

Examination report

Renovation, Management & Reuse



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FOREWORD

In Rotterdam, at Brede Hilledijk 95, Rijnhaven, stands the national monument Santos. Santos is a coffee warehouse built in 1901 and designed by architect J.P. Stok Wzn and J.J. Kanter. I have been asked to give this warehouse a new purpose and to create a management plan.

The redevelopment of the warehouse falls under the Rijnhaven area development project, designed by American landscape architecture firm Michael van Valkenburgh Associates and approved by the Rotterdam Board of Mayor and Aldermen. This project is being carried out on behalf of the municipality of Rotterdam.

My name is Nadia Monsengo, a second-year Architecture student at NCOI. As an architect, it is important to know how renovation, management and maintenance fit together and what needs to be done to renovate, manage and maintain a building/house. The steps that need to be taken are broad and contain a lot of information such as building management, operating costs, renovation concepts, BENG requirements, building physics, lifespan, laws and regulations and more. National monument Santos is the perfect project to show what happens during a renovation.

I am therefore grateful that NCOI has given me the opportunity to work on this project.

- Nadia Monsengo

The Hague, May 09, 2023

SUMMARY

For this module, I was asked to develop a case in which the existing Santos warehouse in Rotterdam is given a repurposing. When creating a repurposing, a management plan was also made for 10 years.

Pakhuis Santos is a warehouse from the early 20th century, which has been empty for years and now also has the title of monument has received.

I used several sources to make this report. I went to Rotterdam myself to visit the warehouse. Unfortunately, it was completely closed. The building is surrounded by construction fences. There was no way to get inside. However, I was able to take pictures of the outside. A number of photos are included in the appendix. In addition, I was able to find a lot of information in the report called "Building Historical Exploration Pakhuis Santos Brede Hilledijk 95/ Rijnhaven Z.Z. 6 Rotterdam". This report contains a lot of information about the history of the Warehouse and its construction, which is very interesting, given that building was built in 1901 and not much has changed.

My main findings are the condition of the building when it was built compared to the current state. In terms of difference, not much has changed. On the outside, the quality of the building is reasonably good remained. Less so on the inside. I found out that many construction parts need to be replaced must be added to meet the requirements of the client, the target group and the other technical requirements. The intention is that the building will be sustainable and energy efficient. Therefore changes must be made to the floors, facades, windows and roof. In addition, there must also be among other things, partition walls, water pipes and new electrical installations.

My conclusion is that a lot needs to be done to make the building habitable, energy efficient and sustainable. As architectural student, I advise (if this has not already been done) to also carry out a foundation investigation. From the found information, it was not clear to me what the condition of the wooden foundation is. It is important to find out. If this does not happen, it can have terrible consequences for the building. The building can sink completely, sink at an angle, or some parts may sink more than others, with serious consequences of it. I also advise considering putting a roof terrace on the roof with a small restaurant, so that the owner can generate an extra form of income, because the Multi-Year Research Plan shows that maintaining the warehouse annually will cost a lot.

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INTRODUCTION

In Rotterdam, a Dutch port city full of history, many construction projects are taking place. Rotterdam is a city that lost much of its historical architecture during World War II. One of the buildings that survived this terrible period is Pakhuis Santos. This warehouse was built in 1901-1902 and was designed by architects J.P. Stok Wzn and J.J. Kanters.

Pakhuis Santos, as the name suggests, was initially a warehouse intended for storing goods. In this case, Brazilian coffee. I have been asked to give this warehouse a new purpose that is sustainable and energy-efficient. And also to answer the main question: "What scenario should the owner follow to improve the vacant building in a profitable way and reintroduce it to the market?". I have also been asked to develop a 10-year management plan.

To answer the central question, the central question has been divided into sub-questions. The sub-questions are answered per chapter.

The first chapter contains the sub-question: "What requirements does the target group have for sustainable and energy-efficient quality of such buildings?" This describes what the purpose is, who the target group is, what the vision, ambition, and objectives are, and what the requirements are.

Then, chapter 2 addresses the quality of the building. It describes what the strengths and weaknesses are in terms of installation/technology, construction, layout flexibility, and usability. To give the building a new purpose, this information is very important.

Subsequently, chapter 3 asks which architectural and installation interventions are most effective in improving/renovating the status of the building to the level required by the target group. This chapter mainly focuses on the materials and construction components that need to be replaced or added to make the building a sustainable and energy-efficient building.

Finally, 3 detail drawings have been made showing how a new concrete floor is connected to a modified facade and how a modified facade is connected to an improved sustainable roof with a rooftop terrace. These drawings are included in the appendix.

Additionally, the 10-year management plan/multi-year maintenance plan is also included in the appendix.

ASSIGNMENT

Main question: Which scenario should the owner follow to profitably improve the vacant building and put it back on the market?

Sub-question 1: What demands does the target group place on sustainable and energy-efficient quality of such buildings?

