

“RECONSTRUCTION AND
DEVELOPMENT OF
THE MAISON D’ARTISTE
PROTOTYPE”

Mick Eekhout et al

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PREFACE

By Evert van Straaten

With its daring composition and inspiring workings, Theo van Doesburg and Cor van Eesteren's model of their Maison d'Artiste from 1923 has gained an important place in architecture and art history. It is the outlined materialisation of a vision of architectural art in which time and space stand in a dynamic relation, the laws of gravity are challenged and colour plays the leading role. It is an imaginative attempt of Neo-Plasticism to create a harmony that reflects the cosmic order and offers living space.

The model was already lost in 1925. Editor of the magazine *L'Architecture Moderne*, Jean Badovici, stored it in a humid basement together with other models and drawings after having received it for the purpose of making photographs. A shocked Van Doesburg wrote to Van Eesteren on 28 October 1925: "I just saw the models ... one single unidentifiable pile of rubble, everything in ruins. Horrible. And to have to experience something like this during your own lifetime!"

What remained were the photographs taken in 1923, the collages made from these photographs and the sketches for dimensioning and colour scheme, a part of which were made later, probably in 1924. The material was sufficient, however, to appreciate the artistic value of the model and to inspire architects and artists until this day. The absence of the original model and of exact drawings contributed to an aura of mystery. It has certainly underlined the visionary, conceptual aspect of the design. The somewhat neglected importance of technical and structural feasibility during the design process in combination with Van Doesburg's reputation as amateur in construction matters has undoubtedly contributed to the fact that a study about the possibilities of building the Maison d'Artiste in true size was considered pointless.

I am very happy that Mick Eekhout and the TU Delft have conducted a thorough study into the possibilities of constructing the model on the basis of the existing material, and have then researched the requirements to build the Maison d'Artiste. To me, the results are impressive. Firstly, we now have new material and new information available that increase the possibilities of interpreting the intention and the value of the design, and that may offer more detailed insight. Secondly, we learn that Van Doesburg and Van Eesteren have indeed greatly challenged the laws of gravity. Eekhout rightly states that "the design of the Maison d'Artiste was 90 years ahead of developments in technology". The description of the reconstruction of the original model's geometry and colours are fascinating. In my opinion it shows that the geometry as well as the colour scheme were developed during the work on the model. Clearly, this model is a snapshot; its dimensions and colours are only valid for that particular moment in the design process.

A reconstruction of the model of the built design at a specific ratio by means of most advanced methods and techniques has now become a possibility. This book presents various recommendations on how to accomplish this. To reconstruct the model based on the results of the research seems obvious to me. This is also true for the possibility to generate a 3D virtual reality tour through the house based on all the newly found facts. Since building the house on a scale of 1:1 according to the now reconstructed design would require too many adjustments to make it usable, it is recommended to realise a building on a scale of 1:5 or possibly even a little smaller. To me this is a sensible suggestion because it would allow a better experience of the original vision (or at least the vision of the moment of the design phase) including its shortcomings. The argument that this would affect the original vision or the mysterious aspect is nonsense. New attempts in different materialisation provide fodder for new interpretations; such as technological research in the paint and the techniques that Vincent van Gogh used can provide more insight without diminishing the quality of his work. I welcome each new layer that can be added to the life of an iconic piece of art, not least because it will expand its societal and cultural value.

Evert van Straaten

former director Kröller-Müller Museum

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01 THE PROCESS FROM 1998 TO 2016

By Mick Eekhout

This book deals with the TU Delft's contribution to the exhibited model design of the 'Maison d' Artiste' as it was made by the painter Theo van Doesburg and the architect, later famous town planner, Cor van Eesteren in 1923.

The first step towards his publication was made in 1989 when the Foundation 'EFL Stichting, trustee of the Van Eesteren heritage, asked professor Mick Eekhout as an independent technological specialist to make a feasibility study on the technical buildability of the Maison d' Artiste. They had to decide on a request to build the Maison on real scale and needed a technical feasibility advice. The Maison d' Artiste had been designed and built in the form of a model in an exhibition in Paris in November 1923 by Van Doesburg and Van Eesteren in a flurry of excitement. Shortly after the exhibition the two got a difference of opinion on the authors' rights. Who was responsible for what? Van Doesburg wanted to develop the Maison further as a 3D-painting. Van Eesteren was more interested to develop the Maison further as an architect. It made a split that still is felt today, between the legatees: the Van Doesburg side and the Van Eesteren side. Just like a pop music group.

The feasibility study presented in 1990 was not only seen purely as a technical study, since the answer could have been given by a technical design for realization; but it was surrounded by considerations of cultural nature: would it be sensible to really build a concept that never was meant as a preliminary realistic design? It could either lead to a very impractical literal realization, reducing the magic the Maison d' Artiste had as a design in the early start of Modernism in Architecture, or it could lead to a disappointment as the only way to realize it would be with many alterations and improvements to make it a contemporary building. May be for highlighting the model it would be better to reconstruct and build larger models on scale 1 to 5, where the outer dimensions would already be gigantic and impressive: 4x4x4m³. But in that scale the interior was not usable and not interesting. It was the outside view all around that would be important to show. And by the way, due to the improbable cantilevers of the cubical volumes stacked on top of each other and the lowest one on two glass panes, it would only be able to be realized in composites: carbon fiber reinforced epoxy, as this material is very stiff and lightweight, but extreme costly. The feasibility report is translated in this book as Chapter One.

The report was taken up by the EFL Foundation to reject the request by Victor Veldhuijzen van Zanten to build the Maison d' Artiste on a real scale 1 to 1. Architect Veldhuijzen [1941] was a nephew to Cor Van Eesteren, had rebuild the Maison d' Artiste in cardboard models in the 1980-ies and by selling 3000 copies was largely responsible for the revival of its popularity.

Between 1998 and 2003 professor Mick Eekhout supervised the 2nd year study module 'Production and Realization' ['Productie & uitvoering'] which was followed by 300 students yearly. They could choose in ateliers of 24 students a subject of a list of new buildings, all realized shortly before. The study would focus on an alternative materialization, the production and building site aspects of the materialization. They were not allowed to change the design. The architects were available, the building could be visited. So it was a realistic engineering design task. The module coordinator was Ep Huttinga, later Huib Plomp. The module was highly praised because of its efficiency, coherence between the atelier tutors and the positive results. Around 2000 the Maison d' Artiste was added to the list of choices of available buildings. It was the only building that could not be visited. The architects were no longer alive. But as a compensation the design had been very famous and Eekhout doubted its buildability very much. So it promised to become a lot of hard work. Yet the subject was chosen and under leadership of the super enthusiastic tutor Leendert Verboom it led to remarkable conclusions. Yet a difficult aspect appeared to be the cantilevers of the cubical blocks stacked on top of each other, without a proper and strong structural core. The central shaft possessed only the dimensions of a chimney which was less than a central load bearing core from which all cubical volumes and their material envelops would be able to cantilever. So all the skeleton models of the students had deformed cubical volumes. Some students spoke about a hopeless task. Out-rigging or cantilevering was a major problem and gravity still was not conquered, even almost 80 years after 1923.

However, in 2003 the dean of the Architecture faculty decided to make a completely new study module scheme. Every 4 to 5 years the calendar would be turned upside down by a new dean or a new director of education. We were not very charmed. We decided to combine one last time the 2nd year module with a series of 2 study modules in the 4th year: B3 Prototype Making and B4 Prototype Testing. This series had been engaged since the opening of the PO Lab, 'Product Development Laboratory', also called the 'Prototype Lab' in September 1995 by 24 students on a semester base. In this lab the students were taught to make shop drawings, to learn handicraft techniques like welding and machining. They were challenged to make a design of their own of [usually] a façade, and to produce this as a prototype of 2x2m² in the same semester. In the later module B4 testing of the prototype was undertaken.

The idea was to show the combined power of the 2nd year study module of production and realization of the Maison d' Artiste with the prototype making in B3 and B4, ending in a prototype scale 1 to 5, a large undertaking with all students involved as a group. And the students had to hang on: first to follow the 2nd year bachelor architecture project and one year later the 4th year master building technology project.

But before doing so, we had realized from the previous student groups that the historical documents, which were the plans and elevations of architect Cor Van Eesteren, the photographs of the 1923 model, the contra-constructions made in 1925 by Theo van Doesburg, the 2.000 cardboard models made and sold by Victor Veldhuijzen and the museum model by Tjaarda Mees of 1982 all had different dimensions. The first challenge for the 2nd year students was to reconstruct the original geometry. One does not spend so much energy on building a scale 1 to 5 prototype when the geometry would be wrong. This was surely a scientific challenge for the 2nd year students.

In order to prevent discussions later, Victor Veldhuijzen was asked as the guest tutor for the geometrical study, while Monique Suttoorp was asked as the guest tutor for the reconstruction of the colors. Some years before she had reconstructed the colors of the Paris atelier of Piet Mondriaan in Rue du Départ 28 and exhibited the reconstruction of the Mondriaan Atelier in the 'Exchange of Berlage' building in Amsterdam. She could compare the black-and-white photographs of paintings of Piet Mondriaan with the still existing paintings. So in that respect, the color reconstruction challenge for the Maison d' Artiste would be a class more complicated, as there were no existing colors for comparison. And indeed, the results of the geometry study, largely under leadership and initiative of student Joris Braat were astonishing: 98% of the ribs around the volumes could be deducted from the original black-and-white photographs and 2% were not visible, but could be deducted by vertical lines. Many of the rib lengths of the volumes differed from the reconstructions of the 1980-ies. The scientific data are available to enable future parties or persons to do a future scientific check to falsify our results. It is not impossible that this Maison d' Artiste design deserves to become the subject of a PhD study in the future. This reconstruction of the geometry is given as a scientific summary in Chapter Two.

The reconstruction of the colors was also difficult and scientifically even more risky. The photographs were black-and-white and no comparable colors existed. A Talens color chart from 1923 was borrowed and the best spectrometer from the US was flown in. All colors proved to be different from the color pick of the 1980-ies model. The most different was that colors of the stairs which are black in the 1982 cardboard model, changed to red in the original reconstruction. Black is logical from an architect's view, but it will probably have been the painter Van Doesburg who decided a flaming red color for the vertical element of the model composition. Yet when a new scientific research with improved spectrometers would be done, the chances are clear that the colors could be different again. The color reconstruction is given in Chapter Three.

The students in their 4th year indeed embarked on the prototype and the making and testing of it. Yet, the model or prototype was so complicated as a building that it took far more time for the students to make the shop drawings in the new geometry, to design and decide on the details and materials and lastly to make the prototype in the Octatube Laboratory in Delft. The final colors of the prototype was white, accepting that further studies on the color patterns still could be done and that the final colors could be added in the form of a film layer on the outer surface of the model. The making of the prototype is described in Chapter Four.

What had we done? This student research work showed that the dimensions in the model geometry were different up to 15% and the colors were, our good fortune, completely different. And these were normal students at the TU Delft. The results were astonishing. It was good that Victor Veldhuijzen was weekly advising the group of students as their guest tutor. He later commented that he took these data on the reconstructed geometry as the base for his further attempts to really materialize the Maison d' Artiste in real scale 1 to 1, an ambition which he still drives to date. The cultural implications are described by an outsider of our student work, architect Joris Molenaar. He describes the influence of this work of students and its results in cultural respect in Chapter Four.

The conclusions of this remarkable student work, going from education into research and development, into prototype building and its consequences as contribution to the culture of Architectural Design of the Modern Movement is given the last Chapter Six. A number of technical considerations for future development and use in the architectural domain are given from the perspective of the Chair of Product Development in Architecture.

The prototype has been restored from damages due to the Big fire of Architecture May 13th 2008 and has been positioned on the TU Delft campus, where it will stay up to 2023. It will be loaned for an exhibition '100 years after De Stijl' in the Lakenhal Museum in Leiden in 2017.

In 2023 a centennial exhibition could be organized in Paris, the original exhibition place of the 1923 De Stijl Exhibition. At this moment of activity, the future destination of the restored prototype Maison d'Artiste after 2023 is not yet known. The 'Foundation Maison d'Artiste Prototype' is the owner, steered by former staff and students.

02 CULTURAL AND TECHNOLOGICAL CONSIDERATIONS

By Mick Eekhout

THE EXHIBITION OF 1923

In autumn 1923 the Art Gallery of Rosenberg 'L'Effort Moderne' in Paris organized an exhibition on 'Les architectes du Groupe 'De Stijl' Hollande'. De Stijl was an architectural movement derived from the magazine that carried the same name 'De Stijl' and was founded by Theo van Doesburg. It was in 1920 that Van Doesburg had met Leon Rosenberg and had received a request to design a country house for him. The exhibitions consisted of a number of architectural scale models, paintings and drawings. Aim of the exhibition was a joint manifestation of artistic, spatial and architectonical aims and visions of members of De Stijl. Amongst others the work of Theo van Doesburg and Cor van Eesteren was represented by 3 architectonic models, a number of 'contra-constructions', isometric drawings (perspectives without perspective centers) with colored planes.

40-year old Theo van Doesburg and 25-year old Cor van Eesteren made all three of the building designs and two of the three models. 35 year old Gerrit Rietveld built the third model in his workshop in Utrecht:

- Maison Particulière;
- Maison d'Artiste;
- Hôtel Particulier.

The original plan design drawings by Cor van Eesteren and a number of photographs of the exhibition and its preparation were published.

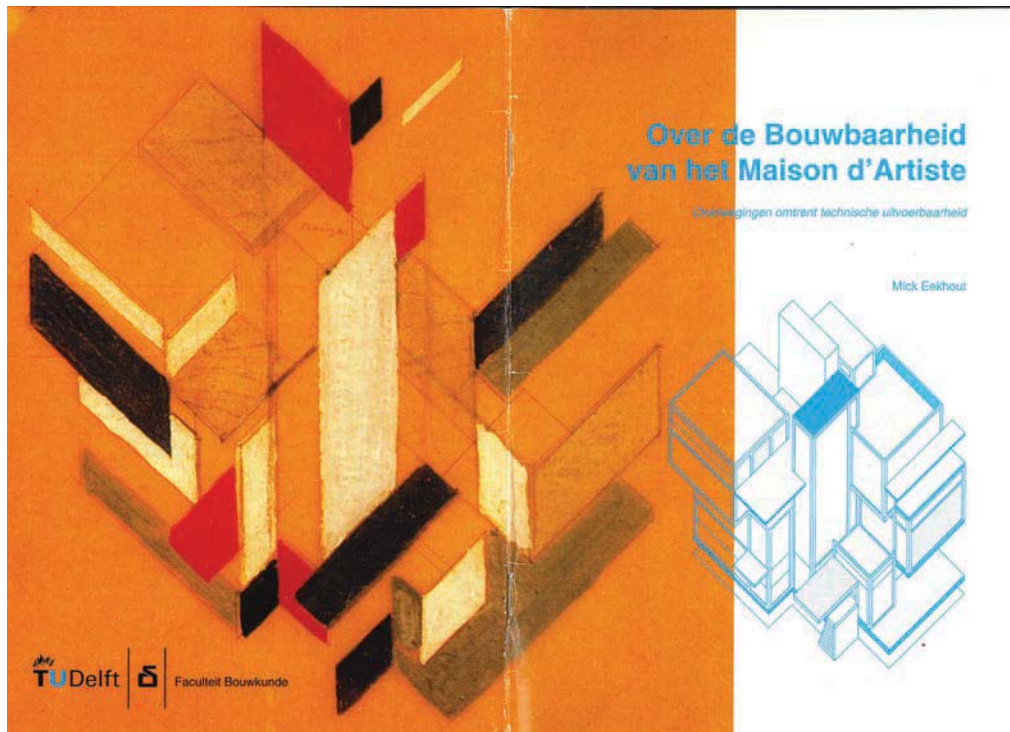


FIG. 01 Booklet 2000 'Over de bouwbaarheid van het Maison d'Artiste'

1.01 PURPOSE AND DEVELOPMENT OF THE MODEL

The model photographs indicate the time pressure and the circumstances of the last manipulations on the models. The first two models were quite professional in its presentation. May be these two were a reason to make the last model a little bolder and to try a more loose stacking of cubical volumes. Both the Hôtel Particulier and the Maison Particulière, called 'Maison Rosenberg', were quite realistic designs, based on the newly introduced reinforced concrete structures of horizontal and vertical plates for floors, roofs and walls with all kind of openings for windows. May be the last model was not well planned. Too much ambition, too short a time to spend on the design and on the model. While building the model, they were still designing. Many discoveries appeared while contemplating and designing. This all happened in an sensational atmosphere of thrilling discoveries.

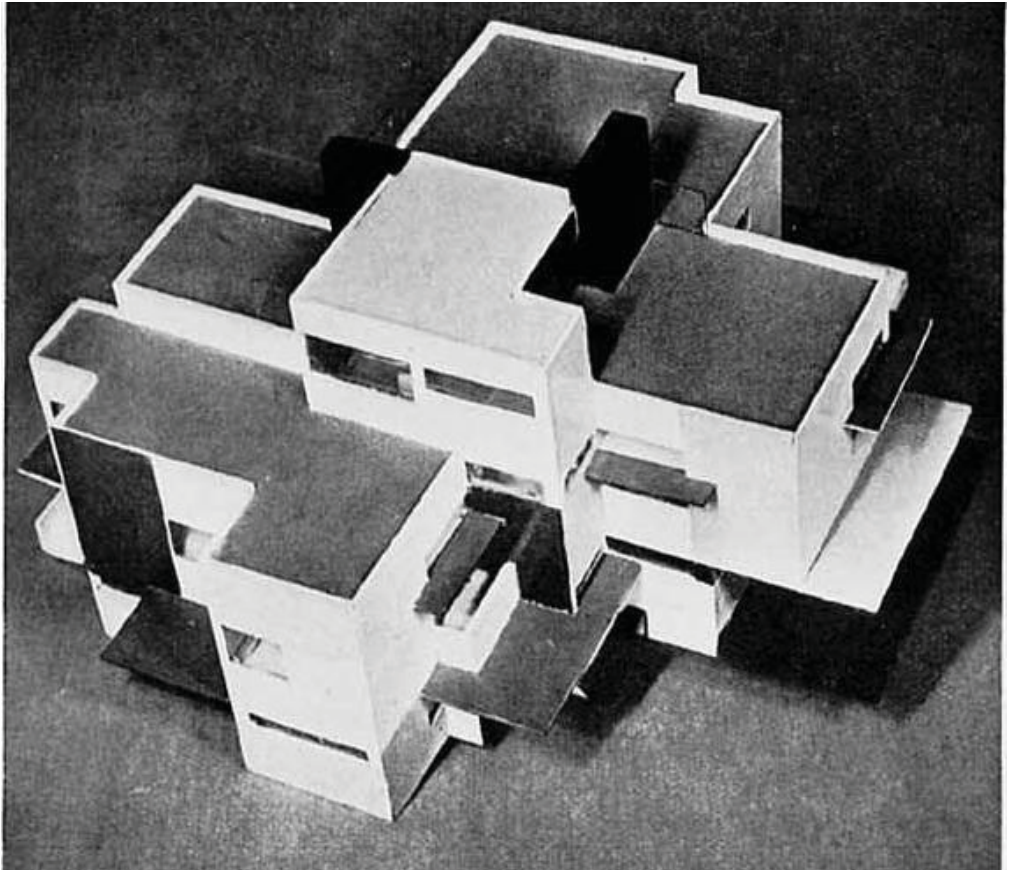


FIG. 02 Maison Particulière

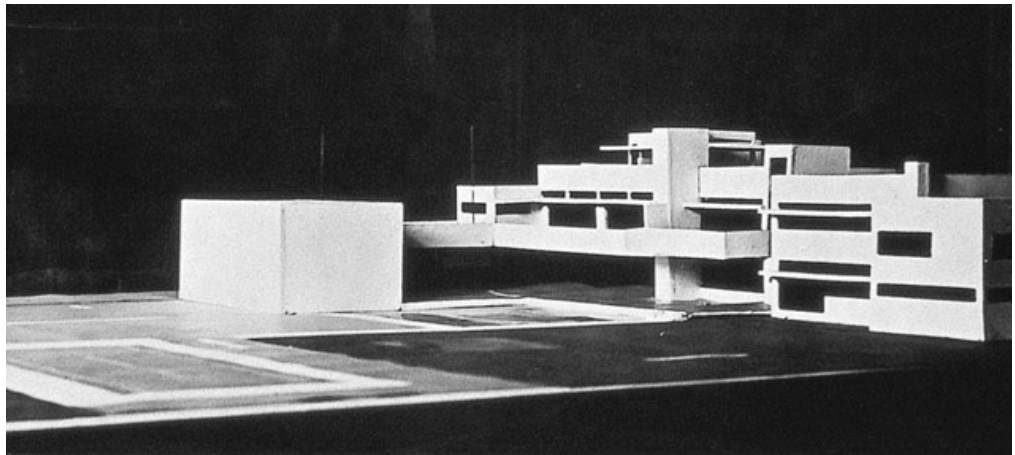


FIG. 03 Hôtel particulier

The border crossings of Theo van Doesburg, from painter to architect and the relative professional inexperience as a young architect of Cor van Eesteren stimulated the whirl of excitement. Those are the reason that the model of the Maison d'Artiste did not look as professional as the other two models. It was a design model used for the exhibition and not a pure exhibition model. But when one sees the original model of the 'Hôtel Particulier', it seems old-fashioned, it was quite buildable. The Maison d'Artiste, however is still almost an impossible dream.

Several discrepancies are visible on the drawings of the ground and storey plans, like the projections of the cantilevering or receding floors, roof areas and balconies. One could also see discrepancies between the drawings and the model photographs. Most probably the floor plans were drafted first, after which the model was built and the 'contra-constructions' and isometric projections to design the color planes [the real specialism of Van Doesburg].

Both designers entered voluntarily in a complicated challenge. The design appeared spatially and structurally very complicated. My guess is that they first made a cardboard model, which collapsed during assembly. Four hands on deck was not enough. They asked a metal workshop around the corner to solder a metal skeleton, after the main form was fixed. In the main form also the floors and roofs were fixed. Probably the opening of the exhibition was nearing rapidly and the model was far from finished. The designers could devote their time to the external walls and their colors. Roofs and floors were defined in the model skeleton. The external walls were facades with open and closed planes and the additional means of expression like solar hatches and above façade openings and the balconies below. The metal frame enabled them to design the different parts of the facades independently, to discuss them and to fix them or replace them individually. The metal skeleton simplified the design process. It replaced more hands on the model and glue. It would not have been necessarily the intention of the designers to materialize a skeleton in reality. It was just logical in the fast model making process to do so. The structural logic and refinement was a bridge too far. They would attract a structural designer if the project would ever be able to attract a client. And indeed, even after 90 years, I guess as a structural designer that the structural and constructional development of the model would be an immense challenge for the best professional.

The 'contra-constructions' were used to try out different colorings, before they were put on the model. The model building of the 'Hôtel Particulier' was outsourced to Gerrit Rietveld, who started his professional career as a furniture maker. His design for the Schröder House had already commenced building in Utrecht and would be completed in 1924. The model of the 'Hôtel Particulier' arrived probably too late in Paris to allow van Doesburg to paint it consciously and well balanced. So this model remained white during the exhibition.

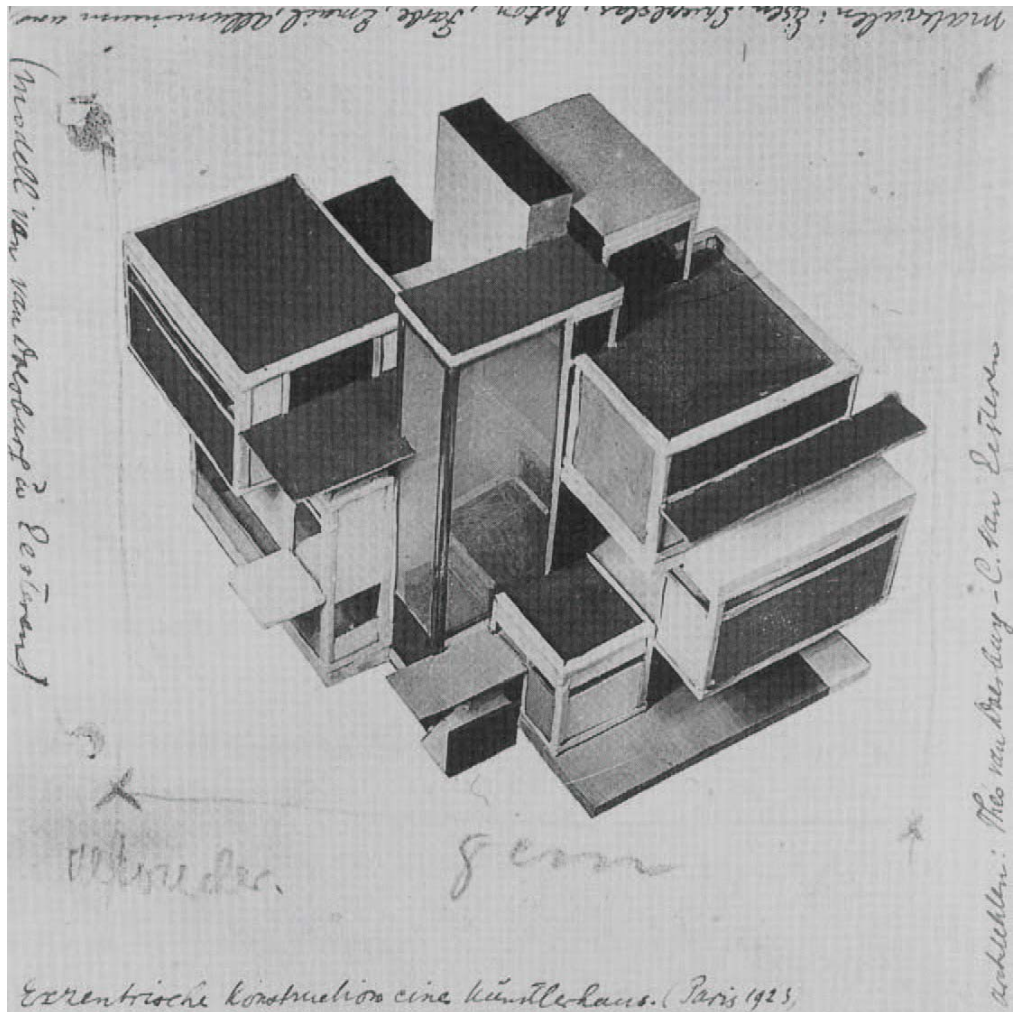


FIG. 04 Photograph of the model of the Maison d'Artiste as published by Theo van Doesburg

1.02

EXPERIENCES OF THE AUTHORS AS ARCHITECTS

With my limited art-historical knowledge Van Doesburg seems to have been a passionate and ambitious person. A painter, much in favor of integration with other forms of art and applied arts. Van Doesburg did not have the high class like Rembrandt van Rijn, but possessed the drive to develop new terrains. He was the initiator and leader of 'De Stijl', although he did not present himself like as such. De Stijl was a group, be it with a heterogeneous character. Specifically and unique was the cross section of the professionals in the arts and in the architecture. Van Doesburg had a reasonably dominant

character. As he met other likewise cocky designers, with toes as long as his own, in many debates controversies arose. This resulted in the welcoming but also of the farewell of many designers. The signal in her time, the revolution that de Stijl initiated, was far more important by the synergy that Van Doesburg was able to press out of his friends, than the individual abilities of the members or their differences in opinion. I try to imagine the atmosphere around the exhibition in 1923. Just five years after the Great War had ended, bringing France and Germany on the verge of bankruptcy and many families in the two countries in sorrow. The dark days of the Great War were over. Many countries nursed their wounds. The Netherlands had tacked neatly with its neutrality between the two big countries Germany and France.



