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SUSTAINABLE **PLEASANT** GREEN

Flora

Pellikaan
DESIGN • BUILD • OPERATE

Contents

Sustainable pleasant green

Villa Flora is built on behalf of the Venlo region for the 2012 Floriade, the World Horticultural Expo. After the Floriade exhibition, the combination of exhibition and office space will house several innovative companies, including agricultural businesses, under one roof.

The striking building is designed according to the cradle-to-cradle principle and is extremely sustainable. Full of greenery, the building provides a pleasant and flourishing environment. It will be an on-going asset to the Venlo region, which is the second Greenport in the Netherlands.

Footprint

Villa Flora's energy use is minimised through the use of an ingenious lighting control system, energy-efficient lighting, and underground thermal energy storage. We also use glass and roofing materials rated high for insulation, and optimise the use of renewable energy during operation (solar, geothermal, bio-fermentation). This ensures that Villa Flora has the smallest possible carbon footprint.

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'Villa Flora adds flair to the heart of the Venlo region'

Hubert Bruls, regional chairman and mayor, Venlo

Villa Flora, **the greenest office in The Netherlands**, puts the Venlo region and all companies that are settling in this icon of sustainability on the map. The architecture and engineering office of emeritus professor Jón Kristinsson have used all their experience to provide the region and town of Venlo with a lasting legacy. With Villa Flora, Venlo has aimed high.

Located next to the InnovaTower by Jo Coenen, Villa Flora is an impressive landmark of the first order. Over thirty meters high, its eye-catching glass structure is a true reflection of innovation.

The transparent Villa Flora is an iconic building both in appearance and in sustainability. Utilising state-of-the-art environmental technology, it is an excellent example of the cradle-to-cradle principle. Villa Flora will help to set new standards and will influence the design of sustainable buildings for years to come.

Villa Flora will play an important role in Greenport Venlo, the second-largest horticulture area in the Netherlands. Positioned at the heart of the working landscape of the future, it will bring people from all areas of the agriculture business together and will add a touch of flair to the heart of the Venlo region

Hubert Bruls, regional chairman and mayor, Venlo





'Pelikaan, your partner in sustainable construction for now and the future'

Gert-Jan Peeters, commercial director Pelikaan UK



Gert-Jan Peeters

Villa Flora is a wonderful model project for Pelikaan, as it allows us to use all of our experience from previous projects, mainly in Germany, Belgium and England, including solar panels and underground tremal energy storage. Indeed, this led to Pelikaan being selected as the main contractor for Villa Flora.

Design & Build

What also worked in Pelikaan's favour during the construction of Villa Flora is that we are used to working on a Design & Build basis. That meant we

were well equipped to merge the documents from the architect, structural engineer and M&E engineer into one complete plan.

Taking the future into account

To minimise the future maintenance of Villa Flora, we use our operating experience to give advice on choices of materials. Villa Flora is developed with future generations in mind. This appeals to us. As a family business, in which the third generation of the Pelikaan family is now working, we understand the importance of continuity.

Fruit of regional cooperation

Villa Flora is an inspiring example of the power of co-operation. As a team player, Pelikaan applauds the many different councils that worked together to ensure Villa Flora became a reality. The completed project is a testament to excellent regional co-operation both in construction and operation.

New applications

As well as more familiar measures such as increased insulation and thermal energy storage and solar panels, Villa Flora boasts many new, innovative sustainable measures. These include Phase Change Material (PCM) for heating and cooling and bio-fermentation for generating energy from waste.

Another innovative feature of Villa Flora is appliance of the cradle-to-cradle principle. The building structure can be dismantled and has been designed to be versatile. For example, the hollow floor system

means the building can be easily adapted for any future changes.

Inspiration

Which of these great new applications will be used in future, obviously depends on the level of ambition of the clients. It is certainly nice that with Villa Flora we can show the possibilities of these technologies and we hope that it is a source of sustainable inspiration for you as well.

Gert-Jan Peeters, commercial director Pelikaan UK

'Sustainable spin-off for the region'

Twan Beurskens, town and country planning alderman Venlo council

The Villa Flora story began when the current Governor, Leon Frissen, suggested that the Venlo region be used for Floriade 2012. 'Can we do that?' was a first response, tells Twan Beurskens about the plan. Inspired by this idea, the province and region joined together with the ambition that Floriade would give a spin-off sustainable development that would serve the Venlo region for twenty or thirty years.