Destination

To determine the requirements of the target group, we must first know who the target group is. To find out, it is necessary to know what destination the warehouse will have. The destination “homes” has been chosen. Rotterdam is a city full of students and starters, who are often looking for housing. Transforming the warehouse into apartments and studios is a good long-term investment. It is easy to respond to an uncertain future. In addition, a city like Rotterdam will always need housing. In this case, the real estate object remains usable during its lifespan and also provides an asset in financial and social terms.

Target group data:

- Gender: Men and women.
- Job: Working young people/students and starting entrepreneurs and freelancers
- Residence: Residents of Rotterdam and the surrounding area.
- Relationship status: Both single and in partnership, no children.
- Age: 22 to 35
- Education level: MBO, HBO or University student with a part-time job or a guarantor.
- Student income: For (working) students a minimum income of €1400 per month.
- Starter income: For starters a minimum income of €1900 per month.

General vision, ambition and objectives

1. With regard to sustainability and energy efficiency:

- A modern and sustainable building.
- A building that takes into account the separation of waste
- A building where energy is generated in a sustainable way (via solar panels, solar boiler, heat pump, wind energy or micro hydropower)
- A quiet and natural living environment with lots of greenery.
- A building where you are not bothered by heat in the summer and cold in the winter (sustainable)
- A building where the materials last a long time and are well maintained (sustainable)
- A building that is constantly maintained in terms of cleaning and technological progress.

2. Other:

- An affordable place for young people and starters
- A building where you can not only live but also study and socialize with other residents.
- A place that is easily accessible by public transport to the city of Rotterdam and other cities
- A place where you can retreat to focus and work on your future.
- No place intended for students to party or hang out.
- Student parties etc. are not held here.
- Pets are not allowed.
- Finding a roof over your head that is affordable for young people and starters.
- A building where it is easy to contact the owner in case of problems.

Now that the target group has been determined, we will move on to the program of requirements.

In the new destination, the property is used as a functional system that is divided into a number of levels. A functional system involves functional requirements, performance requirements, and technical requirements of the target group. These requirements are added in appendix 1.

Sub-question 2: What is the quality of the building and what are the strengths and weaknesses of the building in terms of installation/technology, construction, layout flexibility, and broad applicability?

~~Quality Pakhuis Santos~~

1. Exterior:

For a building that is approximately 120-122 years old, the quality has remained very good. The warehouse looks to be in good condition on the outside. The facades appear to be barely damaged. The parts consisting of natural stones also look good. Unfortunately, there are no photos from 2023 showing the current state of the facades. The building is covered with red shielding. See the images in appendix 2. It cannot be said with certainty whether the facades are currently 100% in good condition. This requires thorough investigation. The KDR Companies website contains a number of photos of Pakhuis Santos over the years. These photos have been added in appendix 3. From the photos, the wooden shutters and loading doors appear to be in good condition and able to perform their functions. The bars in front of the windows should be replaced, because steel rusts over time. It is not known whether a means has been used over the years to prevent rust. It goes without saying that the glass in the windows does not meet the legal sustainability requirements.

2. Interior:

The condition of the inside of the warehouse is worse than the outside. For example, rising water still enters the basement of the warehouse, causing the reinforcement of the ground floor to rust and the concrete to break, the steel structures, the columns, are no longer good, the bricks are partly damaged and concrete and wood have rotted over the years. The toilets and meter cupboard are also no longer of good quality.

~~Construction Strengths: 1.~~

Brickwork:

The warehouse has brick piers, frieze, and windows. A strong point here is that bricks are resistant to frost and temperature changes and the material itself is very strong (bricks have a specific gravity of approximately 1800 kg/m³). It can withstand high pressure well. In addition, bricks retain heat and release heat to the environment.

2. Natural stone:

The warehouse has natural stone sills, speck layer, and blocks. Natural stone is a natural, versatile, durable product that appears to become more beautiful as time passes. It is a sustainable product because it lasts a long time and a natural product because it comes from nature and is not chemically processed.

3. Wooden poles:

Wooden poles were used for the foundation. Wood has a long lifespan, is maintenance-free, and maintains good quality under the groundwater, as long as it is protected against moisture. Despite the fact that wood is flammable, a construction will not quickly collapse due to the insulating protective carbon layer that is created in the event of a fire.

4. Steel:

The warehouse has steel hinges and locks, bars, and columns (supporting structure). The advantage of using steel is that it is a material where the parts are often delivered prefabricated. This saves

Habitos, n.d. Advantages and Disadvantages of Bricks, Retrieved on 05-09-2023 from <https://www.habitos.be/nl/bouwen-verbouwen/voordelen-en-nadelen-van-bakstenen-8003>

²⁵ Advantages of natural stone, n.d., Retrieved on 05-09-2023 from <https://bouwenmetnatuursteen.nl/5-voordelen-van-natuursteen/>

working in the workplace. When building the warehouse, the steel columns were not delivered prefabricated, but were constructed from quadrant profiles that were riveted and rolled together with strips of flat iron. It is lighter than concrete or cast iron columns, which were commonly used at the time, it can carry a lot and is easy to install. It is also durable because it lasts a long time and can be reused.

