M S c 0 4

A CARING SPACE

D E S I G N F O R D E M E N T I A

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"*Architecture articulates the experiences of being-in-the-world and strengthens our sense of reality and self; it does not make us inhabit worlds of mere fabrication and fantasy.*"[1]

- Juhani Pallasmaa

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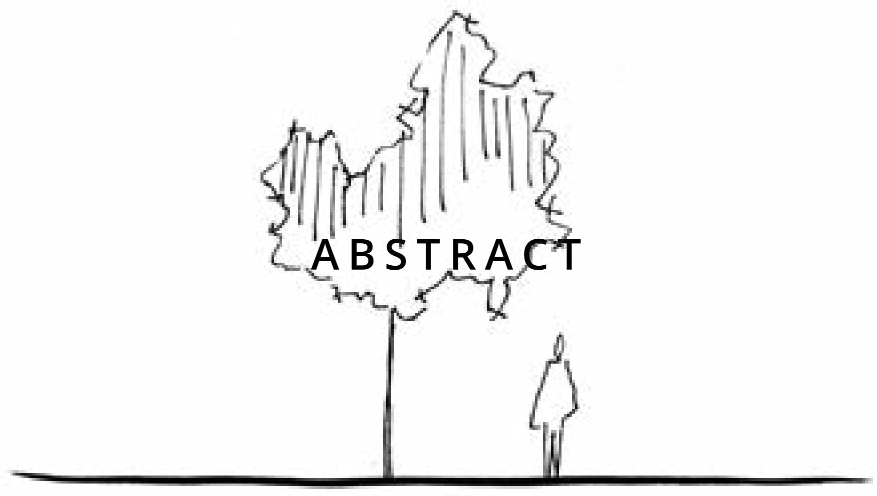

ENGLISH

The master's thesis, *A Caring Space*, investigates the interrelation between the built and the natural environment within the thematic context of dementia and patient care. Through a tectonic approach within an interdisciplinary methodology, the fundamental dialogue between architecture and dementia is linked to the site-specific context of Hammer Bakker, mediated through the presence, characteristics, and qualities of nature as the common denominator.

Ultimately, an architectural concept is conveyed on the basis of the meeting between building and nature; adherently exploiting and integrating the gestures of nature with the architecture to facilitate a preemptive care facility for elderly people with cognitive impairments. This conditions the purpose of the juxtaposed physical environment as a tectonic work of architecture.

DANSK

Kandidat projektet, *A Caring Space*, undersøger forbindelsen mellem det byggede og det naturlige miljø indenfor den tematiske kontekst, demens og beboerpleje. Gennem en tektonisk tilgang indenfor et interdisciplinært felt, etableres et link mellem arkitektur og demens til den site-specifikke kontekst af Hammer Bakker via tilstedeværelsen, karakteristikken og kvaliteten af naturen som fællesnævner.

Et arkitektonisk koncept formidles på basis af mødet mellem bygning og natur; ved fordelagtigt at udnytte og integrere naturens gestusser i arkitekturen for at facilitere en forbyggende plejeinstitution til kognitivt hæmmede ældre. Herved betinges gøremålet af det samlede, kontrastfulde fysiske miljø som et arkitektektonisk værk.

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FORMAT AND FORMALITIES

The booklet is comprised of an A3 landscape spread format to accede to the presentation of architectural drawings in a sizable scale. Its composition is divided into ten chapters with an array of content-specific topics. Within each topic, the core textual content is organised by subtopics to support legibility.

On the initial page for each chapter, a descriptive overview is provided to strategically guide the reader. On the final page of each chapter, a listing of references respectively acknowledges the authors of literature applied throughout the project. For the chapteral endnotes, *the Modern Humanities Research Association* styled citation, commonly referred to as the *MHRA* style, is adopted.

A CARING SPACE

PROLOGUE

DESIGN FOR DEMENTIA

The *prologue* introduces a series of fundamental thoughts and thematics related to the procurement of a care facility for elderly people with dementia. The chapter is formed on the basis of motivations, focuses and problems which encircle the project scope and its methodological approach.

Subsequently, a dialogue between architecture and dementia outlines the needs and causes that the project seeks to serve. An understanding of the symptoms and conditions of the disease is established, ultimately, to find common denominators within the dialogue. Cross-referencing, investigations of a particular state-of-the-art building design within the field of dementia are made in order to compare the current state of care facility practices to the dialogue-based research theory.

- MOTIVATIONS
- METHODOLOGY
- ARCHITECTURE AND DEMENTIA
- THE STATE-OF-THE-ART

M O T I V A T I O N

OUR POSITION IN THE DISCOURSE

The role of the contemporary architect is increasingly ambiguous. Challenged by various emerging societal, environmental and economic agencies and exigencies, the correspondence between means and ends in architectural practise tends to blur. Additionally, the trajectory within the field is dominated by numerous specialist discourses - e.g. industry and technology - that in turn focus on more isolated topics. In response, the architectural discourse has become both diverse and fragmented.[2] Although no discernible or dominant architectural discourse appears to exist, it is our comprehension that modern architecture, specifically within the western context, is engaged with an idiom of utilitarian one-dimensionality enforced by exigency; arguably due to its current state and practise. This positions the tacit work and responsibilities of the architect, improving the built environment as physical instances of everyday life, on the brink.

In contemporary practises, it is our observation that the primary purposes and latent qualities of architectural spatiality, tend to become neglected. Our prudent position, as interdisciplinarians on the threshold between architecture and engineering, grants us the vision to reevaluate the role of the built environment - and, in the service hereof, the ambition to reposition the disciplinary relationship between architect and engineer.

TECTONIC SEMANTICS

The etymological notion of tectonics is adopted from its archaic form into a contemporary revisionment. Within our modern context, Kenneth Frampton alludes it to "*the poetics of construction*"[3] which, arguably, exceeds architecture itself and relates to the physicality of design in general. Adherently, Frampton's allusion entails the interdisciplinary practises of both the architect and the engineer; hence the prudency of our position.

Frampton's notion builds on those of Eduard Franz Sekler, who argues structure to be the underlying, physically manifested principle of architectural construction. The distinction between structure and construction is substantiated by Sekler's observation of post-and-lintel reinvention through time; tectonically defined by the ideological confinement of a given period (technologically) or architect (individually).[4] The latter notion resembles the elder tectonic conception of Gottfried Semper, who denotes it as an interior theory[5]; a direction *"[...] for the architect to engage in a continuous critical individual positioning within the field of architecture,"* as resoundingly interpreted by Marie Frier Hvejsel.[6]

Semper's notion sheds light on the importance of engagement in discourse. Thus, to us, this strongly ties to the neglectance of experienced quality in architecture today - and the fundamental belief that we carry a responsibility to improve and give reason to the quality of the built environment through articulate, propitious and enriching means. Our interior semantics of tectonics is rooted in this responsibility of quality; to engage the human body; to caress the human scale; to fundamentally nurture indulgence in existence.

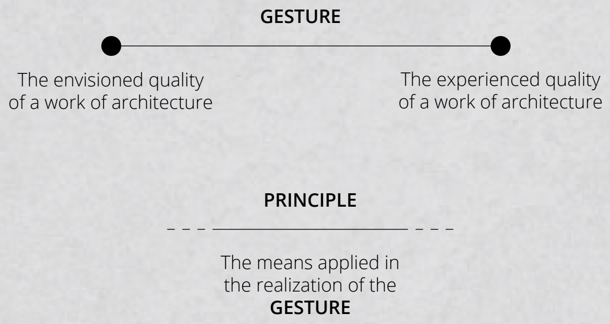
ARCHITECTURE AND DEMENTIA

Cognition is a prerequisite of existentialism, *"[...] the unique position an individual has as a self-determining agent responsible for the authenticity of his or her choices."*[7] When cognition is at jeopardy, however, so is the individual. As an imperative of our problem-orientation, Europe is facing rapidly aging societies due to an upsurge in the population's median age caused by increasing life expectancy and declining fertility rates. Thus, the need for care and dealing with illnesses of the elderly is evermore evident. To help alleviate these needs through architectural means and ends, we seek to address the stimuli potentials of the physical environment to support a dignified quality of life among institutionalized elderly people with cognitive deficits - in this instance - caused by dementia. The thesis seeks to investigate the multitudes of architecture, its sensory perception, and the affect it has on the human body. Juhani Pallasmaa asserts, *"[...] our capacity of memory would be impossible without a body memory. The world is reflected in the body, and the body is projected onto the world. We remember through our bodies as much as through our nervous system and brain."*[8] By that analogy, the medium of architecture becomes a universal language that holds the potential to communicate and resonate with people despite cognitive deficits; linking the physical and mental realms.

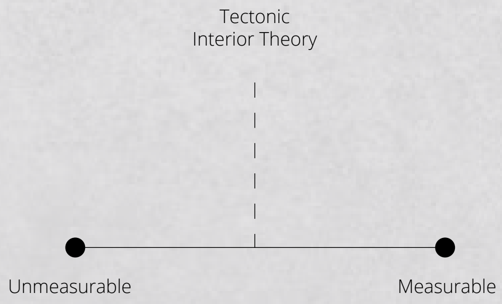
THE PROBLEM-ORIENTATION

Based on our immanent scepticism towards the state of contemporary architecture, the master's thesis should be considered as our contribution to the discourse at large - as well as a testament to the final chapter of our vocational foundation; and finally as the initial chapter of our professional lives. We believe in the propitious link between the built environment and the human scale; a link of latent potentials, especially, in the mitigation of dementia. Thus, as the raison d'être of this thesis, we raise the initializing question: *How can a built environment facilitate the potential means and ends of tectonic spatiality and its quality, to preemtively enrichen both the physical and mental conditions for the elderly, exposed to dementia, while actively supporting the autonomy for them as individuals?*

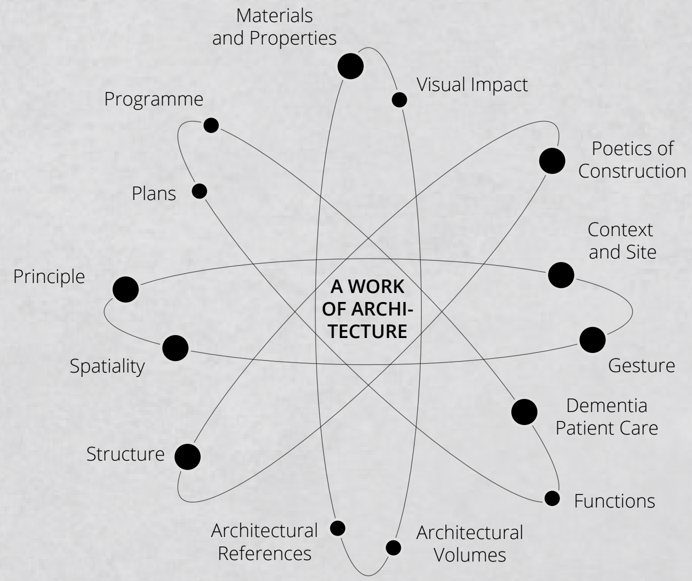
The perplex nature of the problem-orientation forms a sequence of methodological challenges to regard, in order to solve the issues at hand. Such comprehensiveness calls for a critical positioning of a strategic approach to arrive at the steps of a caring space.



▲ *Ill. 001: Visual transcription of the mutual dependency established through the notions of Gesture & Principle.*[13]



▲ *Ill. 002: Measurable and unmeasurable means facilitated through interior theory; Semper's notion on the architect's conscious and critical positioning within the field.*



▲ *Ill. 003: Parameters of the Integrated Design Process*[14] *altered to accommodate the nature of the thesis project.*

M E T H O D O L O G Y

THE BALANCE OF THEORY AND PRACTISE

All creative endeavours deal with a dilemma of transduction; the conversion from one form into another. In thematic relation, Anne Beim refers to this dilemma as "[...] *a dialogue between visionary intention and the pragmatism of reality [that] provides the basis for making architecture.*"[9] Contemporarily, the accord between vision and reality appears questionable. However, depicting the creative as an individual, Louis I. Kahn asserts, "*Man is always greater than his works because he can never fully express his aspirations. For to express oneself in music or architecture is by the measurable means of composition or design. The first line on paper is already a measure of what cannot be expressed fully. The first line on paper is less.*"[10] By association, these notions address a fundamental incapability in architectural design to transduce theory into practise - as thought into medium - in a 1:1 scale. As a means of balancing the two, a link between tectonic theory and architectural practise is established through an approach of Gestures & Principles strategically applied to a methodological process of integrated design.

GESTURES & PRINCIPLES WITHIN INTEGRATED DESIGN

The critical notions of Mary-Ann Knudstrup and Marie Frier Hvejsel form the methodological nucleus of the thesis project. Superimposed, they outline integration and facilitate tectonics as a method of design. As the first of the two fundamentals, Knudstrup delineates the Integrated Design Process on the basis of five phases - defined as 'problem', 'analysis', 'sketching', 'synthesis' and 'presentation' - that inform each other non-linearly. The latter notion reflects the iterative nature and fundamental principle of the process; enabling back-and-forth loops in order to progressively and transparently test and refine the design; inspiring synergistic interplays between the multidisciplinary parameters of the design (see atom diagram) hence the integrated nature.[11] It is our critique, however, that the Integrated Design Process merely constitutes a series of steps, rather than concise actions.

To that end, Hvejsel's contribution of Gestures & Principles delineates an approach of tectonic design, in her own words, "*[...] by establishing a mutual critical dependency of the two notions of 'gesture' (which delineates the envisioned and experienced quality of a work of architecture) and 'principle' (which delineates the means applied in its realization) across the different scales, areas, and work phases of the architecture.*"[12] The disciplines of architecture and engineering are, hereby, represented in their commodity of quality. By those means, tectonics becomes an articulate discussion of quality in works of architecture; on a poetic level (in regards to the construction as a whole) as Frampton might add. It is our notion that balancing the envisioned and the experienced qualities of any given gesture and principle is a very delicate matter. It is our conception, however, that a denoted semperian view on the means of realization, is key in order to both comprehend and evaluate quality.

METHOD OF EVALUATION

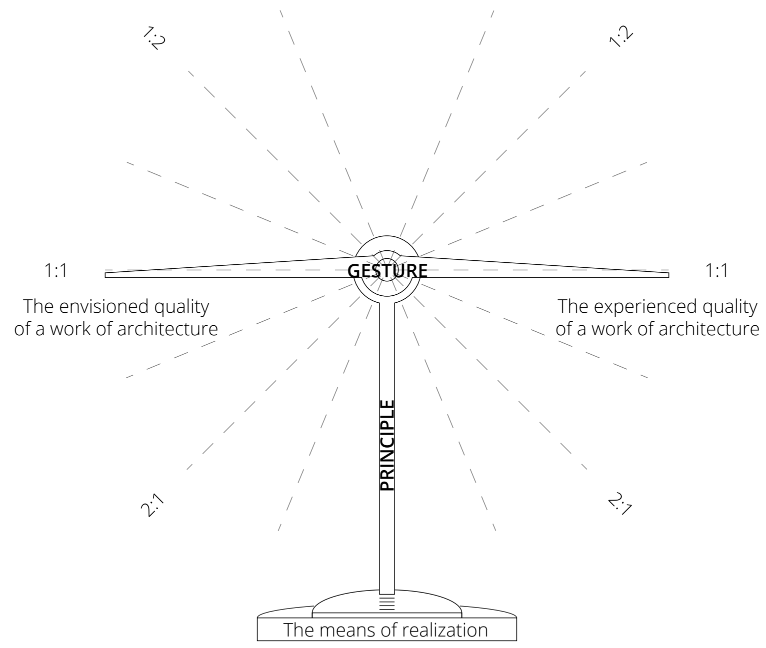
Inspired by Semper's notion of interior theory, what we are exposed to both actively and inactively throughout a project, informs our position and basis of the means applied in its realization. Hereby, considering our exposures as interchangeable means, we qualify our ends. As the input, these exposures become of great importance as they 'make' or 'break' the link between theory and practise; 'breaking' the link in an impeding iterative sense (e.g. if agencies are neglected) that jeopardizes the envisioned quality in experienced form; 'making' the link in an integrating qualitative sense (e.g. if agencies are facilitated) that substantiates, or even enhances, the envisioned quality in experienced form. In the analogy of a double-pan balance scale, weighing the envisioned and the experienced quality against each other is rendered possible, in part, by the 'lintel' gesture and 'post' principle through their mutual critical dependency. The basis on which this dependency stands - referring back - is the means of realization, interior theory, exposures, etc.

This evaluation of quality or gesture suggests an inclusive grasp and understanding of the nature of the specific design, its challenges and its potentials. Fundamentally, a mutualism between Gestures & Principles and the Integrated Design Process bridges the gap. To this end, for the architect-engineer to mediate quality, integration and - hereby - responsible trandsuction from theory to practise, they are considered as inseparable.

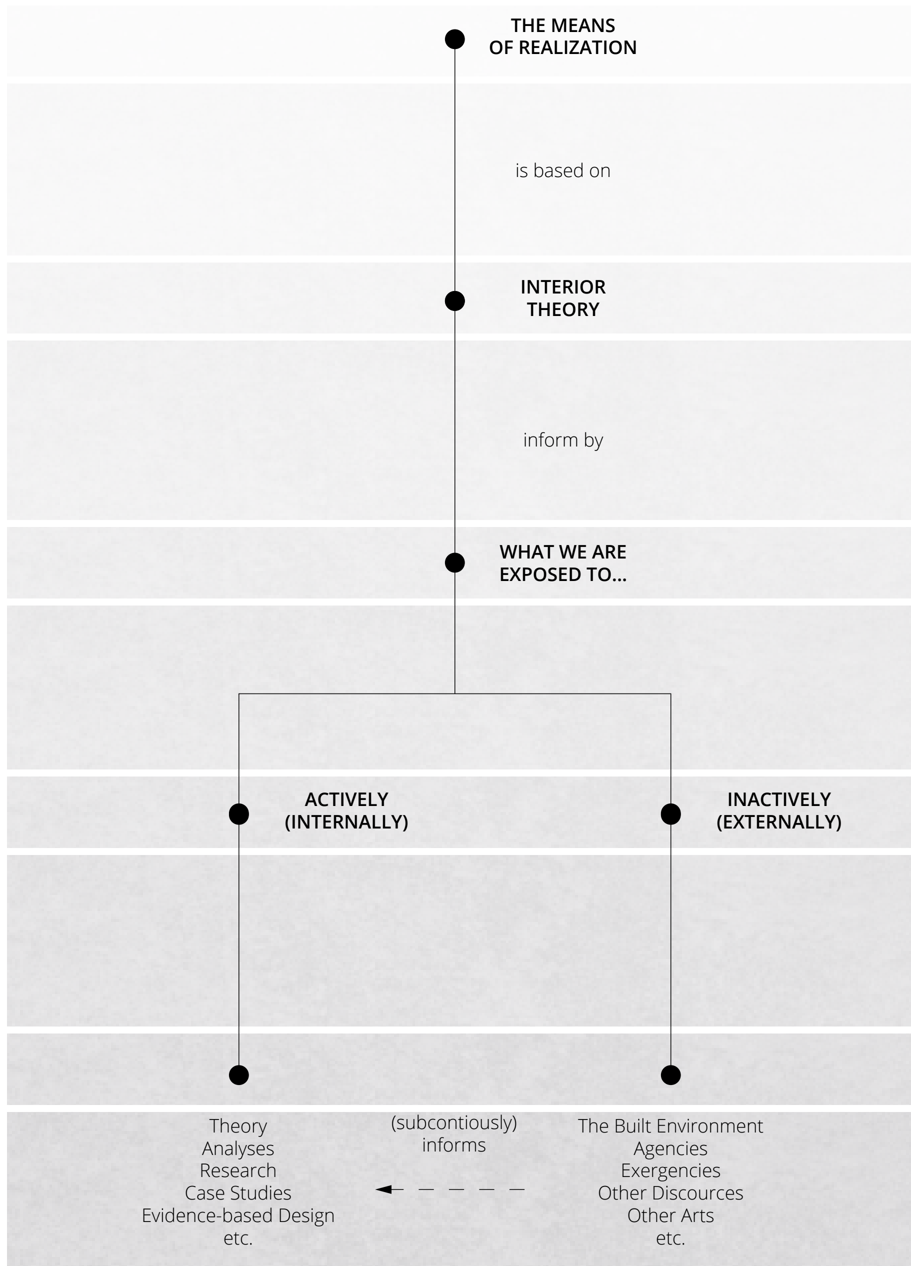
PERSPECTIVE

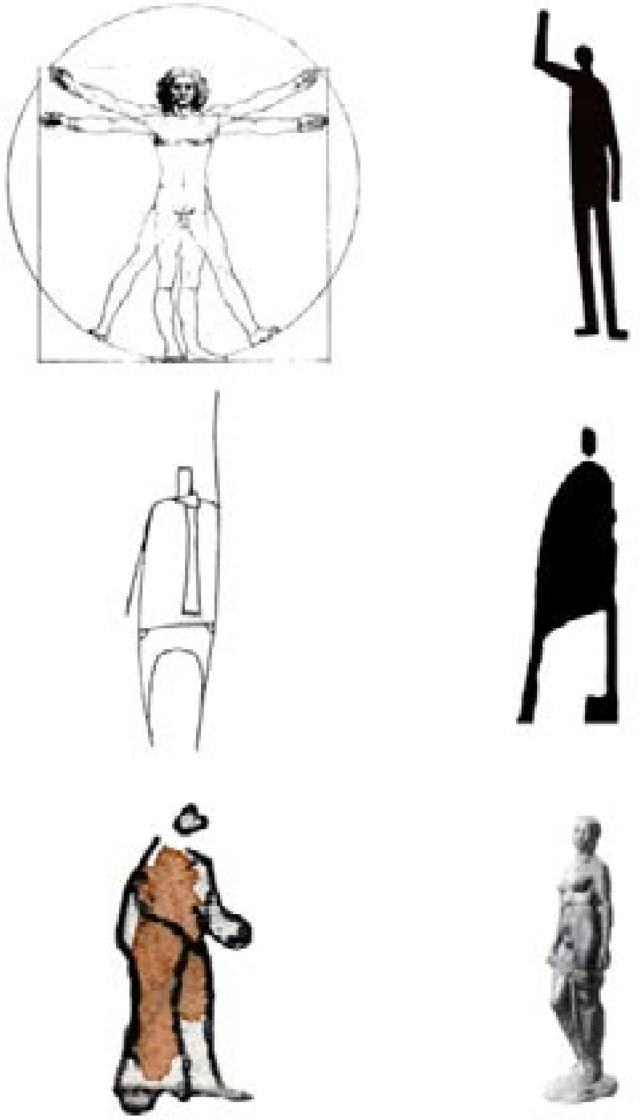
It is difficult to adequately compare a theoretically and practically realized work of architecture. This is due to the - often - incomprehensible nature of the exposures at hand, hence all architectural projects are 'new' in principle. In a practised context however, the dynamic correspondence between agencies and exigencies - e.g. societal, environmental and economic - might strongly inform the active exposures and hereby affect the means of realization through interior theory. This is not possible to dynamically simulate or mimic in an educational environment. As a disclaimer, the methodology seeks to simply accommodate the theoretical nature of the thesis project. Nevertheless, clear parallels between this theory and that of practise can be made.

Ill. 004: Gesture & Principle[15] *as an evaluative tool of a work of architecture as the 'lintel' balance between its envisioned quality and its experienced quality mediated through its 'post' principle. Without either the principle or the gesture, however, no mutual dependency can become neither construed nor constructed.*



Ill. 005: A node system denoting the basis of the means of realization as interior theory; what we are exposed to actively or inactively in the process of design. This should be seen in parallel to the parameters (electrons) of the Integrated Design Process and their dependency on interior theory.





▲ *Ill. 006: Depictions of the human body interpreted by Leonardo da Vinci, Sanaa, C.F. Møller, Glenn Murcutt, Steven Holl and Mies van der Rohe. The illustration reflects the ambiguous nature that relates to the human being as well as its centralized position in architecture.*

ARCHITECTURE AND DEMENTIA

A DIALOGUE OF PURPOSE

What is the fundamental purpose of architecture? That is a simple yet complicated question to which Martha Throne argues, "*The first purpose of architecture is to create habitat and to fulfil the needs of society or individuals for places to work and live.*"[16] By addressing the need *or* cause that architecture serves, Throne ultimately positions the individual human being at the center; as an entity surrounded by preconditions for being. In parallel, the cause of a care facility is to substantiate the conditions for individuals in need of care. To rightfully serve that cause, however, understanding the needs and conditions of these individuals is pivotal. To that end, insights into dementia as a disease - from the perspective of the individual as well as society - are made to establish a purpose-driven dialogue.

PERSPECTIVES AND STATISTICS

Dementia is clinically defined as a chronic or persistent syndrome of cognitive disorder, severe enough to interfere with social or occupational functioning beyond the expected decline in normal aging. As an irreversible, terminal neurodegenerating disease, the root causes are associated with negative affects on the human brain e.g. due to insufficient sleep cycles, physical injuries or other diseases.[17] Hence, dementia is commonly associated with age. An upsurge of dementia is expected to increase significantly as the elderly population is steadily increasing. Its impacts are severe; ranging from physical and mental to social and economic difficulties. Hereby, the disease does not simply affect condemned individuals - but relatives, friends, and society as well.

According to statistics, 50 million people concurrently suffer from dementia worldwide, with an increase of nearly 10 million new cases per year. The total number of affected is predicted to reach 82 million in 2030 and 152 million in 2050.[18] The most common instance of dementia is known as *Alzheimer's disease* (degeneration of the brain's limbic system referred to as the hippocampus) which is responsible for approx. 70 % of all related cases. Other instances of dementia such as *Lewy bodies* (abnormal dispositions of protein development in the brain) accounts for approx. 20 % and *vascular dementia* (deprivation of vital oxygen and nutrients for brain cells enforced by a stroke) represents a further 10 % approx. The remaining cases are categorized as instances of *frontotemporal dementias* (the degeneration of the frontal and temporal lobe of the brain) frequently causing cognitive decline for people under the age of 60. Even though symptoms are similar, the boundaries between these cases are blurred, as each instance is specific to the individual person. However, a congestive mixture of these cases can occur.[19]

ASSOCIATED SYMPTOMS

The following insights denote *Alzheimer's disease* - abbreviated AD. Clinical practice alludes its impairments to be inherent to personality disorder, behavioural change, and spontaneous aggression. The root cause is damaged *or* corrupted brain cells. The communicative abilities between these cells are affected by defects, resulting in perceptual, behavioural and emotional disorder. Medical science suggests, that the brain contains distinct regions responsible for distinct functions. Should a region be critically damaged, the process of executive communication - resulting in an action - cannot occur, as under usual circumstances.[20] The progression of AD is often described to occur in three stages categorized by symptoms. (1) In the early stage, impairments are gradual; ranging from language difficulties and problems with short-term memory to disorientation and signs of depression and aggression. (2) Symptoms intensify in the second stage; showing abnormal behaviour and unprovoked aggression while requiring assistance with getting dressed, personal hygiene and sanitary needs. (3) Within the third stage, patients are left fully dependant on care and are confined to either a bed or wheelchair. Difficulties of eating and recognizing family, friends and familiar objects occurs. Cognitive distinction between past and present becomes unclear and the motile regions of the brain debilitate, causing muscle mass deterioration.[21] Ultimately, AD leads to death, although this might be caused by infection - and not the disease itself.[22]

Currently, there is no treatment available in medical science to cure or reverse impairments of AD. Basic initiatives, however, can help to slow its progression. Commonly, mental and physical health and well-being are promoted through the upkeep of stimulating activities - referred to as *brain training* or *neurobics*.[23] Reinstating the notion of purpose, a correspondence between the conditions of AD patients and of architecture is fundamental. For architecture to emit rather than impede such preemptiveness, activities - or even spaces, constructions or views - of stimulating nature are considerable design parameters. These relate to the fundamental needs and causes served by the architecture.

RESEARCH-BASED DESIGN

People with AD have a significantly limited capacity to adapt to environmental factors. A supportive environment, such as that of a care facility, can therefore aid the individual to perform daily activities.[24] Researches-based design within the field suggests that dementia-friendly architecture can facilitate wayfinding abilities, regulate temporal disorientation, aggression and agitation as well as promote health and well-being of residents.[25]

Research-based theory from recent years appoints a set of guidelines to be considered in order to entail a supportive architectural design: 1) *Basic design considerations*, 2) *environmental attributes*, 3) *ambience* and 4) *environmental information*.[26] These guidelines are engaged with the effects of architectural spaces and technological considerations, as well as the safety, legibility, and autonomy that these support. Additional research on the institution as a habitational facility, suggests that dwellers flourish better - both socially and mentally - in group homes of smaller scale, compared to those of a larger scale; ideally up to six dwellers per group. Additionally, subdividing social and private constellations are proven to be advantageous as it allows dwellers to collectively interact on differing scales. Thus, disruptive situations are less likely to occur and will be easier for staff to control.[27]

To facilitate wayfinding, research appoints the notion of reduced decision-making throughout a building layout as being fundamental in order to ensure clear legibility of transit areas and avoiding loops and long corridors. Wayfinding is further enhanced through means of visual access, recognizable interventions, and anchor or reference points. As opposed, ferocious patterns are likely to provoke and confuse people with impairments, while darkness and dark colours act as mental barriers. In parallel, daylight is emphasized due to its revitalizing qualities; positively impacting the ambience of spaces as well as the mood and senses of the individual person.[28]

Although the field of sensory stimuli in relation to AD is less researched, a latent potential is found in nature, as it bears a therapeutic capacity to stimulate the full spectrum of senses; the visual, the tactile, the auditory, the olfactory, and the somatosensory. This latency, however, is strongly dependent on the context of the surrounding environment.[29] On a less scientific note, addressing the potential as the transactions between body, imagination, and environment, Kent C. Bloomer and Charles W. Moore argue, "*To at least some extent every place can be remembered, partly because it is unique, but partly because it has affected our bodies and generated enough associations to hold it in our personal worlds.*"[30] It is hypothesized that nature is universally held in the personal worlds of most - if not all - individuals. Commemorating memories through means of nature ties a parallel layer of *neurobic* stimuli different to those of the senses.

A NOTION OF NUANCE

At this point, the dialogue between architecture and dementia is engaged with the notions of 1) *memory* and 2) *wayfinding*; notions that form a significant understanding of the demands of AD patient care. As a nuanced addition, however, a fundamental research study conducted by Lars Bronson Fich et. al. in 2017 sheds light on the physiological effects of 3) *the stress system* in relation to AD and the built environment.[31] The latter notion is elaborated on in the following.

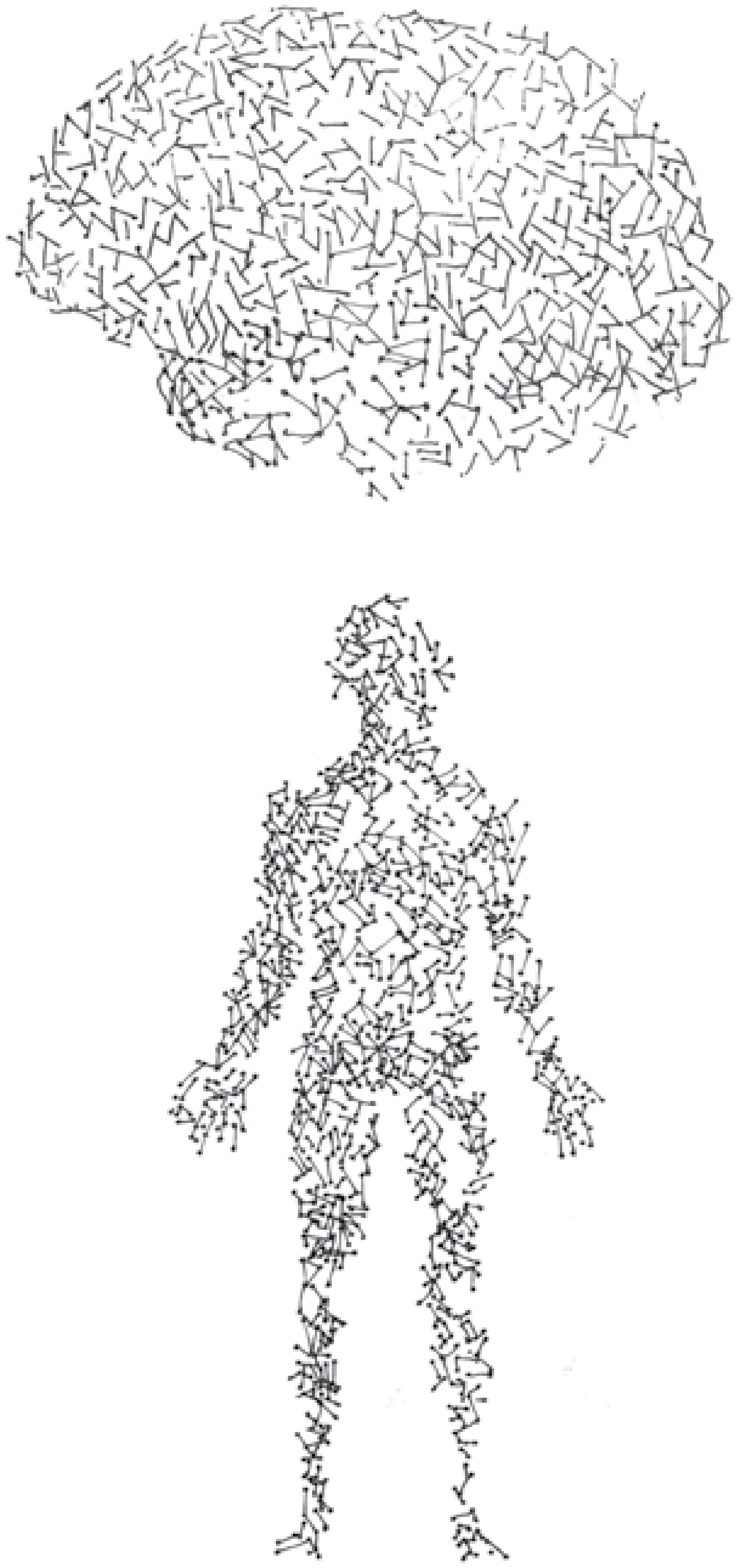
THE MEDIATION OF STRESS HORMONES

The structure of the hippocampus, as Fich's research apprises, can be divided into three functions that correspond with the three notions above: "*Formation of new memories, wayfinding and stress control.*"[32] By affecting hippocampal regions, scientific experiments have linked these to the importance of normal memory function and spatial navigation. Stress control, however, is different as it occurs across several brains structures. Nevertheless, the structure that is most sensitive to stress hormones - namely the hormone, cortisol - is by far the hippocampus. This entails cortisol as a risk factor as it is associated with permanent damage to that particular brain structure.[33] The fact that AD progressively degenerates the hippocampus, forms the sentiment that "*cortisol release can lead to a downward spiral of stress in AD patients with a reduced hippocampus [...]. This inflicts further damage on the hippocampus, because of the impact of an evermore uncontrolled cortisol release relative to the decreased volume of the compromised hippocampus, thereby accelerating the course of the disease.*"[34]

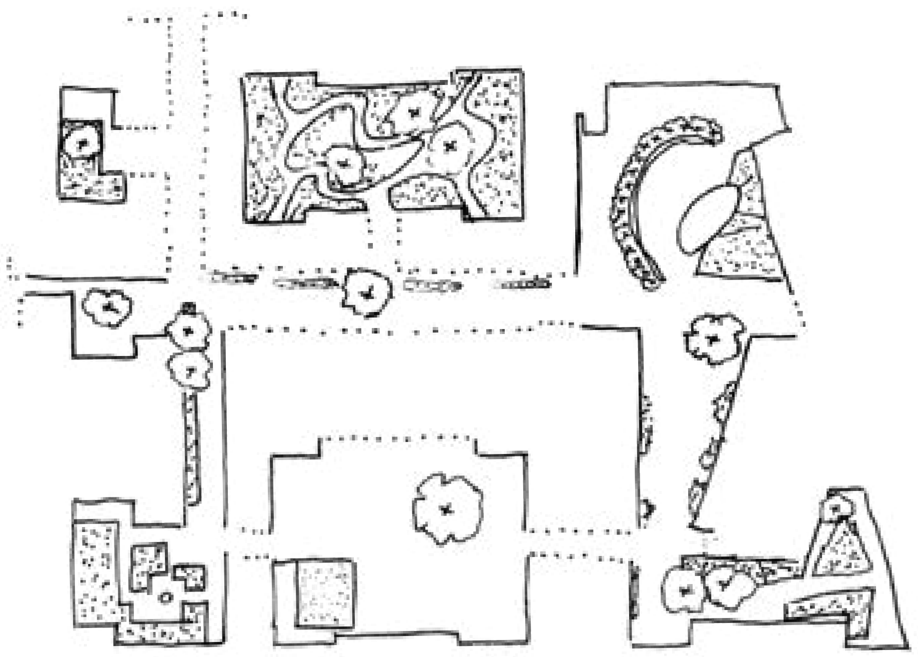
An imperative for all reactions is reason. By identifying the physiological reaction of cortisol release with a psychological reason, a preemptive understanding is approached. Fich's research does so by conducting an experiment based on psychosocial stressors, stressors of unpredictability, and a controlled spatial context. The results suggest that the architectural design of a space has the capacity to influence the amount of cortisol released, as well as the duration of enhanced cortisol levels, in connection to psychosocial stress episodes. In other words, hence stress hormones are mediated by the built environment, it is possible to preemptively minimize the effect of stressors through means of architectural design. In relation to the *fight-or-flight* response, this is achieved through openings toward the horizon, figuratively allowing for escape *or* flight.[35] These means are considered to influence and slow the progression of AD.

THE COMMON DENOMINATOR

Referring to the notioned means of nature and means of architectural design, a common denominator within the dialogue with dementia is found. In brief, nature addresses mental and physical health and well-being through stimuli where as architectural design addresses the impact of stressors and the progression of dementia through spatial context. These are to be involved in the planning and process of designing for dementia. Other notions - e.g. the associated symptoms, small scale of group homes, and wayfinding through reduced decision-making, visual access, recognizable interventions, and anchor points - are regarded on a pragmatic level.



▲ Ill. 007: Illustration of the human brain and the body



▲ *Ill. 008: Mapping of the layout of Hogeweyk Dementia Village, translating the built and the natural environments.*

HOGEWEYK DEMENTIA VILLAGE

Investigating the pioneering state of practise in the cross-field between architecture and dementia, the Dutch care facility Hogeweyk Dementia Village (2009) defines as an exemplary addition to healthcare institutions. The complex is built on a contemporary village model - for individuals who are used to living in an urban context - and is deeply engaged with aspects of a sustainable lifestyle for elderly people with impairments. All residents are claimed to have an advanced stage of dementia.[36]

RESEARCH APPLIED IN PRACTISE

The design of the 12.000 m^2 complex forms a sociocultural community of 152 elderly people with impairments. These individuals reside in 23 group homes of six to seven dwellers. The shared facilities are designed to mimic the outside world through recognizable urban features such as grocery stores, markets, cafés, restaurants, theatres, pubs, etc. These are accessible from exterior squares and streets that are enclosed by the architecture itself, hereby making a perimeter. Within, a sense of autonomy and freedom is preserved by enabling roaming and engagement in multiple activities.[37]

Recreational areas such as plazas, parks and gardens are connected across the exterior, creating a dynamic layout that defines habitational areas for different styles of living. These areas are characterized by different architectural expressions; such as cosmopolitan, nature-oriented, traditional Dutch styles, etc. Thus, dwellers are grouped on behalf of their cultural similarities, encouraging social bonds and interactions locally.[38] By that analogy, dwellers are free to interact globally - indifferent to their respective group homes.

CROSS-REFERENCING

The sociocultural, autonomous and dynamic foundation that Hogeweyk is based on, is greatly admirable and highly creative in regards to its cause. The scale of the architecture allows for a sizable community of elderlies, at which point the establishment of a miniature society is made possible. On the same notion, urban features are integrated in relation to the recognizable environment and familiar lifestyle known by the individual from the outside world. Cleverly segmenting residents into small-scale group homes, while simultaneously subdividing social and private constellations, corresponds to the research theory.

Although nature is integrated in parts of the outdoor environment, it is subsidiary to the general concept. The extent of which Hogeweyk exploits the various potentials of nature seems questionable. Its therapeutic effects are hypothesized to be dominated by the sociocultural interventions of the urban lifestyle. In that regard, however, psychosocial stressors play a significant role. Minimizing the effect of stressors on the hippocampus requires an environment that grants figurative escape. Hence Hogeweyk encourages social interaction through the entire complex, it is inevitable that certain social spaces are perceived to be more confined than others. This entails a potential danger of destructively impacting impairments due to episodic stress. This sentiment pinpoints what is missing in preemptive state-of-the-art design for dementia, architecturally speaking.

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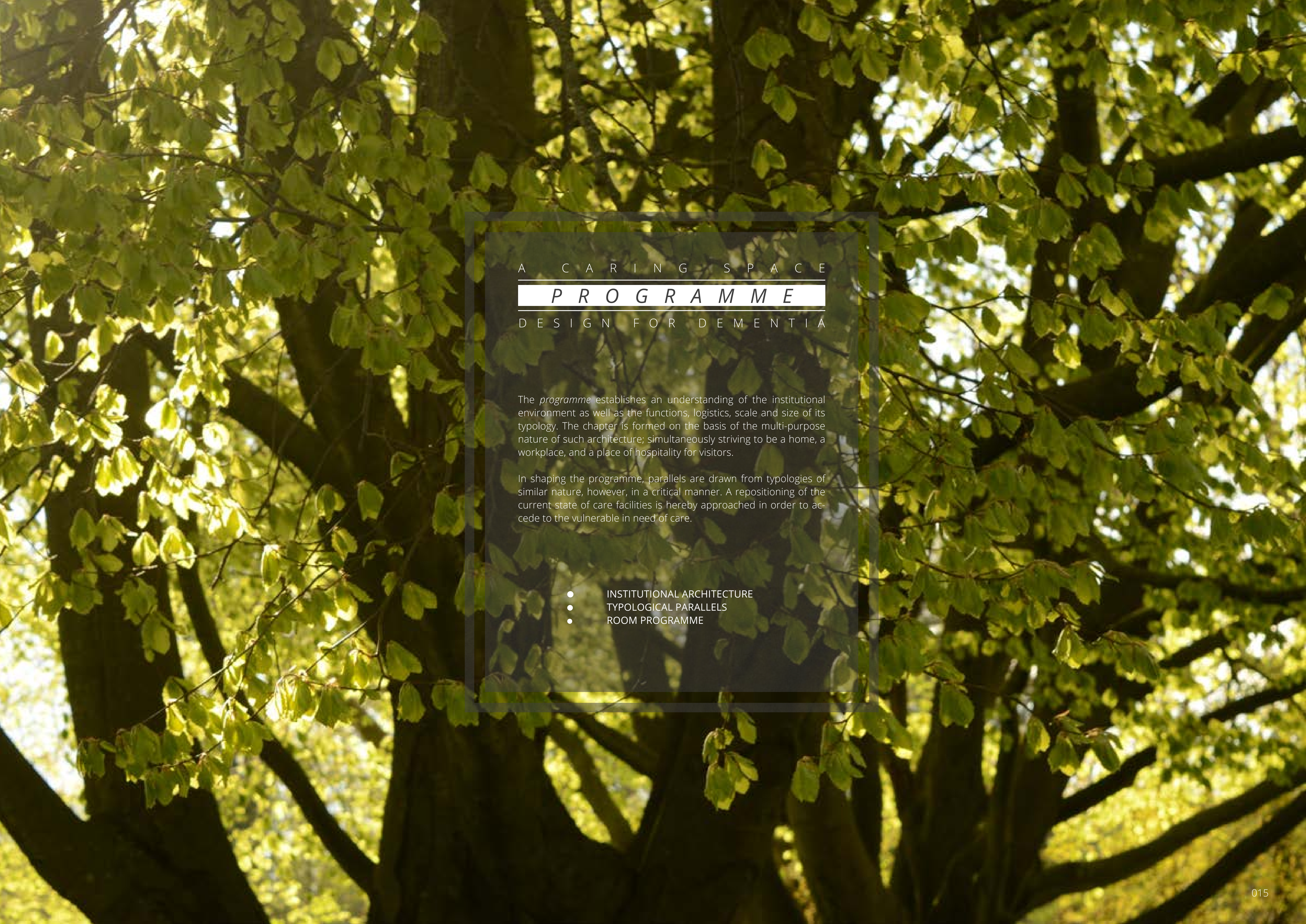


A CARING SPACE

PROGRAMME

DESIGN FOR DEMENTIA

The *programme* establishes an understanding of the institutional environment as well as the functions, logistics, scale and size of its typology. The chapter is formed on the basis of the multi-purpose nature of such architecture; simultaneously striving to be a home, a workplace, and a place of hospitality for visitors.

