HUMAN + NATURE OFFICE DESIGN
Design to support and enhance work and life
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SCHOOL OF ARCHITECTURE
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## Acknowledgments


## Abstract


## Research Process Diagram


## Introduction


## Doctorate Project Statement


## Chapter 1: Designing for well-being

### Biophilia

Liking / approach response ................................................................. 23
Restorative Responses ........................................................................ 23
Effects on High-Order Cognitive Functioning .................................. 24

### Biophilic Design

Restorative Environmental Design .................................................. 25
Organic/Naturalistic & Place-based .................................................... 26

### Evidence Based Design


## Chapter 2: Problems with the office environment

### Demands of the 21st century office

### Offices do not support health and well-being

Poor Indoor Air Quality ................................................................... 31
Sick Building Syndrome (SBS) .......................................................... 31
Acute Respiratory Illness (ARI) ......................................................... 32
Office Preference Experiment .......................................................... 33

## Chapter 3: Benefits of Nature in the Office

### Stress reduction


Natural light and ventilation....................................................................................................................38
Access to nature.........................................................................................................................................39
Case Studies ..................................................................................................................................................43
  223 Yale NBBJ ...........................................................................................................................................43
  HOK Toronto Office ...................................................................................................................................46
  Herman Miller Office by William McDonough .........................................................................................48
  Architect’s Hawaii Office Renovation by Architects Hawaii Ltd. ..........................................................50
  40 S. School Street by Philip K. White and Associates .........................................................................51

Chapter 4: Space Typologies of the Modern Office ...............................................................................54
  Lobby and Information..............................................................................................................................55
  Common Gathering Space .......................................................................................................................56
  Mover Space.............................................................................................................................................57
  Public Purpose Space...............................................................................................................................58
  Recreation Space.....................................................................................................................................59
  Meeting Room.........................................................................................................................................60
  Meeting Space .........................................................................................................................................61
  Collaborative Work Spaces ....................................................................................................................62
  Retreat Space..........................................................................................................................................63
  Individual Work Space.............................................................................................................................64

Chapter 5: Biophilic Human Needs of the office..................................................................................68
  Social Engagement.....................................................................................................................................68
  Sense of Control.......................................................................................................................................70
  Fascination................................................................................................................................................71
  Prospect & Refuge.....................................................................................................................................73
  Involvement in the Environment .............................................................................................................74
  Understanding the Environment ...............................................................................................................77
  Connection to Place and Culture...............................................................................................................79
Chapter 6: Benefits of Nature in other environments .................................................................83

Hospitals ....................................................................................................................................83
Case Study ..................................................................................................................................86
Housing .......................................................................................................................................88

Chapter 7: Sustainability .............................................................................................................89

Energy Conservation ..................................................................................................................90
Passive Design ...........................................................................................................................90
Active Design .............................................................................................................................91
Green Roofs ...............................................................................................................................92
Case Studies ................................................................................................................................94
The Providence Cancer Center by Zimmer Gunsul Frasca Architects .......................................94
Bank One Corporate Center .......................................................................................................95

Chapter 8: Site and Context Documentation Analysis .............................................................98

Site ...............................................................................................................................................98
Building ......................................................................................................................................101
Office Space ...............................................................................................................................104

Chapter 9: Client Analysis ........................................................................................................107

Communications Pacific ............................................................................................................107
Public Relations .........................................................................................................................108
Community Building ................................................................................................................108
Land Use & Real Estate .............................................................................................................108
Marketing ....................................................................................................................................109
Values .........................................................................................................................................110

Keep, Toss and Add ...................................................................................................................114
Keep ............................................................................................................................................114
Toss ...............................................................................................................................................115
Add ...............................................................................................................................................116
Problems with the current office ...............................................................................................118
Chapter 10: Programming ................................................................. 123

Program Goals .................................................................................. 123

Biophilic Design ................................................................................ 124
Sustainability ................................................................................... 124

Program ............................................................................................. 126

Qualitative attributes ........................................................................ 126
Quantitative attributes ....................................................................... 129
Performance Requirements: ............................................................ 135
Plant Requirements ........................................................................... 137
Indoor plants ................................................................................... 143
Indoor Growing Media ..................................................................... 147
Planter Types .................................................................................. 148

Chapter 11: Design ........................................................................... 151

Schematic Design ............................................................................. 152

Design Development ......................................................................... 155

Final Design ..................................................................................... 160

Chapter 12: Conclusion .................................................................... 178

References ....................................................................................... 181
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improves the natural ventilation.

Figure 1: Research Process Diagram
Figure 2: Sample A: Natural Light from perimeter windows, white walls, no plants.
Figure 3: Sample B: Natural Light from windows and clerestories, potted plants and colored walls.
Figure 4: Sample C: Natural light from windows and clerestories.
Figure 5: Sample A: Windows at the perimeter
Figure 6: Sample B: Windows, clerestories and colored walls
Figure 7: Sample C: Windows and clerestories
Figure 8: Comparison between window proximity and sick building symptoms at two USDOE offices
Figure 9: Top chart shows health gains from access to nature. Above chart shows productivity gains.
Figure 10: Amount of SBS symptoms when plants were present or absent in the space
Figure 11: NBBJ headquarters, second floor central hub
Figure 12: NBBJ headquarters, second floor central hub plan view
Figure 13: NBBJ headquarters, second floor central hub section cut
Figure 14: Sunscreens and motorized shades control light and solar heat gain. Floor and ceiling-level windows create a stack effect.
Figure 15: Naturally lit communal spaces encourage collaboration and team building
Figure 16: HOK Toronto Office: Studios face north providing indirect light and operable windows provide natural ventilation.
Figure 17: Herman Miller Office’s interior “street” promotes chance encounters
Figure 18: Section showing the interior “street” of the Herman Miller Office in the middle
Figure 19: Architect’s Hawaii’s new office features a open lobby adjacent to three glazed conference rooms that provide a sense of transparency.
Figure 20: 40 South School Street reuses a neglected concrete building to create a mixed use building that improves occupant comfort while minimizing its impact on the environment.
Figure 21: Lobby is naturally ventilated and the elevator runs off solar energy
Figure 22: Photovoltaic panels provide solar energy to the building, while also creating a patio space on the roof.
Figure 23: Johnson & Johnson lobby, New York
Figure 24: NBBJ Seattle’s Common Gathering Space features the “Giant Steps”
Figure 25: Herman Miller Factory, interior “street”
Figure 26: Quick Loans’ Detroit office kitchen
Figure 27: Innocent Drinks London Office
Figure 28: Conference room at NBBJ Seattle
Figure 29: NBBJ Seattle second floor central hub
Figure 30: Collaborative spaces with large work tables at Buro Miami Coworking Office
Figure 31: Respite space at Seattle Childrens Belleuve by NBBJ ................................................. 63
Figure 32: Office workstations at Design Army Offices in Washington D.C. ................................. 64
Figure 33: Operational Attributes Matrix .................................................................................. 66
Figure 34: Office of WOW Sendai features informal seating that promotes social engagement ...... 68
Figure 35: Humans desire the ability to master and control their environment .............................. 70
Figure 36: Views of nature provide fascination that allows for restoration from stress ............... 71
Figure 37: Example of a Prospect and Refuge from the English Lake District in England .......... 73
Figure 38: Nature is highly sensuous, providing engagement and involvement ......................... 74
Figure 39: 3form Ecoresin provides sensory variability .............................................................. 75
Figure 40: Repetitive elements, unifying textures and visual cues aid in understanding .............. 77
Figure 41: View of Honolulu and Diamond from the Liljestrand House by Vladimir Ossipoff ....... 79
Figure 42: Biophilic Human Needs Matrix 1of2 ......................................................................... 81
Figure 43: Biophilic Human Needs Matrix 2of2 ......................................................................... 82
Figure 44: Floor-to-ceiling windows provide views to the ocean for patients and visitors .......... 86
Figure 45: Honolulu Central Business District .......................................................................... 98
Figure 46: Central Business District Site Map ............................................................................ 99
Figure 47: Site plan of Pacific Guardian Center ........................................................................ 100
Figure 48: Pacific Guardian Center and the Dillingham Transportation Building ...................... 101
Figure 49: Sun path diagram summer solstice ......................................................................... 102
Figure 50: Sun path diagram winter solstice ............................................................................. 102
Figure 51: Pacific Guardian Center Google Earth satellite image ................................................ 104
Figure 52: Plan view of 26th Floor in the Mauka Tower ............................................................... 105
Figure 53: Mauka tower suite 2250 interior view facing west .................................................... 105
Figure 54: Communications Pacific office lobby in the Topa Financial Tower, Penthouse ......... 107
Figure 55: Client news conference at Children & Youth Day on the State Capitol grounds .......... 109
Figure 56: Executive assistant stations serve as informal meeting spaces for employees ............ 111
Figure 57: Glazed offices and an open-door policy promote transparency and accessibility ...... 112
Figure 58: Bookshelf and intern work stations at Communications Pacific ............................... 115
Figure 59: Location of the bookshelf and intern workstations fronting the kitchenette .............. 116
Figure 60: Plan drawing of the 7,149 sq. ft. penthouse in the Topa Financial Center ................. 118
Figure 61: Distribution of public spaces in Communications Pacific’s current office ..................... 119
Figure 62: Communications Pacific office corridor ................................................................... 121
Figure 63: Piko concept diagram ................................................................................................. 122
Figure 64: Pacific Guardian Center’s ground floor plaza ............................................................ 123
Figure 65: Space program for Communications Pacific ............................................................... 130
Figure 66: Public purpose spaces are centralized to promote chance encounters

Figure 67: Meeting rooms are located on both levels and adjacent to work stations.

Figure 68: Accounting and Marketing are located on level one

Figure 69: Account services staff and management are located on level 2

Figure 70: Activity groupings showing public integrated spaces to private compartmental spaces

Figure 71: Integrated and partially integrated spaces promote interdepartmental communication

Figure 72: Vertical fins on the east façade shade nearly 100% of direct sun between 7am and noon.

Figure 73: Vertical fins on the west façade shade between 51-100% of direct sun in all months except between May-August, where it provide between 29-60% shading between 1pm-5pm.

Figure 74: ‘Ilima (Sida fallax) shrub, known as “The Flower of Oahu”

Figure 75: ‘Akia (Wikstroemia uva-ursi) is a hardy shrub that requires little maintenance

Figure 76: Koki’o (Hibiscus kokio subs. st.johnianus) shrub

Figure 77: ‘Ulei plant is indigenous to Hawaii and has fragrant white flowers

Figure 78: Indigenous palm, Loulu (Pritchardia hillebrandii)

Figure 79: Ti Plant (Cordyline fruticosa), “Hawaiian good luck plant”

Figure 80: Buddha Belly Bamboo (Bambusa ventricosa)

Figure 81: Bamboo Palm (Chamaedorea Palm)

Figure 82: Golden Pothos is effective in removing formaldehyde

Figure 83: Section of a depressed planter and curbing to create a more natural interior landscape.

Figure 84: Section of a decorative containing showing the layers and proper mulch height required.

Figure 85: Longitudinal section showing vertical connection between floors

Figure 86: Interior study of a typical enclosed Individual Work Space

Figure 87: Schematic render showing materials, vegetation and color

Figure 88: Schematic render showing bolder bench planters with ground cover
Abstract

This study investigates how architecture can improve the well-being and productivity of urban office workers by examining the problems with traditional high-rise office building and discovering new methodologies to design offices that support the basic human needs of employees, the demands of the modern 21st century workplace and the need to be environmentally sustainable.

Research on the traditional office environment has provided evidence that they do not support the well-being of workers and the demands of the 21st century workplace. There is evidence that shows that the disconnection, both physically and visually, from the natural environment is detrimental to the health and satisfaction of employees. Some common problems include poor indoor air quality, Sick Building Syndrome (SBS), worker stress, absenteeism and low job satisfaction. Sustainability has also been a challenge in high-rise office building because it lacks a human connection and a deeper meaning that goes beyond energy saving, which is not always enough to justify the added cost of a sustainable office. Current sustainable practices lack a connection to human benefit and experience, so it is difficult for a building to be sustainable overtime if the building does not provide added value and a deeper meaning that evokes stewardship. Most offices today do not support the work processes and values of the 21st century workplace. Spaces were designed to separate people based on the type of work they did, which does not support today's collaborative, interdisciplinary workforce. Space was distributed based on traditional models, instead of where space is needed most. This often meant a generous lobby up front and small cubicles with no spaces for teaming in the back.

New office space typologies were developed to address the problems with the traditional office. The hypothesis of this study is that “Human+Nature” space typologies can improve the well-being of workers while supporting the needs of the 21st century workplace. These Human+Nature space typologies are informed by two sets of attributes that describe the sensitivities required of each space. The Biophilic Human Needs attributes, are derived from Biophilia, which believes that humans have an innate attraction and fascination with nature and depend on it for their physical and mental well-being. The Operational attributes come from the needs of the 21st century workplace, the work processes and values of a specific company and the physical environment necessary for health and wellbeing.
The relevance and value of these space typologies were established through 4 processes: Preference Experiment, secondary surveys and data, case studies and finally a design project. The design project is a redesign of an existing office space in a high-rise, glass-skinned building, using the Human+Nature space typologies and the two matrices, the Biophilic Human Needs Matrix and the Operational Attributes Matrix. Communications Pacific (CP) agreed to be the client in this hypothetical design project. A client analysis was conducted to determine the values, goals and work processes of CP. Their office was analyzed to determine the successes, challenges and needs of their current space. The matrices were used as a guideline that was further tailored to support and strengthen the unique identity, values and work processes of CP and their employees. New space typologies were identified as necessary to support the goals and values of CP. These include a gallery space, locker room and showers and a kitchen and dining area.

The design response was a synthesis of Biophilic Human Needs, demands of the 21st century office and the values and work processes of the client, Communications Pacific, all while integrating sustainable features that provide added value and human benefit. The Biophilic Human Needs Matrix and the Operational Attributes matrix were shown to be successful tools in designing for the needs of the employee and the demands of the 21st century workplace. The Human+Nature office not only improves the health and well-being of the employees, but also uses the work environment as a business tool to maximize the value of its employees while strengthening the company’s unique identity and values providing a truly sustainable office that supports and enhances work and life.
Research Process Diagram

How can architecture improve the well-being & productivity of urban office workers?

PROBLEM
Urban offices don’t support the well-being of workers & the demands of the 21st century workplace

EVIDENCE
Disconnected from the natural environment
Sick Building Syndrome
Poor Indoor Air Quality
Worker Stress
Absence
Low job satisfaction
Sustainability
Lacks human connection
Expensive
Driver only energy savings
No connection to human benefit & experience
Does not support work processes & values of the 21st century workplace
Spaces separate people
Designed for a sedentary workforce
Promotes hierarchy
Inefficient use of space

HYPOTHESIS
Human+Nature space typologies can improve the well-being of workers while supporting the needs of the 21st century workplace

Biophilic Human Needs Matrix
- Connection to nature
- Connection to people
- Spatial & Experiential
- Comfort & Satisfaction

Sustainability
- Establish positive relationship between people & nature
- Passive Design
- Active Design

Operational Attributes Matrix
- Healthy work environment
- Adjacencies
- Spaces for collaboration
- Clarity of wayfinding
- Accessibility

RESEARCH METHODOLOGY
Four processes were used to establish value to the employee & the business
- Design Project
- Experiment
- Surveys
- Case Studies

APPLICATION
Redesign of an existing office space using Human+Nature Office Space Typologies

223 Yale NBBJ
HOK Toronto
Herman Miller Factory
Architect's Hawaii Office
40 South School Street

SCENARIO
High-rise glass skin office in Honolulu, Hawaii

Site & Building Analysis

Figure 1: Research Process Diagram
Human+Nature Office Design

Human+Nature Office Design supports and enhances the way people work in the modern workplace and responds to the basic human need to connect with nature, which has been shown to improve the physical and mental well-being of its occupants. The Human+Nature Office challenges the traditional office typology by examining employee's work processes (how people work), and determining the spaces that are necessary for people to work effectively and efficiently. This study explores how the office typology can be sensitive to human experience and need, with the goal to improve the well-being of employees by fostering positive connections between people and the natural environment, while also mitigating the adverse effects of building development on the natural environment. This study will be based on the demands of the modern 21st century office, which values knowledge-exchange, community oriented working and mobility as well as the concepts of Biophilic Design, which believe that people have an innate attraction and fascination with natural systems and processes and therefore nature must be incorporated into the design to evoke a positive, valued human experience in the office environment.

Introduction

The purpose of this doctorate project is to explore strategies to improve the office environment by understanding and designing for the demands of the modern, knowledge-based, 21st century workplace and the way people work while creating spaces that integrate nature and the properties of nature to benefit the well-being and productivity of employees. The focus of this project is not on sustainability, however sustainable design will be applied in ways that improve the workplace experience and serve to benefit the human being in addition to saving energy and creating minimum environmental impact.

The results of this research will be the basis of an office design guideline and matrix that identifies specific space typologies that support the demands of a modern workplace and the necessary attributes and sensitivities required of each space. The ultimate goal is to use this matrix and guideline as a tool to help design a more informed office for a specific client, Communications Pacific, who has agreed to participate in this hypothetical design project, which will be a renovation of an existing office space in downtown Honolulu. The spaces determined as necessary in creating the Human+Nature Office include Lobby &
Information, Common Gathering Space, Mover Space (Circulation & Cooridor), Public Purpose Space (functionally required), Collaborative Space, Recreation Space, Retreat Space (respite), Meeting Room (enclosed space), Meeting Space (not fully enclosed space) and Individual Work Space (office or workstation). There are two main sets of attributes that are important to each space, the Operational Attributes and the Biophilic Human Needs attributes. The Operational Attributes are the quantitative attributes that are necessary for the office to function. These attributes include Environmental Factors, Users, Public/Private Relationships, Awareness of Time of Day, Emotional Dispositions and Clarity of Wayfinding. The Biophilic Human Needs attributes are the qualitative attributes, like comfort and emotional and experiential qualities that are necessary for the health and satisfaction of human beings. I have identified a set of Biophilic Human Needs attributes that are necessary for humans to be comfortable and satisfied in the office environment. These include Social Engagement, Sense of Control, Fascination, Prospect and Refuge, Involvement in the Environment, Understanding the Environment and Connection to Place and Culture. These terms will be defined and explained in the research portion of this paper.

The matrices will outline a specific space on the vertical axis, for example, the Common Gathering Space, and on the horizontal axis it will list either the Operational Attributes or the Biophilic Human Needs attributes, depending on what matrix you are using, this will allow a designer to know what sensitivities are required of each space. Each attribute will help to improve the way employees’ work and will contribute to an employees’ overall positive physical and mental well-being while also promoting a more sustainable work environment. These strategies will be used to renovate and transform an existing office space in Honolulu into a Human+Nature Office for a specific client. This project will serve as a model for reusing and improving offices in aging glass-skinned high-rises, giving the building new life and relevance by enabling them to improve the way people work and live, while being environmentally responsible.

The following design methodologies will be utilized in order to identify the problem with offices today and in the past and to help prove and explain my hypothesis that the integration of nature in the workplace will benefit the well-being of the occupants and thus make them happier, healthier and more productive employees.

The Interpretive-Historical methodology will analyze and compare data about the impact that office buildings have on the health and well-being of its occupants and what
interventions were successful in creating a healthy environment. There is evidence that offices are detrimental to the health and well-being of its occupants and this affects work performance and job satisfaction. Issues in an office building that have a negative impact on the occupant will be identified. Issues explored will include inadequate ventilation, chemical contaminants from indoor sources like adhesives and VOCs (Volatile Organic Compounds) and biological contaminates like mold and bacteria. Also included will be factors that affect the occupants’ mental well-being such as no views to nature, not enough natural light and poor noise control. I explore how therapeutic components such as natural lighting, natural ventilation and direct and representational contact with nature have eliminated these issues. I explore the challenges that offices face and will identify therapeutic components that were successful in mediating or eliminating these problems. Some of the techniques used to address these issues include different levels of privacy, task lighting instead of overall lighting, windows with views to nature, and walls decorated with nature themes.

The Case Study method will be employed to study how offices and other building types have successfully integrated nature to benefit the well-being of its occupants and the surrounding environment. Historic precedence examples will be studied as well as first hand interviews of contemporary projects done in Hawaii. Specific Biophilic and sustainable techniques will be identified in each case along with the positive outcome from each intervention. Post occupancy evaluations will be reviewed when available to determine the effectiveness of each intervention.

Experimental Simulation methodology was used to compare an existing office condition to a simulated intervention of the office space that incorporates more access to nature. I will analyze responses from a group of subjects to indicate the effectiveness of the prescribed intervention. The group was shown three images of an office space simulated to show different levels of biophilic elements. The group viewed the pictures and filled out the following questionnaire.

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1. How would you rate the quality of light in this workspace? 1 (poor) – 5 (ideal)
2. How comfortable does this workspace appear?
   1 (uncomfortable) – 5 (very comfortable)
3. How healthy does this work environment appear? 1 (unhealthy) – 5 (very healthy)
4. How effective is this workspace at providing relief from stress?
   1 (no stress relief) – 5 (Very effective)
5. How relaxing is this workspace? 1 (not at all) – 5 (very relaxing)
6. How favorable would this place be to work? 1 (not at all) – 5 (very favorable)

The most effective interventions were further tested in the design of the hypothetical Human+Nature Office for a specific client.