5. Raising the ground floor:

The advantage of a raised ground floor is that the pipes and cables are easy to hide and easy to access in the event of a renovation.

6. Concrete:

The warehouse has a concrete roof floor, ground floor, facade platforms, floor of the stairwells, elevator shaft and the floor of the machine room. Concrete is a material with high compressive strength, it is easy to use, has good insulation, it can be made waterproof by using special substances, it is ideal for structures under the ground, it is waterproof and windproof and it can store heat.

7. Stamp construction:

In the basement of the warehouse there are stamp constructions that the concrete floor beams supports. See image next to it.

8. Phoenix system:

The warehouse uses composite columns. The so-called Phoenix system: The iron columns consist of rolled quadrant profiles riveted together with flat iron strips. The quadrant profiles give the columns more strength. The beams can also connect to the columns.



9. Thickness and firmness of wooden floor:

In total, the thickness of the wooden floor is 6 cm thick, so 600mm.

The average thickness of a solid wooden floor is at least 20mm. The 600 mm floor package exceeds the

⁸. The 600 mm floor package exceeds the

thickness of 20mm by 30 times. In addition, the floors are applied crosswise to achieve the greatest possible strength.

10. Shed roofs:

Shed roofs are used on the roof of the warehouse, consisting of wooden triangular trusses, purlins and dormers, in connection with as much light as possible.

Architectural Weak points: 1-

Natural stone:

Due to the use of natural stone on the facade, the facade must be maintained with special means. Cleaning agents themselves have a negative effect on natural stone. Natural stone is not scratch-resistant. It absorbs a lot of heat without releasing it, which can also cause a fire hazard.

³The advantages of steel construction, n.d. Consulted on 01-09-2023 from

<https://www.bouwtotaal.nl/2019/10/the-advantages-of-a-steel-structure/#:~:text=Steel%20is%20relatively%20light,load-bearing%20capacity%20with%20a%20low%20weight.>

⁴Raised floor, computer floor Consulted on 05-09-2023 from https://www.joostdevree.nl/shtmls/raised_floor.shtml

⁵Consulted on 24-08-2023 from <https://www.gww-bouw.nl/article/what-are-the-advantages-of-building-with-concrete/>.

⁶Consulted on 22-08-2023 from Building history exploration, Pakhuis Santos, Flexus AWC June 2011

⁷Consulted on 22-08-2023 Building history exploration, Pakhuis Santos, Flexus AWC June

⁸2011 Consulted on 22-08-2023 <https://www.devloerderij.nl/thickness-of-wooden-floors.html>

⁹Consulted on 21-08-2023 Building history exploration, Pakhuis Santos, Flexus AWC June 2011

¹⁰Consulted on 21-08-2023

<http://www.exclusief-keramiek.nl/natuursteen-voordelen-nadelen/#:~:text=Natural%20stone%20is%20brittle%20and%20sensitive,%20and%20they%20can%20leave%20stains.>

2. Load-bearing walls:

The facade walls are load-bearing. This means that these walls may not be removed without replacement and must stand on a foundation on a rigid soil layer.

3. Wood:

In the warehouse, the pile foundation, doors, frames, floors (except ground floor and basement floor), ceilings, and roof construction are made of wood. Wood is a material that requires a lot of maintenance, such as sanding, varnishing, or oiling. After a few years, wood will discolor and get splinters. In addition to splinters, it can also rot, split, and crack. Wood therefore does not have a long lifespan. It is not known whether composite (wood fibers mixed with plastic) has been used. Wooden floors can be very noisy and certainly do not like underfloor heating (due to shrinking and expanding with temperature differences).

4. Steel:

Steel, of which the hinges and locks, the bars on the windows, and the columns consist, can absorb little heat and sound. It has a high conductivity but little absorption capacity. In addition, there is a high chance of cold bridges forming.

5. Single glass:

Because the windows in the facades consist of single glass, there is hardly any insulation. The building can get very hot in the summer and a lot of heat escapes in the winter. Due to the temperature differences between inside and outside, condensation can occur on the glass, and the glass can also cause cold zones. It can easily be draughty.

6. Concrete loading platforms:

They no longer have a function for the building. A new platform could possibly be made for a new entrance.

7. Facade:

The thickness of the brickwork on the front and rear facade of the building becomes smaller from top to bottom. This also applies to the side facades. From the third floor, they have pilasters that support the thin bricks. This is an indication that the load at the top may be too high. Plus, the facade consists only of a solid wall and no cavity wall. Without a cavity wall, there is no interruption of moisture and temperature transport. Without a cavity wall, rainwater cannot flow away through the cavity and open weep holes, and it is difficult to make connections between frames and walls draught- and moisture-proof. Without insulation in the facade, condensation can occur, there is less protection against noise from outside, and cold bridges can occur.