In shaping the programme, parallels are drawn from typologies of similar nature, however, in a critical manner. A repositioning of the current state of care facilities is hereby approached in order to accede to the vulnerable in need of care.

- INSTITUTIONAL ARCHITECTURE
- TYPOLOGICAL PARALLELS
- ROOM PROGRAMME

INSTITUTIONAL ARCHITECTURE

THE INSTITUTIONAL SENTIMENT

Care facilities and nursing homes are - like hospitals - commonly associate with institutional architecture. Typically, these are based on non-profit programmes (in the literal or perceptual sense) independent of public or private ownership. The limitation of their resources, however, is dependent on funding from either the public or private sector. Fundamentally, this links to the status quo of institutional environments today; a notion that will return in later discussion.

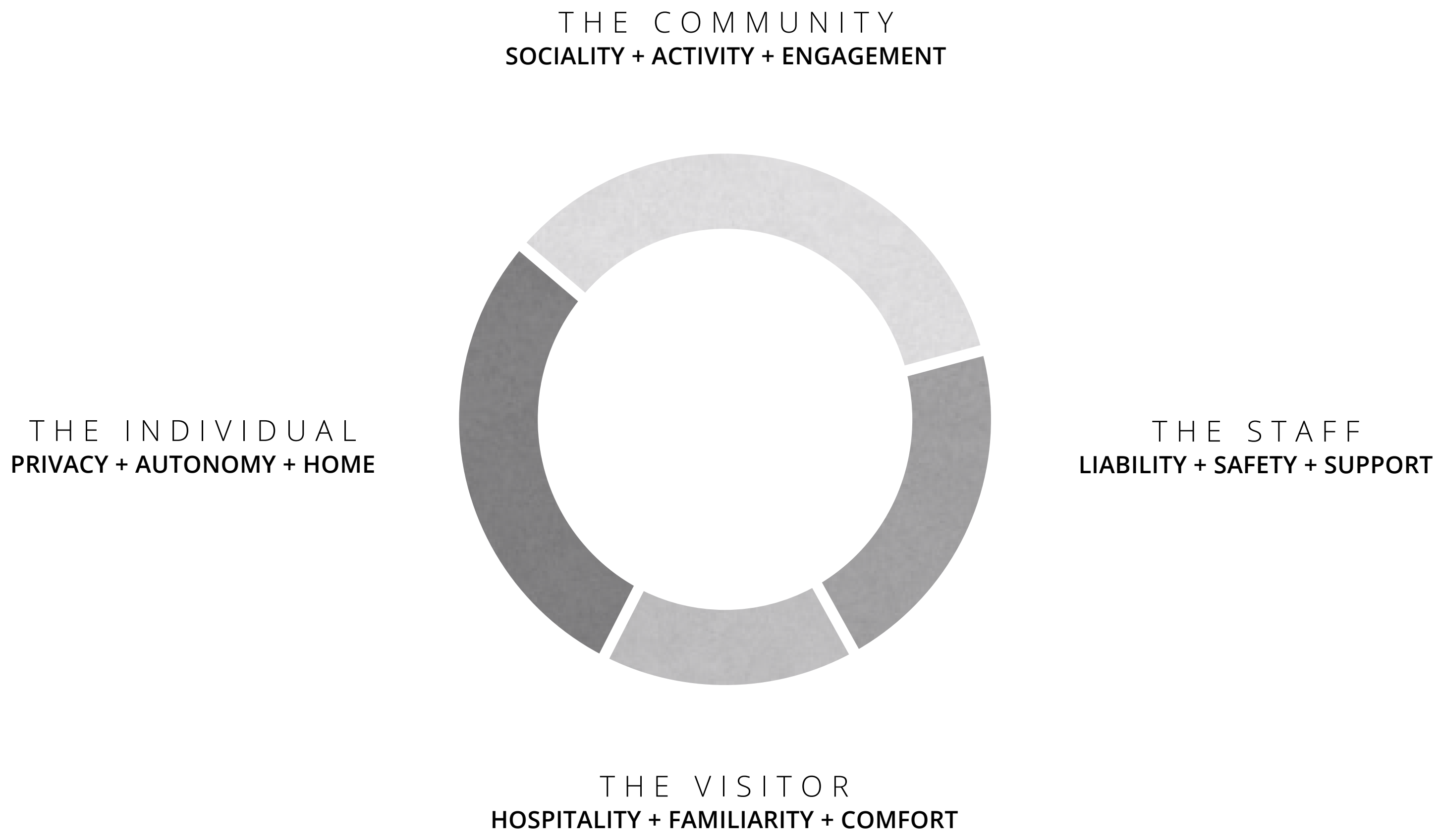
The distinctions between institution, commerce and retail may seem to overlap. Most institutions include office spaces, however, for administrative reasons and staff relations; not for commercial use. In a similar manner, retail such as cafés and canteens are common to find in institutions. Most of these facilities, however, are provided as part of the care service. Referring to the sub-societal infrastructure of Hogeweyk, an in-house currency is periodically given to residents with which they enact in retail-like conditions.[39] Aspects of retail may be provided in institutions, however, for the sake of service rather than profit.

The hybrid nature of the care facility is defined by its multi-purpose assessments; simultaneously striving to be a home to the individual, a social platform to the community, a workplace to staff, and a place of hospitality to visitors – all within the functional, practical, logistical, technical, and aesthetic context of the institution. To that end, integration is pivotal in order to ensure balance.

A SENTIMENT OF CARE

Today, individuals are institutionalized for various reasons. Common for most cases, however, is the referral from doctors and medical specialists. Categorizing the conditions of each individual defines a way to alleviate their situation - either through treatment or care - and to provide service and support in a time of need. This is the model on which the Danish healthcare system is based, involving people, institutions and resources.

The pinnacle of this project is the conveyance of a caring space; a space that preemptively responds to the needs and causes of dementia. In part, this is approached through architectural means (regarding the practise of gesture, integration, and stimuli) and means of mental health (regarding the theory of memory, wayfinding and stress control). Together, these constitute an appreciable amount of aspects and parameters to be considered in the process of designing a caring environment. Conveying a space of such intricacy is highly dependant on the architectural concept or principle from which it is formed.



▲ *Ill. 009: A visualization of the balance between different user groups considered in the development of the design, associated with the desired user aspects.*

◀ *Ill. 010: A prelinimary conception of the project, constituted by the merge of the physical environment and considerations on mental health - both related to dementia patient care.*

▶ *Ill. 011: Schematic excerpts of the programmes of Hogeweyk Dementia Village[40], Demensplejehjemmet Aalborg Øst[41], and Holmegårdsparken[42] (exhibited to compare the relation between inhabitant count and total area)*

HOGEWEYK DEMENTIA VILLAGE
WEESP, NETHERLANDS

INHABITANTS	152 residents
TOTAL AREA	12.000 m^2
* AVERAGE AREA	79 m^2 / resident
DWELLING TYPE	Group home
INSTITUTION TYPE	Care facility for dementia patients

* an estimate based on TOTAL AREA

DEMENSPLEJEHJEMMET AALBORG ØST
AALBORG, DENMARK

INHABITANTS	72 residents
TOTAL AREA	5.670 m^2
* AVERAGE AREA	78 m^2 / resident
DWELLING TYPE	Group home
INSTITUTION TYPE	Care facility for dementia patients

* an estimate based on TOTAL AREA

HOLMEGÅRDSPARKEN
CHARLOTTENLUND, DENMARK

INHABITANTS	120 residents
TOTAL AREA	14.300 m^2
* AVERAGE AREA	119 m^2 / resident
DWELLING TYPE	Group home
INSTITUTION TYPE	Care facility for elderly in general

* an estimate based on TOTAL AREA

TYPOLOGICAL PARALLELS

EFFICIENCY VS. HUMANITY

Despite the fact that the conditions of contemporary institutions are indifferent to each other, they all share the purpose of alleviation - not only in regards to the individual, but to society as well. By that rather crass analogy, relatives and friends of impaired individuals are relieved of the role that institutional care provides. Hereby, these individuals are facilitated in communal groups - so to speak - *outside* of the everyday-life of society in the act of care. However, referring to the notion of limited resources, a tendency of efficiently grouping people with special needs on confined area raises concern as it may jeopardize the fundamental aspect of care; an observation that crucially questions the balance between efficiency and dignity in institutional architecture today.

Contemplating the scale and efficiency of three institutional typologies, the observation above is further investigated. The cases of Hogweyk Dementia Village, Demensplejehjemmet Aalborg Øst, and Holmegårdsparken all define as care facilities and inhabit a generous amount of residents between 152 and 72 individuals. This is, of course, relative to the scale of each institution. However, an estimated average total area per resident insinuates a rather efficient margin, considering that approx. 40 - 50 m^2 represent dwelling units. From this observation, the areas regarded as shared facilities are believed to be more frequently occupied by multiple individuals. Naturally, the dependency between efficiently facilitating a certain amount of people and the available resources that these people imply (e.g. through housing costs and staff or care services) is the catalyst that is fundamental to all contemporary institutions. To challenge this notion, however, a reposition is made.

REPOSITIONED BY CAUSE

It is argued that the primary purpose of institutional environments is to facilitate care for the individual. In relation to dementia patient care, it is reinstated that psychosocial stressors (linked to episodic social stressful) entail the release of the stress hormone cortisol as a risk factor associated with permanent damage to the hippocampus. For that reason, the mindset of efficiently grouping large amounts of impaired individuals is argued to be misfit for the cause of preemptive care. Hereby, the notion of contemporary architecture as being highly efficient is repositioned. In response, the programme seeks to facilitate more total area per impaired individuals, hence perusing a more preemptive and caring environment, socially speaking. Social functions are still greatly considered, however, supported by preemptive interventions within the built environment - as to be seen in the following.

ROOM PROGRAMME

PROGRAMME PARAMETERS

On the basis of the previous sentiments and observations, an understanding of the overall conditions of the building programme is outlined. A set of three parameters are considered to reify these conditions in the formate of a room programme. These are (1) natural daylight, (2) view, and (3) outdoor connectivity. Evaluating these parameters for each spatial function within adds a preliminary understanding of the quality of each specific room, relative to the theoretical guidelines of memory, wayfinding, and - especially - stress control. Hereby, some room functions appear to be pragmatic while others appear more caring in nature.

FORMAT AND DEFINITION

The format of the room programme takes inspiration from a competition brief of Demensplejehjemmet, Aalborg Øst[43] by ArchiMed, Kuben Management, and the municipality of Aalborg. Published in 2015, the brief is deeply engaged with dementia patient care as specialists from within the field were involved in its process of development. The main notion of the brief has been the definition of spatial functions that specifically relate to dementia patients and patient care. Additionally, a similar logistical approach of zoning the complex into subgroups (such as *x* dwellings per collective) is adopted.

Due to the ambiguous nature of the complex, the room programme is segmented into multiple schemes in order to clearly commemorate the different functions and user groups. The initial scheme summarizes the full programme in a simplified manner. Its contents are subsequently listed as smaller stand-alone room programmes that delineate individual specification. Hereby, a clear overview of the comprehensive programme is presented in both a generalized and detailed scale.

	FULL PROGRAMME	QUANTITY	UNIT AREA	TOTAL AREA	COMMENTS
	Main Hall	1	318.5m^2	318.5 m^2	Serves as the logistical and transitional anchor point, main arrival
	Second Hall	1	206	206	Serves as logistical and transitional anchor point, secondary arrival
	Neighbourhood	4	788 m^2	3152 m^2	One neighbourhood supports two collectives
*	Collective	8	330 m^2	2.640 m^2	One collective supports six dwellings
*	Dwelling	48	40 m^2	1.920 m^2	Accommodate physical/invisible disabilities
	Staff Facilities	1	791 m^2	791 m^2	Centralized but hidden out of sight
**	Parking Facilities	1	-	640m^2	Facilitates up to 60 cars and 40 bikes
**	Outdoor Facilities	1	-	-	Constitutes shared gardens, terraces
			SUM	**6375- m^2**	

* Included in total area of neighbourhood
** Excluded in total area (SUM)

▲ *Ill. 012: The full programme simplifies the comprehensive nature of the complex by listing its different zones and referring these to their quantity. The total area is summarized to translate the scale of the architecture.*

MAIN HALL	QUANTITY	UNIT AREA	TOTAL AREA	NATURAL DAYLIGHT	VIEW	OUTDOOR CONNECTION	COMMENTS
Entrance Area	1	15 m²	15 m²	■	■	■	Translating openess and embraciveness
Wardrobe	2	1.5 m²	3 m²	■	■	■	integrated with timber lamels, connected with entrance area
Reception	1	2.5 m²	2.5 m²	■	■	□	Up to two persons
Meeting Room	1	30 m²	30 m²	■	■	□	Up to 10 persons
Resting Space	5	4 m²	20 m²	■	■	□	Retreat or resting spaces with integrated vegetation
Kitchen	2	20 m²	40 m²	■	□	□	Open kitchen for experiencing food experience
Dining Space	2	56 m²	112 m²	■	■	■	Directly connected with exterior terrasse, up to 50 persons
Congregation/Dining Space	1	75 m²	75 m²	■	■	■	Double hight gathering area connected with courtyard garden
Toilet	8	4m²	32 m²	□	□	□	Accessible toilets
		SUM	**318,5 m²**				

◂ *Ill. 013: The main hall is the area that is first entered when visiting the building, and therefore it establishes the first impression of the home. It is a place through which the public can be introduced to part of the center without disturbing the dwellers, in addition to being a place for management and educational purposes.*

SECONDARY HALL	QUANTITY	UNIT AREA	TOTAL AREA	NATURAL DAYLIGHT	VIEW	OUTDOOR CONNECTION	COMMENTS
Dining/gathering Area	1	140 m²	140 m²	■	■	■	Directly connected with exterior terrasse, up to 50 persons
Wardrobe	2	2.5 m²	5 m²	■	■	■	Integrated with timber lamels, connected with entrance area
Kitchen	1	25 m²	25 m²	■	□	□	Open kitchen for food experience
Resting space	5	4 m²	20 m²	□	□	□	Retreat or resting spaces with integrated vegetation
Toilet	4	4 m²	16 m²	□	□	□	Accessible toilets
		SUM	**206 m²**				

◂ *Ill. 014: In the second hall the dwellers can enjoy a semi-public space, which in some places promotes activity and social interaction, while in others establishes a quite retreat. It is an area that is open for the public but reserved for the dwellers as a social gathering place for the whole community.*

Ill. 015: Throughout the complex are a total of four neighborhoods, with one neighborhood being the meeting of two collectives and a total of twelve housing units. The intention with the neighborhood is to establish a social bond between two collectives while promoting a pragmatic application of a shared wet room and activity room.

NEIGHBOURHOOD	QUANTITY	UNIT AREA	TOTAL AREA	NATURAL DAYLIGHT	VIEW	OUTDOOR CONNECTION	COMMENTS
Wet Room	2	20 m²	40 m²	■	■	□	Flexible room for doctors, dentists, hairdressers, etc.
Activity Space	1	60 m²	60 m²	■	■	■	Up to 24 persons
Depot	3	6 m²	18 m²	□	□	□	Related to the activity space
Toilet	2	4 m²	8 m²	□	□	□	Accommodate physical/invisible disabilities
-							
Collective	2	330 m²	660 m²	-	-	-	See programme for "COLLECTIVE"
		SUM	**788 m²**				

Ill. 016: Throughout the complex are a total of eigth collectives, with one collective, being comparable with a group home, consisting of six housing units. The intention of the collective is to establish a social extension of the dwelling, in which only six neighbors and their relatives will be sharing the space. This extension will also create a connection to the neighboring collective and the exterior spaces surrounding the dwellings.

COLLECTIVE	QUANTITY	UNIT AREA	TOTAL AREA	NATURAL DAYLIGHT	VIEW	OUTDOOR CONNECTION	COMMENTS
Shared Living Room	1	60 m²	60 m²	■	■	■	Social space for up to 10 persons
Open Kitchen	1	20 m²	20 m²	■	■	■	Facilitates social interaction and activity
Toilet	2	4 m²	8 m²	□	□	□	Accommodate physical/invisible disabilities
-							
Dwellings	6	40 m²	240 m²	-	-	-	See programme for "RESIDENTIAL HOME"
		SUM	**330 m²**				

Ill. 017: The individual dwelling is defining the perimeter of a private space, establishing a safe place for the dweller. The intention of dwelling is to create a personal space in which the dweller can develop a sense of home. Additionally it is a place that should be easy accessible for the staff in case of emergencies.

Dwellings	QUANTITY	UNIT AREA	TOTAL AREA	NATURAL DAYLIGHT	VIEW	OUTDOOR CONNECTION	COMMENTS
Entrance Area	1	3 m²	3 m²	■	□	□	Area for coats, shoes, etc.
Kitchenette	1	6 m²	6 m²	■	■	□	A personal small-scale kitchen
Living Room	1	14 m²	14 m²	■	■	■	A personal small-scale living room
Bedroom	1	8 m²	8 m²	■	■	□	In direct connected to the bathroom
Bathroom	1	6 m²	6 m²	■	□	□	Accommodates physical/invisible disabilities
Hallway garden	1	3	**3**	■	-	-	Personal entrance gardening area in the hallway
		SUM	**40 m²**				

STAFF FACILITIES	QUANTITY	UNIT AREA	TOTAL AREA	NATURAL DAYLIGHT	VIEW	OUTDOOR CONNECTION	COMMENTS
Common Office	1	50 m²	50 m²	■	■	■	Management office, optional meeting and gathering space for staff
Meeting Room	2	30 m²	60 m²	■	■	■	Privatized meeting rooms
Staff Lounge	3	20 m²	60 m²	■	■	□	Area for larger meetings, events, etc
Staff Kitchenette	2	8 m²	8 m²	■	■	□	Recreational lounge for staff
Staff Wardrobe	3	4 m²	16 m²	□	□	□	
Staff Bathrooms	4	6 m²	24 m²	□	□	□	
Technical Room (Small)	8	6 m²	48 m²	□	□	□	For ventilation, etc.
Technical Room (Large)	4	15 m²	60 m²	□	□	□	For ventilation, etc.
Depot(Large)	8	18 m²	145 m²	□	□	□	Logistical storage rooms
Transit Area	1	320 m²	320 m²	■	□	■	Logistical accesses and connecting hallways
		SUM	**791 m²**				

Ill. 018: This area involves everything related to staff-functions, and might also be characterized as the machine that allows the complex to run effectively. The intention is to create the best possible work environment for the staff, while hiding the logistic nature of this machine in the rest of the complex.

PARKING	QUANTITY	UNIT AREA	TOTAL AREA	NATURAL DAYLIGHT	VIEW	OUTDOOR CONNECTION	COMMENTS
Loading Area	2	20 m²	40 m²	-	-	-	Suitable free space at both entrances of the complex
Public Parking Spot	36	12 m²	432 m²	-	-	-	Including 2-2 accessible parking lots close to the entrances
Staff Parking Spot	12	12 m²	144 m²	-	-	-	
Bicycle Parking	30	½ m²	15 m²	-	-	-	
		SUM	**631 m²**				

Ill. 019: The parking area should include space for staff and public parking inlcuding accessible parking lots closed to the entrance, as well as loading spots and bicycle parking.

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A CARING SPACE

SITE

DESIGN FOR DEMENTIA

The *site* chapter depicts the physical environment in which the project is situated as well as its inherent challenges and potentials. On this basis, an overview of Hammer Bakker forms an understanding of its cultural background, additionally, substantiated by qualitative (phenomenological) and quantitative (measurable) investigations of the context.

The approach is synthesized into a conclusion that entails a fundamental notion that crucially links to the problem-oriented notion of the built environment. In response, a discussion of tectonics in architecture is subsequently evident.

Ill. 020: A cartographic mapping of southern Hammer Bakker (1:5000) highligting the institutional environments in the context as well as the site on which the project is situated.

H A M M E R   B A K K E R

A PLACE AND HISTORY OF NATURE

North of the Danish city of Nørresundby lies Hammer Bakker, a characteristic landscape area covered by heath, meadow and trees. Its name insinuates a direct relation to hills. As a result of deposition from different ice ages, hills and valleys have been moulded the terrain, making the area rises from its flat surroundings. The soil primarily consists of sand and gravel which has a low level of nutrients. For that reason, the area has never been established as a settlement throughout history. However, settlements on the fertile grounds around Hammer Bakker rose to establish such suburban towns as Vodskov, Vestbjerg and Grindsted. Today, these are conveniently positioned in the lowlands around Hammer Bakker. The only historic establishment on the upland is the old Kongevej [King's Road] which currently serves as the primary route to and through the area.

During the 16th century, a substantial amount of beech trees were harvested and lost due to logging. From 1882 to 1915, however, the seeding and cultivation of pine trees reinvigorated the presence of nature. Today, a mixture of pine and beech woods contradicts the empty heath. This has guided the establishments of recent buildings, however, within the latest 100 years, Hammer Bakker has been a place of relatively untouched nature.[44]

THE INSTITUTIONAL CONTEXT

Situationed close to the local community of Vodskov, the southern part of Hammer Bakker holds different types of institutions that facilitate and support individuals with mental illness. Development of the area as an institutional context for care began in 1915. The settlement of a large-scale mental institution (planned for more than 750 patients) associated Hammer Bakker with a workplace environment. Thus, an increase in traffic and activity incited the further development of Vodskov as a residential suburb - and Hammer Bakker as a landscape area of institutional and recreational nature.[45] Today, the area contains kindergartens, schools, and treatment centers for people with mental or physical disabilities. The most recent addition of institutional architecture is that of Kastanjebo (2010) which facilitates care for adults with autism or ADHD. The district plan of this facility puts emphasis on the fact that the institution is experienced as an integrated part of the landscape; a notion that the municipality of Aalborg repeatedly underlines, supported by observations of the value and beauty of the context. The balance between these notions and the architectural appearance is likewise greatly considered.[46] As can be concluded, the architectural quality and respective integration of the landscape is of great importance to authorities when establishing contemporary institutions in the area.

FROM NATURE TO NURTURE

Hammer Bakker is undoubtedly rich on its qualities of nature. This especially applies to the southern part. Vast and scenic views of the hilly surroundings are sensed from the main road, however, these are fully rewarded from the various tracks and viewpoints throughout. From these, the phenomenological presence of nature becomes evermore evident - both in the sense of sight, sound and smell.

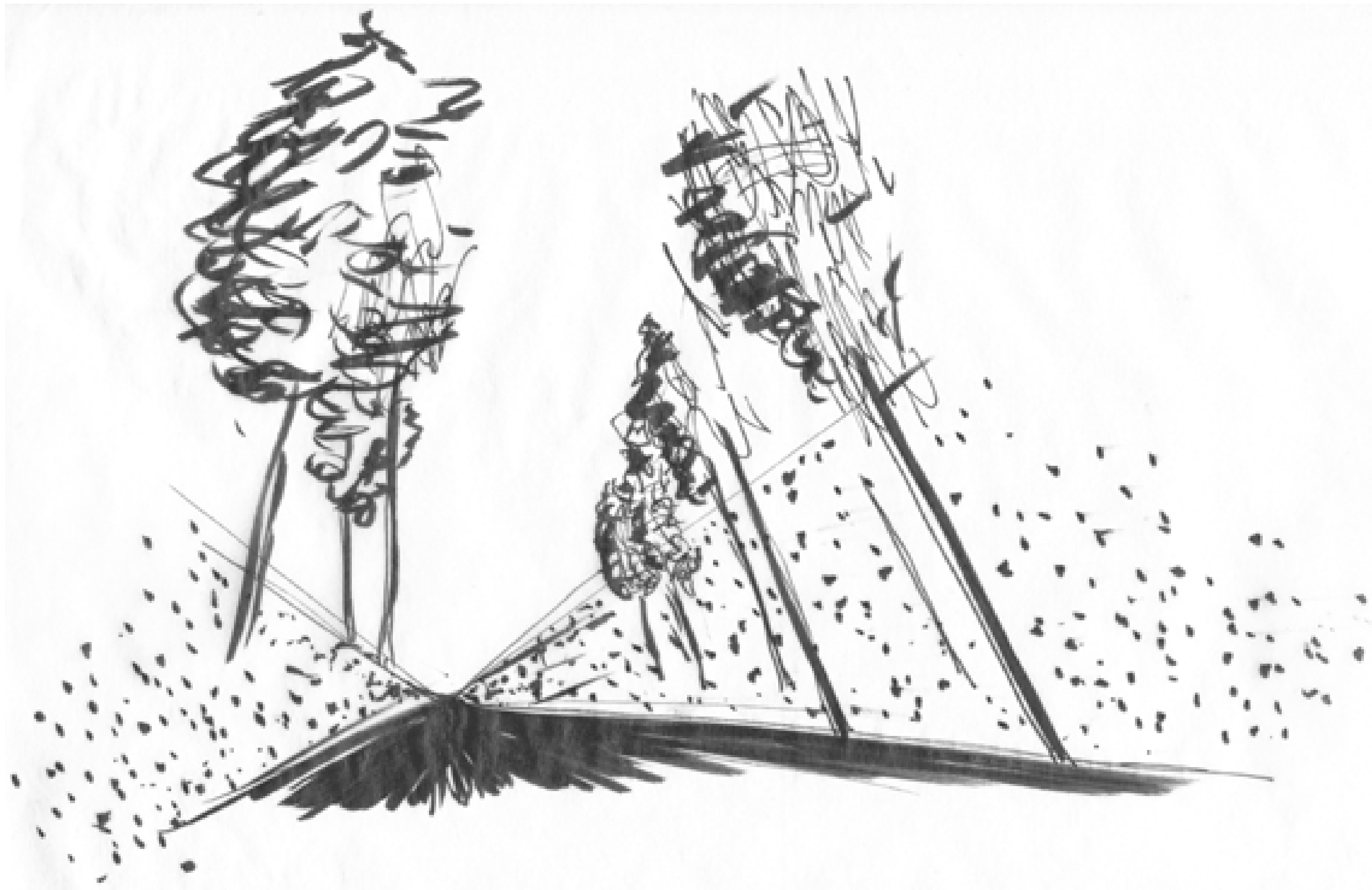
A grand view of the landscape presents itself east across the site, having the heaths descend downward, across the fields, and into the horizon. The ridged foothold within the site compliments the dynamic and versatile movement of the topography; ascending upwards towards south and west while forming a generous hilltop towards north. In culmination with tall vegetation such as shrubs and trees, this creates a sense of comforting enclosure - as from within a sphere of nature. The colliding sound of winds and trees is regularly accompanied by voices and movements of birds, hares and similar creatures. Biodiversity is favourably conditioned here - and its presence unquestionable. In addition, the local farm house east of the site seasonally keeps goats that occupy the nearby fields. This hints a sense and motion of life in the landscape. As diverse are the smells of nature. Whether it is sun-baked heaths or humidified soil, this natural environment provokes a series of stimuli experiences. In a similar manner, these apply to the senses of taste and touch as being respectively associated with smell and sight.[47]

From these phenomenological observations, the comprehension of Hammer Bakker goes much beyond its physical surface. Embedded within are latent potentials of nature; a notion that has the quality to advocate enrichment and nurture to the cause of dementia patient care. This crucially links to the theory on brain stimuli and *neurobics*, essential to the up-keep of mental health as well as to slow the progression of dementia. From a more holistic perspective, it seems that Hammer Bakker is judiciously associated with institutional environments, arguably due to its nurturing nature. This associates with the hypothesis on personal worlds and the universal position that nature holds.


Avlsgården:
Institution for maladjusted young adults
Local Farm House
SITE
Kastanjebo:
Institution for adult with autism or ADHD
Water tower
Kastanjebo:
Administration
Birken:
Kindergarten for children with autism
Specialprojekt Bøgen:
Dwellings for mal-adjusted young adults
Kostskolen:
School for SOSU students
Engbo:
Dwellings for the physically challenged
Skovhuset:
Institution for deaf and blind people
Behandlingscenter H.B.:
Treatment for the physically challenged
Marco Polo:
Activity facilities
Bevaringscenter Nordjylland:
Preservation center
Møgelbjerg:
Sagfører Olesens Villa
Egebakken Skole:
School for children with autism
TOWN OF VODSKOV
0 50 100 200
meter

◂ *Ill. 021: Sketch of the embracive sense and journey towards the site from Vodskov,*

▸ *Ill. 022: Cartographic excerpt of southern Hammer Bakker (1:5000) highlighting the main road to the site from Vodskov. Additionally, the map contains altitude measures denoted in 'meters above sea level' (MASL)*



A SENSE OF PLACE

JOURNEY AND ARRIVAL

Continuing to phenomenologically approach the context of Hammer Bakker, an experienced graduation of building and nature unfolds along the main road to and from the site. This characteristic is sensed in parallel to the progression of the hilly landscape. In the transition from Vodskov to Hammer Bakker, the density of built settlement gradually fades as the heaths and meadows rise. Subtly, the natural environment addresses its presence as pine trees and vegetation densify around the road leading towards the site. It is as if the landscape envelopes Vodskov, gesturing a fluent motion of contrasts from the suburban town into the nature of Hammer Bakker.

GESTURE OF THE SITE

The journey towards the site insinuates to the phenomenology of the site. Arriving from the south, the topography descends from the main road, making a clear line-of-sight east across a vast landscape. The boundary of the site is outlined by intersecting roads and paths. From within, an immediate feeling of embraciveness and protectiveness is sensed as the site is tucked between two ascending hills and the elevated road. This physically and visually segregates a direct connection to the road, reinforcing the presence of nature. As to be concluded, the composition of the dynamic topography emits a sensuous nurture of protection and embrace that is substantiated by the naturally granted vast view towards east. The culmination between these experienced qualities define as a prudent gesture of the site.

▲ Ill. 023: Photography from the site

▲ Ill. 024: Photography from the site

▲ Ill. 025: Photography from the site

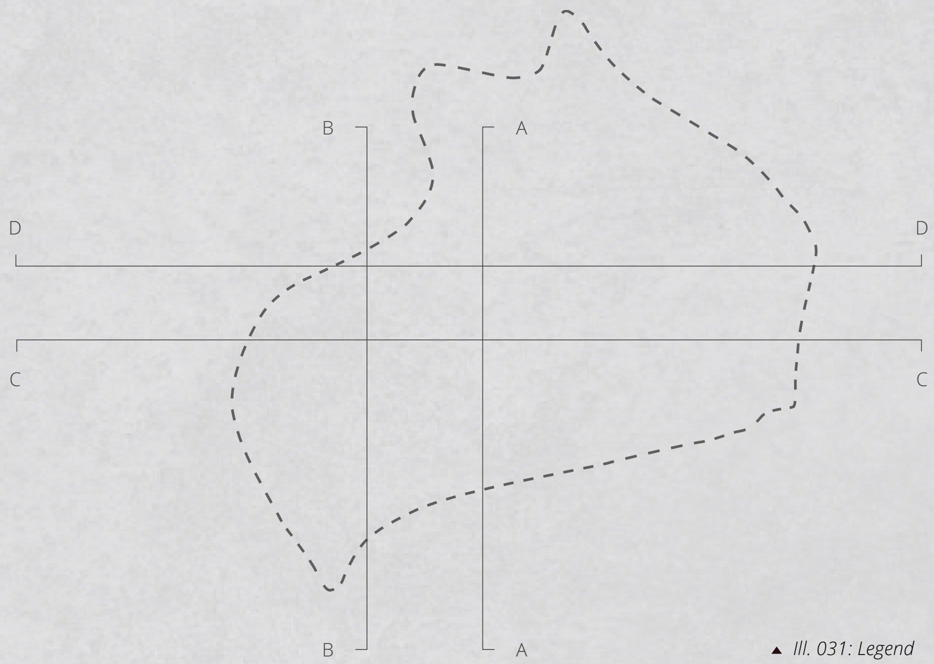
▲ *Ill. 026: Photography from the site*

▲ *Ill. 027: Photography from the site*

Ill. 028: Photography from the site

▲ Ill. 029: Photography from the site

▲ Ill. 030: Photography from the site



Ill. 031: Legend

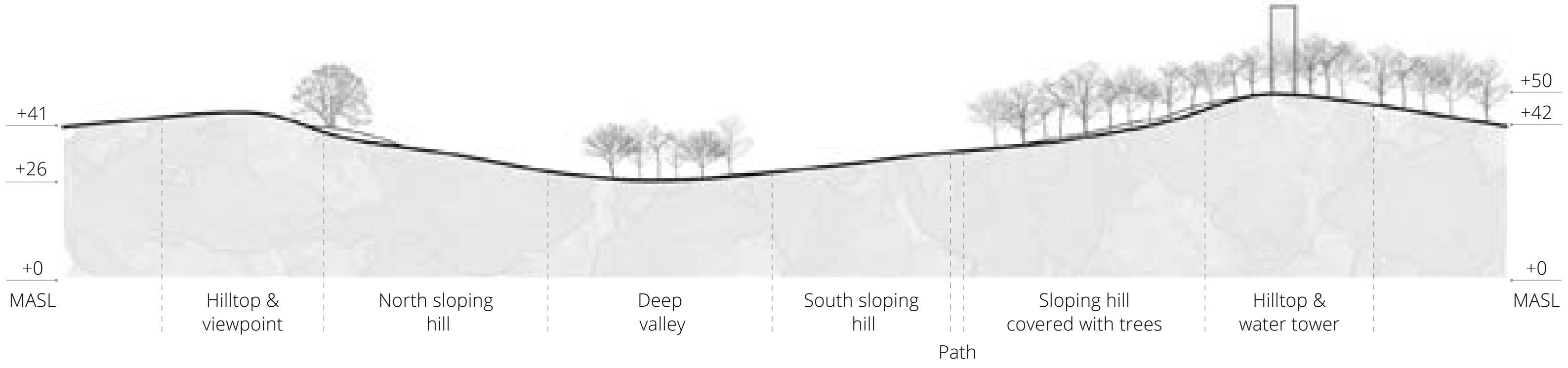
S I T E   C O N D I T I O N S

THE TOPOGRAPHY

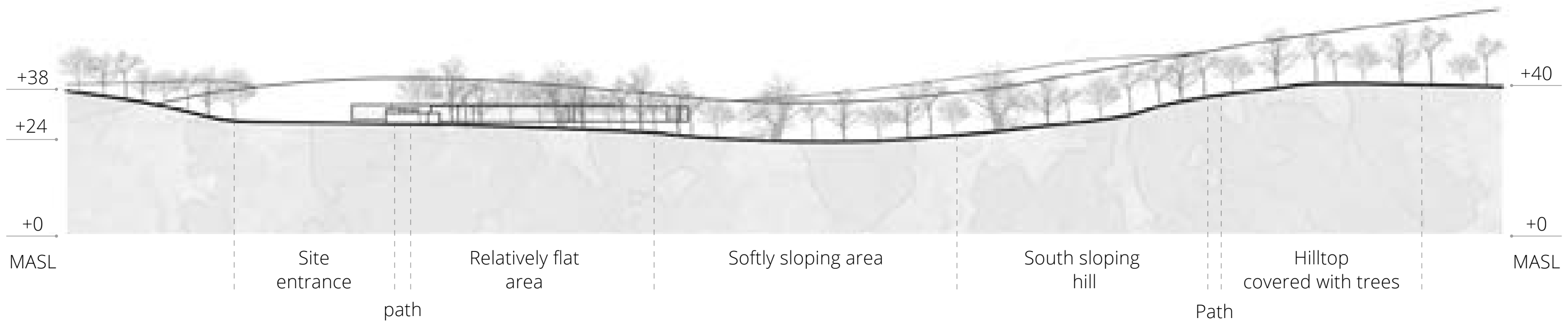
At this point, the gesturing nature of the topography is clear. Nevertheless, to fully understand the immediate context in which the institution is to be designed, these conditions are mapped and visualized through measurable sections. These grant insight to both the challenges and potentials related to operating within such dynamic conditions.

The overall dynamic of the site can be simplified into two intersecting, curved movements that gradually change; (1) resembling a positive parabola moving north-to-south (creating a valley at the low point in the center) and (2) resembling a negative linear curve moving west-to-east. While this generalization might be crass, it compresses the topographical complexity of the site into a format that is applicable and understandable. In the same analogy, extruding the parabola along the linear curve forms an image of the directive valley. In reality, however, the valley flattens out both east and west of the site, fading into the landscape. As previously noted, the nature of Hammer Bakker cultivates a phenomenological sense of embraciveness and protectiveness - and the valley strongly articulates that very notion.

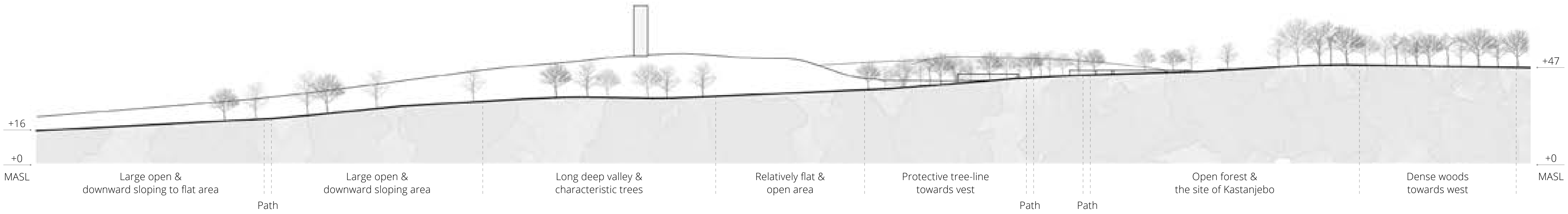
Due to its variable sloops and movements, the topography is expected to be the main challenge of positioning an institutional building complex on the site. Considering both the scale of the programme and the nature of the topography, an adaptive architectural composition is called for; one that responds to the topological challenge and converts it into a quality rather than an adversary. As to how this can be done is approached through the development of principles defined through further studies and investigations.



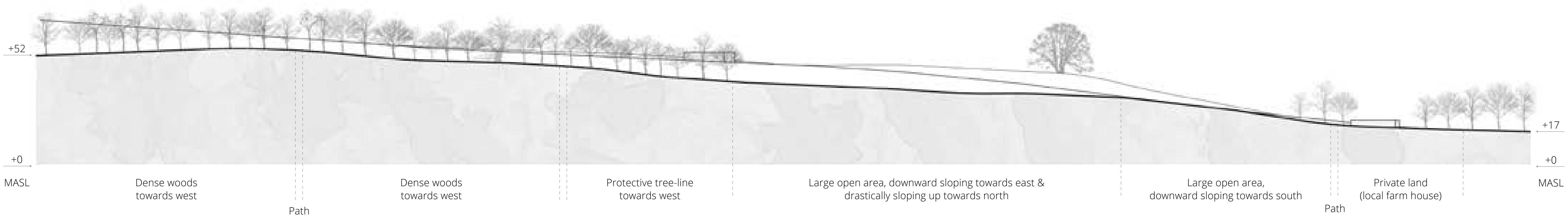
Ill. 032: Section AA (1:2000)



Ill. 033: Section BB (1:2000)



▲ *Ill. 034: Section CC (1:2000)*



▲ *Ill. 035: Section DD (1:2000)*

Ill. 036: The cartographic diagram translates the site conditions through a superimposed sun and wind analysis.

Ill. 037: A precipitation, temperature, and sunshine chart of Aalborg, North Jutland.[48]

THE CLIMATE

Vegetation subtly and sparsely rises from the topography within the site, primarily scattered along the southern and central parts. Surrounding the site, however, more dense woods and tree-lines envelope from south and west. Their tall appearance is solidified by their high-ground position. These observations are well-related to the climate conditions within the site as they influence the effects of wind and sun.

The typical Danish wind climate can very well impose a considerable challenge to architecture and the outdoor comfort. To define the on-site conditions, it is noted that the strongest winds blow from south-west and west in an eastward direction. In itself, this has the potential to impose a challenge, however, the site is complimented by two important factor: The ascending surroundings and the descending topography. From its unique placement in the landscape, the site is literally protected by a natural barrier of tree-lines and hills. As with the south-west and west winds, the tree-lines and hills also shield the site from south-eastern and northern winds. An opening from east enables wind fluctuations to enter the site, however, these are not as strong and frequent as those of e.g. the west. As the overall wind strategy, the joint protective qualities of the surroundings and the topography can be utilized as long as the architecture does not exceed these in height. Hereby, designing a layout in more than two levels is argued to be critical in regards to these wind conditions - and the challenges they might impose on the architecture.

As daylight is especially essential to the mental health and well-being of people with impairments, it is crucial to understand the site conditions of sun. In the context of equinox, the sun rises in the east, stands heighest in the south, and falls in west. The degree to which this varies depends on the time of year relative to solstices; the events when the sun reaches its most northerly or southerly excursion. This directly relates to the site conditions of which summer solstice grants approx. 18 hours of daylight while winter solstice grants approx. 6,5 hours of daylight. Referring to the ascending surroundings and the descending topography, the southern tree-lines will block parts of the low winter sun. This is conditional to the placement of the architecture. In response, the building complex should distance itself from the southern rim of the site to gain more daylight hours in the sparse winter period. Summer solstice, however, is more generous. The increase in sun hours impose the risk of overheating. Hence the nature of the project, the architecture should utilize the daylight while efficiently controlling the intake of the direct sun - especially - from the south.

Precipitation and temperature conditions are increasingly relevant to the project. From the recurring notion of nature, the architecture should consider the outdoor environment and the comfort experienced here. In context, the monthly average amount of days with rain spans from 10-17, which is substantiated by an average high temperature measured below 12 °C from November to April. In responds, these conditions inform the architecture to include covered exterior spaces that can be utilized when the climate is less comfortable.

