08 - DESIGN PROCESS

Design Process

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Abstract

Over the span of the design project, many facets have been covered and tested to finally reach the definitive design of the hospice. During this period of design, this booklet is used to register and document all the steps taken in the process.

The booklet primarily consists of sketches, and diagrams, but also some references that have been used as a source of inspiration during the design phase or even the technical detailing phase. Overall this document gives a clear overview of the development and justification of the project.

Keywords

Design, Process, evolution, architecture

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Initial Sketches

For the P1 presentation, the main goal was to work on the masterplan, to create a well-developed whole in which we can design our buildings towards the P2 presentation and onwards. A finger exercise was made by giving a first impression on the initial thought of the look and feel of a building that would be placed on the chosen plot.

The first insight that was incorporated into this sketch was the effect of the water, which is in this illustration at a relatively normal level. In the background and on the island itself there are some parts flooded, and if the water would rise any further the pole foundations would be flooded as well. The water is also used by nature and humans for recreation in inhabitation, we see someone swimming, and fishing, and some birds are present in the water going towards the ditch. All in all, water is considered the dominant factor in this sketch.

figure 01 - Sketch for P1 presentation (09-11-2023)

Site soil conditions

During the site analysis, three types of soil are affecting the plot. On the waterside, a band of peat soil covered with a thin layer of clay is found. Further towards the land, the peat soil makes place for sand, covered with a slightly thicker layer of clay. Then on the tidal-inversion ridge itself, more compacter sand is found, offering the most sturdy ground of the three.

In the sketch, first thoughts are drawn on how the foundations that result from these soil conditions might translate to a building typology.

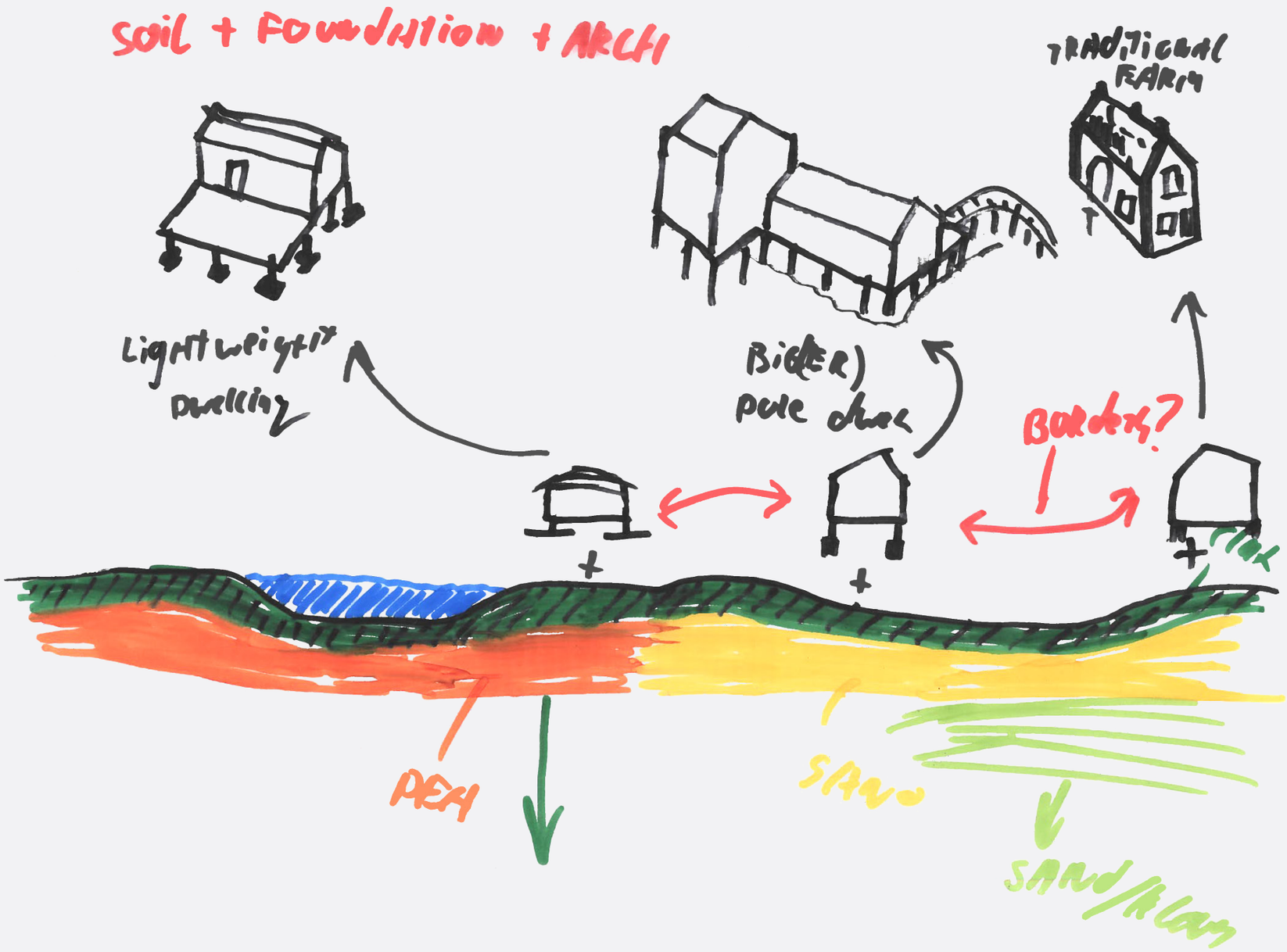
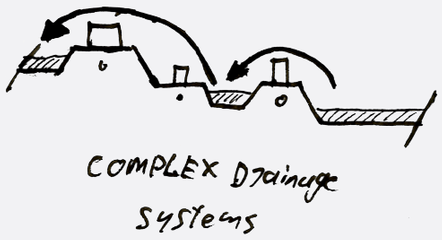
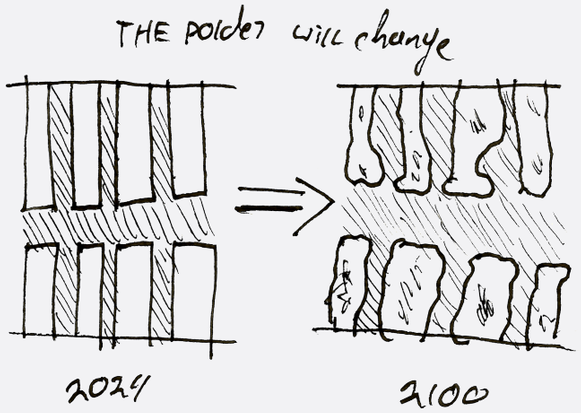
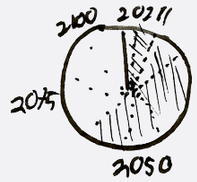


figure 02 - Soil conditions in section (15-12-2023)

Storyline Sketch







10 years?
30 years?

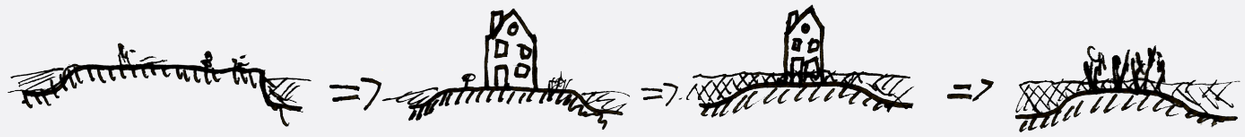


figure 03 - Sketch on storyline (19-12-2023)

Building Program

Based on the first thought of an unfinished case study research, a program of areas was made based on two similar-sized hospices. The program is divided into three parts, the palliative dwellings and most private areas, or dwellings. The public spaces for the patients, staff, and guests, and finally the service and staff areas.

In the following pages, some design variants are made based on this program of areas. The areas were cut out in foam, and experimented with in the form of a model.

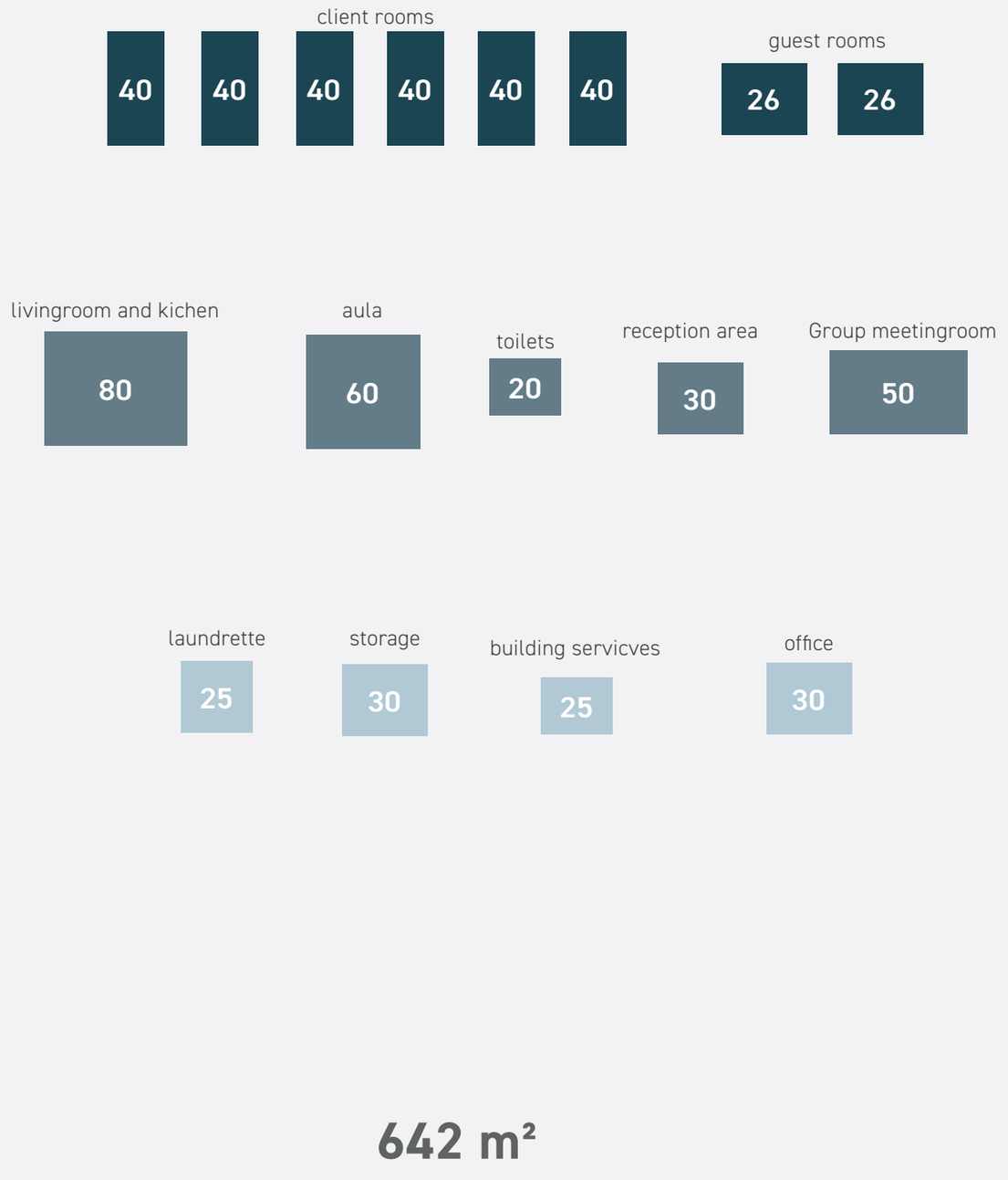
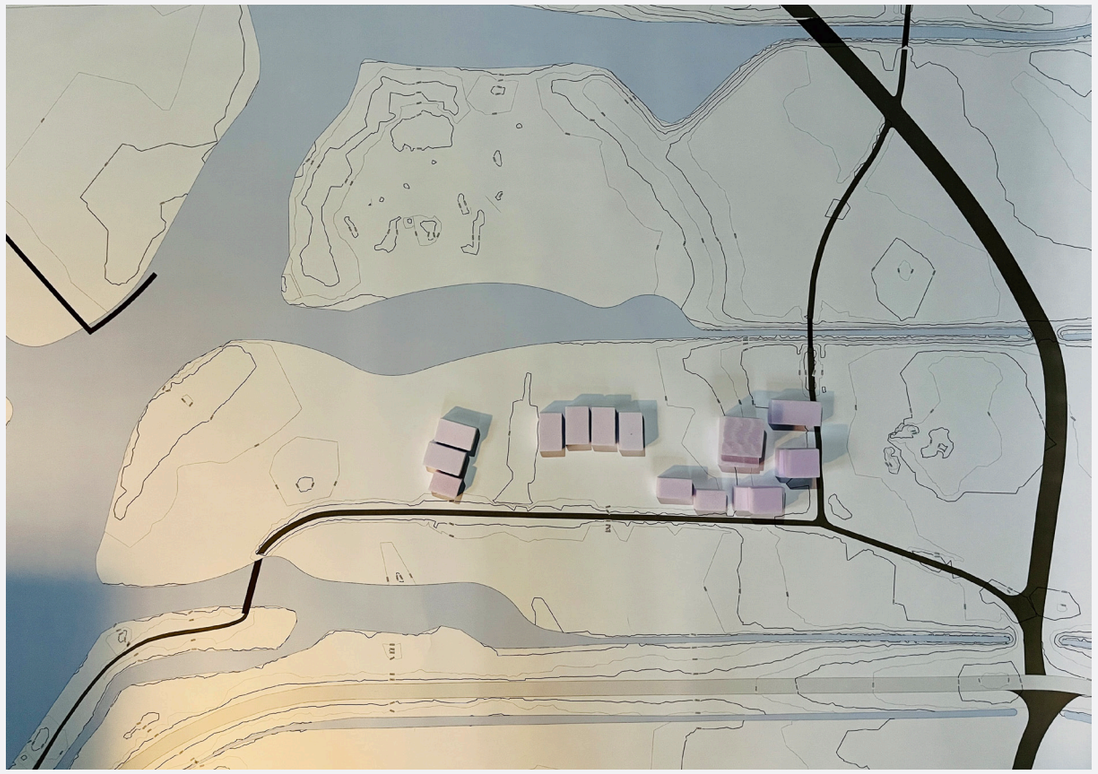


figure 04 - Building program (not the final version)

Variant 1

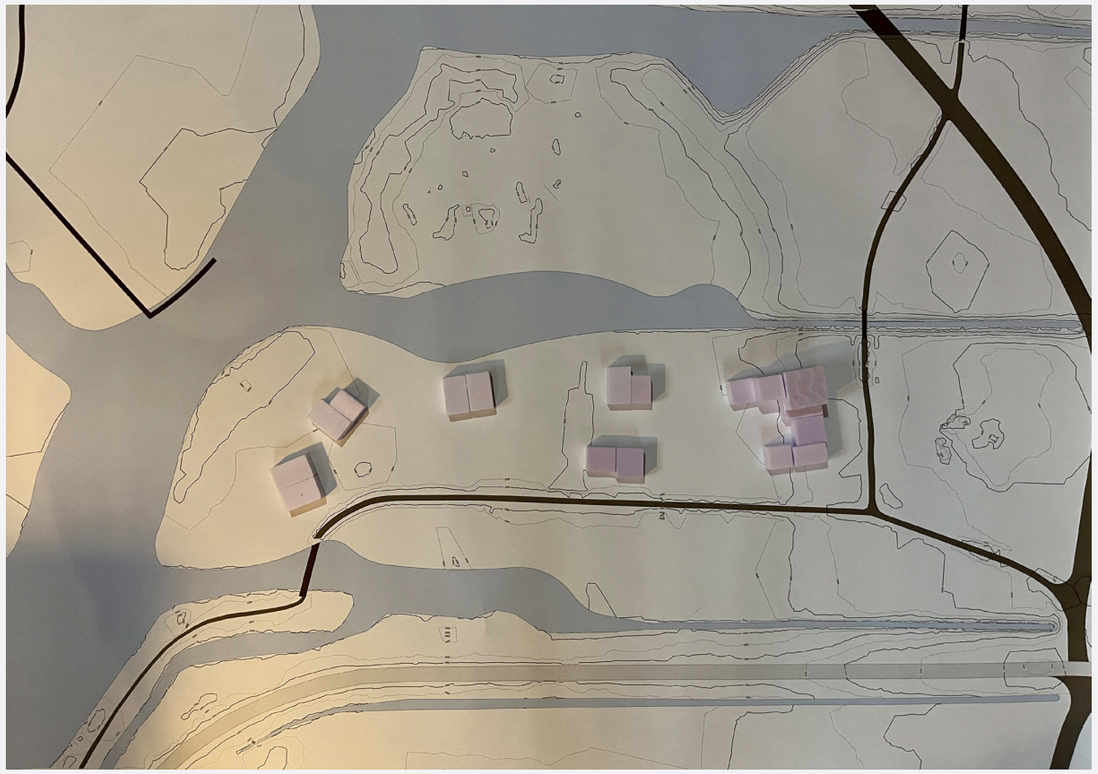


The first variant was based on a clustering of the public and service spaces on the right side of the plot, whilst the palliative dwellings are clustered more towards that nature, which they also have their primary view aimed towards. It is important to separate the palliative dwellings from the more busy areas of the hospice since many of the guests want to close themselves off to contemplate.

figure 05 - Variant 1 Plan

figure 06 - Variant 1 model

Variant 2

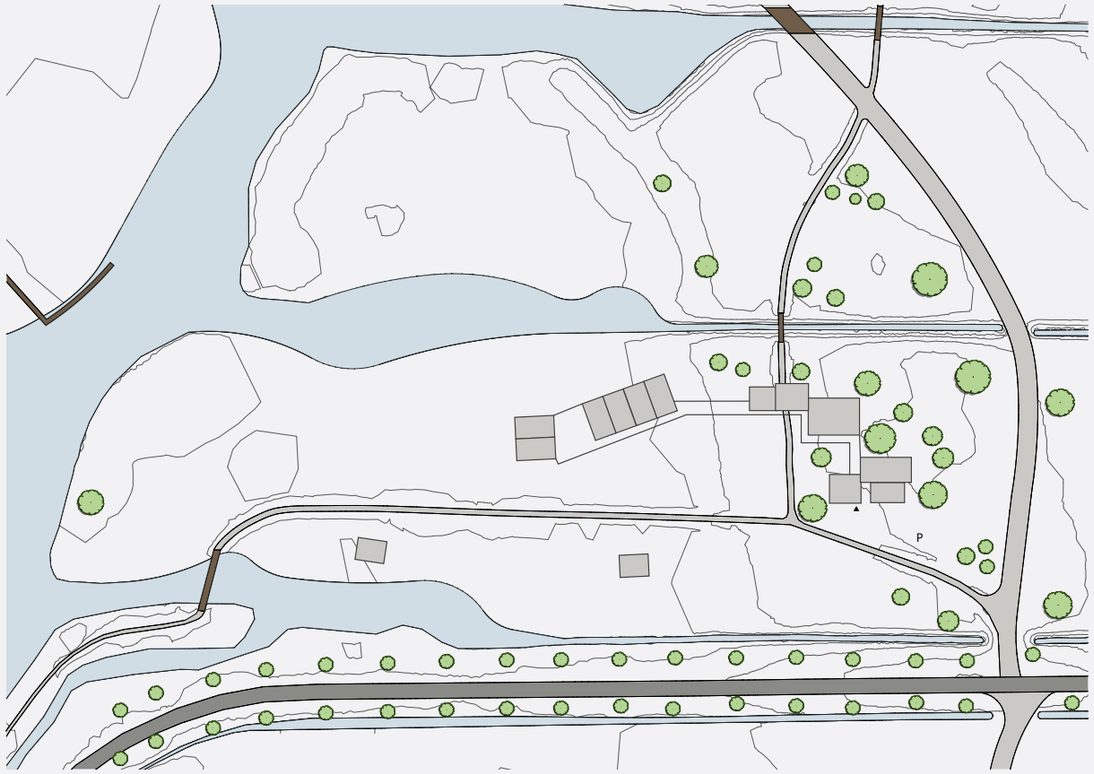


In comparison to the first variant, this model is more spread out, with the organizational and staff areas on the tidal-inversion ridge and the palliative dwellings reaching out into the landscape. The smaller blocks of the palliative dwellings are guest houses, of which the main thought is to combine them with the palliative dwellings so that the family can sleep close by.

figure 07 - Variant 2 plan

figure 08 - Variant 2 model

Variant 3



In this variant, the organizational/public areas are woven into the existing and newly added trees. It for instance also offers a place for the aula on the second floor, connected to the treetops. The palliative dwellings are added with a corridor to connect them to the public spaces. There are two separate guest houses detached from the hospice itself, allowing the family to be close but yet on their own.

figure 09 - Variant 3 plan

figure 10 - Variant 3 model

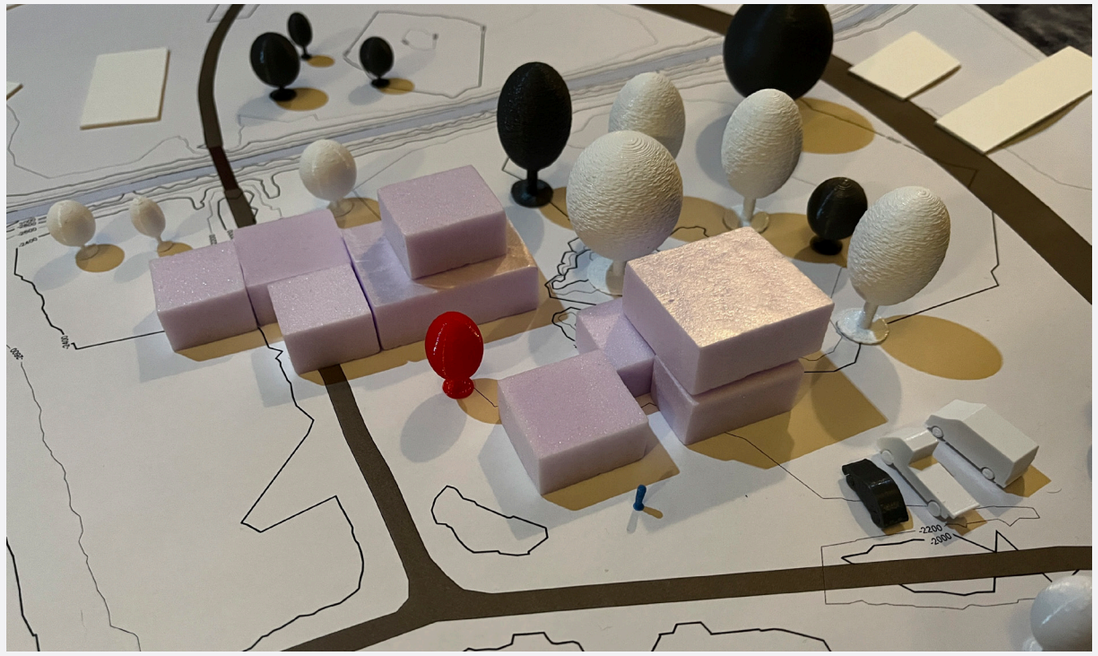


figure 11 - Variant 3 model

figure 12 - Variant 3 model

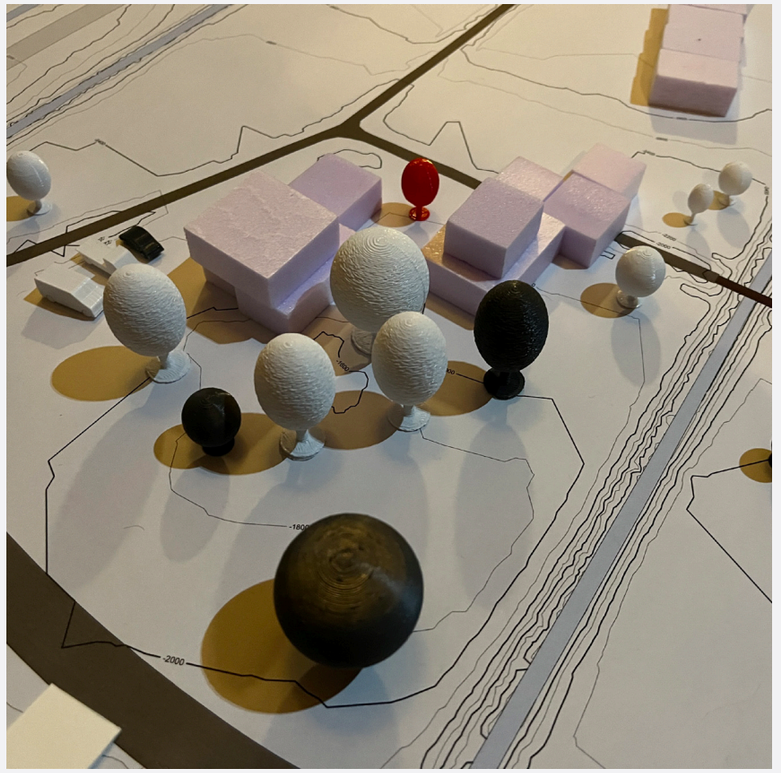
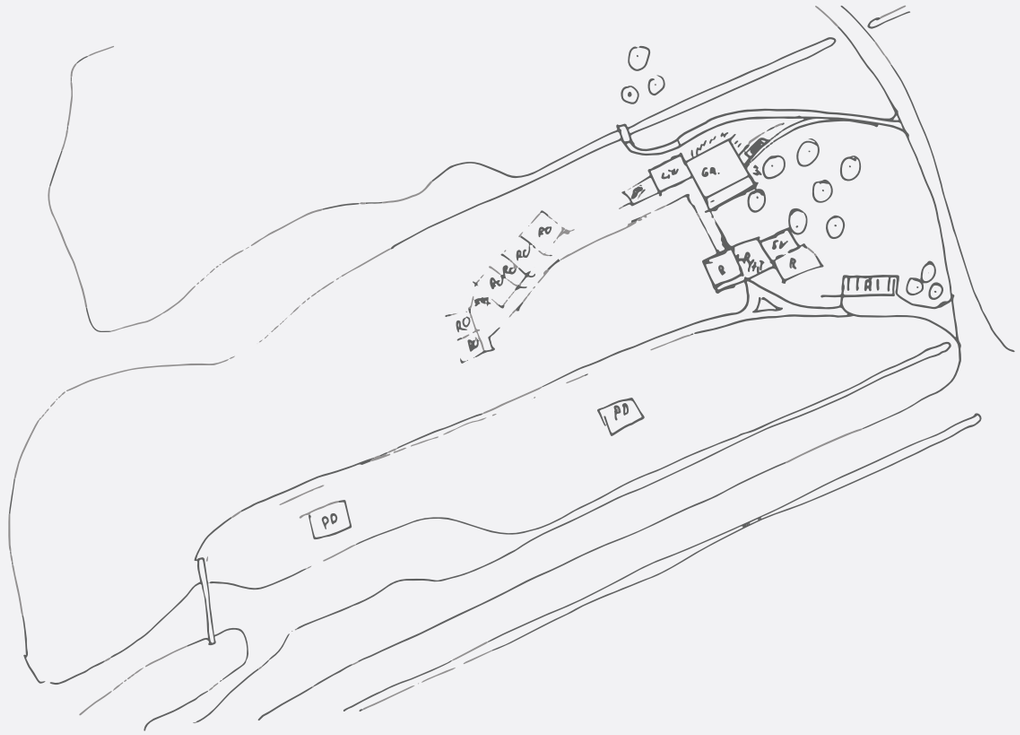


figure 13 - Variant 3 model

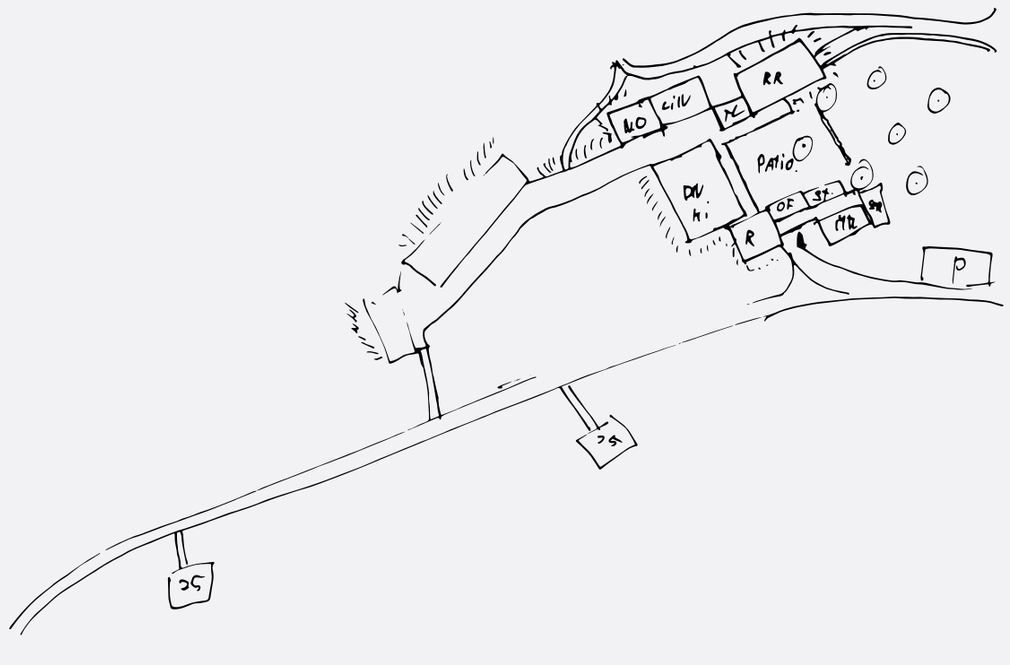
Existing sketch



During the visit to Hospice de Liefde, the guide said that the patio was used a lot by the patients during warm summer days. The patients were moved with the bed to the patio to enjoy the sunlight, without a cold wind. Combined with the corridor a patio was made in this sketch as a change from the previous variant. This sketch was truly based on the current tradition and wish of hospices.

figure 14 - Design based on visit

Existing sketch redefined



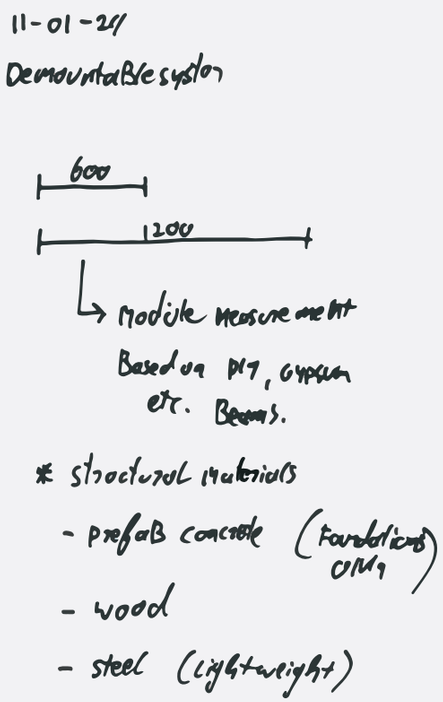
Because the previous version had a lot of corridor space to create the patio some rooms were taken to the ground floor. This also helps eliminate an elevator, which is needed to vertically transport the patients. A corridor is still present but now acts as circulation for the surrounding building volumes.

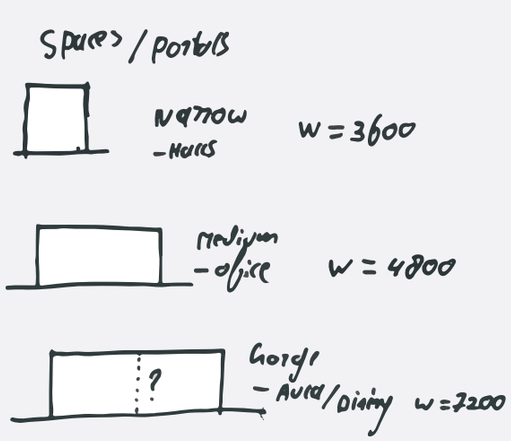
figure 15 - Redefined version of visit design

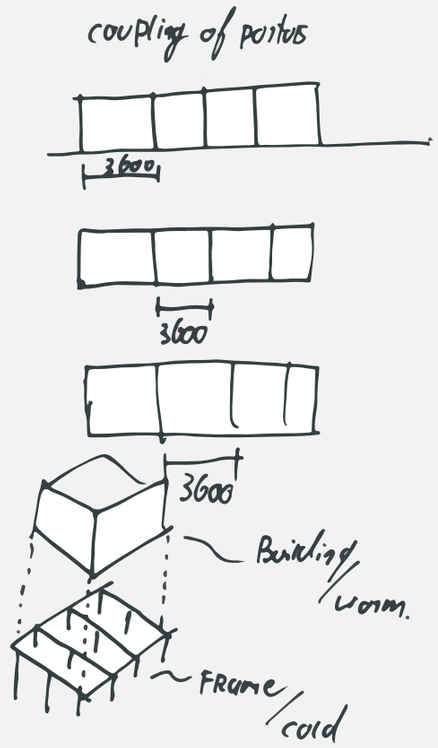
Palliative variant Ground floor

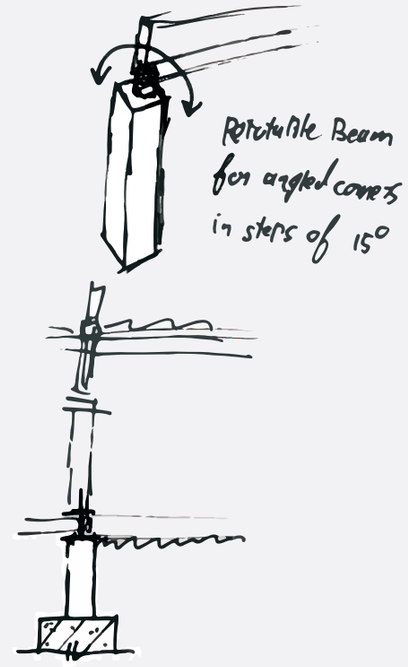
figure 18 - [insert name]

Demountable concept









Another point of the design is the demountability aspect of the building, in this sketch, a scheme is designed to represent the optimum demountable variant. On the top, standard measurements that are simple to handle by amateurs are noted, resulting from a modular dimension of 1200mm (plywood, gypsum, wooden beams) This resulted in the right bottom sketch, following a strict grid structure to expand the building horizontally.