8. Brick cellar floor:

The cellar floor is made of brick and supported by a wooden pile foundation. The brick cellar floor has no insulation or an indication that the floor has been made waterproof. Brick can effloresce and shrink when it is not protected against moisture. A cellar floor must be water and moisture resistant, because otherwise mold and bacteria will develop.

In the place of the old elevator shaft, there was a hole in the floor that is covered with a wooden floor with a covered steel plate. Despite the fact that it is covered, this still brings a weakness in the floor construction.

¹¹ <https://www.woodcomposiet.nl/blog/algemeen/hout-composiet-40-voordelen-en-nadelen/>

¹²

<https://zador.nl/nieuws/voor-en-nadelen-van-staalconstructie-ten-opzichte-van-concreteconstruction/#:-:text=Disadvantage:%20Steel%20has%20poor%20heat%2D%20and%20soundinsulation&text=For%20buildings%20and%20houses%20is,heat%20or%20sound%20to%20absorb.>

¹³

<https://www.glasconcept.nl/van-enkel-glas-naar-dubbel-glas/#:-:text=Single%20glass%20is%20very%20thin,condensation%20on%20the%20glass%20occurs.>

¹⁴ Basisboek Bouwkunde

¹⁵ https://www.joostdevree.nl/shtmls/na-isolatie.shtml#isolatie_binnenzijde

¹⁶ <https://www.joostdevree.nl/shtmls/baksteen.shtml>

Layout flexibility - Strengths:

- In terms of height, there is enough space to transform the building into various destinations, from homes to restaurants to an art gallery. Each floor has a height of at least 3 meters.
- The stairwell is also flexibly arranged. It runs from the ground floor and continues on each floor at the same place to the roof. It is not necessary to take a different stairwell on a certain floor to continue to the top floor.
- The layout on the inside from the ground floor up to the 5th floor is completely the same and has hardly changed over the years. This makes it easy to create a design for a new destination.
- Because the interior space only consists of columns and no interior walls, it is also easier to create a new design and place demountable interior walls/partition walls.

Layout flexibility - Weaknesses:

- The basement floor has a total of 35 brick piers that support the columns of the overlying floors. The large number of piers and their size make it difficult to divide the basement floor according to the client's wishes. This ensures that there is not much space available. This can be clearly seen in the original floor plan from the year 1901. See image 1 in appendix 4. ¹⁷.

Broad applicability - Strengths:

- Because the inside of the building consists of columns and the building is in a location that is easily accessible, the building can be used as various destinations: A shopping center, catering establishments, school, clinic or other destinations. Or a mix of various destinations, such as a shopping center in combination with apartments.

Broad applicability - Weaknesses:

- The amount of columns prevents the building from having a parking space. Around the building itself there is also no room for creating a parking space for the target group of the building. See appendix 4, image 2. Another location would have to be used for this.

Installation/technology - Strengths:

- The ceiling construction consists of wooden beams. In images 3 and 4 in appendix 4, it can be seen that there is no ceiling is present. This applies to every floor, except for the office on the ground floor. This has does have plate material against the overlying floor. The beams of the roof floor are also visible. Is also called a clean beam layer. The absence of a ceiling makes it easier to install pipes and install wires. A suspended ceiling can be easily installed.
- With the presence of a leveling beam, there is room to place rising and falling pipes along the wall.
- Because there are no existing interior walls yet, a stud wall can be used in a bathroom or toilet against noise pollution from sanitary appliances.

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¹⁷ Building historical exploration, Pakhuis Santos, Flexus AWC June 2011

¹⁸ Building historical exploration, Pakhuis Santos, Flexus AWC June 2011

Installation/technique - Weak points:

- When installing a suspended ceiling with pipes from the toilet, bathroom, kitchen, etc., take into account to make that part of the construction soundproof. This can be difficult, as wood is a non-sound-absorbing material.
- Placing a possible recess and trimming for placing and/or running certain pipes becomes difficult, since the wooden floor beams are part of the supporting structure. There may and no hole can be made in the floor without replacing the loads on that part of the construction.
- The building has old switch boxes and electric motors. These must be replaced.

Sub-question 3: Which architectural and installation-technical interventions are most effective in determining the status of the to improve/renovate the building to the level required by the target group?

Architectural:-

1. Foundation:

- Foundation repair: Replacing wooden foundation piles with concrete piles to improve the load-bearing capacity.
- Repair damaged (wet) bricks on the masonry foundation piers.