Logical Argumentation Research Methodology is used to reveal how specific biophilic techniques used in one setting, for example a hospital, can spawn secondary studies of the same techniques as applied to a different setting, for example an office. The goal is to establish a set of normative design standards that have been proven to work in the hospital. A correlation will be established between the needs and desires of hospital patients and office workers, and will finally conclude with the logical argument that if the needs of office workers are similar to the needs of hospital patients, for example stress relief, then the techniques used in the primary setting should apply to the secondary setting.
Doctorate Project Statement

This study will explore strategies to improve the office environment by understanding and designing for the demands of the modern 21st century workplace and the way people work as well as creating spaces that support the Biophilic human needs of the employee. Millions of people spend a good portion of their day and life working in an office so it should be a place that enhances the way they do work and fosters quality of life and good mental and physical well-being with the hope that a better work environment will lead to more satisfied and productive employees.

There is evidence that the traditional office model does not support the way that businesses and people work in today’s modern environment. I will be identifying public space typologies and amenities that can support and enhance the way that people work in today’s modern environment where mobility, knowledge exchange and collaboration are valued. This is just a starting point that will be tailored to a specific client and their business. The workplace strategy and culture of the unique client will determine the amount or need of individual workstations or offices as well as the amount and type of public and amenity spaces as well as private spaces.

Research has also shown that offices in an urban setting that are closed up and offer only limited views to the outside are detrimental to the health and well-being of its employees and result in unhappy employees and decreased productivity. There is evidence that the integration of nature and its spatial and experiential properties in the built environment have a positive effect on the well-being of its occupants. I will be identifying a set of Biophilia human needs, which come from the belief that humans have an innate need to connect with nature and humans, to create office spaces that support and enhance the physical and mental well-being of its occupants while also benefiting the surrounding environment.

In summary, it is important to address both the demands of the modern workplace as well as the demands of the human being when designing the Human+Nature Office. Designing with the necessary attributes of both the workplace and the human being enable people to be more productive and satisfied with their jobs which ultimately allow the organization to fulfill their goals, creating a strong reason and incentive to create better work environments.
Chapter 1: Designing for well-being

Biophilia

People from all over the world have embraced the idea that exposure to nature can benefit the physical and psychological well-being of people and reduce stress from urban life. Even with this widespread belief it is still difficult to determine the value of green spaces and the reasons why it is so vital to the wellbeing of humans. The concept of Biophilia will be used to help explain why humans are attached to nature and what types of benefits can be derived by having contact with nature in the office environment.

Biophilia is the theory that humans have an innate attraction and fascination with natural systems and processes. Humans evolved from a natural environment and depended on nature and the spatial and experiential qualities of nature for their comfort, wellbeing and survival. This predisposition in early humans to response positively to nature contributed to their fitness and survival. Stephen Kellert, co-editor of the Biophilia Hypothesis, argues that the human need for nature is linked not just to the material exploitation of the environment, but also to the influence of nature on humans’ emotional, cognitive, aesthetic and even spiritual development. In today’s modern world humans continue to depend on these qualities to provide comfort and to help navigate the built environment.

During human evolution there were both rewards and dangers in the natural setting, making it necessary for humans to learn both positive, or biophilic, responses as well as negative/avoidance, or biophobic responses to certain natural stimuli and settings. Since humans spent ninety-nine percent of their history as hunter-gatherers it is perhaps the reason why people are still attracted to water and trees, but are afraid of snakes and darkness. Humans are biologically prepared to acquire and especially not forget adaptive biophobic responses to certain natural stimuli and situations that have presented survival-related risks throughout evolution.

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Kellert and Wilson define nine categories of human’s evolutionary dependence on nature as a basis for survival and personal fulfillment.

1. Utilitarian: the physical benefits derived from nature as a fundamental basis for human sustenance, protection and security.
2. Naturalistic: satisfaction derived from direct contact with nature. It encompasses a sense of fascination, wonder and awe derived from an intimate experience of nature's diversity and complexity.
3. Ecologicistic-Scientific: urge for precise study and systematic inquiry of the natural world and the related belief that nature can be understood through empirical study.
4. Aesthetic: physical beauty of nature one of the most powerful appeals of humans.
5. Symbolic: human use of nature as a means of facilitating communication and thought.
6. Humanistic: deep emotional attachment to individual elements of the natural environment. Usually directed at sentient matter, typically larger vertebrates
7. Moralistic: strong feelings of affinity, ethical responsibility and even reverence for the natural world.
8. Dominionistic: desire to master the natural world. Perspective more relevant to earlier periods of human evolution. Its occurrence today is associated with destructive tendencies and waste. From the perspective of an office setting it can be viewed as having a sense of control over your space or control over wayfinding.
9. Negativistic: sentiments of fear, aversion, and antipathy toward various aspects of the natural world.

Today humans still depend on nature for utilitarian benefits and personal survival, but the modern, especially urban, built environment does not offer enough contact with nature to provide us with the other part that people depend on nature for, which is personal fulfillment. This personal fulfillment is important for psychological and physical well-being.
The three types of Biophilic responses to nonthreatening natural landscapes are: liking/approach response, restoration or stress recovery responses and enhanced high-order cognitive functioning.

**Liking/approach response**

Modern humans have a partly genetic predisposition to like or visually prefer natural settings having savanna-like or park like elements such as spatial openness, scattered trees or small grouping of trees, and relatively uniform grass cover.7 A conclusive study of people from Europe, America and Asian has shown that they all had a universal preference for natural landscape scenes over urban or built views, especially if the urban view had no natural content.8 Another study of a group of people from the United States, Europe and Japan focused on the preference of trees and other vegetation in urban or built environments. The finding showed that people attached a higher liking to urban scenes containing nature than to similar urban settings without nature.9

**Restorative Responses**

1. **Functional–Evolutionary Perspectives:** certain natural settings create a restorative response that was necessary for early humans to help recharge their physical energy, rapid attenuation of stress response following an encounter with a dangerous threat, and rapid reduction of aggression following conflict with other humans.10

2. **Restorative Effects of Viewing Natural Settings:** On studies of stressed individuals, viewing unthreatening natural landscapes tends to promote faster and more complete restoration from stress than does viewing urban or built environments lacking nature.11 It suggests that biophilic responses to natural landscapes extends...
far beyond aesthetic preference or liking to include broadly positive shifts in emotional states and positive changes in activity levels in physiological systems.

3. Health–Related Effects of Viewing Natural Scenes: Restorative effects of natural views are often greatest when people experience high levels of stress or anxiety and are obliged to spend long periods in confined situations such as hospitals, prisons and high-stress work environments. Studies of visual décor in office settings show that people in windowless offices used more nature posters and photos to decorate their work spaces than did people in windowed offices where views of nature were available.

4. Long-term or frequent views of nonthreatening nature may have persistent positive effects on psychological, physiological, and even behavioral components of stress that can contribute to wellness.

Effects on High-Order Cognitive Functioning

Effects on High-Order Cognitive Functioning is defined as tasks that involve processing diverse materials or associating previously unrelated information or concepts. It has been proven that stress can negatively impact performance on cognitive tasks. Rachel and Stephen Kaplan have speculated that exposure to nature can promote recovery from mental fatigue stemming from work situations involving prolonged, directed, effortful attention.

Biophilic Design

Biophilic Design is design that incorporates nature to evoke a positive, valued human experience in the built environment. It comes from the concept of Biophilia, which as described earlier believes humans have an innate attraction and fascination with nature and life-like processes.\textsuperscript{15} This affinity and dependence on nature has a biological origin based on humans evolving in a natural, not artificial or constructed world. This biological need is still present in humans today therefore contact with nature is vital to human health, productivity and well-being.\textsuperscript{16}

This study will utilize Biophilic Design principals to benefit the well-being of office occupants. It will also integrate sustainable design or low environmental impact design to minimize the building’s impact to the natural environment. The combination of Biophilic Design and sustainable design is called Restorative Environmental design.\textsuperscript{17}

Restorative Environmental Design

Restorative Environmental Design is a synthesis of sustainable design and Biophilic Design. Its goal is to promote positive contact between people and nature in the built environment, while minimizing the negative effects of building development on the natural environment. Biophilic buildings must be sustainable, but should always fostering positive connections between people and the natural environment in order to enhance human well-being. Without this human connection to nature, long term sustainability will be difficult to achieve no matter how many advances are made in technology. Technology is always changing, but a beautiful building that provides positive connections to nature will always be a great building that people will be motivated to maintain and sustain over the long term. Current sustainable design efforts have been focused solely on low-environmental impact design that avoids harm to the natural environment.\textsuperscript{18} This effort is based on environmental and economical benefits and ignores the importance of long-term sustainability, which is only possible by restoring people’s relationship with nature in the built environment.\textsuperscript{19}

Low-environmental-impact design is not focused on benefiting productivity, health and

\textsuperscript{15} Stephen Kellert, Biophilic Design (Hoboken: John Wiley and Sons, Inc., 2008), 3.
\textsuperscript{17} Stephen R Kellert, \textit{Building for Life} (Washington DC: Island Press, 2005), 93.
well-being of its occupants and consequently is rarely sustainable over time. Instead it focuses on issues of energy efficiency, use of renewable energy, maintaining good indoor air quality and avoiding habitat destruction and loss of biological diversity.

**Organic/Naturalistic & Place-based**

There are two main categories of Biophilic Design, organic or naturalistic dimension and place-based or vernacular dimension. According to Kellert organic or naturalistic dimension includes "...shapes and forms in the built environment that directly, indirectly, or symbolically reflect the inherent human affinity for nature." Direct experiences include views and contact with plants, animals and other elements in their natural setting and exposure to daylight. Indirect experiences include nature that requires human intervention for survival. These include potted plants, water features, vegetated roofs and walls, and aquariums. Symbolic experiences with nature do not involve real contact with nature, but instead depend on representation. These include decorative symbolic forms inspired by nature, use of natural colors and artwork or photos of nature scenes.

Place-based or vernacular dimension include buildings and landscape that are tied to the culture and ecology of the region or geographic area. This has also been termed a sense of place or spirit of place and reflects how buildings and landscape become an important part of peoples' identity taking on life-like qualities and giving life to the people. In order for people to want to sustain a building or landscape they need to have a connection to the culture and ecology of the place. "Despite the modern inclination for mobility, most people retain a strong physical and psychological need to calling some place “home” said Kellert. This attachment to place is the reason why people have the desire and willingness to

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sustain buildings and landscapes. Without this attachment to a place people have no motivation to sustain buildings and landscape for the long-term.

**Evidence Based Design**

“Evidence based design is the process of basing decisions about the built environment on credible research to achieve the best possible outcomes.”

Evidence Based Design (EBD) has been used to justify the real and perceived extra cost and time that may be required to implement Biophilic Design and sustainable design. Decisions are made based on solid, reliable information and positive outcomes and performance that can be measured. Clients are always interested in improving the financial performance of their business. Architects will be more convincing if they can provide evidence of design’s positive influence on financial performance. Other clients are more concerned with performance outcomes instead of financial. Hospitals want to know clinical outcomes, educators want to know student performance and businesses want to know effects on employee turnover and productivity.

EBD has been commonly used in healthcare design where patient safety and improved clinical outcomes are vital. If there is evidence that the use of nature and natural elements in the design of hospitals can benefit the well-being and recovery of patients, this is a compelling reason to incorporate these features. Evidence that shows how exposure to natural light can increase productivity and focus of hospital staff also make a strong case for the inclusion of nature in the design of hospitals.

EBD has also been used to justify sustainable design especially in its infancy when it was new and less understood and accepted. Implementing sustainable design practices have the perception of being more expensive, time consuming, complicated and unnecessary. EBD helps to make a compelling case for sustainable design by using credible evidence and research that justifies every element of the design and ties it to positive outcomes that the client can appreciate. EBD is research informed design that will help clients define

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sustainable design techniques that make sense for their building allowing it to be truly sustainable.

Similar to how EBD was used to make the case for sustainable design I believe it can be used to justify the integration of nature, or Biophilic Design in the workplace. Many people spend most of their day at work and thus the work environment is a major influence on their quality of life and well-being as well as job satisfaction and productivity. Case studies can provide valuable data of techniques used and the resulting outcomes. If there is evidence that shows employees are happier, healthier and more productive when they have access to nature then this creates a strong argument for companies to integrate nature into their workplace.
Chapter 2: Problems with the office environment

This study will first examine the past and current problems that offices face and what can be done to mitigate or eliminate these problems. Offices today do not always support the way people work and the values of the organization. Space is often distributed based on historical models instead of the needs of the business and often the layout and design of the office contradicts the values of the organization. The rising cost of real estate and more awareness of employee well-being have allowed businesses to use the office as a tool to enhance the way people work and live.

Demands of the 21st century office

The traditional office model supported the isolating culture of many 20th-century offices that were designed to be “…hierarchical containers for work, populated by largely sedentary workforces unable to share ideas with clients or colleagues on account of the status-driven, departmental, static division of space.”29 Many early modern offices were designed to keep people apart and to discourage conversation and social contact, believing that a dull, monotonous environment would enable concentration and a good work ethic.30

According to Judith Heerwagen, psychologist and editor of Biophilic Design, the direction of office design is moving toward a network of places for collaboration, socialization and the need to see people. She added that the traditional enclosed office wants to go away. Even the idea of a cubicle for every employee is being challenged because it doesn’t make sense to have workstations for 150 people when half that number actually use and need a cubicle space.

Arnold Levin, Workplace Strategy Director at architecture firm NBBJ, said that historically clients would spend their money on the public on-stage spaces like the reception and lobby, areas that their clients could see. These often costly lobbies did not serve any function other than just being an idea of the brand. The back office area where the employees worked were not designed thoughtfully and often did not have the spaces necessary to do their job effectively. Levin said that one of the more progressive models that he uses when designing

an office is called “Activity-based Work Model,” which distributes space based on the activity of the employee regardless of their position. For example, if an executive of a company spends most of their day on the road meeting with clients than they get a small work station, whereas a researcher who spends 100 percent of their day in the office will get their own office to support the way they work.

Levin said that it is important for designers and planners to have a conversation about how work is being done by understanding and engaging in the clients’ work processes. One of the tools that he uses is called the “Day in the Life” where he takes a typical individual of a department and maps how they use space throughout the day. He also does brainstorming sessions and asks employees what in the office do they want to keep, toss or need to create. This helps to determine if space is being used effectively and where space needs to be redistributed.

He said it is also important to understand the younger generation of workers so designers can support the way they live and work. An example of this is mobile technology and how it has allowed people the flexibility to work anywhere they want. There is a need to support this mobility while also supporting the need for employees to interact and collaborate with each other in person.

According to Levin the main driver for all workplace design strategies has been a reduction of real estate cost. The need to reduce cost creates an opportunity to examine how the real estate is being used to come up with a workplace design strategy that reduces cost and improves how people work. Reduction in cost is a tangible driver, but it is the intangible drivers that improve employees’ work processes. These include maximizing flexibility, maximizing the use of space and providing the accommodations necessary to support the business.

**Offices do not support health and well-being**

Climatically controlled buildings that use primarily artificial lighting, lack natural ventilation and use materials and products with toxic VOCs are detrimental to the physical and mental well-being of employees. Studies have found that offices that incorporate natural lighting and ventilation, use natural materials and allow for direct and

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representational contact with nature have higher levels of job satisfaction, higher productivity and improved physical and mental well-being.  

**Poor Indoor Air Quality**

The main sources of indoor air pollution in hermetically sealed buildings are synthetic materials that off gas, poor natural ventilation and human bioeffluents, which are a source of pollution from humans’ biological processes. Buildings continue to be sealed hermetically to maximize energy efficiency by reducing fresh air exchanges. Unfortunately fresh air is needed to help control indoor air pollution by replacing stale air with fresh outside air. Materials used in modern construction are made up of synthetics that are put together with glues and resins. These materials include carpets, paints, particle board, upholstery, electronic devices and wall coverings that emit hundreds of volatile organic chemicals (VOCs) into the air. The building industry recommends that people allow building materials and furnishings to off gas before bringing them into the building, which decreases the amount of VOCs that occupants are exposed to. Human bioeffluents can also affect the indoor air quality. Spaces that are at high risk for human bioeffluents are closed poorly ventilated areas with a lot of people. People can release upwards of 150 VOCs into the air. Increasing ventilation rates and having local filtration instead of central can reduce bioeffluents.

**Sick Building Syndrome (SBS)**

Offices with low ventilation rates, air conditioning, higher indoor temperatures and increased levels of pollutants are the main contributors to Sick Building Syndrome (SBS). “SBS symptoms are acute symptoms, such as eye and nose irritation and headache, associated with occupancy in a specific building, but not indicating a specific disease,” said Lia Johnson. Diseases that can be attributed to a specific cause are called Building-Related-
Illness (BRI) and include lung cancer from asbestos exposure and legionnaire's disease from bacteria from stagnant water in HVAC systems.\(^{40}\)

Although the cause or origin of the SBS cannot be determined occupants who leave the building for an extended time see their symptoms disappear, but when they return to the building the symptoms come back.\(^{41}\) Other problems include skin disorders, excessive fatigue as well as physical and psychological ailments that can result in high absentee rates, poor morale, decrease in productivity and clinically diagnosed disorders.\(^{42}\) One study found that increasing ventilation rate by 10 cubic feet per minute per person would decrease the SBS symptoms by one third. A survey of 100 U.S. offices showed that 23 percent of office workers or 64 million workers commonly experienced two or more SBS symptoms while at work.\(^{43}\) The estimated decrease in productivity of office workers due to SBS is 2 percent, which results in an annual loss of $60 billion.\(^{44}\)

**Acute Respiratory Illness (ARI)**

Acute Respiratory Illness includes influenza and the common cold and have been linked to indoor air quality. Eight studies of building occupants found a 23 to 76 percent reduction in ARIs among those who occupied buildings with greater ventilation rates, less space sharing, less occupant density and the use of ultraviolet light to irradiate the air.\(^{45}\) Another study found a 35 percent decrease in absenteeism in buildings with higher ventilation rates. If these attributes are applied to the number of office worker's suffering from ARI it would result in an estimated 16 million to 37 million potentially avoidable cases of the common cold and influenza, which could result in an productivity gain of $6 billion to 14 billion based on the $70 billion cost of ARIs.\(^{46}\)

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Office Preference Experiment

Experimental Simulation methodology was used to analyze responses from a group of subjects to indicate the effectiveness of the prescribed Biophilic intervention. A group of 27 students were shown three pictures of an office space simulated to show different levels of biophilic elements that were not described or explained to the subjects. (See Figure 2-4) The group rated the space on a scale of 1-5 based on a set of questions.
Figure 2: Sample A: Natural Light from perimeter windows, white walls, no plants.

Figure 3: Sample B: Natural Light from windows and clerestories, potted plants and colored walls.

Figure 4: Sample C: Natural light from windows and clerestories.
Question one asked:

“How favorable would this office environment be to work?”
Rate 1-5 (5 most favorable)
The majority of the group identified Sample B as the preferred place to work, which scored 87 points out of a possible 125, with Sample C scoring 77.5 and Sample A, 61. This shows that the addition of biophilic elements creates a more favorable work environment.

Question two asked:

“Which work station would you choose and why?”

My hypothesis was that people would always prefer a workstation near the window for natural light and views to the outside, so it was no surprise that the majority of subjects chose workstation 4 and 5. What was interesting was the workstations near the core, 1, 2 and 3, became just as desirable and sometimes more desirable than the workstations near the window, with the introduction of more daylight in Sample C and more daylight as well as natural colors and indoor plants in Sample B. This is evidence that nature can improve, and make more desirable, work spaces that do not have direct window views to nature.

Figure 5: Sample A: Windows at the perimeter
Figure 6: Sample B: Windows, clerestories and colored walls

Figure 7: Sample C: Windows and clerestories
Chapter 3: Benefits of Nature in the Office

There is a growing body of evidence that access to nature, including natural light and natural ventilation, in the workplace promotes physical and mental well-being while also increasing productivity and job satisfaction. Satisfaction with the environment is closely related to job performance. According to the 2008 U.S. workplace survey by Gensler, 90% of office workers indicated that better workplace design and layout results in better overall performance. Office workers spend a good portion of the day in the office so a pleasant setting will positively reinforce their efforts to further the company’s interests. My hypothesis is that if nature is integrated into offices, businesses will see an increase in morale and employee retention, an increase in productivity, a decrease in sick building syndrome and overall healthier well-being in all aspects of their life. Having access to nature in an urban environment gives employees a place to walk, observe nature and think. These health benefits extend beyond work, where employees are more satisfied with their homes, their jobs and their lives.

Stress reduction

Many corporations are investing in stress management strategies because they know that stress is a problem that affects employees’ performance and satisfaction. “According to 2004 data from the American Institute of Stress, work-related stress and resulting accidents accounted for 75-80% of absenteeism.” 49 “...this leads to an annual cost of over $300 billion dollars.” 50

Office workers with window views to nature have less stress and improved physical and mental well-being compared to workers with no view. A study involving European office and factory workers showed that just viewing nature reduced job-related stress as well as improved their psychological well-being. 51 A study of American office workers showed that

47 The Gensler Design + Performance Index The U.S. Workplace Survey
employees who had window views had less job-related stress and frustration and better physical and mental well-being than the employees who had no view. Looking out the window provides a brief distraction and restoration from stress that gives workers a sense of relief and relaxation.

