

Are You Comfortable? *Re-Imagining the Home Space Through Functionality, Efficiency, and Necessity*

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Abstract

A way of determining best practices for designing small-scale dwellings based on reinterpreted and reimagined functional design techniques can be accomplished through efficient and necessary use of space. This use of space is determined through in-depth studies of the human body through anthropometrics and the physical practice of yoga, as well as self-studies of the body.

Utilizing efficient architectural design methods based on the histories of Japan, Scandinavia, and North America has led this thesis to designing for necessity, functionality, and efficiency. Country-specific values and philosophies influence architectural design and the use of home spaces for living.

Addressing external influences in Japan, Scandinavia, and North America identify the impact of cultural lifestyles on architectural design. Why do country-specific values and cultural values influence the design of the home and how can residential design be improved to better suit the needs of user's functionality, necessity, and efficiency in the home?

By rethinking and re-evaluating personal values and philosophies that relate to material consumption and possession, new understandings of functionality, necessity, and efficiency will concede the design principles found.

To sustain claims and foundations of research, country-specific studies of Japan, Scandinavia, and the United States are thoroughly assessed and evaluated. Examining ergonomics and anthropometrics support investigations on country averages.

Design varies around the world due to external circumstances. By focusing specifically on the home, observations on how people use this space based on their country's external circumstances and their personal values and philosophies can merge existing ideas of function, necessity, and efficiency for new methods of design.

Thesis Statement

The general focus of this thesis investigation is to determine best practices of designing small-scale dwellings based on reinterpreted and reimagined functional design techniques. Through the analysis of global relationships of residential designs, this thesis will incorporate functional and necessary use of space utilizing efficient architectural design methods. The study of country-specific values, philosophies, and histories, along with self-studies and self-analyzations will contribute to reimagined functional design techniques.

Studying the architectural histories and residential design histories of Japan, Scandinavia, and the United States will lead this thesis to its ultimate goal of designing for necessity, functionality, and efficiency. With the understandings of ergonomics and anthropometrics, investigations of the advancements in functional design will guide the research to precedent studies that exemplify functional and efficient dwelling spaces. Furthermore, this thesis is conceptualized through self-studies of material consumption and possessions, personal interpretations of space, functionality, and necessity, all of which add or detract to way of life.

This thesis addresses external influences (political factors, economic factors, industry factors, social factors, and technological factors) in Japan, Scandinavia, and the United States that impact their cultural ways of life and architectural design through history. Questions considered are related to why and how country-specific values and cultural values influence the design of the home, as well as how residential design can be improved to better suit the needs of functionality, necessity, and efficiency in the home. Using the above will provide answers on how to design small-scale homes through these methods.

By rethinking and reevaluating personal values and philosophies that relate to material consumption and possession, new understandings of functionality, necessity, and efficiency will concede the design principles found in this thesis.

To sustain claims and foundations of research, country-specific studies of Japan, Scandinavia, and the United States are thoroughly assessed and evaluated. Studying ergonomics and anthropometrics will support investigations on country averages that include average height, vehicle size and popularity, home size, country size, population, and building material cost specific to each country. Selfstudies of yoga and physical movement of the body contribute to the functional and necessary defining of space.

It may be inferred that not all wish to live by necessity. Country values and individual identity can be expressed in many ways, not all of which will align with one another. It may also be known that individual levels of comfort will affect spatial design through personal understanding and experience. By providing the opportunity to perceive space differently, alternative impressions and considerations are anticipated.

While researching foundational information regarding each country of study, it is conceivable that the ability to gain access to appropriate figures and geographic scopes are limited. In developing new design methods through personal experience and studies, it may be queried that insufficient evidence and research can withhold the larger questions being posed. Although it is possible that this is a constraint, by supporting personal experience and studies with attested foundations of affirmed practices, it can be justified that these personal methods can be feasible in a newly proposed design method. Design in a spatial and architectural sense varies around the world due to many external circumstances. Focusing specifically on the home, we can observe how people use this space based on their country's external circumstances and their personal values and philosophies. With every location having distinct architectural design features that have impacted home design, merging existing ideas of function, necessity, and efficiency can aid in new methods of design. Ultimately, through the convergence of concepts, principles, methods, and notions worldwide, reimagining the home space based on functional and essential needs will produce practices of design that will confidently transform the home.

Introduction

Functional design in architecture can extend into many areas and can be applied to many practices within design. We can have functional spaces in terms of heating and cooling, or the software used to design a space. The most common practice and understanding about functional design is that it comes from the architectural term functionalism; the principle that buildings should be designed based solely on their purpose and function. This principle is questionable, as design can be both functional and multi-use, while a single space can have more than one function throughout the day. We can see this in traditional Japanese dwellings with the influence that Zen Buddhism provided to the space to produce a oneness with dweller and dwelling. The relationship that developed for human and space through this particular use of functional design can be a model for other methods of design.

We can look at functional design as a tool to produce smaller spaces, particularly in the Western world. In recent years, the United States has been permeated with homes larger than their intended purpose. While there is no fault with current home design, this thesis intends to produce a method of design based on necessity and functionality. It will analyse these spaces and their inhabitants while comparing them to the same functional use spaces in Japan and Scandinavia. This analysis will be used as a means for redefining the home space in the United States as a way of introducing design for necessity and reintroducing design for functionality.

Definitions

Comfortable:

Being in a state of physical or mental ease and relaxation; Affording or enjoying contentment and security with finances; To be free from vexation or doubt; To be free from stress or tension in the mind or body.

Internal Identity:

Internal identity is how you see your ideal self and who you want to be. This is the identity you wish others to see. It comes about (and changes) due to past experiences. Contrast this with your external identity. Your external identity is how others see you and categorize you.

Values:

Value denotes the degree of importance of something or of an action, with the aim of determining what actions are best to do or what way is best to live, or to describe the significance of different actions.

Functionality:

The quality of being useful, practical, and right for the purpose for which something was made.

Ergonomics:

An applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely

Anthropometry:

The study of human body measurements especially on a comparative basis.

1

Japan as Inspiration

A Brief History of Japanese Architecture

Since the emergence of the Japanese dwellings home, looked much like any other, constructed mainly of wood and thatched roofs. Japan began to develop its own style and aesthetic with the introduction of shrines, but these worshipping spaces were still heavily influenced by other Asian countries. Around the 7th century, wood emerged as favoured material due to the lack of stone available, as well as wood's durability to earthquakes.

"Traditional Japanese architecture" as it is commonly referred to as today, are the structures built during the Edo period of the 17th to mid-19th century. This architecture was similar to that of Medieval European architecture at the

time due to its castle-like appearance (although still much simpler than Europe's), and heavily influenced by the Chinese. Whilst still having international influence. Japanese architecture is renowned and can be easily distinguished by its main elements of material, structure, form, and space.

