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Contributing with Voluntary Certification Systems

A Case-study Evaluating Knowledge Gaps Between Design Professionals and the Well Building Standard

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A Case-study Evaluating Knowledge Gaps Between Design Professionals and the Well Building Standard

by

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Thesis

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Master of Science in Sustainable Design

The University of Texas at Austin

May, 2017

Dedication

This work is dedicated to those who believe the answer to our problems cannot be found by simply optimizing the solution, but by maximizing the number of solutions available.

Abstract

Contributing with Voluntary Certification Systems

A Case-study Evaluating Knowledge Gaps Between Design Professionals and the Well Building Standard

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The University of Texas at Austin, 2017

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This research draws its assumptions from a number of complex issues around sustainability discussions and voluntary standards as the most known influence to achieve the materialization of sustainability strategies in our built environment. In the United States, green building certifications are tools used voluntarily to take into account different frameworks and scales that deal with various aspects of sustainable design. In fact, before such standards were introduced in 1990's, sustainable practices had no common definition or explicit guidance in the built environment. Today, despite voluntary standards reaching industry-wide adoption among practitioners in the design industry, real state, and society, these certifications still struggle to shape standards that are representative, comprehensive, and reliable.

Most specifically, this study seeks to understand the gaps between explicit codes

and the knowledge held by certain groups and frameworks found in such standards. The relevance of this analysis lays on the fact that the extent of such gaps between the system and the user could hurt the application and thus the impact of such tools.

Under a constructivist framework, this research utilizes the Well Building Standard as a case study to analyze the characteristics of these gaps, by conducting a survey that engaged with more than ninety design professionals throughout the United States. The intention is to reveal the extent of these gaps, as well as its causes in order to provide a more representative standard for future users. Ultimately, this investigation also pairs essential findings in the case study with voluntary standards in order to draw bigger arguments.

Therefore, the findings address two scopes in order to make recommendations: the scope of the Well Building Standard specifically, and the scope of voluntary building standards. In all, the results from the survey confirms the existence of a gap within the knowledge in practice and the consensus explicit in codes. This study makes recommendations for The Well Building Standard decision-making board, and for voluntary standard systems on how to better serve the concerns in the practice of design.

Table of Contents

List of Figures

INTRODUCTION: RESEARCH DESIGN

RESEARCH QUESTION

How does the WBS illustrate limitations of voluntary accreditation systems within the design professional's body of knowledge and assessment of sustainability practices?

SECONDARY QUESTION

What do these limitations mean for action within the field of certification systems as it relates with the design industry?

PROBLEM STATEMENT AND RELEVANCE

One of the ways in which sustainability is communicated, applied, and assessed is through green building certification systems. In the United States, green building certifications are voluntary and have different frameworks and scales that deal with various aspects of sustainable design. These voluntary certification systems aim at becoming the normative point of reference around sustainable practices. The intention of this study is to explore the fundamental issues found within the code of these voluntary certification systems. Inconsistencies between code content and users' knowledge is typical, but at certain degree this variation could hurt the adoption and application of these tools and the logic they represent.

Different from federal policies, and state or locally enforced building codes that are set in a top to bottom fashion, voluntary codes are set the other way around, whereby consensus among knowledgeable practitioners and stakeholders determines policies and strategies that shape their work. As a result, elements of these standards have to be trimmed down so that consensus is achieved among all of the stakeholders creating them. Consequently, these systems may contain segments that do not accurately represent the full body of knowledge of each individual code-user. This condition in the conception of voluntary standards causes some gaps between the code and the knowledge of specific groups of users of the code. Thus, this research investigates the characteristics of gaps and trends between user's knowledge (the designers) and the explicit code, by using as a case study the new Well Building Standards (WBS).

The WBS proposes an innovative approach to green building systems, whose strategies are centered on the user's wellbeing. Sustainability standards as the WBS are drafted as codes containing credits and parameters against which all-technical aspects relating to the topic of the standard are compared.[1]

The WBS considers policies, technologies, and space management issues that can create positive social equity outcomes. The WBS is now limited to commercial office buildings, yet its model can set an important precedent for future green building systems that can have a more obvious social impact due to its comprehensive approach[2]. Furthermore, in the recent history of "green buildings," a general consensus has grown around the idea that voluntary certifications can have a major effect on the three pillars of sustainability: economy, environment, and society.

Sustainability certification tools allow us to create complex socio-technical networks that are part of the social, political, technical, economic, and ethical infrastructures that constitute social dynamics (Busch 2011). Thus, the correct development and application of voluntary standards is important to keep improving and learning from the different frameworks they propose about sustainability.

The research carried out in this thesis provides empirical evidence of the existence and the extent of gaps between the WBS code and the 90 design professionals' perspectives across the US. These professionals include architects, urban designers, interior designers,

[1] The terms 'code' and 'standard' are used interchangeably to refer to the regulatory framework created in voluntary certification systems.

[2] The WBS non only focuses on building performance but also on operational strategies that have more obvious social impact.

building analysts, and project strategists in the United States. The study showcases that such gaps result from two phenomena: First, a lack of understanding of some pieces of code that do not resonate with designers and their day-to-day practice, and second, professionals who do not perceive several pieces of the code as relevant to their practice. Hence, better means to overcome such voids are necessary in order to facilitate the adoption of sustainability practices in the design community.

Moreover, specific to the WBS case, quantitative and qualitative evidence suggests that practitioners associate and prioritize the concept of wellness in different ways than code does. The data shows that practices associated with wellness can be conceptualized into four strategic areas that represent the different natures and intentions that wellness has within the design practice. This research superficially elaborates about these strategic areas as they reveal how practice can enrich the content of the codes. However, since the issue of wellness itself is beyond the scope of this study, this analysis suggests that more exploration regarding conflicting meanings of wellness has to be done.

METHODOLOGICAL APPROACH

This study makes its assumptions by applying a constructivist methodological approach. This means that the research bases its findings on empirical data, both qualitative and quantitative, to respond the research question. This framework is used to determine the answer to the following questions: How does the WBS illustrate limitations of voluntary accreditation systems within the design professional's body of knowledge and assessment of sustainability practices? And what do these limitations mean for action within the field of certification systems?

The constructivist framework creates a platform for a logical and coherent system of inquiry that makes sense within the bottom-to-top system that voluntary standards propose. Since this study involves investigation within two fields, (i.e. sustainability voluntary certification systems and the practice of wellness within the scope of sustainable design), the research assumptions must be congruent with these discourses.

A constructivist framework takes the position that knowledge is not universal or objective, it is in fact constructed, explicit or not, through social agreements (Groat and Wang 2013). Hence, this research project first understands and evaluates voluntary code criteria and later inquiries about the perspectives of design professionals in regards to their take on its frame.

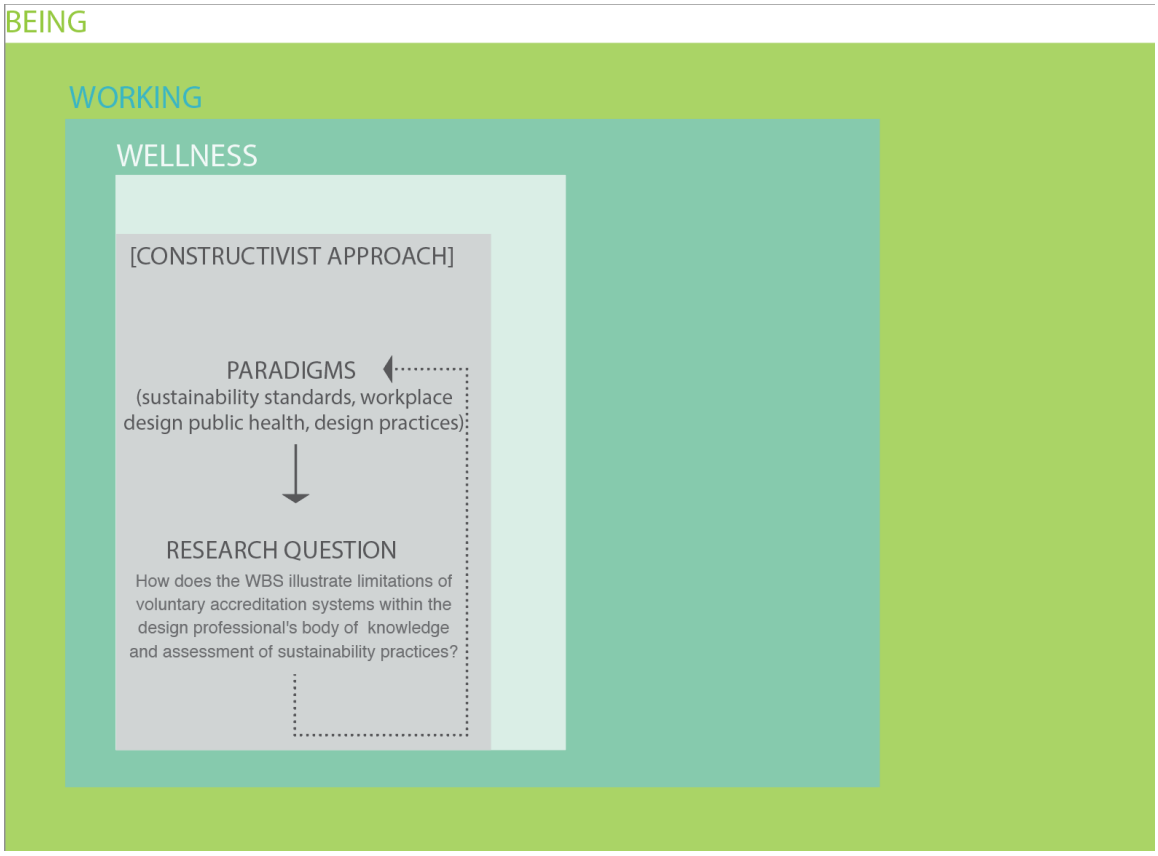

Figure 1: Diagram of Research Paradigms.

Consequently, this research creates a contemporary case study to understand the dimension and characteristics of the gap existent across voluntary codes and design professionals. The idea is to ask a group of design professionals, through an online survey, for their take on the credits[3] set by the new WBS framework. This study recognizes that, in various arrangements of society or circumstances, things might be perceived differently than expected. Therefore, the knowledge generated by this study is contextual and

[3] Credits are standards' components. Credits represent each of the strategies proposed to earn points and get certified. Better description about the credits in the WBS is provided in Chapter 3.

conditions are always subject to change.

The topic of sustainability standards is complex and involves numerous situations and players. Consequently, as Figure 2 showcases, the boundaries of the study lay on the comparison of one group of stakeholder's view with the explicit code. This exploration generated conclusions and recommendations that aim at contributing with the betterment of the code. Ultimately, the purpose of this study is to contribute to the process of refining the knowledge and information used in voluntary standards, and elaborate on the limitations of WBS.

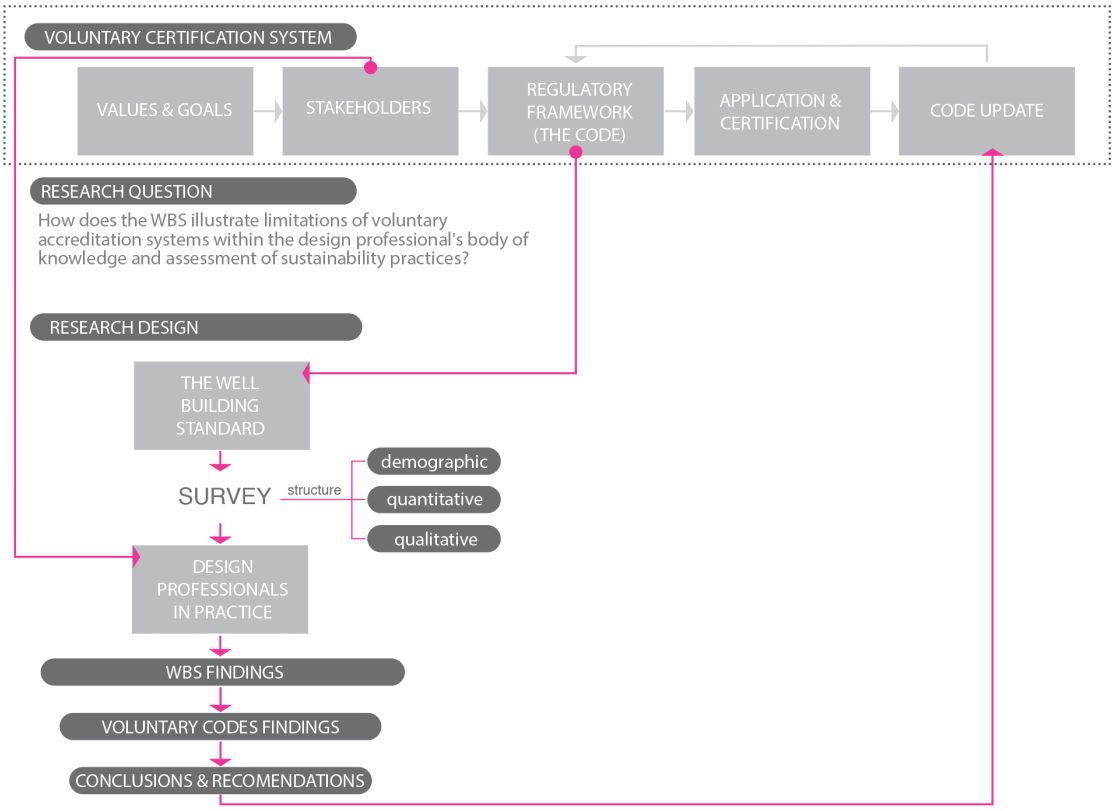

Figure 2: Research Design Diagram.

SURVEY METHOD

The survey instrument looks to quantify the professionals' posture about the different credits established by the WBS. The survey was designed to collect a significant amount of responses from the online sample. The questionnaire was distributed to over one hundred and eighty design professionals, aiming at getting at least ninety responses.

The reach of the survey was determined by the numbers of credits to evaluate based on the expert review method and analysis[4]. The expert review method and analysis was developed together with Michael Mahometa from the department of Statistics and Data Sciences of the University of Texas. Through the heuristic analysis, it was established that ninety people are the minimum amount of responses needed to have reliable results.

Moreover, the questionnaire was designed with three strategic sections that add up to a total of thirteen questions. The first section collects demographic information, such as age, sex, practitioner position in the company, years of experience in this position, and if they have ever before incorporated "wellness" concepts into their projects. The second section asks subjects to evaluate the thirty-six strategies established by the WBS in four questions that are randomly arranged. The respondents evaluated the responses using a common Likert scale of 5 points that ranged from 'not important', 'less important', 'not sure', 'somehow important', to 'very important'. Lastly, the third part consists of

[4] Expert review consists on an inspection designed to identify usability problems of a product in an online way. This analysis is a method designed to find reliability in a system that has many variables in different categories. In this research, this system was used to determine that 90 people were the number to determine reliable results from the survey. This is because, within each of the seven categories of the WBS code, the largest one contained nine elements to evaluate.

qualitative inputs. Here, design professionals were asked to include practices that they consider important that were not listed previously. The survey was set on anonymized response in order to protect the identity of the respondents. The complete questionnaire of the survey can be found in the appendix of this research.

OUTLINE OF WORK

Chapter 1 provides a literature review of relevant terms related to knowledge and voluntary codes. Chapter 2 provides a historical overview and relevance of the topic of wellness within sustainability discussions. Chapter 3 describes and analyzes the WBS in depth. Chapter 4 presents the findings from the surveys' result. Lastly, Chapter 5 exposes the conclusions and recommendations offered to the WBS case and to voluntary building standards in general.