'We want to prevent the beautiful buildings, like Villa Flora, de InnovaTower and the terrain of Floriade from lying idle after the world horticultural exhibition,' he says. This focusing on the future use of the development, led to the creation of the sustainable industrial estate GreenPark. This enormous project ensures the landscape and buildings continue to serve a purpose in the Venlo region long after Floriade 2012 is over.

'Everyone put their back into it'

Mid-2009 was a crucial point in the development

process. There were several visions for the project, but there was no clear direction. That led to criticism both internally and in the media. The Mayor of Venlo and the representative from the province concluded: 'We cannot receive the Queen in a marquee on a site under construction.' Beurskens laughs about it now: 'That's the beauty of a deadline... it makes everyone put their back into it.'

It was agreed that the council of Venlo had to direct the complicated project. At that stage, the first tenant was yet to be found, but by the time Villa Flora

was completed, all of the contracts were signed. Beurskens says 'We had an ambitious goal with a high sustainability profile. Despite the massive recession, we decided not to lose sight of that goal.'

'Our efforts are this for future generations'

The cooperation between councils in the Venlo region and with the province has delivered huge long-term benefits, of which Beurskens is rightly proud. 'What I find so beautiful is that it will not only be a short-term success for the millions of people who come

to Floriade. Villa Flora will continue to develop after 2012, so our efforts are also for future generations.

Pellikaan delivers on their promise

'There were some European heavyweights that tendered for Villa Flora,' remarks Beurskens. 'but rather impressively Pellikaan beat the competition. They deliver on their promises with solutions that are technically brilliant, which is especially remarkable considering the short time scale given to them. They dealt with many setbacks admirably, including high water in the harbour of Venlo, and were able to remain on schedule.'



Twan Beurskens



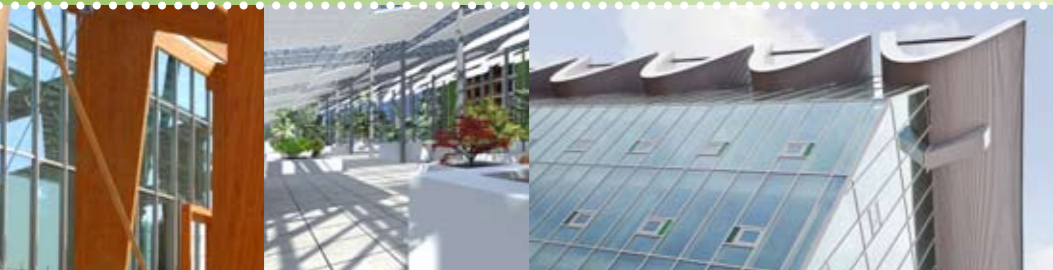
Innovative: Project creation

Pellikaan uses a very innovative way of project management, in literature, they call it 'project creation'. With this, all parties are presented with a clear vision of what the project is to achieve, and everyone works simultaneously to achieve the same end goal. 'Working this way requires people to work at peak performance and be able to improvise as and when required.'

Twan Beurskens, town and country planning alderman Venlo council

'We set the bar high and it worked'

Leo Verbart, director



'Such a novel and ambitious sustainable building is a perfect match for the forward-thinking companies in the agricultural business' says Villa Flora director Leo Verbart. 'We set the bar high and it worked. We have attracted companies that are at that same innovative level with food, such as Fooddome from Kids University. There, children will learn about food and its origin in an engaging and appealing way. Educating the next generation is also a key part of sustainability.'

Looking beyond the delivery

Villa Flora is a special project for the region of Venlo. As Verbart points out, 'Normally, the region only builds and does not operate', but for Villa Flora, the region have set up an organisation for operations. 'We are therefore looking beyond the delivery' says Verbart. 'Importantly, we have all of the lease contracts signed well before completion. Given the decline in the office market, this is a great achievement.'

