

The reinforced concrete frame of the Paimio Sanatorium in the making

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Although building technologies, such as reinforced concrete structures, are often discussed in research of modern architecture, very seldom is there an interest in the building in the making. The focus is often on the final product, which overshadows the processes of its formation.¹ Retrospective study of the success of an architectural solution often omits the process of trial and error as well as the interplay between the different players involved.

This paper deals with the decision-making during the design and construction of the reinforced concrete skeleton of the Paimio Sanatorium (1928-1933) designed by Alvar Aalto. It focuses especially on the interaction between the sponsors, the designers and the constructor.

Alvar Aalto's winning entry in the open architectural competition for the Paimio Sanatorium main building was based on the use of reinforced concrete as the loadbearing structure. In 1928 he had written that there can be no new form when there is no new content. Nevertheless, he considered a novel construction method to constitute such a remarkable challenge that it alone may encourage the architect to create a new form, type or concept, even if the function of the building were more traditional.² The point of departure in the Paimio Sanatorium project for creating something truly expressive of its time was optimal, as both the conditions, a new construction method and a new social content, were fulfilled. Work on the design began in 1929, and the construction work was started in 1930. Design work continued into 1932, and the building was finally completed in 1933.

The sponsors and the designers

The Finnish state promoted the founding and operation of public institutions for the treatment of tuberculosis, passing in 1929 an Act³ and a Decree⁴ that provided the fundamental framework for building new institutions. The Paimio Sanatorium project was initiated by the Federation of Municipalities of South-Western Finland. The Building Board of the Sanatorium was responsible for communication with the authorities, such as the National Board of Medicine, which in the role of guardian of the state coffers, approved the designs for the Sanatorium. The Building Board invited statements on the location of the site from specialist physicians, and on Aalto's competition entry prior to commissioning the architectural drawings. During the construction phase, the National Board of Medicine provided statements on request, but did not actively supervise the Building Board's work. Architect Alvar Aalto and Physician Markus Sukkinen participated in the work of the Building Board as specialists.

For the preparation and implementation of decisions, the Building Board appointed from among its members a Building Committee, operating under the authority of the Board. The named specialists, and the Clerk of Works, engineer Kaarlo Albert Kilpi, participated in the work of the Committee. The contractors did not participate in these meetings, but separate meetings were held with them. Apparently, no site meetings, where all the parties involved were present, had been held⁵.

Besides the architectural design, the building specification and the cost calculation, Aalto's commission included interior design and the overall supervision of the construction work.⁶ The Building Board approved Aalto's motion on the scheduling of the building work, partly on a cost plus basis by the project organization, and partly as separate subcontracts.⁷ The work was supervised by engineer Kilpi as the representative of the Clerk of Works' Office of the Building Board.⁸ The Building Committee was

authorized to invite contract tenders and to consider the extent of the first contract, i.e. the construction of the main building skeleton and the sequence of contracts to be performed.⁹ The appendices of the minutes of the Building Board and Building Committee meetings show that many of the tenders had been addressed directly to architect Aalto, i.e. he had requested them as a representative of the Building Board. He therefore had a significant influence on the choice of contractors.

In May 1930, the Building Board entitled the Building Committee to contract a structural designer to the project.¹⁰ Some of the Board members were of the opinion that the building contractor should be responsible for the structural calculations. The aim of the management team was to separate the design and the execution from each other in special works. The design and supervision were to be entrusted to a negotiating specialist.¹¹ Engineer Emil Herman Henriksson (1894-1970), who ran an engineering practice in Turku, was contracted to design the reinforced concrete structures and to supervise the construction work. It was probably Aalto who contacted him, as he was the appointed specialist responsible for the construction of the project.

Emil Henriksson had studied reinforced concrete construction technology in Germany in the early 1920s, where it was more advanced than in Finland. He was active in promoting the new technology by writing articles, lecturing and putting ideas into practice. Prior to the discussed project, Aalto and Henriksson had cooperated on three projects. All of these had involved the implementation of innovative reinforced concrete solutions, such as the asymmetrical columns of the printing hall of the Turun Sanomat building, the use of steel moulds in casting them, and the reinforced concrete roof trusses in the theatre hall of the South-Western Finland Agricultural Cooperative Building in Turku. Besides, the Turun Sanomat building was entirely based on the slab-column system. Henriksson was also involved in the design of the Standard Apartment Building, which was based on a system of precast units developed and patented by the contractor Juho Tapani.

