ARCHITECTURAL HISTORY THESIS (AR2A011)

VILLA HENNY: THE CONCRETE HOUSE

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PREFACE

Before you lies a history thesis, written for the master course Architectural History Thesis (AR2A011) at the faculty of architecture of the Technical University in Delft. The thesis concerns a notable project in the scene of architecture in the Netherlands: Villa Henny (1916) by the architect Robert van't Hoff, and its use of reinforced concrete.

I'd like to thank Jean-Paul Baeten, my tutor, who guided me in the process of doing research, the municipality of Zeist and the municipality of Apeldoorn for providing me with valuable information and documents on which I could base my research. And Dolf Broekhuizen, for answering any questions I had and who wrote a book that was entirely necessary for me to get a grip on the elusive architect Robert van't Hoff.

Information (photographs and scans) in this document may not be spread. Questions or other information may be acquired by request.

Delft. March, 2022.

Arthur Hamelers

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1. ABSTRACT

Villa Henny (1916), designed by Robert van't Hoff, baptized as the concrete villa, defines a turning point in modernism in the Netherlands. The Villa has been extensively researched in relation to the De Stijl art movement and influence by the American architect Frank Lloyd Wright, yet less attention has been given to the fact that it is one of the first dwellings in the Netherlands with a construction of reinforced concrete. The aim of the thesis is to shed light on the role of the project in terms of using this new material in the early 1900's. After a contextual outline of reinforced concrete and the architect responsible for the project, the paper will elaborate on the design and influence of Villa Henny, determine the relations between architectural and structural properties, evaluate the transition of reinforced concrete from a civil structure to private dwelling building material, and analyse the effects it had on the design of dwellings in the Netherlands.

2. INTRODUCTION

VISIT

The N237, a provincial road between Utrecht and Amersfoort (the Netherlands), is flanked by woods, meadows and gardens. Trees and bushes are placed between the gardens and the road to form protection between the two, both in sound and sight. As one goes along the N237 and the flashing bushes grant the viewer an occasional peek through the wall of greenery, the structures behind are slowly revealed. The houses, though bigger in size than the average Dutch house, are fairly traditional in style. That is, until 11a: The greenery curves open along a gravelled path and behind an inward corner sits a house, white and grey, angular, monolithic-like and more than a hundred years old. I'm looking at the backside – and it feels like staring at the back of someone's head – of Robert van't Hoff's most iconic project: Villa Henny in Huis her Heide.

In Dutch architecture, the villa has been baptized by the public as the "concrete villa" (or "betonvilla" in Dutch) and from my first impression, I could understand why this name was bestowed on the project. The horizontal grey bands and the overall rectilinear design made the leap to concrete an easy one. But looks, as they often do, deceive. As I waited by the door for my knock to be answered by the resident, I noticed the walls to be simply plastered and the grey colour to be simply painted. There was, in fact, not a single concrete element to be seen from the outside.

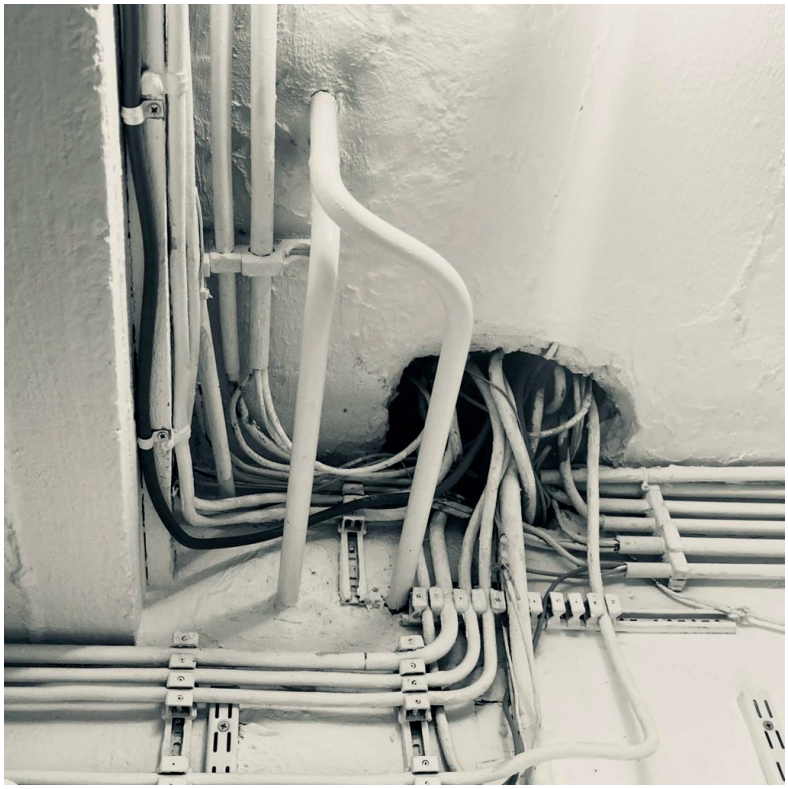
An older man, the resident, opened the door, welcomed me in, and told me I could go as I pleased. He carried a metal watering can and moved about the house in a shuffle through his home, visiting his plants in silence to attend them. No one else was home. From the inside, the house was less remarkable. The strong symmetry had been broken by stairs and other functions that are generally found in a home. I took the tour, circled my way up and down, trying to find the true value of this house. I eventually found it in a place I was least likely to find it.

