De Nekker/Sports & Recreation Centre/Mechelen/

new/unified/green/bold/gateway/

OO 1705 A

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Introduction/

Swimming pools and sports centres are vital to our contemporary society, not only as places for exercise, enjoyment and well being but as places for the community to get together. The New Swimming Pool for De Nekker has multiple roles to play, both as a community facility and in its contribution to the built and natural landscape of the Mechelen region.

The vision for the swimming pool hall for De Nekker is of a civic meeting place capable of attracting and energizing the whole community but also the existing facilities of De Nekker. There is an opportunity to create a new destination for the broadest spectrum of visitors and at the same time improve the surroundings in which they sit is central to our design philosophy. Based upon a Scandinavian architectural tradition of democracy and social responsibility we design buildings that reach out beyond the themselves and offer identity to their surroundings. Here surroundings should be understood as the community, the users and the physical landscape.

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1. Entrance reception
2. Children area
3. Chidren playground
4. Sport hall
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6. Cafetaria
7. Cafetaria
8. Kitchen
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Aims/

To create a superb new pool facility
This new pool must operate at the highest level functionally for the users. The team will bring expertise in pool design standards and specifications, and for the leisure pools, it will bring imagination and flair. Every aspect will be considered – the quality of the light, acoustics and ventilation, the ease of orientation and circulation, the quality of all the support spaces, changing facilities, fitness centre and other spaces.

To create a maintainable facility
At the forefront of our thinking in the material we choose and the way we put them together is longevity. In is not in anyone's interest for a building to look good with it opens if it will not look as good in the years to come. We are aware of technical requirements of swimming pool environments and carefully select materials. We do this in conjunction with the client, ensuring that their maintenance regimes are compatible. Our broad vocabulary of materials has evolved from our Scandinavian heritage and been informed by modern materials and methods.

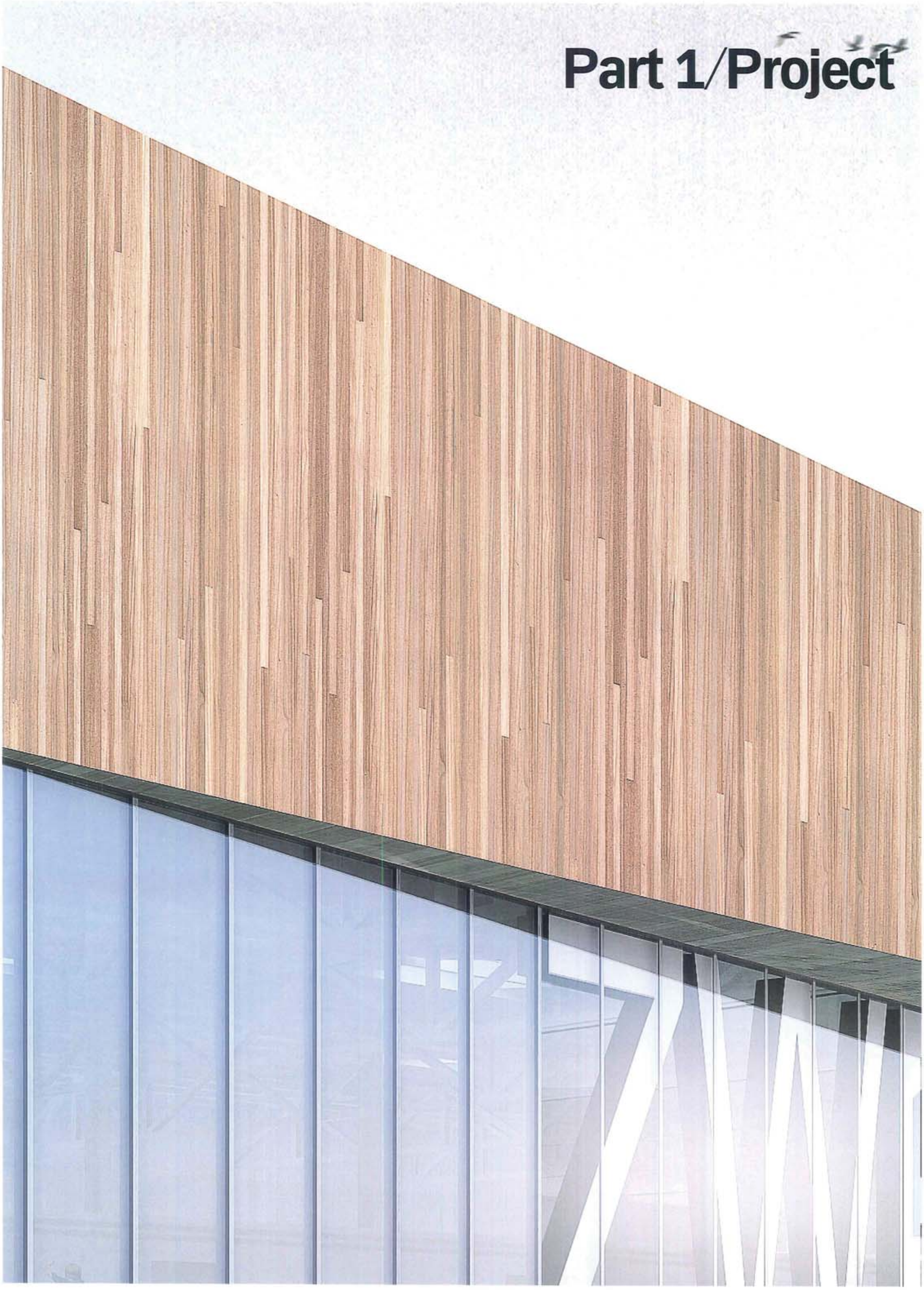
To create a sustainable facility
Striving for the highest standards of sustainability in the design and construction of the new pool will be an imperative and the design of the building cannot help but be affected by these considerations. The need to build sustainably is both a global collective responsibility and a practical way of 'future proofing' the building for later generations by reducing the energy demands, and therefore the running costs of the building. Sustainability will be approached holistically, with consideration of all the social, environmental, health and economic aspects of the project.

Swimming pools typically have high energy usage to maintain year round water and air conditions. With our specialist experience, the design team will explore innovative techniques to reduce the demand for energy. At minimum the project will:

- Strive for reduction in running costs by utilising passive solutions, optimising natural ventilation, providing local controls and reclaiming heat.
- Design in thermal stability with night cooling and high levels of insulation.
- Optimise the use of daylight, saving on electricity.
- Maximise the reduction of waste through the reduction of ground works and off site production.
- Incorporate alternative sources of energy, solar, alternative fuels, alternative heat sources.

To create a welcoming and popular destination
The New Swimming Pool should be a draw for the local community and also a destination for visitors from afar. The local community will be regular users, for the amenities that the centre has to offer and for changing programmes of events. Visitors from afar might come for the quality of the view, the coffee, the architecture. Architecturally, much can be made of the non-pool parts of the brief – the entrance, the café, the flexible spaces.

Part 1/Project



Part 1/
The Project/

From the outset, it is clear that the De Nekker Sports & Recreation Centre must represent itself as a single unified entity – a new contemporary Sports Centre for the Mechelen area. We believe this is not a project to create a new 'stand-alone' indoor swimming facility that is simply connected to the existing Sports Hall complex via a link or bridge.

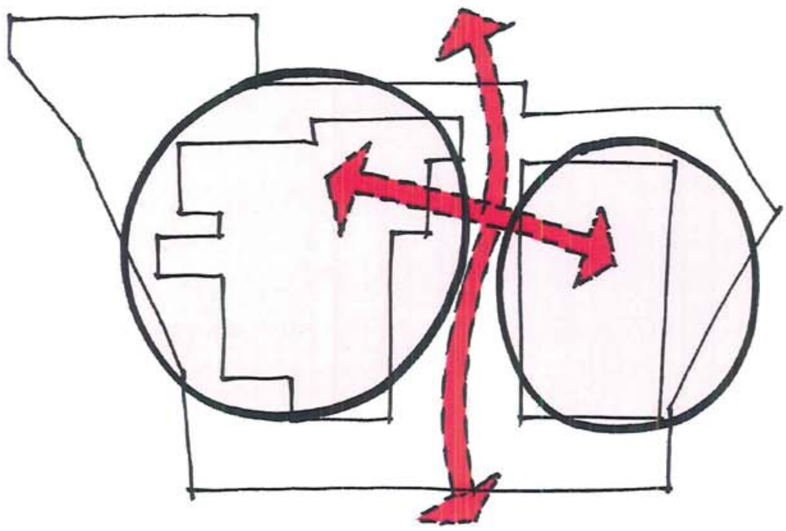
A new 'stand-alone' pavilion-like structure located on the site of the existing crazy golf course, would arguably create a new and fresh addition to the Sports Centre, yet it has a number of inherent problems, both technically and visually.

Although a separate pavilion would give the opportunity to add a 'new' face to the De Nekker Centre through the addition of a new building, it would somewhat neglect the existing building. This does not address the desire to collectively represent the Sports Centre as a single new entity.

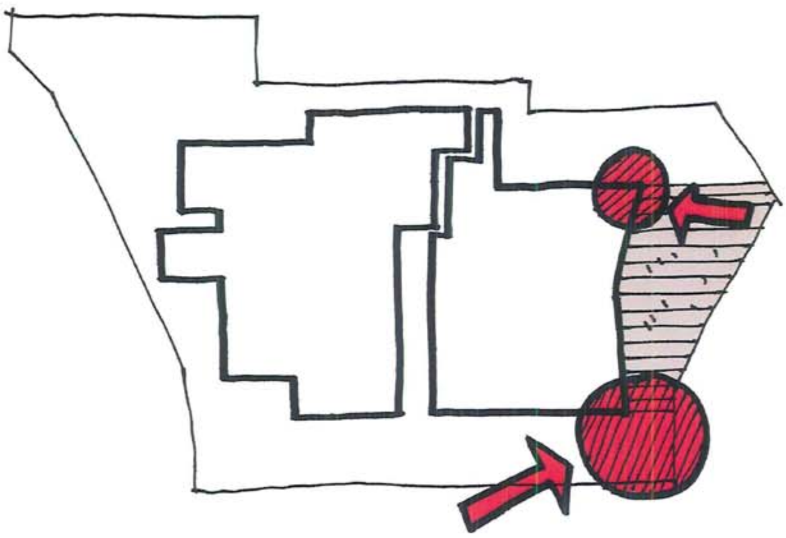
The existing Sports Hall complex is entered at first floor level via a large external ramp. Upon entering the centre the majority of users have to immediately descend back to ground floor level to access the existing changing facilities. These facilities do not benefit from any natural light due to their positioning behind the existing access ramp. We propose to simplify this access sequence, inject new life into the existing changing facilities, and create a new 'heart' for the new sports centre.

Furthermore, the existing entrance space is cramped, cluttered and dark and does not provide the light, open and airy entrance the complex desires.

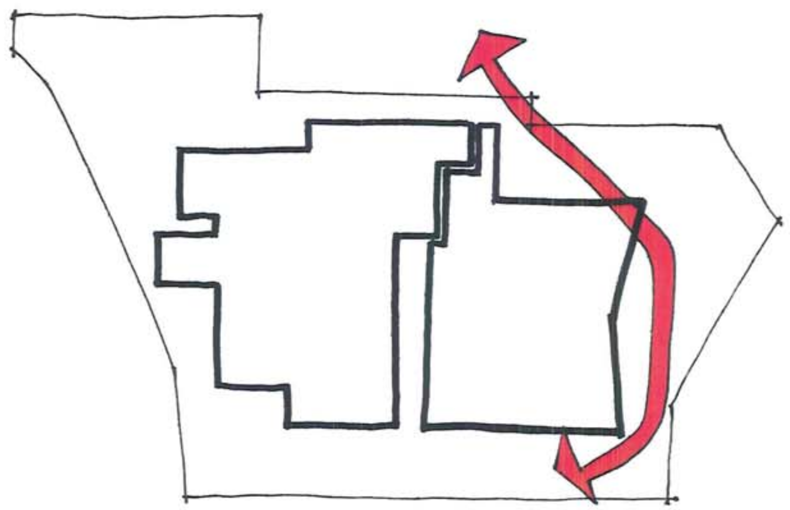
The requirement to address the existing internal spaces of the existing sports complex and the creation of a unified external 'face' for the new Sports & Recreation Centre, informs the proposal.



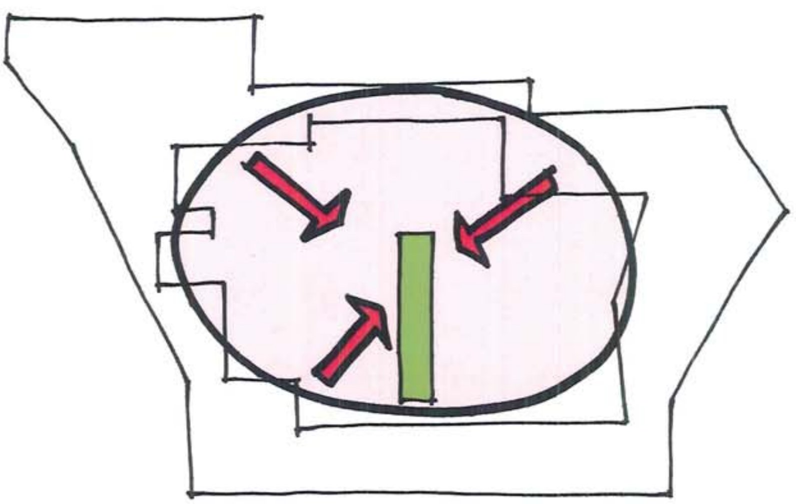
The creation of a stand-alone pavilion with a central access route splits the "new" sports centre into two clear buildings, making it less connected as "one" single entity.



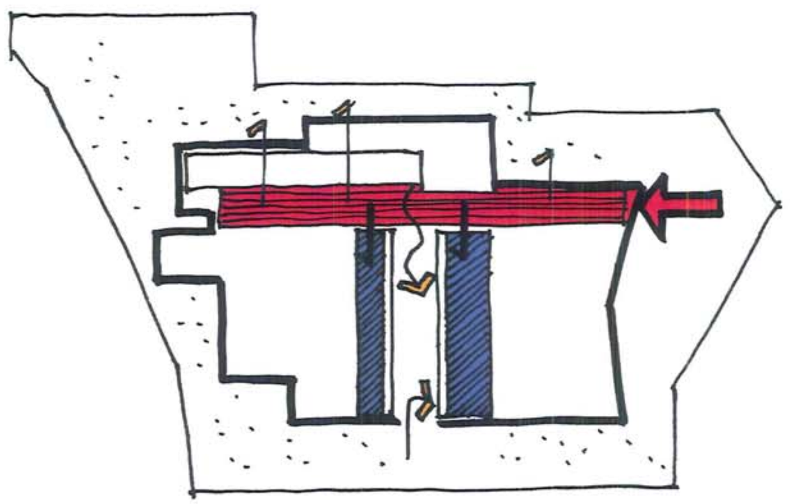
The proposed project pushes the new extension tight against the existing building.



The proposed project becomes the new gateway to both the new 'sports centre' and the outdoor areas.