MONTH	AVRG. DAYS W/ RAIN	AVRG. DAYS W/ SNOW	AVERAGE HIGH TEMP.	AVERAGE LOW TEMP.	SUN HOURS
January	15	8	2 °C	-3 °C	40
February	11	7	2 °C	-3 °C	72
March	10	5	5 °C	-1 °C	134
April	11	2	10 °C	2 °C	190
May	10	-	15 °C	6 °C	266
June	11	-	19 °C	10 °C	273
July	13	-	20 °C	12 °C	264
August	14	-	20 °C	11 °C	229
September	15	-	16 °C	9 °C	165
October	15	-	12 °C	6 °C	102
November	17	2	7 °C	1 °C	46
December	16	5	3 °C	-1 °C	28

N
5%
10%
15%
20%
22:19
21
04:25
06
W
18
E
09
15
12
15:39
15
08:58
12
S
> 11 m/s
5.0 - 11 m/s
0.2 - 5.0 m/s

CONCLUSION TO SITE

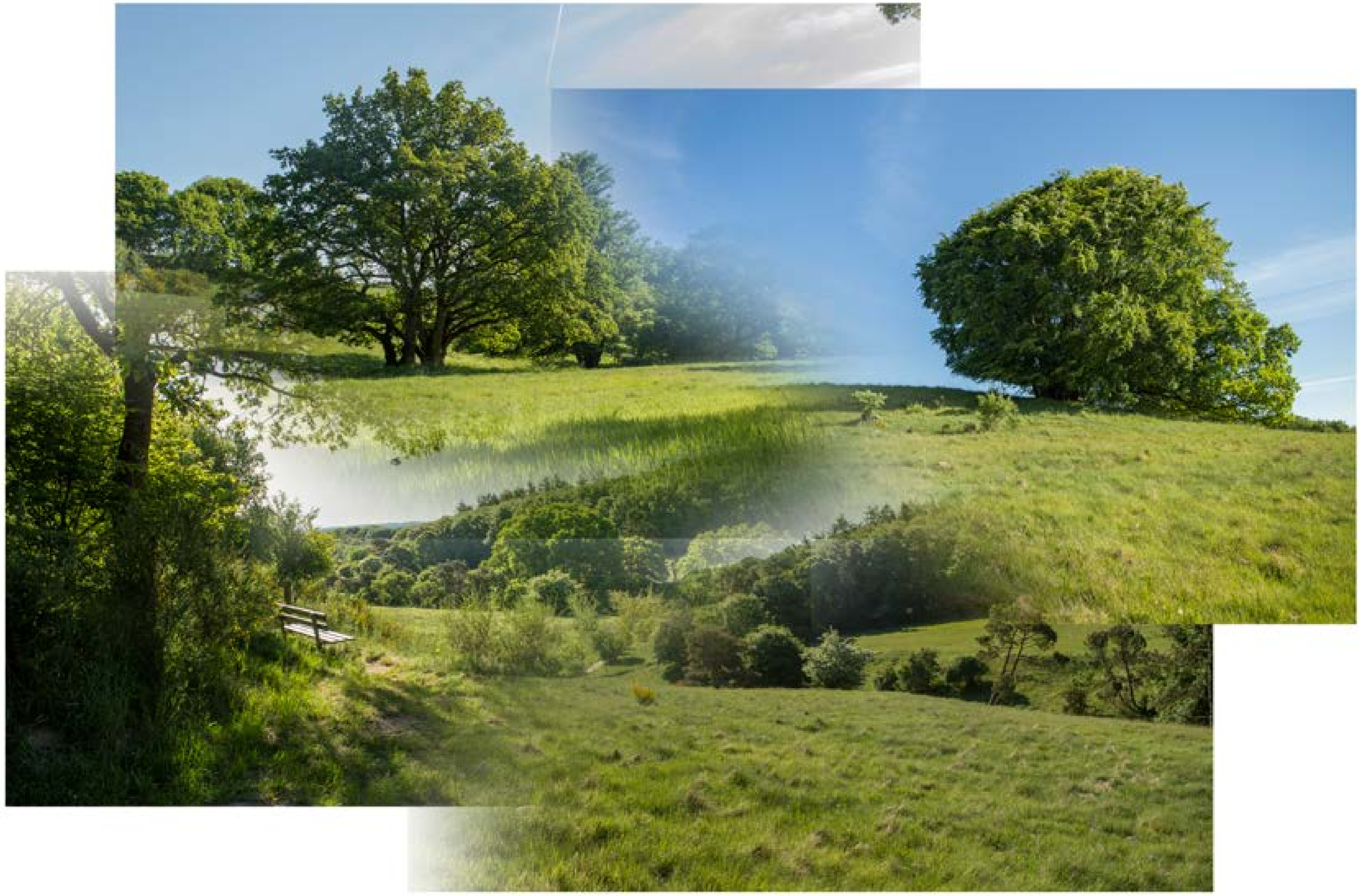
HIGHLIGHTING THE QUALITIES

In conclusion to the site analyses, Hammer Bakker appears as a rich and prudent context of natural and nurturing qualities, especially essential to the mental health and well-being of individuals impaired by dementia. These qualities are represented in the form of 1) multi-sensuous stimuli experiences, 2) vast landscape view towards east and 3) a sense of embraciveness and protectiveness - all of which relate to the fundamental presence of nature. This is an important notion as the correspondence between these qualities and the theory on dementia patient care is mediated through nature; the common denominator. Hereby, the natural location of the site is thematically related.

As a subsidiary quality, the context of Hammer Bakker is well-established as an institutional environment, providing multiple services of care. This is relevant on a larger social scale, considering both life outside of the institution and the plans of the municipality of Aalborg.

REINTRODUCING TECTONICS

On the basis of observation, the site imposes a significant topographical challenge. However, rather than displacing the architecture, the topography is considered to be directly exploited in the pursuit of articulating the gestures of the site; the sense of embraciveness and protectiveness as well as the vast view of the landscape towards east. By reinstating Frampton's notion of tectonics as *the poetics of construction*, an essential idea takes form; an idea founded on the poetic merge between architecture and nature to preemptively facilitate care. In relation to the context, tectonically situating the architecture within the site becomes definitive. As to how the built environment situates itself on the site in Hammer Bakker - and to what specific end - becomes the fundamental question. In order to approach a potential answer, two related architectonic cases are studied in the following chapter.



▲ Ill. 038: Submerged images of the site, translating the clear presence of nature and its latent qualities.

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[46] Teknik- og Miljøforvaltningen, '*Lokalplan 5-2-103 Institutionen Kastanjebo*' (2010), <www.aalborgkommune.dk/images/teknisk/planbyg/lokplan/05/5-2-103.pdf> [accessed 08.02.2018]

[47] See Juhani Pallasmaa, '*Eye of the Skin: Architecture and the Senses*' (Chichester: Wiley-Academy, 2012)

[48] Climate Data, '*Aalborg, North Jutland*' (2018), <https://www.climatedata.eu/climate> [accessed 03.28.2018]

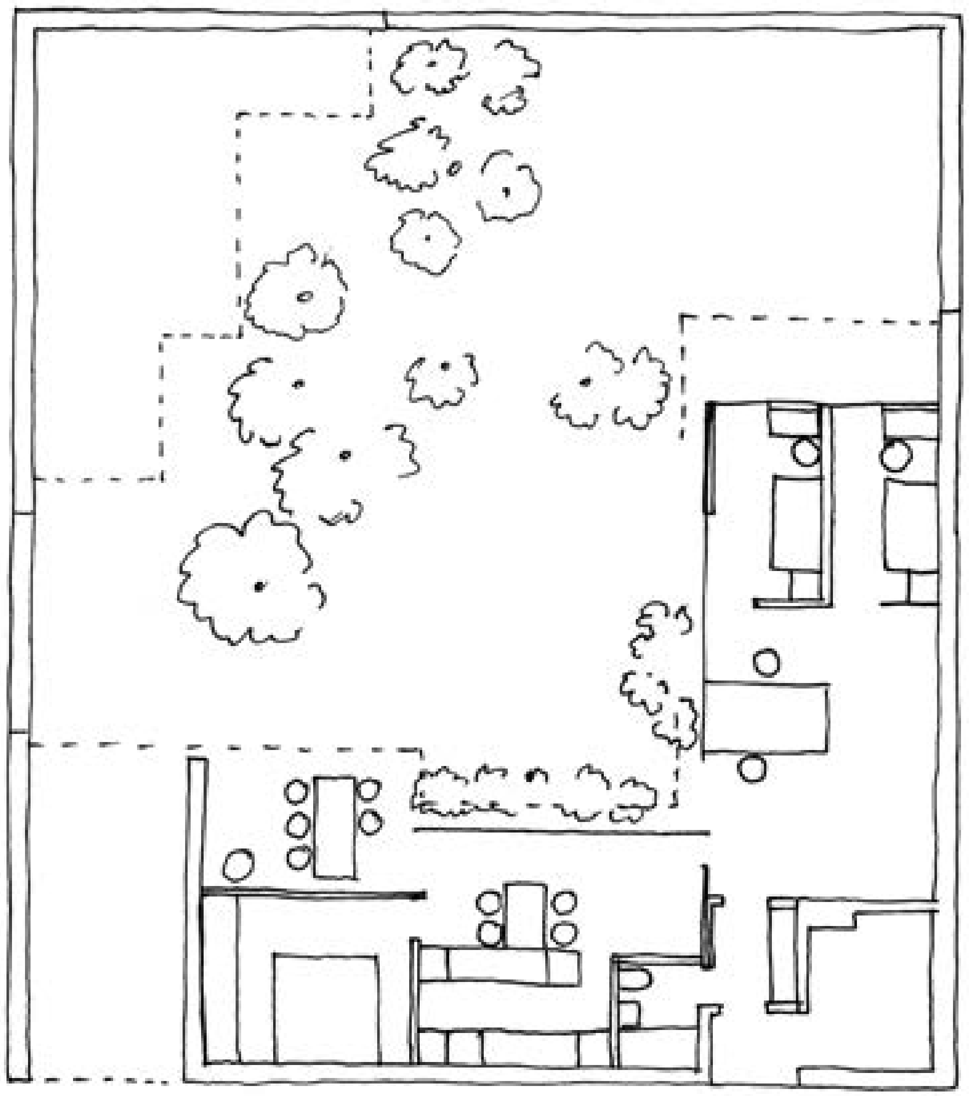
A CARING SPACE

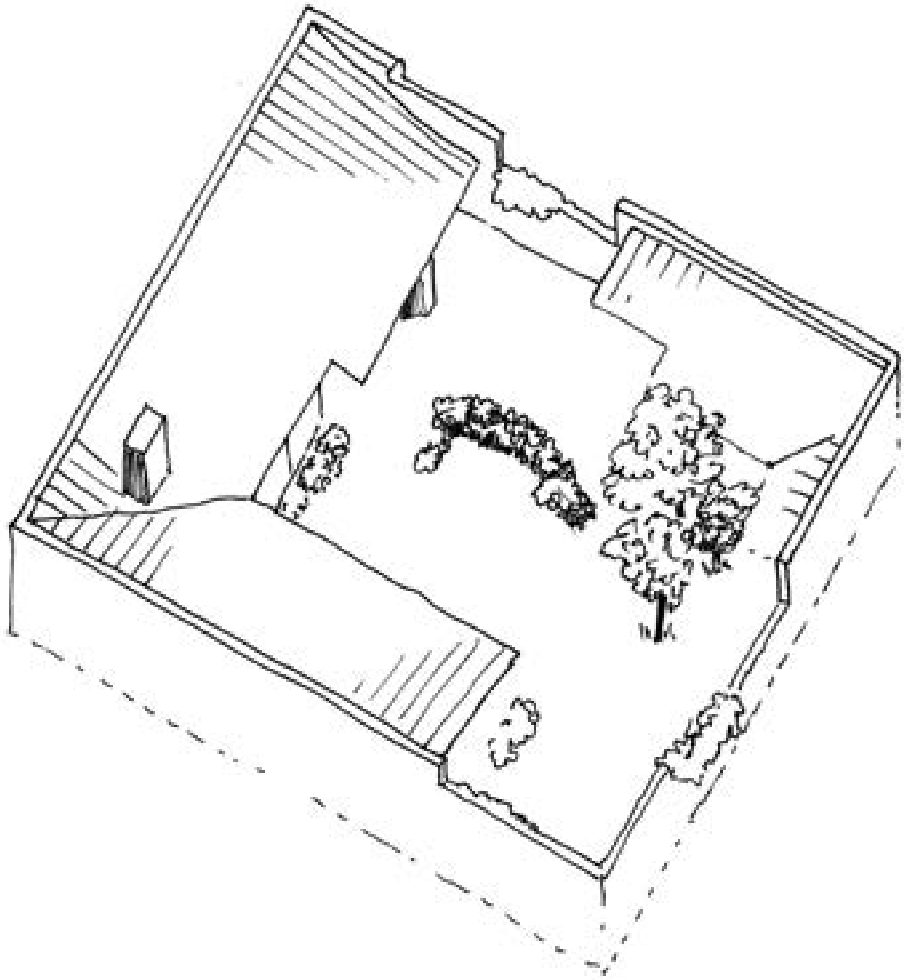
CASE STUDIES

DESIGN FOR DEMENTIA

The *case studies* chapter continues on the discussion of tectonics in architecture. By exemplifying the architectonic works of Jørn Utzon and Alvar Aalto, concrete dialogues between the built and the natural environment unfold. These incept the idea of an interrelation that proactively construes an architectural gesture; one that adds both perspective and principle to the identity of the project.

- UTZON'S KINGO HOUSES
- AALTO'S VILLA MAIREA
- CONCLUSION TO CASE STUDIES





◂ *Ill. 039: Floor plan of a unit of Kingo Houses.*

▴ *Ill. 040: Sketch of a unit of Kingo Houses.*

▸ *Ill. 041: Site plan of Kingo Houses.*

UTZON'S KINGO HOUSES

COMPOSITION AND ENVIRONMENT

The architectural work of Jørn Utzon exemplifies a modernist generation of tectonic thinkers; a generation that strayed from the rigidity of pragmatism and approached architectural composition of the environment. As a result, most associated architects - including Utzon himself - developed an organic conception of the interrelation between archcitecture and environment. This involved actively allowing the environment to inform the design process, instead of enforcing preconceived composition onto it. Utzon adopted this approach to architecture through Gunnar Asplund, Alvar Aalto and Frank Lloyd Wright with whom he was committed in early years of his career. In 1948, a trip to Morocco inspired Utzon to invent his molecular system of additive architecture. From this, he resolved the duality between standardization in architecture for the sake of a pragmatic repetitive production, and uncompromised architectural quality and flexibility that is essential in order to conform to the needs of people. The architectural design of the Kingo Houses (1957-1960) in Helsingør stands as a physical manifestation of these architectural thoughts and ideals.[49]

A PLOT AND A UNIT

The study of Kingo Houses investigates Utzon's tectonic interior as well as his exploitation and placement of prefabricated design in the landscape. The design is based on that of an earlier non-realized project: The Swedish Houses. In 1953, Utzon and Ib Møgelvang Nielsen formed this new typology in which privacy was the main design parameter. The housing design had a 20 x 20 meters building plot surrounded by a high wall. Essentially, the wall would allow the dwellers to rearrange as they desired without disturbing neighbours. In the form of an L-shape, the main living spaces were flexibly arranged against two walls, forming a house around a courtyard garden in which the dwellers could keep animals, build boats or even extend the dwelling to accommodate other needs.

This design introduced two important elemental boundaries between building and environment: 1) the bearing wall, creating the perimeter of the house and 2) the lightweight membrane of the living space, defining a transition between inside and outside. Additively positioning these individual housing units, a large-scale complex would be organize, adapting to the urban and natural contexts. If the context allowed for intricate views, extrusions through the elemental walls could connect the surrounding context to the private exterior. This served as the fundamental idea of the Swedish Houses; an additive principle of units and plots that could be tailored to site-specific conditions hand-in-hand with personal preference. Although never realized, Utzon's premature exercise of the Swedish Houses led to the establishment of the Kingo Houses in later years.[50]

ORGANIC ARCHITECTURE FROM GEOMETRIC FORM

With the Kingo Houses, Utzon achieved and realized a practised example of adaptive prefabrication design. The typological design was similar to the Swedish House but differed in terms of layout, materials and details to perfect its ideals and relate to the context of Denmark. The plots are organized into a complex of housing units that flow through the wide hills of old agricultural land, creating a niche around a lake in the center. The architecture exemplifies Utzon's adoption of the semperian formula; designing a contrasting relationship between *the earthwork* and *the roofwork*. This is exercised through the design of a strong platform (*the earthwork*) that embraces the site and defines the architectural space, sealed by its hovering construction (*the roof work*). The design of these domestic atrium houses has the flexibility and adaptability to fit any topography, which is clearly exemplified in both Kingo Houses and Fredensborg Houses - two parallel projects that are based on the same principles.

The architecture of Kingo Houses consists of 63 atrium houses arranged into 11 different clusters of differing sizes. All atriums face either south, south-east or south-west. The northern oriented walls connect the garage and the main road, establishing entries at the perimeter of the site. Thus, the shared green area in the center of the site is both traffic-free and encircled by the arranged atrium houses. Even though the complex is built from 63 identically appearing units, the flexible design of each unit compliments a natural integration into the landscape. The outer walls outline the private sphere in which courtyard and living spaces are conditioned. Within, Utzon's design suggests a set of plan layout variations, all of which are based on the three-bedroom L-shape unit. In some instances, only the roof continues the L-shaped form that is apparent from the exterior. The physical volume of the main interior space is - in some cases - separated into a primary and secondary spaces. In all instances, the garage is situated underneath the L-shaped roof, creating an entrance into the courtyard.

There is a clear reference to Japanese rock gardens in Utzon's design of the courtyards. A separation of cultivated and wild nature is contrastingly enforced by the outer wall, an essential aspect of integrating into the surroundings. Thus, the context becomes part of the courtyard experience - as in a painting of overlapping layers of nature. The multi-purpose assessment of the wall as the demarcation between the private and the public environment allows for great flexibility and variation within the architecture. Hereby, the Kingo Houses exploit the potentials of prefabrication and landscape positioning to create organic architecture from simple geometric form. In the words of Utzon, *"[...] the standardized building elements will be combined in such a way [...] in the flats and in the single houses themselves to get a combination without the awful stiffness well known from many modern housing schemes. There are many ways to arrange the same books in a book-shelf."*[51]

▸ *Ill. 042: Floor plan of Villa Mairea.*

▾ *Ill. 043: Elevation of Villa Mairea*

A A L T O ' S   V I L L A   M A I R E A

BUILDING AND ENVIRONMENT

The architectural work of Alvar Aalto is characterized by its modern and tactile aesthetics. Villa Mairea (1939) in Noormarkku, Finland, is no exception. A study of the architecture investigates Aalto's tectonic interior as well as the relationship between building and environment - both from an exterior and interior perspective. The villa is a residence for the art enthusiasts, Harry and Maire Gullichsen, and combines an art gallery, an atelier, and a private home into one building.

As the architect, Aalto was given the freedom to use the project as an experiment of architecture, in which he could explore themes that had intrigued him in his theoretical work. Thus, the villa marks a phase in which Aalto shifts from a simple pragmatic form into a more organic and modernistic architecture. Today, the final design stands as a collage of materials, textures, rhythms, motifs, and spatial experiences. These aspects of the design are critically linked to those of nature - and in doing so, the boundary between the surrounding pine forest and the interior of the building is blurred. From this, the architecture establishes a strong sense of place.

The concept of Villa Mairea is based on a 250 m^2 living space in which all shared facilities of the home, the reception, and the exhibition seamlessly flow together; in a blend with nature. The domestic functions of the house is connected as a wing that moves into the landscape, and extends through a pergola that leads to a sauna. On the upper floor, the private residential rooms, the guest rooms, and the atelier are located to separate them from the openly shared spaces beneath. These continuous spaces are the resultant of modernistic spatial ideals, however, applied to the metaphorical reference of nature and its limitless spatial depth.

Through the garden, elements of the surrounding nature are introduced to the buildings interior which establishes a sense of fluent spaces. Aalto's approach of continuously applying motifs, materials, and textures is similar to that of a painter, uniting colours to translate his feelings and visions through the canvas. Hence, the design is not controlled by the rigidity of one architectural idea. Instead, the aspect of multiple ideas - or figurative worlds - unite in a sensuous gesture that is inspired by the contextual natural environment.[52]

IRREGULARITIES OF NATURE

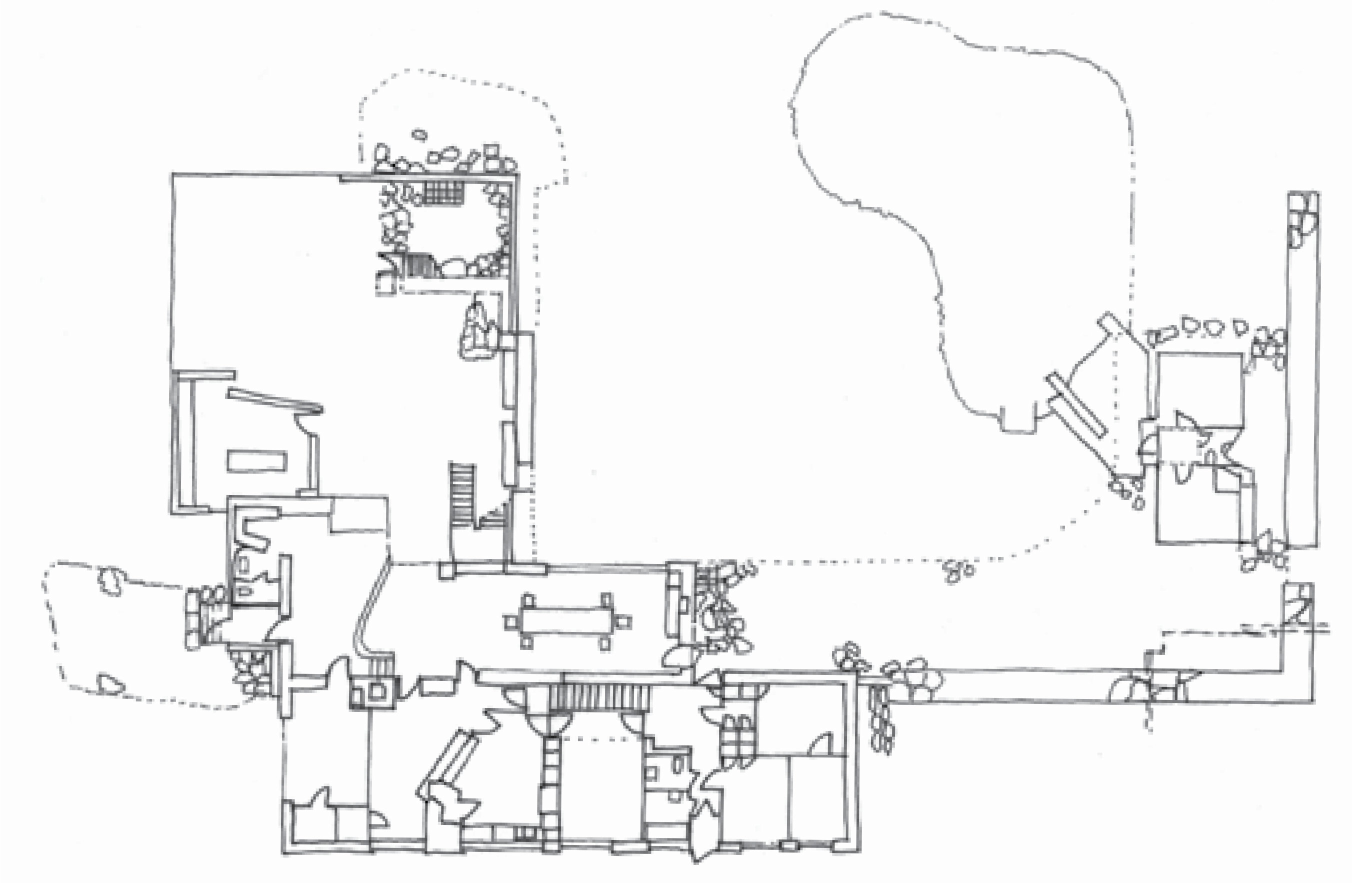
The imitation of the atmosphere of nature is respectfully represent throughout the design of Villa Mairea. To do so, Aalto utilizes shifts in materiality, textures, and placement of structural elements to maintain organic spatiality. Through this irregular application of materials and textures, distinctive progressions between domestic and living spaces are created, changing from stone to tile to timber to fabric. Additionally, even the ceiling changes from clinically white concrete in the domestic spaces to timber panels in the living spaces.

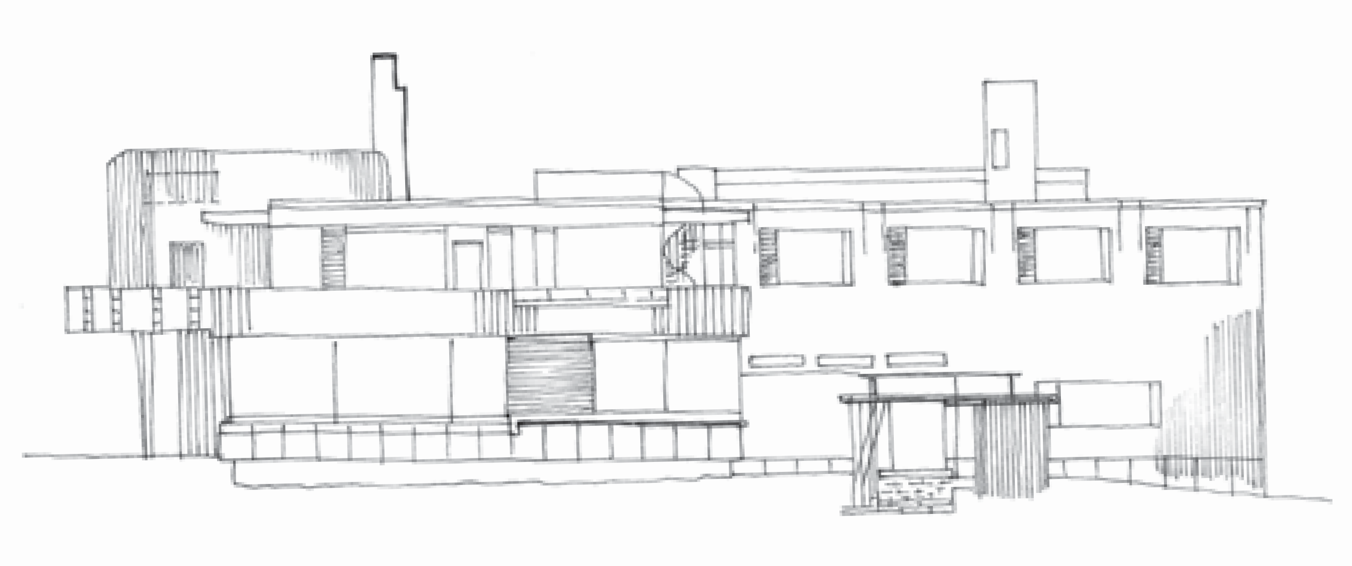
An irregular rhythm of vertical poles is used to define the upper part of an organic boundary between living room and vestibule. A similar pattern is uses around the stairs, creating a transparent boundary that subtly refers to wild composition of trees within the surrounding forest. Within the living space, structural columns hereby define the locality. By treating both structural and decorative elements with the same irregular pattern, Aalto blurs the distinction in architectural hierarchy just as he blurs the distinction between interior and exterior. The collage approach becomes visible through the numerous juxtapositions applied throughout Villa Mairea. Even on the exterior, the architectural appearance of a singular villa is disrupted by juxtaposed white brick walls and timber cladded surfaces. The irregular collage approach, Aalto's argues, is "*an attempt [...] to avoid artificial architectural rhythm in the building.*"[53]

Through the abundance of materials, textures, details, motifs, and pattern arrangements, Aalto's introduces a character of irregular rhythms similar to that of nature. This becomes the gesture of Aalto's architecture which translates through the tectonic application of structures, columns, and walls as well as material surfaces. Through this coherent and highly unique atmosphere, an experienced tectonic architectural whole is conveyed.[54]

AALTO'S TECTONIC INTERIOR

The tectonic interior of Aalto is clarified as a nuanced and complex understanding of the latent and potential role of tectonics in architecture. Aalto challenges one-dimensional logic and rigidity by allowing organic flow and irregular rhythm to inform the design. Although this appears foreign, it is formed on the basic understanding of the contextual environment; the wild and irregular patterns of nature. This translates into an architectural gesture that constitutes the spatial and tactile interior and - in certain parts - blurs the distinction between interior and exterior *or* building and nature. To that end, the collage approach serves as the principle means of creating irregular patterns, material shifts, fluent spaces, seamless depth, etc. This constitutes Aalto's personal and picturesque mindset which informs the design. As the resultant, Aalto translates the motions of nature as a gesture in synergy with modern living.[55]





CONCLUSION TO CASE STUDIES

KINGO HOUSES

The design of Kingo Houses is deeply engaged with context and nature. The principle of the atrium house is comparable to that of a primordial dwelling in which *earthwork* and *roofwork* are connected by a protective enclosure that gives shape to the morphology of the settlement. Utzon articulates the definitions of architectural elements and their function in parallel to Semper's theory on the four elements of architecture.[56] However, in a modern architectural context, the notion of the *hearth* relates to the psychological sense of home, as a place in which the dweller feels protected. This translates in the distinction between private and public spaces. In relation to the site, the *earthwork* is fundamentally linked to the architectural principle as it establishes a positioning of the building within the site. As separate physicalities with individual agendas, building and nature morph together to inform one complete entity. However, the building is flexibly configured to adjust its performance through nature; the core principle of the design. By considering the role of site and context, Utzon links tectonic application with prefabrication, both on a large scale (the complex) and a small scale (the atrium house).[57]

In relation to designing a care facility in the context of Hammer Bakker, the principles of Kingo Houses are advantageous to draw parallels from. Its positioning in the landscape is a unique feature that constitutes the basis of the dialogue between the built and the natural environment. From this notion, a similar positioning of architectural elements is considered; one that informs and exploits the bond between building and nature.

VILLA MAIREA

While the study of Kingo Houses addresses the project on an exterior scale, the study of Villa Mairea approaches principles of interior design. Aalto's picturesque approach of tectonically collaging gives form to a unique interior that melds spatiality, materiality, and tactility into a motif of nature. Substantiated by the notion of irregular rhythms, this constitutes recognizable and highly sensuous spaces; an experienced quality that relates to the dialogue between architecture and dementia (specifically in regards to stimuli and *neurobics*)

From the study, two main notions derive. Firstly, in order to convey the aspect of care, the facility should consider spatiality, materiality, and tactility to support memory and wayfinding. The application of a recognizable structures or spaces, for instance, is considered to act as anchor points. Ideally, a space can be defined from a correlation of these notions. Secondly, the facility should consider the motif and presence of nature, integrated within the interior to support health, well-being, and stress control. Views toward the vast landscape or even more immediate nature, for instance, are crucial to ensure a sense of freedom. To that point and in the scope of Villa Mairea, Aalto argues, *"[...] nature is a symbol of freedom. Sometimes nature actually gives rise to and maintains the idea of freedom. If we base our technical plans primarily on nature we have a chance to ensure that the course of development is once again in a direction in which our everyday work and all it's forms will increase freedom rather than decrease it."*[58]

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[50] Jørgen Jørgensen, '*Glæden ved at Bo*' (Copenhagen: Forlaget Rhodos, 2010) pp. 14-39

[51] Jørn Utzon, '*Elineberg*' (Milan: Zodiac 5, 1959) p. 90

[52] Juhani Pallasmaa, '*Villa Mairea: Fusion of Utopian and Tradition*' (1985), <www.villa-mairea.fi/en/villa-mairea/architecture> [accessed 01.03.2018]

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[58] Richard Western, '*Alvar Aalto*' (Austria: Phaidon Press, 1995) p. 98

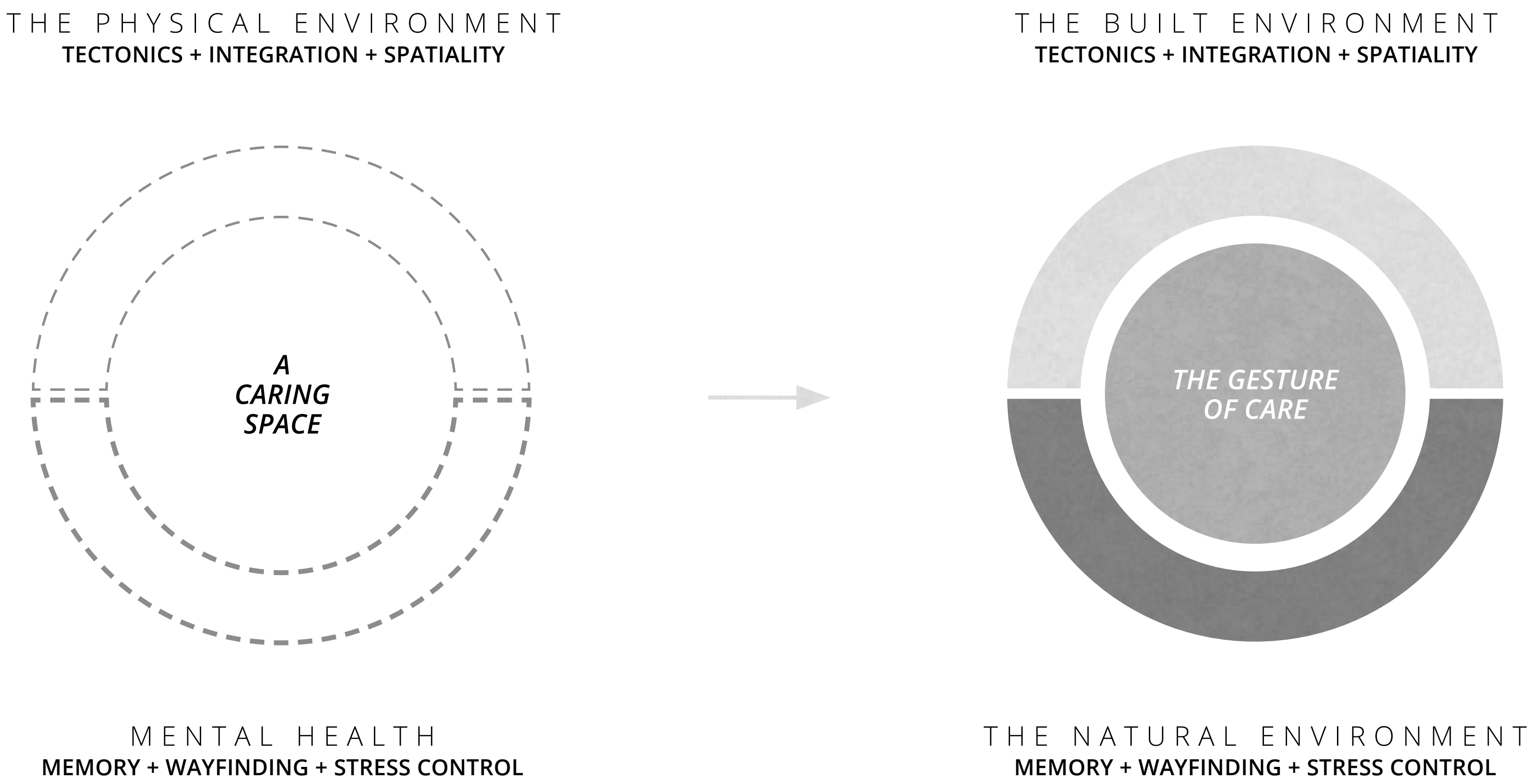
A CARING SPACE

GESTURE & PRINCIPLE

DESIGN FOR DEMENTIA

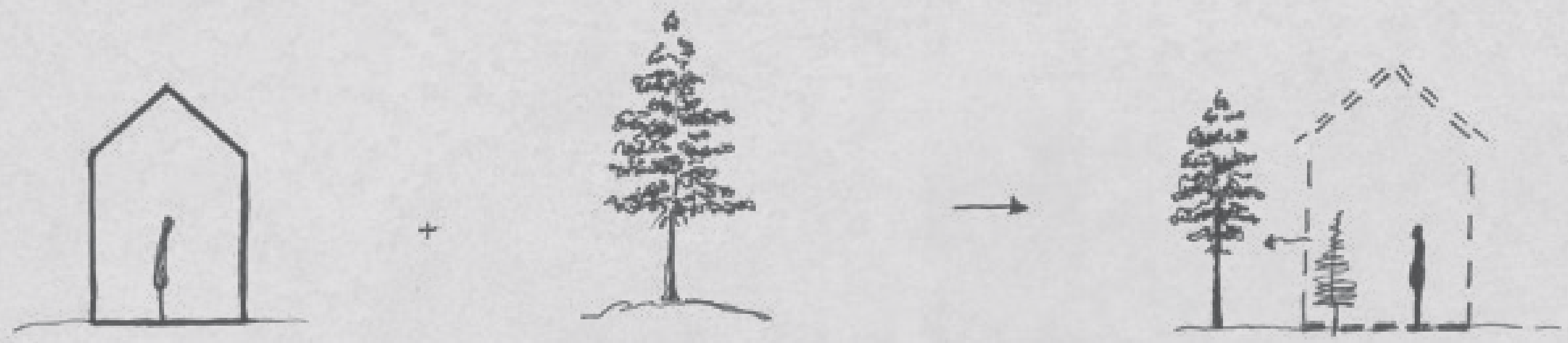
The *Gesture & Principle* chapter synthesizes the knowledge obtained throughout previous chapters to respond to the initial problem-orientation. As a result, a new-formed rhetorical question arises; a question that links problem and solution through means of 'gesture' and 'principle'. Thus, an architectural concept is approached. The concept is conveyed through a gestural interrelation between the built and the natural environment as a tectonic positioning within the site defined by an axial principle. Entailed is the conception of *a caring space* for people with dementia.

- BUILDING AND NATURE
- TECTONIC POSITIONING



▲ *Ill. 044: The evolution from a preliminary conception of the project into a synthesized conception in which the built and the natural environment constitutes the whole: The gesture of care.*

▶ *Ill. 045: Conceptual sketch of the synergistic merge between building and nature.*



B U I L D I N G   A N D   N A T U R E

THE PROBLEM-ORIENTATION, REINSTATED

In the pursuit of giving answer to the preliminary problem-orientation, an array of knowledge has been systematically obtained throughout the booklet. From gathering research information on dementia and establishing an understanding of its symptoms and progression, a nuanced perspective on the disease - and its link to the physical environment - was given. This fundamental understanding was synthesized into preemptive means and measures that, conveniently, were presented on-site in the natural environment and context of Hammer Bakker. Additionally, the site promoted significant qualities and traits that - through the means of design - are potentially linked to the application of tectonics.

Reinstating the preliminary problem-orientation: *How can a built environment facilitate the potential means and ends of tectonic spatiality and its quality, to preemtively enrichen both the physical and mental conditions for the elderly, exposed to dementia, while actively supporting the autonomy for them as individuals?* The answer to this ambiguous question seems to be manifested in the natural environment and the gesture that it translates in interrelation with the built environment. In short, the built environment can facilitate spatiality, quality, autonomy, and enrichment through its synergy with the natural environment; preemptively conditioning and complimenting the needs of impaired individuals through the physical environment.

Approaching an architectural concept, the notion of building and nature fundamentally repositions the problem-orientation. From this, a rhetorical question is formed: *How can tectonic spatiality facilitate a link between the built and the natural environment - and how can its architectonic quality preemptively reduce the progression of dementia (AD) through stress control, while promoting autonomy and freedom for the individual?*

THE GESTURE OF CARE

The link between the built and the natural environment is contrived through the gesture of care; the core aspect of the interrelation between the two. Together, they introduce the aspects of tectonics, integration, stimuli, memory, wayfinding, and stress control essential to the cause of the architecture. The envisioned quality of care translates through the characteristic qualities of the site in Hammer Bakker, articulating a sense of embraciveness and protectiveness from the valley within and an immediate presence of nature throughout the physical environment.

The experienced quality of care is moreso dependent on the means of its realisation; the principle of positioning the built environment within the natural environment, creating juxtaposed elements of architecture. Adherently, the immediacy of nature links to stimuli experiences, preemptive effects, and *neurobics*. Thus, the integration of views, daylight, structure, etc. support this perceived atmosphere and experience of the caring gesture. In the interdisciplinary analogy, both the reason for and the poetics of construction go hand-in-hand.

▸ *Ill. 046: Illustrations of the movements of the topography, translated through the two axis that conforms to the principle of its gesture.*

▾ *Ill. 047: Legend.*

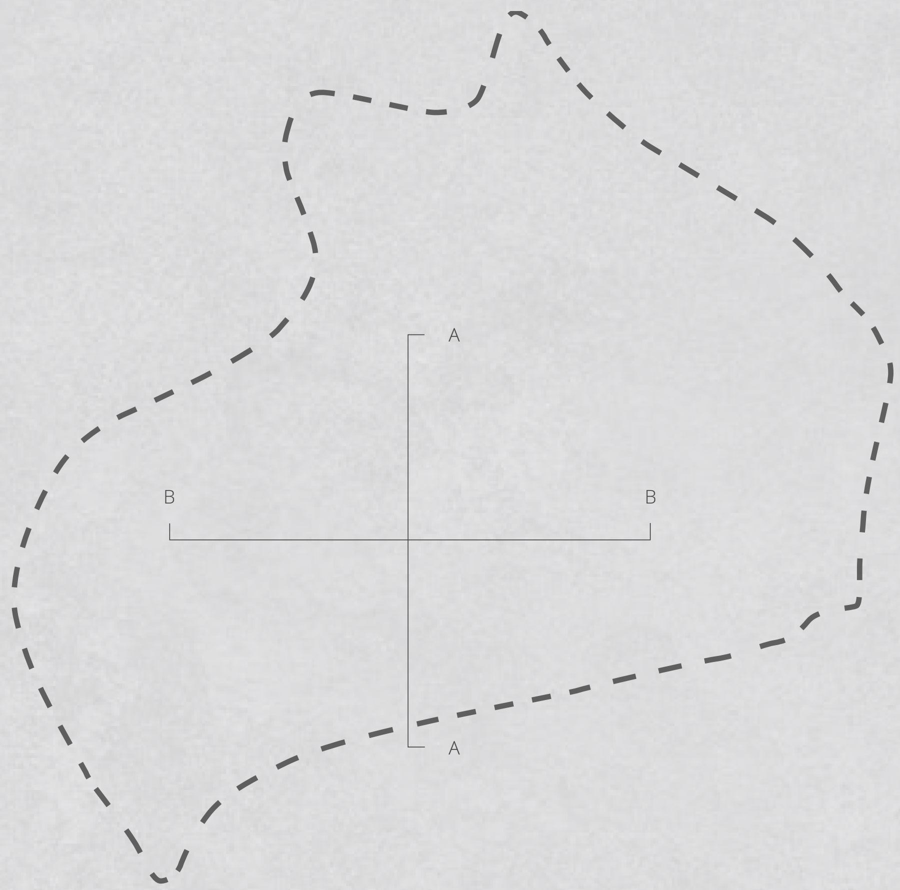
TECTONIC POSITIONING

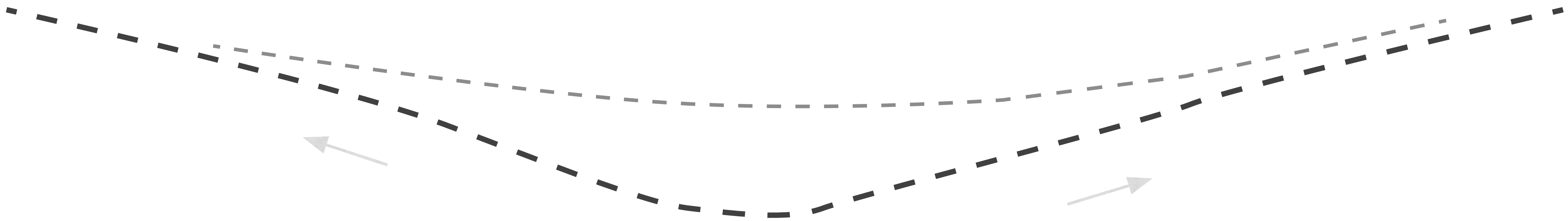
AXIAL MOVEMENTS

In order to situate the built environment within the natural environment, a principle of axial topographical movements is established. This principle is formed on the basis of the site and the topographical conditions thereof. From within the centralized valley, the adherent quality - and the caring gesture - of embraciveness and protectiveness is strongly articulated, as the surroundings are elevated, giving rise to heaths and tree-lines on three of four sides. As a means of exploiting this quality, the architecture positions itself within both the valley and the landscape, progressively adapting to the dynamic changes in height imposed by the topography.