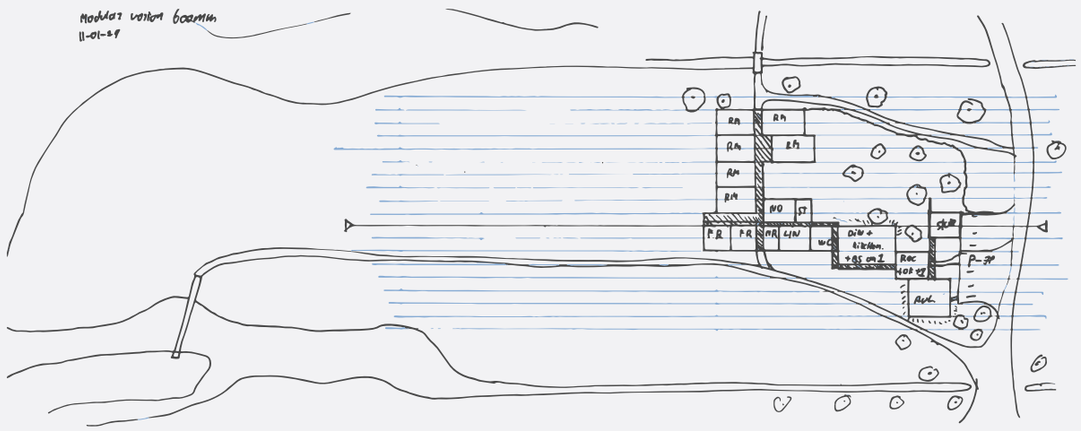


figure 16 - Demountable measurements (11-01-2024)

figure 17 - Demountable concept sketch (11-01-2024)

Palliative variant Ground floor

figure 18 - Ground floor of demountable variant

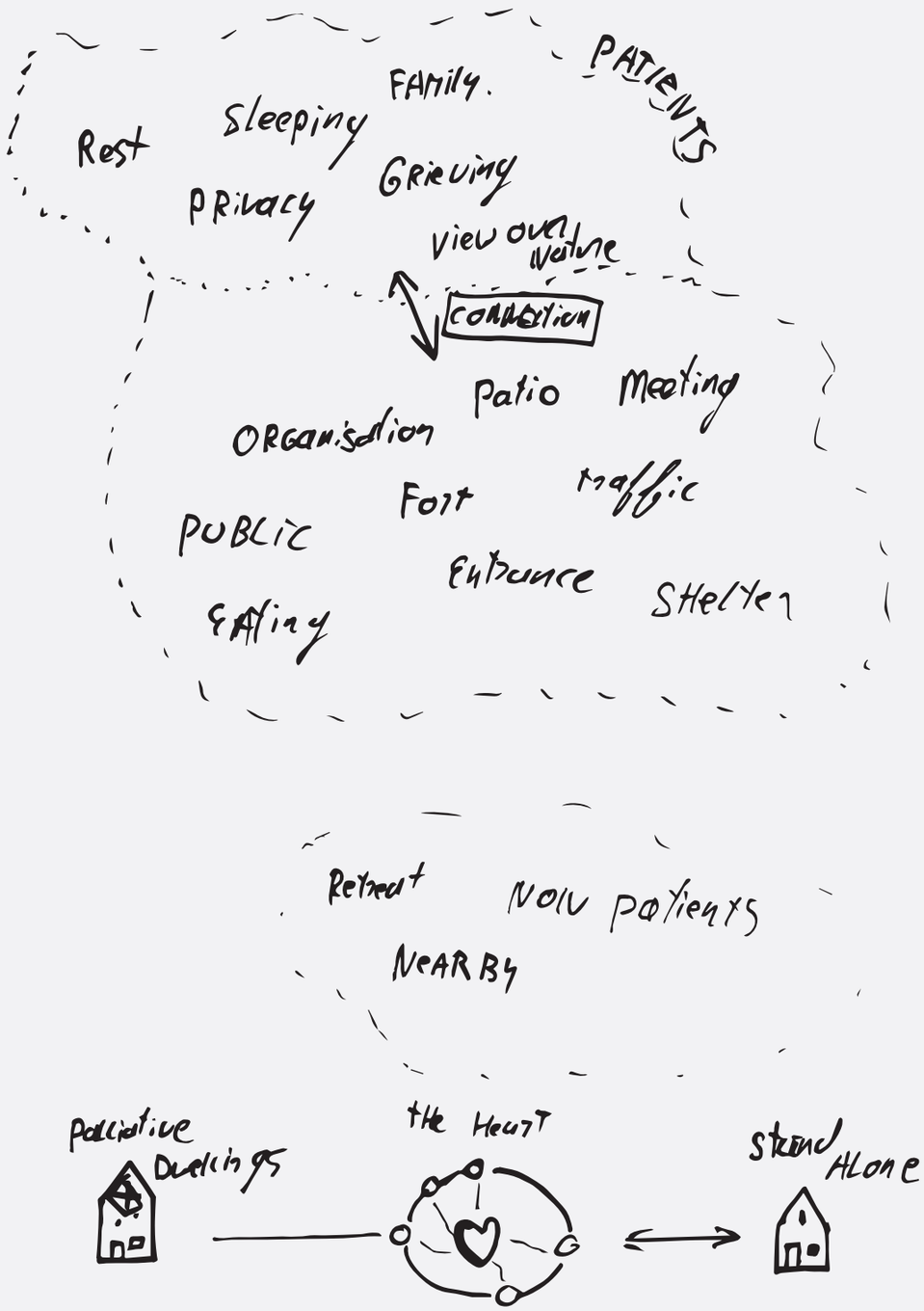


figure 19 - Naming of the building elements (16-01-2024)

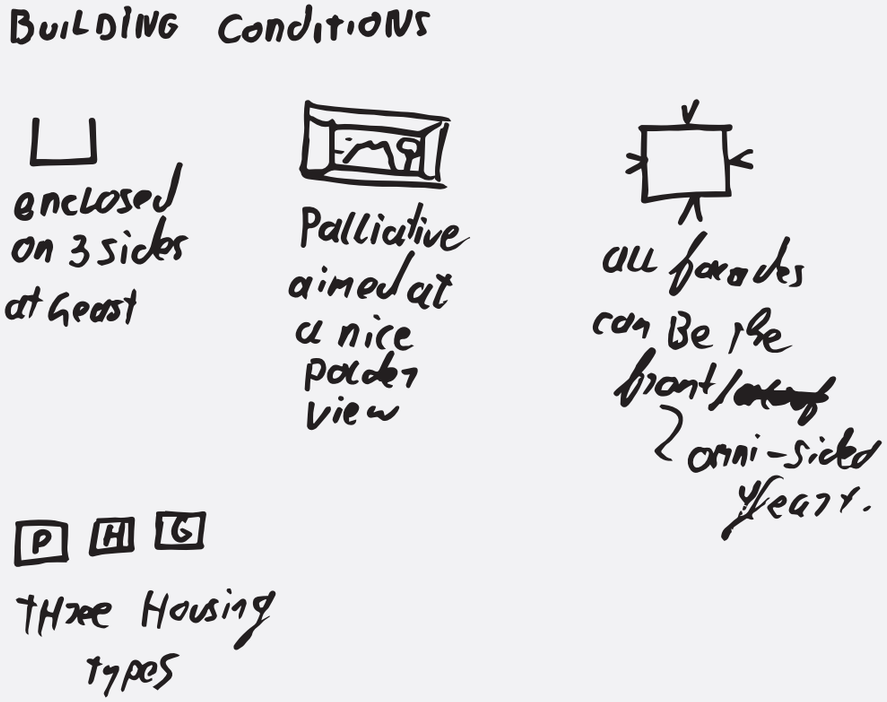
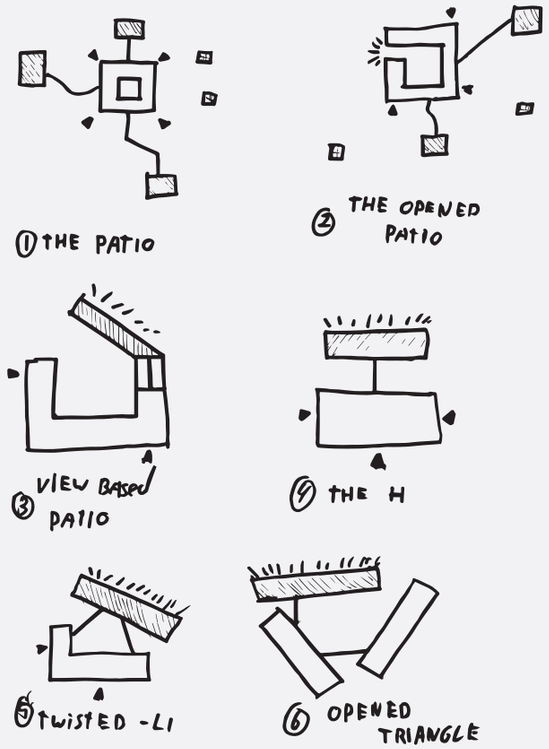


figure 20 - Building conditions (16-01-2024)

To formulate the to-be-built elements well, a word cloud has been utilized, describing the three elements that the building will be made of. Eventually, the building will have a centralized heart, connected to the palliative dwellings with a corridor or some sort of connection. As stand-alone objects, the guest housing is detached from the building. Additionally, the building conditions require the structure to have a patio enclosed at three sides, the palliative dwellings aimed at the natural view, three types of housing, and a flexible central heart.

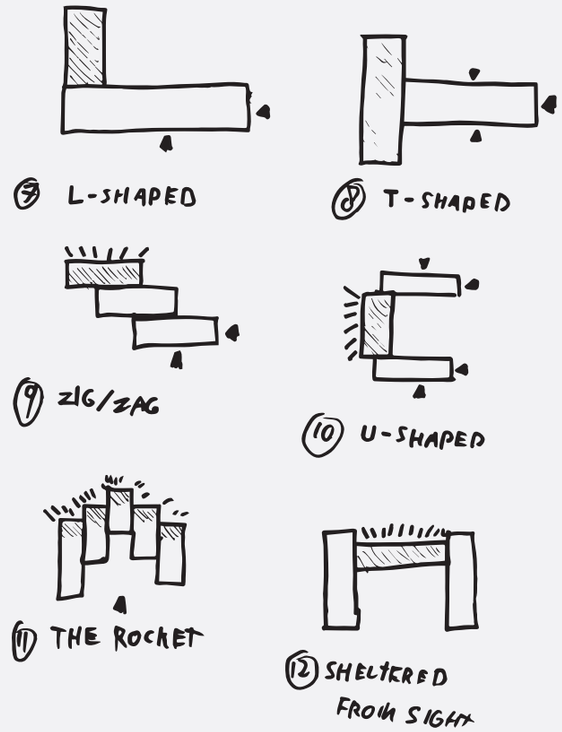
Detached Palliative Dwellings



To be flexible at aiming the palliative dwellings at a natural view, the palliative dwellings can be seen as detached units, connected with a corridor. All elements have the required patio that serves as an outdoor shelter for the patients. The most flexible and uni-directional schemes are numbers 1 and 2.

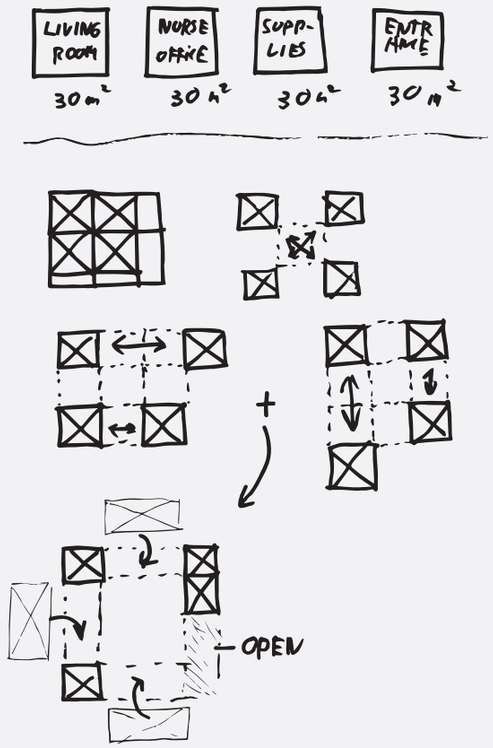
figure 21 - Detached Palliative Dwellings (16-01-2024)

Attached Palliative Dwellings



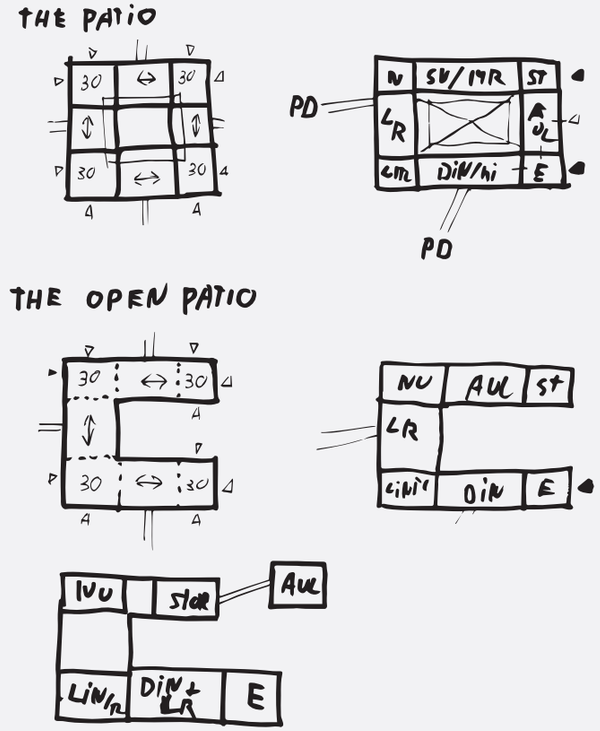
A less flexible, but still achievable way of incorporating the palliative dwellings into the design is to attach them to the central heart structure. This does implicate that the building will rotate to the view of the palliative dwellings. Also, the patio structure is harder to achieve, especially with the models that are all aimed toward one particular direction.

figure 22 - Attached Palliative Dwellings (16-01-2024)



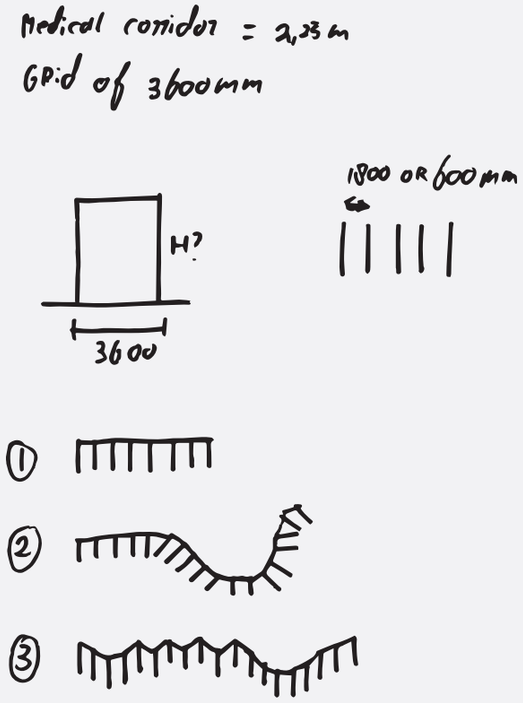
To create a uni-directional patio system the concept illustrated on this page was developed. The program contains four similar-sized units of 30 m² that are all able to represent a corner of the building. In keeping these units square, the building can be expanded in four directions between the units. This way, the building can be adjusted according to the site conditions and direction of the view that will define the palliative dwellings.

figure 23 - Patio Concept (16-01-2024)



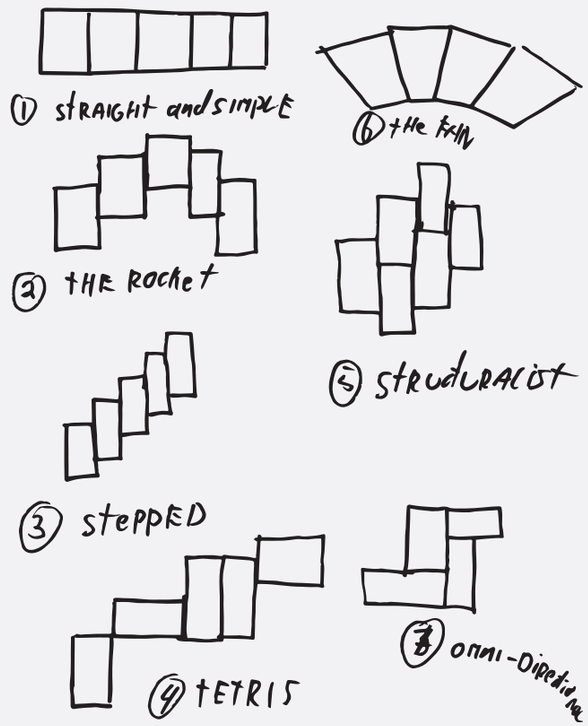
To illustrate the concept of the patio, mentioned on the previous page, the following scheme is made. It shows that the building has been expanded in multiple directions, also containing a separate hall towards the Aula, which could be desired on some sites because of privacy.

figure 24 - Patio Idea (16-01-2024)



The corridor concept is based on demountable portal frames of roughly 3600mm wide. These portal frames can then be placed in a line, curve, or angled with a spacing of 1800 or 600 mm. This is most presumably the most customized element of the building, which is because of its demountability and relatively simple look.

figure 25 - Corridor Concept (16-01-2024)



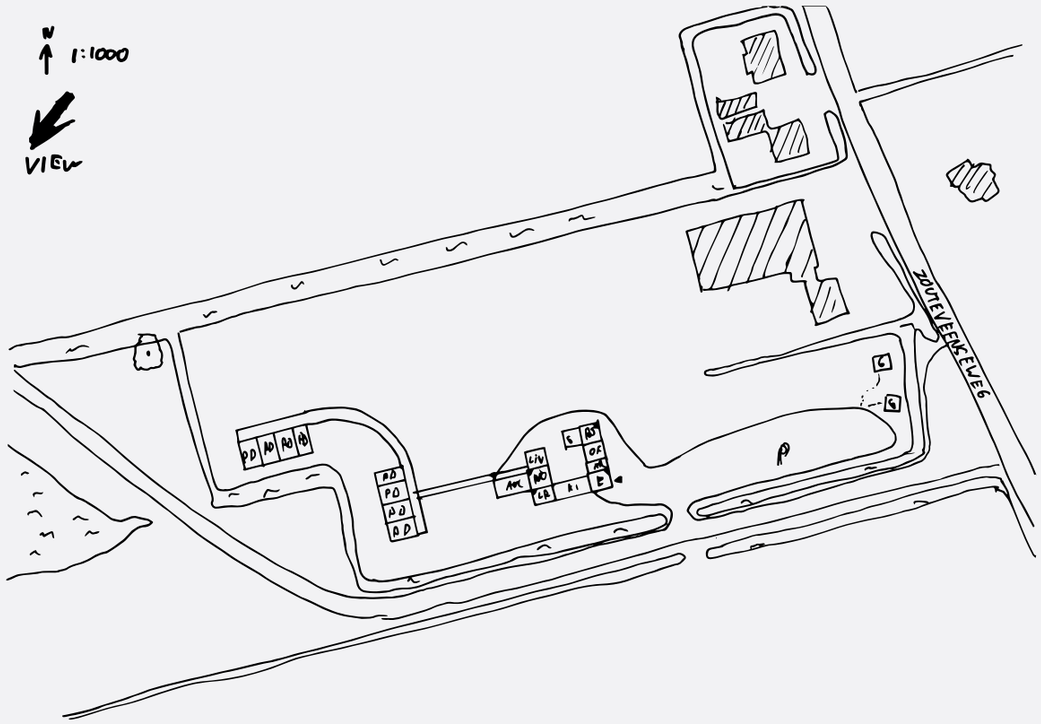
To get the most out of the polder views different variations of room concepts have been sketched. For the demountability sake, a more straightforward form is easier, requiring fewer parts for the access systems. That being said, multiple elements of these structures can be made up out of simple volumes.

figure 26 - Palliative dwelling concept (16-01-2024)

Site 1

The first selected site to project the building program is located in the same polder as the project, on the edge of Schipluide. As seen in the image the site is characterized by a directional view looking towards the open polder landscape, which is at a 45-degree angle compared to the plot. As a response to the site, the entrance is placed close to the little dam, splitting the ditch. Parking is located on the other side of the plot. The palliative dwellings are placed on the corner of the plot to maximize the view, whilst distancing itself from the bicycle lane for privacy. The corridor follows the curvature of the corner and the ditches near the palliative dwellings.

figure 27 - Site 1 location



T- figure 28 - Site 1 ground floor sketch

B- figure 29 - Site 1 view over the polder

Site 2

The second site is situated in the middle of the Netherlands in the town of Loosdrecht, connected to the Loosdrechtse plassen. The main characteristics of this location are the rectangular polder structures that reach far into the open landscape. These polder structures therefore clearly illustrate the plot sizes and demarcate the borders of these plots. Just like the previous variant the entrance is placed close to the road, combined with the Aula and building storage. This way the car traffic does not interrupt the patients that are housed further into the polder. A similar type of patio is used as the previous version on site 1. The palliative dwellings however are ordered into a more zig zag pattern, aimed to create a panoramic view of the polder, which extends in a diagonal line.

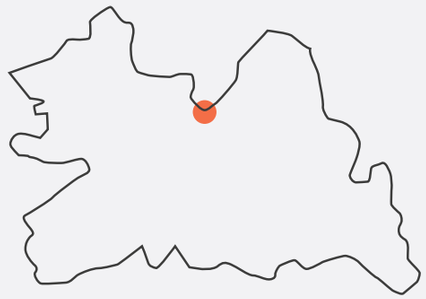
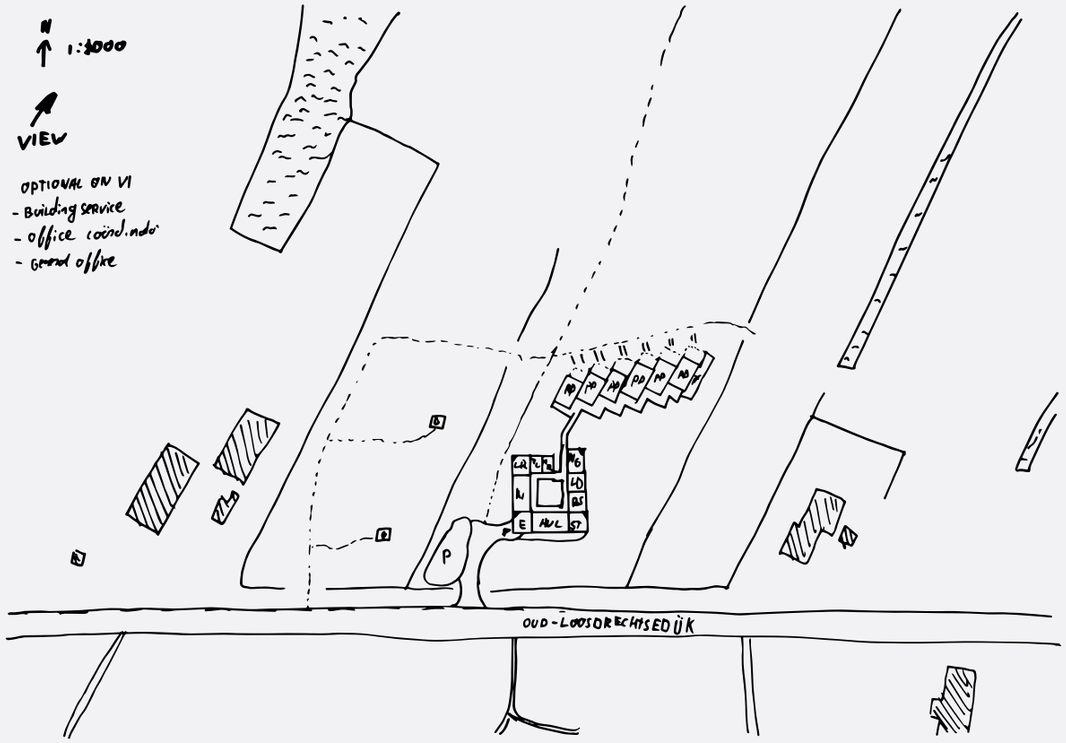


figure 30 - Site 2 location



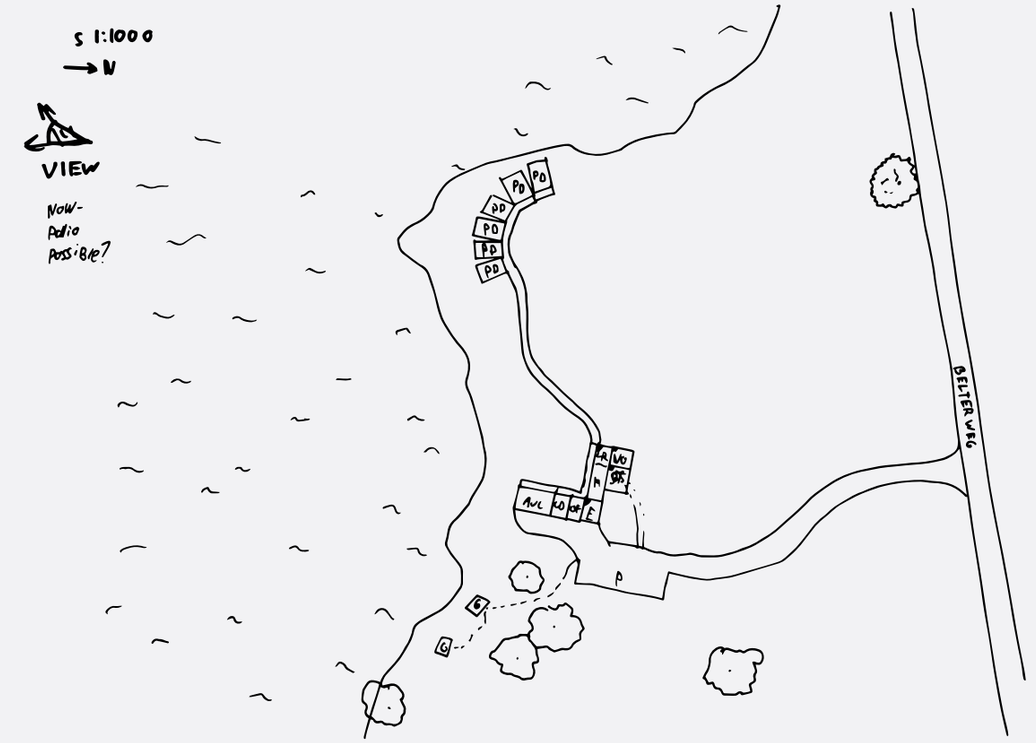
T- figure 31 - Site 2 ground floor sketch

B- figure 32 - Site 2 view over the polder

Site 3

The final site is in the north of the Netherlands in a somewhat more remote location, offering a wide view over a lake. This lake is the Schutsloterwijde, which is close to the small village Belt-Schutsloot. In the case of this building an L-shaped figure is developed, offering shelter from the wind that comes from the lake on the North side or close to the West side with a view over the lake. Because the viewing angle over the lake is so wide, and there is plenty of space a fanned-out figure for the palliative dwellings is chosen. The guest houses are sheltered between a cluster of trees, offering privacy and a place for contemplation. The site is close to a bus stop, but it might be useful to offer more guesthouses because of the remote location.

figure 33 - Site 3 location



T- figure 34 - Site 3 ground floor sketch

B- figure 35 - Site 3 view over the lake

Three Variants

As illustrated on this page the three variants resulting from the sites shown on the previous three pages are different in their configuration. Still, the characteristics of the concept are visible, with the heart of the building and the palliative dwellings visible in the plans.

During the research it was noted that a patio is not per se needed, sheltered corners by forming L-shaped volumes can also be useful in preventing the wind from protruding into the volumes. Another element that should be noted is the length of the corridors leading to the palliative dwellings, the inhabitants of the units will most presumably not be in a great condition, so minimizing the distance between the dwellings and the heart of the building is recommended.

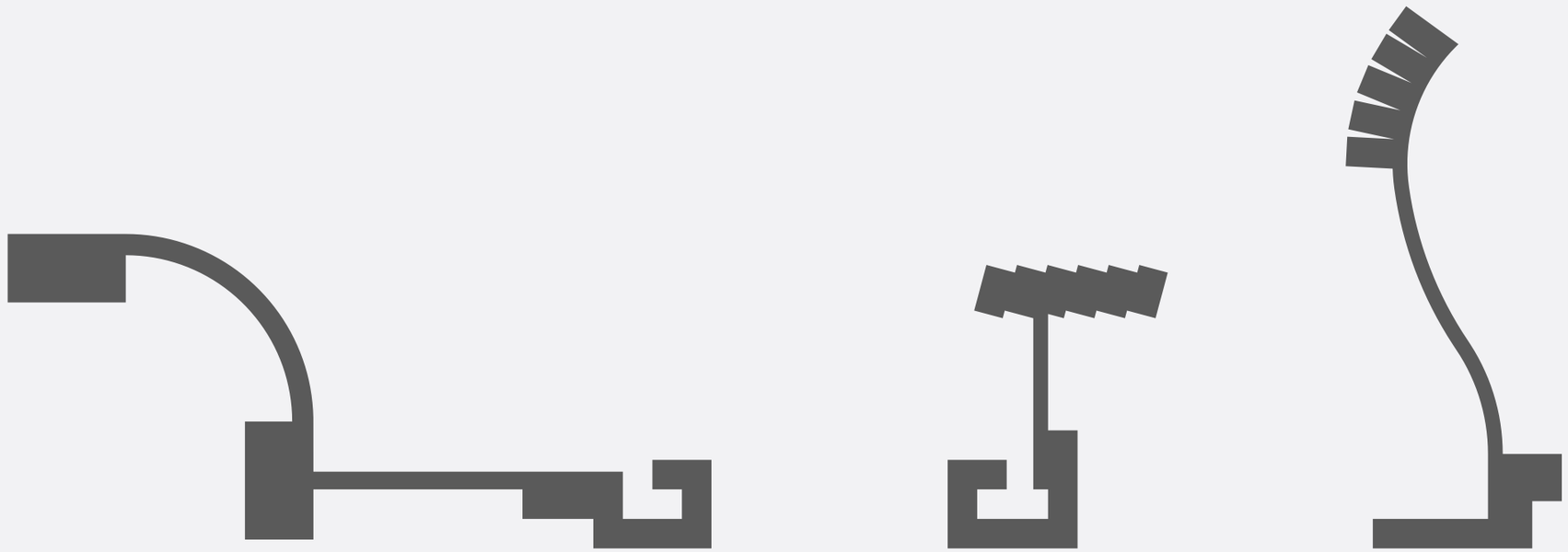


figure 36 - Three site dependant variants

P2 Presentation

The main focus for the P2 presentation was to have finished most of the research that had to be conducted to base the design decisions. To complete the P2 presentation a basic design exercise has been used to generate floorplans, sections, facades, and an impression. The drawings are a pragmatic conclusion of the research that has been done already, the experience of the users, visitors, and staff have not been considered to a far extend.

The feedback from the P2 presentation also acknowledges that the design is practical and rational, suggesting that further research into the experience of the spaces in the design can benefit the overall product. In exploring the design further in the period up to P4 and P5 the design will be explored more in-depth on both technical and experience/aesthetic aspects.

