

WHITE WALLS & GREEN CEILINGS

on creating architectural healing environments

An extensive comparative research on architectural healing environments through the works of Jan Duiker and his Zonnestraal sanatorium, and Alvar Aalto and the Paimio Sanatorium.

by Marloes Pieper
History of Architecture
Nordic Modernism A-27.2220 // December 2013

In the first decades of the 20th century many new sanatoria were built for the treatment of tuberculosis. Since the development in understanding the exact nature of tuberculosis had steadily been increasing in the mid 19th century, places were needed where its sufferers could be housed and treated. In an essay published by an Englishman named George Bodington in 1840, the very first ideas about curing tuberculosis were published. His ideas focused on having lots of rest, following a special diet and receiving specialised care from a hospitalized institution. However his thoughts were not received with great enthusiasm which discouraged him. Since he was never able to implement his ideas about the treatment of tuberculosis into any building, he continued working on housing for mentally ill people instead.¹

Although Bodington his ideas would eventually find their way into the treatment of tuberculosis, the main focus of initial research being done lay with the quality of air. Around the same time as Bodington his essay was published, an American doctor named John Croghan took 15 people suffering from the disease into a cave. Here he expected the constant conditions in the cave, concerning both the temperature and the purity of the air, would cure his patients. However within a year everyone who had followed the cave treatment died.² The doctor would later follow the same unfortunate faith; he died of tuberculosis in 1849.

Another field of research was leading towards the solution of lowering the atmospheric pressure around patients in order for their hearts to better function in irrigating the lungs. Places and buildings which lay far above sea level were therefore favoured. German physician Hermann Brehmer suggested the completion for a collection of cottages in Görbersdorf (today Sokołowsko, Poland), which finds itself on an altitude of 630m. The buildings offered a place for patients to stay and rest with the favoured conditions of a lowered pressure. Initially it consisted of just a dozen homes but it grew into a true hospital with over 300 beds.³ It became known as Brehmerschen Heilanstalt für Lungenkranke and here the most positive results ever of treating tuberculosis were seen. It was the combination of fresh mountain air and the intake of a nourishing diet which were said to be doing patients well. Soon Brehmer became the leader in a sanatorium movement as many were constructed all over mountainous areas in Europe. An old patient of Brehmer, Peter Dettweiler, became his assistant and would later, in 1877, open his own sanatorium in Falkenstein. Here he combined the fat-rich diet of Brehmer and the fresh clean air with a pre-set schedule of outdoor resting times. The results were very promising and eventually more sanatoria appeared also at lower altitudes and near large populations.⁴ Since the key factors of treating tuberculosis were now focused on giving patient access to the maximum amounts of fresh air and sunlight, new sanatoria buildings were being constructed as pavilion type buildings. The 1920s and 30s saw a major rise in the number of sanatoria being built. At the time the functionalistic ideologies had made its way into society and the pavilion structure symbolizes many of its main principles. These pavilion structures, often much more complex than the word suggests, concentrated on being a virtue of the natural being combined with the latest technology. The main focus lay on terms such as efficiency, rationality and science.⁵

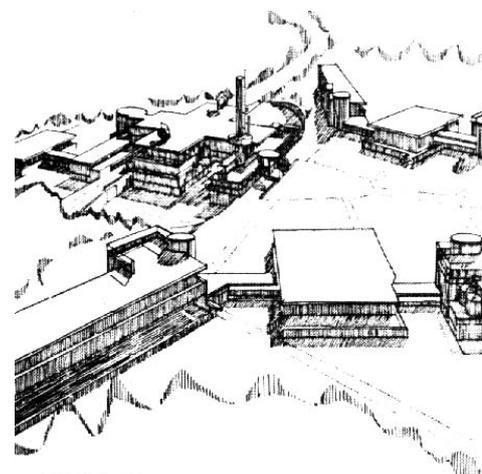
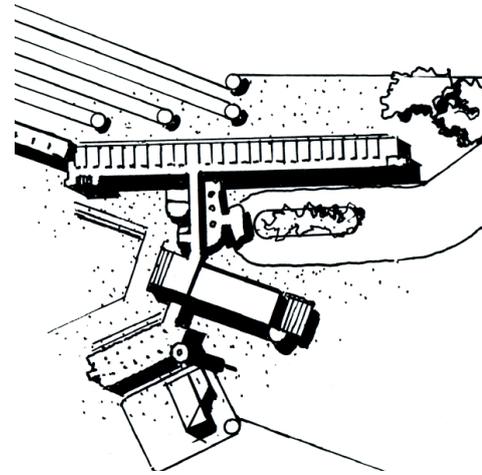
¹ *What Tuberculosis did for Modernism: The Influence of a Curative Environment on Modernist Design and Architecture*, Margaret Campbell MPhil, Med Hist. Oct 1 2005; 49(4):463-488