Kids University

During the first year, the stylish exhibition space will be hired by the Floriade, who will also landscape the terrain and pavilions for the world exhibition. After the exhibition, Verbart informs us that the exhibition space, the large glass hall will be put to immediate use. 'It's good to know that it will then be hired by Fooddome' he says. 'They will use the area to explore exciting concepts, such as the Kids University, which complements the other agricultural initiatives taking place at Villa Flora.'

'Excellent Area'

Verbart expects Villa Flora will be a long-term icon for the Venlo region. 'The building will maintain its charisma long after the Floriade in GreenPark' he enthuses, referring to the renowned business park that is home to Villa Flora. GreenPark is much appreciated, which is reflected by the high scores both it and Villa Flora reached in the 'Beautiful Netherlands' and 'Area of Excellence' schemes.

Beautiful performance

To see Villa Flora fully realised within such a short time frame is a source of great satisfaction for Verbart. 'This is a great achievement for everyone who has contributed to the construction and operation of Villa Flora' he says. 'It is an accomplishment that the region can gain from; a success from which everyone benefits.'

Leo Verbart, director Villa Flora BV

'Villa Flora was designed cradle-to-cradle before that term was known in The Netherlands'

Jón Kristinsson



Jón Kristinsson

'Each assignment begins with the ambition level of the client' says renowned architect Jón Kristinsson, 'and with Villa Flora, that ambition was high, right from the start.' As an architect, emeritus professor, and inventor, he has been a pioneer in sustainable buildings over the last 30 years. The InnovationNetwork, working on the behalf of the Netherlands Foundation for Innovation Conservatory Horticulture moved swiftly to get Kristinsson on board to apply all of his knowledge of sustainable building innovations to Villa Flora.

Villa Flora had to be an office and exhibition space that made excellent use of glass and greenery. 'Research shows that it is much more pleasant to work in a green environment than in a traditional office. Plants have a good influence on the health and wellbeing of the people. Now it is quite normal to take this into account in your design. It's cool, even.' Kristinsson says laughing.

Energy self-sufficient building

Jón Kristinsson has many years of experience with low energy self-sufficient buildings. Back in 1977, his plan

for the council offices in Lelystad promised to deliver the Netherlands' first energy self-sufficient building. Sadly, the council voted against his plan at that time. Today, Kristinsson is recognised as a pioneer in sustainable building design. Peter Oei of the InnovationNetwork knew of Kristinsson's pioneering work in this area and he recruited Kristinsson to implement the advanced technology in Villa Flora.

Sustainable building

Kristinsson's definition of a sustainable building is simple: 'Everything our future generations will inherit,

use and maintain.' With this in mind, Villa Flora was designed to have its own character and charm, inside and out. 'When you have a building that you can be proud of, it makes you feel more pleasant too' Kristinsson says, echoing the comments of Jugendstil architects – 'In a beautiful building, you do not have ugly thoughts.'

Villa Flora is designed to make full use of the sun's natural light and heat. The southern side of the building faces the sun and features a canopy that is lined with 1000 m² of solar cells for energy

generation. Offices are situated in the north side of the building, so there is no need for sun-blinds, and an ingenious decentralised ventilation system means windows and doors can be opened as required.

Built Sustainably

In creating the design, Kristinsson took great care to ensure Villa Flora was built in a sustainable manner, and used prefabricated elements for minimal waste. He also used components that can be disassembled and reused with ease. 'Villa Flora was designed cradle-to-cradle before that term was known in the

Netherlands,' adds Kristinsson. 'That idea has been around for thirty years, but it is only now that it is becoming accepted.'

Jón Kristinsson, architectural and engineering Kristinsson bv

'Daily liaison to stay on course together'

Contract manager Rob Verwater and design manager Harry Aerssens



Contract manager Rob Verwater:

At Pellikaan, I am ultimately responsible for the Villa Flora project and I am also the main contact for the client. I am assisted by an excellent team, with specialists from all fields.

Design manager Harry Aerssens:

As of May, June 2010, I have been working on Villa Flora. At first, I was responsible for inspecting drawings, checking details and managing people. Then checking if items were made according to the design specifications and making sure that all of the components were fitted together correctly on site. Making sure that all subcontractors understand our vision and follow our plan is a vital part of our work.