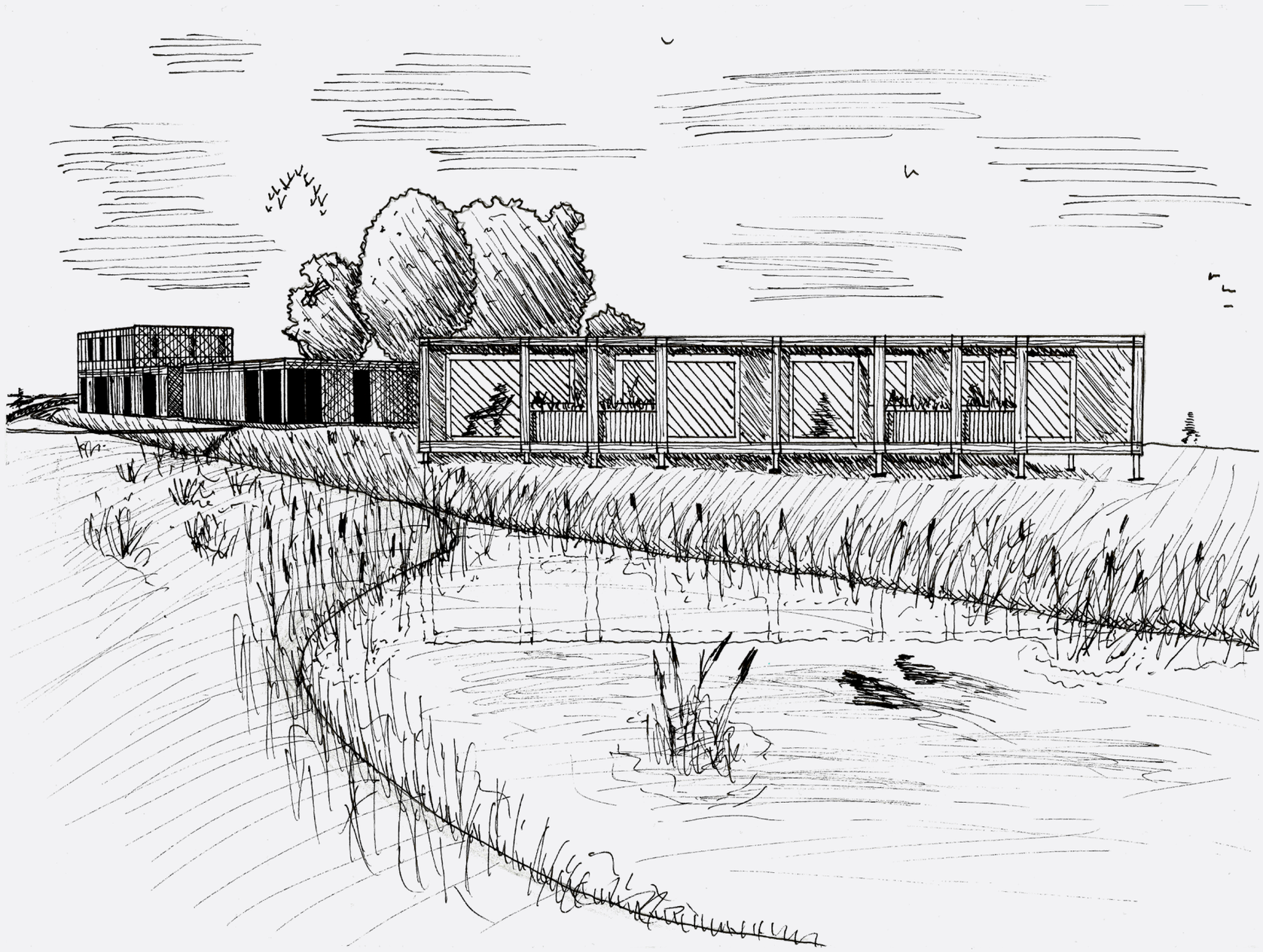


figure 37 - Impression of building design P2

Ground Floor

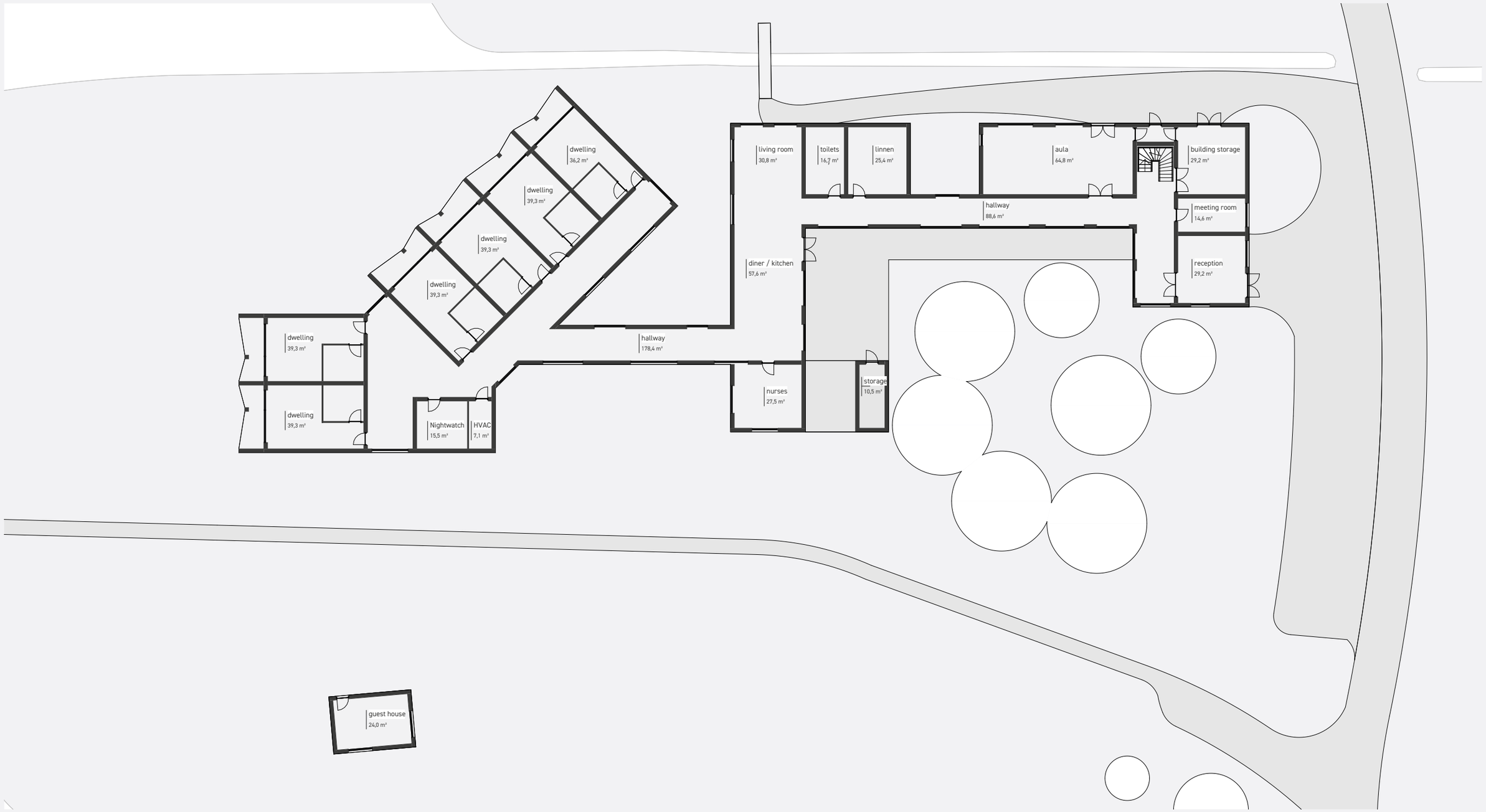


figure 38 - Ground floor P2

First Floor

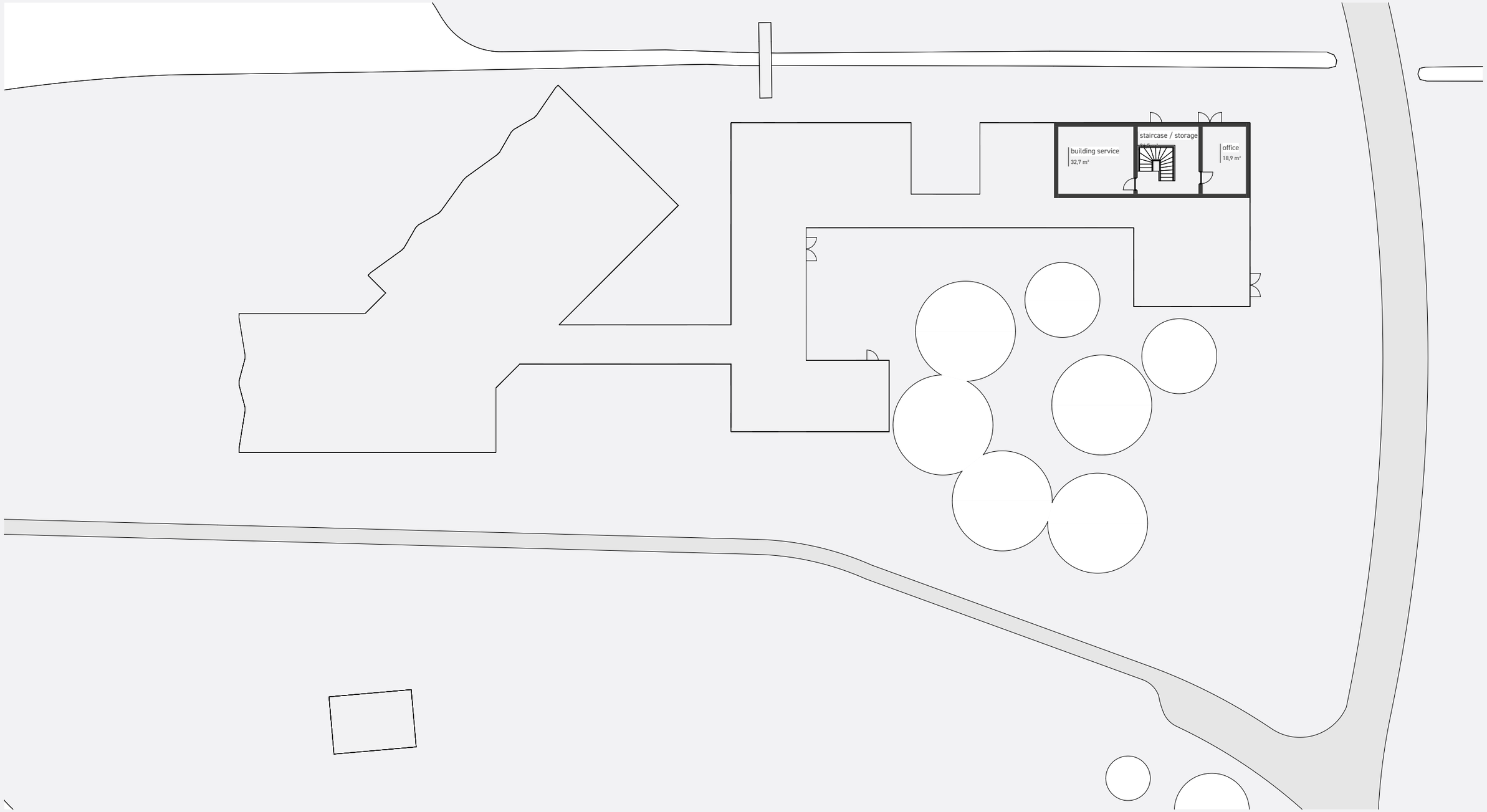
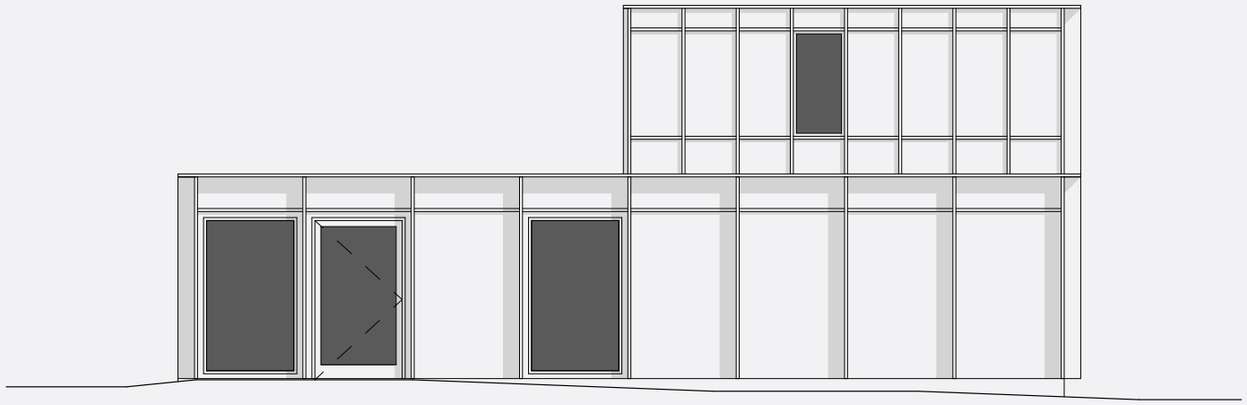
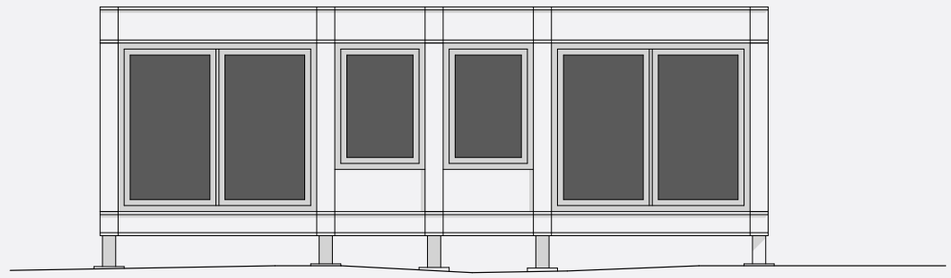


figure 39 - First floor P2

Facade and Section





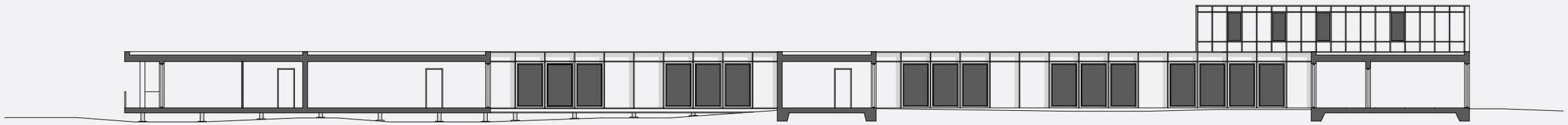
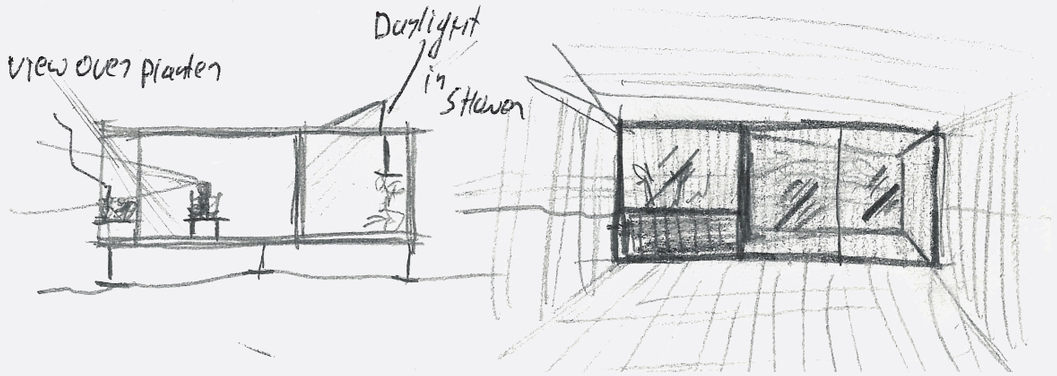


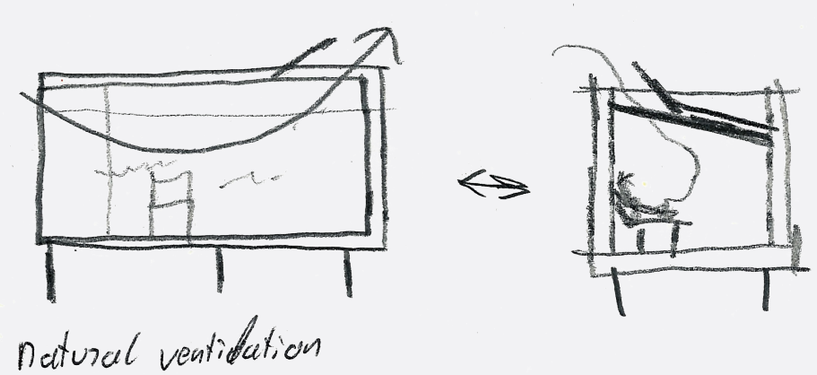
figure 40 - Facade and sections for P2

Palliative room design



In the polder area, the view toward nature is one of the most important elements of the building design. Natural daylight is essential and also benefits the relaxation of the patients. Because the polder exists out of a lot of grass, a planter is sketched to break up the flat green landscape.

figure 41 - Daylight in room and bathroom (24-02-2024)

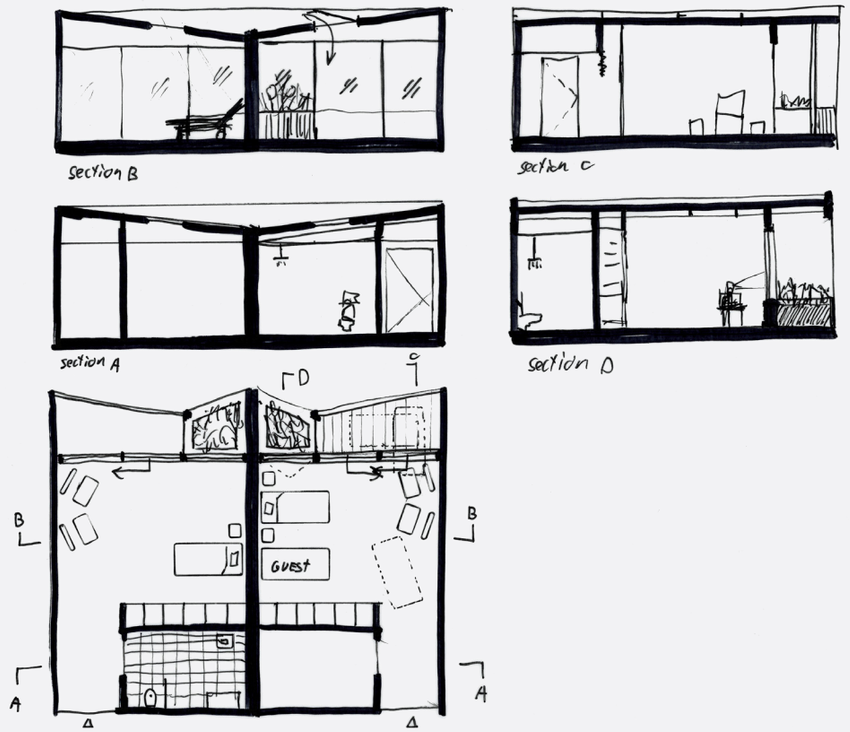


Based on the biophilic aspect of thermal & airflow variability[1] openings in the roof are added to have user-controlled natural ventilation in the room.

figure 42 - Natural ventilation in room (24-02-2024)

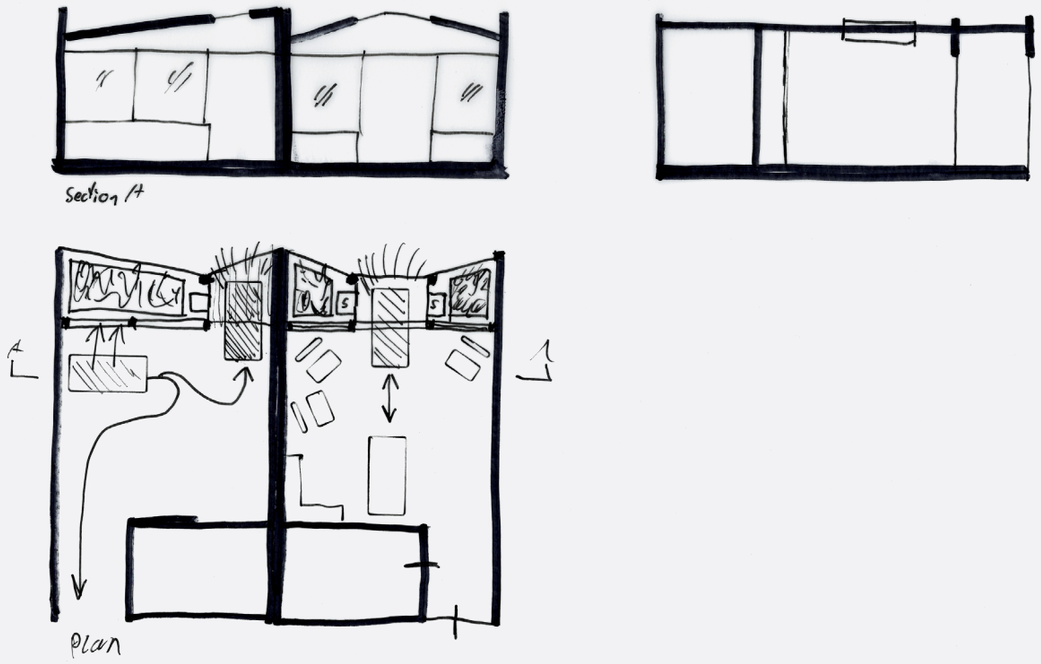
The patient will not be in bed for the whole period when they are admitted to the hospice, this also depends on the condition of the patient. It is therefore important that the patient can see nature from various positions, for instance, the bed but also a relaxing chair. One can of course explore the façade windows, as well as the opening in the roof, which enables the patient to look at the clouds or hear the ticking rain on the window.

figure 43 - View towards natural elements (24-02-2024)



This first variant is based on a room design similar to the hospices analyzed in the case study research booklet. It has the bathrooms next to the entrance bridging the hallway and the actual room, with an additional row of closets accessible from the room side. The room is quite spacious, enabling the bed to be easily maneuverable, this is especially important if the patient wants to be on the outside balcony during warm days. For ease of construction a shed roof is used, containing roof lights that are openable for natural ventilation.

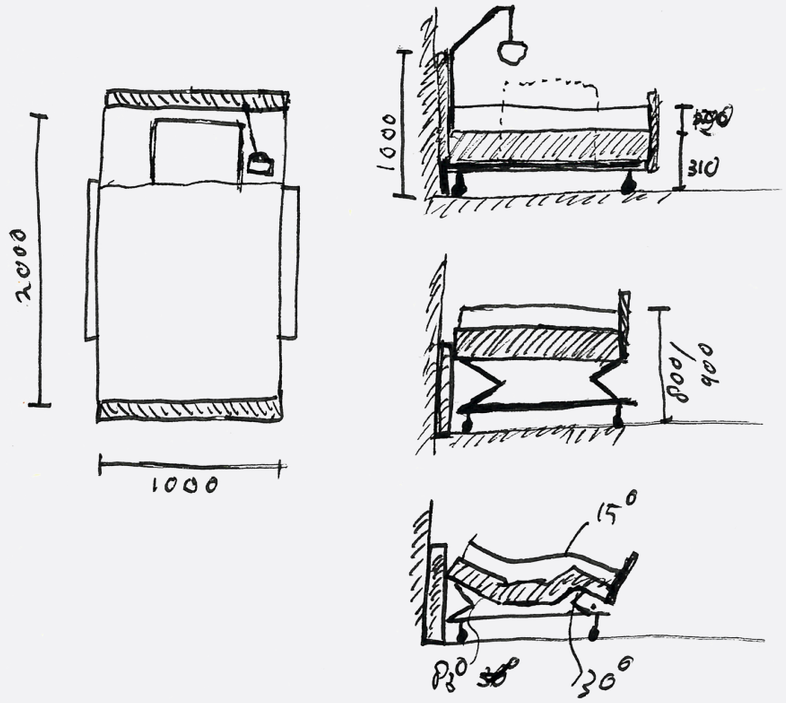
figure 44 - First room sketch (24-02-2024)



In this additional variant, an exploration has been made with a bigger amount of planters on the balcony, indicating that the bed can only be pushed in aimed at one direction. Seats are integrated into the platers for the family to take place. Roof lights are still present in both cases with one variant having a gable roof instead of a shed roof. The right room has a bed that is movable in a straight line, semi-blocking the convenient storage space.

figure 45 - Second Room sketch (24-02-2024)

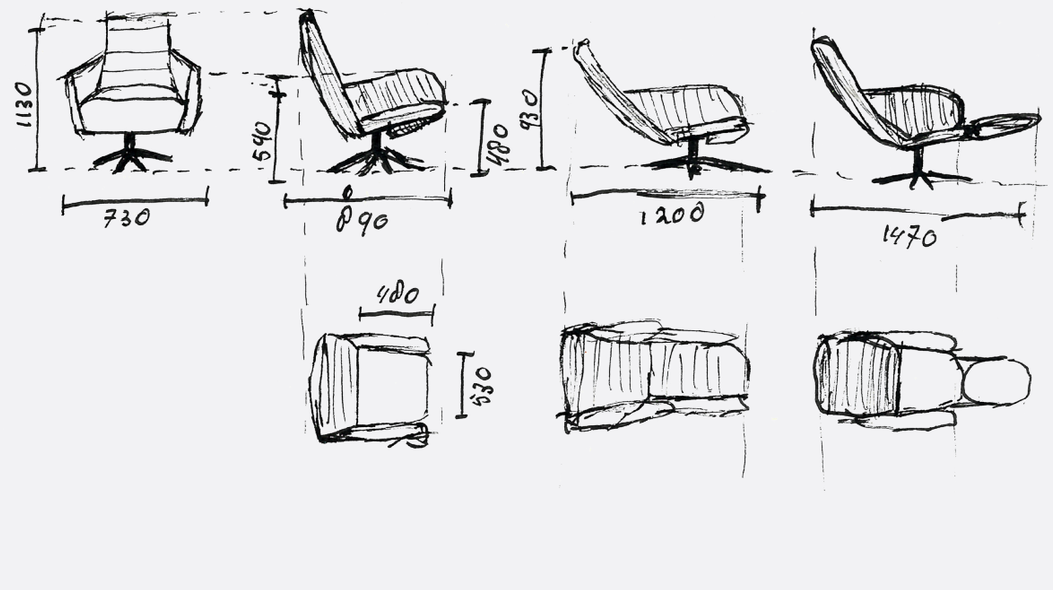
Hospice bed



A hospice bed has to be movable and adjustable for the patient's needs, especially for bed-bound patients a comfortable bed is essential. Also for the nurses, it is important that the bed can be lifted to a measurement between 800mm and 900mm above the ground. Normally the frame of the bed has a height of 310mm above the ground, the final height of the bed in the lowest position depends on the thickness of the mattress.

figure 46 - Hospice bed dimensions (27-02-2024)

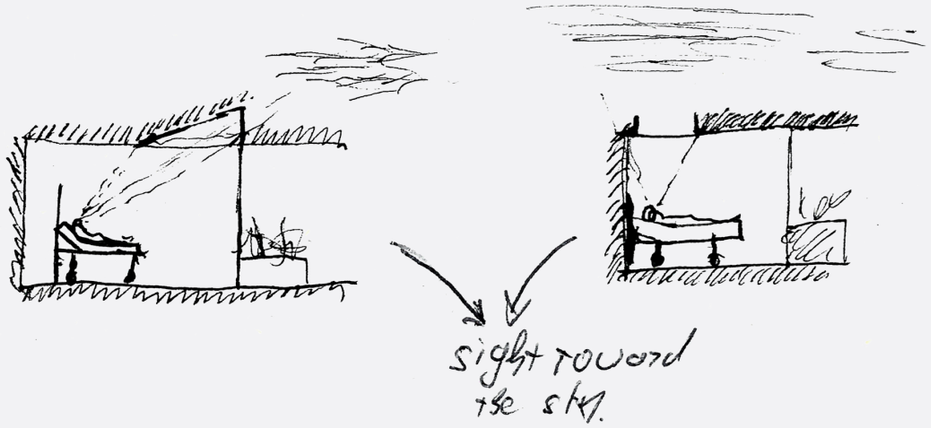
Relax chair



Again to make the patient's stay as comfortable as possible relax chairs make an integral part of the hospice design. These chairs are found all around the building from the actual bedroom to the shared living room or hallways. The chairs are fixed on the site and not moved as often as the hospice beds, therefor the radius of the chair has to be taken into account when designing the hospice rooms.

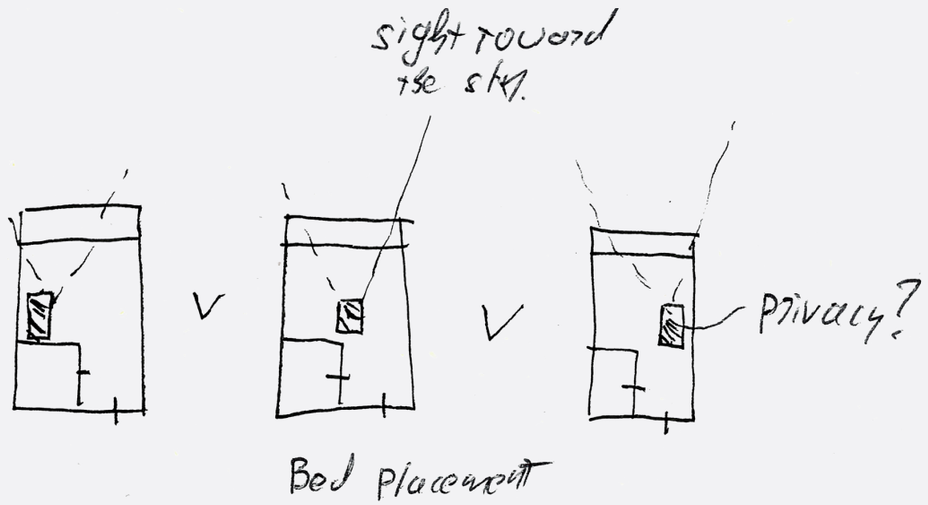
figure 47 - Relax chair dimensions (27-02-2024)

Beds placement



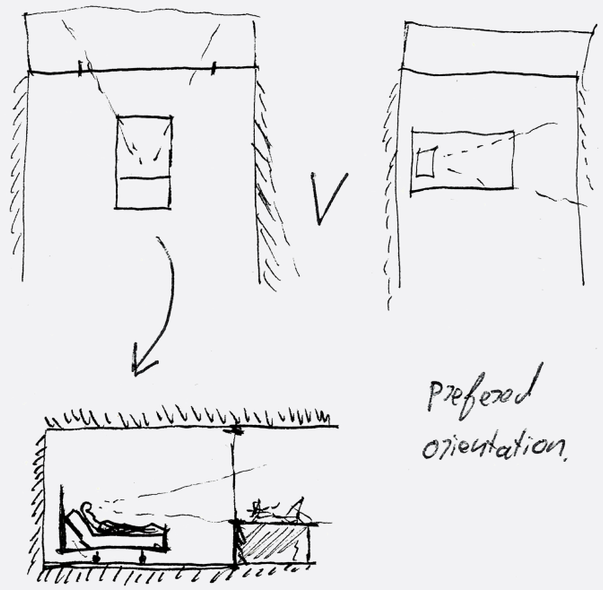
In addition to the conventional windows in the façade, roof lights can be added to let the bed-bound contemplate while they look toward the sky.

figure 48 - Roof lighting from bed (27-02-2024)



The bed can be placed in two logical positions, close to the wall on the left-hand side of the room or in the center of the room. The right-hand side of the room has less privacy.

figure 49 - Bed placement in room (27-02-2024)



In conventional hospices, as the two researched in the case study booklet, the beds are placed squarely to the nature-facing windows. Although this may be perceived as a more efficient setup, the patient is not able to see the natural environment that surrounds the hospital with comfort. When the bed is placed in line with the view, one can raise the headboard and comfortably enjoy the natural polder view.

figure 50 - Bed orientation (27-02-2024)

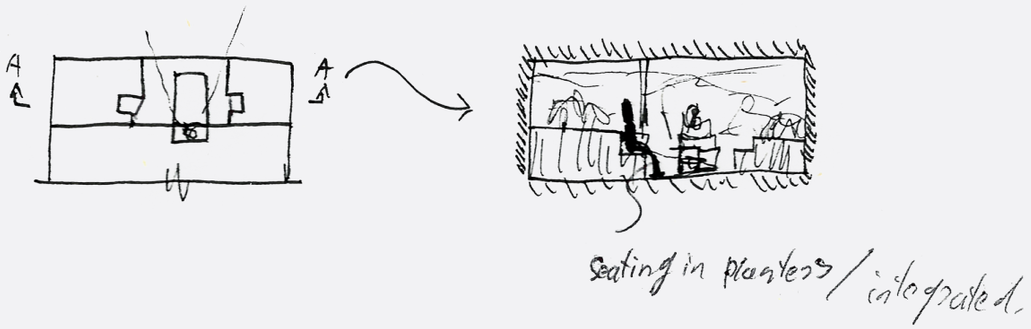
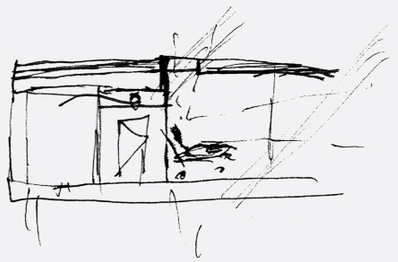


figure 51 - Balcony seating (27-02-2024)

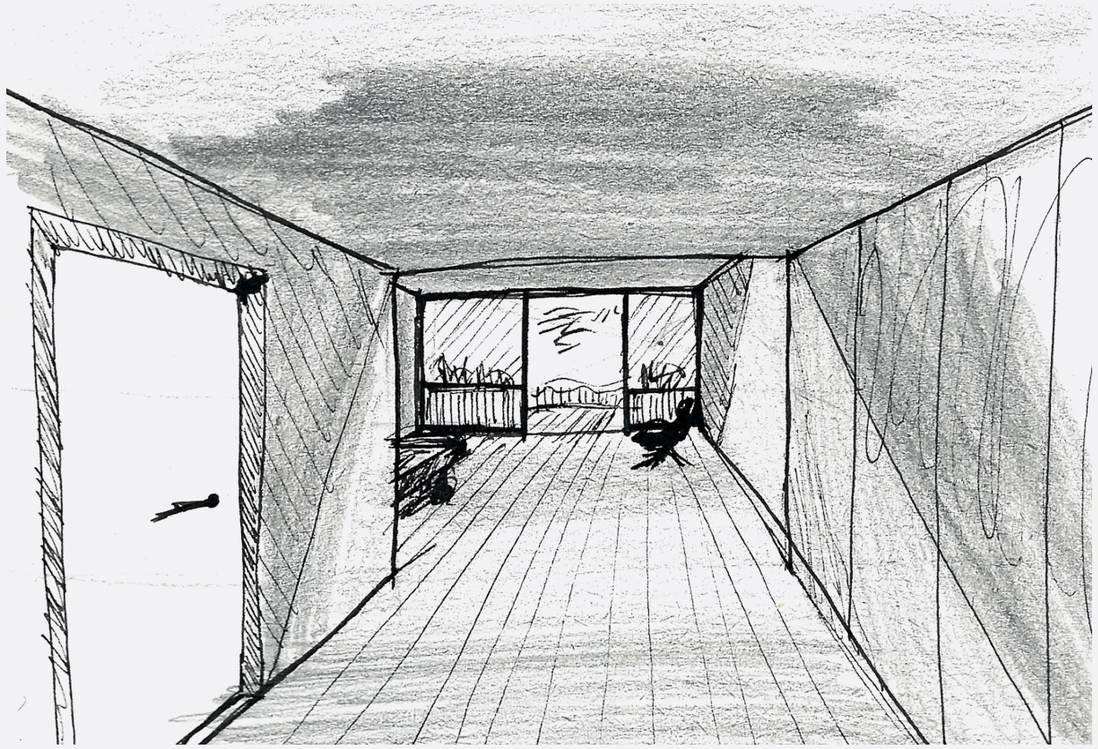


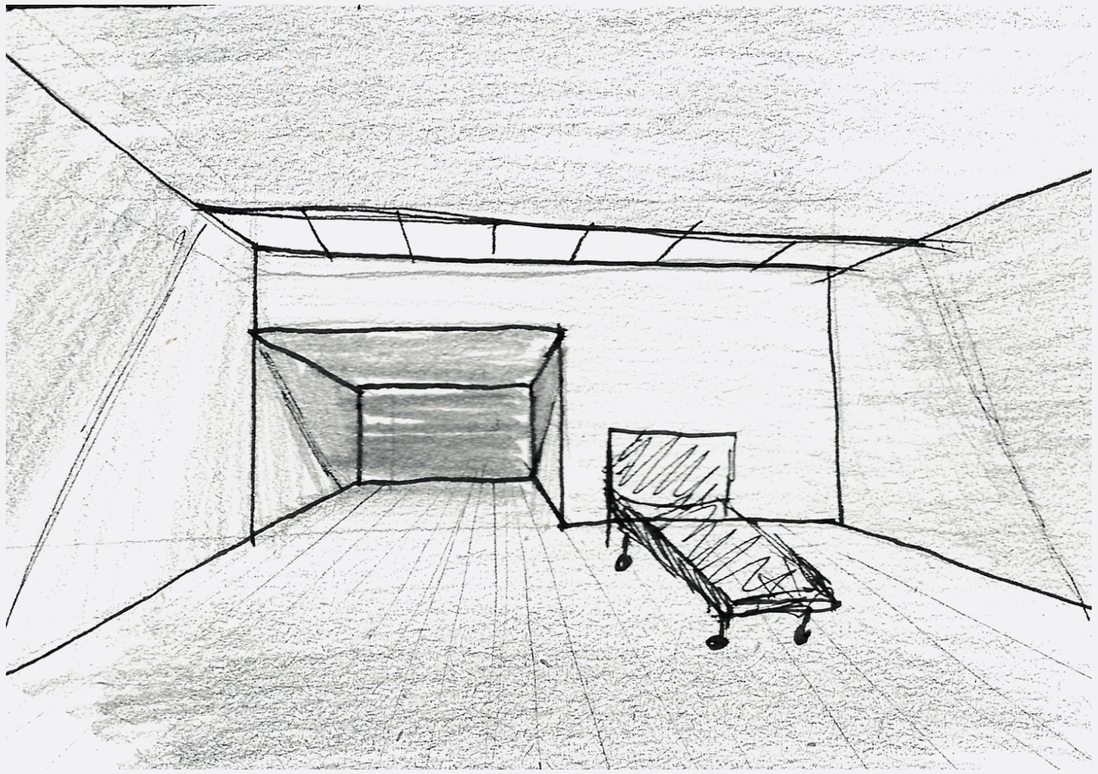
Outside there needs to be a possibility of placing the hospice bed on the balcony of the room. The patient can therefore decide to take in outside air and smell the countryside surrounding the hospice.