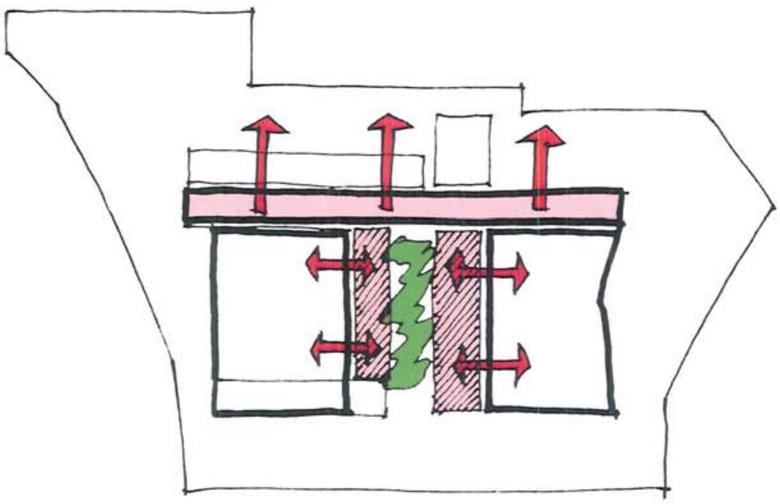
What was an uninviting entry ramp becomes the new heart of the proposed project, visually linking both the existing and the new changing facilities over an open external courtyard with reflective pool bringing daylight deep into the plan.



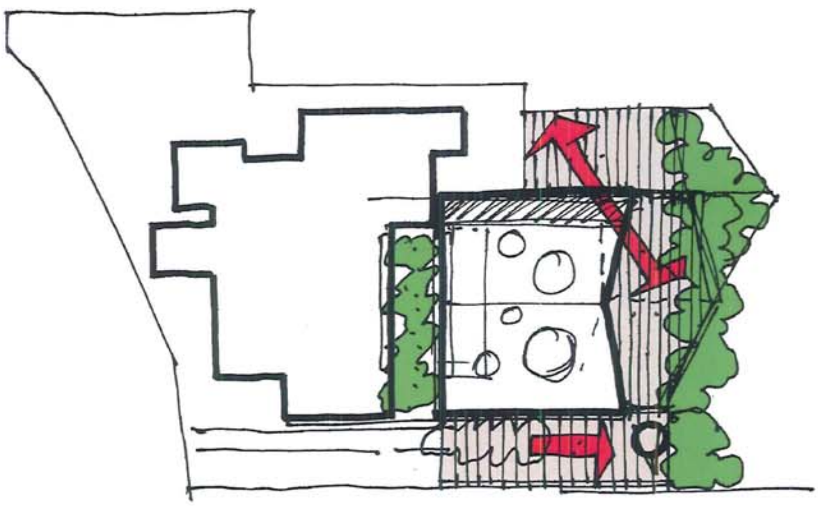
A new combined grand entrance provides direct access to both the pool hall and the existing sport hall and their respective changing facilities.

Part 1/
The Project/

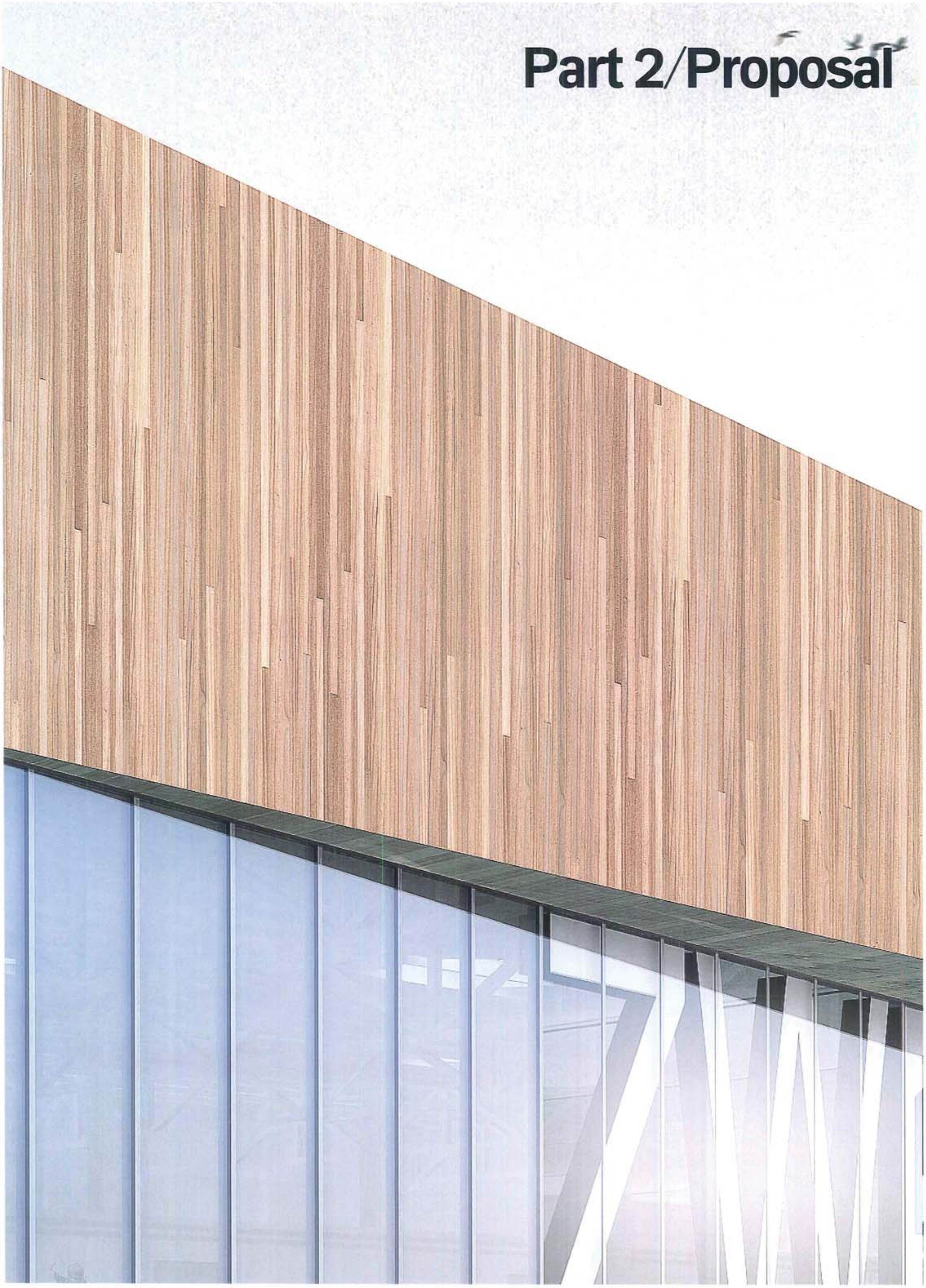
This new public frontage addresses both the park and the open external courtyard.



Hard and soft landscape articulate the various faces of the proposed project.



Part 2/Proposal



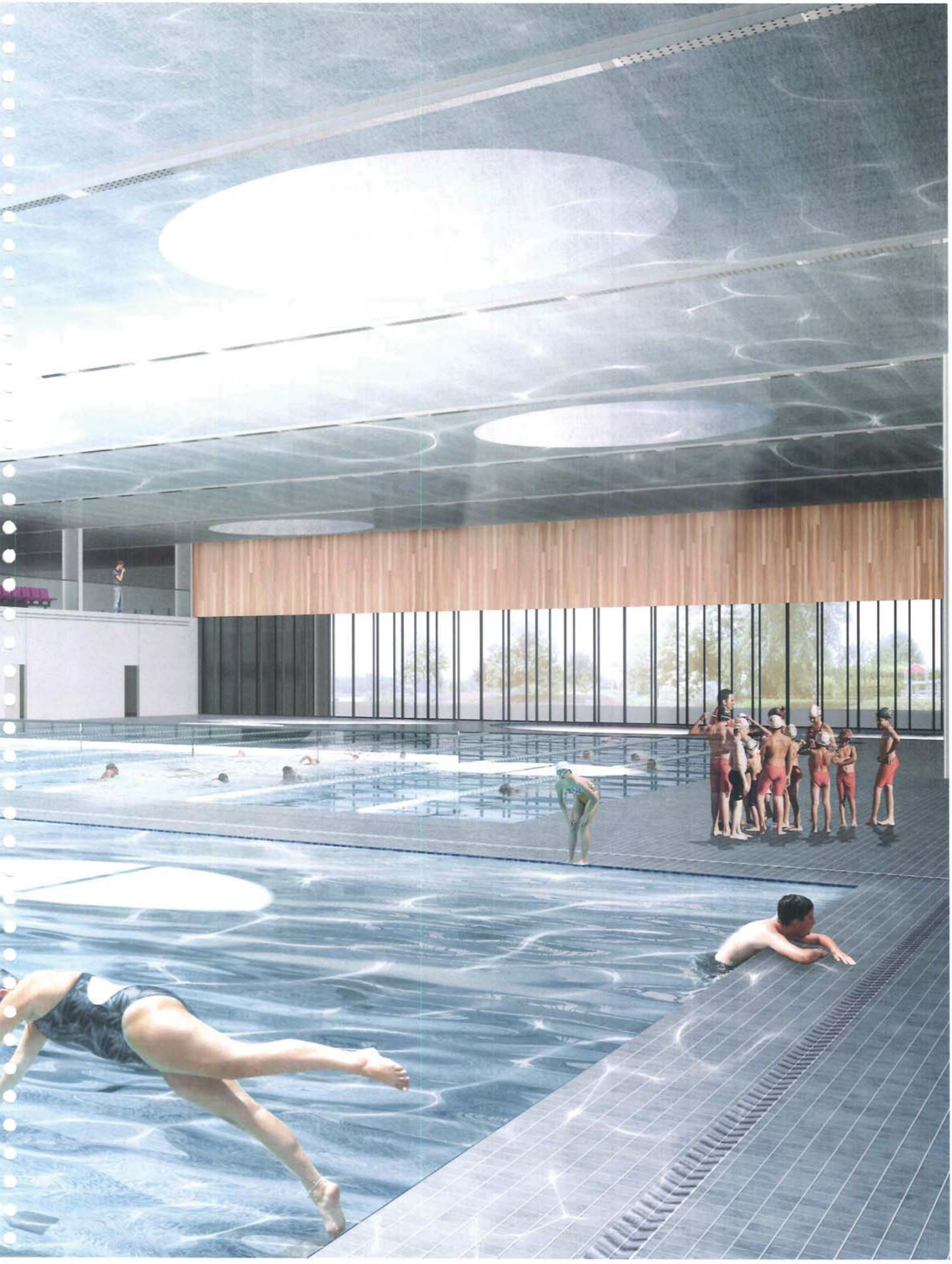
Part 2/
The Proposal/

The new proposal aims to provide a new unified and contemporary face for the De Nekker Sports & Recreation Centre.

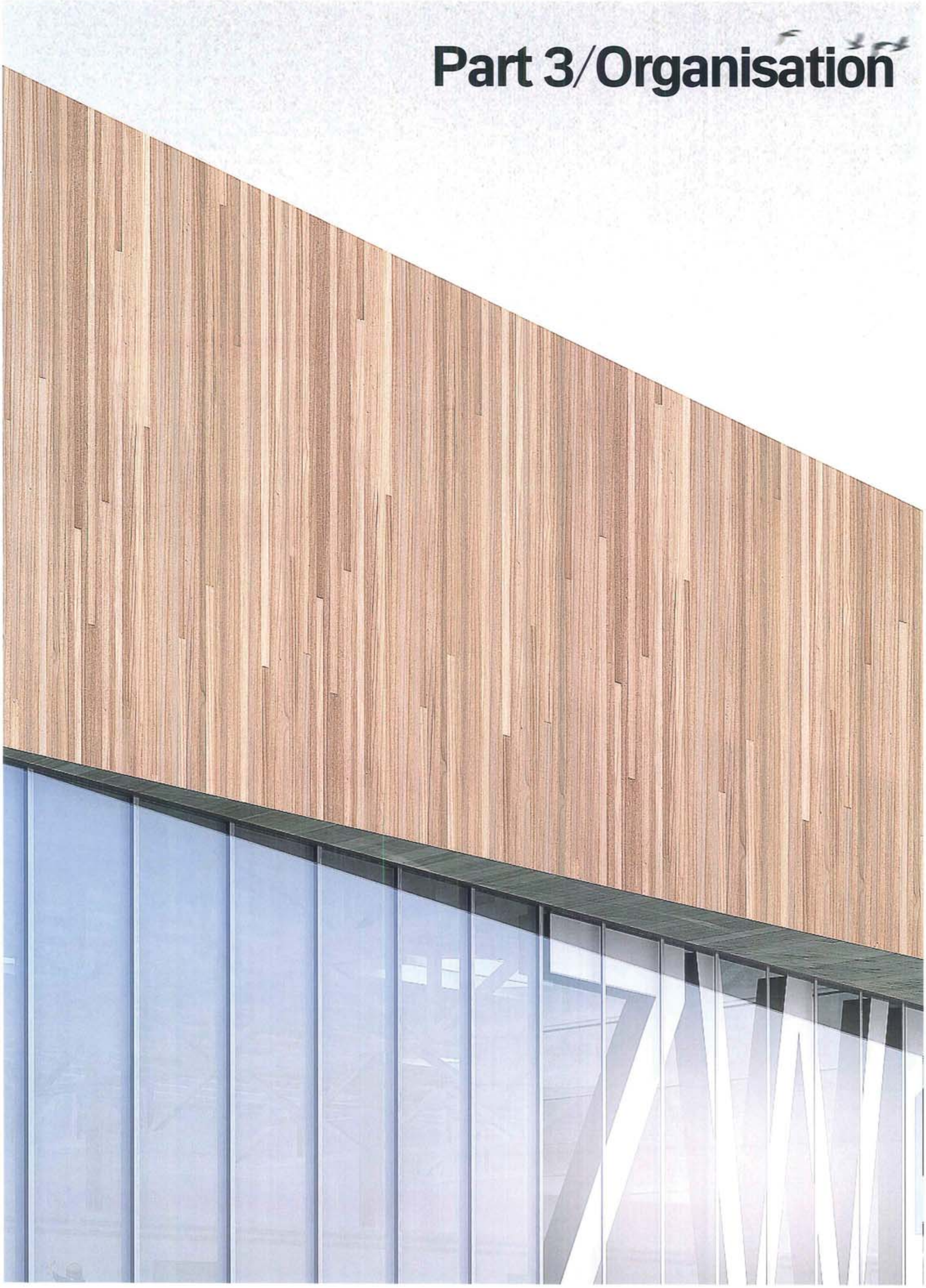
A bold angled façade leads visitors through a new landscaped plaza to a new double height entrance space looking south towards the lake. A large overhanging roof marks the gateway to De Nekker, the new entrance to both the Sports Centre complex, and the external grounds beyond.