FIG. 05 Theo van Doesburg and friends with Dada on the table

After these dark days one could build a new vision of a clear future and bring is to the eager markets of Germany and France. “The warriors of light were not concerned on the shadow thinkers”, to speak with Louise Fresco [Huizingalezing NRC 1998, www.nrc.nl]. Could the neutrality of The Netherlands result in an extra push on the back of De Stijl? With the new post-war political climate the opportunity arose for a turnaround in the cultural climate. The De Stijl members felt apostles of a new way of building or better of a new vision of architectural design. No more architecture in closed spaces in closed buildings, which were never opened up by the limits of brickwork buildings. But in the meantime reinforced concrete technology had outgrown its infancy. It brought the possibilities of fire proof buildings and rigid building

structures. Reinforced concrete enabled safer and also high rise buildings in load bearing skeletons. Le Corbusier published his idea for the 'Domino' principle of a building skeleton for a free standing building already in 1915. So that was known.

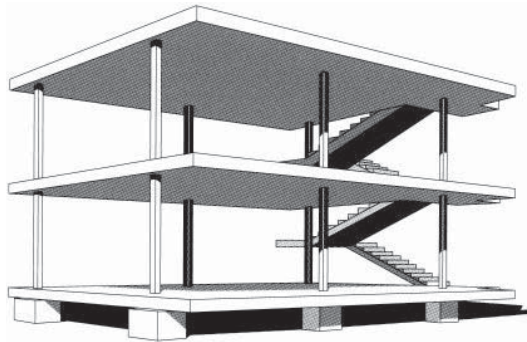


FIG. 06 Domino principe of Le Corbusier uit 1914

The gentlemen knew each other. Le Corbusier was engaged in that time in developing concepts for mass production. He regarded the German Bauhaus members as artists who did not contribute essentially to the future of architecture. De Stijl was closely linked to the Bauhaus. But Le Corbusier could have noticed that De Stijl approached his domain quite close. He still confined himself to apartments in rectangular buildings, although the exhibition of De Stijl showed the building as a composition of cubical volumes. In his head he could have had the idea the De Stijl had jumped ahead. Especially the ten new possibility of concrete flat plates for floors and roofs had a major impression on experimental architects of the twenties. The new concrete technology enabled the realization of flat roofs and rigid floors without any reminiscence to the traditional vocabulary of brickwork walls, timber floors and timber roof structures. Concrete plates could also cantilever without problems horizontally, being stiff enough for this aim. They offered a transparent transition of spaces from inside to outside. The vertical stacking of bricks and stone from the past changed into a horizontal composition of autonomous and cantilevering reinforced concrete plates and panels that would determine the following century years of modern architecture. At the same time a logical possibility arose: the concrete solar screen. The expression of cantilevering horizontal planes worked quite sculptural. This solar screen was more practical directly on top of the glass window opening. The principle of the cantilevering concrete plates was recognized quite late by architects. Around the turn of the century one generation before François Hennebique (1842-1921) and other had developed concrete technology towards maturity. The earthquake of San Francisco in 1906 caused the worldwide breakthrough of concrete technology: only concrete buildings stood up firm after the disaster. In 1923 airplanes became more and more reliable and gigantic zeppelins were built. Le Corbusier was deeply impressed by cars and airplanes, referring to his book 'Vers une architecture' published in 1923. Aeronautics were greatly stimulated by technology, while traditional building technology grew dull as to remain something provincial.



FIG. 07 Airplane and ship in 1923

The building technology at the time was based on brickwork. Something had to happen. The new concrete technology has caught up the iron and steel technology in fire-resistance. Iron and steel concrete was only used by architects as a functional and ornamented skeleton for brickwork and stone facades. Hendrik Berlage [1856-1934] was one of the first Dutch architects who showed concrete in her functional and specific material appearance. The engineers occupied themselves with reinforced concrete structures for larger structures. Concrete was not common for smaller buildings. Contractors will have maintained that they could build cheaper in the more traditional materials. That is always their argument, even up to date. Many architects did have no or hardly any experience with designing and building of reinforced concrete structures. They were not able to use reinforced concrete optimally. Certainly a painter like Van Doesburg was not aware of the possibilities of the building material reinforced concrete. And the freshly graduated building engineer Cor van Eesteren will have had no practical experience with reinforced concrete, although his family were contractors. His first design of a private house for the widow Van Zessen was being built in Alblasterdam, the Netherlands [south of Rotterdam], in 1923 and 1924 in brickwork and timber floors. Van Doesburg aided in the coloring design. This house is recently restored.



FIG. 08 House van Zessen in Alblasterdam, arch. Cor van Eesteren

Nevertheless, Van Doesburg and Van Eesteren were full of ambitions to realize three-dimensional painting and extremely sculptural spatial art. Their inexperience was as big as their bravura, their daring to undertake a new direction and to change architecture forever.

Van Eesteren had graduated two years before, worked one year [1922] in the famous Bauhaus in Dessau, where he also had followed lectures and workshops of Van Doesburg. They got into conversation, even became friends. Van Doesburg saw this young engineer as enjoyable company. They differed half a generation in age. Van Doesburg did not doubt the professionalism of Van Eesteren. It was a relief to talk to someone with a good understanding of building, even though he only started his career. Van Eesteren was able to direct the spatial intentions of Van Doesburg as an architect. Van Eesteren could prevent that Van Doesburg would make failures or mis-judgements. He became later the Dutch pioneer and master of town planning whom we know now in the Netherlands, but as a freshly graduated architect he might not have shown himself yet as brilliant as he became later as the post-war town planning genius.

It is enlightening to write about the personal circumstances of both designers, as it was a part of the environment in which their ideas came up. Theo van Doesburg was the pseudonym of Christian Emil Marie Küpper from Utrecht, who was married up to 1923 with Lena Milus. He would marry the professional piano player Nelly van Moorsel in 1928. He was between marriages at the time. His girlfriend Nelly inspired him probably to design a hospitable house where they both could work. Theo would favor to paint, to build models and to discuss and debate with his friends of De Stijl group. Nelly saw an opportunity to play the piano exuberantly. There was ample space for guests. The entire design breathed a very stimulating atmosphere for the breeding place of innovation that De Stijl was and the bomb in architecture it later really became.



FIG. 09 Theo van Doesburg and Nelly van Moorsel

If he saw the model as a future opportunity, as Van Doesburg wanted to impress his extrovert girlfriend Nelly, he somewhat overestimated the dimensions of the house. It could have been that he realized that it would remain a dream after all. The design had a volume of at least 1575 m³ for a floor area of 525m², when keeping an average height of 3m. Only a successful business man or a moneyed family could afford such a house. Unlikely that this was the case for a painter like Van Doesburg.

The making of a design, the process of designing, was in itself an exciting experience. To design the house for and with the girl of his dreams, made the experience even more intense. On top of that it was a kick to show that design to the entire world at the Rosenberg exhibition. My guess is that the realization of the house was not at all foreseen. Van Doesburg did not owe a penny and did not earn a fortune with his paintings. He was an ambitious dreamer and history has recognized that. He died 8 years later, in 1931, barely 3 years after his marriage with Nelly van Moorsel and one year after he had built a much smaller house in Meudon near Paris. The building of this house was financed by a heritage from the side of Nelly van Moorsel. [The Meudon House has been donated to the Dutch government and since 1983 is available for artists to live in and work for one year].

Van Doesburg did not know yet what impact the three-dimensional designs of De Stijl would have in the world of architecture. In history many costly buildings have been realized which did not have a fraction of the impact of this design. And the 'Maison d' Artiste' was only a poor model, made in too short a time. It was not even perfect as a model. And it was not only the exhibition itself that played a major role, but the publicity afterwards, in architectural books and publications in the last 90 years. In its own time the potential greatness and influence of De Stijl was much debated and often neglected.



FIG. 10 The 1923 exhibition with the maquette in the back corner.

The photographs of the exhibition show a traditional interior of the Gallery 'L'Effort Moderne' of Léonce Rosenberg: a way of building against which De Stijl actually opposed. The exhibition was positioned in small rooms. Hopefully there was ample publicity, otherwise it could have been a small affair. Completely in contradiction with its effects in the following decades up to now.

Another conclusion from the photographs is that the white model of the 'Hôtel particulier' made by Rietveld, looked very well considered and professional. Rietveld might have thought that Van Doesberg did not have the right to touch his model, that he only could color his model after thorough thinking. Rietveld might have had his own ideas when he saw the provisional model of the Maison d'Artiste, but as a design it was very intriguing.

The model of the Maison Particulière actually was a design gift for their host Rosenberg. Much effort was spent on this very design, otherwise much criticism would have been their share. Was the design of the Maison Particulière a sort of compensation in kind for the exhibition? Also this design has never been realized.

1.03 SPATIAL ANALYSIS OF THE MODEL

The design of the Maison d'Artiste had to be overwhelming in order to impress the public. A Dutch house would have been too small in the grand city of Paris. As the house was never meant for realization, the message of 'being able to build in another architectural language' was most important. The load bearing structure of the house was not considered. As long as the construction of the model would stand reliable, it was ok.

The building technical message was probably in the design process to make use of the newly developed reinforced concrete technology and to exploit this in favor of spatial art. There was not enough experience with architecturally reinforced concrete to be innovative. Roofs and floors were at best reinforced concrete plates and were not treated as architectural objects. Spatial art resulted in the sculptural treatment of the exterior of the design by recessed and cantilevering volumes. These volumes were made more exiting by façade openings, balconies and solar screens and more in detail by the treatment of the facades. The models shows that there are four quite different facades or external orientations. Only in diagonal view the model shows its masterly performance. The most exiting views are the diagonal view, one with the staircase in the center and the other at the other side of the model. The diagonal views have been studied extensively in its form and coloring by Van Doesburg. Only one isometry has been preserved of the Maison d'Artiste, see fig

This confirms the suspicion that the Maison d'Artiste was the last of the designs, an afterthought. In the polemic that lasted up to one year after the exhibition the subject is the authorship: who designed what or what part, a common phenomenon amongst collaborating

designers. The individual spaces do not have the same richness of for example Gerrit Rietveld's fluent transitions between indoor spaces. Another great master from the Bauhaus time, Ludwig Mies van der Rohe, designed in 1923 a [non-realised] villa where the spaces flow over between them and between inside and outside.

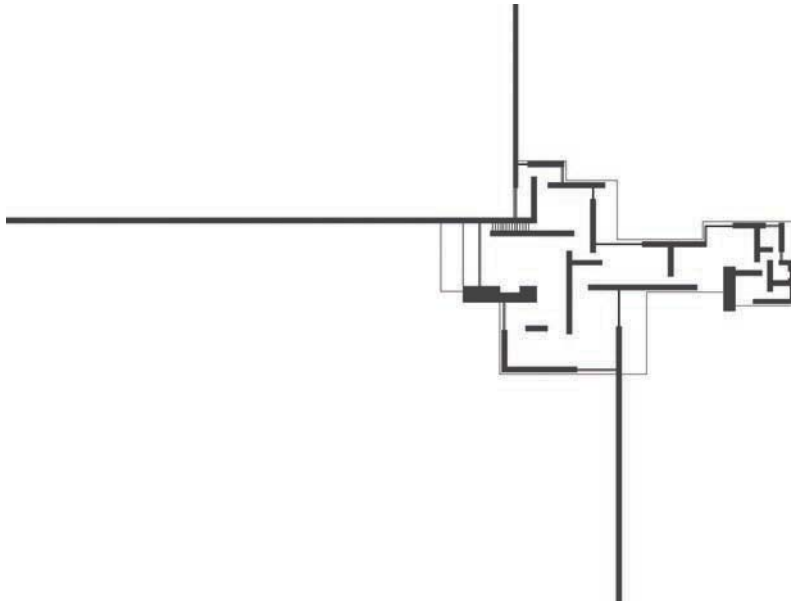


FIG. 11 Design villa in open park situation, Ludwig Mies van der Rohe, 1923, not realized

Only the plan of this house are for many a contemporary architect mouth-watering. Mies strived for internal spaciousness, extrovert, while the Maison d' Artiste primarily was designed as an externally spacious sculpture. During designing and building the interior did not get much attention. The floor plans are characterized by small and separate closed volumes. These spaces received on three sides a special façade treatment, hence they are characterized. Looking from inside outward, the special façade treatment is the most spatial and characteristic of the inner spaces.

By the conquest of the external sculptural appearance and the treatment of the surprising façade openings this model of the Maison d' Artiste, together with the two other models at the exhibition, gave the primacy of De Stijl. It has been published the world over. Rietveld's Schröder House, a small and hard-to-find small house in Utrecht, had a similar attraction. All foreign architects, traveling through the Netherlands, want to see and visit this small house themselves.

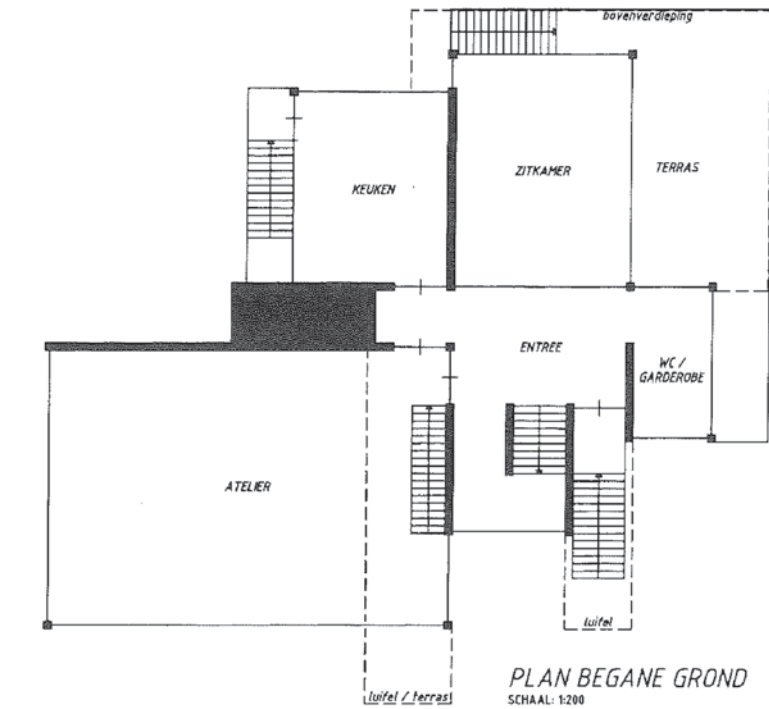


FIG. 12 Rietveld's Schröder house in Utrecht

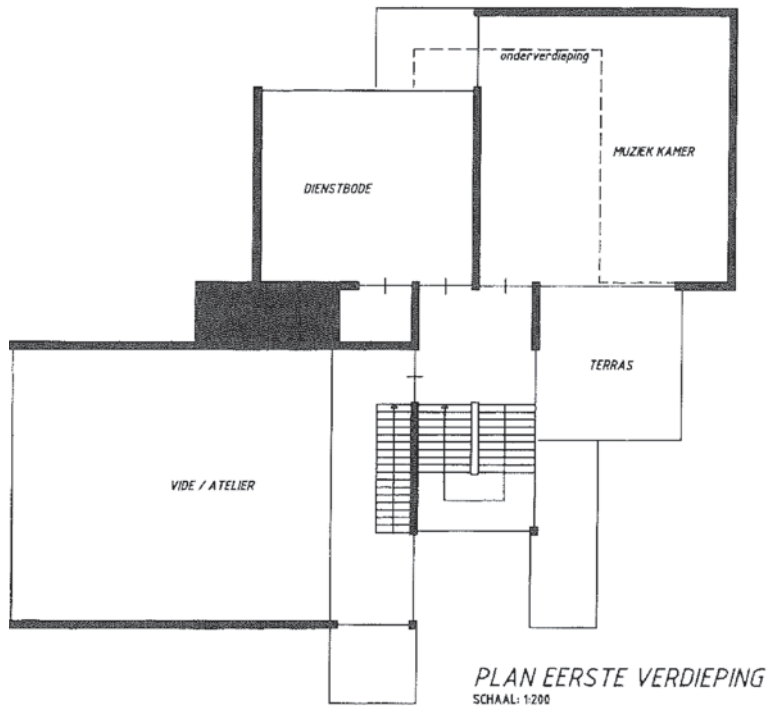
The fame of the Maison d' Artiste goes even beyond. It exists only in photographs, some drawings and in cardboard models from the 80-ies. A brilliant idea and a very modest investment in time and money created a bomb in world architecture.

One has to analyze which new phase will be reached when the intention of architect Victor Veldhuijzen van Zanten to really build the Maison d' Artiste is eventually realized. The PR no doubt will conform the large impact of the cardboard model. Only very designs of architects are as yet realized 90 years after date. Antoni Gaudi [1852-1926] saw only 25% of the Sagrada Familia Basilica ready when he died and it will take one or two decades more to finish and inaugurate completely the Sagrada Familia, more than 100 years after his decease. It is visible that more than 5 generations of architects, each with their own interpretation, worked on the church.

Any way these late realizations pay absolutely homage to the original author! However, the plans of the Maison d'Artiste do not have the same high quality as the external spaciousness of the model. The orthogonal facades [facades in projected view] are intriguing. But the spatial model is astounding. One could say that the model was the summit of the presentation of the design. The financial consequences of spending more millions in Euro for a potential realization, should have surprising consequences in order to make the money effective, compared with the little money and energy it required for the cardboard model. But this is the competence of potential financiers.

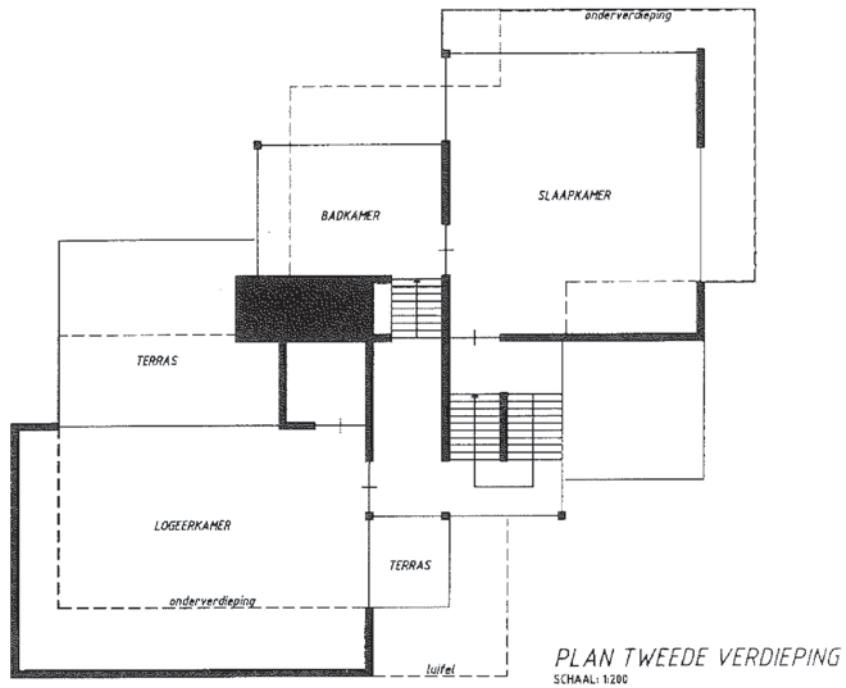


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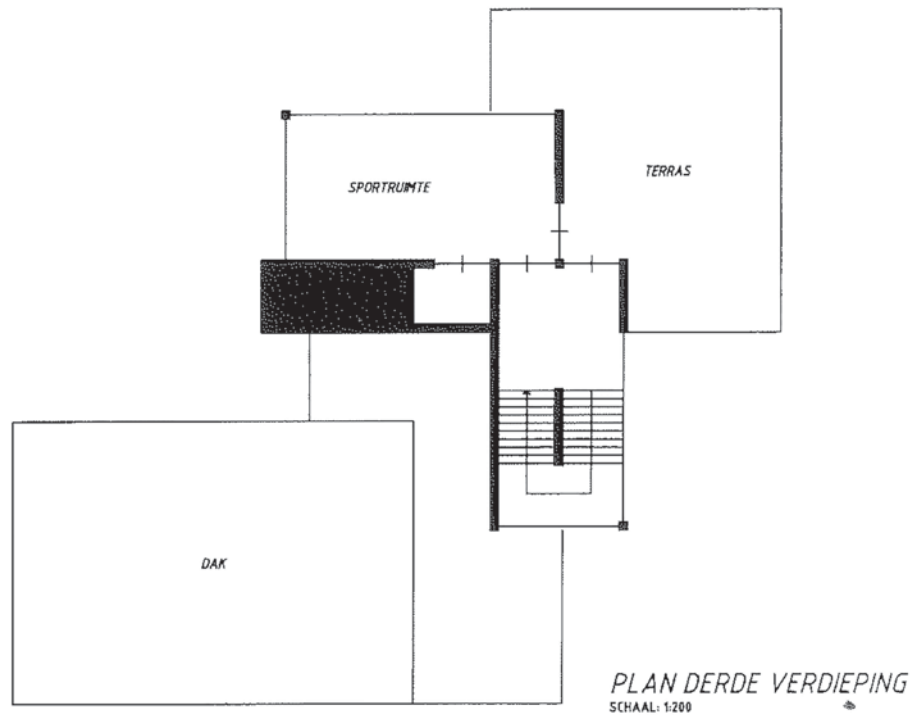


2

FIG. 13 Plans of ground and first floors of the Maison d'Artiste



1



2

FIG. 14 Plans of the second and thirds floor of the Maison d'Artiste

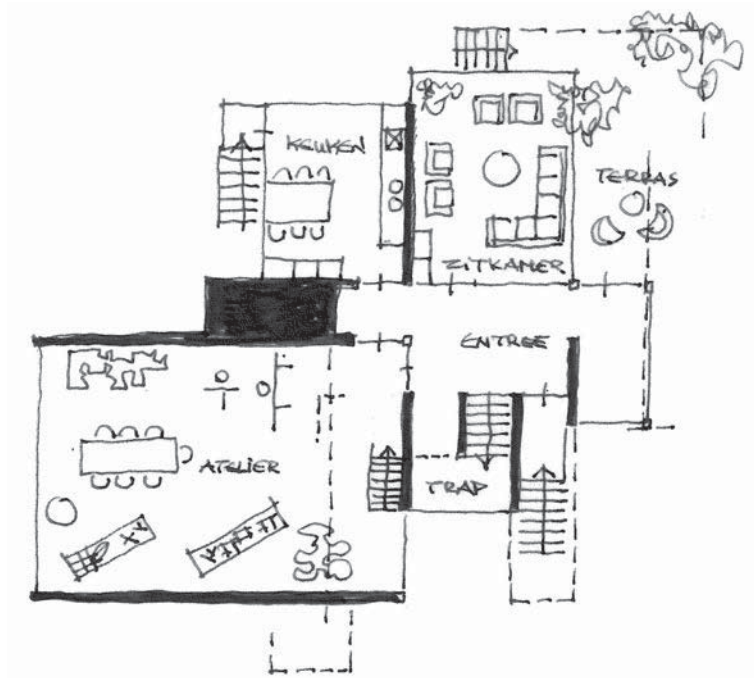


FIG. 15 Proposal of interior use of the ground floor of Maison, sketched by Mick Eekhout



FIG. 16 Proposal of interior use of the first floor of Maison, sketched by Mick Eekhout

Van Doesburg and Van Eesteren concentrated themselves after the drafting of the plans and facades to the sculptural surprising design and the model building. The model was used as living research model for spatial composition and color studies. The model has prominent improvements compared with the first plans and facades. Neither of the designers had an eye for the interior that still needed much optimization. The interior did not play a role during the exhibition. It is easy to imagine how the Maison would be used in our eyes.

One of the contemporary means of design to check the backward quality and to follow an eventual optimization process is Virtual Reality programming. Even modern computers can follow a person three-dimensionally walking in space. So an analysis of the three-dimensional environment, even for hardly visible volumes can be arranged. The University of Amsterdam was one of the first a decade ago in its SARA center , where the Maison d' Artiste could be set up in 3D and one could walk through it with spectacles whose direction of looking caused the computer to adapt the perspective one would see. Nowadays virtual reality spectacles and VR computer programs are popular for smaller computers. The model can be provided by the exterior facades, so that one can walk inside the Maison d' Artiste, but also outside. The artifact can even be positioned in different environments the model. Good for procedures in case of development of the building prior to realization and approval procedures from the government. The new computer programs are better and more visual than the old cardboard model and the endoscope.



FIG. 17 Virtual Reality specs in a contemporary model 2017

Architecture is the art of making space for human use. Actively experiencing the special qualities of a virtual design in real scale has hardly been developed up to now. In the development of ICT this is 'virtual reality architecture'. The perfections of virtual reality do not bother with the troublesome material process of building. For some challenges one could wonder whether it really worthwhile to invest so much energy in real building, when one also could experience architecture perfectly. This is architecture approaching the Hollywood movie industry. Reality can only lead to disappointments. But reality serves a purpose: the functional use of the building. Virtual reality is the contemporary pendant of the old model, but more perfect and cleaner. Virtual reality models of the Maison d'Artiste could be multiplied and in his own way contribute in the celebration of the Maison d'Artiste Experience. The eminent past can help the future, like the future helps the past.

1.04 ANALYSIS OF FUTURE USE

The Maison d'Artiste has been designed as a house cum painter's studio and a music room. Scale and size of the different rooms show that the not very well to do Van Doesburg used the ground plan organization of the house for the model, for the message of De Stijl and to impress his girlfriend Nelly van Moorsel. This was more his purpose than his intention for real building. The message was double. Professionally the message was the architectural ideas of De Stijl, as Van Doesburg had since 1919: an extreme spatial design, a three-dimensional art of painting and a new structural form walking and living in a three-dimensional painting. As a result of which the architectural model would challenge gravity forever. Privately the message was a tribute to Nelly van Moorsel, as an ideal for future joint living.

A contemporary user of the house would have the ground plans develop further, as the requirements and expectations in housing have developed and changed much since 1923. For a house nowadays the sizes are sometimes amazing: Atelier 7 x 9,5 m² and 6 m high is quite logical, but a sleeping room of 7,5 x 7,5m² and a guest room of 6,0 x 7,5m² are luxurious for Dutch standards. In contradiction to the large rooms the traffic spaces seem to be too narrow and low. In such a building an elevator is absolutely necessary. But as the building has many levels, an elevator would need more than 2 doors in different level heights.

