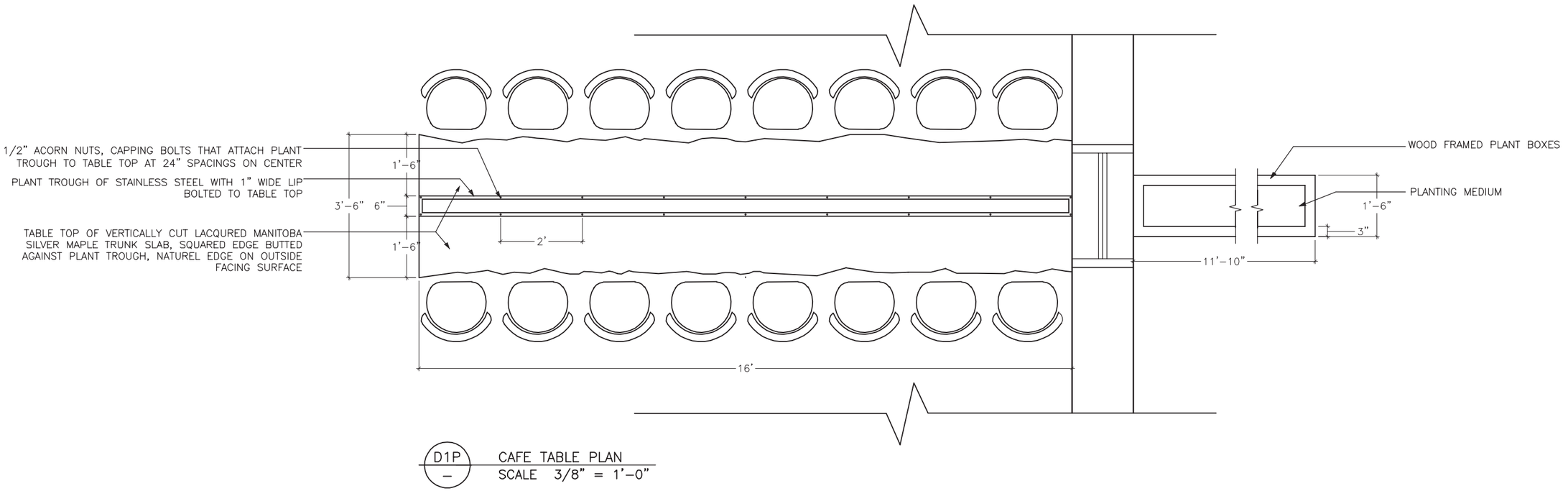


Figure 6.26. Plan detail of café table.

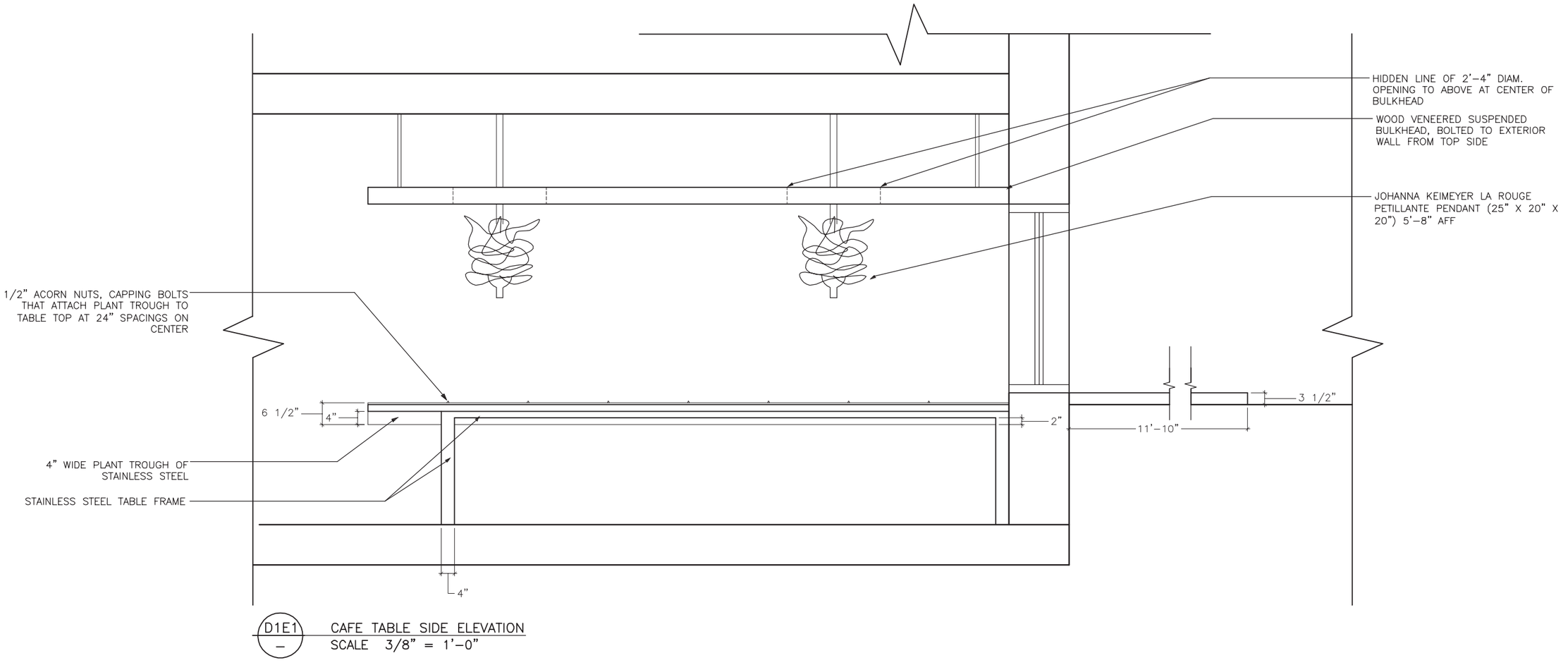


Figure 6.27. Side elevation detail of café table.

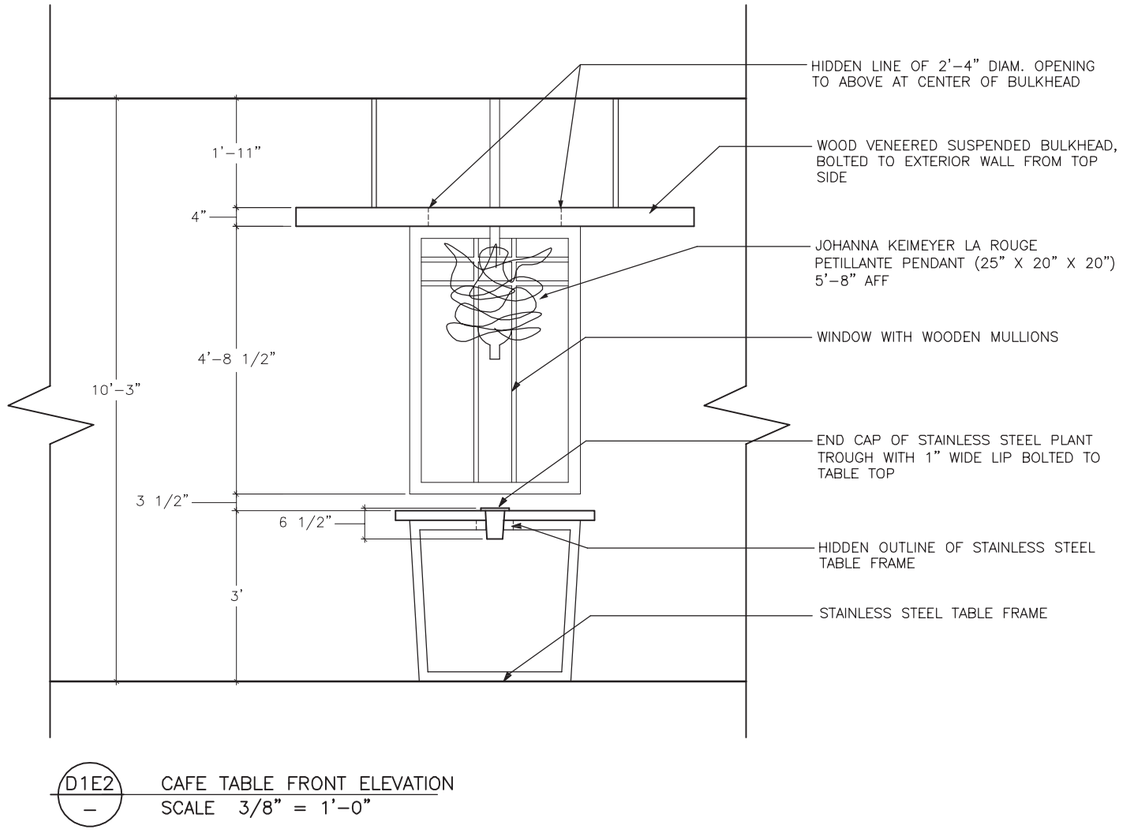


Figure 6.28. Front elevation detail of café table.

6.4. Daycare

The daycare is located in the west section of the basement next to the café and is accessible directly from the north entrance of the building trunk, which opens into the reception area (see Figures 6.10 and 6.17). Private secondary accessibility points are also available from the south-west side of the building directly to grade, which has been excavated by three feet in this area. Since the daycare is a semi-public area of the design, its location off the trunk allows for ease of access from the outside and a visual prominence to bring awareness of the service to the broader community, particularly those utilizing the café.

Spatially, the daycare is divided into four sections: the reception area and support areas on the north side of the building; the three childcare rooms (infant, toddler, and preschool) on the south side of the building; and the exterior covered porch and sensory play garden on the south side of the building (see Figures 6.10 and 6.17). Each care room is spatially arranged around a centralized axis that physically and visually connects the interior and exterior, creating between space at the point of the south wall. This axis creates the division point of each care room into wet and dry areas, with the wet area having direct access into the exterior covered porch and the exterior sensory play garden (see Figures 6.8 and 6.17). The terrazzo flooring in the wet area extends to the outside to emphasize the connection between interior and exterior.

Each care room's linear axis is highlighted by a change in ceiling height and floor material (see Figures 6.18 and 6.19). The liveliest spaces, the wet messy areas, have higher dynamic ceilings, a large digital wall covering of animals on the farm wall, and lots of floor detail underfoot in the form of floor tiles with colors that move under pressure and terrazzo tiles with playful glistening colors that sparkle in the light. Sensory play with water, sand, dirt, clay, and paint take place in this area (see Figure 6.29 and 6.30). In comparison, the dry, active area has a slightly lower ceiling plane and includes a tree-house-like play area to develop exploration

and motor skills and to create prospect and refuge. The quiet area, in comparison, has the lowest ceiling and a raised floor to create more of a feeling of refuge (see Figure 6.31). The floor in this space is covered with wool carpet tiles that offer different sensations of texture. Cozy nooks are formed in this space with cushioned seating areas and upholstered chairs that resemble small nests. From this quiet space, prospect views to the exterior and to the greenhouse are created so that children can engage with nature from a contemplative distance (see Figure 6.32). The toddler room also has dome windows that look into the café greenhouse (see Figure 6.31).