CHAPTER 1: LITERATURE REVIEW OF VOLUNTARY CODES

"Technology is society made durable; then, standards might be similarly considered social values made technological." (Busch 2011)

Voluntary codes play an essential role in the development of sustainable strategies by promoting and prescribing certain practices to the design field, but, as a tool, they still have some limitations that might hurt their application. This chapter seeks to understand the intrinsic reasons behind existing gaps between knowledge explicit in such standards and the knowledge found in practice. Consequently, this section discusses the fundamental limitations of explicit and implicit frameworks present in the design field and how this can be found in standards such as the WBS. By addressing this crucial situation in perspective, the research seeks to understand the driving forces behind gaps of knowledge that arise between voluntary codes and the practice of design.

Explicit knowledge is common place among many fields of study primarily because it is the main means through which criteria can be efficiently transmitted (Zisko-Aksamija 2008). It allows for standards to be articulated and verbalized easily, which makes it readily available for others to replicate and implement. Voluntary codes are considered to be a well-documented set of guidelines used by design practitioners to guide their efforts in the matter of frameworks related with sustainability.

Codes such as the WBS are an explicit form of the information available in the matter of health and wellness which criteria has to be representative of the design field knowledge. For instance, the WBS makes efforts in collecting and structuring strategies

necessary to ensure health and wellness in the built environment. Structured sections consisting of individual credits that explain the extent of each of the strategies makes it convenient and easy to understand by any professional.

While explicit codes and standards are commonplace across many fields, certain professionals rely heavily on implicit guidelines to carry out their work. Different from most professions, architecture typically has a higher level of reliance on tacit knowledge, specifically when it relates to aesthetics, distributions, and proportions in practice (Owen and Kim 2008). The main limitation with implicit knowledge across many professions is that it is incredibly difficult to document.

Tacit knowledge makes reference to the information that is hard to articulate and transmit. It is also associated with special abilities that contain subjective insights, intuitions, and skills that require lengthy experience and innate ability to master (Zisko-Aksamija 2008). For instance, in the design practice, this mastery is thought to be largely experience-based, including factors such as culture and artistic sense within the design considerations. Therefore, it is appropriate to recognize that knowledge limitations and gaps of voluntary codes in the design practice are in part a result of the nature of such dynamics. Thus, the WBS case study is expected to confirm the existence of such gaps.

In all, standards establish the rules of the game, creating and determining the way designs, systems, and operations are set in the built environment. While gaps are expected to be found between the explicit knowledge expressed in standards and the knowledge held by the standard's users, this is indicative that this tools still have room for improvement in assessing wellness in the design field. Therefore, rethinking ways to bridge existing gaps

on voluntary codes could result in better and broader systems that increase means for sustainable design practices. Voluntary standards that do not align with knowledge in practice result in lack of application of important measures when their impact and importance is not understood by designers.

CHAPTER 2: THE CONTEXT OF WELLNESS WITHIN SUSTAINABILITY

Two factors have shaped the modern public health system: first, the growth of scientific knowledge about sources and means of controlling disease; second, the growth of public acceptance of disease control as both a possibility and public responsibility. (Committee for the Study of the Future of Public Health 1998)

This research emphasizes solely on voluntary green building standards. 'Green Building,' as a concept, comes from the fusion of two powerful late-nineteenth century ideas: preservations of the natural environment and protection of public health (Moore and Engstrom 2005). Since then, various green building standards emerged addressing environmental concerns and promoting more sustainable practices using different frameworks and concerns. For instance, Leader in Energy of Environment and Design (LEED) and the WBS are examples of two explicit green building codes that communicate the conventions intended to be followed by standard users.

Today, our understanding of the consequences of our actions have evolved, and so have the scope and consideration of sustainability[5] discussions. Within this context, the concept of 'Green Building' represents just one of the many approaches within the sustainable scope.

[5] Sustainability definition by the Brundlant Commission: "Meet the needs of the present without compromising the ability of future generations to meet their own needs"

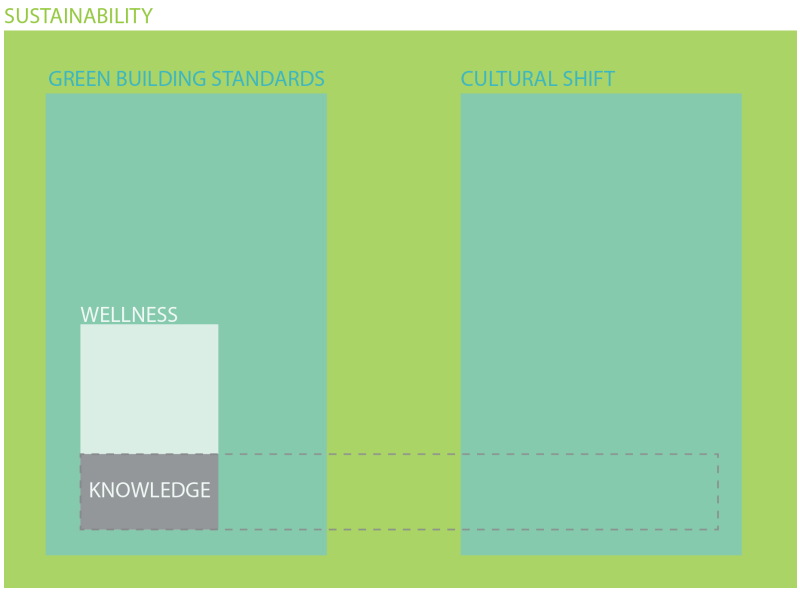

Figure 3. Schematic diagram about sustainability and the green building topic relationships.

Enclosed by the matter of green buildings, standards are the socio-technical tools that organize the complex networks around the interventions in the built environment (Busch 2011). Since the creation of LEED, the focus on the responsibilities of buildings has shifted from concentrating on energy efficiency, to broader and yet more complex issues. An evidence of this can be found in the inclusion of new frameworks, such as regenerative architecture, resiliency, and wellness.

The existence of tools as the WBS evidences the relevance of wellness into the ongoing sustainability conversation, and requires a closer investigation from rarely before studied angles. Briefly identifying historical concerns around health and wellness helps us framing the subsequent investigation within a limited historical context. Therefore, this chapter will provide the historical and theoretical framework to contextualize this research

within the sustainability discussion.

Additionally, the focus on workplace makes this study narrow in scope and interesting in context. Globally, the primary purpose of a workplace is to facilitate the provision of a work environment where the users process activities different than those they undertake at home or in other settings. However, as technology and communication advance, the understanding and dynamics associated to the workplace are shifting. Thus, current changes in the conception of the workplace generate the appropriate environment to open the conversation about the physical, social, and political implications of that change (Morgan Lovell 2016).

Moreover, workplaces, in particular, gather people that represent diverse social spheres making it an ideal space for collective studies. It has been proved that individuals spend the majority of their waking hours indoors[6]; therefore, interventions in the interior aspects of the building can have profound repercussions in employees' health. For this reason, many organizations are now applying wellness and health related strategies into their workplaces.

Firms, in order to attract and retain top talents, use wellness strategies. Hence, people are interested in being exposed to well-being initiatives in their place of work, which in turn will make health and wellness strategies desirable to be applied into other typologies of buildings. In all, the workplace case provides this research with an understanding of the fundamental characteristics to define workplaces as green following a wellness framework.

[6] According to the Environmental Protection Agency (EPA), the average American spends 93% of their life indoors.

PERCEPTIONS OF WELLNESS IN CONTEXT AND THE RISE OF WELL-BEING AWARENESS IN PUBLIC HEALTH

This section discusses the evolution of public health in understanding the causes of diseases and its direct influence on the built environment as means to prevent such diseases. This review helps to understand current practices and postures of voluntary certification tools with regards to wellbeing.

The link between science, the development of interventions of public authorities, and the increase of public understanding led to social commitment and actions enhancing public health practices through the years. Before the eighteenth century, sporadic communal efforts were already in place to protect citizens from epidemics such as the plague, cholera, and smallpox. At the time, society often associated disease with poor moral and spiritual condition which was mediated through prayer and piety. Consequently, before 1850 building regulation was limited, if nonexistent in British, European, and American cities (Hutchinson 2010).

By the eighteenth century, several communities had already reached a size that demanded more formal arrangements for the care of their ill than Poor Laws[7]. The eighteenth century's scientific advances brought new perspectives about both causes and meanings of diseases. As a result, diseases were seen less as a human condition and more as something that could affect anyone. At the time, one theory argued that diseases

[7] The Elizabethan Poor Laws, codified in 1597–98, were administered through parish overseers, who provided relief for the aged, sick, and infant poor, as well as work for the able-bodied in workhouses.

originated from chemical ferments produced by dirt and decay which could generate spontaneously under the right atmospheric conditions, especially wherever sunlight and fresh air were lacking (Hutchinson 2010). Thus, building codes attempted to produce new structures with improved ventilation and more windows.

Alongside the emergence of the germ theory, the idea of public health became the potential means of controlling society's health through public action. Especially, it became more tangible as the result of pressures put on the government to solve many of the negative consequences of industrialization in Britain in the early 1800's. The introduction of the germ theory at the end of the century started to change paradigms of what was once thought to be threatening (Burnham 2015). An example of the lack of awareness of the germ theory is the common cup – a cup located next to the water fountains intended for the use of any member of society. As the germ theory came to be accepted, what began as private and voluntary actions became public and imposed. Some of the manifestations of the built environment for that period include weather-filtering water, substituting sewers for privies, and more and better building codes.

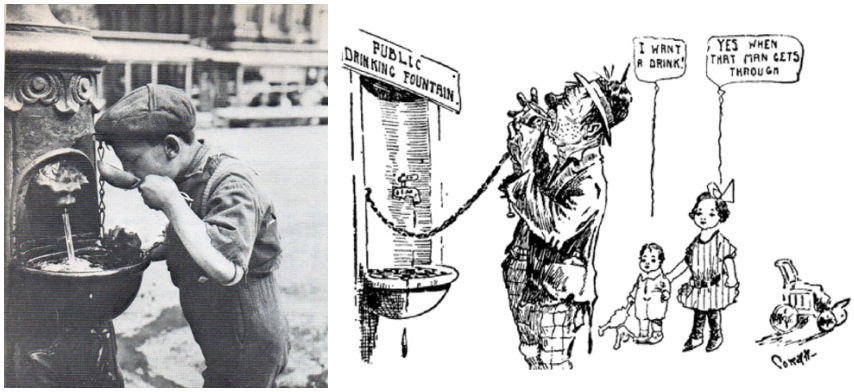

Figure 4. Public understanding that viruses and germs can easily be acquired by the common cup made it disappear.

For the first time, it was known that diseases had specific causes, and environmental sanitation and individual health were the priority target for authorities. Also for the first time, it was implicit that every citizen was at the same level of risk of being contaminated by germs. Despite this fact, for some Americans, ill health as well as moral failings represented evolutionary failure, hereditary lines of unfitness certain to die out. As a result of this resistance, based on class and ethnicity, the germ theory was not immediately accepted (Burnham 2015).

When the germ theory was finally accepted at the end of the 18th century, the built environment that resulted evidenced the new set of values and ideas. Due to restrictions imposed by building codes, construction costs increased and potential profits for developers were compromised (Hutchinson 2010). As a result, building codes were met with resistance and were often "watered down" and easily avoided. Consequently, poorly

constructed houses continued over several decades, giving cause to collateral issues as "the sick building syndrome."

As public health became a scientific enterprise, it also became the province of experts in the late nineteenth century (Committee for the Study of the Future of Public Health 1998). Prevention and control of diseases were no longer tasks of common sense and social ethics, but knowledge and expertise. Thus, public health agencies moved towards the creation and management of clinics for individual treatment and the education of healthy habits. By the mid-twentieth century, local, state, and federal responsibilities in health continued to increase, and central role became more prominent (Committee for the Study of the Future of Public Health 1998). As a result, the Social Security Act was implemented in 1935 as a grant-in-aid program to the states.

By 1970, the financial impact of the expansion in public health activities of the previous 40 years began to become apparent (Committee for the Study of the Future of Public Health 1998). Health expenditures per capita doubled in less than five years. As a result, the social values of earlier decades were put into doubt and criticized. Consequently, arguments about the scope of public health and the extent of public health responsibility continue to this day.

Parallel to the public health policies of 1970, other concerns about the built environment were taken into discussion by the Brundtland Commission[8] in 1987. Two important issues were already at play in American architecture: the energy crisis and the

[8] Formally known as the World Commission on Environment and Development (WCED), the mission of Brundtland Commission is to unite countries to pursue sustainable development together.

increasing prevalence of sick building syndrome (SBS) (Moore and Engstrom 2005). The failures of airtight energy efficient buildings of the 1970s and 1980s were becoming apparent by 1990. The SBS is a term used to describe when occupants of a building experience acute health- or comfort-related effects that seem to be linked directly to time spent in the building (Sumedha 2008).

The oil embargo of the 1970s led building designers to make buildings more airtight, sacrificing outdoor ventilation in the name of energy efficiency (Sumedha 2008). At the time, ventilation was reduced to 5 cubic feet per minute (cfm/person) in workplaces. Now, The American Society of Heating, Refrigeration, and Air-Conditioning (ASHRAE) recommends 20 cfm/person in office spaces.

The vast amount of sick buildings at the time, coupled with widespread complaints related to poor indoor air quality, required additional or different actions previously not taken. Along with this, the environmentally conscious enforcement within the practice of architecture increased, and so did demands for better approaches to addressing issues of poor indoor air quality, energy efficiency, and natural resource depletion.

However, the concepts of environmental responsibility and public health were so ideologically opposed at the turn of the twenty-century, it took a full century of changing conditions to reconcile the opposing assumptions that motivated their respective supporters (Moore and Engstrom 2005). These two paradigms later combined under the Sustainability umbrella, creating spaces for "green" practices.

From this point on, the earliest references to “green building” are found. Consequently, sustainability has all along been a contested concept, or as a discussion

based on the development of green building practices. This debate and its jargon have shifted over time, giving place to mutations in green building approaches based on the popular perceptions of wellness during the era, current ecological concerns of the place, and moment in history. Thus, green buildings act as a means of raising awareness about all of the environmental, economical, and social issues that have to be considered by the built environment in context (Guy and Farmer 2001).

It was not until early 1990, twenty years after the Brundtland Commission, that sustainability became commonplace for the practice of architecture. References to "green design" and a "Green Label" appeared in London for the first time. In August of the same year, the term “green architecture” appeared in the United States for the first time on the “Editor’s Page” of Architecture magazine (Moore and Engstrom 2005). By the mid-1990s, the usage of "green" terminology was widely popularized, and the sense that green building was an indicator of failures within American architecture was growing. By 1990, the Building Research Establishment (BRE), the largest established assessment method for sustainable buildings was first published in England. Later, in 2000, the United States Green Building Commission (USGBC), launched the largest green building related certification in the United States, Leadership in Energy and Environmental Design (LEED).

Today, it can be argued that green building certifications had mainly focused on reducing the energy consumption of buildings through the implementation of different strategies (Moore and Engstrom 2005). In the same way, green building certifications had put aside, or at least not put as a priority, issues of users’ health in the built environment

(Allen, et al. 2015). As a result, a popular view was created that sustainable architecture is tantamount to energy efficiency. This research holds the posture that this tendency is changing, and wellness is an important topic that is becoming more popular within these practices.

THE AFFORDABLE CARE ACT INDIRECT INFLUENCE.

While examining the postures on public health by the turn of the twenty-first century, public agencies in America had shifted their values in the implementation of public health programs across the country. It was found that higher wellbeing is seen as the outcome of a culture of great choices that create lives well-lived and careers that matter (Committee for the Study of the Future of Public Health 1998). Attention to health problems has shifted from two realities: First, people are no longer battling infectious disease but instead are dealing with chronic conditions and dangers arising from modes of living (Kirscht 1983). Second, investing on preventive behavior rather than investing in curing diseases is thought to be more economically effective. Hence, there is a readily apparent affinity for prevention as means to decrease the new patterns of morbidity and mortality causes.

