

DUTCH HEALTH ARCHITECTS



Ghent University Pediatric Hospital



DUTCH HEALTH ARCHITECTS



TABLE OF CONTENTS

Dutch Health Architects Company profile	5
Vision on hospital design	7
Healing environment and evidence based design	9
Sustainability	15
Projects	19
Erasmus Medical Center	21
Deventer Hospital	23
Ghent University Pediatric Hospital	24
Sint Antonius Hospital	27
Bernhoven Hospital	28
Radboud umc Medical Faculty	31
Jeroen Bosch Hospital	32
Dutch Cancer Institute	35
Jan Portaels Hospital	36
Hospital Reinier de Graaf Gasthuis	39
University Medical Center Utrecht	40
UZ Leuven University Hospital	43
Pharmacy A15	44
Honliv Hospital Cancer Center	47
Wanica Medical Center	48
Themes Innovation	51

Zaans Medical Centre, Zaandam, The Netherlands



DUTCH HEALTH ARCHITECTS

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COMPANY PROFILE



Dutch Health Architects, which originates from architectural firms founded in the 1930's, is an independent architectural firm operating worldwide. The consultancy services provided by Dutch Health Architects root in an architectural background and focus on people's interaction with their environment.

With a total staff strength near 210 working nationally and internationally Dutch Health Architects can call on a strong resource base and offer quality services based on globally built experience.

Dutch Health Architects takes a multidisciplinary and integrated approach to any project covering technical, logistical, legal, organizational, social, environmental and economic aspects to arrive at sustainable and practical solutions.

Trough our personal service, we thus contribute effectively to a successful planning, design, implementation, commissioning and operation of projects and programs.

The mother firms are accredited to Quality Management System Standards ISO 9001 Environmental Management Standards ISO 14001.

The firm's turnover in 2012 was approximately € 25 million.



Zaans Medical Centre, Zaandam, The Netherlands



DUTCH HEALTH ARCHITECTS

VISION ON HOSPITAL DESIGN

Dutch healthcare is well known for its innovative approach and effectiveness. New concepts focusing on patient logistics and efficiency of workflows and work-processes are combined with aspects of Lean hospital design, Healing environment and the Plane tree Philosophy.

It is our challenge to define and fully understand the demands of our clients before the best possible 'answer' in designing a building is developed. It is not just implementing proven solutions, but generating intelligent concepts that facilitate the client's organization now and in the future.

We have a multidisciplinary and integrated approach to our projects, covering technical-, logistical-, legal-, organizational-, social-, environmental- and economical aspects to arrive at sustainable and practical solutions. And last but not least, we create an inspiring environment for people to feel comfortable.

In the vision of DHA, hospitals and adjacent facilities should be able to accommodate the rapid developments in healthcare and be able to facilitate new treatments without compromises as well as be able to provide patients, personnel and visitors a healthy and preventive atmosphere (healing environment) for the benefit of shorter average treatment times and better working conditions.

The beauty of a good hospital lies in the inside: the design of the functional aspects and the healing architecture asks for designing from the inside out.

Dutch hospital design has the tradition of creating the design in close corporation with the client, using workshops, dialogues and expert meetings. These 'open design processes' guarantee that the expertise of the end-users is always incorporated in the design. For DHA the advantage is that by the processes we are able to gain a lot of practical knowledge that we consider to be very precious to serve our clients.

The experience in design hospitals in this tradition for more than 50 years, gives us the freedom to generate new hospital concepts in which functionality and safety are combined with healing environment and excellent architecture.

The tradition of the 'open' design-process gives us the opportunity to integrate the culture of the client's organization and the unique aspects of a regions cultural tradition in our projects in the most intelligent way. Also new concepts for better healthcare can be implemented in the best harmony.

Our efforts results in unique hospital projects according to the latest international standards that can serve the local society in the best possible way.

Haga Hospital, The Hague, the Netherlands



HEALING ENVIRONMENT AND EVIDENCE BASED DESIGN

We are convinced that the design of the physical environment of healthcare facilities can play an important role in increasing quality of life of residents by improving sleep, supporting orientation, reducing agitation, increasing social interaction and providing control and choice. Different aspects of the environment, such as unit size and layout, provision of private rooms, noise levels, and supportive design features, will contribute to better outcomes among patients, students and staff. Creating a homelike environment is also of primary importance in the sense that patients have the opportunity to participate in activities that are familiar from their past lives (as opposed to rigid institutional routines) and spaces that are similar in size and shape to those found in people's homes.

The quality of break-out and landscaped spaces within the hospital are essential contributors to a positive experience of the hospital and educational environment for all users. The disposition, scale, orientation and design objectives of each of these spaces will be carefully considered within the context of the whole building in order to achieve an optimal integrated approach which complements the interior design and wayfinding strategy.

We strive to innovate new health care concepts focusing on patient satisfaction and safety, the efficiency of the workflows and processes, optimizing the quality of care. Our method is Evidence Based Design, where we keep ourselves up to date with best practices and research to make informed design decisions to create an optimal Healing Environment.

One of the important factors in creating a healing environment is access to natural daylight. In the current design, many inside situated rooms are included. In the design review we will optimize the orientation and locations of these spaces.

In recent years it has become increasingly evident that the environment has a great effect on human wellbeing. In relation to health care and hospital design it has a vital effect on the health care outcomes of patients, the involvement of relatives, and the health and efficiency of the staff.

Creating an Evidence Based Design means that every design decision is based on evidence, from science and research, stating how environmental factors can have an important impact on the healing process and health care outcomes of people. We take into account not only the patients in the hospital but also their families, as well as the hospital staff.

Daylight

Daylight plays an important role in the overall experience of a physical environment. Exposure to light has proven to reduce pain, improve depression, improve the biorhythm of the body and thereby the sleep rhythm. Patients assigned to sunnier and brighter rooms turn out to have shorter hospitalization time and quicker recovery. Furthermore, patients in brighter rooms have proven to experience less stress and worry. More practically light has proven to have a large impact on medication and journalization errors as well as injuries amongst patients and staff. Well lit spaces ensure fewer errors and fewer accidents.

Views and Access to nature

The possibility to see or to stay in a green environment has been proven to affect the psychological and physical wellbeing of humans positively. Several studies indicate that real or simulated views of nature can relieve psychological and physiological stress. Gardens and green environments can give a restorative escape from the busy hospital environment, not only for the patients but for relatives and staff as well. Views to nature have furthermore proven to alleviate pain, through increasing the production of positive emotions, reducing stress and distracting patients from focusing on their pain.

Easy Orientation

Designing health care facilities that are easy to overview, can improve the patients' experience remarkably, as the experience of not being able to find ones way only underlines the stress and worry one may already feel from being in an unfamiliar health care environment. In hospitals, a structure that is easy to overview and navigate has proven to save time and money, in terms of time spend by the staff to show bewildered visitors around. Creating a well-organized plan, where related functions are gathered, reduces the internal distances, which saves time and has proven to reduce staff attrition and stress.

Comfortable Acoustic Conditions

Hearing is one of the senses that constitute the human alert system and as opposed to the eyesight it cannot be turned off. Accordingly, unpleasant noise has been proven to have a negative effect on people, bringing psychological reactions such as irritation, fatigue, inattention and low pain threshold.

Indoor Climate

Unfortunate indoor conditions, such as uncomfortably high or low temperatures or bad air quality have been proven to have a negative effect on work performances, mood as well as physical wellbeing. People who are hospitalized are excessively sensitive to the environmental conditions, and for this reason it is an extra important factor when designing health care environments.

Private Space

The possibility to be private has proven to be important in order to build up a confident relationship between patient, relatives and staff. Clear communication has a crucial impact on the course of the disease and the treatment. The opportunity to stay in single bedrooms has proven to ensure a better feeling of privacy for the patient. There are less noise disturbances from other patients, ensuring a better feeling of confidentiality and improving the communication between staff, patients and relatives. Among the staff single bedrooms are furthermore considered more appropriate for examinations and consultations. Single bedrooms moreover prove to give a lower ratio of hospital-acquired infections as a result of less contact between patients and easier and more thorough cleaning procedures.



