



PALLAS Architecture Book

PALLAS

Architecture Book

- With this architecture book, the Preparation Foundation Pallas-reactor (PALLAS) and the ICHOS construction consortium (with principal architect Royal HaskoningDHV) give the reader an insight into the design of the new PALLAS buildings on the Energy & Health Campus in Petten. The design of the Nuclear Health Centre will also be shown. This production facility was designed by the architectural firm Broekbakema.



The future

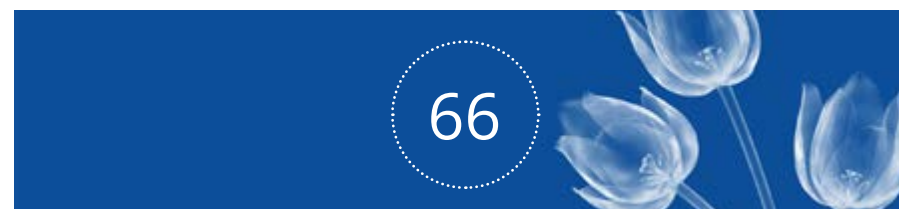
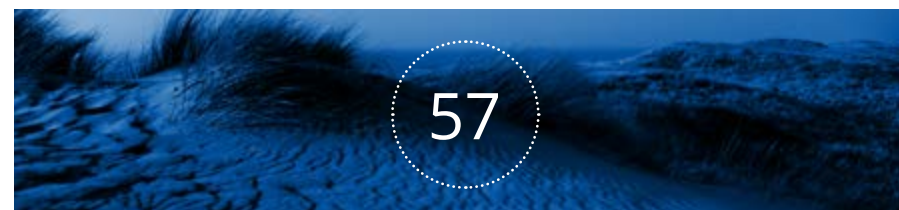
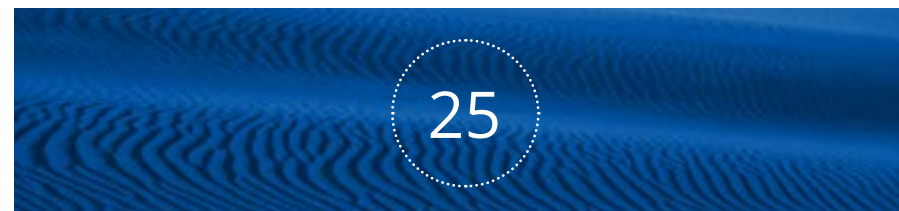
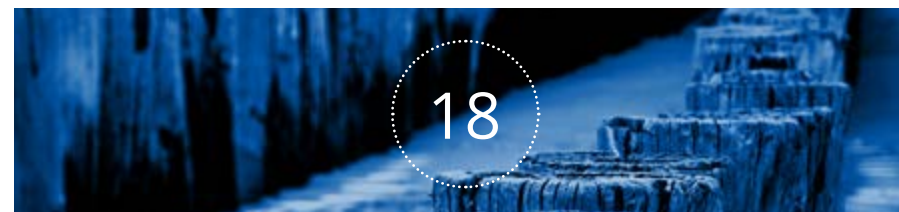
- The Energy & Health Campus is located in a unique dunescape in Petten, on the coast of Noord-Holland, surrounded by a nature reserve. Ever since the early sixties, this unique industrial site, that measures 70 hectares, has been the breeding ground for research and industrial activities. Over 1600 professionals from different companies are based here, developing new technologies and smart solutions in the field of energy and nuclear medicine. This future-proof workplace is fully equipped to develop into a lively campus that will attract companies, research facilities and top talent in the field of sustainable energy systems and healthcare.

● In order to prevent the global supply of medical isotopes from stagnating, the NRG foundation (Nuclear Research Group) initiated the replacement of the High Flux Reactor. At the end of the year 2013, the Dutch government embraced this initiative and as a result, the Foundation Preparation Pallas-reactor was founded to realise the PALLAS-reactor. NRG remained a committed partner in the past years. Effective 2020, PALLAS and NRG have formed a new organisational structure called a 'personele unie' which is intended to form the basis of a continued future collaboration.

DISCLAIMER

This book provides detailed artist impressions of the office building, the support building, the reactor and logistics building, and the Nuclear Health Centre. It is expressly stressed, however, that no rights can be derived from the impressions shown.

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The Energy & Health Campus offers a unique infrastructure for the development and production of nuclear medicine, now and in the (far) future.

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In order to have the character and atmosphere of the Energy & Health Campus fit into the environment, a univocal shape was chosen for the buildings.

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One of the priorities in the design is integration with the dunescape. This is clearly expressed in the paving, the integrated security measures and the indigenous plants.

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Preface

● Building a new nuclear production and research facility is both a unique and a complex experience. Unique, as there are only a few reactors of this kind in the world. Complex, as a reactor is a technically advanced and innovative production facility. Adversaries and supporters of the project make things even more complex. The supporters mainly highlight the new reactor's social and economic function, like the guaranteed supply of medical isotopes for patients, the prospect to use reactor-produced isotopes for the development of medicines to better cure diseases like cancer, and the retention of employment opportunities and high-level knowledge. The adversaries, however, underline the development of alternative production methods, and argue that a heavily secured industrial complex does not suit a protected dunescape where tourists recreate.

There is also a difference of opinion with regard to the proper look and feel of the new reactor building. Some propose a prominent building, whereas others prefer a building that fades into the dune landscape. Why should we hide a building



that's vital for millions of patients all over the world? Well-designed and well-thought-out architecture is pleasant to look at and can be representative of the rural Petten environment. In the new reactor's design, safety and health are important aspects. PALLAS and ICHOS, with principal architect Royal HaskoningDHV, have also included a combination of social demands, sustainability aspects, and the core values of PALLAS in the design.

Anyone going for a stroll on the Petten campus at the end of the 2020s will be surprised. Both visitors and employees will experience nature instead of

an oppressive feeling of a heavily secured site. They will feel welcomed by the open and orderly structure of the buildings. The design is innovative and sustainable, and blends in perfectly with the rural dunescape in Petten. The use of colour in the facades allows a glance of the inside of the transparent office building with its visitor centre, of the support building, of the tower and of the robust reactor building and its L-shaped logistics building. The facades are in perfect harmony with the continuously changing colours in the sky and the landscape, and they pleasantly complement the horizon. The buildings and the colour scheme of

the intermediate tracks and roads combine as one. The same design principle was used for the Nuclear Health Centre, a design by the architectural firm Broekbakema, to make it match the appearance of the other buildings.

In short, this is a splendid first transformation of the research location Petten into a high-quality Energy & Health Campus. After closing down the High Flux Reactor, the new reactor will become the beating heart of a high-tech working area that, in addition to facilitating the production of medical isotopes, will also facilitate the collaboration of varying national and international parties in developing nuclear research and sustainable energy solutions, and thus in improving the health of millions of patients a year. A future that I'm happy to be part of, and that Petten and the Netherlands can take great pride in.



Bertholt Leeftink
CEO PALLAS/NRG



From left to right.
The new buildings: Nuclear Health Centre,
reactor and logistics building,
support building, office building.









1

Introduction

- 1.1 Benefit and necessity
- 1.2 Unique infrastructure
- 1.3 The Energy & Health Campus
- 1.4 Safety



Gerard Krijger
Head Radio Pharmacy UMC
(Medical Centre Utrecht)

“The construction of the new reactor helps the Netherlands to defend its historical solid position in the field of nuclear medicines. I expect that the developments in Petten will attract many knowledge facilities, companies, and individual researchers. The combined force of knowledge and skills may help us provide even better care to patients in the form of diagnostics and customised treatment in the future. This is an achievement the Netherlands as a country can take pride in.”



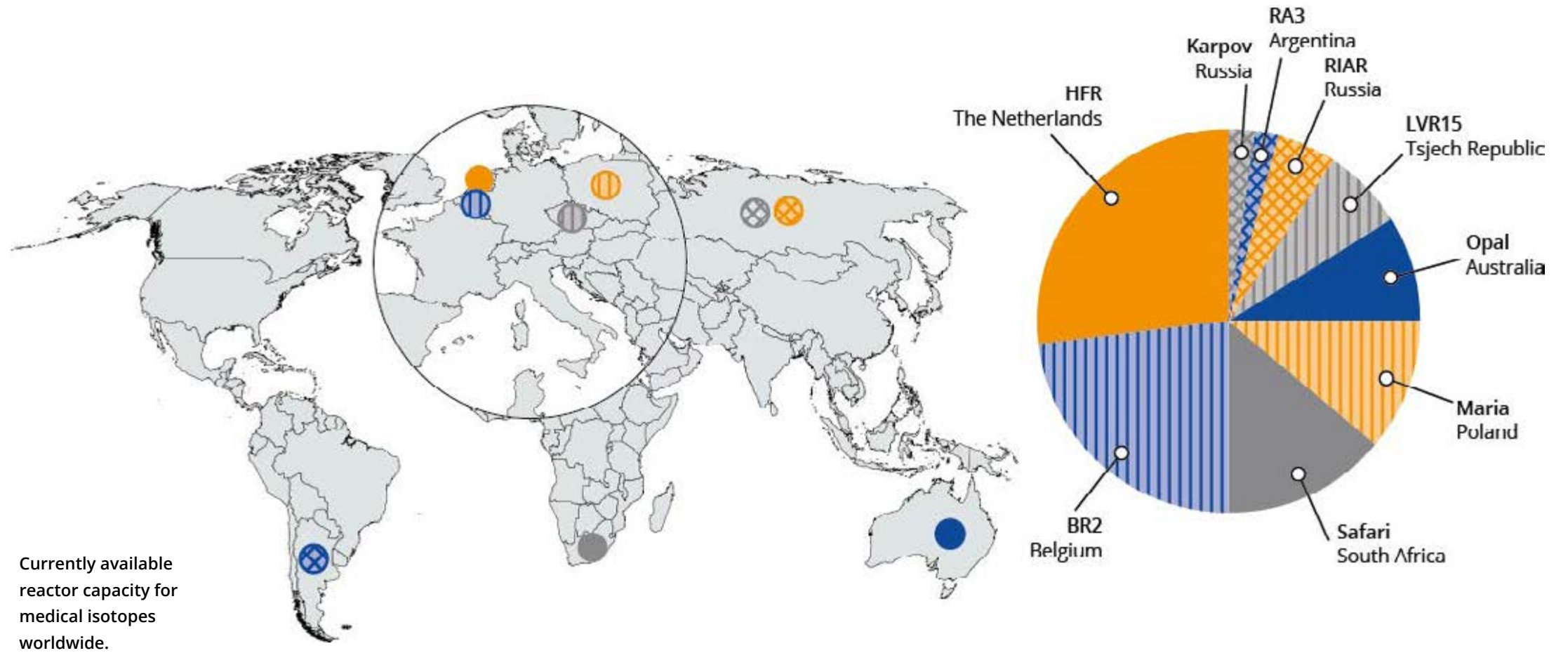
Marjan van Kampen
Mayor of the municipality of Schagen

“I’m a strong believer in the power of working together and dreaming big(ger)! Over the past years, we have worked hard to create a solid basis for the further development of the Energy & Health Campus in Petten, that is situated in our municipality of Schagen. This has resulted in an increasing number of parties joining us, as they believe in the necessity of innovating and investing in a world that grows more and more sustainable and healthy. I am super proud that our municipality will be the home of a reactor with such importance for global healthcare. Another positive aspect that cannot be overlooked is employment: the realisation of the PALLAS-reactor will give an enormous boost to quality employment.”