2. Floors:

- Replace wooden floors with concrete floors (flat slab floors), by pouring concrete on site. Prefabricated concrete floors are difficult to get into the building. Because the bottom is flat, the application of piping will not be complicated, in addition, not much formwork is used, which saves on costs.
- Make masonry cellar floor waterproof.
- Insulate the ground floor on the underside via the cellar. The basement has no ceiling. Insulation can easily applied and sealed with a ceiling.
- Create recess in the floors for the escalators and a recess for the stairwell from the 5th floor to the roof.
- The roof floor on the fifth floor, which consists of a wooden supporting structure, must be like the other floors are replaced with a concrete floor. Strengthen the roof extra in connection with the load of the roof terrace. ¹⁹

3. Facades and facade openings:

- Insulate facade walls on the inside. This can be done in 2 ways: Plasterboard or insulated chipboard glue to the inside of the facade or place a stud wall (A wooden or metal attach a grid to the wall and fill it with insulation material, vapor barrier and finish with plaster or chipboard).
- Due to thinner masonry from top to bottom, on the load-bearing facades, the bricks on these facades must be partially replaced with similar stones that can properly provide rigidity and stability support. In this way, the piers from the third floor can possibly be removed become.
- Repair other bricks by repairing cracks, filling holes and removing stains and deposits remove on the inside and outside.

¹⁹ <https://bouwadviesshop.nl/dakterras-aanleggen/>

- Repair the wood of the transit hatches and loading doors with filler for minor damage and/or wood rot fillers for deep damage.
- Replace existing window glass with insulating glass (triple glass or HR+++) and new windows create in the west and east facades, in order to create apartments and studios with enough daylight.
- Add a cavity wall and insulation to the inside of the facade to the load-bearing facade by adding a front wall.
- Insulate doors

4. Interior walls:

- Repair Hennebique concrete walls by removing the damaged parts and adding new concrete. bring. Then make the concrete waterproof by sealing it with a penetrating concrete impregnation agent.
- Install demountable soundproof, fire-resistant partition walls to create meter space, studios, apartments and reading and meeting rooms on the 5th floor.
- Check whether the wall construction at the boss's office on the ground floor meets the legal requirements: Is it soundproof? Is the wall thick enough? Is it fire resistant? If not, it must be supplemented or be completely replaced. This also applies to the ceiling at the same location.

5. Columns and beams:

- The steel columns and beams must be repaired and protected against fire. This can be done by fire-resistant covering with concrete, paint, gypsum or vermiculite concrete slabs or spray or stucco. A another option is to use suspended ceilings.
- Columns on the first floor are covered with mesh reinforcement and stucco, see appendix 4, image 5. These must be replaced with new stucco.

6. Ceilings:

- Add a ceiling on each floor to make the room soundproof and a space create for pipes and cables.

7. Roof:

- Replace the windows in the shed roofs with insulated windows.
- Add a roof terrace with lots of greenery and a small eatery/bar. Given the building has a stone balustrade has, placing a fence is not necessary.
- Expand the elevator machine house on the roof into a small eatery/bar.

8. Stairwell and Elevator shaft:

- Place new stairs in the existing stairwell.
- Install new elevators and elevator doors.
- Install new escalators from the basement to the roof.
- Check concrete elevator shafts for concrete rot and repair

Installation technical

interventions: 1. Sewerage:

- Install pipe networks/relaxation system that ensure:
 - The discharge of rainwater/rainwater via the DWA to the sewage treatment plant and
 - The discharge of domestic waste water to the sewage treatment plant (dry weather discharge)
- Sovent stacks, connection pipe(s), drain collecting pipe/ground pipe, pressure pipe, rainwater pipe, house connection, discharge devices (such as bath, shower, sink, sink,

²⁰ <https://www.eazy-fix.nl/nieuws/houtreparatie/>

install washing machine connection), downpipes, stench traps, equalization pipe, collecting pipe and water traps.

- Place roof drain on the roof that is connected to the downpipe.
- Install indoor rainwater drainage.

2. Sanitary appliances:

- In each apartment and studio, the installation of toilet, shower and/or bath, sink in the bathroom, sink in the kitchen and dishwasher and washing machine connection. Preferably with a facing in connection with noise pollution.
- In the reading room on the 5th floor also 2 toilets each with a sink.
- A sink will also be placed in the small diner on the roof.
- Place fountains on the roof.

3. Drinking water installation:

- Install fire hose reels on each floor, connected to the drinking water installation.
- Install fittings, water pipes and associated appliances.
- Install water meter in the meter room in each studio, apartment and the diner. The meter room in the diner is also used for water and energy consumption on the terrace.
- Have the main tap connected to the water meter by a plumbing company.

4. Electrical installation:

- Install an air-to-air heat pump on the roof for the study room on the fifth floor and the small diner on the roof.
- Install a ventilation heat pump in each apartment and studio with an electric boiler for the heating of water. Each apartment and studio must have a meter room and mechanical ventilation. The heat pump replaces the mechanical ventilation box. ²²²³²⁴ An electric has been chosen. boiler, because it is smaller than heat pump boilers.
- Place solar panels (photovoltaic panels) on the roof.
- Install batteries in each home to store energy produced by solar panels.
- Install induction plates in the kitchen.
- CAI, sockets,
- Install home automation in the form of lighting sensors in all areas of the building, opening of security doors via GSM, door intercom via GSM, switch on indoor blinds, fire and smoke alarm. control, temperature sensors in the halls and study rooms for operating the heating and air conditioning, burglar alarm and water taps with sensors at the toilets throughout the building.

