Nuclear resistance; Keeping the historical fabric

Technical university Delft Faculty of Architecture
Thesis plan: RMIT
Msc 3 Studio KEMA, Arnhem

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Colofon

The nuclear laboratory: Keeping the historical fabric.
A redesign for the KEMA estate, Arnhem. Providing a second life’s for the old Laboratories and offices so that the Business Park can rise to the prestige it ones had.

Graduation Thesis

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Personal motivation

The time of the fast growing economy is behind us. This we can see in many facets of life and also in the field of construction. The history of our welfare leaves us a trail of vacant, mostly industrial and office buildings. That raises the question how to go deal with this kind of build heritage. What we can do, and in the modern history often did is to demolish and rebuild, because that what doesn't meet our requirements had to be replaced. In this time of financial difficulty, sustainable consciousness and plot shortage we have to search for other solutions. Otherwise we will repeat the same mistake as we have done over the last decades and with that loosing even more heritage.

The public awareness off the cultural heritage concealed in buildings is growing. Big interventions from the 50's all the way to the 80's changed our urban fiber dramatically, going from small dimension buildings to immense constructions. The Hoog Caterijne, realized in 1973 is such a major construction project located in the city center of Utrecht. The project that started off as a desire to improve the parking around the train station area, soon became something bigger: A futuristic plan high above street level, and of a massive scale. In the end the Hoog Caterijne was constructed at the expense of a historical building block, containing 'The Utrecht' a pure and precious Jugendstil building. (M Blekendaal, 2003). A lot of people, and especially the municipality of Utrecht were enthusiastic about this new building typology, but unfortunately in the last four decades the building has harvested more criticism than praise. In the Netherlands there are numerous of examples where functionalism has beaten the historical heritage. These how ever are the projects that have ensured that the public became aware of the build heritage, the stories they tell and the atmosphere they bring to our surroundings.

The time we find ourselves in is a time of awareness. A time where the maintenance of our historical heritage is considered important, but at the same moment the use and comfort needs and requirements are very high. It is this tension that fascinates me as a student in Architecture.

At the master studio of RMIT, the main goal is to learn how to deal with build heritage and interventions. On the scale of regional landscape, city planning, building and building components.

For me it was a simple choice to go into this field of architecture, because reuse assignments can differ from coastline intervention to redesign of glass facades and it's always dealing with the situation that is already there, that borders your project and gives inspiration.

The scale of a building for me is the most interesting because here you combine all the knowledge we learned in our bachelor. With the analysis going from urban context, to architectonic elements to technical details. All different levels where the architect can find tools and inspiration for the redesign.

An other more personal reason, for my interest in the RMIT graduation studio is that this field of education isn't common at other universities around Europe. My ambition and dream is to work and live in France. France has build heritage that is perfectly conserved and at times studiously renovated, the citadel of Briancon is an example of a nicely conservation, as is the chateau Chambord in the Loire valley. When we look at the architectural field of renovation and re-use, we see a less extensive number of projects. For me getting this specialized design education here at the TU in Delft is an important step into my career in France as a renovation architect.
Subject and context

The graduation studio of RMIT that started in the spring semester of 2012, has as a subject; revitalizing the industrial heritage. The location on which it concentrates is the Kema terrain in Arnhem. The KEMA terrain is an indirect result of the office oversupply in our country. The office buildings on the terrain are vacant because they do not meet the modern requirements of the average company. But there is something about the atmosphere that isn't to be found in a new build. It's the feel of history.

The KEMA area is a business park situated in the east of the city Arnhem, just north off the river bank of the Rhine. The KEMA company bought the, what's now just a part of the, terrain back in 1938 from a family. This Family, called the Pallands, had taken good care of it and even had foreseen the site of an English garden structure.(fig 02) In 2002 TCN became owner of the building site, that by then had extended all the way down to the river Rhine.

The Business park is now 55 ha. and divided up in four zones, due to three infrastructural routes penetrating the terrain. The four zones are, Mariendaal, den Brink, de Hes and Rosande.(fig 03) Each is visually distinguishable from the others, for they all have different characteristics.

Mariendaal is the on north side, situated between two railway tracks and a road. It was designed together with den Brink, but now several original KEMA buildings have been demolished and a new building is under construction. So it has lost the share of characteristics with den Brink.

Den Brink is the oldest part of Business Park Arnhem. It was designed under English landscape architecture and has a very low building density. All the buildings have a relatively low scale and are build in the architecture style of the Haagse School.

De Hes is the first extension of the KEMA terrain to the south. It is a blurry site, where office building in all different shapes, styles and sizes are to be found. The density is a lot higher than the two sites mentioned above.

Rosande is the most industrial part of the business park and it is the new location of the KEMA company. The buildings here are purely designed for functionality. Rosande has a direct excess to the river Rhine.

The Business park is situated on the out spurts of the national park 'de veluwe' and therefore has a high quantity of trees and lawns. The sloping landscape of the business park provides the visitor with small valleys containing numerous interesting views.
Problem statement
The business park Arnhem is dealing with multiple problems, in this next chapter the main three problems will be described and explained.