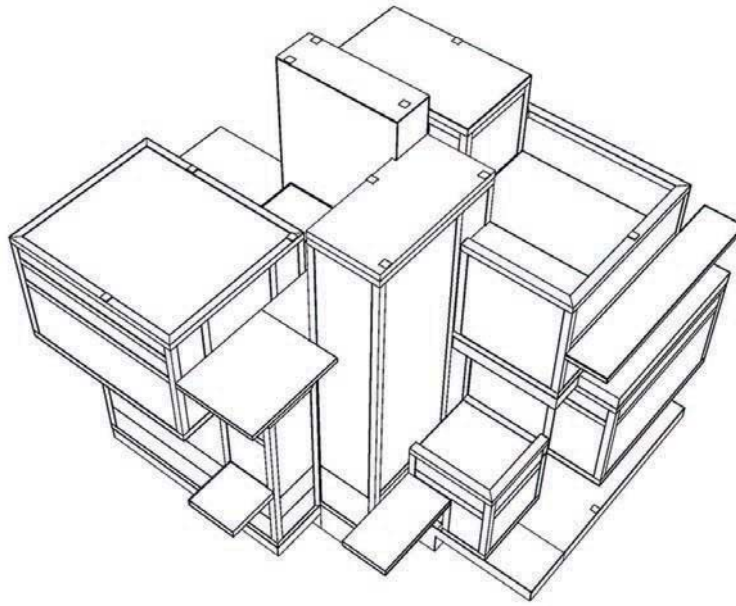


FIG. 18 Drone flight view Maison d'Artiste prototype during engineering

As an alternative one could state that potential future users of the Maison could see it as an historic monument that will be offered in its original form, in case the design of 1923 was consequently realized as per original design. Like all inhabitants of monument have to adept themselves to the building. Many people live happily in the Dutch canal houses as strict monuments. If the future users would like to live in the Maison d'Artiste as an institute, a small museum devoted to art, architecture or town planning, a Van Doesburg Museum, a Van Eesteren Museum or a De Stijl Museum, the big spaces are quite welcome, but the corridors and stairs are much too narrow to receive many visitors at the same time, the stairs do not land at the designated levels and the handicap of an elevator is logical.

If the current design is to be used for future realization to receive visitors at a larger scale, a contemporary architect will have to make adaptations and changes, starting inside, which also will have its consequences for the outside design. The work of the architect-arranger will be different from that of the original architect-composers. The question is whether the world is waiting for an arrangement of an architectural adaptation instead of the dream of the original phantom. The Maison d' Artiste has never been more than a design with a message shown in a cardboard model worldwide, which had worldwide attention from architects, a built adapted result may disappoint.

The question is whether one would honor both designers better and show their model by making a model in scale between the cardboard scale [1 to 50] and real scale [1 to 1]. For example on a scale still part of reality in model building. If the model would be realized on scale 1 to 5, then the dimensions of the Maison d' Artiste 20x20x20m³ will become 4x4x4m³, still impressing when a visitor would walk around the model. And one cannot enter as the volumes are too small for human inspection or experience. This scale will only

allow an outside experience. Widths more than 1.8m are wide as one cannot reach this with the tips of one's fingers; likewise 2.3m is high in vertical reach. Le Cobusier showed this in his Modulor range of human dimensions. The interior of the 1 to 5 model would not have to be adopted, the structural problems can be solved more easily and the finances are of a complete different order than real building. If one would consider to build a small series of multiples of the Maison d' Artiste this model would not be an unique artwork, but could have a spread-out over the world. The model could travel from exhibition to exhibition. The cardboard model of Maison d' Artiste produced in 1984 by Tjarda Mees and Victor Veldhuijzen van Zanten was completely sold out with 2.000 copies, which decorate many interiors.



FIG. 19 Cardboard model from 1984, Victor Veldhuijzen van Zanten

1.05

TECHNOLOGICAL ANALYSIS OF THE MODEL

The model with its cantilevering volumes challenges gravity. The horizontal direction, the spatial explosion and the cantilevering of rectangular volumes were new challenges on top of the vocabulary of the other two designs for the exhibition in 1923. These volumes

were composed of reinforced concrete floor and roof plates. The design process was aided by the introduction of a metal skeleton in the cardboard model. One wonders whether the designers did not think of 2 cantilevering concrete plates with vertical columns in between.

After they made the model with their own hands as a tower with cantilevering volumes, they were more interested in the facades with their color possibilities. Whether these facades were load bearing or not, did not play a role during the building of the model. The model was never to be realized anyway. The cantilevers, fighting gravity and an attempt to undo the laws of building which made the act of building related to low technology (even in the time of airplanes and zeppelins), were made visual in this model.

It will not be easy to build the Maison d' Artiste nowadays in the technology of reinforced concrete, cast on site. The different floor fields that have to carry in cantilevering action the outside facades and the partly recessing or cantilevering volumes above, would result in extremely high bending moments in the floors as load bearing structural plates.

The geometry, the form of the model, was not even analyzed in the expectation that this would be critical. There was no thought devoted to strengthening the most critical floors that were heavily loaded by the extreme cantilevering facades. The contemporary concrete technology with high pre-stressing for vertical and horizontal plates will hardly have an answer as the connections between plates are heavily loaded by bending moments, too. The facades were the result of playing with openings and color.

Structural action or integration did not play a role. It would become a nightmare for a structural engineer to design the load bearing structure. Both the 'Hôtel Particulier' as the 'Maison Particulière' consisted of horizontal concrete plates and vertical concrete panels provided with openings, of which most were horizontal. These models had a trustworthy system of load bearing concrete panels. In structural sense these two models do not challenge the engineer as much as the Maison d' Artiste does, even to date.

At the end of the preparation time, days before the opening of the exhibition, Van Doesburg and Van Eesteren wanted to go a step further than the first two models. They were obsessed by the vertical dimension, the dimension of high rise. To go on and show their aversion to the closed cube by positioning the model on a pedestal much smaller than the model itself, so that the model would hover over as a real piece of art. It was a house with a slender and hence weak central core. This central core is quite under-dimensioned, even for our contemporary structural capacities. The volumes are placed as cubical swallow's nests to all 4 sides, suspended and stacked. No question of a clear structural vision or statement. Which is in order for a model that never will be built anyway. In structural sense the Maison d' Artiste was a token of a naïve exciting and overconfidence experiment. It would never be built as the client was absent. The model never got a structural set-up.



FIG. 20 Exhibited model of the Municipal Museum 1982, The Hague, built by Tjaarda Mees

1.06

TECHNOLOGICAL SYNTHESIS OF THE LOAD BEARING STRUCTURE

One could distinct 3 possibilities for a structural principle of the different rooms:

- Horizontal plates and vertical panels;
- Horizontal plates and vertical columns;
- 3D steel skeleton with filings of non-load bearing plates and panels.

The positioning of the volumes of the different rooms stacked on top of each other never shows a continuous line from top to bottom. The volumes always stagger. There is no route which leads from top to the bottom of the Maison and its foundation. The thickness of the floors is everywhere 200 mm, there is no room for auxiliary structures or extravagances.

A structure of horizontal plates and vertical panels, like in the other two designs, is not possible by the obstinate form of the walls and façade. The walls and facades are partly open, even on the corners.

A structure with horizontal plates and corner columns would lead to dangerously high forces in the corners and the columns might punch through the floor corner. These columns would have to lead to steel beams on top and bottom, linearly, or crossing, which would bring over the concentrated loadings from the top floor via the columns to the lower floor.

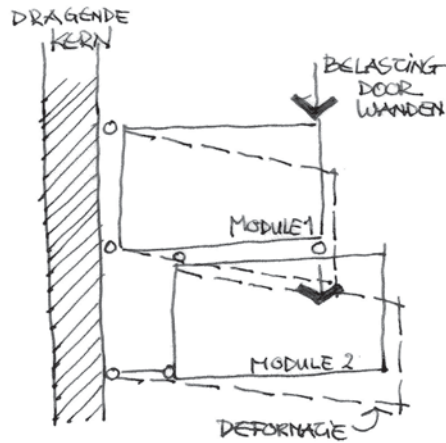


FIG. 21 Module cantilevering from a central core and the principle of cross beams in floors

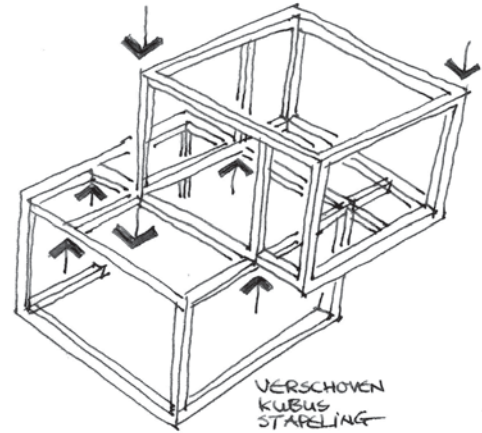


FIG. 22 Module cantilevering from a central core and the principle of cross beams in floors

A structure with a metal skeleton? The model from 1923, scaled 1 to 20, had a metal skeleton, most probably a soldered skeleton of led profiles as used for stained glass. Making models teaches us how the model behaves, but also gives a good indication how a real building would behave. In my opinion the steel skeleton is the only structural skeleton-like direction to realize the very characteristic, vertically staggering collection of cubical volumes in a structurally ad-hoc way.

But even this third possibility does not solve all problems. The sleeping room is positioned on top of the music room. The music rooms is suspended freely on top of the glass façade around the living room. The loading of the upper floors cannot be suspended upward. At this moment in time, in 2015 and even with the most advanced knowledge of experienced glass structures, we would even be very reserved to have the loadings of the upper volumes put as vertical loadings on two glass planes. Hence these loadings will have to be guided away through the floor, loaded in bending. The floor, however has a cantilever of 7.5m orthogonally and 10m diagonally from the central core. Such a floor would need a thickness of 300 to 400 mm to get the floor rigid with a dead weight of 750kg/m², only to carry the live load of the upper room of 200 kg/m². Which does not seem efficient. And even than the core has to supply the reaction forces, has to be rigid enough.

So my conclusion would be a steel skeleton with square hollow sections, with dimensions within the thickness of floors and walls. Between these skeleton elements floor components in stressed skin sandwich panels, like steel panels on a foam core. The sandwich could even better be made of epoxy carbon fiber reinforced epoxy on a structural foam core, which combines high rigidity with extreme low deadweight. Alas this last carbon fiber technology is expensive and up to now never been used for housing. This reasoning leads more the yachting industry than to the traditional reinforced concrete technology in housing and utility buildings.

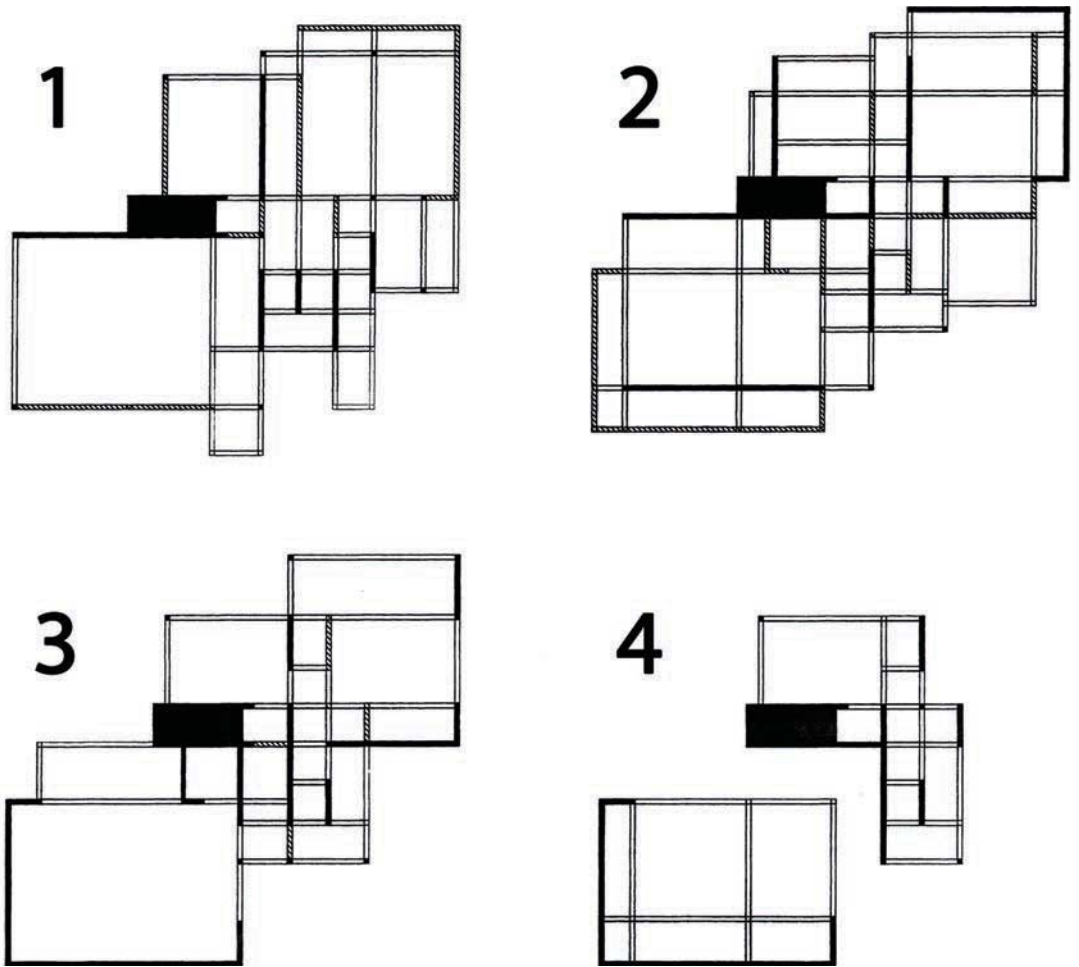


FIG. 23 Plans of crossing beams in floors to accommodate the corner forces from spatial modules above these floors

The structural challenge is focused on the cantilevering of the different horizontal floors, staggering on top of each other with zigzagging corners. It would be logical to provide all floors with 4 steel edge SHS beams [Square Hollow Section], filled out with carbon fiber sandwich panels, where randomly in the field of the sandwich a column of the upper room will rest. In order to prevent this column to punch through the relatively weak sandwich a system of crossing SHS beams or RHS beams [Rectangular Hollow Section] would have to be imagined. In this way of doing each floor can receive almost randomly corner loadings from columns above in the upper floor of a room or could lead them down to other corners below in the floor below the room. In principle each floor has a system of outer edge beams and inner crossing beams to receive the point loadings from above and to lead these down to the corner of the room below.

The result would almost lead to a Mondriaan-like subdivision, which seems to belong to the vocabulary of De Stijl.

Reasoning from top to bottom, along gravity, it has the following consequences for the two diagonal halves of the plan:

- The two columns of the sporting room are not positioned directly above the corner columns of the bath room. In plan the columns have been coded, which immediately gives the relationship between corner columns and crossing floor beams;
- In a similar way the different floor plans are projected on top of each other, resulting in floor schemes. The intersection of the crossing beams always coincides with the position of the corner columns of the room above and below. This are the designed structural schemes containing the steel skeletons around the room volumes and internally in the intersection floor beams.
- The structural analysis will have to prove that departing from the deadweights and live loads on the steel skeleton, which loading in the steel members will result from these *modus operandi*. Derived from these are the loadings of the edge beams and the intersecting cross beams.
- The most salient columns are the two corner columns of the living room at the ground floor, fully enclosed by the three glass façade panes (fig 18: glass corners of the living room). The corner columns on top and below are represented in the floor schemes. Challenging gravity is illustrated by the fact that the floor of the music room above cantilevers in one direction 2m, in the other direction 4.5m.
- It would be an extreme risky experiment to attain the 3 glass panels as load bearing glass panels, carrying the loadings from above 3 rooms stacked on each other above the sitting room. Yet this might have been the debate both designers in 1923 might have wanted to have if there was time and glass technology experience available as we have nowadays. The glass panels would have to be made in triple laminated glass panels, all fully tempered and in order to prevent condensation and to stimulate the view to the outside from the sitting room, provided with an outside pane of double laminated glass. Only in the last decade since the millennium the thermal pre-stressing and lamination ovens have been enlarged to the required sizes for the glass panels of the sitting room. The usual precautions will have to be agreed on exchange of the panel in case of breakage of one of the blades. Even when one panel breaks, the laminated assembly stand would be able to resist the loadings from above, but exchange may be needed in an order like changing a tire of a car: pre-thought and designed for substitution.
- In the total set-up of the architectural design it is questionable whether such an extra structural experiment has to be engaged on top of the carbon fiber reinforced epoxy sandwich floors. In this project there are ample challenges for a structural designer. The miracle of the missing corner column would be a revelation, however. Always the question mark is: would the designers be flattered by this possibility? It took almost a century before a structural system could be developed that suited the original design. Or to put it in other words: the design of the Maison d' Artiste was almost a century ahead of developments in technology.

TECHNOLOGICAL ANALYSIS: BUILDING CONSTRUCTIONS

The choice of the structural system has to be made before the construction can be advised. Subject is the thermal insulation around the steel structure, the floor plates and façade panels. When following the route of the intersecting steel beams in the sandwich floors the following 5 problems have to be solved:

- The thermal insulation around the steel structure as ‘connective tissue’ around the outer sides of all structures and covered with a watertight skin in order to cope with temperature and humidity cycles compared to a continuous interior climate.

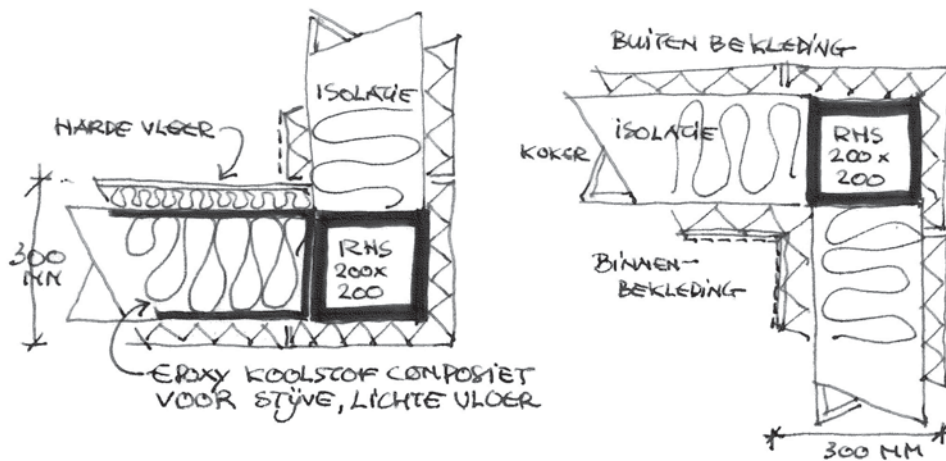


FIG. 24 Vertical and horizontal details with RHS steel, sandwich insulation and outside cladding

- The acoustical mass of the floors will have to be increased by means of a floating anhydrit floor layer on insulation of some centimeters; alternatively the sandwich floor would have to be integrated with a top mass layer.
- For the acoustics in the large rooms ample acoustical absorbing finishes have to be provided. The choice of the wall and façade panels at the outer position of large cantileverings and recesses and the narrow dimensions of the floor fields has to be restricted to lightweight panels as the above mentioned sandwich types, however, resistant against a lower wind loading and interior sideward loading. Concrete infilling should be avoided seen the large cantilevers.
- For a permanent Maison d' Artiste built on one site an insulation layer, composites reinforcement and a stucco-like finish could be chosen. If, however, the Maison should be demountable, the choice would go into the direction of prefabricated, de-mountable and re-mountable sandwich panels: a metal skin or an composite skin highly resistant to the damages during transport and re-building.

CONCLUSIONS AND IMPLICATIONS

From the aforementioned analysis and brainstorms a number of conclusions can be drawn, which were Mick Eekhout's recommendations to the Van Eesteren (EFL) Foundation answering their request for buildability of the Maison d' Artiste. The original report was handed over in 1999. This text has been translated in 2015 to accompany the exposition of the scale 1 to 5 Prototype built by my TU Delft students. Hence the text is not only translated but in its content also updated to function in this book on the Maison d' Artiste Prototype. Building the design in real scale has as a consequence that the new building again will be a manifestation of the enormous theoretical impulse De Stijl gave to the world architecture. Logical to think ahead on an explosion of this fact in the Centre Pompidou in 2023, 100 years after the making of the original model. Further I have the following conclusions:

BIG STEP FORWARD FROM MODEL TO BUILDING

The zero order question has to be posed whether the design of the model that had an important influence on architecture since 1923, has to be followed by the actual realization of a material building. Theoretical boosters have their function, too. The Maison d' Artiste played a major role in the development of architecture of the last century. When literally the model design would be built, a large number of inefficiencies will become public and lead to disappointments. Inefficiencies as the model was only a sketch design, nothing more. When developing the design further with functional and technical adaptations to be suited for use in the century to come, the design would not be the original design but an arrangement by a contemporary architect. It would reduce the mystical gloom that the non-built and even destroyed model has in architecture. For Van Doesburg and Van Eesteren the Maison was less the first step towards a real house as its intention was more of an exercise in space a token of the message they had for architecture in view of the vision of De Stijl. Although Van Doesburg saw the ground plans as an ambitious way of life together with Nelly van Moorsel, the oversize of the rooms associate with the fata morgana character.

MODEL 1 TO 5

More in line with the model making it would be better to honor Van Doesburg and van Eesteren with a model or prototype execution in scale 1 to 5, made in stainless steel and glass, coated in the designed colors as a spatial sculpture in a museum or in a public space. Or in an environment for the education of artists and architect. The Dutch Maison d'Artiste prototype model, which was the work of my architecture students, would later stand from January 2004 to May 13th 2008, the day of the Big Fire of Architecture, at one of the entrances of the faculty. From 2009 up to 2013 it stood at the foot of the temporary Architecture faculty. It was removed after a discussion between the then dean and Mick Eekhout, saying that the Maison d' Artiste did not have a building permission. It is now officially positioned at the TU Delft campus. It shows that the suggestions from 1999 can be experienced. The model dimensions of 4x4x4 m³ still are impressive. One can

walk around it. Also it would be possible to build a unique sculpture or in multiple form so that the prototype could carry the De Stijl message on different places in and outside of The Netherlands.



FIG. 25 Prototype at the entrance of the former architecture building

LOAD BEARING STEEL SKELETON WITH COMPOSITE SANDWICH PANELS

Indien toch het plan zou worden doorgezet om het maquetteontwerp te materialiseren als gebouw op ware schaal in de werkelijkheid van de 21 eeuw, dan verdient het aanbeveling de constructie uit te voeren als stalen skelet van vierkante kokers met interne elkaar snijdende raveelbalken in de vloeren boven en onder de hoekkolommen, teneinde de verticale verspringingen van de ruimteblokken te kunnen realiseren. En met stalen sandwichpanelen als vloeren en aluminium sandwichpanelen in de wanden.

INTEGRAL OR DEMOUNTABLE TRAVELING 1 TO 1 EXECUTION

In consequence with the idea of the authors to show a model to the world, it would be consequent to show the ambitions of De Stijl in a moveable or demountable building. One could think on a temporary site on a World Exhibition. In that case the primal question to build it in Amsterdam or Rotterdam can be omitted. Also in this case a demountable steel skeleton would be in place with prefab panels for floors and walls and facades. The electrical installations have to be made in a plug-and-play modus.

The experiences in offshore industry how that buildings of 20x20x20 m³ indeed can be prefabricated and shipped out over water and over a restricted distance also on land after the harbor. It brings forward the idea that the Maison d'Artiste could manifest itself on different places in the world near harbors. So a traveling exhibition with the message of De Stijl can reach a larger public.



FIG. 26 Mammoet would later transport a complete office building over water from Zwijndrecht to Dordrecht, 30 km

IMPLICATIONS FOR OPTIMIZING THE INTERIOR

There are three major implications for the interior when developing the Maison d'Artiste to function as a building:

- The ground plans will have to be adapted for use as a house or a small museum. The contemporary use of houses and the technology which serves it, has been developed in the last 90 years. The traffic spaces have to be adapted, the entrance area enlarged. The room heights are wild and only a rich man can afford such a house.
- The really built house could per definition be used as a house and atelier for an artist or a family in line with the original set-up. Many monuments are used in their original form and people have to adapt to the material environment of a monument. Likewise this counts for this non-build monument. A curious and unique construction to live in.
- The collection of spaces is may be better usable for a small museum. In which case the entrance is too small, the entrance hall too narrow for groups of people, the stairs are much too small, the landings are too narrow and the stairs do not land on the floors. And an elevator is dearly missed.

There are more secondary considerations that appear on the table after one has decided to go for a real scale building. The inner rooms have hardly any visual connections. Reason is the material core. All doors to be fully glazed and interior glass room divisions to get as much spatial connections as one can get. The spatial character that makes the exterior so surprising was not at all studied in the original model. So the design will have to be adapted in this sense. Not one thought in 1923 was given to services and installations, so that these have to be developed and integrated in the floor and wall / façade sandwich packages. The current central tower was most probably based on a chimney, which is too small for services, to act as the central stability tower and contain the elevator.

3D VIRTUAL REALITY

In order to improve and develop the interior spaces of the current design, the way forward is digitally by making a complete digital model of the exterior and interior spaces, to be able to walk through the spaces and around the digital artifact and to comment and improve them. In doing so improvements can be made in spaces and no doubt a contemporary arrangement can be made.

One step further and a similar CD-Rom can be made of the best designed situation, like Victor Veldhuijzen van Zanten has presented to the EFL Foundation in March 2005, together with a description. This digital tour in and around the Maison d' Artiste could be published internationally, on the internet. For students in Communication & Marketing it could be a graduation project. In that case it is even faster around the world than the tiresome building and luring of international architects to the really built Maison d' Artiste in The Netherlands.

03 RECONSTRUCTION OF THE ORIGINAL GEOMETRY

By Leendert Verboom, Joris Braat en Mick Eekhout

CHALLENGE FOR ARCHITECTURE STUDENTS

In 1999 a second chapter was written as a report for the Van Eesteren Foundation on the buildability. Mick Eekhout's conclusion was that a 75 year old stimulating dream would be destroyed when the Maison d' Artiste would be built, either as the original with the inherent mistakes in the interior or as an adaptation or arrangement by a contemporary architect. It would be better that the dream remained a dream..

At the same time the structural problems of the Maison d' Artiste were quite challenging for students in architecture and building technology. From 1999 to 2004 in the Faculty of Architecture TU Delft a study module in the 2nd study year, now called bachelor, was organized and called 'Production & Building'. Students could work in groups of 15 and could choose a building out of a series of 25 recent projects. This chosen building had to be stripped, de-materialized and then the educational challenge was to re-materialize [without touching the architectural spatial design] with new materials for the project. So the challenge was to accept the spatial design, to materialize this design and work it out in groups of students. We decided that one of those 25 buildings could as well be the Maison d'Artiste, never built and without need to de-materialize. Three groups of bachelor students under guidance of Leendert Verboom did an attempt to materialize in concrete, in composites and in steel. Especially the structural design was extremely difficult with the cubical volumes twisting over into 2 directions. The models made by the students at that time showed this also.

Three groups of Bachelor students under guidance of Leendert Verboom did an attempt to materialize the design in concrete, in composites and in steel. Especially the structural design was extremely difficult with cubical volumes twisting over two directions. The four groups of students worked in 2000 up to 2003, in groups of 16 and 17 students, 69 students in all. The situation around the subject of the Maison d'Artiste is complicated. There was a lot of opposition from the regular study supervision. As a result there was no regular space, no desk computers, no budget, no storage, no regular study module code: it seemed a tramp journey on a ship in wild sea with only enemy harbors. And it was. But the captain set the destination

and the navigating officer managed the sea route and the sailing crew. From the beginning this study module had an extra gloom of a cultural purpose. Leendert Verboom even proposed a complete building in scaffolding on the central Market Square in Delft, which Mick Eekhout torpedoed immediately.