**Natural light and ventilation**

Research by the Lighting Research Center at Renselaer Polytechnic Institute have found a connection between sunlight exposure and melatonin production, which control circadian rhythms, sleep cycles, task performance and cancer cell development. Lack of melatonin from the sun causes circadian imbalance which results in loss of sleep, poor coordination, carbohydrate cravings, depression and susceptibility to disease. In a study of night-shift workers the use of large skylight simulating fixtures meant to replicate natural light was effective in improving short-term memory and grammatical reasoning. “Several studies report that workers with natural ventilation and natural lighting demonstrate more focused attention and superior cognitive performance than those in artificially lit and ventilated settings.” Multiple studies have shown that offices with natural lighting and natural ventilation improved employees’ attention and cognitive performance. The use of natural lighting and ventilation has been attributed with a 6 to 16 percent increase in the productivity of office workers.

Natural ventilation in offices has many positive benefits to occupants including reduction in SBS, headaches, colds and circulatory problems. Carnegie Mellon’s Center for Building Performance and Diagnostics (CBPD) have conducted over 270 field studies that show the benefits of natural ventilation and mixed-mode HVAC

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systems, which support the use of both natural and mechanical ventilation. CBPD has found that natural ventilation and mix-mode conditioning systems can provide 0.3-3.6 percent health cost savings, 0.2-18 percent productivity gains and 47-49 percent HVAC energy savings that results in an average return on investment of 120 percent. Based on current research showing the benefits of natural ventilation, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has increased their ventilation rate standard from 10 cubic feet per minute to 20 cubic feet per minute. A 1990 multiple-building field study of 86 workers in 43 office buildings in the UK found a 59 percent decrease in SBS symptoms and a 9 percent reduction in absenteeism among workers in naturally ventilated buildings compared to workers in air-conditioned buildings.

**Access to nature**

Offices that are closed up and offer only limited views to the outside are detrimental to the health and well-being of its employees and contribute to unhappy employees and decreased productivity.

Research has shown that proximity to windows and seated views to nature can be attributed to lower stress, reduced sick building syndrome, increased task performance and overall improved emotional health. A survey of over 2,000 employees of two buildings at the U.S. Department of Energy, Carnegie Mellon University’s Center for Building Performance and Diagnostics found that employees with a seated window view of nature had a 10-20 percent reduction of symptoms of sick building syndrome. (See Figure 8).

The survey did not indicate what the user attributed to personal health, whether it be light,

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view, perimeter conditioning systems, or increased level of environmental control at the windows (blinds, HVAC controls).66

A study of American office workers showed that employees with a window view experienced less work-related frustration and better health than employees with no window.67 A productivity study found that workers who occupied offices with plants had fewer errors and were more productive doing computer tasks compared to the workers who did not have plants.68 A study on job stress called the “Job Pressures Project,” found that access to nature in the workplace is related to lower levels of job stress and high levels of job satisfaction.69

Carnegie Mellon’s CBPD team have done research that links access to nature, which includes natural light, window views to nature, natural ventilation and indoor nature, to health, energy and productivity of employees.70 (See Figure 9)

Figure 8: Comparison between window proximity and sick building symptoms at two USDOE offices71

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Employees who had views of nature felt happier and more satisfied with their jobs than employees with no views of nature. Another study found that employees with windows had substantially less SBS symptoms than employees who worked in the windowless core of the building. The Heschong Mahone Group did a field study testing the affects of windows and natural light on 100 full-time customer service representatives at the Sacramento Municipal

Utility District.\textsuperscript{74} They found that call center employees who had seated views of nature through large windows had a 6-7 percent faster call handling time, which is a standard measure of productivity, compared to employees who had no views to nature.\textsuperscript{75}

![Figure 10: Amount of SBS symptoms when plants were present or absent in the space](image)

Another study showed that employees with no window had a tendency to decorate their space with potted plants and pictures depicting nature more so than employees who had no window views to nature.\textsuperscript{76} This shows that employees have an affinity to nature and that it can make their space more comfortable and easier to work in. A study on the impact of potted plants on “…self-assessed health symptoms…” of 51 employees at a Norwegian company found an average 21 percent reduction in reported SBS symptoms when indoor plants were present in the office.\textsuperscript{77} See Figure 10 above, which shows the correlation between SBS symptoms and the presence or absence of indoor plants.

\textsuperscript{74} Stephen R. Kellert, Judith H. Heerwagen, and Martin L. Mador. \textit{Biophilic Design}. (Hoboken: John Wiley and Sons, Inc., 2008), 120.


Case Studies

223 Yale NBBJ

The concept behind NBBJ’s new 77,000 sq. ft. LEED Gold office was to create a workplace that was sustainable not only to the environment, but also to the people who worked there. Through an analysis of the employees’ and their work processes, the design team found that people valued the ability to connect and collaborate with each other and their old offices did not always support that because they were divided between six floors and conference rooms were closed off and out of sight. Common areas were placed away from major circulation paths making them less accessible and less used. In their new office they chose to have two larger floors versus six floors and to promote connectivity between the floors they designed this central hub that runs through both levels. (See Figure 12, 13) Shared amenities like the kitchen, coffee bar, library and the model shop, were brought to the central hub. Designated informal critique areas and open meeting spaces with large tables were also situated in the central hub.

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78 NBBJ staff photographer, Second floor central hub, 2010, NBBJ Seattle
According to NBBJ principal Alan Young, the intent of centralizing these amenities and meeting spaces was to encourage people to see, hear and participate in the social and creative dialogue that happens at the firm. Workstations were designed around the hub on both levels encouraging people to walk through these common areas of activity to get from studio to studio, further encouraging encounters and connectivity between employees.

79 NBBJ, 223 Yale building plan, 2010, NBBJ Seattle
80 NBBJ, 223 Yale building section, 2010, NBBJ Seattle
Through employee feedback, public amenities like locker room and showers and a green roof deck for respite, were added to support the lifestyle and well-being of the staff.

![Diagram of sunscreens and motorized shades controlling light and solar heat gain. Floor and ceiling-level windows create a stack effect.](image)

One of the innovative sustainable features that have both, environmental as well as human benefit is the hybrid HVAC system that utilizes both operable windows and an under floor heating/cooling system. Air comes from diffusers in the floor, which people can adjust or turn off providing better occupant comfort. Due to Seattle temperate climate it is estimated that air conditioning may only be necessary less than 10% of the year, which mean energy and cost saving as well as maximizing daylighting and natural ventilation, which studies have shown increase productivity. (See Figure 14) Eighty-eight percent of the building is lit by natural lighting and 90% of the building is heated and cooled through operable windows. On the outside of the building fixed sunscreens and a motorized sun shades adjust throughout the day to help control light and heat loads.

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HOK Toronto Office

This adaptive reuse project designed by HOK used site selection as a key factor in choosing the building. The building is located in an urban area near public transportation and is surrounded by lots of restaurants and shops. The space had operable windows and a designated storage space for bicycles. Natural lighting was also a key component in the design of this office. (See Figure 15, 16)

Employee workstations were placed at the perimeter allowing views and natural light for each employee. Meeting rooms and support functions were placed at the core. To bring light deeper into the core of the building light colored surfaces and low panel light shelves were used. A daylight harvesting systems, which adjust artificial light based on the amount of natural light, was used to save energy and make the most of daylighting. Operable windows allowed for natural ventilation and air filtration technology reduced VOCs.

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Herman Miller Office by William McDonough

This 295,000 sq. ft. project is an office, manufacturing and distribution center for Herman Miller, a company with a history of conservation, recycling and interest in creating a better work environment.\(^{85}\) It was also part of a study conducted by psychologist Judith Heerwagen and her team, who looked at office and factory workers at Herman Miller who were moving from a traditional office into a new building that had green features, natural lighting and ventilation, access to nature and public spaces that encouraged interdepartmental communication.\(^{87}\) The building benefits from natural light and natural ventilation through the use of skylights, sloped glazing and operable windows. The building


also provides opportunities to connect with nature through views of the natural landscape and a constructed wetland that helps to filter storm water runoff.88

![Figure 18: Section showing the interior “street” of the Herman Miller Office in the middle](image)

The interior “street” or main circulation spine connects the offices at the front of the building with the high-production factory spaces at the back, creating opportunity for chance encounters between different employees.89 (See Figure 17, 18) Access to nature is provided through interior courtyards and outdoor planted areas, which include picnic areas and walking trails.90 This study by Heerwagen examined worker stress, satisfaction, motivation, health, performance and emotional well-being before, right after and 6 month following a move into the new office.91 Employees gave high ratings to the lighting, air quality, healthiness and overall design of the new building. They also valued the enhanced opportunities to connect with nature through improved views, restored wetlands and surrounding vegetation. They expressed feeling healthier, more satisfied with their job and feeling excited about work. These ratings also corresponded to a 20 percent increase in worker productivity nine months after the move.92

Architect’s Hawaii Office Renovation by Architects Hawaii Ltd.

According to Architects Hawaii designer David Bylund, the goal of this project was to create a more open collaborative environment for employees that included a range of work and meeting spaces. The guiding principle was to have senior staffers scattered through the office. This non-hierarchical, spatial organization gives Architect’s Hawaii a sense of transparency and encourages interaction between management and staff. It eliminated the private corner office or any closed offices on the perimeter, which block light from getting deeper into the core of the office. Bylund said this allows newer employees to witness and hear what senior staffers are doing which makes them aware of what is going on and helps them learn. There is a range of work and meeting spaces that include two small rooms for private phone calls or human resources conversations, small conference rooms, large conference rooms and more public open areas to meet. Bylund said that the core of what makes the place work is collaboration and the way people talk to each other.

The new office layout allows as much natural light as possible. Because all the workstations are open, there are no private offices. Low partitions allow vistas to the outside of trees and

people. The office is located on the second and third floor allowing them visual access to ground level landscaping. The low partitions encourage and enable collaboration between peers. “The openness that relates to light is absolutely congruent to how people need to work with each other,” said Bylund. The accounting department needs to be private and secure so it includes private offices. The positive outcomes of the new renovation include more spontaneous conversations and meetings in the diverse meeting spaces that allow different levels of privacy for staff to quickly meet and do what they need to do. The open office configuration also gives every employee natural light and a view out the window.

Figure 20: 40 South School Street reuses a neglected concrete building to create a mixed use building that improves occupant comfort while minimizing its impact on the environment.\textsuperscript{95}

\textbf{40 S. School Street by Philip K. White and Associates}

The 40 S. School Street building is a 10,604 sq. ft. LEED Silver adaptive reuse project of the old three-story Kaneda’s Catering building, which was built in 1963. Before the renovation the building was a neglected 3-story concrete building located just outside of downtown Honolulu. The building was renovated in 2007 by Philip K. White & Associates as a mixed use office and retail building. It is the new office of Philip K. White and Associates and interior design firm Philpotts and Associates who are the project architect and interior designers of the project as well as the owners of the building. This project has been awarded

\textsuperscript{95} Dayton Wong, “40. South School Street,” 2010, 40. South School Street.
LEED Silver and incorporates renewable energy, recycled and low VOC materials and products to minimize the impact on the environment.

![Figure 21: Lobby is naturally ventilated and the elevator runs off solar energy](image)

It also integrates nature into the space by giving all users a window view, natural light and access to a roof deck. The kitchen and meeting rooms are located adjacent to glass windows and doors that lead out to the outdoor deck. The outdoor roof deck is a social space used for parties. It is also a respite space allowing employees to take a break from their work and get some fresh air and sunlight. The roof deck is used for yoga once a week contributing to a healthier lifestyle for the building occupants. Bicycle parking and a rooftop shower/changing room encourage building users to bike or walk to work instead of driving, which reduces pollution, saves energy and contributes to a healthier lifestyle. White said that natural light has limitations in an office because it travels only so far. To allow more light deeper into the space, lower cubical walls were used, which also allow for easier collaboration with coworkers. An Ecoresin translucent wall panel was used in the corridor to provide natural light in an otherwise dark space. Motion sensor lights are used throughout the office to eliminate unnecessary artificial light as well as save on energy cost. Workspaces feature adjustable lighting controls and thermostats that give users control of their environment to maximize comfort.

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Natural ventilation was used in the vertical circulation tower, but the offices required a controlled climate due to its location and humidity. The vertical circulation tower that houses the elevator and stair has natural lighting as well as open vertical grills that naturally ventilate the space. White said that AC was necessary for the office spaces to protect the computer equipment from Hawaii’s moist humid air. Air pollution as well as noise from traffic were also factors in conditioning the space. To maximize occupants’ comfort and to save energy, zoned air-conditioning was used, which turns off the air when no one is in the space.

White believes that natural ventilation and light is appropriate in residential homes because of the good weather and cool trade winds. One of his clients demanded a fully air conditioning home and he agreed to do it as long as he could design it to work naturally ventilated as well. The power went out one day and the client had to open all the windows. They found that they actually were more comfortable and happier with the naturally ventilation that the AC and they didn’t turn the AC back on until a year and a half later.

![Figure 22: Photovoltaic panels provide solar energy to the building, while also creating a patio space on the roof.](image)

Shading is also an important element in preventing heat from entering the building envelope. Photovoltaic panels are suspended above the roof of the building creating a patio like shelter where employees can relax as well as creating airflow and shade for the building. Window overhangs block the low sun angles from the West and South West. All

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windows feature double-pane glass and retractable as well as permanent shades that help keep the building cool.

Although the firm has not measured any changes in productivity since the move, White has noticed that employees had a greater sense of professionalism and pride for the new LEED silver office and that it showed in their work.

Chapter 4: Space Typologies of the Modern Office

I have identified nine key space typologies that are necessary to support and enhance the way that people work in today’s modern office environment where mobility, knowledge exchange and collaboration are valued. These spaces include: Lobby and Information, Common Gathering Space, Mover Space, Public Purpose Space, Recreation Space, Meeting Space, Meeting Room, Collaborative Space, Offstage Space and Individual Work Space. I have also identified and defined a set of Operational Attributes that are required of each space. These attributes include Environmental Factors, Users, Public/Private Relationships, Awareness of Time of Day, Emotional Dispositions and Clarity of Wayfinding.
Lobby and Information

The Lobby and Information space is a public on-stage receiving space that transitions people from public to private. This space acts as the front door and helps to brand the identity of the business and its values and mission. It should be a pause point and give a sense of arrival and pride for employees who pass this threshold every morning before they start their day.

The environmental factors that make this space effective are natural light and prospects or distant views of the surroundings. Users of this space are employees, clients and visitors. The psychological passage of time in this space is that time moves slowly and so it is necessary to provide a positive distraction through education of the company's history and values as well as allowing for access to nature or an ambiance that has Biophilic elements like natural materials, colors and artwork of nature.

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98 Kursty Groves and Will Knight, *I Wished I Worked There! A look inside the most creative spaces in business* (Chichester: John Wiley & Sons Ltd., 2010), 14.
Common Gathering Space

The Common Gathering Space is an informal, multi-purpose recreation and social gathering space for employees, clients and visitors. It is the closest thing to true public space in an office. It must be a flexible space that supports large receptions as well as smaller informal gatherings. This space can be a key architectural feature near main entries, public circulation spaces or special designated places in the building. The environmental factors that make this space effective are natural light, an open and lofty multi-height space and views to nature. This space should be a landmark that aids in wayfinding and creates a sense of arrival.

99 NBBJ staff photographer, Giant Steps, 2010, NBBJ Seattle
Mover Space

Mover Space is a public space of constant movement with high user volume. This is often the main circulation or corridor that leads to different departments. It needs to facilitate clear movement, allowing people to transition from shared work spaces and amenities to the more private individual work spaces. The mover space is designed to be wider than a corridor to support not just circulation, but also informal meetings and breakout space. The environmental factors that make this space effective are natural light, controlled climate, views to the exterior and prospects or views of what’s ahead. The users of this space are employees, clients and visitors. Time goes by quickly in this highly active space and so legibility and efficiency of the space are important. This will also help mitigate the feelings of anxiety and stress as people try to get to their destination. This can be mitigated by having clear movement and visibility of spaces and departments, which provide people with assurance and a sense of control.

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Public Purpose Space

Public Purpose Space is a functionally required space that serves a specific function like a kitchen, copy room or library. This space must support an ebb and flow of user volume and yet facilitate a highly effective specific function. The environmental factors that make this space effective are light control, climate control and clarity of design. The users of this space are employees and clients. Awareness of time is heightened in this space so it is beneficial to provide a positive distraction though views to nature of natural elements and textures that provide sensory variability. The Public Purpose Space is a public amenity that should be located centrally and along a clear path from the main circulation giving everyone equal access as well as encouraging serendipitous encounters.

Recreation Space

A Recreation Space is an active respite space or a play space for employees to de-stress and expresses themselves physically while bonding and interacting with co-workers. It is place to establish common ground and trust as well as improve communication. “Playful spaces elicit a lightness of being that opens up lines of communication between people, helps them to try new things and sometimes is just plain fun.” It also can be a space that promotes creativity and aids in problem solving by allowing for tactile learning, or learning by doing. Kursty Groves, author of “I Wish I Worked There!,” calls this “explorative play,” which “...is the act of doing or making things to test and develop ideas.” This space benefits from having some form of entertainment that engages employees and brings them together. This space should also provide access to nature, which helps to reduce stress and to encourage social behavior.

103 Kursty Groves and Will Knight, I Wished I Worked There! A look inside the most creative spaces in business (Chichester: John Wiley & Sons Ltd., 2010), 109.
104 Kursty Groves and Will Knight, I Wished I Worked There! A look inside the most creative spaces in business (Chichester: John Wiley & Sons Ltd., 2010), 14.
105 Kursty Groves and Will Knight, I Wished I Worked There! A look inside the most creative spaces in business (Chichester: John Wiley & Sons Ltd., 2010), 14.
**Meeting Room**

Meeting Room is an enclosed conference room for more formal meetings between employees and clients enabling an exchange of ideas and knowledge. These rooms can vary in size and privacy to serve different functions from private one-on-one meetings to large group charettes or brainstorming sessions. The environmental factors that support this space are natural light, user-controlled climate, clean air and a sense of privacy and refuge. It benefits from having glass walls that allow for sound privacy and natural light, while still giving a sense of inclusion and participation for other employees. This is also a way to express the transparency of an organization, showing that they have nothing to hide.

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106 NBBJ staff photographer, conference room, 2010, NBBJ Seattle
Meeting Space

Meeting Space is an open or not fully enclosed meeting space that enables serendipitous encounters and spontaneous conversations that allow for an exchange of knowledge and ideas. These spaces often share space with circulation space or are adjacent to it. Because of the public nature of this space, it is more active than a Meeting Room and so it inherently provides less privacy and noise control. The openness of this space makes it more accessible and enables and welcomes participation from other employees that may be passing by and want to hear what’s going on, but do not want to feel committed to staying an extended length of time.

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107 NBBJ staff photographer, second floor central hub, 2010, NBBJ Seattle
Collaborative Work Spaces

Collaborative Work Spaces are spaces that are designed between or around Individual Work Spaces to support collaboration and knowledge exchange between employees. These spaces are more private than a “Meeting Space” and benefit from designated desk space and chairs. They support quick, informal meetings between workstations and aids in generating ideas through collaboration. Collaboration in these spaces can be “...in the form of iterative and continuous feedback.” It also allows for more instant feedback, instead of having to setup a meeting or send and wait for an email.

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109 Kursty Groves and Will Knight, I Wished I Worked There! A look inside the most creative spaces in business (Chichester: John Wiley & Sons Ltd., 2010), 13.
**Retreat Space**

The Retreat Space is a private or semi-private space for employees to go to, to step away from a stressful situation or task. It should be a respite that encourages calm and restoration. One of the key attributes of this space is having a sense of being away, physically and/or mentally. The environmental factors that make this space effective are a sense of privacy and refuge, natural light or artificial soft diffused light, controlled climate and a view out to something preferably a nature scene, which has its own restorative properties. Time is often distorted for employees that are stressed, so it is beneficial to provide them with an awareness of the time of day. It is important to provide a positive distraction to get a person’s mind off the time and their work if only for a short period. This space must be solely designated as a Retreat Space and not serve multiple functions like a break room or a locker room, which would not be compatible with the goal of respite. Wayfinding should be along a short, clear path, adjacent to Individual Work Space or the space where work is occurring.

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110 Dayton Wong, respite space, 2010, Seattle Childrens Belleuve
An Individual work space is a semi-private space that can be an open workstation, a more enclosed cubicle or even an enclosed office. The type and amount of individual work space will depend on the type of business and the employee’s work processes, or how they work. The environmental factors that make this space effective are natural light, a sense of privacy, controlled climate and a window view. The window view provides employees with restoration from stress as well as an awareness of the time of day. This space should be adjacent to Collaborative Spaces, allowing for impromptu meetings and knowledge exchange.