THE PRINCIPLE AND THE STORY

The principle of positioning becomes the foundational means of conveying the poetic story of the meeting between building and nature. Relating to the design of the built environment, however, another scale of poetry is presented on the interior; one that reflects the poetry of its construction[59]. This relinks the gesturing notions of integrating views, daylight, and structure as their qualities relate to and substantiate architectural poetry as well. Thus, the poetry and story of the meeting between the built and the natural environment is facilitated through tectonics and vice versa. The tectonic approach of Gesture & Principle[60] hereby informs, directs, and contrives a caring space.





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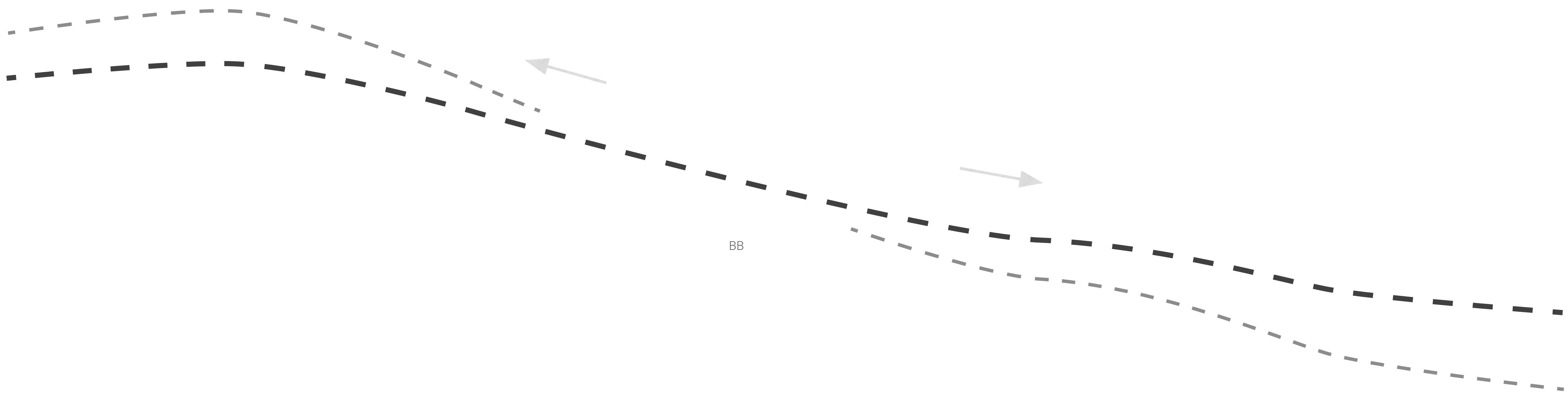

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A CARING SPACE

PRESENTATION

DESIGN FOR DEMENTIA

The *presentation* chapter exhibits the fruition of project in the format of explanatory illustrations, visualizations, architectural material, and construction details. In advance, an understanding of the architectural concept outlines the capacity of the project followed by an in-depth elaboration of the spaces within.

These contents are formed on the basis of tests and refinements through a tectonic approach of integrated design - more on this process in the following chapters.

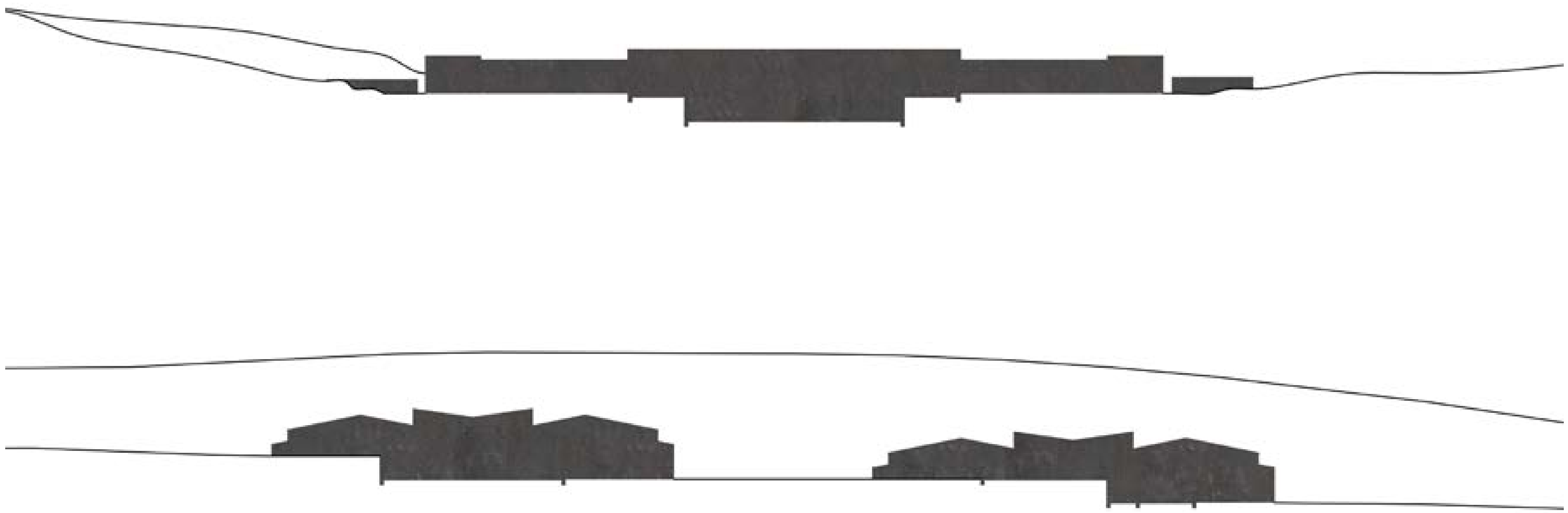
A R C H I T E C T U R A L   C O N C E P T

THE EXTERIOR PRINCIPLE

An architectural concept is founded on the meeting between the built environment and the natural environment, derived from the preemptive exploitation of the gesture of care that these - interrelated in the form of tectonic design - facilitate; both on the interior as well as the exterior scale.

On the exterior, the principle of tectonically positioning the building within the unique landscape conforms to the embracive and protective gesture of the site as a natural environment. The building modestly embeds itself in the valley, integrating into the nature, utilizing an axial principle related to the movements of the dynamic topography. From this composition, a juxtaposition of built and natural environments overlap, adherently exploiting individual qualities together. Additionally, both wild and cultivated nature is integrated in order to substantiate this notion whilst promoting stimuli experiences and *neurobics*.

Imitating the direction of the valley, the architecture opens up towards east, granting a view across the heaths and meadows of Hammer Bakker. The authentic presence of the immediate nature envelopes the complex as constituted by two buildings. In between, wilderness is kept in order to promote the nuanced phenomenological effects and experiences of the nature within, confining a vibrant sensory garden. At the far ends, embedded walls physically extrude and figuratively outline the perimeter, creating exterior areas, social spaces, and cultivated gardens. These are locally positioned from collectives and dwellings that define the private spaces.



▲ *Ill. 048: The exterior principle of tectonically positioning the built environment within the natural environment, embedded within the enveloping landscape.*

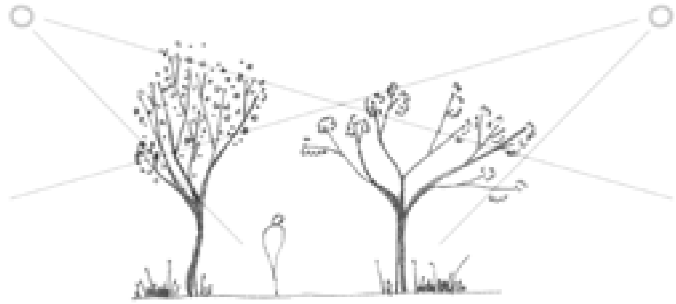
A R C H I T E C T U R A L C O N C E P T

THE INTERIOR PRINCIPLE

While the exterior principles facilitate the gesture of care through nature, so does the interior principles. However, the notion of nature as the common denominator in the dialogue between architecture and dementia informs the adversely constructional design and composition of the complex. Essentially, two underlying roof typologies and their associated constructional principles conveys the architecture as a whole; (1) the duo-pitch of the traditional home, facilitating private and semi-private function and (2) the contradictory v-roof, facilitating social and public functions.

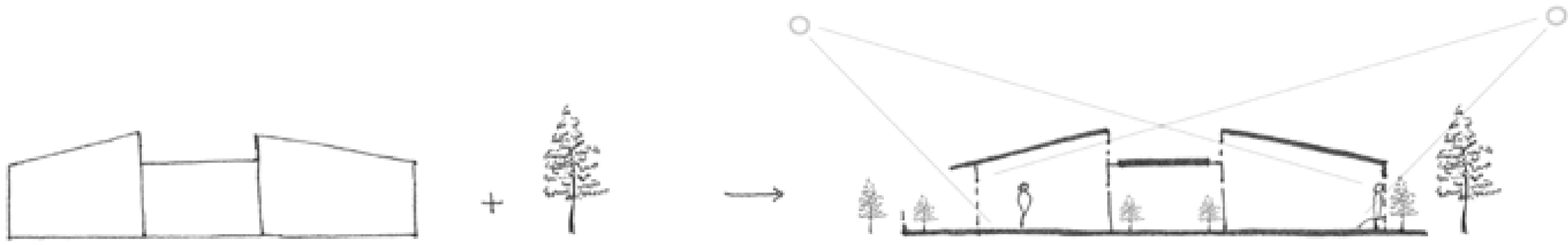
In juxtaposition, these contradicting roof typologies adherently compose the principle of funnelling generous amounts of daylight into the centralized main hall as well as the dwellings, simultaneously defining a lucidly recognizable distinction between social and private spaces. Supporting the unique spatiality within the hall, a visible ceiling structure is deliberately integrated to emphasize the locality as well as tectonically interact with the daylight and the acoustics of the hall. Additionally, the natural form of both roof typologies naturally integrate the principle of natural ventilation, evacuating polluted air via thermal buoyancy through the upper windows. These principles are crucially linked to the preemptive notions of health and well-being, memory, and wayfinding.

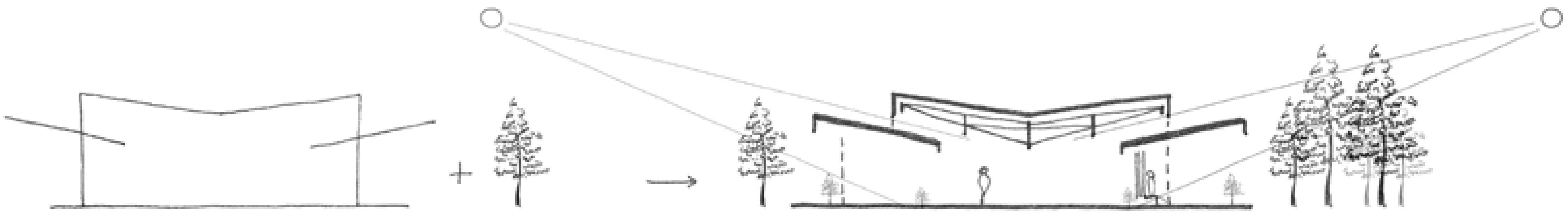
In the scope of stress control, the built environment of the complex integrates large transparent facades in all social spaces, minimizing the affects of social stressors and cortisol release on the impaired hippocampus by physical means. A synergy is achieved through the notions of integrating anchor points (in this instance defined by staged views toward the natural environment) and the integration of visual nature. Additionally, installations of vegetation are directly implicated in the interior, facilitating a immediate and physical connection to nature within.



GESTURE

PRINCIPLE





▲ Ill. 049: The interior principles of tectonically composing and juxtaposing the principles of daylight intake, and spatial distinction, and the integration of nature. Above, the source of inspiration (nature) is depicted, referencing the same gesturing qualities.

A CARING SPACE

Ill. 050: Render

Ill. 051: View towards the site.

The arrival at the building site begins with a journey trough the forest area of Hammer Bakker until one is met by a small opening in the tree-line southwest of the site where the road splits. Moving further into the site, the motif of a building emerged from nature appears between the tree-line. At this point the road splits again, one opening towards an entrance area with parking and another continuing along the back of the site establishing an access road for the second building.

The building site is protected by tall trees along its southern and western boarder, while the natural slope of the landscape is protecting the building along the northern side. Due to the tectonic positioning of the building, an embraced pocket of wild nature is seperating the two buildings creating a common exterior space in which the dwellers can insert themselves in a stimulating experience of nature. At the ends of each collective the meeting between the built and the natural is characterized cultivated and embraced environment, in which the dweller can seek retreat on an everyday basis.

▲ Ill. 052: Site plan (1:1000)

▲ *Ill. 053: Elevation West (1:500) of building 1.*

▲ *Ill. 054: Elevation East (1:500) of building 1.*

▲ *Ill. 055: Elevation East (1:500) of building 2.*

▲ *Ill. 056: Elevation North (1:500) of the complex.*

▲ *Ill. 057: Elevation South (1:500) of the complex.*

At the main entrance of the building the visitor arrives at a small parking area paved with sandstone gravel and embraced by the western tree-line. This clearing in the forest defines the first steps trough the complex, and as one looks towards the entrance from this spot, it becomes clear how the built environment naturally merges with the natural to create a warm and embracing atmosphere. Moving down the sloping pavement from the parking to the entrance one gets the feeling of descending into an embracive atmosphere created by the meeting between building and nature. From a distance the entrance seems inviting and as one gets closer the scale adapts to the that of the human body.

▲ Ill. 058: Entrance

ANNOTATIONS

1 Parking
2 Entrance Courtyard
3 Cultivated Garden
4 Green Garden
5 Terrace
6 Wilderness Garden
7 Entrance Courtyard
8 Secondary Entrance

▲ *Ill. 059: Floor plan (1:500) of the complex*

 ▲ *Ill. 060: Sections AA (1:200)*

The main hall of each building defines the central node and gathering space for the residents, their relatives and the staff. At the same time it is a space that provides the dwellers with stimulating experiences everyday through the immediate presence of wild nature, interior motifs of nature as well as the process of making food as a social experience. The structure in the ceiling ads to the experience of nature flowing into the space as it is mirroring motifs found in nature. Due to the placement of the skylight window, direct sun will only enter the space from this point a few hours everyday.

As the sunlight is reflected on the structure in these rare hours this motif mirrors that of sunlight filtering trough the tree tops of a forest. Additionally the hall is characterized by the fluent transition between zones, only defined by the use of timber elements and vegetation as a contrast to the white concrete walls. In the center of the room a large open kitchen is placed to offer the resident the experience of watching their food being made. In the first building a double height space is found in front of the kitchen, making the flow between zones even more fluent, as well as providing the residents with an extra gathering area and access to the wild nature between the buildings.

▲ Ill. 061: Main hall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▲ *Ill. 062: Main Hall, level 00 (1:200)*


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ANNOTATIONS

1 Elevator
2 Kitchen
3 Food elevator
4 Dining hall
5 Staff lounge
6 Shared accessible toilet
7 Shared toilet
8 Technical room
9 Staff locker room
10 Kitchen depot
11 Cold room
12 Staff office and meeting room
13 Clean depot
14 Dirty depot and laundry room
15 Parking lots

▲ *Ill. 063: Main Hall, level -1 (1:200)*

A section trough the central hall of both buildings makes it clear how the tectonic positioning of the complex cleverly exploits the natural properties of the valley to create two hall spaces that are accessible from two directions on to different levels. This creates a pragmatic solution that allows to use the bottom floor of the first building as a backstage area for the staff functions and deposits as well as a space for larger gatherings, while the main floor that is directly accesible from the dwellings is kept undisturbed. In the second building the area beneath the large terrasse is utilized for parking. This configuration also makes it possible for both buildings to interact with the surrounding nature in two ways from the same space. Terrasse area in both buildings one can have a view over the landscape, at ones being part of the wild nature while distanced from it. In another instance one can have direct acces to the imidiate nature between the buildings.

▲ Ill. 064: Sections BB (1:200)

As a contrast to the untamed nature between the buildings and around the site, a more controlled approach of cultivated nature is used at the collectives to establish a nurturing retreat in which the dweller can feel safe and move around freely in a shared garden space for the dwellings. The cultivated scale of nature is continuously used in the interior design of the whole complex as well, to promote the contact to nature as a healing element throughout the whole complex.

Focusing on the exterior space at the collective, this is created by the meeting between the built and the natural, where two brick walls at the end of each collective pushes back the landscape to create a protective pocket inside the hill. The ground in front of the dwellings is paved with granite tiles, placed in a pattern that naturally creates plantation areas while allowing the dwellers to move around freely. Additionally small areas in front of each dwelling is loosely defined by planting boxes around it, to maintain a semiprivate area as an extension of the dwelling.

▲ Ill. 065: Cultivated garden

The second building is not provided with the experience of the double height space found in the first building. Instead this central hall extents towards east into a large exterior balcony oriented around a void through which two of the trees on site grows, creating the experience of walking around the tree tops. Additionally plantation and seating is integrated on this balcony, creating yet another experience of this meeting between the built and the natural. This balcony provides an opportunity of extending the dining situation outdoors into a green space with a view over the landscape of Hammer Bakker. The large area that the balcony covers is utilized for parking and the establishment of a secondary entrance for visitors and staff members connected to the second building.

▲ Ill. 066: Outdoor terrace area

The space connecting the dwellings with the central hall is known as the neighbourhood space is establishing a gradual transition from the private and intimate nature of the collectives to the social and stimulating nature of the gathering hall. The functional idea with the neighbourhood is to create a space for different types of social activities reserved for the twelve dwellers living in that particular neighbourhood. From the hall this space is accessed through a door, to promote the sensation of moving further into more private spaces of the home.

To create a slight separation between the activity space and the dwellings a level difference of 40 cm is applied. As a result the ground of the exterior space in front of the window is in level with the interior seating height integrated into the window frame. Trough this invention the window seating is creating the experience of sitting in direct contact with the exterior nature, and by opening the window panels the two spaces extend into each other.

▲ *Ill. 067: The activity room*

ANNOTATIONS

1 Activity Space
2 Shared Toilet
3 Depot (Activity Space)
4 Depot (Collective)
5 Quite Corner
6 Wet Room
7 Collective Hall
8 Dwelling with Garden
9 Dwelling with Terrace
10 Open Kitchen (Collective)
11 Shared Living Room (Collective)
12 Technical Room (Collective)
13 Depot (Garden)

▲ Ill. 068: Floor plan (1:200) of the collectives

Two different dwellings are designed for the complex both considering how a compact dwelling can be considered towards people with dementia by establishing a strong sense of home and thereby becoming part of the dwellers identity and relation to the world. One dwelling type is oriented towards dwellers who are still partly autonomous with a plan layout that creates a fluent motion between the different zones from the kitchen to the window niche, the bedroom and the bathroom. Even the bathroom is carefully designed with the focus of creating a nice bathroom for a handicapped person.

The furnishing is integrated and removable to make movement easier for a person in a wheelchair. These dwelling types are all oriented towards the common green area between two collectives. The other dwelling is design towards less autonomous, more introvert or even bed bound dwellers, with the focus of having everything in close proximity to the bed. Additionally part of the interior has been removed in favor of a larger private exterior space with the possibility of moving the bed outside. Both dwelling types uses the contrast between the warm timber and the white concrete to highlight zones in which the dweller can interact with the dwelling.

▲ *Ill. 069: The dwelling*

ANNOTATIONS

1 Entrance Area
2 Kitchenette
3 Living Room
4 Integrated Seating
5 Bedroom
6 Private Toilet
7 Private Terrace

▲ Ill. 070: Floor plan (1:100) of the dwelling

Based on investigations of Realdania's therapy gardens[61], specific types of gardens can improve mental health problems as they consist of several different layers of nature. Three instances of nature that is especially important to create a therapeutic garden for mentally ill are cultivated and protected nature, wild nature and nature that is rich on species. This is the reason why the project works with the contrast of the embraces cultivated nature at the collectives and the wild nature between the buildings. The area between the buildings is kept untouched with the exception of a single path connecting the two buildings. This provides the dwellers with the feeling of being able to freely explore the landscape. Due to the topographical conditions as well as the tectonic positioning of the building there is no need for closing the area completely off. In not doing so the design promotes a strong sense of freedom for the individual while softly protecting them through the meeting between building and nature.

▲ *Ill. 071: Wilderness garden*

▲ *Ill. 072: Perspective section of the main hall space.*

▲ *Ill. 073: Perspective section of the dwelling space.*

MATERIALS AND VEGETATION

MATERIALS

The materiality of the design strives to be considered towards the condition of the dwellers since dementia (AD) affects the way colour and materiality is perceived by the individual. Additionally the design has to be respectful towards the natural setting it is placed in, hereby letting building and site meet in a symbiotic relationship that enhances rather than compromises the qualities of the landscape. To do so the exterior cladding is executed in a combination of western red cedar and a brick with a subtle and earthy appearance. The exact brick used in the project is from Petersen Bricks type D190[62], combined with a light mortar to avoid a heavy appearance. The bricks are mainly used on the collective buildings, since it establishes a reference of a well known building material used in Danish building traditions. The attempt is to build a strong image of what the dwellers would associate with a house, thereby giving them a stronger connection to the space and a sense of home.

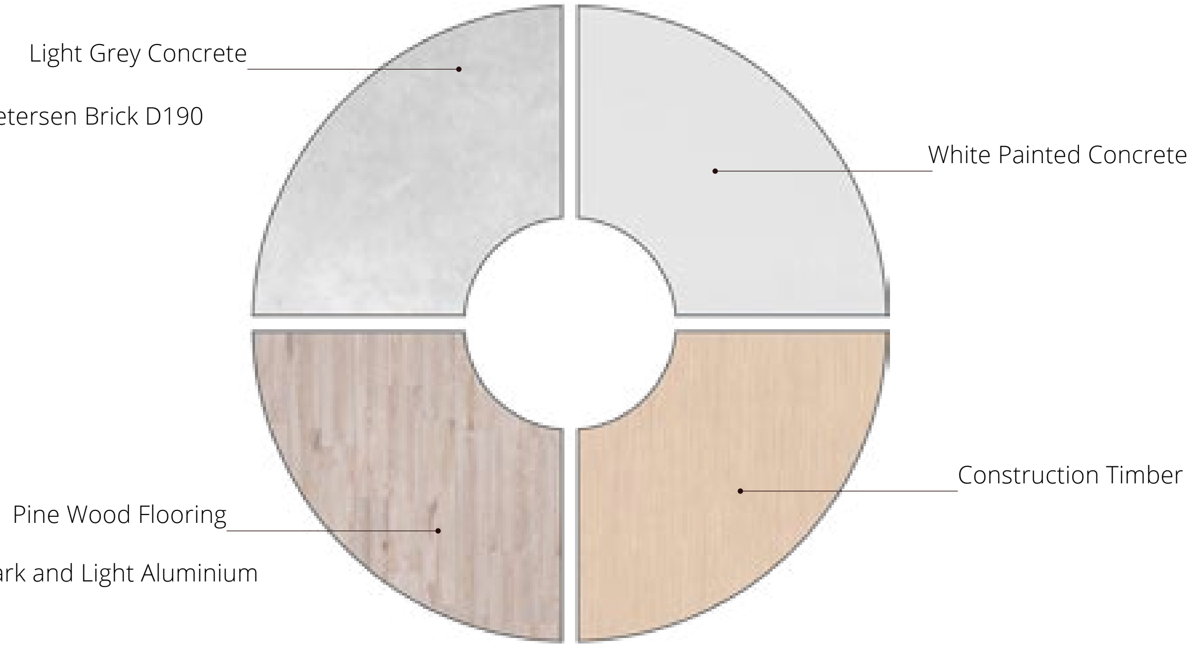
On the walls that holds back the landscape as well as the brick railings around the dwellings, the brick formation is arranged in a manner that creates a pierced wall from which vegetation can grow, making it a green wall. Hereby the design adds yet another level of the integration that physically merges building elements with nature. The timber cladding is used in the pocket of the dwellings, the roofs as well as the upper part of the central building part. Due to the tectonic positioning of the building and the application of large timber surfaces, including all roof surfaces, it appears as if the building is naturally emerging from the landscape. The Western Red Cedar is chosen for its warm and welcoming colour as well as its high resistance to the Nordic climate[63]. On the roof flashings of the collective buildings as well as the handrails, a black painted aluminium is utilized to distinguish the edge that defines a material shift, as well as defining the horizontallity that stretches across the valley. A light aluminium material is used on the window frames to create a undisturbed view.

Due to the way people with dementia (AD) perceives colour, it is important to establish contrasts in the design to promote autonomy. Though it is important to avoid patterns of high contrast on the floors since this can be mistaken for obstacles.[64] For this reason the interior uses soft contrast between concrete and timber to define the difference between transit and embracing places to sit. To distinguish a difference from flooring to walls the floor is made in a light grey concrete and the walls in white painted concrete or gypsum. Although, to define more intimate an embracing zones, such as the dwellings or the collective living area, timber floors of pine wood is used due to its light appearance and high reflection. The structure, the railings and other integrated timber elements are executed in construction timber or another timber type of similar appearance.

VEGETATION

As an addition to the interior application of timber, a series of plants are also integrated throughout the complex as a continuation of merging building and nature, and to further distinguish zones of interest, in which the dweller can interact with an embracing space inside the space. A handful of important plants has been chosen for the interior due to their ability to improve the indoor climate. These are Spathiphyllum (Peace Lilly), Chamaedorea (Table palm), Ivy (Hedera), Fern and Tillandsia. All these plants has been chosen due to their ability to lower the humidity inside a building, and since the design is a complex that houses many people their is a risk of high humidity levels that will compromise the comfort levels for the dwellers. The plants are all suitable for growing in an indoor environment and are not in need of much care.[65] In addition to these five vegetation type the hibiscus flower is also applied to the list due to its strong colour and healing effects. The flowers of this plant can be utilized in making a tea that can balance cholesterol and blood pressure which are both common health issues with elderly.[66] In this way the flower promotes a common activity between dwellers and staff to gatherer the plants and make tea, while it benefits the general health and well being of the elderly living in the home.

▲ *Ill. 074: Choice of materials for the exterior*



▲ *Ill. 075: Choice of materials for the interior*

Spathiphyllum (Peace Lilly) | Chamaedorea (Table palm) | Ivy (Hedera) | Fern | Tillandsia | Hibiscus

▲ *Ill. 076: Choice of vegetation for the interior*

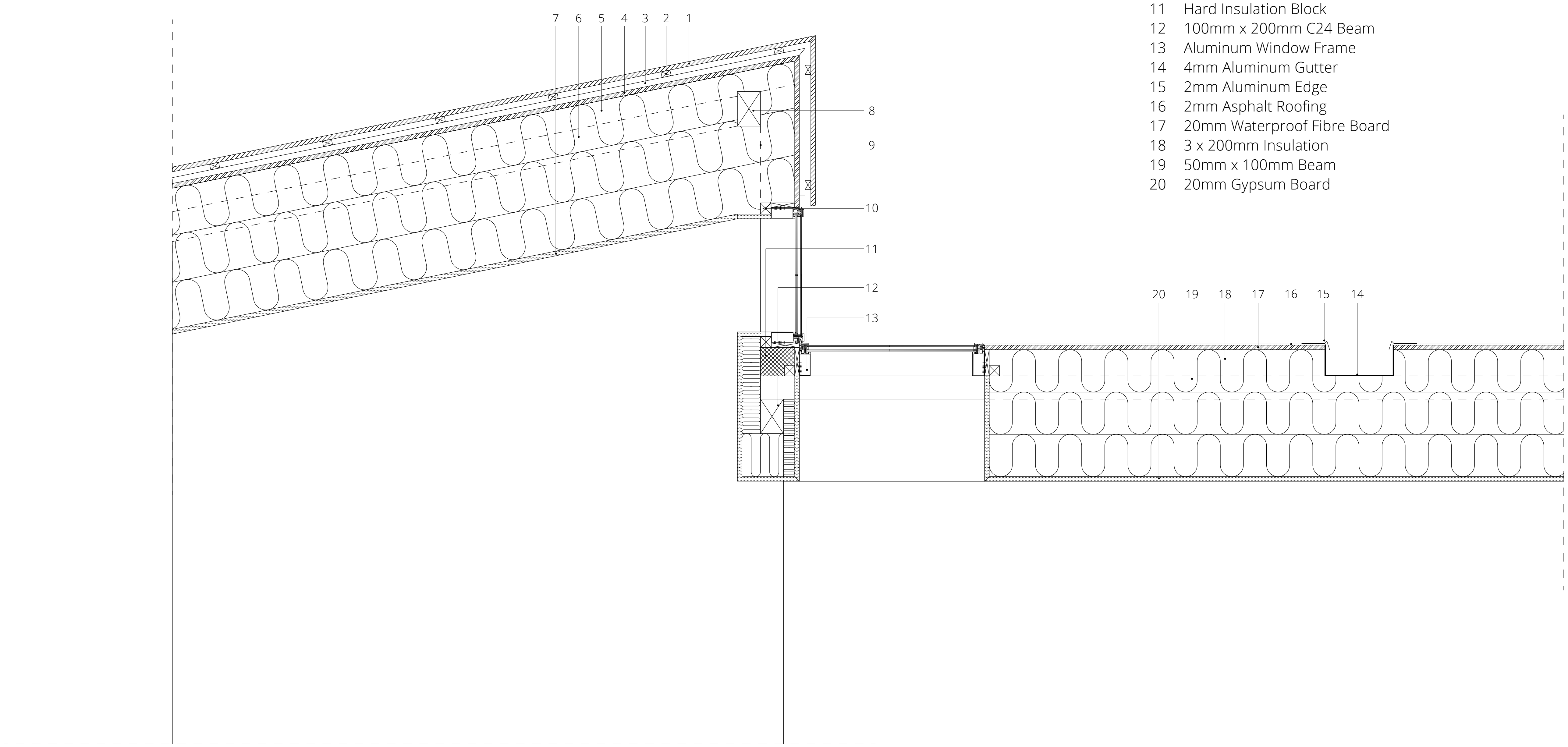
CONSTRUCTION DETAILS

THE COLLECTIVE

Due to the complex nature of the buildings construction the design requires a set of details to solve the most challenging sections of the building. This is important to ensure that the construction of the detail establishes a reasonable solution that does not compromise but rather enhances the atmosphere in the given space of situation the detail is found in. The first detail is found at the point where the sloping roof of the dwelling meets the flat roof of the hallway between the dwellings. In this instance a vertical skylight meets a horizontal skylight in a corner with the risk of creating a cold bridge. Since the skylights are important to the experience of entering and staying in the dwelling, the detail is designed as seen on the following page.

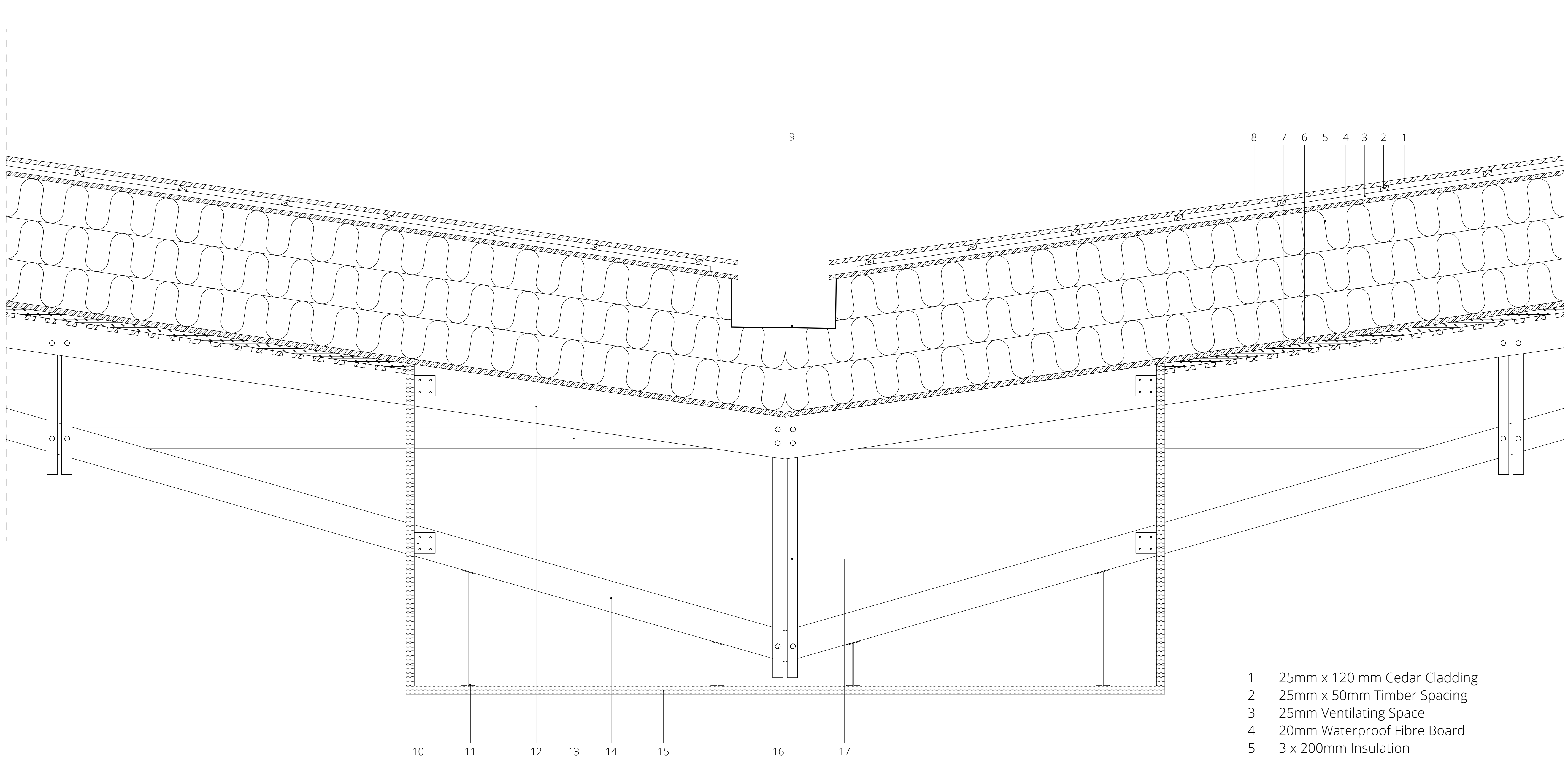
THE COLLECTIVE

Since the hall constitutes the meeting of several inwards sloping roofs with hidden gutters and windows in different positions, it is also here important that the detail is solved correctly to ensure that it compliments the intentions of the space and the structure. The two details from the hall are illustrating how the two sloping roofs are meeting with a skylight window and how the hidden gutters are placed in the roof. Additionally they show how the structure becomes part of the full construction and how acoustical panels are integrated in between each truss element.



1 25mm x 120 mm Cedar Cladding
2 25mm x 50mm Timber Spacing
3 25mm Ventilating Space
4 20mm Waterproof Fibre Board
5 3 x 200mm Insulation
6 50mm x 100mm rafter (behind insulation)
7 20 mm Gypsum Board
8 100mm x 200mm C24 Beam
9 200mm Concrete Wall Behind
10 45mm x 45mm Timber Mount for Windowframe
11 Hard Insulation Block
12 100mm x 200mm C24 Beam
13 Aluminum Window Frame
14 4mm Aluminum Gutter
15 2mm Aluminum Edge
16 2mm Asphalt Roofing
17 20mm Waterproof Fibre Board
18 3 x 200mm Insulation
19 50mm x 100mm Beam
20 20mm Gypsum Board

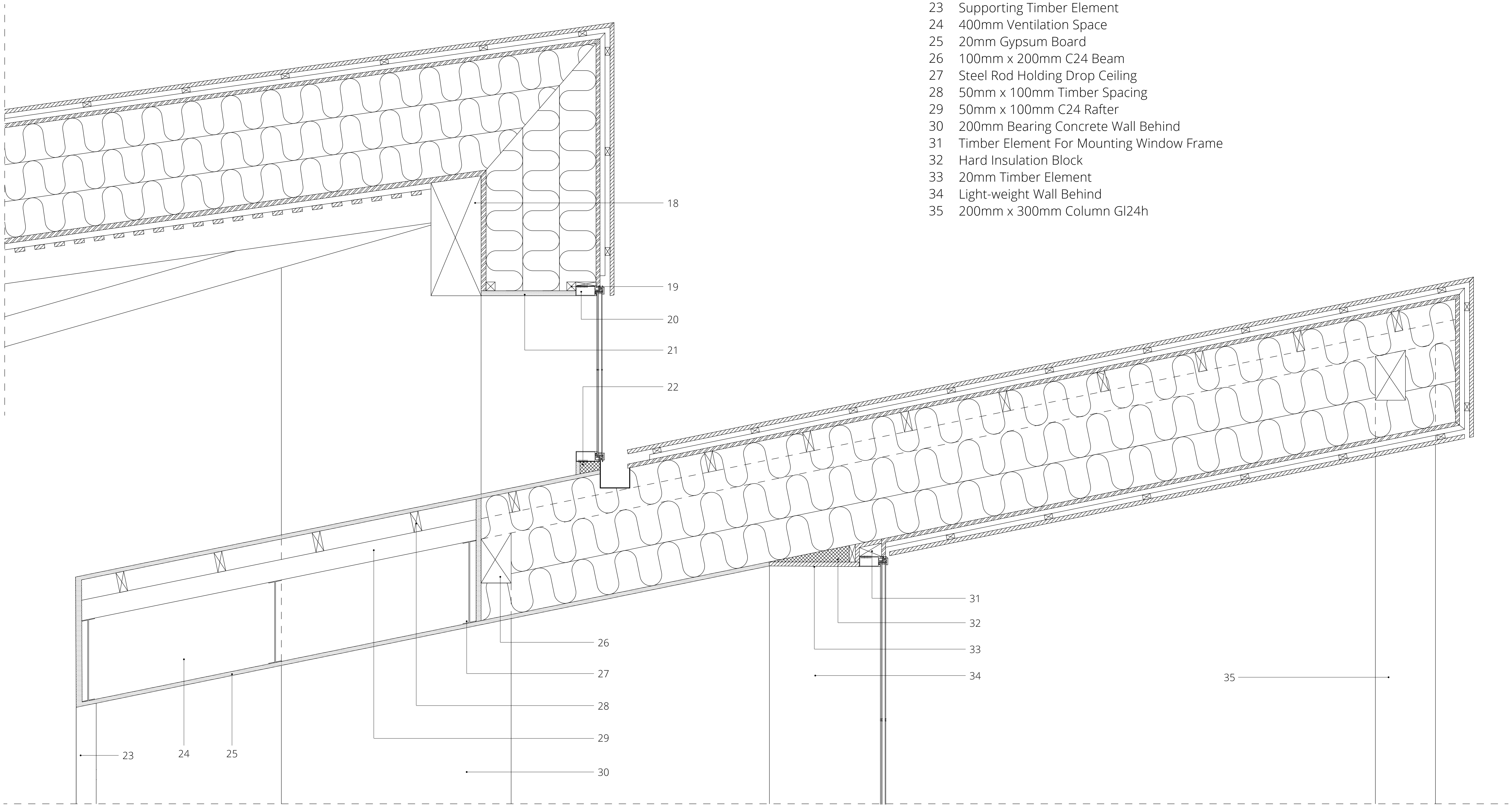
▲ *Ill. 077: Construction detail (1:20)*



1 25mm x 120 mm Cedar Cladding
2 25mm x 50mm Timber Spacing
3 25mm Ventilating Space
4 20mm Waterproof Fibre Board
5 3 x 200mm Insulation
6 20mm Plywood
7 40 mm Acoustical Foam (Black)
8 20mm x 50mm Timber Elements
9 4mm Aluminium Box Gutter
10 2mm Steel Mount For Drop Ceiling
11 Steel Rod Holding Drop Ceiling
12 2 x 50mm x 200mm C24
13 50mm x 100mm C24
14 50mm x 150mm C24
15 40mm Gypsum Board
16 20mm Steel Dowels
17 4 x 50mm x 50mm C24

▲ *Ill. 078: Construction detail (1:20)*

18 300mm x 600mm Beam Gl24h
19 45mm x 45mm Timber Mount for Window Frame
20 Aluminium Window Frame
21 20mm Gypsum Board
22 Hard Insulation Block
23 Supporting Timber Element
24 400mm Ventilation Space
25 20mm Gypsum Board
26 100mm x 200mm C24 Beam
27 Steel Rod Holding Drop Ceiling
28 50mm x 100mm Timber Spacing
29 50mm x 100mm C24 Rafter
30 200mm Bearing Concrete Wall Behind
31 Timber Element For Mounting Window Frame
32 Hard Insulation Block
33 20mm Timber Element
34 Light-weight Wall Behind
35 200mm x 300mm Column Gl24h



▲ Ill. 079: Construction detail (1:20)

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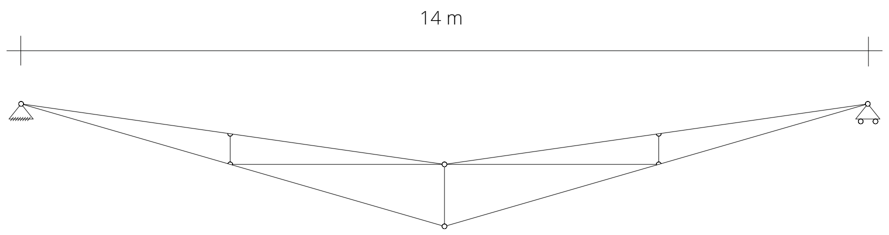
A CARING SPACE

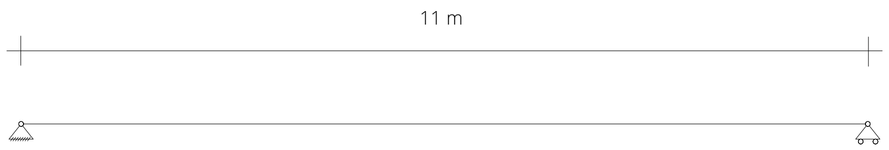
STRUCTURE AND CONSTRUCTION

DESIGN FOR DEMENTIA

The *Structure and Construction* chapter regards the primary structural challenges within the architectural design in order to certify static equilibrium. The case for individual loads and load combinations are defined as the basis for dimensioning the ceiling structures inside the main hall. As the result of an interdisciplinary approach, the qualities and effects that this construction adds to the space within are emphasized in parallel to Frampton's tectonic notion of *poetics of construction*.