Usefulness and necessity

• Although we may not often think about it, it's highly likely that every one of us knows someone who has been examined or treated by means of radioactive substances in the nuclear department of a hospital. The larger part of the medical isotopes that are used for treatments and diagnostics all over the world are produced in as few as six reactors. Within 15 years, 75 per cent of the production facility will need replacement given that five of these reactors, including the High Flux Reactor in Petten, are older than 45 years. The older a reactor is, the higher the risk of a sudden production standstill that will prevent patients from being diagnosed or treated. Every day, over 30,000 patients are treated with radiopharmaceuticals that are made or processed in Petten, for instance for the purpose of diagnosis or treatment of cardiac diseases or cancer. It's expected that this number will only increase as a result of:

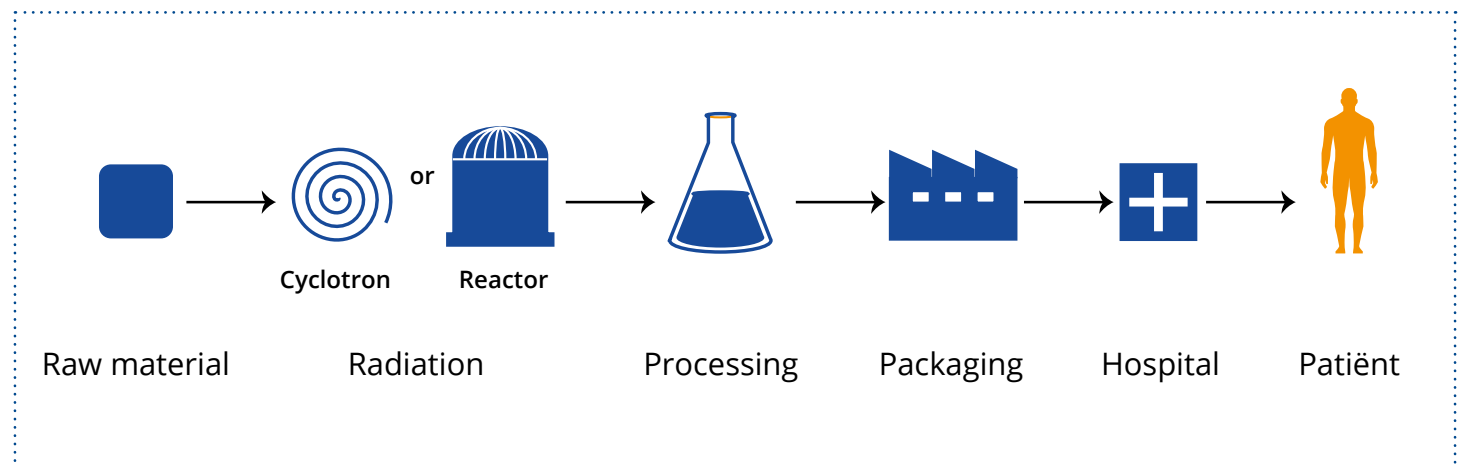
- The increased life expectancy;
- The increasing demand from a growing number of hospitals and the improving healthcare in developing countries;
- The rapid development of new isotopes and



more effective therapies, allowing patients to receive better-targeted (personalised) treatments with fewer side effects.

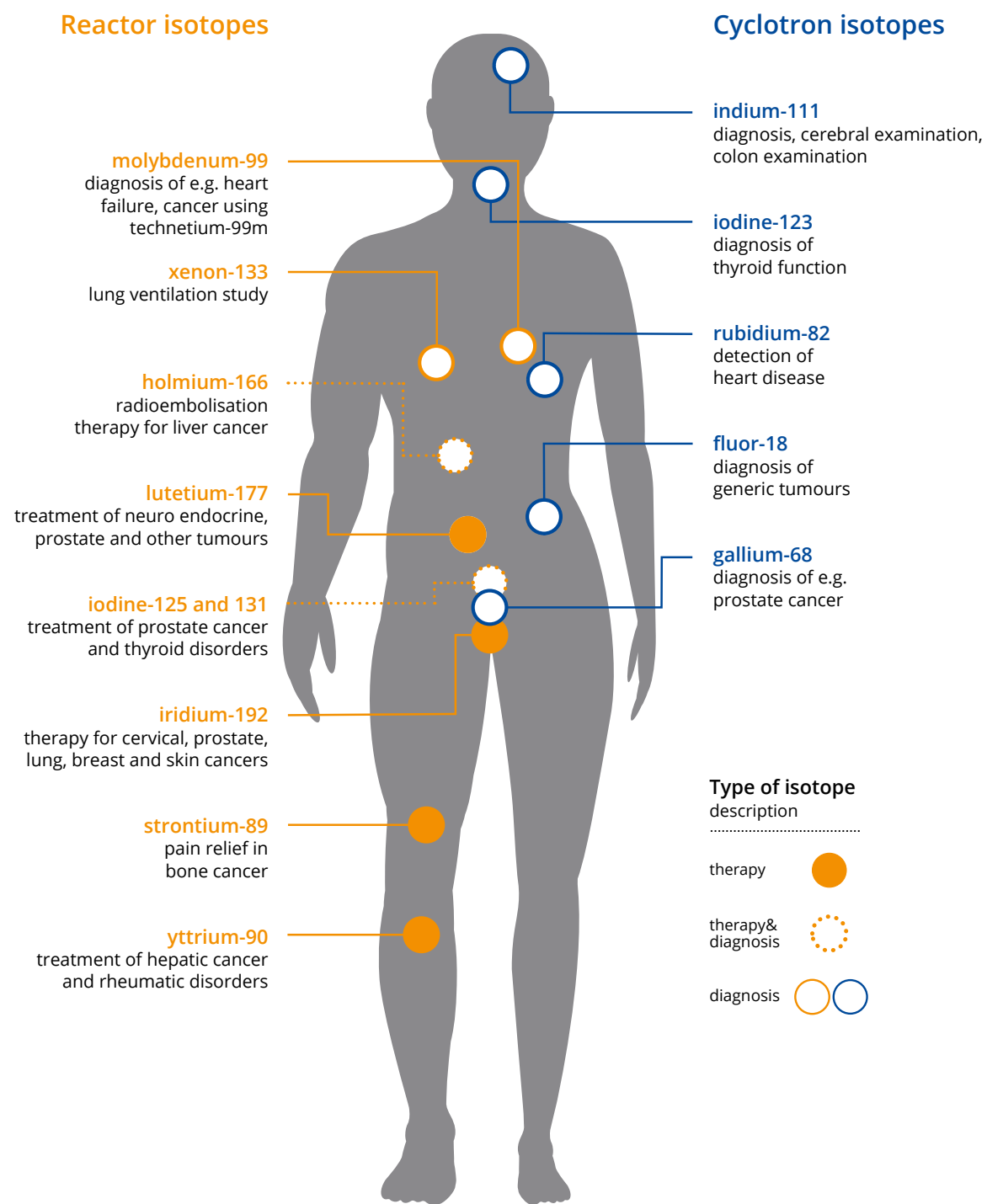
In order to prevent a global hitch in the supply of medical isotopes, the Dutch government decided to replace the High Flux Reactor, which was the go-ahead for the realisation of the PALLAS-reactor.

An overview of the nuclear chain



Some medical isotopes are suitable for large-scaled production in a reactor, but not in an accelerator. Therefore, cyclotrons will never replace the reactors, but they can complement each other.

A patient is diagnosed with the help of medical radioisotopes while going through a scan.



Unique infrastructure

- The Netherlands is the market leader in the field of development and production of medical isotopes with the High Flux Reactor. In European hospitals, 70 per cent of the medical isotopes used for the purpose of diagnosis is supplied by Petten. Globally, this amounts to 30 per cent.

PALLAS and the Foundation NRG (NRG) have the joint ambition to continue and expand the Dutch position as a global top producer of radiopharmaceuticals from Petten. Nowhere in the world, the production chain for nuclear medicines is more complete than at the Energy & Health Campus: from research to irradiation, and from processing to packaging. However, PALLAS and NRG don't stand alone in their ambition; they collaborate with the academic world, knowledge institutions and customers like Curium, the world's

largest supplier of radiopharmaceutical products in the field of diagnosis, which is also established on campus.

At the Energy & Health Campus, the combined forces of PALLAS and NRG are well-illustrated by the realisation of the FIELD-LAB (a research facility focused on the development of new medicines), the reactor and the Nuclear Health Centre (a new production facility for the processing of therapeutic isotopes). Although the diagnosis market remains a spearhead, the focus is also on innovations and on expanding the production chain for therapeutic isotopes. The collaboration with various national and international academic hospitals and knowledge institutions must help the FIELD-LAB in becoming a European breeding area for new nuclear medicine. This will lead to new treatments

that could help implement customised therapy for the patient. The Nuclear Health Centre, that is expected to open its doors in 2022, will focus on the large-scaled production of irradiated raw materials (medical isotopes) that will be processed into semi-finished products (radiochemicals) and medicines (radiopharmaceuticals), and will pack these for the pharmaceutical world.

Without the FIELD-LAB, the new reactor and the Nuclear Health Centre, the guaranteed supply of medical isotopes and the development of nuclear medicine are bound to stagnate. Moreover, these facilities act as a catalyst for the activity on the Energy & Health Campus. Start-ups, knowledge and educational institutions, as well as the business world will consider Petten as an interesting location for establishment.

The Energy & Health Campus

- The Energy & Health Campus is an attractive work environment located on an inspiring, visible site, connecting stakeholders and facilitating innovation and activity. The campus enables people to create a healthier world together, collaborating in the field of carbon-neutral energy supply and the guaranteed supply and development of nuclear medicines.



A look at the Energy & Health Campus.

The parties involved in the Energy & Health Campus.



