Graduation project Vacant Heritage

Sustainable estate of the future – research booklet

Research and design into a sustainable reuse of Dutch estate Huis ‘t Velde

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Vacant Heritage Dutch Police real estates

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Content

Summary

In this research report is the topic sustainability in relation to the repurposing of Dutch (rural) estates investigated. Making an estate more sustainable has been researched on the basis of two redesign theories and several case studies. The research question was: *'how can design approaches help in a contemporary reuse and redesign of a Dutch estate where both building, and nature, contribute to a sustainable design, and in particular for Huis 't Velde in Warnsveld?'*. This research was conducted in response to a design assignment for the reuse of an estate in Warnsveld, Gelderland. That is why the research also examined the history and typology of Dutch estates in particular.

Typology of Dutch estates

In the Netherlands, about 800 estates are spread across the country. Most are in the provinces of Noord-Holland, Zuid-Holland, Gelderland, and Overijssel, but this building typology can be found all over the country. Estates can be divided into three categories: former castles, estates with agricultural purposes, and estates as pleasure grounds. The remaining estates are only a small selection of the total amount that have stood in the Netherlands. It is estimated that there have been more than 3500 estates in the past.

The estate building typology goes back to the 17th century and even earlier. The urban elite and nobility looked for places to live outside the city. Family castles were not only places to defend, but also places to live and to rule over the property. Most families also had a house in the city, however large and richly decorated this was usually second in prestige. This indicates how important estates were for these population groups. Living on an estate was also a way to escape the filthy, smelly, and busy cities during summer and to live in a green and relatively clean environment. The peak was at the end of the 16th and beginning of the 17th century, but until the 19th century many estates were build. Sometimes even nowadays are new estates built.

The most important feature of Dutch estates is that royal families did not build them. The buildings had a strong bourgeois character and rivalled the relatively austere buildings of the royal family. The nobility and the bourgeois had a lot of power in the local and national government. This was reflected in the size and decoration of their homes.

An estate is an integrally designed composition of nature and buildings. A design consists of a garden layout and one or more buildings. A consistency is obtained by adding sight axes, walking routes, roads, and other elements. In the 17th century, there was a strict design ordering of axes and geometric shapes. In the second half of the 18th century, this shifted to a scenic garden design with an arcadian landscape. This style is still used nowadays. In both cases were sight lines/axes and staged 'look throughs' of great importance to give visitors an impressive experience.

Former use

The history of Twickel and Huis 't Velde has been used to investigate how such estates were used in the past. The research revealed that an estate was more than just a place for fun and recreation. Many estates were a place for production and consisted of various small companies that occupied parts of the lands. Moreover, the land has been shaped by human hands by improving irrigation and planting many plants and trees. Especially in

the eastern part of the country the farmlands used to be nothing more than moorlands. The arcadian character of this area is the result of centuries of farming on estates.

Many estates are built on or near a river or a stream. The water provided not only clean drinking water, but also fertile and wet soil on which crops could grow and animals could live. In addition, watermills were built on the rivers for sawmills or other uses.

The trees on the farmlands had two functions. One the one hand these were for aesthetic reasons to dress up the land, on the other hand they were for the production of wood. There was always a strict distinction between the two kinds of trees. Trees for felling always grew on special designated locations. These were so-called production forests (*akkerboschen*). Wood was processed in a sawmill and then used or sold.

Farmers leased their yards for farming. Here they grew crops of kept livestock. The peasants had to obey the landlord and occasionally give up part of their production or do extra work. In return they were allowed to live in one of the farms and use the lands. The rent provided an income for the landlord.

An environment of recreation and fun was created around the mansion. Beautiful gardens were laid out here for residents to walk in and enjoy. Animals were kept especially for hunting. In addition, there were often vegetable gardens and special buildings to store things. The orangery is one of the building types created on estates. In order to store orange trees inside during wintertime to protect them against the freezing cold.

Redesign theories

Two redesign theories related to the repurposing of monumental buildings were examined for the research. The first one is the theory from former TU-Delft professor Jo Coenen. He wrote that there are five attitudes in which you can make a new design in relation to the existing building. These are: *continuity, polarity, dialogue, congruence, and blending*. The second theory comes from the American architect Charles Bloszies, who wrote that there are three approaches: *restrained, referential, and an extreme approach.* The main message of both theories is not so much the attitude towards the existing building itself, but the way in which the design process takes place and is fed with the right information. And how the design attitude can help in decision making.

According to Job Roos, a repurposing design assignment consists of three subjects. It is a combination of the programme of requirements, the location, and the value of the existing. A successful redesign gives new meaning to the existing building. By adapting the building and determining the design interventions and improvements the architect's attitude towards the existing is very important. For this reason, it is important to go through a research-based design process.

Making a monument more sustainable is all about adding improvements. It should not be forgotten that old buildings already have a certain degree of sustainability in them, because they often last for more than hundred years. It is therefore important to improve them rather than change them completely. This is reflected in a research-based design process. This is a process based on research and information gathering prior to the design itself. The existing building have to be analysed and examined for history,

qualities, values, and points of improvements. Margret Brons en Paul Meurs described this process to redesign a building and make it more sustainable in four steps: 1; research the building and current installations, 2; test the actual needs, 3; implement measures, 4; make the redesign flexible for the future.

The case study research showed that sustainability solutions have an impact on the exiting building and its values. In every case, the impact of the solutions has been weighed up and a decision has been made as to whether they are applicable. It has emerged that sustainable design solutions have impact on the historical, technological, and aesthetical values of the exiting building.

By feeding the design process with sufficient research information and analysing the existing building, sufficient input can be collected to make a building more sustainable. Only with the right information can a designer form an opinion or attitude towards the existing building and make the right decisions. A design attitude, which can be differ per building, designer, and situation, will provide direction during the design process.

1. Introduction

This research report is part of my master graduation project. The project is part of the Master Graduation Studio Heritage & Architecture of the faculty of Architecture, Urbanism and Building Sciences of the Delft University of Technology.

This year, the Heritage & Architecture graduation studio (H&A-studio) does research into a group of buildings from the Dutch National Police. The department Atelier Politie Bouwmeester is doing research in collaboration with the TU Delft Heritage department for the reuse opportunities of possibly vacant police real estate. In the coming years, the Dutch police have to divest approximately 700,000 square meters of real estate. For the research in collaboration with the TU Delft are ten buildings selected:

1. Koudenhorn, Haarlem
2. Huis 't Velde, Warnsveld
3. Eenheidsbureau, Groningen
4. Politiebureau, Rotterdam
5. Eenheidsbureau, Den Haag
6. Havenpolitie, IJmuiden
7. Eenheidsbureau, Eindhoven
8. Havenpolitie, Rotterdam
9. Politiebureau Witte de Withstraat, Rotterdam
10. Politiebureau, Middelburg

Huis 't Velde in Warnsveld is an estate (Dutch: buitenplaats/landgoed) near Zutphen. This building was chosen for the graduation project because of a personal fascination and interest in estates and castles in the Netherlands.

Besides the individual design and research part does the HA studio research into the Spatial Building Typology (SBT-research) of eight of the police buildings[1]. The research is done with the whole student group. This year's research is the second part of a long-term research line. See this year's publication for the results of this research[2].

1.1 Individual research

The individual research is about the sustainable reuse of Dutch estates (buitenplaatsen). This applies to the entire estate and not just to the main buildings only. This is because of the cultural significance of the whole ensemble. Reusing and redesigning an estate is not only about the design of a building, but also about a spatial design of the whole area. This research focusses on the contribution of monumental buildings, space, and nature to a sustainable design and the effect they can have on the monumental value of the whole estate. This is worked out in a research for design attitudes and an analysis of case studies.

In the recent decades, the attention of architects in the heritage sector has been on design attitudes. They were questioning; how to deal with architecture? In 2006, former

[1] See for an example SBT volume 1: Zijlstra et al. (2021).
[2] See the newest SBT publication: Zijlstra et al. (2022). SBT volume 2: Vacant Heritage: police real estate in the Netherlands.

TU Delft R-MIT professor Jo Coenen distinguished five attitudes in dealing with the redesign of a heritage building. Six years later in 2012, distinguished American architect Charles Bloszies three equivalent approaches. The question is how these theories can be translated to 2021 with the topic: sustainability? Are the design attitudes still seasonable and can they help by determining sustainable design solutions?

1.2 Research question

The following research question is formulated for this research:

'How can design approaches help in a contemporary reuse and redesign of a Dutch estate where both building, and nature, contribute to a sustainable design, and in particular for Huis 't Velde in Warnsveld?

The following sub questions are formulated:

1. What are the design attitudes from Coenen?
2. What are the design approaches from Bloszies?
3. What are the characteristics of Dutch estates?
4. How did former residential owners make use of the estate's garden(s) and building(s)?
5. How is sustainability elaborated in the case studies?
6. Which parts of estate 't Velde can contribute to a sustainable reuse and redesign? (Design part)
7. What sustainability solutions are applicable for Huis 't Velde? (Design part)

The first five questions are part of this report. The last two questions are design research questions who will be investigated and elaborated during the design process. The results of these two questions can be seen in the final design which will be presented in the P5 presentation. The P5 presentation will be published in the TU Delft repository after June 16, 2022.

1.3 Case study analysis

The case study analysis forms the biggest part of this research. The cases are selected on the basis of a few criteria. The buildings have to be:

- A Dutch national monument 'rijksmonument'.
- An estate or castle.
- Already reused and redesigned with (partly) a different user function
- Redesigned with sustainable measures.

The selected cases are:

- Landgoed kasteel Twickel
- Landgoed Singraven
- Kasteel Ruurlo

1.4 Research method

The research consists of three parts. The first part focusses on the history and typology op Dutch (rural estates) to investigate the historical context and meaning of this kind of

buildings. The second part is a literature study on design attitudes. The last part is the case study research.

The literature study mainly concerns on two books. These are the books of Jo Coenen and Charles Bloszies. Both describe the design attitudes and approaches. This will be complemented by building examples found in this literature and other literature to make the attitudes visual. Recent literature by Paul Meurs and Job Roos is used to bring these theories into the actuality. Attention is paid to the literature about sustainability versus the contemporary design process. In this way an attempt is made to translate the design attitudes to the current sustainability issues.

The case study research is intended to collect information about sustainability solutions. The current situations of the buildings are used here and not of decades ago. This means that archival research is out of place unless a recent construction archive is found that relates to the current situation of that specific monumental building. The research uses information disseminated by architectural firms, engineering firms, professional architectural magazines, newspapers, and other media.

1.5 Research by design

During the design process there is an opportunity to test and implement the research conclusions. Moreover, is the acquired knowledge about sustainability solutions helpful for the elaboration of the design. That is why the last two sub questions will be answered by the design itself. For the result and answer to this question I would like to refer to my P5 presentation[3]. Therefore, are the answers to these questions not mentioned in this report. Except for the appendix, where two short essays can be found about the research outcome and design assessment written for the SBT-Volume 2 publication.

1.6 Relevance

The Heritage & Architecture studio focusses on the redesign of vacant heritage buildings. Moreover, it focusses on current prominent issues. One of the focus points is sustainability. This is partly because of the global climate goals. It is difficult to make a heritage building more sustainable, but a big estate offers a lot of opportunities. That is why it is interesting to research it.

The estate Huis ‘t Velde is a ‘buitenplaats’, a Dutch word for a group of residences from former noble families or rich civil families. The estates were part of the way how these influential families displayed their social-cultural position and where they lived. In the Netherlands are a lot of estates, it is a big part of the cultural heritage. Luckily more than 800 estates are still preserved, but that is only about 20% of the total amount of buitenplaatsen that ever existed. The rest is demolished during the centuries[4].

For the preservation of the tangible heritage it is important to preserve and maintain these kinds of buildings. According to Fred Vogelzang (2016) were in 2016 more than

[3] The P5 presentation and other documents according the graduation project can be found in the TU-Delft Repository after June, 16, 2022.
[4] According to Heidi van Limburg Stirum, director of the Dutch Castle foundation (Vogelzang, 2016).

300 castles and estates still in private residential use, but more are getting divested because the costs for maintenance are too high or noble family owners extinct.

That is why many estates in the Netherlands are in danger for decay and loss of ensemble value(s). Segmented sales threaten the estates while it is important to keep the ensembles complete. According to Strootman Landschapsarchitecten (2013) this is important because it is necessary to keep the buildings and the gardens as an ensemble for future research and of course for the full experience of this heritage. At the same time lacks these buildings in comfort and they have a high energy consumption. The stigma is that it is impossible to insulate these heritage buildings properly[5]. The design and research of the graduation project relate to this urge of reuse and redesign.

In the scientific framework the graduation project contributes to the research of what is started by Henri van Wyck (1974) and later Gerdy Verschuure-Stuip (2019). They both started to research the relevance and cultural value of castles and buitenplaatsen and Verschuure-Stuip is still continuing doing that. In the last years are both foundation Gelders Landschap & Kastelen and the Kenniscentrum voor Kasteel en Buitenplaats doing research into how we can preserve and reuse rural estates.

Finally, the graduation project contributes to the Spatial Building Typology research line from the Vacant Heritage graduation studio. As Huis 't Velde is one of the buildings being researched in the SBT research, the individual research and design gathers more information about this specific building. Some drawings in this report are therefore taken from that research, this is mentioned with the mark 'SBT vol.2 drawing'. The individual research and design conclusions will also be part of the second SBT research publication in 2022: *SBT volume 2: Police real estates in the Netherlands.* In part 3 will a short essay be published about the conclusions of this research report. In part 4 will a short essay be published about the redesign proposal of estate Huis 't Velde.

1.7 Content

This report is structured in three parts and is divided into seven chapters. The first chapter describes the project case for the research and design assignment. The second chapter deals with the history and typology of Dutch estates in order to get a better picture of the context of such a building typology. Finally, the fourth chapter deals with the former use of an estate and its lands.

The second part starts with chapter five where the design attitudes of Jo Coenen and the design approaches of Charles Bloszies are examined and described. This is followed by a chapter about the case study research.

The last part consists of two chapters. The seventh chapter describes the research based design process and the place in which design attitudes can help in making sustainable design choices. Finally, the eighth and final chapter contains a conclusion on the entire research. The two individual parts of the SBT Volume 2 publication have been added in the appendix.

[5] According to Paul Meurs (2021).

2. Project case

Adres: Rijksstraatweg 127, Warnsveld (NL)
Owner: Stichting Gelders Landschap & Kastelen
Status: national monument, ensemble number 526689.
The analysis report can be consulted for a more detailed description of the project case.

The project case is located in Warnsveld near Zutphen. This is in the eastern part of the Netherlands in the province of Gelderland. The estate is owned by Stichting Gelders Landschap en Kastelen and used by the Police National Academy for conferences and education. The carriage building is in use as a hotel for the academy. The history of the estate goes back to 1326 when it was first mentioned in municipal archives. The history of the estate is described in the analysis report.

Figure 1: map of the Netherlands, the project location is marked (SBT vol.2 drawing).

2.1 Location

Warnsveld is a small town next to the city of Zutphen. The estate is located next to the edges of the town and is not part of the neighbourhoods. Therefore, it is located in a natural area with less buildings surrounding the estate.

The boundaries of the estate are marked by two roads, a river, and a tree lane. On the northern edge flows the river Berkel. On the south side is the *Rijksstraatweg*. A primary road going to Zutphen.

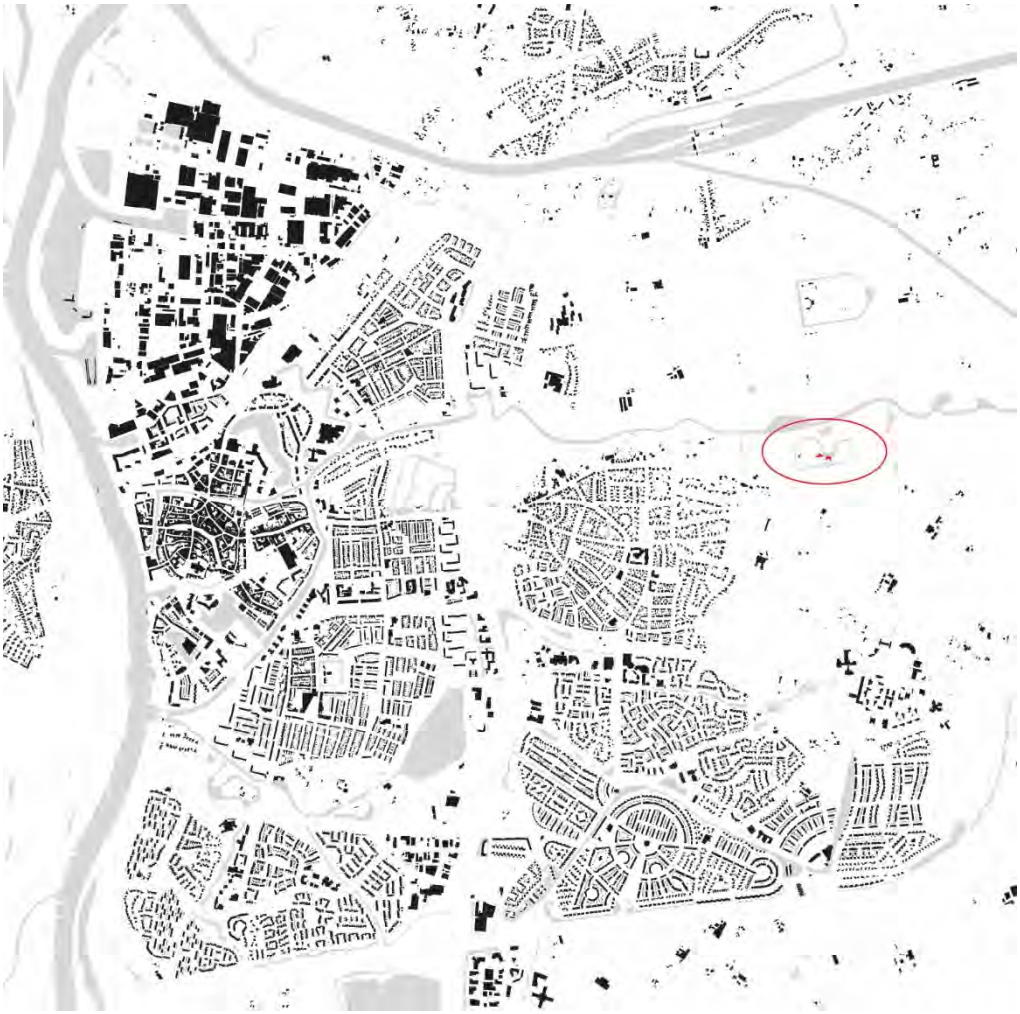


Figure 2: map of Zutphen and Warnsveld (SBT vol.2 drawing).

Figure 3: bird view of the estate (SBT vol.2 drawing).

2.2 Estate

The estate has a size of 328,479 square meters[6]. Most of the estate consists of nature in the form of meadows, trees, and water. The hart of the estate are the inner islands with three monumental buildings and a fourth residential building. The inner islands have together a size of approximately 25,600 square meters.

The estate has a few walking/cycling routes that go around the edges of the land. These routes are marginally connected to other routes in the area. The routes are separated from the islands.

The most important of all buildings on the estate is the main residence/mansion. The existence of a house is first mentioned in 1326 and as far as it is known are the oldest existing building parts from the 16th century. The second building is a carriage building built around 1806. The third and last building is an aviary (bird house) that is built around

[6] According to Dutch 'kadastrale gegevens'.

1810-1820. The fourth residential building is built during the last big restoration period in 1961-1965.

Figure 4: layout of the estate. Own image.

Figure 5: front facade of the main residence. Own image.

Figure 6: rear facade of the main residence. From: Noah van Asselt, 2022.

Figure 7: front facade of the carriage building. Own image.

Figure 8: the aviary (bird house). Own image.

Figure 9: the estate's lands consist of meadows and forests. Own image.

3. History and typology of a Dutch estates

In this chapter is the sub question addressed: *'what are the characteristics of Dutch estates?'*. Two of the most important sources to answer this question are the dissertation from Henri van der Wijck: *De Nederlandse Buitenplaats* (1974), and the dissertation from Gerdy Verschuure-Stuip: *Welgelegen* (2019). Both give a very comprehensive impression of the history, character, and important values of estates in The Netherlands. The two most important characteristics of Dutch estates in the past were the use as a status symbol and place for amusement.

3.1 Value and Social-public background

There is a growing interest for Dutch estates in The Netherlands. This also increases the interest in the connection between the buildings and their natural environment. Since 2000, the Dutch Heritage Agency has changed the heritage policy and since then is also the natural environment emphatically described, valued, and protected. In this way, the cohesion between building and nature can be better preserved.

The terms estate and castle contain actually three categories of building typologies. According to Van der Wijck (1974), the following subtypes can be distinguished:

1. Castles (*Dutch: kastelen*)
2. Estates with agricultural use (*Dutch: landgoederen*)
3. Country estates (*Dutch: buitenplaatsen, lusthof*)

The origin of estates in the Netherlands go back to the urban elite and nobility who have been looking for opportunities to live outside the city since the Middle Ages. Family castles were places from which the landlords could control their lands. These houses were the main residences from the families. Even the family's city house, however large and richly decorated, was usually second in prestige[7]. Living on estates was a way to escape the filthy, smelly city in the summer and live in a clean natural environment. For centuries, the social elite and nobility had the habit to live 'in the green'[8].

Its peak was at the end of the 16th and during the 17th centuries when many members of the upper class decided to build a country house outside their cities. Many of them came originally from Belgium before the Spanish took over the control of the Burgundian empire, like the families Egmond, Brederode and van Wassenaars. They brought a lot of money with them and started to build new houses in the Netherlands[9]. That is why most estates have their origin in the first half of the 17th century, except when it has the origin as a fortified castle. Castles generally have their origins in the Middle Ages, but were often demolished and rebuilt, or heavily refurbished, to an estate during the 17th and 18th century by the upper class[10]. The construction of estates and mansions during this time period laid the foundation for a fashion or 'standard' that will last for three centuries.

[7] See Ottenheym, van Wezel, Noldus, & Sellers-Bezemer (2007), p. 325.
[8] See Verschuure-Stuip (2019), p. 33.
[9] See Wijck (1974), pp. 15-18.
[10] See Wijck (1974), p. 16.

An exception to this are the Havenzaten buildings in Gelderland, Overijssel and Drenthe, of which estate Huis 't Velde is also one. These houses were built since the late Middle Ages and had strong similarities with castles. These buildings were the status symbol of the nobility in Gelderland. To build one, you had to be of noble origin. To be a member of the local knighthood you had to be of noble origin and at least had to own one Havezate[11].

The tradition of building estates probably originated from the Northern Netherlands (*Noordelijke Nederlanden, Friesland*), where the nobility started to build these houses near their castles (*huysen van plaisance, sommerhuysen, somerzaelen*)[12].

3.1.1 Legislation

Today, the protection of estates involves two scale levels. On one hand, attention is paid to the protection of nature (gardens, avenues, trees, plants, etc.) and on the other hand, attention is paid to the protection of the buildings (residences, gates, additional buildings)[13]. In the Dutch heritage law is the opportunity created to protect both building and the natural estate and to value both separately and in an ensemble.

This combination derives from two aspects. Firstly, there is a growing interest and emphasis on structure-oriented protection. This also reflects in a policy change by the foundation Gelders Landschap & Kastelen and the Province of Gelderland. A study commissioned by Strootman Landschapsarchitecten clearly shows the importance of the preservation of landscape structures and ensembles. This even transcends the boundaries of estates when several estates are present close to each other in the area[14]. The second aspect concerns the interest in historical narratives. There is an increasing attention to the narrative of a location and heritage experiences. These experiences tell visitors a social-economical and historical story about the history of a certain place[15].

3.2 The typology of Dutch estates

Perhaps is the most important characteristic of Dutch estates that it has a bourgeois character instead of a royal one. Moreover, the differences between a noble and a bourgeois family were marginal. This was often because noble estates had an agricultural function to derive income and because the family did not live there all year round. Nevertheless, these buildings were a status symbol of prosperity and reflected the success and wealth of urban elite families and nobility[16].

The estates were almost always built and owned by the urban elite and nobility who wanted to enjoy the countryside in the spring and summer and – as stated before – to escape the city. That is why the architectural style is also linked to the architectural styles

[11] See Canon van Nederland (n.d.), havezate & Van der Wijck (1982), pp. 85-87.
[12] See Verschuure-Stuip (2019), p. 64.
[13] See Verschuure-Stuip (2019), p. 41.
[14] According to Strootman Landschapsarchitecten (2013), who investigated the value of the ensemble in a part of the province of Gelderland.
[15] See Verschuure-Stuip (2019), p. 41.
[16] See Verschuure-Stuip, (2019), p. 65.

in the city where the owner came from. It was a place for rest and recreation, amusement, but also a place to manage agricultural and industrial operations[17].