The built environment exposes occupants to toxins or pollutants and influence lifestyles that contribute to chronic diseases such as diabetes, coronary vascular disease, and asthma (Collins, Stone and Gostin 2003). Research in how buildings' components affect individual health is already taking place in academia, but it is in early stages. A recent Harvard Alumni Study found that men who climb in average at least eight flights a day enjoy a 33% lower mortality rate than men who are sedentary. Thus, the results of how buildings' design, development, and management are becoming tangible. As a consequence of this seemly connection, the attention and regulatory framework around the built environment is turning its head towards the relationship between the design of spaces and

occupant wellness. However, it is important to mention that currently this is still a topic in growing recognition, and the quantitative implications are vastly contradicted.

Policies have also adapted to the frame of understanding public health, and consequently in 2010 The Affordable Care Act and Wellness Program, ACAWP, was implemented. ACAWP intent to "…offer the nation the opportunity to not only improve the health of Americans but also help control health care spending." To do so, the ACAWP creates new incentives and builds on wellness programs that encourage opportunities to support healthier workplaces. This research did not found a direct correlation of strategies stated by the ACAWP with the built environment. Although, it assumes the indirect influences that the ACAWP in the creation of initiatives such as the WBS. Some examples of how the ACAPW could indirectly influence the future of the practices in workplace design is the implementation of health-contingent wellness programs that:

- Reward to those who do not use, or decrease their use of, tobacco.
- Provide a reward to those who achieve a specified cholesterol level or weight as well as to those who fail to meet that biometric target but take certain additional required actions.
- Programs must be reasonably designed to promote health or prevent disease
- Reimburse for the cost of membership in a fitness center
- Reward employees for attending a monthly, no-cost health education seminar

- Provide a reward to employees who complete a health risk assessment without requiring them to take further action.

The aforementioned strategies found in the ACAWP document showcases some of the current American indicators and understanding of the importance of wellness-related strategies. This research argues for a comprehensive understanding of sustainability in buildings that also focuses on health and wellness strategies. These strategies can bring health, and wellness outcomes to its users, their families, and society. In this sense, the indicators from ACAWP are just one example of what this study defines as policy strategies. In greater detail, workplace policy strategies are the socially responsible rules of a determinate company, business, or organization where the work is performed. The objectives of policies are to enhance the organizational culture, promote corporate responsibility, and look for employee's benefits by encouraging healthy lifestyle choices in and beyond the workplace.

Certain policies require an infrastructure that supports them, and vice-versa. Consequently, and as learned from the historical review, often knowledge, policies, and design merge. Common knowledge and political trends are a major influence in decisions across the design practice through codes and regulations that in turn are shaped by the very same knowledge and trends. In the case of the WBS and sustainability it is not different, it is society's and government's shift towards wellness that is pushing the ball. Thus, this study sees value in the relationships within knowledge and policies, as they are major influence in decisions across the design practice.

WHERE ARE WE NOW?

Historically, the development of public health together with environmental concerns formed the values of the policies and practices that currently shape our built environment. This understanding helped this study to acknowledge the existence of voluntary standards in the United States as contingent and contextual in nature. Voluntary building codes and certifications influence concrete decisions that directly impact climate change and public health every day. Specifically, green buildings, in most cases became prescriptive, mechanical, quantitative and capitalized; and in turn, so it is the way we think about sustainability in relationship to the built environment (Busch 2011).

Until 2015, any (and every) green building rating system aims to improve building energy performance and the presence of wellness was usually reduced to "indoor air-temperature-light quality" strategies. In order to fully understand the outcomes of the relationship between buildings and people, shared perceptions of wellness and public health have to be better integrated into popular certifications methods. This research embraces the notion of comprehensive space design and management practice; one where the designer understands that a holistic approach to sustainability involves efficiency measures, such as building mechanics, as much as intangible strategies that affect occupant health and wellness, such as the social strategies promoted by ACAWP and WBS and its implications in design. **The interaction with practitioners will reveal their attitudes and understanding towards sustainability and wellbeing in their practice.**

CHAPTER 3: THE WELL BUILDING STANDARD

"Central to a building's success is its impact on people, individually or collectively."
(Heerwagen, DESIGN, PRODUCTIVITY AND WELL BEING: What are the Links? 1998)

The first prototype of the WBS was launched in October 2014 following a three-phase comprehensive expert peer review. A year later, in October 2015, the first official version was released. Further amendments have occurred after its official release in 2015, and this research used the WBS V.1 from February 2016.

According to the WBS website, research on health and wellness as well as existing green building codes were parameters that shaped the code. As a result, codes like Leader in energy and Environmental Design (LEED), Green Globes, Living Building Challenge (LBC), and Sustainable Sites (SITES) are aligned with the parameters established in the WBS. Moreover, this index is the result of seven years of research and the collaboration of health experts from the Cleveland Clinic, Mayo Clinic and a board of doctors from Columbia University Medical Center and building industry professionals.

The WBS was developed by the International Well Building Institute (IWBI), and registered as a trademark of Delos, a wellness real state and technology firm. Additionally, the WBS is recognized by the Green Business Certification Incorporation (GBCI) which focuses exclusively in administering project certifications of green business and sustainability industry. The GBCI also administers other codes such as LEED, PEER, SITES, EDGE, GRESB, and Park Smart.

This standard was selected as a case study because it deals with important considerations of wellness that have been neglected in the past. There is growing

recognition of the importance of wellness related practices in building's design, the WBS has already certified more than 25 million sq.ft only in commercial buildings worldwide, from which 4 million sq.ft are located in the United States[9], but at the same time, it is still a fairly new topic within the practice of design.

Additionally, voluntary certifications related with the topic of design are growing in popularity nationally, and regionally. To illustrate, Fitwel, developed by the Center of Active Design, is another certification applicable in a national level that emphasizes on health and wellness in buildings. Another example is the program Austin Green Business Leaders that incorporates wellness into its criteria to evaluate the greenness of buildings. Thus, the results from this study could potentially be applied in several other certifications that also deal with the issue of wellness and the built environment.

Although there are other codes available, this research focuses on the WBS because of the amount of information available at the moment. Similar programs such as Fitwel, were recently launched in March 2017. Also, the WBS, as it is the first certification program of its kind has the most developed criteria available on-line. Lastly, the fact that the WBS is recognized by the GBCI adds reliability to the system that was considered by this research.

[9] This information was retrieved from the Well Building Standard Website in March 09, 2017.

DESCRIPTION OF THE WBS STRUCTURE AND CREDITS CRITERIA

This code establishes one hundred features that include performance metrics, design strategies, and protocols that can be implemented by the owners, designers, engineers, contractors, users and operators of a building. Each feature, also called credit or strategy, is designed to address issues that impact the health and wellness of the occupants of the building. They are organized into seven concepts or categories that are relevant to occupant's health and wellbeing: air, water, nourishment, light, fitness, comfort, and mind.

Three types of credits compose the aforementioned categories: performance, policies, and design oriented credits. Performance-based credits establish environmental conditions and therefore are affected by both building design and building-systems operation. They are also technology-and-practice-neutral; allowing flexibility in how a project meets acceptable quantified thresholds. Policy credits are also prescriptive, but for building M&O or corporate policies and schedules. Lastly, design credits require that a specific technology or design strategy be included in the planning and execution of the building design. The distribution of the types of credits is 52% design credits, 33% policy credits, and 15% performance credits. Hence, the code favors design strategies overall.

The WBS currently focuses on commercial new and existing buildings. This means that depending on the building type (e.g., New and Existing Interiors or Core and Shell), only certain parts of a given credit may be applicable. Within each part are one or more requirements, which dictate specific parameters or metrics to be met. Pilot versions are

being developed to address communities, residences, retail, hospitals, and educational buildings as well.

The credits are categorized as Preconditions, necessary for all levels of WBS Certification or WBS Core and Shell Compliance. As the WBS claims, these features represent the core of the standard. It is important to note that for certification or compliance to be awarded, all applicable Preconditions must be met.

On the other hand, the other credits in the code are called Optimizations. They are not required to achieve Silver level certification, but create a flexible pathway towards Gold and Platinum level certification. The WBS recommends all projects to strive to achieve as many Optimizations as possible.

This study reviews each of the categories that the WBS proposes, in order to have a better understanding of their intent and their weight in the code.

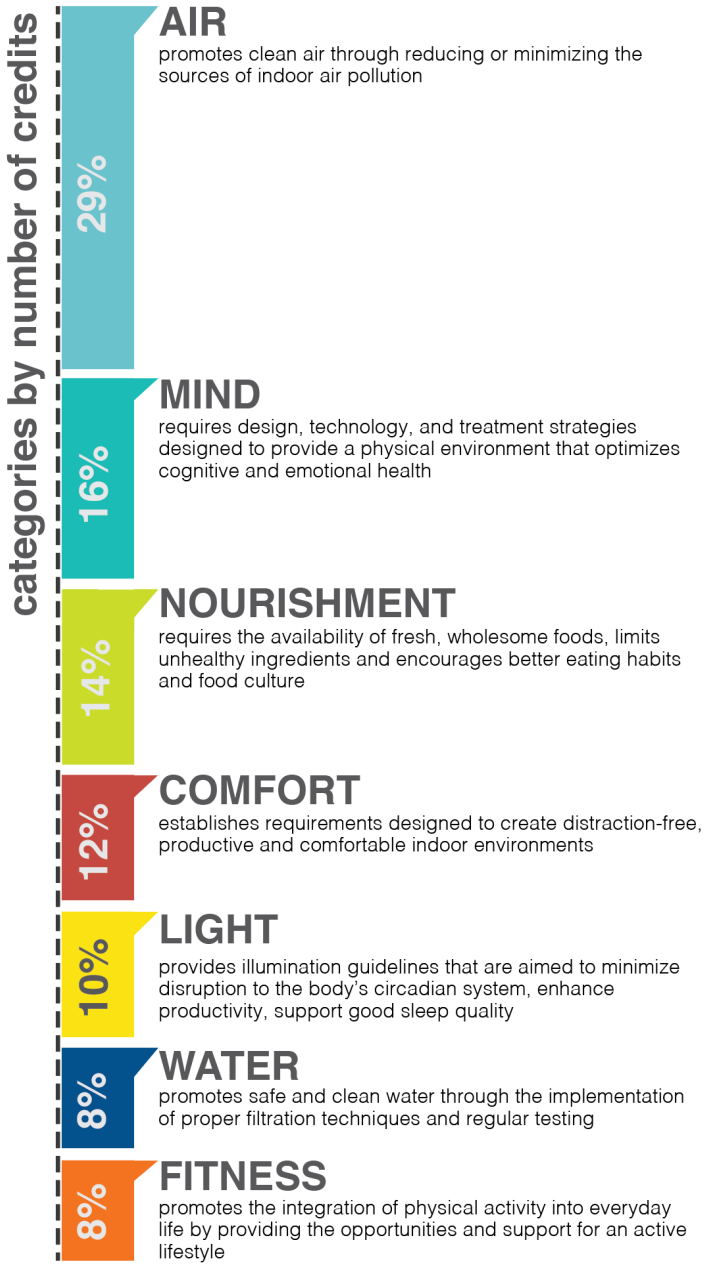

Figure 5. Summary Diagram of Categories' Intent and Weight in the Code.

Air: This category encompasses 29 credits from which 9 are preconditions. The code for Air promotes clean air through reducing or minimizing the sources of indoor air

pollution, requiring optimal indoor air quality to support the health well-being of building occupants.

Water: There are 8 credits total in this category from which 5 are preconditions. The WBS for Water promotes safe and clean water through the implementation of proper filtration techniques and regular testing in order for building occupants to receive optimal quality of water for various uses.

Nourishment: This category has 14 credits from which 8 are preconditions. The code for Nourishment requires the availability of fresh, wholesome foods, limits unhealthy ingredients and encourages better eating habits and food culture.

Light: This category contains 10 credits from which 4 are preconditions. The WBS for Light provides illumination guidelines that are aimed to minimize disruption to the body's circadian system, enhance productivity, support good sleep quality and provide appropriate visual acuity where needed.

Fitness: There are 8 credits within the fitness category and 1 precondition. The code for Fitness promotes the integration of physical activity into everyday life by providing the opportunities and support for an active lifestyle and discouraging sedentary behaviors.

Comfort: The category of comfort contains 12 credits, and from there 4 are preconditions. The code for Comfort establishes requirements designed to create distraction-free, productive and comfortable indoor environments.

Mind: Here there are 16 categories from which 5 are preconditions. The WBS for Mind requires design, technology, and treatment strategies designed to provide a physical environment that optimizes cognitive and emotional health.

The seven categories of the WBS provide a framework for project teams to incorporate a variety of strategies for wellbeing and health at the space design, construction, and operations and maintenance (O&M). Similarly, as LEED, the WBS also allows project teams to innovate and propose new credits in the evaluation of the code. Besides the 100 credits, 2 extra credits are proposed for teams to propose new practices that can be verifiable. In this way the code brings more flexibility to the process of design with wellness in mind.

From the holistic view of the categories of the WBS it is evident that issues of health and wellness are addressed from different angles and scopes. Many practices highlighted in the code intended to improve health are supported by existing government standards or other standard-setting organizations. Some other credits are intended to change behavior through education, design, and corporate culture. These behavioral credits provide, for example, information and support for making positive lifestyle choices.

STUDY OF THE PRECONDITIONS AND CODE VALUES

"Preconditions are thought of as the foundation for wellness in the built environment." (The Well Building Institute 2016). Therefore, for the evaluation of the code across professionals, the survey studies the 36 preconditions of the New and Existing Interiors for commercial spaces in the code. The 36 preconditions studied vary in their

scope and objective, and they are studied in greater detail to determine the values of the WBS before contrast it with the design professionals.

A total of 36 preconditions where studied and quantified in order to rank the categories. Additionally, the type of credit, are analyzed in order to identify the main nature of the code. The raking of the categories together with the analysis of the type of credits, provide better picture of the values and priorities of the WBS. The ranking and the intent will be later compared with the result from the survey.

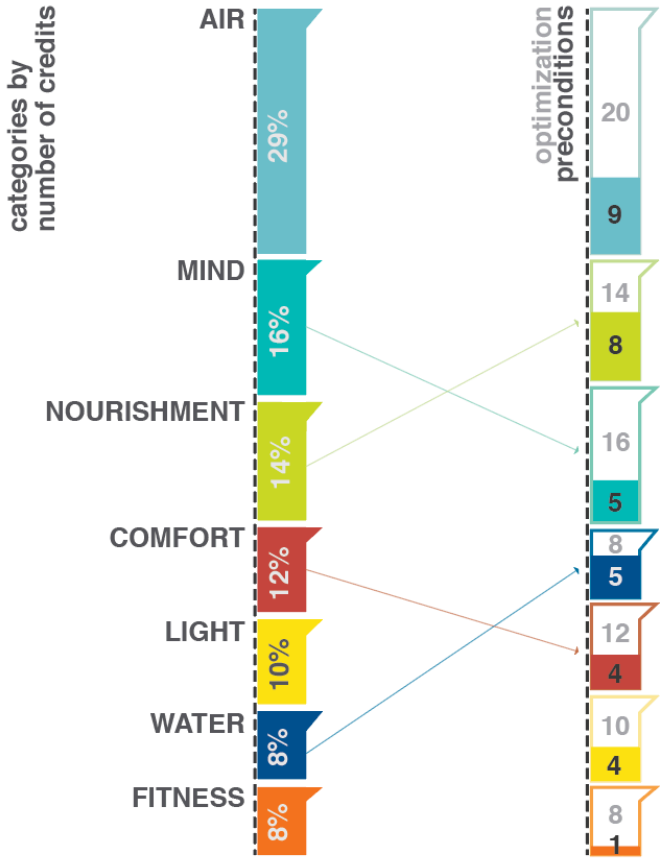

Figure 6. Code Values by Categories. Categories Ranking According to the Amount of Preconditions.