² *Speleological Management of Consumption in Mammoth Cave, An early effort in climatologic therapy*, F. Tremaine Billings Jr. & J. William Hillman, Trans Am Clin Climatol Assoc. 1957; 68: 10-15

³ *The key to the sanatoria*, O. R. McCarthy, Journal of the Royal Society of Medicine, Aug. 2001; 94: 413-417

⁴ *The Edinburgh Anti-Tuberculosis Scheme*, Writer unknown, The British Journal of Nursing, Feb. 1914; 117

⁵ *Functionalism and Technology, The Case of the Paimio Sanatorium*, Marianna Heikinheimo, Nordisk Arkitekturforskning, Nordic Journal of Architectural Research, Nov. 2003; 16



sketch of Paimio sanatorium, above
sketch of Zonnestraal sanatorium, below

The sanatoria were seen as an instrument to aid the curing process of a patient. In other words; the sanatoria became a leading building type of the functionalistic movement, the natural solution to promoting the healthy body. They were built as places where people would be able to receive the optimum amount of sunlight and fresh air, suggesting them being an extremely important part of the healing process of tuberculosis.

Two works which are often described as most optimum ideology of functionalism are the Zonnestraal sanatorium, designed by Jan Duiker, and the Paimio sanatorium, designed by Alvar Aalto. They were respectively completed in 1928 and 1932, during the prime time of functionalist virtues and ideals. As they were both designed for the treatment of tuberculosis, they are the key buildings to discuss when it comes to architecture and its possibilities to aid in a curing process. Because of the differing locations, Zonnestraal in Hilversum, The Netherlands and Paimio in Finland, there ought to be simple differences in climatic solutions but a comparison between the architects' their conceptual thinking will be explored in order to come to a conclusion. Comparing the organisation, use of colour, function and materials, technology and relation to the surrounding landscape, will show the similarities and differences the architects had while designing the sanatoria. It will show what kind of role architecture can play in healthcare, according to the time and their personal statements. The comparison will search for the layers in which the architecture plays a role in the healing process, whether or not it is an instrument for the medical world to be used.

The Zonnestraal sanatorium was originally meant for the workers of a diamond cutting factory who had become diagnosed with tuberculosis. It was designed by Jan Duiker, in collaboration with Bernard Bijvoet and Jan Gerko Wiebenga, in 1925 and completed in 1928. It consists of a concrete frame with steel windows and single pane glass. The main building has three wings with the medical ward in the northern section, the kitchen and pharmaceutical ward in middle and the terraces, baths and boiler-room in the south. Two pavilions on both side of the main building were able to hold 25 patients each and were surrounded and connected by a large relaxation space. The entrance between two of the wings coming of the main building is covered by a large structure which holds the canteen area. At the time, Duiker assumed that the medical research regarding the treatment of tuberculosis would advance quickly and thus the sanatorium was initially not meant to last longer than 50 years, yet the building has been proved to be incredibly sustainable even today and has recently been renovated to its original glory.⁶

The Paimio sanatorium is also still in use today. Originally designed by Alvar Aalto in 1929, and completed in 1932, it functioned all the way until the 1960s as tuberculosis sanatorium. Aalto won the architectural competition for the project in 1929 and designed a completely, structurally daring, concrete frame. It held four wings, each with designated specific functions such as the patients' rooms, balconies, treatment rooms, dining hall, library, kitchens, staff rooms and a heating plant. The design was commented on how far advanced the competition entry was, with very thought through plans and sections.