DE NEKKER


DE NEKKER



Part 3/Organisation



Part 3/Niveau 0

Key

Swimming Pool Halls

Staff

Entrance area

Technical Spaces

Changing Rooms

Public Zone

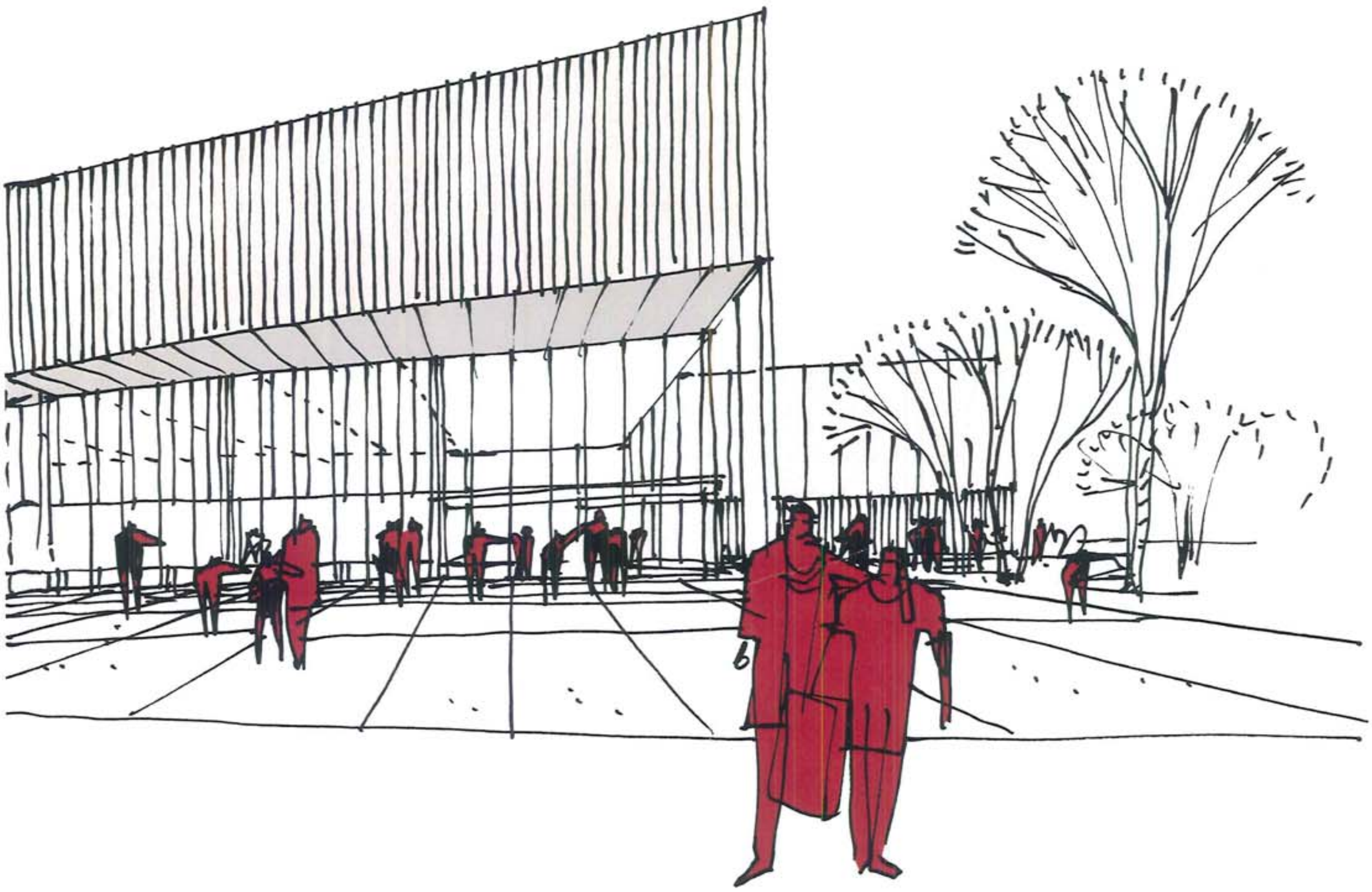
Upon entering the new Sports Centre visitors pass through a naturally ventilated and single glazed 'winter garden' that acts as an enticing viewing point both into the new swimming pool hall to one side and the external ground to the south, a gathering point for school children, and as a thermal 'buffer' from the swimming pool hall itself.

This 'buffer zone' is passively heated, due to its southern aspect, to achieve 5-6 degrees celcius above outdoor temperature. This higher temperature, combined with the reduced air turbulence on the pool glazing surface will reduce the conduction loss from the pool hall, and thus reduce the heating demand.

Beyond the 'winter garden' is the secure new entrance hall proper. This space is located to allow visual surveillance (and physical control if required) of access to the existing sports hall and changing facililties, the new swimming pool changing and vertical circulation to the cafeteria, children's facilities, parents lounge and competition spectators at first floor level, while also being visually connected to the 'winter garden' and the main entrance. This central control point helps unify the new Sports Centre with a new grand entrance space for all visitors.

When proceeding through to the new changing rooms for the swimming pool, visitors and children are suddenly presented by a new central courtyard space. This new space replaces the previous entrance ramp and acts as a new 'heart' to the combined new Sports Complex. A shallow reflecting pool draws light deep into the centre of the building. The newly revealed elevation of the existing building is vertically planted creating a lush green and light central courtyard. Two new large openings are created in the existing building visually linking the existing sports hall changing with the new swimming changing across the reflecting pool.

For visitors utilising the sports hall or newly located squash courts, they simply continue at ground floor level beyond the new central courtyard towards the sports hall.

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Part 3/Niveau 1

Visiting parents and spectators proceed to the first floor via either the new generous open staircase or via newly located elevators. Upon arrival at first floor level, visitors will experience a rejuvenated lobby space previously the existing sports hall entrance. From this point they experience an elevated view over the new central garden, with both the cafeteria, children's facilities and parents lounge within view.

Key

Zwembaden

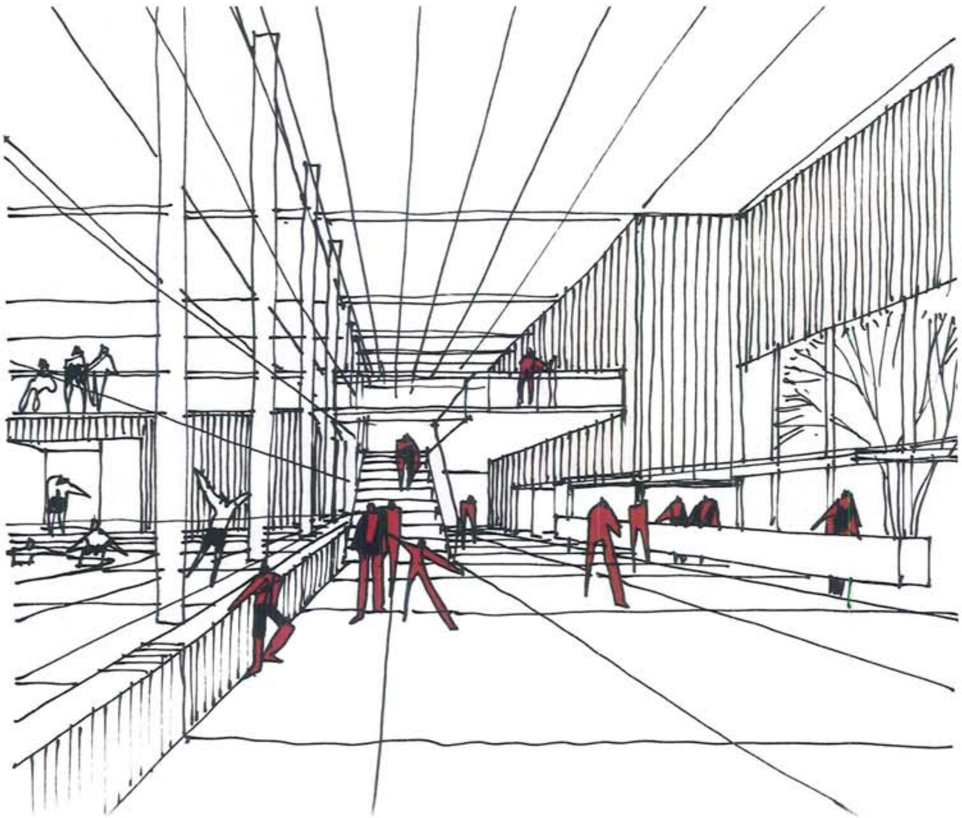
Kleedruimten

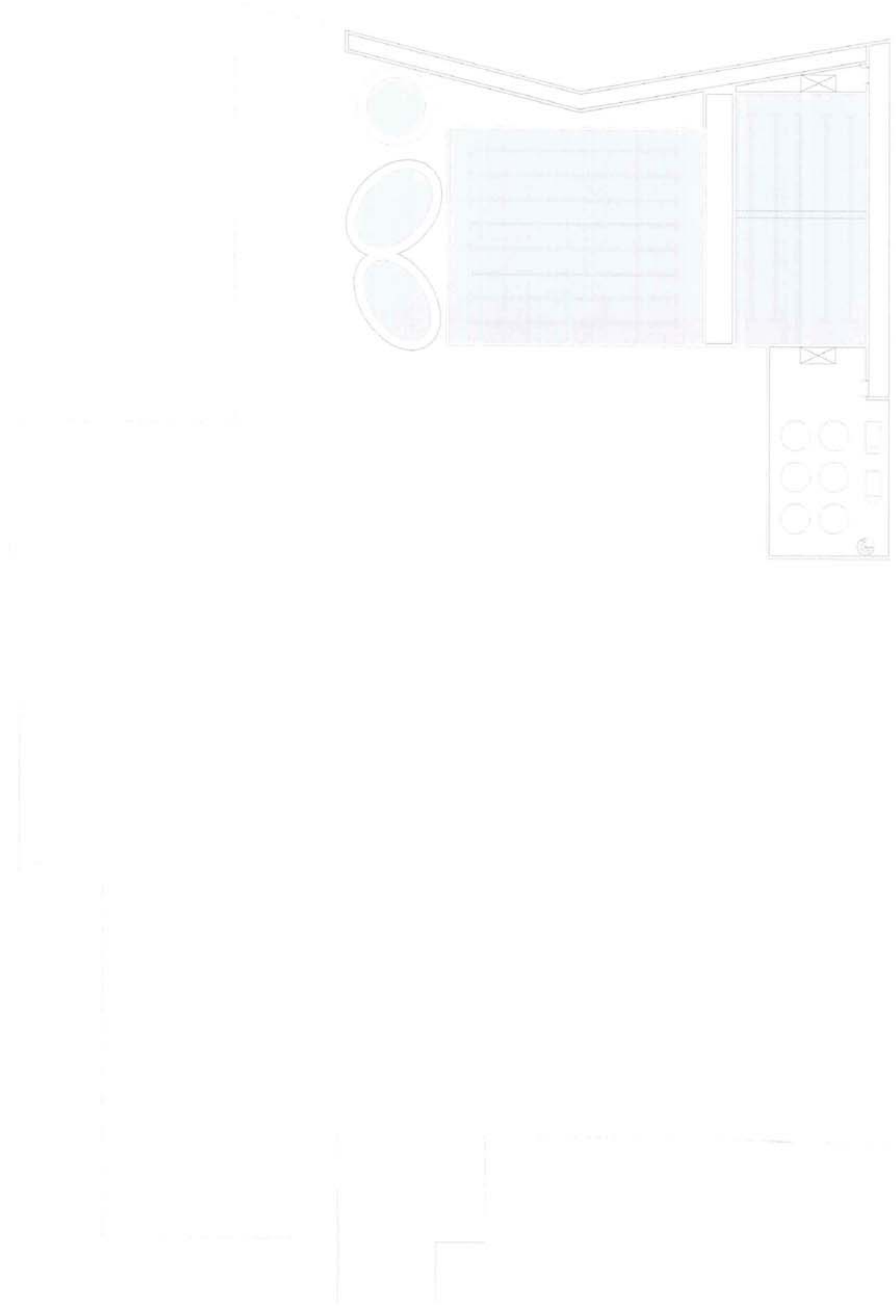
Personeel

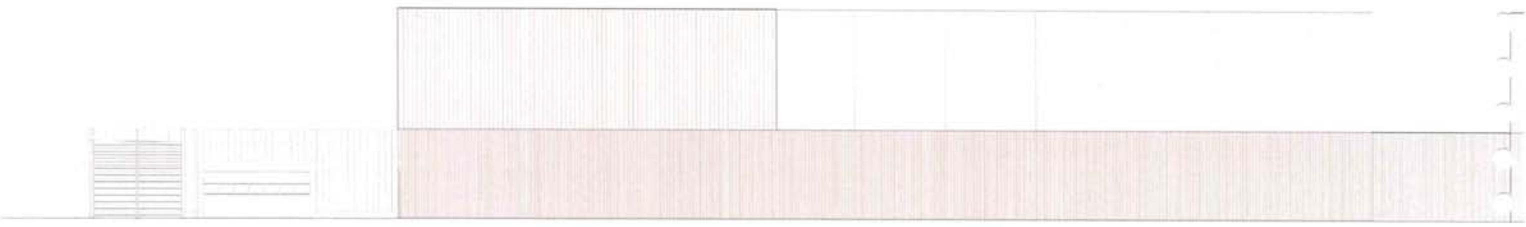
Inkomzone

Technische Ruimten

Publiekszone

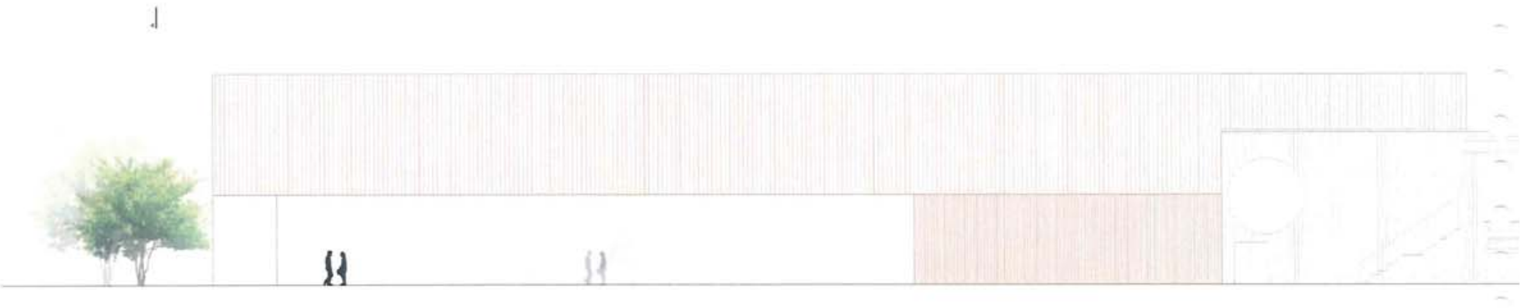






North facade

West facade



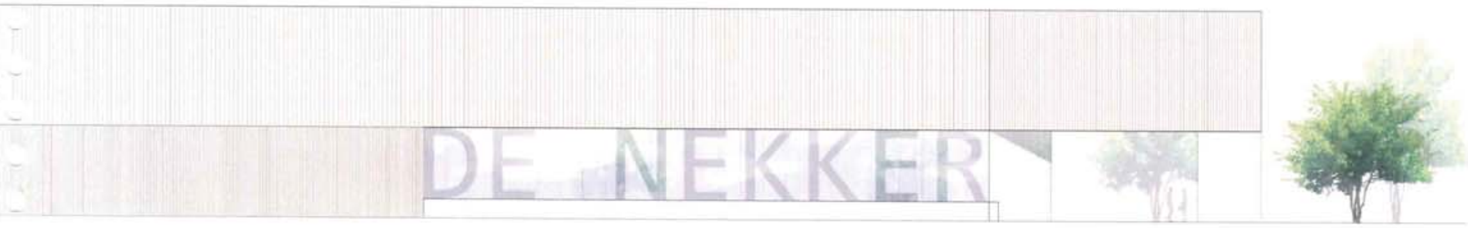
South facade

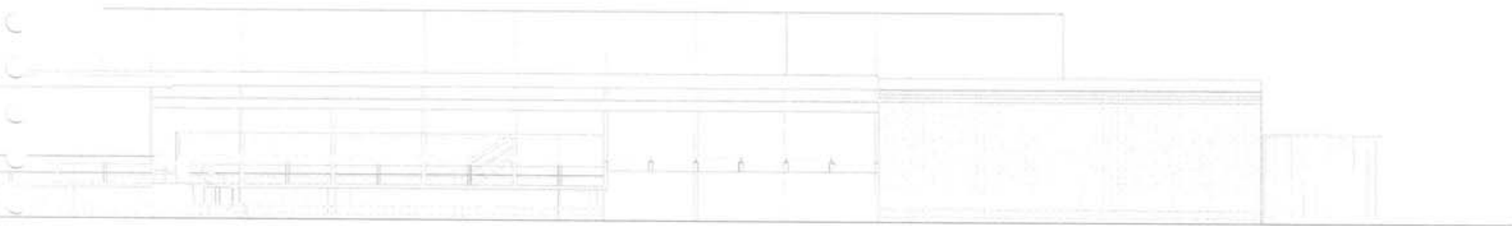
Part 3/Facades

A new simple yet bold 'face' for De Nekker Sports & Recreation Centre is proposed. A solid and monolithic hardwood volume hovers high over the pool hall, cantilevering out over the new gateway to the complex itself and the landscape beyond.