Safety

- The social importance of PALLAS cannot be ignored. The architectural design and the harmonisation with the environment primarily focus on the safety and health of people and the environment.

In the Netherlands, the Authority for Nuclear Safety and Radiation Protection ensures that the PALLAS-reactor meets the highest safety standards, both during the construction and the production phase. The reactor design complies with the conditions set by national and international laws and regulations with regard to nuclear safety and the security of nuclear installations and nuclear material. In order to obtain all required permits and comply with national and international laws and regulations, the most far-fetched circumstances have been tested. The reactor's design, for instance, can resist external hazards like earthquakes, extreme weather conditions and biological hazards that may only occur once every ten thousand years at the most. Even in case of a flooding scenario, which is likely to occur maybe once in every million years, the design offers protection with a sufficient



The reactor design complies with the highest standards of both national and international laws and regulations with regard to the security of nuclear installations and nuclear material.

margin, thus preventing such a natural disaster to result in a radiological disaster.

It's of the utmost importance to secure the (nuclear) facilities, material and information. In order to safeguard the safety of man and environment or to keep knowledge and information about the reactor, the technology

or (nuclear) material from falling into the wrong hands, PALLAS complies with the Nuclear Security Guidelines, the administrative rules of the International Atomic Energy Agency, and the relevant national laws and regulations.

In the past years, the PALLAS organisation has been working on a solid safety culture supported

by open and transparent communication and working methods. This safety culture is being actively propagated and has meanwhile become integrated in daily administrative and operational processes. Security procedures and instructions are being continuously trained and the focus is always on improvement. PALLAS and NRG work closely together in the safety field.

2

Inspiration

- 2.1 PALLAS's core values
- 2.2 Themes as an inspiration
- 2.3 Architecture as an inspiration
- 2.4 Colour scheme
- 2.5 Flora as an inspiration
- 2.6 The environment as an inspiration
- 2.7 Design principles



Marisa van der Walt
Engineering Manager, PALLAS

“As an Engineering Manager, it’s my most important responsibility to guarantee the reactor’s design and safety. Together with a group of multidisciplinary engineers I translate the business points of view into the technical demands and conditions that the design team of the reactor must process. Working in a multicultural team requires flexibility. I myself am from South Africa and I’m very proud to be a part of the PALLAS organisation. It consumes all of my energy, but it’s worth it.”



Tulio Calderon
Programme Director, ICHOS

“The safety requirements with regard to the construction of these types of reactors have only become stricter throughout the years. And rightly so. Our organisation INVAP, part of ICHOS, has always tailored to these requirements. The PALLAS-reactor will be constructed as a so-called pool reactor: the core of the reactor will be placed at the bottom of a 15-metre deep pool. The water in the basin is used for cooling purposes as well as for radiological shielding. The substantial depth of the pool allows the operators to safely work in the reactor’s vicinity all day long. The Authority for Nuclear Safety and Radiation Protection will grant PALLAS the required Nuclear Energy Act permit as soon as all legal safety requirements are met.”

PALLAS's core values

• PALLAS's mission is to offer unique solutions for nuclear medicines and research. Our philosophy, actions and emotions are characterised by the core values of care, reliability, excellence, and connected collaboration, as described in the figure.



Her
men
van der Lugt
CEO, PALLAS

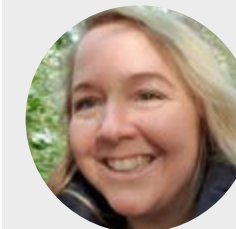
“Effective the establishment of our foundation, we have been striving for the highest level of transparency in order to be a reliable partner and employer. A unique project like this demands intensive reflection and diligence to keep our promises. I feel it’s important to radiate this transparent and reliable character not only to the world, but also and especially to our employees. With all the knowledge and experience we have collected from all over the world, PALLAS can realise the reactor the world is waiting for. A safe reactor that offers a guaranteed supply and that integrates with the Petten dune landscape. That, too, is care and connected collaboration.”



Themes as an inspiration

• In the build-up to the architectural design of the reactor building and its surrounding buildings, PALLAS's core values have been translated into design themes that will be leading for both the scenic and architectonic design. The themes, illustrated in the word cloud on the left, represent the design's focus and are inextricably connected.

PROFESSIONALITY
 DIVERSITY
 NATURE
 SAFETY
 HEALTH
 PROTECTION
 TRANSPARENCY
 SUSTAINABILITY
 COMMUNICATION



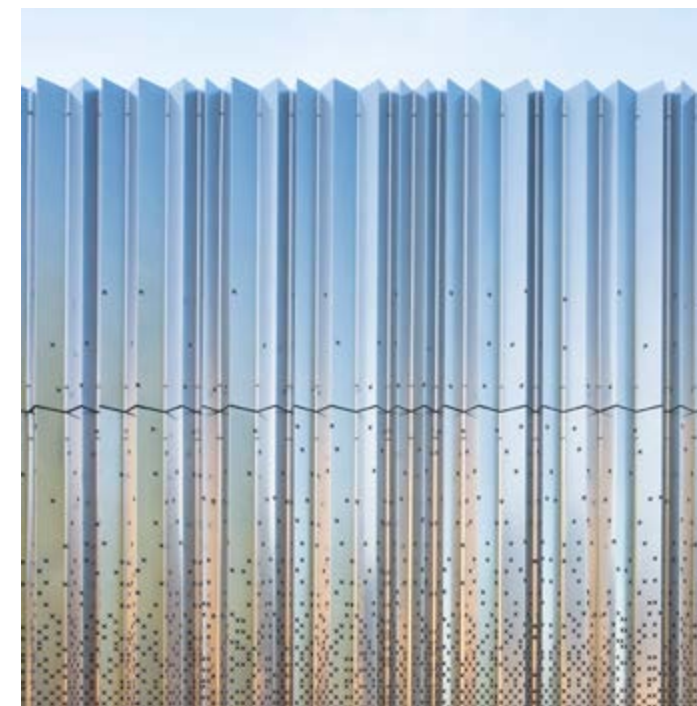
Marloes Borchert
 HR Advisor, PALLAS

“The PALLAS employees are especially motivated by the core value of care: the opportunity to contribute to the global recovery of cancer and cardiac-disease patients through the use of medical isotopes. As an HR advisor, this motivation also relates to our employees: Looking out for your colleagues, looking out for each other. For example, PALLAS also employs expats for whom we try to arrange a smooth transition to the Netherlands. It is important to us that they feel welcome and that they can effortlessly integrate, whether they come alone or with their families.”

2.3

Architecture as an inspiration

- Cool, reflecting and smooth materials make the facades look attractive and reflect the environment. During the day, the incidence of light changes and, as the seasons turn, the environment gets a different look as well. The choice of materials makes the facades eye-catching, yet never contrasting with the sky.



Top: Parametric Perforated Facade design and 3D render by The Craft.
Bottom left: Louvre-Lens Museum.
Bottom right: Arctia Head Quarters, Helsinki.

2.4

Colour scheme

- Where the facades reflect the sky, the colour of the roads, tracks and the mounds that the buildings are situated on have been adjusted to the dune landscape. The materials are executed in earthy colours. Basic shades used in the exterior and the interior are referring to the surrounding dunes. The contrasting colours are derived from the bright colours in the nearby bulb fields and the natural blooming growth of the dunes.

Flora as an inspiration

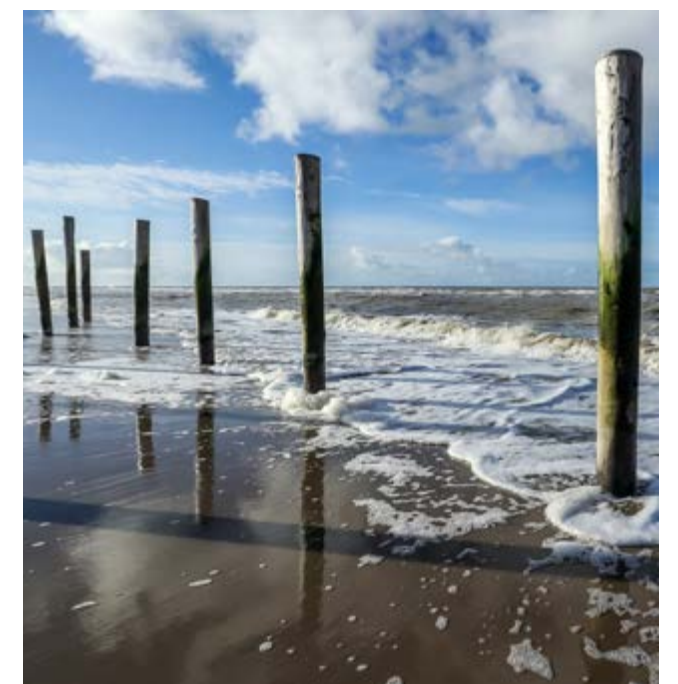
● The Energy & Health Campus is enclosed by two Natura 2000-areas: The Pettemerduinen in the south and the Zwanenwater in the north. The campus setup is based on a building design that contributes to the recovery, continuity and perception of the dunes ecology. To optimise the result, PALLAS worked closely with an ecologist and a landscape architect, and it was decided to use indigenous plants only.

From left to right:
Beach grass, hawthorn, tulip fields, blooming sea buckthorn, heather and buckthorn (gorse).