⁶ *Zonnestraal; Restoration of a Transitory Architecture: Concept, Planning and Realisation in the Context of its Authenticity*, Wessel de Jonge, DOCOMOMO Proceedings, 2003

This could have been the results of his travels to Paris and The Netherlands right before the competition. Here he had seen many new buildings, including the Zonnestraal sanatorium and Villa Stein by Le Corbusier. These influences perhaps already had him thinking about the functionalistic ways of treating health-care architecture; being inspired for a new sanatorium was a logical next step as he joined the competition.⁷

Organisation

Since Aalto had seen the Zonnestraal sanatorium on his travels he was able to implement some newer ideas to the concept of the tuberculosis treating building type. Zonnestraal was made into a perfect example of pavilion type architecture. All its wings are separated and only stacked upon one another forming a collection of glass and concrete volumes. The patient's wings are even completely separated in the exterior, and thus the sanatorium rather consists of a collection of buildings which form one unified whole. Duiker was of the opinion, following the functionalistic treatment of spaces of the time, that every function needed its own individual, carefully specific, designed space. Thus a building could not own the capabilities of being flexible or adaptable. The expected lifespan was therefore very short, especially in combination with Duiker his predictions about the medical advancement in the treatment of tuberculosis. The organisation has led to a very specific arrangement of functions and volumes, with the most specified dimensions and characteristics towards the patient's rooms. Besides their carefully picked colour scheme, which will be discussed later, most attention was given to the orientation of the rooms. Since the wings were separated from the main building Duiker was able to place all rooms at an angle of 45°, optimising the view to the outside while still keeping the sun exposure. The individual rooms were concentrated in a structural square of 3x3 meters, following the extensive study Duiker performed with this associates, in order to optimise the different activities concentrated inside the rooms.⁸ The main building was designed with the same principles, although maybe a little less visible because of the stacking of volumes. Functions are concentrated in designated wings, focusing, for example, on all medical or all administrative activities. Depending on the function, the interior spaces also have different heights of ceilings. On the exterior this lead to the extra clear expression of individual pavilion blocks on top of each other. The slow rise and build-up of volumes suggests an increase in spirit, moving up, improving in treatment. Duiker aimed at creating a direct link to the mental state of the patients their wellbeing; reaching for the sky.

In a way this could also be said about the Paimio sanatorium, especially in the subject of the staircase which always overlooks the best views to the outside, slowly rising up above the forest, uplifting the feelings of anyone walking on them. But where Zonnestraal is a true pavilion type, Aalto had implemented some new ideas into Paimio concerning the organisation. Rather than having separated wings, he constructed an organisation which has different wings, yet is one building and still holds the true functionalistic ideas of creating organic perfect-fit for each function. Where Duiker has clustered his functions and then separated them into wings, Aalto was focused on directions of functions and how they would operate within the same stretch of building.

⁷ Alvar Aalto
*Architect, Paimio
Sanatorium 1928-
32*, Esa Laaksonen,
Rakennustieto
Publishing, Sept.
2013

⁸ *Zonnestraal; Res-
toration of a Transi-
tory Architecture:
Concept, Planning
and Realisation
in the Context of
its Authenticity*,
Wessel de Jonge,
DOCOMOMO
Proceedings, 2003

As a result the organisation of the building lives up to the very specific demands for the patients but at the same time is also a very functional building to work in for staff.⁹ The organisation focuses on the communality between the patients, as often they would have to spend some months inside the sanatorium. The patient's rooms are facing south-east and are filled with sunlight, always accompanied by a long corridor running alongside the rooms. Since the rooms are only located on one side of the corridor the patients are given a feeling of being in control of their own space; there is no one looking in from the opposite side. The patients would never need to come in contact with functions they would feel uncomfortable in or could worry them; the arrangement was made in such way to obtain the most peaceful situation. Even the entrance, which was maybe the most public aspect of the entire building, offered a homey atmosphere by using simple pigeonholes where patients could leave their slippers.¹⁰

Colours

This attention to detail in both Zonnestraal and Paimio is maybe best seen by looking at their use of colours in both the interiors as well the exteriors. It was colour which played probably the biggest role in creating a peaceful or calming atmosphere, something both architects aimed at.