Wood

Aforementioned, wood became preferred over stone and other materials due to Japan's humidity, risk of earthquakes, and possibility of typhoons. It allowed for proper ventilation and was durable enough to face natural elements. In older Japanese homes, no paint was used on walls as a way of showing appreciation and respect to nature and its beauty. The use of minimal material communicates Japan's values of sustainability and deep connection to nature with this mindset.



Figure 1.1: Japanese Wood Construction

Engawa and Genkan

Engawa translated to English means "edge side" and is a Japanese veranda that resemble porches. Commonly made of wood, the engawa merge the external with the internal. forming а relationship with elements commonly and used in summer months to experience the climate. As a part of the home, it is tradition that shoes are not to be worn on it and are instead placed on the traditional stone step beside it in the genkan.

The *genkan* is a traditional Japanese entryway located immediately inside a home.

They serve as the area for show to be placed before walking inside the main part of the house. Typically sunken lower than the rest of the floor, its purpose is to keep dirt out and remind visitors to respect the home they are entering.



Figure 1.2: Engawa

Shoji and Fusuma

Shoji (moveable screens) and fusuma (sliding doors) are an integral feature of Japanese homes. Shoji are constructed from wood frames with translucent paper to allow light to shine through, while fusuma paper is opaque, allowing minimal light in. Both are utilized as interior doors and partitions, allowing spaces to divide and re-divide through flexibility. This empowers spaces to be used in accordance to the needs of the hour, offering adaptability to the home.



Figure 1.3: Tatami mats are framed by shoji and fusuma at a temple in Tokyo

Tatami

Tatami are mats used as flooring in traditional Japanese spaces and are still very common in homes today. They were traditionally made of rice straw and cloth edges with a standard size of 2:1. *Tatami* used to completely cover the floor of the home but it is now more common to find them in a specific room in a home.



Figure 1.4: Tatami mats

Japanese Architecture Today

Contemporary Japanese architecture is a mixture of traditional design practices and modern Western aesthetics. Japanese spaces contend to a more human scale with nature often as an essential part of composition. The perception of form is essentially a pattern making function and the structural necessities of spatial form have been gradually transformed into dynamic patterns and radiating rhythms that help unify and order the total form of a space. Perfection of a system of asymmetrical order may be Japan's most significant contribution to architecture. The inherent vitality of asymmetry requires participation in the experience of form - by suggesting, by directing the mind to complete

the incomplete, and by providing a constant source of ever-changing relationships in space. Asymmetrical order is an extension of the process of life and recognizes that life is not static or perfectable, but that its essence is growth, change, relatedness.

recognized Most notably Japanese architecture as today are modern, modular buildings with simple forms that are two to three stories tall. The high cost of land keeps most lots small, causing houses to rise upward. Flat roofs are common, and the architecture relies on form, line, and mass rather than on ornamentation.

Traditional home design is still apparent, or has an influence on the overall design with a more modernised approach.



Figure 1.5: Kakko House by Yoshihiro Yamamoto is a 3.4-metre-wide home in Japan

International Influence

As always, Japanese aesthetic has been embraced and celebrated in its own culture. but more recently its ability to be functional and beautiful has been recognized globally. The emphasis on simplicity, horizontal lines, and flexible spaces have been adapted by Western architects and have influenced the Mid-Century modern style and current contemporary design. The influence of Japanese design modern on architecture with Mid-Century modern style borrows the Eastern principles of sliding partitions and open floor plans. In 1899, Ernest Fenollosa, the world's leading Western expert on Japanese art at the time, had published his theory of organic wholeness in his book "Composition". The ideas were

applied to all of the visual arts, which were primarily concerned with the aesthetic division of space, inspired directly from Japan.



Figure 1.6: Dow's interlocking 'organic line-ideas.'

From this publication, Frank Lloyd Wright had been inspired and adopted these principles, applying them to his own organic architectural plans. His favourite Japanese print artist, Katushika Hokusai, had published sketches illustrating how the subtleties of living forms could be constructed from simple mechanical shapes. Wright based his plans on similarly overlapping geometric modules. This was a quite radical notion of the time, when planning was typically based on grid and axis.



Figure 1.7: 'Organic' forms based on regular shapes: On the left, Katsushika Hokusai's 'Ryakuga Haya-oshie,' 1812-15. On the right, Wright's 1938 plan for the Ralph Jester House.

His style was informed by the "elimination of the significant", shown through his home design with clean simplicity, the use of natural materials and warm earth tones, and the integration of the house with garden.



Figure 1.8: Lloyd's Westcott Home has multi-paned windows which are thought to resemble a shoji screen.

Go Global

To Scandinavia

То allow this thesis to expand and look at global relationships with dwellings, Scandinavian countries are the next foundational focus. In general, Scandinavia denotes Norway, Sweden, and Denmark. This thesis will refer to all three countries by using "Scandinavia" in its broadest sense.

History

Before the early 20th century, much of Scandinavian architecture was influenced by Europe which was completely vernacular in nature. Dwellings were constructed in simple ways using locally materials sourced and knowledge, often without the innovation of architects. It could be argued that the lack of formal architectural

practice is what inspired the craftsmanship and ingenuity of the design. The vernacular builders were more concerned with function than with form due to the lack of materials and grueling winter months.

What is recognized Scandinavian today as architecture from grew this historical practice. In 1930. the architecture movement in Scandinavia happened at an exhibition in Stockholm. This is where two architects introduced the concept of Functionalism. The functionalist style buildings were minimal but incorporated an enthusiasm the condition. in human These buildings were to be simple yet beneficial to people in a thoughtful manner. While

modern architecture is about simplicity and order, the Scandinavian approach of architecture is that but with its own important adaptation of the inclusion of people in space.

Characteristics

Scandinavian architectural design relies upon simple materials, a connection to nature, and a relevance for the craft of architecture. This makes the design characteristics similar in to Japanese many ways design, prioritizing many of the same qualities. There are key elements that distinguish Scandinavian architecture from other similar styles which include simplicity, utilisation of natural light, functionality and comfort, efficiency, and integration with nature.

Establishing harmony with an individual's environment and creating forms made to last is another guiding characteristic of design. This seeks to compliment the art of living well by promoting simplicity, specifically in the home environment. Quality items enhance the organic and unhindered lifestyles devoid of excess consumerism. This carries over into design that is conscious and socially innovate, while being understanding of nature.

The inclusion of these characteristics begins to drive the design intentions of this thesis to produce a dwelling that will incorporate Japanese design elements with Scandinavian design elements. The amalgamation of these techniques will cultivate the unique experience of reimagining and re-defining the Western home.