Villa Flora is a very special building, where everything is different from the norm: from the use of shapes and materials to the implementation of energy-efficient systems. Of course, to create something that is exceptional requires more effort, and Pellikaan's Rob Verwater and Harry Aerssens know this like no-one else. 'In July last year, we started the first assessment of the concrete element drawings that lay on my desk,' reflects Harry, 'There were over 400 in total, with each element drawn separately.' The concrete element drawings were just the start. By mid-August, the first sketches of the parabolas began to arrive. 'At that stage, nobody even knew how to construct parabolas!'

Looking back, contract manager Rob Verwater attributes much of the project's success to teamwork. 'Our project partners understand the art of translating plans and ideas into feasible and affordable solutions,' he says. 'This is perhaps embodied best by the striking landmark on the roof of the office building, which was a joint effort by Voltanis, Holcon and Pellikaan.'

'A perfect piece of work'

'From August last year until February this year we were busy making the nine parabolas, which weigh 25 tons each,' Rob Verwater remarks, 'they now stand securely on the roof and are a perfect piece of work. Hats off to all those who helped.'

Canopy of glass and steel

Another outstanding achievement is the enormous exhibition area. Measuring 7500 m² with a maximum height of 19 meters, the exhibition area is bigger than a football field and is covered by a stylish canopy of glass and steel.

Challenge

'To think that at the beginning of this year, only the foundations and ground floor were in place,' laughs Rob, 'There was no concrete or steel, there was no glass, nothing. That gives you an idea of the challenge we faced.'

On course together

For Rob, clear communication was the key to the success of the project. 'In a beautiful project like this, where so many new things are implemented, it is incredibly important that everyone communicates.' He says. 'I had daily contact with Harry as we worked closely together. But we also made sure that we liaised with all project partners, suppliers and on-site subcontractors every day, and were in touch with project managers and directors on a weekly basis. By keeping everyone up-to-date, we were all able to keep everybody on course.'

Contract manager Rob Verwater and design manager Harry Aerssens

'Very refreshing to come up with something better and more beautiful'

Jan Houwen, director



Jan Houwen

As the engineering consultant Volantis is responsible for the design of the installations, energy systems, structural engineering and other building physics aspects such as acoustics and fire safety of Villa Flora. But just how did they go about designing the greenest office in the Netherlands?

'You start with the concept of the building and the preliminary studies,' explains Jan Houwen. 'What does the building look like? What kind of installations have to be installed and is there any flexibility with that? That way you see what your options are.' Two elements of the concept quickly became clear. 'The building had to be self-sufficient in its energy use, and the design contained a lot of glass' Houwen recalls, 'taking those factors into account, and also considering the high comfort levels required, we were able to identify the most useful possibilities that were open to us.'

Natural cycles

Villa Flora is built using the cradle-to-cradle concept. 'We use natural cycles and materials where possible,' states Houwen, 'we look at which woods are sustainable and do not require additional treatment. Then we consider how we can make use of energy waste and the water that comes from the roof.'

Simulations

All ideas are then calculated by sophisticated simulation models. 'For example, you can simulate air speed, air turbulence and temperature build-up' 'We made models of the exhibition conservatory and offices and then simulated the expected comfort levels. This approach offers more certainty for the client because they see the impact that new applications will have'

Special feeling

The Volantis team are specialists in sustainable housing and have worked on many beautiful buildings. But even for them, Villa Flora stands out as an exceptional project. 'Villa Flora is top-notch,' states Houwen, 'if you stand in the exhibition conservatory, you get a special feeling because of all the glass. I'm convinced that it is a building where people will work with pleasure. We are also very proud that we can establish our own offices here and help to show how beautiful sustainability can be.'

Opportunity for the future

Jan Houwen sees the approach taken with Villa Flora as an important lesson for the future. 'Often, designers depend too much on assumptions from the past, but it is

far more refreshing and rewarding to create something better and more beautiful. We have to look at how we want to work, live and reside and determine how to create that. That's the best way to design new buildings that are a delight to work and live in.'

Jan Houwen, director engineering consultant Volantis

'We build it like Lego and put it together like Meccano'

Rob Wensink, director

'Around the table at an early stage'

Rob Wensink: 'Essential to prefab construction, is that discussions take place regarding how things are going to be built during the preliminary stage - the engineering phase. We have to cover all eventualities before you start. Suppose you need a hole for an air duct - that needs to be defined, described, and discussed as part of the preliminary process.'