Based on the amount of preconditions in each category, this study determined that:

- The categories are organized in the following order: Air, Nourishment, Mind, Water, Comfort, Light, and Fitness.

- Different from the overall code, preconditions contain more policy credits than design credits. The relation in 44% policy, 39% design, and 17% performance credits. This distribution reveals a shift in thinking about sustainability from performative to operational.

- This study understands the preconditions of the standard as the priority of the WBS. Consequently, the survey only presents these credits to the professionals to later contrast professionals' view.[10]

This information is important in further analysis in the findings chapter, since these characteristics may be represented in the responses of the design professionals group.

[10] Professionals where asked: "From your experience, please evaluate the strategies you consider most important to implement for achieving user's health and well-being in the workplace from the list below." The design of the survey can be found in the appendix section of this document.

CHAPTER 4: FINDINGS

This research has discussed the concept of voluntary codes, as well as their origin, tradeoffs, and significance within the practice of sustainable design. The WBS has been instrumental in identifying gaps within the WBS and design practice, while providing a solid case study. In order to identify perspective gaps and trends within this code and the design practice, a survey was conducted to active professionals throughout the US. Both, quantitative and qualitative responses were analyzed to formulate the findings in this section. The scope of the findings is divided into two areas: the first one focuses specifically on the responses and values of the WBS, and the second one deals with the issue of gaps within professionals' knowledge and explicit voluntary codes. [11]

THE WELL BUILDING STANDARD FINDINGS

Most of the findings in this research made direct reference to the Well Building Standard case study, thus the topic of 'wellness' in the built environment was central to the study. Based on the qualitative and quantitative results, this research found that overall, wellness as a design and policy approach has growing recognition in practice[12]. Consequently, practitioners with and without experience of wellness certifications shared

[11] The data interpretation methods used is explained in greater detail in the appendix of this document. The methodology developed in this study seeks to identify the dimensions of this gap in perspective. In doing so, we could potentially develop better means to create a more accurate code that represents all stakeholder views and values.

[12] Growing recognitions and concerns about wellness policies and design practices also come from the desire of clients.

similar notions on the most important strategies from the WBS code, reinforcing the relevance of wellness considerations in the design field.

However, wellness in the built environment remains a loosely defined collection of strategies that touch on collective health and safety strategies. In fact, the quantitative and qualitative data collected showed overlap in the boundaries between practices associated with health safety and wellness. For instance, quantitative data shows that basic health needs are the most valued among all other concerns; whereas, qualitative data indicates that for designers experiential and well-being needs not mentioned in the code are also as important as basic health needs. This tendency might be this way due to the fact that wellness is a relatively recent topic within green buildings and sustainability overall. Another reason can be that the knowledge associated with the design aspects of some wellness strategies rely on notions of proportions and aesthetics that are hard to determine, and thus communicate, partially because each project has different conditions.

The results from the survey evidenced that in the topic of wellness, designers see workplace policies almost as important as the design component itself. In other words, today there is a growing recognition from the design field about the importance of building and organizational operation policy and its implementation and relationship with the design counterpart. This mindset shift in the design practice will be helpful for some more wholesome considerations in the relationship within the built environment and society at large.

Lastly, this research categorized all information collected in the survey into four areas that currently shape workplaces for user's wellbeing. These categories do not touch on the seven concepts created by the WBS, and mainly comprehend the areas of design, policies, and performance. These sections are Corporate Policies, Indoor Environmental Quality and Safety, Space Design and Configuration and lastly Active Design. The intent

of creating the alternative strategies is to capture their relationship with the built environment rather than its relationship with the different systems of the human body. In doing so, the relationship between design and policy is more evident and can help policy makers better understand designers' perspective.

THE WELL BUILDING STANDARD: QUANTITATIVE FINDINGS

The largest section of the survey was the quantitative ranking of the credits of the standard. In this part, design professionals assessed the importance of the individual credits as they relate to wellness. In this section, we will focus our attention on the details of the assessment to elaborate about the nature of the credits that are most and least valued. In order to do so, the weighted method, which assigns a more qualitative value to the responses by providing more weight to certain answers[13], is applied to rank the credits. The ranking of the credits in the following chart is displayed in decreasing order and they are valued from 0 being not important to 10 being very important.

[13] This method is explained in the methodology chapter was applied to the responses in order to discover the ranking of each credit.

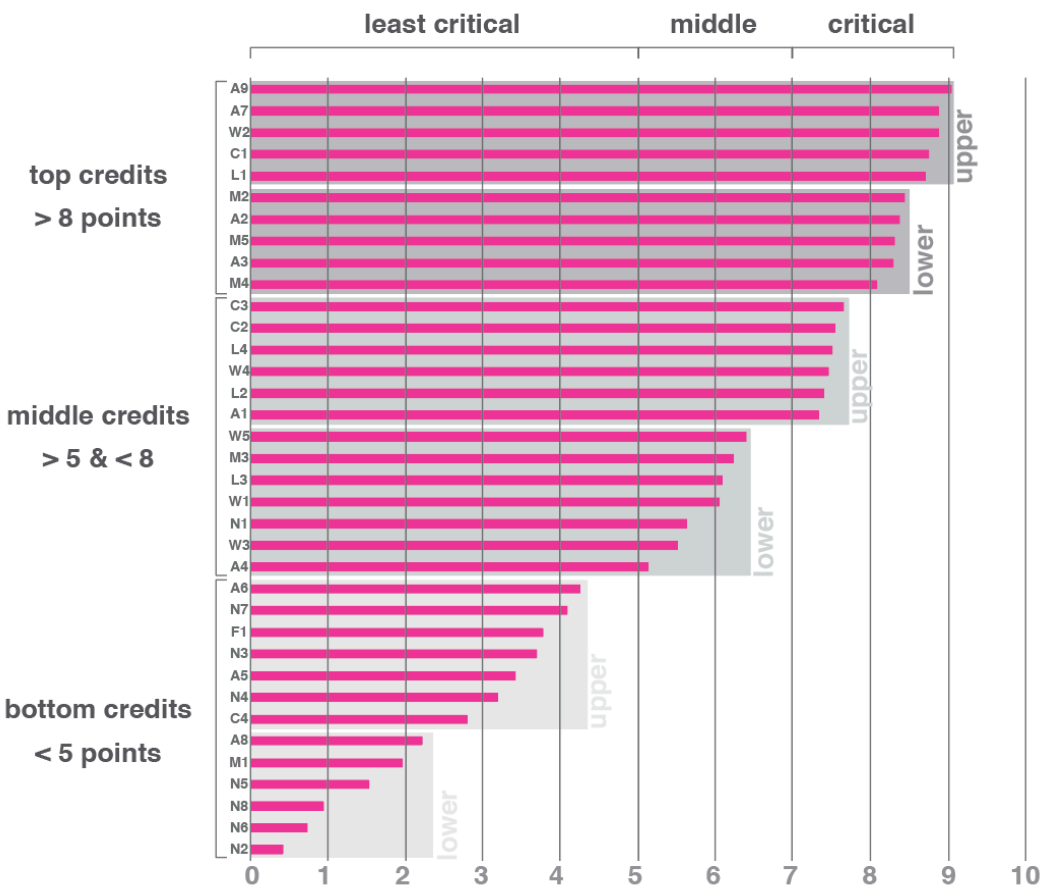

Figure 7. Survey Responses by their weight. Each section, critical, middle, and least critical, has an upper and lower section. This structure helps organize findings. The legend of the credits can be found in the appendix.

1. **The first observation on this section is that the respondents consider 1/3rd of the code very important for designing with wellness in mind.** As the chart shows, there are tree recognizable sections in which credits could fit: critical credits, strategies that had an appreciation of more than 8 points; middle credits are somehow important, which have less than 8 points but more than 5 points of appreciation; and least critic credits at the bottom of the chart are considered less

important, accumulating less than 5 points of appreciation. Each of these sections are divided into upper and lower credits, and specified when it is pertinent in following statements.

Comparing answers between Experts and Non-experts in the topic of Wellness

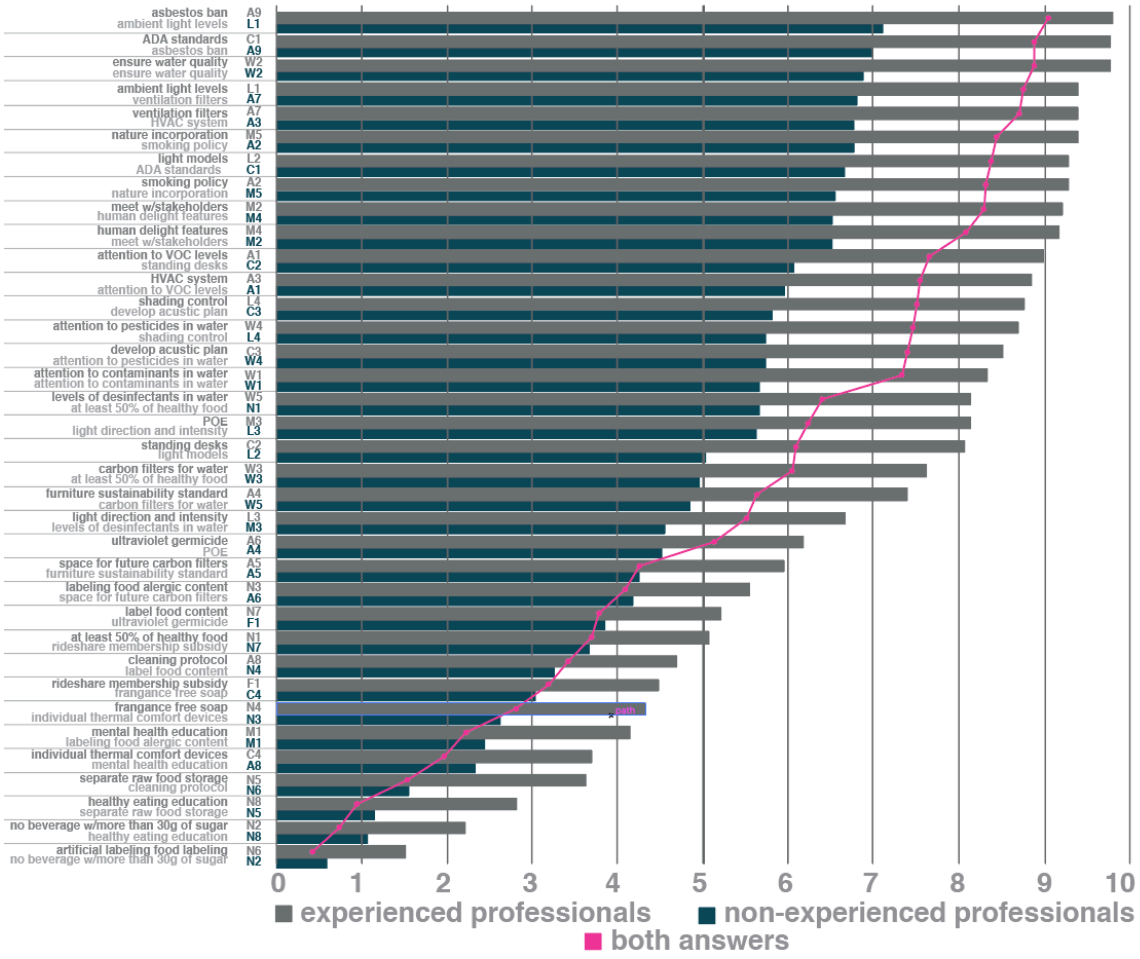

Figure 8. Comparison between experienced and non-experienced' results. Darker gray shows experienced responses and light gray depicts non-experienced responses. Pink shows average of both groups.

2. **As a second observation, the distinction between top, middle, and bottom credits is clearer in experienced designers' responses in the poll.** The comparison between experts and non-experts' responses is relevant for determining the reliability of the practices suggested by the WBS. It is interesting to find that, experts see more value in all credits proposed. Additionally, although answer values increased incrementally and smoothly, the distinction between top, middle, and bottom is clear in both scenarios.
3. **Third, in both cases, for experts and non-experts, top, middle, and bottom credits are located in almost the same order.** In other words, both groups have the same criteria and hold similar values to the credits proposed by the standard. In different degrees, the idea of what it is important and what it is not is very clear across the design professionals regardless of their level of expertise in the topic of wellness.

About the content of the top credits

4. **Practices that tackle 'survival needs'[14] occupy the upper section of top credits.** For the credits in both lists, experienced and non-experienced professionals rated high the same credits, yet in some cases the order varies. The upper section of the top credits for both kinds of professionals, take care of common practices such as asbestos levels, clean and drinkable water, adequate levels of ambient light, HVAC

[14] According to Judith H. Heerwagen in her paper 'Design, Productivity, and Well Being', design practices that respond to 'survival needs' tackle aspects of the environment that directly affect human health such as clean air and water, lack of pathogens or toxins, and opportunity for rest and sleep.

filters maintenance, lighting modeling, and smoking ban policies. This trend most likely responds to the reliability on the content of such common practices or health-related common concerns[15].

To illustrate, the highest ranked credit of the survey response deals with asbestos banning. The EPA has banned asbestos since 1989, and since to that time, it is known to be a highly toxic agent. Regardless, some ceiling tiles, insulations, floor tiles, and dry walls manufactured today still contain some forms of asbestos. Similarly, another characteristic of top credits from the results is that strategies that touch on points previously mentioned in other voluntary standards such as LEED or the LBC are also greatly ranked. As with basic practices, currently experts are more receptive and familiar with to credits and strategies that have been around for a while. For example, the smoking ban policy credit has been previously specified in the Indoor Environmental Quality criteria of the LEED code. Like with asbestos, the smoking ban was first pursued as a policy in the late 20th century. Thus, knowledge of existing credits and concerns are very likely to influence perceptions in a positive way, although they do not necessarily deal with wellness, but with health.

[15] According to the World Health Organization 2014 report, US adults risk factors are: 1. Tobacco or smoking; 2. Alcohol consumption; 3. Obesity; 4. Chronic respiratory diseases.

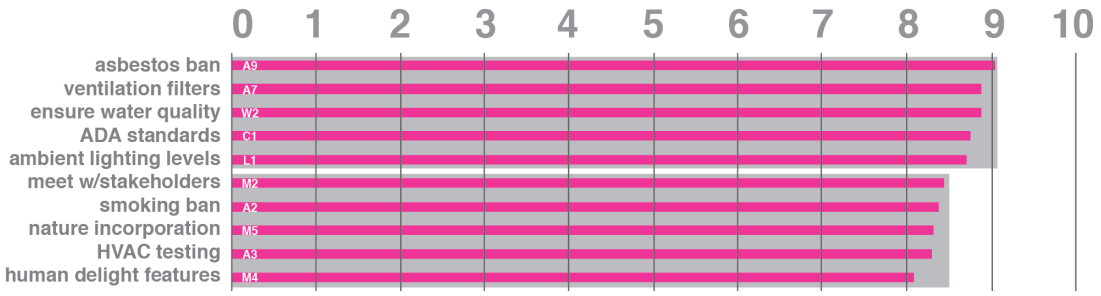

Figure 9. Top Credits' Zoom in. Upper and Lower Sections.