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The 3 details have been added in appendix 5 and the 10-year management plan in appendix 6.

²¹Basic Book of Architecture.
²²

<https://www.kemkens.nl/kennisbank/warmtepompen/appartement-verwarmen-met-warmtepomp/#:~:text=De%20geschikte%20warmtepomp%20voor%20een,%2Delectric%20ventilatielucht%2D%20water%20warmtepompen.>

²³ <https://www.inventum.com/kb/wat-zijn-de-voor-en-nadelen-van-een-ventilatiewarmtepomp/>

²⁴ <https://gaslozewoningen.nl/warmtepomp/ventilatie-warmtepomp/#warm-tapwater-met-boiler>

²⁵boiler [https://nl.wikipedia.org/wiki/Domotica#Tweede_generatie_domotica.](https://nl.wikipedia.org/wiki/Domotica#Tweede_generatie_domotica)

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t., load capacity%20with%20a%20low%20weight.

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<http://www.exclusief-keramiek.nl/natuursteen-voordelen-nadelen/#:~:text=Natural%20stone%20is%20brittle%20and>
sensitive, and%20can%20even%20leave%20stains.

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Steel%20has%20poor%20thermal%2D%20and%20sound insulation&text=For%20buildings%20e
and%20homes%20is, to%20absorb%20heat%20or%20sound.

<https://www.glasconcept.nl/van-enkel-glas-naar-dubbel-glas/#:~:text=Single%20glass%20is%20very%20thin,condensation>
%20on%20the%20pane%20occurs.

https://www.joostdevree.nl/shtmls/na-isolatie.shtml#insulation_inside

Building history exploration, Pakhuis Santos, Flexus AWC June 2011

Basic Book of Architecture

APPENDICES

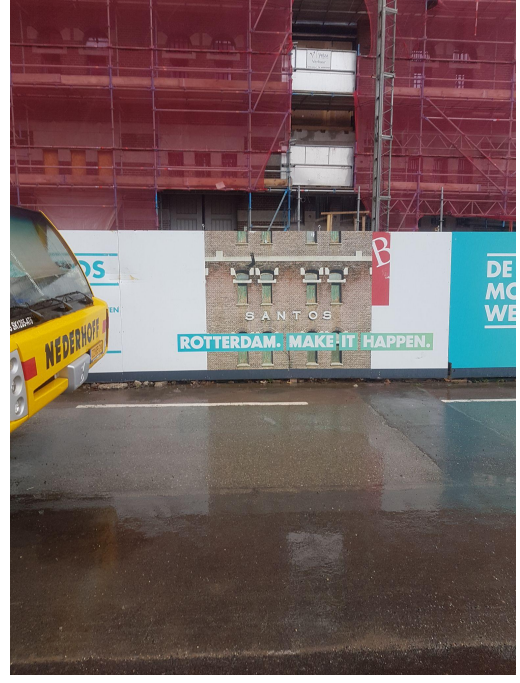
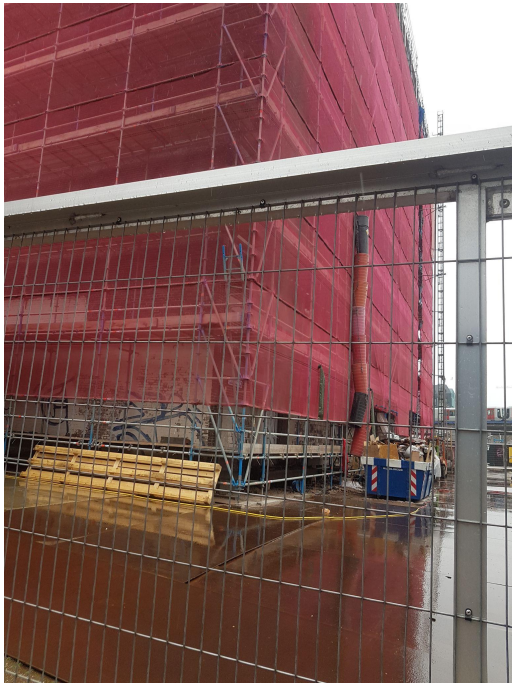
APPENDIX 1: PROGRAM OF REQUIREMENTS