On the exterior, the sensory garden includes a feeder area for birds and small animals, a butterfly garden, an experiential water feature that gathers rainwater, a food growing garden, and visual access into the café greenhouse. The landscape also has been designed as the play structure with berms and swales being utilized as areas to climb and explore, creating a more personal direct relationship to the earth. This undulating landscape and the various plant textures and forms provide year round interest since colors and forms shift through the seasons. Together, these incorporations into the design are important because they facilitate respect and care for animals, curiosity and exploration of nature, a sense of our relationship to nature, and knowledge of where food comes from (see Figure 6.8).

The daycare slightly deviates from the overall tree structure concept of the whole building (Figure 6.1) as it was designed with the idea of a forest in mind. This has been accomplished through incorporating interactions with small animals, fish, and insects in the farm wall, thus creating a tree-canopy-like feel with various ceiling heights and ceiling plane forms, as well as incorporating micro, human-scale sensory details at ground level to facilitate attention on various scales (see Figures 6.29 and 6.31). Moreover, a recycling and compost collection node has been designed into the primary path of travel, bringing to the forefront relational cycles of use and reuse between humans and nature.

Material choices support the tree concept with products being utilized that express the unique grain and textural qualities of natural wood (see Figure 6.33). In addition, materials were chosen based on recycled content, reuse, and integrity of the material, meaning materials are what they appear to be. Equally as important, the color scheme and material choices for the daycare are also linked to the cultural vernacular. To this end, the original Tindal stone walls are emphasized and paired with neutral colors and punctuations of brighter colors. Flooring treatments are closely linked to the vernacular since reclaimed prairie barn wood flooring is utilized as well as terrazzo floor tiles, a type of flooring originally utilized in portions of the building.

Figure 6.29. Daycare wet area looking toward the patio and garden access.

Figure 6.30. Daycare wet area looking toward the entrance.

Figure 6.31. Daycare quiet area with views to the exterior and to the café greenhouse.

Figure 6.32. Daycare exterior covered porch with café greenhouse enclosing the area to the right.

1. Cedarworks, Rhapsody 5 – Natural wood indoor play structure. Available from www.cedarworks.com 2. Besa Lighting, 9038CS-AL Slipstream – Ceiling flush mount 3. Maharam, Mohair Supreme 451801, in Cayenne – Reduced environmental impact 4. Maharam, Mohair Supreme 451801, in Cerulean – Reduced environmental impact 5. Maharam, Dingbats 465994, in Taupe – Reduced environmental impact 6. Octopus Products ltd., Kirei Board, 10mm – Made of approximately 90% post-industrial recycled content and rapidly renewable materials 7. 3form, Varia, in 1/2" Birch Grove 46" Fade with sandstone finish – Made with Ecoresin 8. Jackson, Sheerweave, in Chocolate – Window light filter 9. Sample representative of existing brick walls 10. Civic, Ciao – Suspended fluorescent 11. Prairie Barnwood – Recycled barn wood flooring 12. Flor, Love Ewe, in Gotland Grey – Modular carpet tile made of natural fibers 13. Flor, Lamb Cord, in Gotland Grey – Modular carpet tile made of natural fibers 14. Contrast Lighting, T2010V, in Cobalt Blue Stepped Glass – Low profile downlight with glass tube 15. Jockimo Living Surfaces, Liquid Lava tile, in Blue/Light Blue 16. Jockimo Living Surfaces, Liquid Lava tile, in Blue/Red 17. Vetrazzo, in Cobalt Skyy – Terrazzo counter made from recycled bottles 18. Nurazzo, Crystal Collection, in C503 Made in America – Terrazzo tile made from 70% post-consumer recycled material 19. Maharam, Cuckoo by Harmen Liemburg (10' x 15') – Washable wall textile made of 48% Cellulose, 35% Latex, and 17% Nylon 20. Color scheme based on vernacular chromatic character

Figure 6.33. Material board for daycare design.

6.5. Living Units and Communal Spaces

The main floor of the building contains communal spaces as well as living units and has a similar layout to the second floor, with the exception of the eastern section, which has communal spaces on the main floor and living units on the second floor (see Figures 6.34 – 6.39). Within both of these floors is a communal gardening lounge and hall. The gardening lounge is located within the building's trunk and contains a communal workspace (see Figure 6.40). The hall runs directly perpendicular to the lounge along the south wall and acts as a circulation point and an extension of each living unit (see Figure 6.41). Personal greenhouses are located off the south side of the common hall, directly opposite each living unit (see Figures 6.34, 6.37, and 6.42).

The hall and gardening lounge work in tandem since the lounge functions as a place for the residents to tend to the plants they keep in their greenhouses. Further, the lounge also contains a recycling and compost collection area (see Figures 6.40, 6.43, and 6.44). Again, as in the other areas of the building, this feature has been brought into the main circulation area to bring attention to, and to engage people with, human-nature relation cycles. The prominence of the personal greenhouses and gardening lounge workspaces has a similar effect, highlighting the integral give-and-take processes essential for the longevity of people and nature.

The location and layout of the living units, hall, and gardening lounge within the western portion of these floors is directly related to the building's sun exposure, with the more active areas and growing spaces located to the south and private refuge areas being located to the north. Further, this arrangement allows for prospect views from the communal areas toward the south gardens, connecting the area to direct and indirect nature experiences.

Moreover, the layout of the main and second floors relates to the linear language present throughout the design. Similar to the basement level, the trunk of the main and second floors

has its linear access highlighted by thermo-reactive tiles running through the center (see Figures 6.36, 6.39, and 6.40). At each end of the trunk are large mullioned windows, which act to change the color of the tiles as the sun heats up the space throughout the day and to create dynamic light and shadow patterns. Further, these windows each have a large tree-like silhouette at their center symbolically relating to the trees in the south garden. This lining up of the trees with the window mullions is important as it creates a situation where direct nature is seen through its symbol, enabling a vivid comparison and a more dynamic relation, similar to that seen in the Radial View exhibit in the precedent analysis in section 4.

In the hall, the spatial arrangement has particular significance to cultural vernacular forms. Particularly, the space has been influenced by the massing and void pattern of the residential buildings around Saint-Boniface, as well as their front façade characteristics, including their strong rectilinear forms, feeling of penetrability with symbols of invitation, and transitional spaces such as exterior porches, as discussed in subsection 3.3. Incorporating these characteristics into the design, interior veranda spaces have been created that are accentuated by textural and visual changes to the ceiling, lighting, and flooring (see Figures 6.34 – 6.39, and 6.41).

The design of the living units continue with the above mentioned symbols as each unit opens up into this veranda space through the operation of a folding wall system. This area, then, opens into the private greenhouse space for each unit by moving another folding wall. These folding walls are glazed systems allowing a sight line through the spaces if desired, even when they are closed, if curtains do not cover them. The form of the personal greenhouses, which extend from the face of the south façade, were also influenced by local character being influenced by the awnings of many residential buildings and some of the large scale building in Saint-Boniface, further relating the design to the cultural vernacular.

In referring back to the tree concept in Figure 6.1, the occupancies of the main and second floors are conceived as the tree canopy with refuge, prospect, and regeneration being enabled here. Consequently, each living unit is designed on a privacy gradient with the refuge spaces (bedrooms and washroom) located at the north wall and the more public areas (living room and open kitchen) toward the south where there are multiple prospect views. This layout creates refuge while a promise of prospect is available as soon as one enters the central axis of the space and looks toward the personal greenhouse. In order to magnify the prospect-refuge effect, a slight pinch and release of space is created at the point of the living room with its lowered bulkhead and differentiated floor patterning. The full level of prospect is then created as the hall and greenhouse areas are entered. This pinch and release also occurs at the working counter for the garden lounge, creating a greater level of dynamic relation between prospect and refuge in this area. Further, again referencing the tree concept, regeneration relates to the personal greenhouses, composting spaces, and gardening lounges, which act together in a cycle to foster personal (mental) and physical (plant) growth. Regeneration is also a part of the communal aspects of the residential floors as these spaces support the development of a strong community.

Spatially, the living units, in a fashion similar to the other occupancies in the facility, are designed around an axis at the center of each existing column bay in the building (see Figures 6.34 and 6.37). This axis point extends through the center of each living unit and through the common hall and personal greenhouse space to the exterior. On the north side of this axis is a small window that is operable and patterned with mullions, offering connection to the outside and light patterning on the interior (see Figure 6.45). On the south side of the axis are the large operable windows of the personal greenhouse (see Figure 6.46). Most importantly, a long, linear suspended bulkhead that extends through the center of the living unit to the

exterior highlights the connected flow through these spaces (see Figures 6.34 and 6.37). At its point of termination outside the personal greenhouses, a lighted experiential rain chain hangs from the bulkhead collecting precipitation to create a dramatic sensual effect from weather patterns (see Figure 6.32).

Symbolic and indirect connections to nature are further developed and enhanced in the living units with the inclusion of a vermacomposting area built into the kitchen counter in each living unit (see Figures 6.47 – 6.49), a greywater recycling kitchen sink and toilet, and a Biotower, an enclosed ecosystem where plants, algae, and fish are grown for consumption (see Figure 6.45). These components of the living units also connect the space to the regeneration that is important to the tree concept, as previously discussed.

When considering the color and material design for the main and second floors, the ecological vernacular and cultural chromatic and material characteristics, explored in subsection 3.3, again informed the selection process. Through this influence, the original brick walls have been emphasized and paired with neutral colors, with punctuations of brighter colors found in the vernacular vegetation in the area. Moreover, flooring treatments are closely linked to the vernacular since reclaimed prairie barn wood flooring is utilized in the living units. In addition, terrazzo floor tiles are utilized throughout the main common areas as this relates to the original flooring found in the 1902 section of the building. The tiles are also appropriate as they are largely comprised of recycled marble (see Figure 6.50).