5. **The lower tier in top credits, reference to 'experiential needs.'**[16] In both groups, experienced and non-experienced professionals, this is the trend. To illustrate, common measures that some of the strategies refer to include the incorporation of nature into workspaces, establish parameters with stakeholders' prior project conception, and the incorporation of human delight features in the workplace. These strategies are, in a way, more indirect in their locus of impact, and they affect overall health through their relationship to fulfillment, quality of life, and psychological health (Heerwagen, DESIGN, PRODUCTIVITY AND WELL BEING: What are the Links? 1998).
6. **Credits located at the bottom of the ranking, least critical credits, are typically policy-related, or credits that do not normally associate with the designer's scope of work.** Regarding the credits located at the bottom of Figure 7, different

[16] According to Judith H. Heerwagen in her paper 'Design, Productivity, and Well Being,' there is a blurry boundary between survival and experiential needs since both could ultimately affect one's health. The difference lays on the dimension of the impact.

findings can be drawn. In general, least weighted strategies refer to practices that in most cases are not typically associated within the scope of designers' roles. For instance, the least weighted four strategies are related to content food labeling, education for mindful eating, and developing cleaning protocol. Although relevant, food labeling for instance, relates to operations and management, and HR concerns which designers do not typically touch on or see as part of their scope of practice, and as can be expected, they can take longer to adopt.

7. **Strategies on the middle section have varied intents that relate to design and O&M that deal with risks and toxins prevention, as well as psychological and physical wellbeing promotion.** For instance, these encourage the inclusion of sit/standing desks in the workplace, post-occupancy assessment of indoor environmental quality, promotion of eco-friendly and toxin-free furniture and finishes, and the use of subsidy as motivation to encourage alternative means of transportation.

From all this, we can conclude that designers are aware of and value common practices of health and indoor environmental qualities, as they are predictable and largely proven in the past. Additionally, designers also see great importance in credits that address different concerns of people's wellbeing. Thus, there is a notorious relationship of the concept of wellness to practices that go beyond pollutants prevention and tackle behavioral change. Where failure to satisfy survival needs may lead to serious illness or death, failure to satisfy experiential needs produces stress related and other kind of illness (Heerwagen,

DESIGN, PRODUCTIVITY AND WELL BEING: What are the Links? 1998). In all, each element affects building occupants' health in different scales.

THE WELL BUILDING STANDARD: QUALITATIVE FINDINGS

The questionnaire asked design professionals to add strategies that enhance wellness in the workplace not mentioned in the quantitative section. In this section, the inputs typically came from wellness-experienced professionals. Besides highlighting important wellness-related strategies in their practices, surveyed professionals added thorough comments about their vision of the topic of wellness in the workplace.

The qualitative section was analyzed in two ways: First, the responses were organized in groups by the nature and intent of the strategy. Second, the responses were quantified using excel word count and later added to the overall ranking of the code ranking in pertinent cases.[17]

8. **The varied practices registered in the qualitative section on the survey suggest the concern of four strategic areas outside of the existing code.** These practices are varied and were conceptualized into four categories that represent the different natures and intents of each: Corporative Policies, Indoor Environmental Quality and Safety, Space Design and Configuration, and Active Design. The contrasting views collected in the survey portray the agreements across the interdisciplinary decision making of codes.

[17] In depth description of the methods can be found at the data interpretation method in the appendix of this paper.

These categories do not represent the ample spectrum of discourses around the topic of wellness, but it is a good approximation on this theme as it is relevant to standards. For this reason, we recommend further studies to consider conflicting definitions of wellness since this may influence the use of a particular set of practices over others.

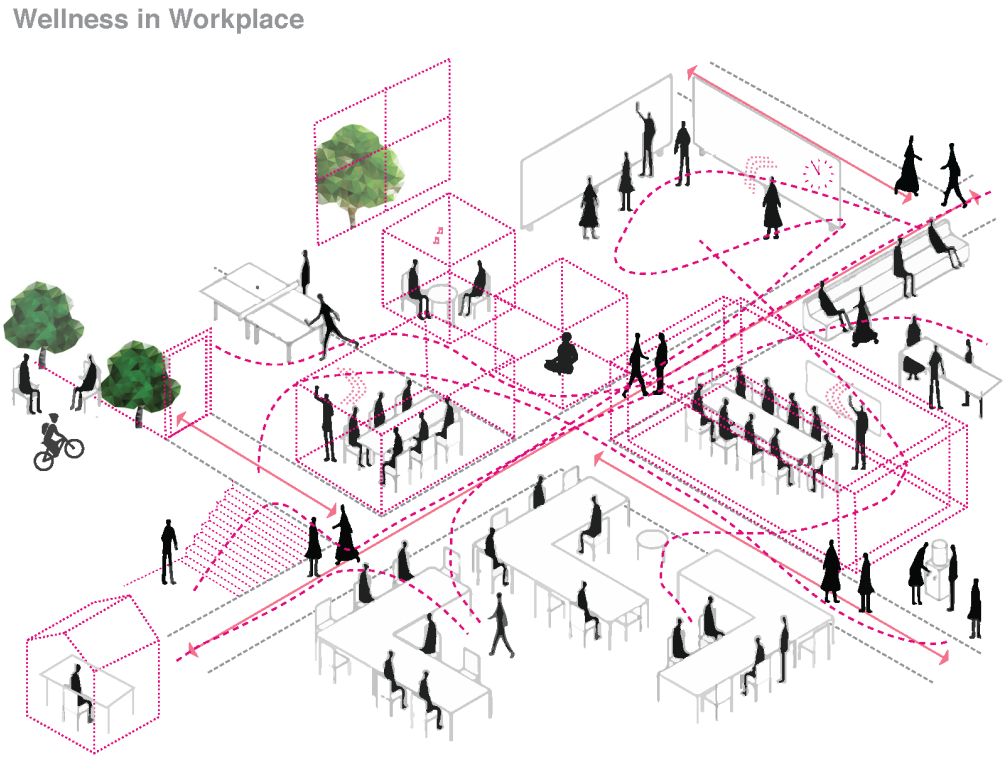

Figure 10. Diagram that Summarizes the Four Strategic Areas from Survey Data.

First, Corporate Policies refer to those guiding principles and procedures by which a company will operate. This strategic area reflects the concerns from professionals on the topics of schedule flexibility, subscription to classes for exercising, encouraging breaks

and walks for employees, and encouraging the usage of alternative means of transportation. This list of practices has the commonality that all are heavily dependent upon the client, not the designer, and in some cases can be part of the considerations when starting the design process[18].

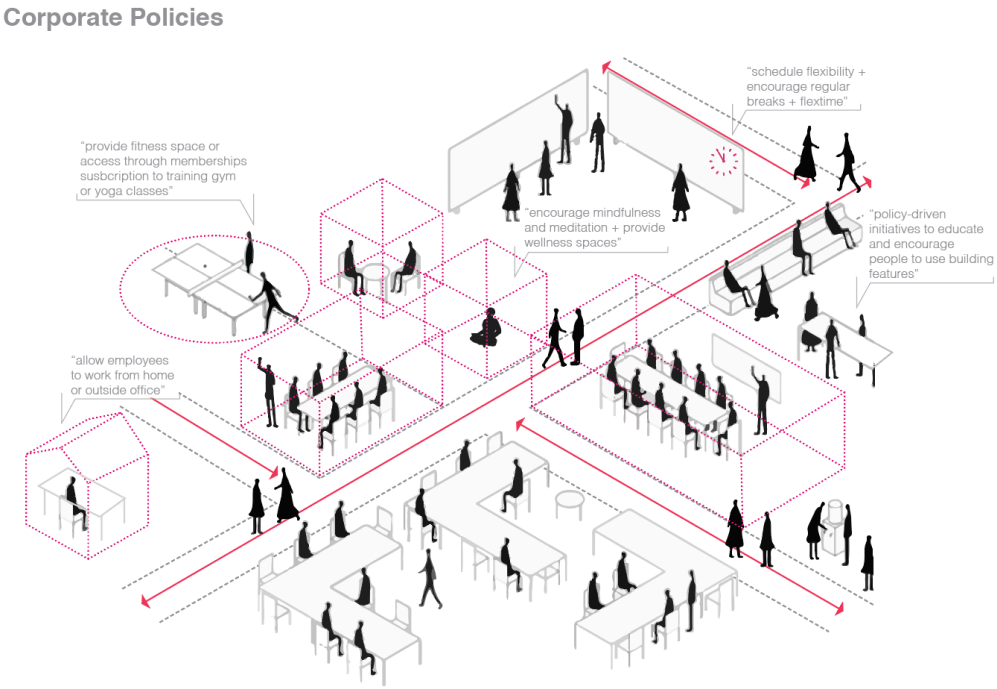

Figure 11. Corporate Policies. Lessons Learned from Survey Data and Interpretation Diagram.

The second, third, and fourth strategic areas relate in one way or another to the practice of design. However, they have been divided into three categories, according to the reiteration perceived in the results of the survey. As such, the three areas of design relate

[18] One could argue that the designer has a responsibility to educate the client too.

to Indoor Environmental Quality and Safety, Space Design and Configuration, and Active Design.

Indoor Environmental Quality and Safety is the strategic area that has the least amount of inputs. It encompasses observations related to risks and toxins, as well as access to natural light and ventilation. To illustrate, one example is of stand-alone dehumidification systems that are implemented to ensure accurate levels of relative humidity and that mold & dust mite activity are kept low. In general, the information gathered in this section relates to common practices that have been largely discussed in practice.

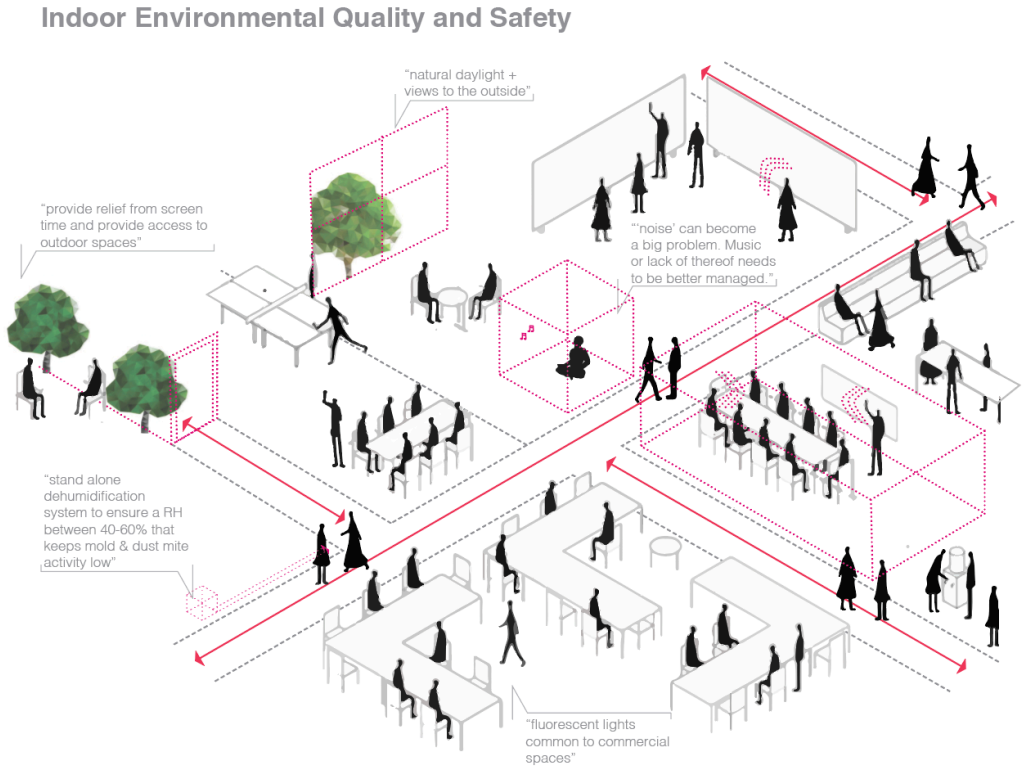

Figure 12. Indoor Environmental Quality and Safety. Lessons Learned and Interpretation Diagram.

Space Design and Configuration include all characteristics that relate to the site location, space design, and space distribution. In this case, designers suggested practices such as walkable locations, safe indoor and outdoor walking paths, flexible floor plans for workspaces, a spectrum of private and personal spaces, and spaces for praying, meditation, or maternity needs. Thus, in this view, on a wide range of scales, designed actions provide wellness in the workplace, and also considerate strategies that go beyond the indoor space and include connections to the outdoor and context.

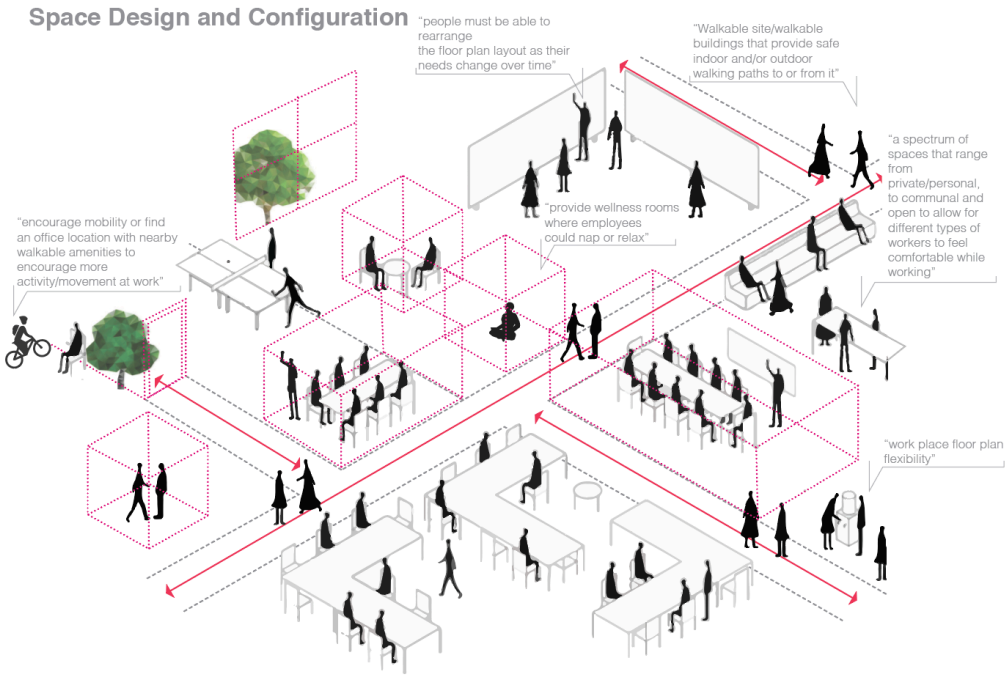

Figure 13. Space Design and Configuration. Lessons Learned and Interpretation Diagram.

Active Design concentrates on all of the practices that have a direct relationship with active design principles. Thus, professionals emphasized strategies that encouraged the use of stairs over elevators, provided visual cues and opportunities for movement, promoted access to a gym and showers, and allowed sit/stand desks in the workplace. This category reflects a great deal of influence from active design practices in the interpretation of wellbeing.