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I utilized theses spaces and attributes to create an Operational Attributes Matrix which lists the space typologies on the vertical axis and the operational attributes on the horizontal axis. A designer could use this to help determine the sensitivities required of each space. (See Figure 33). This set of spaces and attributes are not meant to be an exhaustive list, but instead it will serve as an informed starting point that will be tailored to a specific client and their business. The workplace strategy and culture of the unique client will determine the amount or need of individual workstations or offices as well as the amount and type of public and amenity spaces in addition to any private spaces.
## Operational Attributes

<table>
<thead>
<tr>
<th>Space Typologies</th>
<th>Environmental Factors</th>
<th>Users</th>
<th>Public / Private Relationship</th>
<th>Awareness of Time of Day</th>
<th>Emotional Disposition</th>
<th>Clarity of Wayfinding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobby &amp; Information</td>
<td>Natural light, line of sight of the surroundings</td>
<td>Staff, clients, visitors</td>
<td>Public wayfinding space, adjacent to Mover Space</td>
<td></td>
<td></td>
<td>Sense of arrival, clearly visible, identify company</td>
</tr>
<tr>
<td>Common Gathering Space</td>
<td>Natural light, open, lofty receiving space.</td>
<td>Staff, visitors, clients</td>
<td>Public receiving space, transition and buffer from public to private spaces</td>
<td>Awareness of time of day through views to the outside.</td>
<td>Anxiety, loss of orientation &amp; control: Need assurance, Sense of orientation</td>
<td>Clear movement with central focal point &amp; visual cues. Legibility is important.</td>
</tr>
<tr>
<td>Mover Space (Circulation/Corridor)</td>
<td>Natural light, Prospects (lines of sight), views to outside, interior landmarks to help orient</td>
<td>Staff, Visitors</td>
<td>Main public transition space that ties all spaces together</td>
<td>Awareness of time of day through views to the outside.</td>
<td>Relief from anxiety &amp; stress: Need assurance</td>
<td>Clear path from main circulation</td>
</tr>
<tr>
<td>Public Purpose Space (Specific Purpose/Function) Break room, Copy room, Library, etc.</td>
<td>Controlled light &amp; climate, clarity of design</td>
<td>Staff</td>
<td>Public, service space, Ebb and flow of traffic, Clear interface and boundaries</td>
<td>Awareness of time of day is heightened, benefit from positive distraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation Space</td>
<td>Natural Light, views to the outside</td>
<td>Staff</td>
<td>Semi-Private Space</td>
<td>Stress, directed attention fatigue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meeting Room (enclosed space)</td>
<td>Natural light, controlled climate, clean air, sense of privacy &amp; refuge</td>
<td>Staff, clients, visitors</td>
<td>Semi-Private, Clear interface and boundaries</td>
<td>Time goes by slowly. Allow awareness of time of day.</td>
<td>Anxiety &amp; Stress: Need assurance</td>
<td></td>
</tr>
<tr>
<td>Meeting Space (not fully enclosed space)</td>
<td>Natural light, controlled climate, clean air, sense of privacy</td>
<td>Staff, clients, visitors</td>
<td>Public, Clear interface, boundaries implied. Often share space w/ circulation or adjacent to it.</td>
<td>Time goes by slowly. Allow awareness of time of day.</td>
<td>Anxiety &amp; Vulnerability: Need assurance</td>
<td></td>
</tr>
<tr>
<td>Collaborative Space</td>
<td>Natural light and/or diffused light</td>
<td>Staff, Client</td>
<td>Semi-Private, adjacent to individual work space</td>
<td>Allow awareness of time of day, preferably through a window view</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retreat Space (Space to step away, Respite)</td>
<td>Natural light, noise control, sense of privacy &amp; refuge, view out to something</td>
<td>Staff</td>
<td>Private/Semi-private space, adjacent to purpose space or Individual Work Space</td>
<td>Time is often distorted. Allow awareness of time of day.</td>
<td>Stress &amp; Vulnerability: Need Restoration &amp; Respite</td>
<td>Clear path from Individual Work Space</td>
</tr>
<tr>
<td>Individual Work Space</td>
<td>Natural light, sense of privacy, controlled climate, window view</td>
<td>Staff</td>
<td>Semi-private space, adjacent to Collaborative Space</td>
<td>Allow awareness of time of day, preferably through a window view</td>
<td>Stress, anxiety</td>
<td></td>
</tr>
</tbody>
</table>

*Status of Health is an important attribute not listed because it applies to all spaces and should provide accessibility to all people using Universal Design when possible.*
After exploring these space typologies and describing their unique Operational attributes I felt that the spaces needed to be sensitive to the emotional disposition of the users of the space. For example the goal of a Retreat Space is to provide restoration and relaxation to employees who are stressed and vulnerable. The intention to address these emotional dispositions is there, but there is no methodology that informs the designer on how to create a calming, restorative space. This is when it became clear that the space typologies would benefit from being informed by the basic Biophilic human needs that a person has in any given environment. The next section describes the seven key Biophilic Human Need attributes and sensitivities required of each space typology.
Chapter 5: Biophilic Human Needs of the office

I have identified seven key Biophilic Human Needs that are necessary to maximize human well-being, comfortable and satisfaction in the built environment, specifically the office environment. These attributes include Social Engagement, Sense of Control, Fascination, Prospect and Refuge, Involvement in the Environment, Understanding the Environment and Connection to Place and Culture.

![Figure 34: Office of WOW Sendai features informal seating that promotes social engagement](image)

Social Engagement

People did not develop in isolation and so they naturally crave the companionship of others for identification, affection, belonging and survival. Offices should provide spaces for social support, collaboration and team building.

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Offices should be designed as a social landscape that encourages interaction and support, which promote confidence, self-esteem and a community of people with a common purpose.\textsuperscript{114}

Today's modern workplace must support the shift to a knowledge-based economy where mobility, knowledge exchange and collaboration are vital. Specific public spaces need to be designed to support knowledge exchange and collaboration. Provide places for employees to share ideas, collaborate and build bonds. Provide both sociopetal and sociofugal spaces so employees have the option to socialize or to step back and have their privacy. Sociopetal spaces facilitate social behaviors and interpersonal communication, while sociofugal spaces encourage solitude and privacy.

Research has also shown that exposure to nature also encourages cooperation and sociability.\textsuperscript{115} Therefore it is beneficial to provide window views of nature and access to indoor plants and representational forms of nature in office spaces.


Sense of Control

Sense of Control comes from early human’s desire to master and control the natural environment, which was necessary to provide for physical safety and a feeling of security. This also fulfilled people’s need for independence and autonomy, exercising resourcefulness and ingenuity to cope with challenges and adversity on their own.117

Today sense of control is just as important in the office setting. An employee’s ability to control their environment is directly related to their satisfaction and quality of experience. The most basic level of sense of control should be clarity of wayfinding so a person always feels in control of where they are and where they are going. Sense of control also extends to privacy, lighting, climate as well as access to information, like a resource library and Wi-Fi that allow employees to educate themselves and stay connected. It is necessary to provide for a variety of work settings that support employees’ work processes throughout the day.

**Fascination**

Fascination is a positive distraction, also called involuntary attention that lets our directed attention, or attention that requires focus, to rest. Humans have only a certain capacity for directed attention before fatigue sets in causing ineffectiveness and human error. There are two types of fascination, hard, which can be an exciting sporting event or soft, which can be experiencing a nature setting. Soft fascination is more effective at providing restoration from directed attention fatigue because it also allows an opportunity for reflection.

Other attributes that contribute to providing a positive distraction are a sense of being away, extent and compatibility. “Sense of being away” allows one to disengage from the task requiring directed attention, allowing it to recharge. This does not always mean a physical change of scenery, in fact it take more than just a physical change, it requires the mind to focus on something else like a view out to a nature scene, giving them a sense of being away.

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Extent is the amount of information richness necessary to create a whole other world or environment that engages the mind.\textsuperscript{123}

Compatibility between the environment, either built or natural, and one's purpose is important. If the space is intended to be a Retreat Space to provide respite then it should not be in the same space as a kitchen and eating area. The behavior of respite should come naturally and comfortable without second guessing whether it is appropriate behavior in the space.\textsuperscript{124}

\textsuperscript{123} Kaplan “The Restorative Benefits of Nature: Toward an Integrated Framework” 173
\textsuperscript{124} Kaplan “The Restorative Benefits of Nature: Toward an Integrated Framework” 173
**Prospect & Refuge**

A Refuge is a secure and protected setting in the natural or built environment that gives occupants a sense of privacy and protection.\(^{126}\) A Prospect involves having distant views of the surroundings allowing inspection and evaluation. This helped early humans locate food, identify dangers as well as opportunities and facilitate movement and navigation.\(^{127}\) Today Prospect and Refuge is still important for humans to feel safe, comfortable and in control in the built environment.

In the modern 21\(^{st}\) century office, where transparency and collaboration are valued, Prospect and Refuge becomes a challenge because the idea of a Refuge where no one can see you is being questioned. Ideally Individual Work Spaces and Meeting Rooms should have a sense of privacy and Refuge, but must also give employees views of their surroundings, or Prospects, as well as allow other people visual access to them, without feeling like someone is looking over their shoulder.


Involvement in the Environment

Human involvement in the environment depends on Sensory Variability, Information Richness and Enticement. Humans have always depended on a highly sensuous and variable natural environment for their survival and well-being. Sensory information like light, sound, touch, smell and other sensory conditions was used to help them decipher opportunities for shelter and food as well as threats. Offices can benefit from creating variations in color, texture, patterns and light that help define spaces and landmarks and also provides the sensory information that humans desire for satisfaction and well-being. This level of sensory variability also benefits from some order and organization when integrated into the built environment because too much variability can also cause confusion and anxiety.

Humans respond positively to an environment that is rich in information. This applies to the office typology where it can be used to create a more stimulating and engaging work environment. Integrating actual or metaphorical forms of natural patterns from nature can

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create similar variety, texture and details found in nature.\textsuperscript{130} These attributes can create an environment that can stimulate curiosity, imagination, exploration, discovery and problem-solving.\textsuperscript{131}

Figure 39: 3form Ecoresin provides sensory variability

Sensory variability and information richness can be accomplished by using modern products like 3form’s Ecoresin which integrate flowers, bamboo and other natural elements that create variations in light, shadows and color throughout the day. Of course every attempt should be made to also incorporate living indoor plants in the office, which naturally possess sensory variability, information richness and the added benefit of cleaning the air. Indoor plants can be used to divide spaces, create a more intimate Refuge space and create restorative Retreat Spaces.

A scene with enticement is a scene that suggests that more information can be acquired if you go deeper into the space.\textsuperscript{132} In nature this trait is characteristic of a trail that disappears around a bend or a brightly lit clearing in the woods that is partially obscured by trees and foliage.\textsuperscript{133} It was necessary for survival to have these signs and clues of a promising setting. This creates more involvement while moving through the environment because the mind is focused on the possibilities of what lies ahead and is encouraged by subtle hints that make the space legible and coherent.

\textsuperscript{130} Stephen Kellert, \textit{Biophilic Design} (Hoboken: John Wiley and Sons, Inc., 2008), 9.
\textsuperscript{131} Stephen Kellert, \textit{Biophilic Design} (Hoboken: John Wiley and Sons, Inc., 2008), 9.
\textsuperscript{132} Joye “Case for Biophilic Architecture” 307
\textsuperscript{133} Grant Hildebrand, \textit{Biophilic Design} (Hoboken: John Wiley and Sons, Inc., 2008), 267.
A major characteristic of a scene with enticement is when we have a view to a setting brighter than the one we are at.\textsuperscript{134} Light is an effective tool to create enticement and the promise of a pleasant setting, but it is important for people to move from dark to light so they can see before being seen to ensure their safety and satisfaction. One of the worst experiences an occupant can have is not being able to see what’s at the end of a corridor because it’s too dark.

\textsuperscript{134} Grant Hildebrand, \textit{Biophilic Design} (Hoboken: John Wiley and Sons, Inc., 2008), 267.
Figure 40: Repetitive elements, unifying textures and visual cues aid in understanding

Understanding the Environment

Understanding and making sense of one’s environment is a basic human need that is necessary for psychological well-being. If there is not enough information for a person to understand their environment it can cause frustration and hostility.\textsuperscript{136} Coherence and legibility are key attributes in understanding the environment.

Coherence provides a sense of order and aids in directing attention.\textsuperscript{137} Features should contribute to the organization, understanding and structuring of the landscape image. Coherence describes the micro attributes of the environment or a human’s picture plane,

\begin{flushright}
\textsuperscript{135} Dayton Wong, “Understanding in Nature,” ca. 2011, Manoa Valley. \\
\end{flushright}
relying on the two-dimensional aspects of a setting. These can include repetitive elements and unifying textures and color that help the scene come together.

Legibility includes the qualities that help predict and maintain orientation while navigating through a natural or built environment. It is the ease of navigating to and from a person's destination and knowing where one is at any given point. Legibility describes the macro environment, beyond what is seen in a human's picture plane. Visual cues, nodes, interior landmarks, clearly defined spaces all aid in making a space legible. Line of sight, being able to see where you are going, is also an important attribute that aids in legibility.

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140 Joye “Case for Biophilic Architecture” 307
141 Herzog “Searching for Legibility” 461
**Connection to Place and Culture**

People desire locational familiarity and a sense of belonging to a place. Buildings can provide geographic, historic, ecological and cultural connections to place, creating a deep connection to the building and a sense of stewardship, providing a strong motivation to sustain a building and environment over time.\(^{143}\) This motivation to sustain and preserve a building will save on the amount of resources and energy needed to demolish and rebuild a building that becomes obsolete. This maximizes the resources and embodied energy already invested in the building making the building truly sustainable.

Cultural connection to place encompasses the geography, history and ecology of a place creating a unique identity that is maintained by its people through tradition, events and architecture. Geographical connection to place helps to create feelings of familiarity, predictability and comfort.\(^{144}\) Historical connection to place gives a sense of participation and awareness of an area’s culture and history. Buildings that can make a connection to the past help people feel connected to the history of a place. Ecological connection to place

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acknowledges the unique ecosystem of a place such as watersheds, mountains and rivers, allowing the building to feel like a part of the environment.

The seven Biophilic Human Needs attributes that were described above were used to create the Biophilic Human Needs Matrix, which is a tool for designers to address the emotional and experiential needs of each space with the goal to increase comfort, satisfaction and efficiency. (See Figure 42, 43)
<table>
<thead>
<tr>
<th>Space Typologies</th>
<th>Social Engagement</th>
<th>Sense of Control</th>
<th>Fascination</th>
<th>Prospect and Refug</th>
<th>Involvement (sensory variability &amp; enticement)</th>
<th>Understanding (Coherence/Legibility)</th>
<th>Connection to Place and Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lobby &amp; Information</td>
<td>Social support, sense of belonging</td>
<td>Sense of control through clarity of wayfinding</td>
<td>Positive Distraction</td>
<td>Prospect: allow line of sight for clear navigation</td>
<td>Involvement &amp; engagement in the environment</td>
<td>Coherence &amp; Legibility: Must be a landmark,</td>
<td>Use of local materials and artwork provides comfort and satisfaction</td>
</tr>
<tr>
<td>Common Gathering Space</td>
<td>Informal, multi-purpose recreation and social gathering space</td>
<td>Flex space to allow for a variety of activities</td>
<td>Prospect: provide distant views of surroundings</td>
<td>Enticement can be used to bring people to this space</td>
<td>Must be a landmark, give a sense of arrival</td>
<td>Provide views to the outside, use local materials, acknowledge culture of area</td>
<td></td>
</tr>
<tr>
<td>Mover Space (Circulation/Corridor)</td>
<td>Extra wide corridors support serendipitous encounters and spontaneous meetings</td>
<td>Sense of control through clarity of wayfinding. Line of sight and other visual cues give user control, independence &amp; autonomy</td>
<td>Prospect: Benefits from a central focal point, which provides passage &amp; wayfinding. Simplifies travel by limiting options</td>
<td>Use of natural patterns, color, detail from nature that can stimulate imagination, exploration making travel seem shorter. Use light to entice and wayfind.</td>
<td>Coherence &amp; Legibility: Visual cues, nodes, landmarks, clearly defined spaces. Repetitive elements, unifying textures and color aid in understanding</td>
<td>Provide views of the outside help people feel connected to the place and also aids in wayfinding by acting as visual cues.</td>
<td></td>
</tr>
<tr>
<td>Purpose Space (Break Room, Copy Room, Library)</td>
<td>Provide casual seating and tables to encourage interaction and knowledge exchange</td>
<td>Provide a library and computers to empower people to inform themselves.</td>
<td>Prospect: line of sight to destinations from circulation space</td>
<td>Sensory Variability through the use of color, textures and light help define space and engage the user providing efficiency</td>
<td>Coherence: Use color, texture, patterns and other features that distinguish spaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreation Space</td>
<td>Place to interact and create a common bond between employees</td>
<td>Provide variety of activities allowing for choice</td>
<td>Provide a sense of being away both physically and mentally. Hard fascination through physical activity allows directed atten. to rest</td>
<td>Both. Create a sense of privacy while allowing for views of the surroundings</td>
<td>Enticement can be used to create the promise of a fun and relaxing space</td>
<td>Must be a legible space that is easy to find</td>
<td>Use of local materials, representational forms of nature, views to the outside provide comfort and relief from stress/anxiety</td>
</tr>
<tr>
<td>Meeting Room (enclosed)</td>
<td>Formal meeting space to exchange ideas and do business</td>
<td>Control over privacy, sound, light and climate, access to technology. Variety of room sizes/privacy</td>
<td>Both. Create a sense of privacy while allowing for views of the surroundings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FIGURE 42: 1 of 2**

H+N 81
### Biophilic Human Needs

<table>
<thead>
<tr>
<th>Space Typologies</th>
<th>Social Engagement</th>
<th>Sense of Control</th>
<th>Fascination</th>
<th>Prospect and Refuge</th>
<th>Involvement (sensory variability &amp; enticement)</th>
<th>Understanding (Coherence/ Legibility)</th>
<th>Connection to Place and Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meeting Space (not fully enclosed space)</strong></td>
<td>Social support, sense of belonging</td>
<td>Control &amp; mastery of environment</td>
<td>Positive Distraction</td>
<td>See without being seen</td>
<td>Involvement &amp; engagement in environment</td>
<td>Understanding &amp; making sense of the environment</td>
<td>Familiarity &amp; sense of belonging to a place</td>
</tr>
<tr>
<td></td>
<td>Informal meeting space, supports serendipitous conversation and exchange of knowledge &amp; ideas</td>
<td>Provide variety of break away spaces around circulation space</td>
<td>Public nature allows for less protection, but should provide prospects of surroundings</td>
<td>Must be legible and a clearly defined space</td>
<td>Use of local materials, representational forms of nature, views to the outside provide comfort and relief from stress/anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Collaborative Spaces</strong></td>
<td>Allow for sharing of information, builds social bond, trust</td>
<td>Sense of control through ease of access</td>
<td>Prospect: allow line of sight to co-workers</td>
<td>Legibility: clearly defined space, line of sight from individual work space</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Individual Work Space</strong></td>
<td>Should allow visual/physical access with fellow employees while providing privacy when needed</td>
<td>Control over privacy, sound, light and climate</td>
<td>Need positive distraction, something to look at to take a mental break from work</td>
<td>Prospect and Refuge: sense of protection as well as Prospects of the surrounding</td>
<td>Use of nature or colors, patterns and textures provide information to stay engaged</td>
<td>Views to the outside provide a connection to place</td>
<td></td>
</tr>
</tbody>
</table>

*FIGURE 43: 2 of 2*
Chapter 6: Benefits of Nature in other environments

Hospitals

Stress is a major problem in the healthcare field and affects patients, staff and families of patients. “Stress is defined as a process of responding to events, environmental features, or situations that are challenging, exceed coping resources, or threaten well-being,” said Kellert.145 Patient stress triggers psychological responses including feelings of fear, anxiety, sadness and helplessness.146 Stress can cause an increase in blood pressure and heart rate and increase levels of steroid and stress hormones that tax the heart and other major organs.147 These lead to physiological responses like increase in blood pressure and stress hormones that suppresses the immune system making recovery difficult.

Restorative theory explains that it was vital for early humans to have the ability to recover from stress quickly after a demanding episode and so a genetic capacity for responding restoratively to nature was necessary for survival. This capacity for restoration had many benefits including faster replenishment of energy, rapid declines in stress-related negative emotions such as fear and anger, increases in positive feelings and reduced levels of stress hormone and enhanced immune function.148 Reductions in stress should directly and indirectly promote improved health outcomes including reduced pain and faster healing that is attributed to improved immune function.149 Restorative theory states that because modern humans evolved from nature they also have a capacity to acquire stress-reducing responses to certain nature settings and content, but have no affinity for most built environments and manmade materials.150

Several studies of nonpatient groups have shown that a short viewing of nature settings can create quick and significant psychological and physiological restoration from stress. Exposure to nature and natural light can have a positive impact on patients by decreasing stress, improving emotional and physical well-being and alleviating pain.

The experience of nature in hospitals can affect human health and healing, including recovery from illness. The presence of flowers and other vegetation have been linked to calming and healing effects on patients. One investigation concluded that contact with nature in hospital rooms, views of the outside and exposure to gardens was the most desirable health care preferences.

Survey results from studies on bedridden patients have shown a strong preference and importance to having a window view to nature. A study of an urban long term care facility found that elderly residents placed great importance on having a window view to gardens and plants. This shows that nature has a therapeutic effect on patients and that it offers comfort and relief from stress. A study of 920 professional women in France found a 57 percent decrease in absenteeism from sickness, 35 percent reduction in hospital stays and a 17 percent reduction in doctor’s visits among employees with natural ventilation in their workplace compared to those in an air conditioned environment.