- LOAD AND LOAD COMBINATIONS
- DIMENSIONING THE TRUSS
- DIMENSIONING THE BEAM
- DIMENSIONING THE JOINT





L O A D S A N D L O A D C O M B I N A T I O N S

THE DISCIPLINE OF ENGINEERING

In the interplay between architecture and engineering, the construction of a design must conform to the rules and guidelines that are technically requisite to its realization. In that sense, these disciplines integrate in the process of giving form to spaces, defined by the fundamental purpose of its architecture (referring to Throne's notion). In relation to the project, the main focus is the space and structure of the main hall.

Engineering a visible structure for the main hall is substantiated by the notions of memory and wayfinding as well as the integration of daylight. By articulating a unique and recognizable spatial experience, the structure is adherently visible in the ceiling, carrying the construction of a V-roof and enables an intake of daylight in its far ends. Thus, the structure facilitates both the construction and the experienced space within.

Structurally, two elements are examined and verified for static equilibrium in the following; the visible truss structure and the its supporting beam. As the beam rests on concrete wall elements, the criticality of these elements is disregarded. This is done in correspondence with the rules and guidelines of the Eurocodes (EC) and Dansk Standard (DS).

PARAMETERS

Focusing on the critical case of the truss and beam structures in the main hall, the following parameters are fundamental in dimensioning the main halll strucutres.

$\alpha = 8{,}1°$ is the roof pitch angle of the V-roof
$l_{c/c} = 0{,}5m$ is the center-to-center lenght between two trusses
$l_b = 11m$ is the critical unsupported span of the beam
$z = 9m$ is the construction height above the terrain

LOAD COMBINATIONS, EXPLAINED

In order to verify static equilibrium of the truss structure in the main hall, a basic understanding of loads and load combinations is required. The basic formula for calculating the combination of loads is defined by the following equation:

$$\sum_{j\geq1}\gamma_{G,j}\cdot G_{k,j}"+"\gamma_{Q,1}\cdot Q_{k,1}"+"\sum_{j>i}\gamma_{Q,i}\cdot\psi_{0,i}\cdot Q_{k,i}$$

in which

$G_{k,j}$ delineates the permanent actions (self-weight)
$Q_{k,1}$ delineates the leading variable action (typically the imposed load)
$Q_{k,i}$ delineates the accompanying variable actions (snow and wind load)

To ensure reliability differentiation, the individual partial factors, γ, account for risks associated with a class specific case.[67] Depending on the case, the partial factor is set to increase its assigned action accordingly. In context:

$\gamma_{G,j} = 1{,}1$ is assigned to the permanent actions
$\gamma_{Q,1} = 1{,}5$ is assigned to the leading variable action
$\gamma_{Q,i} = 1{,}5$ is assigned to the accompanying variable actions

Furthermore, a multiplication factor, K_{FI}, is assigned each partial factor, relating to the consequences classes specified in the Eurocodes.[68] In this case, the RC2 classification, $K_{FI} = 1$, is chosen which mathematically disregards the factor.

Lastly, the combination factor, $\psi_{0,i}$, accounts for the weight of the accompanying variable actions relative to their load type. [69] For wind, $\psi_{0,i} = 0{,}3$.

PERMANENT ACTIONS

As the permanent action imposed on the structure, the self-weight, $G_{k,j}$, is determined using the standards for calculating light-weight roof constructions. In order to do so, the standardized weight of the construction, $300N/m^2$, is multiplied by the effective length, $0{,}5m$, between two trusses. Hereby, the self-weight is deduced from the following equation:

$$G_{k,j} = 300N/m^2\cdot 0{,}5m$$
$$= 150N/m \sim 0{,}15kN/m$$

LEAD VARIABLE ACTION

As the lead variable action, $Q_{k,1}$, no imposed load is considered on the roof structure as the roof is not accessible by people or occupied by e.g. furniture. Hence the absence of an imposed load, the lead variable action is defined by an accompanying variable action; whichever one constitutes the leading action defined by the value of its load.

ACCOMPANYING VARIABLE ACTIONS

As the accompanying variable actions, $Q_{k,i}$, two loads are considered: Snow load and wind load. Notably, the calculation of these loads are dependent on the shape and form of the roof construction; a notion that relates to the implication of a V-roof. Despite sharing this dependency, the two loads are calculated individually in the following.

SNOW LOAD

The snow load, Q_s, on roofs for persistent or transient design solutions is deduced as a surface load in the following:

$$s = \mu_i\cdot C_e\cdot C_t\cdot s_k$$

in which

$\mu_i = 1{,}1$ is the snow load shape coefficient (EC 5.3.2)
$C_e = 1{,}0$ is the exposure coefficient (normal terrain)
$C_t = 1{,}0$ is the thermal coefficient
$s_k = 0{,}9kN/m^2$ is the characteristic value of snow load on the ground

$$s = 1{,}1\cdot 1{,}0\cdot 1{,}0\cdot 0{,}9kN/m^2$$
$$= 0{,}99kN/m^2 \sim 1{,}0kN/m^2$$

To paraphrase the resulting surface load as a line load, the center-to-center lenght between two trusses, $l_{c/c} = 0{,}5m$, is applied:

$$Q_s = s\cdot l_{c/c}$$
$$= 1{,}0kN/m^2\cdot 0{,}5m$$
$$= 0{,}5kN/m$$

WIND LOAD

The wind load, Q_w, is more extensive to deduce as it considers an array of conditions and factors. Firstly, the basic wind velocity, v_b, defined as a function of wind direction and time of year at 10 meters above the terrain[70], is determined from the equation:

$$v_b = c_{dir}\cdot c_{season}\cdot v_{b,0}$$

in which

$c_{dir} = 1{,}0$ is the directional factor
$c_{season} = 1{,}0$ is the seasonal factor
$v_{b,0} = 24m/s$ is the fundamental value of the basic wind velocity

$$v_b = 1\cdot 1\cdot 24m/s$$
$$= 24\ m/s$$

Secondly, the mean wind velocity, $v_m(z)$, at the defined height, z, above the terrain, depends on the roughness and orography of the terrain as well as the basic wind velocity, v_b.[71] It is determined from the following equation:

$$v_m(z) = c_r(z)\cdot c_o(z)\cdot v_b$$ in which

$c_r(z)$ is the roughness factor
$c_o(z)$ is the orography factor
$v_b = 24m/s$ is the basic wind velocity

However, the roughness factor, $c_r(z)$, must be deduces from either of the following expressions dependant on the case:

$$c_r(z) = c_r(z_{min}) \quad \text{if} \quad z \leq z_{min}$$

or

$$c_r(z) = k_r \cdot \ln\left(\frac{z}{z_0}\right) \quad \text{if} \quad z_{min} \le z \le z_{max}$$

in which

$z_0 = 0{,}3m$ is the roughness length, here, associated with *terrain category III*
k_r is the terrain factor dependant on the roughness length, z_0.

Given that the construction is at the height, $z = 9m$, above the terrain, then the expression $z_{min} \le z \le z_{max}$ fits the case as $5m \le 9m \le 200m$. Thus, the roughness factor, $c_r(z)$, should be determined from the associated equation. However, to do so requires the terrain factor, K_r, which is deduced from the following equation:

$$k_r = 0{,}19 \cdot \left(\frac{z_0}{z_{0,III}}\right)^{0{,}07}$$

in which

$z_{0,III} = 0{,}3$ is associated with *terrain category III*
$z_{min} = 5$ is associated with *terrain category III*
$z_{max} = 200m$ is the maximal height

$$k_r = 0{,}19 \cdot \left(\frac{0{,}3m}{0{,}3m}\right)^{0{,}07}$$
$$= 0{,}19$$

Hereby, the roughness factor, $c_r(z)$, can be deduced through the equation:

$$c_r(z) = 0{,}19 \cdot \ln\left(\frac{9m}{0{,}3m}\right)$$
$$= 0{,}65$$

The orography factor, $c_o(z)$, is simply deduced from the Eurocodes. The factor considers the increase of wind velocities due to topographical conditions e.g. significant hills, cliff, etc. In this case $c_o(z) = 1{,}0$ as the terrain is occupied by a considerable amount of trees and vegetation.[72]

To summarize, the mean wind velocity, $v_m(z)$, depends on the following:

$$v_m(z) = c_r(z) \cdot c_o(z) \cdot v_b$$

in which

$c_r(z) = 0{,}65$ is the roughness factor
$c_o(z) = 1{,}0$ is the orography factor
$v_b = 24m/s$ is the basic wind velocity

$$v_m(z) = 0{,}65 \cdot 1 \cdot 24m/s$$
$$= 15{,}6m/s$$

Thirdly, the wind turbulence intensity, $I_v(z)$, at the defined height, z, above the terrain, must be deduces from either of the following expressions dependant on the case:

$$I_v(z) = I_v(z_{\min}) \quad \text{if} \quad z \le z_{min}$$

or

$$I_v(z) = \frac{k_I}{c_0(z) \cdot \ln\left(\frac{z}{z_0}\right)} \quad \text{if} \quad z_{min} \le z \le z_{max}$$

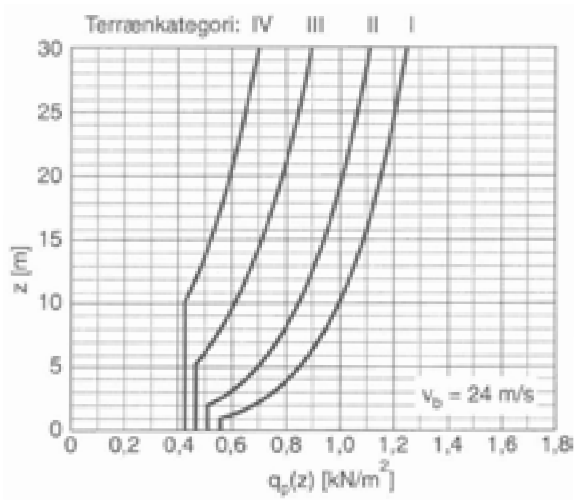
in which

$k_I = 1{,}0$ is the turbulence factor[73]
$c_o(z) = 1{,}0$ is the orography factor
$z = 9m$ is the construction height above the terrain
$z_0 = 0{,}3m$ is the roughness length

Again, hence the expression $z_{min} \le z \le z_{max}$ fits the case as $5m \le 9m \le 200m$, the wind turbulence intensity, $I_v(z)$, should be determined from the associated equation:

$$I_v(z) = \frac{1}{1 \cdot \ln\left(\frac{9m}{0{,}3m}\right)}$$
$$= 0{,}29$$

Fourthly, the peak velocity pressure, $q_p(z)$, at a height, z, above the terrain, is determined from a table[74] relative to the terrain category, III, and the construction height above the terrain, $z = 9m$.



The table applies to peak velocity pressure, $q_p(z)$, related to the cases where the turbulence factor $c_o = 1{,}0$ and the orography $K_I = 1{,}0$. As a result: $q_p(z) = 0{,}6kN/m^2$

Fifthly, given that the construction is a V-roof, the external wind pressure coefficient, C_{pe}, is determined from a table[75] relative to the roof pitch angle ($\alpha = -8{,}1°$) and a zone for wind direction, $\theta = 0°$.

Table 7.4a — External pressure coefficients for duopitch roofs

Pitch Angle α	Zone for wind direction θ = 0°									
	F		G		H		I		J	
	$c_{pe,10}$	$c_{pe,1}$	$c_{pe,10}$	$c_{pe,1}$	$c_{pe,10}$	$c_{pe,1}$	$c_{pe,10}$	$c_{pe,1}$	$c_{pe,10}$	$c_{pe,1}$
-30°	-1,1	-2,0	-0,8	-1,5	-0,8		-0,6		-0,8	-1,4
-15°	-2,5	-2,8	-1,3	-2,0	-0,9	-1,2	-0,5		-0,7	-1,2
-5°	-2,3	-2,5	-1,2	-2,0	-0,8	-1,2	+0,2		+0,2	
							-0,6		-0,6	

To simplify, two external pressure coefficients, $C_{pe,H}$ and $C_{pe,I}$, are defined relative to their zone.

$C_{pe,H} = -0{,}9$ as zone H is in tension
$C_{pe,I} = -0{,}5$ as zone I is in tension

Finally, the wind pressure acting on the external surfaces, w_e, is deduced from the following equation:

$$w_e = q_p(z) \cdot c_{pe}$$

in which

$q_p(z) = 0{,}6kN/m^2$ is the peak velocity pressure
c_{pe} is the external wind pressure coefficient relative to zone H or I.
$c_{pe,H} = -0{,}9$ relative to zone H
$c_{pe,I} = -0{,}5$ relative to zone I

$$w_{e,H} = 0{,}6kN/m^2 \cdot (-0{,}9) = -0{,}54kN/m^2$$
$$w_{e,I} = 0{,}6kN/m^2 \cdot (-0{,}5) = -0{,}3kN/m^2$$

To paraphrase the resulting surface load as a line load, the center-to-center lenght between two trusses, $l_{c/c} = 0{,}5m$, is applied:

$$Q_{w,H} = w_{e,H} \cdot l_{c/c} = (-0{,}54\ kN/m^2) \cdot 0{,}5m = -0{,}27\ kN/m$$

$$Q_{w,I} = w_{e,I} \cdot l_{c/c} = (-0{,}3\ kN/m^2) \cdot 0{,}5m = -0{,}15kN/m$$

LOADS ON BEAM

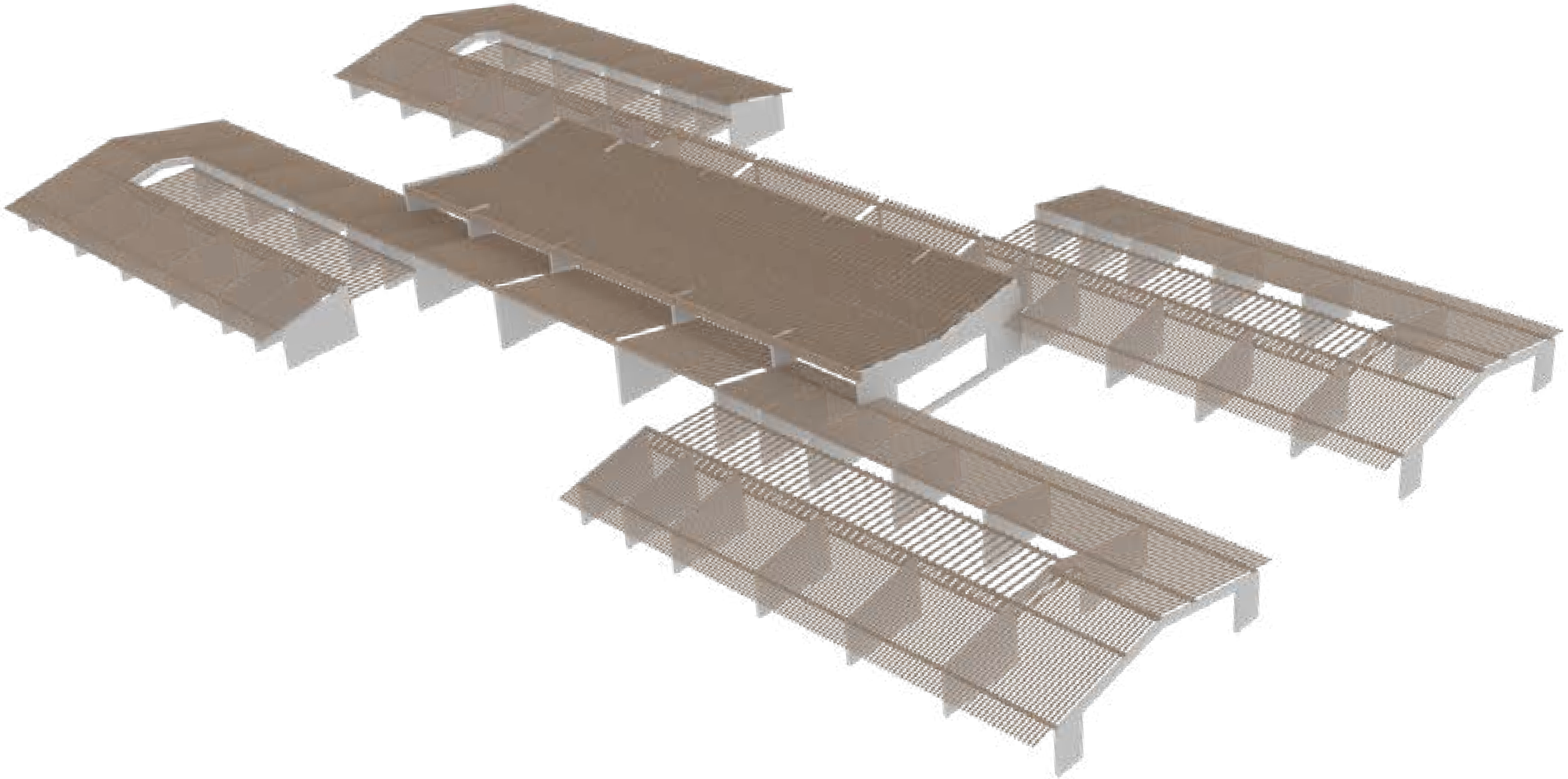
In order to deduce the loads working on the beam, the results are calculated in a similar manner. This is done realtive to the critical unsupported span of the beam, $l_b = 11m$. However, to simplify, only the results are presented in the following.

$$G_{k,j} = 4{,}78kN/m$$

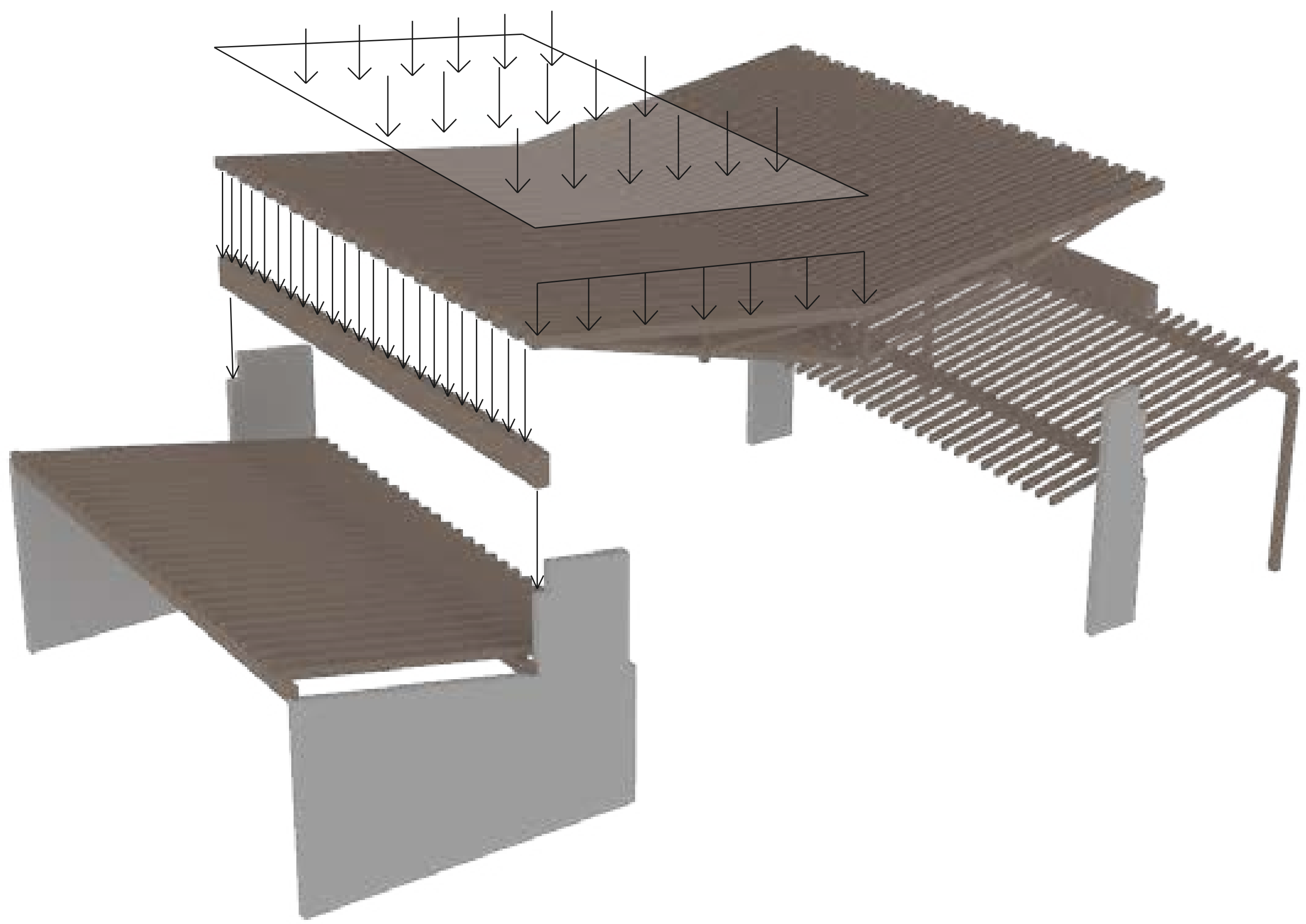
$$Q_s = 7kN/m$$

$$Q_w = -3{,}78kN/m$$

N.B.: The the self-weight, $G_{k,j}$, consideres both the roof construction and the weight of the truss itself. Additionally, both the snow load, Q_s, and the wind load, Q_w, relate to one part of the roof as the other beam carries the other part. Hereby, the results denote the loads working on one beam.



▲ Ill. 080: Structural composition of the main hall



▲ Ill. 081: Structural composition of the main hall

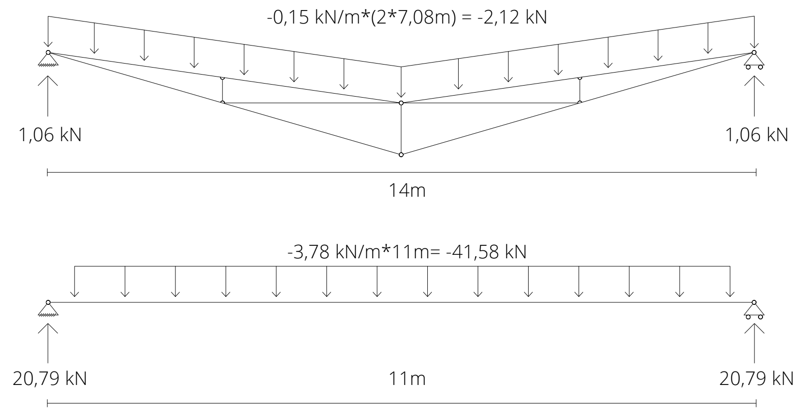
D I M E N S I O N I N G   T H E   T R U S S

The structural design aims to enhance stimulating experience of the main hall that is created around the meeting between the built and the natural. To do so the structure has to provide the room with a delicate expression imitating motifs of nature. It is of great importance that the structure does not become intimidating to the demented individual, and as a result large structural elements are avoided. To achieve this the structure that is developed consists of a series of reversed scissor trusses spanning over 14 m, constructed of small timber elements that maintains a relation to the human scale. The reversed shape allows for a room that opens up towards the wild nature outside the building while filtering light in from a narrow skylight window at each end of the truss. In the process of dimensioning the truss it is prioritized how the result affects the atmosphere of the room over the effectiveness in utilization. That is one reason to why the structure is over-dimensioned with the highest utilised element being on 44 %.

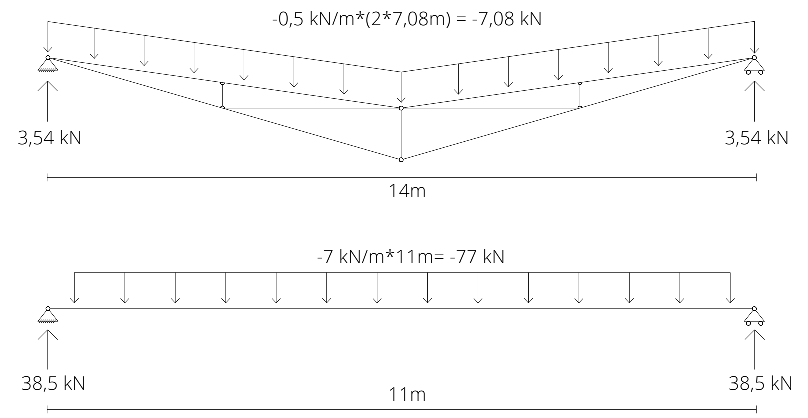
Another consideration towards this is, that even though the truss might be able to carry a larger load, that might compromise the delicate appearance of the joints. The loads applied to the truss are calculated as above and applied as seen in the static diagrams. In many cases there would be more than just one instance of wind load, but according to the Eurocodes, there is only one case of wind load for this particular roof shape. As a result of the roof shape, the wind creates suction and thereby helps the structure. To asure the credibility of digital calculation small checks are made such as making sure that the reactions are equal to the loads applied and checking that the forces in the structure is distributed as expected. Since it is a truss, it is expected that the larger internal forces will come from normal forces and there will only be bending moment in the top and bottom chord elements. Additionally, it is expected that there will be compression in the top chord and vertical elements while tension in the rest. How the normal forces are traveling through the truss is visualized in a diagram on the following spread.

▲ *Ill. 082: Details of the ceiling structure; a tectonic truss that effectively distributes loads into its larger segments via a vertically constructed four-piece element.*

TRUSS RESULTS	TOP CHORD	BOTTOM CHORD	SHORT VERTICAL SEGMENTS	LONG VERTICAL SEGMENTS	HORIZONTAL SEGMENTS
Distance	c/c 0,5 m	c/c 0,5 m	c/c 0,5 m	c/c 0,5 m	c/c 0,5 m
Timber	C 24	C 24	C 24	C 24	C 24
Length	7,08 m	7,29 m	0,5 m	1 m	3,54 m
Profile	200 mm x 100 mm	150 mm x 50 mm	100 mm x 100 mm	100 mm x 100 mm	50 mm x 100 mm
Utilization	44 %	30 %	2 %	5 %	10 %
Normal Stresses	1,53 MPa	-3,14 MPa	0,24 MPa	0,84 MPa	-1,52 MPa
Moment Stresses	2,26 MPa	-1,74 MPa	0 MPa	0 MPa	0 MPa
Max. Internal Force	N = 23 kN	N = 23,52 kN	N = 2,36 kN	N = 8,4 kN	N = -7,6 kN

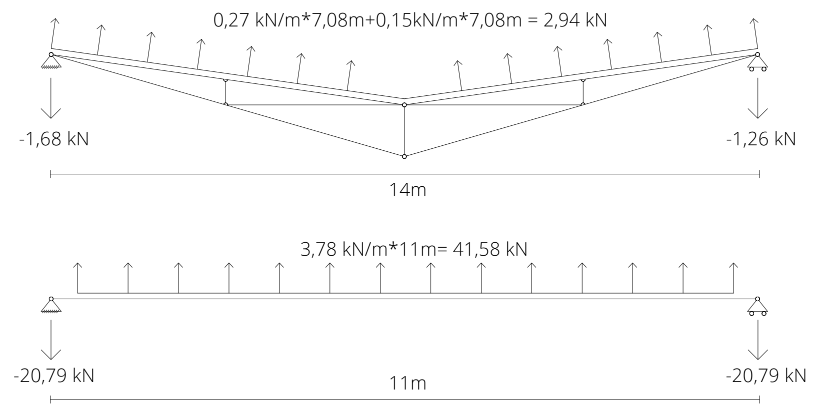


Dead Load
(Roof)



Snow Load

Ill. 083: Static diagrams of the truss; illustrated for the cases of dead load, snow load, and wind load.



Wind Load

BEAM RESULTS	HORIZONTAL SEGMENT
Distance	c/c 7 m
Timber	Gl 24h
Length	11 m
Profile	300 mm x 600 mm
Utilization	79 %
Normal Stresses	0 MPa
Moment Stresses	17,07 MPa
Max. Internal Force	MY = 142,23 kNm

DIMENSIONING THE BEAM

Since the truss is over-dimensioned due to former mentioned reasons this results in a heavy roof construction. The loads applied to the truss, in addition to the load of the truss itself is carried by a large glulaminate timber beam that span 11 meters at the widest, before it is met by a concrete wall that transfers the forces down to the ground. That the truss is supported by a beam is also the reason why one of the supports in the calculated as a roller. This means that if the beam were to bend out of its own plane the truss would follow. The beam is dimensioned to ensure that it can handle the weight of the truss over a span of 11 meters. The loads affecting the beam are in reality point loads with 0,5m intervals, do to the positioning of the trusses. In the calculation it is simplified into a line load, this is argued to be a valid simplification due to the small interval between every truss. Looking at the results it becomes clear that with a profile of 300mm x 600mm the beam has become a large element in danger of compromising the relation to the human scale. Due to the structural composition this is not the case though, since the beam are removed from the spatial experience and hidden at the end of each truss.

DIMENSIONING THE JOINT

DISCUSSING THE RESULTS

An important part of the structure is the joint that structurally acts as a hinged meeting between several elements. The joint is designed with a delicate appearance, which is important since this part of the structure is what reaches furthest into the room. To ensure that the joint can achieve such an appearance while transferring the forces within the structure, a simple hand calculation is made for a joint configuration with only two steel dowels of 20 mm each. The joint configuration is illustrated on the spread with a diagram showing internal forces in the truss, and detail sections showing the direction of the forces in the joint.

In timber construction it is usually the joint configuration that is the critical factor. The strength of the joints can therefore determine the dimensioning of the structure, since the internal forces is transferred between elements through these joints. In the case of this joint steel two steel dowels are place in undersized holes going trough all elements. Dowels are used in timber constructions since they can transmit high forces and are an economic choice due to an easy production. The main parameters influencing the load-carrying capacity of joints with dowel fasteners are: The bending capacity of the dowel or yield moment, the embedding strength of the timber or wood-based material (and the withdrawal strength of the dowel if it is known).[76]

During the first iteration the joint is calculated with the timber member type of C24 but it is discovered that this joint configuration is not strong enough. By using C30 in another iteration it is possible to make the joint strong enough with two steel dowels of 20 mm each. The calculations shown here is for the final iteration using C30.

THE EMBEDMENT STRENGHT OF TIMBER

The embedment strength of timber, f_h, is the average compressive strength at maximum load under the action of a stiff straight dowel:

$$\frac{F_{Max}}{d \cdot t} \quad \text{(EN 383 eq. 2)}$$

in which

F_{Max} is the embedment strength
d is the fastener diameter
t is the thickness of timber

From Eurocode 5, the equation for embedment strength applied to the calculation for dowels in pre-drilled holes[77]:

$$F_{h,k} = 0{,}082 \cdot (1 - 0{,}01 \cdot d)\rho_k \, N/mm^2$$

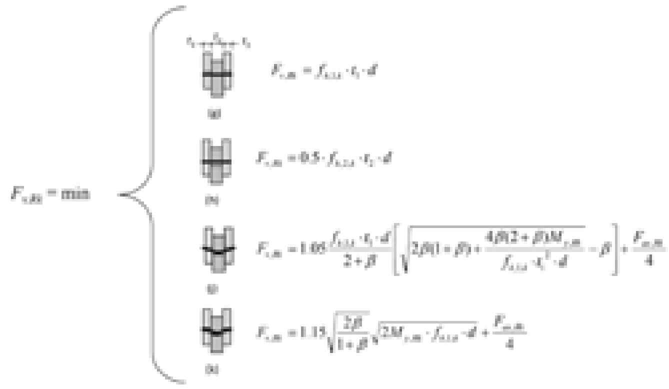
To simplify the strength equation, the ratio of the characteristic embedment strength of the members, $f_{h,2,k}$ to $f_{h,1,k}$, is deducted from the equation:

$$\beta = \frac{f_{h,2,k}}{f_{h,1,k}}$$

Lateral Load carrying capacity of metal dowel type fasteners[78] is calculated by the following form:

$$F_{v,Rk} = friction\ factor + Johansen\ \ yield\ load + rope\ effect$$

As in the case of the current design, all the joints have multiple sheared connections, double sheared failure modes, and the associated equations[79] are considered.



For multiple fasteners, the equation is expands to:

$$F_{v,ef,Rk} = n_{ef} \cdot F_{v,Rk}$$

in which

n_{ef} is the effective number of fasteners
$F_{v,Rk}$ is the characteristic load-carrying capacity of each fastener

The yield moment of the dowel type fasteners are calculated as follows:

$$M_{v,Rk} = 0{,}3 \cdot f_{u,k} \cdot d \cdot 2{,}6$$

All the equations up until this point are prerequisits of during the hand calculation-on the joint strength. The calculations are made using a simplified method based on Eurocode, since its formulas are mainly written for computer aided applications.

Supplementary factors for calculation are found in 3.2.4 Timber structures – design based on Eurocode:

τ is a parameter introduced in the analouge calculation which in combination with β and μ to read a table that states the most likely braking case of the joint and thereby the equation needed for calculating the joint strength.

$$\tau = \frac{t2}{2 \cdot t1} \qquad \beta = \frac{f_{h,2,k}}{f_{h,1,k}} \qquad \mu = \frac{t_1}{\sqrt{\dfrac{M_{y,k}}{f_{h,1,k} \cdot d}}}$$

μ is a slenderness-type number without dimension dependent on t_1, the diameter of dowel and strength of dowel or embedment strength of timber.

It is now possible to use Möller's diagram[80] to determine the way the joint would brake:

In this case, the initial parameters are:

Timber members quality = C30
Diameter of dowel, d=20mm

$$\tau = \frac{t2}{2 \cdot t1} = \frac{50mm}{2 \cdot 40mm} = 0{,}625$$

β=1 as all the timber members are made from the same timber.
f_u=600N/mm is the material properties of the steel

The yield moment of the steel dowel[81] is calculated:

$$\begin{aligned} M_{v,Rk} &= 0{,}3 \cdot f_{u,k} \cdot d \cdot 2{,}6 \\ &= 0{,}3 \cdot 600\text{N/mm} \cdot 20mm \cdot 2{,}6 \\ &= 43{,}4 \cdot 10^4 N/mm \end{aligned}$$

The embedment strength of the timber is calculated:

$$\begin{aligned} F_{h,k} &= 0{,}082 \cdot (1 - 0{,}01 \cdot d)\rho_k \, N/mm^2 \\ &= 24{,}9 N/mm \end{aligned}$$

Hereby, it is now possible to calculate μ as:

$$\mu = \frac{t_1}{\sqrt{\dfrac{M_{y,k}}{f_{h,1,k} \cdot d}}} = \frac{40mm}{\sqrt{\dfrac{43{,}4 \cdot 10^4 N/mm}{24{,}9 N/mm \cdot 20mm}}} = 1{,}35$$

Based on Möller's diagram, it can be assumed, that with these parameters, the h-type of failure will occur in the joint, and the strenght is calculated as follows:

$$\begin{aligned} F_{V,R,k} &= 0{,}5 \cdot f_{h,2,k} \cdot t_2 \cdot d = 0{,}5 \cdot 24{,}9 N/mm \cdot 20mm \cdot 50mm \\ &= 12{,}45kN \end{aligned}$$

The calculated number is the strenght of one dowel and since each joint has two dowels the full strenght is the following:

$2 \cdot 12{,}45\text{kN} = 24{,}9\text{kN}$

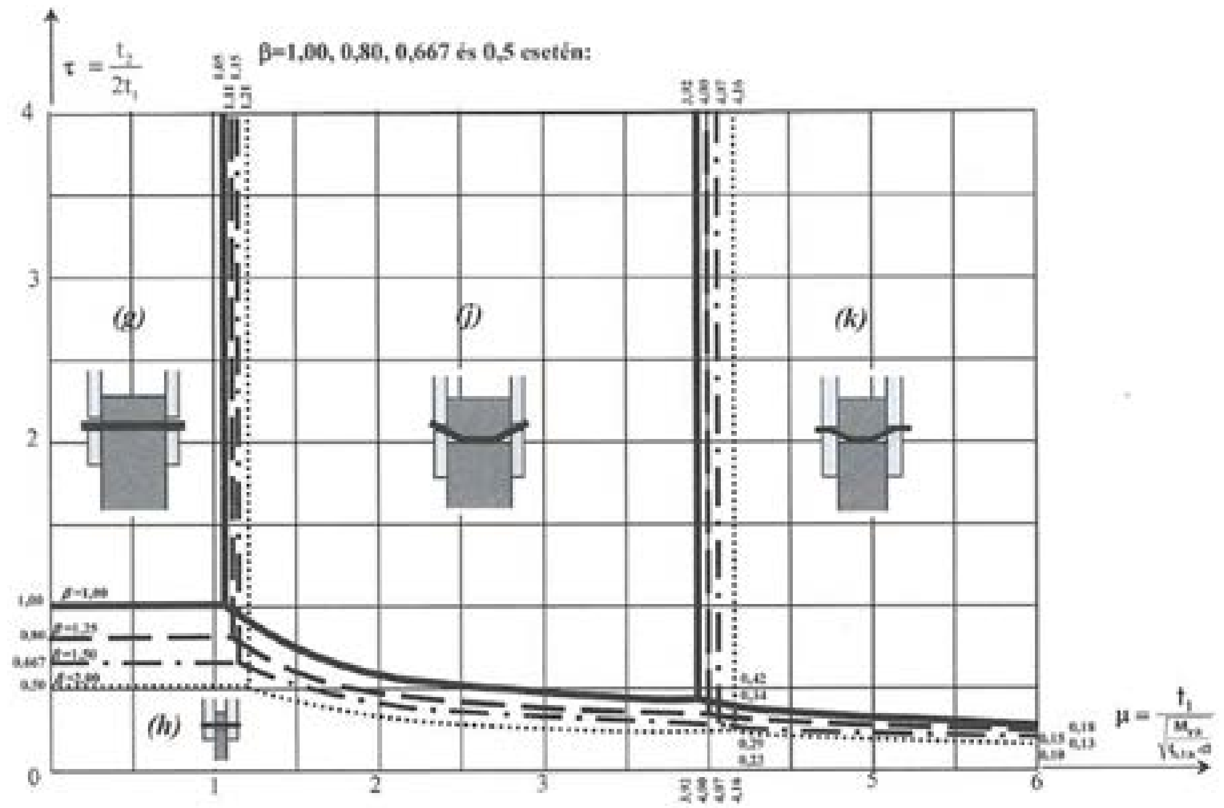
Since the largest internal force in the truss is -23,4 kN we can conclude that the joint will not break with two dowels and the timber member type C30.

embedment strength depending on quality of timber and diameter of dowel:

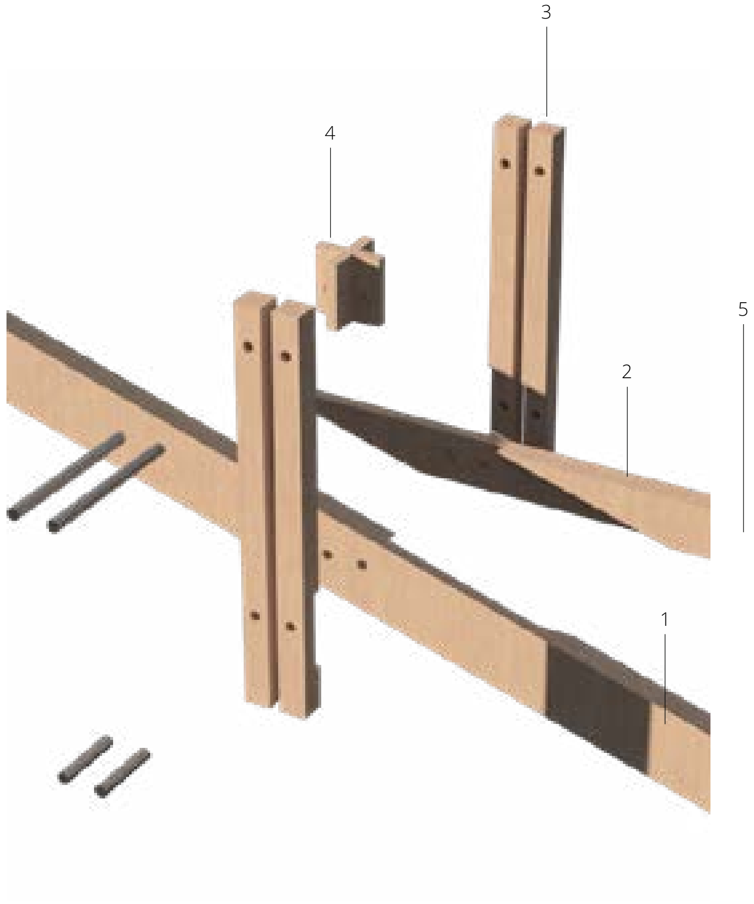
$$f_{h,0,k}\,[\mathrm{N/mm^2}] = 0{,}082(1-0{,}01d)\,\rho_k$$

$f_{h,0,k}$ [N/mm²]		C14	C16	C18	C20	C22	C24	C27	C30	C35	C40	C45	C50	D18	D24	D30	D35	D40	D50	D60	D70	GL24c	GL24h, GL28c	GL28h, GL32c	GL32h, GL36c	GL36h	KERTO-S,Q	KERTO-T
ρ_k [kg/m³]		290	310	320	330	340	350	370	380	400	420	440	460	475	485	530	560	590	650	700	900	350	380	410	430	450	480	410
d [mm]	8	21,9	23,4	24,1	24,9	25,6	26,4	27,9	28,7	30,2	31,7	33,2	34,7	35,8	36,6	40,0	42,2	44,5	49,0	52,8	67,9	26,4	28,7	30,9	32,4	33,9	36,2	30,9
	10	21,4	22,9	23,6	24,4	25,1	25,8	27,3	28,0	29,5	31,0	32,5	33,9	35,1	35,8	39,1	41,3	43,5	48,0	51,7	66,4	25,8	28,0	30,3	31,7	33,2	35,4	30,3
	12	20,9	22,4	23,1	23,8	24,5	25,3	26,7	27,4	28,9	30,3	31,8	33,2	34,3	35,0	38,2	40,4	42,6	46,9	50,5	64,9	25,3	27,4	29,6	31,0	32,5	34,6	29,6
	14	20,5	21,9	22,6	23,3	24,0	24,7	26,1	26,8	28,2	29,6	31,0	32,4	33,5	34,2	37,4	39,5	41,6	45,8	49,4	63,5	24,7	26,8	28,9	30,3	31,7	33,8	28,9
	16	20,0	21,4	22,0	22,7	23,4	24,1	25,5	26,2	27,6	28,9	30,3	31,7	32,7	33,4	36,5	38,6	40,6	44,8	48,2	62,0	24,1	26,2	28,2	29,6	31,0	33,1	28,2
	18	19,5	20,8	21,5	22,2	22,9	23,5	24,9	25,6	26,9	28,2	29,6	30,9	31,9	32,6	35,6	37,7	39,7	43,7	47,1	60,5	23,5	25,6	27,6	28,9	30,3	32,3	27,6
	20	19,0	20,3	21,0	21,6	22,3	23,0	24,3	24,9	26,2	27,6	28,9	30,2	31,2	31,8	34,8	36,7	38,7	42,6	45,9	59,0	23,0	24,9	26,9	28,2	29,5	31,5	26,9
	24	18,1	19,3	19,9	20,6	21,2	21,8	23,1	23,7	24,9	26,2	27,4	28,7	29,6	30,2	33,0	34,9	36,8	40,5	43,6	56,1	21,8	23,7	25,6	26,8	28,0	29,9	25,6
	27	17,4	18,6	19,2	19,8	20,4	21,0	22,1	22,7	23,9	25,1	26,3	27,5	28,4	29,0	31,7	33,5	35,3	38,9	41,9	53,9	21,0	22,7	24,5	25,7	26,9	28,7	24,5
	30	16,6	17,8	18,4	18,9	19,5	20,1	21,2	21,8	23,0	24,1	25,3	26,4	27,3	27,8	30,4	32,1	33,9	37,3	40,2	51,7	20,1	21,8	23,5	24,7	25,8	27,6	23,5