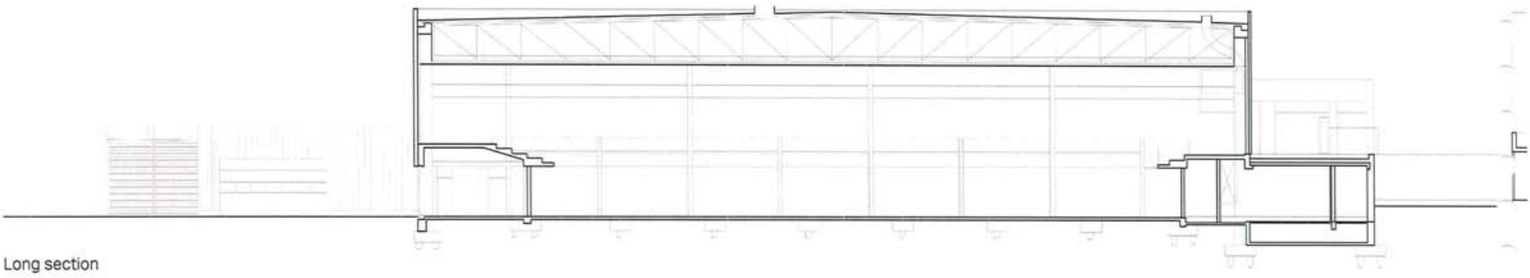
Using a hardwood from managed sustainable sources (Vitex Cofassus), the new façade relates back to the surrounding landscape through its strong horizontality and its direct use of timber. The hardwood requires no preservative treatment nor applied finish, minimising ongoing maintenance costs. Once installed its deep 'teak' colour will weather to a strong silvery grey that is intended to reflect the sun as does the open water beyond.

At low level a standard proprietary glazing system is proposed in a combination of solid insulated panels and large open windows to the external landscape. The words "De Nekker" and "Zwimmen" appear to hold up the structure above as large sculptural installations marking the new building.

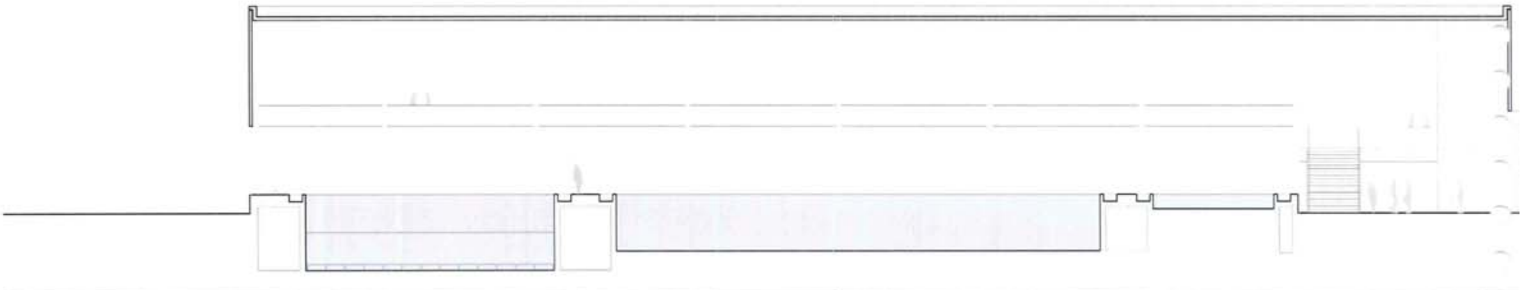




New courtyard



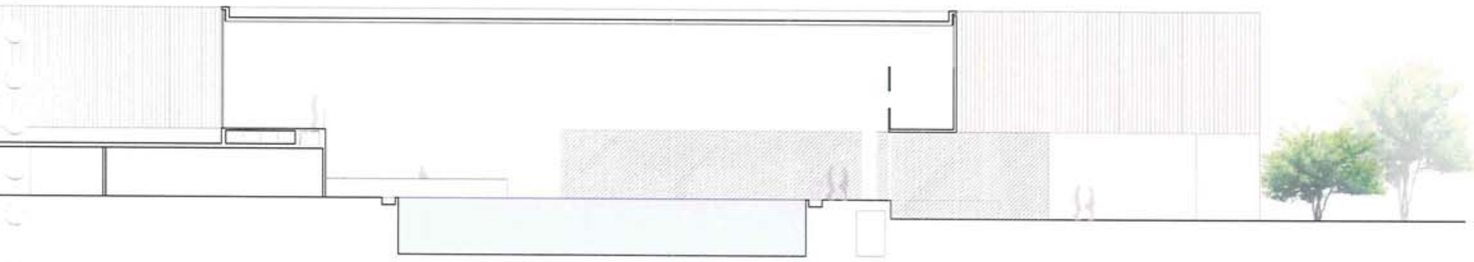
Long section

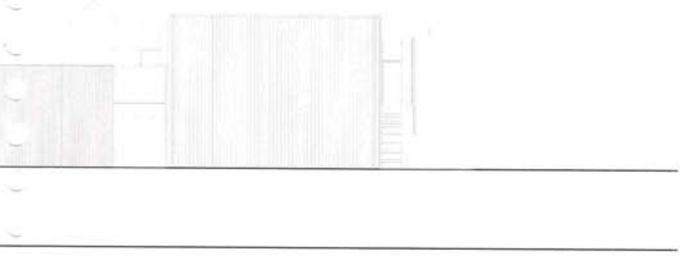


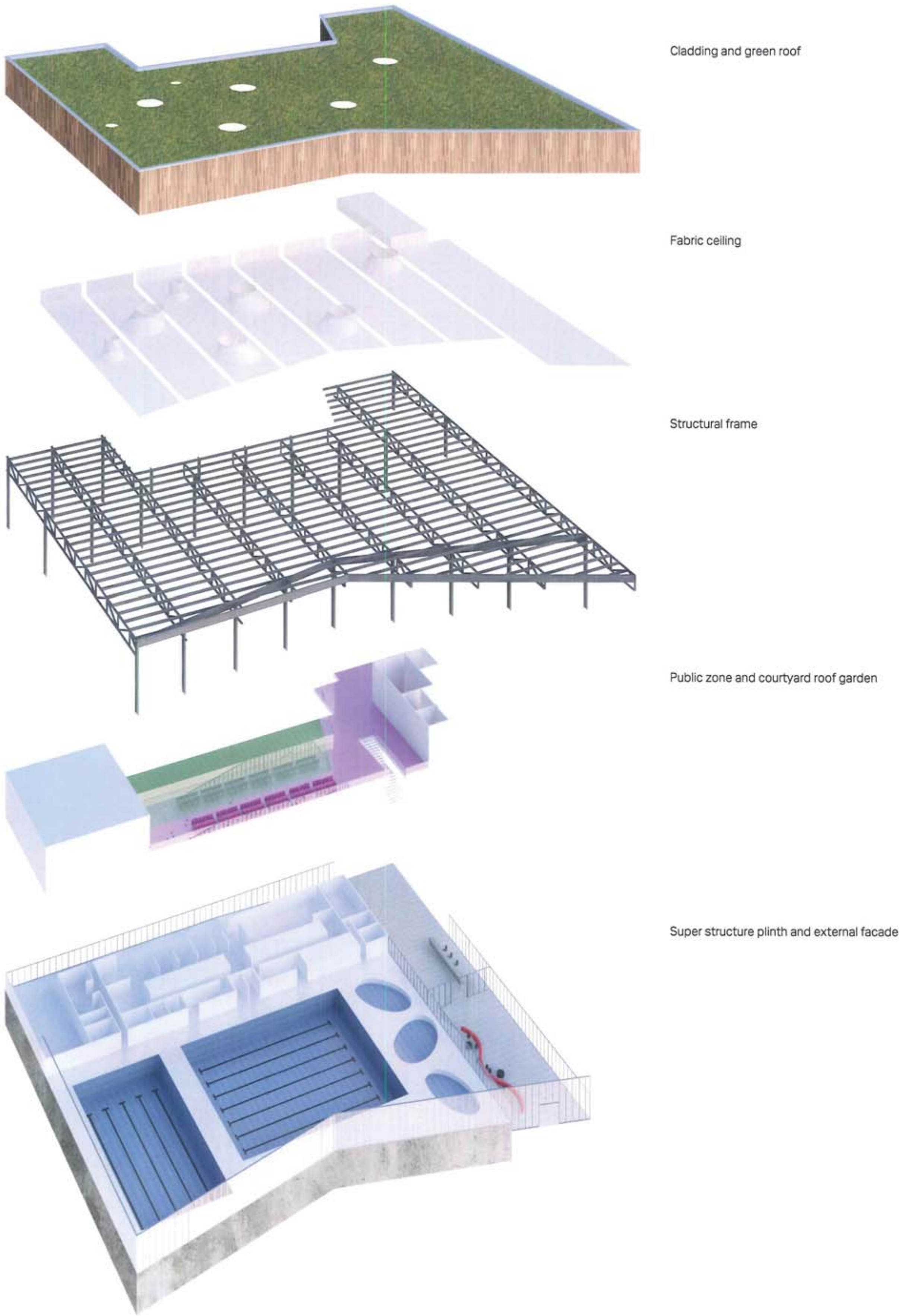
Cross section

Part 3/Sections

In order to minimise structural costs in the construction of the swimming pools themselves, the entire pool hall has been raised forming a 1m high plinth. Not only does this benefit the structural costs in relation to the local water table level, it provides an intriguing low level view into the pool area, especially for smaller school children.






Cladding and green roof
Fabric ceiling
Structural frame
Public zone and courtyard roof garden
Super structure plinth and external facade

Part 4/Sustainability and Services

4.1/ Design Team Approach

General Requirements and Design Team Approach

The scope of the project includes the design of a new swimming pool hall and associated facilities for the "Provincial Sports & Recreation Centre De Nekker" and limited renovation works required to the existing building.

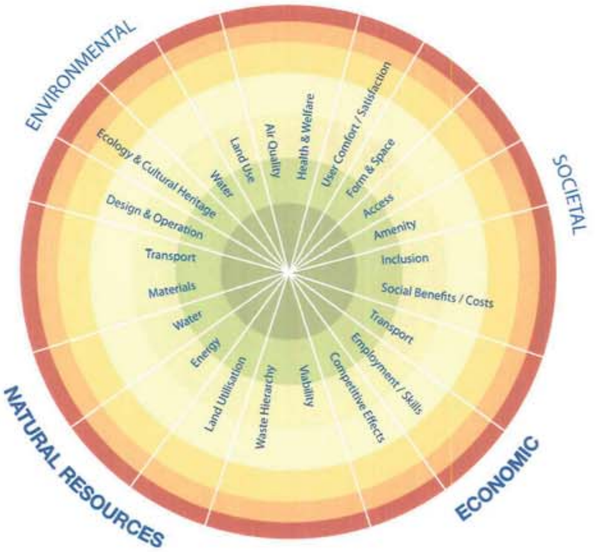
This engineering and design booklet detail the design team aspiration and approaches to sustainability design, which can be defined as "catering for the needs of the present generation without jeopardising the needs of future generations".

In plain, sustainability means the following to us:

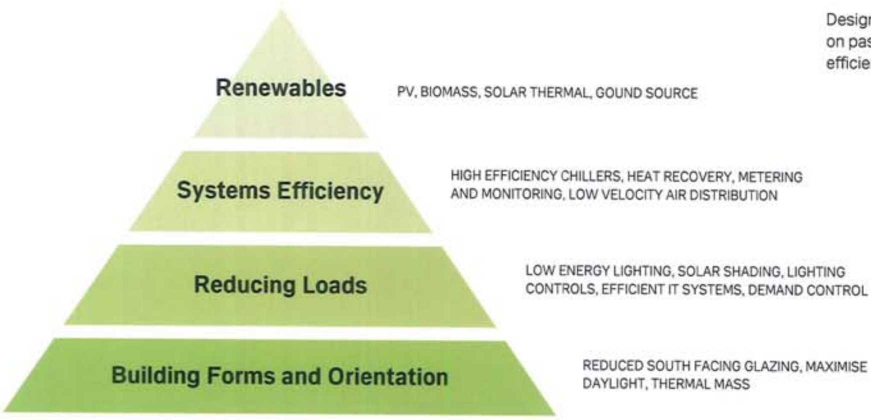
- Deliver quality services to serve the objectives
- Low carbon/energy building design
- Reduction in water consumption
- Reduced embodied energy in construction
- Reduce, reuse and recycle waste management
- Flexibility building to adapt future changes
- Cost effective and sounds business case

All of the above aspects will be considered by the design team in every dimensions to resolve this complex problem by holistic solutions.

Proposals presented in this document are based on the design team knowledge and experiences in similar projects in the region. Proposals are all practical, efficient, and carbon neutral.



SPeAR is a tool developed by our in-house team to demonstrate the sustainability of a project, process or product which can be used either as a management information tool or as part of a design process.



Design team approach in low carbon building design based on passive design, reduction in consumption, system efficiency and the use of renewable energy source.