Verboom was also fascinated by the Japanese art of 'Manga' [Japanese comics] and introduced this philosophy of imaging to his students. They discovered that Karl Peter Röhl, student of Theo van Doesburg at the Bauhaus School in 1922, had made cubical assemblies with metal 'passe-partouts', metal frames that also were present in the Model of the Maison d'Artiste one year later. The complete study modules were recorded on a CD Rom and a CD booklet. Each group of students worked as a total group, a project with roles of technicians, historical analysts, construction and structural designers, managers, etc. The group was largely self-studying, almost autonomous from the regulated educational supervision. It led to a very close collaboration between the students.

Students at the time were almost proud of only studying 28 hours per week and obtaining their diplomas this way, having ample time for a job as a waitress or a shop supervisor to earn money for drinking their regular beers. The faculty of Architecture with its 3000 students is known as a diploma factory. This module changed that for most students involved. The better students chased each other and were 40 to 60 hours per week working. Of course it is not only the quantity that counts, the quality is even more important. The aspect of culture, the expectation of an almost impossible mission was a great challenge to intensify the mode of study for many of these students. In the last group one excellent 2nd year student, Joris Braat, developed himself as the leader of the re-construction team of the geometry. At the moment of writing this book, in 2015, he is working as an independent architect in Greece, not the easiest country for an architect at this moment in time. And he is still used to work 60 hours per week to achieve his high quality houses.

Another problem was that the project had to be finished. It was complex and the study duration exceeded the regular study time. Even after this period a group of students (not all, to be honest) was surprisingly enthusiastic, finishing their work in evening hours and weekends. They were at the end rewarded with extra study credits. Like all well documented study modules, a record of what went right and what went wrong, which miscommunications caused inefficiencies at an annoying scale, everything happened like in a normal building project. In such practical projects in reality this also happens when a group of inexperienced engineers work together in a new challenge. Second year students were plunged into the wild waves of the sea and learned to behave in these processes early in their education. The main insights and conclusions were: interactive study, communication with the supplying industry, a 24 hours study, an exploding coat-rack function sending students outside the faculty of architecture from education to research & development and a life-long learning.

Interactive study is a hot issue. Without the help of other faculties and other external disciplines one cannot educate complete, innovative engineers and the Maison d'Artiste Prototype could not have been reconstructed as it is now.

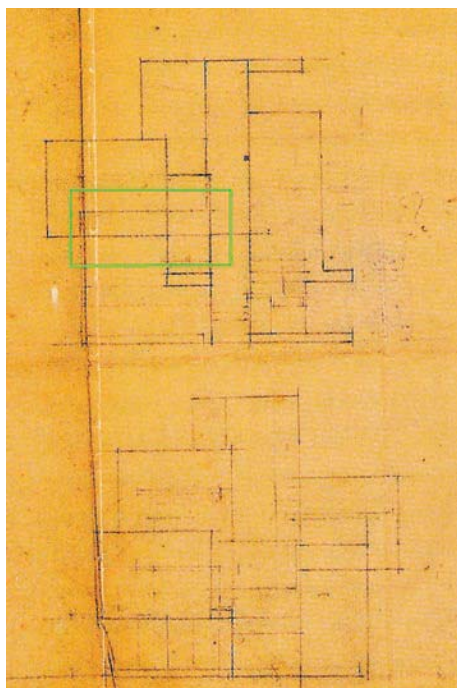
Communication with the industry has always been a doubtful issue in this debate. The university is naturally a research environment, yet in the faculty of architecture research is always connected to social issues. The industry can supply useful expertise and the university is in its turn the domain for [more] fundamental research. Together they can sponsor and support prestigious projects like this one.

Studying is not a '9 to 5' job but a continuous process of insights and moments. Students and the university should adapt to this phenomenon and the latter should enable it. Because this was a project that contained different subprojects, different levels needed to be addressed.

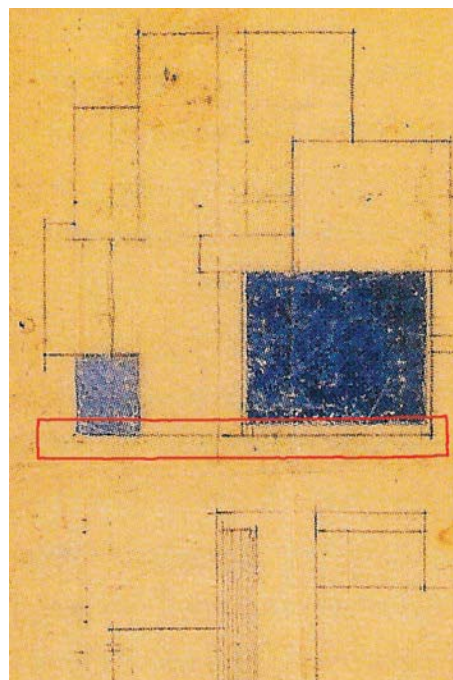
In the experience of the students the demarcation between bachelor and master study was subordinate to the process of learning and in this case a group was as strong as its strongest link. The coat-rack function implied that the realization of the Maison d' Artiste was not a goal on its own. What was important was the large diversity of research areas this project supplied: from culture, realization of buildings, building materials to scale, color and finally education evolution. Education evolution meant, amongst others, that the second year education lead to ground-breaking research. Yet this was not possible without the work previous done by other students. Only if the results or previous groups are known and examined new stapes can be made in order to come to higher insights. These characteristics define the concept of 'Total Education'.

The third group was also the last group of students of this 'Production & Building' study module. We decided to combine this study module in the 2nd year with the prototype module of the 3rd year. In this Prototype module a material prototype was made in the Prototype Laboratory of the Chair of Product Development. Usually it was a part of a façade made in groups of 5 students. The idea came up to spend the entire group of 24 students to make an 1 to 5 model of the Maison d' Artiste. On this point the connotation 'model' changed into 'prototype' because of the Prototype Laboratory, although it was not a prototype in the literal meaning of the word, as there was no intention to make multiples. The multiples were suggested in 1999. It remained actually a scale 1 to 5 model. But for the students it was a prototype and for cultural history it would be a large scale [1 to 5] model.

The 2nd year study module was to be followed by a 3rd year study module of the same students, one year later. For this reason the geometry had to be absolutely clear. For this group of students Victor Veldhuijzen van Zanten was invited by professor Mick Eekhout and attracted to be one of the co-mentors of the group. The third group of students studied first the different geometries in order to be able to make a very accurate scale model. It turned out that all the available data differed too much from each other. The conclusion was that it was impossible to make a final model. The data were contradictory. They had been made in different times by different authors. The elevations, the 'contra-construction', the plans and the cardboard model of 1984 were all different in geometry. This group of students decided hence to work on the reconstruction of the original geometry. For this reason the original photographs were the best base, not drawings, plans or the contra-construction.



1



2

FIG. 27 Facade drawings on transparent paper of the Maison made before building the model

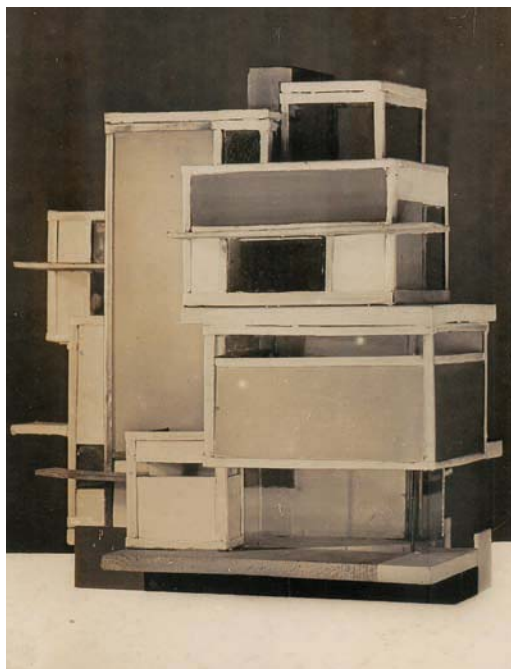


FIG. 28 One of the photographs from 1923

The same group also discovered that the coloring, the colors on several positions in the different data was too different to accept the color spread of yellow, red and blue and black. So a second group of students was to be formed around the topic of reconstruction the original color scheme. For this reason Monique Suttorp was invited as a co-mentor. She had analyzed and built with others the atelier of Piet Mondriaan a few years before, resulting in an exhibition in the Exchange of Berlage, Amsterdam.

The idea of a prototype scaled 1 to 5 as Mick Eekhout had suggested in 1999 in his feasibility study would result in a model of 4x4x4 meters. This size is big enough to experience the spatial composition; it is small enough to do a study into possible structural problems. The prototype could be dismountable and transportable so more people could enjoy and learn from it. To do so, first a number of things had to be examined.

1.09 INFORMATION FROM THE ORIGINAL DESIGN

SURVIVING MATERIAL OF THE MAISON D'ARTISTE

To reconstruct the original measurements of the Maison d'Artiste all available material was studied first by the last group of students. Key questions were if the material really dated from 1923, and if the material was reliable. At various institutions (NAI Rotterdam, National Library RKD The Hague, Central Museum Utrecht) eventually a lot of information was found. A total of eight photos, four plans, four façades and a color scheme drawing were recovered.

ANALYZING THE INFORMATION

Again with the new group of students, not all information proved to be consistent. Quite often, the floor plans did not match the model, as did the façade drawings. The plans were confusing, as they did not take into account height. The façades were incomplete and were more useful to create a global image rather than to extract accurate information.

As can be seen in fig. 27, the entrance volume has glass windows surrounding the total volume. This is also shown in the plans. On figure 4, the photograph diagonally taken with the staircase in the centre, the staircase is connected to the entrance volume. These two features cannot be shown in one plan, as they are not on the same height. If it was decided to produce a plan showing the glass windows, the shed located above the staircase should have been shown. This confusing way of drawing, is applicable on all four plans. The façades contain information about how the surfaces of the volumes are organized themselves [windows, different colors]. Similar incorrect drawings like in the plans can also be found in the façades. Instead of drawing a full façade, volumes that are positioned in different depths are displayed in the same drawing.

APPROACH OF RECONSTRUCTING THE DESIGN

When we look at what Van Doesburg and Van Eesteren used as primary means of expression for the design of Maison d'Artiste, it's obvious that it was the model over the drawings. Therefore, the base for reconstruction was the model. Not all areas of the Maison d'Artiste are covered by photo's, though. Those areas had to be completed by using information from the plans. These may be inconsistent when it comes to heights, but the basic geometry of the volumes is present. The façade drawings proved to be incomplete and not less reliable and were consulted only if the model and plans didn't suffice. Finally, personal interpretation was only be used as a last option. This gives next hierarchy in consulted sources for the reconstruction of the design:

- 1 photos of the model;;
- 2 plans;
- 3 facades;
- 4 personal interpretation.

1.10

DERIVING MEASUREMENTS FROM PHOTOGRAPHS

THE BASICS OF PHOTOGRAMMETRY

Photogrammetry was the means to define the base measurements of the construction and can be interpreted as 'deriving information from photographs'. Information like geometry and allocation can be found when certain information is added to a photograph. Photogrammetry is based on the principle of making multiple photographs at different angles and adding known information to those photographs in order to extract unknown information.

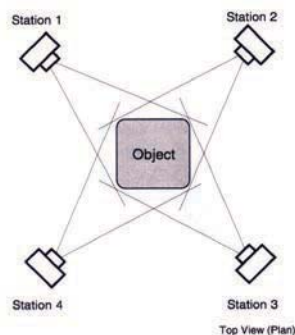


FIG. 29 Position of camera's around an object for photogrammetry

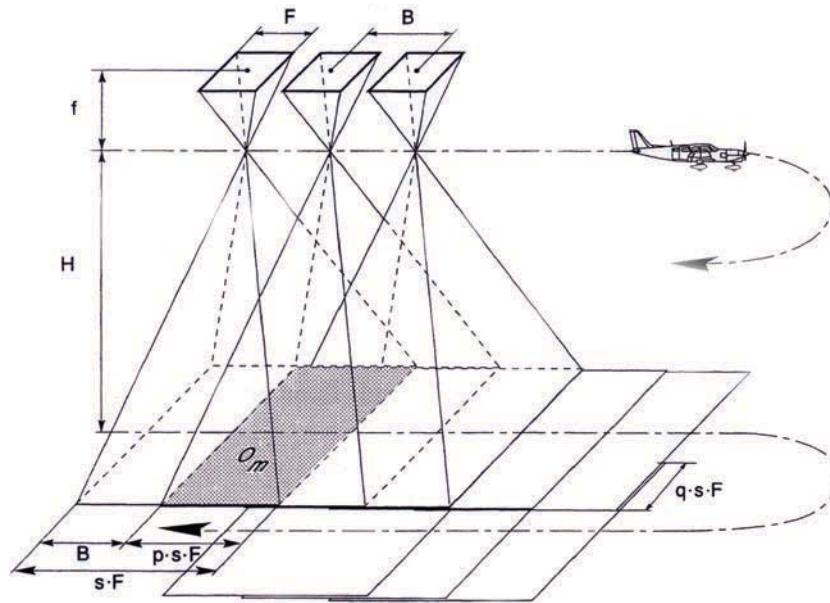


FIG. 30 Geodetical scheme of airborne camera's and the mathematical principle

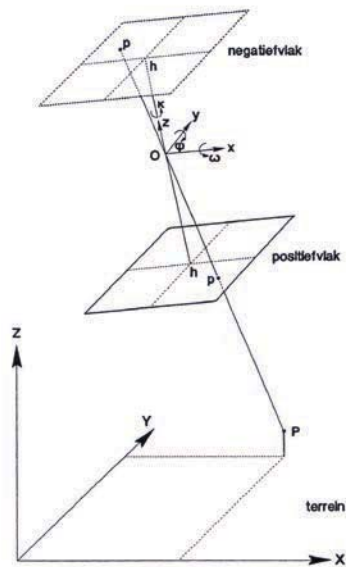


FIG. 31 Geodetical scheme of airborne camera's and the mathematical principle

It's crucial to be aware of the focal length and the orientation of the camera. When this information is known, shape and location of objects on the images can be derived.

Fig. 30 and 31 show a camera that is making an image of point 'P'. It is located in its own X,Y,Z grid. The image of P is called p. This image can be in front or behind the camera (if behind, the image p is rotated). A basic rule is that P, O and p must be aligned. It's a light ray and therefore straight (unlike sometimes when an image is made at great heights). The optical center of the image is h (Oh having a 90 degree angle with the image). This projection does not create a 3D but a 2D image. In order to create a 3D image of P, a second camera has to be introduced at a different angle. Now that two cameras are making an image of P, the same basic rule is applicable. O,P and p have to be aligned. This rule goes for both cameras, so O,P,p and O[2],P,p[2].

In practice perfect alignment will never happen due to inaccuracy, but when enough photos are taken the distances of the light rays are small enough to give a sure verdict about the location of P.

Adding information of the object itself can be very useful to locate other objects. If there would also be an object K, covered only by one camera and not two like P, defining that P and K are on the same height (same z coordinate, xy plane), would give the 3rd coordinate. Another example is that a line can have a certain angle or that a line is vertical, horizontal or parallel.

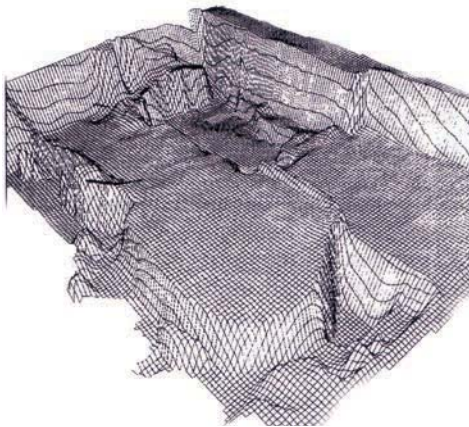


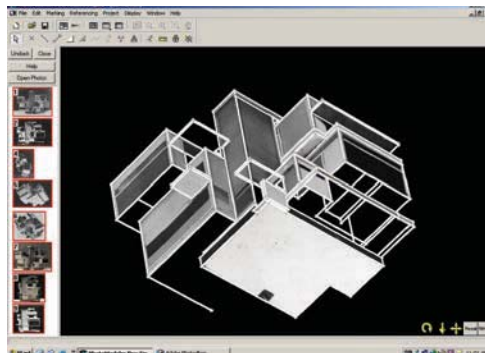
FIG. 32 Resultaat van 3D survey uit vliegtuig via vlakke foto's en digitale integratie

ADVANTAGES

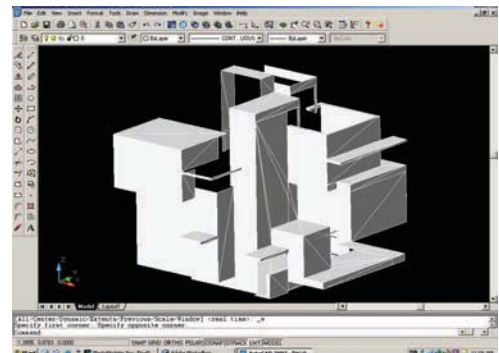
The Maison d'Artiste has some features that are in favor of using this technique. For example, the whole design is based on 90 degree angles. The model which is made by hand and probably with a lot of pressure due to lack of time, may not have presented this exactly. Using photogrammetry on the Maison d'Artiste, all angles were assumed to be 90 degrees, an obvious step into abstraction.

A total of eight photographs is available. It is essential that a strong perspective is present in the photographs. Three photographs possess a strong perspective. Five others do not. If a strong perspective is absent, two of the three vanishing points cannot be analyzed in their exact position. In other words, their location is on a horizontal line. If a vector joining two arbitrary points A and B is pointing in reality in the X-direction [from front to left on the photograph], it could very well seem to be pointing in the Y-direction [from front to right on the photograph].

This does not favor the accuracy of the 3D-retrieval of data. The three photographs that possess a strong perspective, are taken from three totally different directions/angles. This is positive, as more secure information is present.

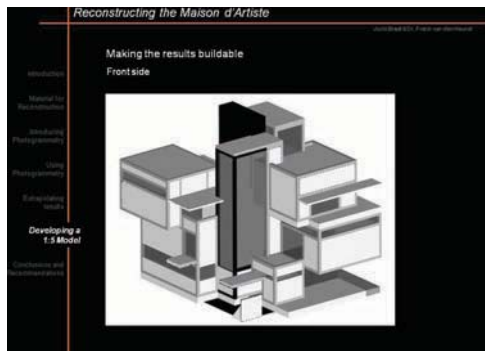


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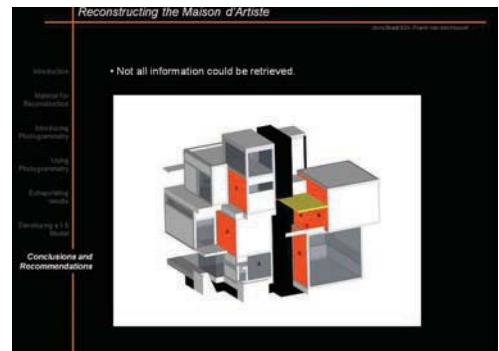


2

FIG. 33 Isometry and reconstruction of the geometry



1



2

FIG. 34 Orange areas which are not covered by the black-and-white photographs from 1923

DISADVANTAGES

The eight photographs that are present, do not cover the Maison d'Artiste completely. The missing areas cannot be retrieved through photogrammetry. There are also areas of the Maison d'Artiste that are covered just by one photo. This impairs the accuracy of the reconstruction. More photographs of an area mean more accuracy. Concluded was that a complete reconstruction of the model through photogrammetry cannot be made fully by only analyzing photographs. Another aspect is the way the photographs are made. Next to fully covering an object, the angle from which an image is made is very important. An ideal situation for making photographs of an object to be able to retrieve 3D-information from is displayed in Fig. 38. The camera stations shown have to vary in height/angle in order to get a strong perspective [or a second ring has to be added].

The photo's made of the model of Maison d'Artiste were taken to show the most interesting sides of the design, not with the intention to make a reconstruction eighty years later, of course. Another disadvantage is the lack of knowledge about where and at what angle the camera stations were located. Nor do we know what the focal length of the lens which was used. Calculating them is possible when using the location of the vanishing points, but this is obstructed by the lack of perspective of many photographs. Therefore, calculating the focal length cannot be done with high accuracy. Assuming a certain focal length can give satisfactory results anyway, though.

1.11

APPLICATION OF PHOTOGRAMMETRY

This chapter gives a description of how photogrammetry was applied to the Maison d'Artiste. Finding the right software was a first objective. Two different programmes have been used initially, Canoma and Photomodeler software to define the used focal length. The results and conclusions will be given for each program. Canoma was interesting but gave insufficient results.

PHOTOMODELER

Photomodeler Pro [4.0] based on Windows, uses a camera as an input device (unlike Canoma) and is able to extract 3D coordinates from 2D photographs. By tagging features of interest on the photographs, Photomodeler produces a 3D model. The basic operation will be explained next. Camera positions, direction as well as focal length have to be calculated first, this will be explained afterwards, followed by the measures that have to be taken in order to successfully introduce an image into the project. Furthermore additional features like lens distortion and principal point position will be explained. Finally the results and their accuracy will be discussed.

BASIC OPERATION

Photomodeler is based on referencing same points that appear on different photographs with one another. For example point A on volume D is visible on three photographs. Therefore this point will be referenced with two other photographs. When calculating, Photomodeler will process point A with three photographs/cameras. Next to referencing points of interest, characteristics of an object can be added. In the research of Maison d'Artiste the following characteristics were used:

- A line to be horizontal into x-direction;
- A line to be horizontal into y-direction;
- A line to be vertical [z-direction];
- Surface to lay in a xy-plane;
- Surface to lay in a xz-plane;
- Surface to lay in yz-plane.

These characteristics are used as constraints and will be processed in that way. Each point of a volume was linked to the same points that appear on the other photographs. A good understanding is necessary of how the Maison d'Artiste is built, as sometimes one is easily fooled.

CALIBRATING A CAMERA

Before being able to process all the to the photographs added data, direction, distance and focal length of the cameras have to be known (each photograph has it's own camera). The camera that was used making pictures of the Maison d'Artiste, is unknown. Therefore Photomodeler will calculate a certain camera direction when enough points are add. These points are referenced and a 3D environment was created. The first attempt to calculate the focal length failed due to lack of perspective, next the focal length was assumed and adjusted to the results that Photomodeler gave, ranging from 500 mm to 1200 mm. These lengths are much larger than in conventional cameras. The reason here for lies in the fact that the photos act as the image on film. Furthermore it's logical to assume the optical center or principal point is always in the exact center of an image. Most of the times this is the case, but when dealing with old pictures, this doesn't have to be the case. Van Doesburg, for example, cut later the photographs made of the Maison d'Artiste so that they would fit well in his magazine 'De Stijl'. Because of that one photograph was found to have a significantly different principle point then the center of the image. This has been taken into account in Photomodeler.

RESULTS

After all steps had been taken, Photomodeler processed the data and a 3D environment was created within an X,Y,Z grid. All cameras were given angles and distances to the model. The model is without scale since none of the measurement of the original model is known.

ACCURACY

With the results of the model, the question rose what the level of accuracy was. There are some ways to check this. Photomodeler has some features that qualify this. The accuracy can be valued by checking the 'tightness' of the referenced points. The ray tightness indicates how well all the 'light rays', that define a 3D point, intersect. Because of inaccuracies in camera orientation and point marking on the photographs, the light rays will not intersect perfectly at one point in 3D. The ray tightness number indicates how 'well' they intersect. The smaller the number the better the intersection. The number is given in a percentage of the total project size. The average tightness is approximately 0.7%, with a few points going to a maximum of 1.2 %. Another way of checking accuracy, is the 'marking residual' display. When operating real time in Photomodeler, one can check if all the points marked are processed correctly. This display shows lines pointing at a certain location. This location is where Photomodeler thinks each point should be, judging from information given from other photographs. Apart from inaccuracies, this marking residual display also shows the crookedness of the model. The shed on the top of one of the photographs was not straight, Photomodeler shows this by pointing away from where it is marked in the photograph. It does so, because information was added [constraints], saying that it's a horizontal surface, connected with a 90 degree angle to the main volume. At any given time, processed statistics about the project of retrieving the original geometry can be requested. Photomodeler gives an estimate of the accuracy as a whole.

CONCLUSIONS

Reconstructing the Maison d'Artiste through photogrammetry was possible, though not completely, due to lack of photographs of the back. The many camera calibration options and the possibility to add constraints make this a highly suitable software package to be applied to the Maison d'Artiste. Not knowing the original camera used proved not to be a problem of such magnitude the project could not be completed. But the accuracy that has been achieved is quite high. The average tightness value of 0.6 % stands for a maximum possible inaccuracy of 24 mm [for the 1:5 scale Model, 4x4x4 meters]. A line possesses a start and ending point. Therefore the inaccuracy of a line is a maximum of 2x24 mm [48 mm]. When this is translated to the real size of the Maison d'Artiste [20x20x20 meters] this stands for a maximum of 120 mm [240 mm maximum for a line]. Although the average value is 0.6 %, there are a few cases where a tightness is achieved of 1.2 %. It can roughly be stated that those points that have a relatively higher tightness value, are referenced in fewer photographs and/or are in such a place where there's not a strong perspective. These areas are obviously at the back of the Maison d'Artiste. The 3D model [with the textures of the photographs attached to it] including its camera positions, is also highly suitable to continue a research into the colors used in the Maison d'Artiste.

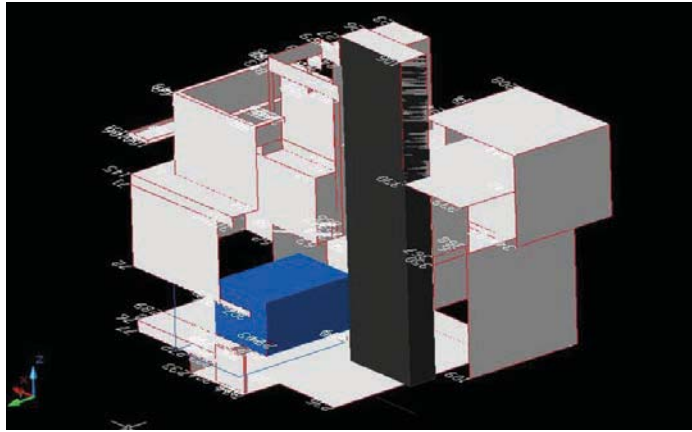


FIG. 35 Reconstruction of volumes at the back of the model, without proper data from the photograph itself;

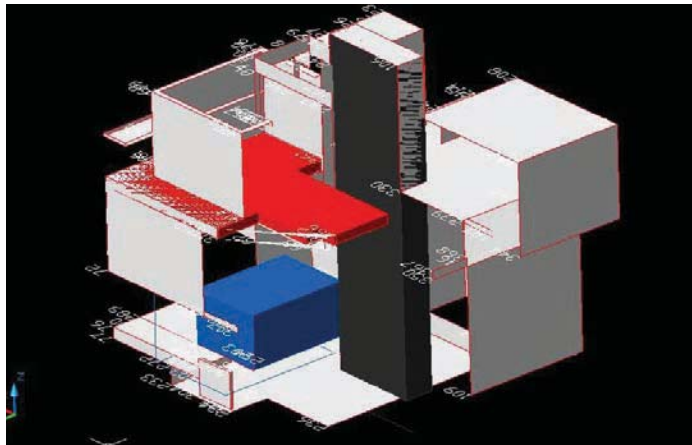


FIG. 36 Reconstruction of volumes at the back of the model, without proper data from the photograph itself

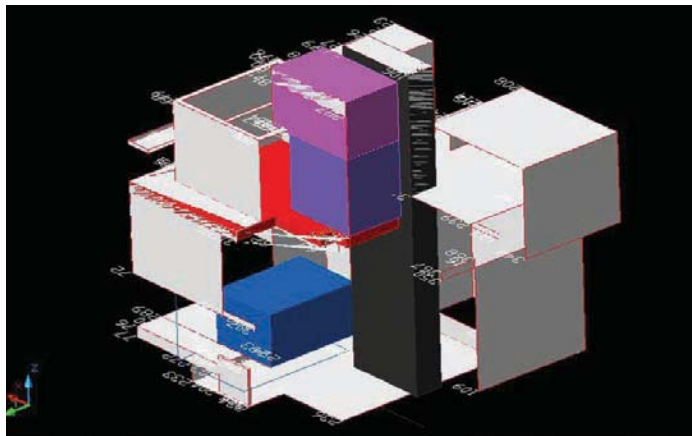


FIG. 37 Reconstruction of volumes at the back of the model, without proper data from the photograph itself

EXTRAPOLATION UNKNOWN AREAS

At this point, the 3D model received through photogrammetry seems only to cover 3/4th of the model. At the back of the model incomplete planes are found which were not photographed or visible. Yet, there is still hidden information that can be extrapolated. The final missing parts of the 3D-model have to be interpreted through other means. It was felt as an abstraction, but much in line with De Stijl thinking.