The environment as an inspiration

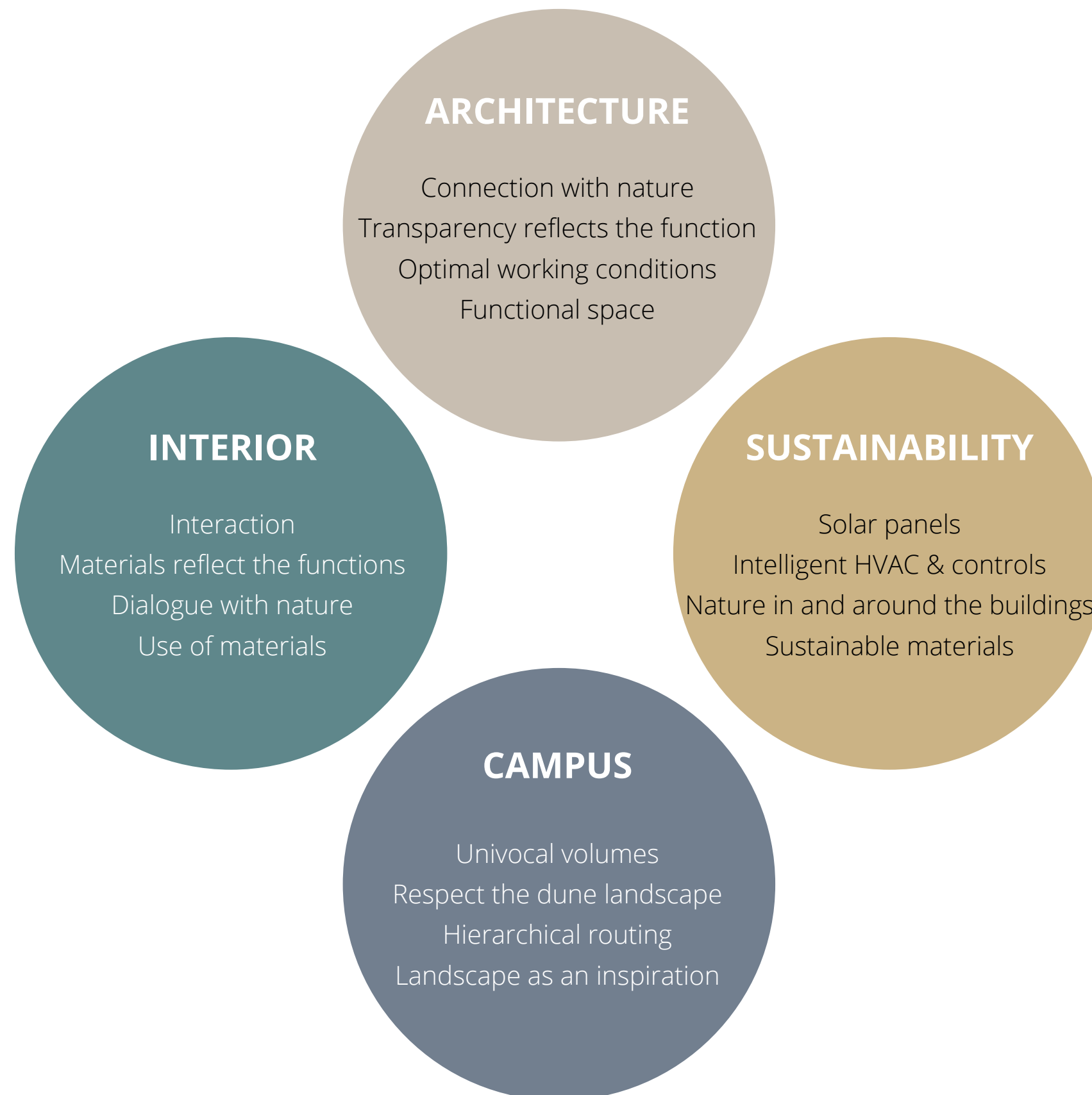
• With regard to the reactor building and the other buildings, the focus was on a compact construction with plenty of space for the landscape. The open spaces between the buildings canalise the view on the dunes in the west and the dikes and the polder in the east. This preserves the experience of watching the Dutch sky touching the vast sea in the horizon for the employees and the visitors who come to the campus daily, and for the locals and polder tourists.



Top: Beach pavilion 'Zee en Zo' in Petten.
 Left: Dune landscape with heather.
 Right: Monument Palendorp
 (pole village) on the Petten beach.
 This piece of art consists of 160 poles
 measuring 6 to 12 metres.

Design principles

• In order to create the optimal design, all inspirations, PALLAS core values, social demands and sustainability aspects have been merged into principles that must be expressed in the design.



3

Starting points

- 3.1 Image quality plan
- 3.2 Logistical movements
- 3.3 Interaction with the environment
- 3.4 Functions and processes
- 3.5 Facades: vertical articulation and louvres



Richard van Rijnsoever
Commercial Manager Business
Development, PALLAS

“The production chain for nuclear medicines on the Energy & Health Campus is the world’s most complete chain. Petten doesn’t only have the knowledge, but also the High Flux Reactor and the production facilities of Curium, the world’s largest supplier of radiopharmaceutical products, at its disposal. The construction of a new reactor, the Nuclear Health Centre and other facilities like the FIELD-LAB, a research facility for new medicines that NRG initiated, will only strengthen this infrastructure. These developments help us, together with partners and customers, to create a future for the Netherlands in which innovation and proven technology go hand in hand and contribute to human health.”

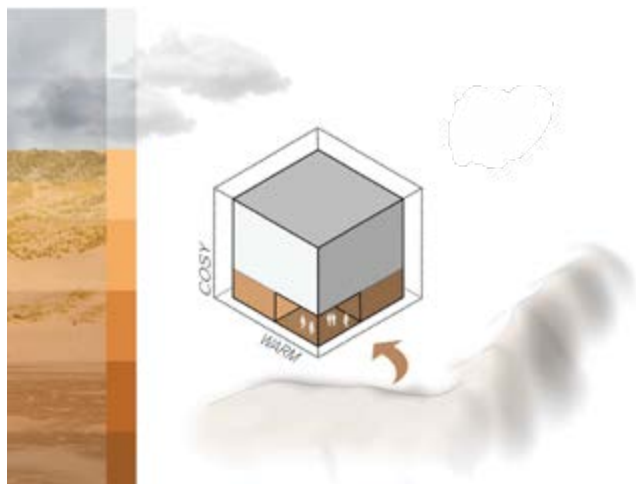
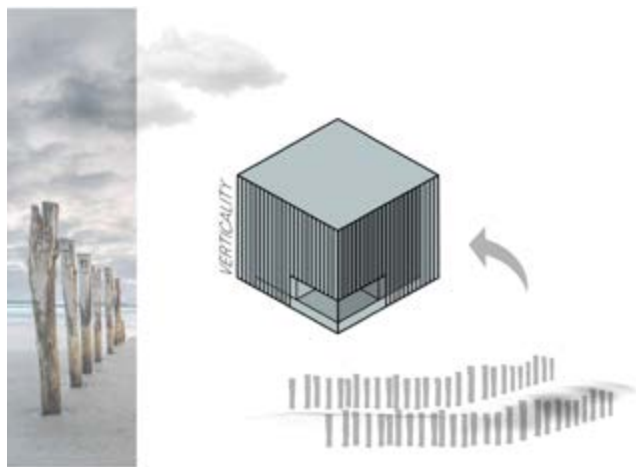
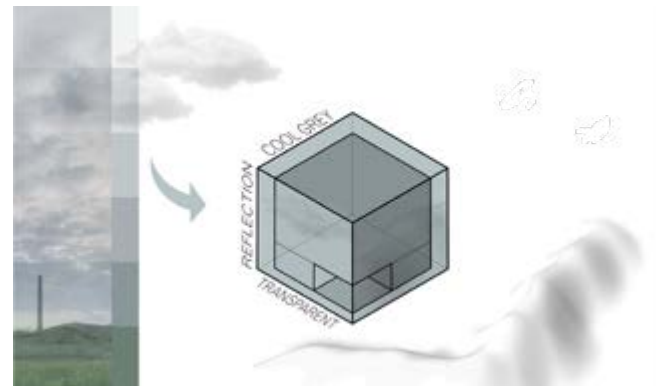


Marjolijn Droog
Manager Chain Management & Integrated
Business Planning, NRG

“It’s important that activities relating to the production and processing of medical isotopes are performed close to one another, and that the logistic movements on campus run smoothly. Medical isotopes are subject to radioactive decay: often the half time is but a few days, meaning that the product will forfeit half of its effectiveness within a matter of days. The faster the irradiated isotopes are processed, packed and transported to hospitals, the more patients a physician will be able to treat.”



Image quality plan and environmental plan



- In order to integrate the appearance and atmosphere of the Energy & Health Campus with the environment, a uniform shape was chosen for the buildings.
- Every building has a well-defined rectangular shape integrating all primary and secondary functions. This marks a clear contrast between the buildings and their environment. Moreover, the environment and the buildings look orderly: there are no technical installations disturbing the view, and the landscape comes out well as the functions are concentrated inside the buildings. The buildings canalise the view and divide the landscape.
- The facades are made of cool, reflecting and smooth materials in order to create an atmosphere that reflects the environment. In rainy weather, the sky will turn grey and dark, while it's bright and clear on a sunny day. During the day, the incidence of light and the colour of the sunlight change and, as the seasons turn, the environment's appearance changes

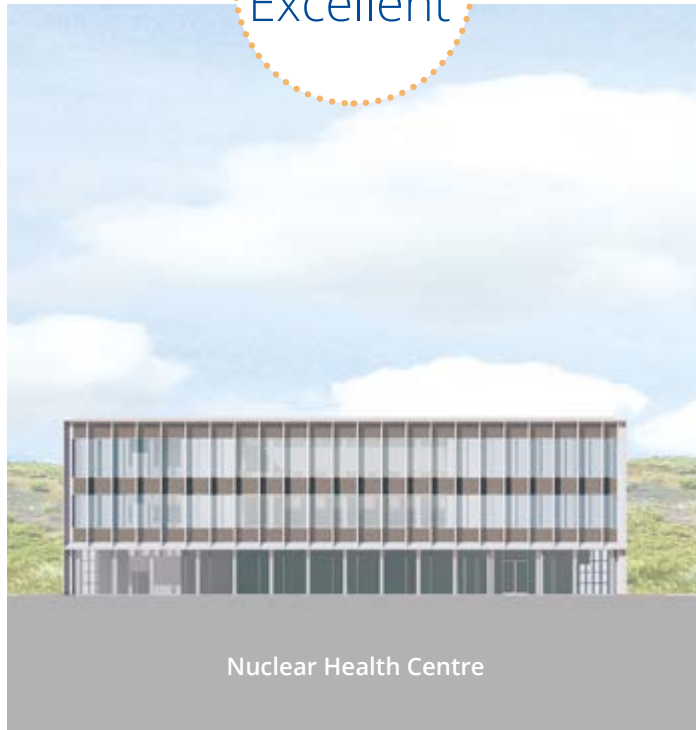


as well. Think of white snowflakes, a foggy autumn morning, and bright shades of green in the spring. The facades are manifest in an attractive and befitting manner, but they will never contrast sharply with the sky. Despite their sturdy volumes, the buildings harmonise with the changing environment and thus soften their impact on the skyline.

- While the facades reflect the sky, the mounds whereupon the buildings have been situated

and where the entrance to the campus is located are adjusted to the dune landscape. The earthy colours of the materials create a warm feeling. The texture changes, as does the natural setting. Think of wooden breakwaters, the undulating ridges that show in the sand when the tide is out, and the waiving lines of beach grass. Basic shades that are applied in the interior savour the surrounding dunes. The contrasting colours reflect the bright colours in the nearby bulb fields and the typical blooming growth of the dunes.