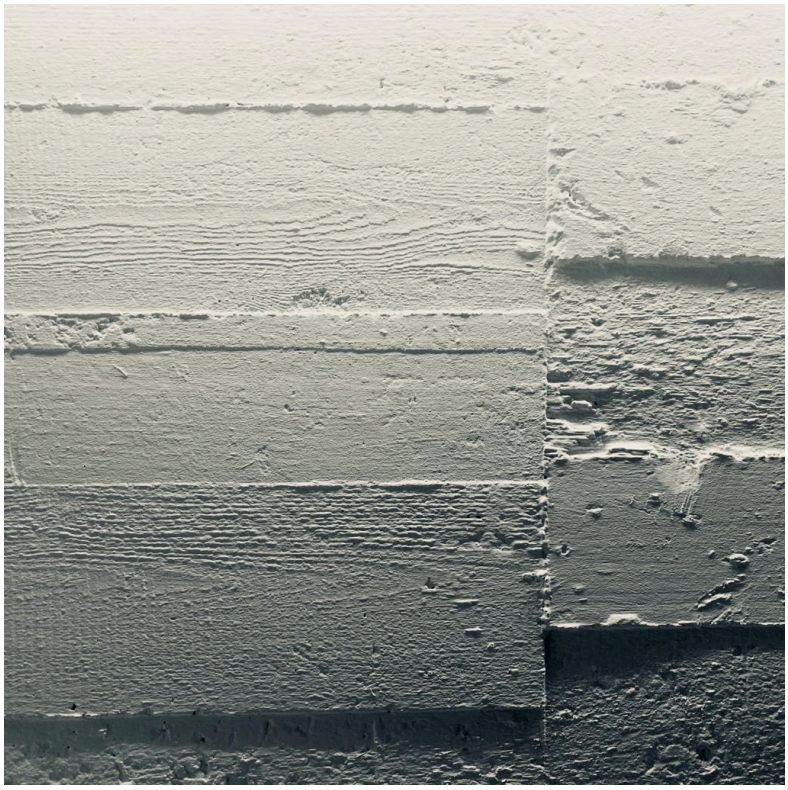
At the end of my visit, as I made myself ready to leave, the resident informed me I had forgotten a room. There was a door in the kitchen (one of the only ones that was closed in the house) and he opened it, revealing a stairway going down into the dark. The old man waited upstairs.

In the basement, the house was stripped from its style and grandeur. What was left were the bones and the nerves of the structure. Electrical cables ran across the walls like vines (see 2.1.). The elegant finishing of the surfaces ceased at the end of the staircase. I looked up and realised I found what I'd been looking for: Concrete slabs and columns were holding up the house. They were stark-naked in comparison to the rest of the building, and brutally honest. The grain of wood from 100 years ago could be read in the concrete ceiling.

RESEARCH

The value of the construction of this building can only be truly measured if one knows a complete context of the project. Villa henny populates an interesting position in the Dutch chronology of architecture of dwellings. The most known and researched topics surrounding this house are its connection to the American architect Frank Lloyd Wright (Van Bergeijk, 2008. P. 127) and, according to its national monument file, it being the unofficial debut of De Stijl architecture. Most sources refer to the concrete structure of the house as being something additional, something that exists next to the ideas the house tries to portray, but I think there is a case to be made that the technical progress of the time, with a focus on the emergence of reinforced concrete, is one of the leading factors that led to the house being shaped the way it is, and thus owes its fame to something hidden from sight. The purpose of this paper is to examine Villa Henny's relation to reinforced concrete and its role in Dutch Architecture. The main question will be: What position did Villa Henny occupy in the use of reinforced concrete in housing at the beginning of the 20th century in the Netherlands? I'll first give a brief introduction to its context, both of the general advances at the time and of the architect Robert van't Hoff. Next, I will elaborate further on the building itself, going into the plans and details, figuring out the relation between structure and form. After this, I'll be looking at the wake the house left behind, looking at notable projects and architects that were influenced by the project (or its ideas). I'll discuss what I've found and converge back to my main goal, locating Villa Henny in the Dutch scene of using reinforced concrete in housing.





2.1. Photographs Site Visit - Villa Henny(2022)

3. CONTEXT

REINFORCED CONCRETE

Concrete as a building material has had a long history in architecture, usually considered to be first used around the 3th century in the Roman empire (Mogetta, 2015. P. 1), yet the use of reinforced concrete – that is, using steel to strengthen the material from within – is a relatively new technology. It was invented in the second half of the 19th century as response to the need of finding an economic and fireproof way of building (Moussard et al, 2017. P. 2791). Firstly making its introduction in civil structures, but slowly, as the 20th century dawned and more countries started establishing regulations for building with reinforced concrete (Mezzina et al, 2010. P. 298), the material started bleeding into other fields of the built environment. Since the perception of the materials wasn't – and to some extend still isn't - a glamourous one (with a functionalist appearance and devoid of individualism (Slaton, 2001. P. 2)), the step from civil to private structures needed a catalyst to make this transition.

This catalyst was found in architects who recognized the advantages in structural - and aesthetic - qualities. Slaton, in her book on the role of reinforced concrete in the modernization of America argues a shift in the role of architects in the 1900's (P. 3). As new building technologies emerge and the possibilities of these technologies change the demands in the built environment, Slaton raises the backward-looking question whether the architect should be an artisan or an engineer? As an example, architects like Frank Lloyd Wright and le Corbusier, arguably two of the greatest names in architecture of the 20th century, both had an affiliation with the emerging technology surrounding reinforced concrete and used it as a wave to propel modernist ideas forward.

As far as the use of concrete in the Netherlands, Marieke Kuipers states clearly (Kuipers, 1987. P. 213) that the house-building experiments done in the early 1900's were a product of the circumstances of the building environment of that time. The cost of both raw materials (mostly brick) and skilled labour at the start of the 20th century were high. By some Dutch architects, including H. P. Berlage, building in concrete was seen as a solution to this.