Fragmentation
The Business park of Arnhem is dealing with multiple problems, one of which is the fragmentation of the park with its four zones. The four zones have their own characteristics in terms of architecture and infrastructure as described in the chapter subject of context. However this is not the but that's not the main reason for the park to be and feel as fragmented as it is. This fragmentation is mostly due to the limited connections between the four zones, which results in a poor accessibility. These limited connections have to do with the infrastructure on a higher scale; two regional roads and two railway tracks are penetrating the KEMA area, literally cutting it into four separate pieces.

The few connections that are there are either made by tunnel or bridge. This lack of accessibility makes that the park isn't experienced as a whole, and therefor it looses its urban typology of what regarding to the public is a business park.

Vacancy
The oldest areas of Business park Arnhem; den Brink and Mariendaal consists office buildings and laboratories differing from late 40's too mid-60's. All the buildings have relatively small dimensions in order to blend in with the English landscape structure of the park. Now that the demands on office spaces are getting higher, the old buildings are loosing ground. They are simply not big enough for the modern companies and the installations for thermal comfort and technology can't reach the requirements modern tenants have regarding health and comfort. At Mariendaal this movement has already resulted into demolition of two of the three historical laboratories, only the nuclear reactor building is still in place.

In the case of den Brink this has resulted into a high vacancy level. A lot of buildings, even two of the three monuments are at the moment without a tenant. Back in the days, companies were satisfied with multiple buildings on which they could spread out there employees. Nowadays, it's preferred to have all the different business section under one wing, to keep control, unity and with that reach a higher efficiency. An example is the VPRO Villa, designed by MVRDV. Before the new build, the public television and radio broadcaster, had his employees spread out over
Loss of the historical fibre
Again we look at the two park zones up in the north. Along side the railway track there was an ensemble of big laboratories that were really important for the KEMA company, back in the days. The three laboratories on Mariendaal corresponded in architectural style with the laboratories down at den Brink. They all were designed with out of functionality with a glimp of Haagse school found in the façades. The brickwork, the towers even the steel windows talked the same language.
In Mariendaal there is just one laboratory left, the other two have made place for a imposing new building for the Tennet company.
The nuclear reactor building is still standing, but not for long, cause the municipal government has already excepted the demolition request asked by TCN.
When this building is gone the whole historical fibre of the laboratory ensemble will have gone with it. The fact that Mariendaal was build as one piece with den Brink will not be visible from site.

The building
For my graduation project I have chosen the Nuclear reactor building at Mariendaal.
The Nuclear reactor building is a former laboratory that was designed for research in the nuclear energy field. At time of completion back in 1956 it the laboratory was facilitated with it's own nuclear reactor, connected to the left wing of laboratory. After KEMA lost its licence for nuclear testing, the reactor got disabled and 20 years later the reactor got demolished. This intervention still is clearly visible in the east façade of the building (fig. 09)
My interest for this building has to do with the fact that it concerns all the problems found on the terrain; Fragmentation, vacancy and the loss of historical urban fibre.
Fragmentation
The Nuclear reactor building situated between two railway tracks, cutting it off from the rest of the business Park on the south side, and from the national park ‘de Veluwe’ on the North side. Besides that, the new Tennet building is constructed just on the west side of Mariendaal. Tennet is a company with a high confidentiality policy and the new office building is designed on this introverted attitude. Resulting in a design with its focus on a central courtyard instead of the business Park. These two conditions combined make the Nuclear reactor building very isolated. In typology and architectural style the building belongs to the Den Brink area, but in fragmentation and accessibility the nuclear reactor building is part of Mariendaal.

Out dated
The building is designed on a strong grid, which makes it efficient in terms of square meters but it doesn't give the user a spatial experience. The layout of the building is very pragmatic with one long corridor connecting the laboratories that are situated on both sides, and doesn't give the user a spatial experience. (fig 0?)

The construction of the building is in perfect order but when it comes to building physics there are a few flaws. One of them being the steel windows that give thermal and sound discomfort. The electrical infrastructure and the ventilation system have been altered several times, often with short term solutions. One clear example is the ventilation pipes that are running outside of the west façade (fig. 12) Another being the second suspended ceiling in the offices, covering the later alterations in the electrical infrastructure, and removing valuable ceiling height.
Loss of historical urban fabric

Keeping the historical fabric is the most important argument for continuing with this building. The rich history of this building park is one of the things that make it unique, and therefore it should remain. The Nuclear reactor building is the only building left of the laboratories ensemble in Mariendaal, and there are plans for demolition. If these plans are realized the Mariendaal and den Brink, who were originally designed as one zone with a Ring road, will lose their coherence, and the story of Mariendaal as the first extension to the KEMA estate will be lost.

Positives

The building is in good constructive condition, and has a column structure that diverts freedom in plan, and therefore freedom in design. It contains no less than 2500 m² of floor space. The strong architectural components of the existing building can work as a colour-pallet for the redesign.