Functional Requirements	Performance and Technical Requirements
Protect against climate (precipitation, wind and extreme temperatures)	High walls, minimum 2.6m
Protect against intrusion by people and/or animals	Studio area of at least 30 m ²
No outside noise/soundproof rooms	Apartment type 1 area of at least 45 m ²
Homes where one can rest, sleep, study and spend his/her free time.	Apartment type 2 area of at least 60 m ²
Homes for students (studios)	Primary fossil energy consumption, according to BENG 2: Below 5 kWh/m ² /year.
Homes for starters (apartments)	Share of renewable energy, according to BENG 2: At least 50% use of renewable energy such as solar panels or wind energy.
Well-insulated homes: Cavity wall insulation, floor insulation, roof insulation and glass insulation	"A habitable room has a ventilation facility with a capacity of at least 0.7 dm ³ /s per m ² of floor area with a minimum of 7 dm ³ /s.
Studios: Bathroom (shower), toilet, open kitchen, living room, meter cupboard and bedroom	"A habitable room with a space for a cooking appliance or with a space for an open combustion appliance for hot water has a ventilation facility with a capacity of at least 21 dm ³ /s."
Apartment type 1: Bathroom (shower), toilet, open kitchen and living room, meter cupboard walk-in closet, laundry room and 1 bedroom	"A toilet room has a ventilation facility with a capacity of at least 7 dm ³ /s."
Apartment type 2: Bathroom (shower and bath), toilet, closed kitchen, living room, meter cupboard laundry room and 2 bedrooms	"A bathroom has a ventilation facility with a capacity of at least 14 dm ³ /s."
Common study room with toilets for ladies and gentlemen	"At least 21 dm ³ /s of the capacity of the exhaust of indoor air from a habitable room in which there is a space for a cooking appliance is discharged directly to the outside."
Partly covered roof terrace with small restaurant	"A habitable room has a purge ventilation facility with a purge ventilation capacity of at least 3 dm ³ /s per m ² of floor area of that room."
Energy generation by solar panels or windmills.	"A vertical external separating structure of a habitable area, a toilet room or a bathroom has a thermal resistance of at least 4.7 m ² x K/W"
Heat generation by	"A horizontal or sloping external separating structure of a habitable area,

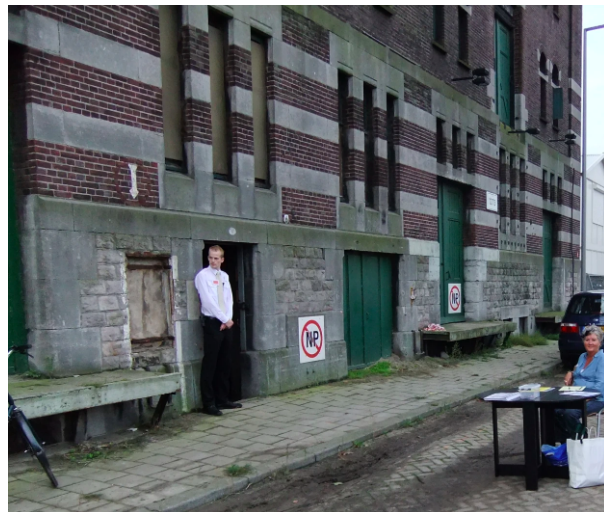
heat pump, solar water heaters, sustainable electricity or biogas.	a toilet room or a bathroom, has a thermal resistance of at least 3.7 m ² x K/W"
Well-ventilated homes	"Windows, doors and frames have a heat transfer coefficient of no more than 2.2 W/m ² ·K."
Protect against climate (precipitation, wind and extreme temperatures)	"An internal separating structure that forms the separation between a residential area, a toilet room or a bathroom, and a room that is not heated or that is heated exclusively for a purpose other than the stay of persons, has a thermal resistance of at least 4.7 m ² x K/W."
Protect against intrusion by people and/or animals	"The average heat transfer coefficient of the windows, doors and frames of a building is, determined at most 1.65 W/m ² ·K."
No noise from outside/soundproof rooms	The air volume flow of the total number of residential areas, toilet rooms and bathrooms of a function is no greater than 0.2 m ³ /s.
Homes where one can rest, sleep, study and spend his/her free time.	When renewing or replacing insulation layers, a thermal resistance of at least 2.6m ² .K/W applies to a floor, 1.4 m ² .K/W to a facade and 2.1m ² .K/W to a roof. When renewing or replacing windows, doors and frames, a heat transfer coefficient of at most 2.2W/m ² .K.
Homes for students (studios)	In the event of a major renovation involving a technical building system for space heating or space cooling or a combination thereof is installed, partially renewed, changed or enlarged, a function meets a minimum value renewable energy of 30 x (A _{roof} / A _{g;tot}) kWh/m ² .yr, determined according to NTA 8800, where A _{roof} / A _{g;tot} is at most 1.0.
Lots of light in all types living space and common area	"An enclosed space through which a protected escape route or protected route passes has a lighting installation that can provide a measured illuminance of at least 1 lux on a floor, a tread or a ramp."
Use of sustainable material, which is also reflected in the appearance.	A facility for electricity complies with 1000 volts at low voltage, and at high voltage.
Mechanical ventilation: Balanced ventilation with HRV (heat recovery)	"The average heat transfer coefficient of the windows, doors and frames of a building is, determined at most 1.65 W/m ² ·K."
Soundproof floors and walls	The air volume flow of the total number of residential areas, toilet rooms and bathrooms of a function is no greater than 0.2 m ³ /s.
Long lifespan	When renewing or replacing insulation layers, a thermal resistance of at least 2.6m ² .K/W for a floor, 1.4 m ² .K/W for a facade and 2.1m ² .K/W for a roof. When renewing or replacing windows, doors and frames, a heat transfer coefficient of at most 2.2W/m ² .K.
	In the event of a major renovation involving a technical building system for space heating or space cooling or a combination thereof is installed, partially renewed, changed or enlarged, a function meets a minimum value renewable energy of 30 x (A _{roof} / A _{g;tot}) kWh/m ² .yr, determined according to NTA 8800, where A _{roof} / A _{g;tot} is at most 1.0.