Figure 2.1: Interior of Archipelago House by Norm Architects

Back to the West

History

With a much more extensive and documented history, the United States' architectural styles significantly vary throughout multiple periods of the country's development and transformation. To remain succinct, this thesis will analyse the architectural history of American dwellings beginning with the Prairie Style, followed by Art Deco and Modern, to Late Modern.

Prairie Style

The Prairie Style was inspired by European precedents in the 19th century but remain very reminiscent of the traditional Japanese design elements. The Prairie Style emerged in the Midwest, pioneered by Frank Lloyd Wright, who is known to be inspired by Japan. This style consists of strong horizontal lines with the home being integrated to the site. These dwellings were typically two-story masonry low buildings with projecting single-storey wings and minimal use of decoration. The roofs are very low-pitched to remain connected to the flat landscape of the Midwest.



Figure 2.2: Frank Lloyd Wright's Robie house in Hyde Park is the epitome of his Prairie style architecture.

Wright wanted to reinterpret domestic life to make a stronger connection between indoor and outdoor spaces, having the appearance of the building emerging naturally from the site. Later on, Wright designed 'Usonian' houses that were L-shaped and brought functionality to middle-class Americans.

Art Deco and Modern

The origin of art deco is in France and Belgium before the first world war, consisting of decorative objects and furniture. It remains with simple shapes clean but develops ornamentation from representational forms. Art deco houses are not common. but they hold the characterdefining features of a flat roof, long horizontal lines, and smooth surfaces.



Figure 2.3: Art Deco + Art Moderne House Style

The modern style is characterized by a rational approach to design. It is free of any historical associations, intending to design dwellings that were highly functional and new. This style was embraced by new technologies of construction with the use of glass, steel, and reinforced concrete. All ornamentation and decoration was removed.

Late Modern

With modern architecture beginning to deflate, people dissatisfied became and desired change. In the 1960s, the architecture that emerged was more imaginative with expressive forms. Architects argued against a minimalist approach in design and favoured those that were varied and sensitive to its context. Instead of simple, modernism. these clean architects sought out complexity in the design with hybrid approaches, making a more opulent architecture style.



Figure 2.4: The former Mummers Theater, designed by Johansen for Oklahoma City.

Averages

What is an Average?

An average is a single number taken as representation of a list of numbers. It is a standard that is considered to be typical or usual. Most often, averages are applied in mathematics for calculations. When we use averages for human characteristics, like someone's height, these are what are known as quantifiable properties. People only have a few quantifiable properties: age, income, height, weight. It is important to understand the difference in mathematical or scientific averages versus averages that would be used in human design.

Human design in relation to architecture can been seen as a human-centred process that seeks to optimize usable systems by focusing on the users, their needs and requirements, and by applying human factors through knowledge and techniques.

As could be expected, it is very difficult to determine the average person. If we were to gather all 7.7 billion people and attempt to find the perfect average, it would be very obscured. There are many factors that determine the average person that will vary from place to place. The most efficient way of determining an average when it comes to human design is to narrow down where the average is coming from. We can do this by locating an area in the world (a sample size) and using this as a basis of research and understanding. This will be an important part

of this thesis later on when determining a universal average for design.
Country Averages

To begin the process of establishing а universal average for design concerning this thesis, countries that have been previously studied will be selected for analysis. The analysis will be based on height, vehicle size, and dwelling size. The countries analysed will include Japan, Scandinavia, and the United States.

Japan

The average height in Japan is 160.3cm (5'2") for men and 148.9cm (4'9") for women. The height of the Japanese has remained relatively the same throughout history, with country location playing a large role in biological evolution. As a secluded island, Japan has had to adapt to environmental changes. Being a mountainous region, evolution suggests that people who live at higher altitudes tend to be shorter. This has been corroborated by studies focused on Tibetan and Bolivian people who live at higher altitudes near mountain ranges and tend to be shorter than surrounding lowland populations. Lack of nutrients like protein due to geographical seclusion is another contributing factor in lack of height.

Because of a shorter height average, the most common vehicle in Japan is the vehicle Yaris. This Toyota measures at 442.5cm (14'5") and 150cm (4'9"), perfectly accommodating the average height person, as well as adapting to the high density

of Japanese cities.

The average dwelling space in Japan is 121.7m2 (1,310 sq ft). This varies widely between major urban areas like Tokyo which has an average space of 91m2 (980 sq ft) and rural areas like Toyama at 178m2 (1,915 sq ft).

Scandinavia

average height The in Scandinavian countries is 181.5cm (5'11") for men and 167.7cm (5'6") for women. Scandinavians are known to be slightly taller than average. This has to do with geographic location, genetics, and diet. Located mostly along the coast, there are great supplies of fish and red meat that contribute to great protein intake, supplementing growth in individuals.

The most common vehicle in Scandinavia is the Volvo S40. This vehicle measures slightly above the Toyota Yaris at 448cm (14'8") and 139cm (4'6") tall. Volvo is a Swedish brand which means "to roll". Because it is a Swedish brand, it is typically inexpensive to buy and is easy to acquire. The average dwelling space in Scandinavia varies upon rural or urban location. As a base average, a detached home is 170m2 (1,829 sq ft) and an apartment is 71m2 (768 sq ft).

United States

The average height in the United States is 175.3cm (5'9") for men and 161.3cm (5'3") for women. This is below the average height of Scandinavians and above the average height for Japanese, however heightism is a large issue in America. Taller individuals are perceived as socially superior and treated as such; something that is not common among other countries.

The most common vehicle in the United States is the Ford F-150 truck, measuring at 588.5cm (19') in length and 196cm (6'4") in height. The fondness of a pick-up truck to Americans is due to its perceived belief of freedom and utility. Americans typically have far larger and wider road infrastructure space and are able to have a larger vehicle than that of Japan and Scandinavia. Land space is abundant in the

United States and freeways are large, hosting room for vehicles of this size. Like the Volvo in Scandinavia, Americans prefer the Ford F-150 over other makes due to Ford manufacturing in the country and the easy accessibility to the product.

The average dwelling space in the United States is 213.7m2 (2,300 sq ft). It is most common in America to live in a single-family home, although urban areas require apartment units as a means of dwelling space, measuring at 87m2 (941 sq ft).



Figure 3.1: Average height and most common car in Japan, Scandinavia, and U.S.

What is an Average in Space and Design?

What we understand from averages for quantifiable human properties is that it is dependent on location. The same can be applied to the average of space and design. As acknowledged in *Country Averages*, dwelling sizes vary greatly by location due to evolutionary factors. In order to design spaces efficiently for function and necessity, there must be a universal average set in place. This thesis will further expand upon how this is achievable in a Chapter 8. For now, the next chapter will discuss the importance of quantifiable human properties pertaining to an average for space and design.