Considering the general view of modern architecture resembles entirely white buildings, it is interesting to look at the differences between exterior and interior. Yes, Zonnestraal as well as Paimio, was rendered in the crispiest whiteness with the general exterior look, yet on the inside something different was happening. After many years of research, it was discovered that the rooms, which Duiker had so carefully designed in their organisation, also had quite a complex colour scheme.¹¹ All the way through the building the walls were painted a pastel yellow for the wainscoting. The height would come up to 1.80m, reaching for most people at eye's height or above the head. The leftover wall part and ceiling was painted the same colour white and would because of the wainscoting seem as if they formed a continuous field. Diminishing the effect of a low ceiling, instead the rooms felt more spacious than they actually were. Even the columns had the yellow wainscoting and thus became part of the interior scene, instead of staying only a functional element. Besides yellow, Duiker also used a very specific light blue, especially produced for the Zonnestraal sanatorium, which he used on window and door frames and other smaller details. These two colours represented quite direct references of the sun and sky. Duiker was convinced the connection with nature would not only physically increase health but also mentally and thus limiting his colour scheme to these two would add to the mental state of patients. Beside yellow and blue, white, chrome, grey and black were mostly used. These calm colours seemed to be also perfect for surgical environments, symbolizing hygiene.¹² There was no difference made between private rooms or public rooms in regards to colour use; the entire building had one atmosphere, tying together all the different pavilion structures.

This was not the case in Paimio; Aalto used colours mostly to accentuate public spaces, with a little more variety than Duiker. Yellow and blue were also the dominate ones here,

⁹ *Nomination of Paimio hospital, for inclusion in the world heritage site*, National board of Antiquities, M. Ehrström, S. Jetsonen, T. Lindh, M. Schalin & M. Schalin, Dark Oy, Helsinki 2008

¹⁰ *Alvar Aalto Architect, Paimio Sanatorium 1928-32*, Esa Laaksonen, Rakennustieto Publishing, Sept. 2013

¹¹ *De Kleuren van sanatorium Zonnestraal te Hilversum*, M. G. Polman, Jaarboek Monumentenzorg 1999, Instandhouding, Waanders Uitgevers, Zwolle / Rijksdienst voor de Monumentenzorg, Zeist 1999

¹² *De Kleuren van sanatorium Zonnestraal te Hilversum*, M. G. Polman, Jaarboek Monumentenzorg 1999, Instandhouding, Waanders Uitgevers, Zwolle / Rijksdienst voor de Monumentenzorg, Zeist 1999



stairs of Zonnestraal sanatorium, above
stairs of Paimio sanatorium, below

but much brighter in use, plus the interiors also showed different tones of green and red. The corridor walls which faced the windows were each treated with a different colour so that on the exterior, especially at night, the long white building would eliminate these colourful strips. Peach, for one was very dominant, Aalto even made the opposing window frames match the colours of the walls. By research it was suggested that warm and calm tones would improve the mental state of patients which Aalto used as a basis for choosing the colour inside the patient's rooms. Off-white in combination with light grey, beige and chrome would colour the beds, the hygiene spaces were treated with a mint green colour, symbolizing uncontaminated and clean areas.¹³ Since the patients were laying down a great deal of the time they spend in their rooms, their main view was unfortunately not outside but upwards to the ceiling. Aalto very much realised this and created a new type of light green that would prevent patients from getting cataract and treated the ceiling with this. The yellow used in the public areas, on for example the stairs, was very strong and also revering to sunlight the same way Duiker did with this pastels. Aalto also used his own developed type of blue in combination with the yellow; a very specific type of dark turquoise.¹⁴

On the outside the Zonnestraal sanatorium was the example image of a white rendered modern facade. There was no plinth; the volumes really demanded their own ground within the forest area they were placed in. Only the same "Duiker Blue", which was used on the interior frames, was used on the outside. But Duiker wanted to create a symbolism of the building vanishing into the sky by using the white and blue combination. The vast use of glass in Zonnestraal added to the sense of vanishing because of the transparency, and in other places reflecting the surrounding forest, giving the building a perfect hiding place. The interior rooms of the patients as well as all the public and surgical functions had the same type of simple, white curtains. Therefore at night the building would completely eliminate with a warm white light, within its natural surroundings.