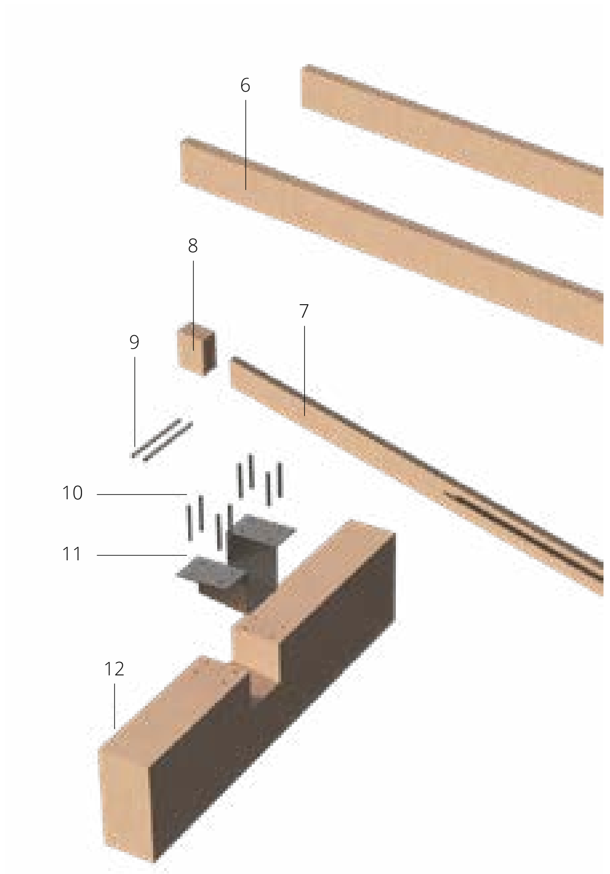
▲ Ill. 084: Embedment strenght depending on quality of timber and diameter of dowel.[82]



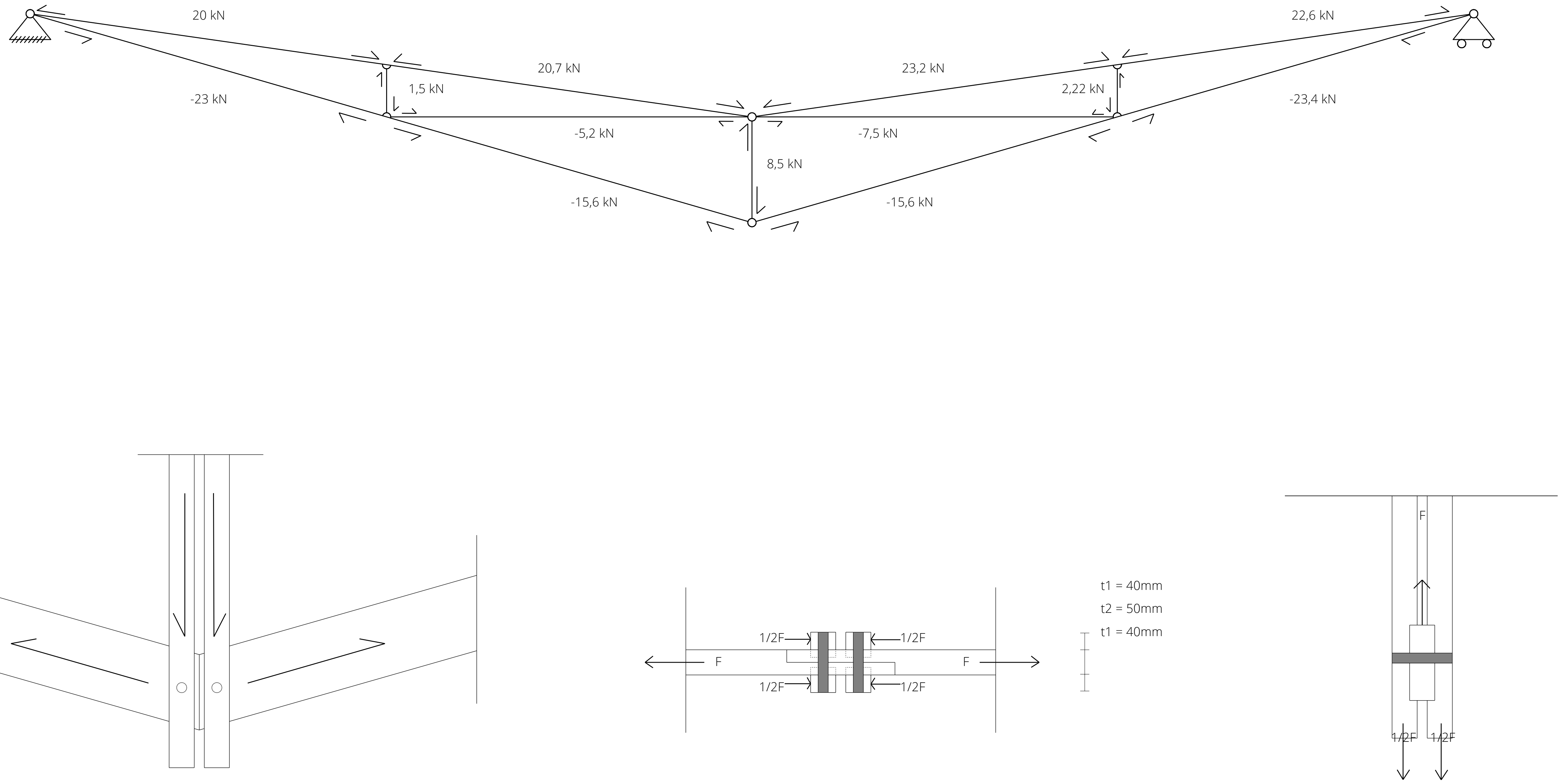
▲ Ill. 085: The Möller diagram[83] denoting four possible ways in which the joint can break dependant on the three factors : τ , β , and μ .



1 50mm x 150mm C24
2 50mm x 100mm C24
3 4 x 50mm x 50mm C24
4 Timber Element Joining Verticals
5 2 x 20mm Steel Dowels
6 2 x 50mm x 200mm C24
7 50mm x 150mm C24
8 Timber Joint Lock
9 2 x 20mm Steel Dowels
10 8 x 20mm Steel Dowels
11 Steel Plate Mounting Truss to Beam
12 300mm x 600mm Gl24h Beam



▲ *Ill. 086: Detail of the joint on the truss (left) and detail of the joint between truss and column (right)*



Ill. 087: Static diagram of the truss translating the distribution of forces within the construction of the structure.

[67] See Eurocode 0, '*A1.3.1 Design Values of Actions in Persistant and Transiet Design Solutions*'

[68] See Eurocode 0, '*B3 Reliability Differentiation*'

[69] See Eurocode 0, '*A1.2.2 Values of* ψ *-factor*'

[70] See Eurocode 1, '*1-4; 4.2 Basic Values*'

[71] See Eurocode 1, '*1-4; 4.3 Mean Wind*'

[72] See Eurocode 1, '*1-4; 4.3.3 Terrain Orography*'

[73] See Eurocode 1, '*1-4; 4.4 Wind Turbulence*'

[74] See Teknisk ståbi, '*4,7; fig. 4.2 - illustration af* $q_p(z)$ *for* $c_o = 1{,}0$ *og* $K_l = 1{,}0$'

[75] See Eurocode 1, '*1-4; 7.2.5 Duo Pitch Roofs*'

[76] See Andrew Livingstone, '*Timber Connections Design theory to Eurocode 5*' (2016) <www.researchgate.net/publication/323291310_Timber_Connections_Design_theory_to_Eurocode_5> [accessed 02.05.2018]

[77] See Andrew Livingstone, '*Timber Connections Design theory to Eurocode 5*' (2016) <www.researchgate.net/publication/323291310_Timber_Connections_Design_theory_to_Eurocode_5> [accessed 02.05.2018]

[78] See Andrew Livingstone, '*Timber Connections Design theory to Eurocode 5*' (2016) <www.researchgate.net/publication/323291310_Timber_Connections_Design_theory_to_Eurocode_5> [accessed 02.05.2018]

[79] Andrew Livingstone, '*Timber Connections Design theory to Eurocode 5*' (2016) <www.researchgate.net/publication/323291310_Timber_Connections_Design_theory_to_Eurocode_5> [accessed 02.05.2018] p. 56

[80] See Miklós Armuth and Millós Bodnár, '*Timber Structures – Design Based on Eurocodes*' (Budapest: Artifex Press, 2011)

[81] Miklós Armuth and Millós Bodnár, '*Timber Structures – Design Based on Eurocodes*' (Budapest: Artifex Press, 2011) p. 48

[82] Miklós Armuth and Millós Bodnár, '*Timber Structures – Design Based on Eurocodes*' (Budapest: Artifex Press, 2011) p. 48

[83] Miklós Armuth and Millós Bodnár, '*Timber Structures – Design Based on Eurocodes*' (Budapest: Artifex Press, 2011) p. 34

A CARING SPACE

THE SKETCHING PHASE

DESIGN FOR DEMENTIA

The sketching phase chapter presents a series of chronological insights into the conception of the project; from conceptualized design to realized design. To disclaim, the documented process is a simplified and streamlined version of actual events.

The fundamental notion of building and nature directs three initial design configurations that perform differently. From these, an axial principle of tectonically situating the building within the site enacts a gesture; an envisioned and experienced quality in the fusion between the built and the natural environment. In order to respond to the technical and architectural challenges within the spaces, an array of investigations are approached in an iterative and integrated manner.

T H E D E S I G N P R O C E S S

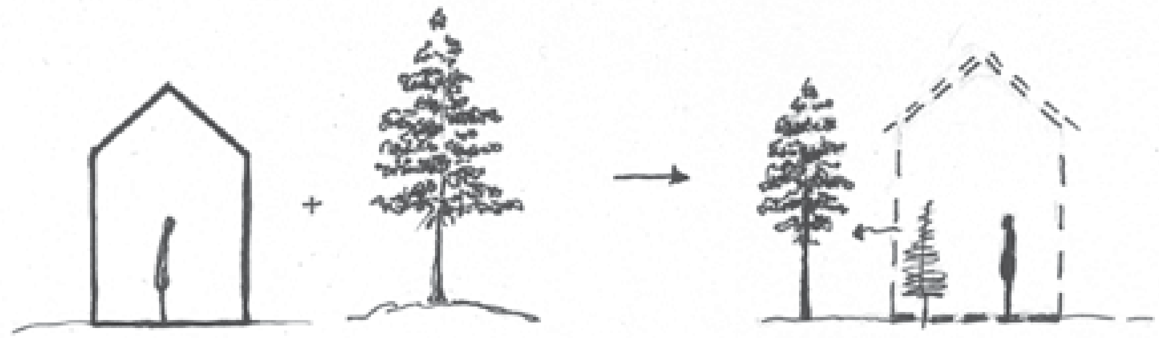
SKETCHING 101

As the first steps of sketching, a series of massing studies were carried out in order to achieve a practical understanding of the site, its dynamic typography, and the scale of the building complex. This was approached through the media of illustrations, sketches, and models.

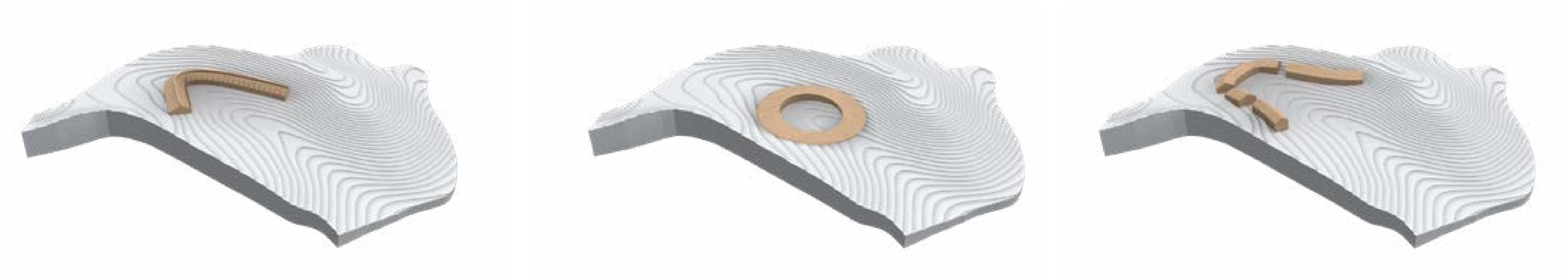
CHRONOLOGY AND ITERATION

The investigative mindset that the initial designs and configurations are based on revolve around the notion of principle and the development thereof. Chronologically speaking, no architectural concept or link between gesture and principle were developed at the time of initializing *the sketching phase* - referring to Knudstrup's process of integrated design.[84] As the foundation, however, the thematic focus of the problem-orientation (delineating *the problem phase*) and the knowledge obtained through the prologue, programme, site, and case studies (delineating *the analysis phase*) direct and inform *the sketching phase* of the process. Throughout this phase, notions and ideas have sparked iterative additions or changes to either the problem or the analysis. To a certain extent, this means that the design as well as the problem and analysis are carried out and developed in parallel *or* iteratively.

To grant the full perspective, the two unmentioned phases are expounded. The Gesture & Principle's chapter (delineating *the synthesis phase*) and the presentation (delineating *the presentation phase*) respectively constitute the creation and exhibition of the project and its principles. Returning to the notion of the investigative mindset, these principles are developed iteratively throughout *the sketching phase*. This is due to the fact that the experienced quality of the gesture is highly dependant on the specific, practical design solution (*or* principle) that is approached, tested, and refined through sketching and synthesis. The envision quality of gesturing care through nature - as the common denominator of both thematics, dementia patient care, and site - originated from the initial conclusion to the analysis. Thus, the sketching phase starts from the premature notion of building and nature.



▲ *Ill. 088: The premature notion of building and nature translated through its initial depiction. This insinuates a gesture or quality that can be facilitated in the interrelation between the built and the natural environment; transcending beyond individual borders to form an enhanced and joint physical environment.*



▲ *Ill. 089: A series of three massing studies, in order to achieve a practical understanding of the site, its dynamic typography, and the scale of the building complex. However, the scale and area of these studies are calculated as estimates - not as exact representations of the gross area in relation to the programme.*

CONFIGURATION 01: THE VILLAGE

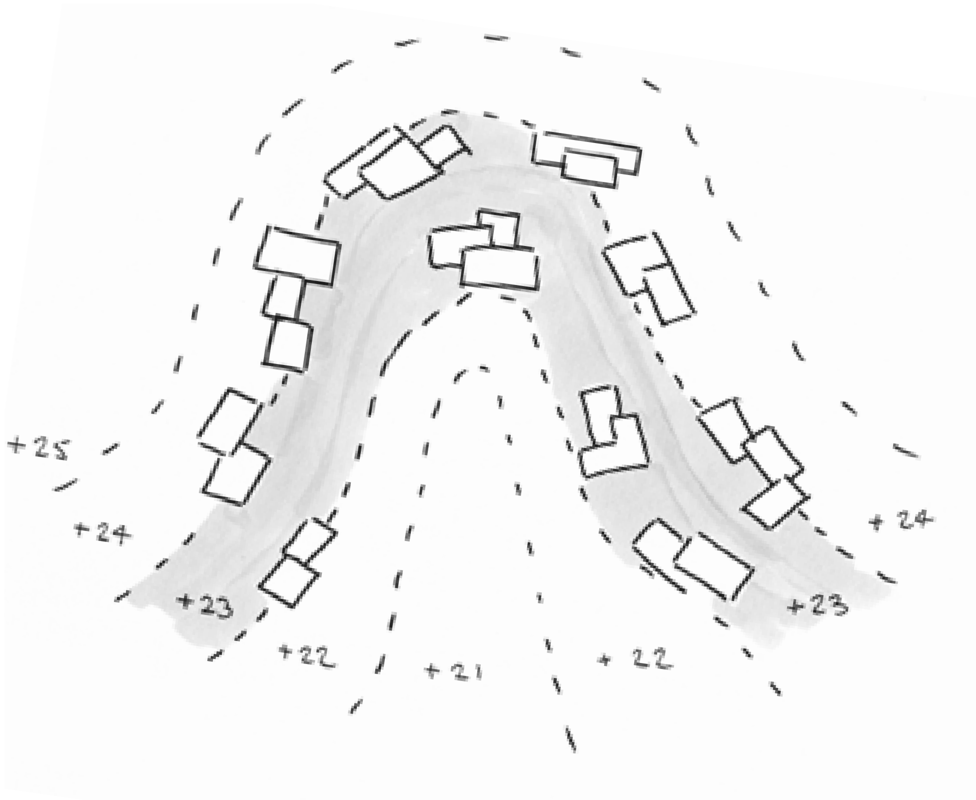
BUILDING AND NATURE

In the dialogue between architecture and landscape, an investigatory configuration of an established synergy between building and nature was developed. Synergy was based on the notions of scale and visual impact of the architecture, figuratively fitting it to the context. To elaborate, the deliberate *establishment* of this synergy was approached through architectural means; considering the visual impact, materiality, and shape. As a result, nature informs the architecture, however, not vice versa. This raises the question: How can architecture inform the landscape and to what end? From this one-way relation, an awareness was essentially gained in the process of designing and linking of building and nature.

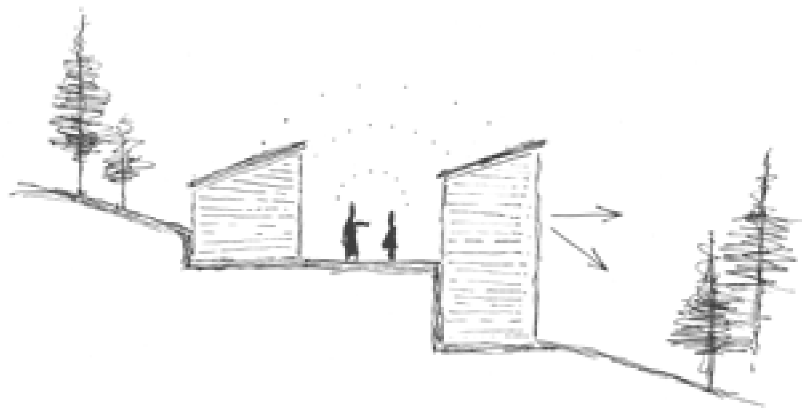
TYPOLOGY AND SCALE

Resembling a village, the configuration consists of multiple small-scale units, modestly positioned in the landscape. The level heights are considered to adapt to the topography in order to utilize e.g. the spatial quality of the valley. In parallel, reducing its presence by keeping low is considered crucial. Additionally, a principle of altitudinal positioning of units along the valley is developed and applied. This grants the quality of disabled-friendly interaction with nature from a continuous and planar exterior area.

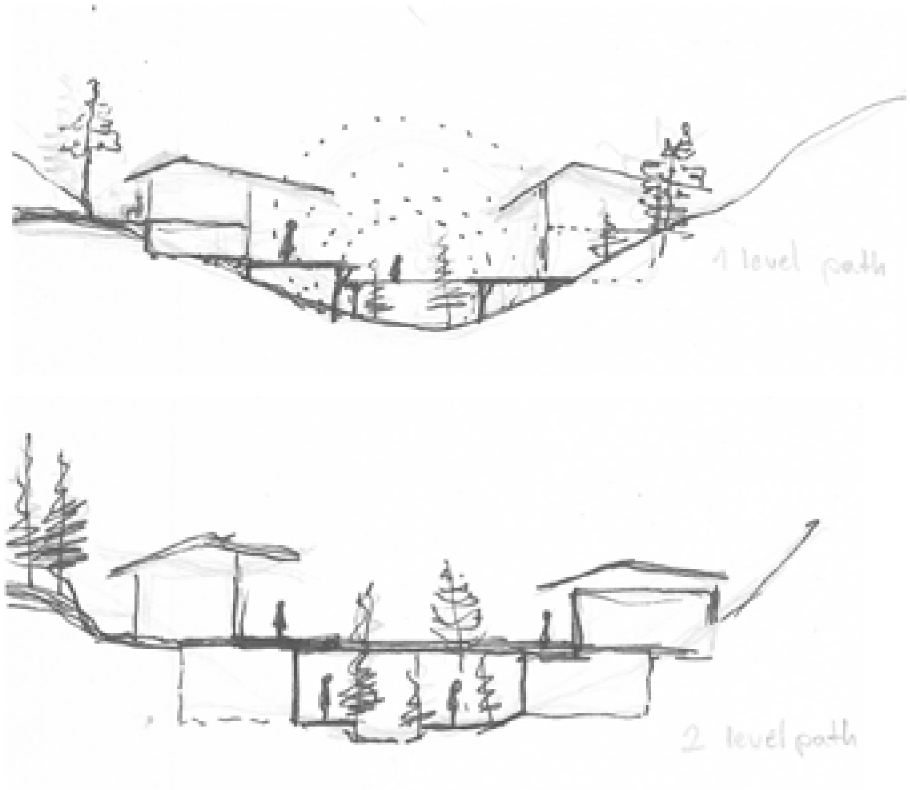
The main issue with the configuration is the segmentation of functions related to the institutional typology. Thus, the individual unit scales impose a practical and logistical challenge. In order to conform to the criteria of the programme - with minimal deviation - the layout of the configuration is troublesome. From this observation, the programme asks for a more large-scale and spatially coherent configuration. Such a configuration was subsequently approached.



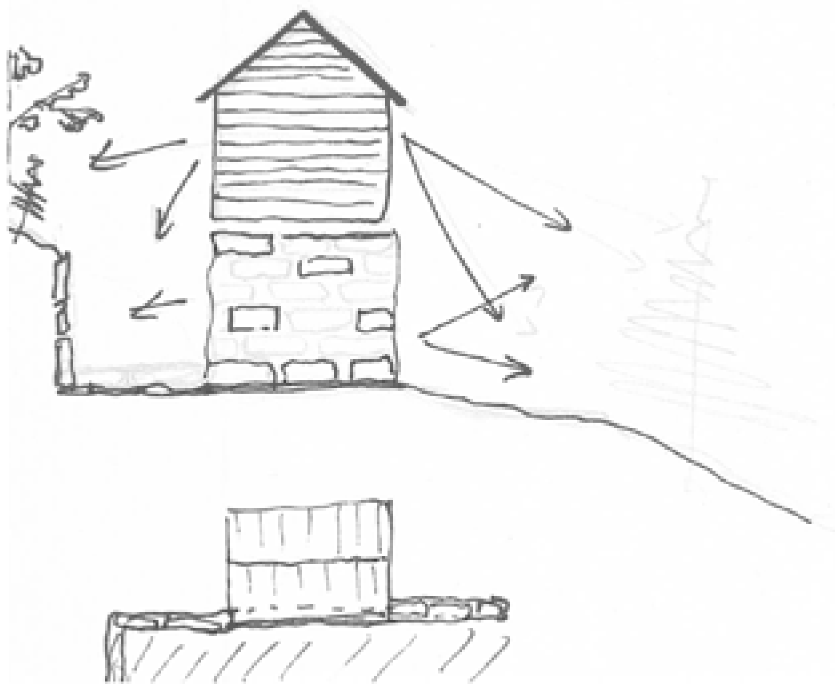
▲ *Ill. 090: From placing multiple individual building units in the dynamic topography, a principle of altitudinal positioning was developed in order to achieve a (relatively) planar and continuous exterior space. By positioning the units along both sides of the valley, the topographical area that is +23 meters above sea level can be planed, creating a large disabled-friendly exterior environment in dynamic conditions.*



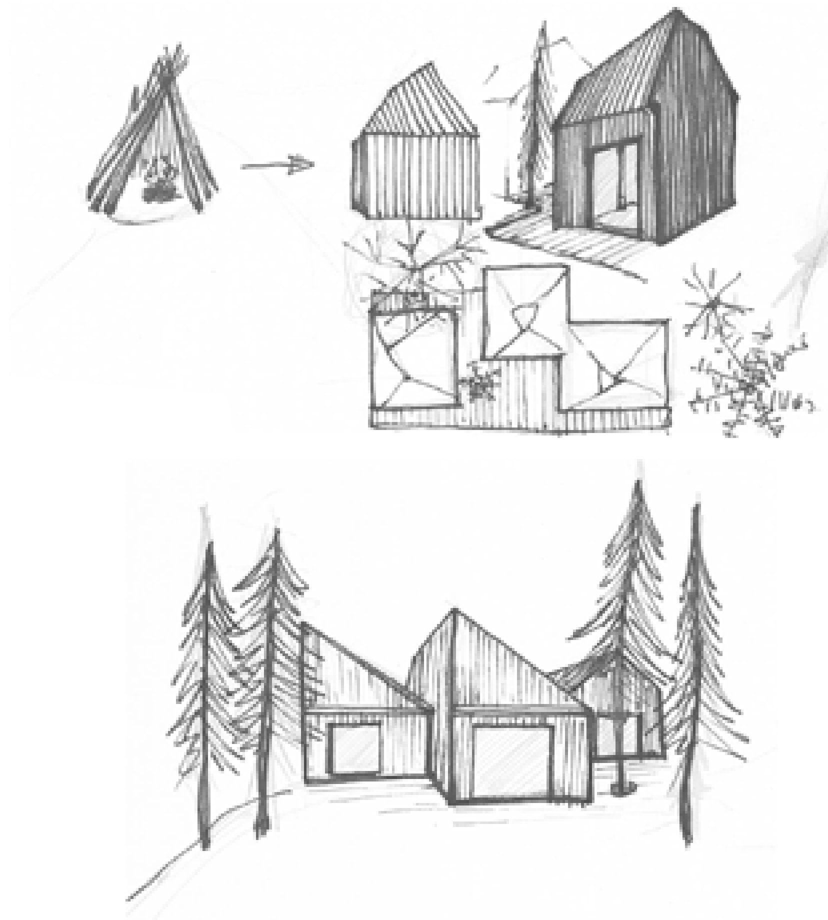
▲ *Ill. 091: The meeting between building and topography facilitated through the principle of altitudinal positioning; the topographical incline continues on both sides of the buildings, adapting through a difference in level. From this, the quality of a viewpoint focused at nature is established.*



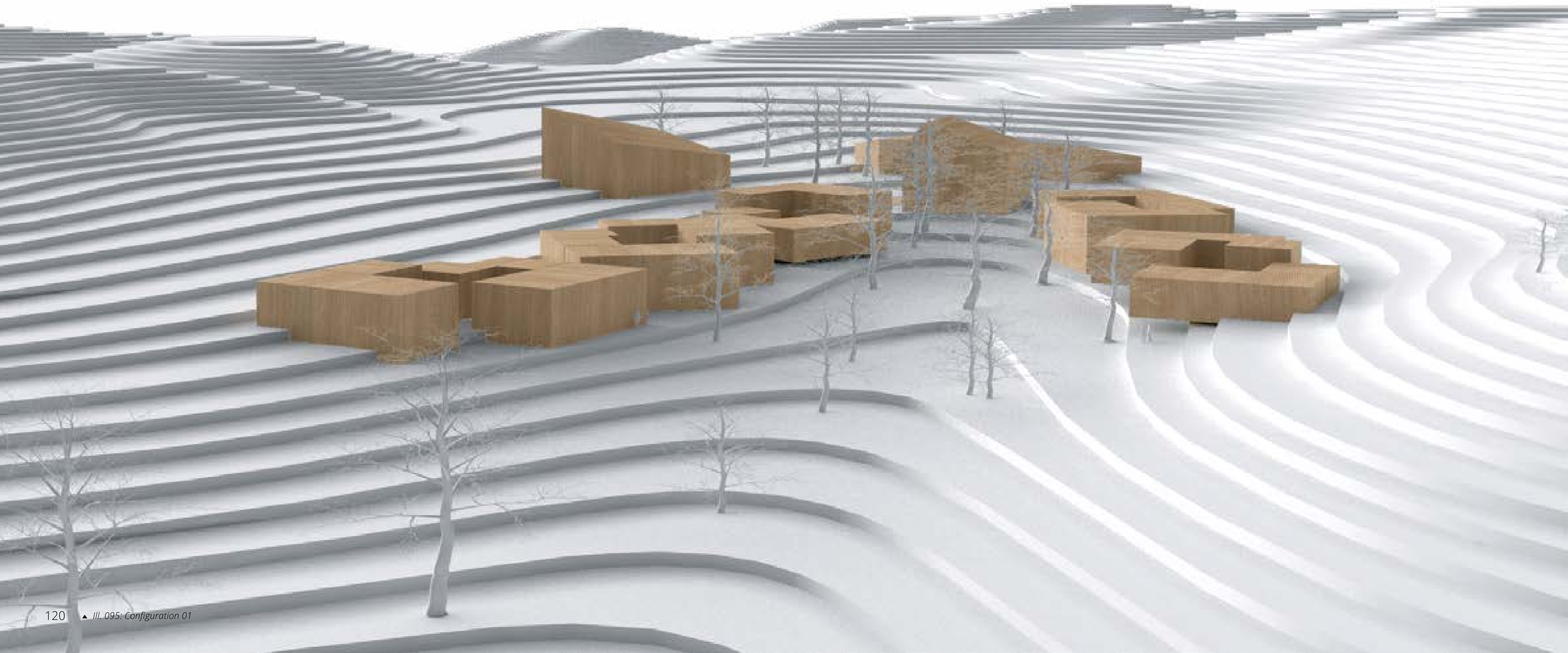
▲ *Ill. 092: Comparison between utilization of the valley in one or two levels. The implication is necessarily dependant on the depth of the valley. Common for both cases is the bridge connecting the buildings on each side of the valley, constituting an elevated platform in the center. From here, vast views and immediate nature*



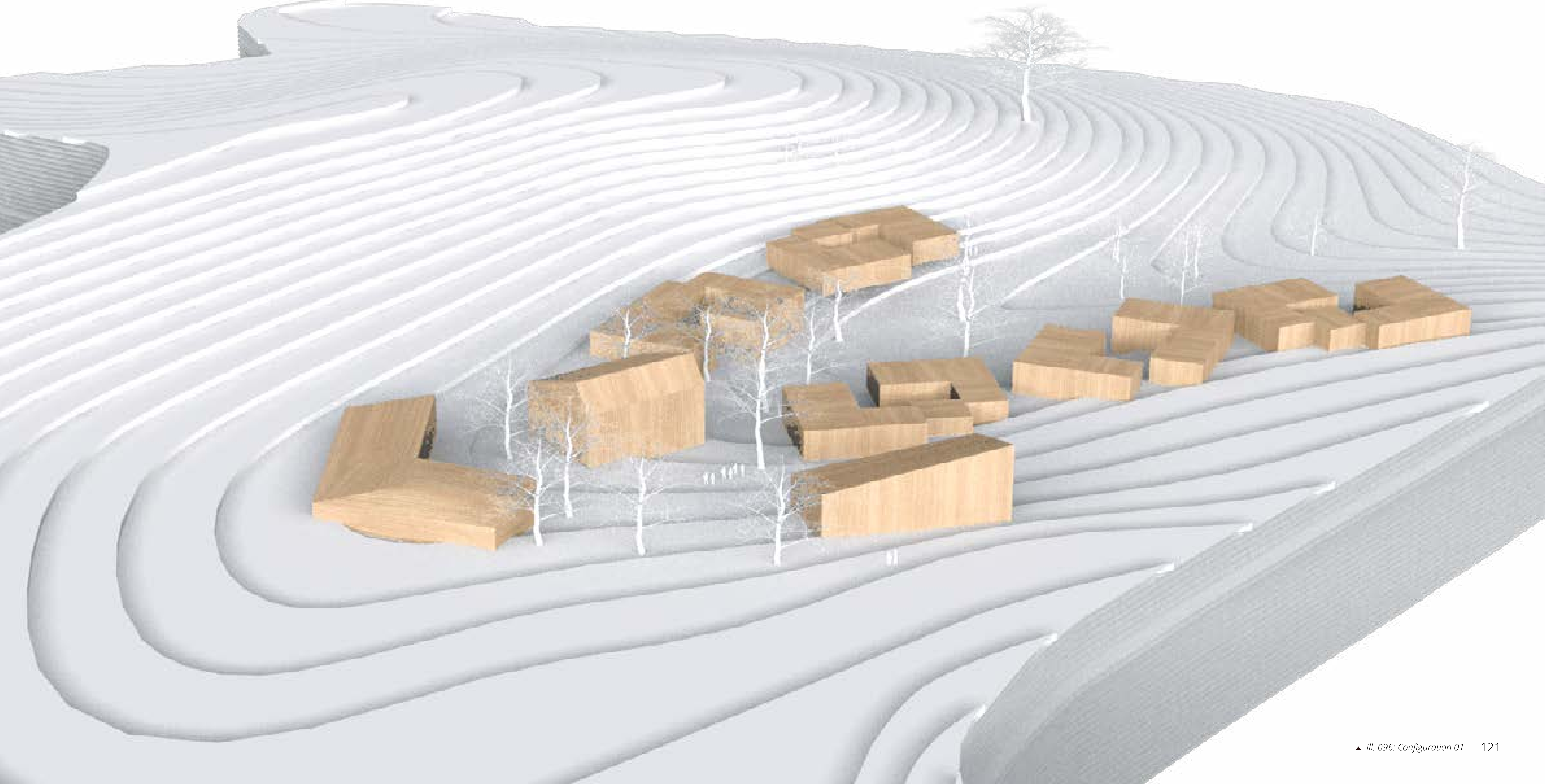
▲ *Ill. 093: Continuing on the idea of designing in two levels, a quality is found in being elevated from the surroundings. Hereby, more scenic views of the landscape are achieved from the interior; a quality that would fit both shared social spaces and private spaces.*



▲ *Ill. 094: Sketches of the exterior expression and identity of small-scale village units. The visual impact, materiality, and shape attempts to adapt to the natural environment, referencing to primordial wooden huts. Thus, nature is integrated in a figurative sense. By that analogy, nature informs the architecture.*



▲ Ill. 095: Configuration 01



▲ Ill. 096: Configuration 01

CONFIGURATION 02: THE MONOLITH

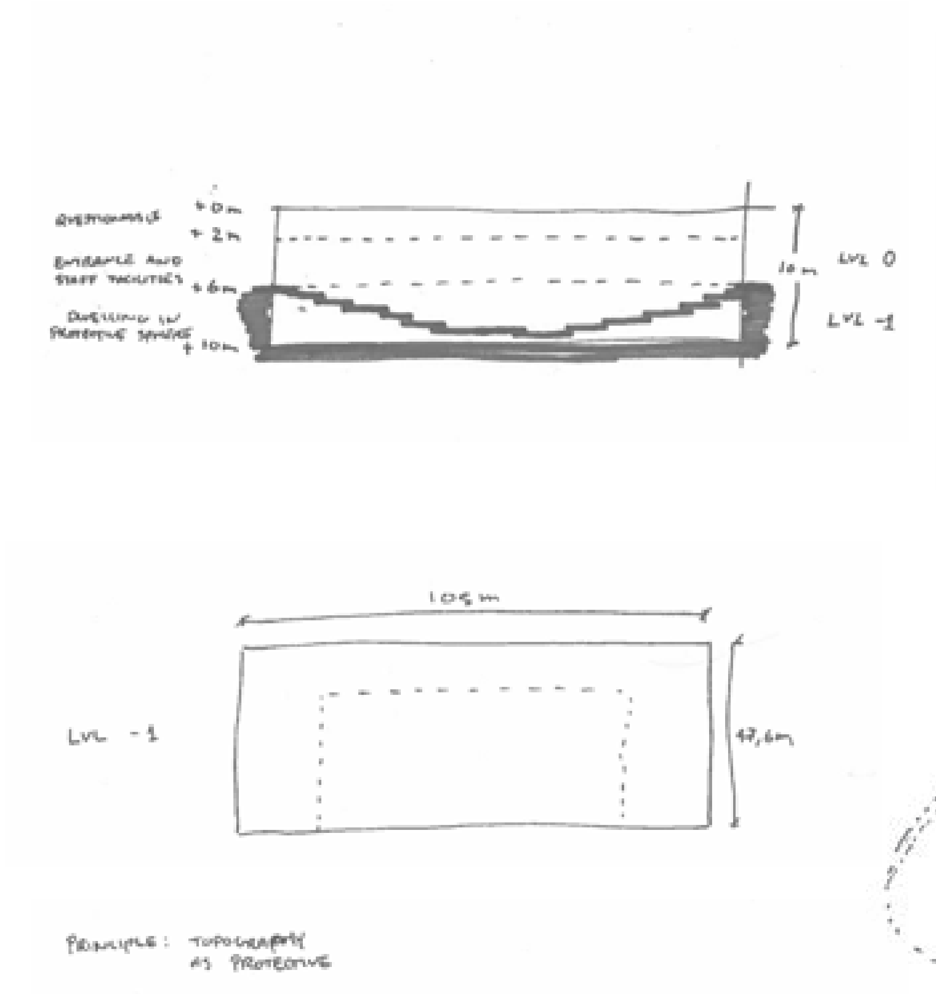
ENVELOPE AND GROUND

Continuing on the notion of coherence between building scale and programme, a densified configuration of a singular large-scale complex embeds itself within the ground of the site. It builds on the principle of locally exploiting the valley in order to naturally define level shifts within. From the front - where the valley narrowly intersects the building envelope - a delivery ramp is practically connected to the lower floor. Around, two areas of parking are defined; one for the public in association with the arrival and one for staff in association with the workplace. From the rear - where the valley openly intersects the building envelope - the building opens up towards a lowered exterior space associated with social functions, protectively embraced by the hills of the valley and its nature. As the main feature, two ramps lead to the center of the social space at the foot of the building.

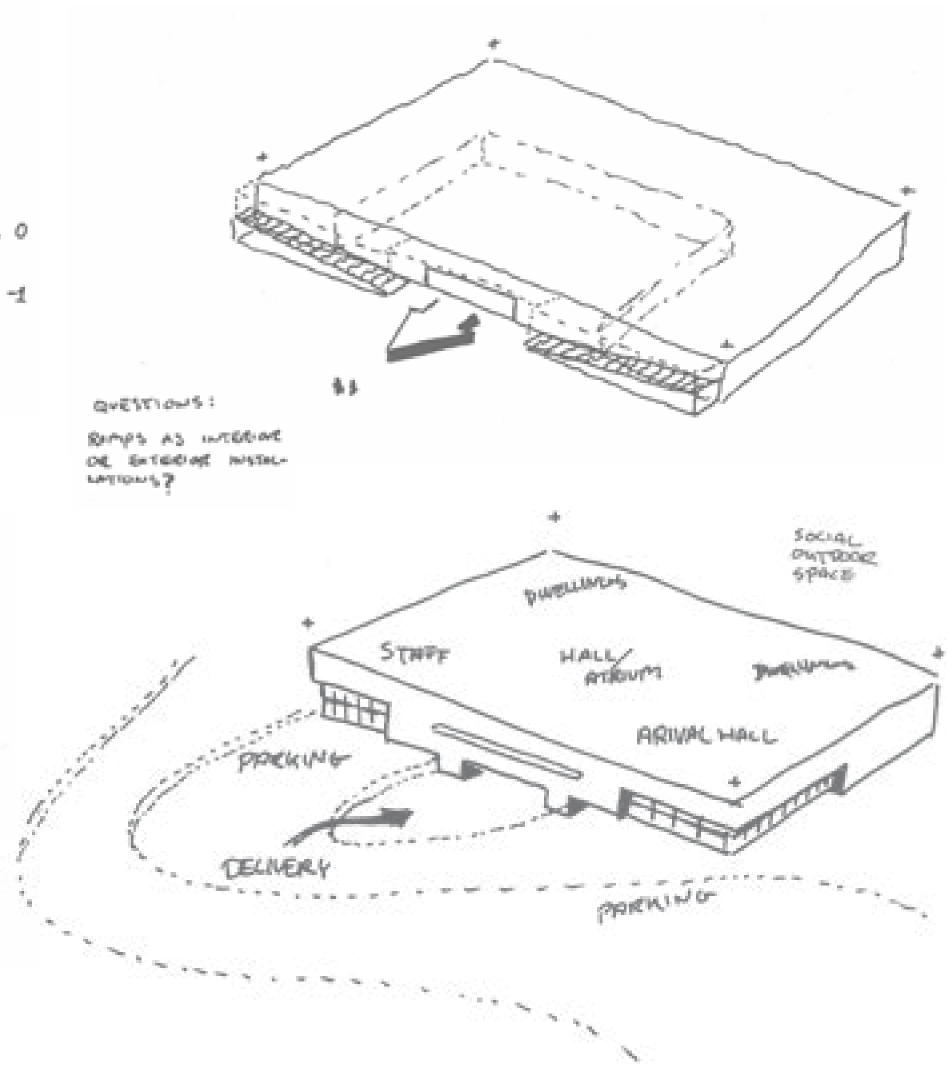
SENSITIVITY AND CARE

Despite its adherent qualities, the configuration resembles a monolithic element of architecture that boldly stands out in the natural context. The rigid and cubic shape of the building mass strongly contrasts to the dynamic and organic landscape, creating a sense of suspense. In the scope of the project, this configuration challenges both the dialogue between architecture and landscape as well as the fundamental dialogue between architecture and dementia.