The process of selecting the contractor

The Building Board published a call for tenders and received nine bids in the first building phase, the construction of the reinforced concrete skeleton. The most inexpensive bid was made by O/Y Tektor A/B. The Building Committee established that all the companies were financially sound, and decided to base its decision on the most economical price. It started negotiations with the three contractors who had submitted the least expensive bids.¹² Aalto informed the Building Board that the manager of Tektor had said in so many words, that the company had not taken into account the masonry work of the chimney, and would for this reason need to raise the bid. The Building Board decided to accept Tektor's revised bid of 3.940 million Finnish marks as the least expensive.¹³ As a consequence, the building contractor and master builder Arvi Ahti, whose bid had been placed fifth in the price comparison, informed the Committee that he had made a mistake in his calculations by including the masonry work in his first bid, and was therefore interested in lowering the price to 4.075 million Finnish marks. The Committee considered that Ahti's announcement did not lead to further measures. It continued the negotiations with Tektor until it emerged that the concrete work of the rear wall of the sun balcony was not included in their bid as it was only presented in Aalto's final drawings. The minutes do not reveal whether Aalto presented new drawings or ideas during the negotiations. When no agreement was reached, the negotiations were terminated. Simultaneously the Building Committee decided to ask Ahti whether his new bid was still valid.¹⁴

The legal adviser of the Federation, Armas Kataja, participated in the next meeting of the Building Committee a few days later. The Committee found that no agreement had been reached with Tektor, the Committee members had continued negotiations with Arvi Ahti, and the contractor had lowered his bid to 3.995 million Finnish marks. The Committee solicited the Board to sign the contract with Arvi Ahti.¹⁵ The Board accepted the proposal “because it was expedient”. A recent closing of accounts of Ahti’s company was presented at the meeting, but the minutes do not mention the name of the company.¹⁶

With this procedure, the three companies who had submitted lower bids than Arvi Ahti were also dismissed. The minutes do not reveal whether any negotiations were arranged with them. The Helsinki based Tektor, which operated all over Finland, was a significant contractor with experience of different types of projects, ranging from industrial buildings for notable companies and schools to multi-storey buildings.¹⁷ In several of these buildings modern concrete techniques had been applied, for example, in the warehouse (1929) of OTK, a cooperative wholesale company, mushroom columns had been used.¹⁸

The construction period

The architect’s drawings and building specifications were given contractual priority over the working drawings and strength calculations¹⁹. The character of the structures portrayed in the architect’s drawings could not be altered. Strength calculations and *in situ* work proceeded in tandem. The pouring of the concrete framework started with the boiler room in June. By the end of July, the wall of the sun balcony section had progressed to above ground level.²⁰ The concrete framework of the various wings was completed from July to October. Calculations for the uppermost beams of the B wing were made in November. The intermediate floor between the dining hall and the library was suspended from the beams in question. Work went on into the cold and rainy autumn. Henriksson worried about the wind loads on the tall parts.²¹ Aalto and Ahti attended the final inspection of the structural frame at the start of December, but Henriksson was absent. He may have felt legally disqualified, as he was a board member in Ahti’s company.²² The minutes communicate a very positive atmosphere. According to the document, the contractor received credit for the work, which he had performed with care to the full satisfaction of the sponsor. Unexpectedly, the developer had been forced to blast the rock beneath the site, with the result that fulfilling the construction contract had been delayed until a less profitable time of year. The contractor expressed special thanks for the fact that part drawings and calculations for the reinforced concrete structure were always delivered, and agreement was reached on all work phases in good time.²³

Resumé

The proceedings lead us to ask why the Building Board gave its consent to the dismissal of Tektor and the three other contractors who had made lower bids than Arvi Ahti? Probably owing to provincial protectionism in a time of recession, the contract for the building of the reinforced concrete skeleton stipulated that local labour and construction materials be preferred at the construction site.²⁴ This was probably the reason why the sponsor, a public organization, dismissed a notable Helsinki-based contractor, who had made the least expensive bid. Nevertheless, the desire to favour local labour does not explain why the gentlemen Löfström & Lyly and master builder Lauri Mattila, both from Turku, and placed second and in shared third position in the price comparison, were also left aside.

The Building Board was working under pressure, as the Sanatorium was scheduled to be brought into use in 1932. The City of Turku had joined the project in February 1930, which had caused a delay. As the Building Board was only negotiating the contract in June, there was pressure to advance the project, the schedule demanding that the frame be finished during the warm period of the very same year.

Although the handling of the negotiations took on farcical dimensions, it reveals Aalto's talent for manoeuvring. The decision ran parallel to his will, but also to the will of the Board, who wanted local labour to be used and did not want a delay, as well as to the will of Henriksson and Ahti, Aalto's partners. In other words, the social circles of builders in Turku were narrow. Ahti and Aalto's close friend and colleague Erik Bryggman had cooperated on several projects, such as the Atrium apartment building (1925-27) and Hotel Seurahuone (1927-28), which Bryggman designed together with architect Ilmari Ahonen.²⁵ Arvi Ahti had built those, and also the housing project for the office staff and workers of Suomen Sokeri (1923-24)²⁶ designed by Bryggman and the Kellonsoittajankatu 8 apartment building (1925), which Bryggman also designed together with Ahonen. Henriksson had made the structural design of the Kellonsoittajankatu 8 project.²⁷ Aalto and Ahti were probably introduced to each other by Bryggman. Besides, Arvi Ahti was Emil Henriksson's brother-in-law²⁸, and the two men were making business together.