Country estate/*buitenplaatsen*:
According to Kuiper and Van der Laarse (2005) is a country estate a place to live outside the city. It is a monumental building (mansion or castle) that forms a unity with the additional buildings and gardens and park layout. Food was often grown on the estate for own use in the kitchen. The land was also used for entertainment. For example for hunting, which was an extremely popular sport by the elite society.

Estate with agricultural use/*landgoederen*:
According to Kuiper and Van der Laarse (2005) is an estate similar to a country estate, but there is a difference in the use of the lands. Estates have a strong connection with the agricultural sector. The emphasis on the lands was on farming. Another difference with a country estate is that an estate is a large property that has been created as one designed visual unit but with different functions. These properties consist of gardens, farmlands, fields, forests, waterways, and other landscape elements.

3.2.1 Location

An estate was not just placed anywhere but was usually built on a strategic location. This location could be favourable because of – for example – a fertile soil, height differences, waterways, important roads, trade routes, near a city or military strategic positioning[18]. That is why country estates are usually located along major roads or rivers. In this way was the accessibility optimal and was it easy to travel and receive guests. In any case, distance was an important criterion: the owners did not want to live too far from the city[19]. In those days, accessibility was difficult because of sandy and muddy roads and of a great importance. The estate had to be accessible by a carriage or a boat.

The characteristics of a location can be divided into a number of elements. These are related to the quality of life and above all to health. It is important to emphasize once again that an estate was seen as a way of escaping the filthy city. In the 17th and 18th centuries cities were a dirty, overcrowded place where diseases and malodour often prevailed. The urban elite wanted to escape this during the summer.

The first element is the presence of fertile soil. This was necessary to grow crops for personal use or for farming. The second element is the connection with the environment through a road or waterway. This was essential for the supply and distribution of goods and for the accessibility for the residents and guests. The third element is the position in the area. An estate had to be located outside the city in the wild nature in order to promote human health. Moreover, the surrounding of nature improved the quality of the garden design. In addition, the presence of water was also important because it was necessary for nutrition, hygiene, and farming[20].

[17] According to Verschuure-Stuip (2019) had almost every estate a degree of operations.
[18] See Verschuure-Stuip (2019), p. 32.
[19] See Verschuure-Stuip (2019), p. 65.
[20] See Verschuure-Stuip (2019), pp. 128-139.

3.2.2 Structure, gardens, and view axes

An estate is an integrally designed composition of nature and buildings. A design consists of the garden structure and building designs. The structure consists of the positioning of the house and additional buildings, sight axes, walking routes, roads, and other landscape elements[21].

In the seventeenth-century Dutch garden design, there was a strict ordering of axes, geometric shapes, and buildings. These axes contributed to the grandeur of an estate and often extend beyond the borders of the land[22]. In fact, there was a scenic landscape in which the visitors were controlled in what they saw. This garden layout was borrowed from the French and Italian garden designs. The grandeur of such a design is reflected in extreme examples of royal French gardens, but near Huis 't Velde had Estate De Voorst also this kind of gardens (Figure 11)[23].

The heart of the design was formed by the 'vista'. A view axe that ran from the house straight through the estate. Walking paths, gardens and water features were arranged around it. Trees and hedges accentuated this view axes even more[24].

A turning point came in the second half of the eighteenth century. New gardens arose within the geometric system of sightlines and lanes, these gardens were no longer strictly geometrically constructed. Freer forms were introduced, and gardens get a rural character. This developed further into an ideal image of 'wild nature'. Gardens were no longer designed rigidly, but more natural and organically in an arcadian style[25]. The origin of the English scenic landscape style gardens was laid with meandering waterways, walking paths and meadows. Although it may seem a bit arbitrary, lines, forms, view axes and views to the mansion or follies were carefully designed. It is this scenic landscape style that is still common on estates today. At Huis 't Velde you can also see that the garden layout has been changed to this style (see Figure 12 & Figure 13).

[21] See Verschuure-Stuip (2019), p. 68.
[22] See Ottenheym, van Wezel, Noldus, & Sellers-Bezemer (2007), p. 331.
[23] The gardens of Estate De Voorst are mostly designed by Daniël Marot. This designer was also involved in the renovation of estate Huis 't Velde around 1700.
[24] See Ottenheym, van Wezel, Noldus, & Sellers-Bezemer (2007), pp. 332-333.
[25] See Ottenheym, van Wezel, Noldus, & Sellers-Bezemer (2007), pp. 333-335.

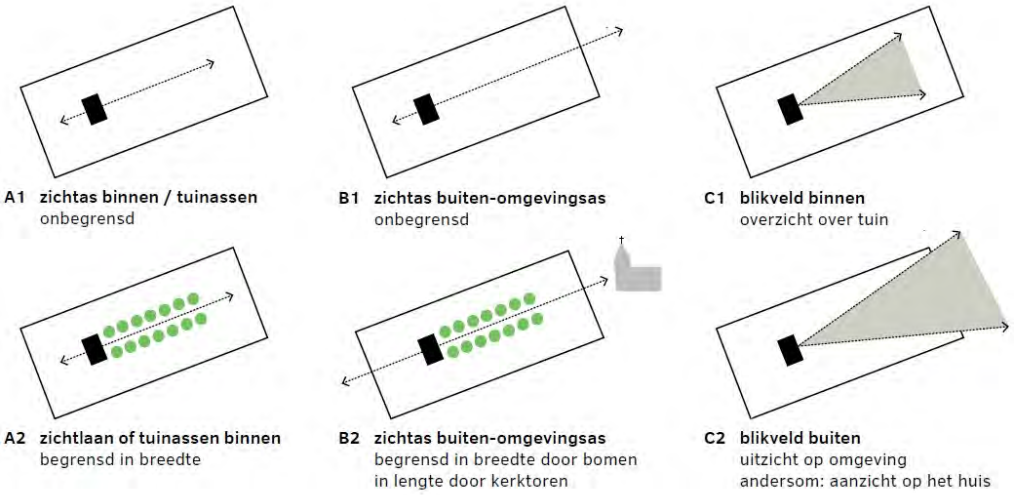


Figure 10: variations in view axes. Retrieved from: Verschuure-Stuip (2019), p. 406.

Figure 11: garden layout of Estate Landgoed De Voorst in 1699. Collection Gelderland in Beeld (GDC007000465).

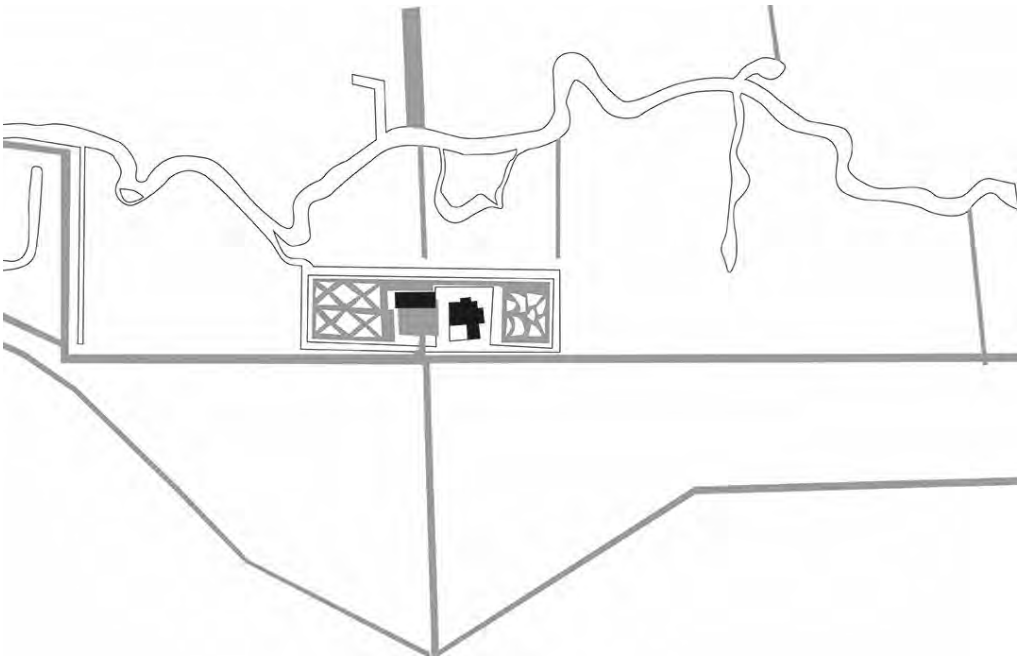


Figure 12: layout of the gardens of Huis 't Velde in 1778.

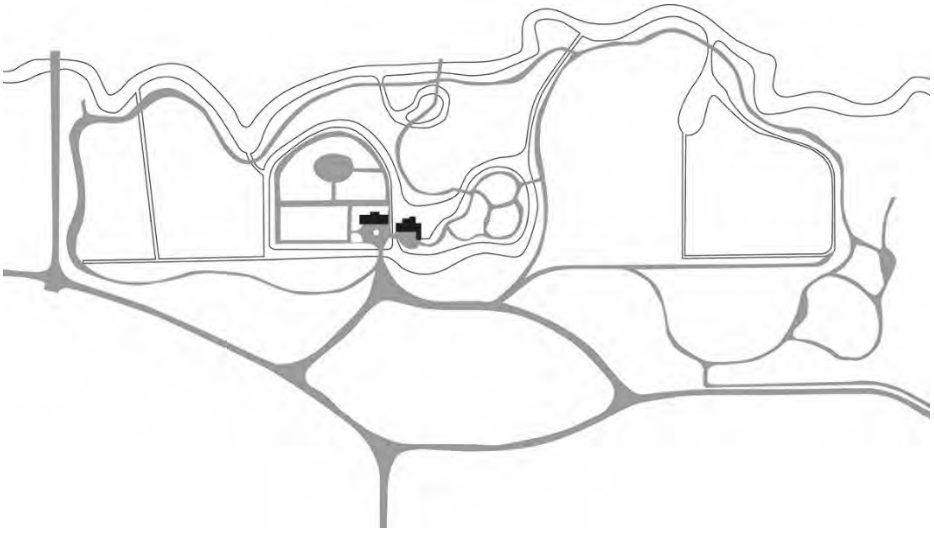


Figure 13: layout of the gardens of Huis 't Velde in 1824.

3.2.3 Buildings

In the seventeenth century, a new country house architecture emerged that broke away from urban architecture and farm typologies. In principle, an estate is a bare piece of land where everything is possible. Designers were able to develop new forms without taking the urban limitations and boundaries into account. In general, this resulted in a block-shaped building volume with an accent on the front façade and the façade to the garden[26]. Estates that were built in the 17th and 18th century often have features from medieval castles. The rich bourgeois who had these estates build, wanted to make an architectural reference to the 'knightly' residences of the nobility and to measure themselves equally against the elite society[27].

In the floor plan shifted the accent from the front to the back of the house. At the rear there was an unobstructed view to the garden and there was space created for the most important rooms in the building. Garden rooms, or garden salons that functioned as the most important room for receiving guests were located here.

The vertical hierarchy of the storeys of an estate house was similar to that of an urban house. In general, a division can be made between the basement with service rooms such as a kitchen, the living storeys, and storage room with service rooms in the attic. The living storey, or the ground floor, was the main floor for the residents. In larger houses were the ground floor and first floor both used by the residents. The ground floor was also named as bel-etage, what means 'beautiful storey' or main storey. Here, on the bel-etage and first floor were the living areas of the family and guest rooms. The staff had limited access here, except than for doing household tasks and serving the inhabitants. The staff lived permanently in the basement and in the attic.

3.2.4 Use

Besides the fact that an estate was used to grow food on, there was also a strong influence from the need for entertainment. Entertainment was extremely important for the residents of the house. This took shape in various activities, such as gardening and walking through the gardens, playing ball games or sail on the canals. In addition, was hunting often very popular. Every noble or urban elite man joined hunting activities and enjoyed hunting on their own lands. Special parts on their estates were even changed especially for hunting purposes[28]. An example of this is the star shaped forests (*sterrenbossen*) that have been created in the Netherlands. From the centre of the star shaped layout of the forest hunters had clear views into several directions what made hunting a lot easier[29]. A star shaped forests has also been built on the estate Huis 't Velde, but no longer exists.

[26] See Ottenheym, van Wezel, Noldus, & Sellers-Bezemer (2007), p. 330.
[27] See Ottenheym, van Wezel, Noldus, & Sellers-Bezemer (2007), p. 328.
[28] See Verschuure-Stuip (2019), p. 147.
[29] According to Albers & Guinée (2019).

4. Learning from the past - former use of estates

Former habits can be a source of inspiration for new uses. Old functions may form a basis for new (sustainable) solutions. Besides that, research into the former use can also learn which user functions are appropriate for an estate. In this chapter will the research sub question be addressed: *'how did former residential owners make use of the estate's garden(s) and building(s)?'.* For this research were two estates examined more closely. Those are Landgoed Twickel and Huis 't Velde itself. An important source of information is a recently published book about the estate Twickel, called *Atlas van Twickel* (Haverkate, den Ouden, Brunt, & Bloemendal, 2021). A second source is the historical research about Huis 't Velde, *'t Velde, Cultuurhistorische analyse en waardestelling* (Albers & Guinée, 2019). Both estates are described separately in this chapter.

4.1 Estate Twickel

Twickel is an estate of approximately 6500 hectares. Nowadays it is the biggest estate in The Netherlands. It finds its origin in 1347 with the purchase of water mill the *Noordmolen* (Figure 14). From that moment on the estate grew and became an important and influential privately owned estate in both the province of Overijssel and nationally. The landscape in the 14th century was a lot different than nowadays. Twente was covered with heather moorlands and not with meadows and forests. The people of Twickel changed the possessed landscapes together with other landlords. They did this manually with the aim to improve agriculture, but also to beautify the landscape. This is how the well-known arcadian landscape is created[30].

Figure 14: artist impression of the Noordmolen in Delden around 1700, Twickel. From Wim Riem, 1969. Source: http://www.waterradmolens.nl/Overijssel/Noordmolen.htm

[30] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), pp. 10-31.

One especially important quality of the handcrafted landscape was that it provided in all needs. From the beginning there were kitchen gardens, these expanded in the following centuries to a more professional bigger scale. Eventually in the 18th and 19th century were a lot of farms established. The farms determined the form of the landscape in the outer area of the estate. Vegetables grew and farm animals lived on meadows. Nevertheless, was the core of the estate always the house and its gardens. This was a place for pleasure and every owner adapted this to his own needs. For example, shifted the gardens from a formal baroque style to a scenic English landscape style during the centuries.

Figure 15: aerial photo of Twickel (2020), from Siebe Swart, retrieved in December 2021, from https://siebeswart.photoshelter.com/image/I0000y_PreZkVqVQ

4.1.1 Water household

An import source for the estate was the river Oelerbeek. The continuously stream of water was a source for power and a source for drinking water. The Noordmolen (Figure 14) was a triple water mill consisting of an oil mill and a flour mill. Moreover, was the water mill a dam in the river that ensured a certain water level in the area[31].

Water run through the whole estate for aesthetic and agricultural purposes. Around the house are ponds that dress up the gardens and small streams through the fields provide farms enough clean water. To ensure a continuously stream through the entire year there were in the past a few locations created for the storage of water in the winter. These water buffers kept the mills running, the fields and meadows wet and the ponds full. Next to the Noordmolen were two of those buffers situated (Figure 16) and one is still kept. In

[31] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), pp. 26-29.

Dutch this is called *'wijer'* or *'stuwvijver'.* Besides that, there was a second practise for the temporarily storage of water in the form of meadows that could flood. These were short term buffers, in Dutch called *'vloeiweiden'.* For both the storage ponds and the buffer fields, were the water outlets closed off with timber walls[32].

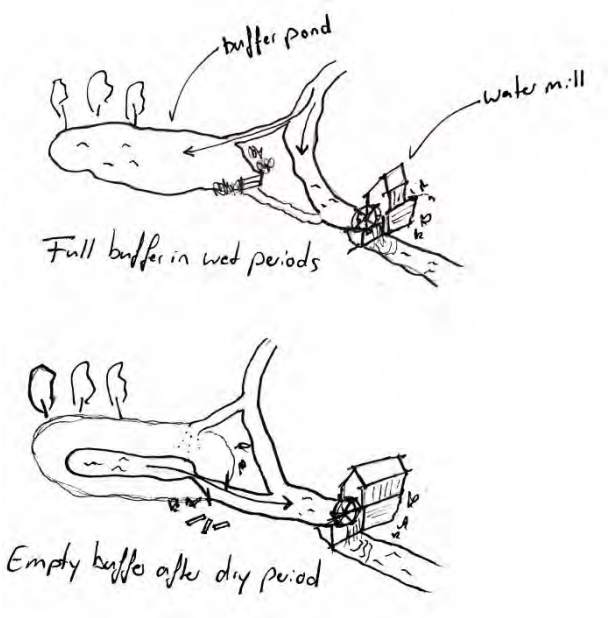


Figure 16: buffer ponds near the water mill. Own image.

New interventions

It is not only good to learn from the past, but also to see what Twickel is doing nowadays to improve the landscape. At the end of the twentieth century the nature impoverished and Twickel had problems with the landscape. The ground dried up and various plants and animals disappeared. A large-scale plan was set up to restore the nature. That started with introducing a new tree felling cycle and rejuvenation of the forests and fields. Moorfields were restored by removing wild growth and trees, and along the edges of the farm fields were tree lanes (*houtwallen*) replaced. The historical character of the arcadian landscape is improved and became even better. The last and especially important intervention is the improvement of the streams of the *Hagmolenbeek* and *Wolfkaterbeek*. The channelled streams have been transformed into meandering streams for a length of more than five kilometres. The banks were formed into places where water can be stored during flood. The effect on the nature was huge. Because the streams could hold more water the ground water level did rise and the flooding improved the fertility of the soil. Due to this intervention the nature restored rapidly and former disappeared plants and animals came back[33].

4.1.2 Wood

During the seventeenth century estates started to plant wood plantations. Trees were planted in clusters on precisely chosen locations. This was for aesthetic purposes and for

[32] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), pp. 28-31, 89-91.
[33] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), pp. 85-91.

pleasure to walk through the forests. More often it was planted for the supply of wood. Wood was one of the most important building materials for houses, stables, mills, etcetera. The surplus was sold in the area.

Twickel produced wood on a larger scale. Finally in 1760 they started to sell it on the national market. The trees on the estate were categorized in two categories: long term planting and production planting. The production category grew for the supply of timber wood. Gardeners planted more than 1000 trees a year. The species varied with oak, pine, beech, birch, maple, and ash wood. Most of the 'production trees' were plant on edges of fields and meadows (Figure 17). They functioned as boundary marks for farmers and wind stoppers. In Dutch called *'houtwallen'* or *'boomwallen'*[34]. Besides that, also complete fields were uses as plantations.

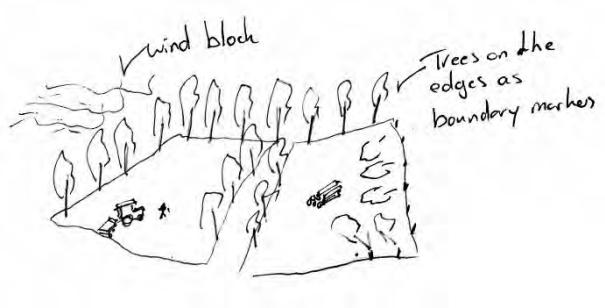


Figure 17: tree lanes around fields. Own image.

Trees were consumed completely. The oaknuts were used as fodder, twigs for fires, branches for struts and timber purposes, and the trunks for timber wood. Scions were raised from the old trees and planted on the place of a felled tree. It was a completely circular process (Figure 18). The production of wood was for Twickel remarkably successful. In the nineteenth century was the production of pine wood scaled up. Around 1835 felled Twickel about 40,000 trees per year. The estate produced more than enough timber wood for their own building practices and other needs, so the rest was sold[35].

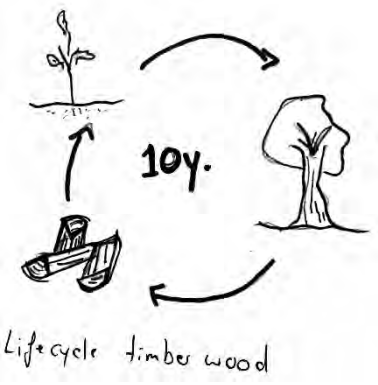


Figure 18: tree life cycle. Own image.

[34] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), pp. 42-57.
[35] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), p. 61.

The substantial number of felled trees demanded for a need to process them for timber wood. That is why Twickel established her own sawmill. First powered by a watermill and later by a steam engine.

4.1.3 Food versus pleasure

The estate offered a place for a lot of animals and plants. The presence of wild animals was for entertainment during a walk, for hunting purposes, and for the provision of food. The plants were planted for aesthetic reasons and also for food provision. Most of the nutritious plants were kept in the kitchen garden and later also in the orangery.

4.1.4 Animals

On the estate was place for a lot of animals. Beside the farm animals like sheeps, pigs and cows at the farms there was a place for other animals in the gardens. There was a clear separation between the animals for the main house and the animals of the farmers. Most of the animals were kept for food, like for diary or meat. Maps of Twickel from 1729 called *'De Grauwe kaart'* and 1794 called *'De Hartmeijer kaart'* (Figure 21) show that the gardens of Twickel had place for fishponds, special hunting gardens (Dutch: *wildbaan*), a henhouse, a deer hutch, and a duck decoy. The hunting garden contained most of the time deer, rabbits, pheasants and other animals that were nice to hunt on. This garden was for pleasure for the landlord and his guests to hunt as a leisure activity. Hunting was an important hobby of noble men. The garden was big enough to provide the animals enough drinking water, food, and space to live. The hunted animals were eaten afterwards, just like the other animals that were kept; like hens, ducks, and fishes.

4.1.5 Vegetables

Most of the vegetables were grown in the kitchen gardens. The large garden was situated outside the gardens of Twickel. Before 1891 the size of the garden was 2.5 hectares. In 1891 it moved to the current place and expanded to 2.6 hectares. The garden has a surrounding stone wall for shelter and to create a special place for plants that use the warmth of the masonry. There are also greenhouses[36] (Figure 20Figure 69).

4.1.6 Orangery

The orangery was originally a place where plants could be stored frost-free during the winter. In the past there used to be about hundred orangeries in the Netherlands, but only twenty are left. The name orangery, in Dutch *orangerie* – is derived from the tree that was kept in it; the orange tree[37].

The function of the place was simple, all exotic flowers and plants that could not hibernate in the Dutch climate were placed inside and kept warm and dry. On Twickel, the first orangery is mentioned around 1760, but that was only a wooden shed. It was until 1810 that a stone building was built. This building was expanded and designed by J.D. Zocher in 1833 to the building as it stands nowadays (Figure 19). The key features

[36] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), pp. 219-225.
[37] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), p. 206.

of an orangery are the sufficient amount of glass surface for enough daylight and a heating source, so that the plants in the building could survive during the winter[38].

What is interesting is that the orangery functioned in the summer as a place for guests to have some food and drinks. Already from the beginning of the public opening of the gardens at the end of the eighteenth century, the orangery was a place to get a cup of tea, wine, or some bread. Nowadays, Twickel places a small exhibition inside the orangery during summertime and also serves foods and drinks to their guests[39].

Figure 19: orangery Twickel. Image from own collection.

Figure 20: heritage greenhouses in the kitchen garden of Twickel. Image from own collection.

[38] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), pp. 206-211.
[39] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), p. 2011.