EXTRAPOLATING

As mentioned before, all angles of each volume are assumed to be 90 degrees. This means that when at least one of each X,Y,Z co-ordinates of a volume is known, an entire volume can be recreated. There are many situations where this is applicable, varying in the amount of known X,Y,Z coordinates. This concerns the long vertical volume ('chimney'). The entire upper horizontal surface is known, as well as a part of the back side. When one looks at the plans and façade drawings, it can be seen that the volume is present throughout the whole height of the building [the z-coordinate is therefore known]. This volume can be completed. By completing this volume, accuracy has not been compromised. Therefore this volume [chimney] is a starting point for other volumes surrounding it.

INTERPRETATION

Completing all the volumes as described before was done without any major problems. Some adjustments had to be made, but these were of a small order [max. 50 mm in real built scale]. Completing all surfaces of each volume at the front side of the model was done through photogrammetry. At the back some surfaces were completed through extrapolation but this was not always possible. Using the drawings of the plans gave an indication of what was most probable, façades often were not usable for this matter. In a few final missing points of the 3D-model this way of interpreting had to be applied. As can be seen, the area surrounded by the green is not visible on either one of the photographs. This area is concerning the right side of the bathroom. A few similar examples can be given. The choice eventually made, is based upon the plans of other similar façades or surfaces.

CONCLUSIONS

The volumes of the 3D model received through photogrammetry cover around 3/4th of the design and almost the dimensions of almost all other volumes could be retrieved through extrapolation. Only one volume or object could not be retrieved this way and neither be interpreted accurately. This concerns the balcony at the back side of the guestroom. This aspect of Maison d'Artiste was left out in this reconstruction and can be completed at a later stadium. The surfaces at the front of the building did not give problems, at the back side a few assumptions had to be made where no direct information on photographs was available.

The meticulous work of research & development in reconstruction of the geometry by Joris Braat were checked by himself in building an aluminum model scale 1 to 50 of all planes. He did not distinct between frame and infill panels, but complete planes between the outer

corners and ribs of volumes. This model is shown in figure 38. The model , unfortunately followed the doom of the Maison d'Artiste models, as it was removed by the cleaners in the faculty of Architecture at the end of the semesters and has never been found back. The only photograph left is shown here.



FIG. 38 Aluminum model of the results of the geometry reconstruction model 1 to 50 by Joris Braat

04 RECONSTRUCTION OF THE ORIGINAL COLOUR COMPOSITION

By Cindy Beckers, Sanne Martens, Monique Suttorp en Mick Eekhout [red.]

In any way our research showed that the color reconstruction provided a complete different colour scheme compared with the known data. Amongst architects colors are seen differently from painters. Contemporary architects often say that good architecture does not need colors. That may have been the reason why Gerrit Rietveld came just in time not to miss the opening the exhibition in 1923 with his model of the Hotel Particulier, but knowing so that there would be no time for Theo van Doesburg to paint the model in colors, which he did not like. Even the world famous Rietveld-Schröder House in Utrecht has only modest colored elements, the facades are white and grey toned. Although Van Doesburg reacted against the grey tones of traditional architecture, the pertinent abstract colorless architecture is another line of architectural signature. Richard Meyer's architecture lives by the grace of whites. No color at all, not even natural material colors, only spatial and graphical design.



FIG. 39 Richard Meier's town hall of The Hague

COLOURS FOR AN EXPLOSIVE INTRODUCTION

The artists of De Stijl wanted to change arts and architecture dramatically starting from its foundation in The Netherlands in 1917, in the middle of the Great War. Holland was neutral, but felt the need for a new equilibrium. In many aspects of life the need for change was felt. De Stijl proposed to live in art. Mondriaan even said he wanted to live in a 3-dimensional painting, which became his atelier in Paris. For architects color is something quite else. Colours are used to pimp up a design. Mick Eekhout asked Renzo Piano in a congress debate in Sydney in 1986 if he still would have used the carnivalesque colors of Centre Pompidou [1976], now that, 10 years after, high tech architecture had established itself: The Lloyd building [designed by Richard Rogers 1978] was all greys and silvers, no colors. See figures 40, 41. Ted Happold answered in Renzo's place: "We needed to change fashion". Apparently ten years later that explosive impulse was not necessary any more. High Tech architecture was established. The same explosive impulse thinking was valid for the introduction of De Stijl as one of the boosters of Modern Architecture. The abstract colorless architecture was another line of architectural signature. Richard Meyer's architecture lives by the grace of whites. No color at all, only spatial and graphical design.

So the 40 year old and rather dominant Theo van Doesburg worked with one of his brilliant students from the Bauhaus time, 23 year young architect Cor van Eesteren. He was the painter who wanted to paint the complete environment, the other was a young and quite inexperienced architect who had its hands full managing an architectural design which was impossible to make. He came from a world of contractors. The originators of the current Dutch main contracting companies J.P.van Eesteren and Boele & Van Eesteren were his brothers. He had a little house for the family Van Zessen built in 1923 as a contract in Alblasserdam on normal terms. Van Doesburg assisted him in the choice of coloring, which for a brick house in the polder was quite unusual. So also for Cor van Eesteren the Maison d'Artiste was a dream in a new world, a 'fata morgana' never to be built, but a feast to imagine and to model.

THE IMPORTANCE OF COLOURS FOR THE DESIGN

At the Faculty of Architecture of TU Delft we looked with some distance to colors. Changing colours in different planes does not seem such a problem. The colors in the model, the contra-construction and the cardboard models from the 1980-ies did not correspond. The first statement was: 'colors'. The second statement was the color composition or the tension between the different colored planes. Especially the reconstruction of Tjaarda Mees en Victor Veldhuijzen was carefully done according to the authors who asked permission from the 85 year old Van Eesteren. Yet the memory of Van Eesteren will not have been accurate in colors, as it was not his job at the time of designing. It was not one of his passions. The colors did not have a signaling function like yellow for the kitchen, red for the living room, blue for working or anything related to this line of thinking. When comparing the contra-construction of 1925 with the Mees / Veldhuijzen 1982/1984 reconstruction of colors, it is easily seen that blue and yellow planes are changed in the music room, blue and white in the sleeping room, red versus white in the central core. Apparently Mees and Veldhuijzen did not possess the color-reconstruction and made their own arrangement, even if sanctioned by Van

Eesteren. Apparently there is a degree of freedom in choosing the colors, which certainly leads to personal interpretation and arrangements and when not stated publicly, it will lead to confusion. The choice of colors was personal and only very personally artistically sound.

But would the Maison be out of balance when the pattern of the colors would have been different? It was clearly not the 'forte' of architects, so professional assistance was called in for this study module of color reconstruction.



FIG. 40 The color spectacle of the Centre Pompidou, Paris



FIG. 41 The more monotonous Lloyds building in London

SCIENTIFIC ATTITUDE TOWARDS COLOUR RECONSTRUCTION

In line with the geometry reconstruction it was scientifically important to reproduce the colours exactly as the model had been painted in. Artist Monique Suttorp who owned an art gallery in Rotterdam 'Dutch-art', had worked on the reconstruction of the Paris Atelier of Piet Mondriaan, which was exhibited in the Beurs van Berlage in 1994. The atelier was small but impressive to visit.



FIG. 42 Exhibited result of the Piet Mondriaan atelier of Rue du Depart, Paris, 1926/1994

As a color specialist she was invited to supervise the color reconstruction team of the students. The first thing she told was that the black-and-white photographs of Mondriaan could be compared with the true colors from known a well-known Mondriaan painting. So for the Mondriaan atelier there was ample basic material, which led to a 100% reconstruction. She doubted that this degree of perfection would be possible in case of the Maison d' Artiste, where the original had been lost and the contract-construction had another purpose and were probably made not at the exact time of the model in the exhibition. So the color reconstruction quest seemed to have many hindrances from the start. The information on the base of which the color reconstruction would take place were:

- the 8 photographs of the 1923 model made by both authors;
- the contra-construction by Van Doesburg, AB 5130, probably from 1925;

And as indirect information:

- the chromatic row of colours by Van Doesburg [1922];
- the colors in the models of Tjaarda Mees and Victor Veldhuijzen 1982/1984;

The means of research were:

- the Talens standard colour scheme of 1919 and 1923;
- the PR-650 Spectrascan Colorimeter being the state-of-the-art of 2002.



FIG. 43 Talens color chart 1923

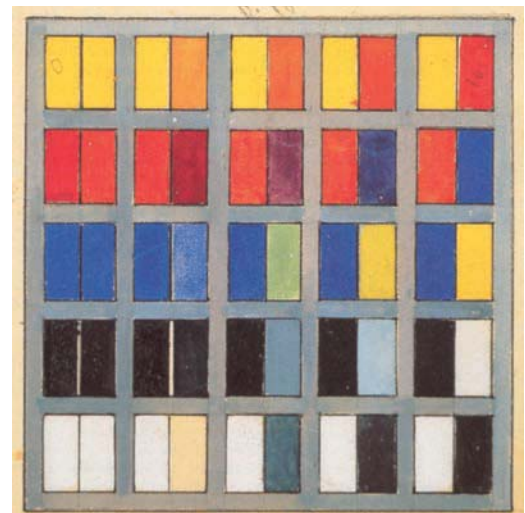


FIG. 44 The chromatic color range made by van Doesburg

The leading students working in the atelier were Sanne Martens and Cindy Beckers. The color fundamentals of Van Doesburg are described by Evert van Straaten. He explains that in a chromatic table of rows of colours the pure colors are combined with the opposite colors in [5x5] 25 pairs, later may be enlarged to [9x9] 81 pairs. He only uses pure colors for the mixing of his colors, no blacks and whites. At the time of the Maison d'Artiste Van Doesburg was still composing his Color Principles. For the research it was important to analyze whether the used colors were mixed colors or straight colors, did he use paint direct from the paint cylinders or were some of the colors mixed?

Color is a value that comes into being when a colored surface is lit by a natural or artificial light source, seen by the eye and translated in the head of the spectator. Temperature, texture, form and scale can also influence the appreciation of color. Color also has a relationship with physical well-being. Yellow and red are supposed to be 'warm' colors, blue and green are 'cold' colors. In this reconstruction the appreciative feeling of colors may not have been a motive for filling in the colors on the model in 1923, apart from attracting attention to the model.

Colors are measured according to so-called 'CIE values', established internationally in 1931 giving comparisons in artificial light, in standard geometry form, standard distance and standard light under 45 degrees between light source and spectator. Two types of meters are available: the spectrophotometer and the colorimeter. The research made use of the PR 650 Spectrascan Colorimeter. As drawings had to be measured the Colorimeter had to be mobile. The 650 is the only mobile instrument in its class.

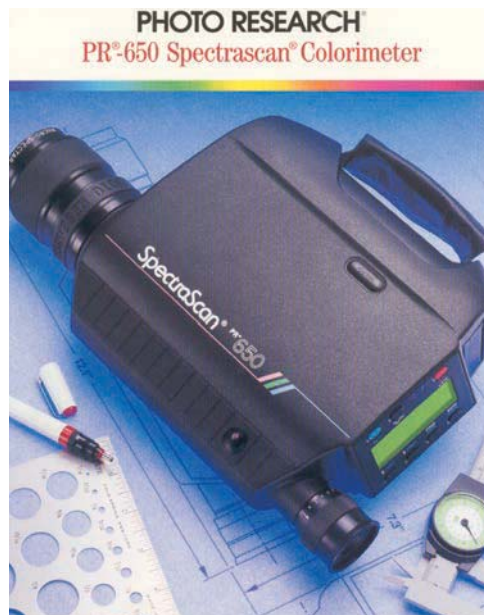


FIG. 45 Mobile 650 spectrometer

The methodology of research is focused on colors. First question was: the white to be lead white or zinc white? Lead white is gouache paint for use on paper, cardboard. Zinc white refers to oil paint, used on linen background. The photographs show cracks in the white, which leads to lead white and gouache. There are no paintings with original colors available for the Maison. The Talens color charts of 1919, 1920 and 1923. Following these charts we could reconstruct the type of colors used in the model.

On the contra-construction AB 5130 as much as 16 points have been fixed which were equal. The climatized laboratory environment was in the basement of the NAI in Rotterdam. The apparatus 650 was calibrated, occasional light was switched off. The colors analyzed are red, yellow, blue, grey and black. The color chart of Van Doesburg, even when completed between 1924 and 1926 was also used as a reference.

The contra-construction has different colors from the cardboard model of 1984.

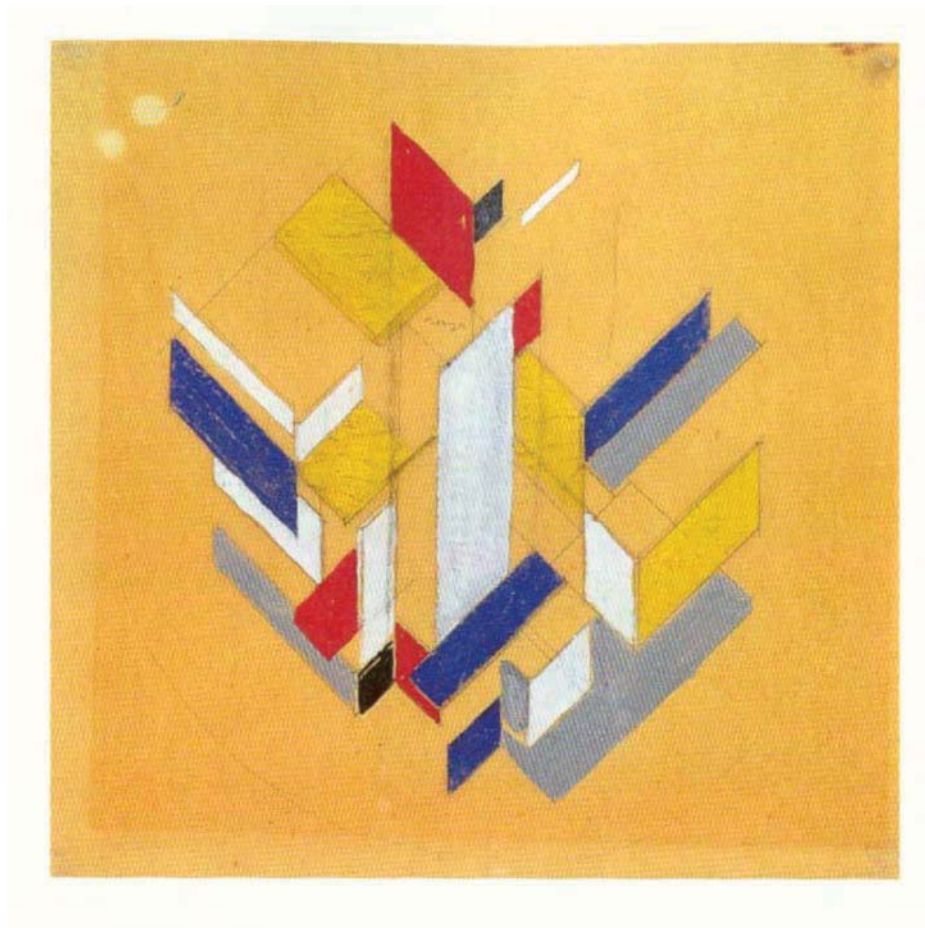


FIG. 46 Contra-construction by Van Doesburg, probably made in 1925

The second part of the reconstruction was based on the different kinds of negatives that were used in 1923:

1. Negatives used for normal photography;
2. Negatives used for portrait photography.

The big difference between the two different kinds of negatives were the darkness of the colors yellow and red. In a normal black and white photograph the color red will be the darker of the two colors, in a portrait photograph however the yellow came out darker than the red. This difference has a significant effect on the color use in the model.

By comparing the different photographs it became apparent the two different kind of negatives were used for photographing the model. This also became apparent from a letter Van Doesburg sent to Van Eesteren; in this letter he states that in some of the photographs the color yellow has become very dark. Unfortunately the original negatives are lost.

From the information is deducted that if a pane on the model is dark in one picture and light in another picture, this pane has to be yellow or red.

By using 'Color Range' on the high resolution black and white pictures one can reconstruct the panes on the model that have the same grey. By doing this for every pane and every picture it is possible to deduce the equal panes and examine which pane has the same color as another pane.

Blue and Black are the same grey-scale in each photograph so they can be easily recognized in the photographs. Using the contra-construction it is decided that the large pane on the front of the model was one in yellow. From that point the other panes can be filled in using the conclusions from Color Range. From this reconstruction it became apparent that the color red has been scarcely used, only for the balcony and the staircase. But this staircase had such a big impact in the composition that the red seemed equally powerful.

'Rendering with radiance' did not achieve the desired result and could not be applied.

The result from this research has been painted by hand (as it were) on one of the original photographs. On the illustrations the contra-construction, the 1984 cardboard model and our reconstruction are juxtaposed.

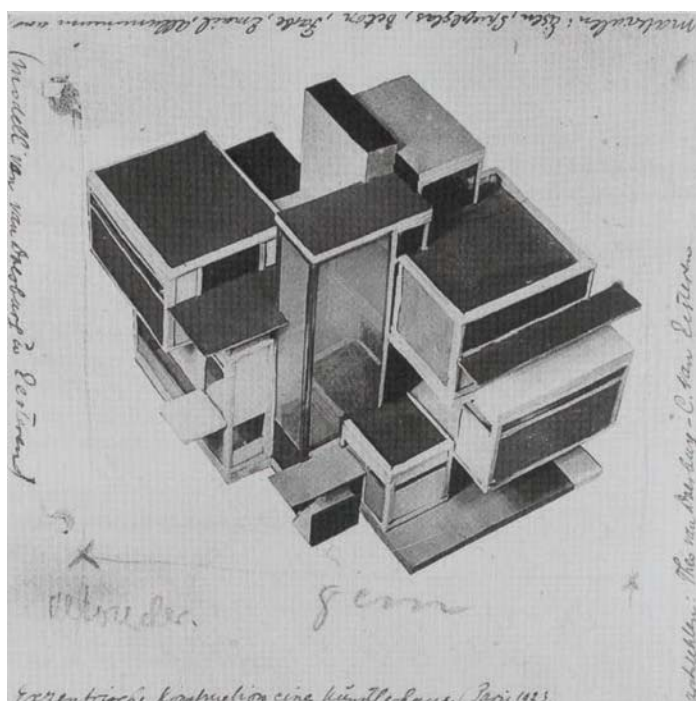


FIG. 47 Original photograph, 1923



FIG. 48 Municipal museum model, 1982

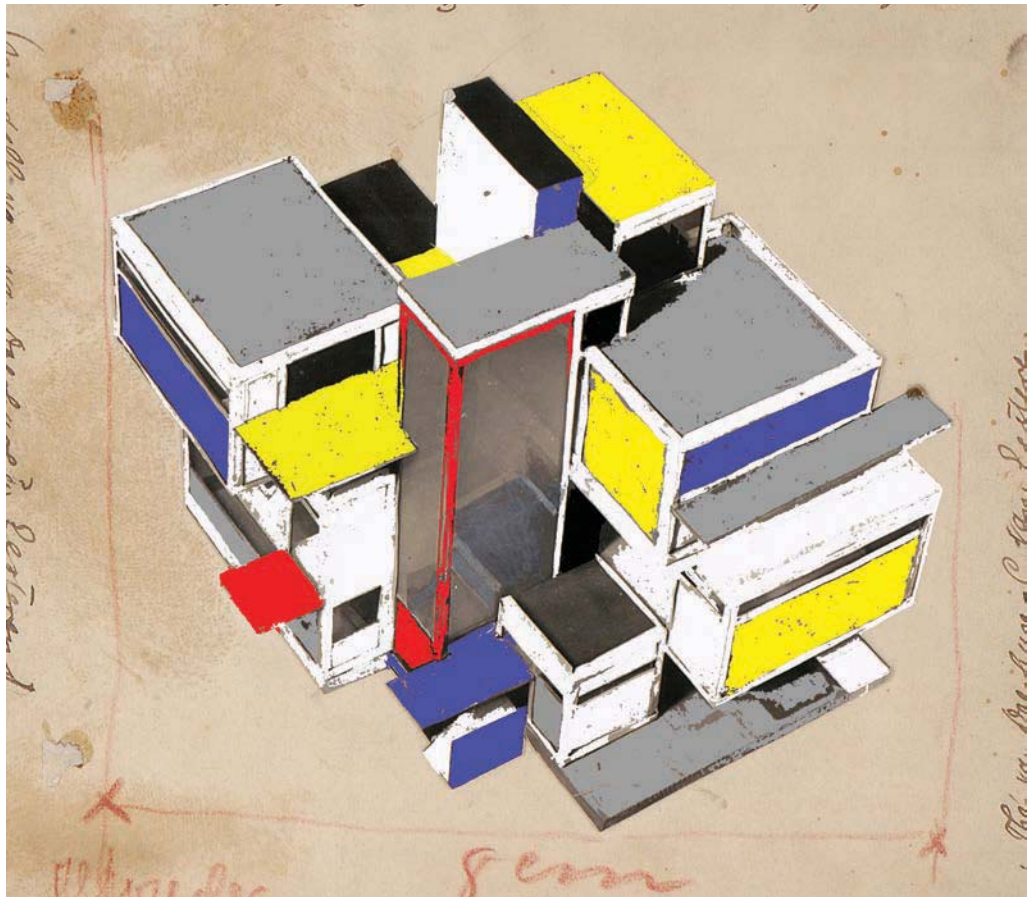


FIG. 49 Color reconstruction 2002/2003 sketched on the original photographs on the staircase side

CONCLUSION

Despite the search for the most secure reconstruction of the original situation with light, paper, color by the different methods, we have found that there are many differences between the contra-construction, 1984 cardboard model and our reconstructed colors. In any way our research showed that the color reconstruction provided a complete different color scheme compared with the known data.

The most obvious is that the hall of stairs has been painted red and not in black. This would indicate the hand of the master: no doubt a flaming red staircase will be the initiative by Theo van Doesburg and not Cor van Eesteren. For an average architect the black staircase is the solid centre of a building. Flaming red is a message: look at me! But other Yellows and Blues are changed and reds on different places. This indicated that even van Doesburg was playing with colors, after the making of the Maison d'Artiste model of 1923. Apparently the model offers many opportunities to fill in different color distributions. It would be interesting to do different color distributions with contemporary artists' experiences in colors, so that different arrangements can exist. Apparently the Maison evokes this.

The colors on the photographs have been given as a type of hand painting, to indicate that even when this reconstruction has been done as scientifically as possible, due to the unknown parameters as described above, the results are not 100% perfect, but may be 80%. It is to be seen as a warning that the colors are much different. When this color reconstruction will be done more extensively and scientifically, the results may be much different. This is the reason why the prototype has been made in white, as to enable coming generations of interested scientists to improve the color reconstruction and to apply the final colors as films on the prototype. For the publication of this book both diagonal wide perspective views were provided with the reconstructed colors. The non-photographed planes at the back side were not colored in this reconstruction, obviously.

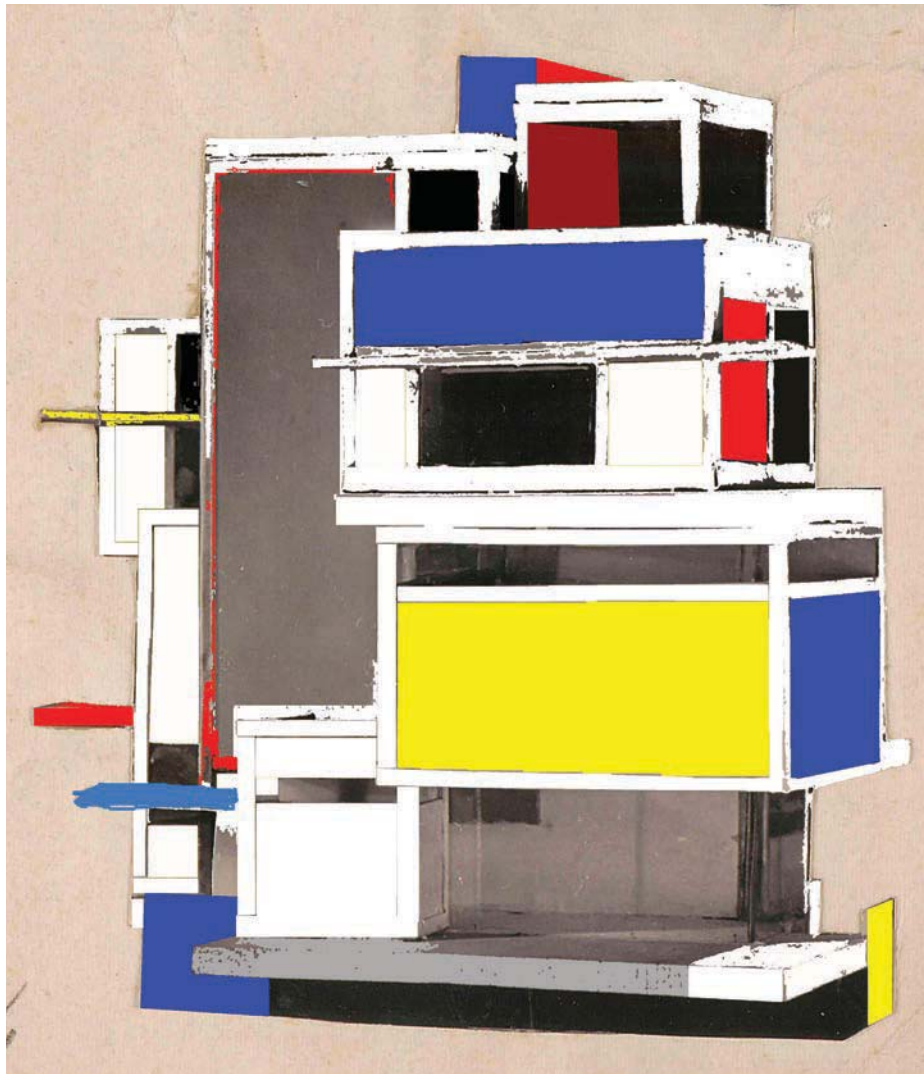


FIG. 50 Color reconstruction 2002/2003 sketched on the original photographs on the top side

05 THE MAKING OF THE PROTOTYPE

By Huub Metsch, Siebe Broersma en Mick Eekhout

The aim of the model was twofold: firstly to have the participating students confronted with the virtues of handicraft work which has been disappeared since the architecture study at TU Delft does not contain a practical work period, and to free them from the fear of cold feet as to materialization of designs. Secondly to show the faculty and dean what the purpose was of the Prototype Laboratory and the obligatory work students did yearly in the Prototype Module. In this case all 24 students would work on the reconstruction of a design that still was almost impossible to build as a building. The model would have dimensions like $4 \times 4 \times 4 \text{ m}^3$. Impressive to walk around, but too big and too heavy to be built up inside. For that reason it would have to be composed of separate cubical components that could be disassembled, transported and re-assembled where needed.