BREEAM
Excellent



Nuclear Health Centre

BREEAM
Inspired



Reactor and logistics building

BREEAM
Inspired

Support building

BREEAM
Excellent

Office building

• BREEAM is an internationally recognised quality standard for sustainable construction and development. BREEAM tests buildings against nine themes, thus creating a solid integral and sustainable whole. The office building and the Nuclear Health Centre will be BREEAM Excellent-certified, showing that

sustainable development plays an important part. The support building and the reactor building apply the same BREEAM-sustainability measures insofar the primary process allows this, and the measures serve a functional purpose. That is why these buildings are BREEAM-inspired.

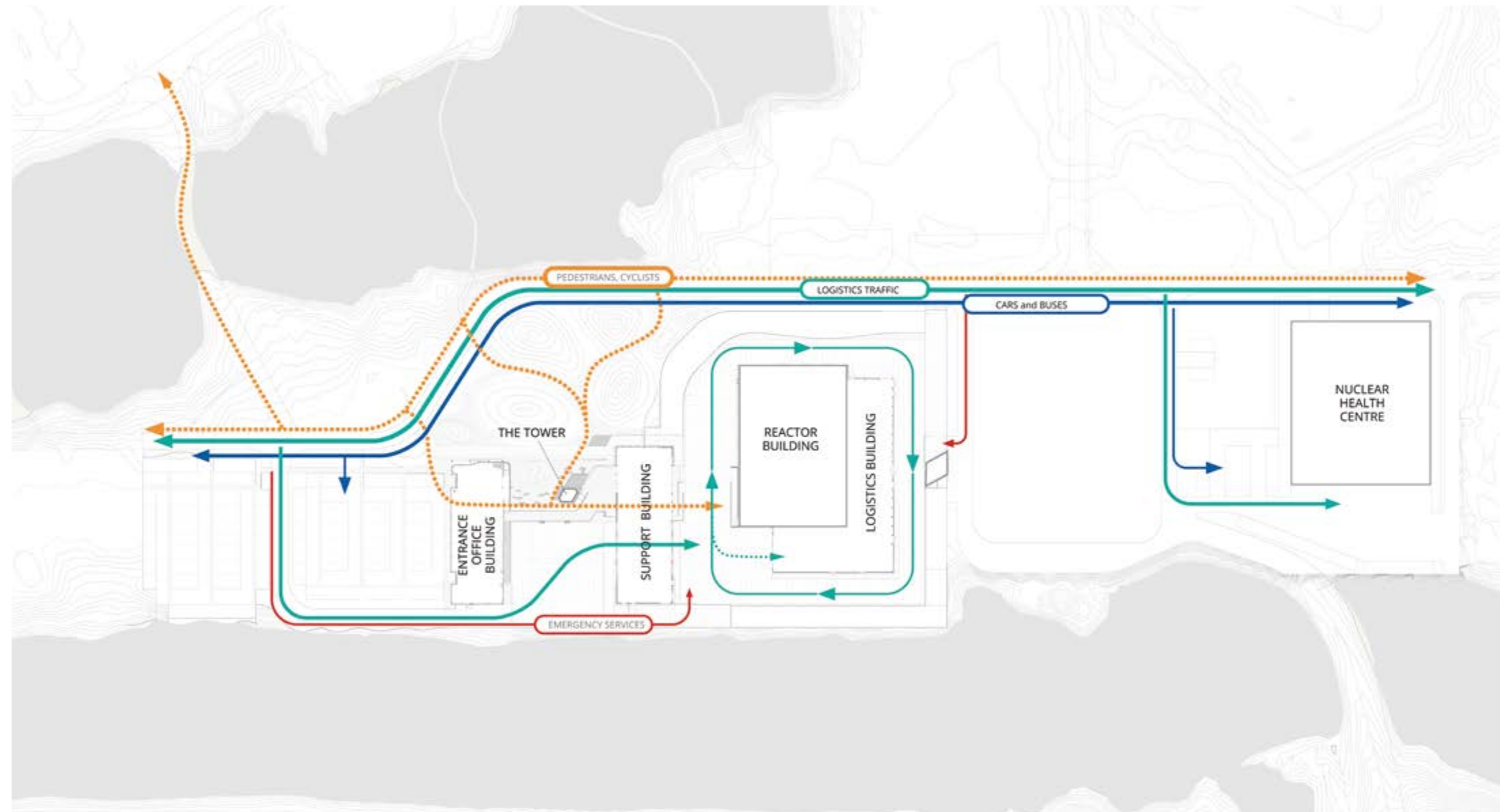


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Logistical movements

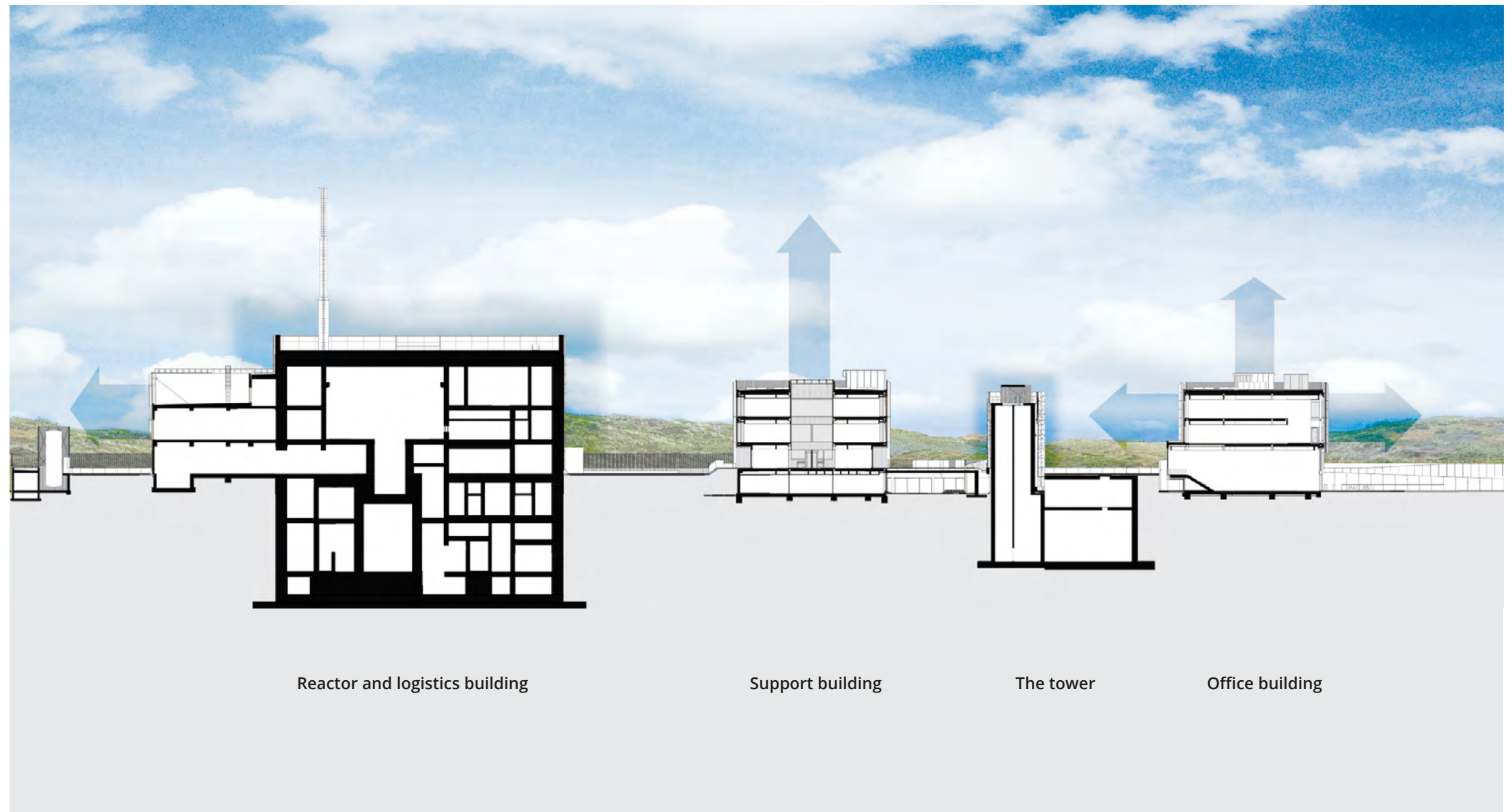
- The road structure is clear, allowing both employees and visitors to orient easily throughout the campus. The main roads have an open and friendly character, partially because the buildings' entrances have been placed manifestly at these main roads. The secondary roads with their identifiable profiles and colour schemes are clearly separated from the main road. These secondary roads are intended to open up traffic on site. Finally, a parking lot and a web of bike paths and foot tracks freely meander through the dunescape, enhancing an atmosphere that befits a campus. This infrastructure ensures a beautiful campus site where people can travel safely and easily.



Interaction with the environment

- The transparency of the buildings allows a splendid view of the dunes and of the campus site itself. The employees feel more connected to nature and they can easily monitor the movements of the employees and visitors on campus. The open view from the outside illustrates PALLAS's open character towards society. In many places, the daylight enters freely yet dosed, as the glass blinds block the bright sunlight. Moreover, they enforce the changing light in colour, intensity and reflection. Inside the reactor building, where the daylight is blocked, the access to the L-shaped logistics building ensures light and a spacious feeling. This helps people who are working in the secured areas to actively interact with the environment as well.

The interaction with the environment is an important starting point for the design.



Function and processes

- The ICHOS design consists of three buildings and a tower. They are situated on a mound to protect them from flooding. The buildings are interconnected on this mound with horizontal platforms.

The first building that catches the eye upon arrival in the East Valley of the Energy & Health Campus is the office building. On the first floor of this building, that accommodates approximately 120 workplaces, is the central reception room including hospitality functions for employees and visitors. The office space for business operations and management is situated on the two upper floors. The ground floor is intended for parking purposes and there is a small exposition room near the entrance, while the roof has a recreational room. The office building is open to employees and visitors.

Next to the office building is the tower. This prominent building is part of the cooling

system of the reactor. The various sides of the diamond-shaped tower offer different views. The positioning defines the space between the office and support building. Moreover, the tower serves other secondary functions that have been integrated in the landscape mound, like the bike shed, the cooling water building, and the nitrogen/electricity building. By assigning these functions to the mound, the campus remains open and orderly.