One other good thing about the building is the location, when discarding the railway tracks. It's position on top of the hill gives it a nice view over the den Brink estate. And it has a key position in between de Veluwe on one side and the business terrain on the other.

Program

The nuclear reactor building will have a program that is suitable for the business park and at the same time brings a new kind of function within the area. It is my opinion that the Business Park will benefit when the whole historical laboratory ensemble that is found in Den brink and Mariendaal will get a more vivid program, that brings liveliness in the evening hours and in the weekend. Such a program will break the introverted appearance of the park and make it more open to the public.

For the Nuclear reactor building I've chosen for a short stay establishment. This will be a contribution to the Business Park, because also here the world globalisation brings its expatriates. Tennet, KEMA and several others big companies situated on the business park, are struggling with finding decent housing accommodation for these international employees. And they expect the number of international employees to grow even higher in the near future. (presentation KEMA)

To meet the housing demands of this growing number of expatriates, it is essential that the short stay housing market enlarges and that apartments are build in the right location and with the right quality.

The Nuclear reactor building is has a large surface of around 2500 m². More than enough to house the short stay apartments, together with some hotel rooms and supporting facilities such as; laundromat, common rooms, bar/restaurant and bike storage.

The typology of short stay housing is relatively new. The social and pragmatic acquisition diver from normal housing facilities as described in the graduation thesis of M. Hoijtink ‘Een thuis ver van huis’. In order to design appropriate housing accommodation, it is crucial that research is done on this particular field.
Aim of the project

The aim of the project is to come up with design solutions that give the nuclear reactor building a second life as short stay apartment building that contributes to the whole feel of the terrain.

The aims that are wished to be achieved.

- With the design the cleft between Mariendaal and den Brink has to be minimized or preferably equalized. So that the whole historical north part of the business terrain can find its former glory of coherence.
- The barrier between the business park and the Veluwe shall be overcome.
- The landscape with its sloping terrain shall have a more interactive relation with the building. Making the users aware of the hill the building is situated upon.
- The short stay apartments will meet the social needs of the expatriates
- The plans in the interior shall have a flexible layout, able to adjust when a change of function in the future takes place.
- The building itself has such an installation infrastructure that it meets the requirements of today’s tenants.
- The noise created by the railway tracks should be minimized, so that the user of the apartments doesn't refer to it as nuisance.
Research questions

How can we transform the nuclear reactor building situated on the KEMA terrain into a short stay establishment that on one hand meets the modern acquirements of the expatriates and on the other hand complements the historical urban fabric, the sloping landscape and the?

Sub questions
Certain subjects mentioned below have already been addressed in the urban, architectural and technical analysis. These however form the basis for the research that still has to be done, and are there for mentioned in the study themes that still have to be carried out.

In front of every sub question the suitable research tool, is mentioned

Sub questions: Historical urban fabric
1. Observation: What is the historical urban fabric of the laboratory ensemble exactly?
2. Observation: What are the main spatial similarities in the plan of the similar areas in other locations/case studies?
3. Case studies: How can one building strengthen the ensemble as a whole?
4. Research by design: How can we transform the public space of the laboratory ensemble so that the nuclear reactor building is taking part in the laboratory ensemble?

Sub questions: Connecting
1. Research by design: How can we use the sloping terrain, to enforce the connection from the business park towards the Veluwe?
2. Research by design: Case studies: How can an overall new infrastructure of Mariendaal and den Brink contribute to a better connection between the Veluwe with the business park?

Sub questions: Short stay
1. Literature study: What are the social living acquirements of expatriates?
2. Literature study: What are the functional living acquirements of expatriates?
3. Case study: What is are general models for short stay housing?
4. Research by design: How can these models be altered in such a way that they complete and complement the building?

Sub questions: Technology; Noise
1. Literature study: What are solutions on urban, building and detail scale to decrease the nuisance as a result of the train tracks?
2. Case studies: What are the architectural design solutions regarding noise nuisance?
3. Research by design: How can the modification regarding the noise nuisance contribute to the overall architecture of the design?
Methods of research

Spiral model
In the past six years of my studies I've been taught several different methods for the project process. There is one that really stood out among the rest, mainly because it is designed for the renovation field, and that is the Spiral of Job Roos. In his book 'Discovering the assignment' he emphasize the fact that this isn't a scientific method, but a model of thought that is based on experience, and can help the designer towards his goal.
In short the model has three main elements;
   1) Value lines
   2) Historical continuity
   3) Spiral line

The value lines contain the goals of the project; the plan of requirements, the future use of the building, the economic value, the social function and several others.
The historical continuity deals with the historical value of the building. It is in fact one of the value lines as described above. But in the field of renovation this is the central element and it must therefore be related to all the other requirements that are explicit or implicit in the assignment. (Roos, 2007; p. 37)
The Spiral line resembles the design process. The line tries to find the core of the assignment, the point where all the value lines and the historical continuity come together. When this point is reached the assignment is clear and the designing can begin.
In the model of Job Roos (fig. 14) it is shown that the three elements start separately, and that they slowly come together to the core. After the core of the assignment is found, the design process begins and the three elements split up again.