Jan Portaels Hospital, Vilvoorde, Belgium



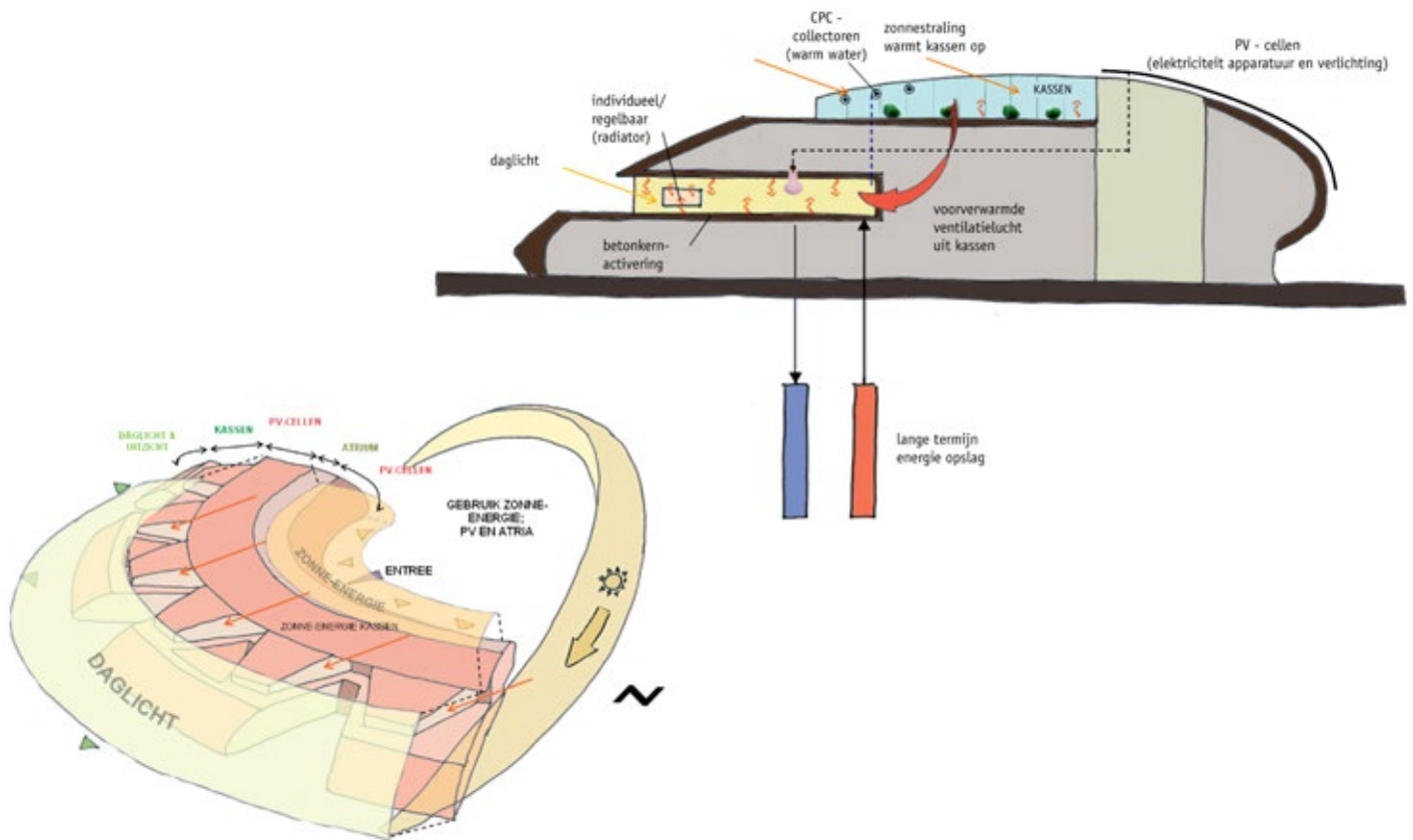
DUTCH HEALTH ARCHITECTS

Space for Family and Relatives

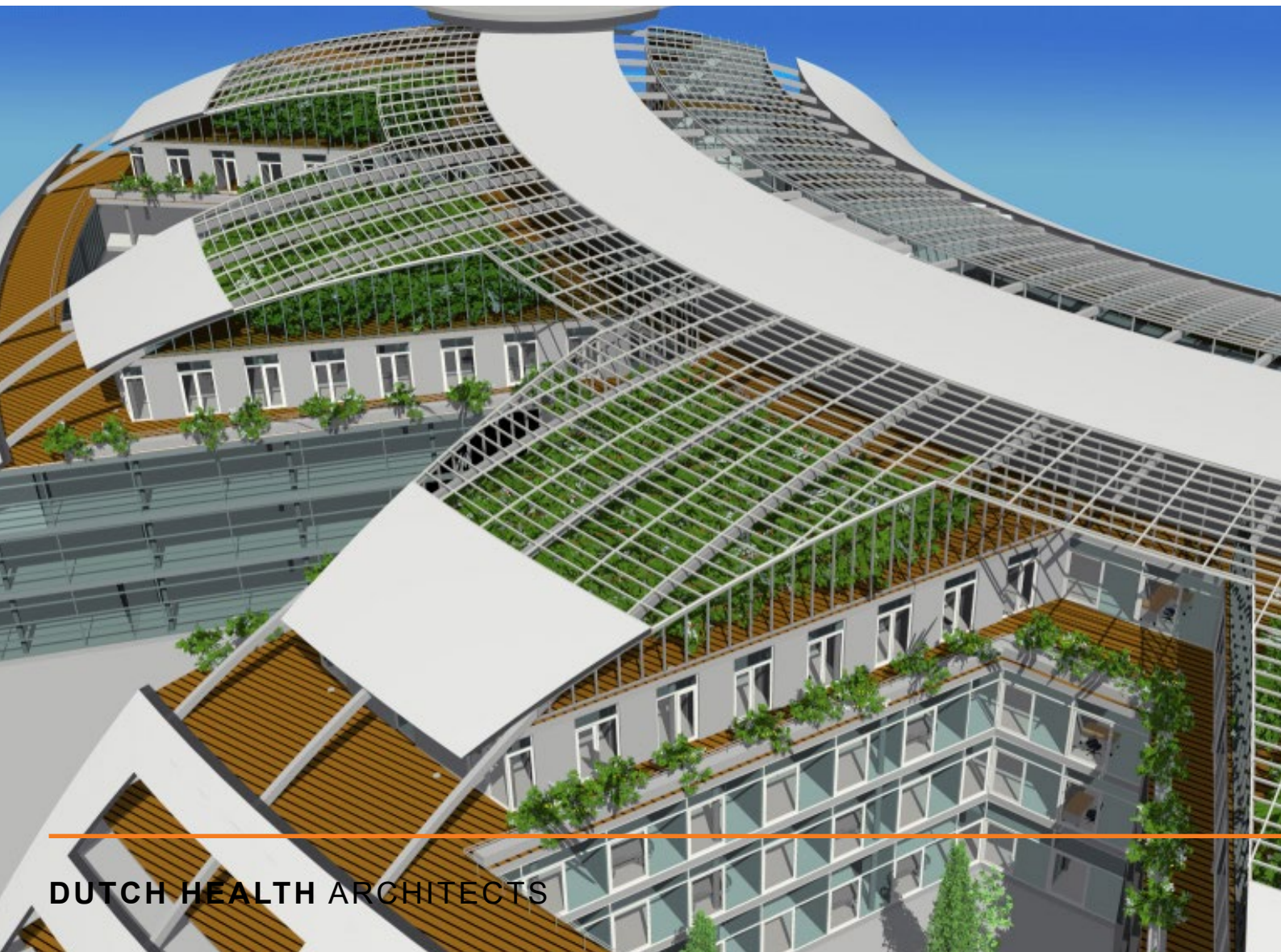
The patient's relationship and social interaction with close relatives have proven to play an important role in the survival from a serious disease as well as the recovery and healing. The explanation may be the influence close relatives can have on the behavior of a patient, in terms of maybe eating healthier, exercise more, following doctor's advice and completing the treatment. Having appropriate space for the family is an important design factor, as it has proven to support the recovery of patients, shorten length of stay and improve their experience of stress, anxiety and fear.

Art and Interiors

Art and colours can function as positive distractors in relation to painful treatments, but also in relation to general stimulation of the senses and mental distraction, making people feel relaxed and less stressed. Colours and art can moreover be part of an overall way finding system, creating focal points that are easily remembered and recognized.



Competition Healthcampus, Knokke, Belgium



SUSTAINABILITY

We are proud to state that environmental issues, energy consumption and life cycle cost are basic subjects which go hand in hand when designing. We operate and design according to the principles of People, Planet (environment), Prosperity (profit), interconnected, and in harmony with one another. We aim to make buildings which take into account the local context (climate, ecosystems, historical and cultural) and are able to adapt flexibly (as regards technical and program) to changing circumstances (i.e. future growth). The new hospital campus should add maximum added value in terms of quality, economics and environmental impact for both users and the environment.

According to us, sustainability also promotes exploitation driven design. A sustainable building results in direct profit in the exploitation and in indirect profit in terms of future value. A sustainable hospital, for example, will not only have a more sustainable energy concept but also a so-called healing environment in which patients heal faster. The air quality, the use of light, color and views are all key factors in this. As a result there's is not only a win for the energy bill, but also for the medical processes. Because of our integral approach we are able to use our resources efficiently and effective and achieve a maximum result.

Below we propose some sustainable examples that could be taken into consideration with regard to environmental sustainability in next stages of the design of the hospital campus.

Energy

The area in which the new hospital campus will be realized is characterized by hot and dry summers and mild, rainy winters. Our approach would be to appreciate these natural resources and benefit from them in creating a healthy and enticing environment. In order to realize a healthy and comfortable hospital campus, passive and active strategies could be applied. The shape, orientation and cladding of the buildings influence the indoor climate and energy usage. High solar radiation can lead to unwanted overheating of buildings, however when shades and louvers are applied, sunlight will enter the building, while the heat is kept out. In that way the benefits of the natural resource are used to its fullest. The same strategy could be applied in landscaping. Planting endemic trees will allow sunlight to heat the environment up in winter, but provide comfortable shading in summer. By applying thermal mass in the buildings, the core temperature remains constant throughout the year.

Water

As water is often scarce in these regions, our proposal would be to introduce a campus-wide water management system of diminishing need, harvesting, re-use of water and filtering of water in landscaped ponds. New water cycles will limit the water footprint of the hospital campus. The need for water can be lowered, by planting of indigenous vegetation, in order to lower the need for irrigation and water efficient fixtures and fittings. For applications with low requirements alternative water solutions are suitable, thereby diminishing the need for potable water.

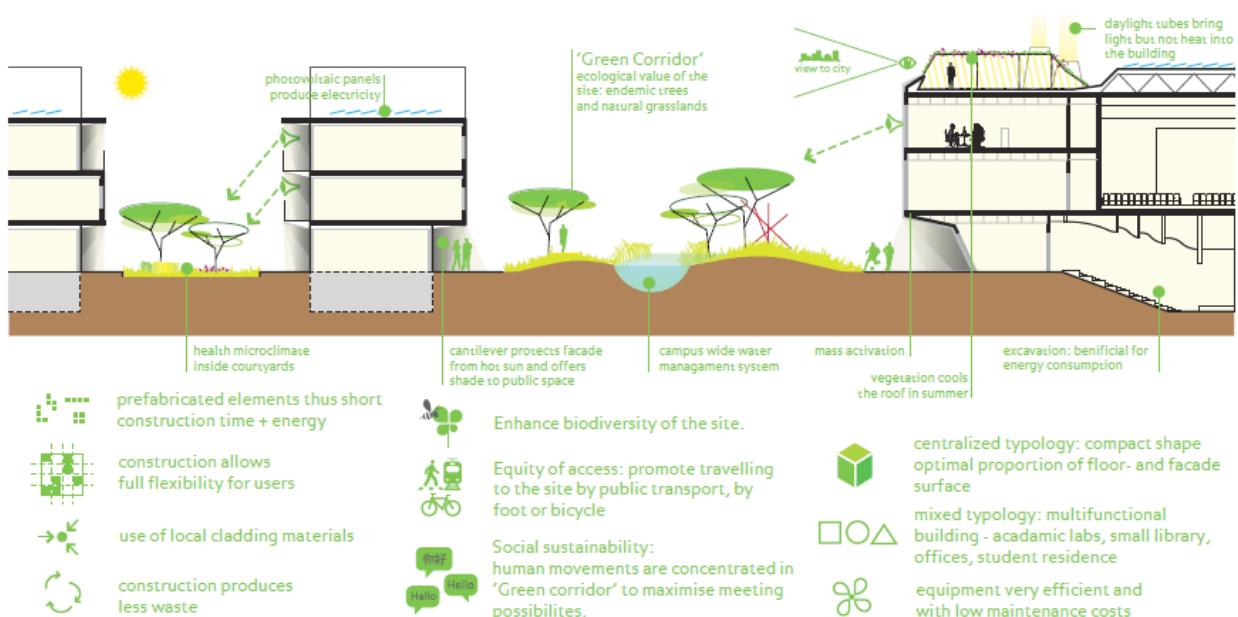
Ecology

To enhance the current ecological value of the land where the hospital campus will be developed, we propose to introduce endemic trees and natural plants which promote the increase of biodiversity. All currently environmentally sensitive land features will be protected and incorporated within the master plan. Environmental management plans and monitoring thereof will be part of all construction procedures and activities.

Certification

In order to ensure, control and measure the objectives regarding sustainability, multiple methods are available. The best known examples are LEED and BREEAM. We use all these various certification methods for measuring, but also as a design tool to translate your ambitions into actual sustainability measures. We perform, for example, a quickscan at the beginning of the project to find out how the design is rated compared to the aspirations and what the possibilities are for improvement in respect of location, investment and operation. In addition, the review can serve as a basis for sustainability certification, to obtain financial support from the government.

The key to successful implementation of sustainability in a building is an integrative approach. In the early design stage, most degrees of freedom for design choices are available, which makes it possible to focus on measures that are in line with the building philosophy and that bring long-term benefits for the company and the community.



Examples of sustainable solutions for hospital design

Deventer Hospital, Deventer, the Netherlands (example of a sustainable design)





PROJECTS





ERASMUS MEDICAL CENTER

Architect	DHA • EGM
Location	Rotterdam
Size	450 beds
Principal	Erasmus Medical Center
Planning period	2004 - 2017
Gross floor area	185,000 m²
Investment costs	approx. € 1,2 billion excl. VAT
Operating rooms	18, including 1 brachy OR
CT/MRI scanners	10 CT, 9 MRI
Radiotherapy bunker	12
Labs & classification	15,000 m² various labs, class. ML-I, ML-II en ML-III
Pharmacy	External production pharmacy A15 Gorinchem



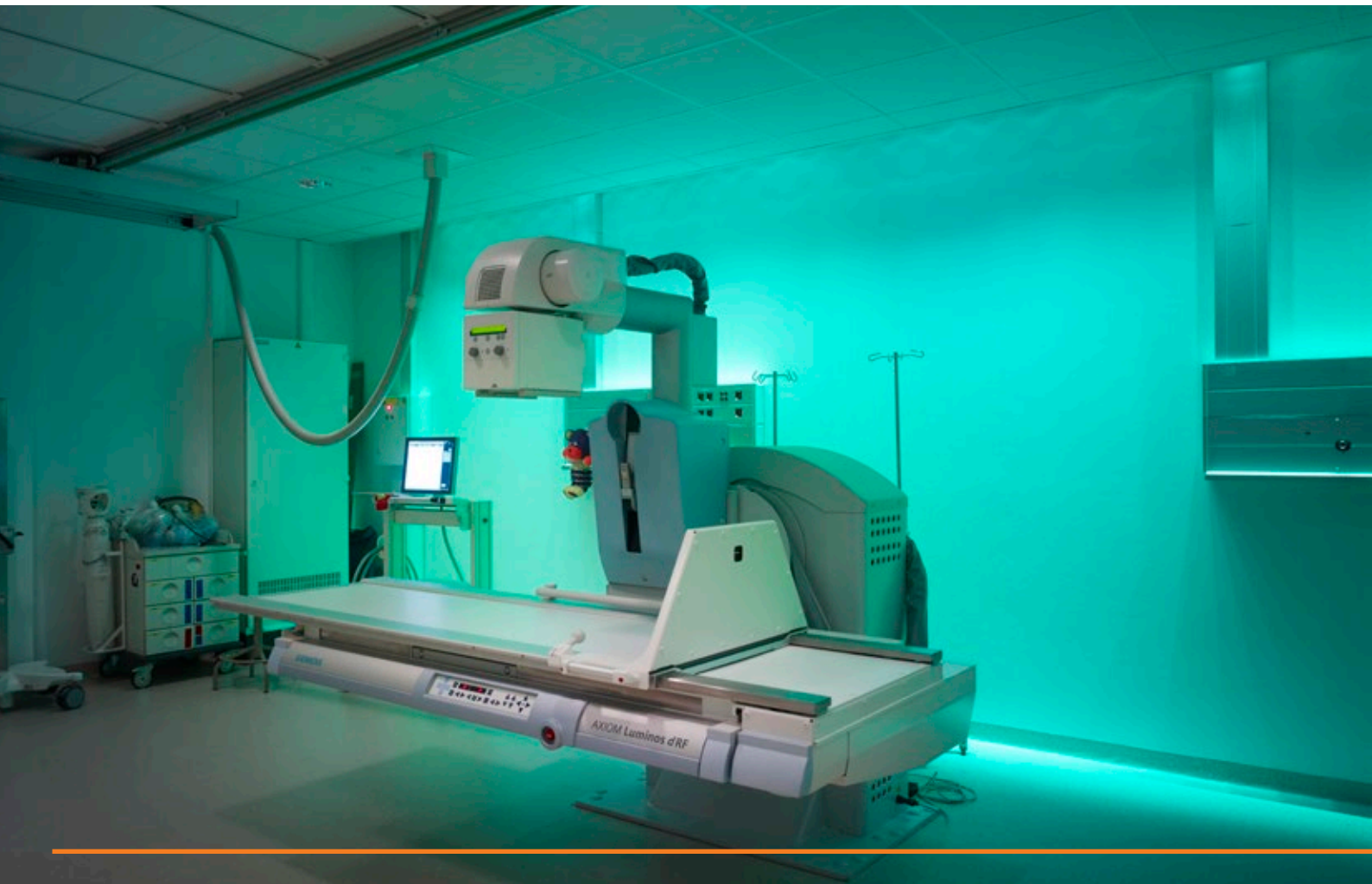




DEVENTER HOSPITAL

Architect	DHA • dJGA
Location	Deventer
Size	377 beds
Principal	Deventer Hospital
Planning period	2000 - 2008
Gross floor area	82,350 m²
Investment costs	€ 117,580,352 excl. VAT
Operating rooms	10 + 2
CT/MRI scanners	2 CT , 2 MRI, PETCT
Radiotherapy bunker	5
Labs & classification	4,000 m² class. D
Pharmacy	Yes