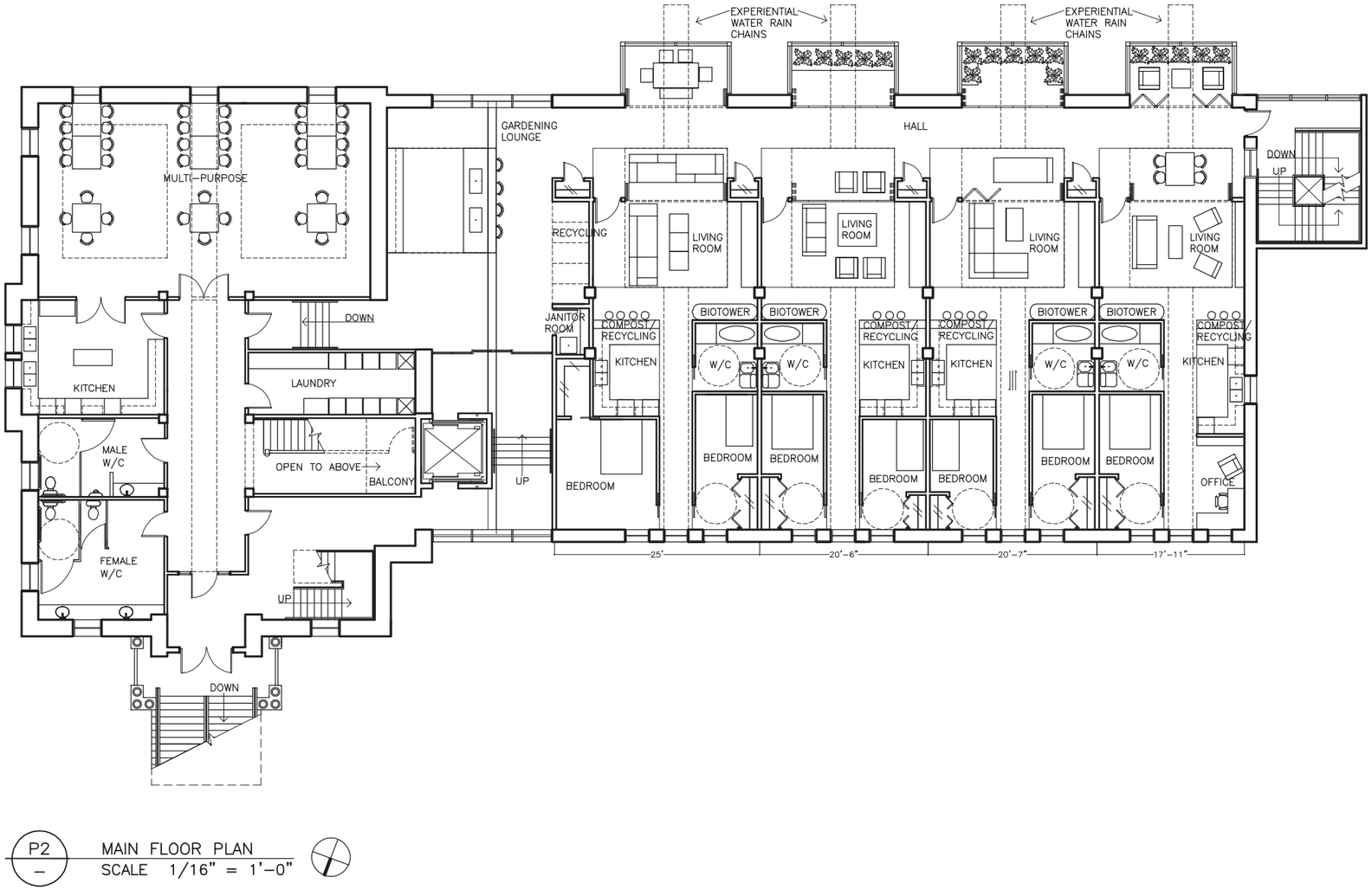
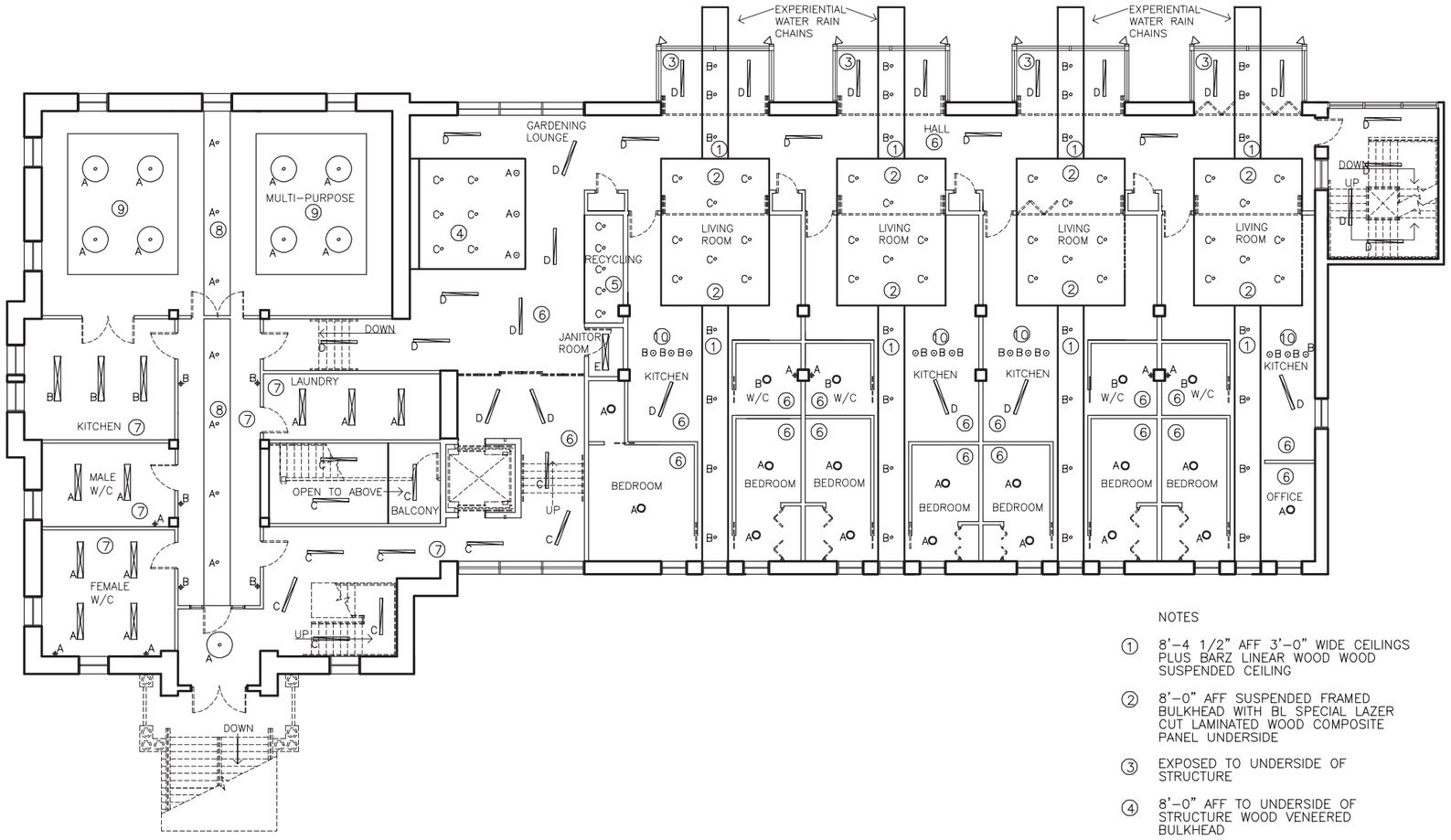


Figure 6.34. Plan for main floor design.



R2 / – MAIN FLOOR REFLECTED CEILING PLAN
SCALE 1/16" = 1'–0"

LIGHTING LEGEND

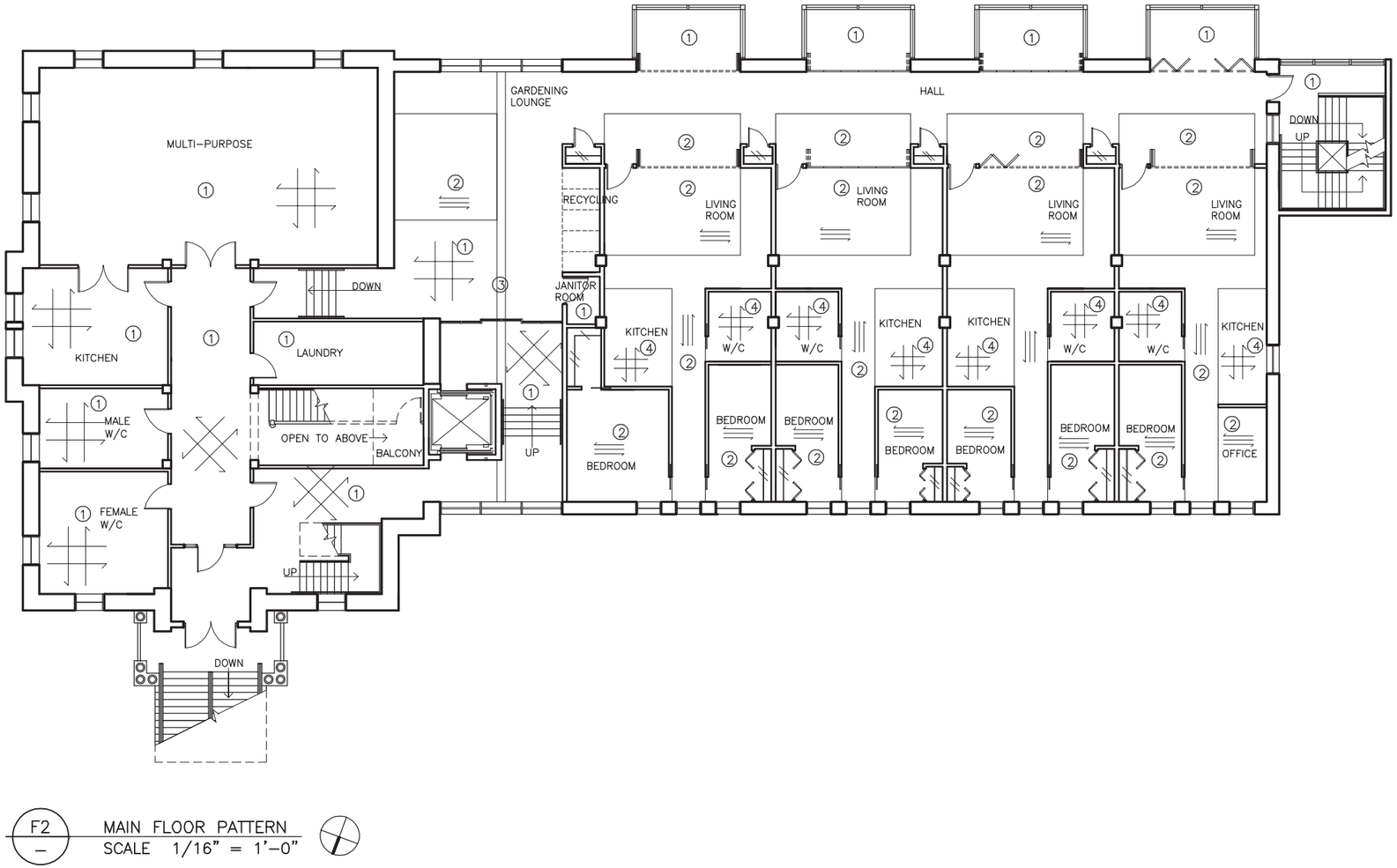
- A — CIVIC AVIO SUSPENDED T5 DOWN LIGHTING FLUORESCENT TROFFER (8.6" X 50") 13'–0" AFF
- B — CIVIC AVIO SUSPENDED T5 DOWN LIGHTING FLUORESCENT TROFFER (8.6" X 62") 13'–0" AFF
- C — CIVIC CIAO SUSPENDED T5 UP AND DOWN LIGHTING FLUORESCENT TROFFER (50" X 4") 13'–0" AFF
- D — CIVIC CIAO SUSPENDED T5 UP AND DOWN LIGHTING FLUORESCENT TROFFER (50" X 4") 8'–10" AFF
- E — CIVIC AVIO SUSPENDED T5 DOWN LIGHTING FLUORESCENT TROFFER (8.6" X 50") 9'–0" AFF
- A⊕ — MAXILITE MX 6595–40 FLUORESCENT WALL SCONCE (4.5" X 16" X 3") 4'–6" AFF
- B⊕ — MAXILITE MX 6334–37 (5.5" X 13" X 6.5") 4'–6" AFF
- AO — CONTRAST LIGHTING FLUORESCENT 4" F24SOVT LOW PROFILE DOWNLIGHT WITH 7" FROSTED GLASS TUBE 13'–0" AFF
- BO — CONTRAST LIGHTING FLUORESCENT 4" F24SOVT LOW PROFILE DOWNLIGHT WITH 3" FROSTED GLASS TUBE 9'–7" AFF
- CO — 4" ADJUSTABLE RECESSED DOWN LIGHT HALOGEN 8'–10" AFF
- DO — EUROLITE 4" TENSION RECESSED WATERPROOF DOWNLIGHT
- A — MAXILITE MX1306–37 PENDANT (32 X 31") 10'–0" AFF
- A⊙ — MAXILITE MX2532 PENDANT (5" X 16") 6'–0" AFF
- B⊙ — MAXILITE MX2532 PENDANT (5" X 16") 6'–6" AFF
- AO — MAXILITE MX3350–14 CEILING FLUSHMOUNT (9 X 3) 10"–5" AFF
- BO — MAXILITE MX3350–1 CEILING FLUSHMOUNT (9 X 3) 10"–5" AFF
- ODDYSEY ADJUSTABLE EXTERIOR SURFACEMOUNT WALL LIGHT 8'–10" AFF