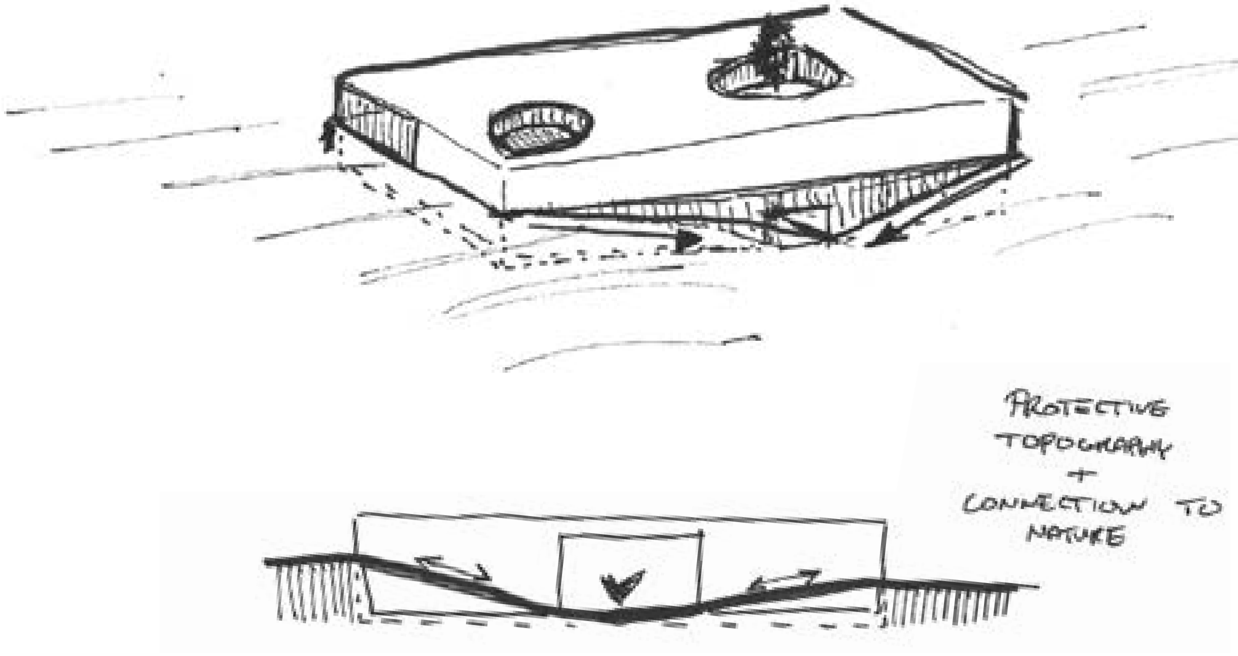
Firstly, the alienated appearance of the building significantly impacts the visual context of Hammer Bakker, disregarding the municipality's notion that the architecture should be experienced as an integrated part of the landscape.[85] Secondly, the sentiment of care seems jeopardized by hard definition between building and nature. However, the principle of exploiting the valley to create level shifts - and a sense of embraciveness and protectiveness within the exterior space - was a pivotal to the overall process.



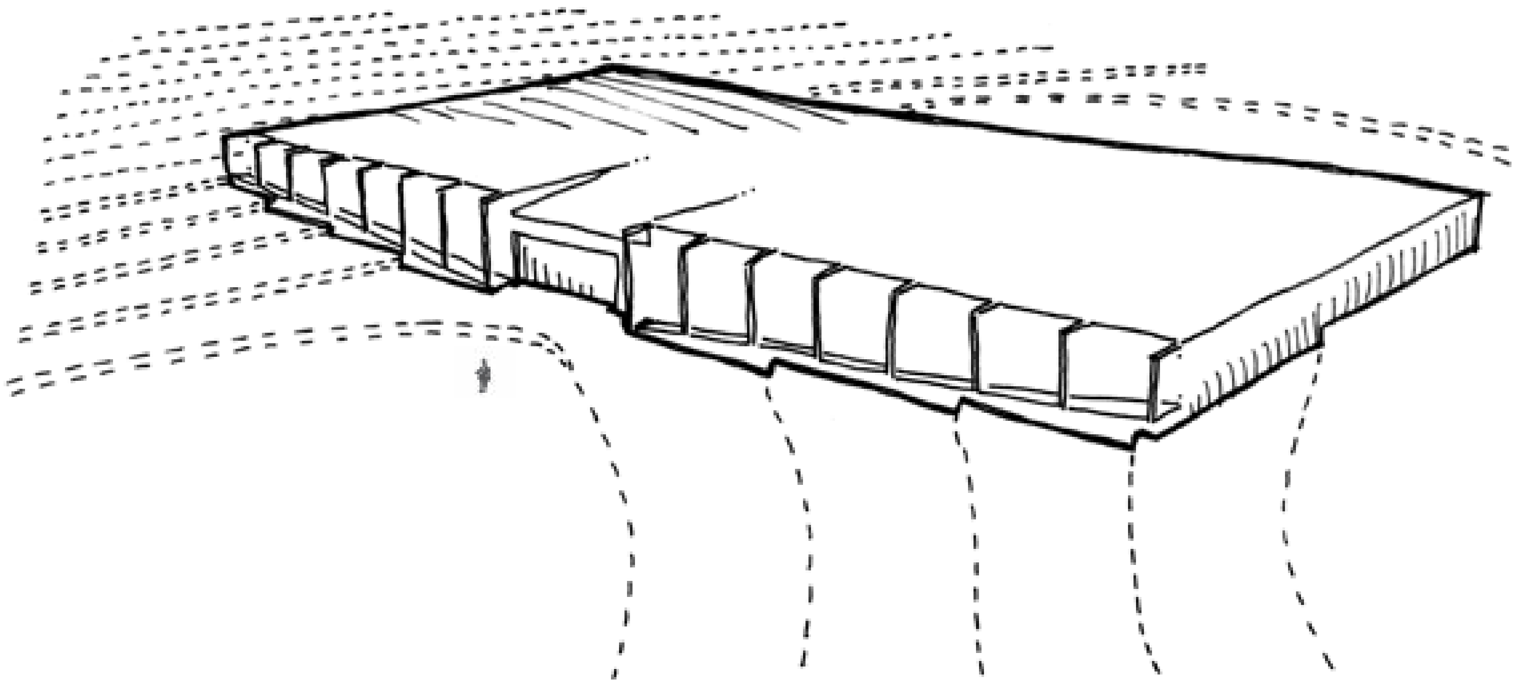
▲ *Ill. 097: A definition of the shape, size and height of the building; approx. 5000 m² in plot,10 m tall and spans across two levels. These are defined as lvl. 0 and lvl -1 as most of the lower part of the building is embedded within the ground.*



▲ *Ill. 098: A depiction of the rear (upper sketch) and front (lower sketch) of the configuration shown relative to the positional principle of locally exploiting the valley in order to naturally define level shifts within. This informs the placement and conditions of e.g. delivery, arrival, and staff functions in the front and an exterior social space in the rear.*



▲ *Ill. 099: At the rear, the ground secedes from the lower part of the envelope, creating downward direction into the valley and an exterior space in the center. Here, the protective topography is sensed and a connection to nature is established.*



▲ *Ill. 100: The monolith; heavily imposed onto the dynamic landscape of Hammer Bakker. Despite its alienating appearance, the architecture adversely adapts to it position. The inclination of the ramps correspond with the 1:10 requirement in relation to accessibility.*

▲ Ill. 101: Configuration 02

▲ Ill. 102: Configuration 02

CONFIGURATION 03: THE COMMUNITY

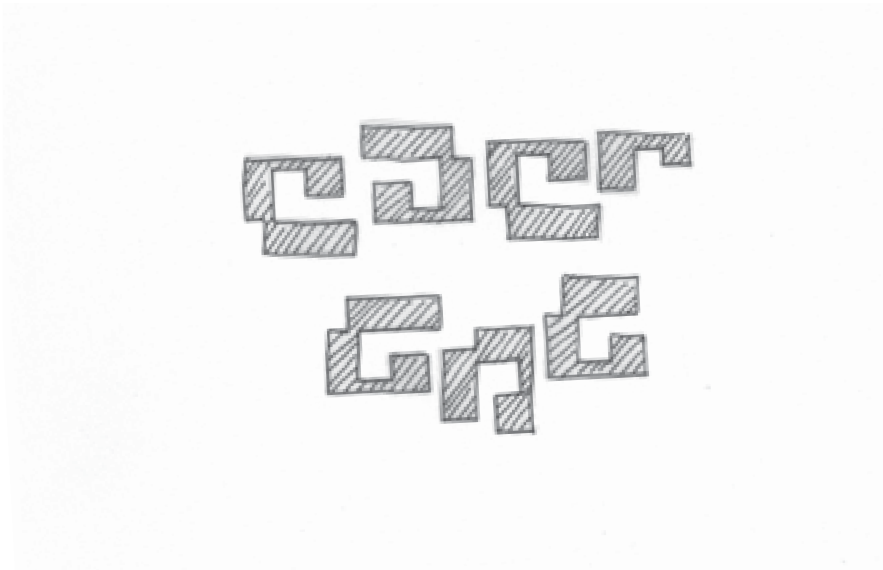
PRIVATE AND SOCIAL

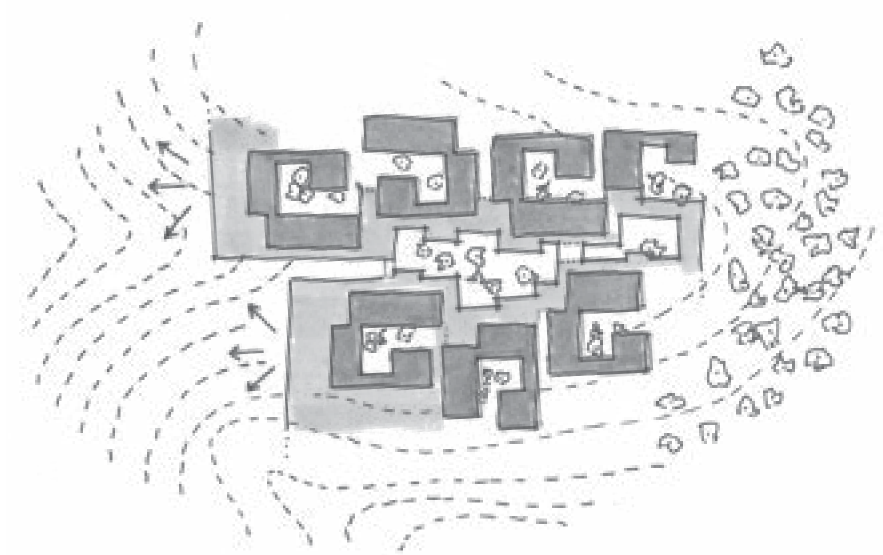
In response to the notion that the architecture should be experienced as an integrated part of the landscape, a subtle and unitized configuration is developed; one that takes inspiration from Utzon's semperian approach of considering the *earthwork*[86] and applying an outer wall in order to integrate into the surroundings. Similarly, the configuration is formed from individual community units. Each of these units support two private zones, a social zone, and a shared exterior space. The private zones contain up to two dwellings and one semi-private hall each. Thus, two private zones (four dwellers) share a social zone. The scale of the configuration is adaptable as more community units can be added or removed. However, with four dwellings per unit, the current layout facilitates approx. 24 dwellers. In relation to the programme and the theoretical notion of group homes[87], the overall configuration calls for optimization; e.g through facilitating six dwellers per community unit and applying more units. The latter notion might prove challenging.

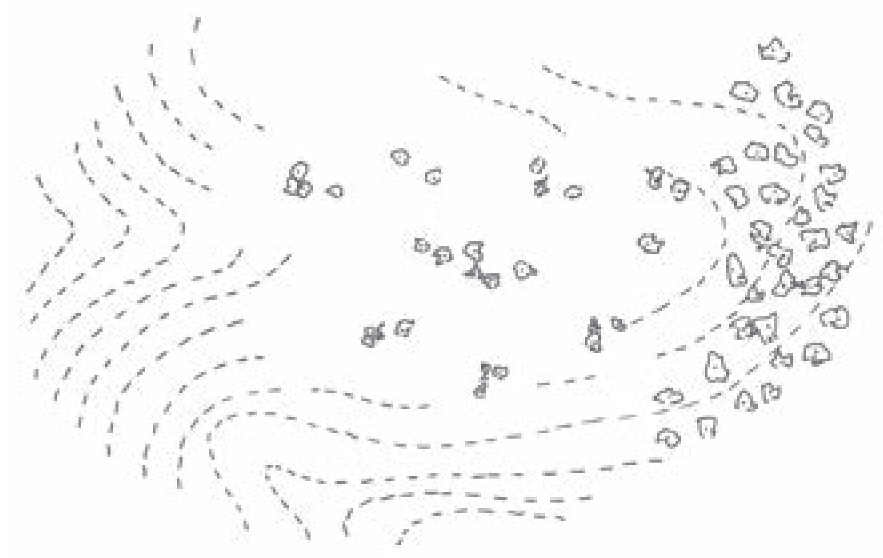
DWELLINGS AND DAYLIGHT

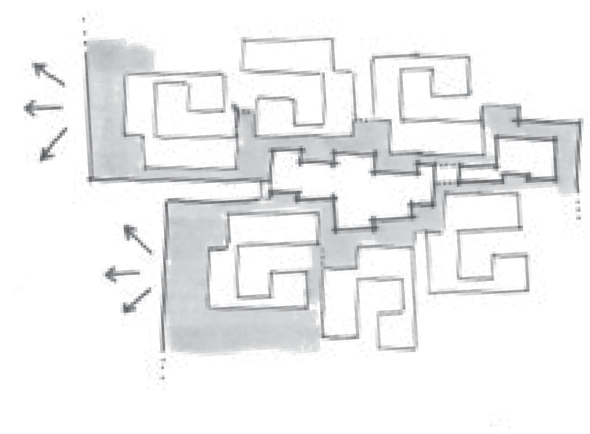
In addition to the previous observations, the layout of the community unit is conditional of its placement in the landscape. In the current configuration of four dwellings per unit, one dwelling is crutially positioned as its exterior facade is covered by the topography. This means that no windows, daylight intake, or visual access to the surroundings are supported from within the dwelling. Additionally, the other dwellings only have one exterior facade through which daylight can enter. These suboptimal solutions are challenged by the physical confinement of the *earthwork* principle.

In order to establish a sense or gesture of care within each dwelling, the design must crutially consider daylight intake realtive to the time of day. Ideally, the amount of daylight should be maximized in order to promote health and well-being within the most private corners of the architecture.



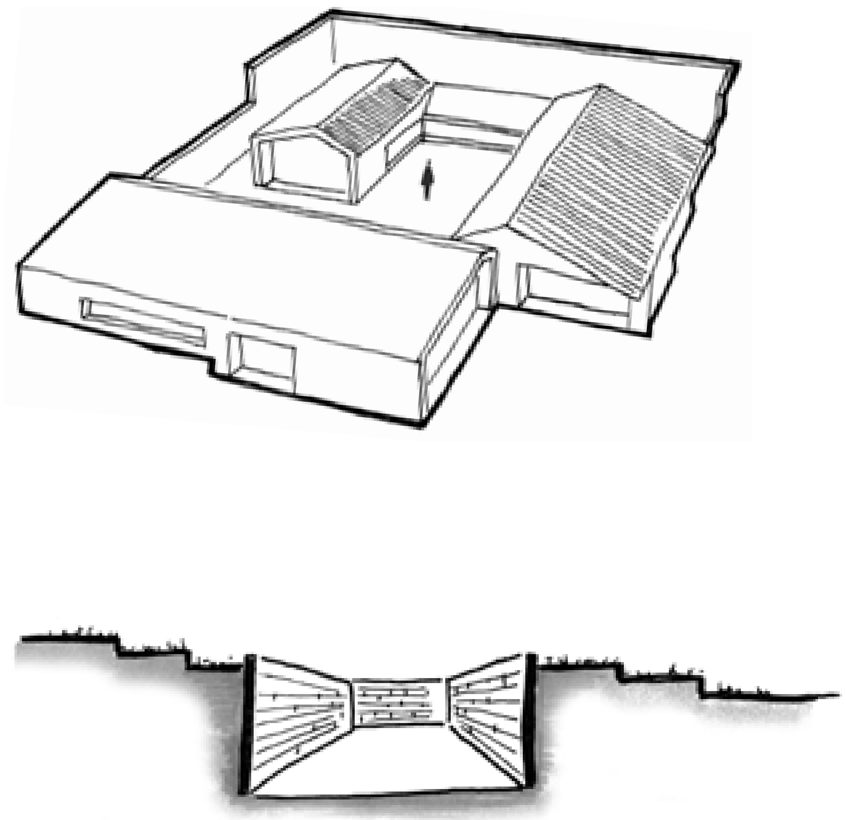




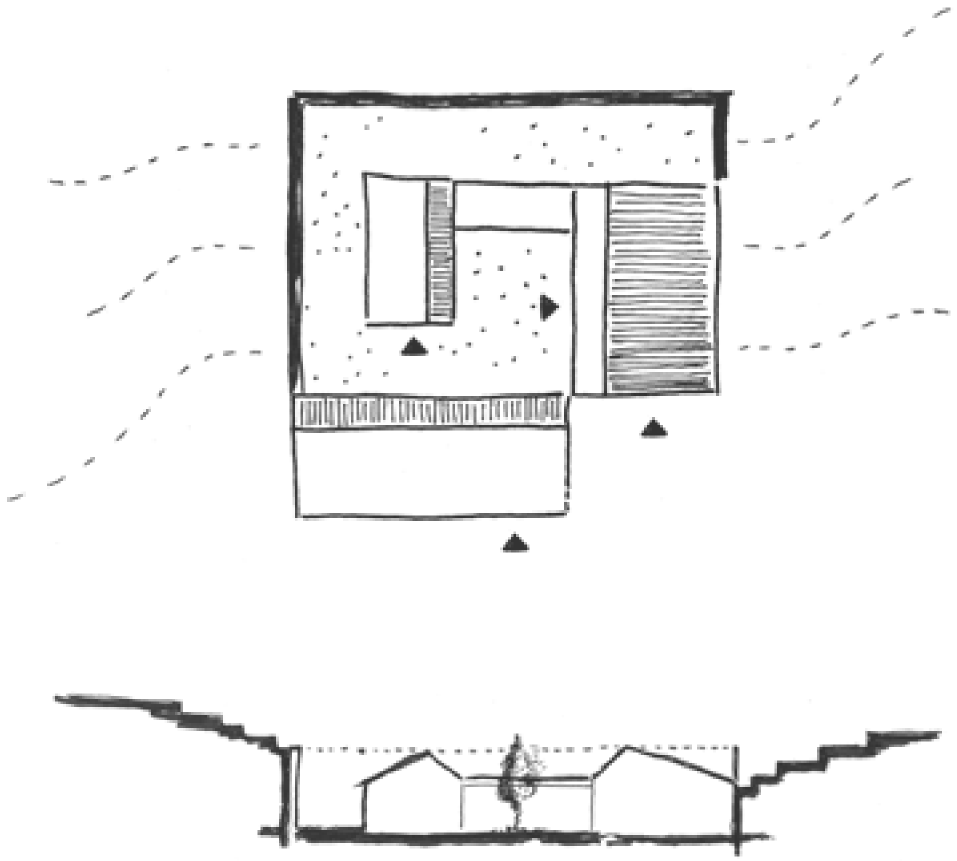


▲ *Ill. 103: A hard distinction manifested through considering the role of the earthwork. Additionally, the design of the built environment responds to the natural environment as courtyards and voids are encircled by the building envelope. Hereby, trees and vegetation are naturally integrated within the enclosed exterior - and the interior, considering the transparency of facades, etc.*

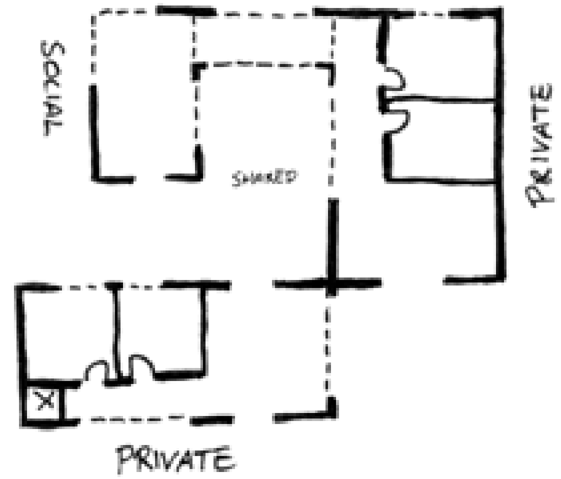
▲ *Ill. 104: A definition of exterior paths and connections between the individual community units. At the far left (towards east), a vantage point is established on the balcony granting a vast view of the landscape; a quality that applies to the associated exterior spaces.*



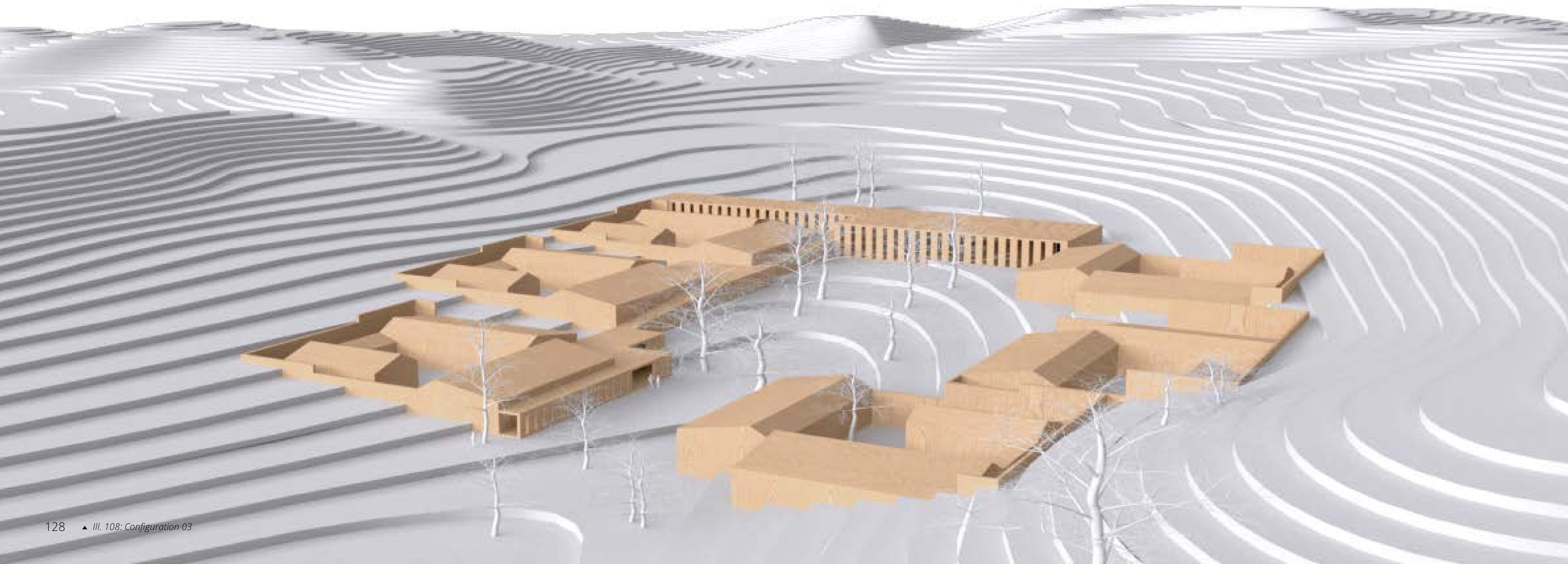
▲ *Ill. 106: Sketch of the community unit substantiated by an illustration of the earthwork principle; external walls condition a planar and functional space within which is an adventurous approach to the dynamic topography of the site.*



▲ *Ill. 105: The community unit presented in site plan and section; translating the embedded positioning of the unit within the earthwork itself. External walls condition and define the physical environment within - both in terms built and natural environments respectively.*

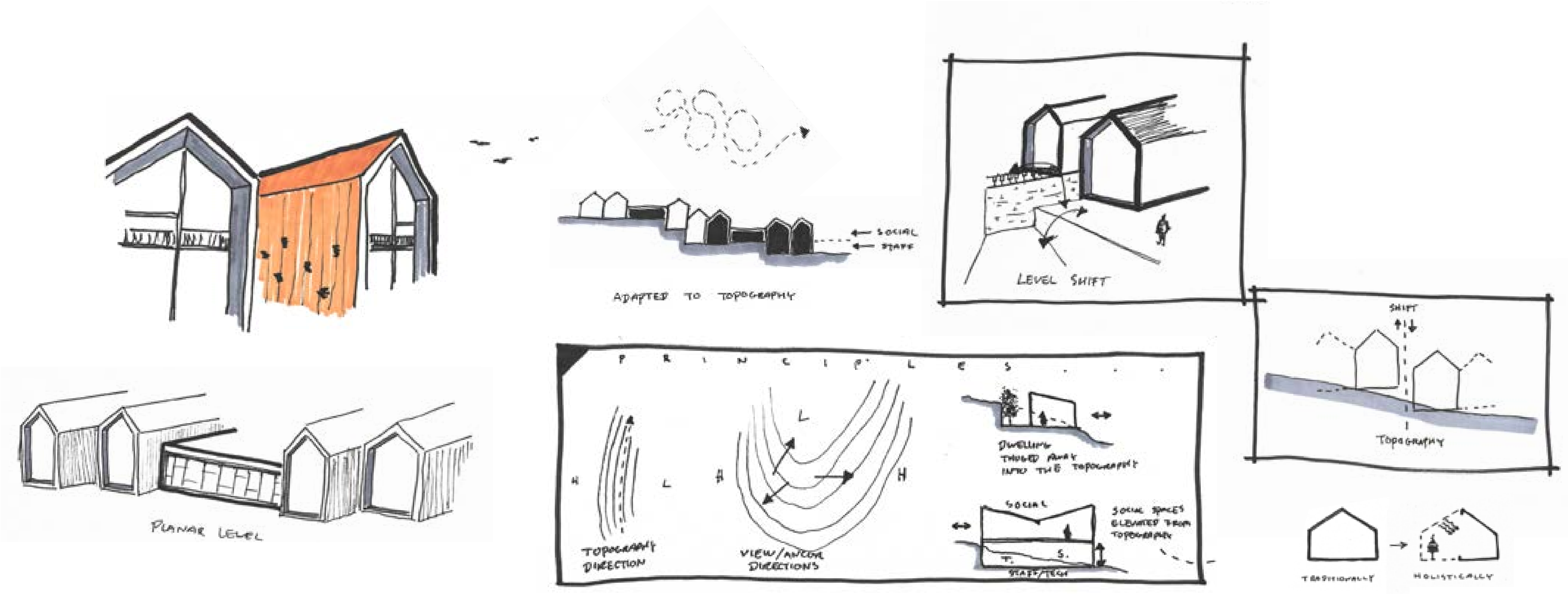


▲ *Ill. 107: The community unit; supporting up to four dwellings (two in each main building), a social space (connected through a pergola), and a shared exterior space in the center.*



 ▲ *Ill. 108: Configuration 03*

▲ Ill. 109: Configuration 03



▲ *Ill. 110: Depiction of a sketch session engaged with an ambiguous mixture of the notions of architectural expression, topography, level shifts, social and private functions, daylight intake, and a principle that facilitates their qualities.*

CONCLUSION TO CONFIGURATION

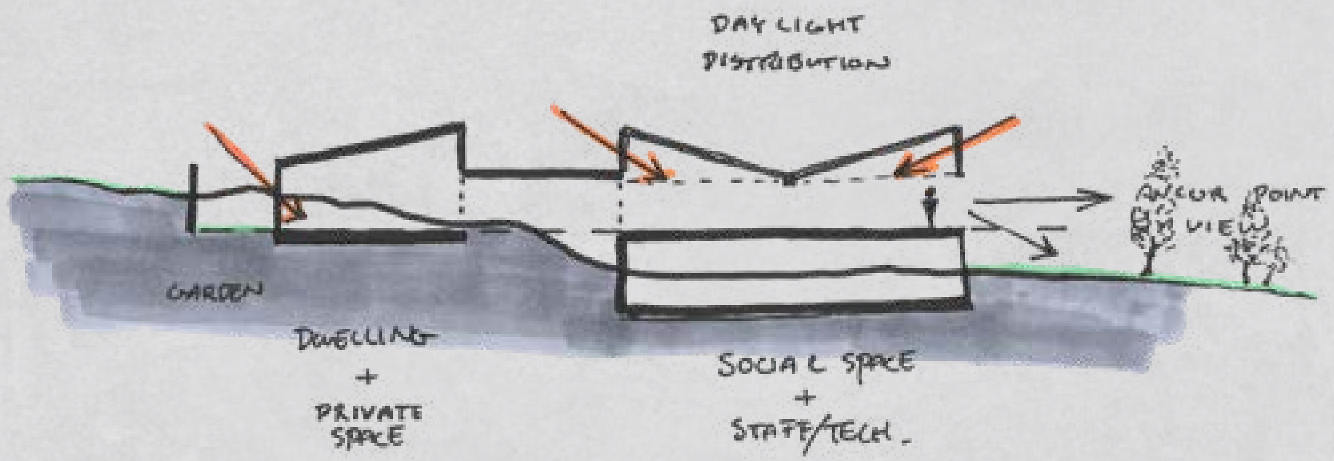
METHOD OF EVALUATION, APPLIED

Through configurational design and testing of principles, the basis of the architectural concept has been outlined in the form of qualities *or* gestures. These are evaluated by comparably weighing the envisioned quality (the intent) and the experienced quality (the result) reflected through its principle *or* realization. Subsequently, these realized designs are considered relative to both the challenges and potentials that they impose more holistically. Essentially, this matches the chronological approach to the village, the monolith, and the community configuration as previously presented. Knowledge and intent converts into design and result in order to iteratively inform new knowledge and new intent and so on. This defines our methodology of gestures & principles within integrated design.

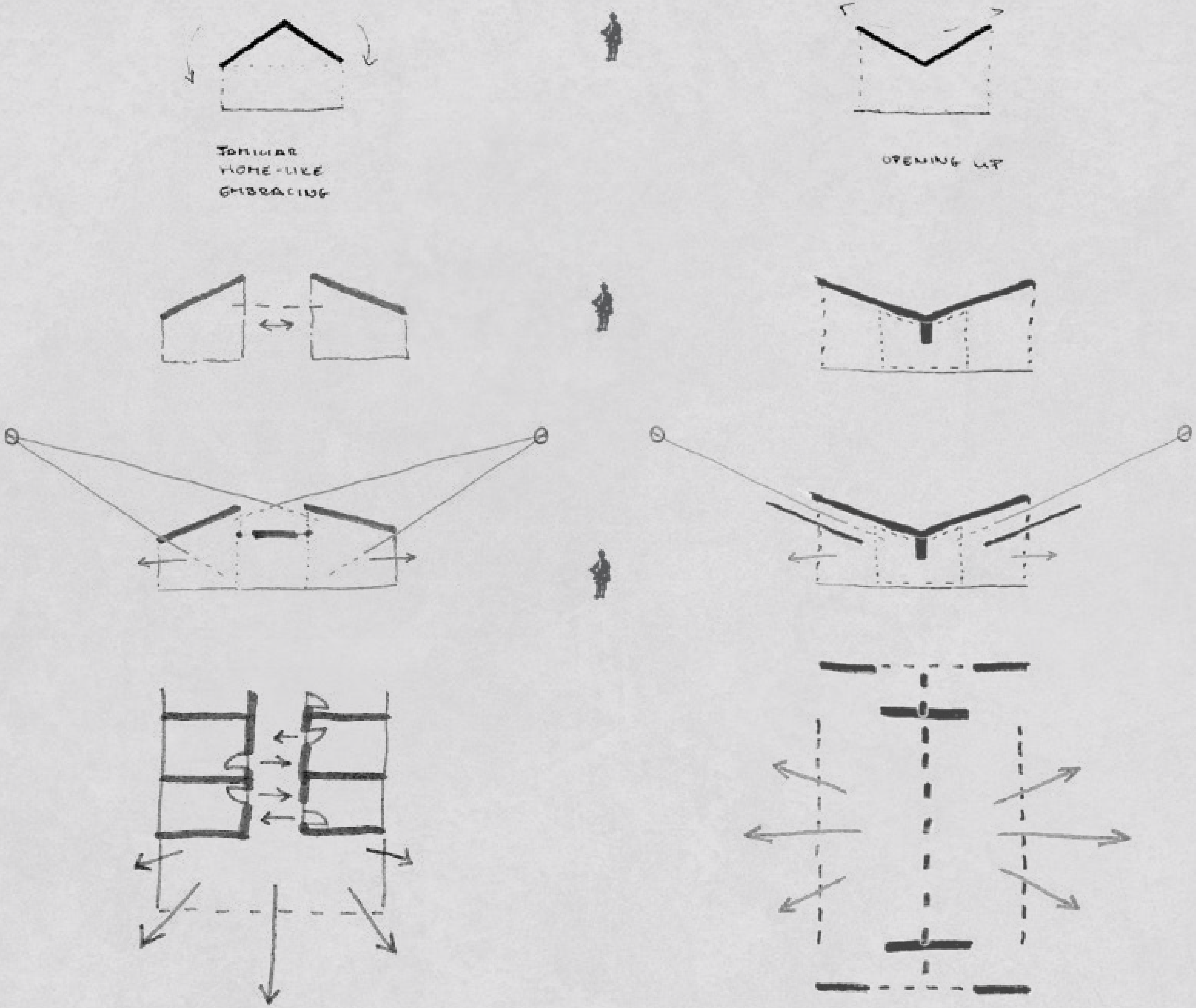
THE INTERIOR PRINCIPLE

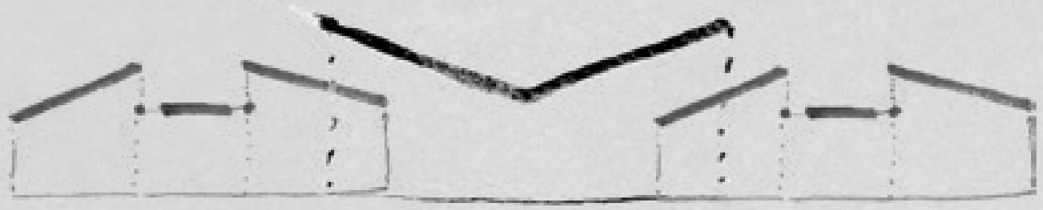
The three preliminary configurations (and sketch session based on iterations thereof) inform the fundamental idea of an architectural space as being visually and recognizably defined by either its private *or* social function. This is linked to the two notions of daylight and roof typology. In reference to the traditional home, the duo-pitch acts as an associative element.

Despite being distinguished by function, the architectural spaces share the same principle of daylight intake conditioned by their differing roof typologies. From this juxtaposed synergy, the fine line between simplicity and complexity begins to blur. In parallel, the realization of the compositional principle constitutes the blueprint for the conveyance of the caring gesture; a quality found in the threshold between the built and the natural environment. In the following, the development of the principle is show in the form of a form diagram.



▲ *Ill. 111: Compositional design informed by daylight intake and distribution as well as the distinction between private and social spaces in connection to nature. The sketch critically*


FAMILIAR
HOME-LIKE
EMBRACING
OPENING UP



◀ *Ill. 112: Form diagram 1/2: The progressive development of both the collective (left) and the main hall (right), visualized in steps informed by private and social purposes, spatiality, structure, daylight as well as connectivity and views to the outside.*

▲ *Ill. 113: Form diagram 2/2: The configuration of two collectives and the main hall, juxtaposed to conjoin both private and social space within the architecture.*

T H E   A X I A L   P R I N C I P L E

COMPOSING THE LAYOUT

From the juxtaposed configuration of the interior principle, a preliminary layout is composed in parallel with its exterior principle of positioning. The layout consists of three parts: An arrival building spanning across two levels, a middle building resembling the first part, however, in one level, and an end building. The first two parts are composed on the same notion; optimizing visual and physical connection to exterior spaces. To that end, the envelope of these buildings resemble an H-shape, conditioning private functions at the four far ends and social function in the center. Together, these buildings facilitate up to 48 dwellers.

The third part facilitates an additional 12 dwellers, however, a distinction is made as these individuals are considered as being severely impaired and therefore bedbound. Thus, the architecture responds to this cause, supported by the vast view of the landscape from within the private spaces of the building. Between and around the three parts, nature is immediate and integrates in the form of both cultivated and wild nature.

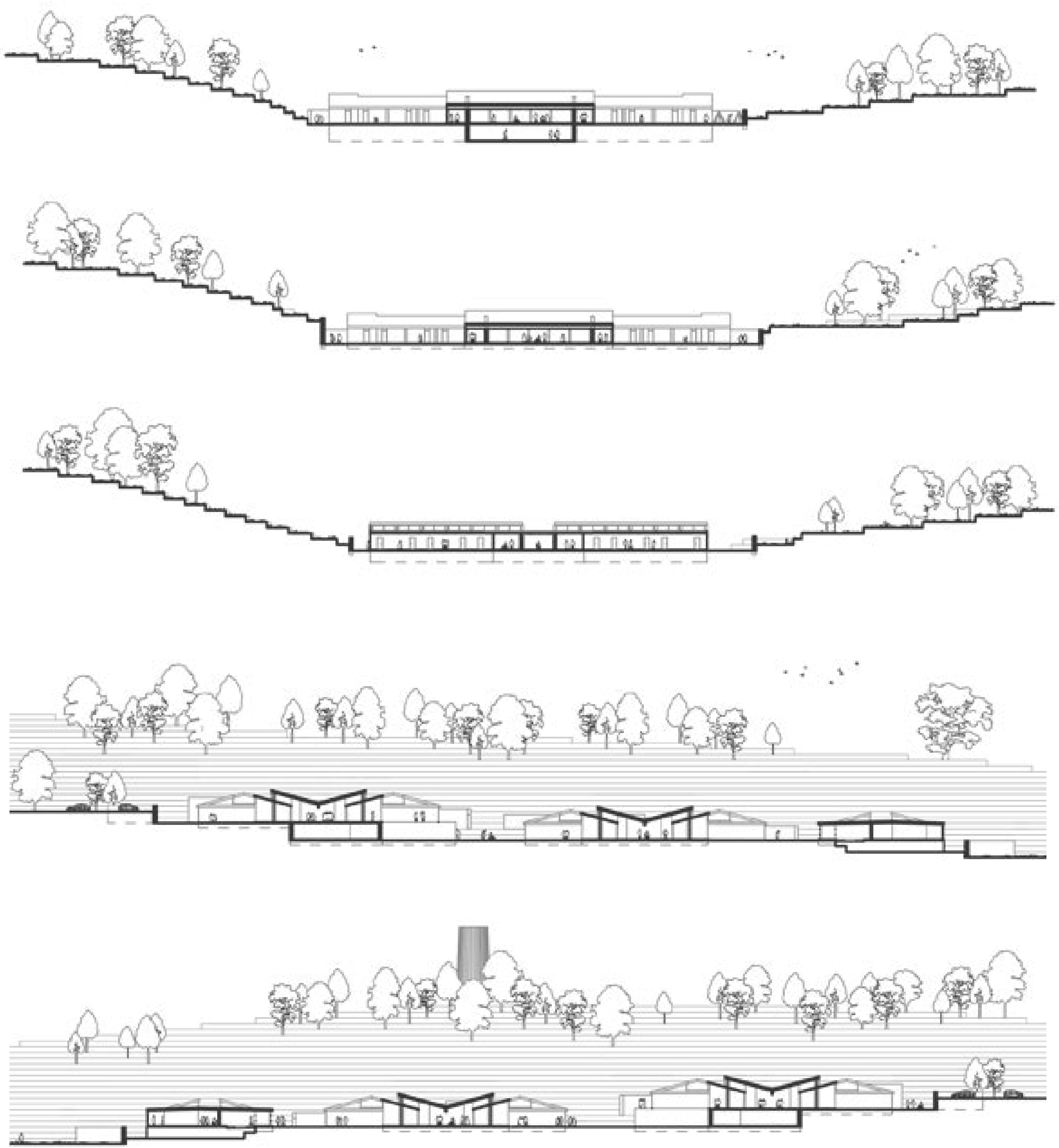
THE EXTERIOR PRINCIPLE

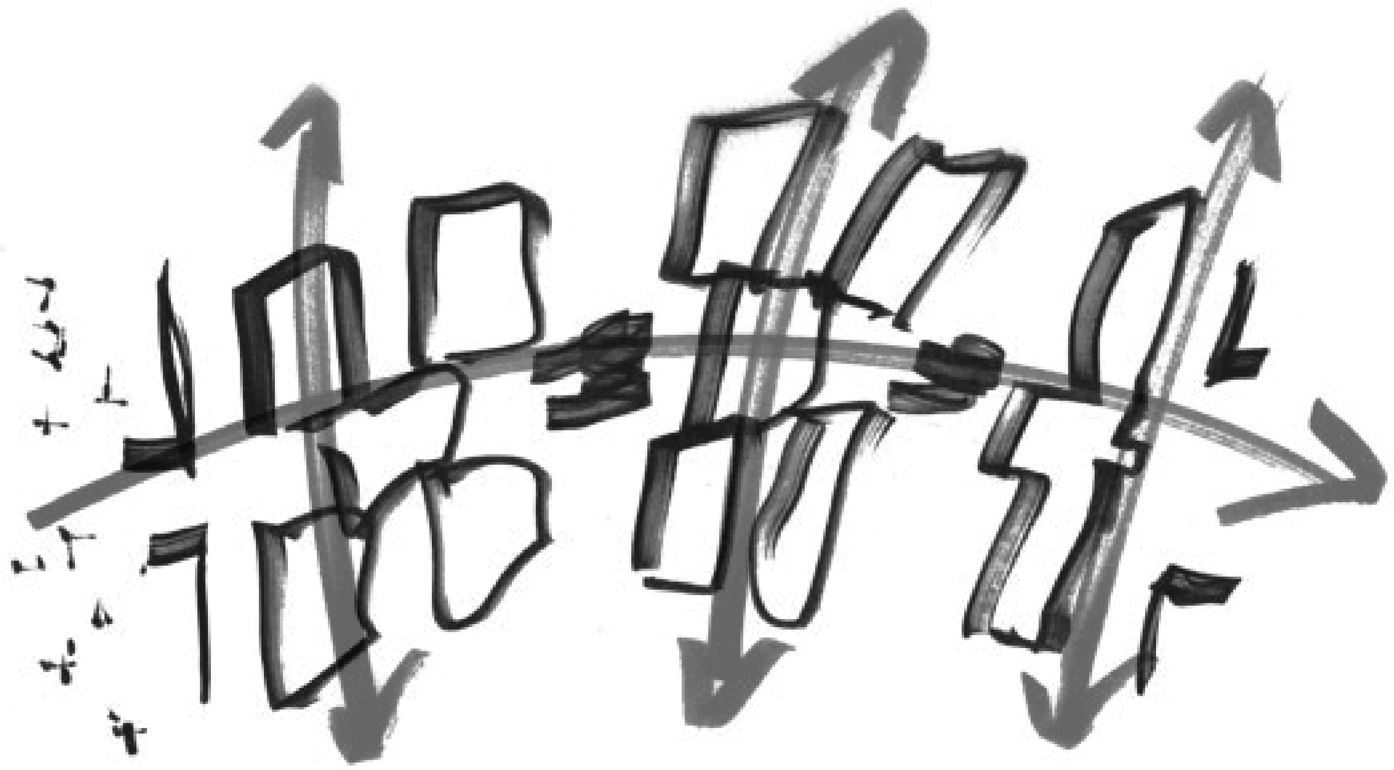
Reinstating the notion of *earthwork*, a set of conditionally positioned outer walls are requisite to the exterior principle. The walls are naturally integrated as they extrude into the valley in order to condition lower large-scale planar areas for the individual three parts to be positioned. Indifferent to its original application, the walls are detached from the actual architecture, figuratively framing the boundary of the complex. Thus, an associated dependency between wall segments and building parts can freely adapt to altitudinal changes, imposed by the topography relative to placement in the valley. In that regard, this principle is a merge of those of the village and community configurations.

The principle of the monolith configuration - positioning the building in order to facilitate a sense of embraciveness and protectiveness within exterior spaces - is present throughout, however, in different manners. In correspondens to the layout, the private functions are assigned an exterior area that is physically embracive and protective due to the appearance of the outer wall. In contrast, the large exterior areas between the three building parts appear more open and embracive in nature.