4

Functionality

Preamble

Functionality in architecture is commonly conceptualized as the placements, forms, and features of a building that reflect its intended use and the people who use it. Functionality permits future adaptations or improvements. It is commonly stated amongst the field that form follows function, however, this thesis argues against this. Form and function must cohere and harmonise to adapt to the reorganisation and improvement of methods to design dwellings for necessity.

There have been feats within spatial design that have contributed to the advancement of such methods. To begin, ergonomics is analysed and then advanced into anthropometry. This chapter will investigate both practices and culminate rationalisations for the preferable.

Ergonomics

Ergonomics is an applied science concerned with designing and arranging things people use so that the people objects and interact most efficiently and safely. In an architectural sense, ergonomics aims to optimize the human-built environmental interactions to increase humans' satisfactions with their built environment and improvement of the performance of buildings. It is focused on the most efficient way to use the objects in a space.

The problem with ergonomics in spatial design is that it is more-so focused on the placement of objects and furniture, rather than the comfortability and efficiency of human use. Certainly, ergonomics is a practical method for design, but not to the extent that is required for optimal and quintessential spatial design.

Vitruvius

Roman architect and engineer, Marcus Vitruvius Pollio, was known for originating the idea of perfect proportion in architecture and the human body. His discussions led to the famous drawing of the Vitruvian Man by Leonardo da Vinci. Vitruvius noted that if a man extends his four limbs so that his hands and feet touch the circumference of a circle, his navel will fall in the exact centre of the circle. The drawing illustrates this while including a square within the circle whose sides are touched by the head, feet,

and outstretched arms of the man. This finding promotes a connection between the body and architecture, as well as demonstrates the perfection of the circle as a connection to the human form. The Vitruvian Man has been studied endlessly by architects and designers interpretations with and discoveries of their own. This drawing can be seen as the foundation of human design.



Figure 4.1: The Vitruvian Man

Neufert

One of the first notable publications on ergonomics in architecture that began designers how to shape thought was Ernst Neufert's Bauentwurfslehr, (Architects' Data) published in 1936. translating exactly to "teachings building design". on This book is a reference for spatial requirements in building

design and site planning, meant to help the initial design of buildings by providing extensive information and graphics. Most notable from this resource for the exploration of this thesis, are the recommended minimum measurements for space, of measurements exact standard-sized furnishings, and treatises on standard building typologies such dwellings (high-rise as and low-rise). Setting the foundation for recommended human-centred design. Bauentwurfsleh is the point of departure for many more explorations of the topic.



Figure 4.2: *Architects' Data*, Man: The Universal Standard

Neufert focused specifically on one type of person in his publication: the average male figure in Europe. While incredibly useful for European design of the time, it is difficult to make use of techniques and practices that apply to anything other than the European male in set positions.



Figure 4.3: Architects' Data, Space Requirements of Various Body Postures

Le Corbusier

Reflecting on Vitruvius and Charles-Édouard Neufert, Jeanneret, more commonly known as Le Corbusier, had created his own version of human proportion in spatial design. Referred to as the Modulor Man (1943), the stylised human figure drawn by Corbusier stands proudly with square shoulders. Typically seen with one arm raised, the man is a denotation for re-ordering space.

This system could then be used to provide the measurements for all aspects of design, from door handles to entire cities. Corbusier believed it could be further applied to industry and mechanics since the modulor system had a series of scales and measurements laid out in a modulor rule.

The fundamental "module" of the Modulor Man is a sixfoot tall man, based on the usual height of detectives in books that Corbusier enjoyed reading. The man is segmented according to the "golden section", a ratio of approximately 1.61. The proportions can be scaled up or down using mathematical progressions. Corbusier began incorporating the man into his buildings, practically and literally with concrete glyphs.

The Modulor is as arbitrary other human as any measurement that has been discussed. Its height basis was from an imaginary novel, with no definitive reason to the height of the figure. A six-foot rule is biased to the design of man, excluding its important counterparts of woman and Although there child. are contentions with Corbusier's measurements, it does put human form at the centre of design.



Figure 4.4: Le Modulor



Figure 4.5: Modulor Man Sketch

Anthropometry

Anthropometry refers to the measurement of the human individual. An early tool of physical anthropology, it has been used for identification and for the purposes of understanding human physical variation. In architecture, anthropometrics comparative is the study of the measurements and capabilities of the human body. The underlying principle of anthropometrics is that building designs should adapt to suit the human body, rather than people having to adapt to suit the building.

Anthropometry can be separated into two fundamental areas: static and functional. Static the anthropometry is measurement of body size at

rest and when using chairs, tables, beds, mobility devices, and so on. Functional anthropometry is the measurement of abilities related to the completion of tasks, such as reaching, maneuvering and motion.

The use of anthropometrics in spatial design aims to ensure that every person is as comfortable as possible. In practical terms, dimensions must be appropriate, ceilings must be at adequate heights, and doorways and hallways must be wide enough. This method of measurement is far more inclusive than ergonomics.

Jocher & Loch

Thomas Jocher and Sigrid Loch, German designers and professors at the University of Stuttgart in Germany, collaborated in 2011 on their publication of *Raumpilot*. This word translates directly into English as "spaceman" but can be better understood through their research as how human bodies can utilize space efficiently.

Jocher and Loch took the ideas and principles from ergonomic design and applied it to spatial design using an anthropometric approach. To fully acknowledge how humans can comfortably and efficiently utilize space, they took multiple forms of the human body and developed the methods further. Their research included men. women. children and handicapped individuals all arrangements and in positions of the human body relevant to the studied figure. This development allowed anthropometry to transcend ergonomics in the use of spatial design for humans. With newly enhanced information about the physical body, more areas of design can be

represented and considered.

As established by Jocher and Loch, the human body in anthropometric design is a reference system of planning for human well-being with all its physical and psychological possibilities. Raumpilot is a central frame of reference for planning and design for space, specific to comfort and human Knowledge of anatomy. human physiology, movement dimensions, and the resulting space and area are essential for appropriate design through all human proportions. Nothing is generalized and everything is actualized into precise ratios for the body.



Figure 4.6: Raumpilot Grundlagen, reaching positions

Gisbrecht

Paul Gisbrecht is a visual architect with many photographic studies of the human body and proportion. Inspired by the relationship between the human body and architecture, Gisbrecht found ergonomics awareness of Only using from Neufert. Neufert as a reference point, recognized Gisbrecht the connection between the body and architecture was poorly and accepted documented before the rise of ergonomics.