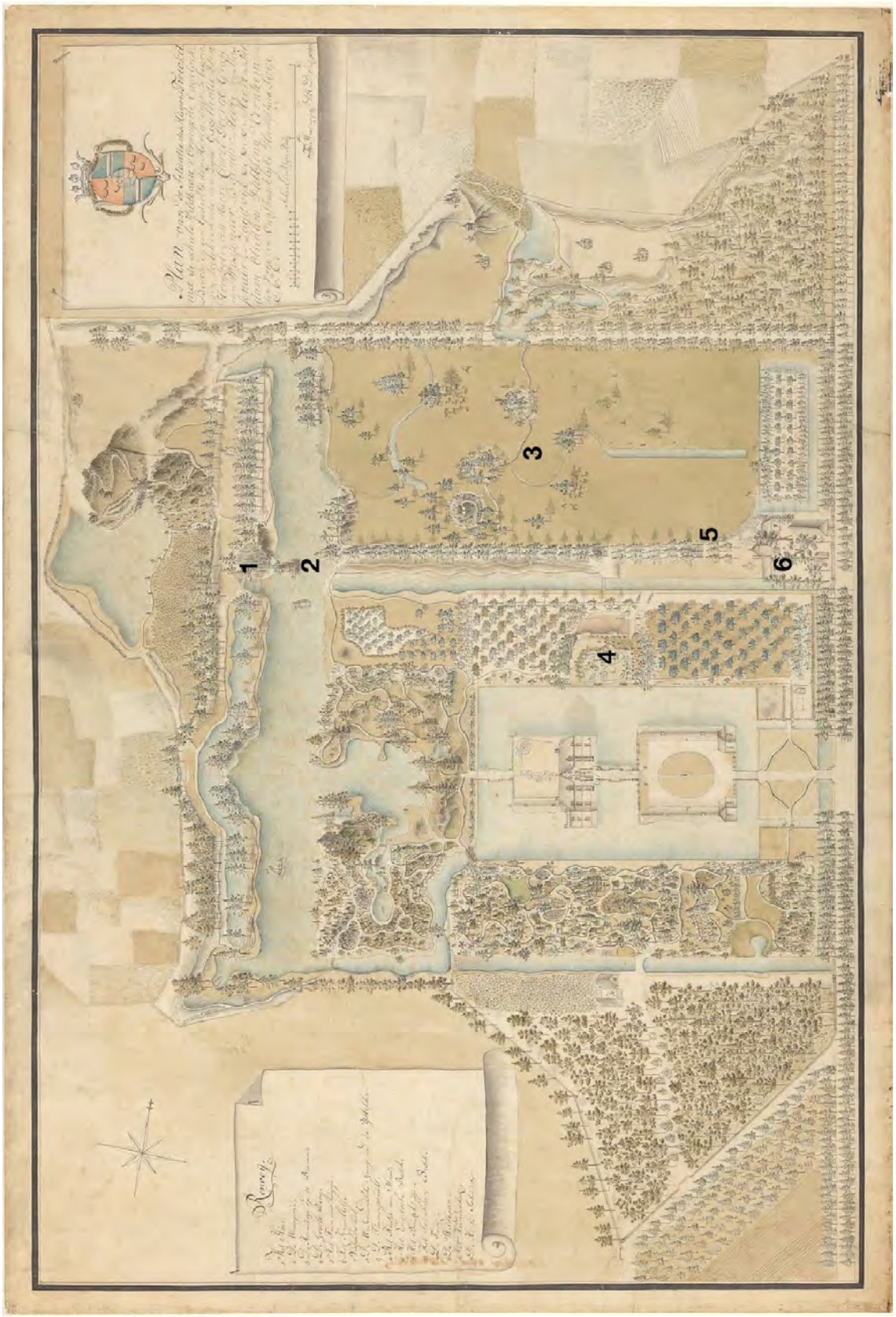


Figure 21: Hartmeijer map of Twickel in 1794. 1: duck decoy, 2: fishponds, 3: hunting garden, 4: orangery, 5: hen house, 6: deer hutch, not on map: kitchen garden. Source: retrieved in December 2021, from: https://www.historischecartografie.nl/publicaties/2021/12/aafke-brunt-over-de-hartmeijerkaart-uit-1794/

4.1.7 Agriculture

A large part of Twickel's lands is in use by farmers. They run their own farming business without having to adhere to strict rules. Only the houses must comply to Twickel's characteristics in colour and material and the farmers have to pay ground rent.

From the first established farms, the landlord had an agreement with the farmers that they must maintain their lands and maintain the lands of the landlord when the landlord asked to do so.

4.2 Estate Huis 't Velde

Not only from Twickel we can learn about the household of an estate, but also Huis 't Velde itself can tell us a lot about former habits of owners and users. For this is the report: *'Cultuurhistorische analyse en waardestelling'* from Albers & Guinée (2019) a good source of information. Besides that, several old maps tell us more about the layout and the design of the estate.

The map from 1897 from Hendrik Jan Walgemoed (Figure 27) shows different types of land use. The conclusion is that estate Huis 't Velde contained farmlands, tree plantations, meadows and forests. It is roughly similar to Twickel, but obviously in a smaller size. It is not known whether there was a kitchen garden around 1897, but there has been one before.

The difference between Twickel and Huis 't Velde besides the size is the absence of animal shelters. There has been no special place for henhouses, deer stables or hunting gardens. Nevertheless, there was a special forest around 1700 for hunting purposes, called a '*sterrenbos*' (Figure 22)[40]. This is a forest built especcialy for hunting. In addition is a hunting lodge built, this lodge is refurbished as a hotel/restaurant nowadays.

[40] See Albers & Guinée (2019), pp. 28-30.

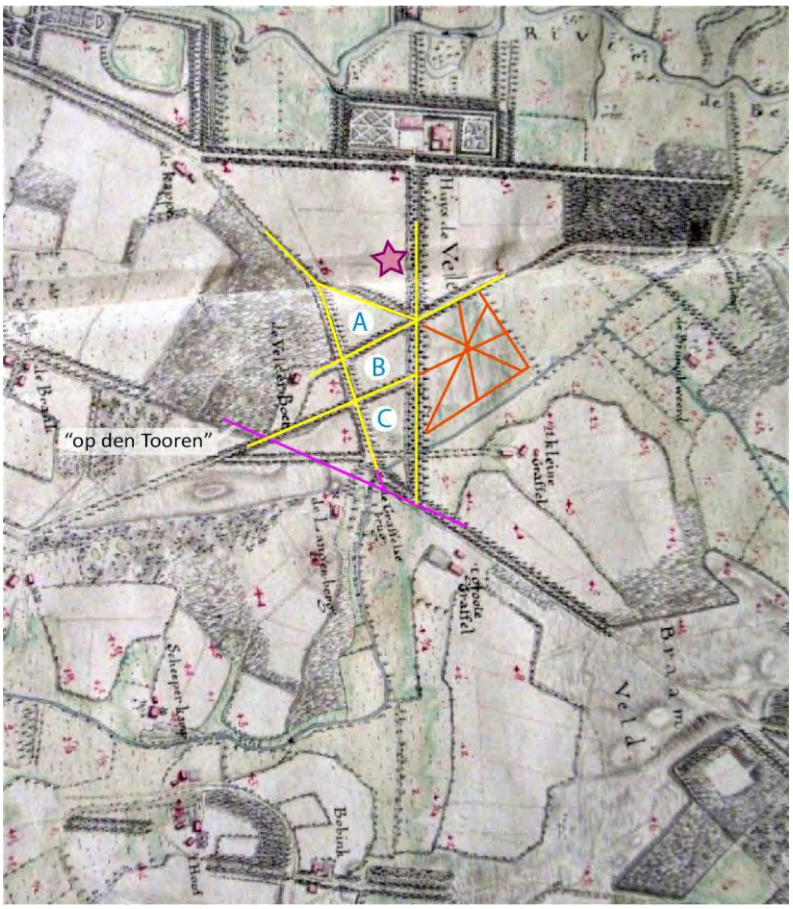


Figure 22: part of the Hottinger Atlas 1773-1794, from Huis 't Velde. In red the 'sterrenbos' for hunting. The centre spot gave a perfect sight in several directions for hunting. Source: Albers & Guinée (2019), p. 28.

4.2.1 Wood

On the map of Walgemoed (Figure 27) can be seen that there were fields on the estate to grow trees for timber wood, called: *'akkerboschen'*. The habit to grow, fell and use wood on the estate is similar to the previously described habits from Twickel. Only the scale was smaller. As far as it is known did estate Huis 't Velde not own a sawmill, wood was sold and distributed to another place for processing.

What is interesting to see is that the *akkerboschen* did not border any paths, roads, or parts of the gardens. They always border to farm meadows or farm fields. When they border to a path or road, a special row of trees is planted as a buffer. In that way, a road or path as a view axe over the estate will always contain the allure without losing its vegetation. It is also visible in this map that trees for timber wood are planted on the boundaries of farm fields. These tree lanes (*houtwallen*) are also the same as in Twickel (Figure 17). It is assumable that the farmers managed these plantations between their fields and had to fell the trees for timber wood and other purposes by order of the landlord.

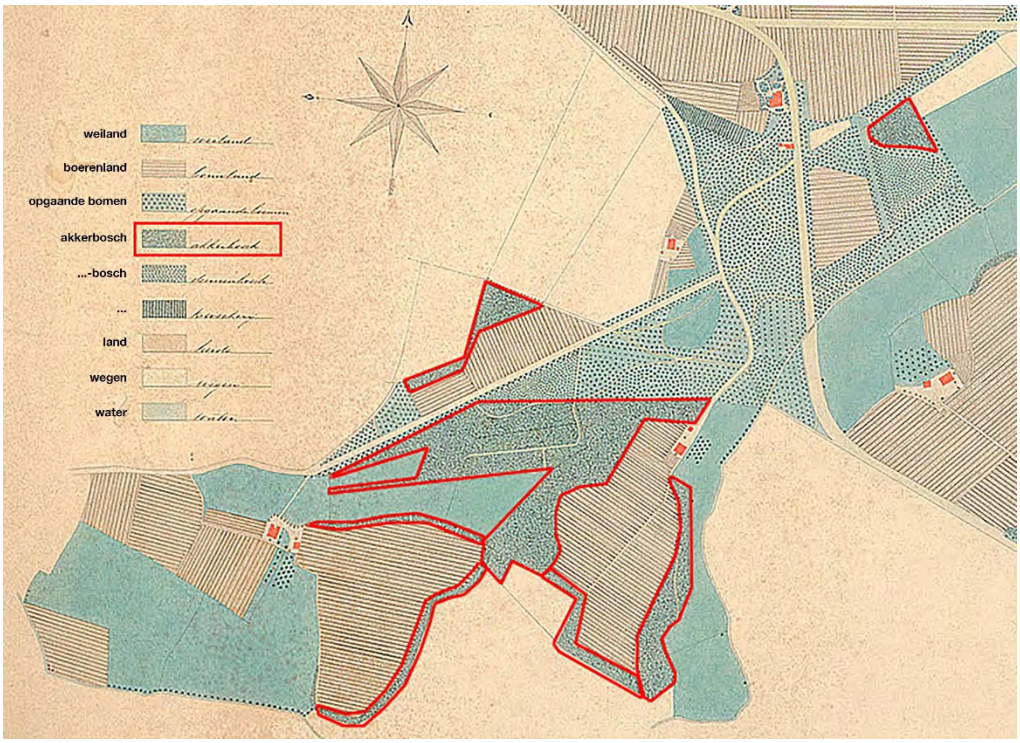


Figure 23: fragment of the Walgemoed map, in red the areas for 'akkerboschen'. Source: see Figure 27.

4.2.2 Agriculture

Estate Huis 't Velde owned five farms in the past. There were four farms during the 18th and 19th century and a fifth farm is established at the end of the 19th century. The ground areas of the farms were sold to the farmers at the beginning of the 20th century because the family of the landlord became poorer[41]. It is a problem that occurred in many noble families because the livelihood became more expensive and wage costs of the personnel increased rapidly. It is the reason why many estates in the Netherlands have fallen apart[42].

The five farms were: *De Velder boer, Het Langenberg* (Figure 24)*, 't Kleine Graffel, De Bieshorst and a farm without a name.* Also, *Herberg De Kappe* had a small farm field. What is striking is that all the farms had similar aesthetic characteristics, so that the buildings were recognizable as farms owned by estate Huis 't Velde. They all had white painted walls, white windows, grey roof tiles and dark green shutters.

[41] See Albers & Guinée (2019), pp. 29-48.
[42] See van der Wijck (1982), pp. 519-520.

Figure 24: old picture of farm Het Langenberg before restoration. From: unknown, Regionaal Archief Zutphen, SZU002002304.

4.2.3 Kitchen garden

Estate Huis 't Velde had a kitchen garden for many decades until the end of the nineteenth century, and a new kitchen garden was made in the twentieth century. The oldest information about the presence of a kitchen garden comes from the *Hottinger Atlas* from 1773-1794 (Figure 26). Here, a rectangular shaped garden with a surrounding wall and diagonal paths can be seen.

Around 1800-1810 were substantial changes made. The garden of the estate was changed to a scenic landscape style and the left island is expanded to the shape as it is still nowadays. Presumably was the kitchen garden also expanded. A map from 1811 confirms this with a changed and expanded kitchen garden with an orchard and oval pond (Figure 25). The kitchen garden was destroyed at the end of the Second World War and is not rebuilt afterwards[43].

[43] See Albers & Guinée (2019), p. 95.

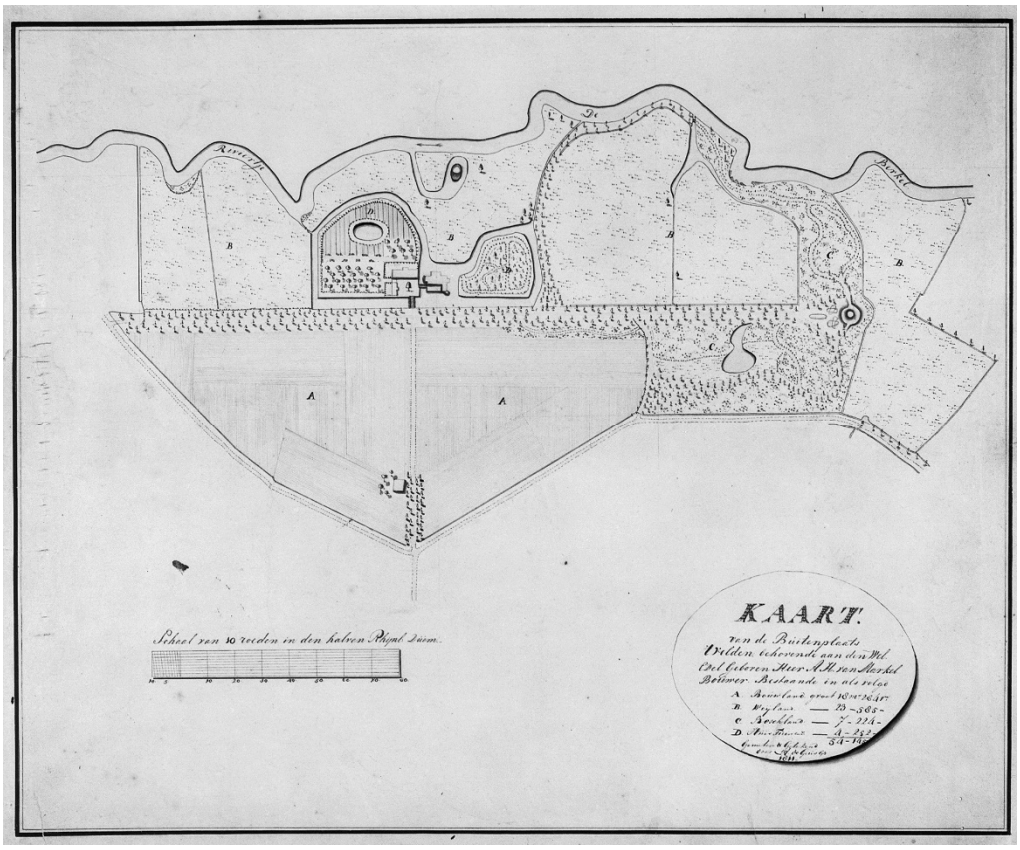


Figure 25: Huis 't Velden, kaart van de Buitenplaats, 1811. Unknow, photocopy by A.H.C. Schollen. Beeldbank RCE, 39.254.

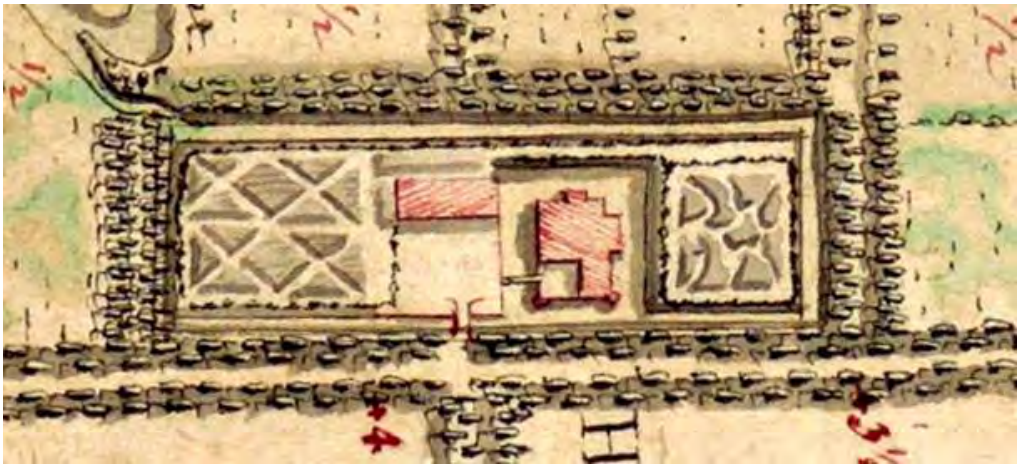


Figure 26: close up of the Hottinger Atlas 1773-1794, from Huis 't Velde. On the left a large kitchen garden, on the right side a primitive form of a landscape style garden, called 'Engelse partij'. Source: Nationaal Archief, Hottinger Atlas [fragment].

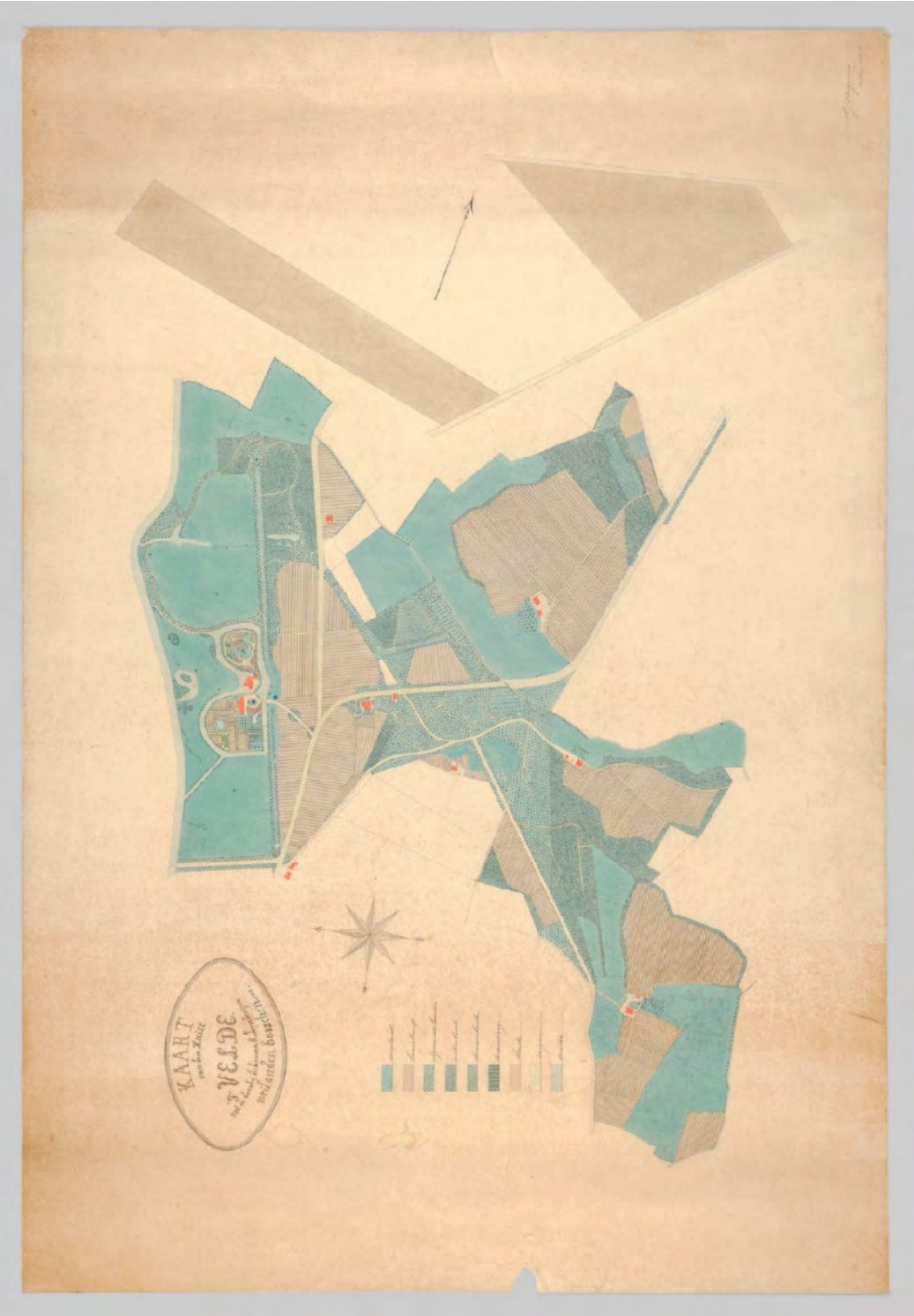
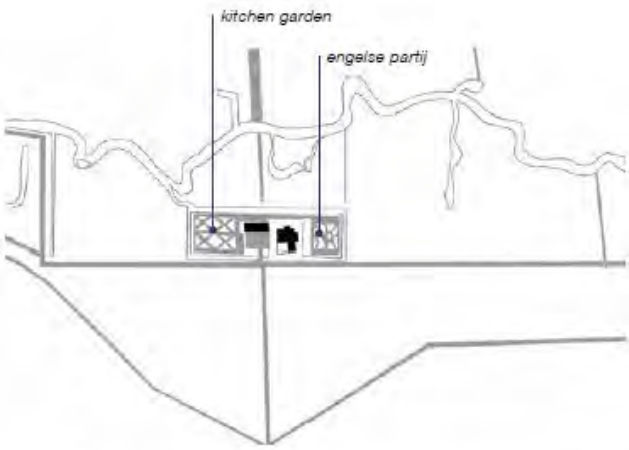


Figure 27: map of the estate with house, gardens, forests, and farms. From: Hendrik Jan Walgemoed, 1897. Source: Collectie Gelderland, GK12854.



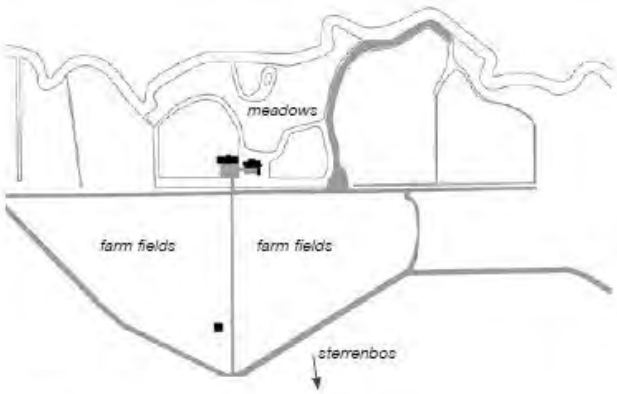
1778

The medieval structure of the garden is still visible and the gardens are surrounded with a moat. The left island contains a kitchen garden and farm house. Later will this house be replaced for a carriage house.

In the middle the main building and on the right a *'Engelse partij'* garden, a typology for a style design of a formal and stylish garden. This was the precursor for the Engelish Landscape style.

There is no hunting lodge yet.

Figure 28: garden around 1778. Own image.



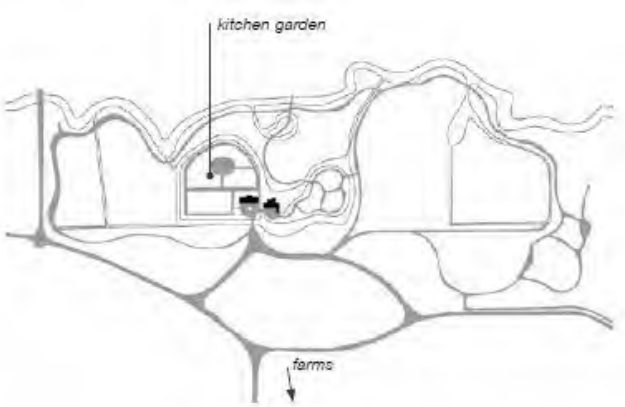
1810

A new garden design and place for farmlands in a English Landscape style garden.

Left and right from the middle islands are places for meadows. Under the main entrance (triangular shaped) fields for farmers. These had no high vegetation so there was a free view to and from the house.

Hunting lodge is built together with a special forest for hunting (sterrenbos), this is not shown on this map.

Figure 29: garden around 1810. Own image.