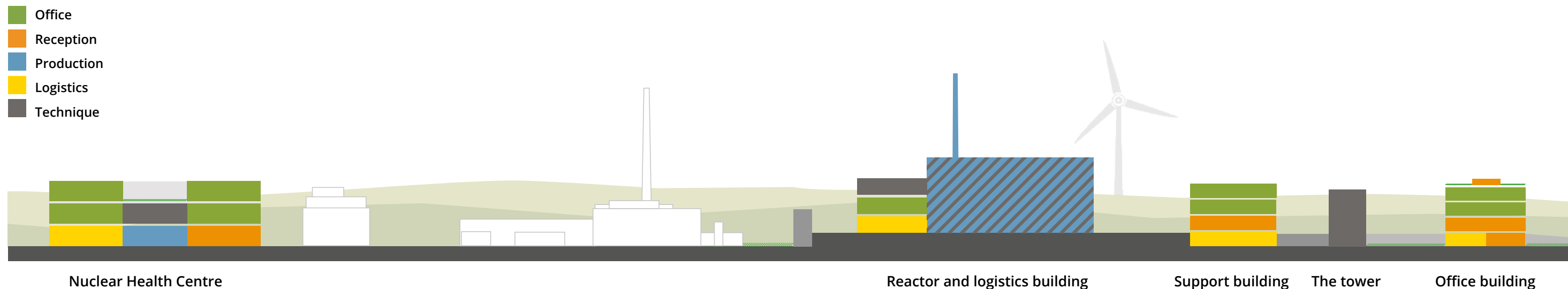
Behind the tower the support building emerges, accommodating approximately sixty workplaces. This building is an integral part of the security layer of the reactor building. Here, every person and all goods going to and from the reactor are submitted to a security check. Changing rooms for the employees and technical areas have been installed at the lower level of the support building. The upper floors mostly accommodate offices and research and training facilities. The reactor building

and its L-shaped logistics building accommodate around forty workplaces. This building was designed for the purpose of the primary processes used to irradiate and process radioisotopes. The employees that provide support to the reactor activities are working in this part of the reactor. The PALLAS-reactor is a so-called pool reactor: its core is placed at the bottom of a 15-metre deep pool. The pool water is both a cooling agent and a radiological shield. The L-shaped logistics building is directly connected to the reactor building. It has installed both a chemistry lab for the purpose of quality control of the processes that take place inside the reactor, and a laboratory where materials are being prepared for irradiation. There are also facilities to prepare the products for transport. The reactor building and the tower are facilities dominated by the technical processes, while the focus in the logistics, office, and support buildings is shifted towards other activities. Upon closer inspection of the facades

and their materialisation, it's revealed which types of processes and functions take place at which locations within the building. Much transparency has been applied to the workplaces. The degree of transparency decreases in places where nuclear technology becomes more relevant.

The Nuclear Health Centre, designed by Broekbakema, will offer a workplace to around 150 persons. The compact building is organised around its core function: processing isotopes into nuclear medicines. As this building was placed in the near vicinity of the reactor, the isotopes don't need time-consuming and quality-decreasing transportation. The main process takes place in the clean rooms on the ground floor, adjacent to the entrance room, and can be observed from campus. The research laboratories and the corresponding office space are located on the first floor. The general PALLAS offices are situated on the top floor around an open rooftop garden.

Who carefully looks at the facades and their materials sees which kind of processes and functions take place on which location inside the building.



Facades: vertical articulation and louvres

• ICHOS and Broekbakema designed the different buildings as an architectural family. There is a clear connection in the vertical articulation of the facades, amongst other illustrated by the lines of the curtain walls, the vertical louvres and the vertically placed facade elements. Still, the facades are not identical, and the differences make them appealing. A high level of transparency was applied in the rooms where the workplaces are located, as people enjoy daylight and keeping in touch with their environment. The level of transparency decreases in places where nuclear technique in the buildings becomes more dominating.



Nuclear Health Centre

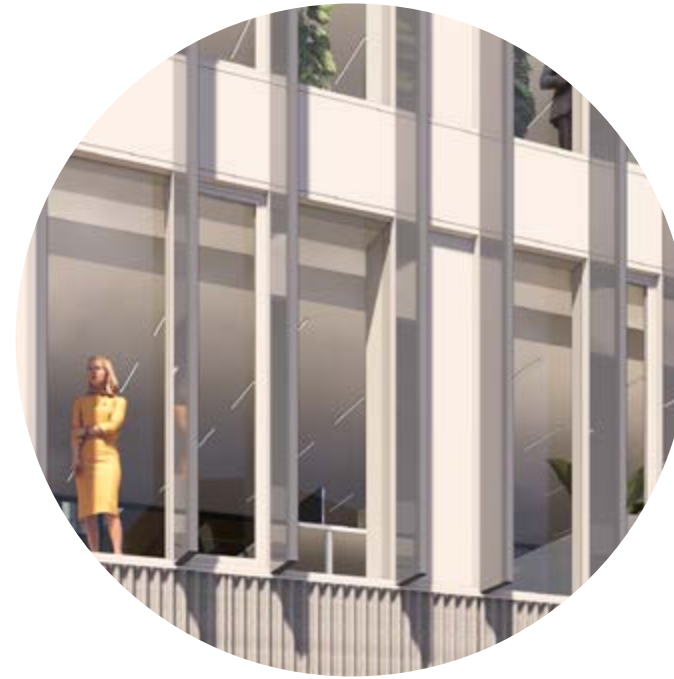


Reactor and logistics building





Support building



Office building



DUURZAAMHEID

Het kantoorgebouw is energieneutraal. Het dak en de opvallende glazen louvres bevatten namelijk zonnepanelen voor maximale transparantie en een energiezuinige gebouwschil. De glazen louvres leveren duurzame energie en zorgen tegelijkertijd voor een structurele verlaging van de warmtelast op de gevels en de werkplekken.

4

Architecture

4.1

Office building

4.2

Support building

4.3

Reactor building

4.4

Nuclear Health Centre



Teun Spruijt

Architect, Royal HaskoningDHV

“The rolling lines of the facades behind the columns and the pushed-back mound make it seem as if the office building is gently landing on campus, like someone who softly touches the warm sand of the beach with his toes. The transparency enhances the contact and dialogue with the direct environment. Open attitudes and interaction make or break a successful collaboration.”



Renze Evenhuis

Architect, Broekbakema

“The efficient and state-of-the-art production of the Nuclear Health Centre is an achievement to take pride in, so we want to make it stand out!”



Robert Collignon

Architect, Royal HaskoningDHV

“As an architect I feel responsible for guaranteeing people a central position in an innovative high-tech environment. An architect should even be able to insert ‘poetry’ into the complexity of a project with a highly industrial character. This creates an environment that in its turn creates backgrounds and opportunity to further stimulate progress.”

Office building

- The office building is the face of PALLAS. Reception and accommodation are key. The employees can be observed from the outside, thus easily characterising the building as an office building. The building's facades allow daylight to enter, generate energy, provide natural ventilation and offer shelter from the sun. Inside, the employees and the visitors have a view of the campus and the dunes as they look through the high windows, while the world outside stays connected to the offices. The office building was built on top of a mound and separates the dunes from the production and research site. The finishing in natural stone and concrete creates a natural and smooth transition from the outside to the inside. These warm materials make people feel welcome. The building is lifted above ground level, thus implying the site passing underneath the office building. The glass double level entrance is the only point where the building touches the ground and from where the visitors are taken to the reception and to the visitor centre on the first floor. The top floor is divided into two levels that are interconnected by various open spaces and meeting



points. A half round spiral staircase leads to the roof garden and easily and rapidly connects the different workplaces and meeting points.

DIMENSIONS OFFICE BUILDING (in m)

Length	55.8
Width	19.8
Height	16.1
Gross floor surface	5,080 m ²

Office building



Office



Reception



Logistics



Technique









SUSTAINABILITY

One of the starting points was to design a building that guaranteed its users' health in the most optimal manner. In this scope, health is taken to mean green and daylight, but also shelter from daylight where necessary. It was also important to safeguard an attractive inner climate with sufficient fresh air supply and the option to individually influence the workplace. It's therefore possible for employees to open windows and individually regulate temperature and light levels.



Left: Reception hall.
Upper right: Meeting point.
Lower right: Presentation room.

Support building

- The support building separates the secured zone from the unsecured zone, thus assigning this building a protective and welcoming function. The support building accommodates employees working on the security of the logistical processes, the site and the environment. Given its function as the access gate to the reactor building, goods and persons are checked here. Despite these formal procedures, visitors feel welcome in the friendly open space. This space is the centre of the building where the visitor can observe the PALLAS team working on the safety of the reactor and its environment day and night. This contributes to the unique experience of the visitor. The materials used in the facades of the support building clearly show where the office activities take place, where technical installations that support the process are installed, and where persons and goods are received and submitted to a security check. Upon approaching the building, the facade becomes more transparent and inviting as the activities inside the building are more and more revealed.



DIMENSIONS SUPPORT OFFICE (in m)

Length	61.2
Width	21.6
Height	16.7
Gross floor surface	4,710 m ²

Support building



Office



Reception



Logistics



Technique







Entrance of the support building.



Office floor above the reception hall in the support building.

Reactor building

- The reactor building and its L-shaped logistics building form the largest of all buildings and its function is closely connected to technique and safety. Traditionally, these two elements were expressed in a dome-shaped building cover, but this image doesn't suit the required and valued connection between the architecture and the landscape. The reactor building is univocal and rectangular. Its appearance is modern and the exterior radiates robustness and safety. The facade is executed in enamelled aluminium, a smooth material. The transparent open facade of the logistics building allows the laboratory activities inside the reactor building to be observed from campus. Due to the differences in the materials used, it's clear where the installations for the main processes are located, where the logistic good transit takes place and where people perform their activities in laboratories, workplaces and offices.



DIMENSIONS REACTOR AND LOGISTICS BUILDING (in m)

Reactor building		Logistics building	
Length	62.5	Length	75.6
Width	42.5	Width	46.8
Height	20.5	Height	15.0
Gross floor surface	20,330 m ² (including logistics building).		

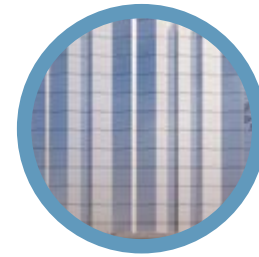
Reactor building



Office



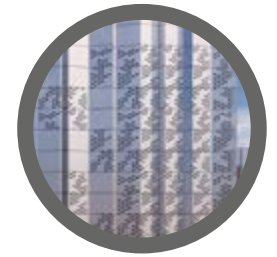
Reception



Production



Logistics



Technique









Left: Entrance reactor building.
Upper right: Loading and unloading area.
Lower right: Exteriors of the buildings.



Marco Visser
Licensing Manager, PALLAS

“The PALLAS-reactor and its corresponding buildings will remain in the Petten landscape for a long time. That is why we tried to apply the latest technologies in the field of sustainable and innovative construction, in close collaboration with architects and within the scope of safety and security requirements. For example, we are re-using the heat generated by the reactor building to heat the other buildings. This helps the PALLAS-reactor to meet the developments of the 21st century. It may be an unexpected aspect of a reactor, but we are well on our way to deliver a sustainable complex. That makes me proud.”