figure 52 - Section of room (27-02-2024)

When sitting in a relaxed chair, one can comfortably look outside both sitting upright and lying down. The sill height of the planter needs to be carefully calculated so that the view over the landscape is achievable in both chair positions.

figure 53 - Relax chair in two positions (27-02-2024)



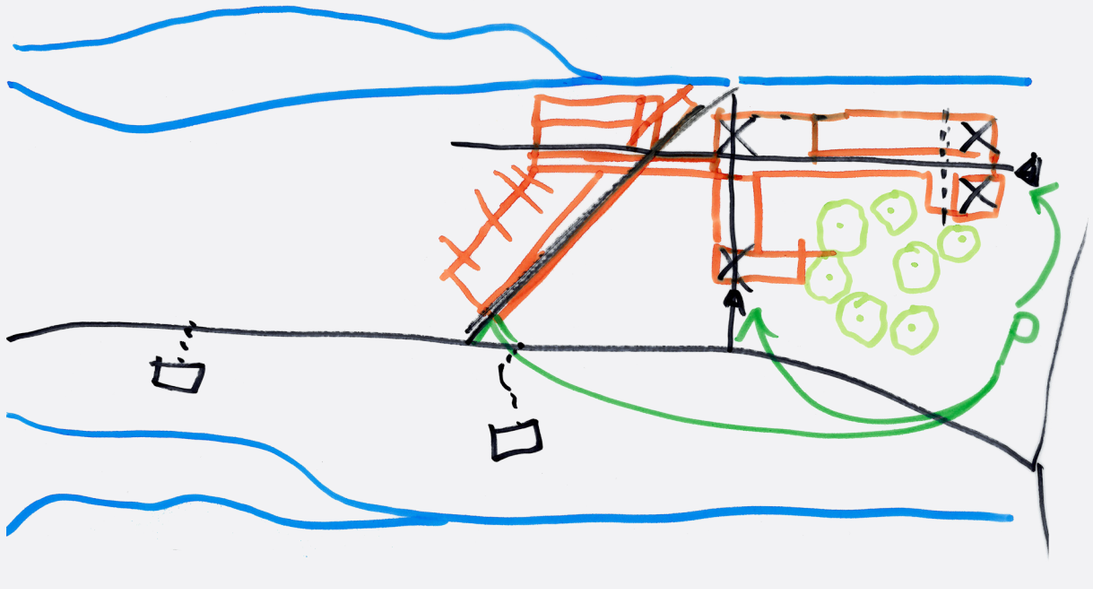


Combining the ideas and sketches of the previous pages the following two sketches have been produced. The one on this page illustrates a view from the entrance of the room looking into the palliative dwelling. As seen on the walls and floor, a skylight has been placed on the location bridging the lower part of the room and the more spacious dwelling part of the room. This skylight is also conveniently placed above the bed, as seen in the figure on the next page, which looks from the balcony into the room.

figure 54 - Interior looking from room entrance (27-02-2024)

figure 55 - Room interior looking from balcony (27-02-2024)

Building configuration



In the current plan, the routing through the building is not optimal and requires some navigation to get from the entrance to the rooms, furthermore, one has to cross the living room in the process. This can be changed by continuing the hallway axis also pronouncing the sightlines into the landscape. This also implies that the current form and ways of the dwellings have to be changed to facilitate the new circulation axis's

figure 56 - Plan with straight lines in hallways (28-02-2024)

New entrance location

Just like mentioned on the previous page the access route is not optimal in the current way and form of the building. The sketch on this page opens up new insight to explore further, the entrance can be moved further toward the living room which is the most occupied element of the building. It is also advised to have the entrance and accompanying reception close to this room which is now achievable. A more theatric and contemplating entrance route through the trees also offers protection and incorporates nature more into the design.

figure 57 - New entrance idea (28-02-2024)

Straight axis variants

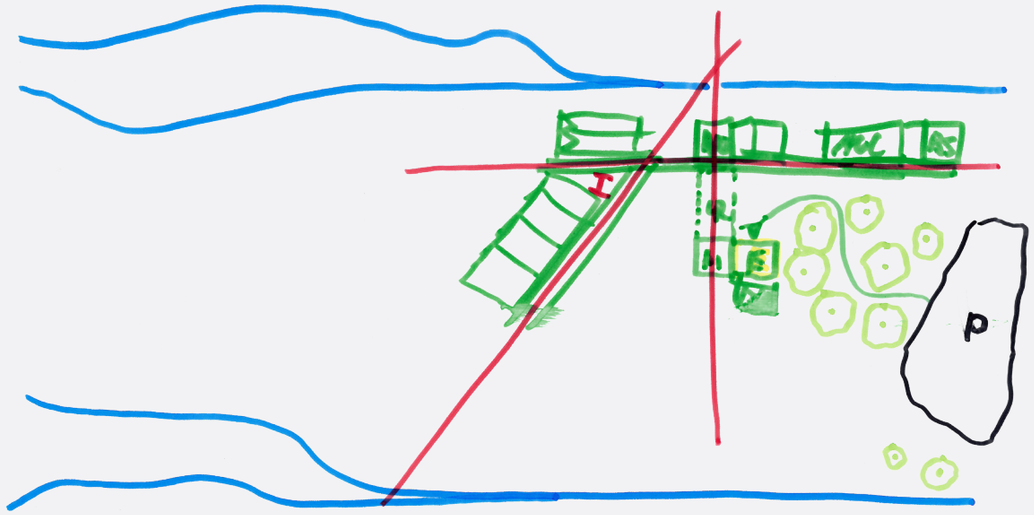


figure 58 - Straight axis variant 1 (29-04-2024)

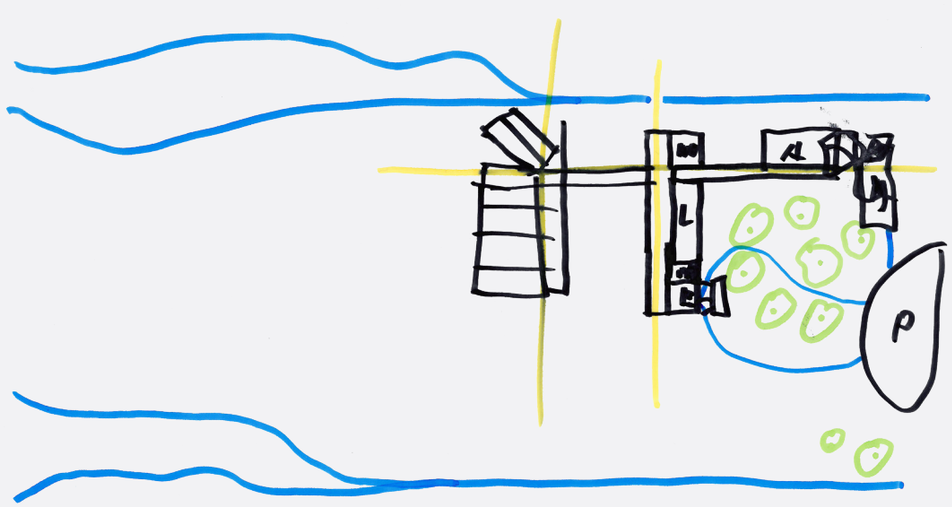


figure 59 - Straight axis variant 3 (29-02-2024)

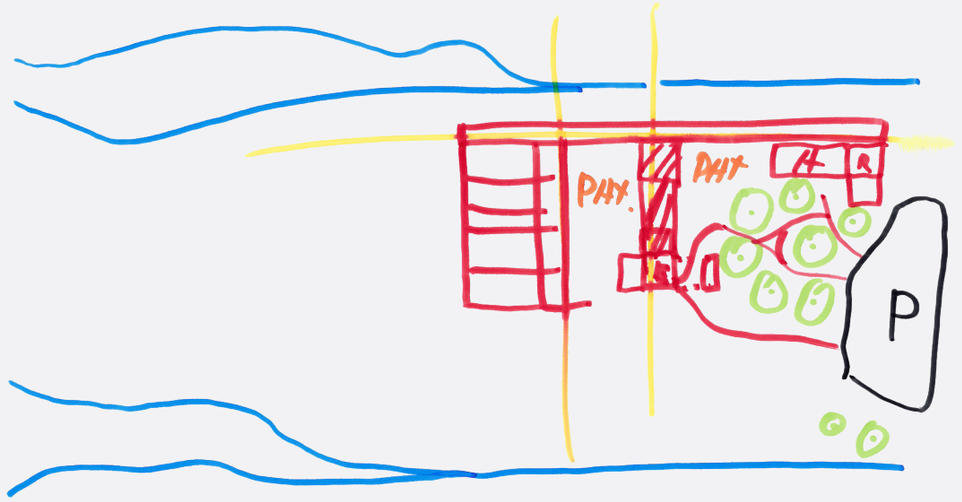


figure 60 - Straight axis variant 2

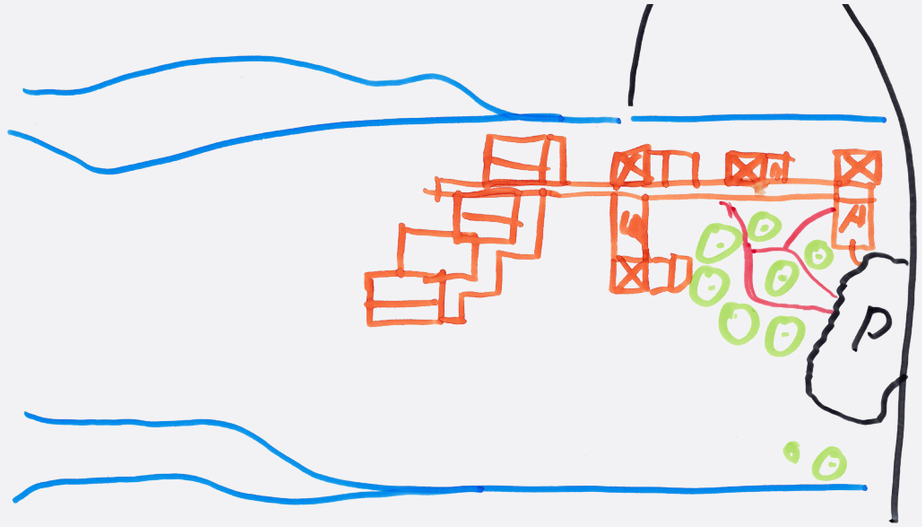


figure 61 - Straight axis variant 4

Straight axis variant

This first variant is based on a long straight axis for the circulation areas. The long axis is aimed towards prominent views in the landscape and gives someone a direction to walk to. This is also a critical factor about these building elements, which might seem overwhelming to patients in bad condition and work in a counterproductive way for their mental health.

Because of the straight sightlines, the building looks like it has a start and an end position, which makes the scheme quite linear. Adaptability on another site will have to be given great care and further researched if continued.

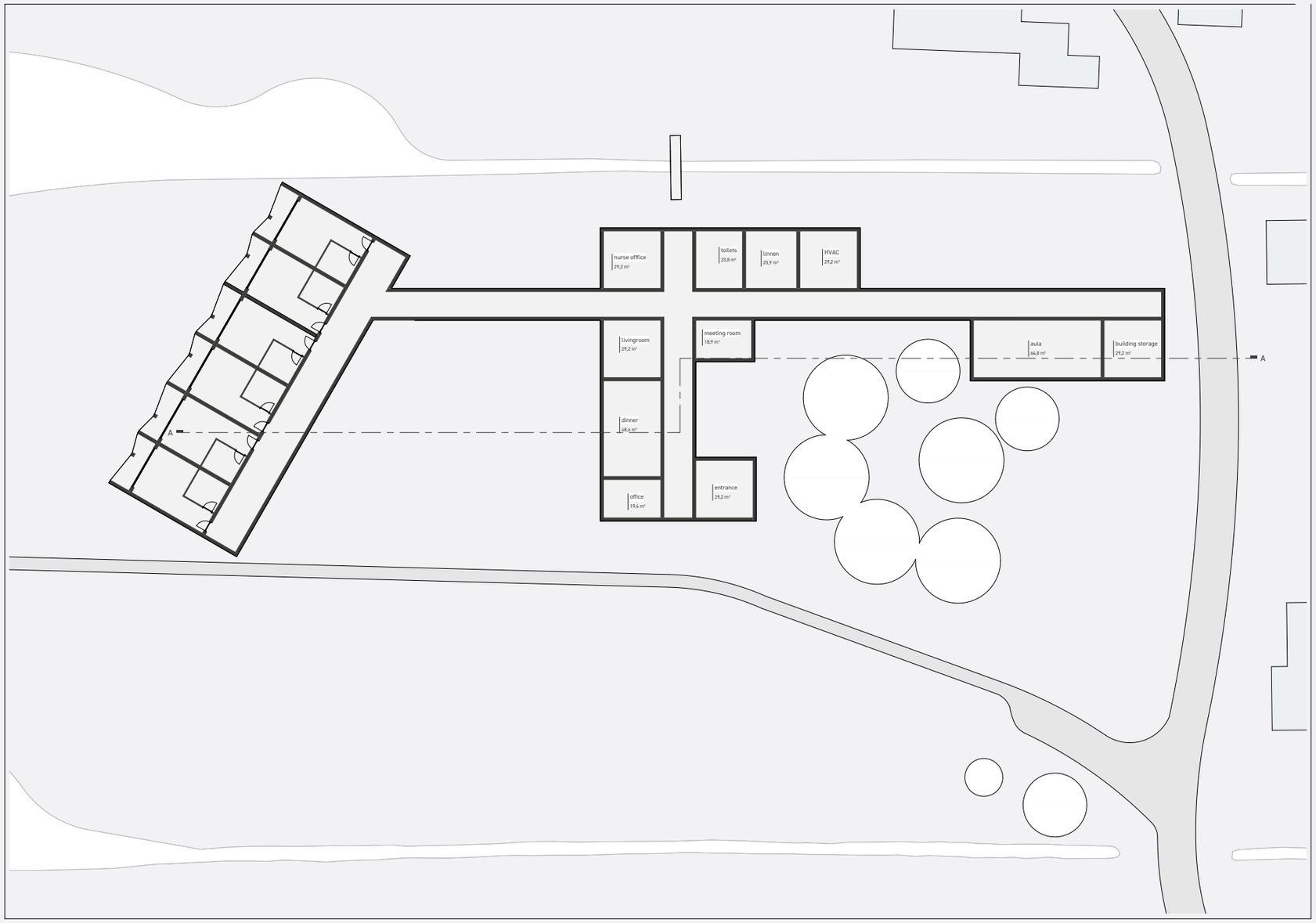


figure 62 - Final straight axis variant (29-02-2024)

figure 63 - Angled axis variant 1 (29-02-2024)

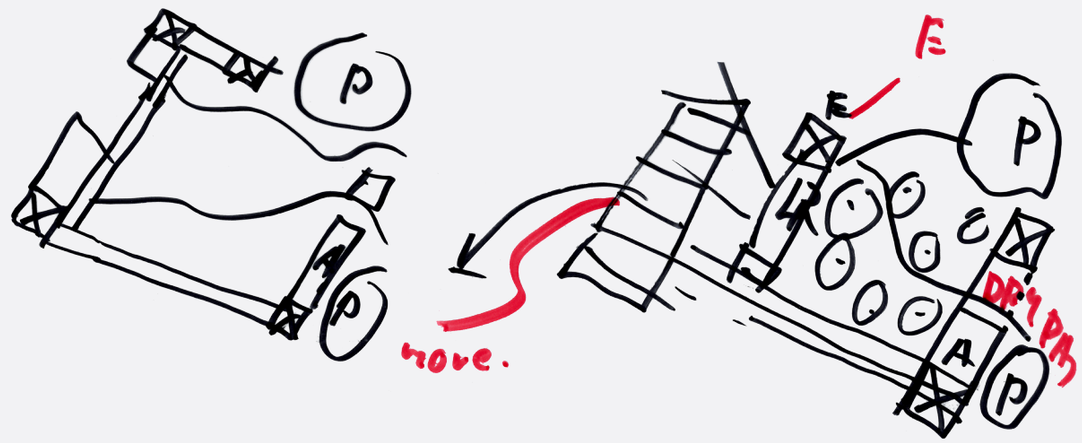


figure 64 - Angled axis variant 2 (29-02-2024)

Angled axis variant

In comparison with the straight axis variant, this model also has similarities, such as the long axis connecting the aula area to the palliative dwellings. It differs however in the organization of the plan, whereas the straight axis variant has a linear organization, this plan has a more centrally oriented organization. The entrance area is in the middle of the plan, branching out in multiple directions.

Also, variations in the palliative dwellings are present, showing that they do not have to be organized linearly. In this case, they are organized more in a clustered form, which would represent the end of the branch.

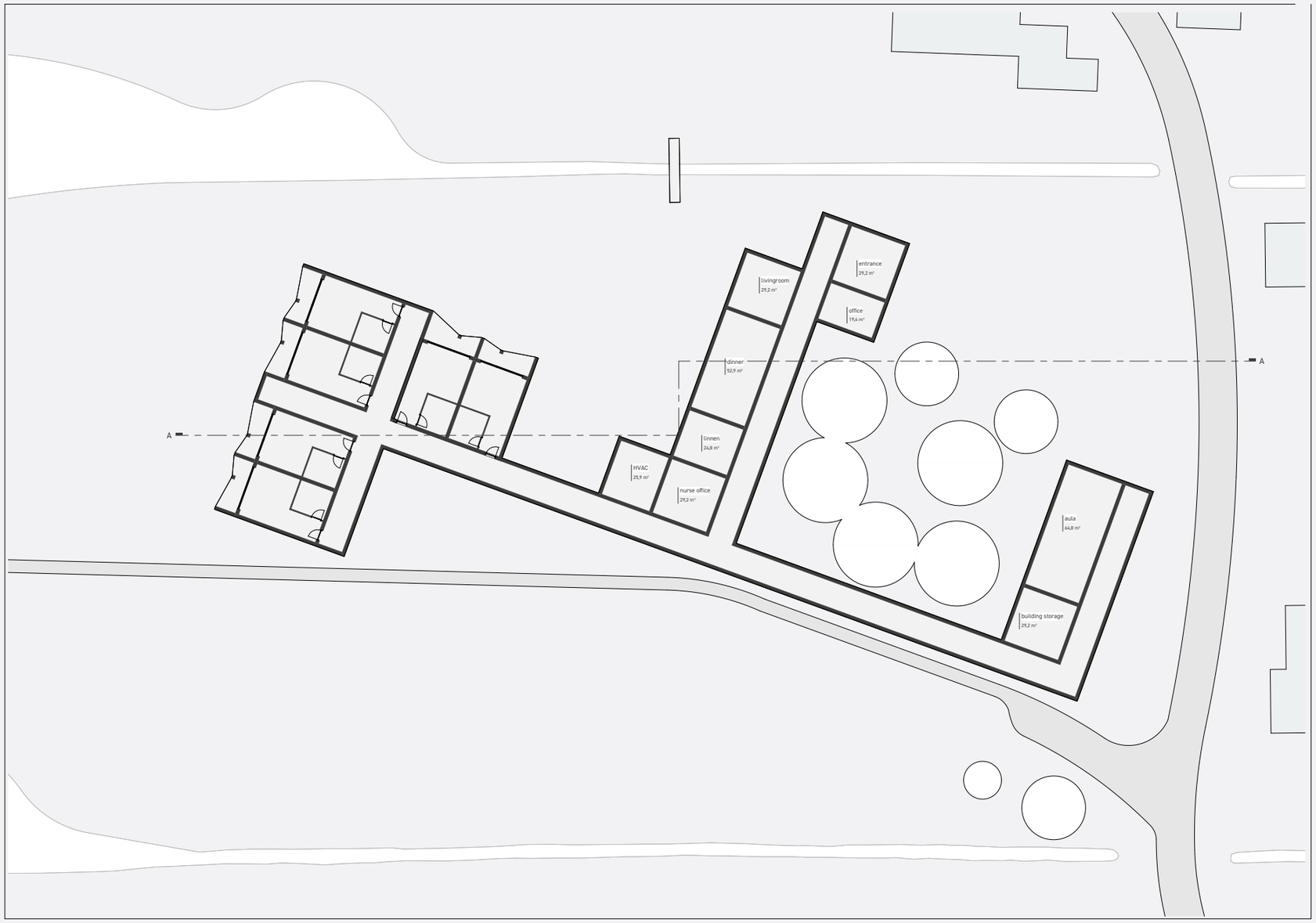
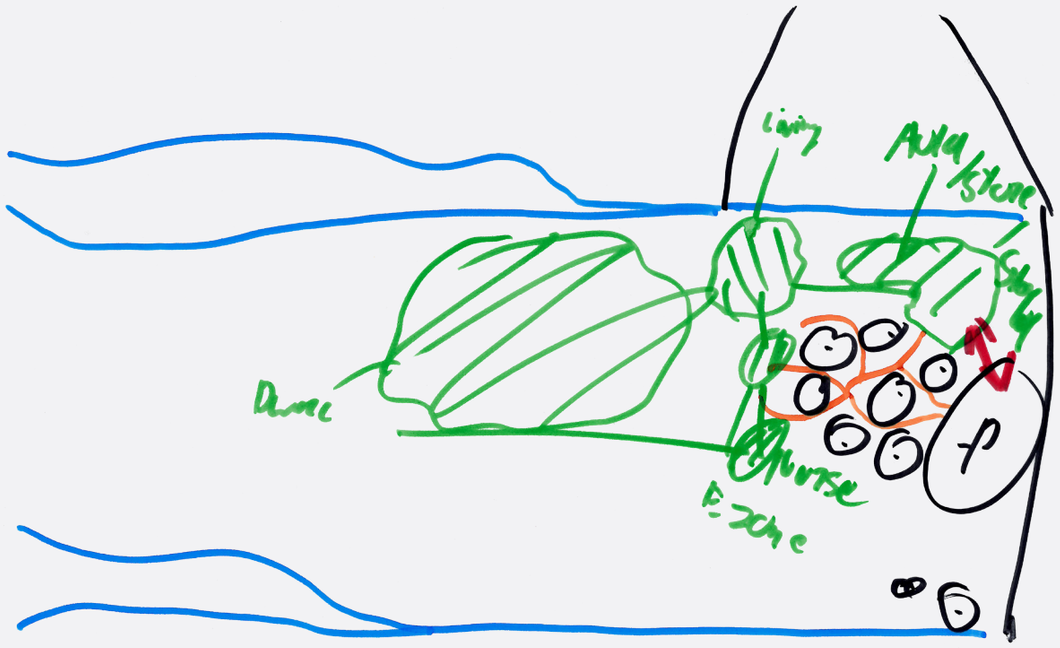


figure 65 - Final angled axis variant (29-02-2024)



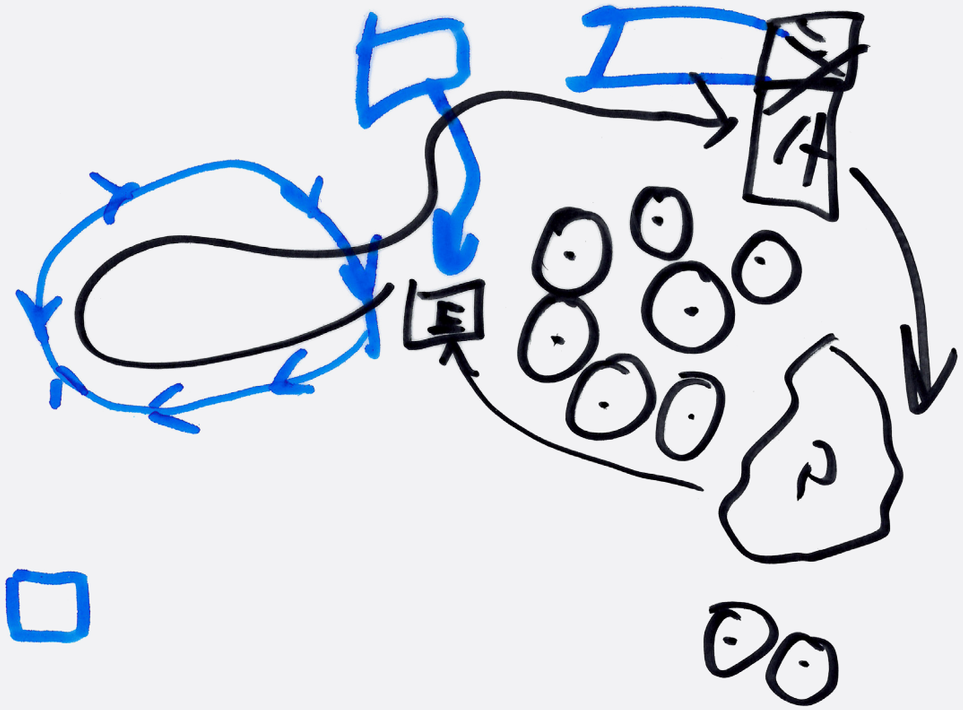


figure 66 - Circle variant 1 (29-02-2024)

figure 67 - Circle variant 2 (29-02-2024)

Circled variant

This plan is based on the thought that life in the hospice is evolving in a circular motion. One enters the building and is allocated a room, after which the patient will be moving towards the dinner or living room and returning to their room unit the day they die. Once deceased the patient will be moved to the aula opposite of the entrance, closing the circle.

One negative of this plan is the excessive amount of circulation space needed to form the circular motion this surely needs to be optimized in further research. Beyond the straight and simple variant, a building that has more circular forms can also be introduced and must be researched further.

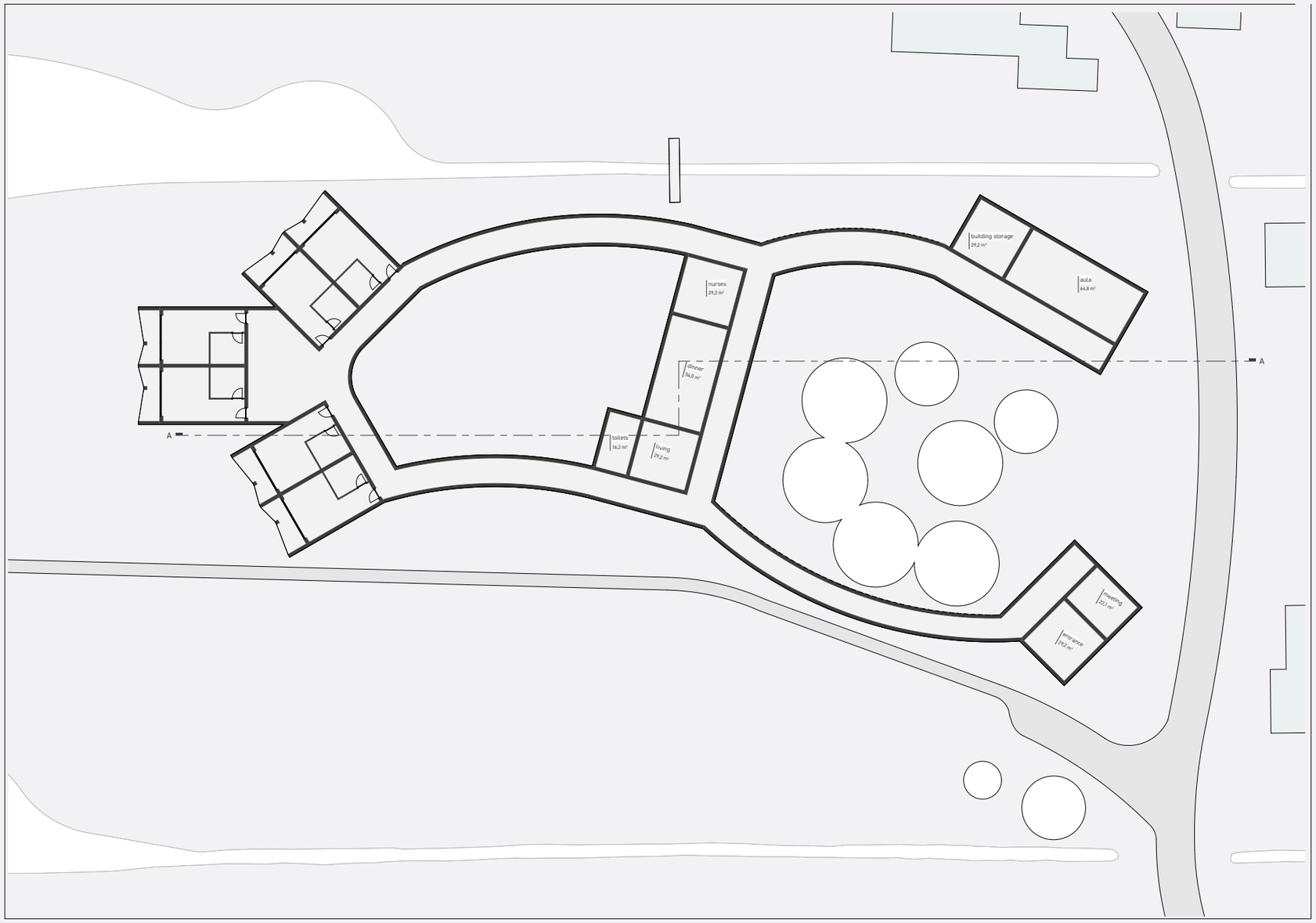


figure 68 - Final circle variant (29-02-2024)

Building Schemes

Based on the previous sketches some building schemes have been made to schematize the organization of the hospice building. Many of these schemes have found their origin in the entrance playing an important role. This role can be divided into a central entrance, or a linear entrance requiring the guest to walk through the whole of the building. Both of these organizational principles can come in useful, depending on varying site conditions.

Beyond the more linear organization, circular or semi-circular principles can also be used, inspired by symbolizing the stay in the hospice. In this case, there is a dedicated entrance and exit in the form of the aula building.