In fact, it was Berlage who was accredited to being part of designing the first reinforced concrete house in the Netherlands: the cast house in Santpoort (1911). According to Bergeijk (2014, p. 176), the house in Santpoort was used as a demonstration of how to construct cheap houses by using cast concrete. The house was believed to be the first concrete house cast in situ in the Netherlands and even in the world. It used cast iron panels as formwork after Thomas Edison's invention (see 3.1.).

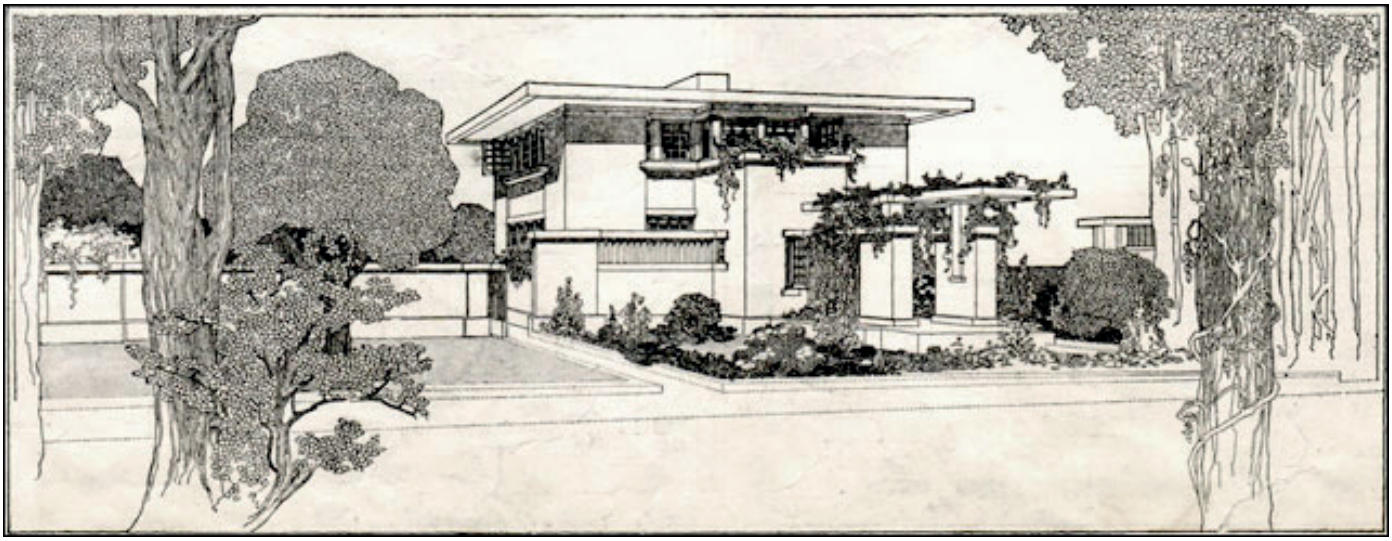
So, as economic tension rose and the technological characteristics advanced, more eyes turned toward using reinforced concrete and it is here where I'd like to introduce the architect of Villa Henny, who saw not only economic values in the new building material, but aesthetic ones as well.

3.1. Photograph - Cast House (1911)

ROBERT VAN'T HOFF

Dolf Broekhuizen, who wrote an extensive book about Robert van't Hoff, States that the architect inherited a great portion of his beliefs from his youth (Broekhuizen, 2010. P. 9). Born in 1887, into a culturally-engaged, scientific, and artistic environment (at this point one would do well to remember Slaton's earlier remark on the architect's shift in perspective from art to technology). Van't Hoff was educated in the UK, where the influence of the arts & crafts movement was still pertinent and he designed his first three dwellings between 1911 and 1914, in which he incorporates his fascination for craftsmanship and using regional building techniques.

Van't Hoff's perception on architecture gets a new impulse when he, in 1914, reads the Wasmuth Portfolio (1910) of Frank Lloyd Wright in which a concept is printed (originally copied from Ladies' Home Journal, 1907) of a concrete, fireproof house (see 3.2.). Wright's portfolio was enough to convince van't Hoff to visit the American architect. A year later, van't Hoff starts the design on Villa Henny in which numerous inspirations of Wright can be recognized. One of these, although hidden behind the plastered skin of the building, is the structural use of reinforced concrete.



3.2. Drawing - Fireproof House (1907)

FOCUS ON MODERN TECHNOLOGIES

Since most of Robert van't Hoff's archive has been destroyed, it is difficult to get a clear insight into the motivations of the architect's decisions. There are, however, rare occasions where this is possible. A few can be found in the De Stijl Magazine publications in which he wrote numerous articles. These will be used to show his understanding about the relationship between a new material and a new way of designing space.

After returning from his visit to Wright, van't Hoff's views on architectural design had evolved. This could be seen in both his products and his writings. In the February, 1919 number of De Stijl (van't Hoff, 1919, February. P. 40 - 42), he wrote a piece about Frank Lloyd Wright, in which he discusses the American architect's views on design and elaborates on three of his projects. He touches upon a thought that (functional) space is the driving factor of architecture. This functionality changes the floor plan and these changes are not always conform to the standard way of building. He explains that (reinforced) concrete is an excellent material to make shifts in plan and section, essentially defending the freedom in design with this new material (van't Hoff, 1919).

An interesting thing to note when looking at van't Hoff's writing about architecture is that his focus was on modern technology. A remark about the proportions of windows is closely followed by a remark about a new invention that allows the production of 80 stone blocks per minute. Architecture, for van't Hoff, was not merely about art, but even more so about knowing the technological improvements in the field and implementing them in design. This, I think, becomes most evident in his first words written in De Stijl, a statement bold in its time: "To acquire style in architecture, the art of building must be completely and technically brought to perfection, with every connotation to 'Art' put in the background." (van't Hof, 1918, March. P. 57 - 59).