It is important that the main contractor, Pelikaan in this case, invited all parties to the table at an early stage: the structural engineer, M&E engineer, principal contractor, steel manufacturer and precast concrete manufacturers. Every week we discussed the process of drawings, engineering and handover. This prevented errors and saved us from having to undertake extra work later. Pelikaan performed their role perfectly.'



Rob Wensink

The office building and the floors of Villa Flora are the first of their kind - they are built with precast hollow concrete elements from Holcon. Director Rob Wensink talks about the special characteristics of this new construction system 'that is built like Lego and put together like Meccano.'

'There are many advantages to building components in a factory and then assembling them on site,' says Wensink. 'The construction is faster and sleeker,

with minimum waste and without the need for wet concrete.'

Prefab construction, people-friendly

Another important point is health and safety. 'The reality is that in construction there is still too much heavy lifting. We are an industry with the highest absence rate through illness and we need to change that.' That is why Wensink believes in prefabricated construction so. 'Concrete cannot be lifted anyway' he points out, 'so you use a crane automatically.'

Short construction time

'With Holcon elements the construction is done in a more people-friendly way, and more efficiently and faster too,' states Wensink. The turnaround time was eight months from engineering to assembly, including the nine roof parabolas. A traditional construction method would have doubled the construction time. Even so, 'We would have been completed even earlier if it hadn't been for setbacks with the shipping and the frost,' said Rob.

Can be completely dismantled

Another major benefit of the Holcon concrete structures is that they can be completely dismantled. 'We build the concrete structure like a combination of huge concrete Lego bricks,' Wensink enthuses, 'then we connect them together with nuts and bolts like Meccano. This means that we can easily dismantle the building. We release the bolts, lift out the floor units and, just like that, we take the whole building apart again. It is Lego for adults.'

Tremendous flexibility

The Holcon concrete gives the designer and builder tremendous flexibility. 'You can easily incorporate all of the ducts and pipework in it, no screeding is required to conceal the ducts and pipes, and you always have access to move or replace the pipe work' says Wensink. Also, the concrete's truss structure gives the material a high rigidity, which means the concrete can easily span twenty meters without intermediate columns or partitions. This gives the designer freedom when planning the layouts of a building.

Like designing with 'Lego'

Wensink's vision for the future is that the architect starts with a box of model bricks, all based on the standard sizes of concrete elements. The architect can then use the bricks to create the design with complete freedom. This would allow Holcon to work even more effectively. 'If the architect designs using these blocks, we can work even faster' claims Wensink.

Rob Wensink, director Holcon

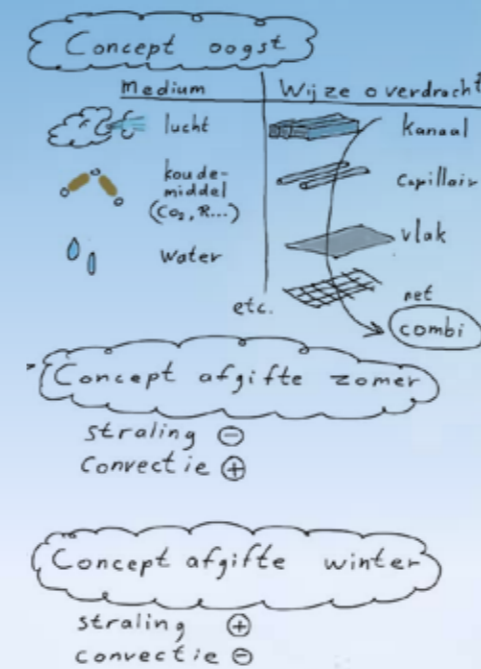
Sun

By creating closed circuits, all available energy sources are optimally used. This includes waste from catering and toilets, and excess heat from the conservatory etc.

The pergola at the south entrance has 1000 m² of **solar panels** for the generation of electricity. The 150kW solar energy is fed directly into the electricity grid.

The **glass conservatory** is facing the sunny side, so less heating is required. The glass has high quality insulation, so heat loss is minimised and it has a coating to keep out an excess of sunlight.

Solar heat feeds the hot water loops that are part of the underground **thermal energy storage**. Villa Flora is fully heated and cooled with this stored energy and heat exchangers.