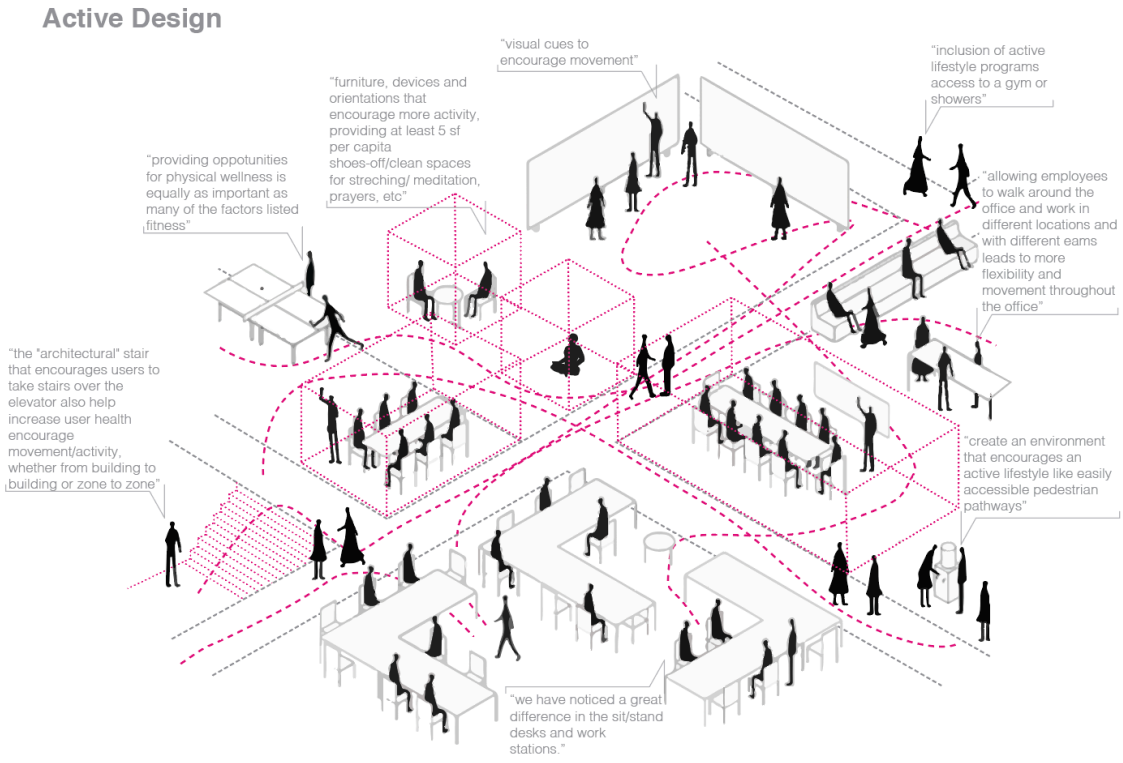

Figure 14. Active Design. Lessons Learned and Interpretation Diagram.

9. **As building creation becomes more holistic and multidisciplinary, stakeholders also value and adopt a broader mindset.** The four strategic areas give us an idea of what wellness is about for the designers in practice. In other words, these categories serve as an indicator of current knowledge on the professional side. As such, the large presence of responses different from design-oriented practices shows that designers see value in multidisciplinary aspects that go beyond their expertise[19].
10. **Different from the code, qualitative inputs did not specify or dimension strategies.** Only two inputs in the qualitative section sought clarification of dimensions or ratios in a given strategy. For instance, one person added, "providing at least 5 sq.ft per capita of shoes-off clean spaces for stretching, meditation, prayers, etc." Since most qualitative input is general and broad, further research into benchmarking and metrics is necessary. In other words, these notions need to be better referenced as benchmarks.

The valued practices collected by this study mostly elaborate about wellness and the design practice. This data can be used to better inform the code on how to integrate these ideas into new credits; or also, these lessons could help as guidance in how to make certain credits more relevant to the practice.

[19] This is relevant because, in some degree, designers also have the role of advisors of their clients.

As respondents of the survey highlighted: ‘one central concept to wellbeing is to go beyond just avoiding toxins and risk, and providing a space that elevates the human experience.’ Also, ‘Many of the things listed are operational, not design issues and do not belong on this checklist even if they are important.” Hence, designers see value on both credits that address survival and experiential needs, but there is not clear distinction between responses when evaluating preferences between survival and experiential related credits.

11. **The categories ranked by the design professionals do not align with the WBS’ priorities.** The seven categories reveal the WBS’ priorities based on their number of precondition credits. But, when comparing the ranking found in the code with practitioner responses, the hierarchy of categories is significantly different. Additionally, the data gathered through the qualitative section, whenever relevant, were also grouped under WBS related categories. In this way, it was possible to generate a more representative ranking of the designers’ views of the code. Through this analysis this study illustrates the differences between hierarchies between the WBS categories and the practitioners’ hierarchies.

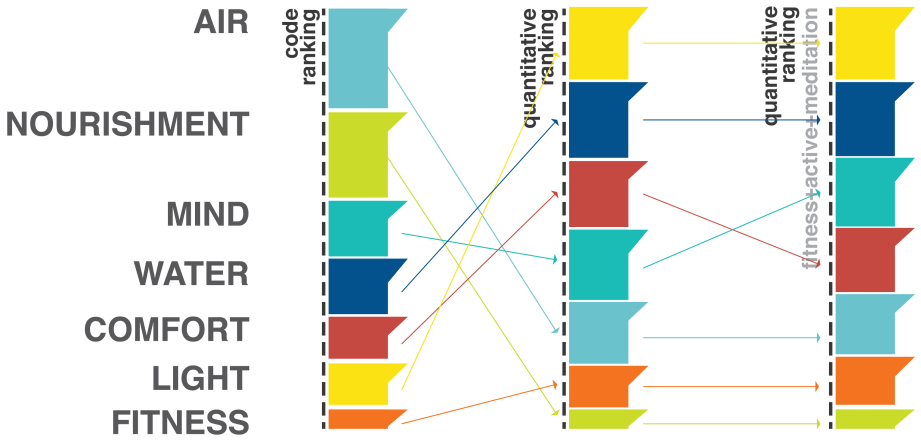

Figure 15. Left: WBS ranking based in credits amount. Middle: WBS based on qualitative responses. Right: WBS raking based on both: quantitative and qualitative data.

After studying the ranking of the categories, it was evident that what for the code was one of the lowest ranking categories, was in fact highly important for the design experts. To illustrate, the category of Nourishment is the second most weighted category in the code, yet is the least weighted by practitioners responding the survey. Creating different categories is necessary in our world, and our anthropomorphic nature drive us to make sense of and organize complex systems. This research recognizes our drive to categorize complex realities. The analysis of survey results is categorized in order to be able to compare results to WBS' categories.

Including the qualitative inputs into the quantitative value of the categories, Mind becomes a higher raked as a category. Similar changes happen with the Fitness category. For instance, at least 35% of the comments in the survey refer in a way to physical activity,

movement, or fitness access in the workplace. Thus, active design concepts are highly valued in the parameters of wellbeing and they are represented in the quantitative data.

Additionally, as Figure 15 illustrates, the order of such categories matter most from a holistic perspective of many voices, but they may need to do a better job at presenting them in order for them to be relevant to the designers. In all, what is important is not the definitions of the frameworks themselves, but the existence of multiple frameworks that together are producing a single unified world (Busch 2011)[20].

12. **Lastly, although this study focuses on the prerequisite credits of the WBS, it was found that some of the qualitative inputs exist in the optimization credits of the code.** Some concerns around wellbeing practices in the design profession can be found in the standard, yet they are not represented in the main values (precondition credits) of the WBS. There is an opportunity to reorganize the code in order to better align with the concerns in practice.

    36% of the comments already exist in the optimization credits[21] of the standard.

    49% of the inputs address similar concerns in the optimization credits.

    16% of the information gathered in the qualitative section refers to a totally different concern than the ones found in the whole standard.

[20] Another important thing is that WBS assigns hierarchy to the strategies. In turn, only certain projects and strategies get awarded the recognition. These designs embody the hierarchies of WBS. As pioneer projects they are models for future designs, even those that do not necessarily pursue WBS accreditation, but they will take cues from WBS projects.

[21] Optimization credits in the WBS are used to reach next levels of certification.

In sum, there are noticeable complexities in designing multidisciplinary and holistic codes such as the WBS that contemplates multiple stakeholders' insights. Hence, the process of weighting its credits and practices is a challenging mission since it has to serve diverse stakeholders, fields, and interests. As a result, there can be found knowledge gaps that some professionals may find not trustworthy, and this conflict can limit the adoption of significant practices within the topics of health and wellness. However, the influence and impact of green building codes in our built environment cannot be discounted.

VOLUNTARY CODES FINDINGS

The empirical analysis yields this research to confirm the existence of gaps between the explicit consensus in the code and the actual practices from the designers. In other words, the priorities of the WBS is not completely aligned with the knowledge of the design practice, in terms of the 93 practitioners who participated in the survey.

What it is clear is that the overall distribution of the responses provides a better understanding of how representative the code is of the true values of the design community surveyed. For instance, it is noticeable that at least a third of the code has a good acceptance of over the 8/10 points in the survey (as seen in Figure 7); whereas one third of it has a very low acceptance with a score less than 5/10 points of acceptance from the poll. These extremes showcase that the gap is actually distributed among middle and bottom credits, and does not reflect a disparity respecting the overall code.

Additionally, the data reflects different impressions about the credits such as positive, negative, or neutral. This study showed that neutral reactions were considerable large in number. **This fact allowed the research to interpret that most important than conflicting opinions about some of the credits, the gap origins mostly from lack of understanding about the content.** This fact might be associated with the way summarized the survey was conducted, and also because of the novelty of the topic of wellness in the design practice.[22]

[22] The survey did not expose the respondents to the entire code, but to a summarized version design for a survey. Thus, the amount of neutral responses may not be 100% representative.

There are obvious difficulties in creating a system that aims at organizing complex relationships within social and technological realms. The homogeneity among the comments found in the qualitative results is the most evident illustration of where practice is leaning regarding wellness in the workplace. The dilemma here, is finding the balance between the knowledge found in practice and the agreements found in the code that are also based on scientific research.

This situation leads to the question of what should drive change: knowledge from codes based on research, or information from practice? This study takes the position that both are fundamental and interdependent. A solution might include using 'internet of things[23]' to keep track of both research and practice. More work of this type has to be done in order to help balancing the decision-making body.

VOLUNTARY CODES FINDINGS: QUANTITATIVE FINDINGS

By measuring the perspectives of the respondents, this study gathered the following results[24]:

- 73% positive perspective on overall credits of the WBS code
- 13% negative perspective on overall credits of the WBS code
- 14% neutral perspective on overall credits of the WBS code
- Total of 27% margin of gap within the code and designers view

[23] the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.
[24] The methodology used by this section was 'overall perception' explained in the Appendix.

13. **Taking a closer look at the professionals' responses, it is interesting to find that neutral perspectives are almost as important in number as negative perspectives overall.** This might be an indicator that either professionals are not sure about what they were asked in a specific credit, or they do not have a concrete opinion about specific credits[25].

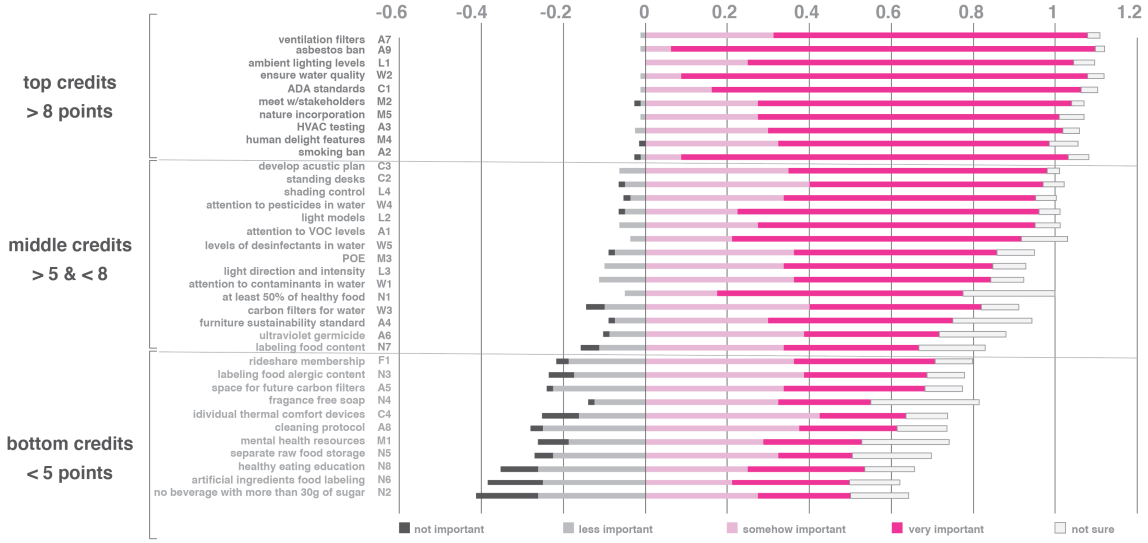

Figure 16. Distribution of Responses. Dark gray: Not Important. Light gray: Less Important. Light pink: Somehow Important. Dark pink: Very Important. Empty bar: Not Sure.

14. **There is a contrasting distribution between top credits and bottom credits.** Therefore, it can be said that some credits are greatly valued, and some are poorly

[25] The limitation of the survey method that did not explain how the credits are applied in great profundity might also play a factor in this reaction.

appreciated. To illustrate, at least 15 out of the 36 credits evaluated in the survey had less than 50% total appreciation[26], whereas 13 credits have over 80% of Total appreciation. Therefore, only about a third of the WBS code credits are really representative of what designers considered important aspects of space design, another third is in the middle, and the last third of the credits can be considered irrelevant or non-well explained aspects.

VOLUNTARY CODES FINDINGS: QUALITATIVE FINDINGS

15. **Qualitative findings confirm the existence of diverse frameworks and attitudes towards the built environment.** This existence is not new; in fact, it has been used by several other codes as an opportunity to differentiate certain practices from others. The importance of this finding for voluntary codes relies on the efforts made to create holistic approaches that in the end are too broad to be reliable or useful for the design practice. There is a need for benchmarks in the practice of design.
16. **As discussed in previous chapters, certain policies for health and wellness already in place require an infrastructure to support them, and vice-versa.** The qualitative information gathered corroborates that existing means such as The Affordable Care Act, or the Active Design Institute, influence the practice of design. Several parts of the professionals' inputs can be also found in The Affordable Care Act code. In consequence, polices have the potential to merge

[26] The concept of Total Appreciation, whereby each credit carries a score resulting from the balance of the positive and negative perceptions on the survey.

design, and in turn, practices acknowledge the importance of policies' adoption. The challenge lies in how to control, measure, and transmit these new sets of practices.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

This study has evaluated a voluntary green building certification by contrasting credits and practice leanings within this certification from different perspectives and angles. Overall, the complexities associated with establishing any set of standards makes this topic an extensive matter to study. While this research confirms the existence of important gaps within the code and design practice, specifically in the case of the WBS, it is not within this research's purview to explore the roots of these gaps. This chapter showcases the overarching thoughts about this research and gives recommendations based on the findings.

RECOMMENDATIONS TO VOLUNTARY CODES

The challenges associated with voluntary codes found in this study evidence the need to re-evaluate the standard's priorities and instructions, incentivize the designer's adoption of neglected criteria, and integrate the in-practice knowledge when possible. By bringing attention to the needs mentioned above, this study intends to enhance voluntary code dynamics and stimulate practice and research to continue this conversation. The following conclusions and recommendations attempt to elaborate on such points.

1. **Set more explicit instructions.** 14% of the impressions collected in the survey had a neutral perception. This is an indicator that professionals were not sure about the relevance of these credits on the WBS; consequently, they did not have a concrete opinion about such credits. These results suggest that in order to emphasize credit

relevance, clearer goals, language, and examples should be employed in all credits so that they can be better understood. Emphasis on strong outreach and education efforts to practitioners is needed to develop codes that do not only prescribe, but also explain and broaden the conversation about the importance of each credit.

2. **Provide Incentives**. Incentivize designers to consider in what ways each credit relates to design and its implications for wellness. Addressing the relevance that least ranked credits have in health and design could improve the perception of importance of such credits, thus making the code more thorough in its use.
3. **Promote constant feedback loops with design practice.** Utilizing the bottom to top approach, designers need to inform the code, which in turn informs the science behind it. In a way, the lack of specificity about wellness strategies reflects the lack of consensus about what sustainability means with regards to the built environment. Consequently, newer concepts and paradigm shifts in this matter, such as wellness, remain vague at the moment.