4. PROCESS

CHANGING CIRCUMSTANCES

The circumstances of the time required new ways of looking at building. A combination of catalysts made it possible for Villa Henny to be created. Besides the macroscale reasons of the vacuum of resources and skilled labour, there were also microscale reasons that created an opportunity. There was the involvement of The Hollandsche Beton Maatschappij, the contractor Pastunink, and the open budget of the client A.B. Henny. These, so it seemed, created the ideal environment for van't Hoff to undertake the experiment of constructing out of reinforced concrete.

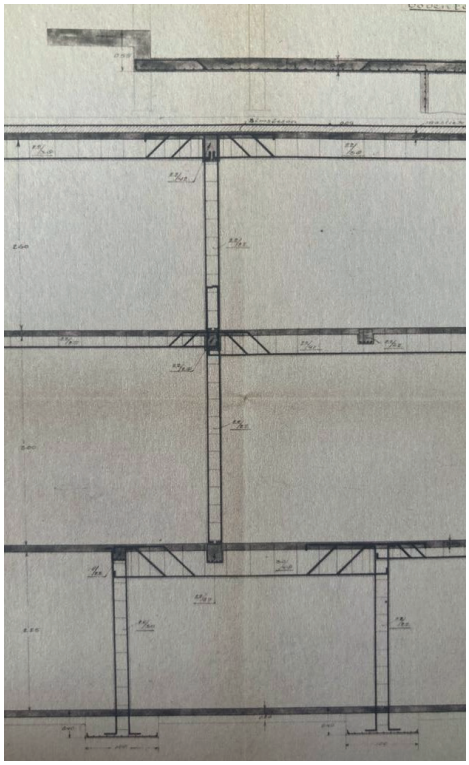
Due to van't Hoff's relative lack of expertise in working with reinforced concrete, he required outside guidance in order to transfer his thoughts from paper to reality. Printed over the structural design drawings of the project, the name "Hollandsche Maatschy tot het maken van Werken in Gewapend Beton" can be read (later referred to as HBM). Being one of the first Dutch manufacturers of reinforced concrete, HBM had the practical knowledge required to assist van't Hoff in his design. Until World War I, the bureau worked exclusively on projects of a big scale - like the Hofbogen in Rotterdam – as they were a company focussed on civil engineering. When the war hit, however, a distribution system of materials ("Rijksdistribiutiesysteem") was implemented in the Netherlands to regulate the scarcity of materials and this resulted in a decreased market of big-scale projects. It was at this time that the knowledge of building civil structures would seep into the construction of private dwellings, like Villa Henny.

The construction process of the Villa wasn't without failure. The contractor Pastunink, with whom van't Hoff also collaborated with on previous projects (Løvdalla (1911) and de Zaaier (1912)), executed the building of Villa Henny. The two projects earlier named were rather traditional in style and building typology (Broekhuizen et al, 2010. P. 50, 56), being inspired by the arts and crafts movement and local Dutch farms, so it was also for the contractor a leap into new territory with the introduction of reinforced concrete. The first iteration of Villa Henny's structure collapsed, so a new structural design had to be drawn up.

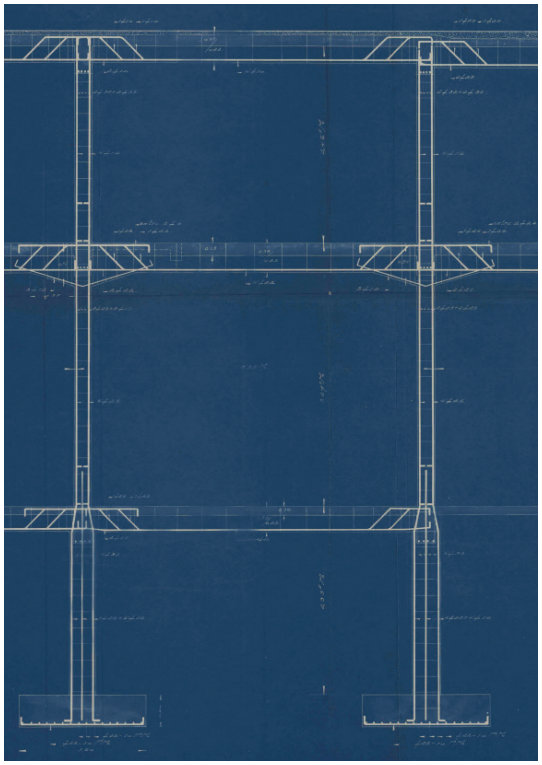
CHANGING STRUCTURE

Below are two structural drawings of the house, taken in section roughly at the same location in the structure (4.1. & 4.2.), yet they show differences in design. It is known that both drawings are made in collaboration with HBM. Because the left one isn't precisely dated, it's difficult to determine the exact chronology of the drawings. From a constructional point of view, however, it is possible to assign an order to the designs. There are three details on the right drawing that are interesting to look at in terms of structural improvement from the left drawing:

- Columns widen at the top to grant a bet ter surface to carry the construction that rests on it.
- Concrete footing below the basement has bigger dimensions (1000 mm increased to 1600 mm)
- All columns are stacked vertically on top of each other, instead of making a horizontal jump. Making it more favourable for the loads to be transferred to the foundation.