The exterior of the Paimio sanatorium showed quite a different treatment of colour use. The sun protecting panels on the outside of the windows are given a dark green and orange colour, stressing the longitudinal effect of the facades. Of course the colours of the corridors would also show on the exterior as well, plus Aalto used a different tone of peach and orange on several parts of the exterior building. They seem to be located on building parts which are not necessarily belonging to the main dynamics, and maybe rather than creating a weaker shape by making them white, Aalto accentuated them and made them part of a composition. Also smaller details such as railings were given a peachy or yellow colour.

Naturally the architectural language played a very large role in displaying the colours. The interiors were very sober and had not much decoration; therefore the colours were really the focus point of the interiors and were very important for what type of atmosphere was created.

¹³ *Nomination of Paimio hospital, for inclusion in the world heritage site*, National board of Antiquities, M. Ehrström, S. Jetsonen, T. Lindh, M. Schalin & M. Schalin, Dark Oy, Helsinki 2008

¹⁴ *Alvar Aalto, Paimio Sanatorium, 1928-1933*, In English, Accessed last on 30/05/2014: <http://www.alvaraalto.fi/net/paimio/paimio.html>

Materials

Both of the sanatorium structures were made out of concrete, glass window panes and steel frames. But besides these, maybe even named 'standard' functionalistic materials, both architects experimented with other materials as well. These would be chosen on the basis hygiene, or in other words their ability to be easily cleaned and their availability. Rubber flooring was one of these, as used by both architects on almost all of the floors. The detailing always involved getting rid of any small corners or lines where dirt could hold up.¹⁵ The wash basins that Aalto had designed for his patients' rooms were porcelain round shaped, completely seamless, and the water would hit the basin in such way that it would not splash or make any sounds. Like this the other patient in the room would not be disturbed.¹⁶ In Duiker his patients' rooms the focus was much more on using efficient and hygienic looking materials, thus most of the furniture was made out of chrome bars. The detailing on the opening handles on the windows played a large role, since they were the only maybe 'messy' part of the room, and they were of course made out of steel. Cold materials were therefore quite dominating the room, but they were counterparted by several other materials. For example the use of very light fabric for curtains which would, rather than blocking out the light, subtly give privacy yet keep the light coming in. Also the yellow on the wall, and presumably the beige bedding, would add the warmth to the room.¹⁷ Never to a far extend, as this was not the focus, Duiker really wanted to prevent the rooms from being cosy or messy, the spotless, well-organized, clean, hygienic space was instead thought to be the best of the patient's physical as well as mental well-being.

This shows the main difference between Aalto and Duiker; as Aalto really tried to implement a homier atmosphere to the rooms by using for example wood in his furniture pieces. Several of these pieces became especially known for their place in the sanatorium, such as the Paimio chair. This chair is one of Aalto's most famous pieces of furniture. It was designed for the patients' lounge and the angle of the back of the chair was meant to optimise the breathing capability of whoever sat in the chair. The standardisation of production methods played a large role in the development of furniture pieces for Aalto, even the windows and doors were designed using pre-determined measurements. Economical advantages as well as efficiency really made the mechanical production of goods attractive to the functionalistic architect, though he never rejected variations and always kept on working on existing designs to make them better. To Aalto the steel-tube furniture pieces Duiker had used in his rooms was much too 'cold' for patients who would have to stay such a long time in the sanatorium. Instead wood would be a comforting feeling, also visually, for a longer period, creating a comfortable place for the patients to stay in.

Technology & healthcare

Striving for an optimal hygienic world, with clean water and high-end spaces, both architects developed several technological spaces within the buildings for the placement of heating plants and water purification systems. These would only function very local and provide the buildings with their own supplies. Aalto also took into account the maintenance element of using

¹⁵ *Light, Air and Openness: Modern Architecture Between the Wars*, Paul Overly, Thames & Hudson, 2008

¹⁶ *Nomination of Paimio hospital, for inclusion in the world heritage site*, National board of Antiquities, M. Ehrström, S. Jetsonen, T. Lindh, M. Schalin & M. Schalin, Dark Oy, Helsinki 2008

¹⁷ *De Kleuren van sanatorium Zonnestraat te Hilversum*, M. G. Polman, Jaarboek Monumentenzorg 1999, Instandhouding, Waanders Uitgevers, Zwolle / Rijksdienst voor de Monumentenzorg, Zeist 1999

a building and designed shafts from which the technical equipment inside the patient's rooms could be accessed, outside of the rooms themselves. In this way, patients would never have to be disturbed if something needed repairing.¹⁸ The shafts were integrated into the concrete structure design which had its own technological advancements.