Personal model
Even though I find this model of thought very helpful, I miss the personal element of the architect. In my opinion the experience you have in architecture and in live, together with your personal interests have a significant influence on the design. Especially in the graduation project, where a lot of freedom is given to us as students.

In figure 15, the design process as I see it is shown. I believe the assignment starts with the observation and analysis of the urban, architectural and technological aspects of the building. These form the bases for the three following components of the design process; the value assessment, the aims and inspiration and the program. As mentioned before in the assignment of the graduation the program is free for the student to choose. And therefore my personal experience in architecture and in live and my personal interests have there influence on this part of the design process. The value assessment can be compared with the historical continuity of the Spiral.
Out of these three elements together with my personal knowledge and ambitions the design concept and the preliminary design are shaped. Subsequently sub-concepts are formed for several components of the design. This is done to create a clear frame for all the building elements, such as façades, routing, composition, materials and so on. These sub-concepts always overlay the main design concept, to make sure that the design tells one clear story.
The main design concept together with the sub concepts give the tools to bring the preliminary design to a solid temporary design. In the design process of this temporary design it is plausible that certain aspects of value assessment, program or aims and interests are forgotten or underdeveloped. Therefore it is required that the temporary design is tested on these points that were stated in the beginning of the graduation project. After this reflection, the design has to be carefully and systematically reviewed with the knowledge I’ve gathered during my bachelor, stage and master and with that all the information gathered during literature studies, case study analysis and researched done by design. As Alan Colquhoun writes in his article Typology and Design methods, architects design with there intuition and this intuition we get when certain information is so well understood that we find it logical or even obvious. For the knowledge we do have, but isn’t part of our intuition (yet) it is essential to test your design not only by subject, but first and for most on the enter action of these subjects.

**Tools**

During the design process I will use some tools that have been working for me in the last couple of years, some of them have already been addressed when explaining my method of design.

- **Framing**
  To get a clear vision about the goal and define an enclosed research field, for the main project but also on smaller levels

- **Sub concepts**
  Design principle for every frame. Intersecting with the overall concept

- **Sketching**
  Sketching helps me to make blurred idea’s or solutions more specific

- **Variants and SWOT analysis**
  Designing multiple solutions and reflecting on these help to get the underlying problem clear and tangible.

- **Models**
  3D models help to get a good sense of the spaces you make.

- **Dialogue**
  Get input from people in or outside architecture that aren’t acquainted with the project. This helps to get your story clear and the solutions strong.

**Fig 15: Method of design**
Social & Scientific relevance

Social relevance
The study of the Kema terrain and the nuclear reactor building is on three points socially relevant.

For one thing the Industrial buildings are part of our national heritage and even though not all the building are listed as national monuments, it is of high importance that these buildings are preserved. The buildings on the KEMA terrain are representative for a certain architecture style called; De haagse stijl. And the way the whole ensemble of den Brink and Mriendaal has developed over time is quite unique. From our history we have learned the importance of heritage maintenance and development, for that what is demolished will never rise again. Secondly, the Kema terrain has known decades of industrial activity. And in the heyday of the KEMA company the park and the work that was carried out were highly appreciated by the surrounding community. The park how ever has lost its formal glory, the business park as it is now lacks tenants and the old industrial buildings are slowly decaying. In order to bring this part of Arnhem back to the working force and the community it's necessary that the business park gets reviewed.
Finally the new typology of the short stay apartments has a high social relevance. The world's globalisation is a fact. Companies are going abroad, are merging together with other companies and are growing out to be companies that work on the world wide market. Along with this development came the expatriate. Employees of big companies whom live and work abroad for a certain period of time. KEMA and Tennet, situated on the business park, employ these expatriates. For these international employees to work productively and efficiently is is of importance that they have fitting accommodation.

Scientific relevance
The scientific relevance overlaps the social relevance on the field of short stay. The research and design project aims to provide the scientific world with a tool box for this new typology of short stay apartments. A tool box that can be used for renovation and new build assignments dealing with housing for the expatriates, elaborating on the apartments as well as the common spaces. The final products will give the academic world substance for there debate on the social and pragmatically living requirements of the international employee and how the tangible community of expatriates should be shaped.
An other subject of scientific relevance is the noise reduction, that a has to be tackled in order to supply a comfortable apartment. On the scale of urban/landscape design, architectural design and technological details the research will produce several design solutions. The solutions on the architectural and detailed scale, will be beneficial to the scientific field of renovation and the dialogue on noise insulation.
# THESIS PLAN

**Nuclear resistance; Keeping the historical fabric**

## Planning

### General goal Period 1:

**General analysis of the KEMA terrain and the building of interest. In order to understand the problems and frame the specific assignment**