4.2/ Climate Analysis

Climate Analysis

Passive building design is the design teams fundamental approach to reduce the overall building energy consumption. The following sections summarise the local climate. The results have been considered by the design team in the development of the building geometry, orientations and the surrounding.

Analysis was based on a detailed historical weather file of Brussels, where it is approximately 23km south-west of Merchelen.

Temperature

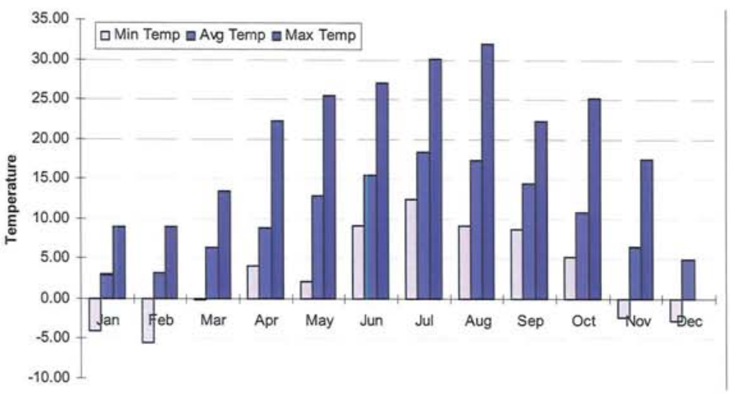
Climate of Brussels can be categorised as mild winter and warm summer. Outdoor air temperature is highest in July with an average value of 18.4°C and peak temperature of 30°C. The lowest temperature occurs in January with an average temperature of 3°C. However, the extreme minimum temperature can be as low as -4°C.

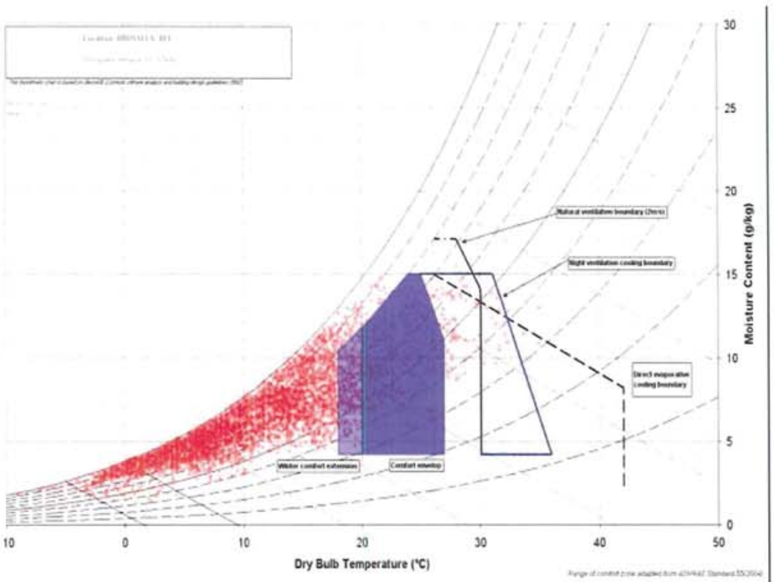
Further analysis shows that temperature in 82% (4185hrs) of the operating hours* of the centre is below 18°C, which means heating mode predominates the ventilation system operation. Techniques such as minimum fresh air control and ventilation heat recovery are proposed where possible to minimise the ventilation heat load.

Around 43% (2172hrs) of the considered time temperature is above 13°C. The design team considers a properly designed passively heated space can maintain a space temperature 5-6°C above the outdoor temperature, which means thermal comfort to occupants can be achieved. This approach was considered in the planning of the entrance hall where large group of people will assemble.

*Operating hours assumed to be 7am to 9pm.

Temperature Profile - Brussels, Belgium





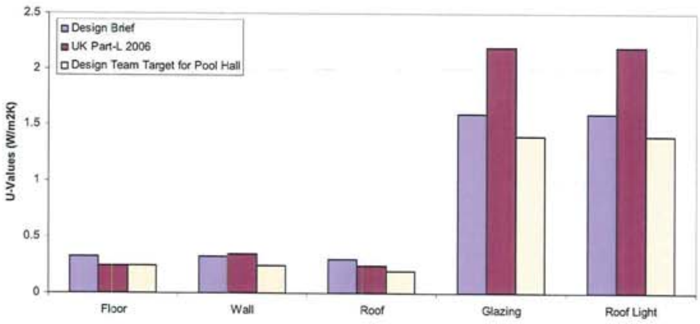
4.2/ Climate Analysis

Precipitation
Rainfall is fairly constant throughout the year with an monthly average precipitation of 60mm. Installation of rainwater harvesting in the development has a potential of collecting 200m³ fresh water monthly. That is equivalent to 25% fresh water requirement for topping up pool tanks.

Wind
Wind direction is predominate from the South-West with an average wind speed of 5m/s or 12m/s in extreme cases. The design team considered this site characteristic and proposes a protected outdoor space solution for the Entrance Hall for people to gather or assemble.

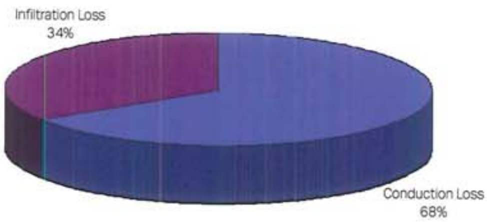
Solar Radiation
Solar radiation is not strong due to the high percentage of cloud cover throughout the year. However a carefully oriented solar panel is capable to absorb 540kWh/m² heat energy annually, or 4.2kWh/m² on the brightest day. Detailed energy assessment is presented in the "Renewable Energy" section.

Building Envelop U-Values Summary

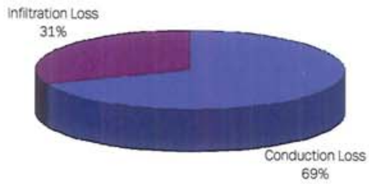


	Design Team Target
Floor	0.25
Wall	0.25
Roof	0.20
Glazing	1.40
Roof Light	1.40

Base Case



After Improvement



It is estimated heat loss through fabric in the pool hall can be reduced by 20% by improving the insulation and air-tightness.

Notes:

- U-Values target shown above
- Air-tightness improved from 7m³/m²hr -> 5m³/m²hr

4.3/ The Project/Engineering Challenge

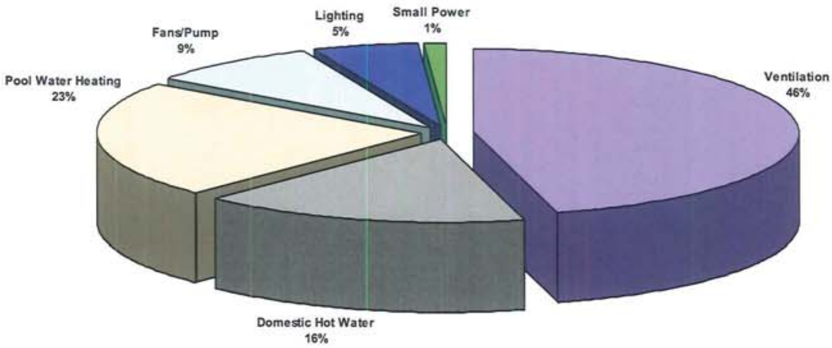
Engineering Challenge in Swimming Pool Hall

Swimming pool hall design is one of the most challenging engineering design in buildings due to the stringent climate control requirements and the amount of energy consumptions. In addition the characteristics of warm, humid and the use of various chemicals in water treatment make the pool hall atmosphere hostile to many normal construction materials. The risk of condensation on building elements due to such warm humid climate is not unusual. There have been a number of structural failures in the swimming pool hall, caused by surface condensation resulting in corrosion in the metal structure.

Swimming pool hall atmosphere is usually controlled at 30°C and 60% Relative Humidity (RH). This close climate control target is to reduce the amount of water evaporation from pool surface, and to maintain thermal comfort for bathers. To maintain climate in that close control range, large amount of heating and electricity energy is required by the ventilation system especially in Western Europe where heating season predominates the ventilation operation. Large amount of heat energy is also consumed in other forms such as pool water heating and shower water. In response our engineering design philosophy is based on reduces, reclaims and reuses as much heat as possible to reduce the building's carbon footprint.

A typical swimming pool consumes 70% of its energy in the form of heating. Shower water consumption for wet changing area is around 120l/day per square metre. The chart below shows the estimated energy breakdown of the development.

Estimated Energy Break Down of the New Extension



85% of energy consumption is estimated to be in the form of heating due to high density of pool facilities.

4.3/ The Project/Engineering Challenge

Engineering Challenge in Swimming Pool Hall

In additional to the climate and energy system design, there are other engineering challenge the design team has to resolve during the detail design phase, such as glare control and the specification of materials and finishes.

Glare in pool halls is usually due to low sun angle or light reflection from water surface. Glare is unpleasant strong light contrast and would cause visual discomfort to occupants. However, a more severe problem in pool hall is the risk of reflected light from pool surface would prohibit life guards from seeing into the water. Issues can be minimised by the correct selection of glazing; location of windows/skylights and careful space planning of the pool hall. Our design will be contributed by experienced lighting designers with the help of computer modelling and 3D rendering.

As mentioned above the choice of materials is very important in swimming pool hall design. Although modern water treatment system is capable to reduce the use of chlorine significantly, any residual chlorine in the pool atmosphere would still develop into damaging problems during the whole life of the facility. The design team has long history in swimming facilities design. We have the experience in choose the correct, cost effective materials to enhance the life span of the facility. Minimising any future needs of maintenance and inspection is also our consideration.

The design team is experienced in swimming pool design and is commited to resolve any challenges by delivering simple and sustainable integrated approaches. For example, the design of the glazing system will be weighted between the daylight, solar control and costs and architectural drivers.

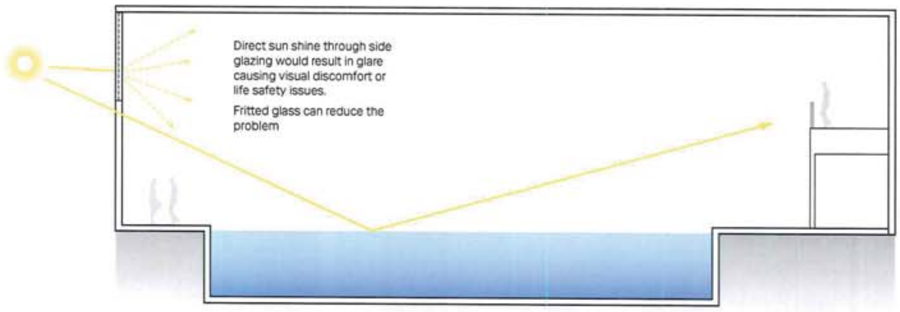
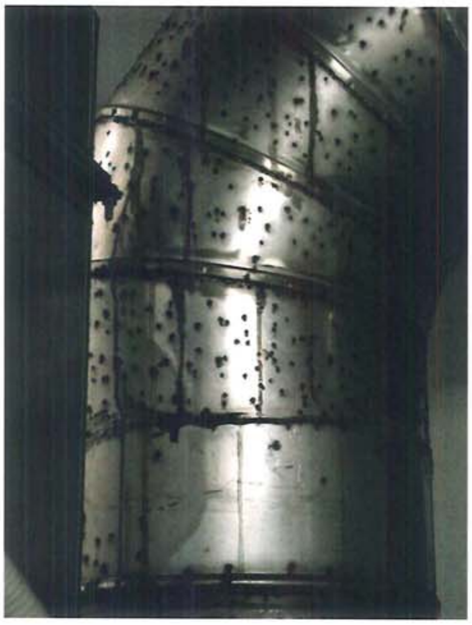


Diagram illustrates the glare problem in swimming pool hall



Surface rusting on stainless steel due to corrosive pool atmosphere

Example of swimming pool hall

Materials used in swimming pool hall shall be resistant to pool atmosphere

4.4/ Environmental Design/Thermal Performance

Thermal performance of building envelope is an important aspect to reduce building's energy consumption especially in swimming pool hall where heating is the dominant for most parts of the year. Thermal performance of building envelope includes:

- U-Value
- Air-tightness
- Eliminating termal bridging

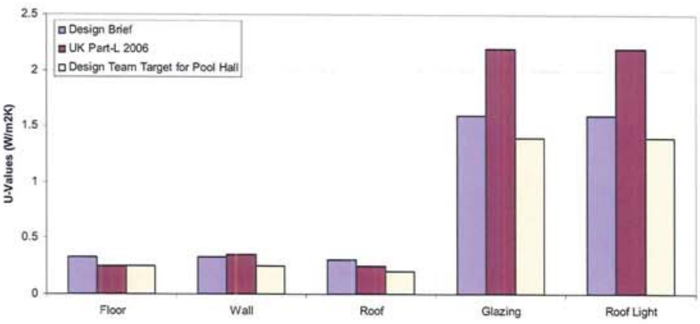
U-Values

U-Value is a quantitative measure of thermal transmittance of building elements (wall or roof) measured in W/m²K. Although the advisory document by Vito, which forms part of the competition brief, defined targets for building elements U-Values, the design team considers a stringent standard should be aimed for especially in the pool hall to minimise heating energy consumption.

The graph below shows the comparison of design team U-Values target with the client brief as well as the UK regulation standard. An initial energy simulation model shows that a the higher U-Values standard would reduce the overall building conduction heat loss by 18%.

Enhanced U-value can be achieved by the use of advanced insulation materials, or by thickening the insulation thickness. An advanced insulation material, Phenolic Foam, has been identified by the design team, which can achieve 40% better than traditional mineral wool of the same thickness.

Building Envelop U-Values Summary



	Design Team Target
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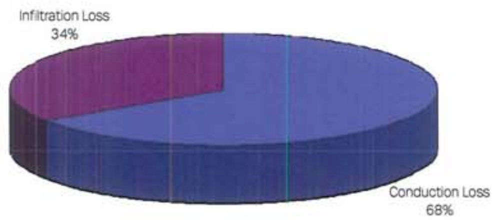
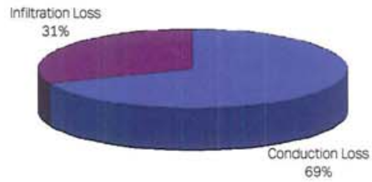
Wall	0.25
Roof	0.20
Glazing	1.40
Roof Light	1.40

Base Case



After Improvement



It is estimated heat loss through fabric in the pool hall can be reduced by 20% by improving the insulation and air-tightness.

Notes:

- U-Values target shown above
- Air-tightness improved from 7m³/m²hr -> 5m³/m²hr

4.4/ Environmental Design/Thermal Performance

Air-tightness

Air-tightness of a building envelope has direct impact on the building energy consumption. A leaky building envelope can account for up to 50% of the total building heat loss. Improving the building air tightness can reduce the capital spending on heating and ventilation system as well as the overall running costs.

Air-tightness can be improved by simplifying building geometry and standardising connection details. An air tightness target will be specified and pressure test will be carried out when the building finished.