NOTE: ALL LIVING UNIT AND COMMUNAL AREA KITCHEN CABINETS TO HAVE UNDER CABINET FLUORESCENT LIGHTING

NOTES

1. 8'–4 1/2" AFF 3'–0" WIDE CEILINGS PLUS BARZ LINEAR WOOD WOOD SUSPENDED CEILING
2. 8'–0" AFF SUSPENDED FRAMED BULKHEAD WITH BL SPECIAL LAZER CUT LAMINATED WOOD COMPOSITE PANEL UNDERSIDE
3. EXPOSED TO UNDERSIDE OF STRUCTURE
4. 8'–0" AFF TO UNDERSIDE OF STRUCTURE WOOD VENEERED BULKHEAD
5. 8'–0" AFF TO UNDERSIDE OF STRUCTURE GYPS. BULKHEAD
6. 10'–8" AFF EXPOSED TO UNDERSIDE OF STRUCTURE
7. 15'–5" AFF EXPOSED TO UNDERSIDE OF STRUCTURE
8. 13'–0" AFF 3'–0" WIDE CEILINGS PLUS BARZ LINEAR WOOD WOOD SUSPENDED CEILING
9. 13'–0" AFF SUSPENDED GYPS. BULKHEAD WITH PRESSED METAL CEILING TILES AFFIXED TO THE UNDERSIDE
10. LIGHTING DETAIL IN KITCHEN LOWER CABINET, SEE DETAIL 2

Figure 6.35. Reflected ceiling plan for main floor design.



NOTES

1. NURAZZO TERRAZZO TILE RECYCLED MARBLE RS802 DOGWOOD 24" X 24"
2. PRAIRIE BARNWOOD RECLAIMED BARNWOOD FLOORING
3. MOVING COLOR LIQUID BLACK TILE IN BLACK 4" X 4" (HEAT SENSITIVE COLOR CHANGING)
4. NURAZZO TERRAZZO TILE RECYCLED MARBLE RS802 DOGWOOD 12" X 12"

F2 / – MAIN FLOOR PATTERN
SCALE 1/16" = 1'–0"

Figure 6.36. Floor pattern for basement design.

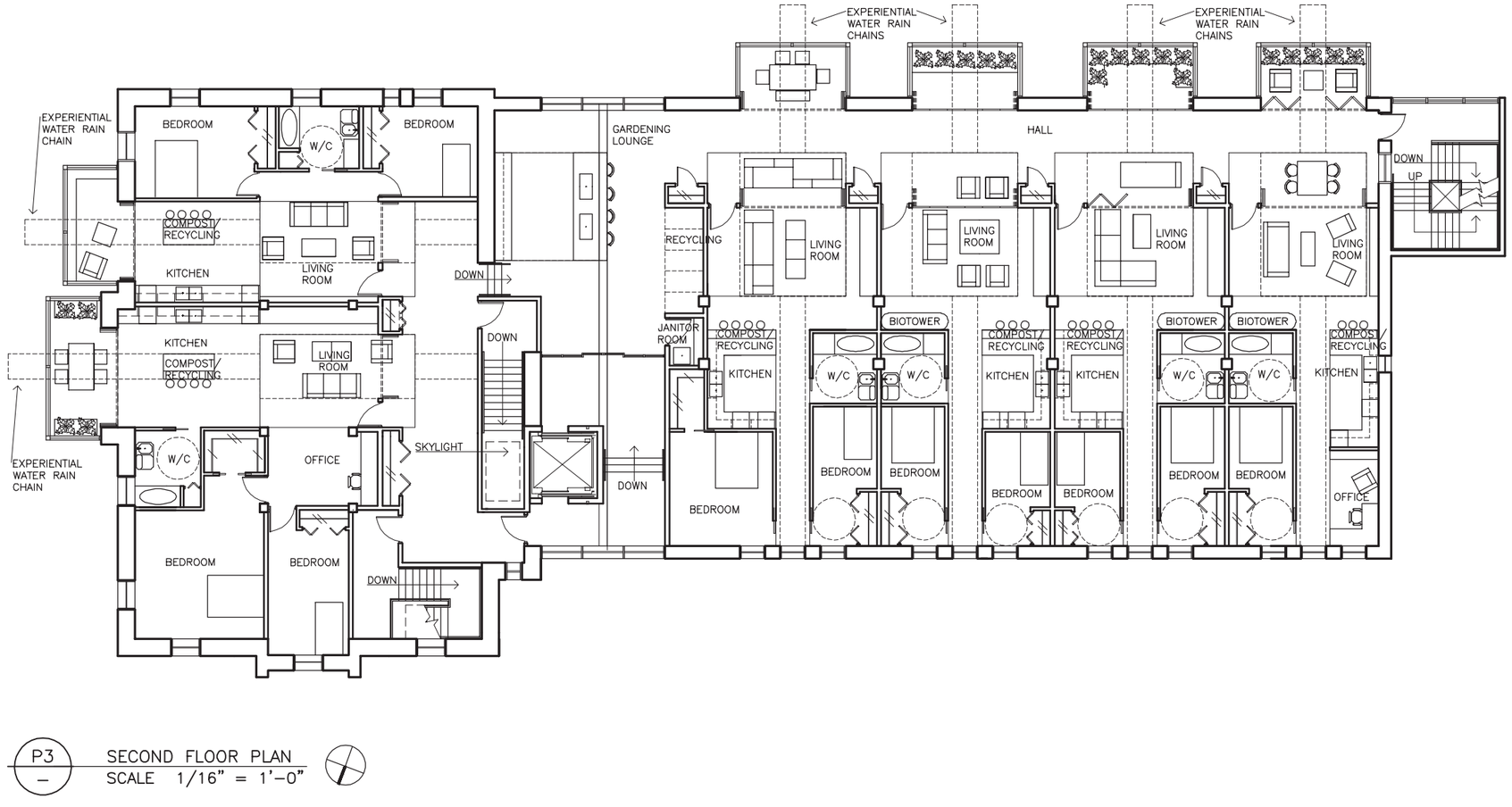
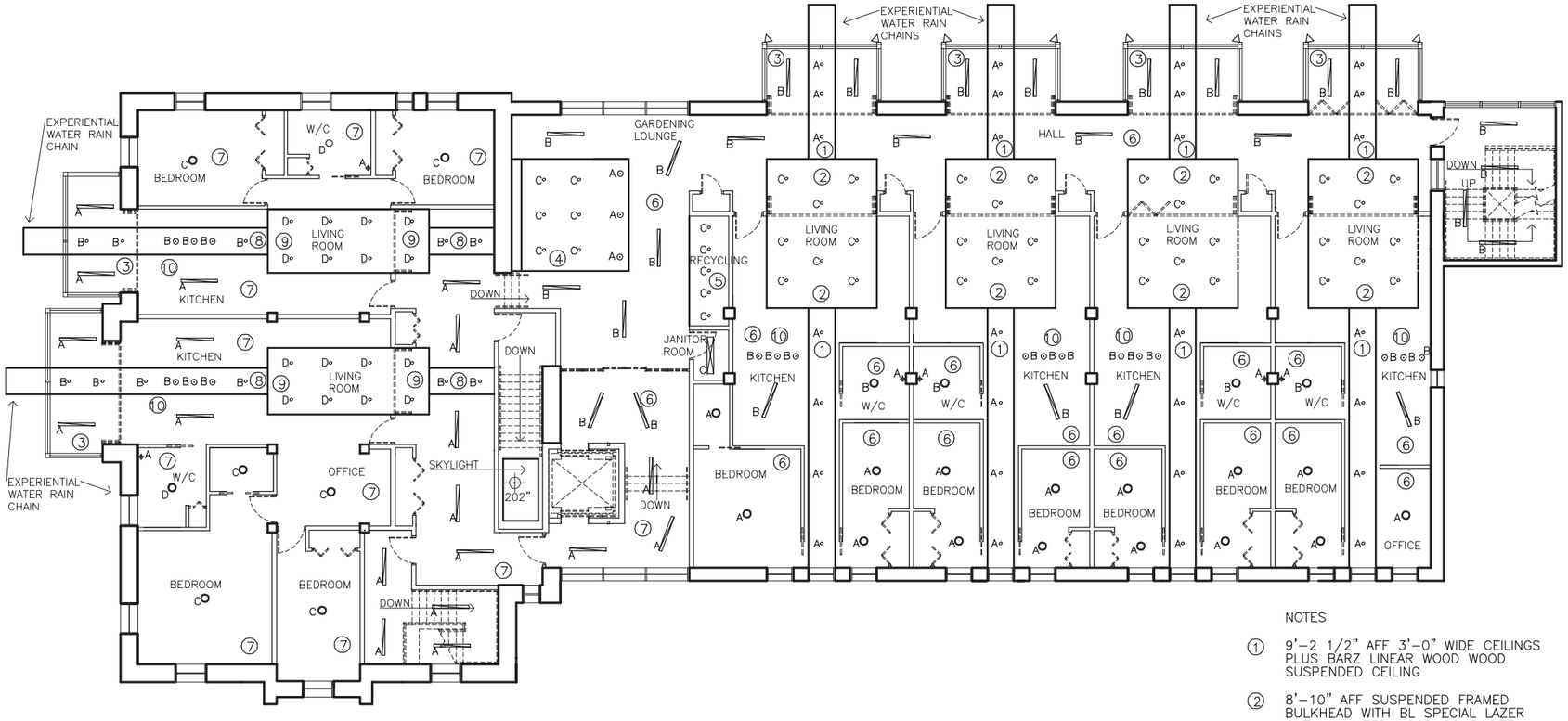


Figure 6.37. Plan for second floor design.