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<th>Wk</th>
<th>Period</th>
<th>SUBJECT</th>
<th>Why</th>
<th>Accent</th>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Introduction</td>
<td>Prevention and insight in the assignment</td>
<td>Gathering information, planning</td>
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<tr>
<td>2</td>
<td>1</td>
<td>Urban analysis</td>
<td>Understanding the location and its activity</td>
<td>reading, gathering information, analysing</td>
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<tr>
<td>3</td>
<td>1</td>
<td>Urban analysis</td>
<td>Gezamenlijke analyse, persoonlijke conclusies</td>
<td>analysing, documenting, concluding</td>
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<td>4</td>
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<td>spring holiday: Handling in history thesis</td>
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<td>spatial analysis</td>
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<td>15-03 pres. Architecture</td>
<td>Architectural analysis</td>
<td>understanding the buildings logistics</td>
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<td>Technical analysis</td>
<td>finding technical flaws and decays</td>
<td>preparing the P1 presentation</td>
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<td>8</td>
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<td></td>
<td></td>
<td>completing the analysis</td>
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<tr>
<td>9</td>
<td>2-03</td>
<td>hand in Draft Thesis plan</td>
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<td>using thesis plan as guideline for P1 booklet</td>
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<td>10</td>
<td>2-03 presentation P1</td>
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<td>11</td>
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<td>Value assessment</td>
<td>Basis for design solutions</td>
<td>define value assessment and aims/goals</td>
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<td>Thesis plan</td>
<td>Method of process</td>
<td>formulate problem statement and design assignment</td>
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<td>13</td>
<td>1.11</td>
<td>Analysis + value assessment</td>
<td>Basis for design solutions</td>
<td>coherent story of analysis + value assessment + program</td>
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### General goal Period 2:

**developing a concept for the terrain and my building of choice. Using the value assessment, aims, concept, program and masterplan to make a preliminary design**

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<td>Framing the assignment</td>
<td>Problems statement</td>
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<td>2.2</td>
<td>My interest</td>
<td>My goal as for this graduation project</td>
<td>Looking for chances and opportunities within the assignment</td>
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<td>3</td>
<td>2.3</td>
<td>Masterplan</td>
<td>Test the knowledge of the area</td>
<td>What are the characteristics?</td>
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<td>4</td>
<td>2.4</td>
<td>Masterplan + deelgebied</td>
<td>Design my building context</td>
<td>Infrastructure, social connections, visual connections</td>
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<td>2.5</td>
<td>PoR program of requirements</td>
<td>To create a functional building</td>
<td>Study on Short Stay apartments</td>
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<td>6</td>
<td>2.6</td>
<td>Concept and arguments</td>
<td>Getting a general idea of the building mass</td>
<td>extensions and there composition Facades</td>
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<td>Preliminary design</td>
<td>Making idea's tangible</td>
<td>Form and spacial experience, sections</td>
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<td>Preliminary design</td>
<td>Getting sense of square meters of the program</td>
<td>Functional layout, plan</td>
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<td>PRESENTATIE P2</td>
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<td>2.10</td>
<td>Reflect and evaluate</td>
<td>Understanding critique,</td>
<td>SWOT analyse and sketching</td>
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<td>2.11</td>
<td>re-take P2</td>
<td>Preliminary design</td>
<td>Making more ground design choises and interventions</td>
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<td>12</td>
<td>SUMMER HOLIDAY</td>
<td>3D model preliminary</td>
<td>3d shows the difficult or weak spots</td>
<td>Rhino modeling</td>
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# THESIS PLAN

## Nuclear resistance; Keeping the historical fabric

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<td>Making connections between form, structure and story. Let the research be the fundation of the design choises</td>
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<td>Bring all the elements together, to let it be a coherent story that sits on a solid foundation</td>
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Reflection

Nine months ago I've joined the department of RMIT (renovation modification, intervention and transformation) at the faculty of Architecture for my graduation. The graduation studio that I joined had its focus on the Kema terrain in Arnhem. Quicker than expected I'm writing for you my reflection chapter, as I am following an accelerated program that gave me the opportunity to finish my graduation project in 9 instead of 12 months.

Renovation architecture for me is about extending the lifeline of existing buildings. It deals with the historical and architectural values of the existing building on one hand and with the modern market needs and requirements on the other. This brings a tension to the design because combining 100% restoration with 100% modern requirements is an impossible mission. It is this tension that fascinates me in the renovation field of architecture in general and now specific in my graduation project. The design process within the renovation field therefore has been a search for the optimum between the existing building and the new program with its requirements.

In this chapter a reflection will be made on the design process. In order to do so the design steps will be discussed, to show the development of the project and point out the crucial points in the process.

After that a reflection will be made on the used methodology. The main question here will be: Was the method that was devised in advance sufficient during the design process? And on which points did it serve me as a designer and on which points it wasn't sufficient enough.

Followed by answering the research question as it was stated in the beginning of this document. Was it the right question for the project and did I managed to answer it with the architectural design.

In the end I will give a few recommendations for fellow students as well as for myself and future design projects.

I certainly hope this chapter gives you a small insight in the design process of the last eight months and that you enjoy the reading.
The design steps

The masterplan is the subsurface off the architectural design project. Here problems that were found during the Urban analysis on the scale of the Kema park and its connections towards its surroundings are addressed. The aim was to design a masterplan that didn’t only solve the problems that were encountered during the Urban analysis, but also to gives guidance for to the building design projects to work out these solutions on a smaller scale.