A MERGE OF PRINCIPLES

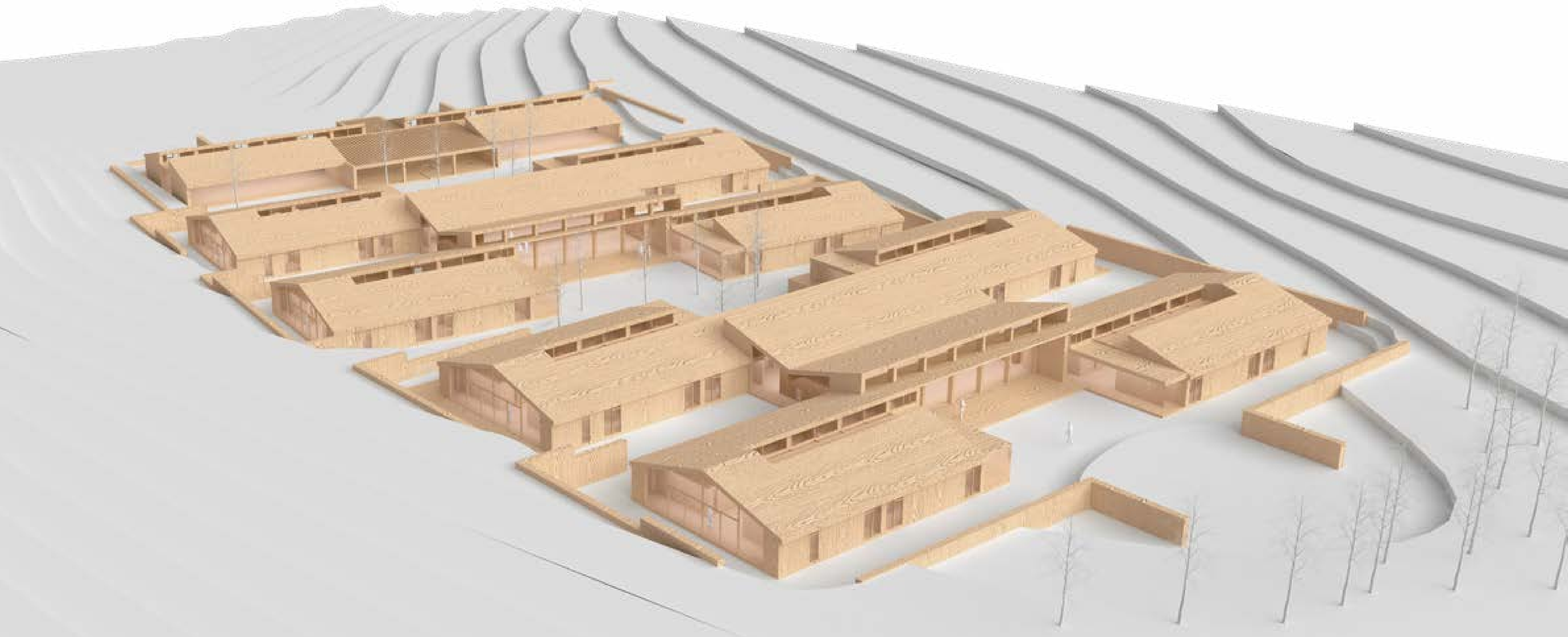
From these principles, a cohesive interior and exterior approach has been established, outlining the continuous scope of the project. Fundamentally, these principles translate the same gesture of care facilitated through the link between the built and the natural environment. In order to test and refine this link, however, integration and detailing are investigated on a practical level in the following. From these investigations, associated principles are developed. As these are essential to the holistic nature of the project, they are regarded as a subordinate part to the main storyline of building and nature - and the facilitation of care for dementia patients.



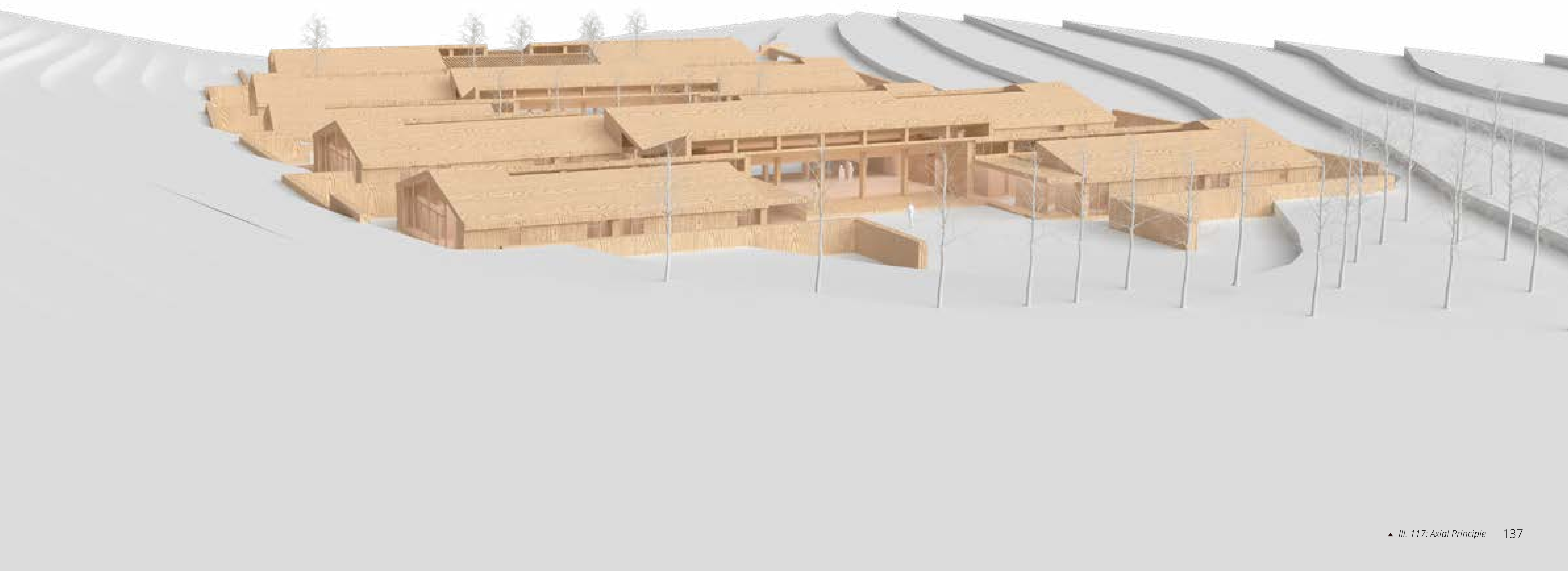


◂ *Ill. 114: Sections (1:1000) translating the reinstated notion of earthwork and the interrelation between built and natural environment, conforming to the gesture of care through both architectural and natural means.*

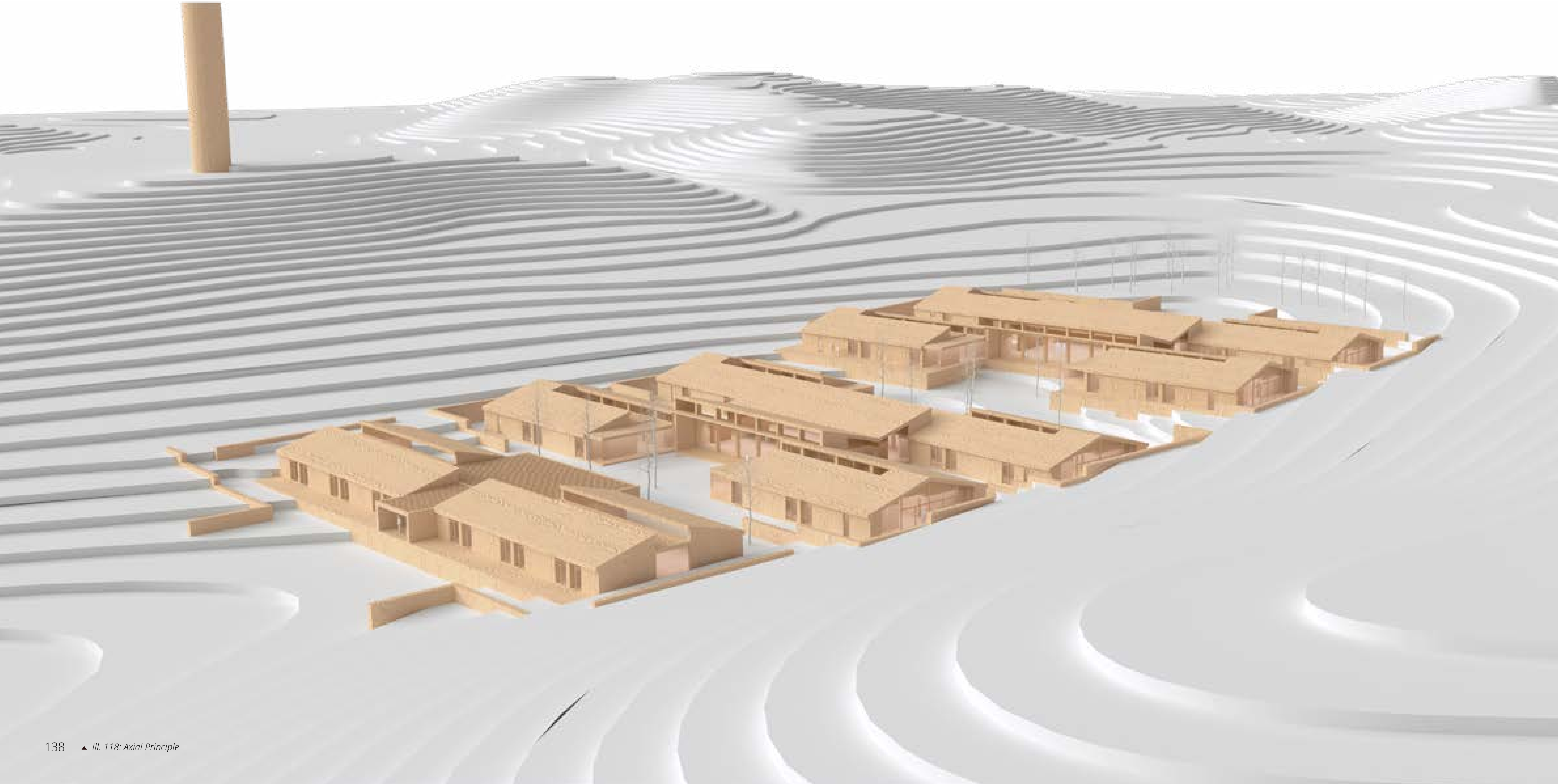
▴ *Ill. 115: Conceptual sketch depicting the preliminary site plan and the social-private concentrations of functions along the different axis. In the intersection between the horizontal and the vertical axis, social spaces are conditioned (e.g. arrival, dining, activities). At the far end of the vertical axis, more private spaces are conditioned (e.g. collectives and dwellings).*



 ▲ *Ill. 116: Axial Principle*



▲ Ill. 117: Axial Principle



▲ Ill. 118: Axial Principle

▲ *Ill. 119: Axial Principle*

DAYLIGHT INVESTIGATIONS

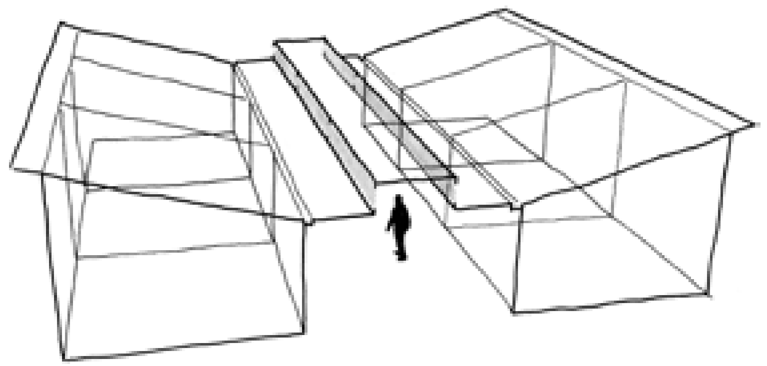
COMPOSITION AND ROOF TYPOLOGY

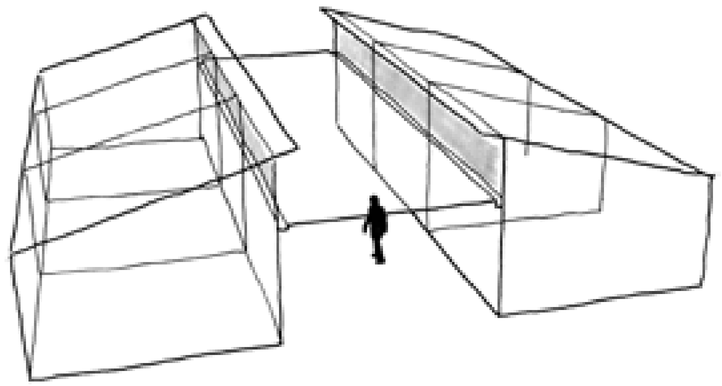
As the investigations of daylight conditions were pivotal to the conveyance of the interior principle, spatial composition and - indirectly - the exterior principle, the process of development originated from the notion of maximizing daylight within dwellings; a notion based on observations of the community configuration. From these, a series of compositional iterations are made based on the balance between exterior surfaces and the application of the roof typology - both in consideration to daylight intake.

Positioning two mono-pitched roofs against a lowered pergola, enveloping it to serve as interior transit, a principle of dual aspect windows promote direct daylight intake from both east and west. Hereby, it is possible for dwellers to sense the presence of the sun both in the morning and evening. This principle both informs the spatial composition and translates the gesture of care through a preemptive physical environment. Thus, a tectonic link is established through the application of the principle.

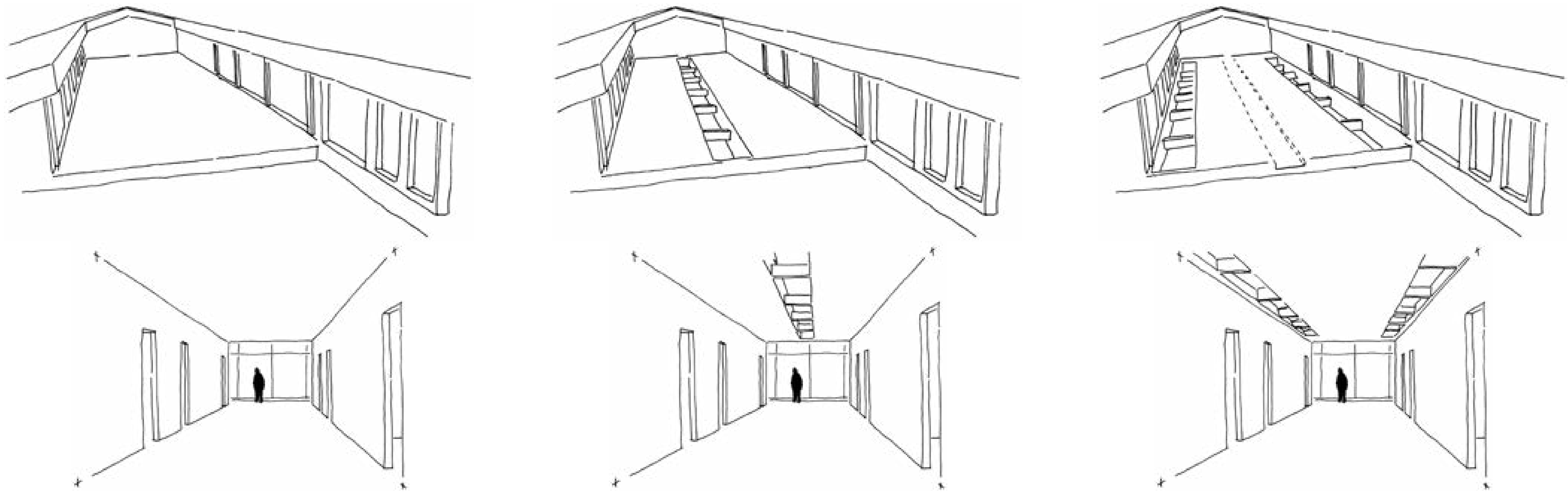
COMPOSITION BY PRINCIPLE

From the principle, a local composition of a the dwelling area is defined. However, in order to inform other areas of the complex - such as the semi-private collective and the social main hall - the principle is applied relative to the function of each area. By that analogy, the typological appearance of roof and ceiling is exploited to form juxtaposed spaces that are easily distinguished; a notion that support wayfinding. Through this approach, the principle is applied as a tool for further design and development. The roof semi-private collective is fully mono-pitched, referring to the traditional notion of home. In addition, the tall facade given by the added hight of the pitch facilitates daylight intake. In the main hall, the revered pitch of a V-roof facilitates social functions and is composed to funnel daylight into the center.





Ill. 120: Excerpts from a sketch session showing the development and integration of the daylight principle. In the center, a hallway facilitates transit for six dwellings; three to each side. The initial idea (top) focused on the daylight conditions of the hallway which inspired the conpositional idea (bottom) of the dual-aspect daylight intake within each dwelling.



▲ *Ill. 121: Iterations of integrating skylights in the hallway between dwellings. This intervention supports versatile and considerate daylight conditions within the collective as a whole.*

VENTILATION INVESTIGATIONS

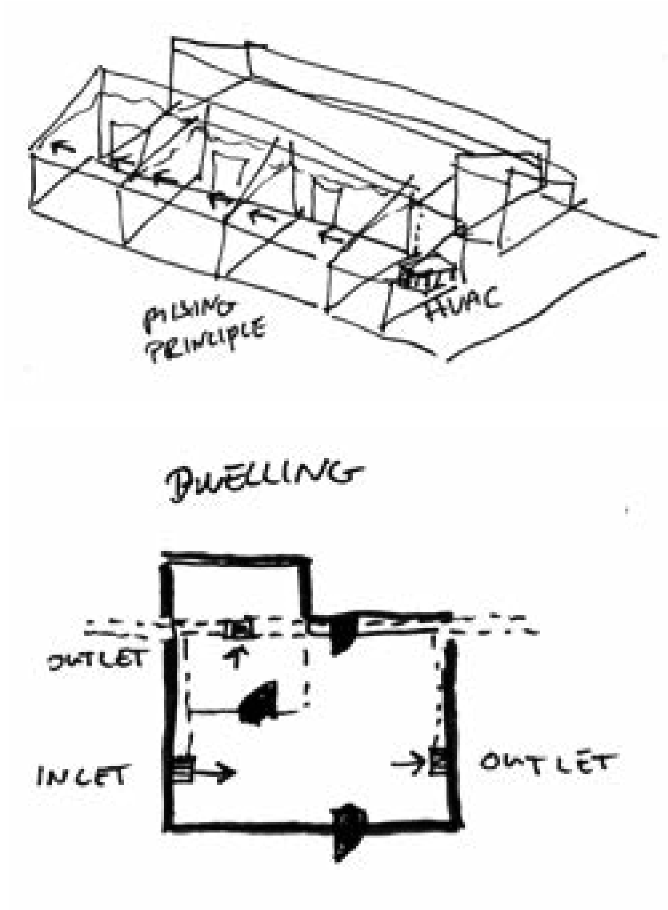
TECHNICAL AND LOGISTICAL INTEGRATION

In order to accede to a controllable and comfortable indoor environment, thermally and atmospherically speaking, technical installation and ventilation systems are considered within the spatial organisation of the layout. In association with the fundamental notion of care, it is highly prioritized that the architecture conceals these technical elements. Otherwise, these elements appear as visual distortion, affecting the experienced gesture within the building.

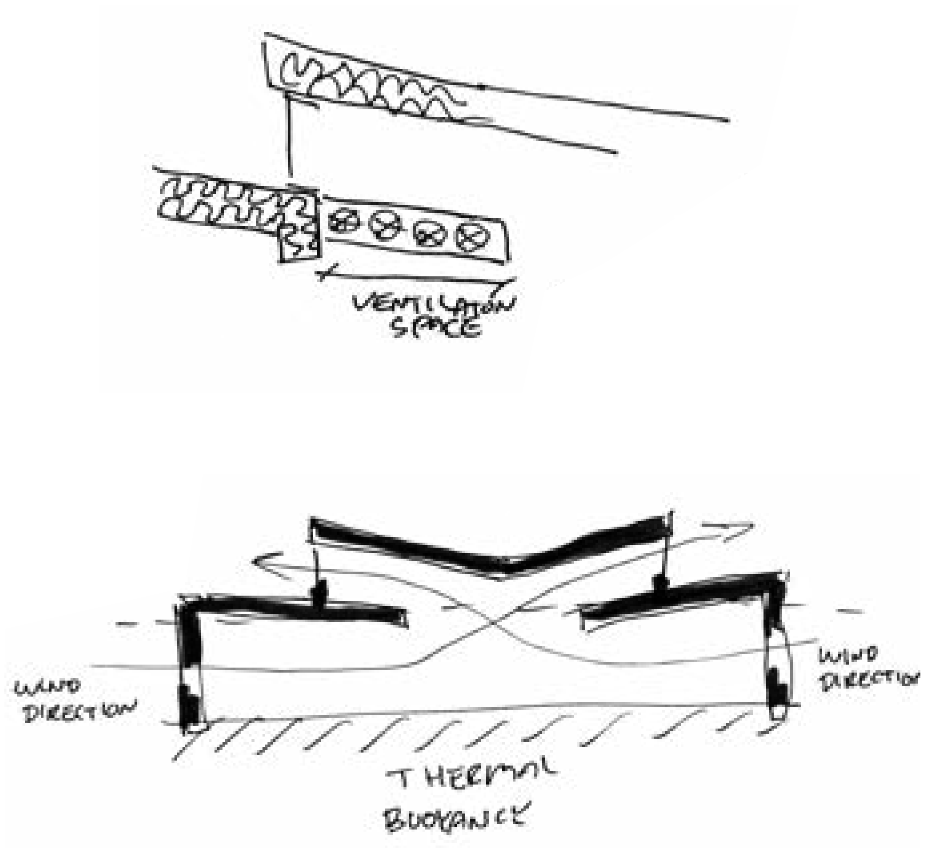
NATURAL AND MECHANICAL VENTILATION

Two types of ventilation are investigated: Mechanical ventilation (driven by an HVAC system) and natural ventilation (driven by the forces of nature). The main strategy within mechanical ventilation revolves around the notions of locally positioning technical rooms within the building as well as incorporating ventilation ducts in its construction. Each collective is fitted with one technical room that facilitates six dwellings and their shared space. Supported by a technical room from the lower floor, the main hall integrates and conceals ventilation ducts in within *the interior wings*. The ventilation principle of mixing is applied, positioning inlets towards the center and outlets on the top and bottom of each wing. Additionally, the windows above the wings enable natural ventilation through the principle of thermal buoyancy. This allows denser, cold air from the outside to lift warmer, polluted air on the inside to sustainably evacuate it.

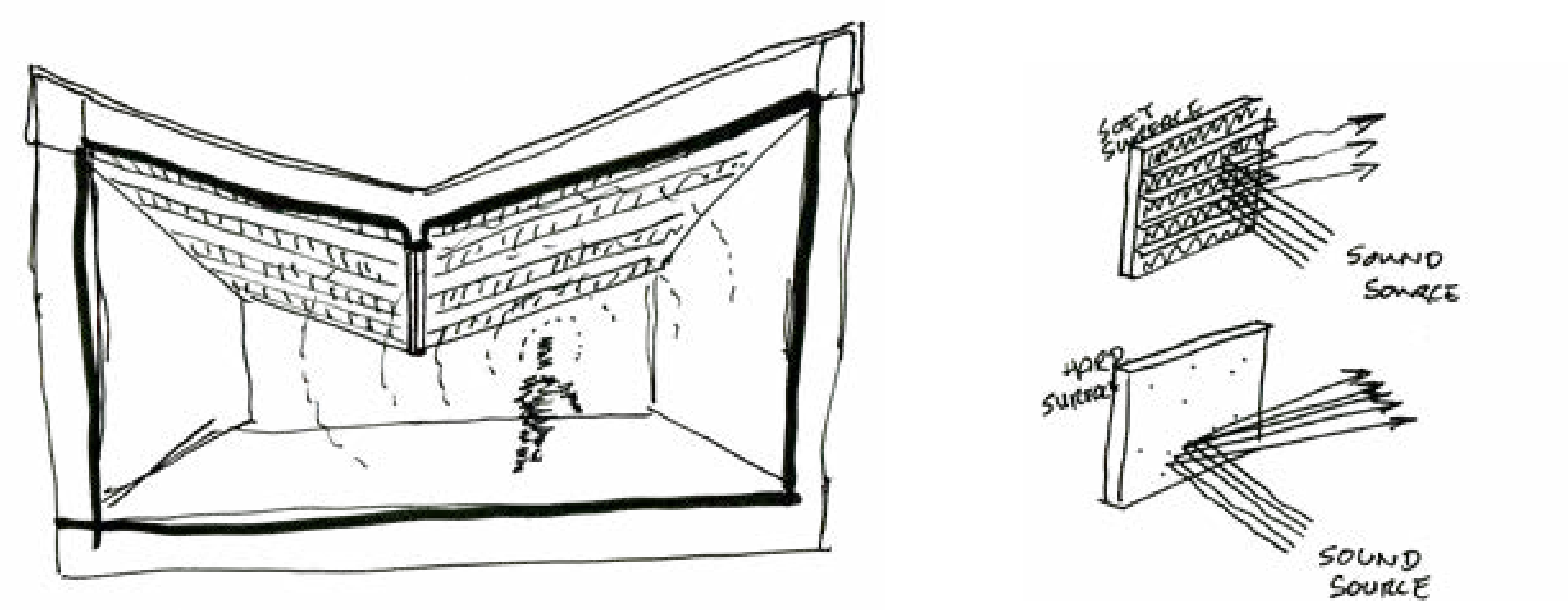
On the notion of interdisciplinarity, a synergy between the spatial, thermal, and atmospheric experience of the main hall is conditioned. This adherently creates an overlap between the fields of sustainability and tectonics.



▲ *Ill. 122: Investigations of mixing ventilation principles in the collective and dwelling; having fresh air supply from one side and an outlet on the opposing side. Additionally, the bathroom is naturally granted an outlet.*



▲ *Ill. 123: Investigations of the natural ventilation principle in the main hall, utilizing thermal bouyancy, as well as the principle of integration a space for ventilation ducts in the interior roof wing of the hall.*



▲ *Ill. 124: Investigations of the acoustic principle of absorption, applying soft surfaces and wooden lamellas in the ceiling of the hall in order to reduce reverberation time and increase intelligibility within.*

A C O U S T I C   I N V E S T I G A T I O N S

NATURE AS A REFERENCE

Continuing the development of the main hall, an essential notion of atmosphere is acoustics. Referring to the link between the natural and the built environment, the main hall should be experienced as a calm and relatively controlled acoustical environment, opening up towards the exterior and sensing nature. In order not to hinder or jeopardize this envisioned experience, considerations on materiality and structure.

ACOUSTICS OF THE HALL

Investigations on the acoustic environment and atmosphere of the main hall has been processed based on the notions above. In order to achieve an acoustically intelligible space, the reverberation time must be proactively reduced through the application of material and material surfaces. To that end, the inhomogeneous surfaces of timber lamellas and absorptive fabric is exploited. In combination, these materials are applied to the ceiling of the main hall as this room is the largest open space in the complex. For that reason, acoustic treatment is integrated.

To further absorbed, reflect, and scatter the sound, the visible ceiling structure is adherently integrated in consideration to acoustics. The tectonic nature of the truss is enhanced as its primary purpose is to bear the loads of the roof construction as well as create a recognizable spatiality to support the notions of memory and wayfinding. Additionally, the structure is considered to significantly impact and reduce reverberation time within the hall.

STRUCTURAL INVESTIGATIONS

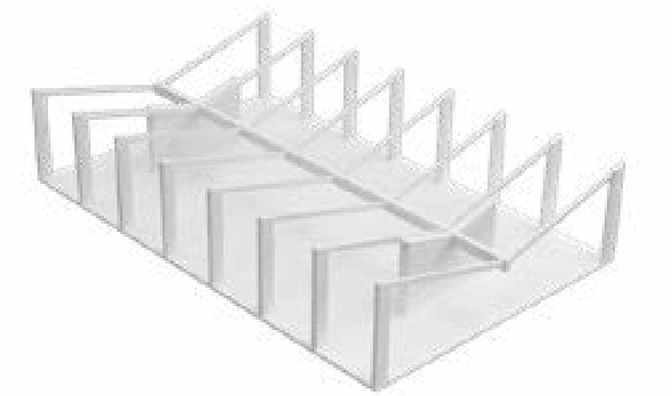
EARLY ITERATIONS

During the early iterations of the process, the structural design were developed with the focus of creating a "guiding" structure in its most literal meaning. The intention was to utilize the structural design to promote wayfinding abilities for elderly with dementia, and hereby create an autonomous space. Some of the very first design ideas involved a large central beam spanning on the longitude direction of the main hall, with the intention of creating a directional sensation, guiding the dweller towards their dwelling. At first this was solved with two concrete walls in standing in the middle of the space at each end of the large beam. Additionally rafters would transfer the forces from the roof into the beam and a series of columns would support the rafters at the roof edge (see configuration 1). The downside to this composition were the fact that the large beam seemed intimidating to the observer, and it was somehow compromising the caring nature of the space. Additionally the long series of columns at the edge were compromising the view towards the exterior nature. This last issue were solved by replacing the columns with large beam at the skylights, which would be supported only by a few concrete walls (see configuration 2). Later on other iteration were beginning to move away from the idea of the guiding direction of the structure, and instead focusing on creating an open room in which the atmosphere from the surrounding nature could completely blend into. Some early ideas of this was to work with the roof as a self carrying concrete shell supported either by walls at each end or columns following the center of the roof (see configuration 3 and 4)

LATE ITERATIONS

Further into the process the notion of the guiding structure and the intention of the open space. This let to the understanding of the guiding structure as an element that would become an anchor point defining the characteristic atmosphere of the central hall space. Additionally it became important that the structure would not only allow a large open space in which the atmosphere of the surrounding nature could float into. It was important that the structure would also interact with the nature in a figuratively manner by mirroring motifs found in nature. The first iterations of this were experimenting with something similar to a scissor truss, only reversed and with a beam running trough the centre of the truss supported by simple columns along the way. Considering this design in its structural nature it became clear that their were some incoherence between the structural behaviour and the aesthetic appearance. This structure were somehow imitating the shape of a truss but due to the positioning of the supports it was not acting like one (see configuration 5). For this reason, and the fact that the columns were interrupting the free space, the supports were replaced with a beam at each end of the roof, supported by a few concrete walls along the span of the roof (see configuration 6). This would keep the space free of columns and narrow in the skylight window, only allowing low sun to filter trough the truss and hereby creating the image of sunlight coming trough the treetops in a forest. In the end, different configurations of the truss were tested towards its load bearing capabilities and its effect on the space. Finally a configuration were developed, in which the internal elements of the truss would optimally decrease the bending moment in the top and bottom chord segments. This design would also include a unique detail of the verticals wrapping around the other elements, delicately creating hinged joints from which the vertical elements would continue into the space and become integrated lighting fixtures (see configuration 8).

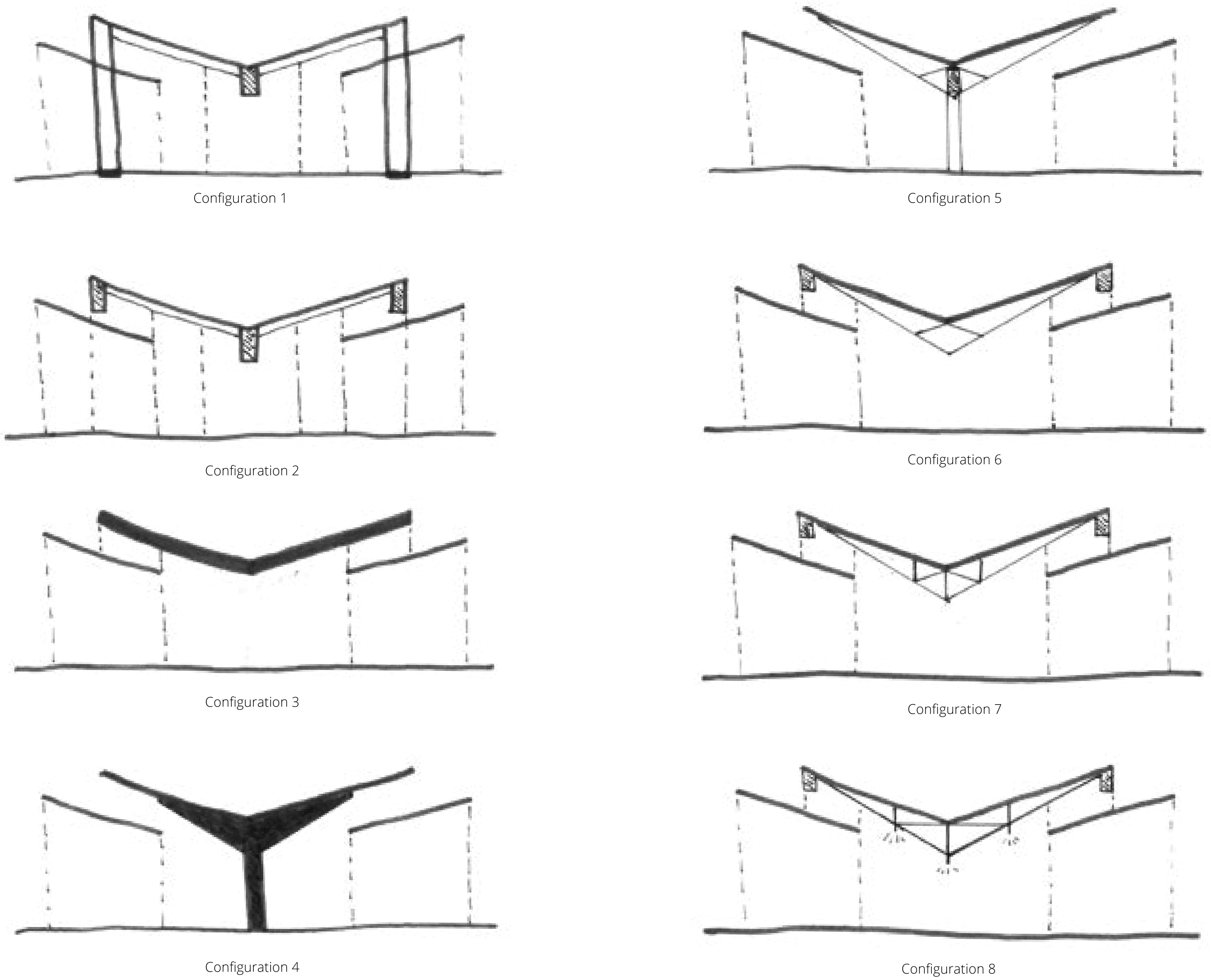
Configuration 1 - collective



Configuration 1 - Hall

Configuration 1 - Hall

▲ *Ill. 125: The initial structures of the collective and the main hall; built on a fundamentally different structural principle.*



▲ *Ill. 126: A series of structural configurations, developed throught the course of the design process. Investigations vary from applying the structural principles of columns, slabs, beams, and - in the end - trusses of different designs.*

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[86] See Gottfried Semper, '*The Four Elements of Architecture and Other Writings*' (Cambridge: Cambridge University Press, 1989)

[87] See Gesine Marquardt, '*Architecture for People With Dementia: Planning Principles, Practices and Future Challenges*' (Dresden: Technische Universität Dresden, 2014)

A CARING SPACE

EPILOGUE

DESIGN FOR DEMENTIA

The *epilogue* evaluates the course of the project in the scope of the problem-orientation, the various factors of its elation, and the resulting work of architecture itself. As a conclusion, the thematic nature of the project is summarized and apposed with its achievements in order to extract general information within the field of designing care facilities - not only as institutional environments but as enriching instances of everyday life.

In extension, the challenges of practically realizing a care facility of such calibre is put into perspective in a reflective manner. As the closing notion, the limitations of costs and area are weighed against its primary cause: Facilitating a caring and preemptive environment.

C O N C L U S I O N

DEBRIEFING

The master's thesis, *A Caring Space*, set out to investigate and address the stimuli potentials of the physical environment to support a dignified quality of life among institutionalized elderly people with cognitive deficits caused by dementia. However, throughout approaching these investigations, this preliminary motivation evolved into a more fundamental and cohesive focus; in which stimuli potentials were one aspect of interest amongst many.

Ultimately, the physical environment was segmented into two fundamental parts: The built environment and the natural environment. By approaching these environments individually, a correspondence between their means and ends was established. Thus, an architectural concept was developed to emit rather than impede preemptive qualities in relation to the site-specific context of Hammer Bakker. This was achieved through interdisciplinary means fused with a tectonic approach.

A GREAT BUILDING VS. A WORK OF ARCHITECTURE

The application gestures & principles within the integrated design process proved greatly fruitious in the conception of an architectonic series of spaces and envelopes that exist on the threshold between built environment and the natural environment. In juxtaposition, an enhanced physical environment is conveyed; one that is informed by and responds to the needs of dementia patients and individuals with cognitive deficits. The investigated link between the built environment and the progression of Alzheimer's Disease reifies the importance and impact of architecture today; a notion that relates to our preliminary observation on contemporary architecture.

Refering to Louis Kahn statement, "A great building must begin with the unmeasurable, must go through measurable means when it is being designed and in the end must be unmeasurable."[88] His notion that goes hand-in-hand with the tectonic approach of gesture & principle. The first intance of unmeasurability delineates gesture as an envisioned quality, the instance of measurability delineates the principle, and the last instance of unmeasurability delineates the gesture as an experienced quality - all in relation to *a great building* or *a work of architecture*. By that analogy, however, a gesture is always unmeasurable and a principle always measurable. As the closing sentiment, this interpretation pinpoints an incapacity in the approach to designing; for how can one evaluate the unmeasurable? The answer to that question is believed to found in a reinstatement of Semper's notion on the architect's conscious - and his or her critical positioning within the field. Hence the results of any architect are indifferent to each other.

PERSPECTIVE

DECLAMATION OF IMPROVEMENTS

As a theoretical project, certain aspects of the design has been neglected throughout the design process. Despite the fact that an architectural design of highly integrated nature and tectonic quality was conveyed, the degree of the building practically performs as envisioned is to some extent questionable.

Certain aspects of the project, however, were deeply engaged in the detail. The calculation and design of the tectonic truss structure went beyond simply dimensioning the individual elements and segments of the truss. The intricate detail of the truss was approach in order to fully define and cover the behaviour of the structural; both statically and tectonically. A solution of the joint itself was developed, however, this revealed that the joints were the critical part of the entire structure - and that the remaining parts were relatively over-dimensioned. Tectonically, the physical appearance of the truss could have been approached more iteratively by measuring e.g. acoustic or daylight conditions relative to the structure itself.

THE CURRENT STATE OF CARE FACILITIES

As initially discussed in the *programme* chapter, the current state of contemporary institutional environments is questioned. The fundamental cause of these facilities is (or should be) facilitating preemptive care to those in need of it. Thus, the tendencies of the architectural discourse should not impede this cause through means of efficiency. Potentially, this could jeopardize the impaired individual which, in turn, could cause an increase in the progression of dementia. This observation influenced the development of and approach to the programme; an essential part of the process that was progressively changed throughout the design process.

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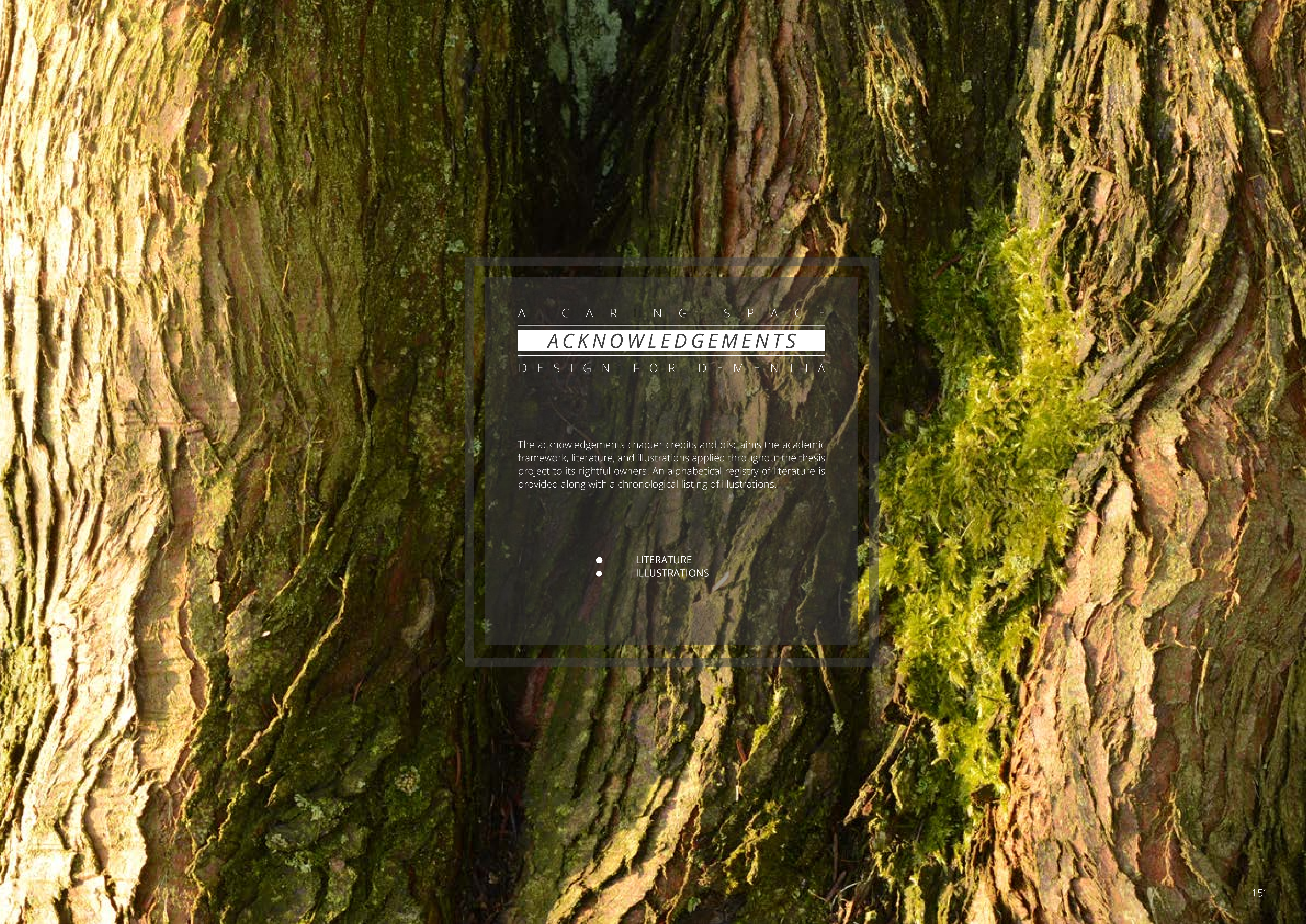

A CARING SPACE

ACKNOWLEDGEMENTS

DESIGN FOR DEMENTIA

The acknowledgements chapter credits and disclaims the academic framework, literature, and illustrations applied throughout the thesis project to its rightful owners. An alphabetical registry of literature is provided along with a chronological listing of illustrations.

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