RECOMMENDATIONS TO THE WELL BUILDING STANDARD

The quantitative results from the survey made it clear that the Well Building Standard addresses a number of practices that are considered important if not oddly obvious, for professionals in practice. Nevertheless, the qualitative responses made it clear that design practitioners do not have only one single vision of the strategies that involve wellness. This might also be a reflection of the lack of consensus about what sustainability means within the context of green buildings and the built environment. Taking a posture

about a common meaning and need of wellness will help to better shape the code. Consequently, the following conclusions and recommendations attempt to bridge gaps and bring unity to the concept of wellness in the design practice.

1. **More and better agreements with design professionals need to happen.** Standards like the WBS need to do a better job of considering designers' concerns and contemplating their experiences in the strategies of the code. Additionally, the standard could make larger efforts to incentivize designers to consider strategies that are currently not seen as important. The results from the survey could serve as a starting point in the discussion of relevant practices in the design field, although, more data needs to be collected to make more specific decisions.
2. **Emphasize distinctions between strategies that address wellness and health by being more precise about the intents/benefits of each.** Although the quantitative evaluation indicates that practices that refer to 'survival needs' are most valued, qualitative inputs made clear that design professionals seeking the WBS are concerned about credits related to wellness. Several aspects on the priorities of the WBS are seen as outside of the scope of wellness, and as a result, are not valued. For instance, one professional stated: "Most of these things do not belong on this checklist even if they are important, they do not touch on what wellness is about." An illustration of how such aspects involve design considerations might make designers relate better with the code and its intentions.

This study recognizes that limitations around the code lie in the ambiguity that the concept of wellness currently has within the design practice. Consequently, better efforts for defining the code around wellness are needed.

3. **Establish better organization and prioritization of existing credits in the code.** From the qualitative data gathered, approximately half of the concerns from the practice that are not in the core of the WBS are partially addressed in the optional credits of the code. Re-evaluating bottom credits and obvious practices, as well as considering the inclusion and evolution of some of the credits outside of the core values, would help to better align the standard with the priorities of the professionals.
4. **More data about the dimension and impact of the strategies is needed so it can become a stronger and more reliable tool.** The outcome of design strategies is sometimes hard (or almost impossible) to measure due to a number of reasons related with the nature of design. Regardless, qualitative data from the survey reveals valuable trends that professionals can apply in their practice and use as a baseline for further development of benchmarks or references.

Green building standards are becoming broadly adopted, and with them, so is the appreciation of benefits that the built environment can have on users' health and wellbeing. Similarly, there is growing recognition of the current limitations and opportunities that 'wellness' as a design component brings to our built environment. Better and more sophisticated performance indicators about strategies around wellness will better warrant their application and outcomes.

FINAL THOUGHTS

This study focuses on standards that undergo incremental change as a long-term 'evolutionary' means, rather than a short-term 'revolutionary' way to deal with limitations in their agreements and advancement. Codes renewal is as much about process as it is related to content, hence the approaches discussed here will be useful for both: the WBS as well as the development of knowledge gaps between codes and the design practice. Thus, it is in the interest of designers and code makers to explore ways to provide a more accessible and flexible means to continue improving such important efforts in sustainable design. Within this context, a dynamic and responsive set of credits in codes are needed and rely on sustaining the engagement of all stakeholders associated, and most especially in the design field.

In the era of the internet of things and big data, standards could perform more as a stimulus for sustainability conversations than governing tools in the field. In this way, knowledge gaps can reduce and evolve as practice and science do. Now more than ever, it is easier to upload strategies and outcomes in an open source format that could be used to inform practice and codes. Different than other widely stablished standards, such as LEED, this open model would allow designers access, and add to it best practices and benchmarks. In this way, even when a client does not seek certification, designers could apply these strategies, and in exchange, also inform the code and increasing the use of it. A model of how to share and evolve sustainability best practices and proven benchmarks is probably a larger move towards making sustainability more understood and accessible to anyone.

Lastly, it is important to think about the close relationship that these operational strategies have with society's behavior. Standards' development should also consider the ethics associated with such tools. Is the implementation of wellness strategies the means to make people work longer hours than intended? Who really benefits from these strategies? More research has to be done on this topic about the ethical dimension that wellness in the workplace involves.

Appendices

1. **SURVEY QUESTIONNAIRE**
2. **DATA INTERPRETATION METHODS**
3. **LEGEND WBS AND SURVEY**

1. SURVEY QUESTIONNAIRE

Perceptions of Wellness in the Workplace: Technologies, Protocols, and Design.

Practitioner Survey

Researcher: Yureisly Suarez (yuresuarez@utexas.edu)

Thank you for agreeing to participate in our research. Your feedback will be truly valuable.

1. **Please indicate your sex?**

- Male
- Female
- Prefer not to say

2. **Please indicate your age range**

- 18 - 34
- 35 - 50
- 51 - 69
- + 70

3. **What role(s) do you have in your firm? If other, please specify**

- Designer (architecture)
- Designer (Urban)
- Engineer
- Consultant
- Contractor
- Analyst
- Strategist
- Real State Agent
- Other (Please specify)

4. **Please indicate in what state is your firm located**

(Dropdown list of the 50 states of the country)

5. **Do you have prior experience in research or projects related to the wellness of building users? If yes, please briefly explain.**

Yes. _____

No

6. **How many years of professional practice experience do you have?**

- 0 to 5 years
- 6 to 10 years

- 11 to 15 years
- 16 to 20 years
- 21 to 25 years

7. **What kind of building typology(ies) or space(s) have you typically applied wellness strategies?**

- Commercial
- Residential
- Educational
- Government
- Industrial
- Religious
- Federal
- Other _____.

The following questions are designed according to the criteria of the new Well Building Standard (WBS) V.1 released in February 2016.

Please answer the following questions according to your perceptions and your work experience.

8. **From your experience, please evaluate the strategies you consider most important to implement for achieving user's health and well-being in the workplace from the list below.**

a. At least 50% of available food options in the workplace are fruits and/or non-fried vegetables
b. Ensure that no beverage with more than 30 g of sugar per container is sold or distributed in anyway in the workplace
c. Provide carbon filters for potable water distribution
d. Ensure that water used by users meets health criteria such as turbidity measures
e. Ensure that all ventilation filters are replaced prior to occupancy
f. Provide labeling of all artificial colors, sweeteners and preservatives present in foods provided by the workplace
g. Ensure that at least 30% of workstations have the ability to alternate between sitting and standing positions through adjustable height desks, seated heights, or computer distance
h. Develop a written cleaning protocol that teaches staff during training a list of high-touch and low-touch surfaces in the workplace
i. Ensure that employees have access to personal thermal comfort devices such as portable fans
j. Establish Indoor non-smoking policy or local workplace code
k. Perform an Occupant Indoor Environmental Quality (IEQ) Survey and report the results to decision makers
l. Achieve the maximum safety limits for common pesticides and herbicides detected in the drinking water

m. Use educational media to encourage consumption of whole, natural food and cuisines
n. Provide accessible fragrance-free non-antibacterial soap, and disposable paper towels in all sink locations of the workplace
o. Do not include asbestos in any installed building material
p. Include ultraviolet germicidal irradiation (UVGI) devices to control microbe and mold to control in cooling coils and similar systems
q. At least 95% of furniture and furnishings meets the limitations established by Furniture Sustainability Standard
r. Provide interior window shading or blinds that are controllable by the occupants or set on a timer
s. Label all food provided in the workplace with the most common food allergens such as peanuts, gluten, wheat, and shellfish
t. Maintain safe concentrations of disinfectants, byproducts, and fluoride in workplace potable water
u. Ensure incorporation of nature in the workplace through environmental, lighting, and space layout elements
v. Provide systems that ensure that Volatile Organic Compounds (VOCs) safe air levels are met
w. Develop acoustic plan that identifies loud and quiet zones in open offices and lobbies

x. Provide a subsidy of at least $50 per year per employees to cover the costs of an active transportation method

y. Labeling all food sold and distributed with nutrition information

z. Provide separated food storage for raw and prepared food

aa. Generate light models or light calculations (which may incorporate daylight) showing that appropriate amount of light is provided to the workstations

bb. Meet with stakeholders to discuss the needs of the occupants focusing on wellness prior to the design and programming of the project

cc. Design ambient lighting levels that are adequate for work tasks, and provide tasks lights available upon request

dd. After substantial completion and prior to occupancy, the HVAC system undergoes testing and balancing periodically

ee. Provide the workplace with features intended for human delight, celebration of: culture spirit, and place

ff. Anticipate a space for future fan and rack for air carbon filters in the workplace

gg. Provide a digital and/or physical library of resources that focuses on mental and physical health in the workplace

hh. Ensure water used by users is not contaminated by pollutants such as Lead, Arsenic, Antimony, Mercury, Nickel, and Copper

ii. Comply with current ADA Standards for Accessible Design in the workplace

jj. Ensure that bare lamps and luminaire surfaces have appropriate direction and light intensity

9. **Finally, would you add one or more strategies to enhance users' wellness that was not mentioned? Please mention it and briefly explain logic. _____.**

2. DATA INTERPRETATION METHODS

This appendix explains the two different processes used to understand, weigh, and organize the data collected in different parts of the survey. First, demographic study will be described, and second, the ranking methods will be reviewed.

DEMOGRAPHIC STUDY

The survey gathered ninety-three responses from practicing professionals in the design industry. This section aims at highlighting important information found into subjects' demographics. This study is structured to summarize commonalities among the sample of the survey. The demography outreach and identification of the characteristics of the respondents shows helps situate the findings.

For all methodological tools, questions of validity ask whether or not a data slice gives the correct portrayal of reality. Both qualitative and quantitative data are vulnerable to challenges of validity and reliability. For this reason, the review of the demographic information helps understanding the context in which the findings are derived. In order to place the findings within a context, the survey was designed to consider respondent's age, gender, size of the firm in which they work, role in the firm, previous relationship with the topic of wellness, and typologies where they apply strategies related. The idea is that, at the end of this section there is a description of the profile of the sample.

In terms of gender characteristics, female respondents account for the 60% of respondents, while male account for the remaining 40%. Although the option of 'prefer not

to say' was presented, 0% chose that option. Hence, the group was almost gender-homogeneous although the number of females is slightly higher.

Regarding age demographics, 50% of respondents are millennials (18-34 years old), 30% belong to the generation X (35-50 years old), and 15% are part of the baby boomers generation (51-69 years old). Millennials represent the largest population in the sample of this survey. This result is not surprising because of two reasons. First, the average age of the network accessible by the researcher is mainly composed by millennials. Second, respectively, millennials and generation x are the larger working population, and are easier to reach through an online tool as a survey. Consequently, young professionals of an average age of 37 years old largely influenced the findings of this study.

Besides age and gender, the data also analyses professional demographic data. Information about practices of wellness across different work roles, project typologies, and firm sizes was important to understand the relevance of wellness in the current professional atmosphere. Green building certification opened the spectrum in the field of sustainability practice within the design industry. The scope now includes strategist, engineers, urban designers, and contractors besides architects and designers. In the same way, this interdisciplinary participation in wellness can be appreciated in the results from the survey. Architectural designers account for the majority of the subjects in the sample with 63%, yet the remaining 40% represents homogeneity strategist, urban designers, contractors, and engineers. This trend is a good indicative that topics around wellness are being taken into account by a diverse range of professionals.

Practitioners were also required to indicate their years of experience in the field. As previously mentioned, since more than half of the samples are millennial, it is to expect that the years of experience are low. The 45% of the poll has 1 to 5 years of experience, 20% has between 11 to 15 years of experience, and other 20% has 21 to 25 years of experience. Lastly, 10% represent people with 6 to 10 years of experience in design. The level of experience in the sample is equilibrated with practitioners with few to large experience in the industry.

The professionals surveyed worked in firms of diverse sizes. The size of the firm is an important dimension on the demographic analysis because it is believed that certifications have limited reach associated with the firm size and work type. This is reflected in the fact that most respondents in this sample, 47%, belong to XL size firms (more than 1,001 employees). Followed by XS firm size with 22%, and S, M, L respectively for the remaining 31% of the survey takers. It is evident that, the outreach of certification tools might be indeed tied to the size of the company and structure.

Moreover, the demographic section of the survey inquires on the typologies in which professionals apply wellness initiatives besides commercial spaces. Healthcare (66%), Educational (51%) Residential (37%), and Governmental facilities (19%) are other important areas in which wellness strategies are being implemented. Besides commercial spaces, healthcare facilities are also an important typology associated with wellness-related innovations.

As it has been discussed previously, knowledge is contextual in time and place. For this reason, the study of the location of the experts is relevant to make contextual

assumptions. As it was to expect, most population, 65%, on the sample work in the state of Texas. This is followed by California with 13%, New York with 9%, and DC with 6%, the remaining 7% is divided between Maryland, Massachusetts, Oregon, Georgia, and Alabama. Thus, the findings in this section are heavily influenced by practices and knowledge from the state of Texas. Some north east, west coast, and central perspectives are also embedded in the poll.

Additionally, survey takers were asked if they had previous experience in working with projects related to wellness of building users. In the sample, 53% of the people has prior experience with wellness practices and 47% do not. In the case the surveyed prospect had previous practical knowledge on wellness issues, they had to explain what was that experience. The inputs in this area can be categorized in three main strategic areas in which professionals validate their expertise: accreditation beholders, wellness design experience, and previous academic research.

From the wellness experienced designers, 60% posses experience designing spaces that are centered on wellness and health. Also, 30% accounted their previous experience to accredited programs beholden. To illustrate, accreditation and application of LEED, WELL, and the LBC are considered part fundamental of their experience on wellness. Lastly, 10% of the practitioner's account their knowledge in wellness to user satisfaction research or academic research. Identifying these strategic areas where knowledge is originated is important to the recommendation section.

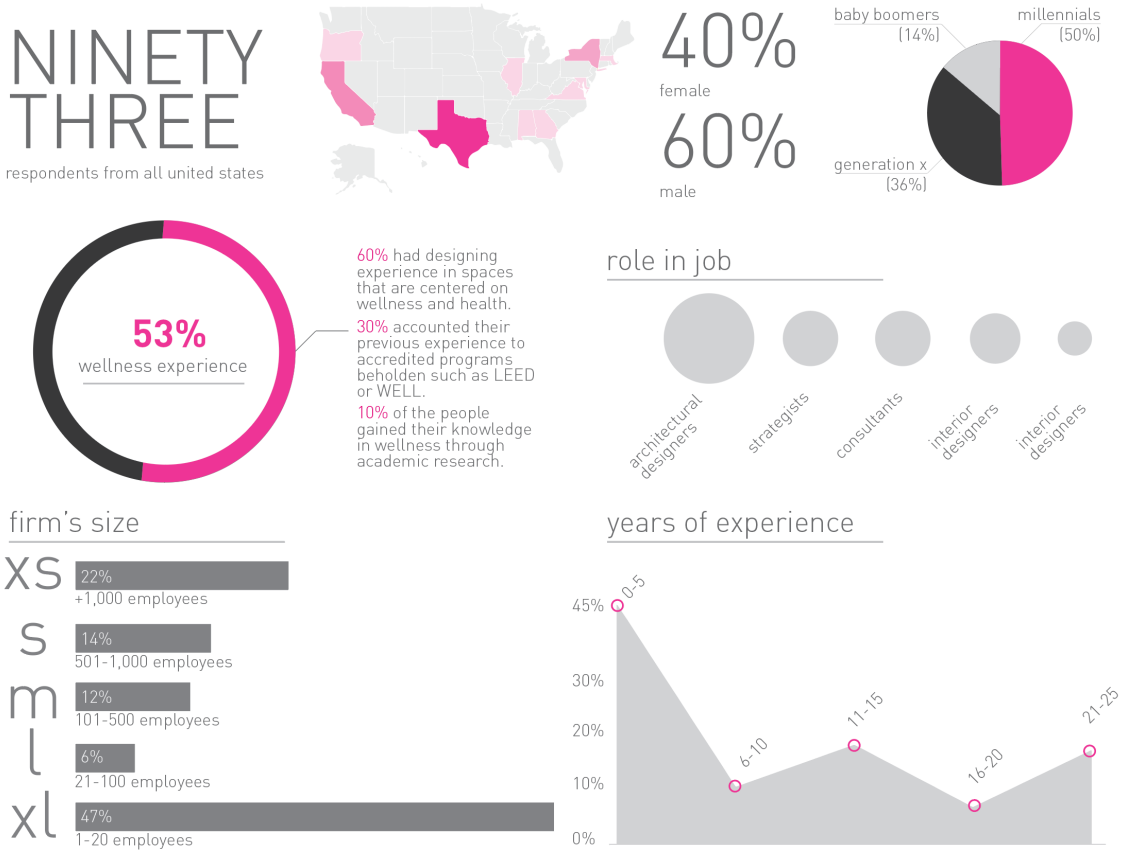

Figure 17. Diagram that summarizes the demographics results.