The focus in modern day design is not on ergonomics, which emphasizes the separation between body and object; it is on how the body is perceived in space and how this perception influences the way buildings and spaces are designed to efficiently inhabit.

Gisbrecht produced a photographic essay on the reification of body in Neurfert's ergonomics. With direct judgement on Neufert's approach to design, Gisbrecht broke Neufert's average and ideal form of man as the norm to design by documenting only female figures in these ergonomic positions. The issue with one particularly specific man as the ideal for human proportion is that this leads to a standardization problem in design. The aesthetic image of human proportion that Neufert had created led to an idealist archetype that sought to encompass a model of the human body which was not universal at all.

The critique of Architects' Data through photographic essay shows a uniform, regular, and measurable body which approximation displays an that rejects everything outside the established norms. The series re-interprets Neufert's drawings through photos of a real woman that display the trajectories of everyday movements as а way to understand place her in the space she is occupying. beyond regular Going movements, the photos depict how a woman would need to carefully bend to pick something up while wearing a dress, or the way she would sit on the toilet. Gisbrecht reinterprets ergonomics and dismantles model image of Neufert's man to show honest and palpable movements of real human bodies.



Figure 4.7: A Photographic Essay on the Reification of Bodies in Neufert's Ergonomics

5

Utilize and Simplify

How Space is Used Internationally

To understand how space is used internationally, the meaning of values must first be defined. Values denote the degree of importance of something with the aim of determining what actions are best to do or what way is best to live. The significance of action in design will vary from place to place based on a country's core principles and ideals. Typically, values are passed on from previous generations and are a collective agreement and understanding to specific community. From this foundational understanding, it can be inferred that cultural values will determine how space is used internationally.

Japan

In Western culture, a room is often thought of as being

empty until someone enters. However, in the East, space understood differently. is The Japanese view space as having meaning prior to any activity that happens within it. Space in Japanese culture is understood by how it shapes relationships and interactions, so in this way, it can always be seen as full. The concepts of space evolved from two foundational religions of Shinto and Buddhism. Shinto places value on harmony in relationships and focuses on connections. From Buddhism, the ideas of emptiness and selflessness were extracted.

Spaces focus on structuring interactions to people and to society. Traditional tea houses have doors that are low and narrow. This forces visitors to lower their head and remind them of their relationship to the host. In this way, the Japanese build spaces as extensions of culture and values rather than as places where culture happens.

There can be at least four different words for "space" in Japanese, differing from the English equivalent. *Wa* is known as relational space, often translated as harmony, and being an awareness of interpersonal connection. It is often described in terms of moving air in the sense that every space has a certain quality that influences the relationships that form there.

Ba is known as knowledgemobilizing space and is about the arrangement of elements to create connections that are more likely to produce new knowledge or experiences. If *wa* is about social and interpersonal harmony, *ba* is about ensuring that people's knowledge and experience can be put to good use. *Ba* is also used as a design principle that allows open concept, free flowing space. Interdisciplinary work is important for the value of seeing things differently and being taught something new from someone else.

Tokoro is the third word for "space", meaning location in a physical sense but also as a state of being. The idea of place is indistinguishable from connections contained within it.

Finally, *ma* is understood as negative space or an open zone that allows for dissimilar things to co-exist. Designing for *ma* is about creating moments of awareness and quiet. Shrines are often built at the top of elevated terrains, having to walk miles to get there. The long and tiring hike prepares the mind to enter the shrine leaving distractions and worries behind.

The Japanese use space intentionally by creating extensions that allow for reflection and integration.

Scandinavia

Like in Japanese culture, many Scandinavian concepts have no direct translation to English. Geographically, many Scandinavian countries



Figure 5.1: Bird's-eye view of the rock at Ryoanji (From Izozaki Arata, Ma: Space/Time in Japan, Cooper-Hewitt Museum, New York 1976)



Figure 5.2: The open-office concept is a reflection of ba as a design principal.



Figure 5.3: An example of *tokoro*, Plaza of Kanagawa Institute of Technology by junya ishigami + associates.

experience long, dark winter months that have influenced the way space is defined and utilized. Resourcefulness of local materials is important to properly insulate spaces for winter months and to allow ample amount of natural lighting into the space. A concept derived from the sense of comfort that can be felt in warm spaces is hygge meaning comfort and contentedness in the present moment. It can be understood as finding joy in life's simple pleasures and recognizing that minute moments can have a large impact on human experience.

Another concept of space Scandinavia is known in as lagom. Lagom is about balance and understanding that achieving balance is vital to relationships in terms of work and play, or time spent together or alone. The moderation and balance in every aspect of life is at the core of Scandinavian culture that is presented in design and in the use of space. Similar to the Japanese concept of wa, lagom is about harmonious connections and awareness to surroundings.

Being connected the to environment natural and connecting indoor and outdoor space is imperative to the Scandinavian culture. even when winters are harsh. The concept of *friluftsliv* translates to "open-air living" and can describe the way the Scandinavian's prefer to use space. Incorporating natural elements indoors is a part of friluftsliv, but it refers more to the idea of connecting to the natural environment by physically being outdoors. This is an important part utilization in of space Scandinavia because of their The challenge of climate. being exposed to cold winter weather is recognized as something to be grateful for in this culture. To be able to experience the landscape in its most raw form gives a sense of preparedness for what is to come.

Balance, harmony, comfort, and embrace are fundamental concepts to understand spatial design in Scandinavian cultures, directly reflecting their cultural values as a country.



Figure 5.4: Lloyd Hotel & Cultural Embassy by MVRDV is an inviting space that embodies *hygge* through both function and aesthetic.



Figure 5.5: The Queen Anne Residence by BUILD Architects embraces *lagom* principles throughout.



Figure 5.6: Barn Rijswijk by Workshop architecten showcases friluftsliv.

United States

Space in Western culture is primarily used for social interaction as well as personal separation and is often designed in forms of hierarchy. Once more, cultural values are foundational to understanding spatial design and the utilization of space.

The United States has а strong sense of individualism. People like to be viewed as self-sufficient and being able to provide necessities for themselves and their families. Individualism means valuing self-expression, autonomy, and the pursuit of personal goals rather than prioritizing the interests of the group. The use of space through individualism can been expressed in many ways. Commonalities in Western dwellings are multiple rooms for differing purposes. This allows inhabitants of the home to have separate and respective areas to use based on the function of the space.

Contrary to individualistic values of space is the common space. Western culture is socially engaged and sanctions individuals to express their individuality to others through the use of social interaction. Common spaces are not specific to Western societies, they are seen globally in many ways, but the way the common space is used in the United States is reflective of their cultural values.