Thermal bridging

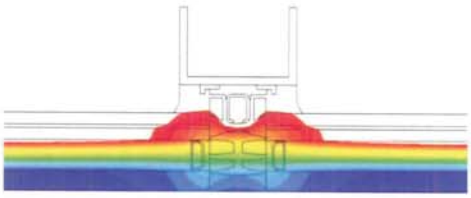
Thermal bridging is localised area of lower thermal resistance in the building envelope usually in structural connections, such as bolts and fasteners, or at building elements junctions. Repeated thermal bridge would reduce the overall thermal insulation of the building envelope but it is of particular danger for swimming pool halls where humidity levels are high and surface condensation due to thermal bridging is likely.

Condensation on ferrous surfaces within the pool hall would result in rusting while condensation on timber surfaces would result in timber discoloring. Corrosion on structural members could even result in structural failure.

The design team's approach in reducing thermal bridging will be by close discussion with cladding contractors to standardise connection details.

Image by Kingspan Ltd.

Air-tightness can be improved by carefully planned construction details



Condensation analysis by computer modelling

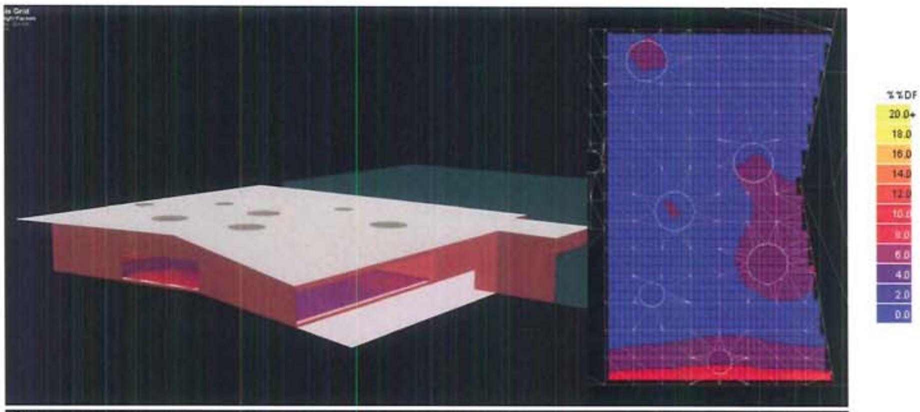
4.5/ Environmental Design/Day Light Design

The proposed building has been carefully oriented and the building form has been developed with the aid of computer modelling to optimise the benefit of passive design.

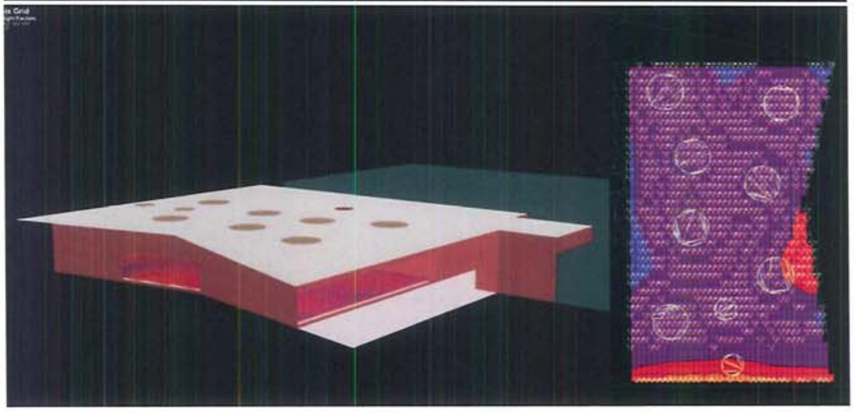
Daylight Design

Scenarios of different glazing sizes and performance were analysed during the development of the pool hall geometry. The objective is to minimise the percentage of sidewall glazing from the west, where risk of glare is high due to low sun angle, as well as to optimise the natural light quality, including the lux level and uniformity.

Initial Case



Final Case
40% glazing on the north facing
13% glazing on the west facing
12% skylight



The target daylight factor is 5% uniformly to achieve a 300lux lighting level on the pool surface

4.6/ Environmental Design/Thermal Zoning

Thermal Zoning

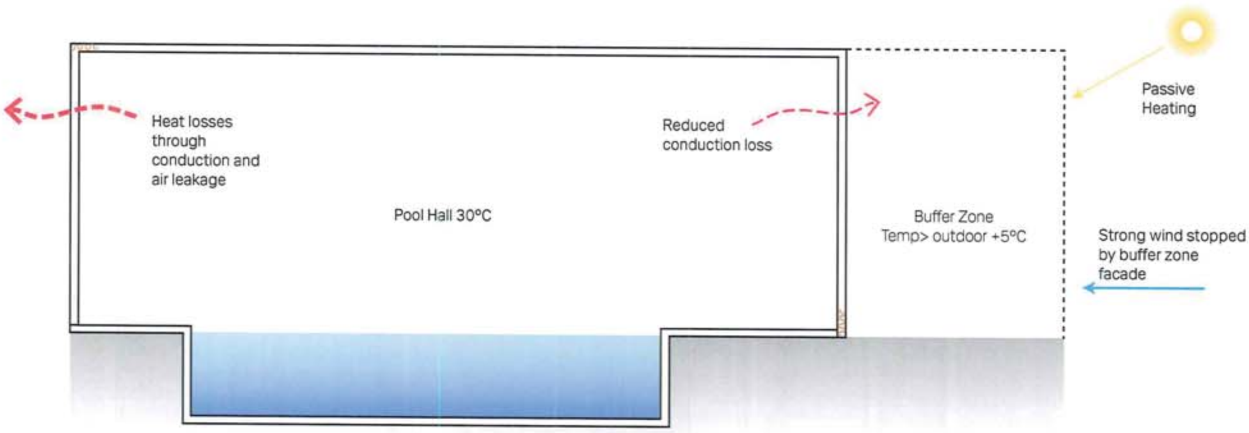
The proper use of natural ventilation and a thermal buffer zone could reduce the building carbon footprint and enhance the indoor air quality. A thermal buffer zone is a non-actively heated space to separate a conditioned space directly from the outdoors. The thermal condition of the buffer zone could be tempered by exhausted air from offices, or by passive solar heating.

Such arrangement would reduce the thermal heat loss from the protected conditioned space due to a smaller temperature difference than if space is directly adjacent to the outdoor. The overall heated area of the building could be reduced, as well as the overall heating energy.

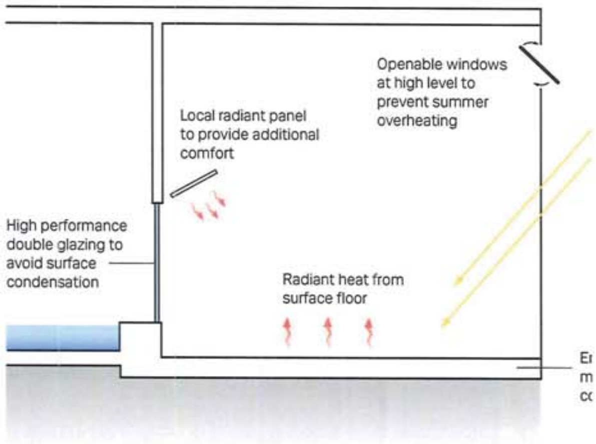
Part of the entrance area of the scheme will be enclosed by a single glazing system but thermally outside the heated envelop. The space would then be a buffer zone protecting the pool hall.

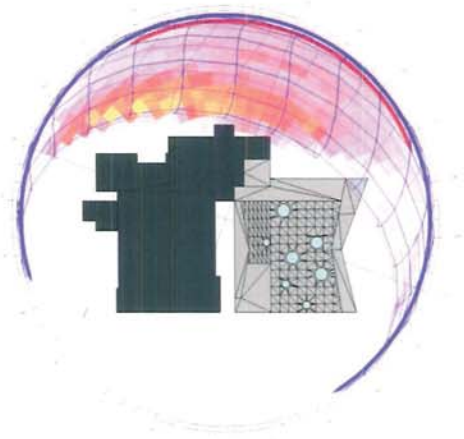
Climate within that area would be significantly enhanced as strong wind from the South-West would be blocked by the façade. In addition warm sunshine entered into the space will be trapped by the façade, which acts like a glass house, to create a warmer climate. Additional passive measures such as enhanced thermal mass, by thickening the concrete slab, will be done as well to maximise the passive heating experience.

It is estimated that during daytime the space temperature could be 5 – 6C above the outdoor temperature.

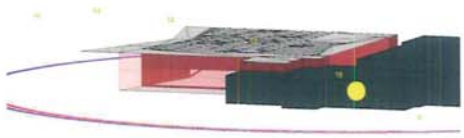


4.7/ Environmental Design/Day Light Design





Computer analysis of the solar intensity within the entrance area. Result shows significant amount of hours passive solar heating is available.



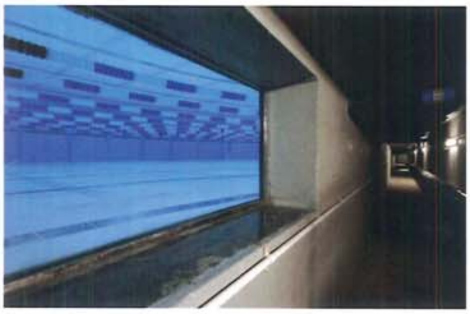
4.8/ Environmental Design/Pool Hall

Pool Hall Environmental Control

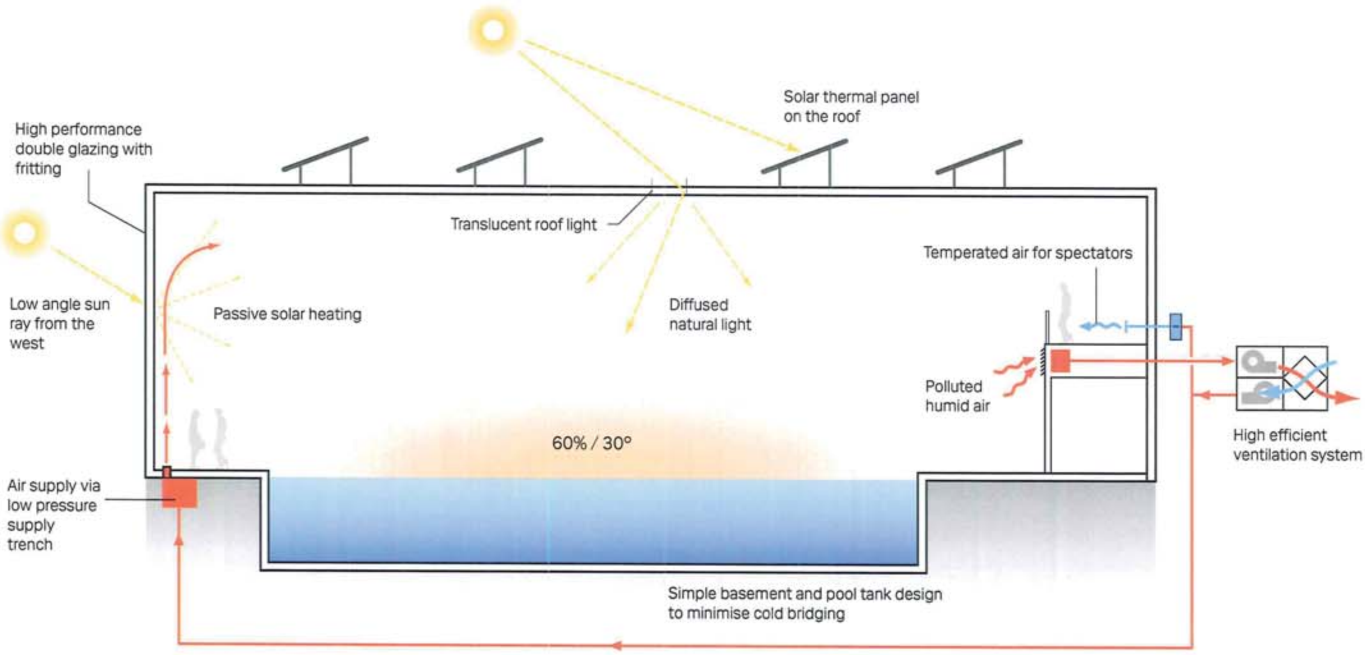
Sketch below illustrates the environmental design concept of the swimming pool hall.

Key issues include:

- Optimised glazing to balance the thermal loss, passive heating and natural light performance
- Translucent skylight and fritted glazing to be used to reduce the risk of glare
- High efficient ventilation system includes heat recovery
- Low loss ventilation system through builders work duct to minmise the use of metal, thus risk of corrosion
- Tempered air supply to the spectator area



Example of swimming pool services trench



Renewables

Systems Efficiency

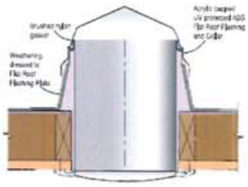
Reducing Loads

Building Forms and Orientation

4.9/ Environmental Design/ Lighting Design

Lighting Desgin

The majority of spaces in the proposed building will be naturally day lit where possible. Where space is enclosed, such as the wet change area and various plantroom, modern solution such as light pipe will be installed to transfer natural light into inner space. Such arrangement not only able to reduce the demand of artificial lighting, a more natural color temperature can be rendered for occupants as well.



Images by Monodraught Ltd.

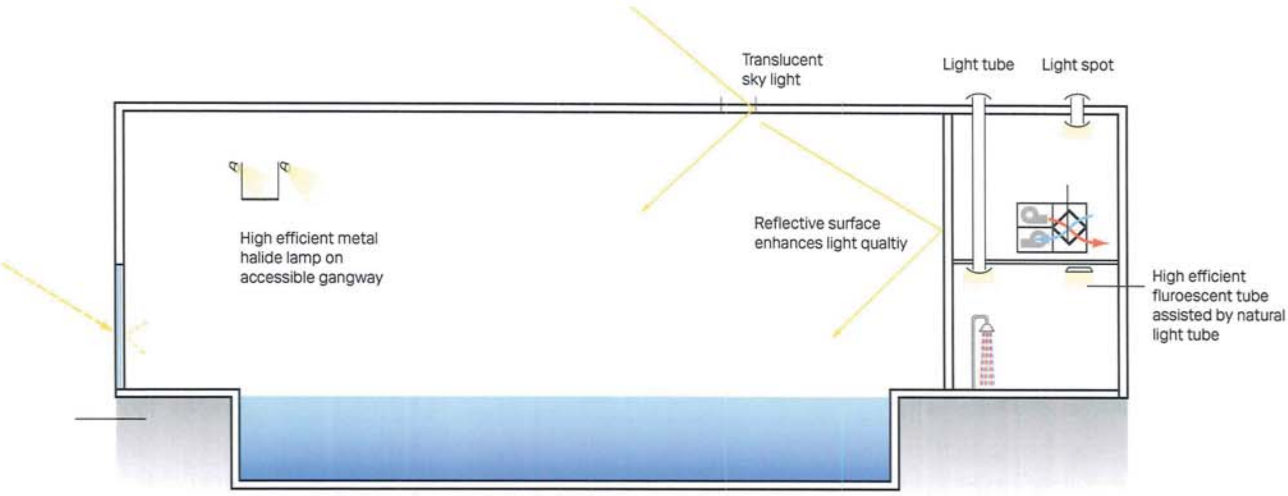
Light tube

A light tube can be a reflective tube or glass fibre which transport light from an outdoor entrance point into indoor space by a light diffuser.