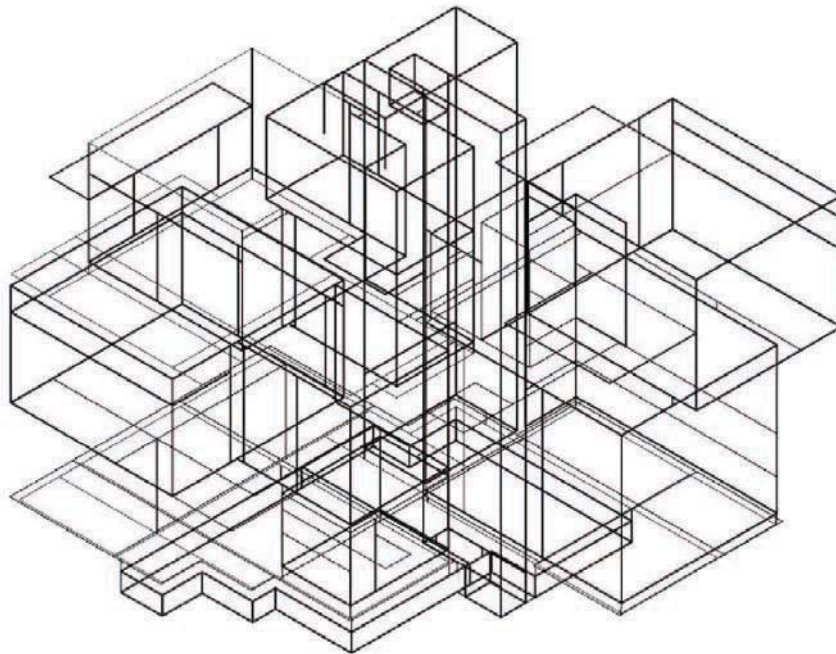


FIG. 51 Isometric wire model from the research by Joris Braat as the start of the engineering of the prototype

The material side of the making of the prototype required a number of sponsors, mainly connected to the Octatube company of professor Mick Eekhout. They gave materials [steel tubes, Trespa panels] or process activities [hot dip galvanizing] for free or at a bottom price. The work was executed by students in the factory laboratory of Octatube in Delft. A number of times the professor would bring pizza's for the students who worked from early in the morning up to late at night. The EFL Foundation [Van Eesteren, Flock-Lohuizen Stichting] contributed also financially.

1.13 DESIGN DECISIONS

After the research into the original geometrical measurements and colors of the Maison d'Artiste was done in their respective dedicated teams, the same students were one year later busy with the challenges of turning the vision of Theo van Doesburg van Eesteren into a buildable 1:5 scale model, called 'the prototype'.

The following technical design brief was laid out: The characteristic 'passe-partouts' that border the surfaces on most volumes were to be realized as a structural frame of square section steel tubes, which would then be filled in with either 'Trespa' façade cladding panels, or panes of tempered glass. Furthermore, taking inspiration from the design as an assembly of cubical shapes, it was decided that the scale model should easily be disassembled into its component blocks, in order to facilitate easy transport.

The above two design goals was believed to result in a series of blocks, the edges of which would be formed by the above mentioned steel tubes. These would then be stacked at the site where the prototype would be exhibited, the act of assembly in itself emphasizing the modular nature of the design.

While working on the basis of the principles, the students found out that these ideas were, in fact, not universally applicable throughout the Maison. Several volumes were found to have shared walls or intersect even further beyond that. To address that issue the intersecting volumes combined in such a way they formed units which were both practical to engineer and small enough for transport and galvanizing.

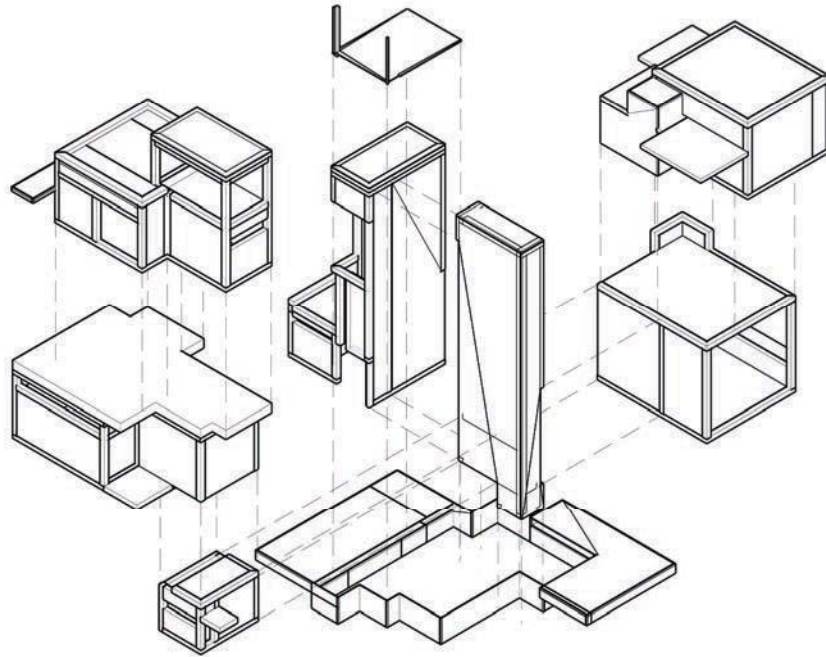


FIG. 52 Exploded view of the separate modules of the Maison

1.14

ENGINEERING AND HET PROTOTYPE

The first choice that had to be made was which the size the tubes should be that would make up the frames of the modules. Measurements for the 'passe-partouts' from the photogrammetry research varied, with an average size of about 58 mm wide when scaled to 1:5. This is close to a standard square section tube of 60 by 60 mm, thickness 2 mm. Although it was briefly considered to use tubes made in imperial measurements, none were available that were a closer match. 60 by 60 mm tubes are available with several wall thicknesses, the choice of which was tabled until after the results of the structural analysis of the design were available.

Connections between the blocks had to be designed to fit this modular approach. After prototyping and testing several alternatives the final design was the following: The steel tube of the lower module would be fitted with a threaded insert, and the upper tube would feature an opening in the side through which one would be able to access the bolt. A cover retained by a spring clip would then hide the whole connection from view. As the illustration below shows, the connection handles compression and tension forces well, but it was deemed undesirable to subject it to shear stress [= horizontal forces in this case].

In contrast to earlier attempts to design a structure for the Maison d'Artiste, that envisioned cantilevering the volumes from the central vertical blocks, it was decided that the weight of each module would be borne by the ones below it, which led to the following design principle:

Each module would rest on three of these connections, ideally each an equal distance from the centre of mass, in order to distribute the forces equally. Additionally, each module would also feature horizontal connections to the tall vertical modules, the 'stairwell' and the 'chimney', to enhance the total integrity of the Maison d'Artiste, and to avoid subjecting the connections to shear forces.

With these decisions made, development continued along two parallel tracks: One group of students would model and check the proposed structure and analyze structurally its integrity, while a larger group went on to produce the engineering and shop drawings needed for the production of the steel frames and claddings of the various modules.

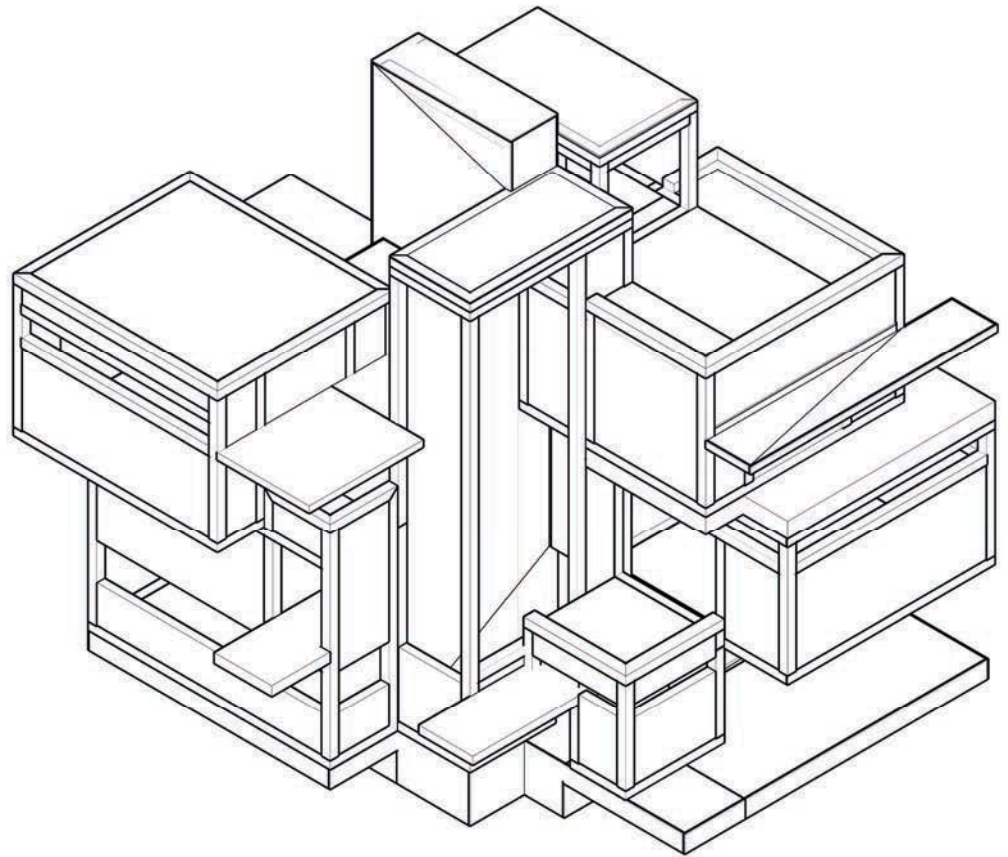


FIG. 53 3D visualization of the frame seen on the staircase side

The structural analysis of the proposed steel frame was eagerly anticipated, as the 1990 analysis of the structure by professor Eekhout had indicated globally that realizing this building 1:1 scale, with all its daring cantilevered volumes, would be a major challenge. Furthermore, as public exhibition of the prototype was desired, vandalism had to be taken into account.

So in addition to the usual forces of dead weight, wind load and snow load additional forces were added to vulnerable surfaces such as the many cantilevering canopies to simulate persons climbing onto the structure.

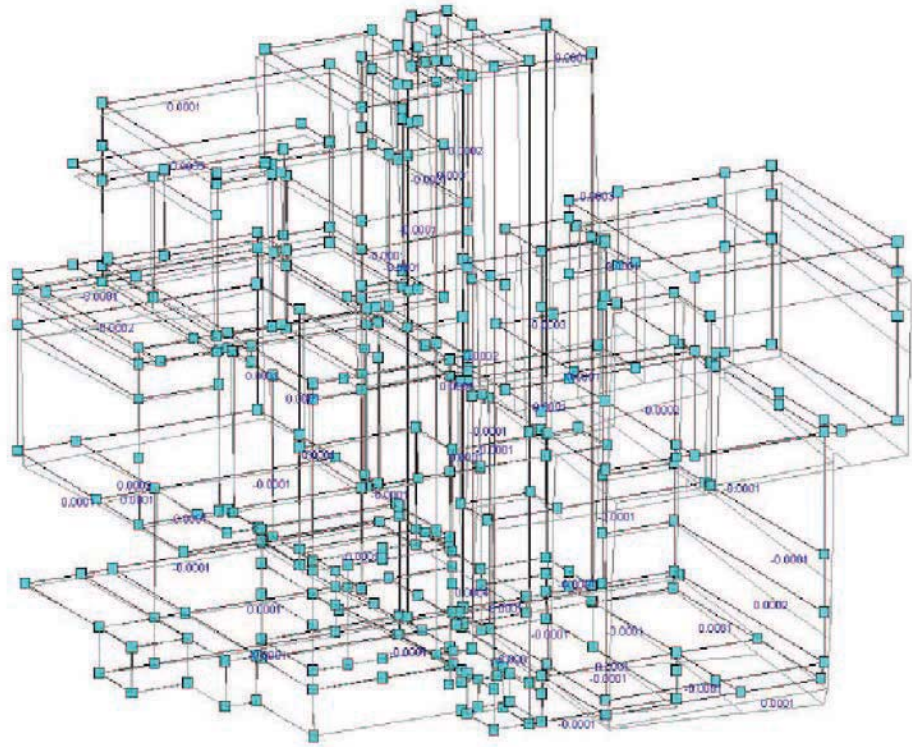


FIG. 54 Deformation scheme under vertical loading with cantilevering modules distorting downward

The results that came in were rather anticlimactic: The proposed tubes of 60 by 60 by 2 mm were more than sufficient to bear the design loads, and the forces of a climbing vandal turned out to be less than, for example, the snow load. An additional calculation was made to check if tubes with a wall thickness of 2 mm would also suffice. This turned out to be the case, but since the 3 mm tubes were more readily available, and much easier to weld due to its thickness, these additional challenges were deemed to outweigh the weight savings of the thinner tubes.

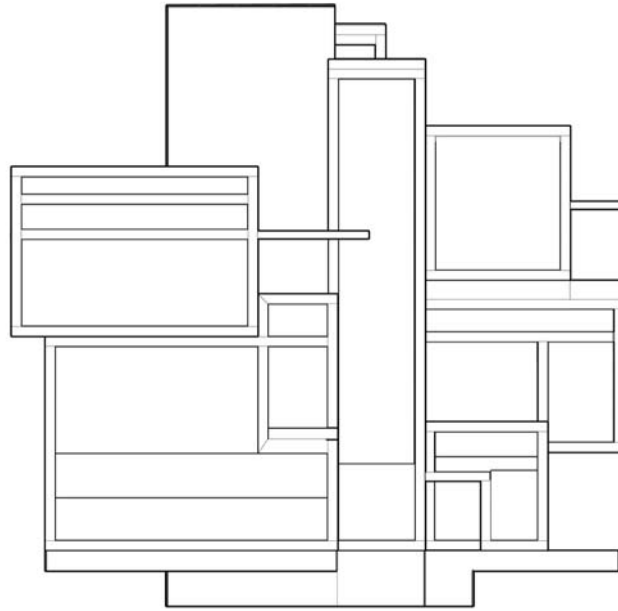


FIG. 55 Orthogonal elevation 1

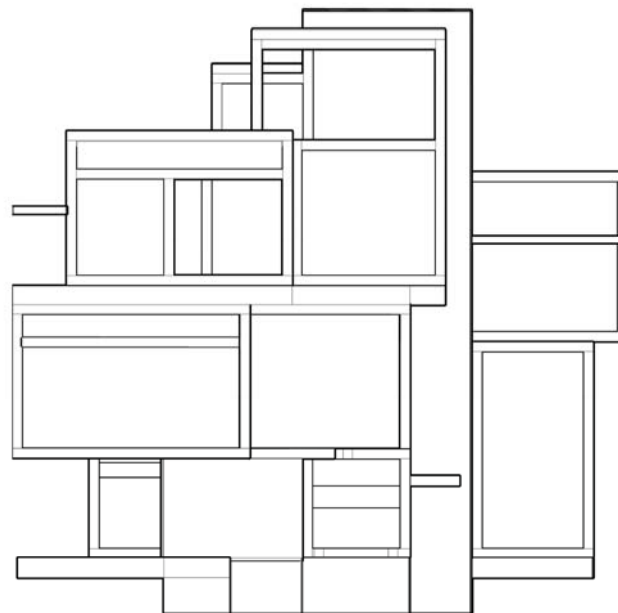


FIG. 56 Orthogonal elevation 2

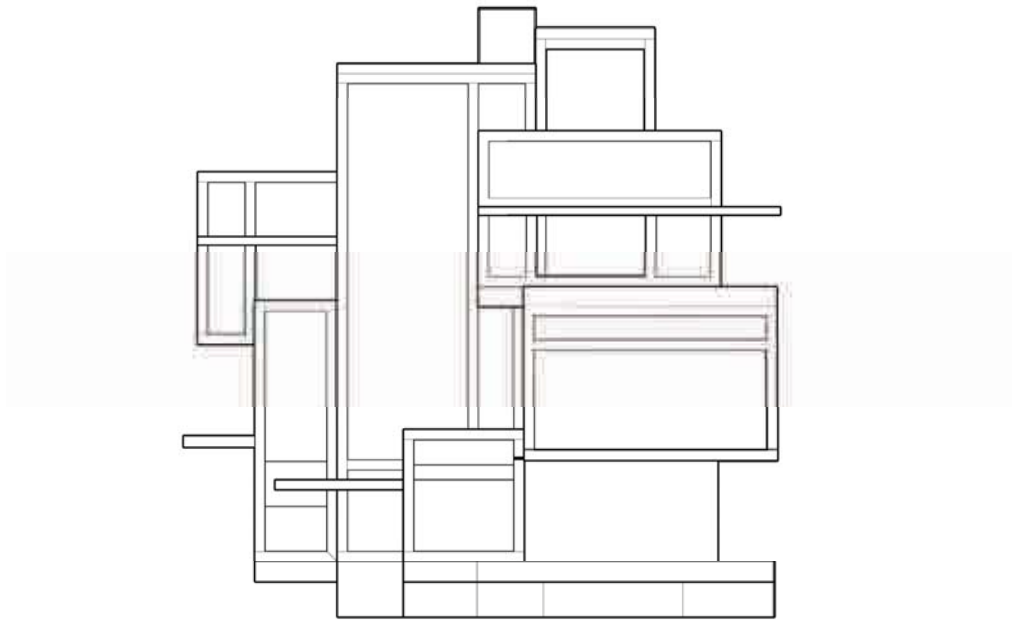


FIG. 57 Orthogonal elevation 3

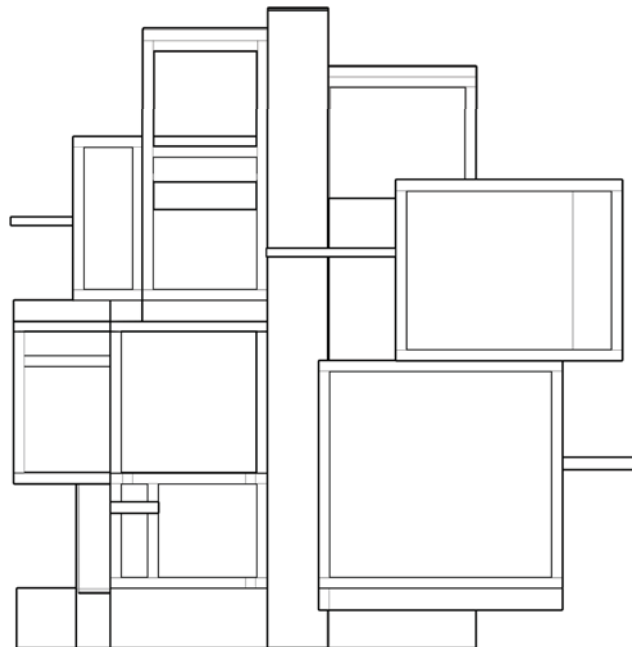


FIG. 58 Orthogonal elevation 4

Meanwhile, the students tasked with producing the drawings for production were facing their own challenges. The first two years of the architecture curriculum had focused mainly on the design of a building as a whole, and rarely touched on the 'nuts and bolts' of actual building. So for many this was the first time the drawings they produced would not only be reviewed by teaching staff, but also would have to face the test of reality, a far more severe future. Things that had been abstract knowledge at best up to this point now became very concrete. Everything drawn really had to fit together, errors and tolerances would have real consequences. The locations for the connections had to be exactly where they needed to be, and concepts like engineering tolerances and the design rules for making the frames able to be hot-dip galvanized needed to be learned and implemented quickly.

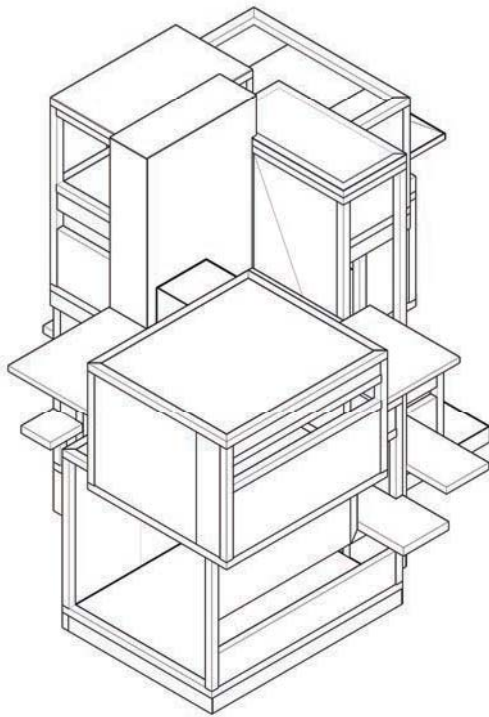


FIG. 59 Left side of the Maison as a result of engineering

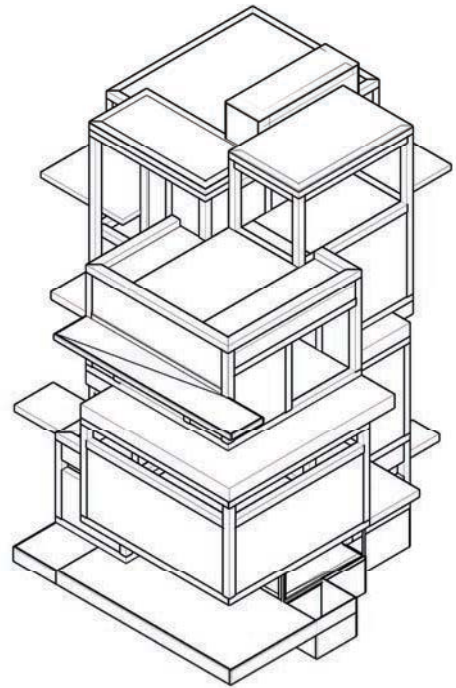


FIG. 60 Right side of the Maison as a result of engineering

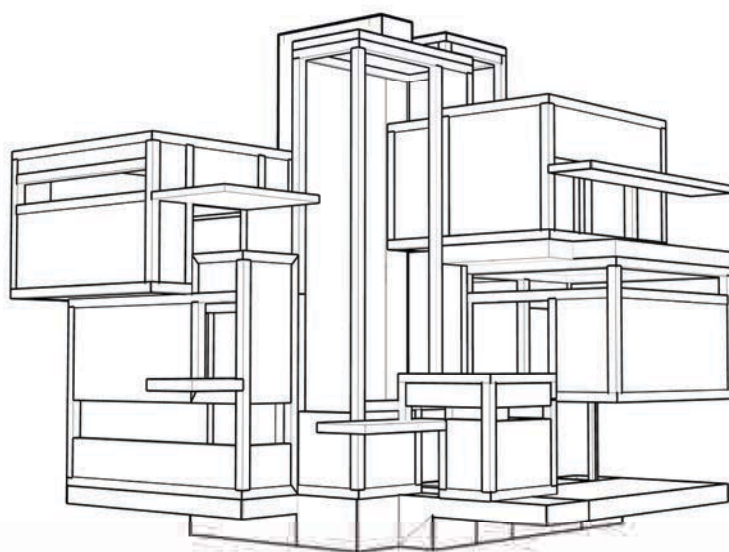


FIG. 61 Engineering result front side

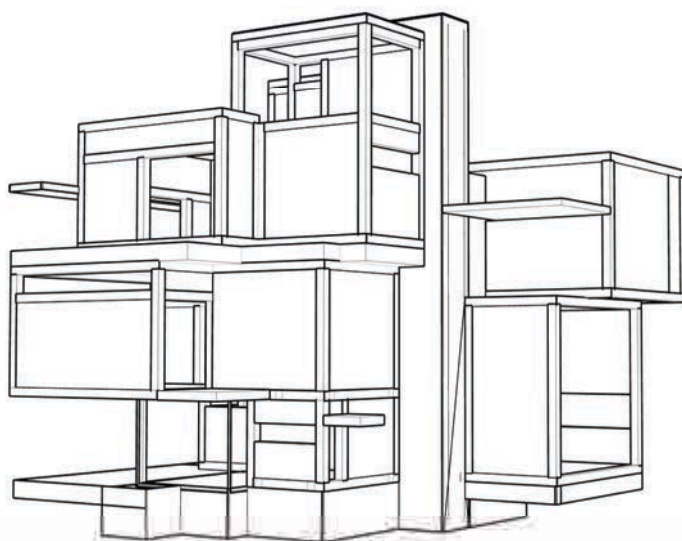


FIG. 62 Engineering result back side

Originally it had been planned that the students of this course would be the ones that would undertake the production of the steel frames themselves, but due to time constraints that work was done by two 'outside' parties: prof. Eekhout's Octatube factory staff and a local school for future metalworkers with close ties to the faculty.

After the frames of the modules were completed, test fitted, and then galvanized and powder-coated, it was time to fill in the openings.



FIG. 63 Total assembly of the steel skeleton.



FIG. 64 Assembly sandwich walls



FIG. 65 One mouler unit in assembly



FIG. 66 Modulaire units ready of total assembly in Octatube laboratory

A SPECIAL CASE: THE GLASS SITTING ROOM

The photos of the original model show that the transparent surfaces are envisioned to be flush with the exterior of the building, and are mounted without any visible traditional window frames. This was emulated by mounting tempered glass panes with structural sealant. Many of the modules have an opening where they intersect with the two central vertical volumes, and it was therefore possible to mount the windows from the inside, so any temporary supports needed while the silicone cured could be taken out afterwards, preserving the clean look.

Each module was also fitted with threaded inserts in its top steel tubes where eyebolts can be mounted, to facilitate lifting them by crane for assembly and transport.