Figure 5.7: Comparing average single family house plans in the

Typically, every room has a function and a purpose. Unlike ba and ma in Japan, space in Western design is intended for a specific use that allows users to function in the space efficiently. The use of space in Western design is concise and has reason. There are definitive intentions to design methods that produce the most effective use of space for the user.



e United States, Japan, and Scandinavia.

The Act of Simplifying

Simplicity can be seen as an effortless composition of orderliness. In simple spatial design, the use of intention is deliberate and produces efficient spaces. Often seen modern architectural in trends, sectional and plan drawings get saturated with furniture, people, and hatches which allude to an active scene. Filling drawings with objects help viewers depict a liveliness and inhabitation that leaves nothing to the imagination unquestioned. exactly what This shows activities will take place in what space and how the space will be used. Activating drawings has its purpose within complex design, but to simplify spaces there must be a level of vagueness to allow interpretation of the space to

be determined by the user.

Japanese architect, Kazuhiro Kojima classified spaces as "black" and "white" to explain the concept of spaces that are given to program (black) and spaces where a variety of activities can happen (white). In white spaces, the user is in control of the function. Kojima's intention was to create a method of design that allowed for certain programmed activities to happen, while having room for flexibility to change overtime or to be multi-functional. In the use of a dwelling, black spaces would be a kitchen and bathroom, while white space would be everything else in regard to sleeping, living, and play. To allow the white spaces to

remain ambiguous, moveable partitions would separate the rooms and ensure that multiple activities can occur in the same space.

To make a space multifunctional and multi-purpose, the flexibility of openness necessary. Flexibility of is a space will allow program to change over time with different occupants and different needs because the space is undefined. It can be interpreted in any way. Implying a single function dictates how the space ought to be used, limiting the use of the space to the user and eliminating а total sense of comfort or control. By simplifying the space to no determined use, it can become a space of anything to happen and a space for ultimate flexibility. Simplicity is clarity and clarity is the purpose and function of necessary design and use for space. If something is simple, it can inspire. The capacity of the imagination is increased.



Figure 5.8: The Japanese ensō circle symbolizes absolute enlightenment, strength, elegance, the universe and mu (the void).

6

What Do You Value?

Preamble

Studying these three areas of the globe - Japan, Scandinavia, and the United States - has established the position for the final product of this thesis design. These locations are used throughout this research to compare, contrast, and draw inspiration from. Varying in physical size, population, economic status, and the average height of an individual, inquisitions arise when thinking about these places architecturally. What sociological and psychological elements have influenced the way architecture is designed in each place? Why do these places differ so significantly in some aspects of design, yet in others they seem to marry and render themselves indistinguishable to a particular place?

What can start to be understood from these questions is that most quantifiable human properties and characteristics are dependent on location. The same can be applied to the average of space and design, with dwelling sizes varying greatly by location due to evolutionary, biological, and environmental factors like discussed in Chapter 4. Considering these spaces and analyzing why they are the size they are will initiate a thoughtful comprehension for each location's overall values.

Internal Values

Internal values derive from one's internal identity. Your internal identity is how you see your ideal self and who you want to be. This is a part of the process of becoming an individual and changing due to past experiences. As a direct influence from one's identity comes one's values. Internal values will be based upon internal identity, ideal or not, to the individual. If a person is secure and confident with their internal identity, their internal values might be composed of traits such as honesty, integrity, compassion, discipline, etc. If a person is insecure and selfconscious of who they are, this will reflect into values such as jealousy, discouragement, anger, humiliation, etc. There is, of course, a spectrum to be

understood with much deeper psychological significance attached, but for the sake of this thesis, it can be understood as positive and negative identity and values.

External Values

Similar to the understanding of internal identity and values, external values can derive by the same method of identity. A person's external identity is how others interpret who you are and what your public image is as a consequence of what you do, what you say, and how you look. One's external identity is a direct influence from others talking, judging, and treating an individual based on the external factors that they perceive as an observer

External values get based around external identity and the need to please others first. When focused on the external value system, there is always a need for more. Once one goal is achieved or an item is acquired, the next goal must be bigger, and the next item must be newer. This becomes progressive convention а leading into ultimate unsatisfaction in life and with goods sought to be acquired. External values are often directed by these artificial stimuli that in turn suppress inner, well-established our traits and attributes. This has a substantial impact on our values.

Cultural Values

Cultural Values are neither good nor bad, but they describe basic tendencies in the way that people prefer to work and live. Cultural Values are personal preferences that remain relatively stable over time. They can differ among individuals with similar cultural backgrounds and also between two individuals from different cultural backgrounds. By understanding one's own identity and values, there are developmental insights that can help understand other's actions and improve interpersonal effectiveness. Understanding your own preferences and learning about the typical preferences others can of help you anticipate possible similarities and differences in ways people approach life and work.

Cultural values begin to define the spaces we inhabit based on the way we view and enjoy the world. Countries that enjoy material goods consumption typically and have larger homes to account for what needs to be stored, whereas countries who place value on intrinsic factors don't rely on material satisfaction and spaces to show for this.

Japan

Japanese values are deeply embedded in all areas of life and impact family, work, and social interactions. Family bonds are strong in Japan and unite not only the living extended family but also generations of ancestors. Due to the large emphasis on family and the physical lack of space that the country has,

spatial design is precious and maximized, often suitable for multiple generations to inhabit together.

In most social situations in Japanese culture, identity and status are largely determined by one's age, gender, sibling rank, and year of entry to the group. Having clear social roles provides a sense of security and comfort, but it can also feel binding. For those coming from a Western culture with a strong sense of independence, work situations where interactions are based on age or seniority, rather than talent or ability, may feel confining and frustrating. Greater awareness of cultural differences and values is helpful in understanding such situations.

Japan's main cultural values can be identified as harmony and honour, collectivism, hierarchy, impermanence, and family.

Scandinavia

Efficiency and responsibility are eminent in all parts of Scandinavian culture, from efficiency in design and consumption to social and political responsibility. As a collective group of countries that seek lagom, from work life, family, interior spaces, thought food, for the environment, and more, lagom is Scandinavian balance. Many of the core cultural values of these countries are centered around the particular idea of not too little, not too much, but just right. It denotes the best, not perfect, solutions in any given context to create this balance.

With lagom in mind, core cultural values of Scandinavia can be identified as preserving the environment and natural resources to work for sustainable growth and development. Implementing new ways thinking, of through creativity and innovation. Using everyone's talents to tackle problems and come up with new tools to improve life. Lastly, compassion and equality with the understanding that all individuals are the same and have the same value regardless of gender, age, religion, political beliefs, or any other personal trait.

United States

Uncovering American cultural values begins with its first inhabitants. The diversity of this country is a fact of life and all citizens have come to agree upon this diversity to build cultural strengths. There is a widespread recognition of the value of cultural pluralism, with diversity as the base that built such an identifiable national identity.