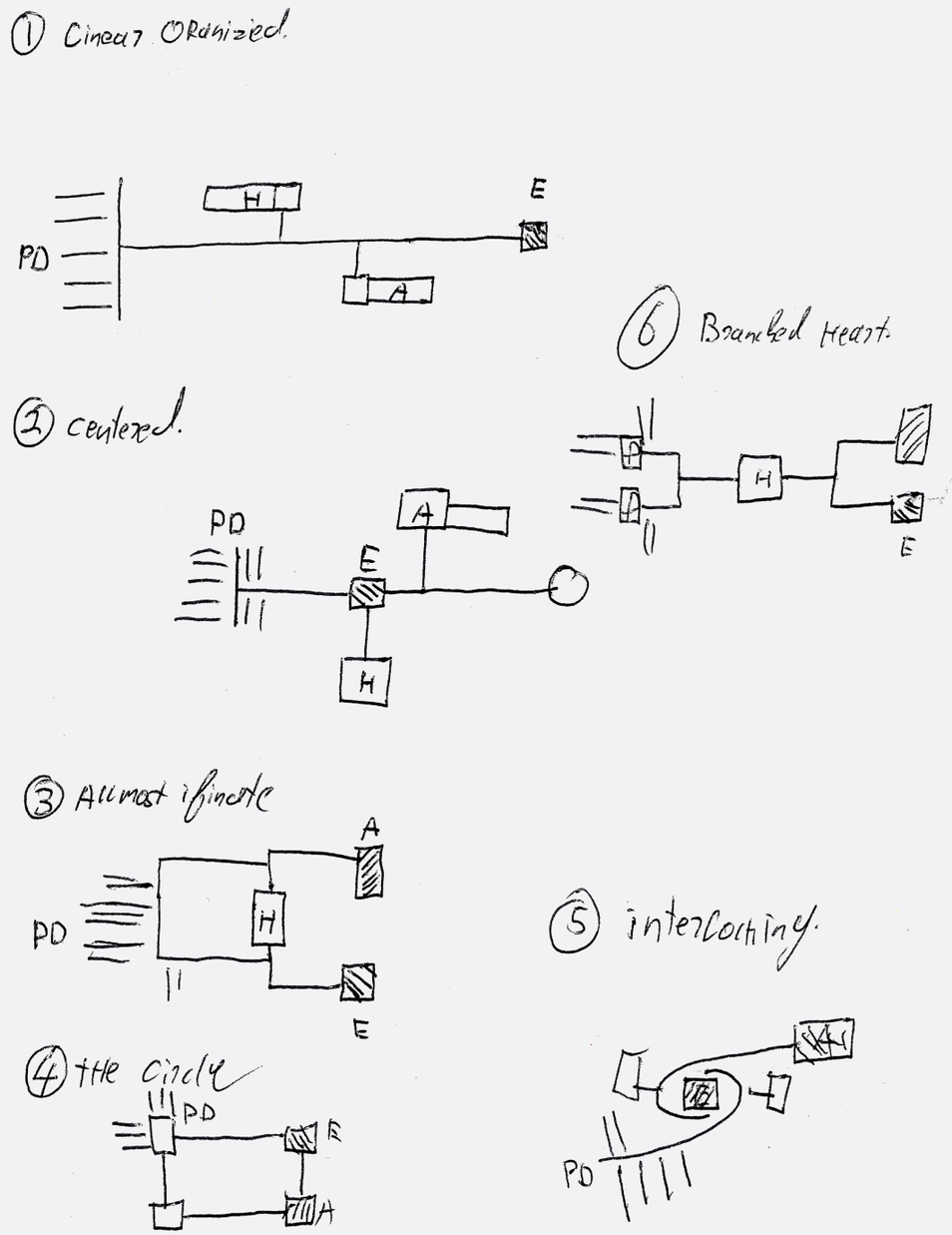


figure 69 - Possible building schemes (05-03-2024)

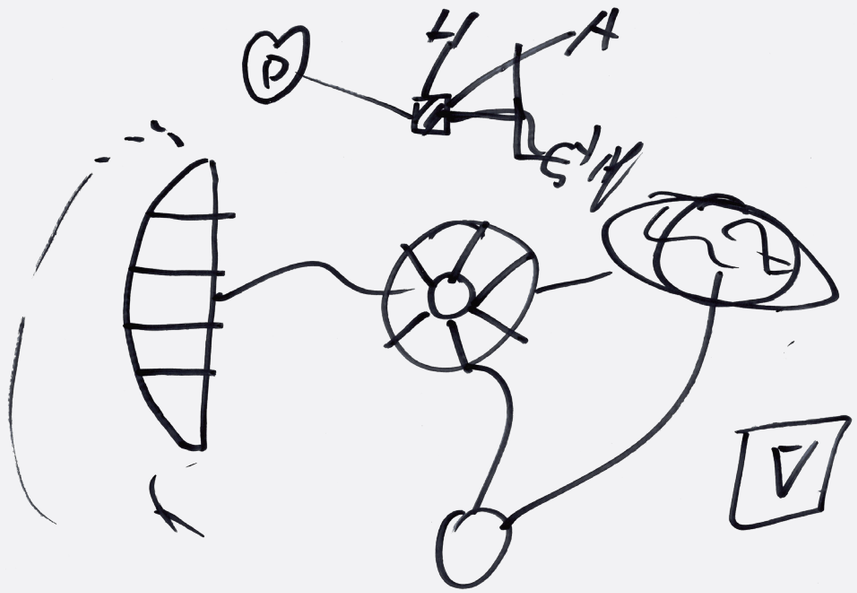


figure 70 - Conceptual circular building scheme (05-03-2024)

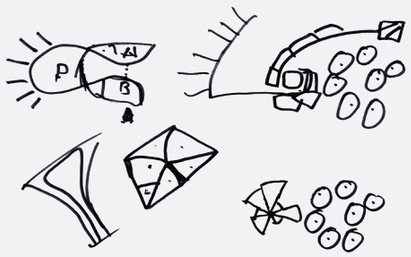


figure 71 - Various conceptual sketches (05-03-2024)

The downside of a circular floorplan lies in the demountability and re-use concept, round elements are less common in the built environment and are most probably less prone to be re-used.

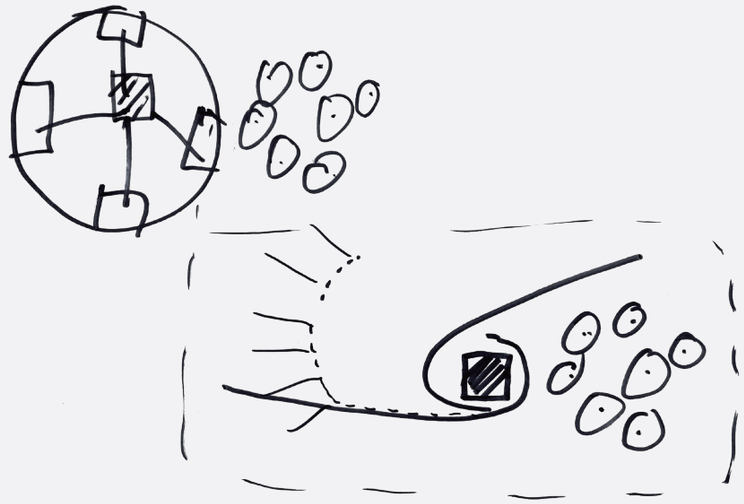


figure 72 - Interlocking concept (05--03-2024)

With the thought of having a circular organization principle, as described on the previous page, there could be an option of having a circular floorplan of the building. The sketch shown on this page illustrates the interlocking principle, making it easy to create a patio as a shelter for the patients of the hospice.

Entrance-Heart-Exit

Sketches on this page show various interpretations of the concept described on the right page. In this building concept, the future can be visualized as a beacon offering security and a prospect about the future of the patient, they will know where they will go. Especially when combined with a patio, one could be offered a view of this building part serenely and elegantly.

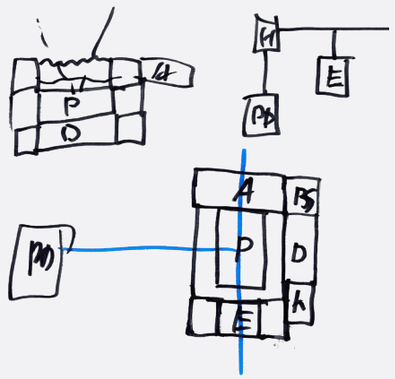


figure 73 - EHE with patio (07-03-2024)

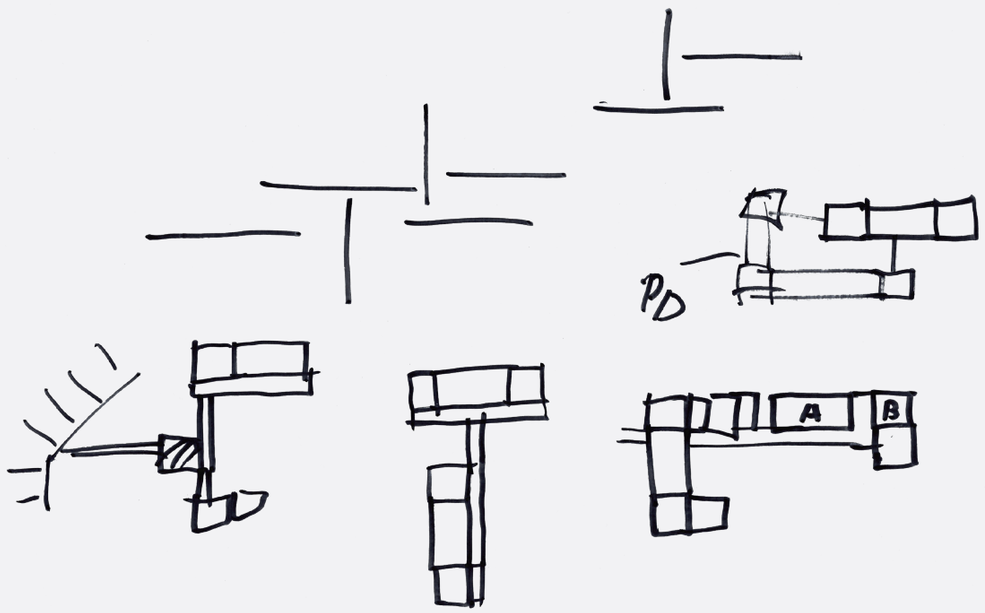


figure 74 - EHE various sketches (07-03-2024)

Within this concept the hospice is zoned into the three phases of life, the patient enters the building, leaving the past behind, after which they will be in the present of the building formed by the heart and palliative rooms. Finally if one is deceased they will move to the future (or the end) which is the aula that will be the final room one will exit the hospice out of.

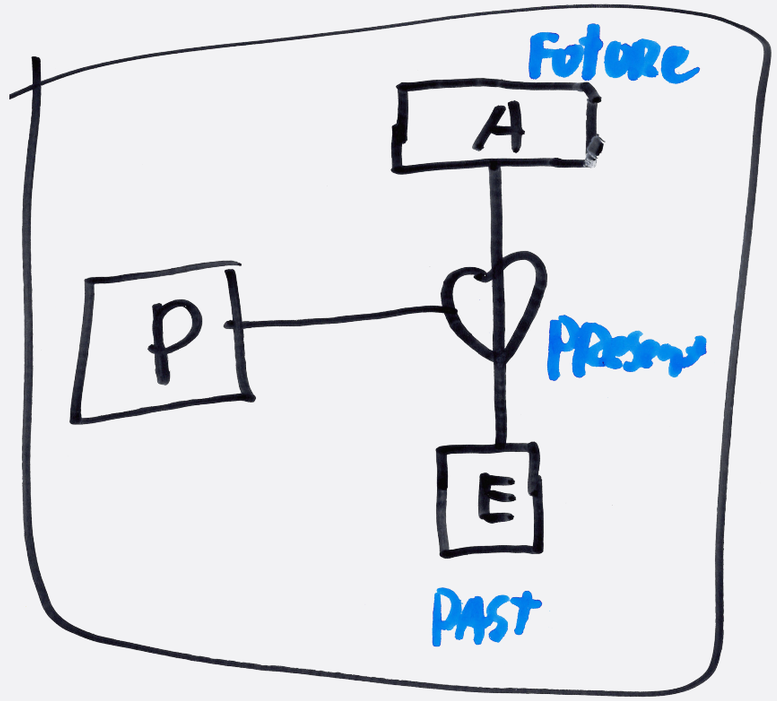
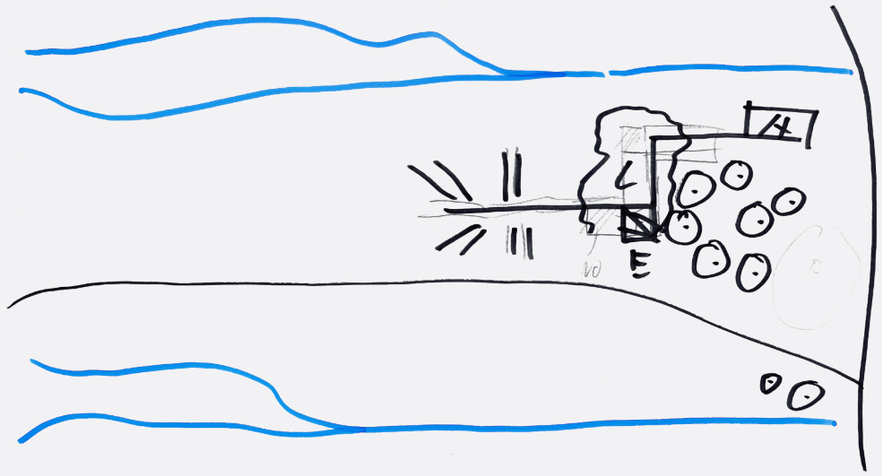


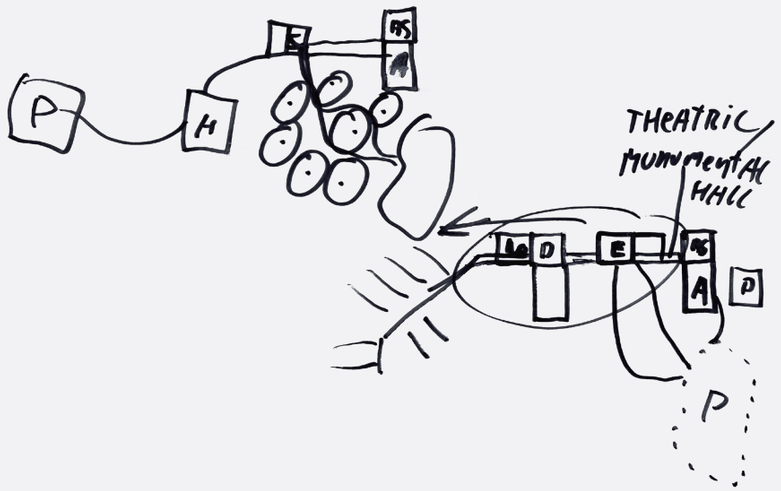
figure 75 - EHE concept (07-03-2024)

Middle entrance



This sketch is based on the entrance heart exit and central entrance principle, entering close to the heart of the building, having an isolated aula part.

figure 76 - ME sketch (07-03-2024)



Withing these sketches an experiment has been carried out to see if one can enter the building through the surrounding trees, giving a more theatric entrance.

figure 77 - ME sketches (07-03-2024)

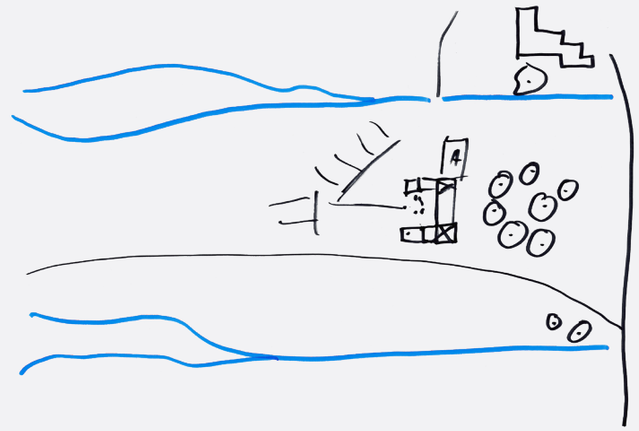


figure 78 - ME detached from trees (07-03-2024)

In the middle entrance concept, the entrance is situated where the name suggests it to be. Having an entrance close to the middle of the building allows the plan to be organized in such a way that circulation areas could be minimized, not only for patients but also for the guests of these patients and the staff of the building.

Various sketches

On the right the concept of the entrance is shown, organizing the room so that connections to it can be made in multiple directions. On the bottom of this page, a sketch illustrates that the building does not per se have to be on one level. Different building elements can illustrate the various functions found in the building. Furthermore, these building elements can all have their own emotions, which are of course present in many forms within the hospice.

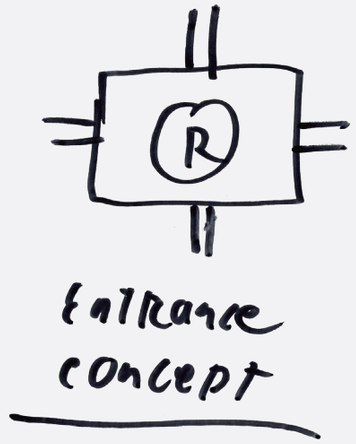
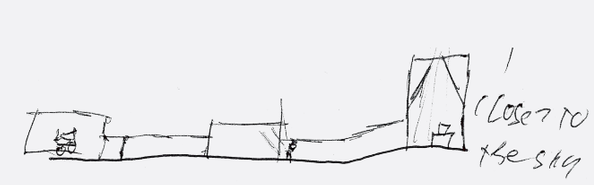
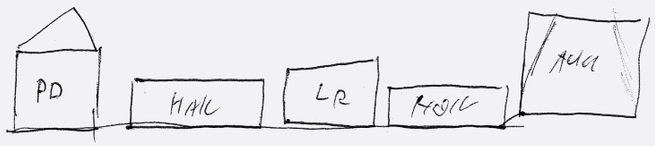


figure 79 - entrance concept (07-03-2024)



Many emotions go through the hospice, is this something to show in the architecture as well



Hallways might be more compact, representing the sad emotion once entering communal spaces these might be enlightening what do the roof forms contribute to this?

Finally, after all the sketches the three schemes below have been selected to continue with during the further development of the building scheme and plan. All these three schemes can be combined and interchanged during the reaction on various site conditions in the future. Continuing, all elements shown in the scheme can be seen as loose elements, naming the heart, palliative rooms, the aula, and maybe the entrance.

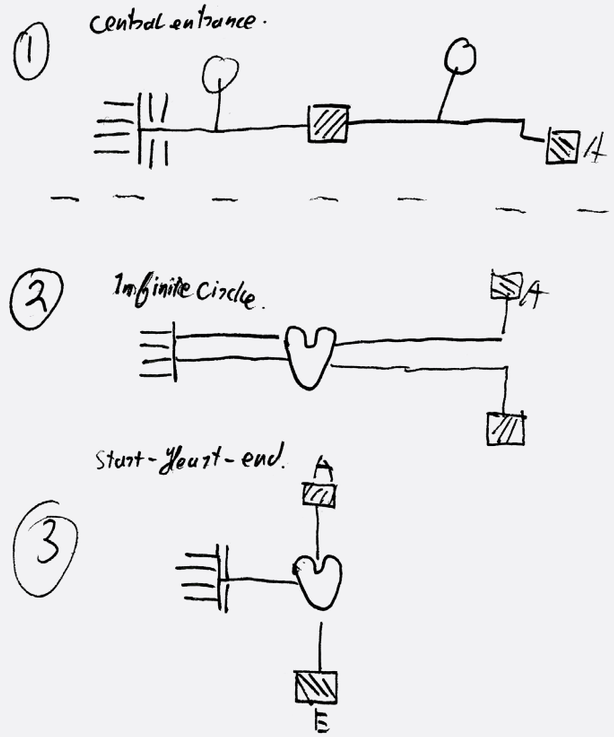


figure 80 - Section concept (07-03-2024)

figure 81 - Final building schemes (07-03-2024)

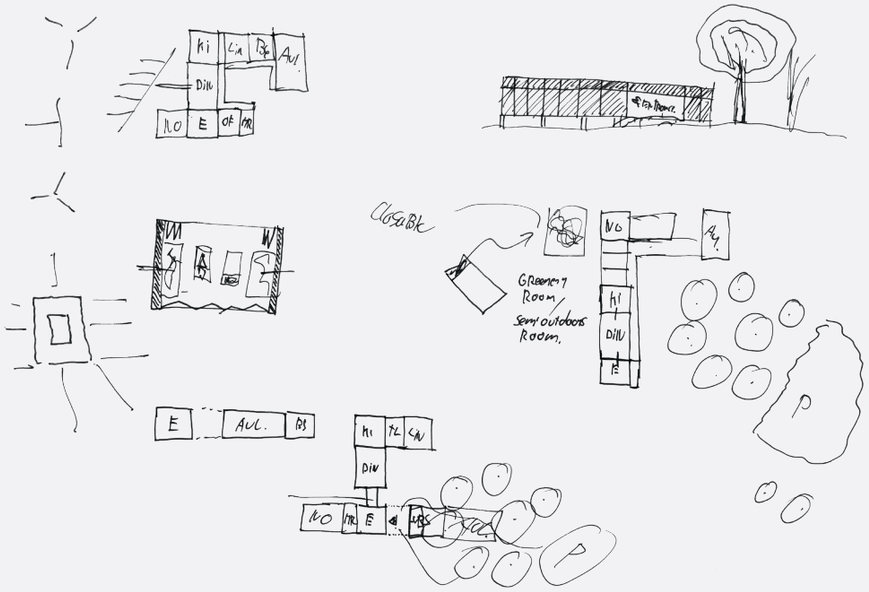


figure 82 - Various sketches on patio/building scheme (08-03-2024)

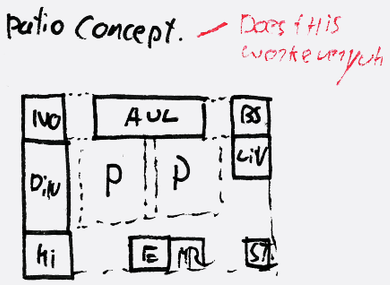


figure 83 - patio sketch (08-03-2024)

In the sketches above this text, a patio is experimented with, it is believed that the patio needs to be seen as part of the building, and also elevated off the site level, making it accessible to the patients.

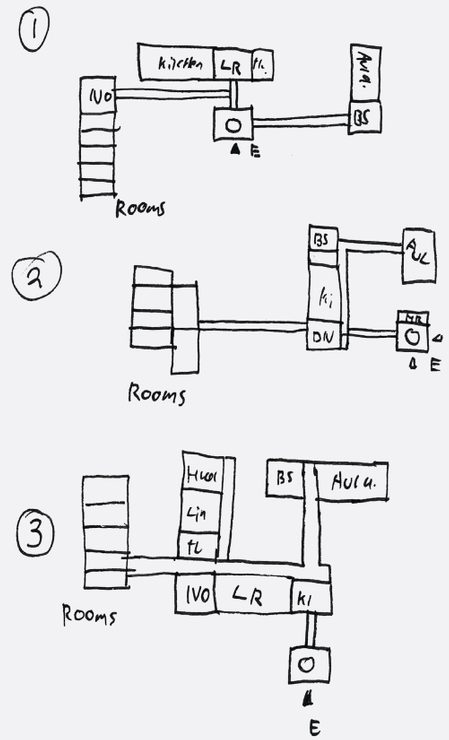


figure 84 - contextless building schemes (08-03-2024)

Based on the schemes drawn on the previous spread, the following floorplans have been designed as contextless standalone objects. As to be seen all variants are relatable to each other and can be interchanged if necessary.

Tectonics and housing

As discovered in the case study booklet, the positive effect of nature on mental and physical health is often used in architectural projects, varying from the sanatorium by Aalto to the Khoo Teck Puat Hospital by RMJM architects. Because dwelling is an integral part of the hospice design, I was referred to the article *Tectonics and housing* by Frans Sturkenboom. Within this article, Sturkenboom criticizes the modern city dwelling through the words of Gaston Bachelard and Rainer Maria Rilke.

In this writing, Rilke's astonishment at the loss of the cosmic dimension that characterizes the urban dwelling was highlighted. The flat dwelling, for example, restricts our association with the sky, it also suspends our relationship with the ground. An older type of dwelling contrasts this, where the roof fortifies itself against the rain, the walls brace themselves against the wind shrieking around the house, and the cellar brings us to the coolness of the earth; in short, where one is readily aware of the cosmic exterior of the dwelling. This is in stark contrast to the flat dwelling which is only focused on a purely optical relationship with the 'outside' because of its one-sidedness[2].

It is to be noted that the hospice designed within this project is located in the open polder landscape, offering views and nature around the building. The challenge in this building will be to combine the three cosmic values described by Rilke into one single room since the building will almost completely exist out of one building layer. Besides the directionality of the views of the building, the experience of the roof, walls, and cellar should be carefully considered.

To close off, Strukenboom mentioned that our current buildings reduce the sensory experience of the cosmic outdoor environment by all the measures the building code prescribes. It is thus an important challenge to integrate natural elements that complement this cosmic way of thinking whilst respecting the building code.

Source: Sturkenboom, "Tektoniek En Woningbouw."

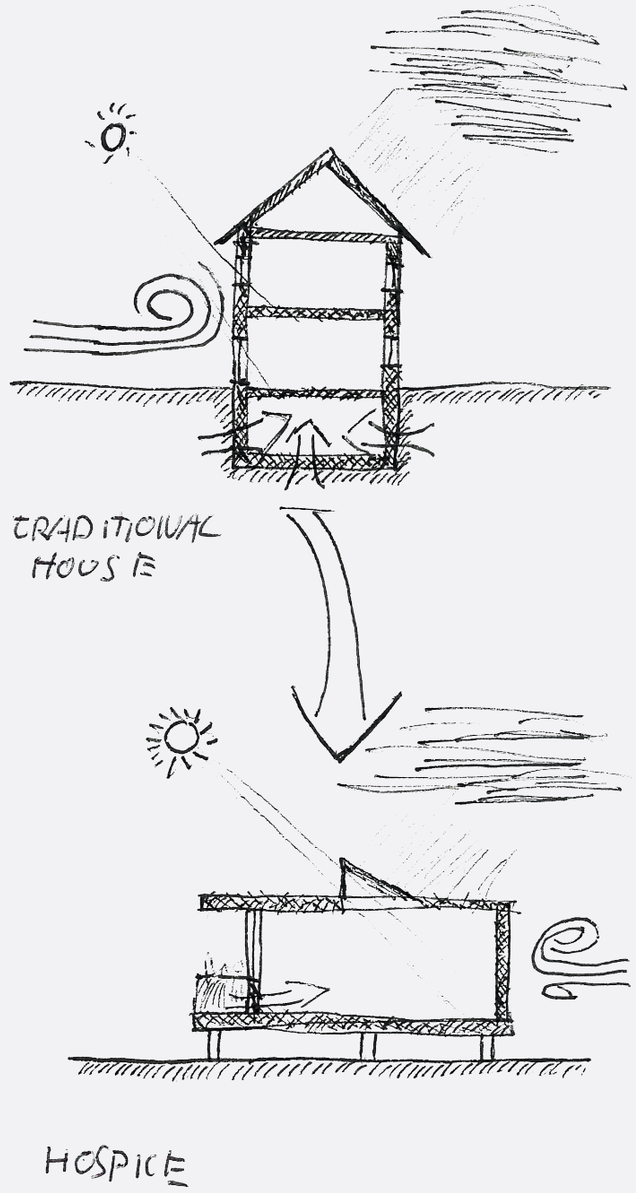


figure 85 - Tectonics and housing to Hospice design (13-03-2024)

Central heart organization

In this chapter, we are gradually going to work toward a definitive floor plan. The first step for this floorplan is to decide on the organization of the central heart, including the aula and entrance zone of the building. The decision will be made by the use of a model, a plan of the ground floor, and a comparative table with a description of the design option. The 5 design aspects that will be critically looked at are compactness, the view of the public space, the view of the patio, and the logistics of the nurses and visitors.

Public space view

The primary public spaces where the patients and their relatives will be present are the living room, dinner, kitchen, and family room. These spaces that are primarily used for the dwelling must have an open and unobstructed view over the surrounding landscape, preferably over the cyclin area or in the same direction as the Zweth.

Patio orientation

The patio is an accessible outdoor space for the patient to enjoy some outside air. The patio should be sheltered from harsh winds predominantly coming from the Southwest direction. Although offering a sheltered outdoor space is the primary goal, making the space half-opened to enjoy the surrounding landscape could be appreciated.

Compactness

The building is standing in the middle of an open landscape, which makes the whole composition visible if it is composed too spaciously. The more compact the building can be the better it will be for the overall impact on the surrounding site.

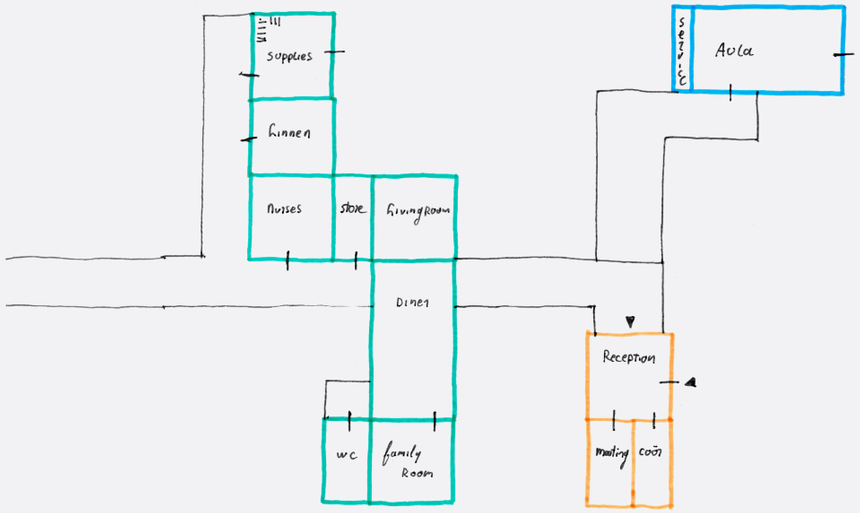
Nurse Logistics

During the tour and interview in Hospice de Liefde the volunteer stressed that the logistics of the nurses are an important element of the design. The nurses have to walk a lot up and down from the kitchen or their office to the palliative dwellings, especially when patients are not able to get out of their rooms anymore. Efficient logistics must therefore be an integral part of the design.

Visitor logistics

The visitors shouldn't have to walk through the building to reach the rooms, an efficient route from the main entrance to the living room and palliative rooms would be nice to have for the floorplan design. This is the least important requirement since the rooms can always be made accessible by adding another entrance close to them.

Option 1



Design Aspect	Rating
Compactness	-
Public space view	-
Patio orientation	- -
Nurse logistics	+ -
Visitor logistics	-

This option is based on a North-South oriented central heart, making it less compact because of its stretched-out nature. The public spaces are somewhat hidden within the central part of this composition, limiting the view. This is also the case for the patio, which is also not sheltered from the prevailing wind direction. The nurses and visitors all have a relatively short distance to span between the rooms and the central heart. The visitors however have to cross some rooms to reach the circulation zone that leads them to the patients' rooms.

figure 86 - Central heart 01-Plan (14-03-2024)

figure 87 - Central heart 01-Model (14-03-2024)

Option 2

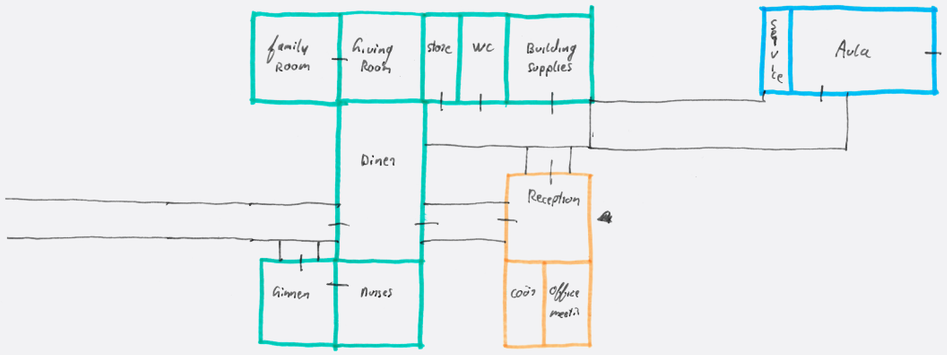


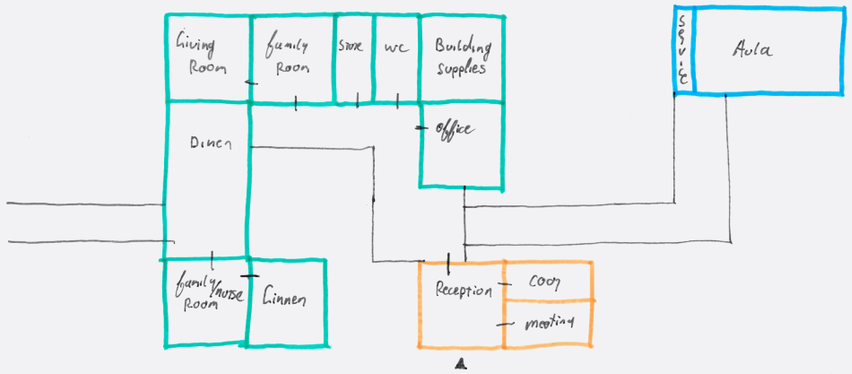
figure 88 - Central heart 02-Plan (14-03-2024)

figure 89 - Central heart 02-Model (14-03-2024)

Design Aspect	Rating
Compactness	+ +
Public space view	+
Patio orientation	+ -
Nurse logistics	+ +
Visitor logistics	+

Overall this option scores well on most design aspects, it is one of the most compact designs, minimizing the circulation areas. The public spaces, such as the living room and family room are aimed straight at the Zweth, whilst the dinner area is a bit more recessed in the building. The patio is not completely sheltered from the southerly wind, which could be improved, it has a clear view of nature. Logistics is efficient for both visitors as well as nurses.