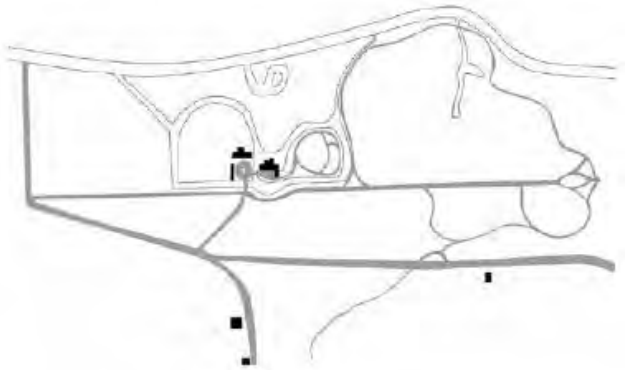


1824
More hiking paths and a softer idyllic design for the garden. There is no place for farms in this part of the estate, only in the south part (not on this map, see map from 1897).

Unlike Twickel was there no place for the keeping of wild animals.

The kitchen garden is back on the left island with a big pond in the middle.

Figure 30: garden around 1824. Own image.

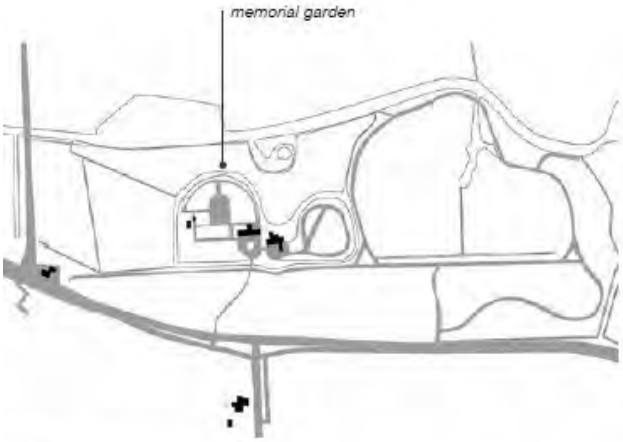


1897
The farms grew in these decades and became solitary. It is not known if the kitchen garden is still there.

The hunting forest (sterrenbos) is gone and the hunting lodge is sold to a hotel company.

The berkel is canalised and contain a dam now. The small streams on the estate are cut off from the stream from the Berkel. The water network of the estate is no longer in direct connection with the river.

Figure 31: garden around 1897. Own image.



2021
In 2005 is the small kitchen garden replaced for a memorial garden.

There are no longer agricultural activities on the estate, besides the farms in the southern parts. Nevertheless are these parts of the estate in private ownership and not part of the estate anymore.

Figure 32: garden in 2021. Own image.

5. Redesigning heritage buildings

In this chapter are the sub questions addressed: *'what are the design attitudes from Coenen?'* and *'what are the design approaches from Bloszies?'*. Both theories are examined and there is questioned why the attitudes and approaches are of importance. This is made clear in the introduction of this chapter. Then, the attitudes and approaches are discussed on the basis of a literature study and examples.

Old buildings bring a familiar feeling. Somehow people are more attracted to old buildings than to new ones. This is because they have a certain memory value. In addition, they usually contain a rich ornamentation, what is somehow seen as a piece of art. Heritage buildings are especially appreciated for their age, old buildings with their imperfections and patina are simply more valued. In addition, they often function as a piece of recognition, or as a landmark. Some buildings even as a cultural symbol[44].

At the same time, the repurposing of buildings also entails a lot of difficulties. Installation facilities are often outdated, and constructions do not always meet modern requirements. It is also usually expensive to adapt an existing building to modern regulations. This can even be more difficult and expensive when the existing interior finish is preserved. The two biggest bottlenecks are usually fire safety, energy inefficiency, and waste[45].

Still, despite the flaws, old buildings have a lot of potential in use and sustainability. Lofty ceilings, large windows and distinctive design are valuable features that can be relevant for many types of use. These values give a building a high degree of flexibility, allowing many reuse options[46].

So, what makes these buildings still being preserved? According to Job Roos (2007), this is because ideas about architecture, art and history converge in buildings. Monumental buildings are unique and have specific values linked to design, context, history, and culture. If these values are present, society will cherish such buildings[47]. Roos classifies several reasons of redevelopment on the basis of material and intangible values. The two most important material values are economic and ecological reasoning. Demolition is loose of money and replacing a building costs a lot of money. Besides that, demolition is waste of material and replacement requires a lot of new and sometimes scarce materials[48]. Something that is in present day, with all the sustainable goals, not always accepted anymore.

Roos addresses three intangible reasons for redevelopment of heritage buildings. The first one is about the conservation of the heritage building itself as a piece of history of a place. Secondly, the design qualities of the old building have already proven itself. The design of a new building has yet to prove these qualities when it is built. So, with a redesign, an aesthetic and functional building is already there as a basis. Thirdly, a building contains a social value. Architecture is an expression of society, and society

[44] See Bloszies (2012), p. 15.
[45] See Bloszies (2012), pp. 20-21.
[46] See Bloszies (2012), p. 29.
[47] See Roos (2007), p. 7.
[48] See Roos (2007), p. 16.

connects and accommodate to architecture. This is described as the cultural value of a heritage building[49].

5.1 Redevelopment

In a redevelopment assignment, a building has to be adapted for a new use. That means that parts of the building have to be changed. If an old building with or without heritage values have to be adapted, a complex task arises. In contrast to the construction of new buildings, the context and existing structures must be considered here and these influences the design. According to Job Roos (2007) is redevelopment a combination of the programme of requirements, the location, and the value of the existing[50]. A successful redesign gives new meaning to an existing building: *'The desire to conserve existing qualities makes demands, while the use influences the existing and can add significance to it. A successful intervention gives an old building or ensemble a new impulse, without touching its soul or spoiling its ambience'* (Roos, 2007, p. 8).

A redesign process exists of a number of subjects. According to Roos, the definition of these subjects are:

1. Architectonic intervention in the existing heritage.
2. Varying from restoration to the adaptation of the existing.
3. On the levels of modification, intervention, transformation.
4. Based on programme of requirements, plan of approach, and a design.
5. Central values are historic continuity and related values.
6. Actuated by research and inventiveness of the designer[51].

Especially with the first, second and third subject is the attitude of an architect of importance. The architect decides either to change a lot of the building, or to maintain and preserve as much as possible. This is called a design approach or design attitude. The attitude gives direction during the design process and supports by making design decisions.

5.2 Sustainability

In the case of sustainability adjustments to heritage buildings the reduction of energy demands is usually directly the case. As indicated above, the energy efficiency of these buildings is often a major bottleneck. However, sustainability is not only related to energy consumption. Old buildings that have been in use for decades naturally have a degree of sustainability and adaptability in them. They have already proven themselves several times and do not use more material than what is already present. Already build buildings do not consume a large number of new materials and the materials used have already proven to last for a long time. New construction requires repeatedly a large amount of scarce building materials. That is why American architect Charles Bloszies stated:

'Sustainable design often starts with developing a strategy to minimize the energy required to operate a building, but a broader definition of sustainability includes taking

[49] See footnote 48.
[50] See Roos (2007), p. 13.
[51] These six definitions are taken from Job Roos, in his book: *Discovering the assignment* (2007).

into account the energy required to build it in the first place. Retaining […] is far more efficient than demolishing […] the energy already expended to build it will not be squandered.' (Bloszies, 2012, pp. 35-36).

Although the design attitudes of both Coenen and Bloszies do not take into account sustainability interventions but focusses on the architectural design, they do are applicable on this part of the design process. Sustainability measurements can have little too much impact on the existing building and the integration of those is more important than ever. That is why the attitude or approach of the architect is also of great importance here too. The next two paragraphs therefore describe the attitudes and approaches of both Coenen and Bloszies.

5.3 Design attitudes of Jo Coenen

In 2006, former TU Delft professor Jo Coenen wrote his inaugural speech about the restoration and redevelopment profession (Coenen, 2006). From his view, restoration and redevelopment is not just about repairing monuments. It is about adding new changes and additions into the existing[52]. According to Coenen this is only possible with analysis, inventory, and research into the existing building and site, and then taking a position onto it[53].This not only covers the level of the building, but also the level of the site and even the level of the environment – and therefore the whole context – surrounding it.

Coenen considers not only buildings as monuments, but also cities, cityscapes, and landscapes. He argues that these should be analysed for their essential architectural features in order to protect them and enhance or complement them in a new (re)design[54]. According to him, good architecture is based on knowledge and insight into the value of the building and location, technical properties, and possibilities[55].

Restoration embraces three different fields of professions. The first one is *modification*, the scale level from material up to the building[56]. This profession is about the materialization of the building in the broadest sense of the word. In fact, this can also be called construction engineering. The main thing is to understand the essence of the existing building and its materials. After all, the expression of a design and therefore the appearance of a building is based on colour and material[57].

The second field of profession is *intervention*. This is the scale level from the building to the ensemble[58].This is about the adaptability of an existing building to adapt to a new user function. It is very important to register the qualities and values of the building before making a redesign. With the right expertise and knowledge, opportunities can be found, recognized, and implemented without damaging the existing building. This applies

[52] See Coenen (2006), p. 9.
[53] See footnote 52.
[54] See Coenen (2006), p. 23.
[55] See van Koningsbruggen (2018).
[56] See Coenen (2006), p. 29.
[57] See Coenen (2006), pp. 44-47.
[58] See footnote 56.

not only the scale level of the single building, but also the level of the urban surrounding or even a total landscape[59].

The third and final field of profession is *transformation*. This is the scale level of material up to the silhouette of the city[60].This scale level from changes inside a building to changes in an ensemble or city scape[61].

In adapting and adding new architecture to existing buildings, Coenen has mentioned five different attitudes that describe the relationship between old and new. These are: *continuity, polarity, dialogue, congruence, and blending*. According to Coenen, the solution for an intervention lies in the existing building itself[62]. Therefore is analysing and investigating the existing of significant importance. It forms the basis of a redesign rather than an obsession of making dominant and striking designs: *'[…] in this area, we need to make a plea for controlled imagination, for giving investigation priority above an obsession with striking images.'* (Coenen, 2006, p. 51). The design attitudes are applicable to all three themes: *modification*, *intervention* & *transformation*, but are intended for intervention designs[63].

The most important message that Coenen tries to convey is that a redesign must result from thorough research and analysis. When a designer understands the building, he or she can adopt an attitude against it. This attitude – or approach – provides a basis for making research-based design choices. It is a kind of guideline. The only question is; what exactly do these five attitudes mean? This is described below with examples from Coenen his book and others.

5.3.1 Attitude continuity

The first design attitude is continuity. Continuity is about succession and coherence. It is not that every new design must be the same as the former one, but there must be a certain similarity and growth. A new design finds continuity of the existing building in for example style, colour, form, rhythm, and detailing. It can be on several scale levels. The best example for continuity could possibly be Amsterdamse Grachtengordel. The canal houses in Amsterdam are not from one period, they are built in a time span of 400 years. Yet, they form a whole, an ensemble of buildings belonging together. That is because they all have the same characteristics, but each time translated in the current architectural style of that time period. This is visible in the picture below (Figure 33). The left black building and the third black building are from the second half of the seventeenth century while the second one is from the first half of the eighteenth century. The fourth black building is from the nineteenth century. So, there is more than two hundred years of difference between them, yet they form a continuous ensemble because the characteristics are equal.

[59] See Coenen (2006), pp. 47-62.
[60] See footnote 56.
[61] See Coenen (2006), pp. 63-69.
[62] See Coenen (2006), pp. 50-51.
[63] See Visser (2008), p. 21.

Continuity is difficult to distinguish from the other design attitudes. It is quite common in the other design attitudes as well. There are many similarities, especially in the attitudes congruence and blending.

Figure 33: Prinsengracht 505. By Google Maps (n.d.), from: Google Maps (01-2022).

5.3.2 Attitude polarity

An example that Coenen addresses as polarity is the Sea Museum in Cadiz (Figure 35). This is built on a former fortress that was built in neo-classical style. The new buildings have a very minimalistic design that is really contrasting with the ornamental neo-classical style. Here, polarity can be found in material and colour, but also rhythm, form, and layout. Every aspect between the old and the new buildings is contrasting each other. That is where this attitude is about. This is also visible in the second example frrom museum De Fundatie in Zwolle by BiermanHenket. The architects concluded that it was not desirable to expand the building with a side wing. In every façade, the symmetry would have been disturbed. That is why they chose to expand on top of de building. The round shape is in big contrast, respecting the old building and leave it in its own value[64].

[64] According to BiermanHenket. Info retrieved from the architect his website: https://www.biermanhenket.nl/nl/projecten/museum-de-fundatie.

Figure 34: Museum De Fundatie Zwolle by BiermanHenket. By unknown (2013), from: https://architectenweb.nl/nieuws/artikel.aspx?ID=31514.

Figure 35: Museo del Mar del Baluarte de la Candelaria by Cruz & Ortiz. By Cruz & Ortiz (n.d.), from: https://www.cruzyortiz.com/portfolio/sea-museum-in-baluarte-candelaria/.

5.3.3 Attitude dialogue

The design attitude dialogue is characterized by a conversation between old and new. Modern designs take over certain elements of the existing building. For example, in the size and rhythm of dormer windows as can be seen in the example of the VOC pakhuizen in Hoorn (NL) (Figure 36). But it can also be in the division of a façade, like the dialogue between the old and new building in Finsbury Circus (Figure 37). WilkinsonEyre designed a new building with a façade that matches the layout and main dimensions of the existing classical building. The dialogue is in these characteristics, while the style of the façade is very minimalistic.

Figure 36: VOC pakhuizen Hoorn by Hangelbroek & Gouwetor Architecten. By Evgenia Kuznetsova (n.d.), from: https://nl.pinterest.com/pin/567523990529178298/.

Figure 37: 8 Finsbury Circus in London by WilkinsonEyre. By WilkinsonEyre (n.d.), from: https://www.wilkinsoneyre.com/projects/8-finsbury-circus.

5.3.4 Attitude congruence

The design attitude congruence is as clear as the word itself. New additions need to have the same form as the existing building. It is important to notice that this is not only the form of the building envelope. Congruence can be found in several scale levels. Like the shape of a roof, a facade, window, or the form of a plan. Many times, are additions designed with a congruence attitude as an extension of the existing volume, or as a similar shaped replacement for something that is demolished.

Two examples of congruence are the Broerekerk by Jelle de Jong in Bolsward (Figure 38) and Barn Living in Aalten by Bureau Fraai (Figure 39). The church was little more than a ruin after a heavy fire. A new roof made it possible to put the building back in use. The roof follows the former contours of the old roof. The metal trusses have the same shape as the lost old wooden trusses. The Living Barn is a new extension of an old historical barn. The architect tended to take over the shape of the historical building and give it a modern look by using modern materials. In this way there is a big contrast, but the congruence connects new and old here.

Figure 38: Broerekerk Bolsward by Jelle de Jong. Own image.

Figure 39: Barn Living in Aalten by Bureau Fraai. By Wim Hanenberg (2015), from: https://www.bureaufraai.com/portfolios/barn-living/.

5.3.5 Attitude blending

The attitude blending is about mixing old and new together, without making big statements or big contrasts. Blending can be found in form, size, and detailing, but also in materials. A well-known example is the Kolumba museum in Cologne by Peter Zumthor (Figure 40). Here are the old facades of a ruin gothic church that was destroyed in World War II blended in new facades of the museum building. The new building follows the contours of the remnant facades of the ruin.

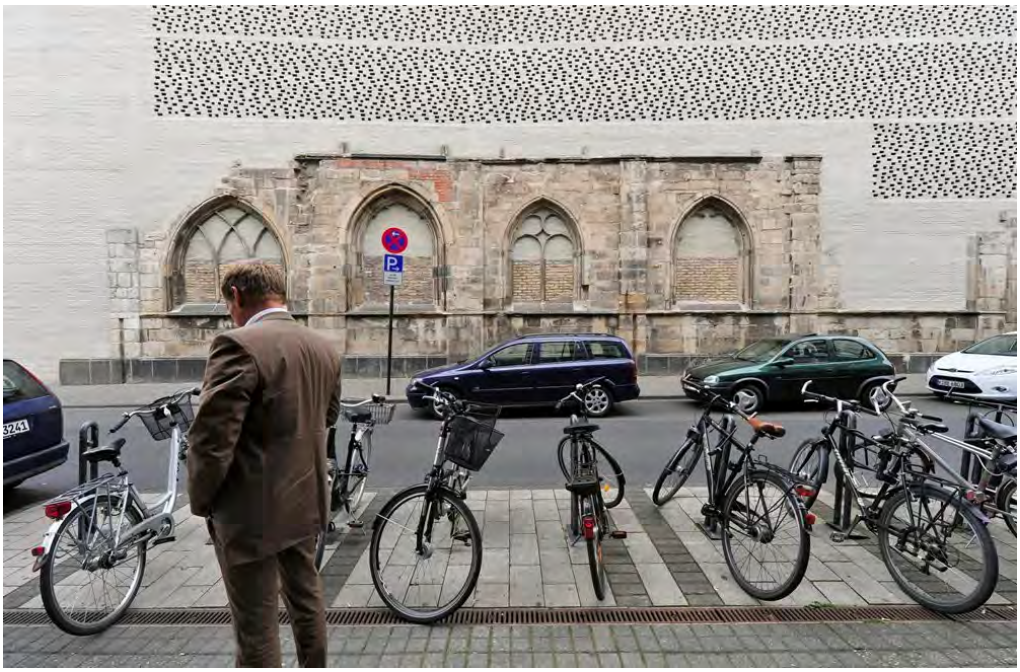


Figure 40: Kolumba museum Cologne by Peter Zumthor. By Jose Fernando Vazquez (2007), from: https://www.archdaily.com/72192/kolumba-musuem-peter-zumthor.

5.4 Design approaches of Charles Bloszies

Charles Bloszies describes in his book *Old Buildings, New Designs* (2012) the architecture genre of joining new and old buildings together. He wonders whether guiding principles can help to make a successful design. According to him, there is currently a field of tension between modern architects who use modern design software to create complex shapes and historic buildings where heritage preservers are putting their heels in the sand to counteract changes by those modern architects[65].

A successful project does not only require a careful design, but also a well-considered existing design. In fact, the qualities of the existing building are transferred and enhanced to the newly made design[66]. This starts with a well-considered decision as to whether or not a building should be preserved and in that case, which parts of a building are valuable[67]. At such a moment, design principles can give direction in decision making.

In addition, Bloszies also wonders whether there is a particular design philosophy that works best for a sustainable redesign. In his research he looked at the key aesthetic parameter how old meets new. He concluded that there are three different approaches in combining new architecture with old. The approaches are workable for aesthetic purposes, but later in the book it is not made clear if the approaches work for sustainability measurements. He also concluded that there is no generic standard approach applicable to all redesign assignments. It is always custom work that depends on the values of the existing structure.

[65] See Bloszies (2012), p. 11.
[66] See Bloszies (2012), p. 12-13.
[67] See Bloszies (2012), p. 23.

All three approaches are based on contrast[68]. There must be a degree of contrast in order to distinguish old from new. That is why the restoration approach is not elaborated in the book. The restoration approach focusses on repair, conservation, and reconstruction instead of adding new architecture. The difference between old and new can vary between subtle differences to great contrast in form and material. Bloszies distinguishes three contrast strategies for the design approach: *extreme, restrained, and referential contrast*. According to him, these contrast strategies can help develop a qualitative good redesign[69]:

'[…] contrast as bases for design, and most reveal the architect's deep understanding of the immediate context represented by the existing construction. The best work results when the architect has combined respect for the old with a skilled command of the new' (Bloszies, 2012, p. 47).

The three strategies were tested for their degree of intervention. In this, Bloszies distinguishes three gradations: small interventions, major additions, and repurposed buildings[70]. His research has shown that no strategy or degree of intervention ultimately leads to a design that pleases everyone and every value. It depends on the quality of the location, context, the existing building and the new design, and the architect finds the best way in between. Below are examples described per design approach and per all three gradations. The examples are taken from his book.

[68] See Bloszies (2012), p. 45.
[69] See footnote 68.
[70] See Bloszies (2012), p. 64.

5.4.1 Restrained contrast

Bloszies does not address a reuse design with a restrained contrast in the chapter about small interventions. The first example is in the chapter about major additions. There, it becomes clear that this design strategy is about keeping interventions simple and to a minimum. This can be seen in the example *Knocktopher Friary* by ODOS architects (Figure 41). What is striking is that the new building never touches the old one with massive materials. There is always a strip of glass in between functioning as an intermediate material, and the new building is set back from the old one[71].

Figure 41: Knocktopher Friary by ODOS architects. By ODOS architects (n.d.), from: https://www.archdaily.com/239458/knocktopher-friary-odos-architects.

For a repurposed building example, Bloszies addresses an industrial building that is reused as a studio to live and work in. Village Street Live-Work Studio is designed by Santos Prescott (Figure 42). The single storey foundry is still recognizable. Prescott tried to retain the open character of the spaces and kept the original materials and finishes. With small interventions she made the spaces suitable to live in. She added new floors, but those never span the whole room. Self-sufficient sustainable heat sources prevented the need to insulate the walls from the inside[72].

[71] See Bloszies (2012), pp. 86-89.
[72] See Bloszies (2012), pp. 120-123.

Figure 42: Village Street Live-Work by Santos Prescott. By Eric Oxendorf (2006), from: http://santosprescott.com/project/27-village-street/.

5.4.2 Referential contrast

This strategy finds its origin in references. This can be in form, materials, and other connections between new and old. The first example mentioned by Bloszies is *// Forte di Fortezza*, a fortress in southern Tirol (Figure 43). Redesigned in 2007 by architects Markus Scherer and Walter Dietl a design with referential contrast has been made. Interventions are only made on places where it was necessary to improve the architecture and functionality. References with the existing are made in material colour and the use of simple, strong materials[73].

Figure 43: il Forte di Fortezza by Markus Scherer & Walter Dietl. By Endri Kicaj (n.d.), from: https://nl.pinterest.com/pin/480548222719307886/.

Another example really shows the essence of referential design. An office expansion in Kearny Street, San Francisco, from the office of Charles Bloszies itself and designed by him shows how measurements and rhythm are used as a reference (Figure 44). The new building is designed with a clear base, shaft, and capital, just like the adjacent old building, but with modern materials and colours[74].

[73] See Bloszies (2012), pp. 80-83.
[74] See Bloszies (2012), pp. 110-113.

Figure 44: 1 Kearny Street San Francisco by Office of Charles Bloszies. By unknown (2009), from: https://www.archengine.com/project/1-kearny-street/.

5.4.3 Extreme contrast

This strategy finds its characteristics in big differences. One of the examples that Bloszies mentioned is a small modern metal building that has been slid into an existing ruin structure. It is the Dovecote Studio by Haworth Tompkins in Snape Maltings, England (Figure 45). The ruin consists of overgrown and weathered brick walls and broken windows[75]. Bloszies classifies this intervention as a small intervention because minor changes are made to the ruin structure.

[75] See Bloszies (2012), pp. 68-69.

Figure 45: Dovecote Studio by Haworth Tompkins. By Philip Vile (2010), from: https://www.archdaily.com/89980/dovecote-studio-haworth-tompkins

An addition that is classified as a major addition with extreme contrast, is according to Bloszies adding a significant big new form to expand an existing building. These additions alter the aesthetics of a building site[76]. One of the examples described by Bloszies of a major addition with extreme contrast, is the contemporary Jewish Museum by Studio Daniel Libeskind in San Francisco, USA (Figure 46). The old building has a rectangular shape and is made out of masonry. Libeskind designed two modernistic angular shaped forms that intervene the existing structure. Made out of metal and glass in contrasts in detail and surface[77].

[76] See Bloszies (2012), p. 85.
[77] See Bloszies (2012), pp. 94-97.

Figure 46: Jewish Museum San Francisco by Daniel Libeskind. By PYGMALION KARATZAS, from:https://divisare.com/projects/330647-daniel-libeskind-pygmalion-karatzas-contemporary-jewish-museum

The last category, repurposed buildings, is a group of redesigned buildings where the original exterior aesthetic is maintained. New user functions are entirely fitted into the existing structure. New contrasting interior elements are according to Bloszies forming a dialogue with the old structure[78]. A clear example with extreme contrast in his book is the reuse design of a church into the Selexyz Dominicanen Bookshop by Merkx + Girod Architects in Maastricht, Netherlands (Figure 47). Here, a vertical intervention was necessary to gain enough floor space for the new function. The architects decided to add a vertical volume with a few storeys to expand the number of square meters. The new volume is completely detached from the structure of the church, standing on its own. The structure is in contrast with the gothic interior because of the simple and straight forward design and colour[79].

[78] See Bloszies (2012), p. 119.
[79] See Bloszies (2012), pp. 124-125.