R3 / – SECOND FLOOR REFLECTED CEILING PLAN
SCALE 1/16" = 1'–0"

NOTES

① 9'–2 1/2" AFF 3'–0" WIDE CEILINGS PLUS BARZ LINEAR WOOD WOOD SUSPENDED CEILING

② 8'–10" AFF SUSPENDED FRAMED BULKHEAD WITH BL SPECIAL LAZER CUT LAMINATED WOOD COMPOSITE PANEL UNDERSIDE

③ EXPOSED TO UNDERSIDE OF STRUCTURE

④ 8'–10" AFF TO UNDERSIDE OF STRUCTURE WOOD VENEERED BULKHEAD

⑤ 8'–10" AFF TO UNDERSIDE OF STRUCTURE GYPS. BULKHEAD

⑥ 12'–1" AFF EXPOSED TO UNDERSIDE OF STRUCTURE

⑦ 10'–4" AFF EXPOSED TO UNDERSIDE OF STRUCTURE

⑧ 8'–9" AFF 3'–0" WIDE CEILINGS PLUS BARZ LINEAR WOOD WOOD SUSPENDED CEILING

⑨ 8'–0" AFF SUSPENDED FRAMED BULKHEAD WITH BL SPECIAL LAZER CUT LAMINATED WOOD COMPOSITE PANEL UNDERSIDE

⑩ LIGHTING DETAIL IN KITCHEN LOWER CABINET, SEE DETAIL 2

LIGHTING LEGEND

A| CIVIC CIAO SUSPENDED T5 UP AND DOWN LIGHTING FLUORESCENT TROFFER (50" X 4") 9'–0" AFF

B| CIVIC CIAO SUSPENDED T5 UP AND DOWN LIGHTING FLUORESCENT TROFFER (50" X 4") 10'–0" AFF

C| CIVIC AVIO SUSPENDED T5 DOWN LIGHTING FLUORESCENT TROFFER (8.6" X 50") 10'–0" AFF

AO MAXILITE MX3350–14 CEILING FLUSHMOUNT (9 X 3) 11"–10" AFF

BO MAXILITE MX3350–1 CEILING FLUSHMOUNT (9 X 3) 11"–10" AFF

CO MAXILITE MX3350–14 CEILING FLUSHMOUNT (9 X 3) 10"–1" AFF

DO MAXILITE MX3350–1 CEILING FLUSHMOUNT (9 X 3) 10"–1" AFF

A⊕ MAXILITE MX 6595–40 FLUORESCENT WALL SCONCE (4.5" X 16" X 3") 4'–6" AFF

AO CONTRAST LIGHTING FLUORESCENT 4" F24SOVT LOW PROFILE DOWNLIGHT WITH 3" FROSTED GLASS TUBE 9'–7" AFF

BO CONTRAST LIGHTING FLUORESCENT 4" F24SOVT LOW PROFILE DOWNLIGHT WITH 3" FROSTED GLASS TUBE 8'–6" AFF

CO 4" ADJUSTABLE RECESSED DOWN LIGHT HALOGEN 8'–10" AFF

DO 4" ADJUSTABLE RECESSED DOWN LIGHT HALOGEN 8'–0" AFF

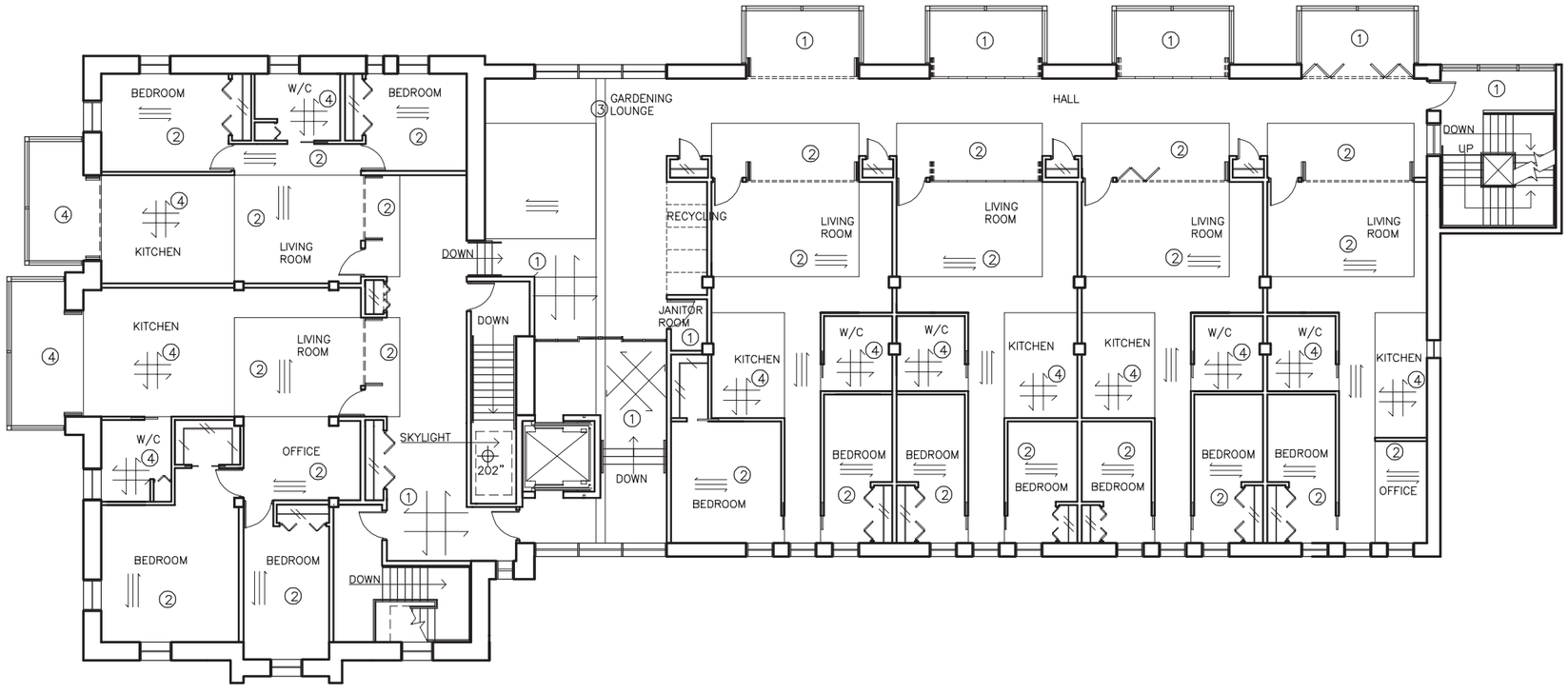
A⊙ MAXILITE MX2532 PENDANT (5" X 16") 6'–0" AFF

B⊙ MAXILITE MX2532 PENDANT (5" X 16") 6'–6" AFF

ODDYSEY ADJUSTABLE EXTERIOR SURFACEMOUNT WALL LIGHT 8'–10" AFF

NOTE: ALL LIVING UNIT AND COMMUNAL AREA KITCHEN CABINETS TO HAVE UNDER CABINET FLUORESCENT LIGHTING

Figure 6.38. Reflected ceiling plan for second floor design.



NOTES

① NURAZZO TERRAZZO TILE RECYCLED MARBLE RS802 DOGWOOD 24" X 24"

② PRAIRIE BARNWOOD RECLAIMED BARNWOOD FLMOVING COLOR

③ LIQUID BLACK TILE IN BLACK 4" X 4" (HEAT SENSITIVE COLOR CHANGING)

④ NURAZZO TERRAZZO TILE RECYCLED MARBLE RS802 DOGWOOD 12" X 12"

F3 / – SECOND FLOOR PATTERN
SCALE 1/16" = 1'–0"

Figure 6.39. Floor pattern for second floor design.

Figure 6.40. Gardening lounge and communal hall entry looking south.

Figure 6.41. View from gardening lounge looking west into the communal hall.

Figure 6.42. View from a living unit hall veranda looking south into the unit's personal greenhouse.