Option 3



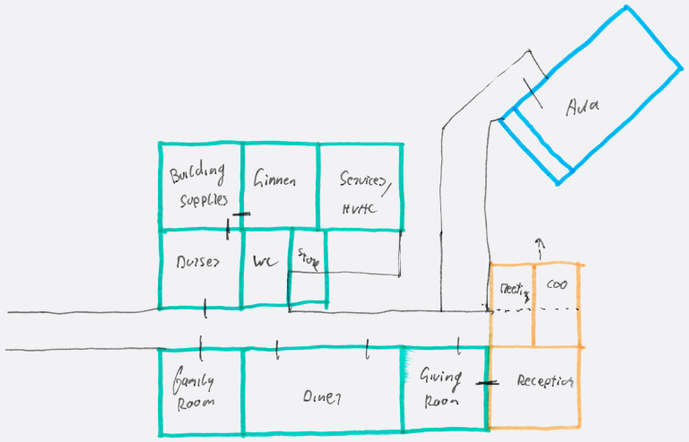
Design Aspect	Rating
Compactness	+
Public space view	+ +
Patio orientation	+
Nurse logistics	+ +
Visitor logistics	-

Again this model is relatively compact, compared to the previous model, it is however less efficient with its circulation area. This is especially true for the logistics of the visitor, who has to walk some extra distance. The Logistics for the nurses is optimal since they are close to the linen and the diner. The patio is more sheltered but still has an opening on the southern side of the building.

figure 90 - Central heart 03-Plan (14-03-2024)

figure 91 - Central heart 03-Model (14-03-2024)

Option 4



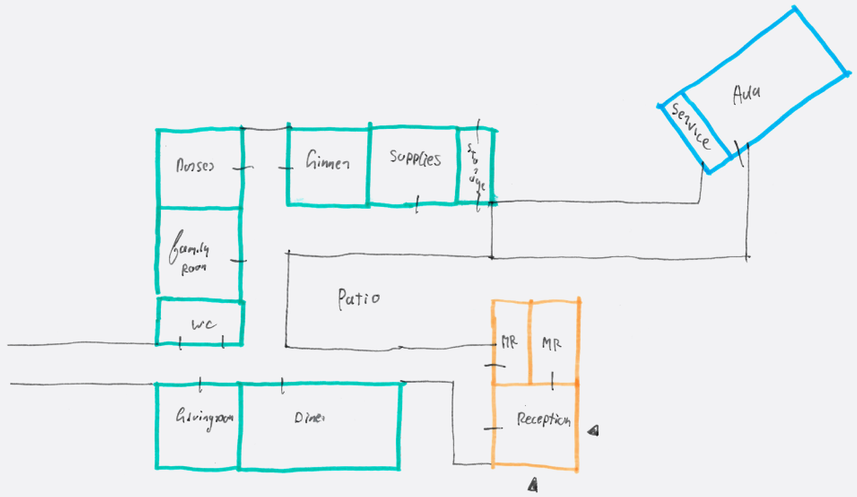
Design Aspect	Rating
Compactness	+ +
Public space view	+ +
Patio orientation	-
Nurse logistics	-
Visitor logistics	+

This is the most compact model of the bunch, which immediately results in an almost non-existent patio, which is a big downside. Because the rooms are close to one another, efficiency in the logistics for the nurses is another negative of this design. For the visitors the logistics are efficient however, there is a clear split between the public and staff-related elements.

figure 92 - Central heart 04-Plan (14-03-2024)

figure 93 - Central heart 04-Model (14-03-2024)

Option 5



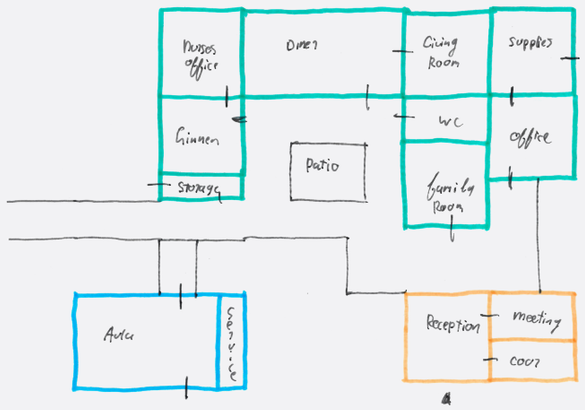
Design Aspect	Rating
Compactness	+ -
Public space view	+ +
Patio orientation	+ +
Nurse logistics	- -
Visitor logistics	+

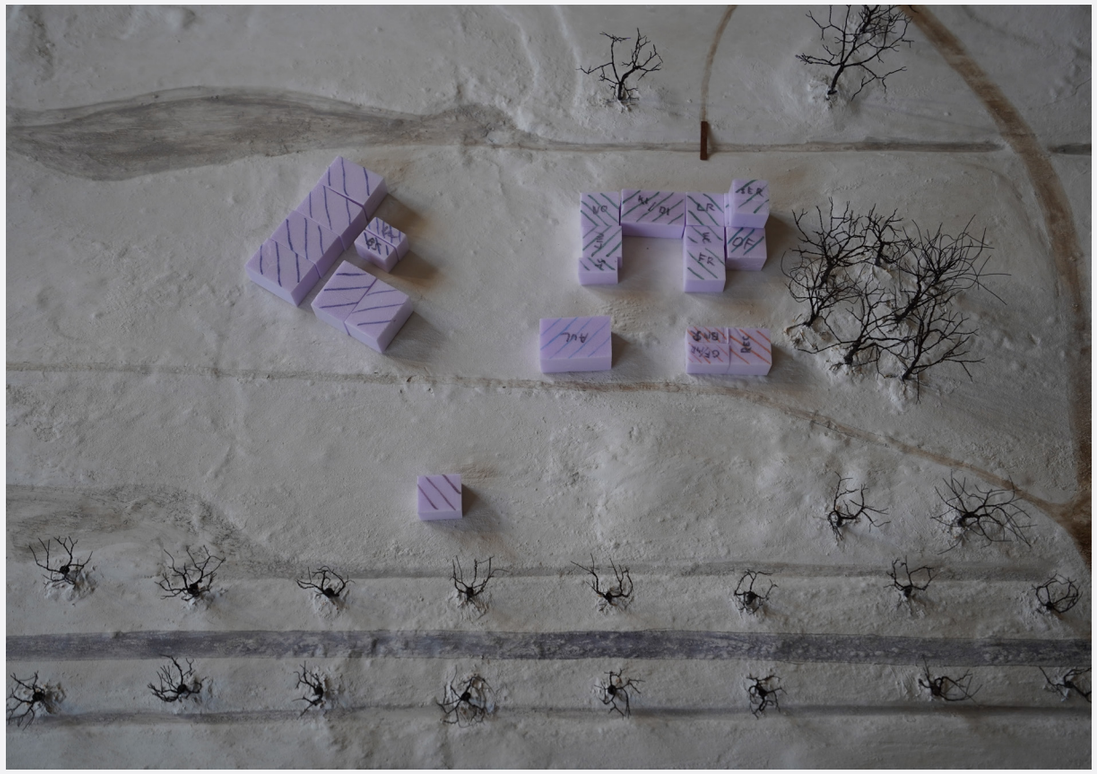
Although this model is not the most compact, it still has a lot of positives. The public spaces are aimed at the Zweth or the bicycle lane on the south side of the building. Routing is also efficient for the visitors, whilst the logistics for the nurses could use a lot of improvement. The orientation of the patio is correct, resulting in a pleasant and quite big patio also hurting the compactness somewhat.

figure 94 - Central heart 05-Plan (14-03-2024)

figure 95 - Central heart 05-Model (14-03-2024)

Option 6





Design Aspect	Rating
Compactness	+ -
Public space view	+ -
Patio orientation	+ +
Nurse logistics	+
Visitor logistics	+

The patio is the centerpiece of this building model, making it less compact whilst guaranteeing good patio orientation, since it is blocked off by a hallway. This hall makes movement for the visitors efficient, whilst the northern hall is accessing the nurse's office and linen, this route requires some more steps though. The views from the living room and dinner are good, but the orientation of the family room can use some improvement.

figure 96 - Central heart O6-Plan (14-03-2024)

figure 97 - Central heart O6-Model (14-03-2024)

Further option developement

After exploring the six options on the previous pages, a selection has been made of two potential models that can make their way to a further design phase. Beyond the two selected cases, one additional design has been taken into consideration, following out of multiple options.

In the coming versions, the negative sides of the options have been reduced to create a more complete composition of the building mass. All the renewed options will be subjected to the same criteria as was the case during the previous exploration.

T- figure 98 - Central heart 02-Model (14-03-2024)

B- figure 99 - Central heart 05-Model (14-03-2024)

Option 2.1

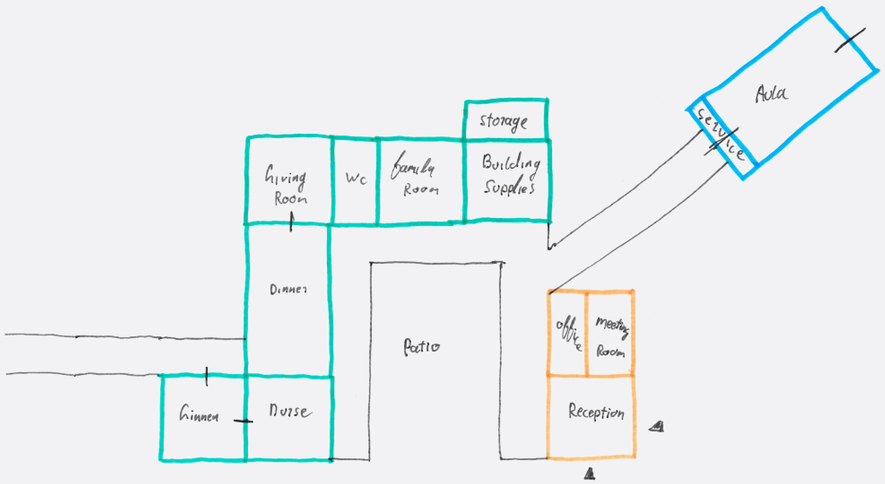


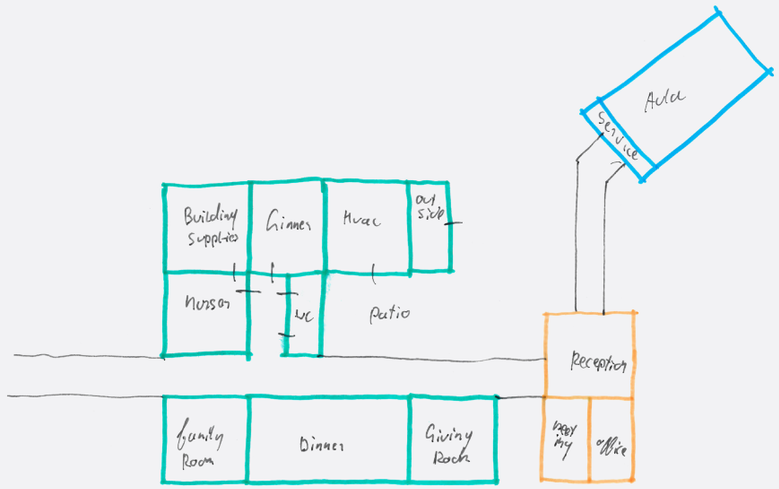
figure 100 - Central heart O2.1-Plan (14-03-2024)

figure 101 - Central heart O2.1-Model (14-03-2024)

Design Aspect	Rating
Compactness	+
Public space view	+
Patio orientation	+ -
Nurse logistics	+ +
Visitor logistics	+ -

Although the model is less compact than the original option, an improvement has been made in the way the circulation areas are attached to the building. These areas in the building however became less efficient, which indicates that the internal circulation of the previous version is preferred. Other factors, such as patio orientation and nurse logistics have stayed the same.

Option 5.1



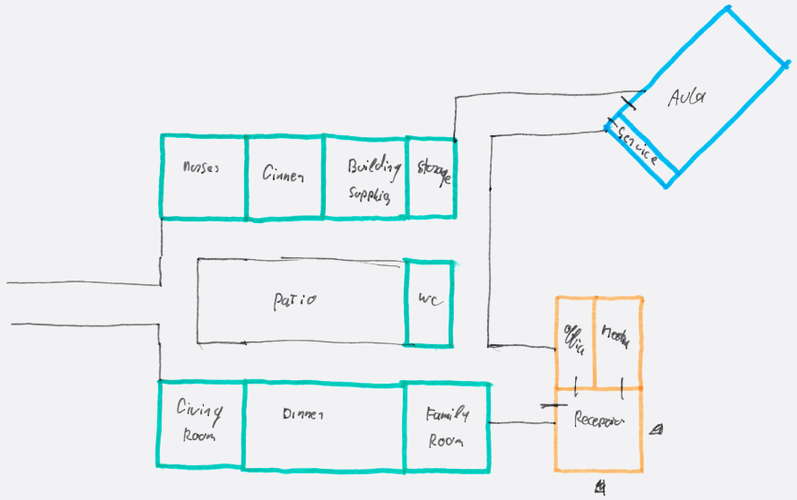
Design Aspect	Rating
Compactness	+ +
Public space view	+ +
Patio orientation	+
Nurse logistics	+
Visitor logistics	+

By the reissuing of this model, the compactness has significantly increased, making the model worthwhile at first glance. The logistics for the nurses have also been improved, resulting in the accessibility of the building supplies being compromised. Overall, the model has improved but still needs some attention in the top left corner.

figure 102 - Central heart 05.1-Plan (14-03-2024)

figure 103 - Central heart 05.1-Model (14-03-2024)

Option 7



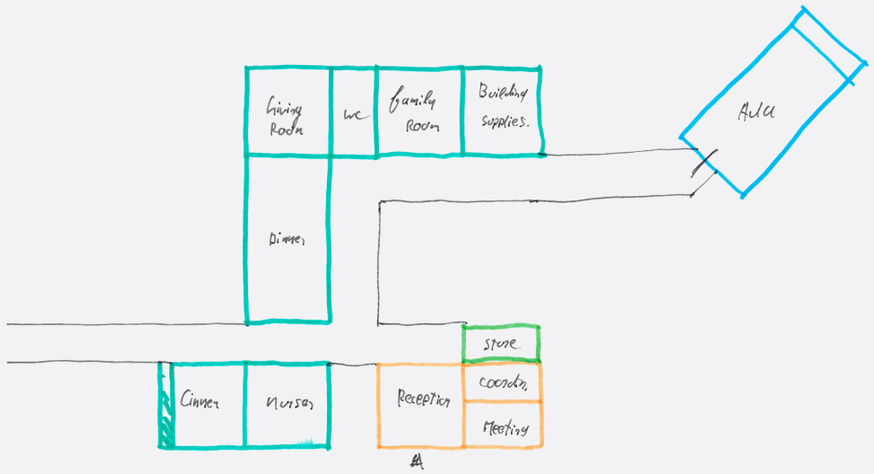
Design Aspect	Rating
Compactness	-
Public space view	+ +
Patio orientation	+
Nurse logistics	+
Visitor logistics	+

A central axis is the main element of this newly introduced option, this represents a large patio element that is enclosed on all four sides. The patio also serves as a bridge between the service part of the building and the publicly used part. Although all building elements are easily accessed, a lot of circulation area is needed, making the overall concept inefficient.

figure 104 - Central heart 07-Plan (14-03-2024)

figure 105 - Central heart 07-Model (14-03-2024)

Final selected option



Design Aspect	Rating
Compactness	+
Public space view	+ +
Patio orientation	+
Nurse logistics	+ +
Visitor logistics	+

figure 106 - Central heart final-plan (14-03-2024)

figure 107 - Central heart final-model (14-03-2024)

This final composition is a combination of the previous three models, trying to integrate all the positive points of them. The compactness is a combination between 2.1 and 5.1, keeping the patio as big as possible, and also making the space suitable to make a connection with the trees. The public spaces are still oriented towards the Zweth, offering a natural view to the patients. The patio is sheltered from the southern winds, making it accessible for most patients over the year. The nurses are in the dead middle of the palliative rooms and the dinner area, placing them in the most efficient spot. The distance visitors have to cover is also minimized as much as possible, having the dinner area close to the reception area.

Final selected option

figure 108 - Final option E (14-03-2024)

Although the layout of the public areas of the hospice is clear, a good look still needs to be given to the entrance area. It should be recognizable from a distance, so strategic placement is important.

figure 109 - Final option N (14-03-2024)

The direction of this viewpoint is where the main view towards the Zweth is aimed. The living room at the corner and the family room just right of that have optimal views. Also, the dinner and kitchen have good views over the Zweth and have the possibility of looking towards the bicycle lane at the same time.

figure 110 - Final option W (14-03-2024)

Ground floor

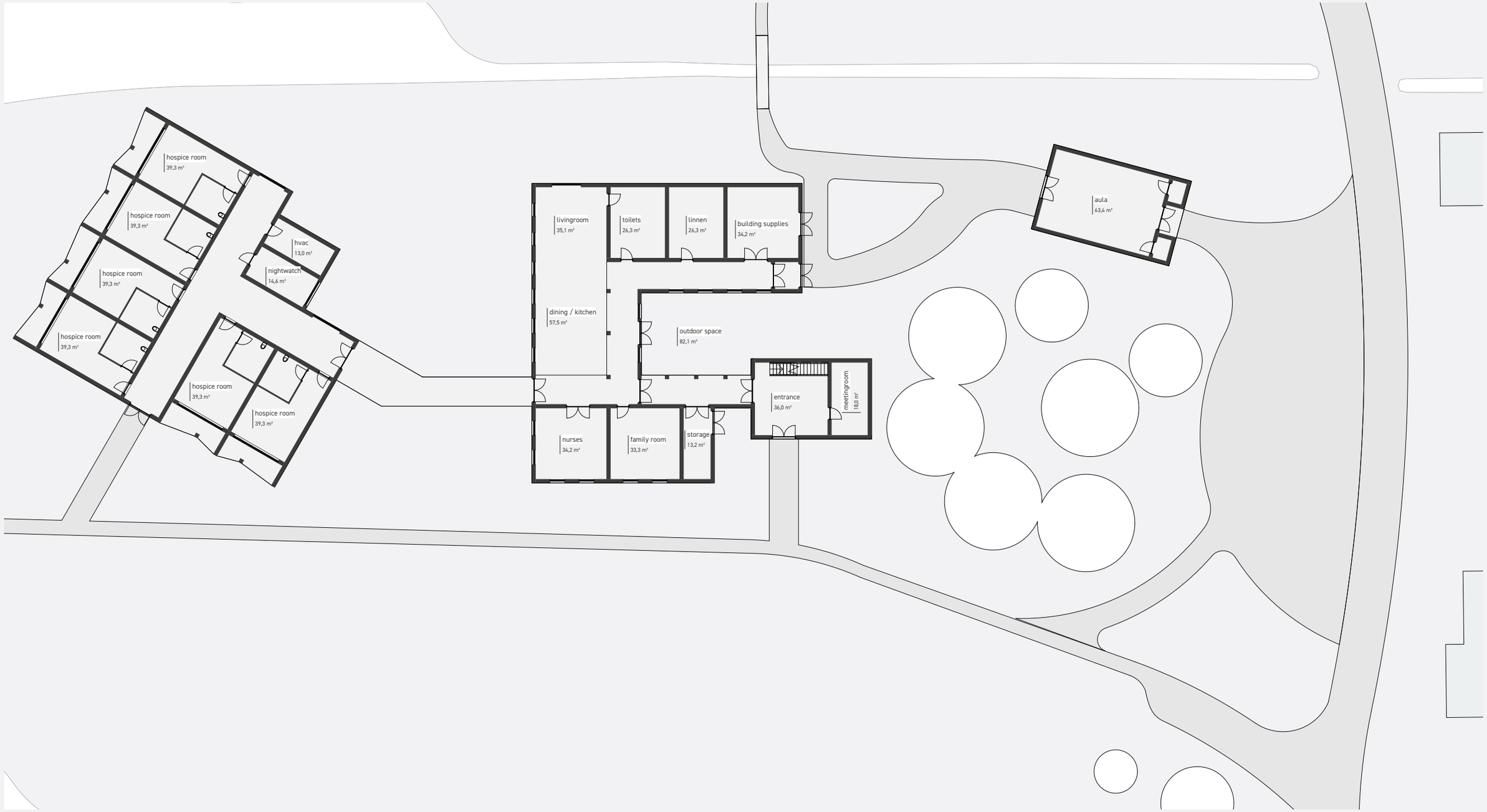


figure 111 - Ground floor (15-03-2024)

First floor

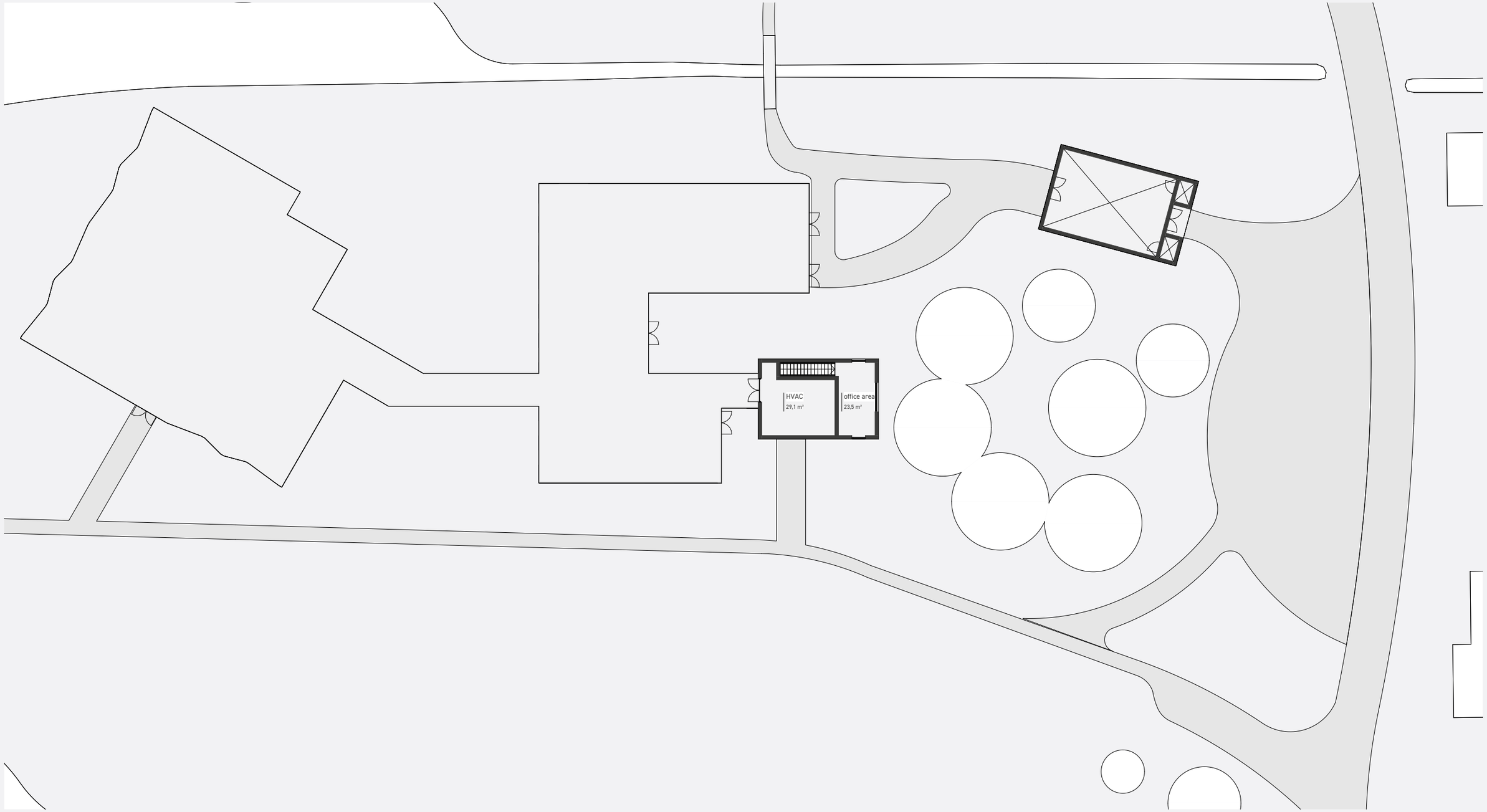


figure 112 - First floor (15-03-2024)

Exterior wall references

The aspect of interest for this reference is the difference in materialization and pattern. The straight and square elements are made out of brick, whilst the walls under the gable roofs are timber.

figure 113 - Dolphins Community Centre - Archio

Instead of differences in materialization, in this reference varying patterns are chosen to highlight the layers of the building. The top layer also looks transparent behind the façade cladding.

figure 114 - Building - Al-Jawad Pike

The building on this page represents a temple, this is visible by the subtle monumentality of the building. In combination with the demountable ambition, and thus possibly architecture made of panels, this building could be an important source of inspiration. The question needs to be raised to what extent the monumentality needs to be incorporated into the hospice design, without being to sentimental.

figure 115 - Temple complex - James Gorst Architects

Palliative room facade design

With the facades and roof forms of three of the four types, naming; entrance, heart, and aula quite clear, the façade, and especially the roof structure of the palliative rooms was harder to find. Because the building should be contextless, and be able to be placed around the Netherlands, a reference to a typical farm in Midden-Delfland could not be used. With this in mind various roof forms were experimented with, especially keeping thtat the experience of space from within the room is most important.

As seen in Figure 114, out of these multiple options, the thought, for now, is to build a mansard-esque roof structure, which has daylight openings on the sides, to let in daylight for the patients. This decision however needs further reviewing. It is furthermore a consideration to keep the bottom part of the building similar as compared to the other three elements and have a contrasting roof.

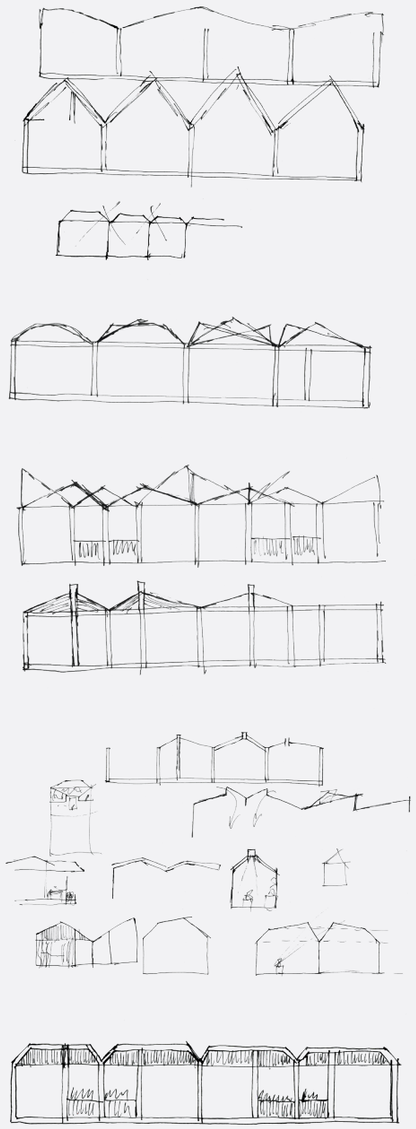


figure 116 - Palliative facade various sketches (18-03-2024)

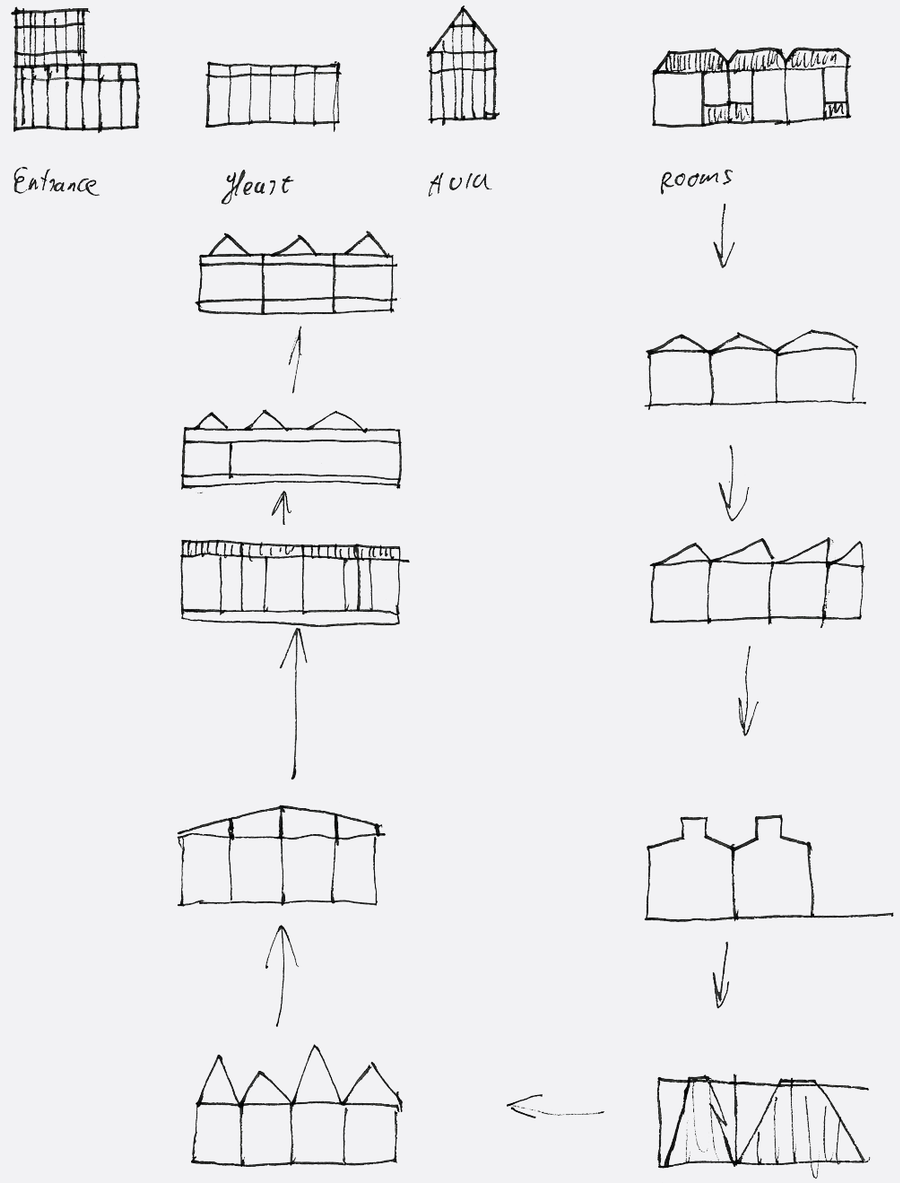


figure 117 - Palliative facade roof options (18-03-2024)

Palliative roof reference

figure 118 - Interior photograph - House in Senda

figure 119 - Interior photograph - House in Senda

Stumbling across this Japanese house in Senda, new inspiration for the roof structure was found for the palliative dwellings. This structure allows for indirect light from most points of view, shedding light on the structure.

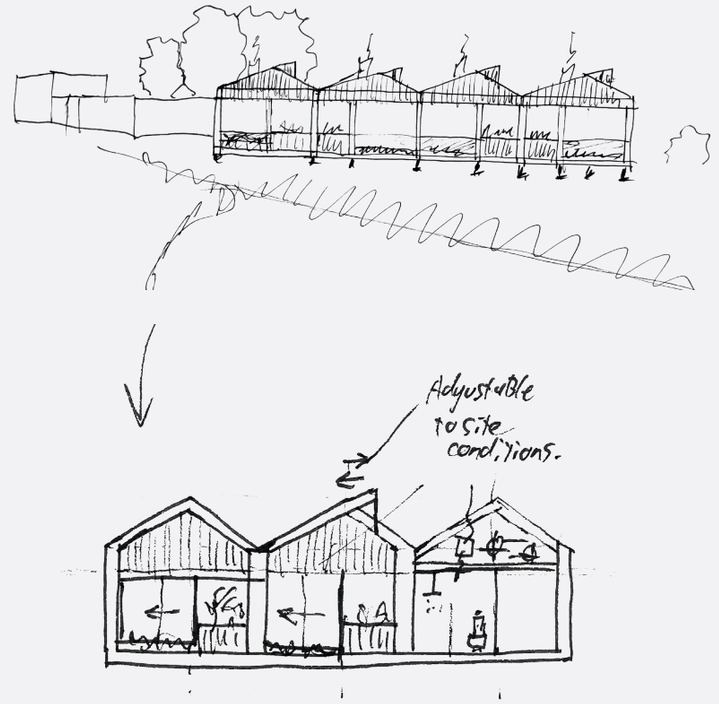
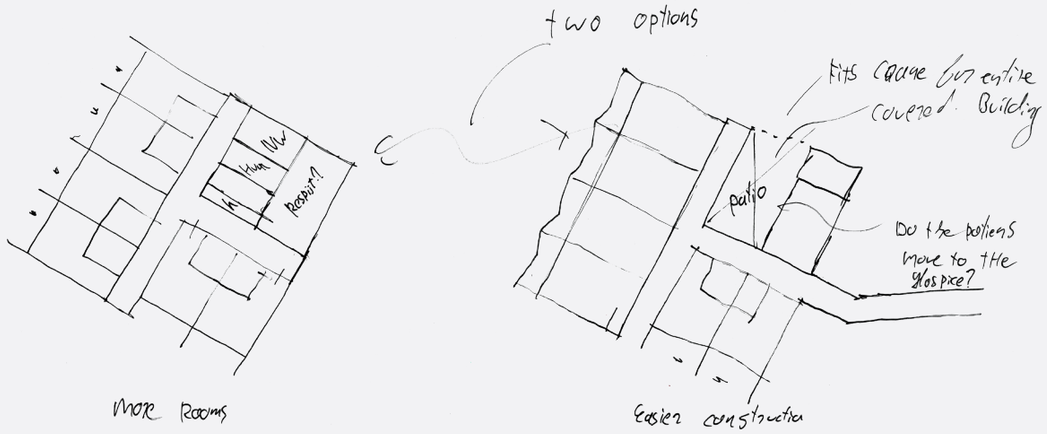


figure 120 - Facade and sections (20-03-2024)

The reference on the left-hand side of this spread was used for the roof of the palliative dwellings. The indirect lighting in the long axis, just shedding light on the structure, but also the direct lighting when looking from the side allows patients to choose which side of the dwelling they want to have their beds, adding to the value of a changeable floorplan.