	<p>"An enclosed space through which a protected escape route or protected route passes has a lighting installation that can provide a measured illuminance of at least 1 lux on a floor, a tread surface or a ramp."</p>
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APPENDIX 2: CURRENT PHOTOS WAREHOUSE SANTOS



APPENDIX 3: WAREHOUSE SANTOS THROUGH THE YEARS



APPENDIX 4: ORIGINAL FLOOR PLAN, BASEMENT AND SITE PLAN

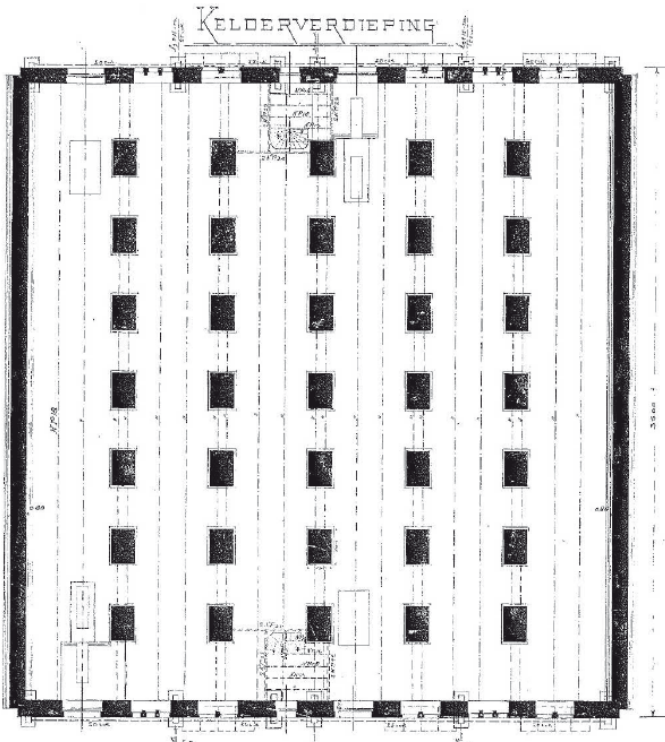


Image 1: Basement Floor Plan

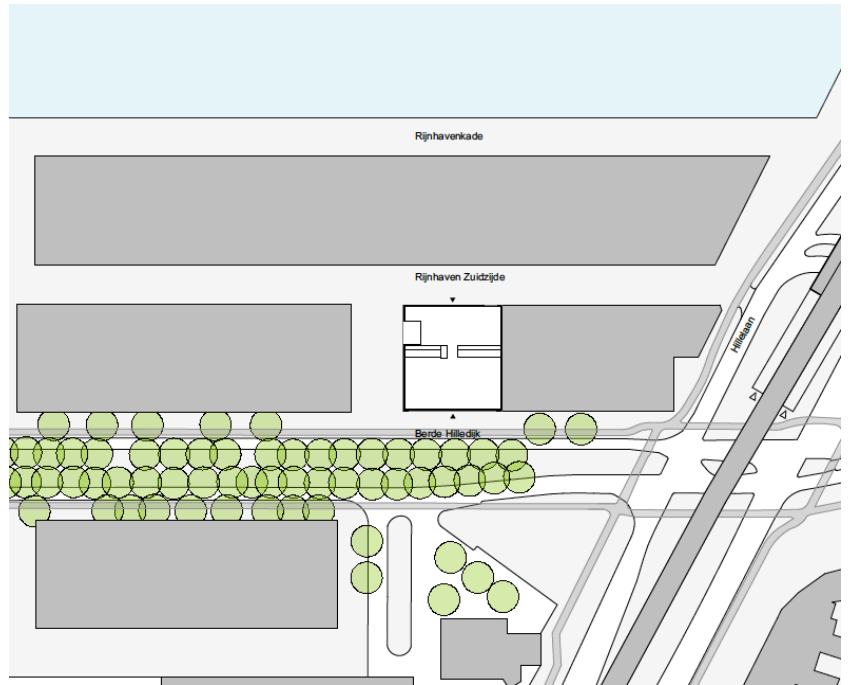


Image 2: Site Plan



Image 3: 4th floor ceiling



Image 4: 4th floor ceiling