Architect	DHA • dJGA
Location	Ghent, Belgium
Size	104 beds
Principal	Ghent Academic Hospital
Planning period	2007 - 2011
Gross floor area	16,000 m ²
Investment costs	€ 29,000,000 excl. VAT
Operating rooms	4
CT/MRI scanner	2 CT, 1 MRI





ZIEKENHUIS
antonius



SINT ANTONIUS HOSPITAL

Architect	DHA • dJGA
Location	Utrecht
Size	220 beds
Principal	Sint Antonius Hospital
Planning period	2007 - 2012
Gross floor area	56,220 m²
Investment costs	€ 84,709,530 excl. VAT
Operating rooms	10
CT/MRI scanners	2 CT, 2 MRI
Labs & classification	Clinical chemical and microbiological
Pharmacy	Yes, class. B

BERNHOVEN HOSPITAL

Architect	DHA • DJGA
Location	Uden
Size	350 beds
Principal	Bernhoven Hospital
Planning period	2007 - 2012
Gross floor area	56,335 m²
Investment costs	€ 101,200,000 excl. VAT
Operating theater	8
CT/MRI scanners	2 CT, 2 MRI
Labs & classification	Classification D
Pharmacy	Yes









RADBOD UMC MEDICAL FACULTY

Architect	DHA • EGM
Location	Nijmegen
Size	485 beds
Principal	Radboud umc
Planning period	1996 - to date
Gross floor area	128,500 m² (multiple buildings, new renovation, redevelopment)
Investment costs	€ 255,960,000 excl. VAT
Operating rooms	25
CT/MRI scanners	3 CT, 5 MRI, 2 PET-CT
Labs & classification	Hotlab GMP C + Radionuclear B Approx. 20 labs classification B and C, biological organism 2 and 3 Medical microbiology Clinical genetics GMP, electron microscopy, VMT and C1 and 2 Specialized bloodbank facilities
Pharmacy	Yes
Particulars	Staff building and dialysis unit with 30 places Helipad, ER, 4 gamma camera Children's hospital, children's IC, obstetrics, neonatology Underground car parking (3 levels) with approx. 600 parking spaces

JEROEN BOSCH HOSPITAL

Architect	DHA • EGM
Location	's-Hertogenbosch
Size	730 beds, including 26 IC, 27 cardiac care and 36 rehabilitation center
Principal	Jeroen Bosch Hospital
Planning period	2003 - 2011
Gross floor area	116,000 m²
Investment costs	€ 403,500,000 excl. VAT
Operating rooms	16 include 1 hybrid OR
CT/MRI scanners	2 PET-CT, 3 MRI, 1 3Tesla, 2 1.5 Tesla, several CT and bucky
Radiotherapy bunker	2 at Verbeeten Institute
Labs & classification	Classification ML1, ML2, ML3 Hotlab, isotope lab nuclear medicine GMP classification D, RN Classification B Labstreet clinical chemistry lab (Vista by Siemens) BSL III lab for medical microbiology Medical microbiology lab ML II Pathological lab
Pharmacy	Production pharmacy





AD PhD



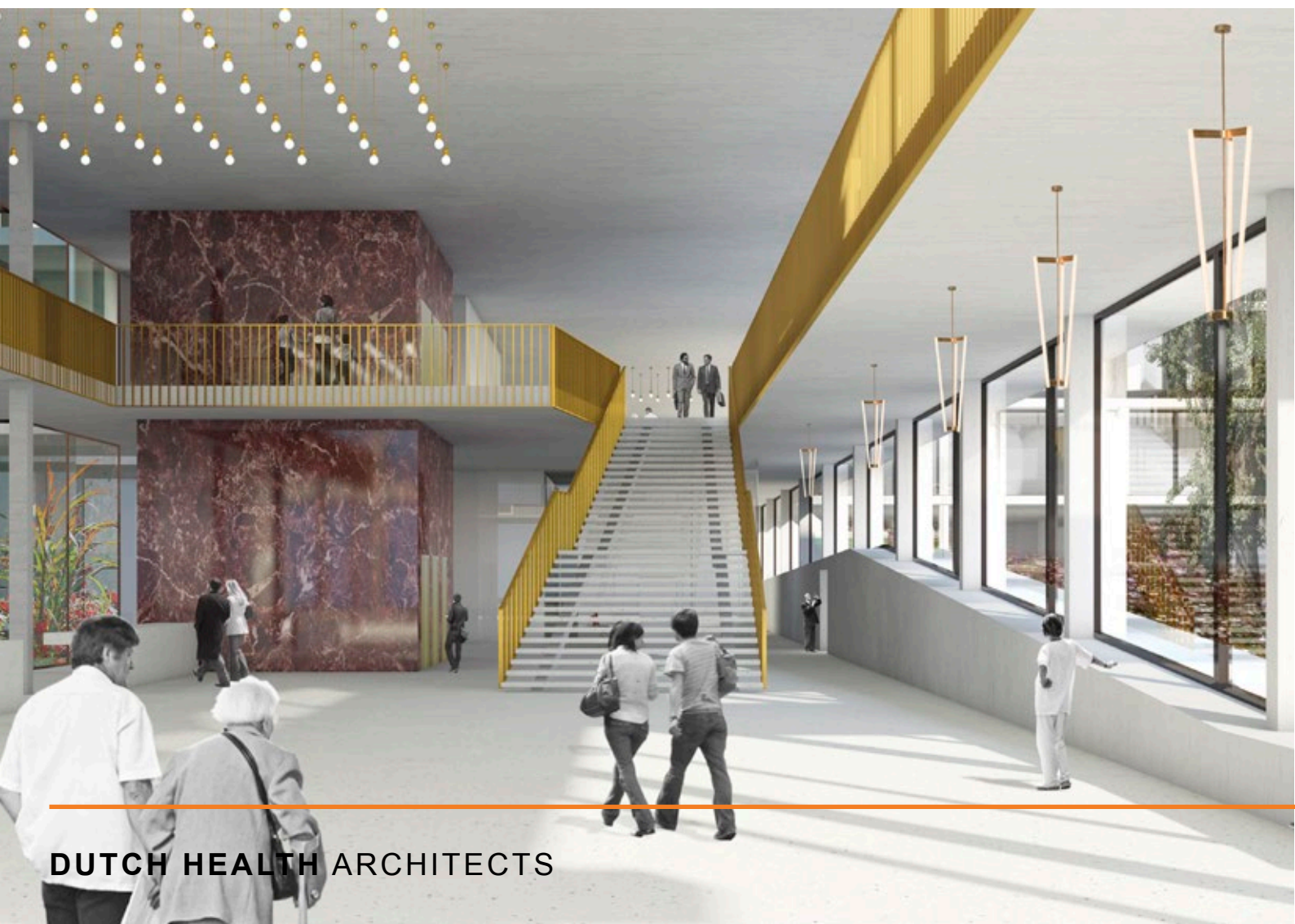


DUTCH CANCER INSTITUTE

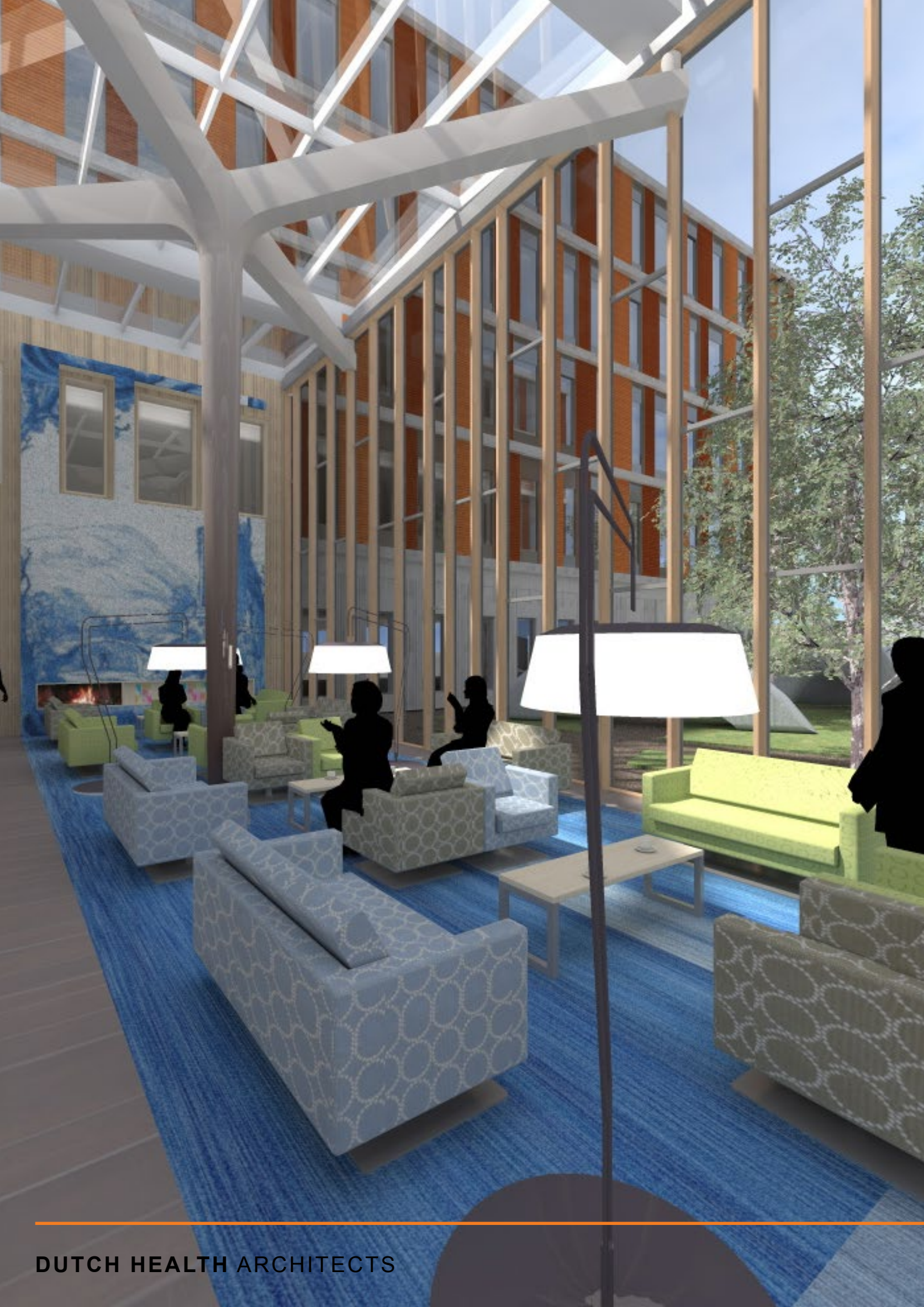
Architect	DHA • dJGA
Location	Amsterdam
Size	108 beds
Principal	Dutch Cancer Institute
Planning period	1999 - 2006
Gross floor area	87,000 m²
Investment costs	€ 124,000,000 excl. VAT
Operating rooms	16
CT/MRI scanner	MRI OR, mice MRI/CT, 10 electa MRI 2CT PET CT Gamma camera, 2 C1, 2 C2, B lab
Radiotherapy bunker	10
Labs & classification	4,000 m² C1, C2, B, clinical lab
Pharmacy	3 pharmacies including 1 Cytotox pharmacy