Duiker had designed several new climatic systems which would remove the objects of radiators from rooms, which were visually too messy and therefore unwanted for his functionalistic ideals. One of the most successful systems concerned a (patented) hot-air circulation system as well as radiating ceiling panels. In order for the room to become the most peaceful environment - e.g. no visually or aesthetically unpleasing objects but the straight lines of the walls - Duiker imagined it should be possible to have all these new systems completely integrated into walls, ceilings and floors. Aiming for this type of solution, he was without knowing looking far ahead into the future. Duiker also explored the use of a minimal amount of concrete, not only due to financial limits but also because he wanted to create a building which only held everything it needed, nothing more. Everything that was used needed to have a full functioning role. For Zonnestraal he designed a concrete column and beam system of 9x3, where almost every longitudinal beam had a cantilever of 1.5 m, caused the bending moment of the beam to be greatly decreased. Because of this much less concrete was needed to build the structure. The structure was filled with single glazed windows inside a steel frame, which caused the unhampered access of daylight into the interior. All the walls were prefabricated concrete, relating closely to Duiker his image of making a contemporary building which should be easily built and possibly soon taken apart again. The 1.5m cantilevers gave the most optimum organisation for balconies and sun decks.¹⁹ These were one of the most important areas of the building as a large amount of time was spent here by the patients. Lying in the sun, facing south, was still seen as the best medical way to being treated.

Aalto did not have a great deal of limiting financial issues and therefore explored maybe more daring shapes. Especially the use of concrete cantilevers brought up quite some discussion at the time of construction. Particularly the wing which holds the medical balconies for the patients was a subject of many architectural publications at the time. It was said too little concrete was being used and it would not be possible to guarantee a save use of the balconies; a devastating problem for a sanatorium, yet the plans were kept unchanged and Aalto proved them wrong by successfully completing the construction he wanted. In order to reach this, a close relationship between the architect and construction workers was needed, and thus Aalto was very often found at the building site, discussion and watching the progress. In some parts of the building - straight, simple walls - the concrete was replaced by brick fillings. Possibly due to the need to reduce building costs as well as the building time. The brick was later plastered with the same white cladding as the rest of the building, suggesting from the exterior that everything was made out of concrete.²⁰



hallway of Zonnestraal sanatorium, above
hallway of Paimio sanatorium, below

¹⁸ *Paimio Sanatorium*, Jesse Russell & Ronald Cohn, Bookvika Publishing, Jan, 2012

¹⁹ *Zonnestraal Sanatorium; een geschiedenis en restauratie van een modern monument*, Paul Meurs & Marie-Therese van Thoor, NAI Uitgevers, Amsterdam, 2010

²⁰ *Nomination of Paimio hospital, for inclusion in the world heritage site*, National board of Antiquities, M. Ehrström, S. Jetsonen, T. Lindh, M. Schalin & M. Schalin, Dark Oy, Helsinki 2008

Relationship with landscape

The concrete structures of both sanatoria stand alone in very natural surroundings. The demand for peace, fresh air and stillness, prevented the sanatoria to be any closer to an urban area and thus they were surrounded by a forestry area. In Paimio's case, the building really rises above the natural landscape. Aalto even adjusted the heights of the stories very late in the process in order to create this effect as the trees ended up being a little taller than he had initially planned.²¹ Duiker on the other hand kept the profile of the building much lower as not to intimidate or compete with the natural surroundings. The height of even the tallest stacked volume does not reach that of the surrounding trees. The volumes instead seem to merge into the same rhythm as the surrounding trees, tying it together with the nature. Both buildings however, of course, break immensely with the nature as they are stark white and really want to be in contrast to the dark, green colours of the forests. The direct surroundings of both buildings have been stripped of any trees however, giving the buildings a real grounding spot within the nature. This symbolizes the need of working together; both the building and the nature would be able to cure the patients.