Henriksson became Aalto's trusted expert on structural matters during his years in Turku. The two had cooperated with master builder, manufacturer and innovator, Juho Tapani, on their three earlier joint projects. However, Aalto had distanced himself from Tapani in the building project of the South-Western Finland Agricultural Cooperative Building, as they had come into conflict over schedules during its construction.²⁹ Aalto needed to find a talented contractor to complete the team in the Sanatorium project. Ahti was probably the most suitable candidate for both Aalto and Henriksson. Aalto, Ahti and Henriksson benefited both professionally and financially from their mutual support, and Aalto could implement his unconventional structure. After the building was completed, Aalto emphasized that he had cooperated with Henriksson from the very early stages of the design, by which he was probably referring to the competition stage, and thanked Henriksson, saying that his participation was the most significant among all the specialists who participated in the process.³⁰

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- ¹According to Bruno Latour, a French sociologist, the living and the inanimate interact. Latour's critical body of work deals with science and technology in the making. He aims to open up the process of making, to open up "the blackbox", step by step, by analyzing how it was closed. Latour 1999, 183-185.
- ²Aalto, Alvar, 1928. Uusimmista virtauksista rakennustaitteen alalla. Uusi Aura 1.1.1929, 11.
- ³Finnish Statute Book 1929 No 269. Act on state aid to municipal mental hospitals and hospitals for tuberculosis patients and for promoting work to combat tuberculosis.
- ⁴Finnish Statute Book 1929 No 270. Decree on the implementation of the Act given on the 31st day of May, 1929, on state aid to municipal mental hospitals and hospitals for tuberculosis patients and for promoting work to combat tuberculosis.
- ⁵There is no site meeting minutes book in the archives of the Paimio Hospital.
- ⁶Aalto's signed contracts dated June 28, 1929. PSA.
- ⁷Workers' housing, pump room, garages and the mortuary would be implemented as cost plus work by the project's organization. The dwellings of state paid employees would be implemented either on cost plus basis by the project organization or as contract work. The actual construction work of the Sanatorium as well as the water mains and pumping station, general plumbing, general electrical work, elevators, doors, windows, painting, kitchen machinery, technical medical equipment and fittings would be carried out as separate projects. Extra work would be performed or implemented on a cost plus basis by the project organization. Building Board March 15, 1930. PSA
- ⁸Aalto 1933, 86.
- ⁹Building Board May 3, 1930; and Building Committee May 9, 1930. PSA.
- ¹⁰Building Board May 3, 1930.
- ¹¹Aalto, Alvar. Paimion parantola. Arkkitehti 1933.
- ¹²A/B Jernbeton O/Y, which shared the third place in the price comparison, was left out of the negotiations at this point. Building Board, June 4, 1930.
- ¹³Building Board June 10, 1930. PSA.
- ¹⁴Building Committee June 12 and 13, 1930. PSA.
- ¹⁵Building Committee June 17, 1930. PSA.
- ¹⁶Building Board August 21, 1930. PSA.
- ¹⁷References of Tektor from the late 1920s were also listed in an advertisement published in 1936. SARK 1936, 20.
- ¹⁸The building is located in Katajanokka, Helsinki. Kanavakatu 3AB, rakennushistoriallinen selvitys. ark-byroo architects, 2012.
- ¹⁹In the archives of the Paimio Hospital there is an incomplete series of Henriksson's structural drawings. Emil Henriksson's structural drawing archives were lost during the Continuation War. Jaakko Hartela's interview on June 6, 2001.
- ²⁰Indicated on the construction drawings dated July 1930. PSA.
- ²¹Jaakko Hartela's interview on June 6, 2001.
- ²²Akso Oy, National Board of Patents and Registration of Finland n:o 62.649, was registered on January 29, 1929. Oral information was given by Tuula Kauppi on October 29, 2003, National Board of Patents and Registration of Finland.
- ²³Minutes of the Building Board of the final inspection of the construction contract of the reinforced frame on December 5, 1930. PSA.
- ²⁴Contract on constructing the reinforced concrete frame was signed by the Building Board and Building Supervisor Arvi Ahti on June 17, 1930. Work and contractor agreements 1929-51. PSA.
- ²⁵Jaakko Hartela's interview on June 6, 2001.
- ²⁶Soiri-Snellman 2010, 114.
- ²⁷Database of architectural objects (Arkkitehtuurikohteet). FMA.
- ²⁸Jaakko Hartela's interview on June 6, 2001 by Marianna Heikinheimo.
- ²⁹The two rebled each other for the delayed work. Pakoma 2003, 24.
- ³⁰Aalto, Alvar. Paimion parantola. Arkkitehti 1933.