Historically, the United States has been viewed as a land of opportunity, attracting immigrants from all over the world. The opportunities they sought out and the experiences they encountered developed unique values. As a part of America's cultural values, what attracts most immigrants to this country is the chance for individual freedom, equality of opportunity, and material wealth. In order to achieve these benefits, one must be self-reliant, competitive, and hard working. Ultimately, these factors combined into system of values create а freedom individual and self-reliance, equality of opportunity and competition, and material wealth and hard work. These three pairs of

values have determined the unique culture of the United States and its people.

7

Let's Get Physical...and Personal
The Impact of Yoga

What is Yoga?

Yoga is a group of physical, mental, and spiritual practices or disciplines that originated in ancient India. The word itself essentially means "that which brings you to reality" and can be understood as a union that brings an individual into the ultimate reality. Yoga refers to union not as an idea, but a philosophy and an experience which focuses on bringing harmony between mind and body. For many, the practice of yoga is tethered to Hatha Yoga (a branch of physical yoga) and Asanas (postures) with physical exercise as a practice, but it can also be understood that yoga is about harmonizing oneself with the universe. It is something that is done and practiced

physically, mentally, and spiritually. Yoga is a process, and it is active. It is the way the world is engaged with an individual to create harmony within the body, soul, and mind.

The Purpose of the Mat

The practice of physical yoga has not always been done on a mat like is common today. The ground sufficed in ancient practices because they were not as physically demanding as they are today. As yoga developed, mats became necessary for support typically being made from animal skins, rugs, or cloths.

The modern-day mat has standard dimensions of 173cm (68") long and 61cm (24") wide. There is no definitive reason as to why this is the standard other than using ergonomics and averages to create a typical mat. Of course, there are mats in all sizes, but the standard dimensions are what is most commonly used in practice today.

How Can Yoga Define Space?

The size of a yoga mat may seem arbitrary at first. Its larger purpose is to provide support as the body moves through practice. As postures are made and transitions flow, the body may reach positions that put it into its fullest extension. An average sized Western woman will be able to extend her body to its absolute measure, while still remaining completely on the mat. The mat begins to define the space in which the body moves on and off it, as well as the physical space around it.

Referring back to anthropometrics, the yoga mat can harmonize with the fundamental methods of efficient movements of the body. If the body can reach its fullest extension while confining to specific dimensions, then yoga can define the aspects of space and narrow it down to what is necessary.

How Can Yoga Design Space?

The body during practice needs nothing more than where it is bound when it is on the mat. This can be referred to as the "necessary space". The necessary space in terms of anthropometrics means that every movement that the human body can physical do does not need to extend past the necessary space. There are instances in which the body could extend past the necessary space, either by centimetres, or possibly larger. This will not be considered in the design of space using the necessary space because these movements of the body would be extreme.

The body in a dwelling will extending likely be not beyond the necessary space, but considering it could, standardization the of necessary space will become slightly larger. Consider the dimensions of the necessary space to fit the Western average. This demographic is chosen as it is in between the the average heights of all

countries studied in this thesis. To acknowledge the height of the average Western male, the necessary space can be recognized in physical dimensions on a basis of 180cm (71") long and 66cm (26") wide.

As the body moves and utilizes a space, it may need to extend beyond the basis stated above. To adapt to these natural movements of the body, the necessary space will re-establish into new dimensions of 180cm (71") long and 180cm (71") wide, creating a square for the body to perfectly move in with necessity. The necessary space regenerated can now be a foundation to the design of space through function and fundamental flow.



Figure 7.1: A self-study of Yoga.

A Pragmatic Practice

Using Tatami to Design

The Japanese word tatami traces its origins back to the verb "tatamu," which means to fold. Traditionally woven from rice straw, tatami mats were 3-foot by 6-foot pads that Japanese men and women sat or slept on to make resting on the floor more comfortable. Mats were often folded or stacked when not in use. Dating as far back as the 8th century, tatami mats began as a symbol of social status, but throughout time have migrated into the homes of almost every class.

Due to the extensive use of tatami mats as flooring throughout Japanese history, the mat came to be the standard unit for measuring room size. Rather than meters or feet, "*jo*" is used to calculate room size by referring to how many tatami mats will fit in a room. This measurement system is commonly used by designers, including for rooms that are not intended to have tatami flooring. If a room is 4.5 *jo*, it is large enough to fit 4.5 tatami mats. Both fullsize and half-size mats are common, in order to perfectly fit a room.

The open feel of a tatami room is meant to provide relaxation and peace of mind. In traditional Japanese culture, a tatami room often served to entertain visitors, conduct tea ceremonies or house a religious altar. Today, tatami rooms are often used as living rooms or sleeping quarters. Some are also used as yoga studios or meditative spaces, due to their airiness and minimalist furnishings.

Considering the tatami mat's influence on human comfortability and its ability to delineate space, both the conceptual and practical features contribute to a new method of spatial design.







Figure 8.1: Human figure seated in relation to the tatami mat and yoga mat.

The Necessary Space

With the tatami mat and its purpose of designing and defining space, combined with the efficiency of the yoga mat, the prior implications of 180cm (71") long and 180cm (71") wide space have further evolved into a more standard spatial configuration of 183cm (72") long and 183cm (72") wide (6 foot by 6 foot). As the body moves and utilizes space, it may need to extend beyond the previously set dimensions. To adapt to these natural movements of the body, the necessary space re-established will allow for a more functional and efficient practice by creating a square for the body to perfectly move in. The necessary space regenerated can now be a foundation to the design of space through functional and fundamental flow.



Figure 8.2: The Necessary Space, diagram.



Figure 8.3: The Necessary Space built out 2 meters by 2 meters.

The Necessary Grid

Following the necessary space, the necessary grid allows for spatial design in home settings to remain functional and efficient. While the grid is neat, it does not supress everyday functions; rather it offers a quantity of various living areas. It expresses both rules and irregularities, abstraction and concreteness. Standardizing these dimensions create functional modular layouts that are able to transform with the needs of the inhabitant.





Figure 8.4: Spatial configurations of figures in the Necessary Grid / 80 square meters planned out.

24'-0"





Figure 8.5: Configuration diagrams of the Necessary Grid.

Applying Practice

From the newly established necessary grid, multiple spatial configurations were explored that could ultimately turn into dwelling units. As the main goal of this design remains to be functional and efficient, a flexible layout is mandatory to achieve these standards. A flexible house will produce a dwelling layout that can adapt changing requirements to and patterns, and both social and technical issues. These changing demands could technological, practical be personal and these or changing patterns might be demographic, environmental economic ones. Thus, or flexible housing undertakes all required to remain functional and efficient in the housing development process.