4.1. Structural Section A (1915)



4.2. Structural Section B (28-10-1915)

It is known that construction of the building began either in 1915 or 1916 (Broekhuizen et al, 2010. P. 75) and that the first iteration of the structure collapsed and thus, logically, needed to be improved upon. So there are two possible scenarios: (1) Drawing A was used as a preliminary design and finalized into drawing B before construction began in 1915. (2) Or drawing A was used for the first iteration (which collapsed before October, 1915) and B was used for the stronger, second iteration. In order to determine the correct scenario, more detailed information about the collapse would be required and that is, unfortunately, lost to the mist of history.

Yet, the influence of civil projects can be clearly recognized in the design of the house. For example, the orthogonal way the elements are connected. The flat roof, which was also a modern concept at the time, is a testimony to this notion. Also the expanded top of the columns are directly transferred from civil projects.

So, the concrete experiment of Villa henny had numeral aspects going for it to gain ground in terms of reliability. The time of material scarcity opened a window of opportunity for bigger companies to be involved in smaller projects. The building methods transferred accordingly and resulted in a building that feels, at least in a structural point of view, very much like a miniature of a concrete column-slab factory.

5. FORM

Now, as a next step for analysing Villa Henny, I'll look at the first perceivable layer of the project, which is composed of, as it is in most architectural projects, aesthetical properties. By looking at the visible tip of the iceberg, the submerged part of it (being its construction) may be able to become visible. This project, as will be further elaborated on in the paper, has no lack of interesting dichotomies. One of these is the relation between structural characteristics and aesthetical form.

In the national monument file is the following aesthetic summary on the house given: "Villa Henny is a detached house with two floors. Terraces and balconies all around and covered by flat roofs with large cantilevers. It is characterized by a grouping of rectangular masses with dominating horizontal lines." (Civil Office for Cultural Heritage. Doc ID: 40410). In essence, there are four properties that make the structure aesthetically interesting and relevant to both F. L. Wright and de Stijl, and so, in turn, made the house tangle with those names and movements that were able to grant it the fame it now enjoys:

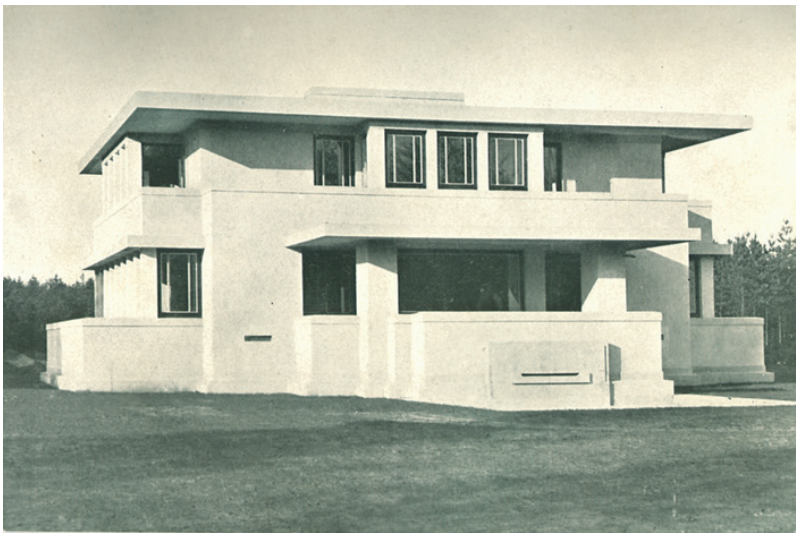
1. Terraces and balconies all around.

2. Cantilevering flat roofs.

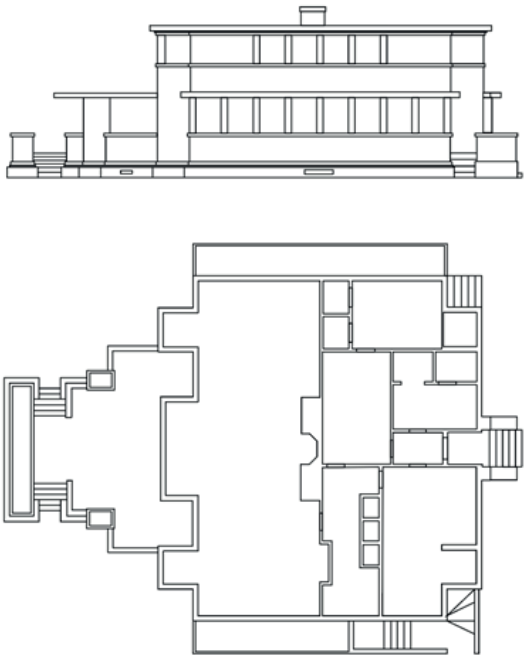
3. Grouping of rectangular masses.

4. Dominant horizontality.

In the photograph (5.1.) and the diagrams (5.2.) below, these four properties can be distinguished. Another dichotomy can be recognised here. A dichotomy between freedom and restriction. Freedom in the irregular shape of the plan and the protruding volumes in the façade. Restriction as the building is tied to a monochrome colour palette and symmetry.