In Aalto his design he worked out a very specific landscape design creating an even closer connection with the surrounding nature. Several walking routes were set out across the area, on which patients would be able to stroll and receive the most optimum amount of fresh air and sunlight. Kitchen gardens were also created, most of the time in connection with the surrounding residential buildings of staff, which would ensure the sanatorium to be able to feed itself.²² The building would be able to perform on its own, only helped by nature. In this way Aalto tried to diminish the distinction between inside and outside and create a new type of collaboration between the interior and the exterior – they are in great need of each other.

Duiker had the same train of thought but explored it on a whole different level of architectural expression. Where in Paimio this might have been impossible due to climatic circumstances, Duiker used as much glazing as possible in order to draw the natural surroundings inside. As if the natural power would be able to reach into the rooms and help cure the patients. In some way this was actually true as the mental state of patients was thought to increase by the site of nature. By overlapping with different volumes and using a pavilion type of structure, Duiker weakened the border between inside and outside, he pulled the nature into the building. As would be expected medically, this would benefit the patient's health.²³

²¹ *Alvar Aalto; His Life*, Goran, Schildt, Ram Distribution, Aug. 2007

²² *Nomination of Paimio hospital, for inclusion in the world heritage site*, National board of Antiquities, M. Ehrström, S. Jetsonen, T. Lindh, M. Schalin & M. Schalin, Dark Oy, Helsinki 2008

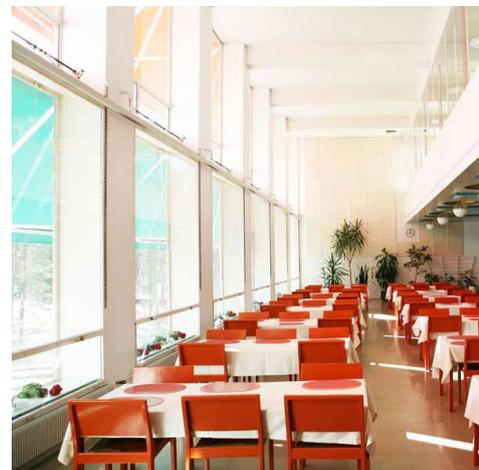
²³ *Architectural Guide to the Netherlands; 1900-2000*, Paul Groenendijk, NAI Publishers, 2006

Layers of curing architecture

A completed and functioning building always consists of several layers through which different aspects of the building are explored. The two buildings discussed and compared; the Paimio sanatorium and the Zonnestraal sanatorium, have shown to hold exactly that. Their layers are diverse and range from the initial building structure to the psychological experience of the interior. Although these structures might come across as fairly simple and straightforward shapes, rooms and functions, they have been designed with such a pre-defined process of thoughts; they are much more complex than initially suggested. When thinking about the concept of “layers” in architecture, two main directions come to mind; the building itself and the experience of the building. Yet this distinction does not seem to be enough when talking about the layers which were used within these sanatoria. Instead they lean more to a triangle, or triple, structure. By adding a layer in between the pure existence of a building and the experience of a building, the division becomes sharper and explores a deeper and more complex approach to designing. Thus three layers can be distinguished in which all areas of the design will fit.

The first layer defines itself as the primal layer. Technology and healthcare are the main components here. Without these the building would not be able to exist and they form the core of whatever layer is applied next. A clear distinction between the two architects can be seen when looking at this first layer. At one side there is Duiker who constantly makes decisions based on architectural preferences. The heat-radiating panels which he designed to be installed above the patient’s beds would replace any ‘messy’ and unnecessary radiators, limiting the amounts of small details in the room. Nothing but the spotless and clear walls would be visible. Another example of this shines through his choice for limiting the amount of concrete as the building should hold nothing more than was necessary. There was no possibility for adding something extra to enhance the patients’ experience; this would diminish the architectural expression. On the complete opposite side stands Aalto who sort of defies the first layer all together and immediately incorporates the experience of the patients into his decisions. This is most dominant in the design of the access to the individual pipe shafts of the patients’ rooms which are accessed from the outside of the rooms. Also concerning his structure he chose the experience of the user above the true architectural soul of the building by replacing some of the supposedly concrete walls by bricks and rendering them white. This reduced building costs but kept the outer experience of the building for the user intact.