Figure 47: Selexyz Dominicaner Bookshop by Merkx + Girod Architects. By Merk-x, from http://merk-x.nl/retail/dominicanenkerk-maastricht/

5.5 The relevance of research and valuation

Despite the fact that Coenen (2006) and Bloszies (2012) both use different terms for their design approaches or attitudes, they actually mean almost the same thing. What both authors have in common is that they criticize and questioning the way architects are making new heritage redesigns. They both advocate a research-based design where research, analysis and valuation forms the basis before the real design process begins. Only with sufficient knowledge about the casus can an architect start designing, formulate an approach and make design choices in an effective way. But what does that research consist of?

According to Wessel de Jonge (Kuipers & de Jonge, 2017) research is the most important input for the design process, and this is different than when designing new architecture: *'the design process typically requires more preparatory research when working with built heritage or other existing buildings than that it is the case when designing new buildings.* [the design is] *…established in part through careful historic research and building surveys'* (Kuipers & De Jonge, Designing from Heritage, 2017, p. 27). Historical and architectural characteristics need to be mapped and valued. De Jonge visualizes the design process with a design curve. The curve of designing new buildings rises earlier, while at that moment the curve of a redesign still lags behind. Only at a later moment when all information has been collected this curve also start to rise[80].

The purpose of the research is to properly map out the existing building to collect data about the age, architectural style, changes over time and also damage. Kuipers & de Jonge (2017) explain this using the shearing layers for a building of Steward Brand. The six layers are: *site, structure, skin, services, space plan & stuff*[81]. Kuipers and de Jonge add a seventh layer to that: *spirit of a place*. The spirit of the place partly determines

[80] See Kuipers & de Jonge (2017), p. 27.
[81] From: Kuipers & De Jonge, Designing from Heritage (2017), p. 33)

whether society will value an old building or not. The value of the spirit of the place was also stated in the introduction of this chapter with the information from Job Roos.

The research methodology consists of twelve tools that can be used to collect data: *literature, documentary, mapping, archive, drawing, maps, case study, inventory, measuring, descriptive photography and side visit*[82].

Kuipers & de Jonge distinguish four steps in the analysis and valuation of heritage buildings. The first step is about the history of the place. With the help of chrono-mapping, the history of a site can be investigated and visualized. Secondly is value-mapping used as a tool to identify and classify valuable parts of a building site. That is the architectural and cultural value analysis. The third step is the technical analysis to gain insight into where the building performs well and where points of improvement lie. The last step is to set up a transformation framework. Kuipers and de Jonge explain this as a position statement against possible interventions, based on the outcomes of the previous steps[83], and name this a design strategy[84]. In fact, the position statement is nothing but another term for choosing and formulating a design approach or attitude. That is where the theories of Coenen and Bloszies become interesting again.

[82] Depending on which piece of information is needed, these tools can be used. See Kuipers & de Jonge (2017), p. 34.
[83] See Kuipers & de Jonge (2017), pp. 72-73.
[84] See Kuipers & de Jonge (2017), pp. 99-113.

6. Sustainable redesigns

To learn more about how sustainable design solutions are done in monumental estate buildings a number of reference projects are examined. This case study research is described below.

6.1 Kasteel Ruurlo

Case: Kasteel Ruurlo.
Place: Ruurlo, The Netherlands.
Type of estate: castle.
Owner: Museum MORE – Hans Melchers b.v.
New function: museum for Carel Willink art.
Year of redesign: 2017.
Project group: Bouwstra&Verlaan erfgoed & architectuur, couturier Ronald Kolk & Hans van Heeswijk architecten.

Figure 48: new entrance of castle Ruurlo. From: https://www.heeswijk.nl/projecten/museum-more-kasteel-ruurlo-toegangsbrug.html

This castle is bought in 2015 to repurpose it to a museum building as a dependence of museum MORE in Gorssel (The Netherlands). The castle is refurbished, restored, and adapted to house paintings. Besides that, there is also place for small temporary exhibitions and parties in the salon. Before it was sold the castle functioned as a town hall. The salon was the wedding hall, and this function is kept. There is an additional wedding suite in the attic. What is changed:

- New improved routing through all the museum rooms via a new central staircase.

- New central modern staircase made in the heart of the building.
- New entrance in glass volume to extend the reception room.
- New modern contemporary bridge designed by Hans van Heeswijk.

The history of the castle goes back to the 14th century. It is used as a residential building until the nineteen eighties by the Dutch noble family Van Heeckeren for almost 500 years. The municipality then bought the castle and repurposed it as a town hall. Melchers bought it in 2013 together with the already reconstructed orangery. The land and other buildings on the estate are still in property of Van Heeckeren and a foundation[85].

The interior is completely refurbished, and historic parts are restored. A lot of the interior was damaged during the period it was a town hall. Most floors and wall finished are replaced, couturier Ronald Kolk made a new interior design. The colours of the rooms are adapted to the permanent placed artworks of Carel Willink or restored to the colours found during the historical research. New wooden parquet floors reflect their layout to the ornaments in the stucco ceiling above.

6.1.1 Extension

At the rear, in the semi-enclosed patio of the building, the castle has been extended with a new volume (Figure 48). This volume is entirely made of glass. Architect Cor Bouwstra of Verlaan & Bouwstra has chosen, after a design study, to add a transparent and minimalist volume. This volume solves two logistic problems in the building, namely the entrance and the routing on the first floor. The building is made of extra transparent glass with sporadic metal connections. Most of it is glued[86].

The volume forms a contrast with the masonry of the castle with the hard glass finish but is yet restrained designed. The connection to the two existing facades has been designed to be as reversible as possible. This is done by letting the glass follow the shape of the wall. Because this is measured digitally, the glass exactly follows the irregular form of the wall. The gap in between has been sealed. So, no rebate has been milled into the stones[87]. In the other facades are rebates milled to put in the glass construction. According to the architect it was no problem here to mill in the masonry due to the younger age of the wall[88].

6.1.2 Building installations

Due to strict climate requirements for a museum are all building installations replaced. The existing structure of the building is used to integrate this out of sight as much as possible. Every monumental room has an air inlet via the fireplace. In the fireplaces are fan coil-units placed to condition the air according to the needs of the room. In deviating conditions are the units able to switch quickly and bring air into the room that quickly improve the air climate. The system is able to directly respond to fluctuations, like with the acute presence of a high number of visitors in the room.

[85] See Verlaan & Bouwstra (2022) and Museum MORE (n.d.).
[86] See text Wind, H. (2017).
[87] See Wind, H. (2017), p. 33.
[88] See Wind, H. (2017), p. 35.

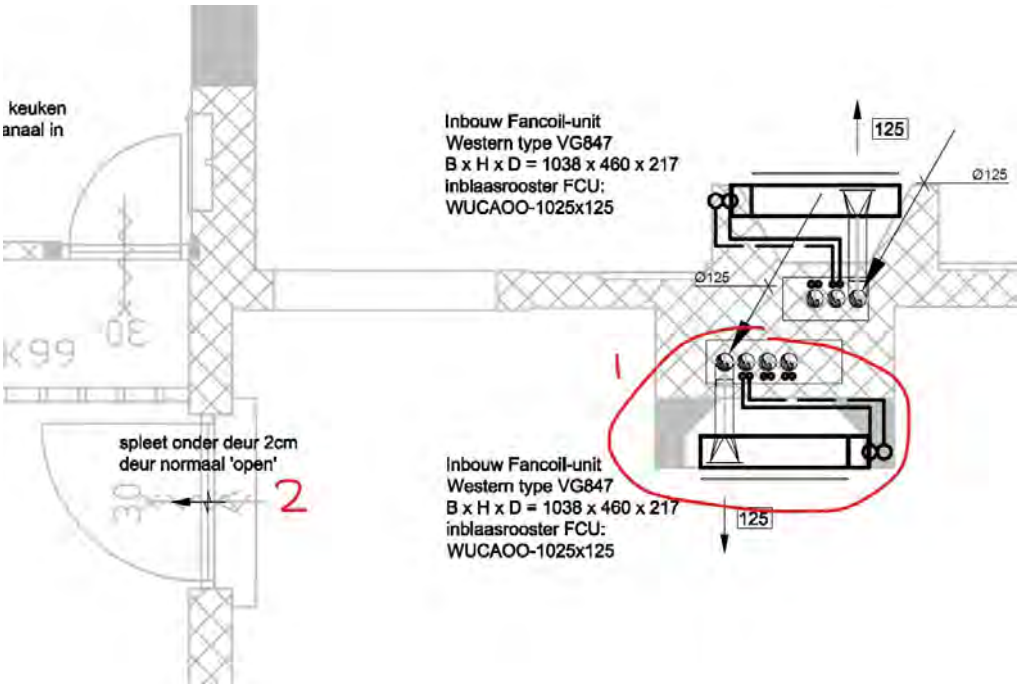


Figure 49: fragment of the installation plan of Ruurlo. Visible are the fan-coil units (1) and the air stream to the other room (2). From: Wolter & Dros, tekening VW-03 plattegrond klimaatinstallaties Ruurlo.

Figure 50: fan-coil unit hidden behind a grill in one of the rooms of castle Ruurlo. Image retrieved from Google Maps Streetview on May, 1, 2022.

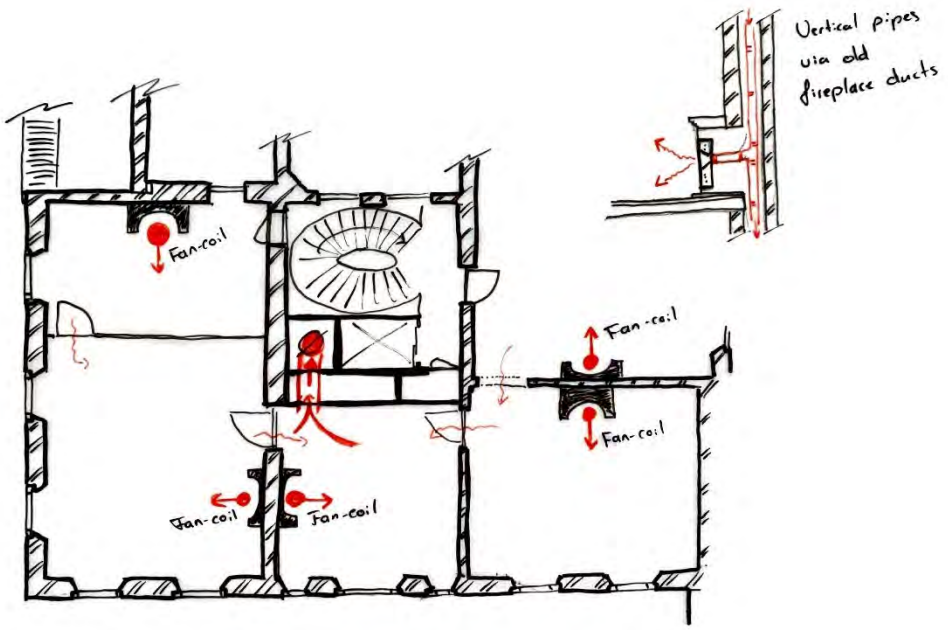


Figure 51: fan-coil units with air inlet in the fireplaces. Air flows under the doors to a central air extraction point.

The air extraction is centralized next to the staircase and elevator shaft. Here is place made for large vertical airducts that extract the air of the whole storey. The air flows from one room to another via small grooves under the doors.

The heat for the fain-coil units is provided by a boiler and heat pump in the attic. In the attic are all installations accommodated.

6.1.3 Insulation

The architects have chosen not to insulate the walls due to the monumental wall finishes. The impact on the wood panelling, cabinets, framing, and stucco ceiling was too high. Moreover, contain the thick masonry walls a heat buffer capacity that can temper fluctuations in the indoor climate temperature[89].

[89] According to a short interview with the project architect Dennie Perdok from Verlaan & Bouwstra in February 2022.

Figure 52: wood panelling and other interior elements caused that wall insulation on the inside was not desirable. Image retrieved from Google Maps Streetview on May, 1, 2022.

Figure 53: the details of the ornaments in the ceiling would have changed if there was an insulation layer added on the inside. That was not desirable. Image retrieved from Google Maps Streetview on May, 1, 2022.

What is insulated are the windows. Here is depending on the situation a mix of insulated monumental glazing (Monuglas) and secondary windows used. The urge to insulate the windows is combined with the urge to improve the safety of the building because of the strict safety regulations for museums. The replacement of the windows resulted that the safety regulations were being met. There are three types of Monuglas used from the manufacturer Stolker Glass Netherlands[90]:

1. Standard 8mm insulated glazing with insulation index 1.9 W/m2.K (Figure 54).
2. 9-10mm insulated glazing special safe, reinforced and with UV-filter. Insulation index 1.9 W/m2.K. (Figure 56).
3. Secondary glazing 98% UV-protection and reinforced for burglar safety.

The roofs are partly insulated depending on the user function inside. In the attic where the installation rooms are located is the roof not insulated. Where the residence and wedding suite are located is the roof insulated from inside.

Figure 54: 8mm insulated double glazing from Stolker in a window of castle Ruurlo. Retrieved from: https://monuglas.nl/kasteel-ruurlo/.

During the construction, a mock-u was made in two windows (Figure 55). One contained thin modern insulated glass and the other contained old-fashioned looking thin insulation glass. The architects then opted to go for the modern variant[91].

[90] According to design drawings retrieved from Verlaan & Bouwstra. Cannot be published here.
[91] See Stolker (2022).

Figure 55: mock-up with to variants of insulated glazing. Retrieved from: https://monuglas.nl/kasteel-ruurlo/.

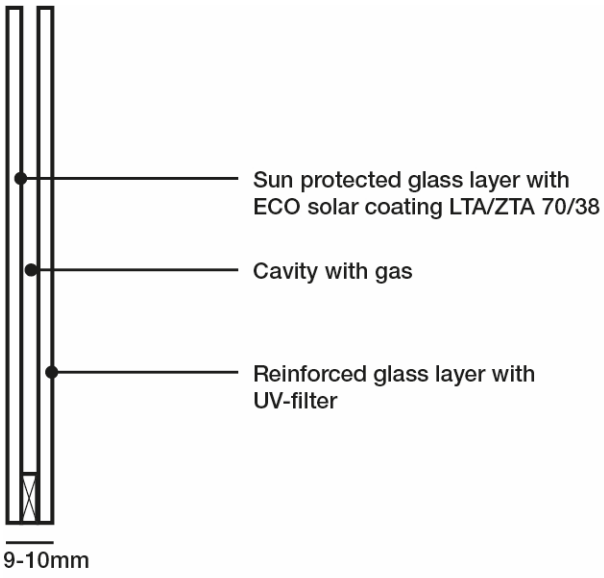


Figure 56: composition of the used Monuglas. Own image.

6.1.4 Use of the estate

The estate does not belong to the museum and is still in ownership by the family Van Heeckeren. Several members of the family own pieces of the estate. The user function mix is interesting to mention, because some of the function gain an income for the maintenance of the estate.

There are ten farms situated on the estate. In case of sustainability these farms are shifting to a bio-based organic way of farming. Important is to reduce the sizes of the

farms. The farmers pay a rent (Dutch: *erfpacht)* for the use of the lands. Besides that, the estate is public accessible for recreational purposes and the Van Heeckeren family still lives on the estate in new build energy neutral houses or repurposed buildings[92].

The orangery is reconstructed at the beginning of the twenty first century in 2001. It was heavily damaged during World War II and demolished afterwards[93]. The orangery is in use as a restaurant (Figure 57). It is also bought by Melchers in 2015. Although it functions on its own, it can also contribute to wedding parties and other parties in the castle.

Figure 57: Orangery Ruurlo. From: https://www.museummore-kasteelruurlo.nl/oranjerie.

[92] See Stichting Landschapsbeheer Gelderland (n.d.).
[93] According to Museum MORE (2022), webpage about the Orangery.

6.2 Landgoed Singraven

Case: Landgoed Singraven.
Place: Denekamp, The Netherlands.
Type of estate: estate, buitenplaats.
Owner: foundation Edwina van Heek.
New function: event location.
Year of redesign: 2018-2023.
Project group: SchipperDouwe architectuur & Strootman Landschapsarchitecten.

Figure 58: estate Singraven. From: https://cdn.nieuws.nl/media/sites/85/2018/01/12140119/Singraven.jpg.

Estate Singraven in Denekamp in the province of Overijssel, the Netherlands, is established around 1448 with the construction of a water mill. The origin of the main house is from 1381, but the current house is built in 1661 with several younger interior parts in Louis XV and XVI style. The estate is nowadays transformed into an event location and has new several residential areas. The main goal for the reuse of the estate was to become energy neutral and economically stable[94].

The park has a size of almost 500 hectares. Most of it is forest, meadows, and farm fields. Through the heart of the estate flows river the Dinkel. In a sharp bend in the middle of the area is the house located. Around the edges of the estate are ten areas selected to improve and build new residences. Seven new areas are build (Figure 59) and existing farms are repurposed to residences. With the so-called *'erfpacht'* is a long-term and secure income guaranteed.

Adaptations:

- New improved routing through the park.
- New user function for main building.

[94] See website BOEi (n.d.), *landgoed Singraven.*

- Energy neutral aim, with a screw turbine, solar panels, and thermal storage.
- New residential clusters on the edges of the estate.
- Recreational forest and forest for timber wood.
- Greenery and real estate long term vision.

Figure 59: map of new locations for residential areas. From: https://www.wonenopsingraven.nl/erven-op-singraven.

6.2.1 Residential areas

Residential areas are not in themselves a sustainability solution for the estate, but it is nevertheless important to describe them here. This is because these new additions ensure a stable and long-term income. Healthy business operations are also a form of sustainability, namely economic sustainability. Estates often look for different user function options, since almost no estate can function as a residence with a number of farms anymore. Estates are similar to large economic companies that have to sustain themselves, subsidies are not sufficient enough[95]. Enough income secures a long-term and thorough maintenance and conservation plan.

In that sense, it is interesting to see how the owner of Singraven is dealing with this challenge. It is clear that not every kind of building is welcome on the estate. That is why two architectural firms wrote a report about the desired quality and aesthetics. It is called *Beeldkwaliteitsplan Landgoed Singraven* (2018) and is written by SchipperDouwesarchitectuur and Strootman Landschapsarchitecten.

The development areas are selected on a few criteria:

- Area connects to former farmer lands.

[95] See Wijnen (n.d.), *Wij zijn maar een stipje in de honderden jaren Singraven.*

- New buildings can be hidden behind bushes and trees.
- Compositions must have characteristics of former barnyards or have enough space to reconstruct this.
- Enough space for new buildings and car parking(s).
- Not visible from the garden of the main house.

For the new build architecture are aesthetical and technological criteria drawn to visibly connect these building to the heritage ensemble. In that sense, it is not desired to gain individual buildings, but every new building has to connect to the existing characteristics on the estate. The architectural firm drew three-dimensional building envelope variations (Figure 60 & Figure 62) as a starting point for designers. They also drew area plans that suggest where to build (Figure 61).

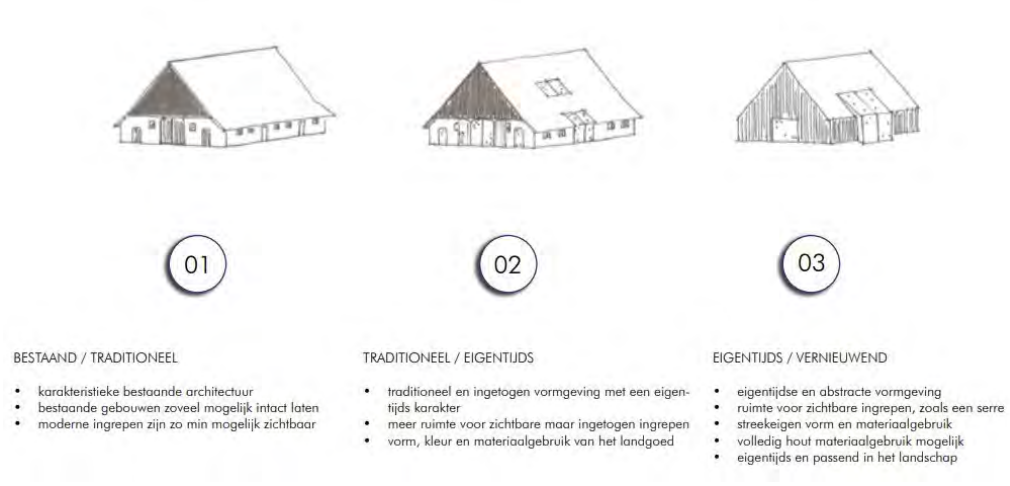


Figure 60: architectural expression of the buildings. From: beeldkwaliteitsplan Singraven.

Figure 61: example of area layout 'landschappelijke inpassing'. From: beeldkwaliteitplan Singraven.

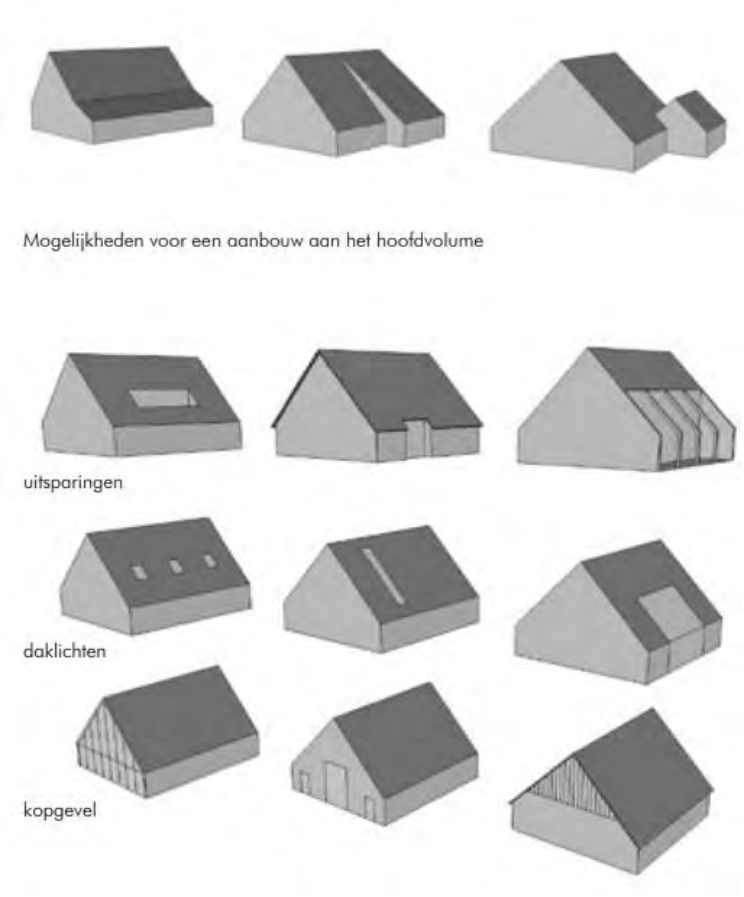


Figure 62: volume study. From: beeldkwaliteitsplan Singraven.

6.2.2 Improved water household

For the gardens and the farms is the water household on the estate improved. The water authority Vechtstromen and foundation Edwina van Heek (the owner of the estate) made a plan called: *'Waterlandgoedvisie Singraven'.* This plan is made to secure the water household in the land and to prevent dehydration. The water levels are set to a perfect condition for gardening and farming[96]. The effect is that less clean drinking water is used to hydrate the lands. The goals of the plan are:

1. Proper water level on the whole estate.
2. Logical grouping of functions in the area in connection with water.
3. Small improvements in ditches and streams to improve water household.
4. Select areas for water storage for dry periods.

Research into old ditches and streams on the estate made clear that the water household was better in the past. Old streams are silted. By cleaning and digging the old streams out, the water irrigation is improved (Figure 63). The result is that the lands are getting 'wetter'[97].

[96] See Waterschap Vechtstromen (2015), *Projectplan Singraven.*
[97] See Eysink, van Dongen, Horsthuis, & Smeenge, 2021.