Main research question:

How can Den Brink be reconnected to Mariendaal and Mariendaal park, without losing the historical value of the pavilion park?

The concept of the masterplan was to keep the park as untouched as possible, with the Brinkweg as main road. A public route for bicycles and pedestrians penetrates the park from the south east toward the north west Connecting the residential area just outside of the Kema terrain with the Mariendaal park situated north of the Kema terrain. The grey stripe indicates the zoetenlab ensemble, a high density zone where the train station and the bus stop is situated. In order to strengthen the original pavilion structure of the park a building and some building parts were demolished.
Building + Program
The most important step in the whole design process was the decision made on the building and its program.
Walking through the project area of Arnhems buiten I was impressed by the architecture of the zoetenlab ensemble, situated along side the railway track at the lower part of the terrain. They form the centre of the old kema estate, den Brink and Mariendaal. The architectural style and the composition of the ensemble made a strong impression, but at the same time I noticed the MO5 building on top of the hill, situated North of the zoetenlab ensemble. The building was not only build with the same materials and in the same architectural style of the ‘the hague school’ but for me it felt like the MO5 building grounded the architectural style and composition of the zoetenlab ensemble. The importance for buildings surrounding the ensemble to have the same architectural language strengthens the ensemble itself.
The fact that the MO5 is building that serves the architectural ensemble, without being a direct part of it, which gave me the freedom to do interventions were it was possible and needed, and in the same time strengthen the ensemble.
The way the building is situated, overseeing the den Brink on the south side and having a close connection to the Veluwe on the North side, for me was a perfect opportunity to look for a program in the housing market. After gathering information from Arnhem's Buiten I found out that short stay apartments were needed in order to answer the need of their international orientated businesses. I was fortunate to find a program that has my personal interest, that served a realistic demand and worked well with the location and design of the existing building.

Landscape
Out of the urban analysis came that the landscape was one of the leading elements when it came to composition and orientation of the existing buildings. Besides that, we don’t find that much sloping terrain in the Netherlands, and it’s my opinion as an architect that we should emphasize this natural feature when we are in a position to do so. The landscape therefore became a third element in my design project, together with the existing building and short stay housing.

Concept
These three subject: existing building, short stay and landscape have been moulded into one design concept. The aim of the concept was to give structure and limitation to the three elements, in such a way that they could blend together.
This design concept stated that the historical element is continued on the north side of the building, the north façade, based on the fact that this was the original orientation of the laboratory. The landscape element comes in from the south, where a sizeable sloping green terrain is situated.
In the building itself we house the short stay apartments.
Short stay
While researching short stay housing, I came across a graduation thesis of M. Hoijtink 'Een thuis ver van huis'. Which gave me an idea on the social and pragmatic acquirements of short stay housing and how they diver from normal housing facilities. Two important themes came forward out of the research done by M. Hoijtink, one being the ratio between residence time and housing needs the other the importance of supporting facilities in short stay establishments. → Fig 17

This information has lead to three big design decisions.

The first design decision has to do with the organization of the private apartments with the public supporting facilities. Two entrances were realized, one in the north façade entering the building on ground floor level and one in the south façade entering into the basement floor. Due to the fact that the existing building is partially sunken into the sloping terrain. The short stay apartments are accessed from the north entrance and situated on the ground floor level and upwards.

The supporting facilities were situated in the basement and have their entrance on the south side of the building. A canopy was designed, so that the basement breaks away from the existing building and orientates more on the sloping landscape.

The second decision was to design different short stay apartments. Three apartment types for three different residential periods:
- 21 m² hotel room for expatriates staying from one day up to three weeks
- 50 m² studio apartment for expatriates staying from three weeks up to six months
- 75 m² maisonette apartment for expatriates with a residence time from six months up to two years.

A fourth apartment type was designed for the VIP expatriates, which has a surface of 150 m².

Beside the information gathered by this graduation thesis, case studies of short stay establishments were analysed on the following subjects: Apartment size, apartment layout and supporting facilities. The information gathered from the case studies showed that the supporting facilities had an extensive share in the buildings surface as in the buildings layout.

Short stay housing is not only about housing needs, for the employer it is important that the expatriate gets more than housing alone. It’s a unwritten rule that employees who leave their home country should feel appreciated and this often is done by providing them luxury facilities.

Fig 21: Separation apartments and supporting facilities

Fig 20: Ratio collective versus private related to the residential period

Fig 22: Organization apartments
The third decision that was made was referring back to the value assessment of the existing building. One of the leading architectural features of the existing building was the readability of the façade. While looking at the building people can distinguish different building parts, each housing a different part of the old laboratory program. The readability of the façade was typical for the buildings found on the KEMA terrain and therefore I decided to continue this readable organization while positioning the short stay apartments in the building. This design decision has lead to the biggest intervention regarding the existing building, which is to demolish the east façade.