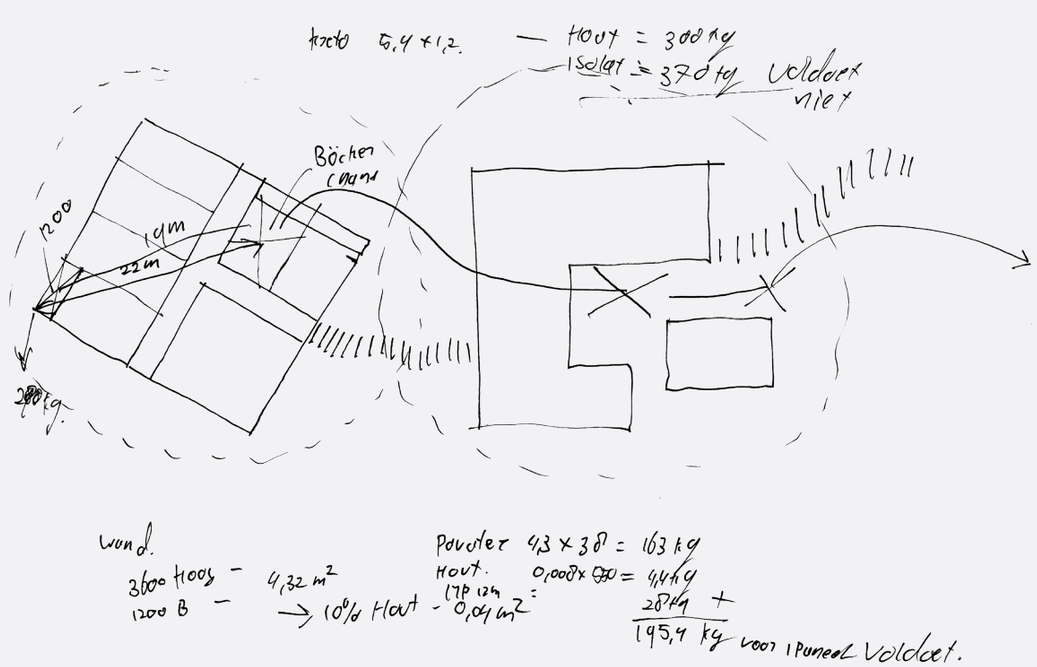
Palliative cluster floorplan



In the last floorplan on page 121, the palliative cluster of the building had a jagged façade on the north side. This did not look logical, and would also have been a waste of space in relation to the added façade surface. Two options can be considered, one having a patio offering additional outdoor space for the patients close to their rooms, whilst the other option is to increase the capacity of the hospice with one extra room that can be used for respite care services. An additional advantage of the patio version is the ability for a crane to be placed in the patio space.

figure 121 - Two palliative options (20-03-2024)

Crane positions



Since the soil of the surrounding site cannot handle excessive loads, only a small crane can be used. This also results in a crane that cannot reach as far as a conventional but heavier crane would. A trailer crane is a suitable option, that can easily be moved around the building site by remote control, whilst not weighing a lot (3500 kg.) The strongest electric crane has been selected, the Böcker AHK 36e trailer crane, reaching a distance of 23.5 meters, enabling it to carry 250 kgs of load[3]. Wall panels of 1,2 m × 3,6 meters would be manageable, whilst floor elements are too heavy requiring two or more positions, lessening the impact of the patio on this aspect.

figure 122 - Crane positions (20-03-2024)

Böcker AHK 36e

Technical Data

Permissible gross vehicle weight (t)	3.5
Max. payload (kg)	1,500 (optional 2,400)
Max. extension length (m)	34.0 (optional 36.0)
Working height up to jib (m)	22.7
Jib extendable (m)	4.9 / 8.0 / 11.1 (opt. 13.1)
Jib payload (kg)	2,400 / 1,500 / 800 / 500 / (250)
Boom angle (degrees)	85
Jib angle (degrees)	162
Pivoting range (degrees)	endless
Hook speed (m/min)	50
Range for crane operation at 250 kg (m)	23.1 (23.5)
Range for crane operation at 500 kg (m)	16.6
Range for crane operation at 800 kg (m)	12.9
Range for crane operation at 1 t (m)	10.0
Range for crane operation at 1.5 t (m)	7.5
Range for crane operation at 2 t (m)	5.4
Range for platform operation at 250 kg (m)	15.8
Range for platform operation at 100 kg (m)	18.8
Working height in platform operation max. (m)	29.0
Drive	Petrol engine / Diesel / 400V hybrid* / 230V with battery

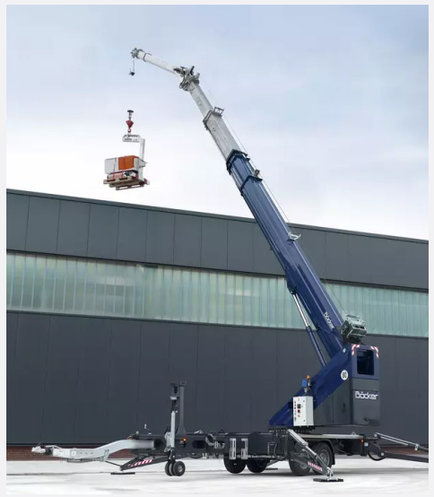
All rights reserved for changes. All specified values are maximum values.
* in combination with petrol engine only. Please check availability in your country

Where 400 V high-voltage current was needed in the past, the AHK 36e is the first battery-powered trailer crane on the market to charge at any conventional household socket with 230 volts. Environmentally friendly and self-sufficient work with free choice of location is thus guaranteed. The new AHK 36e not only makes lifting loads more sustainable, it also offers all the proven advantages of the class leader among trailer cranes. Powered by an 8 kW electric motor, it lifts up to 2,400 kg with low emissions and low noise and reaches extension lengths of up to 36 m with a permissible gross weight of only 3.5 t. The crane is equipped with folding slewing outiggers, auto-levelling, slew and boom angle limitation as well as go-home function. The Easy-Lock system allows the new battery trailer crane to be converted into a working platform in no time. The trailer crane is also available with personal safety mode for fall protection.

Available with Böcker Connect

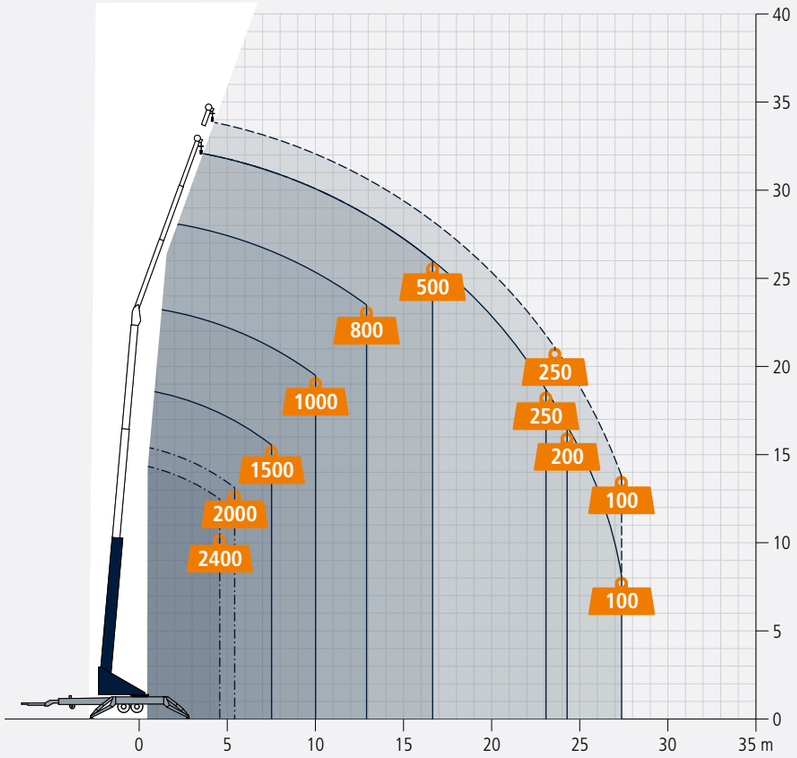
Böcker
MY WAY TO THE TOP

figure 123 - Böcker AHK 36e technical data



The Böcker AHK 36e is one of the strongest electrical trailer cranes on the market, it is easy to operate without a license. Furthermore, the crane does not weigh much, which is an important factor for building on peat grounds.

figure 124 - Böcker AHK 36e appearance



This crane is one of the strongest trailer cranes around, the working range is surprisingly good, but not comparable to larger models. Most importantly it can lift prefab foundation slabs of 800 × 800 × 15mm with a weight of 270 kilograms up to 22 meters. The roofing panels will determine the amount of position changes since they are the heaviest elements. Height-wise, the crane will easily reach the two stories that the building is made out of.

figure 125 - Böcker AHK 36e working range

Palliative plan

With the contours of the palliative room cluster clear the next step is to work out the furnishing and the overall incorporation of the plan. On the top of the plan, above the corridor, 4 options are shown all of them with a bathroom of the same size. An important element to consider is the placement of the closet, which can be placed on either side of the room. It can be placed close to the core or in a row along the wall opposite the core. In the latter option, the fixed furniture element can be seen as one whole connecting element. The bed is also able to be placed in multiple directions when the furniture is organized in such a way.

In the hallway of the palliative units the ceiling can be lowered for installations, and access can be realized using an attic ladder. Further installations for heating, electricity, and water are housed in the HVAC room, connected to the nurse's office. These two rooms are located close to an outdoor area, which is used by the patients. The composition of these rooms can be switched around, offering further shelter for the patio/outdoor area.

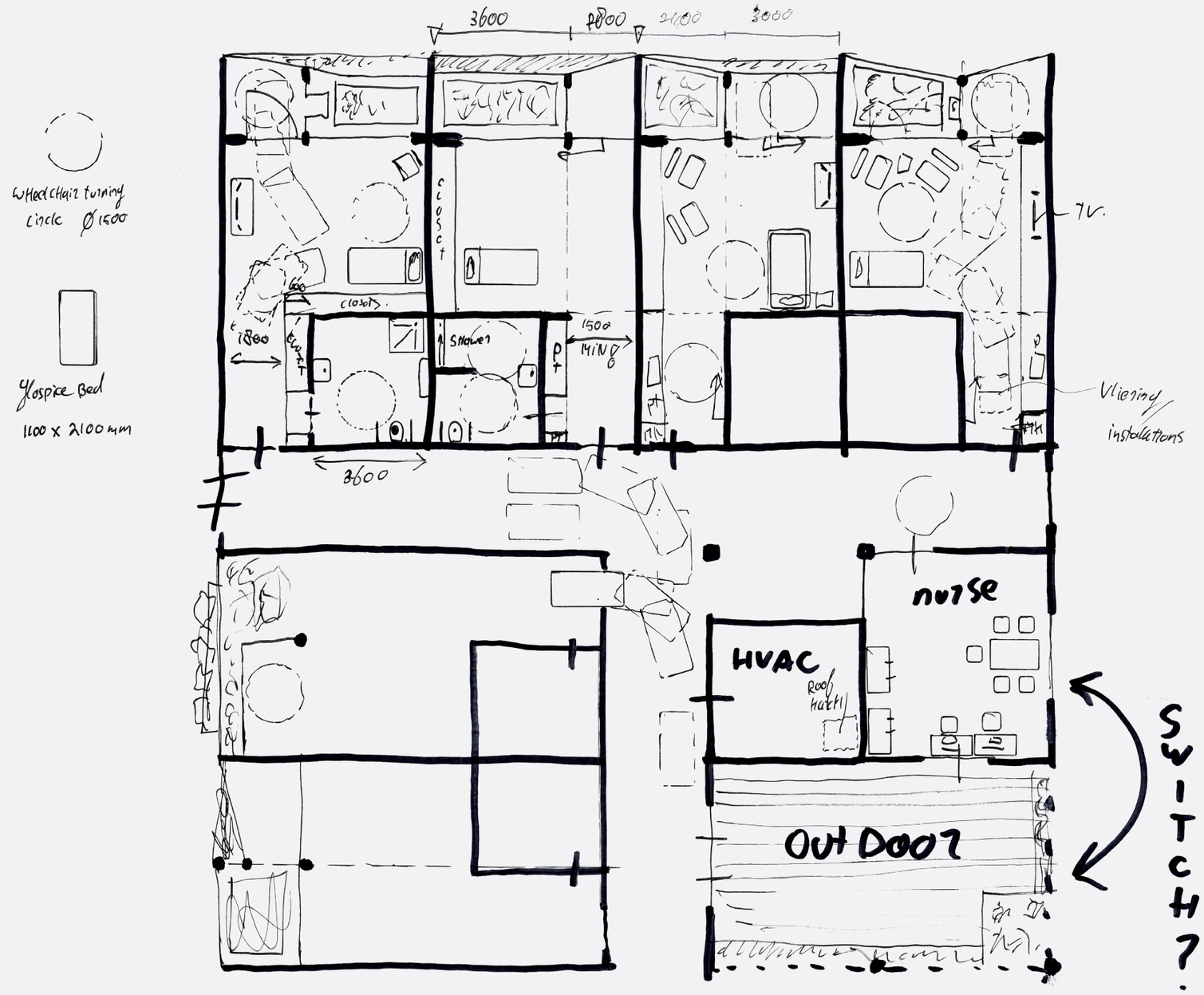
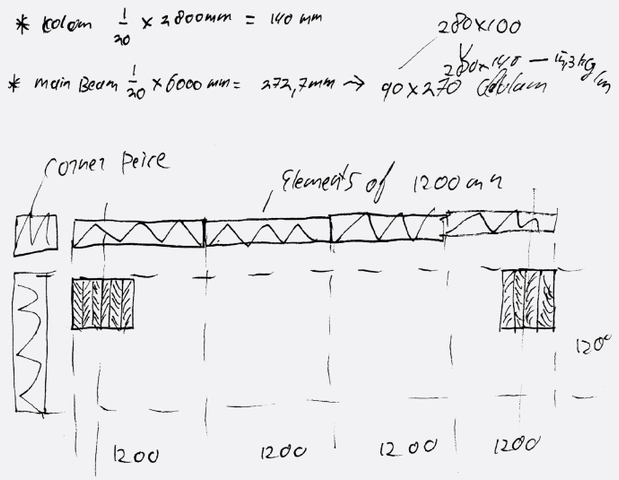


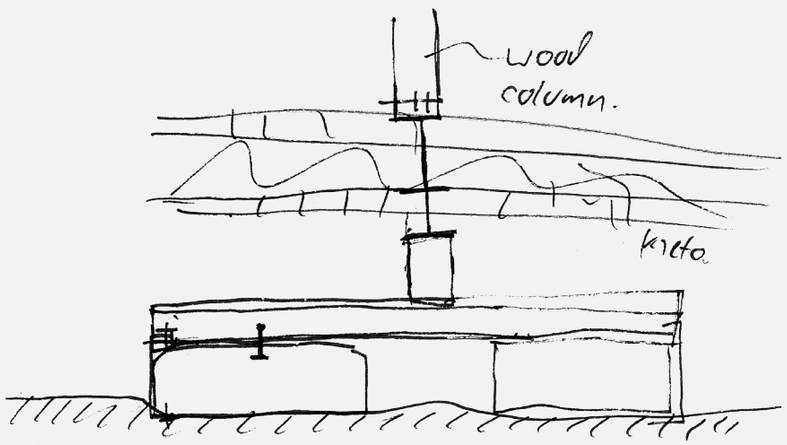
figure 126 - Floorplan of palliative rooms (20-03-2024)

Façade elements



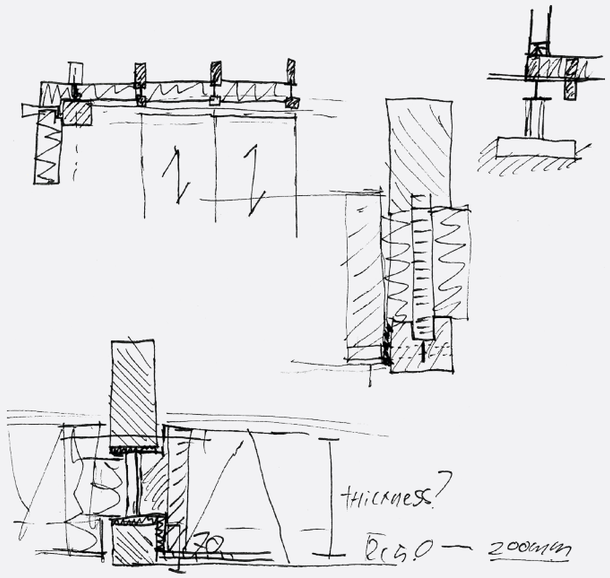
Within the grid of 6 meters, 5 elements of 1200mm are used, in the corners a special corner piece is used to close of the façade. Columns have a thickness of 140mm square, and the main beam requires a thickness of 272mm, which results in a beam of 280 × 140 mm.

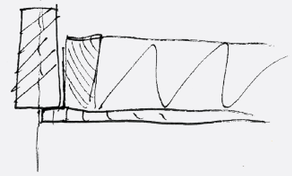
figure 127 - Grid and beam (19-03-2024)



The foundation is based on demountable concrete plates, which have a steel beam resting on them, the capability of the crane will determine the size of the concrete, and thus the amount of blocks needed.

figure 128 - Foundation sketch (19-03-2024)





In the sketches on this page, the façade elements are illustrated, trying to get grips on the way of assembling and demounting the structure. For now, the idea is to lock in the façade elements into wooden frames, which highlight the verticality or panel structure the building is made out of. Further investigation needs to take place in the reachability of the elements.

figure 129 - Facade elements connection (19-03-2024)

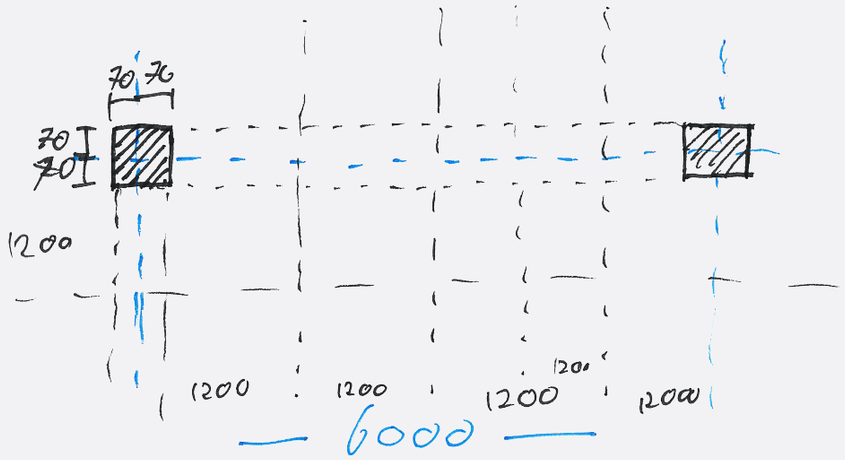


figure 130 - Structure plan view (21-03-2024)

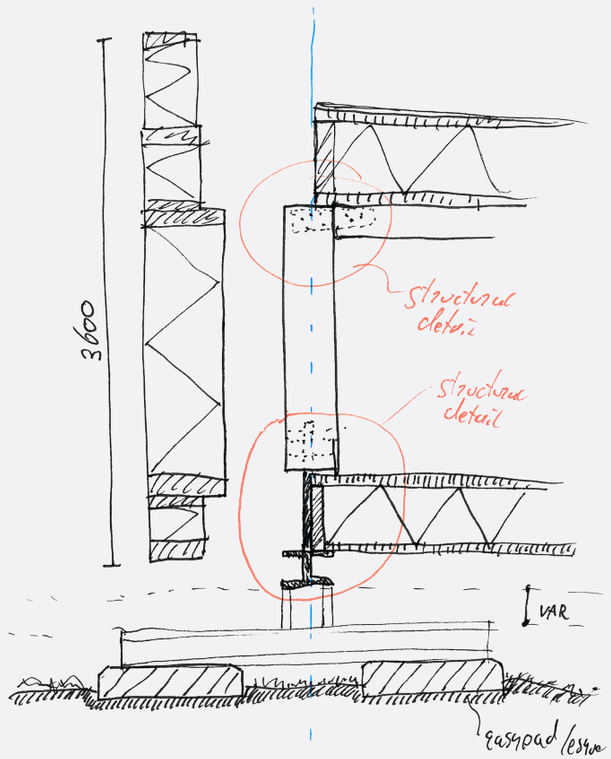


figure 132 - Profile section of facade (21-03-2024)

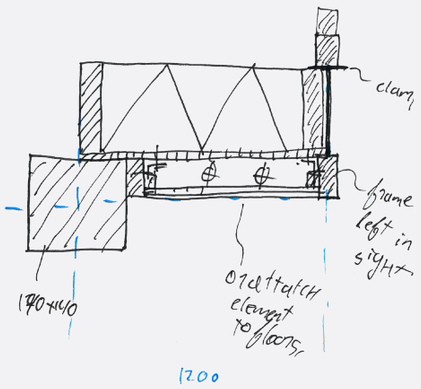
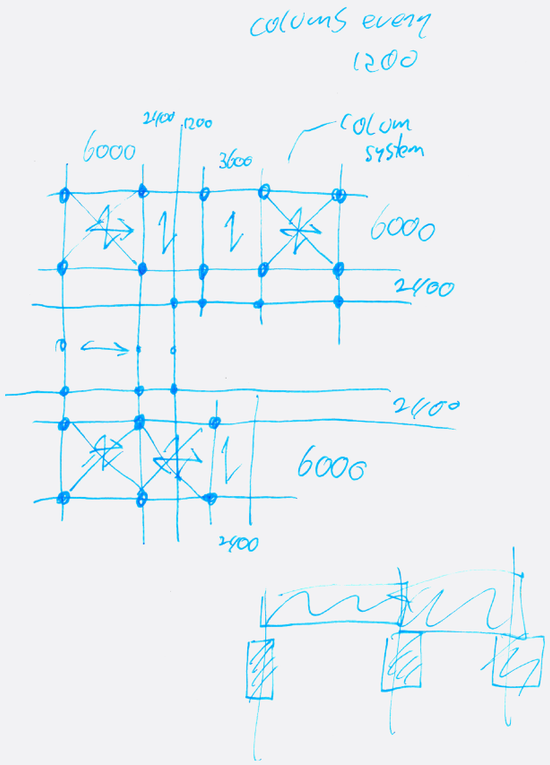


figure 131 - Detail of column facade joint (21-03-2024)

To avoid custom corner elements the column structure is placed on the heartline of the grids, ensuring that all the panels have the same width of 1200 mm.

This section now shows the panel being placed inside of the structure, requiring multiple insets in the framed element. It could be worthwhile to create straight elements that are hung on a separate inside structure. Maybe the elements can also be hung on the roof elements, which makes placement more straightforward.

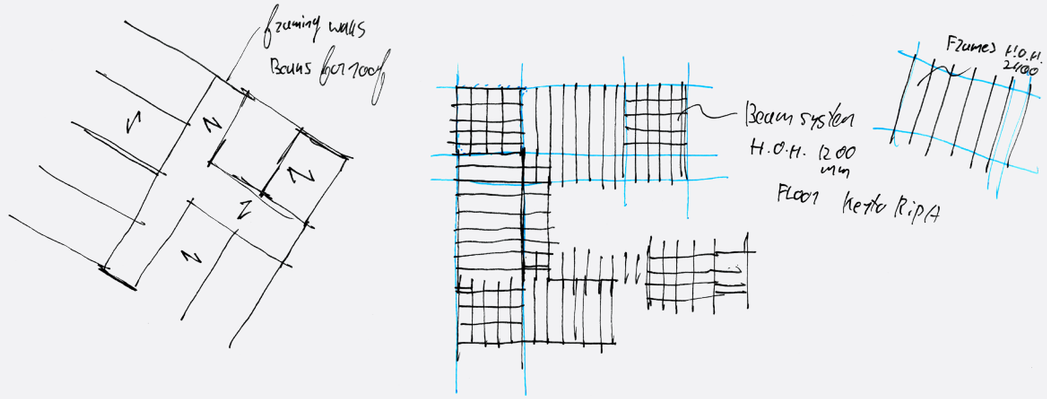
Columns on 6000 mm



One problem with the columns on every 6000 mm is that they are dependent on the room divisions, requiring custom beams for every room. This harms the adaptability of the structure when it has to be moved later on in the future life of the building. The structure can in this case be more gentle to the eye, with it being less present, whilst still having more mass than closely spaced columns.

figure 133 - Columns every 6000 mm

Columns on 1200 mm



With columns placed on every 1200 mm, the overall roof beam structure will be easier to create and make it easier to repeat or change in various configurations of the structure. An additional positive of this approach is the fact that the point loads of the columns are spread out over more, reducing the load on the floor system, and making the system possibly easier to construct.

figure 134 - Columns every 1200 mm

1200 mm spacing

As shown in the bottom image, the workshop in the forest by Haretoke Architects has a grid measurement of 900 mm, resulting in a busy grid structure, this is also affected by the small piece of wood in between the grid. If one thinks this element away, then the structure becomes less overwhelming, as also shown in Figure 135, where materialization plays its part in creating a less present structure.

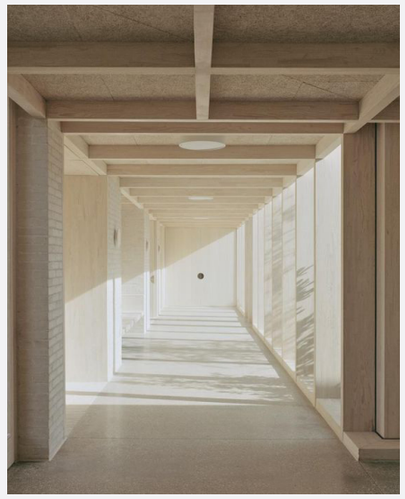


figure 135 - 1000 mm grid - James Gorst Architects

figure 136 - 900 mm grid - Haretoke Architects

Another approach is taken by Studio Weave, which still has a grid structure quite close, measured from the plan roughly 600mm. This close grid is softened by the filling elements of the plywood, whilst still showing the structural thickness of and measurements at the windows and slight inset of the sheeting.

figure 137 - example facade structure - Studio Weave

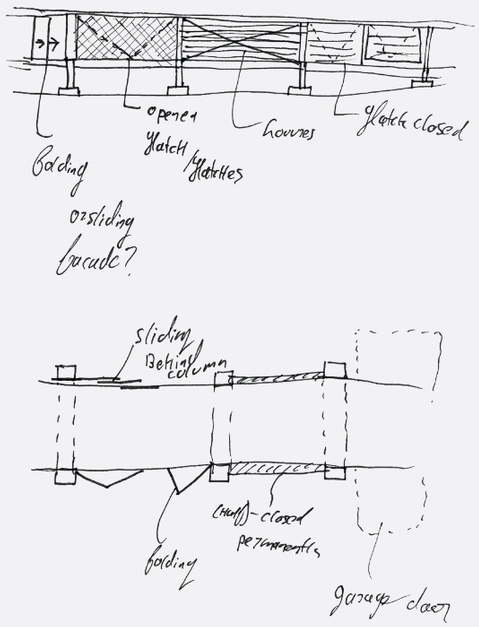


figure 138 - Varying opening panels (21-03-2024)

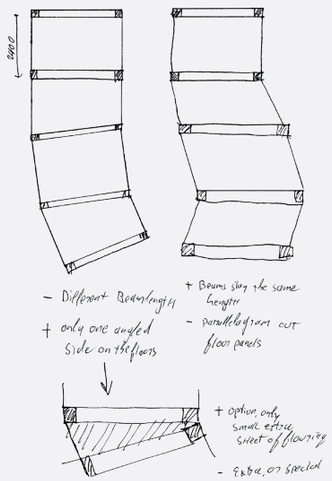


figure 139 - Circulation structure (21-03-2024)

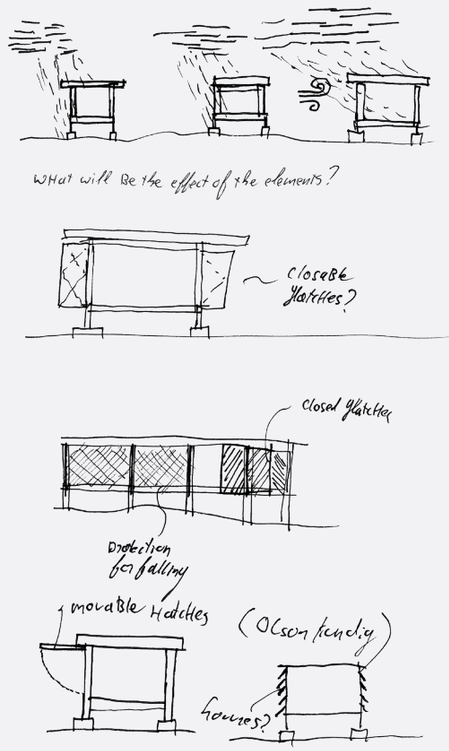
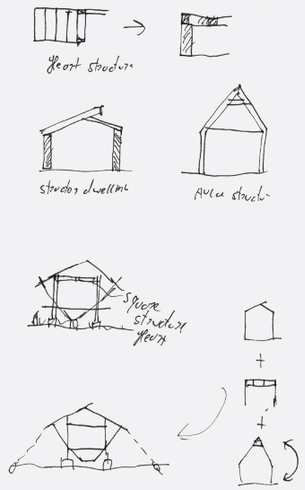


figure 140 - Circulation sections (21-03-2024)

As seen in Figure 139, the structure for the circulation can have two options, both having their pros and cons. In the left option, the beams and plywood are cut to size, whilst in the right option only the plywood has to be cut.

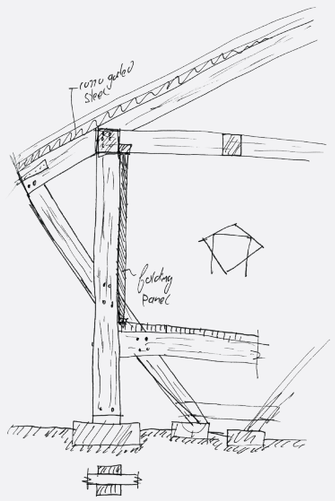
It is aimed to have the circulation between the clusters as an outdoor area, letting the patients experience the outdoor conditions and also approaching the healing and mental relaxing effect of nature. Because the condition of the patients is not optimal, some shelter of weather conditions must be considered. It is especially important to offer some form of shelter from rain, which can be done through movable façade panels, as explored in the sketches.

Outdoor Circulation

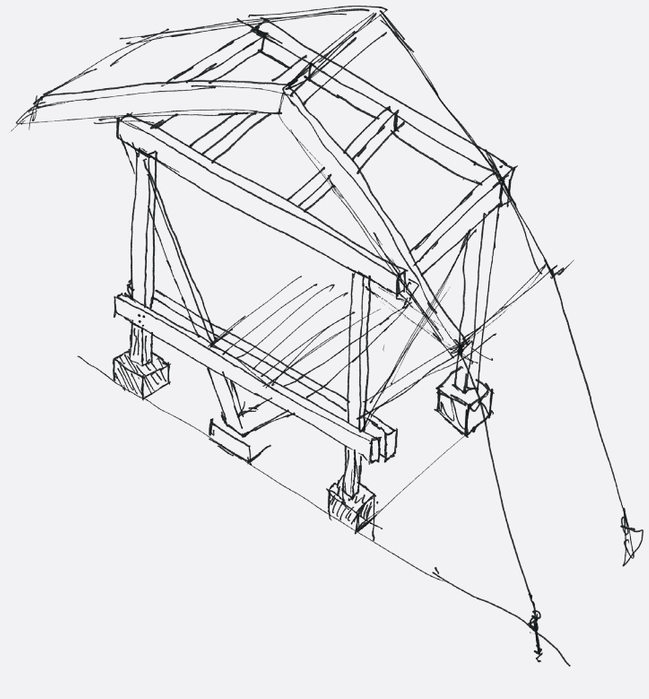


In the search for a suitable form for circulation, inspiration was taken from the already existing roof forms, combining them into one structure.

figure 141 - study on section of circulation (25-03-2024)



Instead of using a steel structure, this more rudimentary structure is completely built out of wood on just a small concrete slab.



To make assembly easier, the structure will consist of a sandwiched wooden structure, that allows for an easy bolt-through application. Because the elements will be connected to the buildings that it bridges, stability in the walking direction is guaranteed. Stability in the other direction is ensured through a tent-like steel structure, acting as a bracing.

figure 142 - Structural drawing circulation (25-03-2024)

figure 143 - Axonometry of ciruclation (25-03-2024)

P3 Presentation

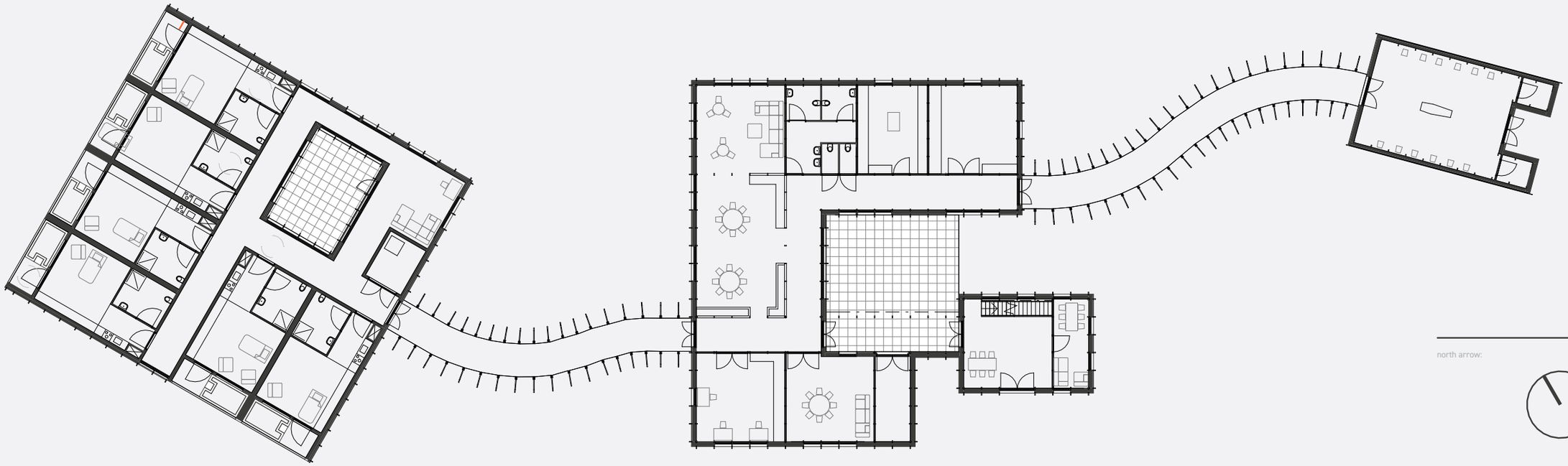
The P3 presentation was set up in such a way that all the products had to be placed in a room to be checked by the tutors without the students being present. For this presentation, all booklets and drawings were updated to show the progress I made since the P2 presentation.

The feedback that was received on the architecture part was that the overall building design was good and developed, and just some small elements had to be changed. The 'chalet-like' palliative dwellings for instance could use some attention, whilst the same goes for the bottom of the platform, which is now one shaded area.

In the Building Technology area, the tutor was not convinced that the products were there. They for instance couldn't see the demountability aspect of the design, with also some elements of the climate sections missing or not clearly shown on the drawing. Overall I should work hard on BT towards the P4 presentation now and leave the architecture part as is to get a good score.

figure 144 - Render for P3 presentation

Floorplan



north arrow:

figure 145 - Floorplan for P3 presentation

Thesis booklet sequence

To get a grasp on the products I need to have during the P4 presentation a sequence of pages was made laying out the storyline of the project in images with text. In the first third of the booklet, the goal is to explain the research and building concept, after which the architecture will be covered in the second third of the booklet. Finally, the more technical elements of the design are described.

All the elements in the booklet are based on the research booklets, which are referenced to the main thesis that understandably bundles all the research, making the research accessible for everyone.