Air

Concrete Core Activation 60 km of tubes containing hot or cold water run through Villa Flora's floors and ceilings and provide heating and cooling. The water temperature is controlled using the underground thermal energy storage system. As a result, the concrete mass temperature stays at the same level.

Phase Change Material (PCM). Special material that absorbs heat by melting, which in turn, cools the air. If the ambient temperature drops, the material solidifies and gives off warmth. As a result, the air is heated again.

Heat exchangers - Use of passive heat in the exhibition conservatory. This is harvested with fine **wire heat exchangers**.

Smart Skin to absorb exterior heat or cold. Tubes fitted into the projecting first floor slab at the entrance (smart skin) absorb warmth and cold from outside the building and this energy is then fed into the hot or cold loops of the underground thermal energy storage via the heat pump.



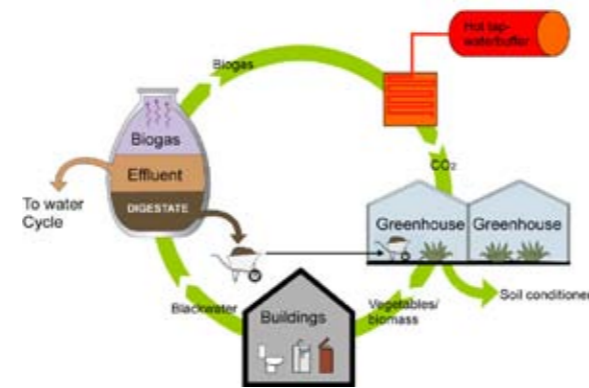
Earth

Sustainable timber. All wood used is certified by the Forest Stewardship Council (FSC).

Biogas installation. The organic waste from catering, garden and toilets are used as an energy source. The resulting biogas is used to heat water.

Underground thermal energy storage.

260 feet below ground are two hot and two cold wells. The heat and cold extracted from Villa Flora are stored here and used to heat and cool Villa Flora as well as the adjacent InnovaTower.



Water

Filtered rainwater from an underground tank is used to flush the toilets.

Surplus rainwater is directed to the groundwater and an overflow channel for flora and fauna instead of to the sewer.

With **vacuum toilet pipes**, only 1 litre of water is used per flush.

Villa Flora Number 1 example of
Sustainable building

Villa Flora Number 1 example of

Pleasant building

Air

The decentralised HVAC system has sensors to measure and control the air climate. This creates an oxygen-rich and comfortable interior climate, and people can still open windows and doors as required. Under-floor heating and ceiling cooling are combined with intelligent ventilation systems in the floors.

Green

The many plants in the conservatory help to create a green working environment that is comfortable. Villa Flora is also surrounded by wooded areas and open spaces, which are a great place to unwind or take a lunchtime stroll.

Light

The limited-light translucent coating and sun screen ensure there is optimal light in the conservatory. The large windows on the north side of the office, ensure good light there as well, without the need for sun blinds. Advanced lighting systems provide the right balance between daylight and artificial light, and can be adjusted for various activities.

View

Villa Flora is a monumental building which offers spectacular views of the GreenPark, which enhances the sense of being surrounded by natural beauty. This makes it an extremely pleasant, people-friendly building. As Jugendstil architects have said, 'In a beautiful setting, you will only have beautiful thoughts.'





Villa Flora Number 1 example of

Sustainable construction

Cradle-to-cradle

Throughout the project we took great care to ensure that the materials we used complied with the cradle-to-cradle concept. Perhaps the best example is our use of the precast concrete. Easy to dismantle and re-use, the concrete can also be returned to the supplier who then refunds your deposit.

We also used untreated wood like Larch and Robinia, cradle-to-cradle certified air supply ducts, plasterboard and MDF board, that are all easy to re-use or recycle.

People friendly

Prefabricated materials are assembled at the construction site using cranes. This means there is less lifting, which makes construction more people-friendly. The fast and efficient assembly also results in shorter construction time.

Footprint

Our carbon footprint was minimised as we reduced our construction waste, minimised energy use and transported the precast concrete components by boat where possible. It will also be reduced by the green re-development scheduled for after the Floriade.