Artificial Lighting

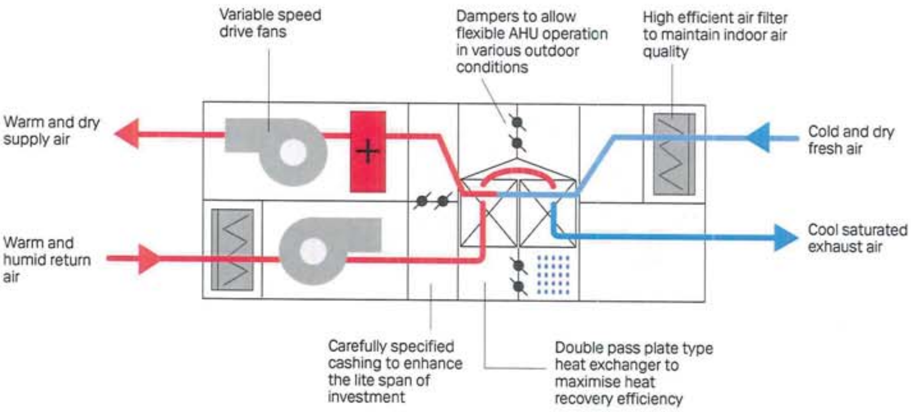
Building finishes will be specified with the consideration of the natural and artificial lighting system. The current proposal is to specify light color where possible to enhance the surface reflectance. That would reduce the lighting energy demand and enhance the uniformity of lighting.

Artificial lighting systems will be properly zoned to suit space function. Daylight and motion sensors will be installed to avoid the switching on unnecessary luminaries.

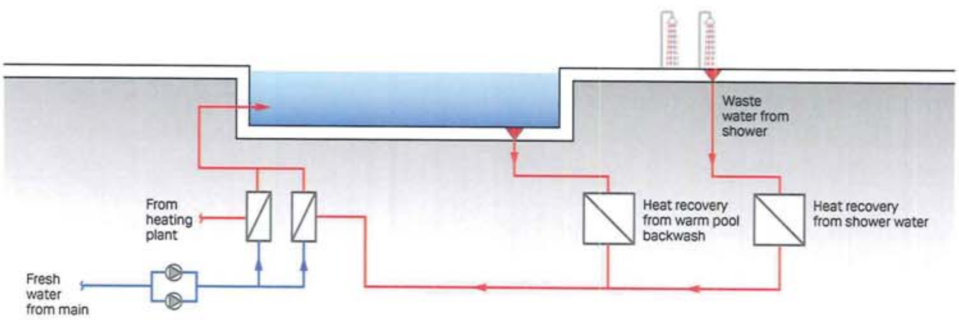


4.10/ Energy/Energy/Low Carbon System

The third step of carbon reduction in the building is using efficient engineering systems or services to reduce the amount of energy input. Due to the nature of the development which would be heating predominately, various heat recovery techniques are proposed to minimise the overall heat input. Other measures such as variable speed pumps; low losses ductwork and pipework; and building management system are proposed as well. Evaluation on the existing plant will be carried out as part of schematic design with the client to investigate the potential of enhancing the existing building system efficiency during the development, or in the future.



Ventilation Heat Recovery / Fresh Air Control
All ventilation system will have heat recovery components and airside economisers installed as standard to reduce the ventilation heating loads.



Waste Water Heat Recovery
Significant amount of warm pool water will be discharged in daily basis (30l per bather) and during sand filter backwash process. Strategy to reclaim heat from those waste water is proposed. The system consists of a small scale heat pump to extract heat from the waste water to preheat fresh incoming water into the pool tank. System efficiency is estimated between 700 – 1000%.

It is estimated that the up to 900kWh of heat energy can be reclaimed through the system.

Similar system to reclaim heat from shower water is proposed as well.

1300 pupils/day x 30litres fresh water x 20°C
= 900kWh/day or 78tons CO_2 per year!!!

Renewables

Systems Efficiency

Reducing Loads

Building Forms and Orientation

4.11/ Energy/Low Carbon System

System Design

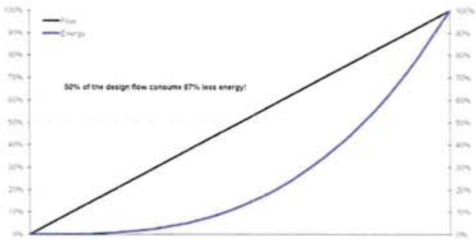
Ventilation and heating plants account for 10% of energy consumption of the building. The HVAC system is designed for the peak design condition. However, 99% of the operation hours the system is in off-peak mode and the ability of reducing the system capacity during those hours would significant enhance the system efficiency, thus reducing the energy input.

All fan and pump systems where suitable will be designed to operate at variable speed mode. System will also be carefully sized using dynamic energy model to minimise risk of over-capacity, thus the initial capital investment.

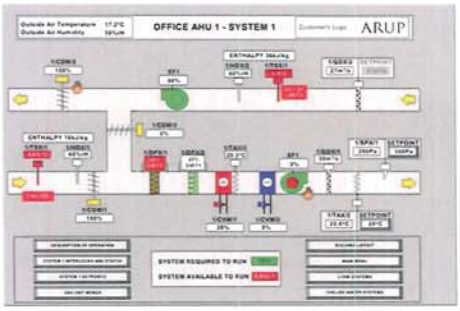
Building Management System

All electrical and mechanical plants will be monitored by the building management system. The system has the following capabilities to inform building operators the health of the building:

- Any water leakage from the system
- Zonal energy consumption
- Space conditions and ventilation system input
- Automatic lighting and plant control
- Hourly energy data for further analysis



Graph shows the benefit of variable speed pumps / fans



Typical graphical interface of Building Management System

Modular plant design combined with building management system to make sure plants always operate at their maximum efficiency

Future Plant Expansion

Flexibility in system upgrade/expansion is a key in sustainable building services design. Plant will be designed in modular approach to enhance future expansion potential. Design team will also consider the possibility of integrating plants in the existing building with the new system to enhance the overall system efficiency.

4.12/ Energy/ Renewable Energy

Renewable Energy

Summary of a number of renewable energy sources assessment is presented in the table below. It is considered that the "Solar Thermal System" and "Combined Heat and Power Plant" are the suitable options for the project. The potential of using biomass to power the CHP plant will be investigated during the schematic design phase. Areas to look into include the local biomass infrastructure, capital investment, and the net carbon saving than a gas system.

System capacity will be revaluate during the schematic design phases with the client to optimise the use of fossil fuel and the capital investment.

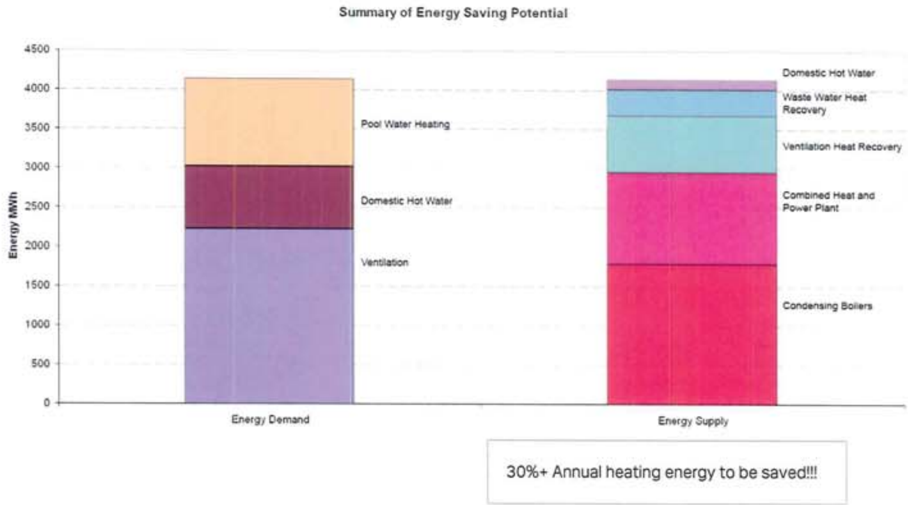
Option		Proposal	Design comments
OPTION 1 **HEAT** SOLAR THERMAL		• 250m² solar thermal panels required to provide 50% of daily hot water heating for shower	• Sized for domestic hot water heating • Commercial products available. Simple solution for flat roof construction. • Extra structural load on roof • Thermal Storage buffer tank required • Efficiencies based on manufacturers data at 60%
OPTION 2 **HEAT & POWER** (BIOMASS) COMBINED HEAT AND POWER PLANT		• A 400kW CHP to provide base heating load throughout the year	• Suitable for this development as the pool heating system will provide a constant heat load throughout the year. • Plant will be sized to provide a base heating load. • Thermal storage buffer tank might be required to smooth the demand • Plant can be powered by either natural gas or biomass if infrastructure is available.
OPTION 3 **POWER** PHOTOVOLTAICS		• Not to be considered further	• Very expensive solution • Carbon pay back would not be achievable due to low carbon factor of grid electricity
OPTION 4 **POWER** STANDALONE SMALL WIND TURBINES		• Not to be consider further • Can be considered as a retrofit items in the future	• Commercial products available. • No roof space required – turbines located in the landscape • Limited amount of electricity generation

4.12/Energy/Renewable Energy

Summary of Heating Energy Saving Potential

Graph below summarises the potential of annual heating energy saving with the implementation of various low carbon and renewable energy sources as described above.

Summary of Energy Saving Potential



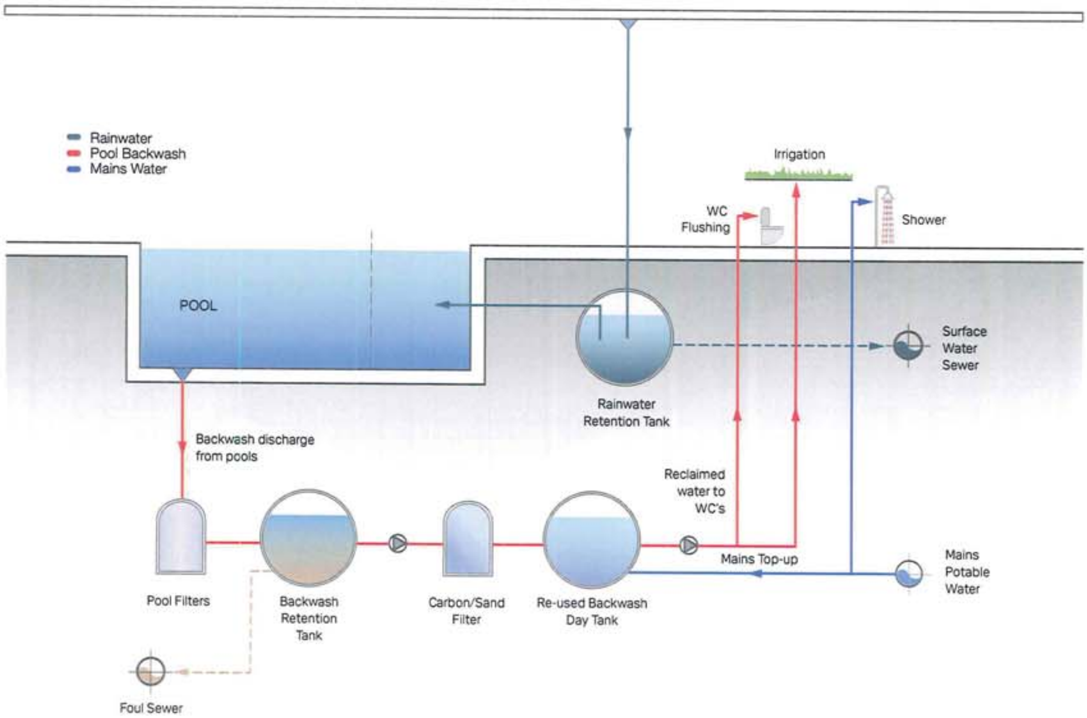
4.13/ MEP/ Water Treatment

Water Treatment

Unsurprisingly pools use large quantities of water and are heavily reliant on maintaining water quality. The aim of our design is to maintain excellent water quality whilst looking for ways of re-using water to minimise the use of our increasingly precious municipal supply. The systems include:

- Use of state of the art pool water systems to provide high quality pool water whilst keeping maintenance simple and straightforward. Our design is based on using UV as the treatment system of choice in conjunction with the more standard primary treatment elements as PH control, filtration and chlorination.

- The UV treatment system will result in lower chloramine levels in the pool water, will provide a better water quality and a better air quality within the pool hall with lower odour.



4.14/ MEP/ Plant Design

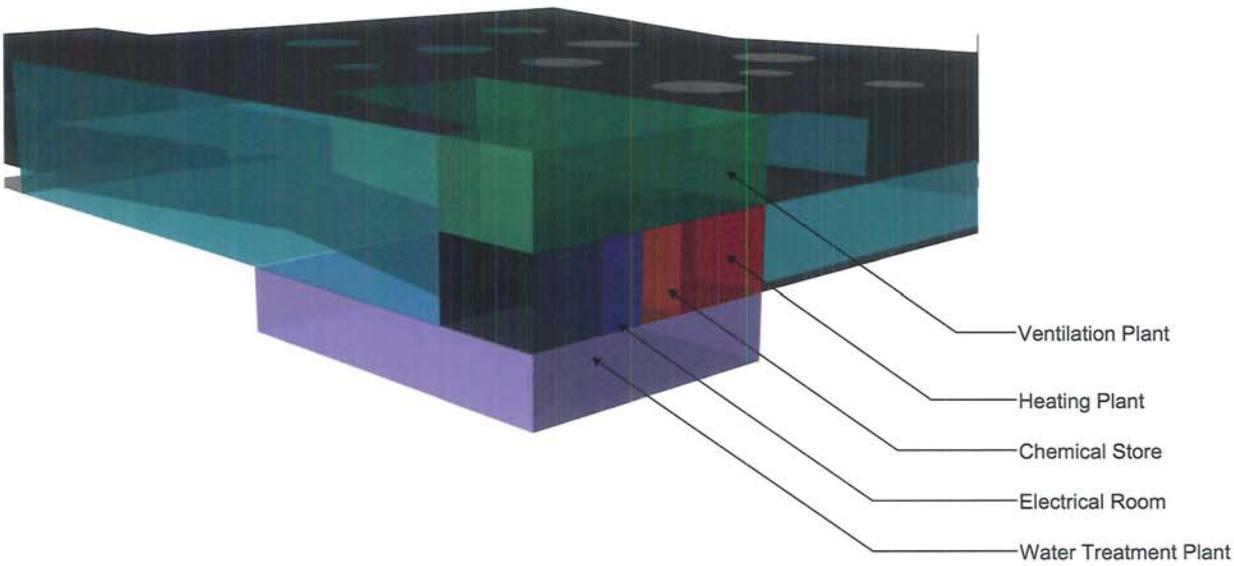
Plantroom Arrangement

MEP plant will be arranged in three main plant areas in the basement, ground and first floor.

Basement
The basement plant room will house all pool water treatment equipment.