The east façade has been altered several times, the last alteration being the demolition of another east wing. Because of the interventions there is a high diversity of brick work and a disturbed rhythm of the windows. There also are several transport doors without function and the first floor level contained a door that leads toward nothing. The architectural language has vanished over the years resulting in the decision that the east facade had to be totally rebuild.

Its my personal opinion that renewing one small east facade while preserving the rest, brings friction. With that in mind I came to an architectural intervention that could bring rest and clearness to the buildings plan. In the past all the additions, demolitions and alterations had led to a more symmetrical building. Given that, renewing the east facade could give me the freedom to make the building even more symmetrical. The design decision that had been made was to copy the west laboratory hall (in volume and facade concept) to the east, and with that not only renewing the east facade but also a bit of the south façade.

With this design decision, the program of the small 21 m² apartments could be organized in the west hall as well as the east hall. The big laboratory hall that we find in the east and west wing will be continued by working with free standing boxes for the short stay rooms.
Pavilions
After looking at several other short stay establishments the decision was made to extend the program with luxury facilities, including as a swimming pool a fitness, a restaurant and a bar.
These facilities however aren't only for the expatriates. The swimming pool and the fitness are public for the people working in the business park.
The other supporting facilities in the form of a restaurant and cafe are shared not only with the business park but also with the public. These functions are beneficial to the public path that leads east of the building and, in order to function correctly, should contain public facilities as well.

With this extension of the program an extension of the building was necessary. The nuclear reactor building however was already one of the biggest buildings in the pavilion park structure, adding a volume on the building would break the rule made by the masterplan designers of keeping the pavilion structure of the park intact.
My design solution was to extend with three pavilions, each pavilion being an answer to the three main volumes that are found in the nuclear reactor building. The pavilions are situated south of the nuclear reactor building and are descending into the ground. They have a humble approach towards the landscape, for as was stated in the design concept; the landscape is the leading factor in the south.

Noise
The train track was an important factor in the design. Creating a luxury short stay establishment in between two train tracks of course was a challenge itself.
The research I did for the train track had its focus on the new build pavilions on the south side.
To find out the consequences of the train track on the new build literary research was done, in order to find out the size of the nuisance and the main ways to prevent it. After that other building designs near train tracks were analyzed, to see different approaches.
In the end an interview was done with DGMR, a company specialized in building construction with vibrations and noise. The project as it was at that time was discussed and a suitable solution for the new build construction was proposed. This consult had its impact on the plan, as well as the materialization of the pavilions.
Square
The architectural design for the square had mostly developed with research by design. The aim of the square was to form a transition between the original building on one side and the landscape with its pavilions on the other. Research had to be done on ways to pull a square inward, so that the presence of the border created by the building facade was reduced.

The tools were found by analyzing Spanish, Portuguese and south American architects. Due to the climate these architects often design the outside space together with the building resulting in a conversation between the outside and the inside world.

While analyzing the case studies, I found four design tools to design the square:
- Using the same materials inside as outside, to continue the movement.
- Play with depth in the facade.
- Bring back the rhythm of the facade (vertical) in the pavement of the square (horizontal)
- Bring volumes outside, let the square have some 3 dimensional elements that relate to the building

Canopy
With the extension of the pavilions and the square on the south side of the swimming pool and fitness a friction between public and private arose again. In order for the users of the swimming pool and fitness to feel private 'enough' I designed the canopy in such a way that it touches the ground once and again. This is a crucial design step in my project, for it doesn’t only create a visual barrier between the square and the more private swimming pool and fitness. It also contains the structural steel columns that carry the canopy, ventilation pipes and the drainage of the rainwater that falls on the on top of the canopy where it functions as a balcony.

The canopy touches the ground in the same material as the canopy itself, namely wooden walls and volumes. Because of the integration of construction, ventilation and drainage within these hollow elements, the floor plan and façade itself can stay open and clear.

Fig 29: Design variant square (September 17)

Fig 30: Sketch on the canopy (July 28)
Reflection on methodology

Methodology in short
Earlier on in this graduation thesis the design model of Job Roos was mentioned as was my own methodology model. In the graduation project I tried to combine the two models.

The overall idea for the design process was to develop one strong concept which was leading, and beside that do research by subject to develop sub-concepts that could help me deal with specific design problems.

The concept together with the extra information would be transformed into architectural solution with different design tools, such as, models, sketching, 3d impressions, framing and so on.

Reflection

The Spiral model of J. Roos is a model that concentrates on the core of the assignment. Using all the information from, architectural analysis, technical analysis, the masterplan and the program of demands and reducing it to the overall question. This core I tried to grip in one clear and strong concept, in which the existing building, the program and the landscape were combined.

At the same time the essential part of my own model was integrated in the concept, namely my personal interest and experience. This was done by choosing a program that was not only suitable for the business park but had my personal interest; the short stay housing. Besides this, the decision to emphasizing the landscape was based on the urban analysis, as well as on my desire to work with the landscape and its sloping terrain, in which I had gained experience during my study semester in Switzerland.