Nuclear Health Centre

- The main entrance of the clear and compact building complex of the Nuclear Health Centre is located at the main campus road. Vertical slats surround the entire building: from the entrance to the sides and then to the expedition side. At the entrance and the expedition side, the slats facade covers one floor to guarantee the open character of the building. The building's entrance side opens up with a transparent warm plinth to campus. This effect is further enhanced by the fluent lines that transition the entrance to the front.

The building's main design is focused on the production process: one continuous flow, from the arrival of the isotopes to the packaging of medicines. By situating this process close to the public entrance of the building, a special design is created that almost involves employees and visitors in the production process. In addition, this level of transparency provides a pleasant, safe and healthy work environment for the employees. Daylight penetrates deeply into the building and the different rooms are clearly visible. The contrast between the public entrance and the clinical world



of the cleanroom is even more emphasised by the choice of materials and by showing the technical room that is located above the cleanroom. The two large spiral staircases connect the entrance room with the higher floors. The laboratories and the offices are all connected to the exterior, either at one side or at different

sides. The sheltered roof garden allows daylight to enter from two sides in the top office floor, and its sheltered setting allows it to be used as an outside workplace. The high roof is used as a water buffer and an energy roof to meet the energy requirements of the Nuclear Health Centre as much as possible.

DIMENSIONS

NUCLEAR HEALTH CENTRE (in m)

Length	62.4
Width	55.1
Height	17.2
Gross floor surface	10,012 m ²

Nuclear Health Centre



Office



Reception



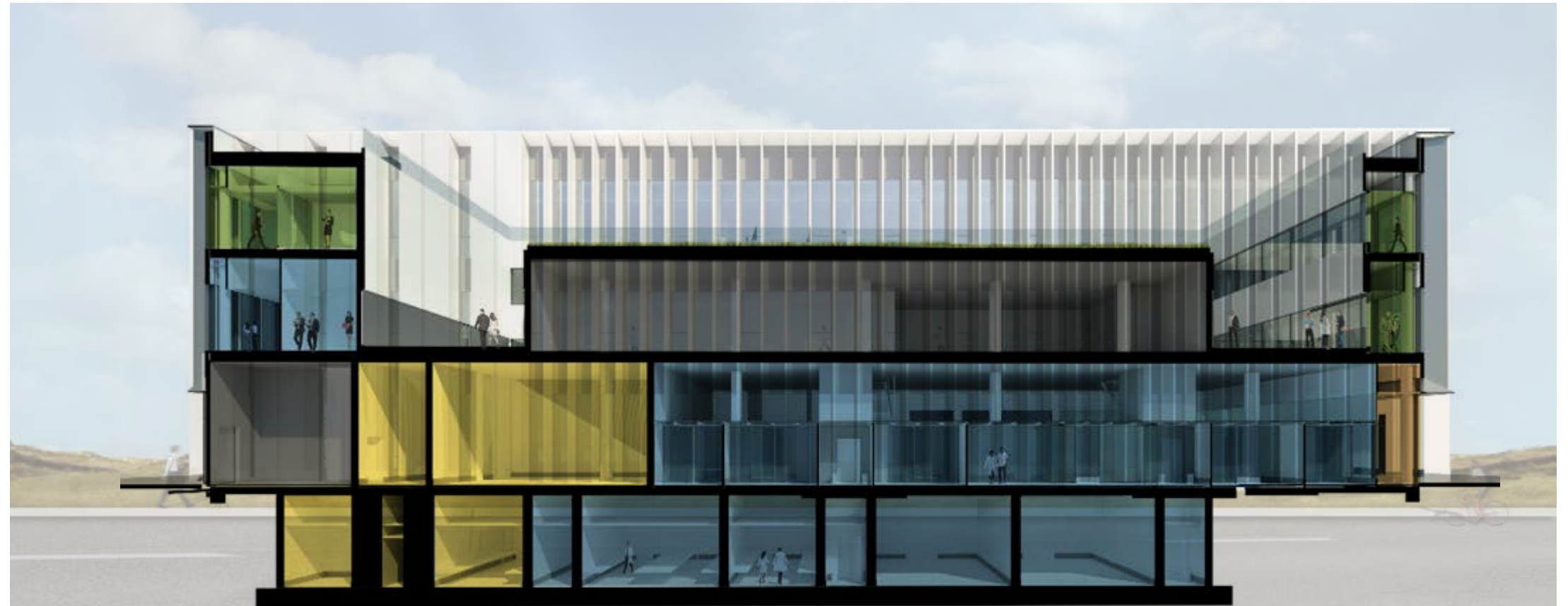
Production



Logistics



Technique









Koen Kodde
 Project Director
 Nuclear Health Centre

“Realising the Nuclear Health Centre is an amazing challenge. Obtaining the necessary permits requires an enormous effort. In the near future, we will meet the highest standards and comply with laws and regulations and quality demands in order to guarantee safe products for the patient, the employees who manufacture the products and the environment.”



Left: Reception hall Nuclear Health Centre.
 Right: Office and conference room.

5

Integration with the landscape

5.1 Environmental integration

5.2 Vegetation

5.3 Pavement

5.4 Integral safety



Robbert Jongerius
Landscape architect, Arcadis

“We’ve managed to make a connection between the design of the PALLAS building and the natural dune landscape. From the building, employees and visitors have a view of the grass dunes of the Zijperzeedijk, or they can take a walk through the dune valley. Thus, the design contributes to an enrichment of nature and a healthy and attractive work environment.”



Roel Krol
SHEQS Manager, PALLAS

“A nuclear installation must meet the highest safety requirements. We primarily looked at the possible use of natural barriers to integrate into the safety requirements when designing the installation. Together with the ICHOS team, the ecologist and the landscape architect, we have found aesthetic solutions that limit the use of degrading fences to a minimum. This integral approach guarantees the open character and landscape harmonisation.”



Landscape integration

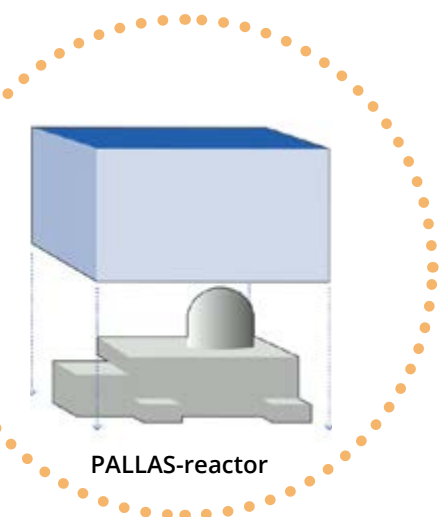
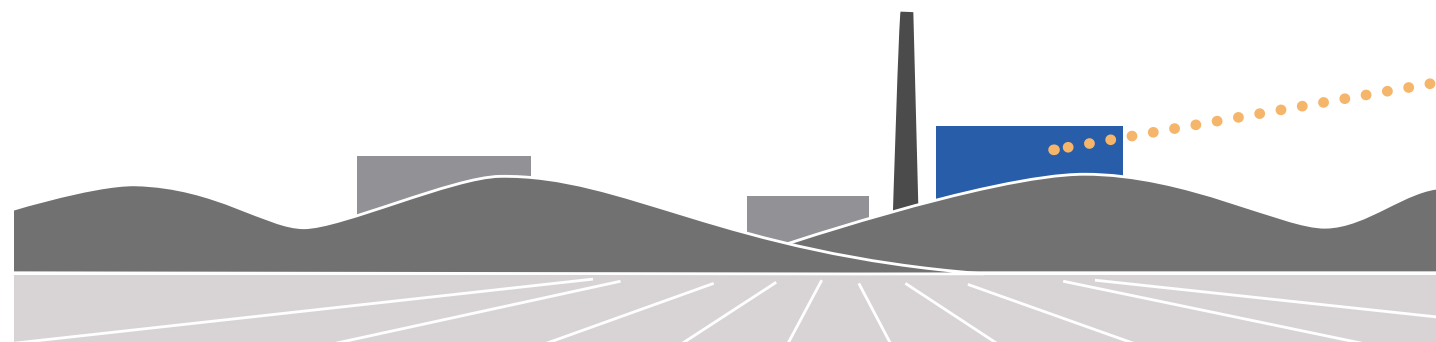
- It's important to consider how the reactor and the corresponding buildings will fit in the dune landscape. The basis is to acknowledge that the unique dunescape supports the identity of the campus. In the design, the buildings were placed perpendicular to the dune row with a lot of intermediate space. Thus, the dunes remain clearly visible from the main road, polder and bulb fields. This contributes to the campus experience and the buildings' appearance. The enclosure that ensures that the reactor building is situated in the secured zone was designed using natural elements that adjust to their environment. Because of that, the protective shield is less conspicuous to the world and gently fades into nature. The employees and visitors won't experience an oppressive feeling as the transparent and open character of PALLAS is emphasized.

Because of a proper integration with the landscape, the PALLAS buildings become a pleasant addition to the horizon. The colours of the facades, blending in the shades of the fading day and adjusting to the turning seasons,



soften the skyline. Moreover, the buildings can be distinguished as separate entities, the view of the horizon isn't unnecessarily blocked, and the image

of the polder is carefully organised. The latter as a result of the orthogonal setup of the PALLAS buildings, perpendicular to the dunes.



PALLAS-reactor

Sight of the Energy & Health Campus from the east.

Vegetation



● The Energy & Health Campus is enclosed between two Natura 2000 areas: The Pettemerduinen (dunes of Petten) in the south and the Zwanenwater in the north. The commitment and respectful relationship between nature and process is reflected everywhere. Having the buildings fade into the environment must contribute to the improvement, continuity and experience of the ecology of the dune landscape. That is why the integration with the

current landscape has been carefully considered. For example, the dunes at the west side are continued into the PALLAS site. It has also been considered that rainwater can easily penetrate the ground in the parking lot, thus watering plants and bushes. The compact construction offers a tidy and clear organisation that helps the rich, rough nature, the waiving grasses, the warm sand and the blooming bushes attract extra attention.

SUSTAINABILITY

Sustainability is not only relevant for the buildings, but also for the surrounding landscape. The ecological aspects and consequences of the buildings on the environment have been carefully considered. The landscape design of the building locations uses and reinforces current ecological qualities by honouring typical structures and types. As an alternative for fences, bushes are planted to define natural security zones.