5.1. Photograph - Villa Henny (1919)



5.2. Diagram Elevation & Plan - Villa Henny (2022)

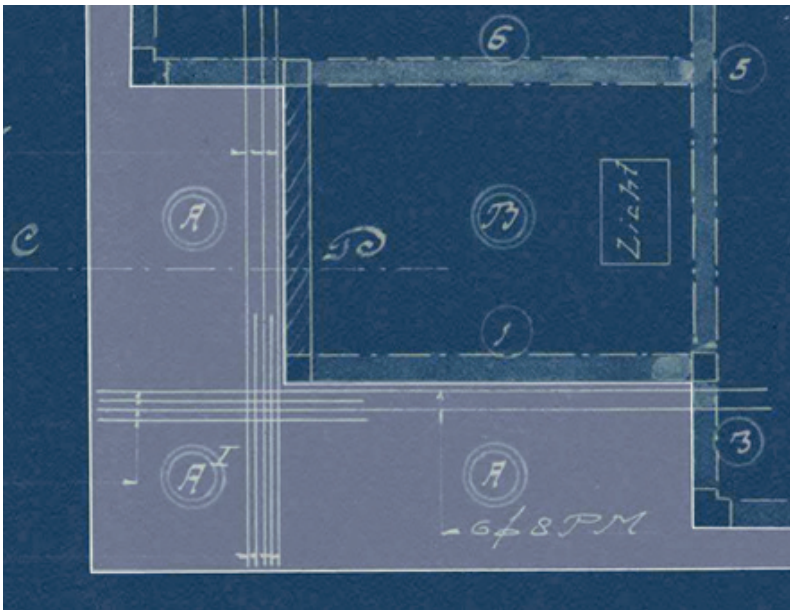
6. STRUCTURE

Now, after discussing the general form of the Villa, the transition to its structural system is made. In the following paragraph I'll make the argument that the form and structure are thoroughly in relation with each other.

24 Columns make up the horizontal structural grid of the building. The vertical grid is determined by slabs of concrete which either serve as a floor or roof. These two grids allowed van't Hoff more freedom in designing, as the rest of the building is "hung" on this open frame.

See, before the introduction of reinforced concrete, the main structural (horizontal) building material in the Netherlands was wood. Using wood results in a linear way of constructing, this is due to the simple fact that trees grow linearly. One of the strengths of using reinforced concrete – one that becomes clearly apparent in the design of this house - is the fact that concrete is a casted material and thus can be used to transfer loads in multiple directions. So, where wood is a linear structural material, reinforced concrete is a planar one.

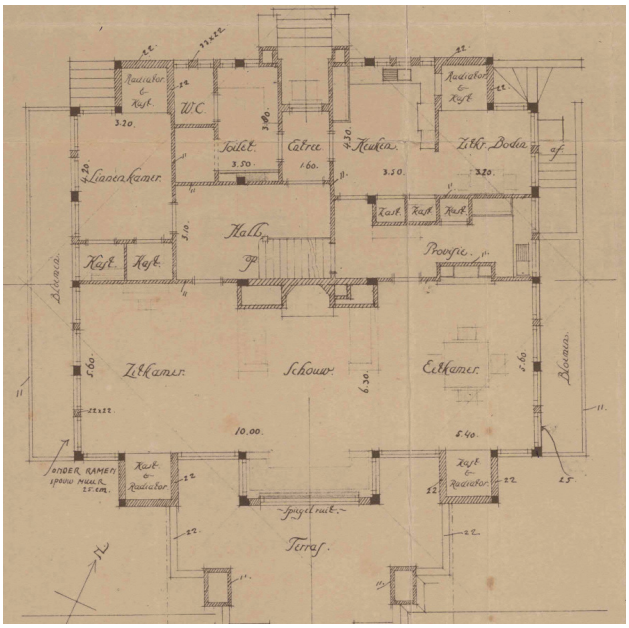
A perfect example of this can be found in the cantilever roof [5]. Normally in this timeframe, when an element would cantilever, this would happen in a single direction, since the structure (wood), could only carry in a single direction. So, while using concrete, van't Hoff was able to have more freedom in designing and thus make his roof cantilever in the corners of the house. These unsupported corners give the elements the illusion of floating and using this idea is one of the cornerstones in his design.



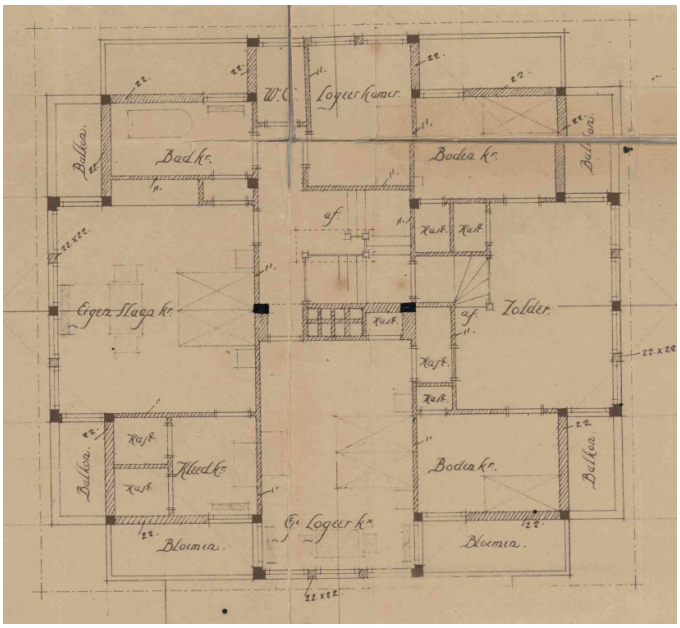
6.1. Structural Plan Roof - Villa Henny (28-10-1915)

Using reinforced concrete allowed (and necessitated), at least in this timeframe, an orthogonal way of building. Although there is a certain hierarchy in the way the Villa is positioned, with the terrace and pond facing south (describing a north-south axis) [6.a], there is also a directionlessness in the building. Where most houses have a gable roof that defines the main axis of the building, Villa Henny has a flat roof and van't Hoff uses this to change the direction of the first floor perpendicular to the ground floor (so establishing an east-west axis) (see 6.2. and 6.3.).

It seems, from the arguments above, that the architectural and structural qualities of the house are strongly related to each other. Whether it were the spatial qualities that guided van't Hoff to using reinforced concrete or using reinforced concrete enabled him to implement new spatial ideas, either way, the two are working in tandem to form the Villa as a whole.