In a now famous observational field study of gall bladder patients, psychologist Roger Ulrich and his team examined patients who were assigned to two types of hospital recovery rooms, one with window views of nature including trees and vegetation and the other with a view of a brick wall. Ulrich, reviewed the hospital records of all patients over a 10-year

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period during the summer months when the trees were in bloom.\textsuperscript{159} The patients with the tree views had 8.5 percent reduction in postoperative hospital stays, 7.96 days versus 8.70 days for the patients with the brick wall.\textsuperscript{160} They also required less pain medication, reported having a more positive experience and made less negative comments.\textsuperscript{161} Representational forms of nature like art, photographs and video of natural scenes can benefit the physical and mental well-being of patients. An experiment on stressed blood donors showed that viewing a video of nature lowered blood pressure and pulse rates compared to watching other daytime television programs.\textsuperscript{162} An experiment with patients that had dementia and Alzheimer’s disease showed that incorporating large color nature pictures and recorded sounds of nature in shower rooms decreased stress and aggressive behavior.\textsuperscript{163}

Natural ventilation in hospitals can benefit the well-being of staff. In a 1992 study involving employees of two London hospitals, one with natural ventilation and one that had a mechanical system, researchers found a 40 percent lower rate of self-reported SBS symptoms in the naturally ventilated building.\textsuperscript{164} A field study of 690 residents at a four building nursing home in Wisconsin showed residents who lived in buildings with 100 percent natural ventilation and local filtration per room had an 87.3 percent reduction in influenza compared to buildings that had 30-70 percent re-circulated air and central filtration.\textsuperscript{165}

Natural light in healthcare facilities benefits staff performance by regulating sleep and decreasing stress. Daylight is responsible for regulating circadian or body clock rhythms that synchronize the sleep and awake cycle.\textsuperscript{166} Morning daylight exposure is important to healthcare staff on the dayshift because it regulates circadian rhythms, which is important
for daytime alertness, cognitive performance and sleep quality. A study of Turkish hospital staff showed that nurses who were exposed to daylight for three or more hours each day had less job-related stress and greater job satisfaction. Buildings that are closed up or have tinted windows that lessen the exposure of daylight can disrupt circadian rhythms and decrease alertness of staff.

**Case Study**

![Figure 44: Floor-to-ceiling windows provide views to the ocean for patients and visitors](image)

*Kameda Medical Center-K Tower by Architects Hawaii Ltd.*

This project located in Kameda Japan incorporated a variety of Biophilic elements including direct, indirect and representational forms of nature. There are two types of healing gardens, passive and active. The passive healing garden was a place where patients can sit and contemplate. These gardens were good for patients who are not mobile or need supervision. The active garden features walking paths that allow exploration and energy release. These gardens were ideal for visitors and family who need to wait but don’t want to sit in the waiting rooms which can cause stress. According to Project Architect Walter Muraoka, one of the goals of Kameda was to decrease the wait time of patients and to keep

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them occupied when they have to wait. This has resulted in more satisfied and less stressed patients.

Windows in the public spaces and in each patient room allowed for lot of natural light and views to the ocean. To mitigate heat gain, high performance glazing was used, which featured double pane glass with low-e glazing. Nature can be experienced directly through a green roof, roof deck and balconies in each patient room. The green roofs serve two purposes, a place for visitors and patients to experience nature, and it also provides storm water management as well as other environmental benefits.

The ability to control one’s own environment is a key factor in providing a therapeutic space for patients. Lights in the patient rooms can be turned down or off if the patient chooses. The temperature in each room can also be adjusted to each patient’s comfort level. Privacy is also important for the well-being of patients so every patient room is a single room, which prevents cross infection, mediates noise, eliminates male/female occupancy and maximizes natural light and views to nature. Awareness of night and day as well as knowing what time it is, is an important factor in the well-being of patients. Sunlight helps to regulate sleep patterns, which is necessary for the body to recover. A patients’ ability to access information gives a patient a sense of control and comfort. Each room is equipped with a small computer where they can access their medical records, browse the internet and even view the daily menu and order their meals.

This hospital fronts the ocean so it utilized a Biophilic ocean theme throughout the building. There is a nautilus on the floor of the lobby and there are ocean patterns in the carpet and on the elevator doors. The design incorporates an ocean motif, which aids in wayfinding by designing each floor with a different ocean theme. Wayfinding is part of a therapeutic environment because people take comfort in knowing where they are and where they need to go.

There is also a small building for patient’s pets so when the patient is in the garden they can be accompanied by their pet. Animals are part of nature and research has shown that pets can benefit the physical and mental well-being of people. “Interaction with companion
animals has been correlated with enhanced calm, peace of mind, and physical and mental restoration and healing."\textsuperscript{169}

These initiatives have created many health benefits to people which include a reduction in the average length of stay from 15 days to 7 days. This means that people are recovering faster, which allows the hospital to treat more people. This hospital is located in a city of only 30,000, but continues to expand because of its popularity throughout Japan, a testament to their quality and success of the new facilities.

**Housing**

A study of the effects of green spaces compared residences of two virtually identical 16-story housing projects, one with green spaces of grass and trees and one without any green spaces.\textsuperscript{170} Residents were randomly assigned to one of the housing projects. Researchers found that the residences assigned to the housing project with green spaces had much higher levels of physical and mental well-being, a better capacity to deal with stress, improved conflict management and superior cognitive functioning.\textsuperscript{171}

Another public housing study has shown that there are major differences in quality of life among residents who live in buildings surrounded by green spaces versus buildings surrounded by hardscape.\textsuperscript{172} Residents of buildings with nature showed the following benefits: stronger social ties, better relations with neighbors and strangers, greater sense of safety and security and a strong sense of community.\textsuperscript{173}

A study of multiple family housing showed that neighborhood satisfaction was greatly affected by elements of the natural environment.\textsuperscript{174} Residents living in neighborhoods with more trees and nature elements indicated higher levels of neighborhood satisfaction.\textsuperscript{175} The physical proximity to natural elements was an indicator of neighborhood satisfaction.\textsuperscript{176}

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\textsuperscript{174} Rachel Kaplan and Stephen Kaplan. *The Experience of Nature.* (New York, 1989), 159.  \\
\textsuperscript{175} Rachel Kaplan and Stephen Kaplan. *The Experience of Nature.* (New York, 1989), 159  \\
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Chapter 7: Sustainability

My research on sustainability will focus on how the integration of nature in the office building can benefit the well-being of its occupants while benefiting the surrounding natural environment. This idea is based on Stephen Kellert’s concept of Restorative Environmental Design, which strives to “...achieve a more harmonious relationship between people and nature in the built environment,” said Kellert. The two objectives for Restorative Environmental Design is 1. Reduce the adverse effects of modern design and development on natural systems and human health, and 2. Promote better positive contact between people and nature in the built environment.

Restorative Environmental Design’s first goal is to reduce the adverse effects of modern design and development on the environment and human health. This is called low environmental impact design, which promotes energy efficiency, renewable energy, decreasing resource use, eliminating pollution, minimizing waste, maintaining healthy indoor environments, and avoiding habitat destruction and loss of biological diversity. This has been the focus of the current green and sustainable design movements that are mainly concerned with protecting the environment and economic savings.

Restorative environmental design goes beyond these initiatives and also strives to create a positive relationship between people and nature in the built environment. Kellert argues that without this positive connection between people and nature it will not matter how much advances are made in energy efficiency or pollution reduction, people will not be compelled to commit the energy and resources to sustain these buildings as they age or need repair. Green roofs are desirable because they reduce storm water runoff and provide insulation as well as create oxygen and reduce the heat island effect, but if occupants cannot see it and do not have access to it then they will not have a connection and motivation to maintain and repair it.

This study will explore how a positive relationship between people and nature can benefit the physical and mental well-being of people in offices, making them happier and more

productive as well as simultaneously benefiting the surrounding natural environment and providing economic benefits.

**Energy Conservation**

Buildings use energy for lighting, heating, cooling and other building functions. This energy has primarily come from burning nonrenewable fossil fuels.\textsuperscript{182} The reliance on nonrenewable energy sources has had a negative impact on the environment and the health of humans.

The incorporation of passive and active design can help to reduce a building's demand on the electric grid. Passive design utilizes the local climate, surrounding environment, orientation and building envelope to reduce energy demands. Passive design does more than help to conserve energy; it also promotes positive contact between humans and nature by bringing in natural air and light as well as views of the natural landscape and the changing seasons. Active design uses manufactured systems like photovoltaics, energy-efficient HVAC and lighting systems, heat recovery systems, sea water air conditioning (SWAC), chilled beams and mechanical ventilation.

**Passive Design**

The use of specifically sized and placed windows, skylights and clerestories reduce the need for electrical lights, which use one-third of the total energy of office buildings.\textsuperscript{183} Studies have shown that natural light provides various health benefits to occupants by regulating sleep, increasing productivity and creating an environment that is conducive to learning. Orientation of the long facade of the building to the West and East axis minimizes the exposure of low sun angles, which create solar heat gain and glare for the occupant. The use of exterior fins or automatic shades can also mitigate solar heat gain and decrease glare, improving occupant comfort while also saving energy.

Double-skin facades provide acoustic and thermal insulation through the use of two layers of glass. It allows for the integration of shading between the layers of glass as well as


allowing operable windows to be used even in higher buildings with high winds. Double-skin facades have been more commonly used in colder climates with lower humidity.

Natural ventilation provides fresh air to occupants and has been proven to reduce the occurrence of Sick Building Syndrome (SBS). Natural ventilation depends on a combination of breezes and the stack effect. The stack effect is when warm air raises through the upper level of a space, while cool air enters through the lower level. The building should be oriented so that the long façade is running perpendicular to the prevailing winds in the summer.184 Narrow building plans, wings and or courtyards increase the flow of air through the building.185 Cross ventilation of rooms requires that it have at least two separate openings, one for inlet of air and the other for air to exit. Floor and ceiling-level windows create a stack effect, which can be made more effect through a multi-height vertical space. Open-plan offices with low partitions maximize circulation of air as well as allowing natural light deeper into the building. Buildings can be designed to use both natural and mechanical ventilation.186 HVAC systems may only be needed in certain parts of a building that require a stable temperature. HVAC systems and natural ventilation could be operated alternately depending on occupancy level, time of day and seasonal climate.187

**Active Design**

Photovoltaic energy converts sunlight into electricity and can also be used for solar hot water reducing the demand for electricity. It can also be integrated into the design to provide shading while also generating energy.188 It can be used to shade the roof, reducing heat gain and protecting the roof. It can also be used as awning to shade individual windows.189 Designers are also utilizing PV as a material on the building façade, which creates awareness and helps to educate occupants and the public about sustainability and renewable energy.

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Energy efficient HVAC systems combined with other sustainable initiatives make it possible to use smaller mechanical systems that use less energy.\textsuperscript{190} 40 Grosvenor Place in London uses a combination of strategies to reduce energy cost by an estimated 20 percent.\textsuperscript{191} Every workstation is placed within 25 feet of natural light. Solar heat gain is mitigated through the use of thermal mass from the building concrete structure, light shelves, recessed windows and exterior fins.\textsuperscript{192} Mechanical systems for office buildings are usually oversized and can be made smaller by proper building orientation, a building envelope that allows for daylighting, insulated walls and high performance glazing and lighting.\textsuperscript{193} A properly insulated building in a cold climate can reduce the heat loss around the perimeter of a building, making it possible to eliminate the HVAC ducts in this area.\textsuperscript{194}

Sustainable HVAC strategies can enhance the well-being of occupants by giving them more control of their environment. The benefits to occupants include a reduction in absenteeism, increase in productivity and greater job satisfaction.

\textit{Green Roofs}

Green roofs are roof assemblies that have a roofing membrane that contains soil and live plants.\textsuperscript{195} These roofs have many advantages over a black tar roof or other impervious roofs that shed rain water quickly, creating non-point source pollution, which is pollution coming from many diffused sources that are transmitted through rainfall and runoff that flows into city sewers and into the ocean. Green roofs also provide improved insulation, reduced storm water runoff, decrease heating and cooling loads, mitigates heat island effects and reduces noise and air pollution.\textsuperscript{196} It also benefits the well-being of people by “...enhancing human relaxation, imagination, intellect, creativity, health, and productivity, especially in

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urban areas often lacking vegetation and open spaces,” said Kellert.197 These human benefits can only be realized if occupants have access to the green roofs either indirectly through window views or direct access to the green roofs.

Case Studies

The Providence Cancer Center by Zimmer Gunsul Frasca Architects

The concept for this 11-story, 492,000 sq. ft. center is the “science of healing and the healing power of nature.” Natural light and connections to nature and the outdoors were emphasized.198

Large windows provide lots of natural light and views to nature, which has been shown to help in the recovery and comfort of patients as well as keeping staff more alert and productive. High performance glass with low u-values, low solar heat gain coefficients and high visible light transmission, was used to reduce heat gain and sunshades were used to reduce solar gain.199 The combination of high performance windows and skylights drastically reduced electricity demand from lights.200 A joint study by Zimmer Gunsul Frasca and the Energy Studies in Building Laboratory, Department of Architecture, University of Oregon tried to determine how to optimize daylighting in patients’ rooms to improve patient health as well as reduce the facility’s energy use. It found that energy saving during daylight hours was as much as 87 percent.201 Daylighting also provides more light per watt than electric lighting, which means less heat and a reduction in cooling load and size and cost of HVAC systems.202

Connection to nature were further reinforced with the use of the region’s natural color palette and natural materials in the interior finishes, art and wayfinding devices.203 Outdoor gardens and courtyards provide direct connections to nature and act as restorative gardens and personal escapes for patients, visitors and staff. It also helps to produce oxygen and provides green surfaces that mitigate the heat island effect and reduce storm water runoff.

201 D. Kirk Hamilton and David H. Watkins. Evidence-Based Design for Multiple Building Types. (New Jersey: John Wiley & Sons, Inc., 2009), 41.
Bank One Corporate Center

This project consists of a 37-story tower and an 11-story tower, providing 1.77 million sq. ft. of office, retail and underground parking. The goal of the project was to reuse the existing infrastructure of the site, including the foundation, and create a new building that met the demands of a sophisticated tenant. The development company commissioned focus groups and market research and determined that tenants wanted raised floor systems, high ceilings, natural light, improved air quality, occupant controls and comfortable workstations.204

Bank One Center used a raised floor system that distributed air from air columns through the floor instead of through the more traditional system of ductworks within the ceiling. This system uses a 14-inch pressurized raised floor that sends clean conditioned air to every workstation and office.205 The floor vents are adjustable allowing occupants control over their ventilation. The system allowed for a reduction in energy usage, better air quality and temperature control and improved ventilation that together benefited occupants by making them more comfortable and productive.206

The under-floor system allows for the most flexibility for tenant, which is important when studies show that an average of 43 percent of occupants change locations within an office each year.207 The increase in flexibility gives tenants the ability to optimize the workspaces of their occupants as demands change. This system also achieves a 15 percent energy reduction than a standard Chicago office.

This building has generous amounts of daylighting from floor-to-ceiling windows and extensive high performance low-e glazing on the exterior walls. The ceilings are also higher than a typical tower, with heights of 10 feet on many floors, making this 37-story tower the height of a typical 50 –story building.208

A green roof was used to mitigate the Heat Island Effect and allows occupants to enjoy the roof indirectly through window views and directly through the 12th floor tower garden. The green roof combined with retail space and a covered arcade over the street fronting the building and improved lighting and landscaping allowed the developer a higher floor area ratio by the city.

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To summarize up to this point, this study has examined why urban offices do not support the well-being of workers and the demands of the 21st century workplace due to its disconnection from the natural environment, lack of spaces that support the work processes of employees and their need to collaborate and how sustainability lacks a human connection and a deeper meaning that goes beyond energy saving.

Human+Nature space typologies were introduced to respond to these demands by having the appropriate spaces to support and enhance the way people work and the health and well-being of the employees. These space typologies were informed by two sets of matrices that address the needs of the human being as well as the needs of the 21st century workplace, all while integrating sustainable features that provide added value and human benefit.

This study has utilized three research methodologies to establish value for the Human+Nature space typologies. The Preference Experiment has shown how the integration of nature and Biophilic elements in offices can make work spaces more desirable. The secondary surveys and data provided evidence of the benefits of the new space typologies and the attributes of each space. Case studies have shown how businesses are using office design as a tool to maximize the value of its employees while strengthening the company’s unique identity and values and minimizing its impact on the natural environment.

The last research methodology is the design project, where the Human+Nature space typologies will be applied and tested through a re-design of an existing office space for a specific client. This will test how applicable and effective the Human+Nature Office Design Matrix is when applied to a real business and an existing building, which will inherently have its own unique demands and constraints. The next section will analysis the site and context of this design project, which includes the site, the building and the office space.
Chapter 8: Site and Context Documentation Analysis

Figure 45: Honolulu Central Business District

Site

The site for this design renovation was selected because of its urban context in downtown Honolulu’s Central Business District, where building occupants have little access to the natural environment compared to offices in less urban areas. This is especially true in high-rise offices, where the higher you are the farther you get from direct contact with nature, which in an urban environment may include landscaped plazas, views of trees and exposure to natural ventilation and sunlight. The goal of my research and design project is to renovate an existing office space for a specific client to support the demands of their business and the way their employees work as well respond to employees’ Biophilic Human needs by creating spaces that integrate Biophilic attributes and opportunities for positive connections with the natural environment. The Human+Nature Office must support both the demands of the workplace and the demands of the human being in order for it to maximize comfort, satisfaction, human well-being and productivity in the office environment. The office should also be sensitive to the surrounding natural environment, so I will be exploring sustainable design that not only benefits the environment, but also has a direct benefit to employees as well.

210 Google Earth Street View, “1002 Alakea St.,” Google Earth, JPEG.
The site, Honolulu's central business district, is an urban area bounded by Nuuanu Avenue, Nimitz Highway, Richards Street and Vineyard Boulevard. (See Figure 46) This area includes most of Hawaii's skyscrapers and the main headquarters of big-businesses in Honolulu. This area was selected because of its urban context and lack of green spaces. The offices are disconnected to the natural environment due to spaces that are completely enclosed and conditioned and a lack of greenery and natural elements in public spaces like plazas, lobbies, roofs and circulation spaces.

Many of the skyscrapers in Honolulu and the continental U.S. utilize fully-glazed, glass skinned facades that are not conducive to occupant comfort and suffer from solar heat gain and excessive energy demands, while not taking advantage of natural ventilation. My design project will be to renovate an office in an existing glass skinned building for a specific client. I want this project to serve as a model for renovating aging glass skinned skyscrapers enabling them to support the way that business is done today as well as improve the well-being of its occupants and the surrounding environment.
Building

I have selected Pacific Guardian Center as the building for my design renovation. This 629,319 sq. ft. skyscraper designed by Architect’s Hawaii Limited, was built in 1979 and consist of twin-towers each 30-stories tall that sit on a 10 story, double helix parking lot. It is the biggest multi-tenant office building in Honolulu. It features a nice landscaped plaza and water feature on the ground floor, which provides a connection to nature on the ground. The towers face North West and are across the street from the ocean. It features a uniform single-pane, glass-skinned window wall system, which is a glass wall system that is mounted floor-to-floor on every façade. Unfortunately the sun’s path affects each façade differently and so certain facades like the south, east and west façade suffer from solar heat gain and glare for the occupant. (See Figure 49, 50)

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According to the architect Joe Farrell, the windows were coated with the most highly reflected glass film at the time of construction, which created big saving for air conditioning then. He admitted that today they would use an insulated glass unit (IGU), which is double or triple paned glass that has thermal and acoustic insulating properties and low-e glazing.
which they didn't have in 1979. This reinforced concrete building has a central service core, which according to Farrell, is best for smaller tenants that require 1,000-2,000 square feet. According to Farrell, there is 35-39 feet from core to window that allowed for a layout of 3 inward levels - outside for private offices, middle for secretarial, third adjacent to the core would be enclosed spaces like conference rooms and storage rooms and kitchens. An open office configuration would have no walls and would allow for three rows of workstations with circulation space between each row. The parking garage, which makes up the first 10 stories, is naturally ventilated and glazed, Farrell called this “parking with a view.” It also allowed the full-glazed glass façade to come down lower giving the building a better proportion. The windows in the parking garage have a two inch opening in middle of the mullions allowing air to flow in from all four sides. Grills cover the Alakea side of parking structure to hide the sloped floors from view. The unique grill design allows air in, but blocks visibility and light from the outside hiding cars, structure and any mess. This is a totally naturally ventilated garage which appears to be totally enclosed. During construction there were still not enough openings in the garage to pass code, which required 20 percent openings on two sides of the garage. Ferrell used fans from the cooling tower and ran ducts from some of the fans to the parking garage to help increase flow of air in the garage, creating a sustainable alternative to exhaust fans.
Office Space

Pacific Guardian Center Mauka Tower

- Suite: 2550 & 2650
- Size: 10,000 sq. ft. (5,000 sq. ft. per floor)
- Rent.: $17,500 per month ($1.75 per sq. ft.)
- View: mountain and ocean

![Figure 51: Pacific Guardian Center Google Earth satellite image](image)

Pacific Guardian Center consists of two towers, Makai and Mauka. The Makai tower provides more direct views to the ocean, while Mauka tower provides some views of the ocean as well as a view to the mountains. Both towers rent for about the same rate, but I chose to look for a space in the Mauka tower because of its access to both Makai and Mauka views as well as the need to mediate solar heat gain, especially during the summer months.