In summary, the sample of this study is gender homogenous, and contemplates and average age of 37 years old. The sample also largely represents the perspective of architects and designers working in the state of Texas. Additionally, although diverse roles were found, most of the respondents perform as architectural designers. Furthermore, the majority of the respondents work in a large well-established, design firms. Besides commercial spaces, professionals apply concepts of wellness into other typologies of buildings that include healthcare, education, and residential. The sample population has in

average 13 years of professional experience in the design industry, and 53% of them have diverse type of knowledge on wellness.

QUANTITATIVE RESULTS ANALYSIS

Two methods are use in order to study, organize, and weight the data: Net and Weighted Perception.

Overall Perception

Overall Perception method values equally all responses in the Likert Scale of the survey. Following this frame, there were three major considerations: neutral perceptions, positive perceptions, and negative perceptions. Neutral perceptions considered all the responses in the Not Sure option and blanks. On the other hand, positive perceptions included Very Important and Somehow Important options, and negative perceptions adds Less Important and Not Important. In order to have an idea of what the overall perception is, negative perceptions are subtracted from positive perceptions obtaining a Net Perception of each credit, each category, and the code as a whole.

In total, all credits evaluated had a Positive Perception of 73%, Negative Perception of -13%, and a Neutral Perception of 14%. This method was used to draw the big picture findings since it clearly depicts overall results.

Weighted Perception

This method consists on using the Likert scale as a system of points where each option has an assigned value according to its importance. To illustrate, the option Very Important weights 1.5 pts, Somehow Important weights 1.25 pts, Not Sure weights 1 pts,

Less Important values -1.25 pts, and Not Important -1.5 pts. This score system was used to obtain a final value that determines its weighted importance. The total is presented in the scale of 0 to 10 where 0 is not well perceived and 10 is very well perceived by the experts. This method is used to make conclusions regarding individual credits of the code. The net negative/positive scoring is just a tool to evaluate tendencies and perceptions.

QUALITATIVE RESULTS ANALYSIS

An important section of this research is the qualitative inputs form the designers in the Survey. In this section, there were collected over 45 responses related with important practices that were not listed in the survey. After study them all, the four strategic areas were developed based on content analysis and excel word count tool. The four strategic areas represent the different natures and intents of the inputs and these are: Corporative Policies, Indoor Environmental Quality and Safety, Spatial and Space Design and Configuration, and Active Design.

Additionally, word count was used later in the results to convert qualitative inputs into quantitative data. For instance, the words fitness, exercise, and active were counted and later added in the analysis of the categories into 'Fitness.' Similarly happened with the words mindfulness, meditation, and culture that later are incorporated into the 'Mind' category.

The qualitative responses review was fundamental for the understanding of the definition and scope of wellness by the design professionals. Throughout these results, further reflections about the topic are made in the findings section.

3. LEGEND OF WBS AND SURVEY

Category	Credit Code	Prompt in Survey	Prompt in WBS
Mind	M1	Provide a digital and/or physical library of resources that focuses on mental and physical health in the workplace	A digital and/or physical library of resources is provided that focuses on mental and physical health.
	M2	Meet with stakeholders to discuss the needs of the occupants focusing on wellness prior to the design and programming of the project	Prior to the design and programming of the project, all stakeholders, including at a minimum the owner, architects, engineers and facilities management team.
	M3	Perform an Occupant Indoor Environmental Quality (IEQ) Survey and report results to decision makers	In buildings with 10 or more employees, the Occupant Indoor Environmental Quality (IEQ) Survey™ from the Center for the Built Environment at UC Berkeley (or approved alternative) is given to a representative sample of at least 30% of employees at least once per year unless otherwise noted.
	M4	Provide the workplace with features intended for human delight, celebration of: culture spirit, and place	The project contains features intended for all of the following: a. Human delight. b. Celebration of culture. c. Celebration of spirit. [13] d. Celebration of place. [13] e. Meaningful integration of public art.
	M5	Ensure nature incorporation in the workplace through environmental, lighting, and space layout elements	A biophilia plan is developed that includes a description of how the project incorporates nature through the following: a. Environmental elements. b. Lighting. c. Space layout.
Fitness			
	F1	Provide a subsidy of at least $50 per year is available to employees to cover the costs of a bicycle share membership	A subsidy of at least $50 per year is available to employees to cover the costs of a bicycle share membership.
Comfort			
	C1	Comply with current ADA Standards for Accessible Design in the workplace	Projects comply with current ADA Standards for Accessible Design.

	C2	Provide at least 30% of workstations have the ability to alternate between sitting and standing positions through adjustable height desks, seated heights, or computer distance	At least 30% of workstations have the ability to alternate between sitting and standing positions through one of the following: a. Adjustable height sit-stand desks. b. Desk-top height adjustment stands. Pairs of fixed-height desks of standing and seated heights (which need not be located adjacent to each other).
	C3	Develop acoustic plan that identifies loud and quiet zones in open offices and lobbies	An acoustic plan is developed that identifies the following: a. Loud and quiet zones. b. Noisy equipment in the space.
	C4	Employees have access to personal thermal comfort devices such as fans	The following condition is met in spaces with 10 or more workstations in the same heating or cooling zone: a. Employees have access to personal thermal comfort devices such as fans (excluding space heaters).
Light			
	L1	The ambient lighting levels are adecuate for work tasks, and tasks lights providing are available upon request	The ambient lighting system is able to maintain an average light intensity of 215 lux [20 fc] or more, measured on the horizontal plane, 0.76 m [30 inches] above finished floor. The lights may be dimmed in the presence of daylight, but they are able to independently achieve these levels.
	L2	Generate light models or light calculations (which may incorporate daylight) showing that appropiate amount of light is provided to the workstations	Light models or light calculations (which may incorporate daylight) show that at least 250 equivalent melanopic lux is present at 75% or more of workstations, measured on the vertical plane facing forward, 1.2 m [4 ft] above finished floor (to simulate the view of the occupant). This light level is present for at least 4 hours per day for every day of the year.

	L3	Ensure that bare lamps and luminaire surfaces have appropiate direction and light intensity	At workstations and desks, the following requirement is met: Bare lamps and luminaire surfaces more than 53Åã above the center of view (degrees above horizontal) have luminances less than 8,000 cd/m..
	L4	Provide interior window shading or blinds that are controllable by the occupants or set on a timer	Interior window shading or blinds that are controllable by the occupants or set on a timer.
Water			
	W1	Ensure that human consumption water measures meets the indicators of presence of any harmful contaminants	All water being delivered to the project area except water not designated for human contact meets the following requirements: a. Turbidity of the water sample is less than 0.3 NTU.
	W2	Ensure that human consumption water meets Lead, Arsenic, Antimony, Mercury, Nickel, and Copper limits	All water being delivered to the project area for human consumption meets the following limits: a. Lead less than 0.01 mg/L. b. Arsenic less than 0.01 mg/L. c. Antimony less than 0.006 mg/L. d. Mercury less than 0.002 mg/L. e. Nickel less than 0.012 mg/L. f. Copper less than 1.0 mg/L.
	W3	Provide the workplace with carbon filters for human consumption water	All water being delivered to the project area for human consumption meets the following limits: a. Styrene less than 0.0005 mg/L b. Benzene less than 0.001 mg/L. c. Ethylbenzene less than 0.3 mg/L. d. Polychlorinated biphenyls less than 0.0005 mg/L. e. Vinyl chloride less than 0.002 mg/L. f. Toluene less than 0.15 mg/L. g. Xylenes (total: m, p and o) less than 0.5 mg/L. h. Tetrachloroethylene less than 0.005 mg/L.
	W4	Achieve the maximum safety limits for common pesticides and herbicides detected in the drinking water	All water being delivered to the project area for human consumption meets the following limits: a. Atrazine less than 0.001 mg/L. b. Simazine less than 0.002 mg/L. c. Glyphosate less than 0.70 mg/L. d. 2,4-Dichlorophenoxyacetic acid less than 0.07 mg/L.

	W5	Maintain the concentrations of disinfectants, byproducts, and fluoride in water	All water being delivered to the project area for human consumption or showers/baths meets the following limits: a. Residual chlorine less than 0.6 mg/L. b. Residual chloramine less than 4 mg/L.
Nourishment			
	N1	At least 50% of available options of distributed food/meal options are fruits and/or non-fried vegetables	If solid foods are sold or distributed on a daily basis on the premises by (or under contract with) the project owner, then the selection includes at least one of the following: a. At least 2 varieties of fruits (containing no added sugar) and at least 2 varieties of non-fried Vegetables. b. At least 50% of available options are fruits and/or non-fried vegetables.
	N2	No beverage with more than 30 g of sugar per container is sold or distributed in anyway in the workplace	All foods, beverages, snacks and meals sold or distributed on a daily basis on the premises by (or under contract with) the project owner meet the following conditions: a. No beverage with more than 30 g of sugar per container is sold or distributed through catering services, vending machines or pantries. Bulk containers of 1.9 L (2 quart) or larger are exempt from this requirement.
	N3	Label all food provided in the workplace with the most common food allergens such as peanuts, gluten, wheat, and shellfish	All foods sold or distributed on a daily basis on the premises by (or under contract with) the project owner are clearly labeled to indicate if they contain the following allergens: a. Peanuts. b. Fish. c. Shellfish. d. Soy. e. Milk and dairy products. f. Egg. g. Wheat. h. Tree nuts. i. Gluten,
	N4	Provide accessible fragance-free non-antibacterial soap, and dispsable paper towels in all sink locations of the workplace	The following are provided, at a minimum, at all sink locations: a. Fragrance-free non-antibacterial soap.

	N5	Provide separated food storage for raw and prepared food	If raw meat is prepared or stored on site, cold storage spaces contain the following: At least one removable, cleanable drawer or container located at the bottom of the unit, designated and labeled for storing raw foods (uncooked meat, fish and poultry).
	N6	Labeling of all artificial colors, sweeteners and preservatives present in foods provided by the workplace	All food sold or distributed on a daily basis on the premises by (or under contract with) the project owner are labeled to indicate if they contain the following: a. Artificial colors. b. Artificial flavors. c. Artificial sweeteners. d. Brominated vegetable oils. e. Potassium bromate. f. BHA (Butylated hydroxyanisole).
	N7	Labeling all food sold and distributed with total of nutrients	For foods and beverages sold or distributed on a daily basis on the premises by (or under contract with) the project owner, the following are accurately displayed (per meal or item) on packaging, menus or signage: a. Total calories. b. Macronutrient content. c. Micronutrients d. Total sugar content.
	N8	Use educational media to encourage consumption of whole, natural food and cuisines	Using prominent displays such as educational posters, brochures or other visual media, designated eating areas or common areas contain a total of at least 3 instances of messaging intended to achieve each of the following requirements: a. Encourage the consumption of whole, natural foods and cuisines. [77] b. Discourage the consumption of sugary or processed foods, beverages and snacks.
Air			
	A1	Provide systems that ensure that Volatile Organic Compounds regular levels are met	The following conditions are met: a. Formaldehyde levels less than 27 ppb. b. Total volatile organic compounds less than 500 µg/m³.
	A2	Establish Indoor smoking policy or local workplace code	Building policy or local code reflects the following:

			a. Smoking and the use of e-cigarettes is prohibited inside the building.
	A3	After substantial completion and prior to occupancy, the HVAC system undergoes testing and balancing	After the HVAC system is installed, the following requirement is met: After substantial completion and prior to occupancy, the HVAC system undergoes testing and balancing.
	A4	At least 95% of furniture and furnishings meets the limitations stablished by Furniture Sustainability Standard	The VOC content of at least 95% (by cost) of all newly purchased furniture and furnishings within the project scope must meet all limits set by the following, as applicable: ANSI/BIFMA e3-2011 Furniture Sustainability Standard sections 7.6.1 and 7.6.2, tested in accordance with ANSI/BIFMA Standard Method M7.1-2011.
	A5	Provide fan and rack space that is in place for future carbon filters	If recirculated air is used, the following requirements are met in ventilation assemblies in the main air ducts for recirculated air: a. Rack space and fan capacity is in place for future carbon filters. b. The system is able to accommodate additional filters.
	A6	Include ultraviolet germicidal irradiation (UVGI) devices to control microbe and mold to control in cooling coils and similar systems	In buildings that rely on a mechanical system for cooling, one of the following requirements is met: a. Ultraviolet lamps (using a wavelength of 254 nm so as not to generate ozone) are employed on the cooling coils and drain pans of the mechanical system supplies. Irradiance reaching the cooling coil and drain pan, including the plenum corners, is modeled. a. Building policy states that all cooling coils are inspected on a quarterly basis for mold growth and cleaned if necessary. Dated photos demonstrating adherence are provided to the IWBI on an annual basis.
	A7	Ensure that all ventilation filters are replaced prior occupancy	To prevent pollutants from entering the air supply post-occupancy, if the ventilation system is operating during construction, the following requirement is met: a. All filters are replaced prior to occupancy.

	A8	Develop a written cleaning protocol that teaches staff during training a list of high-touch and low-touch surfaces in the workplace	A cleaning protocol and dated cleaning logs that are maintained and available to all occupants.
	A9	Do not include asbestos in any installed building material	All newly-installed building materials meet the following materials composition requirements: a. No asbestos. b. Not more than 100 ppm (by weight) added lead.

Glossary

Sustainable design: From the conjunction of several authors, this thesis defines that; at its best, sustainable design is an approach and an attitude on the process of design, construction, and use, operation and maintenance of buildings that is concerned with issues of preservation, protection and conservation of the natural environment and its resources, the promotion of socially equitable environments, and the economic profitability.

Tacit Knowledge: Knowledge that comes from experience and observation. This concept describes the thoughts that cause certain practices in individuals. Typically, this kind of knowledge is associated to not being articulated and hard to explain. Thus, individuals carry this knowledge and is shared and used in the form of practices.

Explicit Knowledge: Knowledge made explicit that can be explained by individuals. Typically, it is considered useful the knowledge of individuals in a system that can be articulated and made explicit and thus, transferable.

Well Building: As 'Green buildings,' Well buildings are socially constructed concepts that refer to a built environment that complies with nested and contextual definitions of what well means. Generally, a Well space or building considers one or more of the following areas: 1. Prevents users from indoor environmental risks. 2. Through policies, provides users with healthy life-styles. 3. Uses spatial configurations to provide users with healthy environments and life-style. 4. Enhances active life-style.

Workplace: Where people work. The scale and location of the workplace may vary from an urban building, to small offices.

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