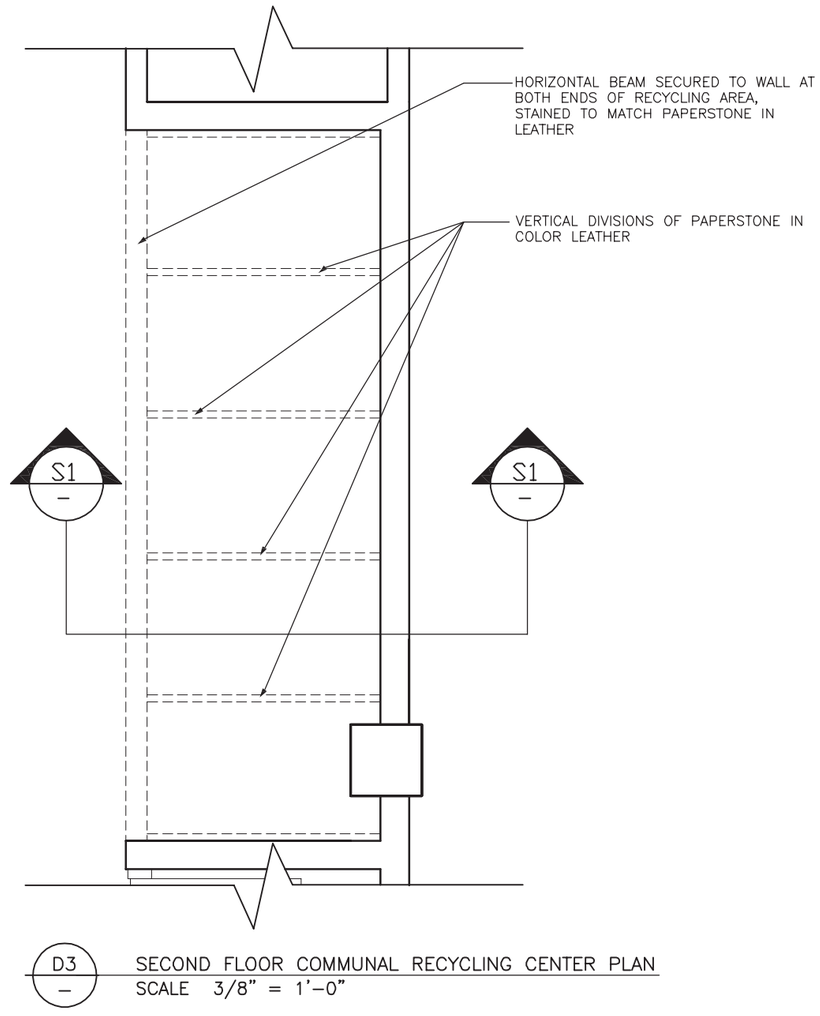
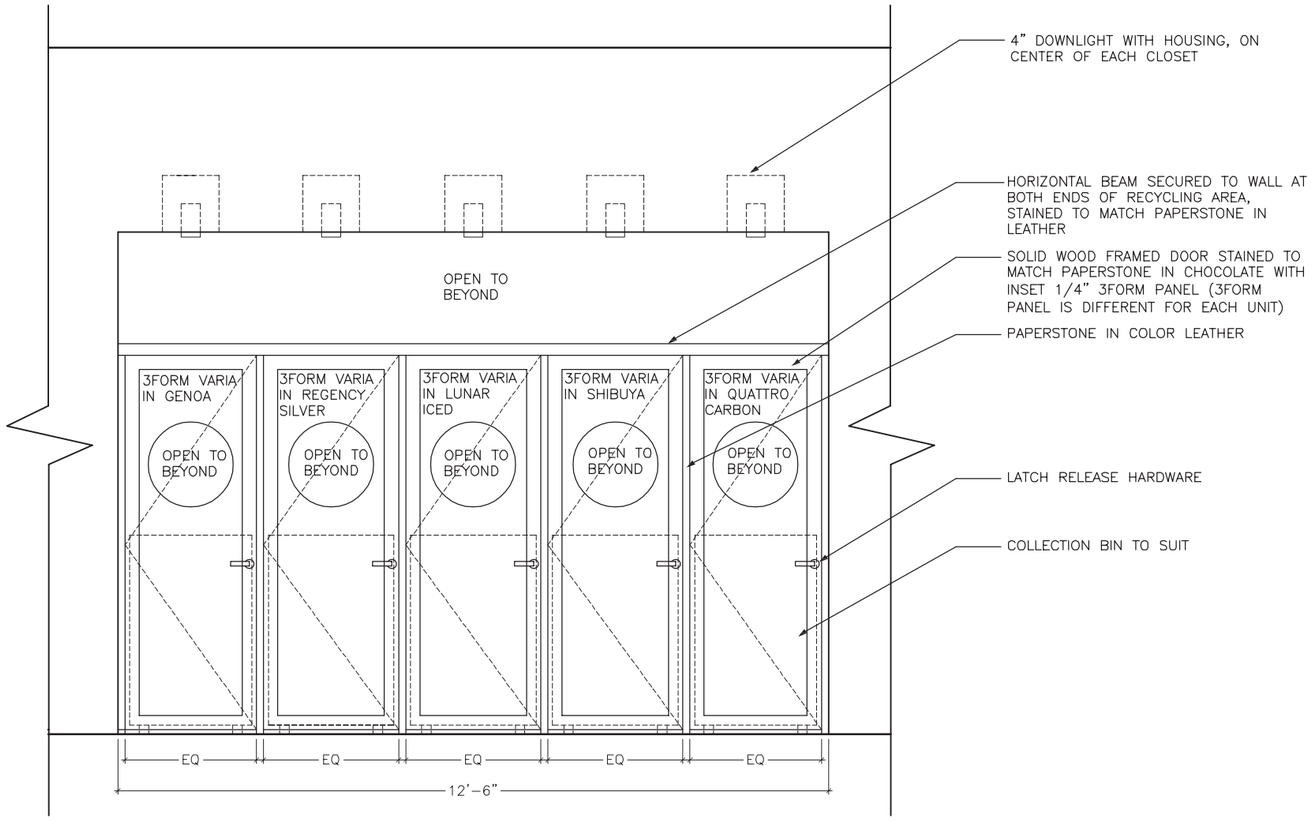
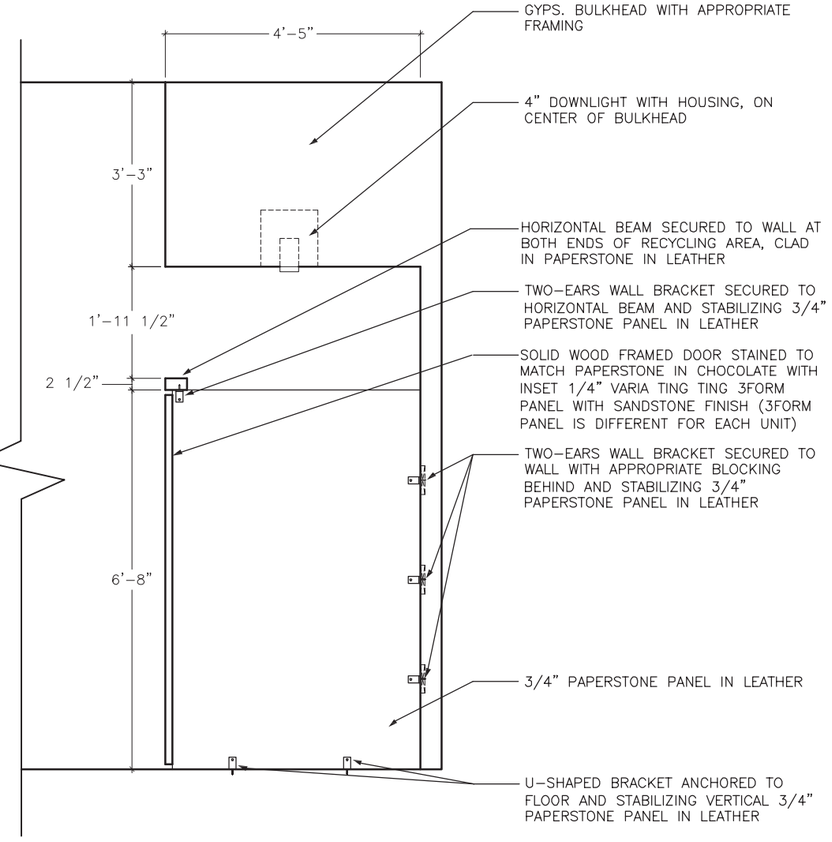


Figure 6.43. Plan detail of second floor recycling center.



E1 — SECOND FLOOR COMMUNAL RECYCLING CENTER ELEVATION
SCALE 3/8" = 1'-0"



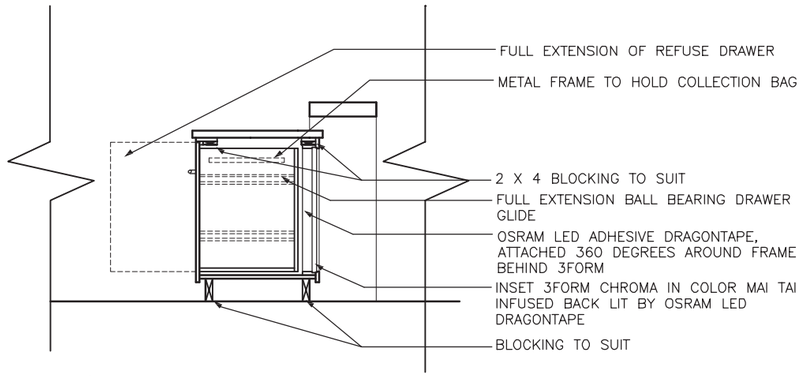
S1 — SECOND FLOOR COMMUNAL RECYCLING CENTER SECTION
SCALE 3/8" = 1'-0"

Figure 6.44. Elevation and section details of second floor recycling center.

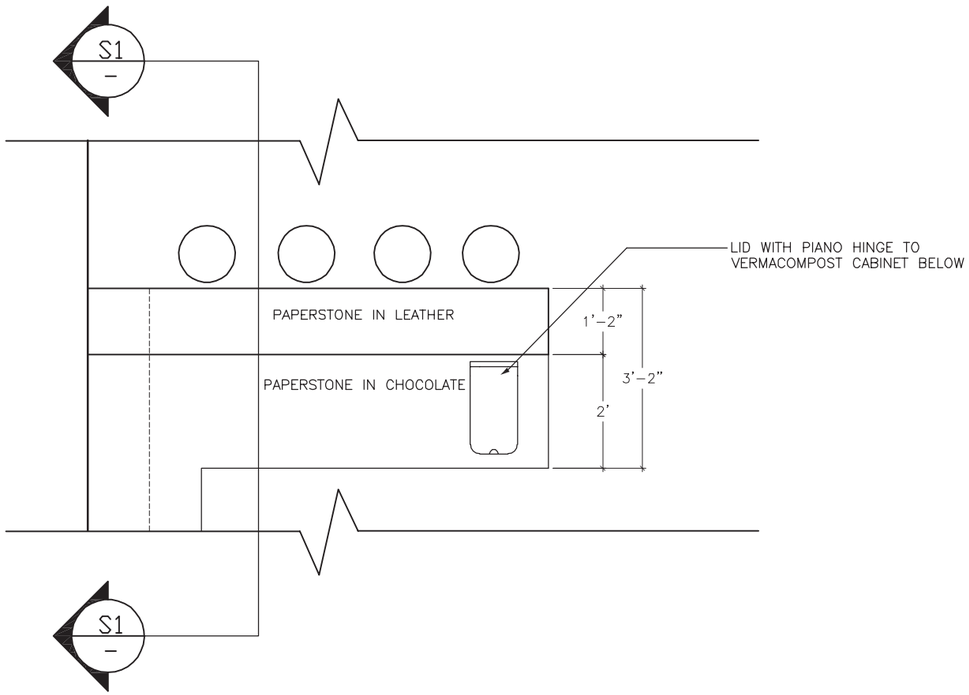
Figure 6.45. View from a living unit veranda looking north into the living unit.

Figure 6.46. View from a living unit's kitchen looking south into the hall and personal greenhouse.

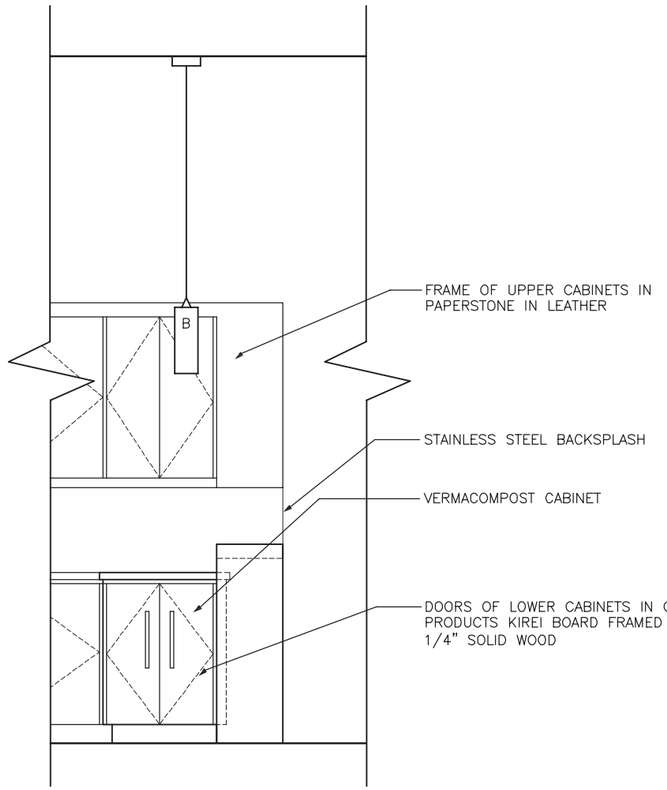
Figure 6.47. Living unit kitchen with the compost and recycling counter in the foreground.