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213 Google Earth Street, “Pacific Guardian Center, Honolulu,” Google Earth, JPEG.
Figure 52: Plan view of 26th Floor in the Mauka Tower

Figure 53: Mauka tower suite 2250 interior view facing west

I looked at few available suites including the penthouse suite, which is larger than the penthouse that Communications Pacific currently occupies, 14,139 sq. ft. versus 7,149. The penthouse would be too big for CP’s needs and so they would need at least half of the floor and would be spread out in a linear configuration around the central core creating long corridors between opposite sides of the office. I decided that it would be more advantageous to have a smaller office footprint stacked between two levels instead of being spread out on one level. I found a 5,000 sq. ft. space, suite 2250, which was located in the North East corner of the Mauka tower, giving it a north, east and west façade. (Figure 52, 53) A previous tenant had occupied that suite and the suite above and they installed a small interior stair that was currently being covered up. I had the opportunity to look at the hole they cut between the concrete floor joists to give me a better idea of the opportunities to create penetrations in the floor slab. Suite 2550 was too small for CP’s new office so I decided to add the suite above as well to create a 10,000 square feet office, which I estimated to be around the amount of space they needed based on what they have and what spaces would be added to the program.
Chapter 9: Client Analysis

Communications Pacific

Communications Pacific has agreed to be the client in this hypothetical design of a new Human+Nature Office in Pacific Guardian Center. When describing what Communications Pacific does their website says “…we’ve created collaborative, client-centered teams that work in concert to provide truly integrated communications strategies custom-designed to achieve your goals.” There are four services that Communications Pacific provides, which complement each other to provide a comprehensive communications strategy. According to their website, the most effective programs are those that are developed with a broader communications vision in mind, which may include a combination of all of their communication services. The four services they provide are Public Relations, Community Building, Land Use & Real Estate and Marketing. CP also used to have an in-house advertising agency, but that service is now out-sourced.

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Public Relations

- The main goal of public relations is to enhance a company’s reputation.
- Present a company to the world in the best light.
- Help give the public and the media a better understanding of how the company (client) works and what makes them stand out from the crowd.
- Give a company exposure to the public (buyers) and adds credibility through a non bias medium.
- Public relations services include media relations, corporate communications and media training

Community Building

- Work to build good relationships with their clients and the communities that may be affected by their projects.
- Help public and private-sector clients arrive at resolutions of community issues that might otherwise stall or derail projects.
- Work closely with local businesses, organizations and communities on behalf of our clients to help build consensus around issues through strategic partnerships.
- Build clients’ reputations as good citizens and responsible landlords, behavior the community expects and customers admire.

Land Use & Real Estate

- Advise and assist clients through all stages of the development process – from counseling developers seeking investment capital, to helping secure entitlements and approvals, and marketing of real estate products.
- Improve business’s ability to remain sensitive to the needs of community, consumers and policy makers.
Figure 55: Client news conference at Children & Youth Day on the State Capitol grounds

Marketing

- Help guide marketing efforts toward the most effective approach based on a client's objectives and budget.
- Event Planning: Ensure that any event they plan not only resonates with the target audience, but also represents the brand effectively. Communications Pacific has a proven record of event success that includes product launches, special events, ship christenings, Hawaiian blessings, groundbreaking ceremonies, grand openings and event promotions.
- Direct Marketing: Personal one-on-one marketing through a highly targeted message or one that requires the recipient to spend more time with the material.
- Web-based: Web is an essential marketing tool. Build strong and creative online user experiences and planning a complete Web strategy is something CP does for their clients.

Values

I spoke with Christina Kemmer, president of Communications Pacific, about the values of their company. A thorough understanding of a company’s values is important in establishing the goals of the design. Values are an important part of the qualitative data that is collected to help create a design program for the client. Office design should be used as a business tool that supports and embraces the values of a firm. If the values are not perpetuated in the design the office environment becomes contradictory and detrimental to the goals of the business.

Communications Pacific values the following seven concepts:

- Community ("Ohana) / Collaboration (Lokahi)
- Diversity
- Face-to-Face Communication
- Enculturation
- Naming
- Relevancy
- Relationships
Community(‘Ohana) / Collaboration (Lokahi)

CP values an integrated team approach that breaks the boundaries of traditional departments and creates a single team composed of different disciplines that together provide clients with an integrated communications strategy. The company used to be larger with 75 employees that were departmentalized by service, but now there are no longer department silos and instead they have one tight-knit group of 30. “The silos were turned on its side and everyone is more connected to each other,” said Kemmer.

Diversity

Diversity is important for CP because having employees from different generations bring different knowledge and values to the table. Having diversity in the office provides different lenses to view situations from different perspectives allowing them to make more informed decisions. It is also important for CP to support the needs of all generations of employees by having the appropriate technologies and work environment to enhance the way they work.

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217 Dayton Wong, “Meeting Spaces,” ca. 2011, Honolulu, HI.
**Face-to-face communication**

Face-to-face communication is important to CP because it is essential in picking up non-verbal cues and connecting with the rest of the team. “Client service and teaming require built-in face-to-face time to establish trust, relationship and bonding,” said Kemmer.

“...team members who spend more time in the office are not only more accessible but are fully integrated into the culture, values, and day-to-day intelligence required to solve problems that can only come from face-to-face time with team members.”

**Enculturation**

Enculturation is practiced at CP, which allows them to support the host (Hawaii) culture. According to Wikipedia, enculturation “...is the process by which a person learns the requirements of the culture by which he or she is surrounded, and acquires values and behaviors that are appropriate or necessary in that culture.” One of the ways they embrace Hawaii’s cultural values is through spirituality, which includes blessings for clients as well as internally in their office.

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218 Dayton Wong, “Face-to-face Communication,” ca. 2011, Honolulu, HI.
**Naming**

Naming is a term that Christina uses for their use of Hawaiian words and phrases that help their clients understanding the underlying protocols of Hawaii’s cultural values, which she says should influence how a business works and does things. CP uses words like malama ‘aina and ohana to help express Hawaii’s cultural values to their clients. According to Kemmer, CP also practices what they preach by using Hawaiian words like lokahi (collaboration and cooperation) and ho’ohana (working with intent and purpose) to express their own company values.

**Relevancy**

Relevancy is important when coming up with any strategy for a client. CP helps their client keep up with the current media trends, like social media and having an effective online presence to reach their customers. Kemmer also said that CP also tries to stay relevant as a company by supporting new modes of working that is both collaborative and individual, in-person and remote, and providing the necessary technology like, smart phones and Wifi.

**Relationships**

Relationships are a key element in their business. As a communications company, Kemmer said that networking and building and maintaining relationships are the core of their business.
**Keep, Toss and Add**

The current 7,149 sq. ft. office in the penthouse of the Topa Financial Center was analyzed to determine what works and what doesn’t work, which help to determine the needs and desires of Communications Pacific. Three employees, Christina Kemmer, president, Harriet Kirihara, vice-president of human resource and Nicole Fuertes, senior account executive participated in an exercise called Keep, Toss and Add, where the participates made a list of things they liked about the office (Keep), things that were not working (Toss) and things that they felt the office needed (Add).

**Keep**

The Keep category included an outdoor lanai, counters for informal gatherings, private workstations and offices, window views to the outside, indoor plants, artwork and the use of color in the corridors and conference rooms. The outdoor lanai served as a multi-functional space for guess speakers, meetings, and even as a respite space. The counters fronting the assistant workstations were used for informal meetings and social gatherings for food and wine after work. All three employees were adamant about the need for private workstations and offices. The nature of their work requires regular conversations with clients that often times include confidential information. The private work stations and offices also afford a level of sound control, which is important when on the phone or when they are writing. Window views to the outside were credited with giving employees something to look at and allowing for a break away from their work and looking at their computer monitor. Indoor plants also provide employees a positive distraction from their work and provides comfort. Communications Pacific has a collection of artwork from Hawaii that they allow employees to choose from to decorate their office. The artwork depicts the landscape and people of Hawaii, which provides a connection to place and culture. The color in corridors and conference rooms helps to reinforce the brand of CP and provides a more hip and energetic environment to work in.
Toss

The Toss category was limited to removing the bookshelf and intern work stations in the space that fronts the kitchenette. Nicole Fuertes felt that this area was in the middle of everything and in the way. She said that the kitchenette area is a place where people gather and have spontaneous conversations, but there is not enough space due to the bookshelf and desk area so it discourages informal gatherings. Fuertes added that the interns don’t have privacy and are also isolated from other employees preventing them from learning by observation.

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The Add category included a dining area, informal meeting spaces and collaborative spaces around workstations, a recreation area, a room for respite and locker room and showers. All three employees expressed a desire to have a place to eat as a group and to have a place to gather informally, similar to how families and friends often gather around the kitchen and dining room. Allowing a place to "break bread" helps employees connect on a personal level, building common ground and trust, which improves communication and strengthens the sense of community and teamwork. Collaborative spaces were identified as important areas where employees can work together and share knowledge quickly and spontaneously throughout the day. According to Fuertes, her job is 50 percent individual and 50 percent team-based, so informal meeting spaces are important in allowing her the ability to stay connected to her team. These Collaborative Spaces also mediate the fact that each employee is in an enclosed workstation or office, which inherently creates a separation between each employee hindering spontaneous conversations. A place for recreation was suggested to CP as a place for employees to relax and to connect with each other on a social level. The employees I talked to agreed that a place for recreation would be valuable and help to build strong bonds between employees as well as creating an active respite space to relieve stress.
and restore directed attention. A Retreat Space for respite is important when employees need to get away from it all and just have some alone time away from work, other employees and clients. Fuertes said that when she get stressed and needs to take her mind off of work she goes for a walk through downtown. Although this appears to be a good solution, employees don't always have the time to leave the office for a walk, they may have just 10 minutes between meetings and need a place for quick relief from stress and restoration of directed attention. According to Kemmer a respite room was actually considered in one of the previous designs, but was eventually turned into a storage room due to space constraints. She added that she does feel like this is an important space that should be incorporated in the future design of their office. The locker room and showers were requested as a communal amenity that would help support an increasingly active workforce that may use other more sustainable modes of transportation to get to work, like biking or walking if there was a place to shower. This would also allow employees to exercise during lunch and also to freshen up and change clothes after work when they need to attend an event in the evening.
Problems with the current office

The current office was analyzed to determine if it supports today's knowledge-based economy and the work processes of their employees, as well as reinforcing the values of the company. I also examined how effective it is at promoting positive connections to nature. Communications Pacific’s current office occupies the 7,149 sq. ft. penthouse of the Topa Financial Center. The following are some of the challenges identified:

- Most of the Meeting Spaces are small and in the way of circulation space. The nook on the lanai is disconnected from the rest of the office creating more of a Meeting Room type environment. (See Figure 61)
- Meeting Rooms are centralized and placed away from work areas, discouraging use for anything other than formal meetings.
- No Collaborative Spaces between individual work areas hinder collaboration and knowledge exchange.
The Public Purpose Spaces, like the kitchenette, the copy room, bookshelf (library) and the lobby are decentralized, which decreases the chance of serendipitous encounters.

No Mover Space and a linear circulation path discourages interaction and chance encounters.

No Common Gathering Space or “piko,” which literally means navel or center, it is the source of activity and place of shared connections to other humans and nature.

The Meeting Spaces include the lobby, the nook on the lanai and the counters around the assistant workstations. These spaces, with the exception of the nook on the lanai, are too small because they share space with circulation. Unfortunately the circulation space was not designed with extra room for these informal meetings. The spaces around the open assistant workstations are also not ideal areas to have extended conversations because it could be potentially disruptive. Also the placement of some of these open stations puts the employee toward the core, with no window view and less natural light. The nook on the
lanai has the space for meetings, but is less accessible and does not afford prospects of the rest of the office due to its separate from the office interior.

The Meeting Rooms are centralized on one side of the office away from the individual work stations, which discourage use for anything other than formal meetings. This means that they are not maximizing a space that they pay for. The Meeting Rooms would benefit from being distributed throughout the office making them more accessible to employees.

There are no Collaborative Spaces between individual work areas, which hinder collaboration and knowledge exchange. As noted in the “Add” category these spaces help mediate the fact that each employee is in an enclosed work station or office, which inherently creates a separation between employees, hindering spontaneous conversations. These spaces should be adjacent to Individual Work Spaces or have line-of-sight from these spaces. The enclosed workstations benefit from having glazed walls, which allows for line-of-sight and visual transparency between employees.

The Public Purpose Spaces are functionally required spaces, like the copy room and the kitchenette, which all employees use throughout the day; therefore it becomes an area for serendipitous encounters with fellow employees that may not otherwise see each other. The frequency or chance of encounters can be maximized by centralizing these Public Purpose Spaces in a communal core or hub where people can interact and exchange ideas and information.
There is no Mover Space, but instead the office utilizes a traditional corridor that supports only circulation. This circulation path is too narrow to accommodate spontaneous meetings. It circles around the core of the building, but terminated at the elevator lobby creating a disconnected horse-shoe-shaped loop. This creates a disconnection between the two sides of the office and employees might tend to stay on their side of the office. It also lacks visual cues and a central focal point to aid in wayfinding, especially if someone is unfamiliar with the office, like a new client.

There is no Common Gathering Space in their current office. A Common Gathering Space is a multi-purpose gathering space that supports both small and large groups. It should be a landmark, offering a sense of arrival and a connection to place and culture. Because culture and community are important to the client I have used the Hawaiian term “piko” to express the meaning of this space, which literally means navel or center, it is the source of activity and a place of shared connections to other humans and nature. The piko is a key element in the Human+Nature office and it is a missing space in their current office. (See Figure 63)

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**Piko** (center)
The source of life from which and around which everything else moves, providing a shared connection to nature and humans.

*Figure 63: Piko concept diagram*
Chapter 10: Programming

Program Goals

The program goals were created before the specific client was chosen and were based on the needs of the 21st century workplace as well as the building and site analysis. The design program will be tailored for Communications Pacific, their culture and the way they work, while utilizing the appropriate space typologies and incorporating Biophilic elements in every space.

The Pacific Guardian Center has an open plan with a mechanical core in the center and structural columns at the perimeter that allow the space to accommodate a broad range of businesses and their operating needs. They also have common public plaza space on the ground floor that includes Biophilic features like vegetation, water features and seated areas that provide a prospect and refuge. The goal is to incorporate Biophilic features in the office spaces above to extend the experience of the public plaza into the work spaces to improve their well-being and productivity while at work. I will be adding sustainable systems that promote energy efficiency and I will be renovating the building skin to allow it to perform better in its climate while improving occupant comfort.

Figure 64: Pacific Guardian Center’s ground floor plaza

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Biophilic Design

The Pacific Guardian Center features a central plaza space between the old Dillingham Transportation Building and the twin towers. This central space includes biophilic elements like plants, trees and water features that people can enjoy while walking through or taking a break in the shade on one of the many seating areas. This is the only direct access to nature that occupants of the building have and unfortunately it sits at ground level, which means that all the offices, which start on the tenth floor, are disconnected from this green space. This renovation will maximize occupants’ contact with nature within the office by providing access to natural light, plants and ventilation where appropriate. The roofs of the two towers are mostly clear because the cooling towers are located on top of the 10-story parking garage. The space on the roofs can be utilized as a green roof, reducing the heat island effect or it can be used to mount photovoltaic panels facing south to harness the energy of the sun and save energy cost to the tenants and owners. It can also be used to collect rainwater to be reused for irrigation and toilet flushing. The roof can also be renovated to make it into an amenity for the people to come up, enjoy their lunch on a green roof with some benches or a pergola and a view of Honolulu and the ocean.

This renovation will look at how balconies can be retrofitted to the perimeter of the towers or created as interior balconies by breaking out part of the glass façade and bringing the exterior glass wall in. Balconies allow occupants access to nature and restoration from stress. It can serve as a casual, comfortable café style work spaces for employees to work on their laptops or for quick meetings between a few people. It may also be a cost effective way to provide naturally ventilated spaces adjacent to conditioned spaces.

The design renovation will maximize occupants’ connections with nature and natural light. The type of office layout will depend on the needs of the business, but I am arguing more a more open collaborative layout with the workstations situated around the perimeter of the building and, if necessary, the private enclosed spaces near the core to allow for the most natural light through the building. Occupants will also be able to control the amount of light and conditioned air in their workstations giving occupants control of their space.

Sustainability

When Pacific Guardian Center was constructed in 1979 one of its few sustainable features was its use of highly reflective, single-pane glazing, which reduced the cost for air
conditioning. The use of a uniform full-glazed, glass skinned façade was justified because it was considerable cheaper to treat every façade the same and the sleek glass tower image was also popular at the time.

Today we have double and triple pane high performance glass that has much greater resistance to heat and better insulation than the glass available at the time of construction. There is also the double skinned façade, which uses two layers of glass with an air cavity in-between the layers allowing air to flow through the space. Double-skin facades provide acoustic and thermal insulation through the use of two layers of glass. It allows for the integration of shading between the layers of glass as well as allowing operable windows to be used even in higher buildings with high winds. This can be used to bring natural air inside and to vent out the air between the cavities. This renovation will replace the aging glass with double-pane, low-e glazing or with a double skinned façade. Vertical shading device would be added on the east and west facades and horizontal shades would be added to the south façade. This would decrease the solar heat gain on the elevations that receive the most direct sunlight.

This renovation will look at changing the air distribution system from a traditional system of ductwork from the ceiling to a raised floor air distribution system. The raised floor system delivers air through the floor, which requires less energy than when delivered from the ceiling. The adjustable floor vents improve ventilation and give occupants control of their workspace, making them less stressed, more comfortable and more productive.

The Human+Nature Office will utilize only recycled materials and finishes with no VOCs. It will incorporate direct digital controls (DDCs) including CO2 sensors that adjust air conditioning based on the amount of people in a room, and daylight harvesting, which adjust or turns off artificial lighting based on the amount of available natural light.

In order to maintain and sustain the high performance, energy efficient systems a tenant energy management program will be implemented to help educate the occupants about the new building and how it is working to improve their well-being while being environmentally responsible.
Program

Programming involves establishing the goals of the project, determining the needs, collecting and analyzing the facts and identifying the problem that the design will solve.\textsuperscript{222} There are two key considerations, function and form, which helped to determine the qualitative and quantitative needs of the design. Function includes the quantitative attributes like who's using the space, what is the space used for and what are the relationships and adjacencies.\textsuperscript{223} Form includes the qualitative attributes such as the physical and psychological environment and the spatial and experiential qualities of the space.

Qualitative attributes

The qualitative attributes were identified first because form attributes are harder to achieve once the spaces are set. These attributes were derived from research on office spaces, Biophilic human needs and the values of the company. The following spaces were added to CP's existing space program.

Dining/Meeting Space

This outdoor dining area and garden promotes CP's values of 'Ohana, Relationships and Relevancy. It is a place to dine together, meet, or work café-style through Wi-Fi. In addition to this functional requirement, it also provides a place to build common ground between employees and clients, which creates trust and a sense of 'ohana. It promotes positive connections to nature through direct access to vegetation, natural air, natural light and borrowed mauka (mountain) and makai (ocean) views. It provides a sense of prospect and refuge, through single and double height spaces and views of the surrounding natural and built environment.

Common Gathering Space

This central multi-purpose space promotes CP’s values of Face-to-face communication, Community/Collaboration and Relationships. It is the “piko” or center of the office where various public amenities are offered, promoting encounters and spontaneous meetings as well as providing meeting space for clients and events. It supports the Biophilic human

needs to feel protected and connected to nature. This space gives workers visibility of their surroundings (prospect and refuge), sensory variability, coherence and connection to place and culture.

**Recreation Space**
This is an active respite space that promotes CP’s values of Community, Diversity and Relevancy. It’s a place to bond with fellow employees and supports a diverse work force that is more active. It supports the biophilic human need for social engagement and a sense of control. Its balcony location includes views of the mountains and ocean as well as direct access to a garden with various vegetation and native plants, providing fascination and a connection to place.

**Library**
This space supports CP’s value of Relevancy and the Hawaiian value “ike loa,” which mean to seek knowledge and wisdom. It benefits from its own designated space allowing for compatibility of the behavior of reading and research. It supports the biophilic human need for a sense of control, by empowering workers with access to information.

**Meeting Spaces**
These spaces support CP’s value of Community and Collaboration, Face-to-Face Communication and Relationships. These informal meeting spaces promote serendipitous meetings and an exchange of knowledge and ideas, which are especially important when employees’ work in enclosed workstations. It supports the biophilic human need for social engagement and a sense of control by having various spaces to meet.

**Retreat Space**
This respite space supports CP’s Hawaiian values of “malama,” which means to protect and take care of their employees. It supports the biophilic need for fascination through access to nature, which creates a positive distraction that allows directed attention to rest.

**Collaborative Spaces**
This space supports the same values as Meeting Spaces, but provides for quicker more spontaneous interaction and knowledge exchange around individual workstations. It supports the biophilic need for prospects by having line of sight from their workstation. These spaces are less private than Individual Work Space but should still provide a sense of privacy by located it away from circulation space and public amenities.
Mover Space

This public circulation space supports CP’s values of Relationships and Face-to-face communication. It supports the biophilic human needs for a sense of control and clarity of wayfinding, utilizing visual cues like colors, patterns, rhythmic elements and unifying textures, which all aid in wayfinding, involvement and understanding one’s environment.
Quantitative attributes

The quantitative attributes were identified through interviews with the president, Christina Kemmer, the vice-president, Harriet Kirihara and senior account executive, Nicole Fuertes. The Keep, Add, Toss exercise was used to determine what already works and what needs to be changed. (See Chapter 9 for client analysis) The following quantitative demands include area requirement, service grouping, people grouping, activity grouping and performance requirements. These have been identified as necessary for their business to function effectively.