JAN PORTAELS HOSPITAL

Architect	DHA • dJGA
Location	Vilvoorde, Belgium
Size	400 beds
Principal	AZ Jan Portaels Hospital
Planning period	2012 - 2018
Gross floor area	45,000 m²
Investment costs	€ 119,600,500 excl. VAT
Operating rooms	7
CT/MRI scanners	2 CT, 2 MRI
Labs & classification	Clinical biology and pathological anatomy
Pharmacy	Yes, classification B







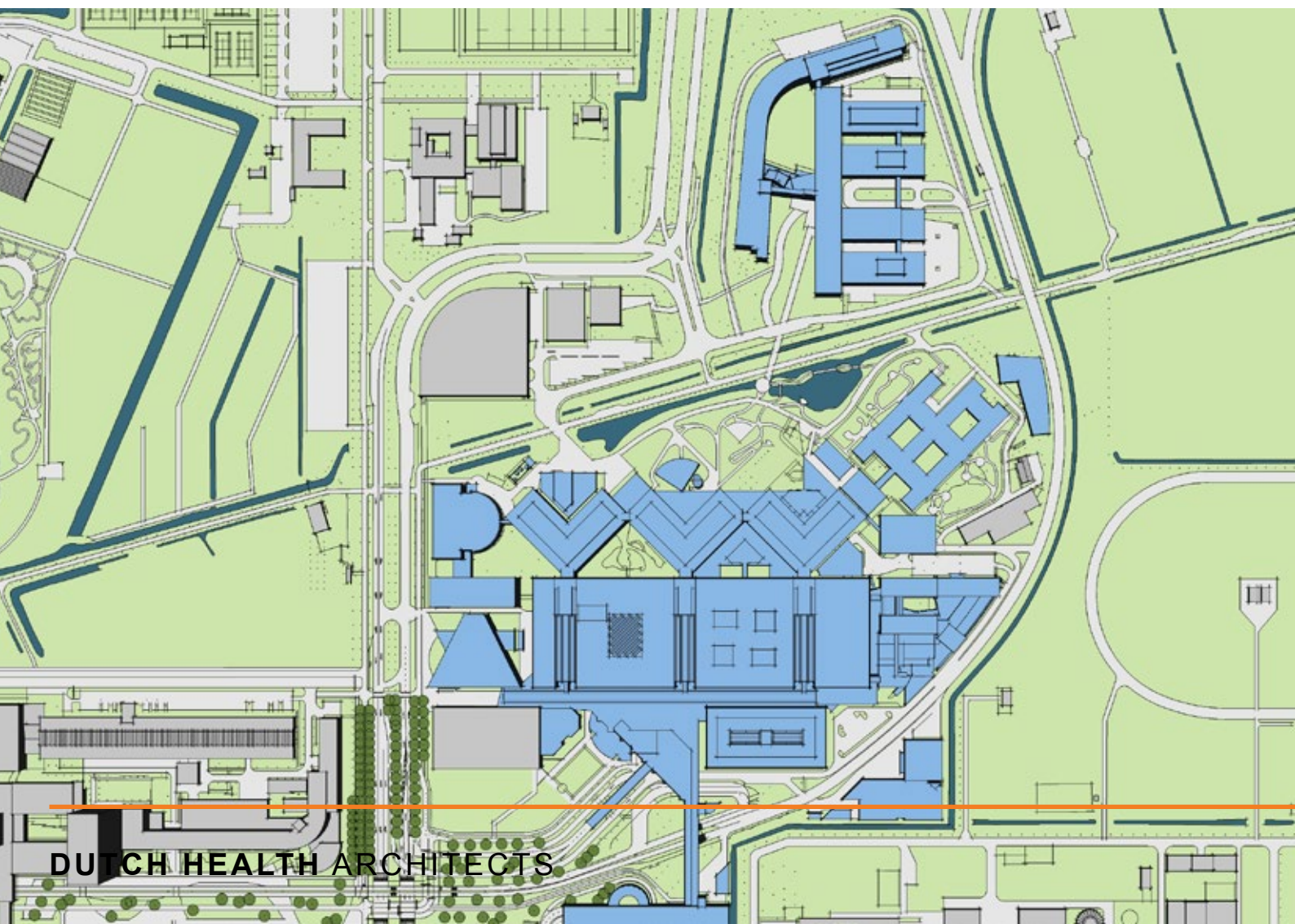


HOSPITAL REINIER DE GRAAF GASTHUIS

Architect	DHA • EGM
Location	Delft
Size	470 beds
Principal	Reinier de Graaf Groep
Planning period	2010 - to date
Gross floor area	57,000 m²
Investment costs	€ 150,000,000 excl. VAT
Operating rooms	6
CT/MRI scanners	4 CT, 3 MRI
Radiotherapy bunker	2
Labs & classification	Hotlab
Pharmacy	24/7
Particulars	Hydrofer, pharma filter (medical waste through Tonto's)

UNIVERSITY MEDICAL CENTER UTRECHT

Architect	DHA • EGM
Location	Utrecht
Size	783 beds
Principal	various clients
Planning period	1986 - to date
Gross floor area	271,300 m²
Investment costs	Multiple buildings (new and renovated) over de last 3 decades
Operating rooms	29
Coronary Cath.	4
CT/MRI scanners	5 CT, 7 MRI
Radiotherapy bunker	14
Labs & classification	Approx. 13,000 m² research and clinical lab Microbiology, pathology, isotope, hematology Class. L1, L2 , L3
Pharmacy	Approx. 3,750 m² production pharmacy (GMP standards)





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DEUR
OPEN



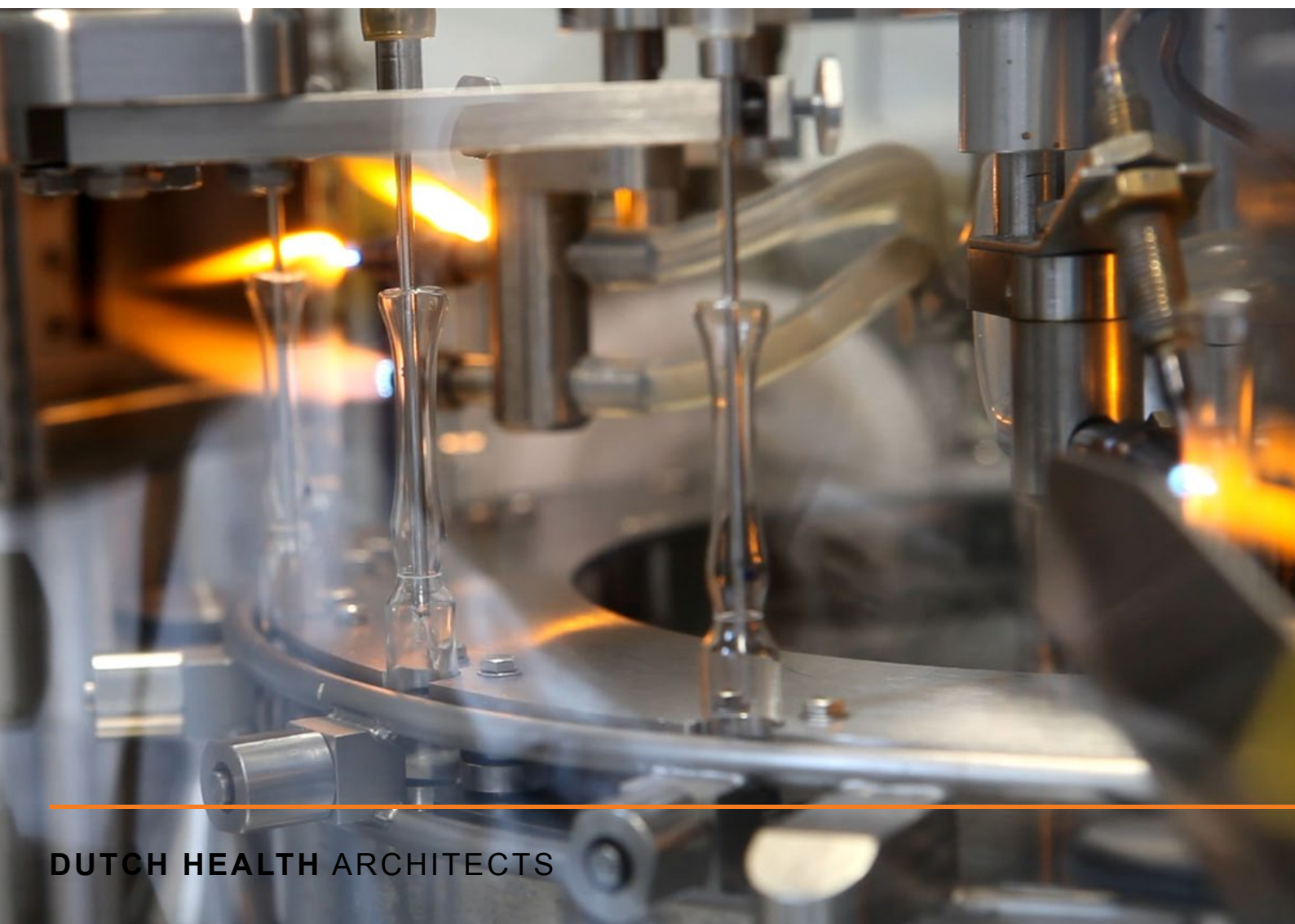


UZ LEUVEN UNIVERSITY HOSPITAL

Architect	DHA • dJGA
Location	Leuven, Belgium
Size	223 beds
Principal	UH Leuven
Planning period	2005 - 2013
Gross floor area	31,000 m²
Investment costs	€ 67,000,000 excl. VAT
Operating rooms	10
CT/MRI scanners	1 CT

PHARMACY A15

Architect	DHA • EGM
Location	Gorinchem
Principal	Erasmus Medical Center, Rotterdam
Planning period	2011 - 2013
Gross floor area	4,500 m²
Investment costs	€ 20,330,000 excl. VAT
Labs & classification	Lab and GMP rooms class. B, C en D
Pharmacy	Central production pharmacy









HONLIV HOSPITAL CANCER CENTER

Architect	DHA • EGM dJGA
Location	Changyuan, China
Size	500 beds
Principal	Honliv Hospital
Planning period	2012 - 2014
Gross floor area	65,350 m²
Investment costs	€ 135,000,000 excl. VAT
Operating rooms	16
CT/MRI scanners	3 CT, 2 MRI
Radiotherapy bunker	5
Labs & classification	15 class. 5

WANICA MEDICAL CENTER

Architect	DHA • EGM dJGA
Location	Wanica, Suriname
Size	300 beds
Principal	Ministry of Public Health
Planning period	2012 - 2016
Gross floor area	40,000 m²