For the future

Villa Flora is built to last for generations. Its innovative construction means that its layout can be changed quickly, as the concrete structure can span up to twenty meters, without intermediate columns or partitions. The hollow floor and ceiling system allows pipework to be moved with ease too.

Parabolic solar collectors - Villa Flora's nine striking parabolas are also designed with the future in mind. They can play a significant role in the harvesting of heat and electricity in future.



Pellikaan: Sustainable partner



Sustainability: People, Planet and Profit are central to all Pellikaan projects - from offices and schools to sports centres and swimming pools.

Pellikaan use all available technologies to ensure sustainability. Besides common techniques such as solar panels and heat recovery systems, we also use special systems including thermal energy storage, Phase Change Material (PCM), and combined heat and power plants (CHP). Some of our installations also use biogas, wood pellets or vegetable oil for energy. The sustainability of projects is tested



through BREEM, with results ranging from 'very good' to 'excellent'.

Pellikaan's expertise with environmental measures on projects in Europe has led to national and international recognition.

Air tight

The sports centre we created for Canterbury Christ Church University has an exceptional air tightness rating of 1.99: 5 times better than the level required by Building Regulations. The Multipurpose Centre



in Herselt (Belgium) also has excellent construction details with which it reaches an energy value (EBP) of E56 – against the maximum national norm of E100.

Environmentally friendly cooling

Aspria Hanover is cooled by the energy saving adiabatic cooling. Drops in water spray withdraw heat from the fresh air through a heat exchanger. This is the basis cooling system for areas like restaurant and fitness.



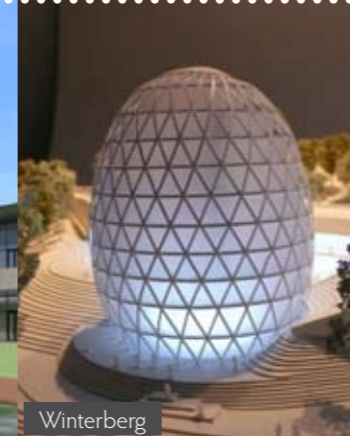
BIM & PIM

Information management changes: with PIM, all up-to-date project information is available at all times. BIM is virtual construction: a 3D building model in which all relevant data is saved, used and managed.

International Green Apple Award

Pellikaan built the Watford Leisure Centre, a local authority leisure centre, which won the International Green Apple Award for the Built Environment. It was also nominated as Sustainable Building of the Year.

International knowhow and innovation



Latest developments

Currently, Pellikaan is working on several special projects that will implement the latest sustainable measures.

Windmills, grass roof and lean construction

We are installing windmills at a new sports centre and grass roofs on a new school as well as a multipurpose centre in Winterberg. **LEAN construction** is applied to the new sports hall in Middelburg. At the new Horley Leisure Centre, we are introducing several sustainable measures, including a biomass boiler, pool covers and solar panels. We will also help a new leisure centre in Lewisham achieve a 45% reduction in carbon emissions compared to building regulation requirements.

Energy efficient pool in Zwolle

In Zwolle and Kelmis, Pellikaan are currently building some of the most energy-efficient pools in The Netherlands and Belgium. These design & build projects include solar panels, heat recovery from backwash water and the cooling system, grey water circuit, LED lighting and energy efficient motors on all air handling units. The pool in Zwolle, with approximately 1,575 m² of swimming water with competition pools, a learner pool, a toddler's pool and a recreational pool will still be energy efficient because of our package of sustainability measures. The centre in Kelmis will feature a 25 meter pool, learner pool and children's pool.

Multifunctional hall following the Passivhaus concept

The development of the new sports hall in Detmold (Germany), is based on the

Passivhaus concept. This is a standard to ensure buildings are energy efficient, comfortable, economical, and sustainable.

For a Passivhaus building, exceptional designs and components are required for: insulation, thermal bridges, air tightness and windows (usually 3-ply glass). We also need to use innovative ventilation systems and heating technologies.

Olympic Training Centre Papendal

The new Training Centre (athletics hall, sports hall, martial arts facilities, weights and recuperation areas and a 130m sprinting hall) will be fitted out with a thermal energy installation, high insulation values and sustainable wooden shell.



Colophon

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A successful partnership with:



-Villa Flora-



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