Area requirements:

Communications Pacific’s current space has 7,200 sq. ft. The client is happy with the amount of individual work space, which includes enclosed workstations, open workstations and private offices. They were also happy with the amount of meeting rooms, which includes a room for 14, eight, six and four. I decentralized the meeting rooms and designed them to support 14, 12, 12 and four persons. Kemmer acknowledged that there was not enough informal meeting spaces so that was designed in as a public amenity. Necessary public spaces and amenities like Meeting Spaces have been identified and added to the program, which increases the total square footage to 10,000 sq. ft. See space program below for a breakdown of spaces. (Figure 65)
Figure 65: Space program for Communications Pacific

<table>
<thead>
<tr>
<th>Space Typology</th>
<th>Square feet</th>
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<tbody>
<tr>
<td>Lobby &amp; Information</td>
<td>356</td>
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<tr>
<td>Common Gathering Space</td>
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<td>Dining Area (public purpose space)</td>
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<tr>
<td>Kitchen (public purpose space)</td>
<td>100</td>
</tr>
<tr>
<td>Pin-up Work Space (public purpose space)</td>
<td>150</td>
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<tr>
<td>Gallery (public purpose space)</td>
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<tr>
<td>Mover Space</td>
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<tr>
<td>Collaborative Spaces (1 per every 4 workstations)@25sf</td>
<td>100</td>
</tr>
<tr>
<td>Enclosed Workstations (17)@96</td>
<td>1632</td>
</tr>
<tr>
<td>Open assistant stations (4)@96</td>
<td>384</td>
</tr>
<tr>
<td>Enclosed Office (7) @200sf</td>
<td>1400</td>
</tr>
<tr>
<td>Retreat Space</td>
<td>90</td>
</tr>
<tr>
<td>Library (public purpose space)</td>
<td>100</td>
</tr>
<tr>
<td>Recreation Room</td>
<td>300</td>
</tr>
<tr>
<td>Meeting Room 20 people (1)</td>
<td>300</td>
</tr>
<tr>
<td>Meeting Room 10 people (2)@250 sf</td>
<td>500</td>
</tr>
<tr>
<td>Meeting Room 4 (1)</td>
<td>120</td>
</tr>
<tr>
<td>Meeting Spaces</td>
<td>1000</td>
</tr>
<tr>
<td>Locker Room/Shower (public purpose space) (2) @ 84sf</td>
<td>168</td>
</tr>
<tr>
<td>General Circulation</td>
<td>1200</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>10000</strong></td>
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**Service Grouping:**

- Public amenities are currently decentralized, the goal is to increase encounters/interaction so Public Purpose Spaces will be centralized to increase chance encounters (see Figure 66, 67)
- Meeting Rooms are currently centralized and away from individual work spaces, goal is to promote more collaboration and a sense of inclusion so rooms will be decentralized to increase opportunities for team meetings (See Figure 66, 67)
Figure 66: Public purpose spaces are centralized to promote chance encounters.

Figure 67: Meeting rooms are located on both levels and adjacent to work stations.
**People Grouping:**

(See Figure 68, 69)

- CEO next to president (Level 2)
- Executive assistant near executives
- President near account executives (2nd Floor)
- Accounting all together (Level 1)
- Marketing all together (Level 1)
- Human Resources adjacent to majority of staff (Level 2)
- Interns near staff (Level 2)

*Figure 68: Accounting and Marketing are located on level one*
Activity Grouping

(See Figure 70, 71)
- Individual Work Spaces centralized
- Meeting Spaces decentralized
- Meeting Rooms decentralized
- Collaborative Spaces adjacent to Individual Work Space
- Production and pin-up areas adjacent to Marketing
- Public Purpose Spaces centralized adjacent to Common Gathering Space
Figure 70: Activity groupings showing public integrated spaces to private compartmental spaces

Figure 71: Integrated and partially integrated spaces promote interdepartmental communication
Performance Requirements:

Maximize natural light for all employees

Every employee will have a window view. Workstations and offices on the perimeter will have glazed walls allowing light deeper into the core. The north façade will feature double height spaces and floor to ceiling windows allowing light to penetrate the Common Gathering Space and the Mover Space. The current single-pane tinted windows will be replaced with clear Insulated Glass Units (IGU), which allow more light in, while keeping heat out.

Coordinate artificial lighting with daylighting to decrease energy demand

Daylight harvesting will be used to reduce energy from artificial lighting. Daylight harvesting is a system that measures the amount of light in a space with a photosensor and reduces the use of artificial lights when there is enough natural light in the space. Natural light also has the added benefit of improving occupant comfort and increasing productivity.
Mitigate solar heat gain and glare on the east and west facades

Solar heat gain will be controlled through the use of high performance IGUs as well as vertical fins. IGU's reduce heating and cooling cost by reducing air-to-air heat transfer. It also reduces condensation and sound transmission. Vertical fins were placed on the east and west facades and were designed to provide a maximize amount of shading while also allowing for views to the outside.

### VERTICAL FIN INPUTS: Northeast

- **Depth**: 32"
- **Latitude**: 20 degrees North
- **Thickness**: 3"
- **Orientation**: Northeast
- **Spacing**: 36"
- **Tilt**: 30 degrees

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</tr>
<tr>
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[Figure 72: Vertical fins on the east façade shade nearly 100% of direct sun between 7am and noon.]

### VERTICAL FIN INPUTS: West

- **Depth**: 32"
- **Latitude**: 20 degrees North
- **Thickness**: 3"
- **Orientation**: West
- **Spacing**: 32"
- **Tilt**: 30 degrees

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<tr>
<td>Dec</td>
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</tbody>
</table>

[Figure 73: Vertical fins on the west façade shade between 51-100% of direct sun in all months except between May-August, where it provide between 29-60% shading between 1pm-5pm.]
**Provide individual climate controls and adjustable lighting to maximize comfort**

Individual climate controls and dimmable lighting will be provided in all compartmental spaces, like Meeting Rooms, Individual Work Space and Retreat Space. This provides a Sense of Control, which is a basic human need that is necessary for comfort and satisfaction, especially in spaces that workers spend extended amounts of time in.

**Improve air-quality to decrease SBS and other building related illnesses**

Indoor air-quality will be improved through the use of indoor plants, natural materials, low VOC paints and finishes and access to natural ventilation. Indoor plants like the Golden Pothos and the Bamboo Palm are effective in removing Formaldehyde, Benzene, and Carbon Monoxide. Natural materials like cork for flooring and unpainted wood for partitions will used to reduce the amount of VOCs in the air. Access to natural ventilation will be provided through a 600 sq. ft. outdoor dining and meeting space, a 300 sq. ft. balcony Recreation Space as well as operable windows in all the enclosed workstations on the perimeter of the building, so that workers can turn off the air conditioning and open the windows in their zone if the temperature outside is cool.

**Plant Requirements**

Plants play an essential role in the Human+Nature Office because it provides direct contact with nature, which promotes restoration from stress, helps to clean the air and can provide a connection to place and culture. These benefits from nature can only be sustained if the plants are properly selected and placed in an environment where it can thrive and be easily managed, preferably by the workers who use the spaces. The selection of plants will be broken down into two categories, indoor and outdoor.

**Outdoor plants**

Outdoor plants will be planted on the first and second level balconies and will also be located in planters on the window sills that surround the perimeter of the office. Native plants will be used on the outside where they naturally occur in Hawaii’s tropical climate.
The west façade on level one, which is on the 25th floor, will feature the ‘Ilima (Sida fallax) shrub, also known as the “The island flower of Oahu.” The ‘Ilima is a common indigenous shrub that is found on the coast and in the dry forest of all Hawaiian Islands. It is a plant that will do well on the west side of the building, facing Makai, because it thrives on full-sun, is salt tolerant, attracts few pest and requires little water. This small shrub generally grows between one and four feet tall. The cultural uses of this flower are for lei and also as a garnish because the flowers are edible and can be added to salads.

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‘Akia (Wikstroemia uva-ursi) will be used on the west façade of level two, which is on the 26 floor. This dense indigenous shrub can grow up to 3-4 feet and features tiny yellow flowers that turn into small bright orange and red fruits measuring a half to three-quarters inch in diameter. The ‘Akia is a popular landscaping plant for Hawaii’s environment because it is very hardy, requires very little water, grows slow requiring little maintenance and has few pests.

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Koki’o (Hibiscus kokio subsp. st.johnianus) will be planted on the east façade of level one. This indigenous shrub is generally around four to 10 feet tall and thrives in full-sun and partial shade and requires little water once established. The distinguishing feature of this shrub is the bright orange, orange red flowers. This shrub can only be found in the coastal valleys of Kaua‘i and nowhere else. Cultural uses include making the flower and leaves into lei and also as a laxative.

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'Ulei (Osteomeles anthylidifolia) plant will be used on the east façade of level two. This indigenous plant is commonly found near the ocean on cliffs as well as in lowland dry forest on all islands except Ni‘ihau and Kaho‘olawe.231 This shrub has dark, glossy leaves and very fragrant white flowers that turn into white fleshy fruit that ripen purple.232 It is generally a small shrub staying under four feet tall. It is a good landscape plant that is hardy, requiring no watering once it has matured and it also has few pests.233 The cultural uses of this plant include using the hard wood of more mature plants to make fishing spears and the native musical instrument the ‘ukeke. The leaves, flowers and fruit are used for lei and the fruit can be eaten.234

The double height balcony space on the north façade will feature Loulu (Pritchardia hillebrandii), an indigenous palm that grows to 20 feet and is drought, wind and salt tolerant. This palm will serve to highlight this double height space as well as act as a shading element. It thrives in full sun and requires light water and well drained soil that contain a mix of sand, cider and coral. It is necessary to use palm fertilizer with magnesium and potassium to keep the plant healthy.
The balcony will also be lined with the Ti Plant (Cordyline fruticosa), also known as the “Hawaiian good luck plant.” This shrub was introduced to the islands and can grow up to 10 feet tall. It thrives in bright light with some shade and requires moderately wet soil. The cultural uses of the Ti Plant are for wrapping food, making various items like plates, cups, clothes and lei.

**Indoor plants**

The indoor plants selected for the Human+Nature office are common indoor landscape plants that are aesthetically pleasing as well as have direct health benefits to occupants by improving the indoor air quality. The following are indoor plants used throughout the office as Biophilic elements that help to create punctuation points that people experience when they move through the space.
Buddha Belly Bamboo (Bambusa ventricosa)

- Prefers shade
- Can reach 45' outside, but stays small inside
- Introduced to islands
- Care: 71 degrees F, soil should be kept moist but not wet, feed regularly with a high-nitrogen food.
- Uses: Landscaping as screen or accent plant.

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Bamboo Palm (Chamaedorea Palm)\textsuperscript{241}

- Requires light, but not direct sun, fluorescents also work
- 3 ft. tall
- Native to rainforest of central America
- Care: keep soil lightly moist
- Uses: small size make it ideal for hallways, reception
- Removes Formaldehyde, Benzene, and Carbon Monoxide


Golden Pothos

- Natural, indirect light-North light
- 3 ft. tall
- Native to southeast asia
- Care: 65-75 degree F, moist, well drained soil
- Uses: effective at removing formaldehyde, planted in hanging baskets, potted, ground cover.

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**Indoor Growing Media**

The main components of indoor growing media consist of 60% Loam, 25% Sphagnum peat and 15% sand.244

- **60% Loam** (consist of sand, clay, silt)
  - Optimal: half particle, half pore space and after watering half pore space should be filled with water.
  - Proportions give each soil different water-holding and aeration characteristics based on the needs of the specific plant.
  - Sand: .05-2mm free-draining, less likely to become waterlogged.
  - Clay: less than .002 mm small pore spaces prone to water logging
  - Silt: smaller than sand, larger than clay—does not drain well.
- **25% Sphagnum peat**: moss retains water and air well
- **15% Sand**

When plants are in a seal container it is important to use free-draining soils in addition to a layer of gravel or aggregate (1 ½-2”) to prevent water logging.245 Charcoal can be mixed with the gravel to keep it fresh.246

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Planter Types

Depressed planter

The depressed planter is a planter that is created by dropping part of the cast-in-place concrete structural slab so that the top of the planter is nearly level with the surrounding pavement making the interior landscape feel more natural and integrated with the space it is in. This technique will be used for the plants on the balcony as well as several other locations in the interior of the office.

Curbing

Another technique used in combination with the depressed planter is “curbing.” Curbing is created by adding a curb, usually a few inches, to the edge or lip of the planter allowing for a deeper plant bed that may be necessary to accommodate larger plants. (See Figure 83) This also protects the planter from cleaning liquids that may spill in or people walking on the plants. The finish grade of the planting medium should undulate away from the bed to accommodate the root ball of larger plants and also to minimize the depth of the slab.

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depression, maximizing the floor-to-ceiling heights of the space below. This also provides a more organic aesthetic, similar to nature’s topography, creating stronger Biophilic effects.

**Decorative container**

A less permanent way to feature plants is to place them into a decorative container. This design project will utilize the decorative container using a “basic” installation where the growing pot is placed into the decorative container. The following are three requirements for this type of installation:\(^{250}\) 1. must fit comfortably in the container; 2. must be placed at the correct height relative to the top of the container; 3. must be placed in a stable condition so that the plant won’t tip over in the container. It is important to coordinate the grow pot size with the decorative container to insure proper fitment. It is common for a decorative container to have a lip at the top and a toeplate at the bottom, further reducing the height and weight of the grow pot. The lip is used to enhance the structural rigidity of the container. The toeplate creates a reservoir at the bottom of the decorative container to collect any excess water. When using a planter with a lip, the plant should be placed so that the top of the mulch is at the height of half of the height of the lip. (See figure 84)

Below is a table providing a rule-of-thumb on the depth of planter required for the size of the plant.\(^{251}\)

<table>
<thead>
<tr>
<th>PLANT</th>
<th>PLANTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small plant</td>
<td>11.5”</td>
</tr>
<tr>
<td>1’6” plant</td>
<td>1’3”</td>
</tr>
<tr>
<td>3’3” plant</td>
<td>1’6”</td>
</tr>
<tr>
<td>6’6” plant</td>
<td>2’</td>
</tr>
<tr>
<td>Mature tree</td>
<td>5’</td>
</tr>
</tbody>
</table>


Figure 84: Section of a decorative containing showing the layers and proper mulch height required.

Chapter 11: Design

The design of the Human+Nature Office will address the needs and values of the client, Communications Pacific, through the implementation of specific space typologies that were identified as necessary to support and enhance the way that employees at Communications Pacific work and live. The space typologies that were outlined in the Research Documentation section of this dissertation will be used when appropriate and through the process of analyzing the client's needs, a couple of new spaces were added to the Human+Nature space typologies to support the work processes and lifestyle of CP's employees.

The analysis of the client, and their existing office helped to identify problems that hinder employees' work processes as well as their connection to nature, which this research has shown, contributes to and influences the well-being, satisfaction and productivity of employees. Through the process of programming and client analysis the following problems were identified:

- **Key missing spaces:**
  - No dining area, which is a missed opportunity to promote their values of Community & Collaboration, Face-to-Face Communication and Relationships
  - No Retreat Space, which is necessary for restoration from stress and to support CP’s values of malama (to protect and care for employees).
  - No Mover Space, which provides clarity of wayfinding and promotes serendipitous encounters and spontaneous meetings.
  - No Collaborative Spaces between Individual Work Space, which hinder quick collaboration and knowledge exchange between employees.

- **Centralized Meeting Rooms far from Individual Work Space,** which mean that these rooms are less accessible and its use not maximized.

- **Decentralized public amenities and no sense of a “piko” or center,** discourages chance encounters between employees who don’t sit adjacent to each other.

- **Meeting spaces share space with circulation and with the open assistant work stations,** but because of the narrow corridors there is not enough room to sustain meetings as well as potentially disrupting someone’s individual work space.
Performance Requirements:
- Maximize natural light for all employees
- Coordinate artificial lighting with daylighting to decrease energy demand
- Mitigate solar heat gain and glare on the east and west facades
- Improve air-quality to decrease SBS and other building related illnesses
- Provide individual climate controls and adjustable lighting to maximize comfort

Schematic Design

I met with CP president, Christina Kemmer and Human Resources vice president, Harriett Kirihara to go over schematic design for the proposed office in the Pacific Guardian Center. I showed them plans, sections and perspectives to give them a feel for the space. Their attention turned to the perspectives where they expressed concern about the two-story design versus a one-story design where everyone is on the same floor. Kemmer was skeptical about the two-story configuration saying that it would cause a separation between the team, something that they experienced in the past when they occupied a floor and a half.

I explained that having their staff spread across an entire floor plate, around a service core, actually separated them just as much as if they occupied half that floor plate, on two levels. What makes the proposed design different than a typical two story office, like the one they used to occupy, is the amount of physical and visual access between the two levels. Their old office occupied the penthouse and half of the floor below, acting as two separate spaces, even having two separate elevators. There was no visual access between floors and the only physical access between floors was a dark, narrow fire stair. This created a separate of employees based on their proximity to each other and virtually eliminated opportunities for chance encounters.

The new Human Nature Office would incorporate visual access between floors through the use of loft spaces and a double height interior balcony providing connections between various spaces that are used throughout the day by all employees. Physical access is provided through a formal interior stair that punctuates the Common Gathering Space or the “piko” of the office where various public office amenities are located, promoting encounters between all employees regardless of where they sit and what floor they are on. The goal of the interior stair is to encourage employees on the second level to enter through the formal first-level entrance to get a
cup of coffee and check their email in one of the informal meeting spaces and also to encourage employees on the first level to go up to the second level to relax in the Recreation room or get away from it all in the Retreat Space. The stair and the public amenities becomes a place of serendipitous encounters and spontaneous meetings allowing for knowledge exchange and team building.

Kemmer and Kirihara were open to concept of the “piko” space connecting the two levels and were ready to move on to discuss adjacencies of spaces and staff location. The first thing that Kemmer asked me was who would be on which floor? This was the same question I had because in a previous meeting I found out that their current layout was not organized by department or by client teams, although the CEO, Kitty Lagareta, and Kemmer were next door to each other to support their regular interaction and collaboration. Kemmer and Kirihara helped me identify the key adjacencies to start to narrow down what functions and employees should be on the same floor. Kemmer suggested that the first level could be the more public level since it already was the formal entrance and lobby. The first level could include the conference rooms and production areas with big work tables and pinup space. The second level could be the more private work areas and additional conference rooms for more private meetings.

I discovered some important adjacencies from the conversation with Kemmer and Kirihara. Accounting must be all together and secured due to privacy issues. Human Resources should be on the same level as the majority of the staff to stay connected and accessible to everyone. Marketing acts somewhat like their own department and so they would be a candidate for the first floor adjacent to the production area. The CEO and president must be adjacent to each other.

Some of the things that Kemmer liked about the design were the central public spaces or the “piko,” which includes a kitchen, a Common Gathering Space, a Meeting Space and a balcony dining area. She said that these public spaces would be good places to entertain and have events and forums. CP currently rents out spaces when they need to host breakfasts and other various events. Kemmer said she liked the double height balcony space, but said that there was still not enough visual connection between the two levels and that more loft-like spaces would create greater connection between floors. She said that the collaborative spaces and the smaller meeting rooms should have round tables instead of rectangular to reinforce the idea that they are one team of equals and that there is no leader at the front of the table. Kirihara said that the entrance and library area was a nice space that flowed well into the Common Gathering Space.
When I met with the owner and CEO, Kitty Lagareta, She said that CP’s value of face-to-face communication and connectivity between employees is a challenge in their current office because employees work inside as well as outside the office. She added that the newer employees often meet at their clients’ offices and sometimes work from there if they are on a project. The more senior staff, including Lagareta, often have clients come to them and they have meetings in their office where they have more room, usually a four person meeting table, and can accommodate client meetings. She said that the proposed Human+Nature office offers more public and private meeting spaces that encourage employees to have client meetings at the office instead of having them go out to their clients all the time, which would promote CP’s value of face-to-face communication and collaboration.

After discussing the first design scheme with the client they requested that I add a couple additional spaces to the design; a locker room and shower facilities and a gallery space. The need for a locker room was mentioned previously by senior account executive, Nicole Fuertes, to help support and encourage an active lifestyle where employees can bike or walk to work as well as exercise during their lunch break. Kemmer also said that the showers were needed because often times employees need to go to special events in the evening right after work and so it would be great to be able to have a place to clean up and get ready. Kemmer also felt the office should have a gallery space to showcase and create awareness of the work that CP does. This helps clients and visitors understand what they do and it also serves to recognize the work of their staff.
**Design Development**

I met with the owner and CEO, Kitty Lagareta, to get her caught up on the discussions I’ve been having with her staff, including an overview of my research on Biophilic Design and the Human Nature Office as well as the design changes that I made from my meeting with Kemmer and Kirihara.

Lagareta appreciated the concepts of Biophilic Design and was receptive to the new Human+Nature Office and all the new space typologies that I identified and designed. She already believes that contact with nature is important and it shows in the amount of potted plants that she has throughout the office. She liked how I was sensitive to the way CP works by providing the necessary enclosed Individual Work Spaces that provide sound privacy, while allowing for a degree of visual access between workstations. She said the locker room and showers were great, because they help to support an active work force that may want to exercise during their lunch break.

She was satisfied with the adjacencies and felt that the two-story configuration would work because there was a physical and visual connection between floors as well as having a centralized location for all the public amenities. She agreed that it was a good idea to decentralize the meeting rooms and to centralize public amenities, which encourage serendipitous encounters by bringing workers to the “piko” or the center of the office.

Lagareta said that in planning CP’s future office she would want to add more technology and also try to reduce overhead by decreasing the amount of office space. The increase in total square footage of their office from 7,149-10,000 sq. ft. came from adding public spaces for meetings and team building, public amenities like the kitchen and dining and places to promote health and well-being like the Recreation Room and the Retreat Space. She agreed that these spaces were necessary and actually provided many accommodations and services that her company normally has to seek out of office for.