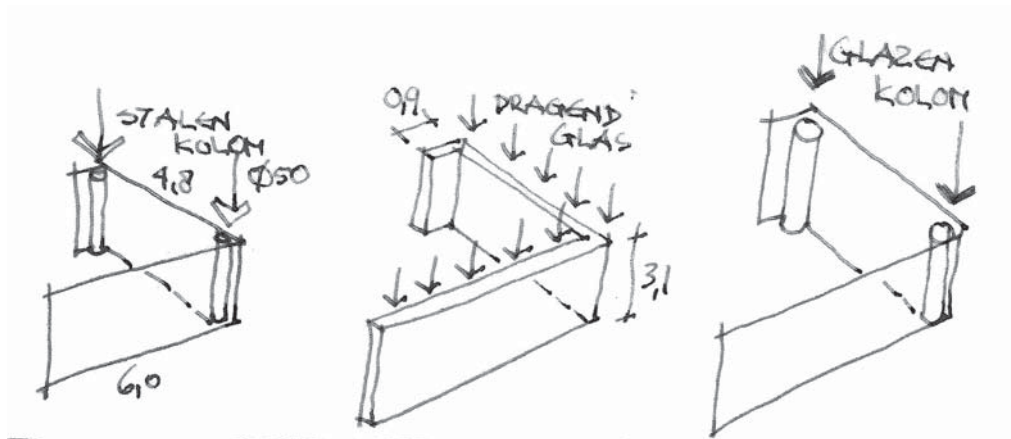


FIG. 67 Sketches of the glass wall around the garden room

One challenge that remained unsolved until late in the process of building the Maison d'Artiste prototype was how to make the all-transparent sitting room at the ground floor. Looking at the surviving photos one cannot determine whether or not the original designers intended to have a support in its outermost corner of this room. To raise the stakes even higher, Van Doesburg and Van Eesteren put the largest unsupported cantilevering volume right on top of it. While research into structural use of glass was being undertaken at the faculty at the same time as this project, it was decided that engineering such a solution was beyond the scope of the course. Instead, a more conventional steel column was chosen, but as slender as possible for minimal visual impact. The column was designed to be separate from the room module itself, so the forces on that support would not be transferred to the glass. The glass and the floor of the dining room were assembled using techniques similar to an aquarium.



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FIG. 68 Eight orthogonal and diagonal elevations in perspective views of the prototype model at the TU Delft campus



FIG. 69 Enlarged figure 68.1



FIG. 70 Enlarged figure 68.5

06 THE PROTOTYPE AS A WHITE CANVAS FOR COLORING

By Joris Molenaar

The Maison d'Artiste as designed in 1923 by Theo van Doesburg and Cor van Eesteren, which they presented in plans, axonometry and scale model, represents in a pure and uncompromising way the theoretical principals on the new imaging of painting and architecture that Van Doesburg formulated shortly before in publications. Van Doesburg and Van Eesteren made a statement in regards to the avant-garde art and architecture of that moment: like the constructivist experiments of for example Malevic, Tatlin, El Lizzitzky or Melnikov in Russia, and for which artists and architects at the Weimar Bauhaus around Walter Gropius also were looking for. It was a jump forward in the quest for neo-plastic architecture with which Van Doesburg in 1922 during his De Stijl class at Weimar already commented upon the course of the Bauhaus those years. Also young architect le Corbusier formulated new basics for architectonic imaging in the magazin 'L'Esprit Nouveau', edited with his friends painter Ozenfant, which he would bundle in the same year 1923 in his famous book 'Vers une Architecture Moderne'. The exhibition of De Stijl in Paris instantly became a statement in the history of modern architecture and the visual arts. This was reinforced by the vanishing of the scale model of the Maison d'Artiste, directly after the Paris exhibition, which gave it an extra mythical and iconic meaning.

As a critic and painter with ambitions towards architecture, Theo van Doesburg was a central figure in the avant garde of art and architecture of those days. He targeted on the Paris exhibition as a turning point. In 1929 he reflected in a journal publication titled 'The battle of the New Style' on the same occasion and formulated how he used the Maison d'Artiste in that battle on the exposition 'L'Effort Moderne': "This exhibition that inspired the Young Paris architects [Mallet-Stevens, le Corbusier, Guévrékian, Lurçat etc], also appeared to be a turning point for the movement of De Stijl. Instead of repeating ourselves we wanted to lift architecture and the art of painting onto a level never imagined before, namely the highest form of mutual integration. The Maison was analyzed, anatomized in its elements. The static axis of the old construction was broken. The Maison became an artifact around which one could move around. This analytical method brought new structural possibilities and floor plans. The Maison was lifted up from ground level and the roof as a roof terrace developed to an open floor. At the time these problems were absolutely new and nobody had engaged these as intensively as the young Dutch

architects and painters. In a fourth manifest the new problems of architecture and the monumental art of painting were concisely worded.²

The 8th and final point of this 4th manifest of De Stijl Group is a call directed to the young creative generation of post-WWI artists and architects:

“The period of destruction has definitely ended. A new time of construction has dawned”.³

Shortly before Van Doesburg had written in one of his many articles on painting and architecture:

Construction is the consequence of composition. The elementary architect commences to compose the functional spaces and the different materials. As soon as he sees that this composition answers the functional and aesthetical requirements, only then he will investigate the most economical way to combine these different materials. In this stage all elements become materials: both light, glass, granite, concrete, as well as iron, stone, et cetera. In this stage also the engineer might assist.⁴

This was the intellectual stage of development in which the model of the Maison d’Artiste came about in 1923. It was the spatial and colorful challenge for architect and artist to develop this idea further.

The architectural models were immediately submitted to criticism and this would remain so through time. Most fundamental would be the criticism by the young principally functionalistic architects Hans Schmidt and Mart Stam, who rejected the models in their avant garde magazin ‘ABC Beiträge zum Bauen’ as merely formalistic expressions, equal to the town hall of Stockholm or the station of Stuttgart, prominent examples of the representative architecture of the days, based on interpretation of tradition. Their reasoning was:

“Composition, composition of cubes, of colors, of materials, will stay means and a weakness. Most important are the functions. They will determine form.”⁵

However, this opinion was much too restricted for van Doesburg. He will not have been bothered too much by this rejection by these functionalistic hardliners. His criticism on the Bauhaus had evoked already much resistance shortly before and he was not to avoid being controversial.

In manifest IV color and experiencing space and time in architecture are considered inseparable from the new expression in architecture. Exactly on this very point the co-operation between Van Doesburg and prominent architect and former De Stijl member Bob Oud had been stranded. Van Doesburg had experimented on a limited scale with color applications in architecture with the lesser known architect De Boer, but his real ambition was much more fundamental. Just before the Paris exhibition he had expressed himself explicitly in publications.

I [FRAGMENT]

'In the new architecture color is of prime importance. It forms an essential part of the expressional elements. Color helps produce spatial effects the architect strives at, visible. In this way color complements architecture and is an essential part of it. [...] Only when building becomes architecture again, that is to say the monumental summation of space, form and color, the latter gets the meaning she merits.'

II [FRAGMENT]

'Each person has the hidden desire to see the relationships of his environments expressed by contradictions. This is the base of the existing right to express proportions in architecture. [The sculptural element]. The desire for contrast between space and objects is revealed as soon as the need arises to give walls and furniture in different colors which do not overflow into each other, thus dividing wall surfaces, either by paintings, colored textiles or by color areas.'

'The whole problem of color in architecture is in culminating of the absolute greyish, neutral and blind to the strongly contrasting. It is a rise from the indetermined expressionless to the most expressive.'

III [FRAGMENT]

'In the utilitarian art of building only the practical side of life is encompassed: the mechanical-functional art of life, living and working et cetera.'

There is another kind of need that exists besides the merely practical need, namely the spiritual need. As soon as the architect or engineer wants to show proportions, like how a wall is positioned relative to the space, his actions are no longer purely constructive, but also sculptural. The aesthetical starts with accentuating proportions [inclusive those of the materials]. Expressing proportions is sculpture. In this stage, the stage of sculptural architecture, color is an expressional material, equal to all other materials like stone, iron, glass et cetera.

This is how Van Doesburg formulated his real ambitions with architecture as an artist just before he started to work with Van Eesteren on the architectural models of the Paris exhibition. At the time of the exhibition he formulated his architectural goals even more detailed in 16 points:

NEW ARCHITECTURE [SUMMARY BY J.M.]

FORM.

- 1 without pre-set type;
- 2 elementary: plane, mass, time, space, color, material etc, the sculptural elements
- 3 economical: without waste of means or materials

- 4 functional: practical requirements laid down in a clear ground plan
- 5 shapeless and yet defined: no type or a priori aesthetical form scheme
- 6 monumental: becomes sculptural: all in propositions
- 7 not a passive moment, the hole in the wall, but openness relative to closed planes
- 8 In plan is de wand doorbroken, de gescheidenheid van binnen en buiten is te niet gedaan
- 9 open: one space by separation walls [interior] or by protection walls [exterior]
- 10 space and time [4 dimensional time-space aspect of sculpture;
- 11 anti-cubical, she throws the functional spatial cells from the centre to the outside;
[which gives architecture when structurally possible - task of the engineers] a more or
less floating aspect]
- 12 against symmetry and repetition: no repetition in time, no street wall or normalization;
- 13 contrast with frontality expressive richness of universal time-space action;
- 14 color organic in itself, direct expressional element of its proportions in time and space;
- 15 anti-decorative: colors are not decorative or ornamental, but organic means of expressions;

synthesis of the new expression, the conclusion of all arts, in its most elementary appearance:

“She proposes in the new area 4-dimensional thinking, that is the sculptural architect, who also can be the painter, is obliged to construct time-space [...] a maximum of sculptural expression, without damaging the practical requirements.”

It is clear that Van Doesburg gave color and painting an integral position in architecture. He wanted to renew architecture fundamentally, on which topic he had disagreed fundamentally before with De Stijl member Bob Oud. Working with Van Eesteren he accomplished for the first and last time an integral co-operation in the field of color and architecture.

Manifest IV of De Stijl Group is to be seen as the result of the findings of Van Doesburg and Van Eesteren in their feverish collaboration on architectural models, especially on the Maison d' Artiste. It contained the revolutionary research program represented by the Maison d' Artiste, in compact form which it still is today.

All considered it is quite logical to take up this material from that revolutionary moment in architectural history to initiate further research, like has been done from the early 80s of the last century at the TU Delft. Despite of the judgment of a renowned architectural historian like professor Manfred Bock on the reconstruction of the original design was, who commented: “An arrangement by a modern architect is not interesting for an architectural historian”.⁸ This seems more like a reflex of a modernistic historian to declare everything that was as absolute an untouchable, which is not very productive in view of Van Doesburg's own vision on the development of art and architecture. Also in this respect history will have to be rewritten by later 'post-modern' generations based on studies with renewed interests.

Continuing the experiments by Van Doesburg and Van Eesteren could also go together with other education and research at the faculty of architecture TU Delft⁹, like the research in the field of color in architecture as the thesis by Mariël Polman at the TU Delft, amongst others for the Aubette by Van Doesburg in Strasbourg, or the thematic treatment of color application in modern architecture as posed by Suzanne Komossa. She wrote recently:

De Stijl literally attempted to achieve the 'solution of color' and the synthesis of the arts in the Maison d'Artiste Paris house design by Theo van Doesburg in collaboration with Cornelis van Eesteren. But strangely enough, despite these famous experiments color did not acquire a permanent position in architectural design or education.¹⁰



FIG. 71 Orthogonal view of the prototype model

The reconstruction experiment of the Maison d' Artiste can produce a change. In this regard studies has not been completed yet. Studying the design is not only a question of structural or technical aspects. The 1 to 5 model is, as it were, the still untouched canvas of Van Doesburg. Waiting for future generations to experiment with experiencing space, time and color. New techniques of light and color projection and dynamic color manipulation offer new possibilities to continue the quest of van Doesburg and Van Eesteren, which by far has not ended yet.

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Towards a collective construction

[Manifesto IV of De Stijl]

1. In our collective work we have examined architecture as the unity of all arts, industry, technique etc. and have found the consequence to be a new style.
2. We have examines the laws of space and their infinite variations (i.e. spatial contrasts, spatial dissonance, spatial complements, etc.), and have found that all these spatial variations can be governed as a balanced unity.
3. We have examined the laws of colour in space and in time, and have found that the balanced relationships of these elements finally result in a new, positive unity.
4. We have We have examined the relationship between space and time, and have found that the appearance colour gives to these two elements expresses a new dimension.
5. We have examined the reciprocal relationships of size, proportion, space, time and material, and have found the definitive method of constructing them as one unity.
6. By breaking out of the enclosed area (walls, etc.), we have eliminated the duality of interior and exterior.
7. We have given color its rightful place in architecture, and we declare that painting detached from the architectural conception (i.e. the picture) has no justifiable existence.
8. The age of destruction is over and done with. A new age starts today: the age of Construction.

Paris, 1923. Theo van Doesburg, C. van Eesteren, G. Rietveld

" Voorwaarden tot een nieuwe architectuur, Parijs, 7 juli 1923, Architectura, nr. 27, 11 augustus 1923, pp. 163 – 165

⁵Redactioneel van H.Schmidt [Basel] [M. Stam, Rotterdam] in: ABC Beiträge zum Bauen, tweede serie nummer 1, 1926, p. 1

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" Theo van Doesburg, De Nieuwe Architectuur, korte samenvatting der architectuur-principes gedurende 1916 tot 1923 door de Stijlgroep in Holland praktisch en theoretisch ontwikkeld, Parijs 1923, Bouwkundig Weekblad, nr. 20, 17 mei 1924, pp 200 – 204

⁸Dr. Ir. Mariel Polman, De kleuren van het nieuwe bouwen tijdens het interbellum in Nederland. Materialisering van een ideaal, dissertatie TU Delft 19 december 2011

¹⁰Dr. Ir. Susanne Komossa, Who is afraid of red, yellow and blue? Colour and identity in architectural design, in: Delft Lecture series on architectural design, edition fall 2014, p. 136 – 159

07 RECOMMENDATIONS

By Mick Eekhout

In this book on the technical feasibility, the reconstruction of the original geometry and colour composition, on the making of the physical prototype model scale 1 to 5, the activities of staff and students of the Chair of Product Development in Architecture have been published as the contributions to the myth of the Maison d'Artiste.

BOOKS

This English version of the book on the making of the Maison d'Artiste Prototype has been written for the international architecture addicts around the jubilee of 100 years De Stijl in 2017 and the coming centennial jubilee of the exposition of 1923, the birth of the very model. If a scientific check would be required all original reports, book, CD Rom and more data have been certified by a notary, and are available for serious research & development.

The **first contribution**, the technical feasibility study, written in 1998 and presented in 1999 to the EFL-Foundation, was critical and warned for the consequences of a physical materialisation in scale 1 to 1 because the original design had not been developed as a mature design in 1923. The interior did not play a role. The model had been designed from the outside, not even from the outside inward, as a piece of art, a painted sculpture. The technical feasibility was hard to obtain because of the large cantilever in two directions and the unlucky positioning of the structural supports. Building literally the original design would require large structural problems to be solved, which could ruin the myth of the design. It was too early to speak of design mistakes in the original model as it was only a conceptual model. On the other hand adaptation of the design would lead to an interpretation of the original model, not being recognized as the original model in its composition.

FROM EDUCATION TO SCIENTIFIC RESEARCH

The **second contribution** was formed by the activities of students developed between 2000 and 2003 from education to scientific research & development. The reconstruction of the geometry resulted in remarkable, almost unbelievable results, which were difficult to accept in the circle of insiders of De Stijl and Van Eesteren. The results of the photogrammetric analysis in geometry and dimensions of components were different than conceived before up to a level of 15%. Which had a considerable influence on the design. The reconstruction appeared more horizontally composed. The ratio's between vertical and horizontal ribs and planes were much different.

COLOR RECONSTRUCTION

The **third contribution** was the analysis of the original color composition, which departed from the same eight black-and-white photographs. This analysis resulted in a completely different color composition than was established by the models of the 1980s. At that time the color combination was made on the eye, keeping the different data from photographs, axonometry [contra-construction] and personal interpretation, blessed by the approval of 85-year old Van Eesteren. From the 1980s architect's eye to recent computer processing revealed enormous progressive insight. The staircase was not dark grey, but flaming red, which was the result of establishing the ambitious painter's hand by Van Doesburg. An architect would make the staircase black of dark grey: balance in the color composition. So far the original reconstruction of the color composition.

The contra-construction made by Van Doesburg after the exhibition, with only black-and-white photographs in the hand in the year after the exhibition show that the color distribution and composition could have been quite different from the original. Van Doesburg kept on changing and improving the color composition as he filled in yet another pass-partout. He kept on thinking and changing.

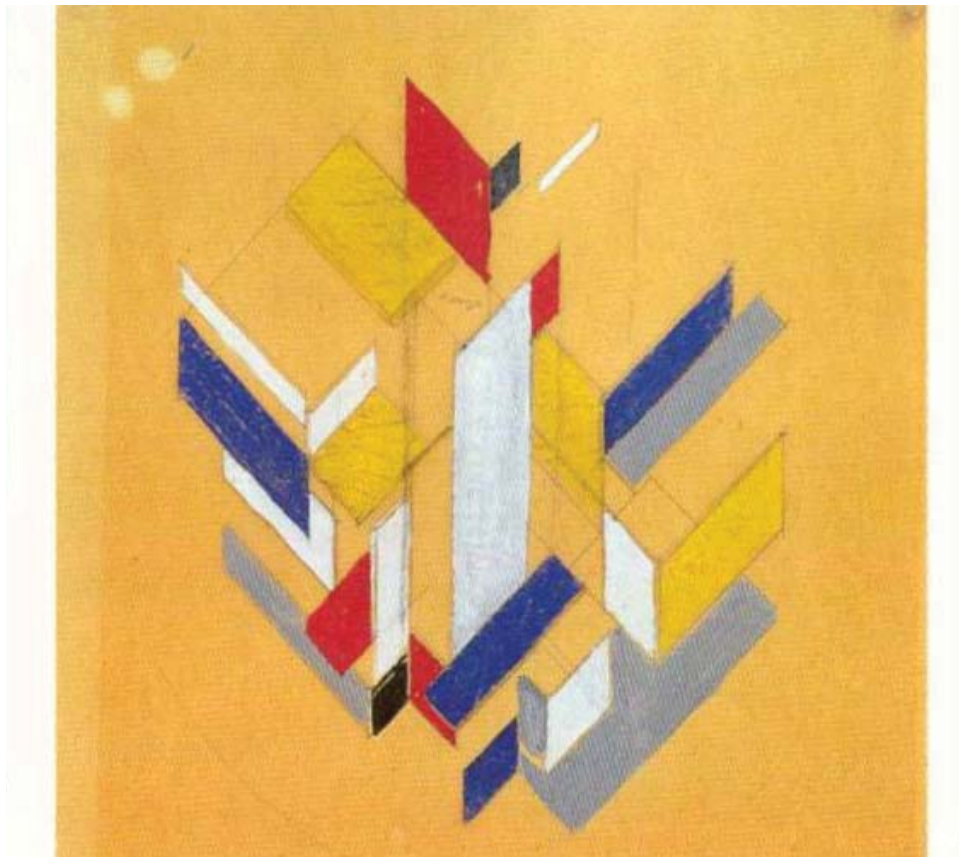


FIG. 72 Contra-construction [Van Doesburg, 1925]

For the future of the Maison there is much more freedom than only one or two color compositions, when keeping in mind the original message of Van Doesburg: he brought color into architecture. Why should we not follow this quest for a better balance, a better message? Should we not invite artists to color the white prototype with different compositions? It is true, architect have less feeling for those colors than artists. For architects the white [not colored] prototype is very attractive in itself. For them it is more the spaciousness of the design that is attractive. Colors might even reduce the spaciousness.

If one compares the known color compositions from 1923, 1982/1984 and 2003, there are distinct differences, even visible with the naked eye, see figures 88 to 91. Looking at the black-and-white photographs of the diagonal staircase side of the maison it is clear that the façade of the sleeping room above the atelier has a dark color, which in 2003 was reconstructed as blue, while it was not colored at all in the 1980s. The lower side of the staircase is in the photographs dark, in 2003 reconstructed as red, while it is in the 1980s white. The contra-construction also has a red lower panel at the staircase. By the way, other photographs, used in Van Doesburg's publications, show differences in the shades of grey. Those photographs, known by their publication date, are disregarded as post-creations. The question on the table remains: original [1923], manipulation [late 1920s], sanctioned arrangement [1980s], reconstruction [2003] or free arrangement [possibly in future]? Architects and designers feel much more flexible in regards to color compositions. The Royal Delft pottery factory, my neighbour in Delft, showed 10 years ago 20 vases, of which the porcelain form was designed by Dutch designer Jan des Bouvrie and which were designed in their decoration by different artists like Herman Brood and Martha Röling. All different, all interesting. All vases were sold in large series. This could be done here in the white ground form of the Maison d'Artiste as well. Interesting study for designers and architects. In the same attitude in which Van Doesburg continued his thinking about colors, this could be continued almost 100 years later. The color composition as a living laboratory quest. The results of the color reconstruction and their influence on the design of the Maison d'Artiste have not been studied extensively by architects, artists or students. It would be a small exercise, but worthwhile. Also the relationship between spatial function, location, and colors has not been extensively studied or developed. The discussion on colors has not been completed. The same counts for scientific research. Science is eternal, the contributions contained in this book is just a segment in time. Science does not stop, but continues.

THE WHITE PROTOTYPE

The **fourth contribution** was the engineering, production, assembly and realisation of the 1 to 5 scale physical model which was called 'the prototype' because it was produced in the Prototype Laboratory of the Chair of Product Development in Architecture of TU Delft. The prototype was completed as a physical 3D model in 2003. As the color composition had not been finished as exact enough as desired when the Trespa panels had to be ordered, we bought them as white outside [and greyish inside] with a later possibility to provide the white planes with colored film.

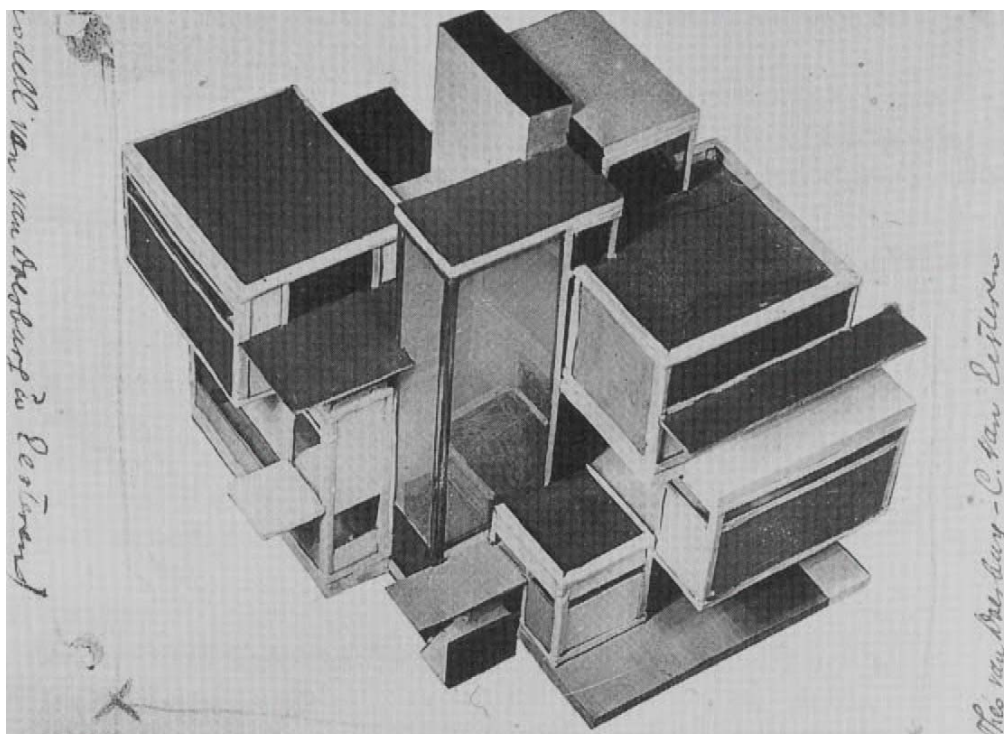


FIG. 73 Photo 1923

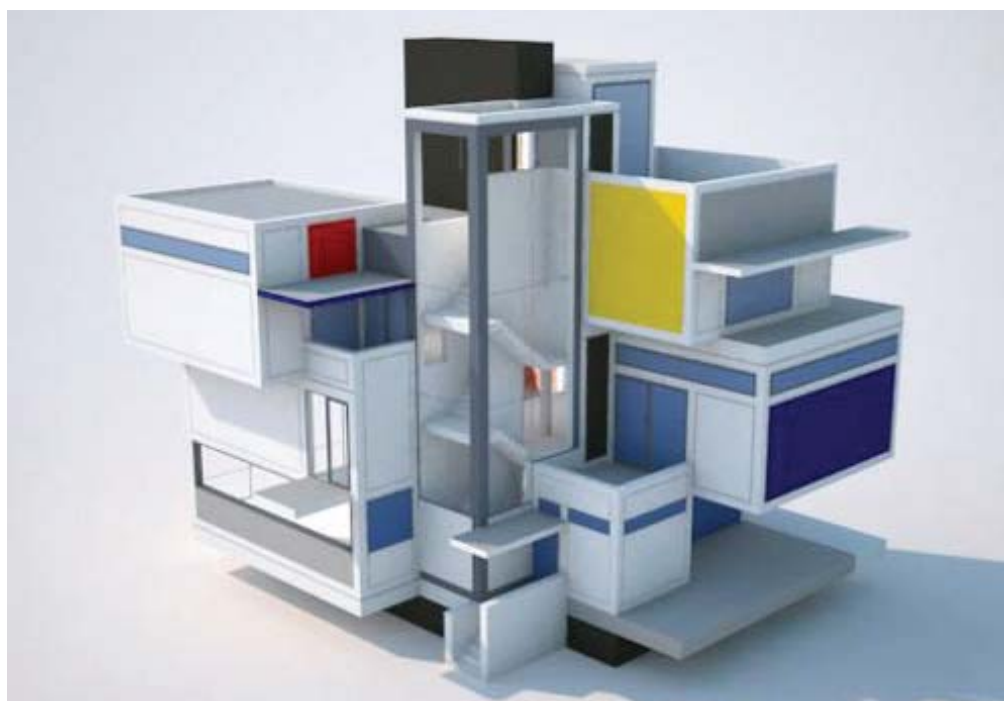


FIG. 74 Model 1982



FIG. 75 White prototype model, 2003



FIG. 76 Colors on white prototype model

PUBLIC DEBATE

The **fifth contribution** was the organisation of a public debate as an evaluation of the research & development work done by students. For the invited professor dr. Manfred Bock, Chair of Architecture History at the University of Amsterdam, who wrote a complete book on Van Eesteren, only the reconstruction of the original geometry and the original color composition of 1923 was important. He was so convinced of the correctness of the 1980s color composition that he exclaimed: *"That is not possible"*. A shock for him and possibly for other architectural historians and curators. The students of TU Delft have done their best to make a scientific analysis of the original color compositions and the result of their work was, to put it mildly, very surprising, not to be denied in future. These results are added to the 'body of knowledge', the collective knowledge and insight of the Maison d'Artiste.

The public discussion with Manfred Bock of 26th of April 2005 resulted in his view that he did not expect the radical alterations [compared to the knowledge of the 1980s] in the geometry and color composition, but he accepted these. Further he stated that from his vision as an architecture historian each change in scale, in physical materials compared with the original model from 1923, would be an unacceptable deviation. The prototype itself, made by the students, was not a reconstruction in his view, it was only an arrangement. The opinion of the architectural historian hence was much different from those of architects and technical designers of the TU Delft. This was a heavy judgment for the painstaking work in a good mood. When considering afterwards, the differences between architecture history and architectural design freedom had to be respected. There was only one original model of 1923 and countless other interpretations and arrangements. The research of the geometry and the color composition could be called 'reconstruction', while the prototype was an 'arrangement', our own interpretation.