D2S1 — LIVING UNIT COMPOST/RECYCLING COUNTER SECTION
SCALE 3/8" = 1'-0"

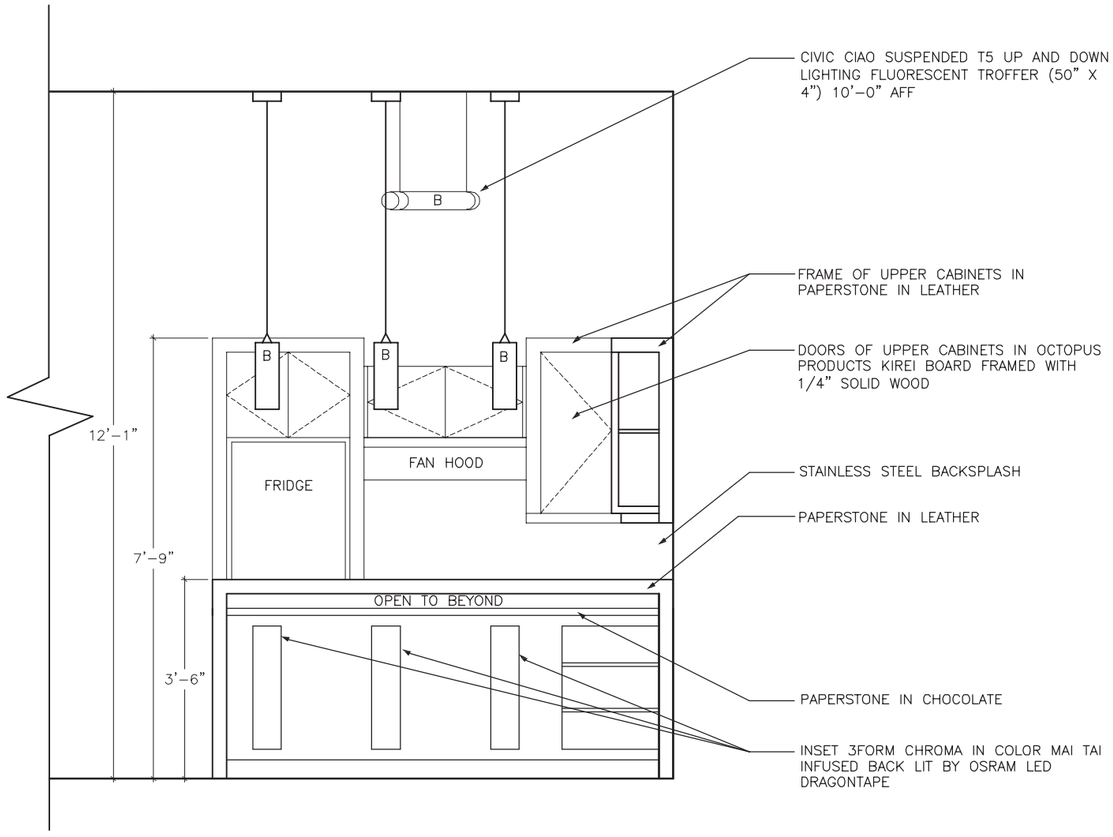


D2P — LIVING UNIT COMPOST/RECYCLING COUNTER PLAN
SCALE 3/8" = 1'-0"

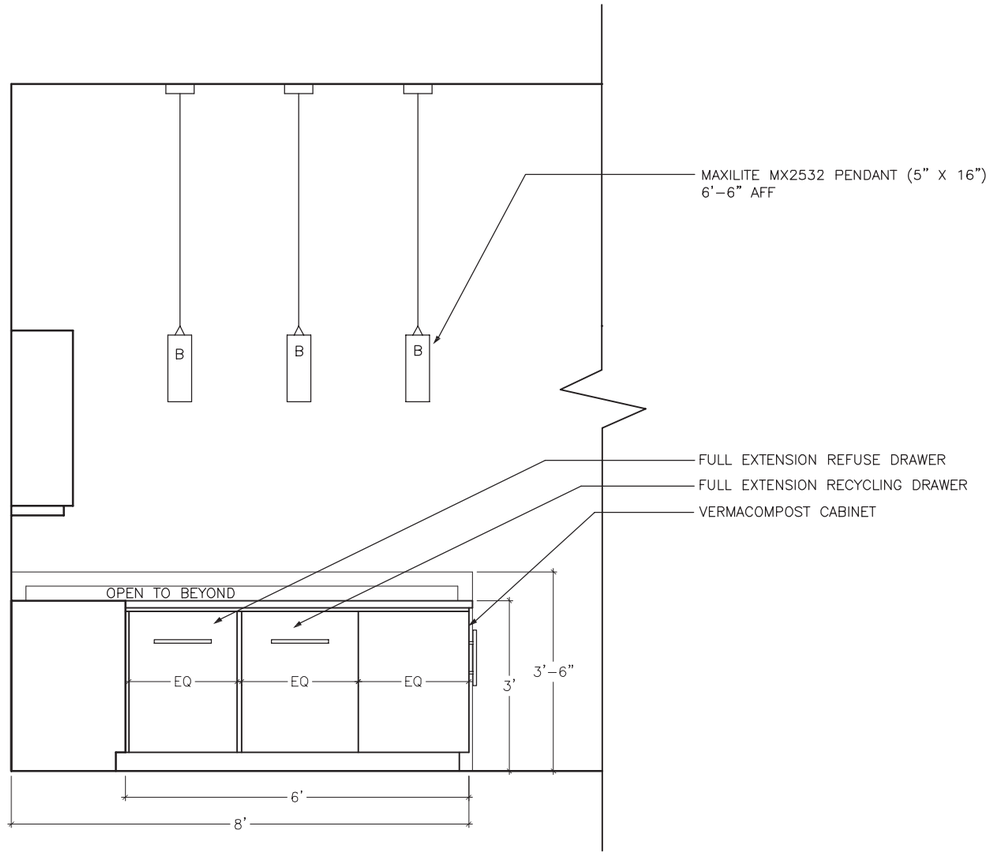


D2E2 — LIVING UNIT COMPOST/RECYCLING COUNTER SIDE ELEVATION
SCALE 3/8" = 1'-0"

Figure 6.48. Design drawings for living unit compost and recycling counter.

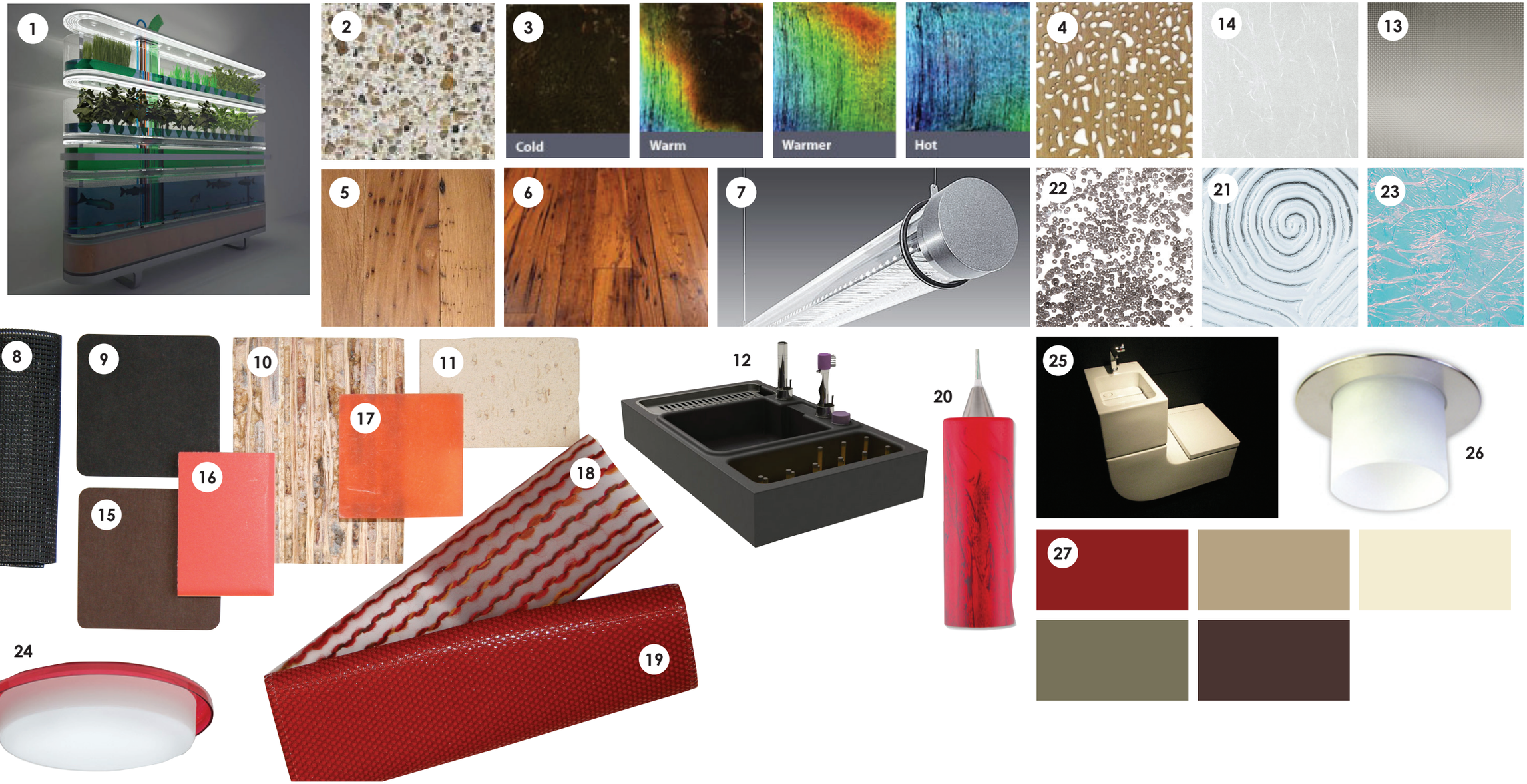


D2E1 — LIVING UNIT COMPOST/RECYCLING COUNTER FRONT ELEVATION
SCALE 3/8" = 1'–0"



D2E3 — LIVING UNIT COMPOST/RECYCLING COUNTER REAR ELEVATION
SCALE 3/8" = 1'–0"

Figure 6.49. Elevations for living unit compost and recyling counter.