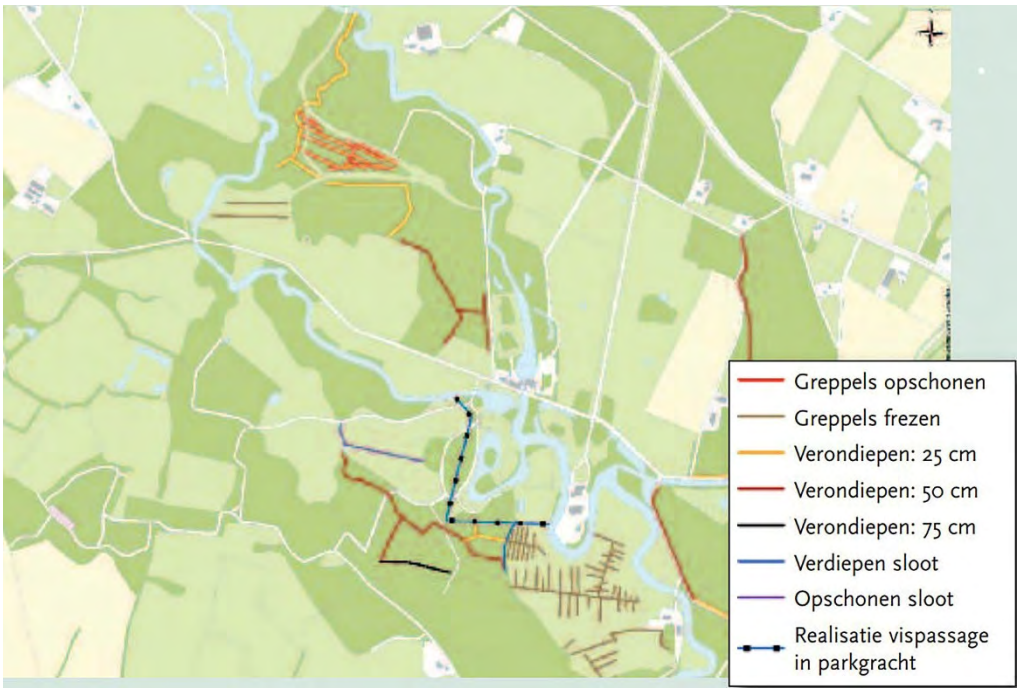


Figure 63: map with interventions in the water household. From: Waterlandgoedvisie Singraven.

6.2.3 Energy resources

One of the goals of the Edwina van Heek foundation for the estate is to become energy neutral. They want to achieve this with solar and water energy.

The estate has become almost energy neutral by the use of water energy. The constant current in the river Dinkel is the source for this so it is called 'white' or 'blue' energy. Next to the old dam in the river Dinkel and the historical water mill is a hydroplant screw turbine placed (Figure 64). The concept is inspired by the old water mill with a sawmill and flour mill in one building, which is running on waterpower for over 600 years. The biggest challenge was to integrate this object in the historical landscape. Another important criterion is that the rivers have a strong enough current. In the case of the Dinkel this was strong enough. It is placed on a spot that is not visible from the area around the main house. Moreover, the construction has been integrated into the dike as much as possible, so it is minimally visible. The screw turbine is harmless for fishes. In full operation it generates 280,000 kWh which is enough electricity for almost eighty households[98]. In this way, the screw turbine can deliver the demanded energy for the historical building without intervening in the aesthetics of the heritage buildings itself. The hydroplant is expected to operate for more than 40 years and will not lose any efficiency[99]. An advantage compared to solar panels is that a lot of energy is generated in winter when there is less daylight. In the fall, winter and spring is the current in the river at its strongest.

[98] According to the info from Nieuwe Energie Overijssel (2022).
[99] See Nieuwe Energie Overijssel (2022) and Twente.com (2020).

Figure 64: artist impression of the hydroplant. From: https://www.nieuweenergieoverijssel.nl/aanleg-vijzelturbine-op-singraven-begonnen/.

Besides the hydroplant are solar panels placed on the estate. This was a tough challenge, because it was not possible to place solar panels on the heritage buildings and it was not allowed to make solar panels fields on the estate. It is an obvious choice to do this since there are a lot of empty meadows, but it is not allowed because it affects the historic arcadian landscape. These regulations for the protection of the area also apply on windmills[100].

The capacity of the hydroplant ensured that new-build residences do not need solar panels. The seven new residential areas get their energy all from the water. Nevertheless, there are solar panels placed on the estate on the roofs of several cubicle sheds. It turned out that these were perfect locations because of the absence of historical value[101].

[100] According to Twente.com (2020).
[101] According to Twente.com (2020).

6.3 Kasteel Twickel

Case: Landgoed Twickel.
Place: Delden, The Netherlands.
Type of estate: estate, Havezate, buitenplaats.
Owner: Stichting Twickel.
New function: partly still a residence, gardens publicly accessible. Park and additional building for recreational purposes and events. Part of the house is also in use for small events. The estate has place for 144 farmers.
Year of redesign: 1953-2022.
Project group: different changes made by different architects. Two important firms are: Michael van Gessel (1998-2015) and Strootman Landschapsarchitecten (2015-now).

Figure 65: Twickel. 2022, own image.

After the last member of the Van Heeckeren family died, the estate came in property of foundation Twickel. The last baroness of Twickel decided to inherit all properties to the foundation with a few demands. The first demand was that the house had to remain inhabited. She gave the right to inhabit Twickel to her great-nephew Count Cristian zu Castell-Rüdenhausen in 1975. Since then, the family Zu Castell-Rüdenhausen lives in a small part of the building[102]. The second demand was that rest of the building had to be conserved and sometimes opened to the public. The house is also in use as a small

[102] See Haverkate, den Ouden, Brunt, & Bloemendal (2021).

events location and office space for the foundation Twickel. The side buildings are in use for storage and archive.

In a period of more than forty years and still counting is a lot changed to improve the use, experience, and qualities of the estate. All initiated by the Foundation Twickel. From 1998 until 2015 had architect Michael van Gessel changed a lot on the estate to repair the deferred maintenance from the 20th century. He designed new parts in the garden and estate and developed a complete estate vision[103]. In 2015, Strootman Landschapsarchitecten succeeded and continued the long-term plan. A lot has changed, in this report there is focussed on changes that have led to an improvement in use and sustainability. What is changed:

- Office space for the foundation Twickel.
- Archive in one of the side buildings.
- New shop and entrance building for the gardens.
- Changed nature maintenance policy.
- Application of green energy sources.
- New energy efficient buildings on the estate.
- Restoration of the vegetable garden.
- Restoration and improvement of garden design.
- Gardens and area publicly accessible for recreation purposes.

6.3.1 Improvements of the building

Foundation Twickel has the task to preserve the mansion and maintain the house as a time document from the last inhabitant. That is why time has stood still for half a century now. It is also the reason why less in changed in the building[104]. It has been decided not to insulate in the building or to place secondary insulation windows. It is not improved energetically, but it is connected to a greener energy network. The foundation tries to keep the building in use as much as possible. That is why the family still lives in a side wing and certain areas in the basement are used as offices. In addition, a number of monumental rooms are a few times a year in use for small-scale events.

On the other hand, are the side buildings certainly improved. Insulated glazing and interior insulation have been placed to improve the indoor climate. One has even been repurposed into an archival storage and study space.

The foundation Twickel is well aware that preserving the main building could pose a problem in the future. The energy transition requires adjustments everywhere. That is why the foundation is looking for solutions on other locations where it is possible to gain green energy. This can contribute to the demands and needs of the monumental mansion[105].

[103] See footnote 102.
[104] See zu Castell-Rüdenhausen (2011).
[105] A tour and interview on the estate made this ambition clear (visit in 2022).

6.3.2 Improvements of the farms

For a reduction in the energy demand is Twickel looking for several solutions to improve the (monumental) farms. One is to make use of insulated glass, and another is to insulate the farms on the inside. Furthermore, are stable roofs equipped with solar panels. These are not placed on the monumental valued buildings. This is not allowed because then the appearance of the buildings would be disturbed[106]. The foundation Twickel is also avoiding solar panels on red coloured roofs because of the distortion due to the colour contrast[107].

On the farms is a lot of heat lost by fridges. Fridges are necessary to cool down fresh cow's milk. Twickel is together with a couple of farmers testing to recover the heat in the warm cow's milk with a heat energy recovery system. This energy is then used for warm tap water and heating[108].

To make the farms more energy neutral it is also necessary to look for an opportunity to gain heat energy. One feature of a farm is that it has a lot of land surface. This can be used to collect solar heat. A recent new project from Twickel is the integration of horizontal ground heat exchangers (Figure 66). This installation is placed approximately one meter below ground level and collect solar and ground heat out of the warm surface that can be used in combination with a heat pump to heat the house.

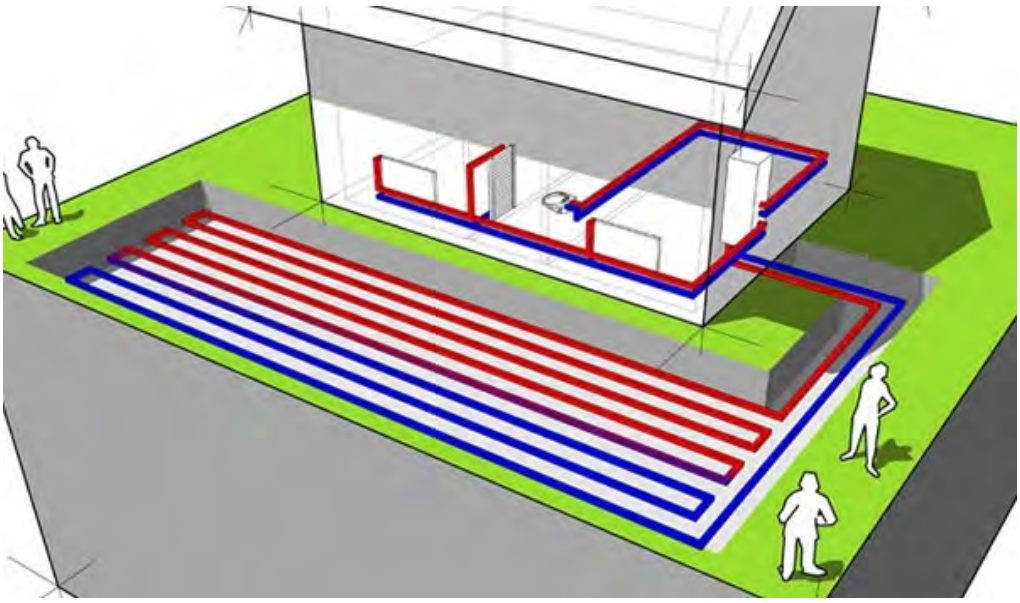


Figure 66: Horizontal ground heat exchanger. From: https://www.warmtepomp-achterhoek.nl/bodem-water-warmtepomp/.

6.3.3 Clean energy

Twickel has two energy goals: save energy and make use of clean energy. The importance of the goals is big according to the foundation: *´Als we dit hier zo willen bewaren voor de generaties na ons, dan is het zaak om nu aan de slag te gaan met*

[106] See Bloemendal, Brunt, Kleerebezem, Schimmelpenninck, & Steenbeeke (2012).
[107] See footnote 106, p. 7.
[108] See footnote 106, pp. 6-7.

energie besparen en slim opwekken van nieuwe energie' (Nieuwe Energie Overijssel, n.d.).

Since 2012, are the monumental buildings of Twickel heated by a wood-fired boiler (Figure 67). The wood is coming from the estate. Rejected timber wood, leftovers and special grown cut trees from the estate are used for fuel. Because the wood is burnt and provided from the estate it is a fully circular process. The fire is computer controlled and optimized to achieve an efficiency up to 93%. The heat is distributed through insulated pipes in the ground to several buildings like the mansion, orangery, and farms nearby. Heat exchangers and heat pumps are placed in the buildings to get warm (tap) water and heating. Since then, the estate does not make use of gas anymore[109]. The wood-fired boiler is placed below ground level and behind bushes to make sure that it is out of sight and do not harm the aesthetic values of the garden.

Figure 67: the wood fired boiler. From: https://nl.pinterest.com/pin/802766702302352890/.

6.3.4 Water storage

One major problem is the dehydration of the land during summer. In the past, many streams and canals were channelled to drain water well. Nowadays, this means that the land dries out faster in a dry summer period. As a result, the use of drinking water has increased enormously. To prevent this and to improve the irrigation of the land, Twickel tries to reverse many interventions done in the past. Streams are regaining their natural shape and are given places where they can naturally overflow in wet periods. This has increased the fertility of the soil and improved water storage. The result is that farmers and residents need to use less water and the land needs less fertilizer[110].

[109] See Bloemendal, Brunt, Kleerebezem, Schimmelpenninck, & Steenbeeke (2012), pp. 4-5
[110] See Haverkate, den Ouden, Brunt, & Bloemendal (2021), pp. 89-93.

6.3.5 Local agriculture

The old vegetable garden is restored and back in use again. Different kind of vegetables are grown here and sold in the '*landgoedwinkel'* shop. The shop is a place to sell locally produced goods. This varies from wood from the sawmill to textiles and beef from one of the farmers on the estate.

Figure 68: the Twickel Shop. Own image.

Figure 69: the restored vegetable garden. Own image.

7. Sustainable Design Solutions

The research has shown that sustainability interventions are based on design choices. These choices can only be made with the right approach for the design process. The theories of Coenen and Bloszies helped to make this clear.

7.1 Design process

According to both, a design process is based on research and value assessment. It is important to research and value the existing before the design process really starts. Paul Meurs described four steps for making a monument sustainable based on a conversation with Margret Brons and Birgit Dulsky. According to Brons, making a monument more sustainable starts with a research into the building, the installations, and the indoor climate. The next step is to test the actual needs of the user. Are they adequate and can they be adapted to the monumental building? The third step is to implement the measures. All measures must be custom fitted into the existing building. Placing new sustainability solutions is not about adding standard solutions, but more about making a smart and intelligent total design focused on the specific situation. The las step is to make the design solutions more flexible for the future. Here it is important to search for opportunities to make the building and installations adaptable and make the interventions as reversible as possible[111].

The research for the design process can be made clear in a number of sub-steps. In the diagram below this is made visible:

Figure 70: the six steps for a sustainable redesign. Own image.

7.2 Impact on values

The research showed that the design research should primarily serve to understand the heritage and map the monumental values. A value assessment of the building helps to do this and can lead to a document where it is visible where changes can be made. But then, the question arises in which themes sustainable design solutions influence their impact? The case study research gave result and showed that the integration of technological building facilities can have a major impact on the monumental values of a building. For example, solar panels can change the appearance of a roof and insulation on the inside of the façade can affect interior finishes. This kind of impact can be eventually exerted on three themes. It is found that the impact of a solution can affects historical, esthetical, and technological values (Figure 71).

[111] According to Meurs (2021), p. 15. He wrote down a conversation with Margret Brons, she is a specialist in monumental sustainability.

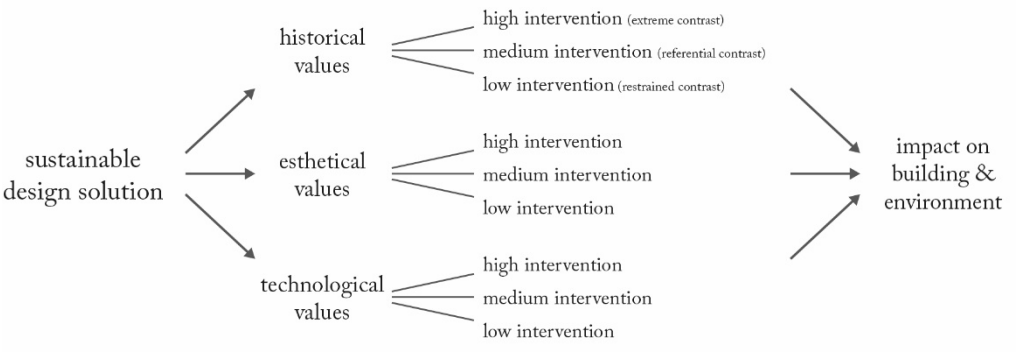


Figure 71: the three values concerning sustainability interventions. Own image.

7.3 Grade of intervention

After the research part about design attitudes, it was concluded that interventions can either have different grades of impact. The different attitudes and approaches by Coenen and Bloszies describe these various levels. Combined together, they represent three degrees of interventions; with a high, medium, or low impact on the existing building and its values. For example, an owner or designer can either choose between historical justified changes or accept contrast, which cause a higher impact. For instance, by introducing a new felling cycle for trees used as fuel for a wood fired boiler, as can be seen by Estate Twickel. In this example, the historical intervention is low, because trees have always been felled according to the Twickel gardening traditions. Nevertheless, the aesthetic intervention is high because it is visible that trees have been felled. Finally, the wood fired boiler requires major interventions in the existing building technology. In this case this is accepted and fitted into the existing structure. The interconnection between the three value topics and the amount of impact is made clear in the diagram above (Figure 71).

7.4 Design process

During a design process, the design attitudes can help to choose which elements of sustainability solutions are suitable for that specific redesign. The pre-conducted research provides important information to weigh up these choices. By investigation and valuing the building parts of an estate, mansion (or other building), interior and other things, in grades of intervention possibilities it can be made measurable and also visible either a low, medium, or high degree of intervention can take place. Then it can be made clear which design attitude or combination of attitudes and elements will fit on that specific part of a building.

Moreover, the research showed how a sustainability goal can be integrated into the redesign. The goal should always be that an adjustment or addition should optimize the existing and not a solitary addition as a patch-up. This is also confirmed by Dulski[112] who stated that a sustainable design starts by analysing the existing building and investigating what can be done better.

[112] See Meurs (2021).

The last question is where in the design process the design attitude can help. In the six steps of the research-based design is the best place for the design attitude after the value assessment and before sustainable design solutions have to be chosen. Here, the attitude can help to choose with solutions and their impact are acceptable and which are not.

Figure 72: the place of the design attitude in the research-based design. Own image.

8. Conclusion

It can be concluded that a design approach cannot simply be used for a redevelopment design task without research. On the research question: *'how can design approaches help in a contemporary reuse and redesign of a Dutch estate where both building, and nature, contribute to a sustainable design, and in particular for Huis 't Velde in Warnsveld?',* the answer is that a design approach/attitude can only help if a research based design process is completed.

A design approach/attitude can only be adopted with regard to the existing building based on the information and values that are found after research. Only after research and value assessment can a designer decide what is important about the existing building and adopt an attitude towards it. After that, an inventory can be made of which improvements are needed to make a building more sustainable. The design approach/attitude can then provide support in making the design choices.

Because of the importance of this research for the design assignment, estate Huis 't Velde is therefore investigated. Research is conducted into the typology of Dutch (rural) estates and the history of 't Velde itself. The history analysis is partly drawn in this report and complemented in the analysis report that accompanies the design assignment as written in the introduction.

The origin of the development of estates in the Netherlands comes from the late Middle Ages. The construction of estates was at its peak during the 16th and 17th centuries, when many rich and powerful citizens had a second home built outside the city. In addition, noble families started to build a country house next to their castle(s) or renovating the castle to a country house themselves.

The quality of estates lies in the combination of a spacious country house and surrounding lands. This combination makes it a unique typology in the Netherlands. There are three types of estates. These are: former castles, estates with an agricultural use, and estates with only recreational use. Huis 't Velde falls under the second category because there used to be five farms on the estate.

Because of the researches from Van Wijck and Verschuure-Stuip, we know how these estates looked and functioned in the past. Country estates used to be a place of recreation and activity. Estates with farms consisted of gardens, forests, meadows, and fields. In former castles and the other estates, the fields were missing, and meadows were not in use by farmers.

The gardens were a place for recreation and growing crops for the residents. This part of the estate was an integrally designed landscape with strong connections between house and garden elements. Think of sight axes, see throughs and ornaments. In the 17th and 18th centuries, the garden design was a strict and geometric design. Later became the Arcadian English landscape style the new standard.

Hiking paths, ponds, canals, plants and other buildings and animals were increasingly common in the gardens. Larger and more luxurious estates had a special place to keep wild animals. There was also room for large vegetable gardens and sheds or orangeries to store exotic plants in winter. The orangery is a building typology that arose from this, in where exotic orange trees were stored in winter.

The information about the history of estates is important to better understand these buildings. This is necessary to properly prepare the design process. According to the design theories of Coenen and Bloszies, it is important to start a redesign process with research. According to them, this is the only way to achieve a good end result. From the second part of the research, it can be concluded that a design attitude is only applicable if sufficient preliminary research has been conducted. This is the start of a research-based design process.

Making a building more sustainable by means of a redesign takes place in four steps. According to Margret Brons en Paul Meurs is the first step to research the building and current installations. The second step is to test the actual needs. Thirdly, to implement the measures and last but not least to make the redesign flexible for future. The last step is very important to make the existing building more flexible and adaptable because that is also a kind of sustainability.

The first step of the redesign process is about researching the existing. It forms the starting point of a redesign, consisting of three different parts: *1: programme of requirements, 2: the location & 3: value of the existing.* By researching this, parts can be valued. After making an inventory what to change it is time to choose which interventions and improvements are applicable and which not. Here is where the design attitudes can help.

The designer can according to Jo Coenen adopt five different design attitudes. These are: *continuity, polarity, congruence, dialogue, and blending.* According to Charles Bloszies can an architect adopt three different approaches, either a *restrained approach, referential* or an *extreme approach.* The most important message of both architects is that a designer can only adopt an attitude and can only make a successful redesign when he bases his design choices on research information. That is why they both advocate for research-based design processes.

The design attitude becomes interesting between the second and third step of the research-based design process. This is where choices about interventions and improvements have to be made. Case study researched revealed that sustainability interventions can have effect on three topics. The sustainability solutions have impact on three different heritage value topics regarding the existing monumental building: *historical*, *technological,* and *aesthetical* values. The solutions have impact on three levels of degree, either a low, medium, or high impact. The design attitude gives a direction in design choices of how much impact on these three values is acceptable and applicable to the monument.

By feeding the design process with sufficient research information and analysing the existing building, sufficient input can be collected to make a building more sustainable. Only with the right information can a designer form an opinion or attitude towards the existing building and make the right decisions. A design attitude, which can be differ per building, designer, and situation, will provide direction during the design process. That is the moment in a design process where the theories of Coenen and Bloszies becomes interesting again and where they can help to make a contemporary redesign and sustainability improvement for an existing monumental building and in particular for Dutch rural estates.

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10. Appendix

For the Spatial Building Typology (SBT) research of the graduation year 2021-2022 are two chapters written that relate to the graduation research. In this report are both chapters appended to this research report. The SBT research is published:

Zijlstra, et al. (2022). *Spatial Building Typology Vacant Heritage: Police Real Estate | The Netherlands.* Delft: Heritage & Architecture TU Delft and TUD OPEN.

The following appendices have been added to this report:

I: essay: *research in sustainable redesign of estate Huis 't Velde*, published by author in SBT vol.2 part 3.

II: essay: redesign of estate Huis 't Velde, published by author in SBT vol.2, part 4.

III: personal reflection.

SUSTAINABLE RE-DESIGN OF ESTATE HUIS 'T VELDE IN WARNSVELD

How can design approaches help in a contemporary reuse and re-design of a Dutch estate where both building, and nature, contribute to a sustainable design and in particular for Huis 't Velde in Warnsveld?

Keywords: landgoed, buitenplaats, estate, sustainability, heritage, nature, design attitude, design approach, green energy

As seen in part 1 and 2 of the SBT research the estate Huis 't Velde is different than the other police buildings. The biggest difference is the large amount of space and nature surrounding the buildings. With a building footprint ratio of less than 0.5% and a total size of approximately 326,000 square meters, lies a big opportunity in the reuse of the land. Reusing and re-designing an estate is not only about the design of a building, but moreover about a spatial design of the whole area. This research is about the contribution of monumental buildings, space and nature to sustainable resources and the effect they can have on the monumental value of the whole estate. This is worked out by analysing the next four case studies: Kasteel Twickel, Landgoed Singraven, Kasteel Wijlre, and Kasteel Ruurlo.

Design attitudes

In recent decades, the attention of architects in the heritage sector has been on design attitudes. Designers and tutors in the architectural field were questioning how to deal with heritage? This former 'hot topic' was about the aesthetic design of old and new architecture and the integration of those new parts and elements into the existing. In 2006 former TU Delft R-MIT professor Jo Coenen distinguished five attitudes in dealing with the re-design of a heritage building: *continuity, polarity, dialogue, congruence and blending* (Coenen, 2006).

Six years later in 2012 distinguished American architect Charles Bloszies three equivalent approaches: *extreme, restrained, and referential* (Bloszies, 2012).

Both authors have in common that they were criticize and questioning the instant urge of making a striking image in every (re-)design. Both stated that it is more important to investigate the effect and impact of interventions on the existing building and to create a symbiosis by well-considered design choices.

The urge of sustainability

Nowadays the urge in the architectural field is shifted to sustainability. Every designer is questioning how he or she can re-design a heritage building as energy neutral as possible. But this is not so easy with monuments. In the Dutch built environment sector are monuments seen as hopeless cases that consume energy and are impossible to insulate properly (Meurs, 2021). In his essay for the Dutch Restoration Platform (NRP), Paul Meurs wrote that a general misjudgement is that sustainability interventions will lead to a loss of heritage values and architectural quality (Meurs, 2021).