Flexibility in domestic architecture will allow inhabitants to take part in the design process of the different possibilities of using their living space. Therefore, inhabitants have the opportunity to carry out their own adaptations to their home spaces.

Figure 8.6 on next page.



CONFIGURATION 2

CONFIGURATION I



CONFIGURATION 5

CONFIGURATION $\mathbf{6}$

Figure 8.6: Detailed configurations of floor plans derived from the Necessary Grid.





CONFIGURATION 3

CONFIGURATION 4





CONFIGURATION 8

CONFIGURATION **7**

9

The Units

Design Process

Creating a flexible dwelling that could function in multiple ways throughout the day, just reminiscent of a traditional Japanese home, is one of the goals for this design. Adapting changing requirements to allows for users to participate and recreate the design as they please through the multitude of arrangements the dwelling spaces have to offer. Through multiple iterations and endless opportunity for the necessary grid to form dwellings, there must be a point at which one becomes more functional and efficient over the other for all types of people to inhabit.

Thoughtful Considerations

Flexible features are added to the spaces, like moveable partitions and multifunctioning wall units in order

to make the most of each The kitchen and space. bathroom in each design are fixed areas of the home that will remain stable for structural. mechanical, electrical, and plumbing eases. In leu of all previous research, the spaces will be open and multi-functional to create relationships with areas both seen and unseen during particular hours of the day. A strong connection to inside and outside stays consistent with ample amounts of natural lighting and opportunity for transitional spaces. Remaining exclusive, 3 varying sized unit types have been designed that will be suitable and adaptable for a variety of different users.



7 AM: WAKING UP



I PM: LUNCH TIME

Figure 9.1: Diagram of potential spatial use throughout the day.



10:30 AM: WORK FROM HOME



8 PM: DINNER PARTY

The Forty-Five

The Forty-Five is a $45m^2$ unit with 1 bed, 1 bath, and 1-flex zone. Intended to be stacked or left as is, this is the smallest of the options, yet allows inhabitants for much flexibility throughout the day.







Figure 9.3: Ground floor plan (top) and second floor plan (bottom).



Figure 9.4: (Top to bottom) Ground floor West facing section, ground floor North facing section, second floor North facing section, second floor West facing section.









Figure 9.5: (Top to bottom) South elevation, North elevation, West elevation, East elevation.

The Sixty

The Sixty is a $60m^2$ unit with 2 beds, 1 bath, and 1-flex zone. With an option to stack this space or to be left on its own, this unit allows for more occupants to live comfortably.





Figure 9.7: Ground floor plan (top) and second floor plan (bottom).



Figure 9.8: (Top to bottom) Second floor West facing section, second floor North facing section, ground floor North facing section, ground floor West facing section.









Figure 9.9: (Top to bottom) West elevation, East elevation, South elevation.





The Ninety

The Ninety is a $90m^2$ detached unit with 2 beds, 1 bath, a flex-zone and the addition of an attached garage. Intended for a larger family, this unit is designed to be detached, allowing for a more covert dwelling.





Figure 9.9.2: Ground floor plan.





Figure 9.9.3: North section (top), West section (bottom).



Figure 9.9.4: North elevation (top), South elevation (bottom).

10

It's All in the Details

Built-Ins

Offering moveable options in design allows for freedom of exploration and movement within a space. As a part of the overall functionality and efficiency of these dwelling designs, built-in units are an initial part of the design and construction. The alternative to opt out of the built-ins before construction is viable, but they are recommended ample storage for and functionality of the space. The built-ins consist of dresser storage, auxiliary storage and shelving, cabinet shelving, workstations, wall-beds, and more.



Partitions

Partitions main are а component of the dwelling design. In order to serve as a multi-functioning and multipurpose unit, partitions are installed in the open flexspaces of the design. Using partition walls creates and delineates spaces, whether it is to close off an area, or to open up an area. Common uses for the partition walls distinguish public to are versus private spaces in the home. If there are moments when inhabitants need to be in a small, quiet setting, the partition allows them to close off their space. When an inhabitant wants to create a large gathering space, one or more of the partitions can be slide open to allow as much space as needed.



Figure 10.2: Partition wall made of plywood and glass.

Construction

The construction of these dwellings will remain functional and efficient to keep harmonious with the design goals. The simple geometry of the necessary grid allows easy construction and transportation of materials. With feasibility and longevity in mind, a timber frame system is used as part of the construction, providing a typical maximum structural life span of over 100 years. One of timber's most valuable characteristics is its well-known high resistance to decay. A breather membrane and ventilation between the core and the outer skin of the wall is added to prevent further decay.

Scandinavian high performance pine windows, which are laminated to provide additional strength, are used. They have been designed for extremely low Scandinavian temperatures with a high resistance to heat loss.

floor units will Top constructed with be Scandinavian-inspired highpitched roofs. This feature allows for better thermal insulation, the possible addition of PV Panels, an option for rainwater collection, and the additional use of space that is intended for extra storage in these designs. The skylights throughout create a bright and airy interior.



Figure 10.3: Exploded axonometric diagram of the Forty Five.





An Inside Look

It is of human nature to want your living space to feel comfortable, even safe. Our interior environment matters just as much as our exterior, making it important to manifest this space to harmonize with your values. these dwellings, walls, In ceiling, fitted furniture, and workstations all appear in natural harmony. Fully integrated sleep & work areas allow for maximization of the multi-purpose nature of the space.


Figure 10.6: Section perspective of The Forty Five.

Practice Anyhwere

Modularity

Modular homes are designed from standard dimensions and come in repeated sections—modules—that get transported to the home site for final assembly. The modules can be placed in numerous configurations, allowing for a variety of floor plans and custom options. Due to this versatility, the design and construction of these units can happen anywhere. It also allows for greater control of the construction process, being sheltered from bad weather and other possible deterioration. This makes the construction more safe and more convenient, as well as more precise and easier to inspect and control.



Figure 11.1: U-Build Modular Diagram.



Figure 11.2: dio inno architects / PAMO.

Samadhi

Samadhi is the highest state of consciousness one can achieve through meditation. It consists of a yoga practitioner reaching spiritual enlightenment where the self, the mind, and the object of meditation merge together into one. When a design begins in the mind, comes to the physical reality through sketching, and manifests ultimately itself into a completed project with values that align, samadhi, in an architectural sense, is achieved. It is the fulfillment, and the bliss that comes with completion and unity. As these dwelling designs continue develop, architectural to samadhi, through values, philosophies, ethics, and consistency in design goals, will emerge into reality.



Figure 11.3: Ideogram for samadhi, from the Zen-inspired brush of the author's calligraphy teacher, Terayama Katsujo.

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