1. Philips Biotower – biosphere with plants, algae, fish and shrimp, and organic waste. Available from http://origin.design.philips.com/probes/index.page 2. Nurazzo, Recycled Marble Collection, in RS802 Dogwood – Terrazzo tile made from 100% post-industrial recycled marble aggregated yielding a 79% recycled product 3. Moving Color, Liquid, in Black (4" x 4") – Thermo-reactive tile 4. BL Special – Laser cut laminated wood composite panel 5. Prairie Barnwood, flooring – Recycled barn wood 6. Prairie Barnwood, flooring – Recycled barn wood 7. Civic, Ciao – Suspended fluorescent 8. Jackson, Sheerweave, in Chocolate – Window light filter 9. PaperStone, in Chocolate - FSC Certified 10. Octopus Products ltd., Kirei Board, 10mm – Made of approximately 90% post-industrial recycled content and rapidly renewable materials 11. Example of existing brick 12. Eulo – Greywater recycling kitchen sink. Available from http://www.student.designawards.com.au/application_detail.jsp?status=2&applicationID=3221 13. 3form, Varia, in Quattro Carbon – Made with Ecoresin 14. 3form, Varia, in Shibuya – Made with Ecoresin 15. PaperStone, in Leather – Made from a renewable resource 16. Ames, Bloc Series, in Coral Red 17. 3form, Chroma, in Mai Tai Infused – Made with Ecoresin 18. Maharam, Ply Tweed Stripe, in Scarlet/Frost 465000 19. Maharam, Peep 464940, in Mars 20. Maxilite, 2532 – Pendant fixture 21. 3form, Varia, in Genoa – Made with Ecoresin 22. 3form, Varia, in Regency Silver – Made with Ecoresin 23. 3form, Varia, in Lunar Iced – Made with Ecoresin 24. Maxilite, 3550-14 – Ceiling flush mount 25. Roca, W+W – Sink/toilet greywater recycling system. Available from http://www.roca.com/ 26. Contrast Lighting, R2450VT – Low profile downlight with glass tube 27. Color scheme based on vernacular chromatic character

Figure 6.50. Material board for design of communal spaces and living units.

6.6. Design Summary

In summary, the following chart synthesizes the design investigation solution in relation to the transformative learning process (encounter/presentation, experience/interaction, and internalization/awareness), the process that guided the investigation, as demonstrated in Figure 1.1.

Transformative Learning Component	Design Solutions
Encounter / Presentation	Created through the inclusion of direct nature in the exterior gardens, design features that heighten awareness of weather patterns, and symbolic nature present in the inclusion of greywater features, materials that relate to the ecological and cultural vernacular, and sensory details that highlight connections and interior/exterior extensions. Further, spatial organization ensures that human-nature connection features are highly visible.
Experience / Interaction	Presented by the indirect nature experiences included in the food growing areas, such as the café table, garden plots, greenhouse, and personal greenhouses, and in the features that draw certain animals and insects to the site. Symbolic changes also create experience and interaction through sensory shifts with ceiling, floor, lighting, and material changes and the interaction that takes place with the operable windows, gardening, recycling, and composting areas.
Internalization / Awareness	Encouraged through the heightened awareness of human-nature interactions and impacts from direct, indirect and symbolic experiences together that will encourage a coevolutionary perspective.

6.7. Conclusions and Critical Considerations

Current practices in sustainable design predominantly offer band-aid solutions that are being employed to reduce resource consumption and avoid damage to the natural environment. These methodologies are missing the real problem – the reasons for our estrangement from the natural world. It is from this estrangement that our lack of consideration and view of the natural world as a commodity stems. Most importantly, humans divorcing from nature vastly limits their experience in regards to physical, emotional, intellectual, and even spiritual growth. As biophilic design is a discipline still in its infancy (first being explored at length in Stephen Kellert's book, *Building for Life: Designing and Understanding the Human-Nature Connection*, in 2005), this design investigation forms an important component of its exploration with regards to its relationship to sustainability and its utilization as an integral aspect of interior design that explores mutually beneficial contact between people and nature. Additionally, it contributes to a dialogue supporting the view that humans evolved in a biocentric world, and to lose the sensibilities gained through this close relationship to nature would be detrimental to convolution and, hence, a healthful existence. Succinctly, the purpose of this investigation was to find ways to harmonize the natural and human built environment in a manner that fostered environmental protective behaviors. I believe that the investigation was successful in specifically demonstrating and providing methodologies to strengthen physical, emotional, intellectual, and spiritual human-nature connections that can be utilized in conjunction with sustainable measures.

When one looks at the broader impacts and applications of this investigation's findings, the overall objectives, as stated in subsection 1.1, were to investigate the following:

- To identify strategies that can facilitate a strengthened connection between people and nature.

- To identify strategies that enable the interior environment to engage with the full sensory spectrum of users.
- To identify strategies that can enrich current sustainable design methodologies in the interior environment.

In the design investigation, the first objective was addressed through the analysis of possible origins and manifestations of the disconnection between humans and nature, as well as possible solutions. Concisely, the concepts and theories I have drawn from explored how otherness is created and how it can be resolved (see subsection 3.1). These theories were then enmeshed with Transformative Learning theory in subsection 3.2. The objective of this union was to obtain a process that could be utilized in this design investigation and other design applications, thus facilitating learning and awareness of interconnections with nature through experience. The process derived – encounter/presentation, experience/interaction, and internalization/awareness – relies on the stimulation and involvement of the full realm of the senses to create an experience with multiple layers of interaction. This sequence was then integrated with biophilic design, which stresses the importance of creating design that reflects the inherent value of nature, culture, and place in concert, as it has been found that this tripartite relationship promotes well being and has the ability to enliven a desire to protect the natural environment. In addition, it attaches people emotionally and intellectually to built form and nature. The primary strategy found to be most successful was to include, and make apparent, reciprocal relations between humans and nature.

To address the second objective, regarding the full sensory spectrum, the Biophilic Design Guidelines chart, detailed in subsection 3.2.2 and utilized in subsection 5.2.1, was created to ensure the design approach considered all of the sensory systems. This method proved to be quite successful in ensuring that all of the senses were considered in the

programming and design phases of the project. Further, the charting process allows for flexibility in the design process to meet the goals set out during programming, thus enabling creativity and a design that is not formulaic.

Finally, the third objective, involving the enrichment of current sustainable design methodologies, is best addressed through the transformative process of encounter/presentation, experience/interaction, and internalization/awareness. This process, when integrated with biophilic design not only enabled design expressions tied to nature, culture, and place that are oriented around the full sensory spectrum but also ensured the inclusion and awareness of reciprocal relations between humans and nature.

The lessons learned, the limitations, and future research directions of this design investigation become apparent when reflecting over the investigation process in the literary and visual investigation and analysis and when comparing the conclusions, methods, and goals drawn to the resulting design. The most important synthesizing points of the literary and visual investigation, from which the design evolved, were the design and nature retrospective in subsection 3.1.3, the site-specific visual study in subsection 3.3, the biophilic design guidelines in subsection 5.2.1, and the precedent investigation and analysis in section 4.

In regards to the design and nature retrospective and the precedent analysis, which are truly intertwined, the primary lessons learned involved the importance of a multifaceted approach, or layering of direct, indirect, and symbolic features when connecting to nature because these elements play off one another. This lesson influenced the design decisions to keep as many existing trees on the property as possible, designate areas for vernacular grasses, bushes, and flowers, and include food gardens and the greenhouse. The importance of this measure was evident in the precedent investigations, which showed only one or two of these elements. For example, the stark interiors in the Agro-Housing project did not employ symbolic

nature, and the installations in the Radial View exhibition did not support its symbolic nature with significant opportunities to engage with indirect and direct nature, limiting the effect of both. Examples in the design retrospective include Le Corbusier's Villa Savoye and Eero Saarinen's TWA Flight Center in the John F. Kennedy Airport, both of which are separated from nature due to a severity created by a lack of symbolic human-scale and micro sensory detailing. This use of one aspect of biophilic design without the others results in a limited and possibly narrow view of facilitating a true relation. It is important, however, to recognize that not every project can contain all of these elements; consequently, the dynamic between different neighboring structures and each structure and the broader community and city becomes important. In effect, macro to micro biophilic design measures truly are important.

The next integral point was that expressions must be tied to place and culture, which was again reiterated by both the historic and precedent investigation. This influenced the choice of the site and building, the highlighting of original building materials, the use of materials that complement or relate to relevant historic materials, and forms of building additions and space. Again, referring back to the historic and precedent investigations, Thorncrown Chapel and Alvar Aalto's Villa Mairea best exemplify the importance tying design to place and culture.

Moreover, these two sections provided a wealth of information on the important points that must be considered in the creation of the between. These points, which are presented in Figure 6.1, influenced such aspects of the design as the materials and floor and ceiling planes that bridge spaces, pinch and release space, create shared spaces, and create detailed transition points. One of the essential lessons derived that influenced the overall layout of the design is the importance of transitional and connecting spaces. These spaces, the arteries of interiors, should be awarded all the respect normally given to individual rooms. They not only greet you but also serve to lure you into the rooms beyond. The hall, stairs, landings and corridors of a house have

a pivotal role to play, and it is through the framework they form that you will view all the other rooms. Often characterized by their mean proportions, irregular shape, and lack of light, these areas require very careful attention if they are to become the convenient welcoming spaces they should be.

Most importantly, the retrospective section (subsection 3.1.3) allowed for a greater understanding of how design has and can influence the current human-nature divide in regards to framing/viewing, domination/control, imitating/transforming, comingling, and interdependence. The analysis of these design expressions, which result from and influence culturally created worldviews, provide important lessons regarding the larger impacts of design choices, both in creating connection and division. Ultimately, sensitive treatment of thresholds in a manner that integrates the interior and exterior revealed itself as the prime consideration with views, transitions, access, and supporting symbolic details becoming essential components.

With regards to the visual study, this process was integral to the design investigation because it involved carefully looking at and analyzing the micro and macro details of the neighborhood. The results of this study influenced the form, color, and material choices made in the design. The desire was to integrate the overall feel and character of the design with the existing community and to draw on qualities found in the ecological vernacular to blend and bridge the design with exterior nature. Although I feel this process was successful, unfortunately, vernacular material choices were limited because there are not many products derived from local materials.

Furthermore, in looking back at the biophilic design guidelines that are centered on the senses and guided by learning outcomes, important sensory criteria were derived that ensured, at the very least, a consideration of all of the senses in the design process. Benefits included an increased awareness of the multiple impacts of each design decision, such as the sensory array

experienced from an operable window, or the texture change from one floor type to another, or the patterns created on wall surfaces by window mullions. Even though I feel the process is beneficial and flexible enough to be tailored to individual projects, the decision to consider various sensory systems to achieve the outcomes must be made or the usefulness of the chart would be negated.

Overall, the limitations in the project were largely determined by the actual space. Although the property provided many community and vernacular attributes, the reuse of the building limited the manner in which biophilic design could be applied. For example, a greater degree of greywater harvesting was desired, but this proved to be overly difficult because of the current structure and drainage in the building. Furthermore, the level of integral ornamentation in the form of the structure was largely determined by the existing structure, as were the options for space planning, natural ventilation, daylighting, and access to direct nature.

In conclusion, further research that would be beneficial to the inclusion of biophilic design as an integral part of a sustainable design process would involve integrating these measures with current sustainability guidelines. In addition, a project that brings to the forefront resource flows and energy generation, as well as direct, indirect, and symbolic investigations, could push the connection between human and nature interrelations much further. A more multi-disciplinary approach, however, would most definitely elevate the level of connection to nature. Such a design team could include those specializing in the areas of biomimicry, neuroscience, city planning, and landscape architecture, to name just a few.

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