The integration of technological facilities can have a major impact on the monumental values of a building. For example, solar panels can change the appearance of a roof. Insulation on the inside of the façade can affect the interior finishes and dimensions of rooms. Moreover, this also has an effect on the material due to the altered building physical performance. However, these technological interventions are inevitable, and an integral solution must be sought.

That is why it is important to question what the influence of sustainability is on the design and values of a building.

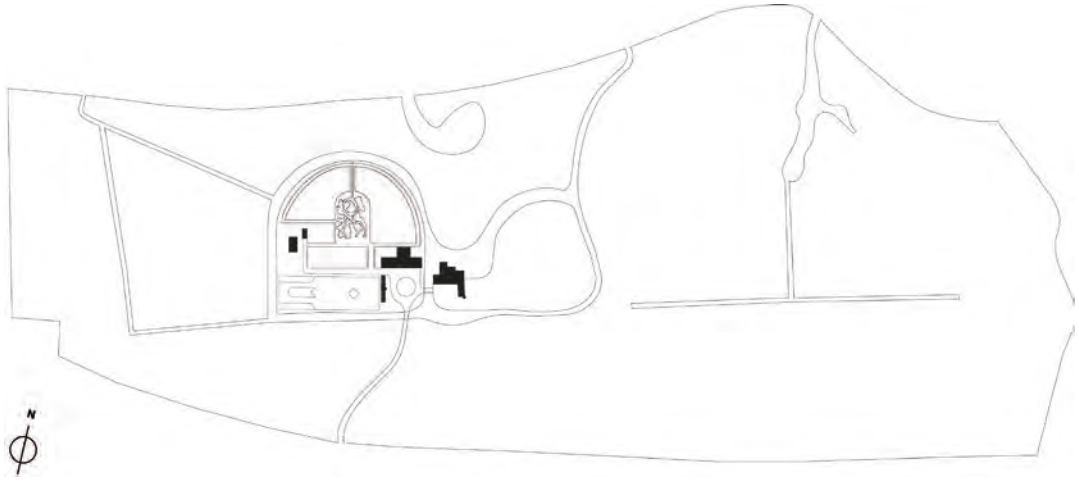

Figure 1: plan of estate Huis 't Velde. The island with house, coach house and aviary is only a small part of the total estate.

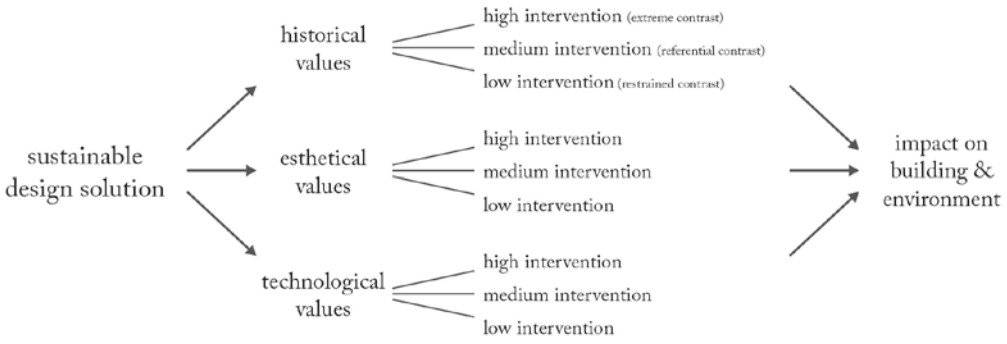

Figure 2: the three values concercing a sustainability intervention.

According to Birgit Dulski (Meurs, 2021), sustainability starts by analysing the existing building and investigating what could be done better. Can a certain solution really be implemented without negative impact or is a different solution necessary? That is where the theories of Coenen and Bloszies become interesting again.

Intervention in historical, aesthetical, and technological values

After the first part of the research, it was concluded that the theories of Coenen and Bloszies can be combined. Combined, they represent three degrees of intervention; with a high, medium, or low impact on the design and values of the building. Sustainability design solutions can be measured by their degree of intervention. But then the question arises; where do they have effect on?

Case study research resulted in three categories on which sustainability interventions in monuments can affect. These three are: historical, aesthetic, and technological interventions. For example, an owner or designer can either choose between historical justified changes or accept contrast. For instance, by introducing a new felling cycle for trees, which are used as fuel for a wood fired boiler, as can be seen by Estate Twickel. In this example, the historical intervention is low, because trees have always been felled according to the Twickel gardening traditions. Nevertheless, the aesthetic intervention is high because it is visible that trees have been felled. Finally, the wood fired boiler requires major interventions in the existing building technology. In this case, that has been accepted and fitted into the existing structure.

Design process

During a design process, the design attitudes can help to choose which elements of sustainability solutions are suitable for that specific re-design. By valuing parts of the estate, buildings, interiors, etc., in grades of possibilities in low, medium, or high interventions, it can be made clear which design attitude or combination of attitudes and elements will fit on that certain part of the building.

Moreover, this shows how a sustainability goal can be integrated in the re-design. The goal should always be that an adjustment or addition should be an optimization of what is already present. Not a solitary addition as a patch-up (Meurs, 2021).

According to Margret Brons (Meurs, 2021), this involves four steps. It starts with an examination of the existing, and then you have to look at the actual needs. Thirdly, all interventions have to be tested for their specific situation. Finally, a degree of flexibility for the future will have to be taken into account. Because that too, is sustainability.

Research is key

The research has shown that making monuments more sustainable is custom work. Various interventions are possible, but it is important for each intervention to investigate what impact they have on the values of a monument. It should be clear that efforts should only be made to optimize the existing building. It is then up to the architect to choose a design attitude and to choose which interventions are permitted and which are not. It is likely that different parts of an estate require different attitudes, but in all cases a choice will have to be substantiated with research.

For examples of sustainability resources and measures for Dutch estates I would like to refer to my research report. This can be found in the TU Delft Architecture repository. Finally, the results of the research will be used in the re-design of estate Huis 't Velde in Warnsveld.

Bloszies, C. (2012). *Old Buildings, New Design.* Princeton Architectural Press.
Coenen, J. (2006). *Art of Blending.* Vssd & TU Delft R-Mit
Meurs, P. (2021). *Niets is zo duurzaam als een monument.* Nationaal Restauratie Platform Nederland.

Casestudies: Landgoed Kasteel Twickel (NL), Landgoed Singraven (NL), Buitenplaats Kasteel Wijlre (NL), Kasteel Ruurlo (NL).

SUSTAINABLE RE-DESIGN OF ESTATE HUIS ‘T VELDE

Warnsveld

How can design approaches help in a contemporary reuse and re-design of a Dutch estate where both building, and nature, contribute to a sustainable design and in particular for Huis ‘t Velde in Warnsveld?

Keywords: landgoed, buitenplaats, estate, sustainability, heritage, nature, design attitude, design approach, green energy

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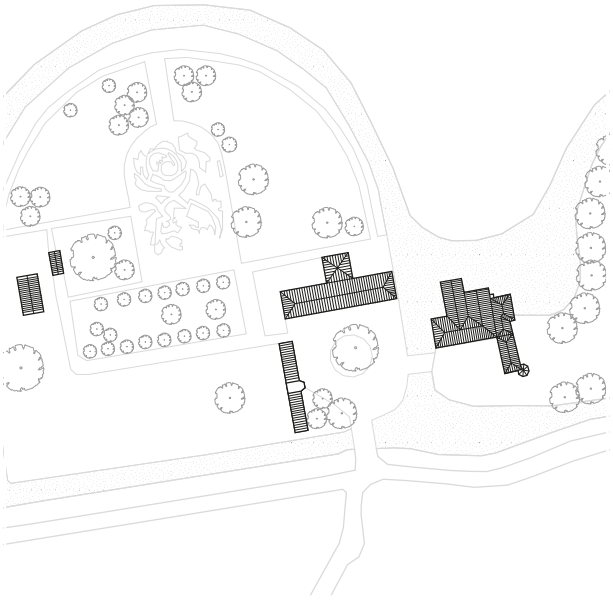

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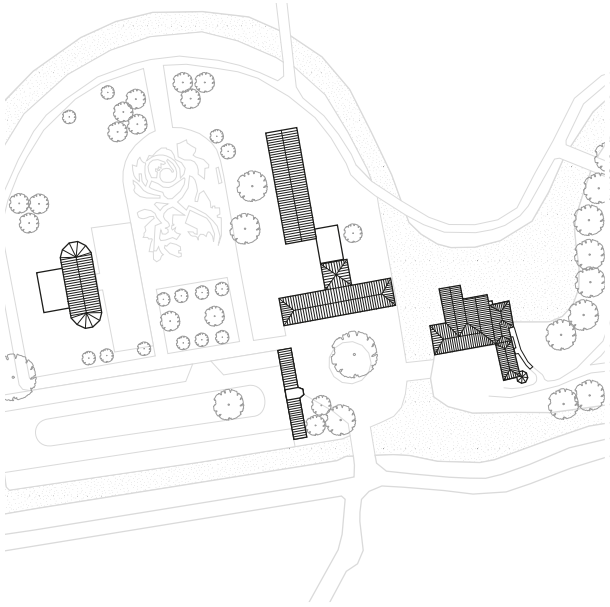

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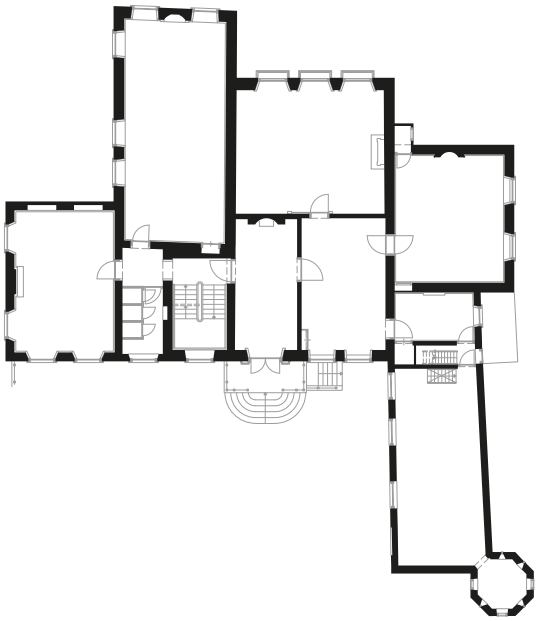

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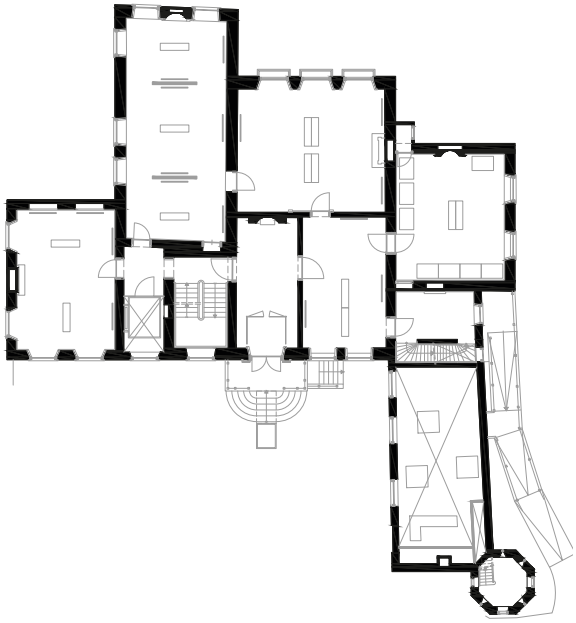

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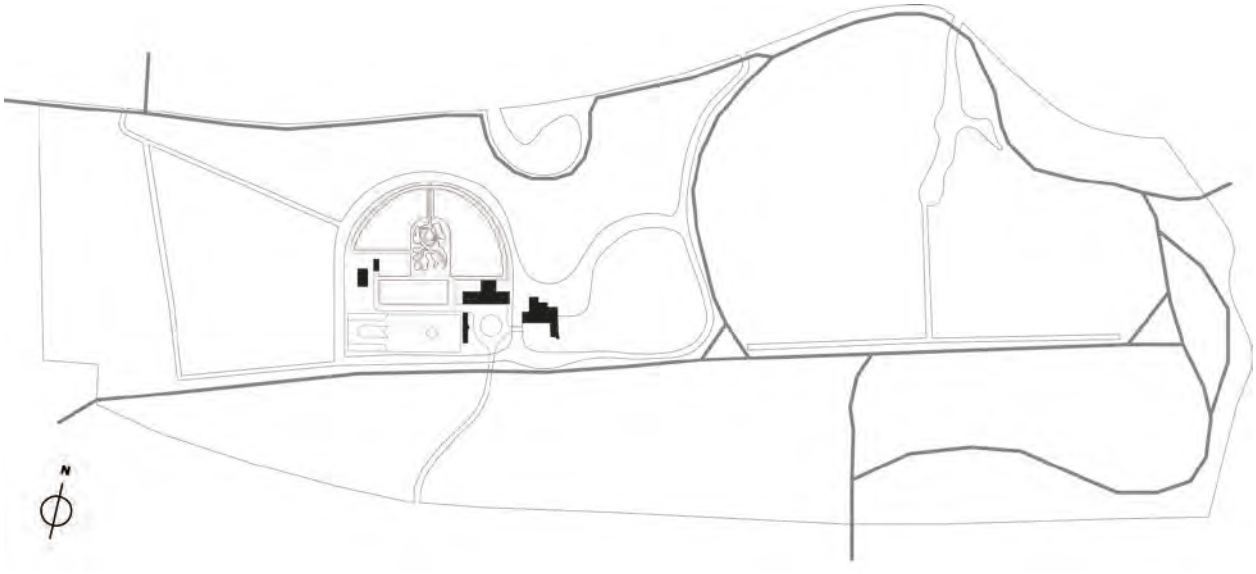


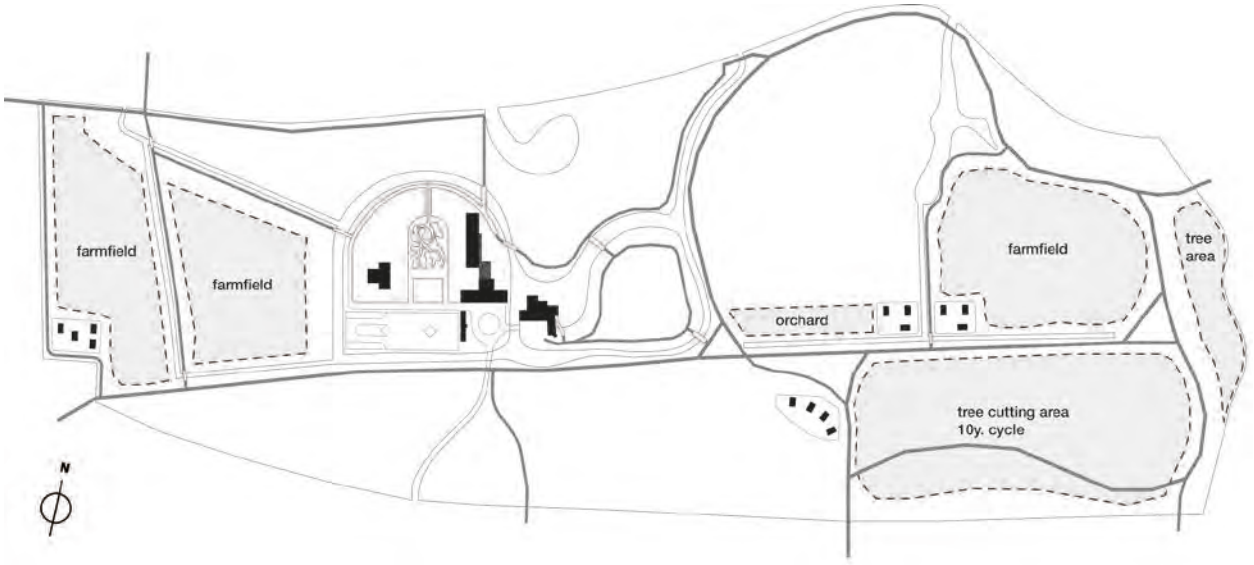
BEFORE - plan overview of the existing estate. The size of the area is 328.479 m^2.

The main quality of Huis 't Velde in Warnsveld is its large area. At the same time this is also a weakness. Because what do you have to do with so much land? In the analysis came up that there are various places on the estate that are suitable to change without threatening the historical context. In addition, there is plenty of green and free space on the land that can contribute to make the monuments more sustainable. Finally, it emerged from the value assessment that the monumental value focusses on the main residence and that the other buildings contribute to that monumental experience.

The research concluded that technical interventions always have an impact on the built heritage. When making a building more sustainable or modernizing the services, the influence of these interventions on the values of the building(s) must therefore be evaluated (see SBT part 3). In the case of Huis 't Velde it emerged that a restrained attitude towards the residence was appropriate. There was more room for adjustments in the side buildings and space for new buildings that can both contribute to the sustainability aim of the building services of the main residence.

With this in mind I elaborated a reuse design for the estate. The idea of the design is not to make only use of the buildings but also to make use of the 'natural' parts of the estate to make an integral reuse proposal. The design focusses on four points: firstly, to open the estate for cultural visitors, secondly to present the time layers from the monument, thirdly to use the estate's lands to contribute to use and sustainability, and finally to modernise the outdated building technology with 'green' energy resources. The goal is to pursue a balanced and stable user function mix to guarantee a long term usage and stable income and to ensure and continue the existence and maintenance of the monumental estate.

The new program of the new reuse design consists of a number of different functions. The most important and largest part concerns a new museum in both monumental buildings that will function as the beating heart of the estate. There is much to experience here with the monumental house itself, a permanent exhibition in the museum house and temporary exhibitions in new rooms near the coach house. On the large island, the 'Tuin van Bezinning' has been respected and preserved. I changed the layout of the island to make space available for an orangery with a restaurant. The orangery functions independently, but can also support the coffee bar in the museum and the annual commemoration ceremonies from the Dutch national police.



AFTER - plan overview of the re-designed estate. New development areas are selected and the routing is improved.

The routing has been adjusted to improve the experience of the estate. In the past it was only possible to walk around the outer edges, and now there are integral hiking trails through the entire estate. Hikers are tempted to discover the two inner islands as well. New small introverted residential areas have been designed in some places between the woods and meadows. This ensures a variety in user functions, but the rent money also ensures a continuous and stable income for the maintenance and preservation of the estate.

All new buildings have to be built energy neutral. This reduces the energy demand as much as possible. In addition, solar panels for solar energy will be placed onto the new houses, museum rooms and orangery. It is important that these must have an overcapacity in their energy generation. In this way, these buildings can support the main building which is left free of major sustainability adjustments due to its monumental character and values. A central geothermal heat exchanger will be installed on the estate that will provide all buildings with heat. Each building gets its own heat pump that is connected to the network. In addition there is a possibility to place a wood-fired boiler to gain more heat capacity during the winter. The wood comes from trees that are cut annually on the estate. The most important aspect of the sustainability plan is its integral and centralized implementation.

The design shows that an integrated design can make a monument more sustainable on an energetic and economic level. In SBT part 3 is more explained about the design attitudes of Jo Coenen and Charles Bloszies. At the start of the design, the attitude continuity was chosen. Research and analysis showed that a reserved attitude towards the monument was best here, but that other areas on the estate allowed more freedom in style of continuity. This is the benefit of the presence of a large plot.

Other than expected in the beginning, during the design process it turned out that one attitude was not always sufficient. The different design approaches show that customization is necessary and that even within one project, one attitude is not always enough. In this way, all parts of the estate were assessed and adapted according to what is necessary and appropriate within their value for the monumental ensemble. It turned out that the most important aspect of making a monument more sustainable is to determine the values of the building parts and to test the impact of design choices on this, instead of focussing on one attitude. Every scale level and even every building part of a design requires its own assessment and interpretation. The design attitude can vary here. It turned out that a design attitude can help to support and direct design choises, but in itself it can never be a goal to achieve.

Graduation project Vacant Heritage

Sustainable estate of the future - reflection

Research and design into a sustainable reuse of Dutch estate Huis ‘t Velde

Mathyn Carsten Klein MA. ing. | 4737601

AR3AH105 Heritage & Architecture – Studio Vacant Heritage Dutch Police real estates

Date: 16-06-2022 final version

Master of Architecture graduation studio
Faculty of Architecture, Urbanism & Building Technology
Delft University of Technology | The Netherlands

Reflection paper master graduation project

Heritage & architecture, Vacant Heritage graduation studio | Mathyn Klein 4737601

Tutors

Design: Lidy Meijers (Heritage & Architecture)
Research: Hielkje Zijlstra (Heritage & Architecture)
Building technology: Frank Koopman (Heritage & Technology)
Committee: Bastiaan van Loenen (Urban Data Science)

Introduction

My master graduation project takes place in the Master Vacant Heritage graduation studio of the Heritage & Architecture department at the Faculty of Architecture of the Delft University of Technology. The Heritage & Architecture specialisation studio is in collaboration with the Dutch National Police real estate department *Atelier Politie Bouwmeester*, researching the repurposing possibilities of ten selected police buildings. This is because the Dutch Police will have to dispose approximately 700,000 square meters of real estate in the coming years. The police feels responsible for these buildings, including the ones that will become vacant[1]. The Atelier Politie Bouwmeester has therefore taken the task of researching the values and potentials of buildings that could possibly be sold in the future. Ten of those buildings are selected for the master graduation studio. One of the ten buildings is Huis 't Velde, an estate in Warnsveld. I chose this location of the National Police Academy (*Politie Rijksacademie*) because of my personal interest in Dutch estates and castles. Moreover, this building stood out to me the most among the office buildings that we could choose.

Figure 1: Huis 't Velde in Warnsveld. Own image.

With an individual research and design proposal of a redevelopment assignment, research has been done into an integral and sustainable repurposing of Dutch estates (*Dutch: kastelen & buitenplaatsen).* The main

[1] This is the conclusion from an introduction lecture from the Atelier Politie Bouwmeester in September 2021, in collaboration with the H&A studio.

focus was on sustainability and a complete repurposing of the whole estate instead of only the main house. On one hand this was done on the basis of a literature and case study research. This resulted in an overview of sustainability interventions and the impact they have on a monumental building. On the other hand, did historical research and analysis gave a lot of information for the design assignment. Both provided important input for the design.

The final design includes a broadly oriented combination of new user functions (Figure 3). A newly designed museum forms the heart of the estate. This is divided into a museum house and a new build exhibition hall. The attractiveness of the estate is enhanced with the presence of a restaurant, a large walking area through the nature reserve, small-scale residential areas, and the already present memorial garden (*Tuin van Bezinning*), where died police officers are commemorated annually.

In addition to the individual research and design, group research was conducted into the spatial typology of the police real estate. For the research line Spatial Building Typology (SBT-research), research was done this year into ten police buildings. Analysis of these buildings was done by using the Hausmann Method[2]. In line with the first year's publication of research that was focused on V&D department stores, the second volume of the SBT series about police real estate will be published this year[3].

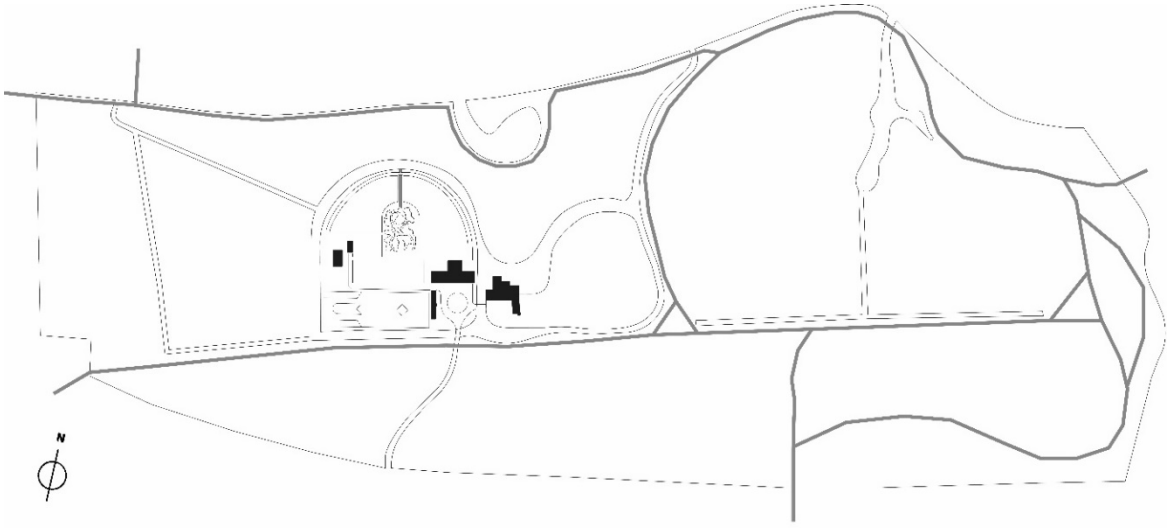


Figure 2: current situation drawing of the estate. Own image.