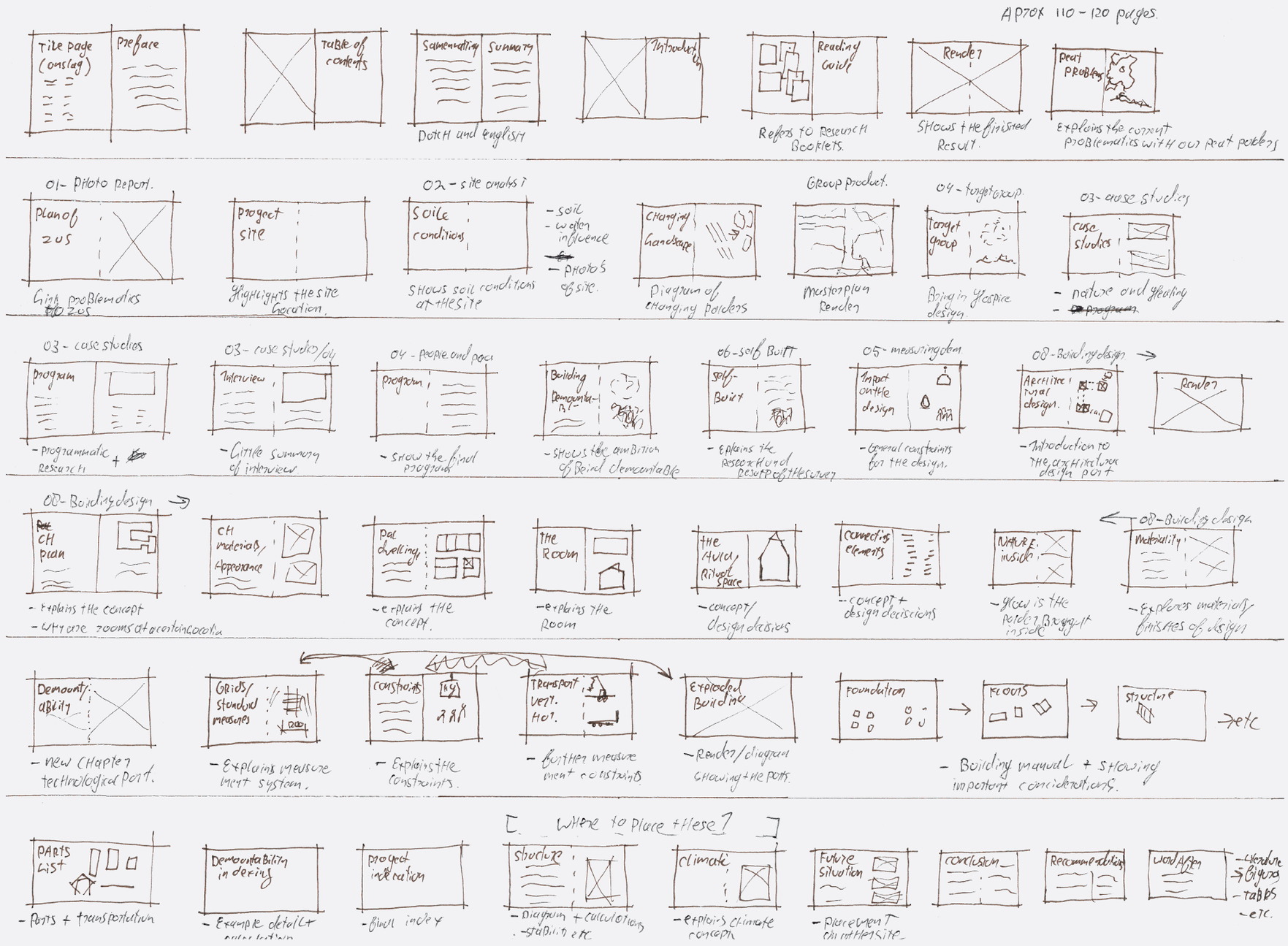


figure 146 - Thesis booklet sequence (08-04-2024)

Guest house

An until now relatively undeveloped part of the building concept is the guest houses, which are going to be present on the site as separate volumes from the actual hospice. These guest houses are meant to be used by relatives of patients living further away who want to stay closer to the patients themselves.

Working in the standard grid of 1200 mm, the following two configurations are made as a set of options for the following design steps. Initially, the preference was for the narrower model, which would have a different form to the current clusters already present in the hospice. When designing the square variant however the hallway seems to be drastically improved, although the bathroom and bedroom might have to be switched around.

In final, we will proceed with the 4800 × 6000 mm variant with the bed- and bathroom switched in spaces, to have the right proportion of space dimensions.

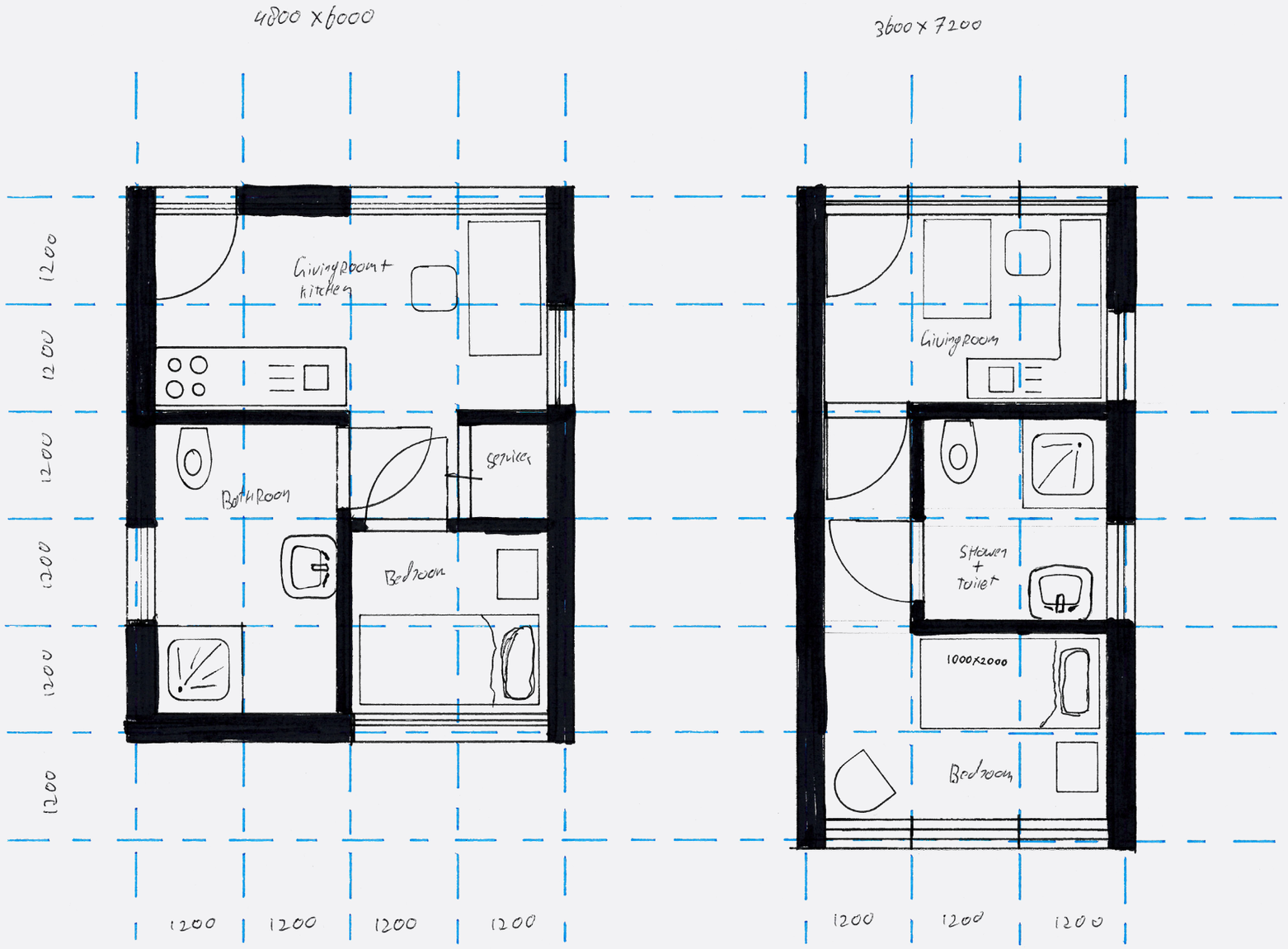


figure 147 - Guest house configurations (15-04-2024)

Building utilities

The hospice will not be fully self-sustainable and thus off the grid. Instead, there will still be some utilities going into the building, this indicates that the building should be connected to the fixed utilities near the road in some demountable way.

For the electricity one could grasp back to the old way of distributing the electricity through the poles, also keeping it well clear of possible water intrusion in case of flooding. The sewer however is another element that could prove problematic, especially because bigger trucks cannot reach the area because of soil conditions, so a sceptic tank wouldn't be possible.

The concept for these systems is to use two rows of precast concrete U-shaped elements, which will house the pipework of the sewer system and freshwater supply. These elements can then also be used as a footbridge to keep the feet of visitors dry in case of flooding. Electricity, data, and so on will be transported via the poles, that are also used as lamp posts.

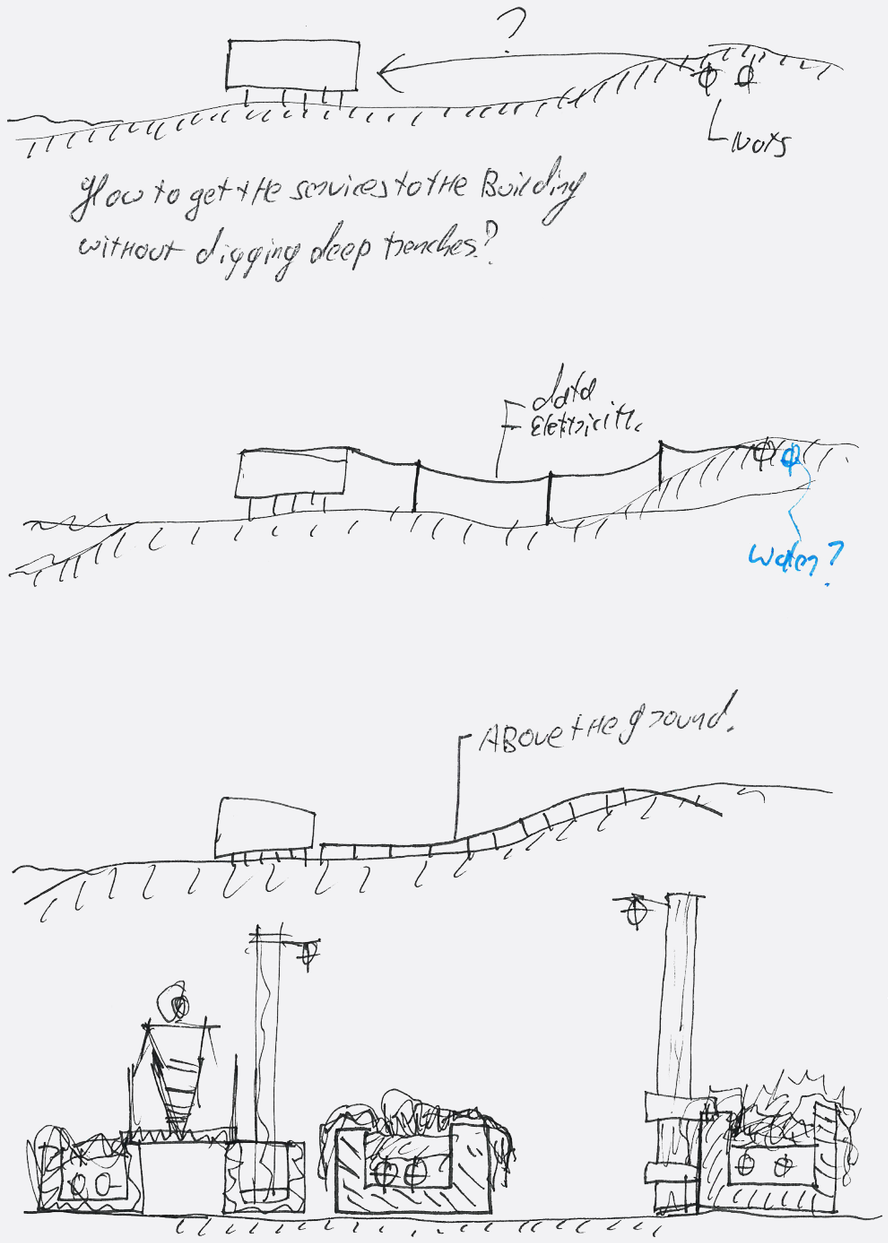


figure 148 - Sketch for building utilities (15-04-2024)

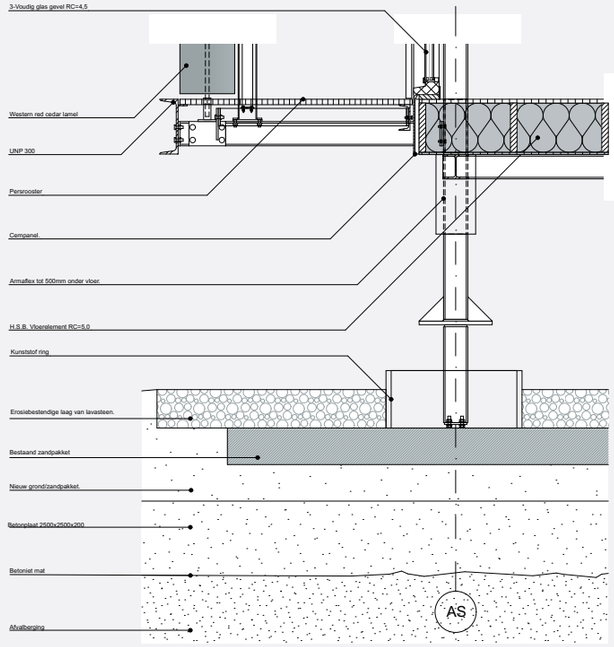
Platform Inspiration

This exterior image illustrates the building on posts on top of the landfill, this soil is a direct result of the bottom structure, which enables the building to be re-adjusted after sagging.

figure 149 - Energie Kenniscentrum Leeuwarden exterior

As seen in this image, the base of the building consists of a galvanized steel structure, with wood floor systems on top of this structure. The details of the connections can be inspirational for the project.

figure 150 - Construction photograph



The detail shown on this page is an insightful inspiration for the project. At first, the foundation using a concrete plate is shown, with the possibility of adjusting the structure. This adjustment is done by installing a hydraulic lift underneath the flanges, after which the bolts underneath can be readjusted. The wood floor is installed with cempanel underneath, wich enables it to withstand moisture underneath the building.

figure 151 - Technical detail Energie Kenniscentrum Leeuwarden

Platform detailing

The sturdy platform the building is going to rest on needs to have many ways of adjustability, not only to cope with the undulating terrain but also to deal with subsidence over time in softer soils. Also, the placement of the concrete slabs is not perfect and needs to be dealt with. The ideas for these elements are sketched on this page, creating a standard connector in figure 150 and possibilities for adjustment of the plate in figure 149.

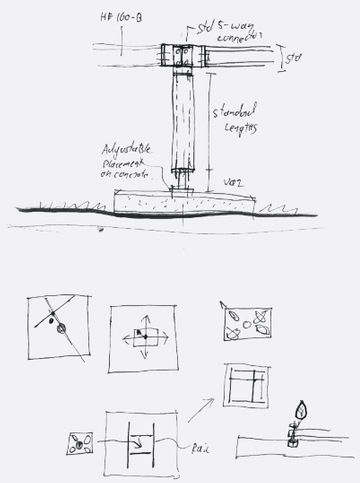
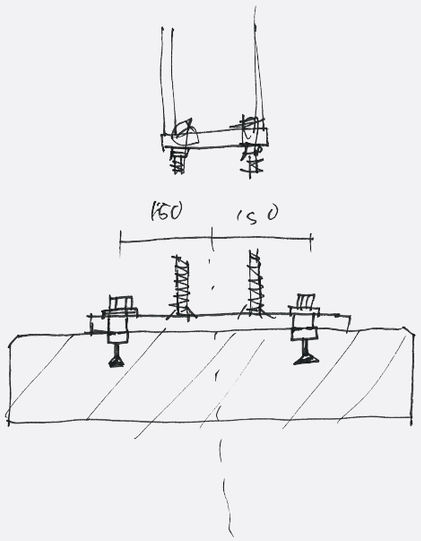


figure 152 - Sketches on adjustability ground plate (15-04-2024)



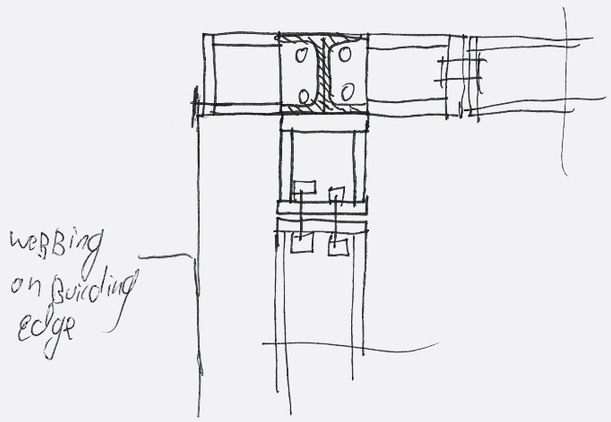


figure 153 - Top- and bottom connections (15-04-2024)

The final chosen model for the bottom connection is to have a rail in one direction standard in the precast concrete element. This way, one can have an adjustment of 300 × 300 mm, which should be plenty for the accuracy of the crane and builders. Besides this, it is also important to not put excessive weight on the sides of the plate which might result in tilting it in softer soils.

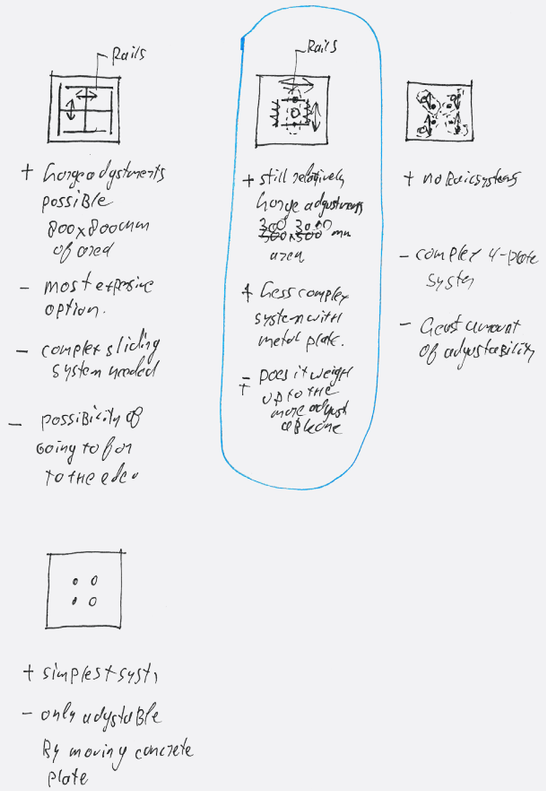
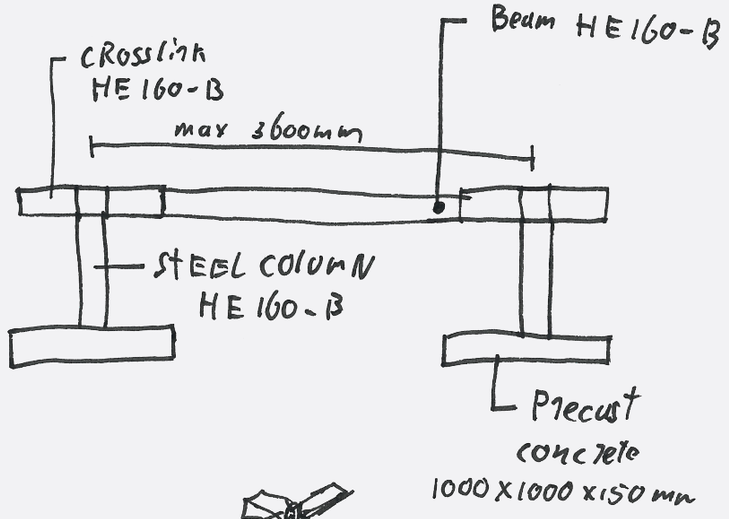


figure 154 - Final chosen fixture (15-04-2024)

Beam = $\frac{1}{25}$ • 3600 mm = 144mm ≃ HE 160-B

colum = $\frac{1}{20}$ • 1400 mm = 70 mm ≃ HE 160-B



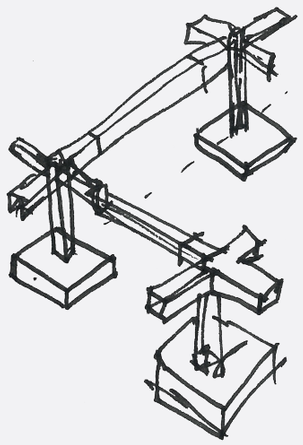


figure 155 - Dimensioning foundation

Ground Floor – Kento Ripa according to span tables

First Floor – Gignalos according to span tables

colomn – $\frac{1}{20}$ x 2785 mm = 139,25 ≃ 140 mm

Beam – $\frac{1}{20}$ x 1200 mm = 60mm ≃ 90mm

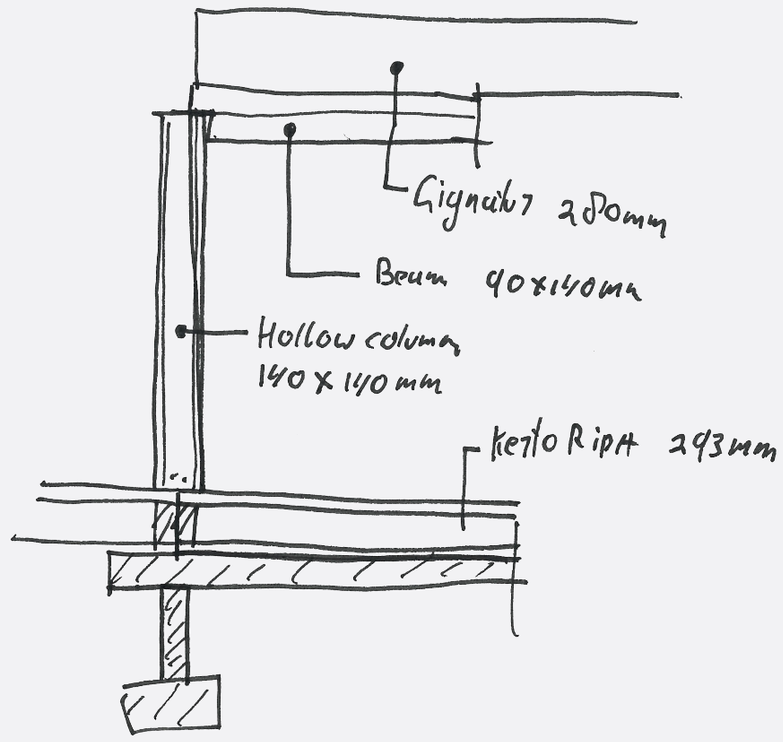


figure 156 - Dimensioning central heart

Framed walls - 38x285 mm, with plywood sheathing
Kerto Floor - span 3600 → 380mm
Wood truss - $\frac{1}{20} \times 6000mm = \frac{300}{2730} \simeq 410mm$
Glulam Beam - $\frac{1}{20} \times 3600mm = 180mm \simeq 90 \times 315mm$

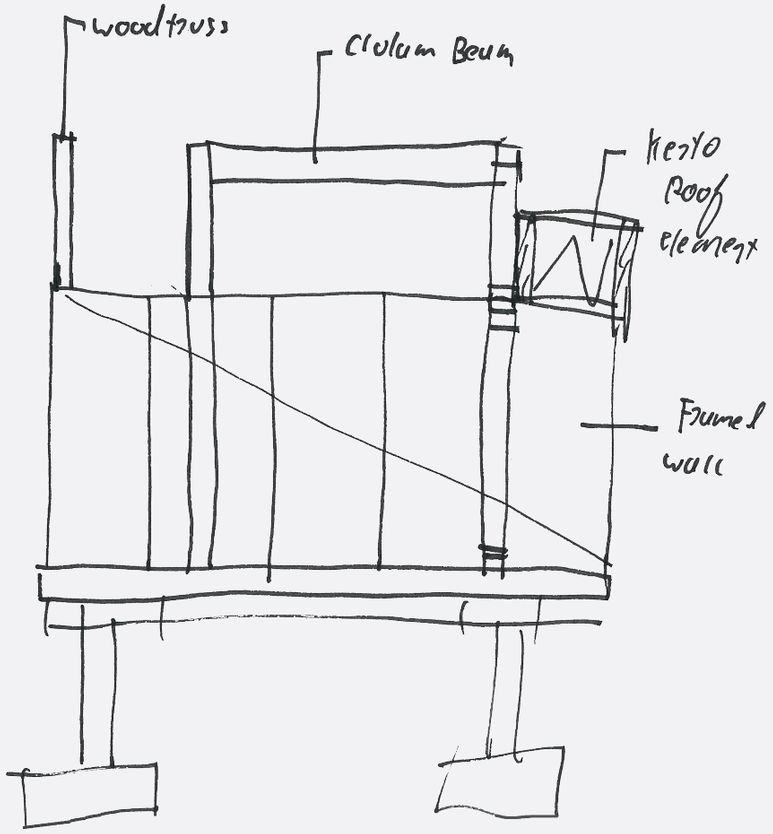


figure 157 - Dimensioning hospice rooms

$H = \frac{1}{\cancel{20}\ 16} \times 7800mm = 520mm$

$B = \frac{1}{6} \times 620mm : 86,6 \simeq 90mm$

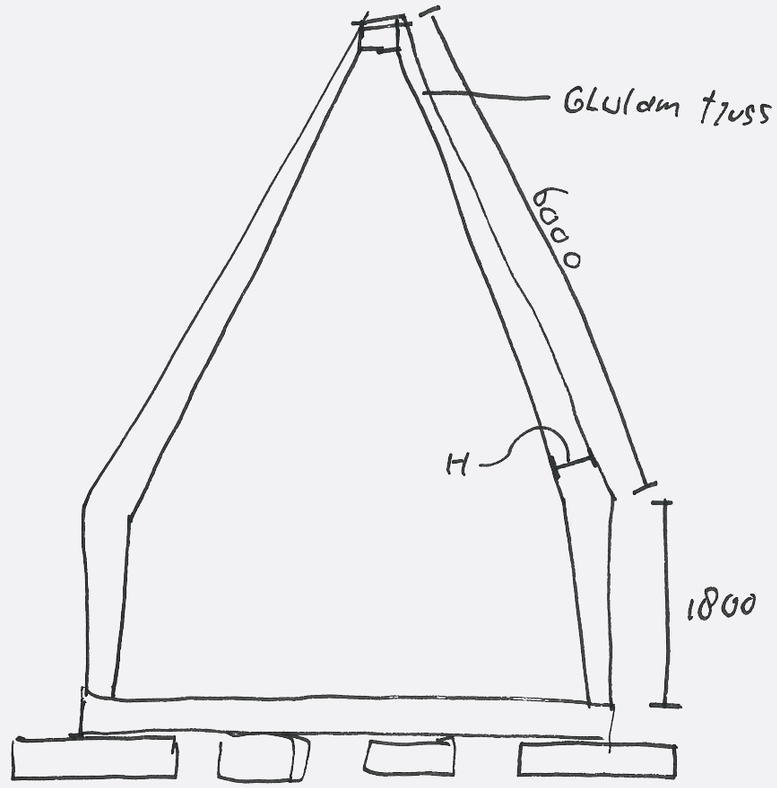


figure 158 - Dimensioning ritual space

Service calculations

Central heart heatpump

The dimensioning of the heatpump is a result of a calculation made in the Uniec 3 software. Resulting from these calculations the central heart consumes 24.146 + 5780 kWh of energy for warming up the water used for heating and tap water.

Dividing the total energy of 29.926 kWh by 1.000 results in a requirement for 29,926 Kw. A heatpump of 30 Kw has been selected for the central heart, having the following dimensions (L,W,H) 1129 × 440 × 1558 mm.

Jaarlijkse hoeveelheid energiegebruik voor de energiefunctie volgens NTA 8800

functie		energie niet-primair	energie primair	hulpenergie niet-primair	hulpenergie primair
verwarming	$E_{H;ci}$				
elektrisch		16.652 kWh	24.146 kWh	1.091 kWh	1.581 kWh
warm tapwater	$E_{W;ci}$				
elektrisch		3.986 kWh	5.780 kWh	0 kWh	0 kWh
koeling	$E_{C;ci}$				
elektrisch		3.795 kWh	5.503 kWh	29 kWh	43 kWh
ventilatoren	$E_{V;ci}$	793 kWh	1.149 kWh	0 kWh	0 kWh
totaal		36.577 kWh		1.624 kWh	

T- figure 159 - BENG calculation CH

B- figure 160 - Heatpump CH

Hospice rooms heatpump

The dimensioning of the heatpump is a result of a calculation made in the Uniec 3 software. Resulting from these calculations the hospice room cluster consumes 26.180 + 5.213 kWh of energy for warming up the water used for heating and tap water.

Dividing the total energy of 31.393 kWh by 1.000 results in a requirement for 31,393 Kw. A heatpump of 32 Kw has been selected for the central heart, having the following dimensions (L,W,H) 1235 × 561 × 1713 mm.

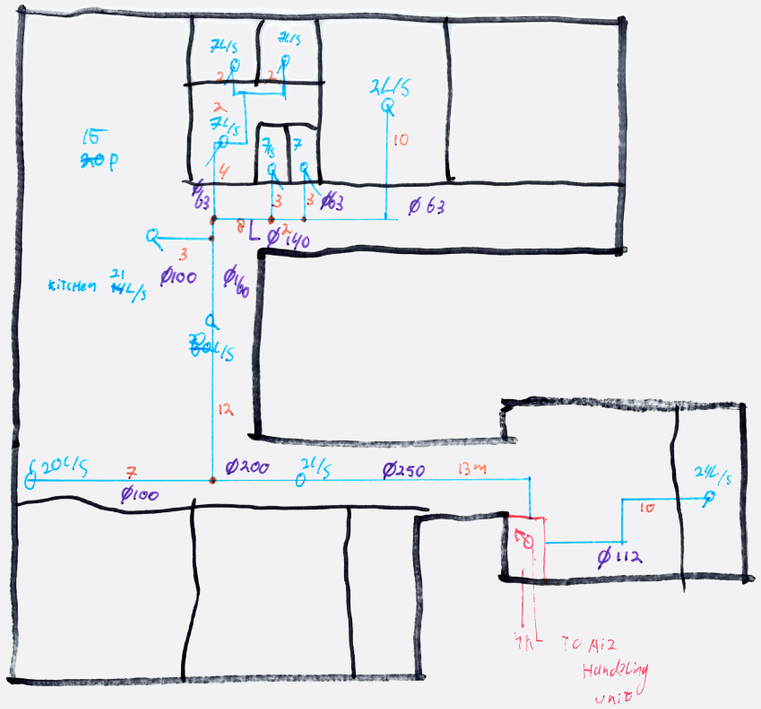
Jaarlijkse hoeveelheid energiegebruik voor de energiefunctie volgens NTA 8800

functie		energie niet-primair	energie primair	hulpenergie niet-primair	hulpenergie primair
verwarming	$E_{H;ci}$				
elektrisch		18.055 kWh	26.180 kWh	548 kWh	795 kWh
warm tapwater	$E_{W;ci}$				
elektrisch		3.595 kWh	5.213 kWh	0 kWh	0 kWh
koeling	$E_{C;ci}$				
elektrisch		5.314 kWh	7.706 kWh	80 kWh	116 kWh
ventilatoren	$E_{V;ci}$	607 kWh	880 kWh	0 kWh	0 kWh
totaal		39.979 kWh		911 kWh	

T-figure 162 - BENG calculation HR

B-figure 161 - Heatpump HR

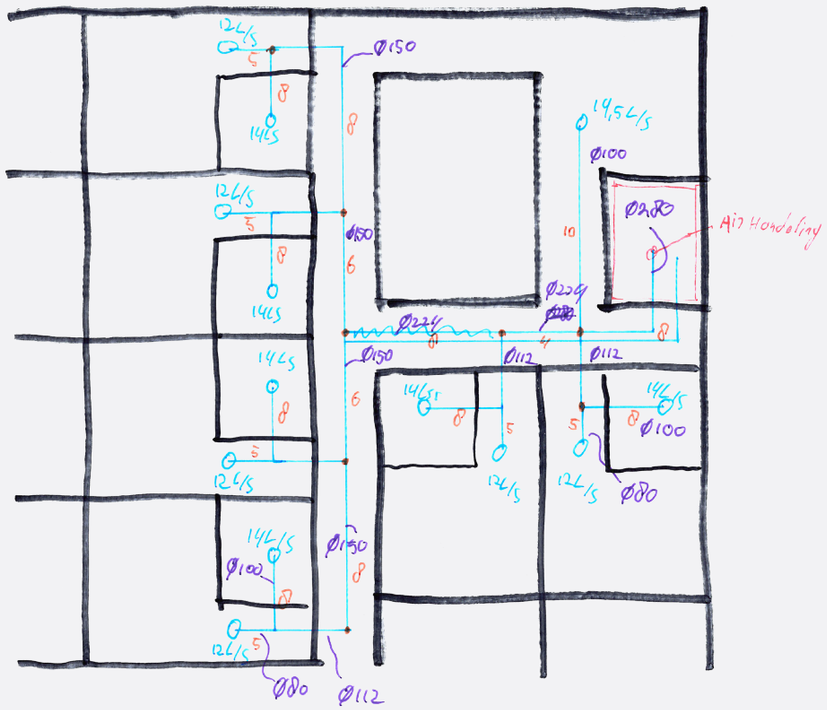
Ventilation dimensioning CH



By making use of the Vent Tools app, developed by Lindab, the sizes of the ventilation ducting has been calculated. In total a 121 l/s has to be ventilated, resulting in 436 m³/h of ventilation capacity. This amount of air is still able to be moved with a relatively small air handling unit of 350 × 350 × 300 mm.

figure 163 - CH ventilation dimensioning

Ventilation dimensioning HR



For each hospice room 26 l/s of air has to be refreshed in order to meet the building code, this translates to 94 m³/h of air. With six rooms the air that is processed is to much for one air handling unit, hence why the system is split into two halves. One covering four rooms (376 m³/h) and one covering two rooms plus the nurses office (258 m³/h.) With these values, two similarly sized air handling units used in the central heart can be used for the ventilation system.

figure 164 - HR ventilation dimensioning

Bibliography

1. William D. Browning, Catherine Ryan, and Joseph Clancy, “14 Patterns of Biophilic Design: Improving Health and Well-Being in the Built Environment,” *Terrapin Bright Green*, January 1, 2014, 30–31.

2. Frans Sturkenboom, “Tektoniek en woningbouw,” *Archis*, no. 5 (May 1, 1996): 71–80.

3. Böcker, “AHK 36: De Sterkste Aanhangerkraan Van Böcker,” Bocker, n.d., https://boecker.de/nl/producten/aanhangerkranen/details/ahk-36-ahk-36e.

List of Figures

08 - Design Process

Hospitable Movement

2024

Jasper Sterrenburg

TU Delft

Advanced Housing Design