The second layer concerns the functional layer. The organization and the treatment of landscape fall into this section as they deal with the everyday life of the building and how people can optimise their actions within the spaces. Through the comparison it can be seen that within the organization the functionalistic design process is very obviously present; in both buildings, different functions receive differently designed spaces, each with their own considerations. Yet Duiker here first clusters them and secondly places the results of these clusters as statically formed shapes upon each other. In this way the shape of Duiker his sanatorium is created.



dining area of Zonnestraal sanatorium, above
dining area of Paimio sanatorium, below

Aalto, on the other hand, takes the considerations of the different functions and tries to combine them where possible, creating a shape consisting of functions fluidly lying next to, and on top of, each other. The exterior shape of the Paimio sanatorium therefore looks much more as 'one' building, instead of the stacked volumes at Zonnestraal. Within the appreciation of the landscape the same trend can be seen. Duiker keeps his building volume beneath the tree line, his image of the natural surroundings being much greater than the human is what determines this. He does however define the definition of nature and human addition but rendering the building completely white, making it stand out between the trees. The exterior and interior are integrated by placing the volumes of different functions into the forest, diminishing the border between the two. The patient's experience of nature stays on an eye-sight level, the architectural expression of the power of nature is more important in his design. Although Aalto his building is also rendered in a crispy white colour, both architects are clear that the human alternation to landscape should be noticeable and clearly an addition. But beside that the two architects do not approach the landscape in the same way. While Aalto was visiting the building site it was noticed that the original plans for the number of stories being built would not make the building rise above the tree line. Thus, while already building, Aalto drew up another story to be built on top. This held the function of a sun balcony for the patients, making them able to look out above the surrounding forest. Here the patient's experience of nature clearly becomes more important than the architectural expression.

The third layer concludes as the emotional layer. This is where the architects' thoughts on colours and materials are placed. The white exterior of both buildings represent the distinction between man-made buildings and nature, as explained above, but the architects differ in their use of colours on the interior. Duiker his palette refers to the pastel tones of the natural surroundings; one of the way in which he tried to combine the exterior and the interior. Patients' were encouraged to see nature as a medical treatment and thus the interior needed to resemble this. The role of the interior was an extension of the exterior in the medical process, relating to the spiritual uplift of patients. Yet these colours were the only form of decoration allowed. In Aalto his sanatorium this was also the case, yet the colours he used were of a much brighter and defined hue than Duiker his pastels. Bright yellow, blue, red and other bold colours were used to create a cheerful and comforting place for patients. The presence of nature around the building was enough of a medical awareness Aalto must have thought, the building will provide the patients with a different kind of help, or rather, comfort. This difference between the two architects can also be seen through their use and treatment of materials. Besides the most dominant materials of functionalism, concrete, steel and glass, the distinction is most obvious in the approach to interior materials. Duiker had developed his 'splashless' wash basins but these stayed on a very functional level. It fits within the buildings function of being able to provide treatment – rest was one of the most 'medical' solutions for tuberculosis – yet the emotional wellbeing of the patient was not to be disturbed with any 'cozy' elements added to the room.

The dominance of hygiene and the power of science was in Duiker his eyes the right atmosphere for the rooms. Aalto did not share this feeling and decided to add one element, in its purest form, into the interior atmosphere which was wood. The power of feeling at home and at ease, instead of inside a medical institution, seemed more fitting to treating tuberculosis in Aalto his eyes and thus supported the function of the building. The emotional state of the patients was therefore treated in a subconscious way, while being extremely beneficial for treatment but not dominantly present as a 'scientific' way of curing.

While looking through the layers, one thing that really binds to two buildings together is the use of the building within the treatment of an illness. The buildings are both designed and have been applied many layers in order to create the optimum environment for curing. Although the layers are applied differently by both architects and also vary in thickness, the common goal is the combination of the building fabric with a function towards the human being, taking part in a medical solution for tuberculosis. For this specific illness the building plays even a more important role as the real scientific and medical treatment, as defined by today, was not even known yet. As a completed building they hold several layers; it is only when these meet and become one, such masterpieces as the Zonnestraal sanatorium by Duiker and the Paimio Sanatorium by Aalto, are created.



exterior of Zonnestraal sanatorium, above
exterior of Paimio sanatorium, below