THEMES | INNOVATION



UZ Leuven University Hospital

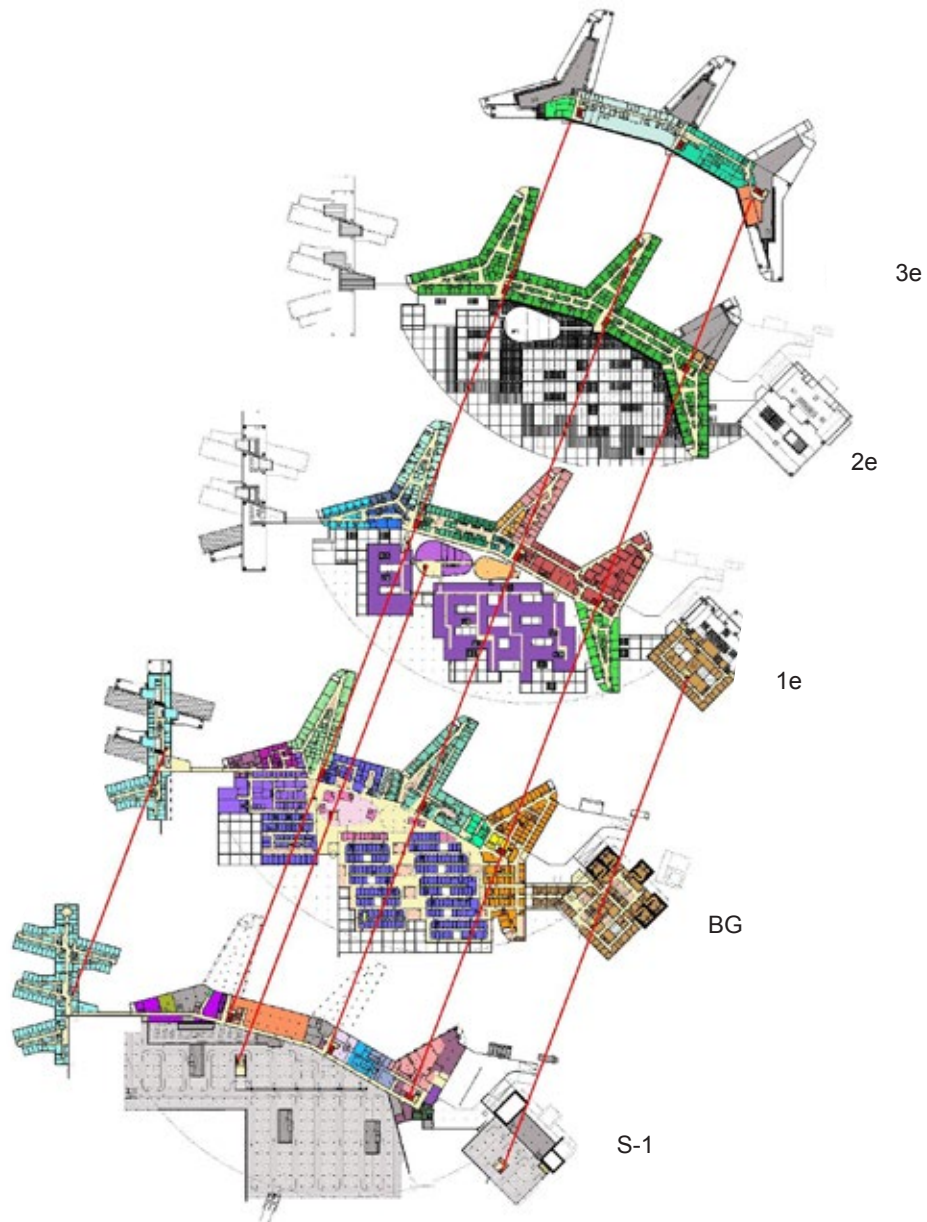


The Dutch Cancer Institute / Antoni van Leeuwenhoek Hospital



The Dutch Cancer Institute / Antoni van Leeuwenhoek Hospital

THEMES | INNOVATION



Deventer Hospital



Utrecht Sint Antonius General Hospital



THEMES | HEALING ENVIRONMENT



NKOC Competition



Colour & Comfort | NKOC Competition



Art | Deventer Hospital

THEMES | HEALING ENVIRONMENT



Nature & Daylight | NKOC Competition



Nature | Rijnveste Psychiatric Care

DUTCH HEALTH ARCHITECTS

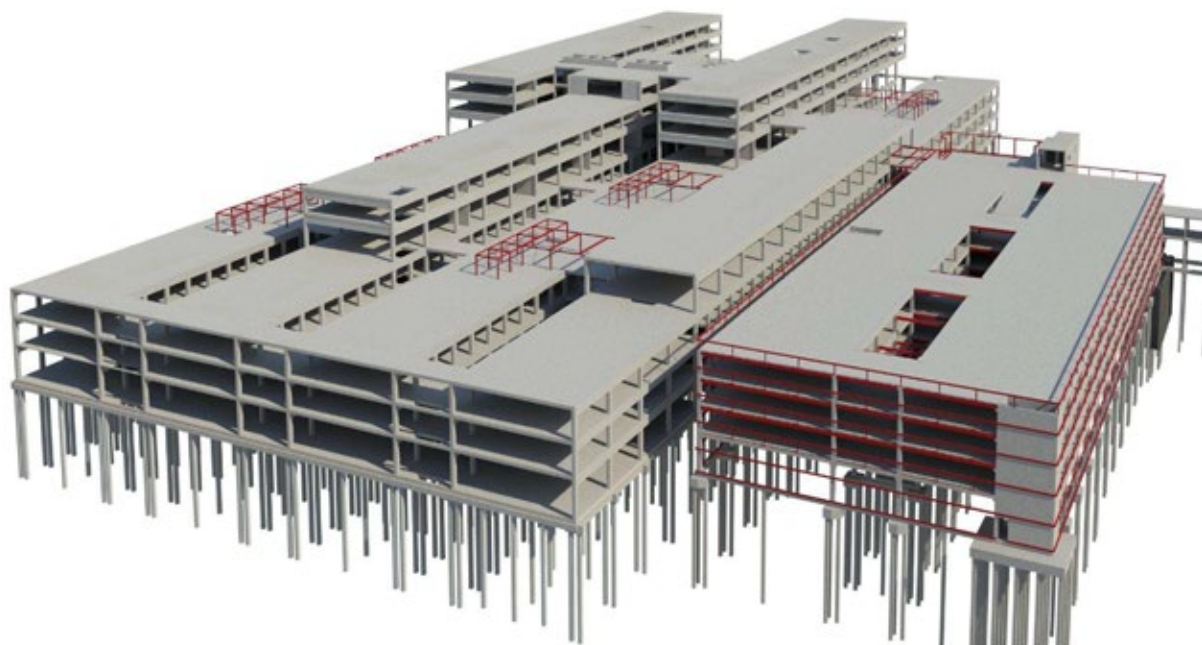
THEMES | HEALING ENVIRONMENT



Comfort | Small Hospital Competition



Nature & Identity | Radiotherapeutic Institute Haaglanden

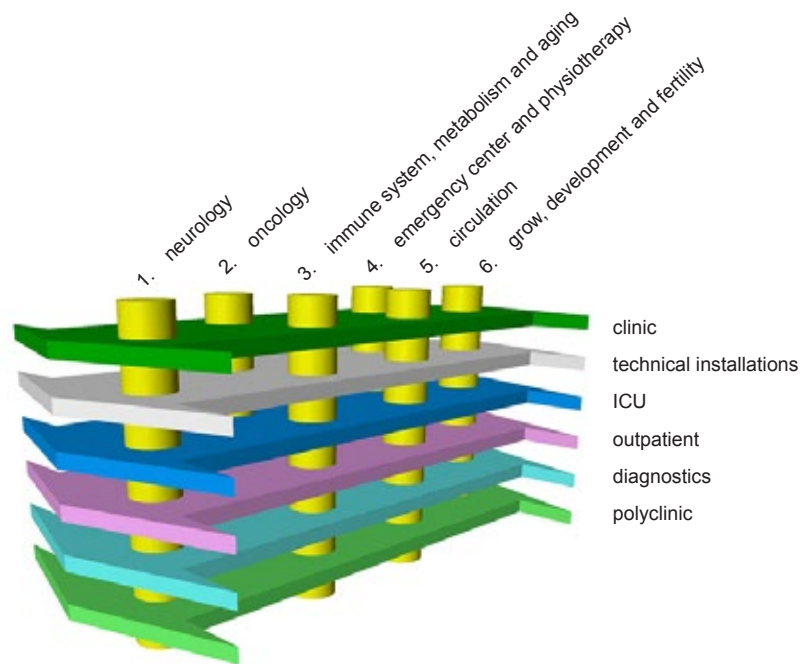


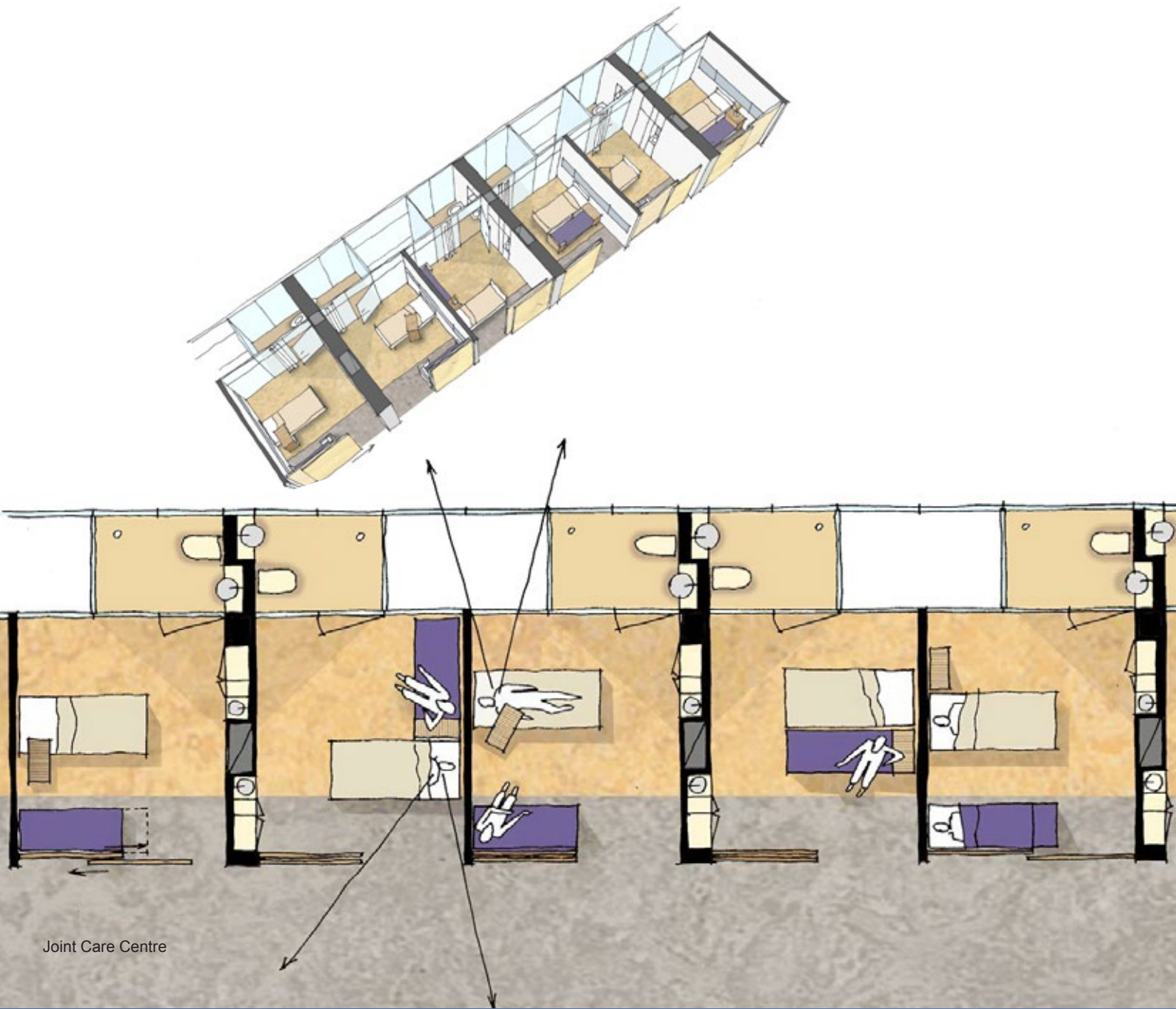
Utrecht Sint Antonius General Hospital | construction scheme