It is my personal opinion that this personalization of the project helped me during the project process. It gave me the freedom to research a subject of my personal interest and that has helped tremendously in the P3 phase during the summer. In that period the contact hours were scarce and motivation and dedication were very important.

The strong concept that I had developed has worked during the whole project process, from urban context all the way to technical detailing. There were times that specific research on subjects, such as short stay housing, or landscape design would take me of my design track. I got lost. Lost in the information that I had gathered.

I got back to the right track by detaching myself from the information and go back to the overall design concept. The concept brought me back every time, because it contained the overall solution to all my design problems.

The development of sub-concepts was only done for the pavilions, the square and the canopy with its descending elements. Which in fact was taking the global restrictions of the overall concept and defining them more specific with the information that was found with specific research.

When looking back at the design tools that were used, sketching, variation studies and making models were the three that were the most beneficial and therefore the most used. The 3D computer programs that I normally use more extensively now were to time consuming due to the sloping landscape, the hand made models took over this part on research by design.

The part that I had the most difficulty with was the square, as I do not have that much experience with designing outside space. There was a tendency to abundantly use all the four tools, resulting in a very busy and indistinct design. This was a phase where a lot of variants were made and in the end the design method ‘less is more’ came in to use, and this has helped to come to the final design.

And now in the end, I can say that my methodology has worked even better than I had imagined: One leading concept, specific research to fill in the gaps and a handful of design tools to put it all in its place.
Research question

The research question as I stated it in the beginning of the project was:

*How can we transform the nuclear reactor building situated on the KEMA terrain into a short stay establishment that on one hand meets the modern requirements of the expatriates and on the other hand complements the historical urban fabric and the sloping landscape?*

The main research question has not been changed over the last eight months and still contains all the subjects that were addressed during the design process. However the focus regarding the short stay establishment was more on the supporting facilities and less on the apartments itself. This was due to the fact that the basement floor with the square and the pavilions was the level where the integration between the existing building and the landscape was realized. In this basement level only the supporting facilities were situated. But it also had to do with the clear organization of the apartments that was found early on in the design process. The layout of the apartments of course took some time to develop but because the organization within the building was clear from the beginning and the apartments only had to relate to the existing building and had no relation with the landscape in terms of layout, the design task wasn't as challenging as was the hybrid basement floor.

The remark can be made that hotel rooms and the logistics behind it isn't fully developed. If I would have had more time to invest in this project it would be this part were I would like to achieve a more thorough design.

In the end the research question has been answered. The short stay apartments follow in general the restrictions of the existing building; the supporting facilities on the basement level realize the transition between the existing building and the landscape.

I believe that in the design the values of the existing buildings have been maintained and that I emphasized sloping landscape of the surroundings. Together with those two aspects a strong and clear short stay establishment has been realized.

Recommendations

Even though the project itself had a very easy flow and the design methodology did work according to plan I did come across two things that I would have done differently in a new design task. These are recommendations for myself in the future but also for fellow students in the beginning of there graduation project.

*Gathering information from experts*

In future projects it will be helpful to have a meeting with the expert earlier in the research phase. Especially in the research on the pavilions construction I lost a lot of time on research done by case studies and literature. Were in the end the meeting with the expert gave me all the information I needed within an hour. The early meeting wasn't possible in this particular project, due to the fact that it was summer holiday and a lot of the companies were unreachable.

With the research that was done on this subject I did run into information that was beneficial for another building part. So the time spend on this case studies research did help me to make fast design decisions further on in the project.

*Detaching*

In the period between P3 and P4 I had a lot on my mind apart from the graduation. This didn't necessarily lead to time shortage but it gave me stress which reduced my ability to oversee the whole project. I got stock in the feeling that I didn't have enough time to elaborate my design and because of this I forgot to detach myself from the project. Looking back on the project an al the design phases I can say that in this period I worked the hardest and it delivered the least.

I most certainly will recommend the students that start their graduation to take time away from their projects. Especially in those periods where you think you can not afford it, because when you have that feeling it means that you are already in too deep.
Do not postpone

The design part that I found most difficult, were the installations. Every time I picked up this part of the design it felt like I lacked the knowledge that was necessary to integrate it well into the design. I postponed it until it was the only thing left to do and with the right teacher I managed to understand the whole mechanism. In the end it would have been better to address this part of the design sooner because over time it decreased the confidence I had in myself as a designer and in my design. At the moment I had it figured out a big weight was lifted of my shoulders and I could see the richness of my project once more.
THESIS PLAN

Nuclear resistance; Keeping the historical fabric

Images
All the figures are made by myself except for the following:
fig 04 Levie P. student RMIT
fig 05 Levie P. student RMIT
fig 07 original source: Google earth

Literature

Books


Articles:

• Blekendaal, M. ‘Dertig jaar na opening Hoog Catharijne’ “Historisch nieuwsblad” (nr. 7, 2003)

Rapport:


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• Anglia Ruskin University, Harvard system of referencing [online] Available at: <http://libweb.anglia.ac.uk/referencing/harvard.htm> [Accessed on: 21 May 2012]