She said the design I presented would be great for their current needs but in the future would be interested how they could decrease their office size by evaluating how the spaces are being used. From my conversation with CP’s staff as well as my observations I believe a closer examination of how their spaces is used would allow us to eliminate unnecessary spaces like unused offices and redundant conferencing spaces, while allowing for the design of key missing space typologies like the dining, Meeting Spaces, Common Gathering Space.
and Retreat Space. It is also interesting to note that the new 10,000 sq. ft. space would cost 26% less than CP’s current penthouse office, yet offer 40% more space. This only strengthens the argument for the proposed Human+Nature Office, which will already save on personnel cost as well as energy cost through a synthesis of Biophilic Design and sustainable design.

Architect and doctorate committee member, Geoffrey Lewis, AIA, reviewed my drawings and was informed of the comments from the client. He suggested increasing the upstairs/downstairs openness, creating more “z” or vertical direction connections so that the office would feel less disconnected between floors and more like one space. He also said that I should consider switching the direction of the stair and walkways so you can walk along the double height window wall and look back into the lower Common Gathering Space. I switched the stair direction, created a bridge platform at the top of the stair and opened up an additional bay next to the stair opening to create a larger opening between the floors, creating a loft type space. (See figure 85)
Lewis said that the interior of the workstations need to be designed carefully to include enough natural light and biophilic elements and suggested I do some interior studies of what it will look like. (See Figure 86)

He also commented on my receptionist area saying that it should allow for more work space to maximize productivity by doing other tasks other than just being a receptionist. I previously had a small office type desk that provided little work space and no buffer from incoming visitors. I replaced that with an L-shaped receptionist desk with a tiered counter, allowing for more space and a sense of privacy. I sketched out the inside of a typical enclosed Individual Work Space to express the opportunities to connect with nature and fellow co-workers from their personal work spaces. A typical enclosed Individual Work Space will feature glass and wood partitions, vegetated overhead trellises, and vertical shading fins with planters installed between every other fin.
I also had the opportunity to go over some rendered perspective views of the spaces with Lewis that started to show materials, light, color, vegetation and people. (See figure 87, 88)
Lewis suggested that I think about what each view is trying to communicate and what the focal point is to make sure the view is communicating something. He said that adding entourage like people will show how the space will be used. He suggested that I incorporate Hawaiian artwork on the walls to create a connection to place and culture as well as making the scene come to life. Lewis appreciated how I used color to highlight walls, but said that it would be more effective if I added a couple other colors to create more sensory variability as well as acting as visual cues to aid in wayfinding and to differentiate between floors.

Committee member, Dr. Andy Kaufmann, appreciated the use of planters and bamboo in the interior space, but felt that they could be improved by integrating the planters with the seating areas, so it wasn’t just a planter behind a typical piece of furniture. He suggested that the planter can also have seating area like a bench built into the planter. (See Figure 88) He said that the hard lines of the planter can be soften by planting ground cover, like Golden Pothos that can grow around the bamboo and flow over the planter edges making the planter feel more part of the environment. He also suggested integrating some type of water feature like a fountain, which is a strong Biophilic element providing satisfaction and restoration. Kaufmann commented that he liked the use of both permanent seating areas

Figure 87: Schematic render showing materials, vegetation and color
and more flexible tables and chair that provide both sociopetal (encouraging interaction) and sociofugal (encouraging separation) seating options, giving occupants a sense of control. He said the table and chairs that I used could be created from things from nature, like stone tables and chairs instead of the typical pieces you can buy from furniture companies like Herman Miller. (See Figure 88)

Committee chair Joyce Noe, FAIA, commented that there were not enough Biophilic elements in the spaces and that there are more opportunities to add more vegetation and natural elements into the space so it does not feel like another office that could be located anywhere. She also added that instead of using planters I might want to build the planter into the slab so that it sits relative flush to the ground and can be covered with other vegetation to give it a more natural feel instead of being a decorative element. She said that vegetation can also be used to cover railings, helping to soften the edges of the architecture. Noe also pointed out the there is not enough of a connection to place and culture, which is a Biophilic human need. She suggested incorporating tapa cloth as a shading device in offices or as a decorative element to cover solid walls. Communications Pacific's current office features various elements that help to create a connection to place and culture. These include artwork of Hawaii’s landscape, koa furniture and canoe paddles.
The site is located in Honolulu’s central business district and was selected because of its urban context and lack of visual and physical access to nature. This is especially true in high-rise offices, where the higher you are the farther you get from direct contact with nature, which in an urban environment may include landscaped plazas, views of trees and exposure to natural ventilation and sunlight.
1. DINING/MEETING SPACE
2. COMMON GATHERING SPACE
3. MEETING SPACE
4. KITCHEN
5. MEETING ROOM
6. PUBLIC GALLERY
7. PIN-UP MEETING SPACE
8. MOVER SPACE
9. MEETING ROOM
10. COLLABORATIVE SPACE
11. INDIVIDUAL WORK STATION
12. STORAGE
13. ASSISTANT WORK STATION
14. PRIVATE OFFICE
15. LIBRARY
16. LOBBY & INFORMATION
LEVEL 2
1 RECREATION SPACE
2 MEETING SPACE
3 MOVER SPACE
4 PRIVATE OFFICE-CEO
5 ASSISTANT WORK STATION
6 MEETING ROOM
7 PRIVATE OFFICE-VP
8 COLLABORATIVE SPACE
9 INDIVIDUAL WORK SPACE
10 LOCKER ROOM / SHOWERS
11 MEETING SPACE
12 RETREAT SPACE
13 PRIVATE OFFICE-VP
14 LEVEL 2 LOBBY

LEVEL TWO PLAN
HUMAN+NATURE
OFFICE DESIGN
1 INDIVIDUAL WORK SPACE
2 ASSISTANT WORK STATION
3 PRIVATE OFFICE-VP
4 RECREATION SPACE
5 INTERIOR STAIR
6 PRIVATE OFFICE-CEO
7 INDIVIDUAL WORK SPACE
8 PRIVATE OFFICE-MGR
9 COMMON GATHERING SPACE
10 DINING/MEETING SPACE
11 MEETING ROOM

LONGITUDINAL SECTION PERSPECTIVE
“E KOMO MAI” - Welcome

The Lobby and Information space is a public on-stage welcoming space that transitions people from public to private space. This space is the front door of the company and helps to brand the identity of the business, its values and mission.

**HUMAN+ NATURE OFFICE DESIGN**

1. Dropped trellis ceiling and vines provides a sense of refuge and arrival.
2. Prospects to the outside environment provide a connection to place.
3. Indoor plants improve indoor air quality by absorbing toxins in the air that cause SBS and other BRI. A variety of vegetation act as punctuation points that aid in legibility of the space.
4. Natural materials, colors and textures provide sensory variability.
5. Stepping stone path, light and prospects provide enticement into the space.
6. Furniture made out of natural recyclable materials.
7. Artwork of local themes, by local artist provide a connection to place and culture.
The Common Gathering Space is an informal, multi-purpose recreation and social gathering and meeting space for employees, client and guests. It is the closest thing to true public space in an office and is designed to encourage serendipitous encounters between employees.

1. Visual access connects people providing sense of community and participation
2. Hanging vines highlight the double height space and provide fascination and sensory variability.
3. Vegetation and lower ceiling height create a sense of refuge
4. Bamboo, Golden Pothos and a green wall define the Meeting Space and also clean the air
5. Native artwork creates a connection to place and culture
6. Enticement is achieved by guiding occupants toward the light. Plants act as punctuation points that promote involvement in the environment.
7. The sound and rhythm of moving water provides satisfaction and assurance to workers and guest
8. Outdoor dining and meeting area provide direct access to nature.

PIKO 'OHANA- Common Gathering Space

HUMAN+NATURE OFFICE DESIGN

Biophilic Human Need Attributes
Operational Attributes
The balcony offers direct access to natural air, natural light and native vegetation. Dining area provides a sense of ‘ohana and a place to build common ground and trust between employees and clients. Mauka to Makai views provide a connection to place. A sense of Prospect and Refuge through broad views of the surrounding landscape and streetscape and a feeling of privacy and refuge through a screen of plants, climbing vines and overhead palm trees. Work tables and Wi-Fi support contemporary modes of working. Transparency and a sense of inclusion is provided through visual and physical access between adjacent spaces on both levels.

**DINING/MEETING SPACE**

This space flows from the Common Gathering Space, almost as an extension of it, and serves as a public amenity that encourages social interaction and a sense of ‘ohana. This space together with the Common Gathering Spaces serve as the heart or the “piko” of the office and is the place that mostly clearly promotes positive connections to humans and nature.

**HUMAN+NATURE OFFICE DESIGN**
Color increases legibility and acts as a visual cue to aid in wayfinding.

2 Mountain views provide a connection to place

3 Vertical fins shade the east facade reducing solar heat gain and eliminating glare for occupants.

4 Planters with native ‘Ulei shrub provides access to nature and a connection to place

5 Stone benches provide sensory variability and a connection to nature.

6 Bamboo Palm and Golden Pothos provides a punctuation point aiding in wayfinding. Also improves indoor air quality by removing Formaldehyde, Benzene and Carbon Monoxide

7 Central location supports an ebb and flow of traffic encouraging inclusion.

8 Unbound space provides prospects of the surroundings and a degree of refuge due to the drop ceiling and partition

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**GALLERY**

The gallery space was suggested by Communication’s Pacific president Christina Kemmer as a place to showcase the projects that they are working on to create awareness of the work that CP does. This helps clients and visitors understand what they do and it also serves to recognize the work of their staff.
Dropped ceiling provides sense of refuge, feeling of being under a canopy, while also absorbing sound.

Diffused lighting and daylight harvesting provide soft lighting, while reducing energy.

Views of the outside provide awareness of seasonal changes and time of day, while promoting a connection to place.

Use of Hawaiian words displayed graphically on the wall embrace CP’s culture and provides a connection to place.

Seated views of nature provide restoration from stress and use of Hawaiian plants provide a connection to place and culture. The Ti plant is known as the “Hawaiian Good Luck Plant,” commonly used in landscaping and lei.

Interior prospects provide visual access that allows a survey of the environment for opportunities or threats, which gives people assurance and comfort.

Glazed walls provide transparency and a sense of inclusion and participation, while providing acoustic privacy.

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**MEETING ROOM**

Meeting Room is an enclosed conference room for more formal meetings between employees and clients enabling an exchange of ideas and knowledge. These rooms can vary in size and privacy to serve different functions from private one-on-one meetings to large group charettes or brainstorming sessions.

**HUMAN+NATURE OFFICE DESIGN**

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**Biophilic Human Need Attributes**

1. Dropped ceiling provides sense of refuge, feeling of being under a canopy, while also absorbing sound.
2. Diffused lighting and daylight harvesting provide soft lighting, while reducing energy.
3. Views of the outside provide awareness of seasonal changes and time of day, while promoting a connection to place.
4. Use of Hawaiian words displayed graphically on the wall embrace CP’s culture and provides a connection to place.
5. Seated views of nature provide restoration from stress and use of Hawaiian plants provide a connection to place and culture. The Ti plant is known as the “Hawaiian Good Luck Plant,” commonly used in landscaping and lei.
6. Interior prospects provide visual access that allows a survey of the environment for opportunities or threats, which gives people assurance and comfort.
7. Glazed walls provide transparency and a sense of inclusion and participation, while providing acoustic privacy.

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**Operational Attributes**
MOVER SPACE

Mover Space is a public space of constant movement with high user volume. This is often the main circulation or corridor that leads to different departments. It needs to facilitate clear movement, allowing people to transition from shared work spaces and amenities to the more private individual work spaces.

HUMAN + NATURE OFFICE DESIGN

1. Honeycomb shaped trellises provide a vegetated privacy screen and create a interplay of light and shadow that change throughout the day providing sensory variability.
2. Glazed partitions allow natural light into the hall and the spaces in the core.
3. Diffused pendant lights provide rhythm that aids in legibility and wayfinding.
4. Well lit, central focal point provides clarity of wayfinding and enticement to move forward.
5. Extra wide halls provide an interior “street” allowing for circulation as well as breakout space for informal meetings.
6. Dropped trellis and a living Bamboo screen create a sense of privacy and refuge in the Collaborative Space.
7. Variety of seating provide flexible work environment that promotes collaboration and interaction.
8. Large work tables promote teamwork and a sharing of ideas and knowledge.
9. Recycled cork flooring provides superior sound insulation and a soft walking surface.
This space is part of the “piko,” or the heart and center of the office where everyone circulations through and around. It features public amenities like the Recreation Space and the Meeting Space that encourage social interaction and opportunities to connect with nature.

**HUMAN+NATURE OFFICE DESIGN**

**PIKO HO’OMAU**

1. Light and vegetation at the ends of the hall provide enticement
2. Colored walls provide visual cues that help define spaces, aiding in wayfinding.
3. Use of Hawaiian words displayed graphically on the wall embrace CP’s culture and provides a connection to place.
4. Interior vegetation like Bamboo Palm and Golden Pothos help clean the air, while providing a sense of refuge.
5. Natural materials, furniture and low VOC paint further improve indoor air quality.
6. Hanging vines highlight the double height space and provide a living screen that affords privacy and sensory variability.
A Recreation Space is an active respite or play space for employees to de-stress and express themselves physically while bonding and interacting with co-workers. It is a place to establish common ground and trust as well as improve communication and promote creativity. It provides fascination, or a positive distraction, allowing directed, focused attention to rest enabling employees to be healthier and more productive.

Balcony garden provides workers with a sense of being away, both physically and mentally through information richness that allows the mind to focus on something other than work, allowing for restoration from stress.

Prospects of the surrounding landscape and cityscape provide a connection to place and culture.

Hawaiian artwork helps celebrate the uniqueness of place.

Loft location on the 2nd level provides transparency to other adjacent spaces, but provides a sense of refuge through its elevated location that requires crossing a bridge to enter.

Casual lounge chairs encourage rest and relaxation.

Not shown: Pin-pong table or other forms of entertainment engage employees and bring them together, which help to strengthen CP’s value of ‘Ohana and Collaboration.

1. Biophilic Human Need Attributes
2. Operational Attributes
Dropped trellis ceiling provides a sense of compression and refuge, while the windows provide a release to views of the landscape and cityscape.

32" deep vertical fins angled to 30 degrees on the east facade provide 93-100% shade except for June/July at noon, which is then 44%. This provides natural diffused light for working, while decreasing solar heat gain and reducing energy cost.

Views or prospects to the outside provide a connection to place and allow an awareness of seasonal changes and time of day.

View of culturally significant plants like the "Ilima and the Ti Plant provide positive distractions allowing directed attention to rest and also help to celebrate the uniqueness of place.

The Bamboo Palm is used inside to provide access to nature and a punctuation point that can be seen from other spaces. It serves to clean the air by removing Formaldehyde, Benzene, and Carbon Monoxide.

Artwork made of local koa wood celebrate uniqueness of place.

Kulana Alaka’i (place of leadership)
The private office is a type of Individual work space that offers the greatest degree of privacy. This space for the CEO of Communications Pacific is designed with glazed walls that allows for a sense of transparency while also providing the necessary sound insulation. Unlike the corner offices of the past, this office is located near the center or “piko” of the office, providing physical and visual access and an open-door policy.
Communications Pacific values a collaborative, open work environment, but require sound privacy that only walls could provide. These enclosed workstations are designed with glass and wood partitions between each station, providing them with the feeling of being in an open office while having the necessary sound privacy to support their work processes. Nature and natural materials surrounds the worker allowing for restoration from stress, increased job satisfaction and productivity and better health.

Individual Work Space

1. Overhead vegetated trellis provides sensory variability, cleans the air and helps to absorb sound.
2. Honeycomb, vertical trellis, provide, a privacy screen for workers while creating changing light and shadows throughout the day.
3. Glass and wood partitions provide transparency, a sense of inclusion between workers and a sense of privacy and refuge. It also provides sound privacy, necessary for private conversations with clients.
4. Potted plants like the Peace Lily, improve indoor air quality by absorbing toxins.
5. Native plants on the window ledge, provide views of nature, help reduce solar heat gain and provide a connection to place.
6. High performance double pane glass reduce solar heat gain and allow for a clear window, which offer views of the harbor on the west wing and mountains on the east wing giving workers a connection to place.
7. Vertical fins reduce solar heat gain and glare, improving occupant comfort.

HUMAN + NATURE OFFICE DESIGN
The Retreat Space is a private or semi-private space for employees to go to, to step away from a stressful situation or task. It should be a respite that encourages calm and restoration. One of the key attributes of this space is having a sense of being away, both physically and mentally. The environmental factors that make this space effective are a sense of privacy and refuge, natural light or artificial soft diffused light, controlled climate and a view out to something preferably a nature scene, which has its own restorative properties.

1. Lighting from above with no obvious light source creates a spiritual effect and a sense of being in a whole other world.
2. Central focal point to a nature scene provides a positive distraction allowing directed attention to rest as well as allowing for reflection.
3. Use of local lava rock and plants provide information richness and a connection to place. Kalo plant is symbolic of creation and life and promotes values of ‘ohana and appreciation of ‘aumakua, which provide a sense of identify and place.
4. Water in most religions is consider the original source of life, it’s sight and sound is soothing and provides comfort and satisfaction.
5. Furniture is made out of natural materials providing a comfortable place to lie, sit or stand.
6. The private nature of this space requires both visual and acoustic privacy, so it is compatible with the activity of respite. The location in the core allows the perimeter spaces to remain open to light and also benefits from creating a space with no associations to the tasks that may have caused fatigue of directed attention and stress.

- Biophilic Human Need Attributes
- Operational Attributes
Chapter 12: Conclusion

The goal of this doctorate project is the creation of a methodology that will 1) help architects design better work environments that support the basic human need to connect with nature, 2) create space typologies that support the demands of the 21st century workplace, 3) utilize office design as a tool to support a businesses’ values and work processes, 4) integrate sustainable features that connect with humans by providing deeper meaning and value. Many people already believe that a connection to nature in the workplace is beneficial and desirable, but few understand why it is so important or how to properly introduce it into the built environment.

Through my research in Biophilic Design, I have shown that access to nature can increase productivity, improve worker satisfaction and happiness, enhance cognitive functioning, decrease absenteeism and reduce Sick Building Syndrome (SBS) symptoms and Building-related Illness (BRI). Through my research on workplace design and interviews with a professional workplace strategist, I have identified 10 (key) space typologies that are necessary to support and enhance the way that people work in today’s modern office.
environment where mobility, knowledge exchange and collaboration are valued. These spaces include: Lobby and Information, Common Gathering Space, Mover Space, Public Purpose Space, Recreation Space, Meeting Space, Meeting Room, Collaborative Space, Retreat Space and Individual Work Space. These key spaces are informed by two sets of attributes, the Biophilic Human Needs attributes and the Operational attributes. These attributes describe the environmental qualities and human sensitivities required of each space so the designer has a guideline that describes the spatial and experiential requirements of the space. This guideline is not meant to be an exhaustive list, but an informed starting point that can be tailored to a specific client. Many of the requirements of these spaces have the added benefit of dictating a more sustainable building envelope that improves occupant comfort and satisfaction, reduces energy load and saves water.

The design portion of this doctorate project was a renovation of an office space for a real client, Communications Pacific (CP). It was important to test how applicable and effective the Human+Nature Office Design Matrix would be when applied to a real business and an existing building, which bring with them unique demands and constraints. The Biophilic Human needs matrix and the Operational Attributes matrix were successful tools in designing for the needs of CP’s employees and the demands of the 21st century office and this design project has shown that the matrix can and should be tailored to support and strengthen a company’s unique identity and values.

For example, it became clear that the Individual Work Space model would conflict with the day-to-day operations of CP’s employees, who need enclosed spaces to make frequent, private phone calls to clients. According to my matrix, the Individual Work Space should promote direct interaction and accessibility among employees. However, at CP such interaction would have to be limited to glass and wood partitions that provide only visual access between work spaces. CP already values the use of indoor plants, but appreciated specific Biophilic Design techniques such as Prospect and Refuge to achieve the right spatial and experiential effects. Because I added more square footage to CP’s existing program, it became essential to establish the values of these additional spaces and to show how it was serving a need that was not being met. An example of this is the dining and kitchen area, because there currently is no kitchen except for a refrigerator and counter, or place to eat together. The purpose of the space extends beyond the function of eating, it is symbolic of
‘ohana and building common ground between employees and clients, which is one of CP’s company values.

When speaking to CP’s chief executive officer and owner, Kitty Lagareta, about the proposed redesign, she said the future plan is to downsize the office, not upsize it. Even if this is the case, many of the principles of Biophilic Design could still be incorporated into a downsized version of CP by examining the work processes of their employees and eliminating underutilized offices or redundant conference rooms, replacing them with some of the key space typologies that increase well-being and productivity.

Today, there are thousands of high-rise urban offices that are inefficient and detrimental to the health and well-being of occupants and the surrounding natural environment. Many of the offices in these buildings do not have the space typologies to support today’s knowledge-based economy. Many more lack a connection to nature, natural light and ventilation, thereby creating unhappy, unhealthy, and unproductive employees. The Human+Nature Office can improve the quality of life and the productivity of millions of people by reconnecting humans to nature. The use of Biophilic Design and sustainability in the office will improve the health and well-being of workers while reducing the environmental impact of buildings, thus creating a truly sustainable office building that supports and enhances work and life.
References


Groves, Kursty and Will Knight. I Wish I Worked There!: A look inside the most creative spaces in business. Chichester: John Wiley & Sons Ltd., 2010