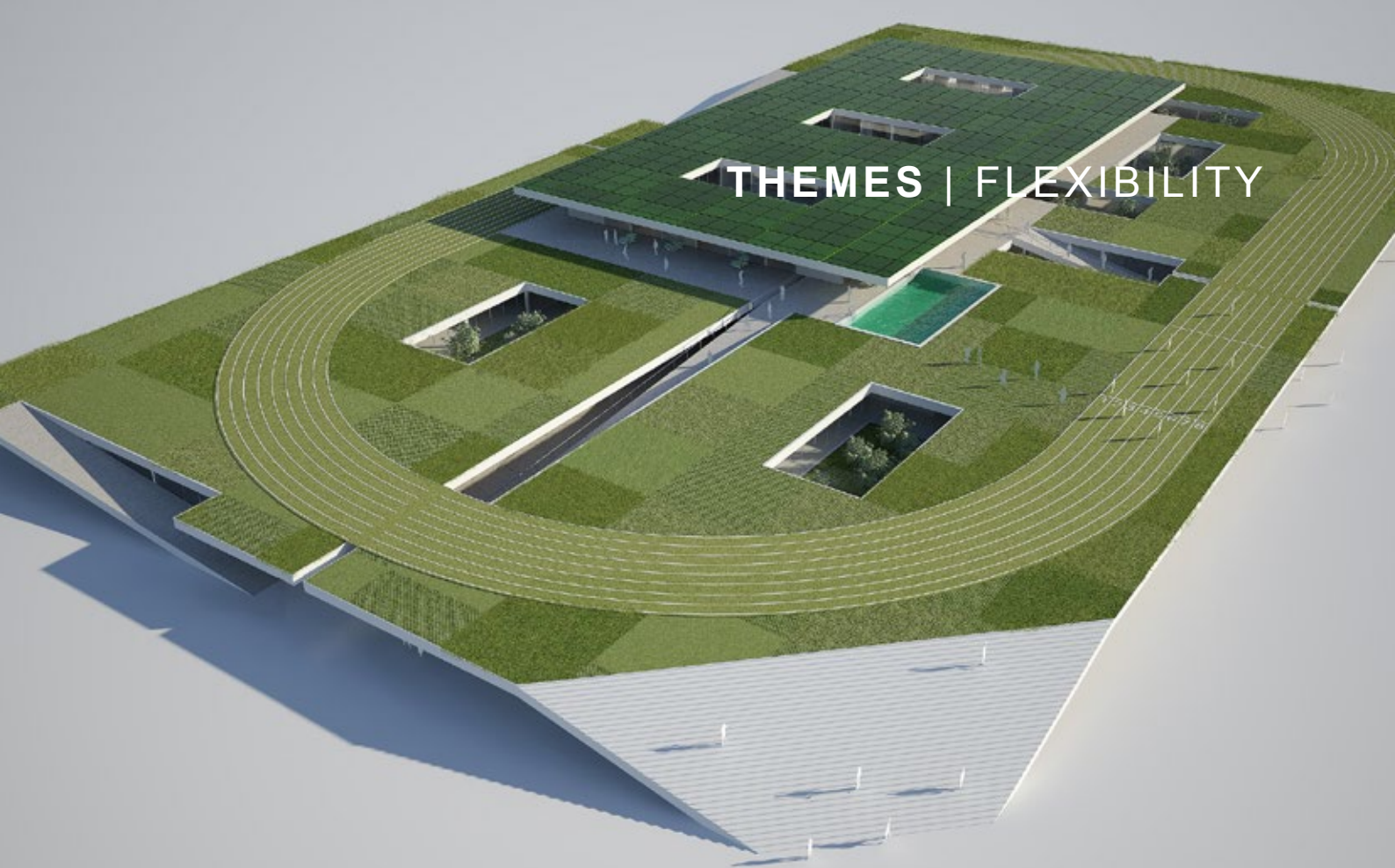


Hospital Maas en Kempen

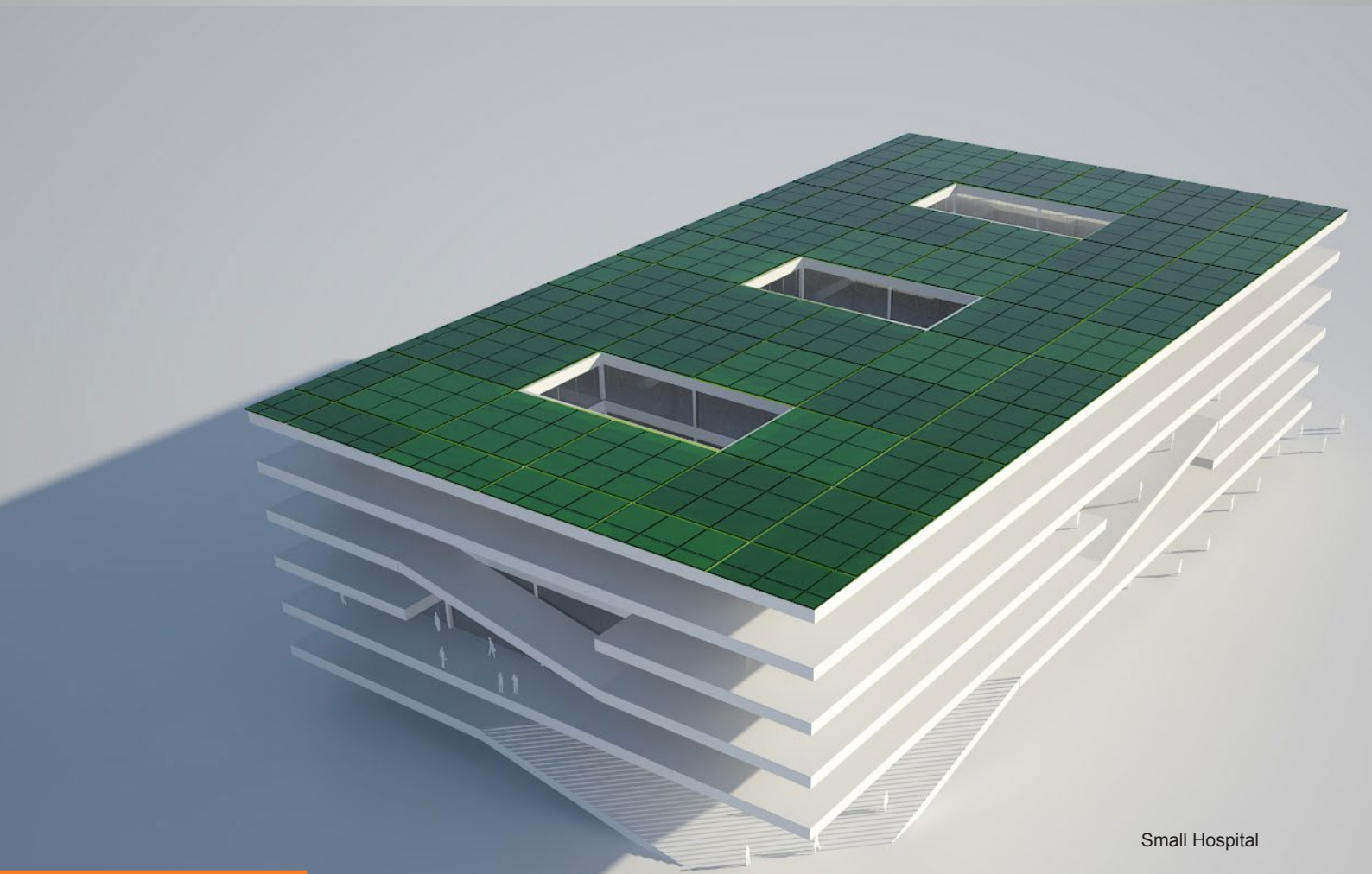
THEMES | FLEXIBILITY



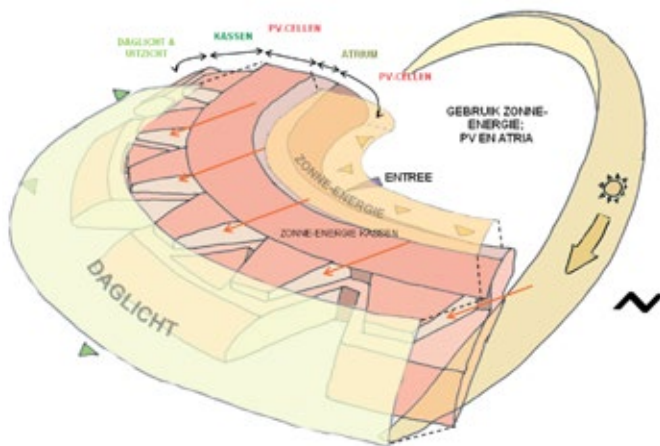
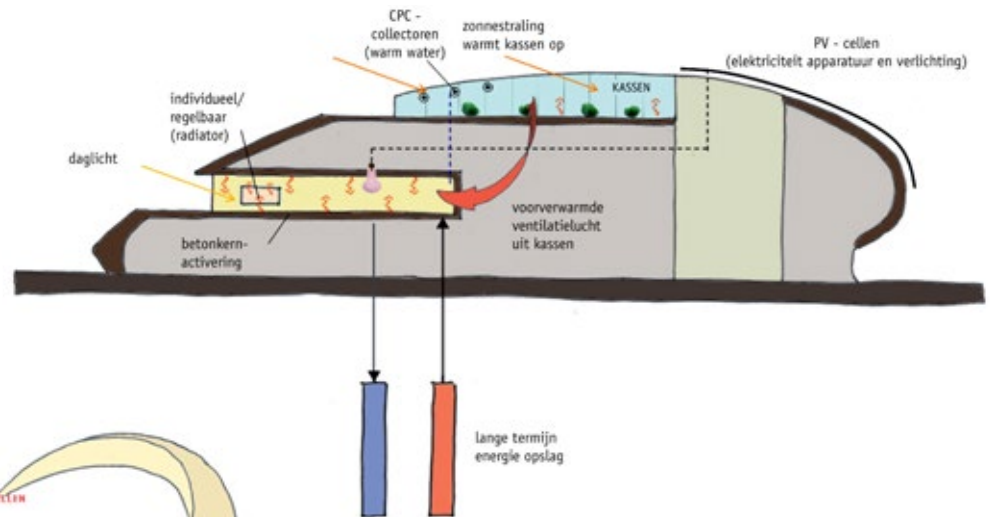




THEMES | FLEXIBILITY



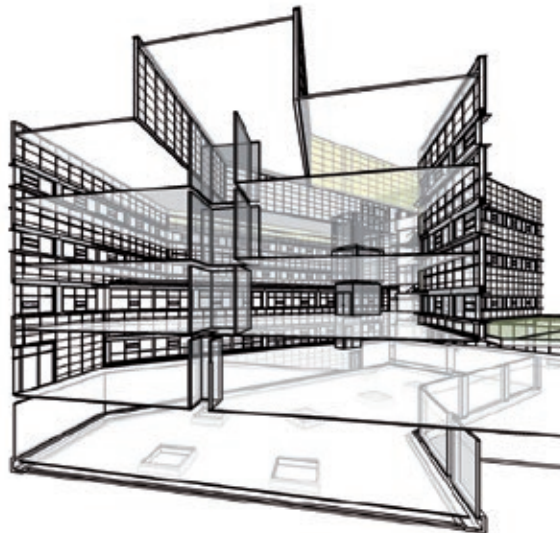
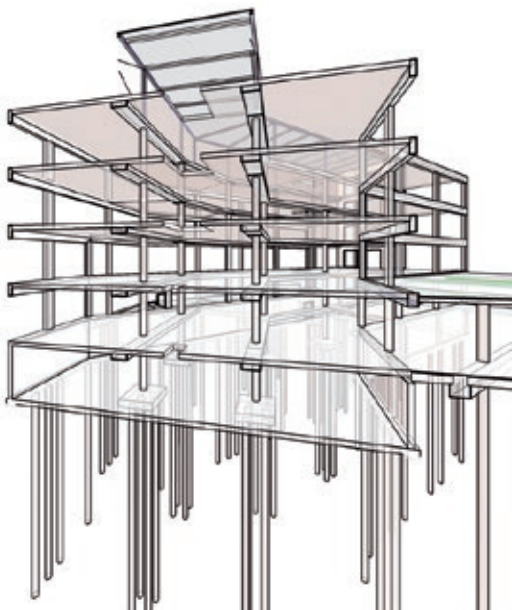
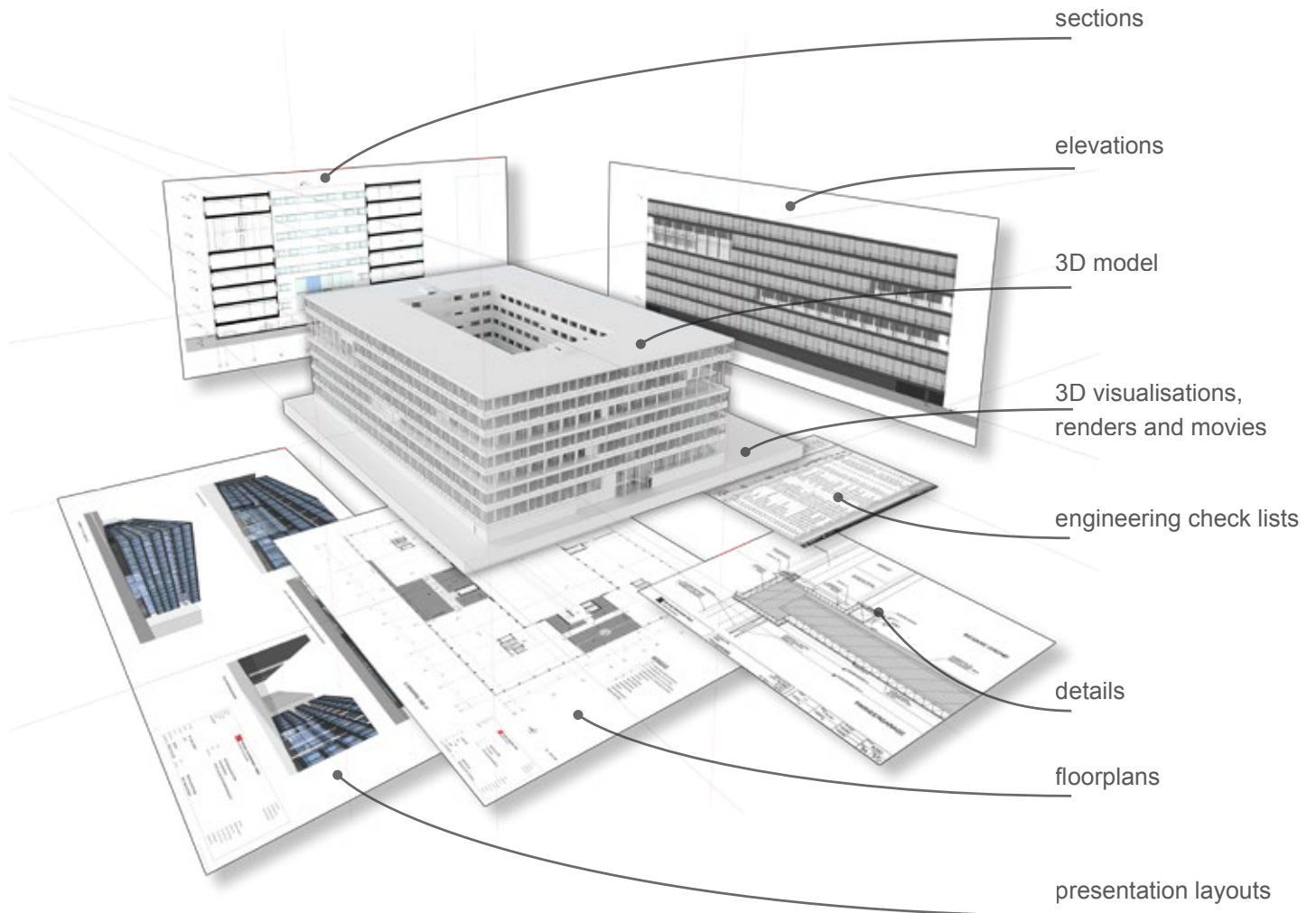
Small Hospital