ANALYSIS OF 2006

Veldhuijzen van Zanten continued his engineering based on the geometry derived by the TU Delft students, with his own interpretation of physical modularity. He demonstrated this design engineering in 2006 to the then State Architect, Mels Crouwel, and a committee of experts. Was the arrangement good enough to be allowed to be built? As the **sixth contribution** I wrote a report for the EFL Foundation to evaluate this 2006 design engineering. The extensive report is not interesting enough to be translated in English. It seemed to me a matter of good architectural engineering, with some dogmatic reasoning in order to be allowed to build the design on real scale, to allow for design alterations. Yet these seemed acceptable in general. But the excellently drawn engineering plans were based on a reinforced concrete structure, which had not been analyzed properly and as a consequence, they were not trustworthy. Neatly drafted drawings do not guarantee that the design is perfectly buildable. Before that stage one needs to analyse and engineer the load bearing structures in all of its consequences. The detailing of the facades was based on a conventional system, but chosen at random.

INNOVATIVE HIGH TECH DEVELOPMENTS

As the **seventh contribution** I have written the following thoughts as the Chair of Product Development in Architecture which could stimulate the further development of the Maison d'Artiste design in buildability and usefulness. Van Eesteren wrote: "The later the Maison d'Artiste is realized, the better it can be realized". Van Doesburg wrote: "Concerning structural possibilities, it will be a challenge for structural engineers".

FUNCTION OF THE MAISON D'ARTISTE

Inevitably linked and prior to any realization, a proper function of the building has to be established [extreme house, house with atelier of studio, museum, public building] and a client who possesses or can acquire enough money for its realization and who can acquire a proper location. We are jumping now from a location-free system design towards a location-bound and functional building design. Important are the function of the building, the location, use directly after realization, and in the further future, the costs of realization and the costs of exploitation. Architects usually have their view limited to the pure costs of building. From my experience as the secretary of the 'Foundation Reddekuip' [Save the Feyenoord stadium, www.Reddekuip.nl] I know that building costs are eminent, but the yearly exploitation costs can be a greater obstacle for future use. Reasoning the other way around ; if the exploitation costs do show an efficient use of the building on the longer run, eventual higher building costs are quite acceptable. Building costs are usually only a small part of any exploitation.

Before a client will become interested, extensive design studies have to be made of the interior designs, the ergonomics and the spatial interior possibilities. Each use [like house, house with studio/ practice, small museum or public building] will require another interior design and engineering. The current design is a collection of non-communicative interior spaces. Can an architect create a better interior continuity of spaces? Can the interior become more spacious? Can the central balustrade of the stairs and the steps be made in transparent glass to enhance the restricted interior space? The structural connection from the spatial modules to the core of the Maison requite strong and rigid connectors on the same place where one would want visual openings. Can the interior walls be made thinner than 300 mm and more fluent to increase the ergonomics? Could certain non-load bearing walls be omitted?

The entrance is not very inviting because of the steep stairs. Impossible for handicapped people and elderly. May be here an added museum basement could bring a solution: this allows a gentle slope for handicapped people to enter in the basement and step into a lift to reach the different floors. The basement could also contain functions [toilets, wardrobe, storage, technical installations] which are not integrated in the current design of the different floors. So that a building will exist like the Van Zessenhouse in Alblasserdam and the Van Doesburg House in Meudon, located against a hilly slope or dike. These are of course architectonical considerations which I gladly leave for the architects involved.

GLASS TECHNOLOGY

I would like to continue the technological reasoning in line with Van Doesburg's claim: "The future is for the engineers". A realization in the tens or twenties of this century would require that the building has to answer the building regulations of this time, but also can be installed with the state-of-the-art of technology. Expectations and norms are much different and more demanding than 100 years ago,. The building would have to be built with a minimal ecological footprint. That is to say the building would have to incorporate the minimal ecological energy or embedded energy in materials.

Technologically speaking the claim of Van Doesburg looked far ahead. The model did not have glazing frames. Frameless glazing has been invented only in the 1960s. Of course not making window systems in 1923 save a lot of time, they were also too small [scale 1 to 50] to be built. At this scale window frames of 70 x 140 mm would have dimensions of 1,4 x 2,4 mm, not practical or even impossible to model. At the same time it enables the designer to think anew about façade technology. Only in 1990 Octatube would dare to touch the theme of frameless glazing by designing and building the Glass Music Hall in the Exchange of Berlage in Amsterdam, which was functioning from 1990 to 2014 and will be rebuilt in the cultural centre of the former Locomotive Hall Tilburg in 2017.

These transparent planes were symbolised in the prototype by 4 mm thick thermally pre-stressed glass panels between the steel tubes, fixed with structural silicone sealant. Many of the modules had communal faces to other modules. So it was possible to fix glass panels from the inside with temporary supports which were removed after curing of the sealant. The same had probably been done in 1923 with the translucent mica panels. Mica has been used for the stair case as it gave no insight in the running of the stairs with its diagonal lines ruining the orthogonal composition of the Maison. The end result was abstract.



FIG. 77 Glass Musichall in the Beurs van Berlage, Amsterdam. Arch. Pieter Zaenen

The modules were provided with threaded holes and eye-bolts in the upper faces to enable the modules to be mechanically lifted. After the 18 modules were connected and bolt-tightened the complete prototype, having a dead weight of 2.500 kg could be lifted from the 4 upper hoisting bolt eyes as one crane package, see figure 18.

Two transparent challenges hidden in the model deserve a further contemplation. They are the front façade of the atelier or studio and the three glass façades of the garden room or sitting room under the piano room. The challenge Van Doesburg directed to engineers is heard. The first challenge counts for the big façade opening of the studio, usually directed to the north side not to receive direct sunlight but the more moderate indirect daylight, better for painting or drawing. Size is 6.6 m wide and 6.1 m high. Making the façade from one panel is not yet possible at this moment in time. In my own house in Delft I have a fully glazed south facade 6.0 x 6.0 m in surface, divided into 9 panels of 2.0 x 2.0 m. The 4 crossing points are stabilised by two horizontal trusses. This house was designed and built 25 years ago. Nowadays It would be possible to clad the faces with 3 panels of 6 m high and 2 m high. It is even possible to have only two larger panels produced like 3.0 x 6.0 m, stabilised by a central transparent glass fin in the centre. When doing a proper structural analysis of the glass, framing the two glass panels all around could even lead to omitting this central glass fin and just sealing the two panels in the centre of the façade together by sealant. The bending moments in the glass panels can be acceptable even without the central glass fin, although bending out of its plane will be larger, no problem for pre-stressed glass panels, even insulated.

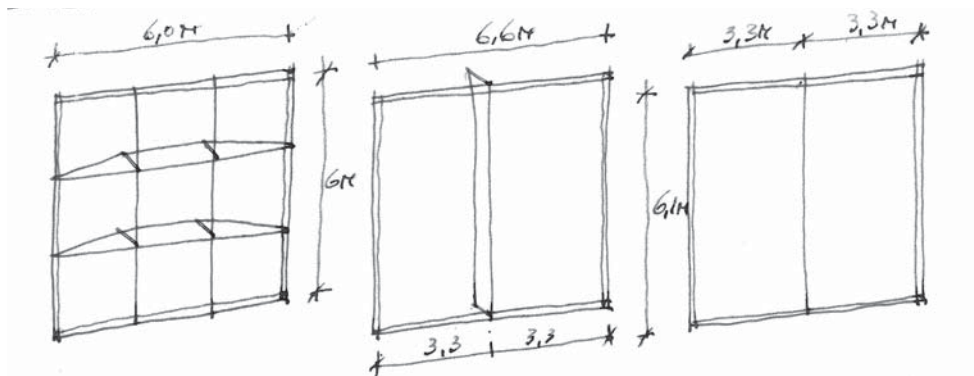


FIG. 78 Detail glass facade of the house of Mick Eekhout [1992], similar to the facade of the Maison d' Artiste

Steve Jobs, at the time CEO of Apple, has stimulated the development of glass production in large sizes. In 2010 Jobs had the Apple Cube at Fifth Avenue in New York redesigned from 6 x 6 panels of 1.6 x 1.6 m each to 3 panels of 3.3 x 10 m high. He invested in a long tempering over for pre-stressing large panels and in a lamination oven for laminating the same lengths. Jobs decided to go to the extreme of large sizes. As off 2010 extreme widths of 3.3 m and lengths of 10 m were available on the market, of course at 'Apple price' level. The costs of transport are often quite high and the cost of damage and replacing enormous. But it is possible.

The second glass challenge was not solved in the prototype, but announced and is firm by the three glass facades of the garden room or sitting room. The Salle de Musique cantilevers 2.5 x 4.5 m out of the plane for these three facades. See figure 85. The structural engineers amongst the student have chosen for a solid square steel rod in the two corners, so that they did not have to bother about this high-end glass challenge. Stacking of modules was realized in the prototype as a structural solution. The 3 glass facades at ground level have the music room above them and on top of that music room also a sleeping room. The glass facades are 3.1 m high and have lengths of 6.0, 4.8 and 0.9 m respectively.

For this challenge we have 3 separate solutions. The first is a solid steel 60x60 mm or thick walled steel column diameter 60x20 mm. The second is circular borosilicate glass (laboratory glass) column, laminated as an internal and external tube for safety reasons. The third is a laminated set up of multi-layered glass panels, in insulated form, which are able to carry the dead load of the cantilevering modules above the glass facades, where the intersecting beams in the floors are on top of the glass panels. These days the loaded glass panels should be possible in multi layers which are chosen in low iron (no green color) so that the thick glass does not show. Outside pane 8.8 and inside pane 15.15.15 mm. In the summer of 2016 I was asked by the Norman Foster Foundation to make a design proposal for a similar load bearing glass façade which would carry the deadweight of a roof on top of 6 m high glass panels and this was proven to be executable. The 3 m high glass panels in this Maison design are feasible as well.



FIG. 79 All-glass roof of the courtyard of the Gemeentemuseum [municipal museum] with the transparent laminated glass fins which are more than 10 meters in length, architect Job Roos.

The glass roof of the atrium of the Municipal museum in The Hague NL has glass fins 12.12.12 and a main glass fin in low iron, almost invisible, of 15.15.15.15, a load bearing glass fin carrying a roof surface of 10 x 10 m². Shown as an illustration that the all glass facades, glass walls actually, in low iron glass can be employed and still transparent. So this technological ambition description leads to new ambitions. Van Doesburg and van Eesteren would have been enthusiastic about new possibilities.

The question of the same corner support has kept many concerned. Manfred Bock even made a cut photograph, see figure 96 where the floor of the piano room seems to rest or 'float' only on a super slender steel column. My insights tell me that an all glass solution would be possible here, without separate corner columns. My students were chased in time and took the easy solution of a solid steel rod, knowing that this solution would be overhauled in time by new solutions.

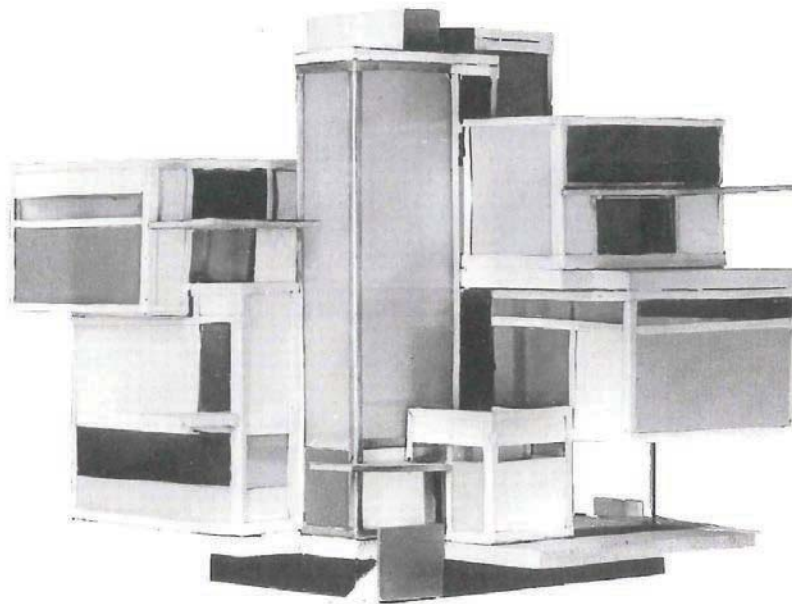


FIG. 80 Photo 1923, modified by Manfred Bock for the cantilever [right below]

ENERGY CONSCIOUS

All installations, climate and electric, which are required in a modern building in a time of energy economy need to be integrated here as well. For voluminous ventilation systems this is quite a requirement in the current design. Heating and cooling can be guided through the inner surfaces of the walls, floors and ceilings. The Maison d'Artiste design with its 'tesseract' / hypercube form, exploding cubes from a central core shows independence

from the base, independent from the earth. Figurative speaking a 21th century execution should also be energy positive or even autarkic in energy sense. An extreme good thermal insulation in the sandwich panels and multi-layered glass plus energy production methods in the skin of the building are requested. The building would have to be energy neutral or energy positive in use, to start with. This is quite complicated as there are not many surfaces which are suited for integration of photo-voltaic (PV)-panels and solar collectors, only the roof surfaces, not the balconies. Some of them have dark colors as if this is roofing. What is needed is energy absorbing paint in the primary colors of De Stijl. Mercedes develops such paint for its sports car: the Mercedes vision G-Code' of which is expected that 'voltaic silver' will be available before 2023 commercially. The building industry could also develop energy-absorbing glass panels to apply this in the east, south and west facades of the Maison. For that reason the orientation of the Maison becomes important. As yet it is non-located. These considerations lead to fundamental technological research & development in the field of solar energy absorption. End of 2020 this energy collecting glass coating is expected on the market [www.yesdelft.nl].

STRUCTURAL CANTILEVERS

Structurally the design poses large challenges. In the mechanical formula for bending $1/8 Q.L^2$, the length is squared. In the formula for stiffness of a beam $5/384.Q.L^3$ the length is in the third power. So the distance is extremely important for stiffness of a structure. This explains why a scale model 1 to 100 or 1 to 50 is easy to make, the prototype in scale 1 to 5 was not that difficult, but a building scale 1 to 1 with large spans, large cantilevers poses quite some problems, especially as the dead weight of the outer walls are resting on the outer perimeter of the modules. Life loads on floors are determined by the norms. Dead weight can be influenced by choosing extremely lightweight sandwich panels such as aluminium sandwich panels with a central foam core or even carbon fiber epoxy skins with foam core. Steel structure in rectangular hollow sections in steel (RHS beams) with rigidly connected corners by welding seem the good starting point. Aluminum or carbon fiber epoxy sandwich panels are better applicable than solid reinforced concrete floors and wall structures. Deadweight of the structure and constructions has to be minimized extremely. The too narrow central core has to be widened a bit at least to contain an elevator and to be more robust for the applied bending moments from the spatial modules.

VIRTUAL REALITY

Also the digital technology has developed itself, exploded even, compared with the situation in 1999. The virtual reality programs which were possible 15 years ago in only 2 places in the world (Chicago, Amsterdam) can nowadays be installed at all PC's. An actual visit to the Maison d'Artiste can be experienced on your own PC, even on your smart phone. Enjoying a drone flight from the outside saves a lot of engineering and building hassle, is much cheaper and necessary compromises are avoided. With a VR specs on one can walk through the interior spaces, look outside and enjoy the environment of the building outside. Why go through the enormous energy of realisation, looking for an appropriate function financing, organizing when the visitor can also be satisfied with a digital experience? Building is an ambition of architects

in order to experience their dreams spatially. The digital technology surpasses the millennia old physical material building processes. One can enjoy a fully digitally designed environment, think of 'The prince of Persia', for a fraction of the costs of realisation. Building the prototype has proven itself in terms of spaciousness and radiation. In Delft the Maison d'Artiste Prototype is a well known object. It stood on 5 different locations. But we know also that it is difficult or at least complex to realise. The second copy is as hard to be realised as the first one. Production and building in the reality of the real scale will be very complex as well, nevertheless challenging for an architect.

My advice is to design an appropriate interior, to have the complete exterior and interior design contained in a digital model, inclusive furniture and paintings and to make a VR tour around the building and through the building, completely with people inside. To act as Theo van Doesburg and Nelly van Moorsel and to have them explain how they wanted this Maison d'Artiste to function, Dutch actors Maarten Spanjers and Sanne Wallis de Vries as real look-alikes could be invited as the actors in the film, in the fashion of 1923, piano playing, painting, chatting with friends. This film can be uploaded in Youtube and can be viewed hundred thousand times to popularise the Maison d'Artiste internationally in 2023.

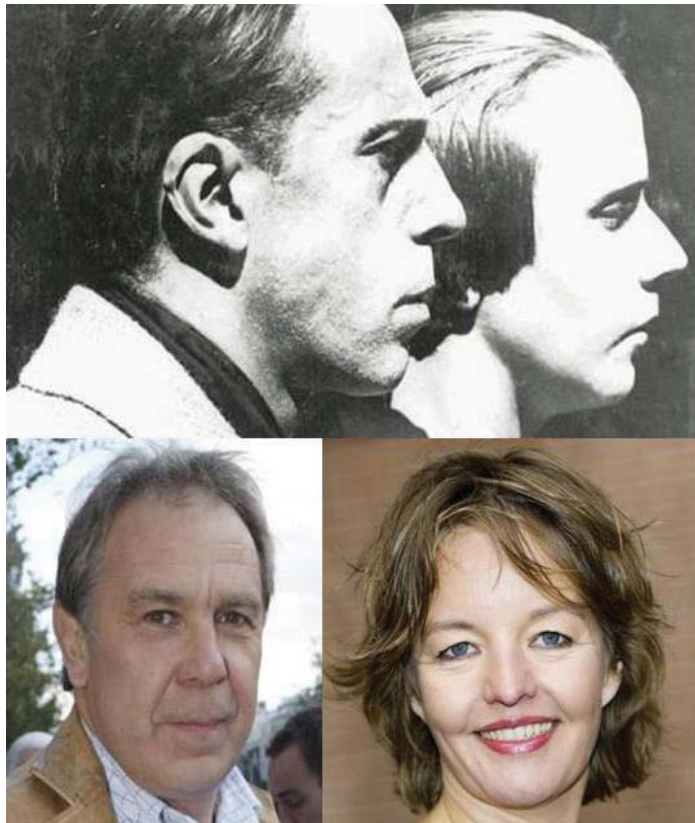


FIG. 81 Theo and Nelly personalised by Dutch actors Maarten Spanjers and Sanne Wallis de Vries [proposal]

3D-PRINTING

Producers claim that 3D-printing has a large potential. All technical problems can seemingly be solved. I doubt this. Engineering and certification of new components of each building is an extensive task. Here also applies the aforementioned mechanical law of sizes $1/8Q$, $L2$ and $3/584.Q.L3$. Printing in plastics is something else than sintering highly loaded metal components under high temperatures to a certified strength. If not this would be the end of the building technical engineer and a shame for generations of designers and engineers whose would be made redundant by the use of 3D-printing. Smoothness in surfaces also needs to be developed for 3D-printing processes. But could 3D printing techniques certainly be promising for a smaller scale, like 1 to 100 models of the Maison d'Artiste? Then more copies would be possible, in small scale.

MAISON D'ARTISTE AS AN ORGAN OF LIGHT AND COLORS

They can be painted in different colors or color compositions. The prototype can be colored in the original color composition by colored films applied on it. It is also possible to provide the colored surfaces of the prototype with glass panes, illuminate them with LED lights so that these surfaces can be colored in the original or any other color in a whim. Doing this the prototype, or also the scale 1 to 1 building could be illuminated by LED lights in yellow, red and blue. May be Van Doesburg would have enjoyed this possibility as a super solution almost a century later.

With these considerations I close off the seventh contribution of future technical innovations.



FIG. 82 Presentation of the Maison as a color and light organ exhibited on de 'Gerecht', a square in the centre of Leiden town in 2017 for the Lakenhal exhibition '100 years after De Stijl.'

FOUNDATION MAISON D'ARTISTE PROTOTYPE

The Foundation Maison d'Artiste has assembled this book on the topic with contributions from the TU Delft side. She owns the prototype and is planning to show the prototype with the original colors, before the De Stijl exhibition '100 years after De Stijl' will start in Leiden, organized by the Lakenhal Museum summer 2017. The foundation prepares a new model of the Maison d'Artiste 1 to 100 for sales and popularisation.

The exhibition in 1923 was a small affair, barely attracting attention. Van Doesburg departed quite fast and left the public relations over to young Van Eesteren. The world famous Maison thanks its fame to the reference by architectural historians to the origin of the modern movement which is De Stijl. Via the Bauhaus in Germany and their emigrants to the USA the modern movement became the International Modernism. And back to the roots.

Until the possible physical realisation of the Maison d'Artiste the prototype is the only and most impressive manifestation of the Maison. And people can enjoy that. It is the cultural and technical contribution of the TU Delft to the myth of the Maison d'Artiste.

The message of De Stijl will be published and exhibited in a number of museum exhibitions one century after 1917 and almost a century after the 1923 exhibition. This will also be noticed internationally. Now that in the recent decades the Modernism has been besieged by De-Constructivism and Post-Modernism, it is good to focus on the start of Modernism and the reasons why. Goal and ambition of the Foundation Maison d'Artiste Prototype is to stimulate the know-how around the prototype as a technical feat and as a cultural heritage. If against 2023 the realisation of the Maison d'Artiste has not been effectuated, the prototype will be exhibited in Paris, 100 years after the original exhibition, now knowing its world-wide effect.

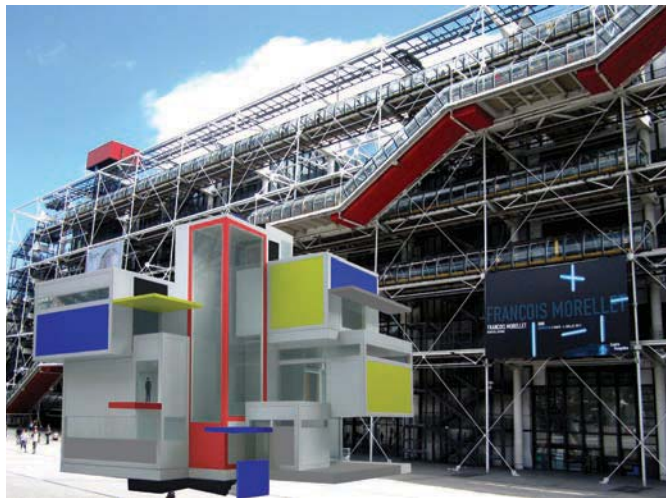


FIG. 83 Maison in Paris at Centre Pompidou'

08 EPILOGUE

By Wessel de Jonge

No doubt the 'Maison d'Artiste' is one of the most mythical architectural designs of the 20th century. Designed in 1923 for a collective exhibition of 'De Stijl' in Paris the original scheme was never developed any further than a scale model. The model represented an idea of a new lifestyle that was hardly imaginable at the time – a modern way of living that would match the Age of the Machine which became increasingly successful and which could only develop into something more beautiful every day. But apart from some black-and-white photographs of the scale model only a few design drawings are known which are not even fully consistent with what the images show. The house was never realized and the design is hardly known by the public at large.

Yet this design by Theo van Doesburg [1883-1931] and Cor van Eesteren [1897-1988] had a major influence on the development of the International Modern Movement in architecture. After The Great War artists and designers increasingly engaged themselves with the social and intellectual consequences of the Machine Age. A shared feeling existed that a radical artistic and architectural purification was imminent but opinions diverged as regards which elements were to play a role and what that role was to be. Members of 'De Stijl' like Van Doesburg and Rietveld focused on the essence of the aesthetic, in which the purity of form and color were important themes, while architects like Duiker, Van der Vlugt, Van Loghem and other members of 'De 8 en Opbouw' started to concentrate on social aspects and building technology, an approach that would lead to 'Het Nieuwe Bouwen', the 'functionalist' current within the Dutch Modern Movement.

Two more scale models were shown at the 1923 exhibition: the 'Maison Particulière' by the same two designers and the 'Hôtel Particulier'. Gerrit Rietveld [1888-1964], who had built the model of the latter project, just added a new dimension to his famous 1918 chair by painting it in the primary colors red and blue earlier that year... Mick Eekhout calls these two models 'quite buildable proposals' while for the 'Maison d'Artiste' the 'design appeared spatially and structurally highly complex' which must have rendered even the construction of the model a difficult task. Whether Van Doesburg ever meant the design to be actually built will probably never be known. Various sources suggest that the scheme may have represented more of a dream of how he and his later wife Nelly pictured their new lifestyle. Featuring over 500 m² of floor area and a number of very high spaces, the house would presumably have been much too large and expensive for them. It was only in 1930 that the artist couple succeeded in building a studio house in Meudon, which was indeed of a far more modest set-up. In this respect it is interesting to recall Van Eesteren's remarks that the design could be realised 'better, if later in time' and those by Van Doesburg that this would be 'a challenge for the engineers'. The reference to the possible use of aluminum

that Van Doesburg wrote in the margins of one of the photographs of the scale model underlines this idea: although the avant-garde had high expectations of it, aluminum was still a highly unusual and expensive building material at the time. This indicates how the design of the 'Maison d' Artiste' conceptually opened up new horizons much more than both other models.

As it turned out it was Rietveld with his 1924 design for the Schröder House in Utrecht, who succeeded in realizing the first sublimation of the architectural avant-garde of 'De Stijl' ever. Evidently Rietveld was able to carry into effect a set of compositional and spatial innovations that was strongly related to the models by Van Doesburg and Van Eesteren shown one year earlier at the exhibition in Paris, and particularly to the 'Maison d' Artiste'.

It is this highly explosive design by Rietveld that came to be known by the general public as a key work in architectural history. This renders it even more interesting to develop the design of the 'Maison d'Artiste' further, to broaden the position of Van Doesburg's intellectual legacy in our cultural history and to give it wider recognition.

The actual construction of the 'Maison d'Artiste' would therefore be worthwhile in its own right. Although the determination of the original colors deserves further attention, the design development, detailing and elaboration in the most advanced materials in order to make this 1923 vanguard dream a reality could become a true celebration. The present research by Mick Eekhout's students has contributed considerably to bring that goal within reach.

Wessel de Jonge, 2015

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The 'Maison d'Artiste' is a design by Theo van Doesburg and Cor van Eesteren in 1923, made for an exhibition of De Stijl in Paris. The cardboard model was lost shortly after by humidity. Only the black-and-white photographs remained as a proof. The Maison d'Artiste became world famous by publications since then.

At the TU Delft Campus the Maison d'Artiste is present as the prototype scale 1 to 5. In 1999 professor Mick Eekhout wrote a technical feasibility study at the request of the EFL Foundation. His students reconstructed the original geometry of the model via geodetical methods from the remaining eight black-and-white photographs. The results showed up to 15 % differences in the lengths of ribs and the sizes of planes. From the same black-and-white photographs the original colour composition was reconstructed via a spectrometer. The results were shocking for insiders. The central staircase was originally fiery red.

In the context of the centenary of De Stijl Mick Eekhout wanted to publish the results of the Maison d'Artiste work of his students and staff, even after his retirement, so that this book can be added as the cultural heritage of the beginnings of Dutch Modern Architecture.