6.2. Plan Ground Floor - Villa Henny(1915)



6.3. Plan First Floor - Villa Henny(1915)

7. AFTERMATH

Despite van't Hoff's relative absence in the public debate, Villa Henny – by many to be labelled the architect's crowning achievement – drew considerable attention. Notably, this attention was mostly tied to its connection to either De Stijl movement or Frank Lloyd Wright (Broekhuizen et al, 2010. P. 42 - 43). Even when the Villa was formally proposed as being a national monument (1980), the description of the house concluded in a separated paragraph with: "Villa of common interest due to extraordinary architectural-historical value in Robert van't Hoff's oeuvre, one of the predecessors of De Stijl group." (Aanvullende lijst van onroerende Monumenten in de Gemeente Zeist, 1980. Art. 8.) The building having a reinforced concrete structure is mentioned between it being Wrightian and having brick, plastered walls. It seems its reputation had (and still has) less to do with it being constructed from reinforced concrete.

The question now remains, as Villa Henny did influence the Dutch architectural scene, according to van Bergeijk (2008. P. 127), how did these structural and aesthetic ideas translate to consecutive projects?

SCHRÖDERHOUSE

An obvious first example would be the Schröderhuis by Gerrit Rietveld. Where Villa Henny is proclaimed to be the unofficial debut of de Stijl architecture, the Schröderhuis is generally viewed as the apex of de Stijl architecture (see 7.1). The similarities in style can be recognized most clearly in the rectilinearity of the design.

7.1. Photograph - Schröderhouse (1925)

But the resemblance ends past the outer skin of the houses. The structure is, as one could expect from a carpenter, erected from wood (García-Salgado, 2018. P. 434). So what constitutes this difference in construction? The main reason lies in its irregularity. Where Villa Henny is framed around a symmetry and a preconceived grid (the 24 columns), the Schröderhuis has no two corners the same. This meant that every part of the house had to be detailed like a piece of furniture. Although the two houses are both classified in the de Stijl movement, the differences in regularity separate the two, and this is, again, in relation to the construction. The two men, Rietveld and van't Hoff, knew each other. Rietveld made Furniture for van't Hoff based on pictures he showed him from Wright in America (García-Salgado, 2018. P. 425). Although the Schöderhouse couldn't be seen as a derivative of Villa Henny, an argument could clearly be made for inspiration from an aesthetic point of view. But, the structural doesn't seem to be translated to well.

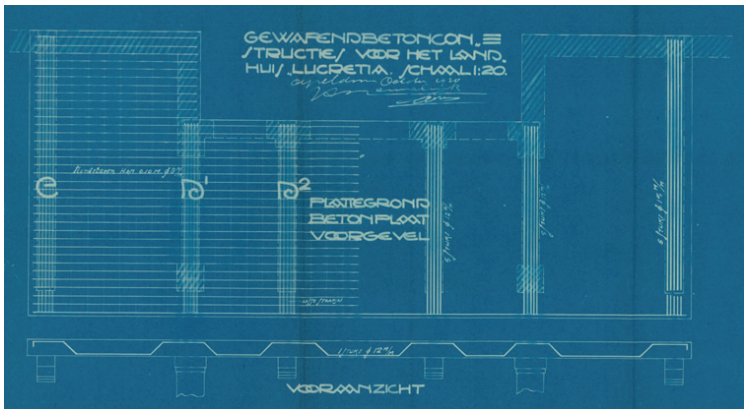
BIGGER SCALE

Marieke Kuipers, in her piece about experiments in making Dutch dwellings in reinforced concrete in the early 1900's (Kuipers, 1987. P. 212 - 213), mentions several projects done all over the Netherlands, focussed on bigger scale projects (Rotterdam, the Hague, Utrecht, Amsterdam, etc.). She mentions that: "Whether or not intended for temporary use, but all as an emergency measure." Meaning the building crisis after the Great War and the high construction materials. So she makes the argument that reinforced concrete was the more economical option for building dwellings at the time. And for most of these projects, the esthetical representation matched this message: Austere, simple and pragmatic. Nothing really like Villa Henny's exploration with the material. Since Villa henny was among the first houses made of reinforced concrete, it must've played a role in paving the road to using it on a larger scale. Yet, these projects were only using the new building material and not really yet to its full potential – as van't Hoff was trying to showcase with his Villa with the cantilevering elements and grid-like approach.