THEMES | SUSTAINABILITY



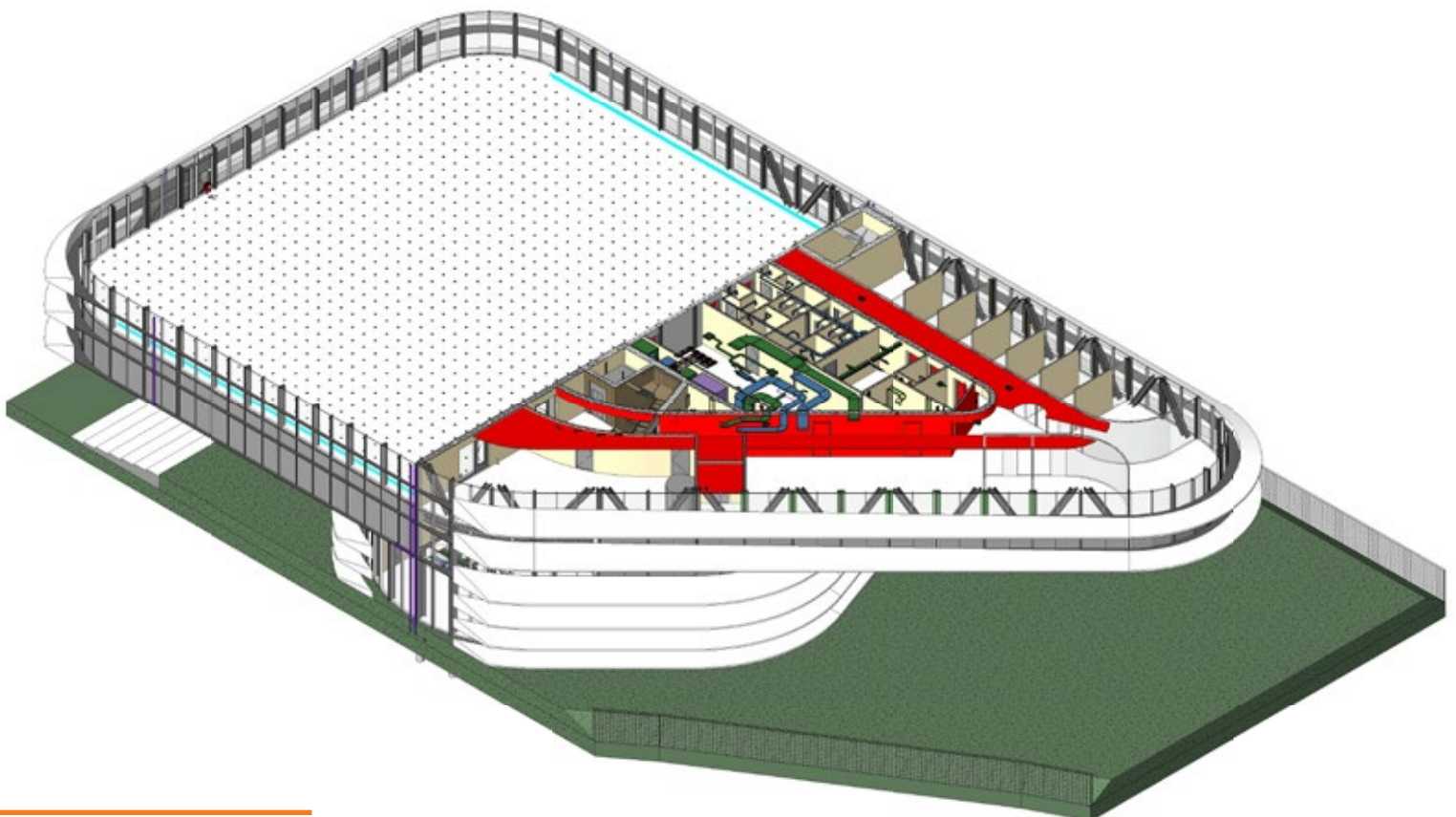
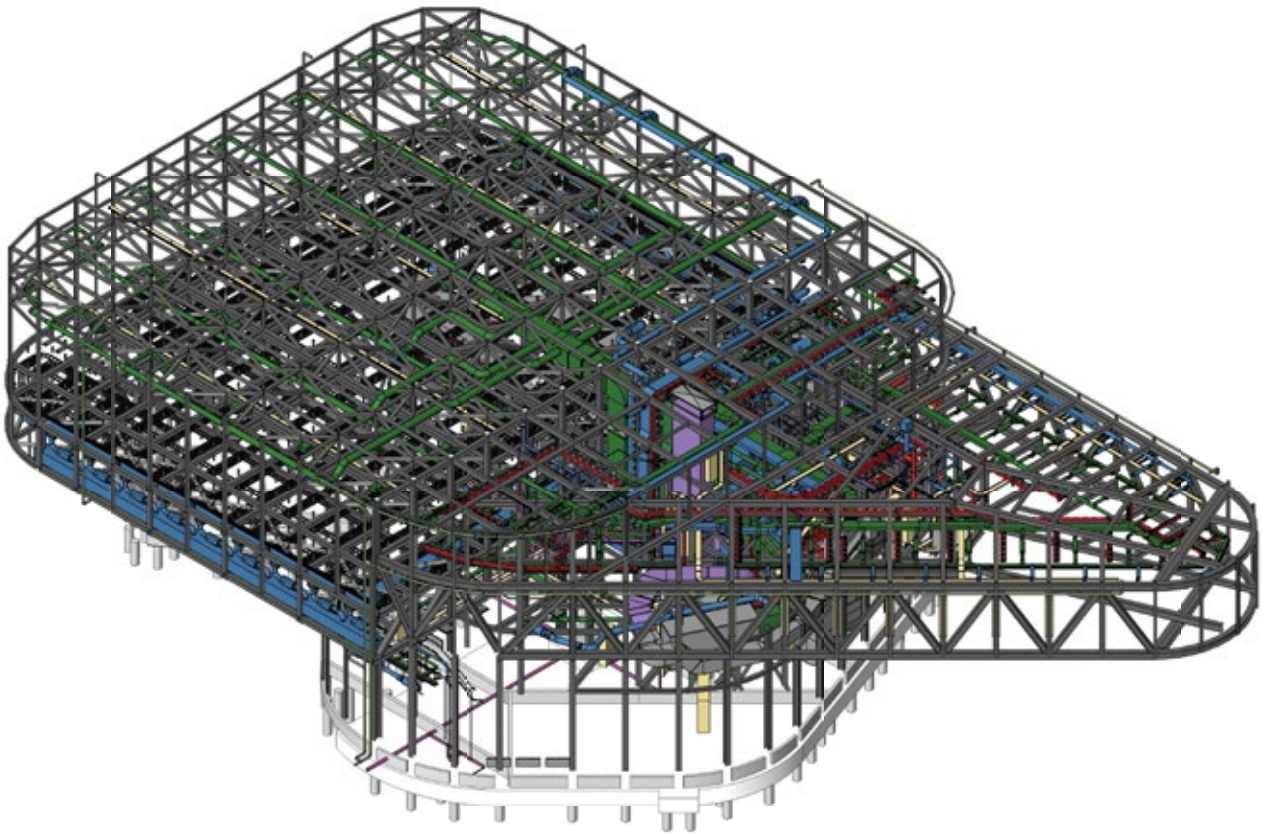
Competition Healthcampus Knokke