[2] See Jallon & Napolitano, 2017 and SBT method in SBT volume 1 (Zijlstra et al., 2021).
[3] SBT volume 2 publication is: Zijlstra, et al. (2022).

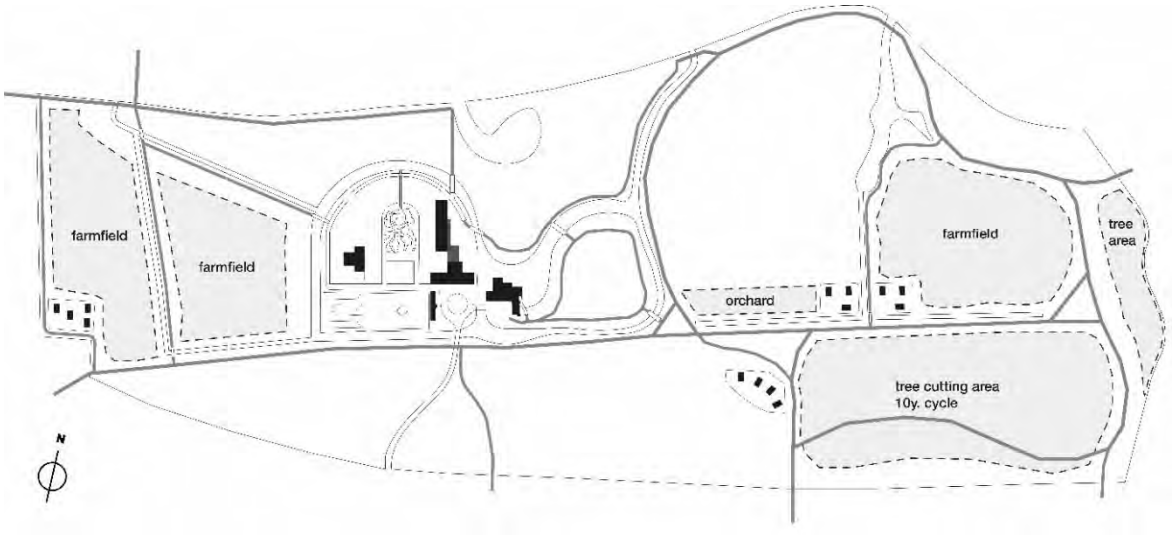


Figure 3: new situation drawing of the estate. Own image.

1. The relationship between graduation topic and the master programme

The graduation research topic is mainly about sustainable repurposing and design attitudes. This fits in the current zeitgeist where sustainability is becoming increasingly important. The Faculty of Architecture of the Delft University of Technology pays a lot of attention to sustainability. The Heritage & Architecture specialisation pays in particular attention to the sustainable repurposing of built heritage. In the master studio, the history, values, and potentials of the ten police buildings were examined and a sustainable redesign was developed. Valuing the existing heritage is a major topic in the H&A department. This is done on the basis of the H&A Value Matrix (Figure 4) from Kuipers and De Jonge (2017) and the value drawings according to the method published by the Dutch Cultural Heritage Agency. This provides insight into what is of value in a building and where interventions can or cannot take place. However, there is no matrix or valuation method that tests the impact of sustainability interventions on the value of the building.

BRAND + / RIEGL +	AGE value	HISTORICAL value	INTENTINAL COMMEMORATIVE value	NON INTENDED COMMEMORATIVE value	USE value	NEW-NESS value	(relative) ART value	RARITY value [+]	OTHER relevant values [+]
SURROUNDINGS / SETTING [+]									
SITE									
SKIN (exterior)									
STRUCTURE									
SPACE PLAN									
SURFACES (interior) [+]									
SERVICES									
STUFF									
SPIRIT of PLACE [+]									

Figure 4: H&A Value Matrix. Retrieved from: Clarke, Kuipers & Stroux (2019).

When it comes to sustainability, people often think of insulation and solar panels. At least I did. It is almost always about energy performance. However, because of the cultural value of the monumental estate ensemble, my research focused on a sustainable repurposing of an entire estate and not just the building technology of the main residence. Case study research revealed that estates are by no means always integrally improved, but there are absolutely opportunities here. In my project I searched for a combination of energetic and economic sustainability. A mix of functions of a museum, restaurant, residences, and recreational area will make the future of the estate more stable. By having these components work together for green energy resources, the monumental building could be repurposed with minimal interventions and still becomes more sustainable.

During my education in the past years, the focus was always on the architectural integration of sustainable installations and interventions. It was always about numbers, capacity, and proper fits. It was almost never about the effect of such an intervention or design choice on the value of the built heritage. With my research I have tried to link the worlds of design, building technology and sustainability in a different way to look whether the impact of those interventions can be taken more into account during the design process.

The design attitudes of former TU Delft H&A professor Jo Coenen (Coenen, 2006) and approaches of American architect Charles Bloszies (Bloszies, 2012) have helped me reaching my goal. These showed that an intervention can be done in different ways and how an attitude can be adopted towards it. However, these are just two theories, while many more redesign theories exist. Due to the time and scope of the research, it was not possible to treat more. It is therefore quite possible that the outcome of the research may change if more redesign theories would be introduced. Nevertheless, I am convinced that the resulting message is uniform: base a design choice on research, analysis and impact on the built heritage and its values.

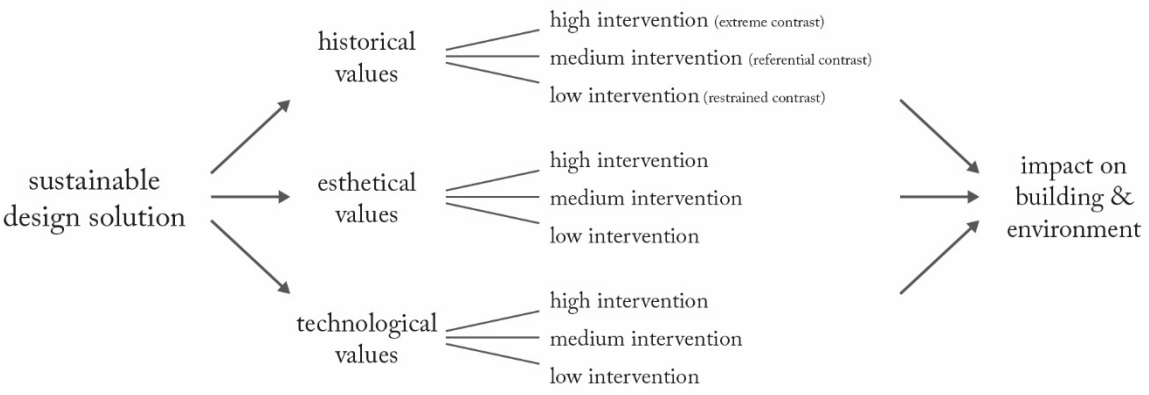


Figure 5: the three values concerning a sustainability intervention. Retrieved from my research report (own image).

2. The relationship between research and design

The research consisted of three main parts. In the first part, the typology and history of estates were investigated. In the second part, the design attitudes of Jo Coenen and the design approaches of Charles Bloszies were examined. The second part concerned a case study of four reference buildings into the application of sustainability solutions in castles and estates. Both parts formed an important basis for the design process for the redesign of estate Huis 't Velde.

The literature study only examined the (re-)design attitudes of two authors, while there are many more. It has been a conscious choice not to expand this, due to the fact of time limits and that all theories ultimately convey the same message. It revolves around a connection between the existing heritage

buildings and a new design, which can be elaborated in several ways. It was therefore important to choose theories of which relate to the repurposing of heritage. On the advice of my research mentor, an essay about making heritage more sustainable by Paul Meurs was involved afterwards[4]. This resulted in an in-depth, whereby an attitude could be linked to a heritage-based design process and the dilemmas that a designer faces in the field of sustainability. This made it for me possible to make sustainability solutions measurable. By introducing three value topics it was possible to examine what impact a design solution could have. The sustainability solutions are tested on their influence on the historical, aesthetic, and technological values of the existing building (see Figure 5Figure).

A personal preference made me choose the attitude continuity of Jo Coenen for the redesign of Huis 't Velde. A direct relationship between research and the design was therefore the choice to base design choices on this attitude. As a result, every design decision is done in relation to the existing structure and its history. This connection occurred at various scale levels, such as: building volume, structure, hierarchy, materialisation, history, traditions, et cetera.

The three value topics on which a sustainability intervention can have impact on a building and its environment turned out to be a useful tool for testing interventions in my design. However, it was necessary first to provide insight into the values of the building. This was done with a building-historical analysis and valuation that was made with a group of three students. The valuation provided the right input to weigh up and substantiate certain design options and choices. An example is the use of solar panels. The aesthetic impact on the monumental building was so high that this was not desired. The case studies showed that a solution can often be sought outside the building. This has led me to look further than just the monumental building. So, I created an overcapacity for energy and heat generation in the new buildings.

Unfortunately, I experienced that my research process was going too slow to support me early in the design process. Due to a bad start, a large part of my research did not take place in the second quarter. A major part is done during the third and fourth quarter in the MSc4 semester. Also, a COVID illness caused me a delay at the end of the second quarter with the result of a retake for my P2 assessment. It certainly did not benefit my design in the MSc4 semester. All together this made the design process a lot more difficult than I expected and the process went very differently that I initially planned in my Research Plan diagram.

3. Research method and approach in relation to the graduation studio

The graduation studio is structured in such a way that the first quarter is mainly about analysis and research of the building with the SBT-research research line and (archive) research into the existing situation. In addition, a research plan was drawn up for the course Research Plan (AR3A010). Because of the amount of work, I started the individual research a bit too late with a self-chosen topic in the second quarter. On the one hand, the preparation worked well because I first gained knowledge of the project before choosing a research topic. On the other hand, it did hinder me in formulating my research question and in the start of my research. The longer I worked on the building, the further I was steered into a certain mindset. Making it more difficult for me to pick a topic that could be separate from it. I started to wonder more and more how I should deal with the estate, which is already a design question and not so much a research question. This question and the feedback of my mentors brought me into the topic of design

[4] See Paul Meurs (2021) *Niets is zo duurzaam als een monument*.

attitudes. Quickly, I came across the literature of Coenen and Bloszies. However, this was not enough to investigate, as what was also told in the feedback I received from my mentors after the P1 presentation.

In the end, I partially switched to the sustainability theme at the insistence of one of my mentors. This was helpful feedback because sustainability has been in my interest for many years. I just could not think about it myself because I got stuck in the theme of design attitudes. In that sense it was a real eye opener. With some guidance I was eventually able to combine both topics and came to a conclusion that helped me in my design process. I have started to look differently at the concept of sustainability and at the integration of installations an elaborating interventions in the built heritage.

Case study research is a common research method in the graduation studio. Like me, most students combined a literature study with a case study. Besides the fact that this gave me a lot of practical information about sustainability solutions, my research had another major effect. Because more side information was collected and studied, it turned out that many projects were often based on a mix of functions, or that estates were used in their entirety to enhance the ensemble. Unintentionally, this gave a lot of input in my preliminary design and concept development to make use of the complete plot.

By applying a mix of user functions of, for example, restaurant and housing, it became apparent that a more sustainable vision of the future can be developed in which use and maintenance can be better guaranteed. This is a form of economic sustainability and is different than energetic sustainability. Moreover, it attracts as many different target groups as possible, and the museum thus reaches as many groups of people as possible. It appears that the presence of a large plot offers unique opportunities that are unimaginable in an urban environment. It gave me the insight that I should not focus on one user function and so I started looking for a function mix. This has been elaborated in the design with a mix of a restaurant, cultural functions, and housing (Figure 3). Ultimately, it turned out that sustainability in my design has been elaborated on three themes: user functions, energy (resources and insulation), and integral use.

Finally, it turned out that the results of the study are not complete. Because only four case study estates have been investigated only a limited number of sustainability solutions have been found. Investigating more cases was not possible because of the time limit. The scope is therefore quite limited in terms of solutions. Moreover, it is also plausible that innovative solutions applied in other building typologies are also perfectly suitable to integrate in estates. So, it is important to realize that there are more solutions than I have found. The conclusion only gave a limited impression of solutions and can certainly be expanded in the future. Towards the conclusion, therefore, a certain abstraction has been sought so that the research result can be used more broadly. The conclusion is that it is not just about the solutions themselves, but more about the way to get there and the influence of the solutions on the building and the environment. Nevertheless, the three value subjects: *historical, aesthetical, and technological impact*, on which solutions can be tested, are still quite abstract. An attempt has been made to make the interventions measurable, but there is still a lot of room for a subjective approach, and it depends on the criteria that a designer or client sets how the conclusion will be.

4. The graduation project and the wider social, professional, and scientific framework

My research contributes to an important redevelopment task in the Netherlands. The group of estates is strongly represented within the large group of monumental buildings that are in danger of becoming vacant and need to be redeveloped. The group of estates forms a large group of more than 800 buildings

that still have many problems to face[5].Gerdy Verschuure-Stuip (2019) indicated this in her dissertation, and this is confirmed in the society by, among others, the fund Stichting Gelders Landschap en Kastelen and studies done by involved architectural firms. There are two main reasons for this problem; first of all because estates are energy guzzling[6], and second, because maintenance has become almost unaffordable. Sustainability improvements are therefore necessary. This is becoming increasingly clear in society through, among other things, the development of the United Nations Sustainable Development Goals and the attention government, companies, and house owners gives to sustainability. My research and design exactly focus on these topics. Moreover, it relates to the Sustainable Development Goals, namely to goal 7: *clean energy*, but also to goals 11: *sustainable cities & communities*, 12: *responsible consumption & production*, and 15: *life on land*.

The results of the research show that a lot can be gained with small and large interventions. Moreover, the design shows that an estate can take a diversity of new uses without major changes to the existing structure. It can be an example for estate owners, but also for other monument owners who experience similar comfort and energetic problems with their property. It should be noted that only a small number of references were analysed in the case study. Therefore, there are most likely many more solutions that are not mentioned here. Nevertheless, the principal approach of analysing, assessing the heritage value and assessing the interventions, remains the same. Other sustainable design solutions can be assessed in the same way for their impact on the building and environment.

Finally, in this academic year the Spatial Building Typology research line brings a new chapter in a multi-year scientific research on building typologies performed by the TU Delft Faculty of Architecture master specialisation Heritage & Architecture. The publication of Volume 2: Police Real Estates, which is jointly produced by the mentors and the group of students from H&A, ensures that the information retrieved about the police building typology, redesign proposals and research conclusions of all students is made accessible to everyone. My individual research and design contribute to this due to two short essays that have been added in part 3 and part 4 of the publication. These essays contain a short story about my individual research and redesign proposal.

5. Ethical issues and dilemmas of the results in practice

During the graduation project I noticed that my position towards sustainability and built heritage have changed. Due to my personal background from the University of Applied Sciences, I was mainly focused on constructional and technological aspects and on the conservation of the existing buildings. In the beginning I had a very reserved attitude towards the estate. This can still be seen in my redesign because I only change small things. Yet my attitude towards the built heritage has changed and I dared to make more interventions as the project progressed. For example, I have significantly expanded the coach house and I have also selected new locations to build new buildings.

During the design process I noticed that there is more room for change than I initially thought. The chosen design attitude *continuity* gave me something to hold on to. In the past I often had trouble designing a new addition to the existing structure. I still have, but because I opted for continuity I was already in a certain direction. As a result, I was able to make choices faster and I had the feeling that a certain coherence

[5] According to Strootman Architecten, Gerdy Verschuure-Stuip and Henri van Wijck is the coherence between nature, lands, and the buildings the most important value of an estate or castle. This ensemble is important to protect and conserve. They also stated that this is under pressure as owners often sell parts of the plot or split estates into separate plots to earn money.
[6] According to Paul Meurs (2021) are monuments in the built environment sector in many cases seen as hopeless cases. The stigma is that these buildings are usually non-functional, consume enormous amounts of energy and cannot be properly insulated. According to Meurs, this is a misconception and smart interventions on diverse levels in monuments can most certainly lead to increased sustainability.

appeared. Despite that, it turned out that one attitude is not always enough. With some design choices, I felt that a different approach would be better. In various parts I looked for more contrast instead of opting for continuity. This has taught me that any design choice is a conscious consideration of options and that it is not wise to focus on just one approach.

In the field of sustainability, my main lesson is that you can look beyond the building envelope. An integrated approach creates solutions that are almost impossible to find and solve within a single monumental building. Moreover, sustainability is also reflected in use and flexibility. This was elaborated during the design process by incorporating a user function mix and by having all buildings work together in achieving a better and greener energy performance.

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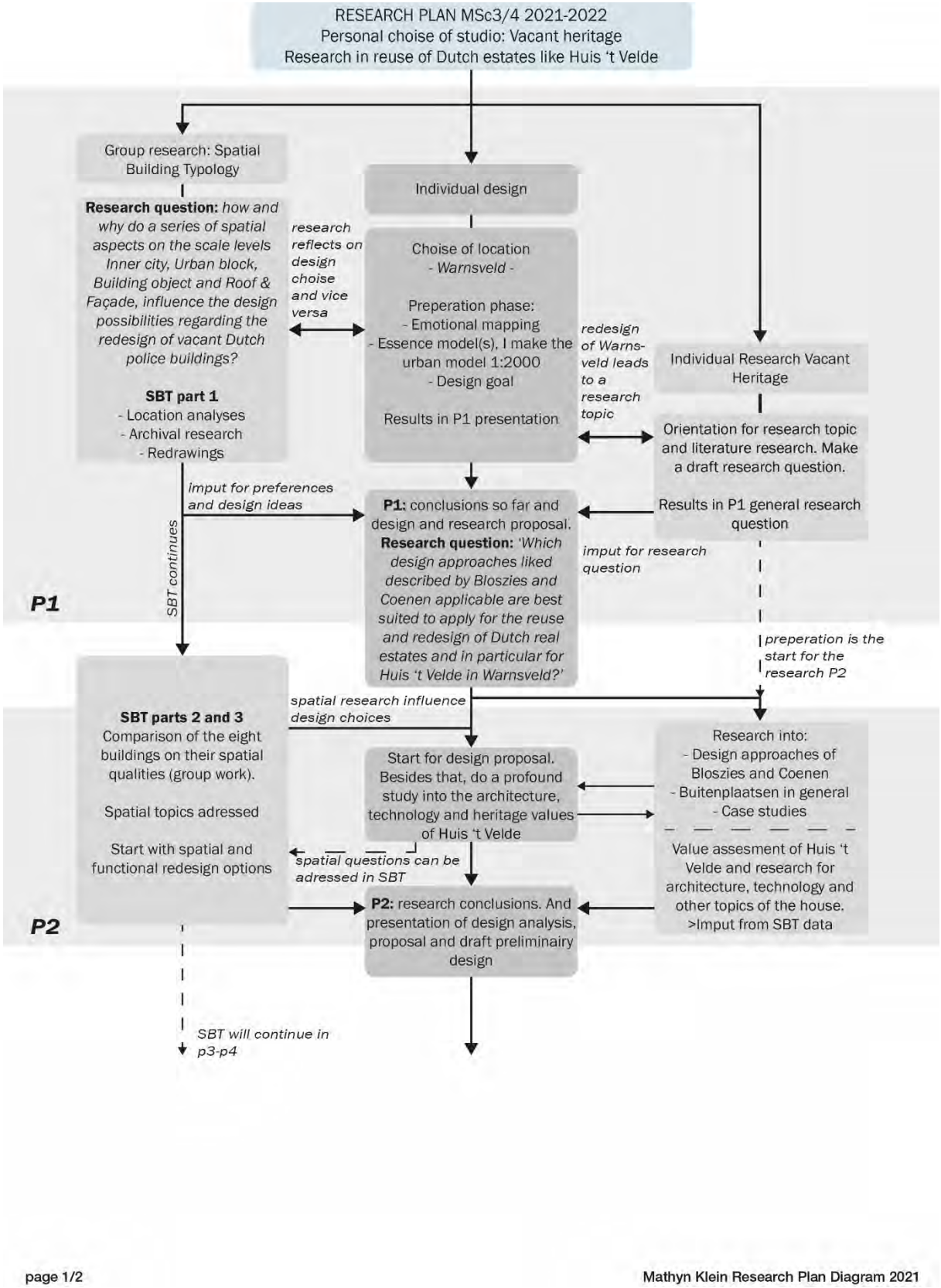
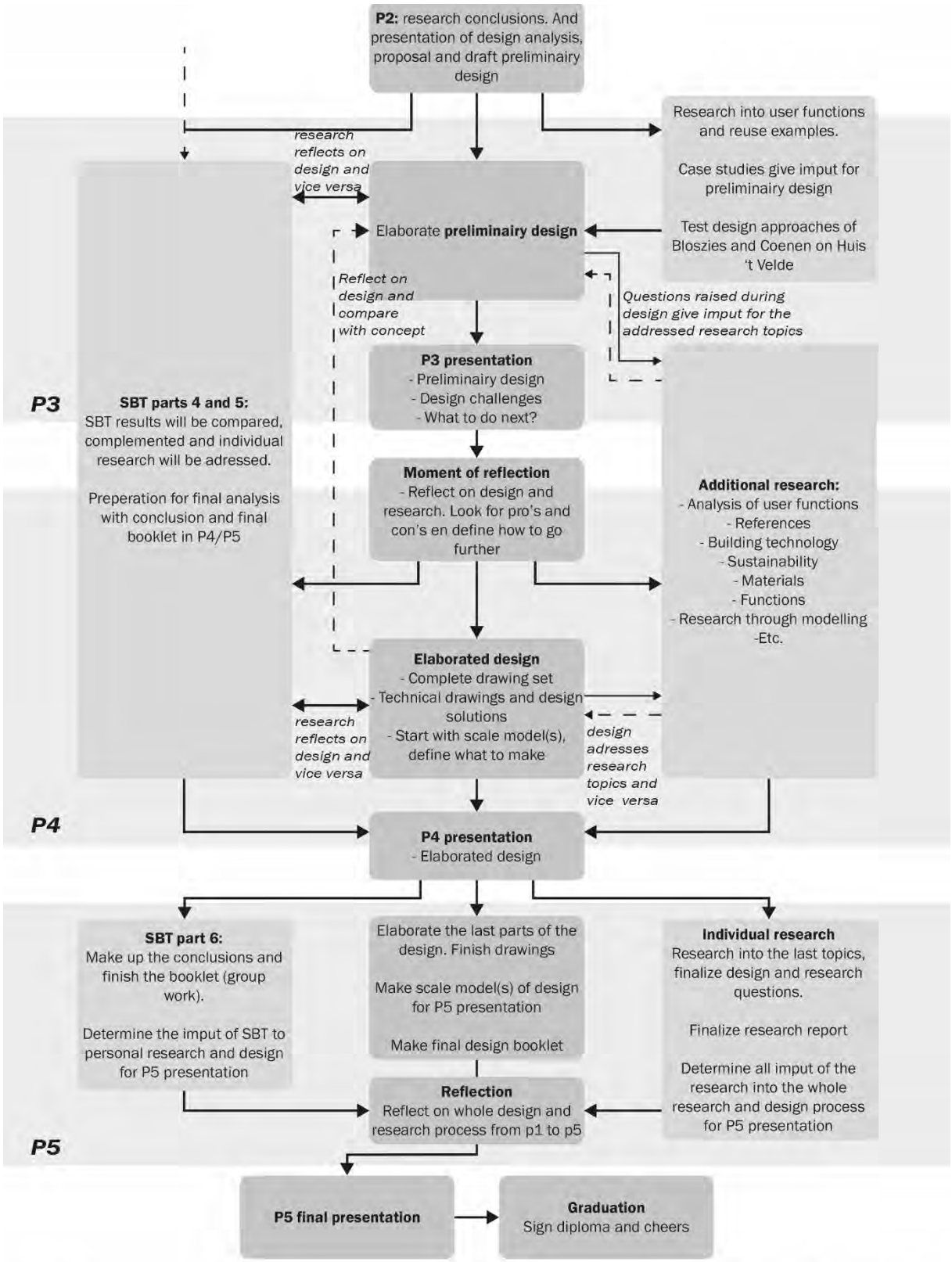
7. Appendix

Research plan diagram, retrieved from my Research Plan report: *Design approaches for reuse & redesign of Dutch estates.* October, 29, 2021.





Mathyn Klein Research Plan Diagram 2021