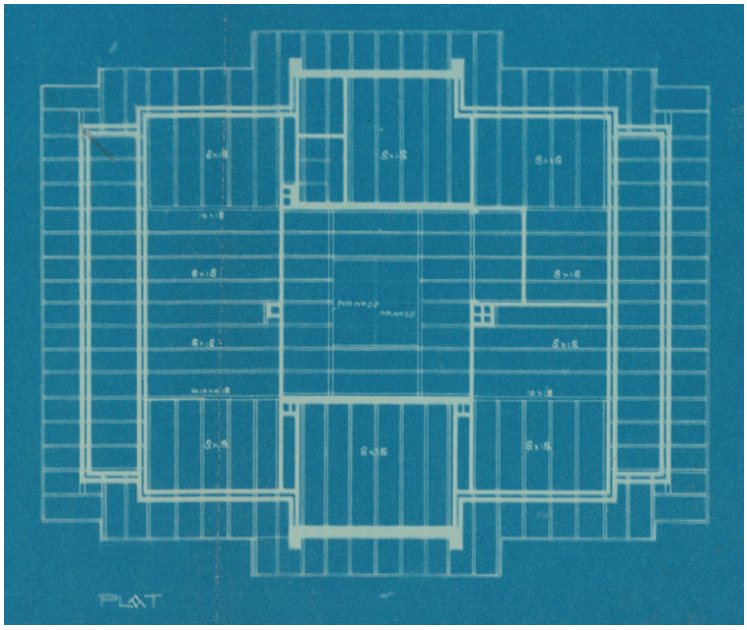
COPY

One of the most obvious copies of Villa Henny is by Gulden en Geldmaker in Apeldoorn (see 7.1.) in 1920. This Villa De Essenhoeck in Apeldoorn is an interesting example to examine since it was the client who directed the architect towards the work of Robert van't Hoff. This resulted in an exterior look that resembles Villa Henny, but an interior that was still traditional and divided in three parts from left to right. In other words, the symmetry did not translate to the inside of the house (Civil Office for Cultural Heritage. Doc. ID: 514549). The construction however, as can be read from the archival drawings of the construction, shares similarities to Villa Henny's (see 7.3. & 7.4.). They both have concrete columns and beams as their primary structure. Now, there are two aspects in this copy of Villa Henny that, I feel are noteworthy. (1) The secondary structure (elements between the main beams) in this house is carried out in wood (see 7.4.), where Villa Henny's was also done in concrete. The other (2) aspect is the concrete wall that is mentioned in the elevation (7.3.). Villa Henny's walls were all made from plastered brick (van't Hoff, 1919, January. P. 30 - 31). In De Essenhoeck, concrete walls are drawn up, and, as far as can be read from the archival drawings, these walls do, in fact, transfer a load. It's interesting to note that this house, from the outside looks like a cheap knockoff of Villa Henny, but is actually introducing new structural elements.

7.2. Photograph De Essenhoeck (1920)



7.3. Structural Section - De Essenhoeck (1920)



7.4. Structural Plan - De Essenhoeck (1920)

So, in the aftermath of the completion of Villa Henny, inspiration spread, and how did these structural and aesthetic ideas translate to consecutive projects in the Netherlands? Although difficult to verify, different things departed from the inspiration of the house. There was evolution in form, a functional take on the use of concrete began spreading and seemingly ruthless copies popped up that aspired to achieve the same aesthetical qualities by using a similar structural system. This last one seems to make evident how entangled van't Hoff's ideas about structure and form truly are.

8. CONCLUSION

I've started my thesis with a visit to the Villa Henny. I recalled finding, hidden in a poorly-lit basement, the traces of a concrete structure. Connections have been made to tie the house with De Stijl and Frank Lloyd Wright, but the Villa itself, partly due to its elusive architect Robert van't Hoff had always been, at least partly, shrouded in mystery. It seemed that its most interesting feature had been overlooked in research: The reinforced concrete construction. That is why the approach for this thesis was to concentrate the research on the use of this, at the time, new building material, in order to find a new angle to consider the project.

Still, an undoubtfully great influence on the project was Wright. Both in his material use and his philosophy on design. His ideas permeated into van't Hoff's work, but instead of copying him, van't Hoff found a well-pronounced partnership between the structural properties of reinforced concrete and his own aesthetic qualities. It marked a pivotal moment in history where a material which was already used in civil – more functional – building projects transitioned into the realm of private dwellings. The form language built upon that which had already been tried and tested in the civil realm and was able to transform into something that could not only be considered a dwelling, but a dwelling which could be considered to be interesting to look at and felt unique. In looking at other projects related to Villa Henny, I keep finding the seeds that refer back to the original building. And although, yes, the argument could be made that the Villa is again a copy of the Wrightian style, I believe, nevertheless, that van't Hoff's work, supported by using reinforced concrete, offered a springboard to modernists in the Netherland.

Earlier, I mentioned that Villa Henny was surrounded by dichotomies. Two sides of a coin, seeming to be opposites. The structural and architectural, the freedom and rigidity, the hand-made craftsman and the industrialization of the modern building. All these things, seeming to be first disconnected, found a way of being connected. Robert van't Hoff was a relationship councillor. By doing this experiment, he contributed in the introduction of reinforced concrete into the realm of dwellings, making it just a step more feasible to build in a new way. He believed in a "unity of contradictions" and as a last example I'll end with an anecdote which, I think, sums up van't Hoff's philosophy perfectly: When Huib Hoste (Belgian architecture critic) heard about the interesting design of a house in Huis ter Heide in 1916, he decided to visit. He walked unto the building site and spoke to the first construction worker he saw, asking him where he could find the architect, Robert van't Hoff. "You're speaking to him," was the man's answer.

9. LITERATURE

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10. PHOTOGRAPHS/DRAWINGS

3.1. Photograph - Cast House
De Prins der Geïllustreerde Bladen 10
1911, May

3.2. Drawing - Fireproof House
By Frank Lloyd Wright
Ladies Home Journal
1907, April

4.1. Structural Section A
By Robert van't Hoff & HBM
Private Collection Heerlen
1915

4.2. Structural Section B
By Robert van't Hoff & HBM
Building Permit
Archive Zeist
1915, 10th of October

5.1. Photograph - Villa Henny
De Stijl Magazine
1919, January

6.1. Structural Plan Roof - Villa Henny
By Robert van't Hoff & HBM
Building Permit
Archive Zeist
1915, 10th of October

6.2. Plan Ground Floor
By Robert van't Hoff & HBM
Building Permit
Archive Zeist
1915

6.3. Plan First Floor - Villa Henny
By Robert van't Hoff & HBM
Building Permit
Archive Zeist
1915

7.1. Photograph - Schröderhouse
1925

7.2. Photograph - De Essenhoeck
Rijksdocumenten. Pbl: 20000626
1920

7.3. Structural Section - De Essenhoeck
By Gulden en Geldmaker
Building Permit
Archive Apeldoorn
1920

7.4. Structural Plan - De Essenhoeck
By Gulden en Geldmaker
Building Pemit
Archive Apeldoorn
1920