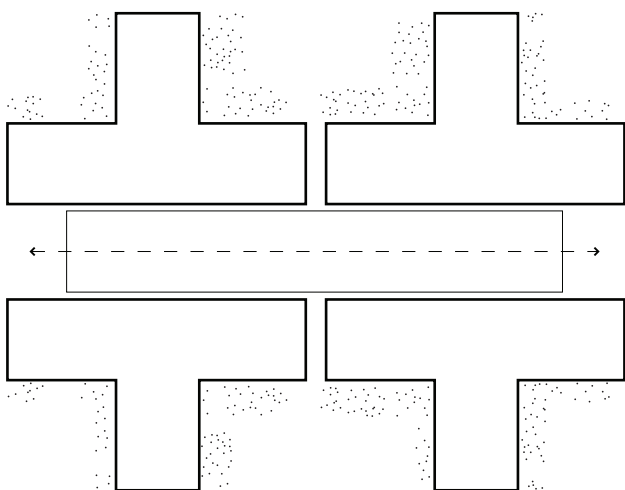


Building Information Model

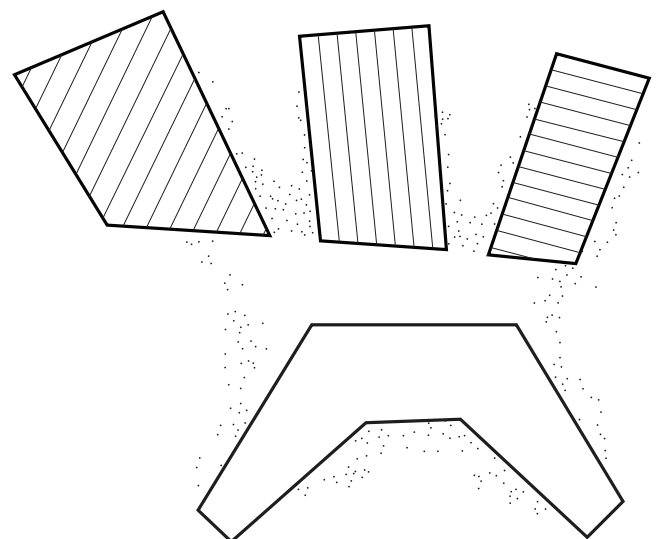
DUTCH HEALTH ARCHITECTS

THEMES | INTEGRAL DESIGN





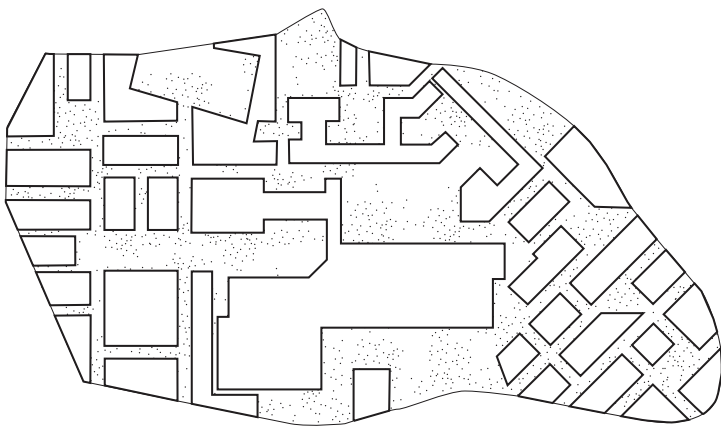
Mall



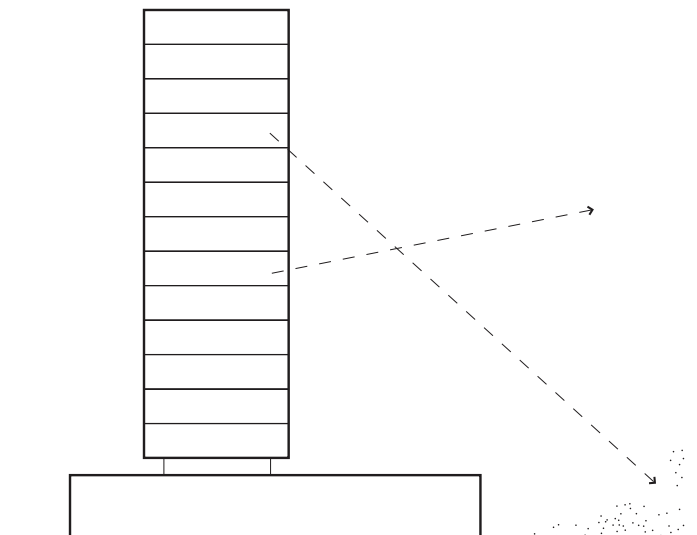
Campus

THEMES | CONCEPTS

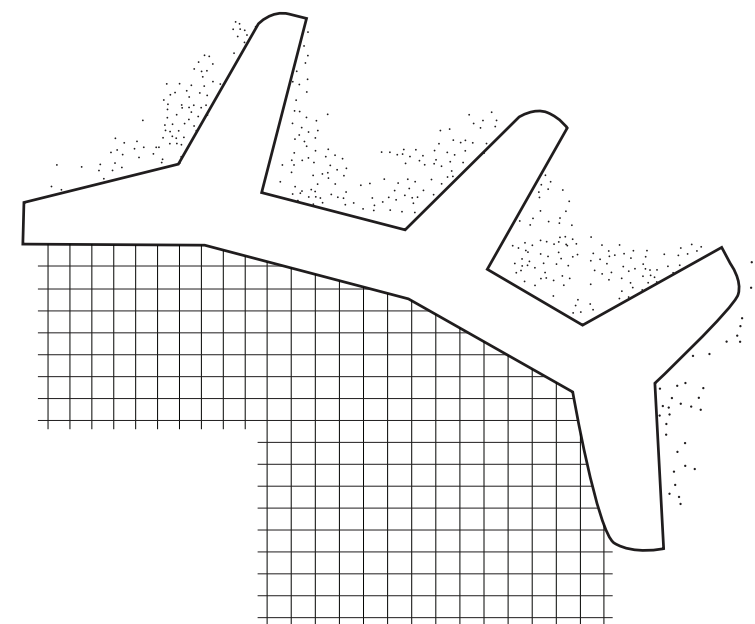
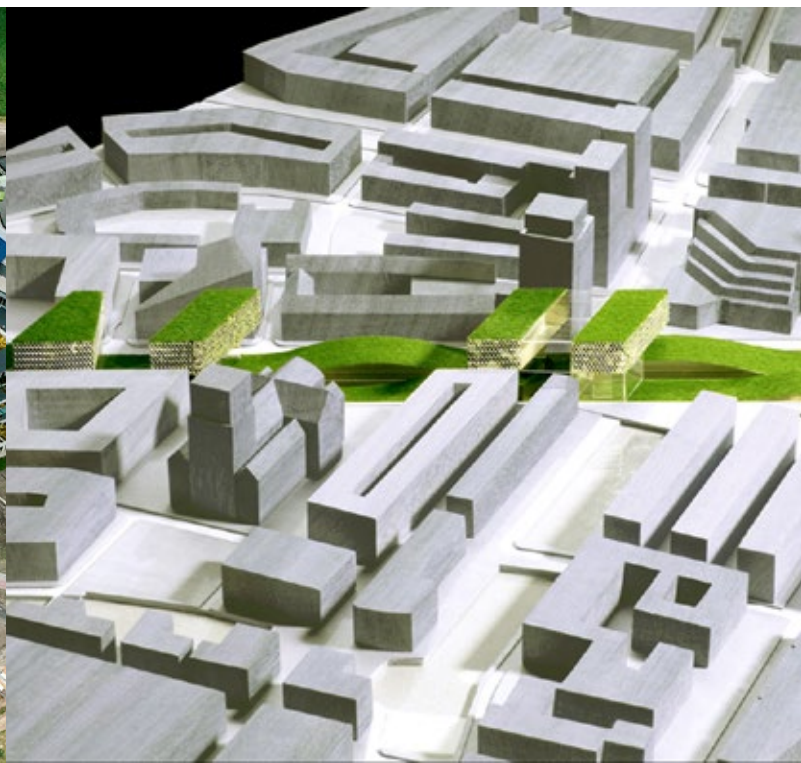
“The hospital as an airport, hotel, mall or village?”



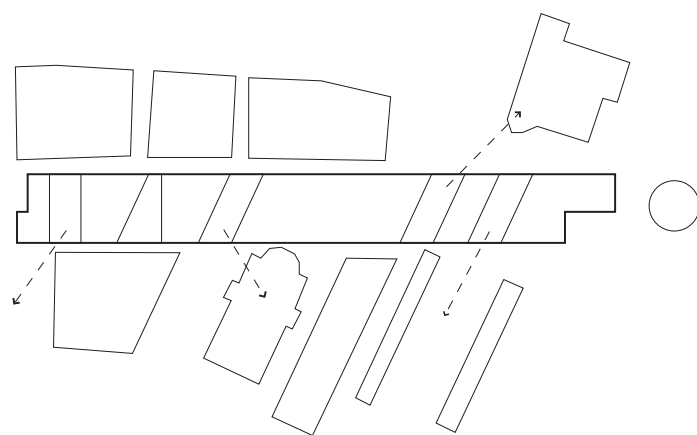
Park



Hotel



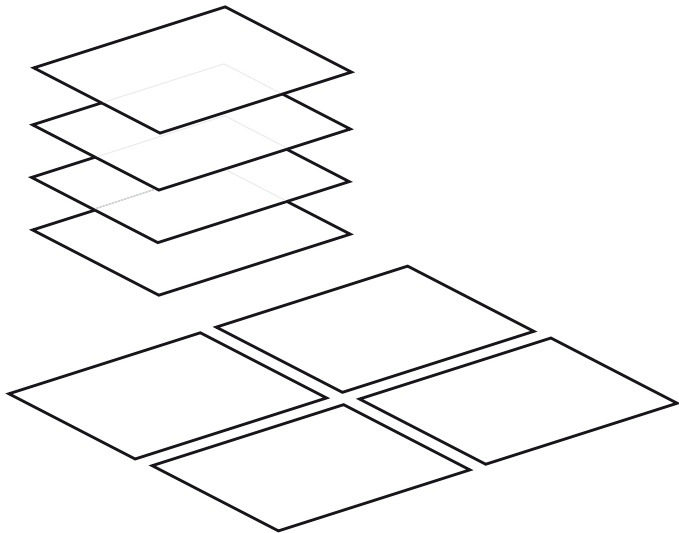
Airport



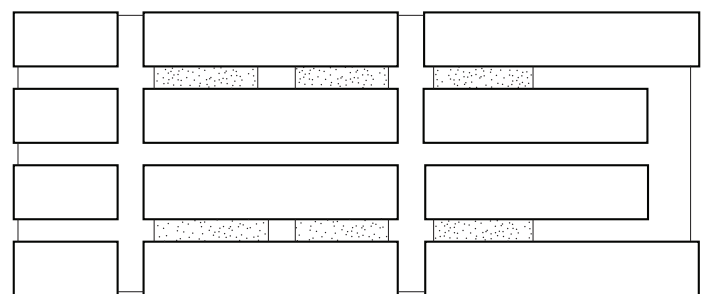
Village

THEMES | CONCEPTS

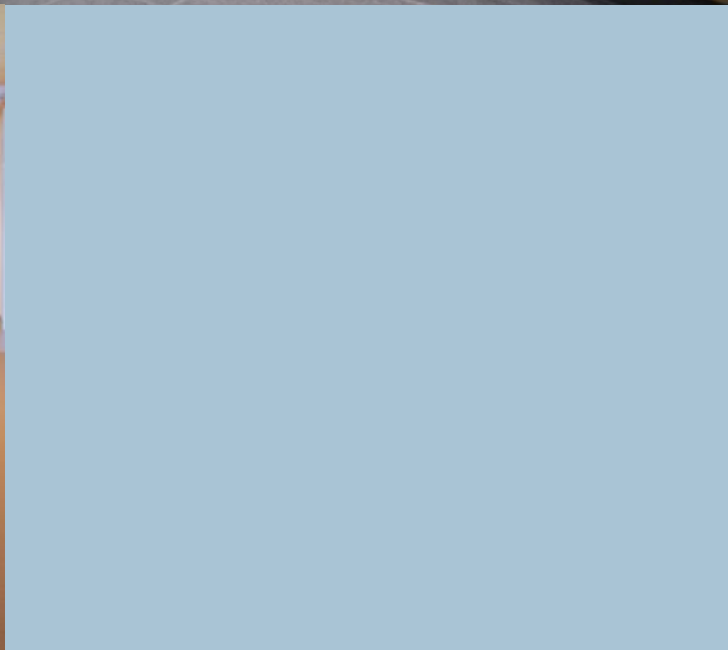
“The hospital as an airport, hotel, mall or village?”



Generic



Market



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DUTCH HEALTH ARCHITECTS

Ikazia Ziekenhuis, Rotterdam, the Netherlands	NKI/AVL Hospital, Amsterdam, the Netherlands
Erasmus Medical Centre, Rotterdam, the Netherlands	K.U.Z. Leuven (Gasthuisberg), Belgium
Maria Middelaars General Hospital, Ghent, Belgium	Deventer Hospital, the Netherlands
VU Hospital Research & Diagnostics, Amsterdam, the Netherlands	Hospital Bernhoven, Uden, the Netherlands
Albert Schweitzer Hospital, Dordrecht, the Netherlands	Hospital Bethesda, Hoogeveen, the Netherlands
Tony Moleapaza Rojas Children's Hospital, Arequipa , Peru	Atrium Medical Center, Heerlen, the Netherlands
Dr Verbeeten Institute Radiotherapy, Den Bosch, the Netherlands	St Antonius Hospital, Nieuwegein, the Netherlands
Medimall MCRZ, Rotterdam, the Netherlands	St Antonius Hospital, Utrecht, the Netherlands
UMC St Radboud Hospital, Nijmegen, the Netherlands	Foundation ZorgSaam Zeeuws-Vlaanderen, De Honte, the Netherlands
Jeroen Bosch Hospital, Den Bosch, the Netherlands	Sint Franciscus Gasthuis, Rotterdam, the Netherlands
Reinier de Graaf Hospital, Delft, the Netherlands	IJsselland Hospital, Capelle a/d IJssel, the Netherlands
Vlietland Hospital, Schiedam, the Netherlands	Harbour Hospital en Institute for Tropical diseases, Rotterdam, the Netherlands
Groene Hart Hospital, Gouda, the Netherlands	Diakonessenhome, Utrecht, the Netherlands
Ronald McDonald House, Rotterdam, the Netherlands	Maxima Medical Center, Veldhoven, the Netherlands
Rijnland Hospital, Leiderdorp, the Netherlands	Hospital Maas en Kempen, Maaseik, Belgium
Kennemer Gasthuis Hospital, Haarlem, the Netherlands	Westfries Gasthuis, Hoorn, the Netherlands
LUMC Education Building, Leiden, the Netherlands	Hospital Rivierenland, Tiel, the Netherlands
Sanquin Blood Bank, Nijmegen, the Netherlands	Canisius-Wilhelmina Hospital, Nijmegen, the Netherlands
Onze Lieve Vrouwe Hospital , Amsterdam, the Netherlands	Hospital Nobo, Curacao
Juliana Children's Hospital, The Hague, the Netherlands	Altrecht Mental Healthcare Barentsz, the Netherlands
Wilhelmina Children's Hospital, Amsterdam, the Netherlands	Hospital Koningin Beatrix GGNet Brengwal, the Netherlands
UMC Utrecht Hospital / AZU Hospital, Utrecht, the Netherlands	Forensic Psychiatric Center, Ghent Belgium
St Maarten Medical Centre, Philipsburg, St Maarten	FPI de Rooyse Wissel, Oostrum, the Netherlands
Dr. Horatio E. Oduber Hospital, Oranjestad, Aruba	Foundation Rivierduinen, the Netherlands
Jakarta Children's Hospital, Jakarta, Indonesia	De Grote Rivieren, Volgerlanden, the Netherlands
Ghent University Medical Research Building, Gent, Belgium	Bavo Europoort de Fjord, the Netherlands
ZNA North, Antwerpen, Belgium	Transferium Youthcare, Heerhugowaard, the Netherlands
Tanger Children's Hospital, Tanger, Marocco	High Care, Oegstgeest, the Netherlands
University Hospital Ghent K12, Belgium	





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