Beach grass



Heather

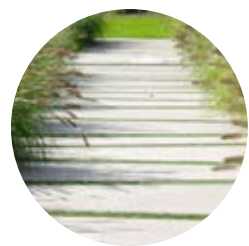


Hawthorn



Sea buckthorn

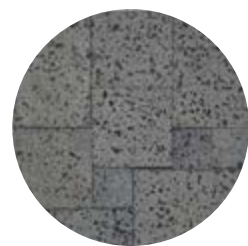
Pavement



Tracks and paths



Park and plaza landscape



Basalt pavement



Sandy asphalt



Concrete and basalt gravel



Anthracite concrete



Pale grey concrete



Sandy concrete

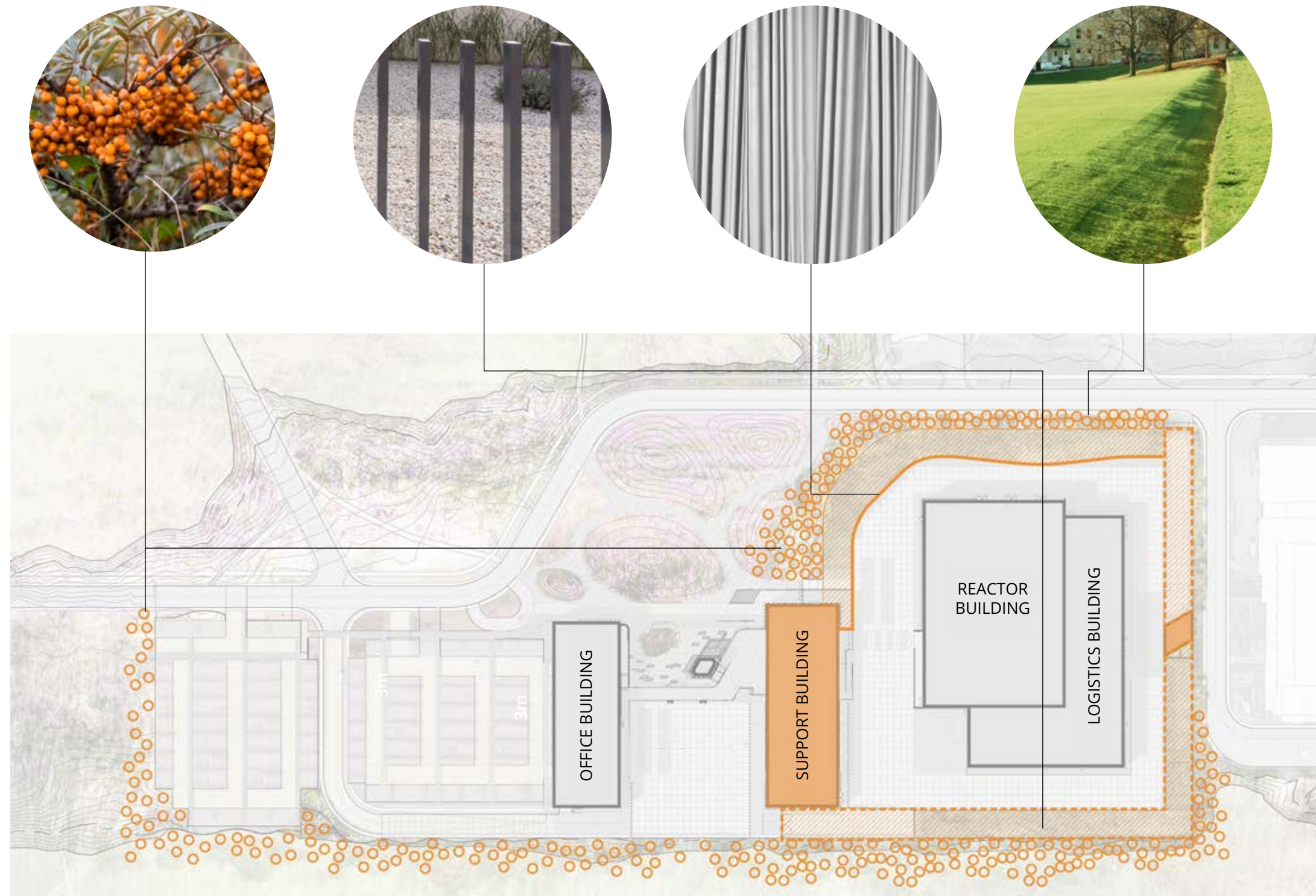
● Concrete foot paths and bike tracks in sandy asphalt complement the dune landscape and are installed on campus in pale grey, dark grey, and a yellowish sandy colour. The parking lot is made of a sandy concrete slab filled with basalt gravel, subtly indicating the parking spaces and allowing rainwater to sink into the ground. The pedestrian paths and car roads can be distinguished by using basalt tiles and sandy asphalt. The vegetation grows over the edges of the pedestrian paths, softening the border between pavement and nature. Colour indications also point to the different logistic processes in the pavement: dark grey areas indicate the truck lanes, pedestrian paths and crossings, and loading zones.

SUSTAINABILITY

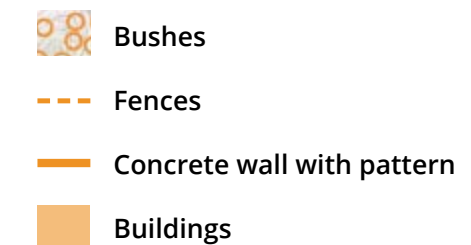
The environment is an inspiration to the landscape design, like plants and pavement. The landscape adds to the design; parking lots and the office-building roof are embellished with plants that are easily infiltrated by rainwater or temporarily retain it.



Integration of security



- The absolute safety for people and the environment, in the broadest sense of the word, might well be the most important aspect in constructing a reactor. The rectangular shape of the reactor guarantees its robustness. In addition, necessary security measures are taken to protect the surrounding area. In order to guarantee that these measures don't stand in the way of the envisaged friendly appearance of the Energy & Health Campus, they are integrated in the architecture and the landscape. For example indigenous bushes, natural differences in height, and gracefully curved concrete walls are used. They fit into the landscape and the architecture, and also meet the intended security requirements of the complex. Fences and gates are designed in a similar manner and positioned as relevant landscape interventions.





6

Looks

6.1 The appearance

6.2 Interior themes



Yannick Aboukou
Amorisani

Lead Reactor Process & Plant
Systems Engineer, PALLAS

“Recently I moved with my wife and two children from France to the Netherlands. I want for them to grow and to discover a new culture, in addition to me being involved in a highly challenging project. A project involving multicultural stakeholders from all over the world that can really make a difference, since it has a direct impact on people’s lives. I’m a passionate mountain biker and therefore am also really looking forward to ride home, crossing the dunes after a day of hard work. This eco-friendly work environment, that shows enormous respect for nature, is highly inspiring. To work in an office with large windows, enjoying the beautiful sunrise and sundown, will definitely make this a stimulating experience.”



Lotte Pas

Junior Secretary, PALLAS

“I am really looking forward to move from the industrial zone in Alkmaar to the colourful dunes of Petten. I can imagine how stimulating it will be to enjoy a stroll through the dunes with my colleagues over lunch. Moreover, I believe it’s my responsibility as a secretary to pass on to the visitors the welcoming, attentive atmosphere at PALLAS. The well-designed, modern, functional and transparent buildings will certainly be helpful.”

The appearance

From the point of view at the beach west of the Energy & Health Campus.

- What will an inhabitant, tourist, visitor, bicycler or driver see behind the Petten dunes? How will the different buildings look from a distance?



From the point of view at the highest point in the forest south of the Energy & Health Campus.

From the point of view at the Westerduinweg.



From the point of view at the Belkmerweg near the Campanula swimming pool.





Interior themes

- As the exterior has been completed, a start is made designing the interior. The starting points in the interior are:

- **Interaction**

Employees feel connected to their work and their colleagues. The interior design should stimulate interaction. The design therefore pays a lot of attention to spaces intended for informal meetings with colleagues. The interior design is also based on the outcomes of further analysis of the interactions of employees within the scope of working processes, in order to further define the functional spaces.

- **Environmental connection**

Experiencing the dunescape is an important

element for the interior design. Literally, by offering the employees a view of the dunes from their workplace, but also figuratively speaking, by bringing the landscape inside through the use of earthly shades with contrasting colour accents.

- **Use of natural materials**

In places that require a pleasant and warm atmosphere, natural materials are applied, like sustainable woods or pale grey natural stones. The colour green is integrated in the design; at a higher level by placing green walls in special locations inside the buildings, and at a lower level by using green shades in cupboards.

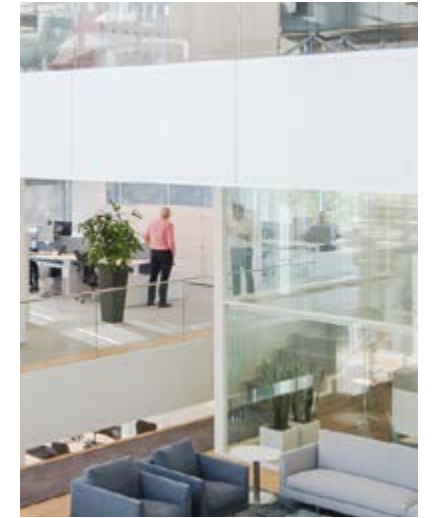
The use of the materials is primarily defined by

the functional demands of the rooms. By relating the material's choice to the room's functionality, interesting contrasts and changing atmospheres are created. The materials are all sustainable and easy to clean, and the acoustics are considered at all times.

In order to further coordinate the interior design, and in particular the intended look and feel of the rooms, mood boards have been developed for three different space typologies distinguished in the PALLAS buildings: Hospitality, Office and Labs & Logistics. In principle, all building functions can be assigned to one of these typologies. The mood boards are intended for inspiration and will be further elaborated in the next months to help define the future interior.

Hospitality

- Entrance
- Reception
- Visitors centre
- Lounge
- Meeting room



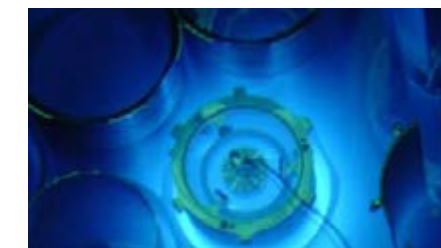
Office

- Offices
- Conference rooms
- Quiet rooms



Lab & Logistic

- Laboratory
- Cleanroom
- Control room
- Reactor hall



Colophon



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PALLAS en ICHOS

Architecture

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Graphic design

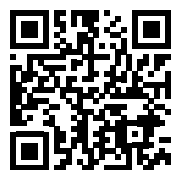
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PALLAS



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