Ground Floor
Further assessment of the existing plants is required to confirm the details. However, the proposal of the ground floor plant area is to house various electrical equipment; boiler plant; and additional water storage tank.

First Floor
The first floor plant room will house the ventilation plants to serve the pool hall and wet change areas. Air intake and discharge will be arranged carefully to avoid risk of recirculation.

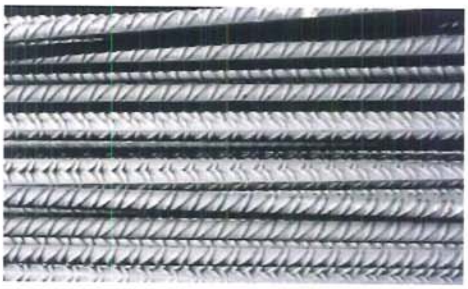


4.15/ Eco-Building/ Materials

Materials use in the construction shall be considered from the day one planning work started. Local and recycled materials shall be considered first and foremost. The design team recommend that strict requirement shall be set for the contractors and materials suppliers to reduce the overall building carbon footprint.

Measures considered are as follow:

- Timber shall be sourced from sustainable sources
- Materials and equipment shall be primarily transported by rail
- Packaging of materials shall be recyclable and reusable
- Incentives shall be given for reusing building materials from dismantled building
- Prohibit the use of materials with CFC or GWP > 5 (GWP: Global Warming Potential)
- Off-site prefabrication is encouraged to reduce the construction waste, and various forms of air and water pollutions caused by construction works
- Building design will be simplified as possible to maximise the potential of off-site prefabricaion

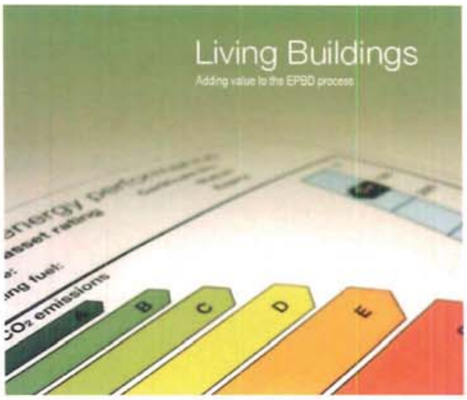


4.16/ Eco-Building/ Operation

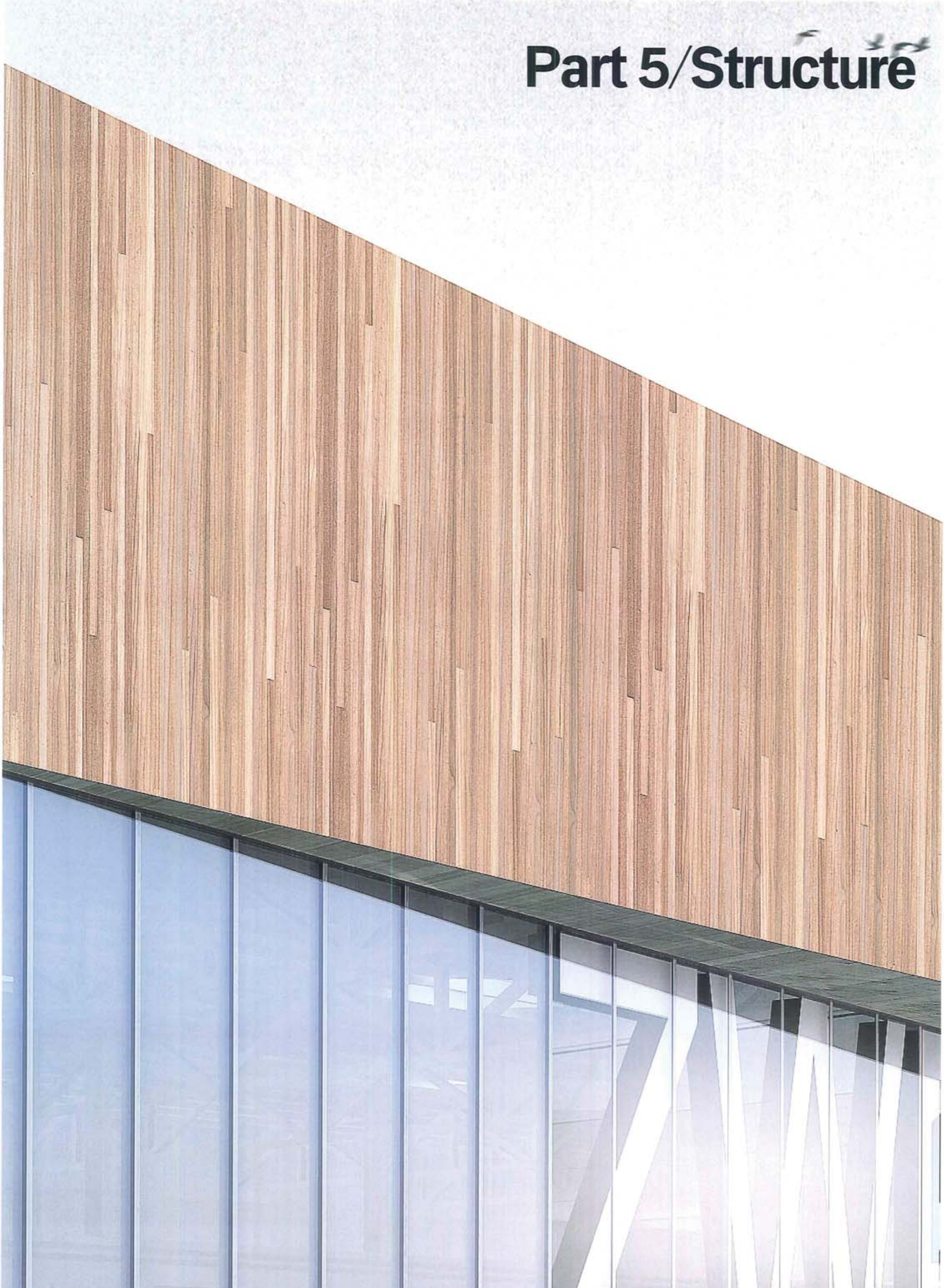
Design of an eco-building does not stop even if the building has been finished. The building operation team plays an important role to make sure the building is operated as design. A poor run building would increase the building energy consumption, or even induce sick building syndromes.

The design team is experienced in post-construction building management and is able to provide advises to the client team to optimise the building operation. Measures that can be carried out include:

- Well documented Operation & Maintenance manual
- Re-commissioning of MEP system after a year of building completion
- Energy audit
- FM/maintenance services audits
- Occupant satisfaction survey



Part 5/Structure



5.1/ Sustainability and Structure

Maximising the sustainability benefits of the structure of a project involves much more than the specification of the right materials with the lowest embodied energy, although this is a major factor. The whole life cycle of the project and the re-use or recycling of the building and its components after the useful design life are considerations as well as maximizing the useable design life itself. Adopting an efficient, modular structural system which minimizes fabrication and material usage are other primary considerations.

The main pool hall roof is formed from steel trusses of medium span supported on standard steel column sections. The structure has been developed to ensure a minimum of energy in fabrication as all trusses are comprised of straight elements with parallel chords. Vertical brace and diagonal elements of the trusses are oriented with flanges vertical and are the same width as the top and bottom chords for efficiency of fabrication. All truss members will be fabricated from plate rather than standard rolled sections to ensure plate thicknesses can be varied throughout the structure to ensure full utilization of the steel and therefore efficiency of material usage.

The suspended floor structures and substructure are formed form reinforced concrete. This will allow for a high recycled content though the use of secondary aggregate where available. Secondary aggregates are the waste bi-products of other industries such as mining and iron production.

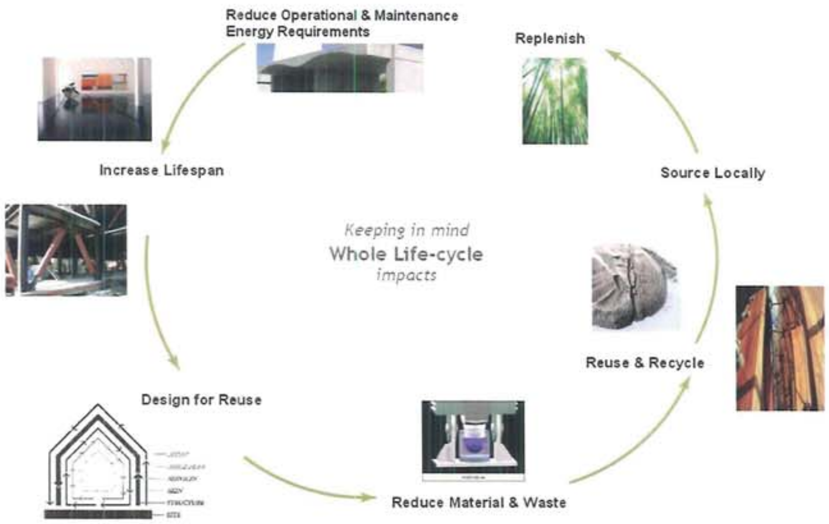
The reinforcement steel used for the concrete is generally 100% recycled from scrap steel which means that no new raw materials are required for its production.

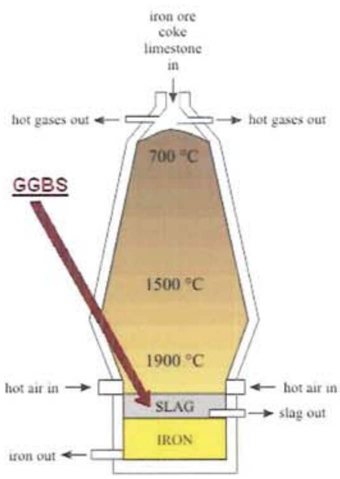
Recycled aggregate

The aggregate in the water retaining structures will consist of carboniferous limestone aggregate, which could not be from recycled sources. Approximately 50% of the concrete works will be water retaining. A high percentage of secondary aggregate for the coarse aggregate will be specified for the non water retaining structure to help to achieve a minimum recycled aggregate content of 25% of the total high grade aggregate uses on the project provided this is available in Belgium.
Recycled aggregate is to be also specified for the surface binder for paved areas and roads, and unbound uses in landscaping and sub bases.

Use of Fly Ash or Ground Granulated Blast furnace Slag

Concrete specification (both water retaining and non water retaining) will permit up to 70% cement replacement with Ground Granulated Blast Furnace Slag (GGBS) or Pulverised Fuel Ash (PFA). Both theses materials are waste bi-products of either the iron production or power production industries and remove the need for a large proportion of cement in the mix which has the largest component of embodied energy.



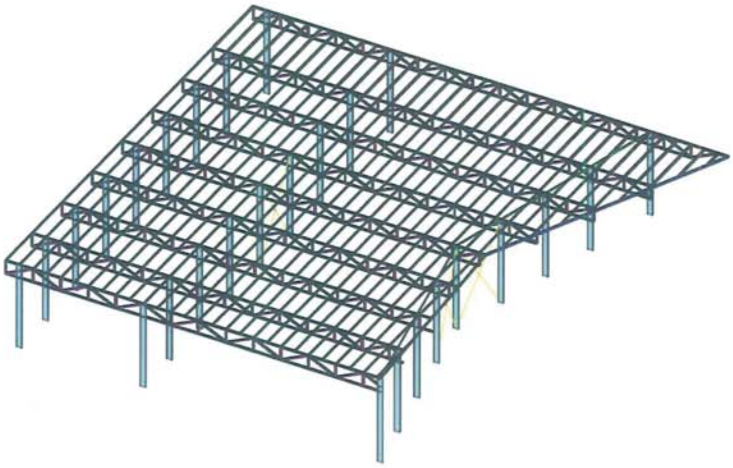


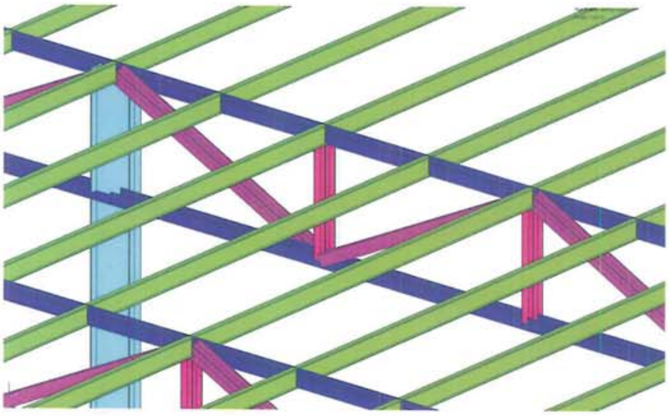
GGBS Source

PFA Source

5.2/ Roof and Superstructure

The primary drivers in developing the roof and superstructure forms have been simplicity of construction, efficiency of material usage and economy of fabrication and erection. The main pool hall trusses span on average 30 to 35m and have a depth of 2m. All truss elements are fabricated of steel plate for efficiency and economy and will be painted with a 3-coat paint system to maximise the design life in the aggressive pool environment.





Roof Truss Detail

The column elements will be also of fabricated steel sections mounted on reinforced concrete bases to prevent the steel elements being in contact with the floor's wet environment. The roofing system will be supported on simple steel I-beam purlins at 2m centres connected to the trusses by simple bolted connections.

5.3/ Foundations and Basement Structure

The main consideration in determining the pool water level and level of pool surround for the building has been the high level of the water table beneath the ground. The Architect has set the pool level at 1m above the ground to ensure that the weight of concrete in the pool tanks is sufficient to resist the buoyancy effect the high water table would have, which tends to lift the tanks from the ground when empty. With a high water level, if the tanks were set too low in the ground there would be significant expense required in order to use tension piles to hold the pool and basements down when empty so that they don't 'float' due to the high water level.

Reviewing the current geotechnical assessment from the existing site investigation, the conclusion is that shallow pad-foundations may not be feasible in the area of the new pool construction. It is likely that reinforced concrete piles in this area will be required to carry the pool and building loads down to firm strata. As discussed above, tension piles will be avoided by setting the pools high enough in the ground that the weight of the pool tanks resists any buoyancy effects from the ground water.

All below-ground structures will be formed as in-situ reinforced concrete water retaining structures due to the existing high ground water levels. The basement substructure is to be constructed without movement joints using timed joints to reduce the effects of shrinkage. The location of these joints is subject to more detailed investigation but will be located, if possible, to avoid the pool structures.

All drainage channels, etc. required in the basement will be formed by 'folding' the base slab to form the required profile, with connection to the ground level drainage system by pumping.

5.4/ Pool Structure

The key requirement for all swimming pools is to provide a water retaining structure for the life of the building. Where pool structures extend below the water table they need to retain both the pool water and prevent leakage into the pool from groundwater, particularly on occasions when the pool is empty. Historically pool tanks have been formed in concrete with a significant reliance placed on the tiling/render to retain the water. Leakage would generally occur at movement joints in the tiling which in turn led to degradation of the substrate and in turn the concrete tank structure

The pool tank can be formed in a number of ways, each having an effect on the cost, speed and complexity of the construction process as well as ease of access for inspection and repair over the life of the facility.
Two of these systems are presented in more detail below with their respective advantages and disadvantages.

Option 1 - Combined basement and pool tank in water proof reinforced concrete

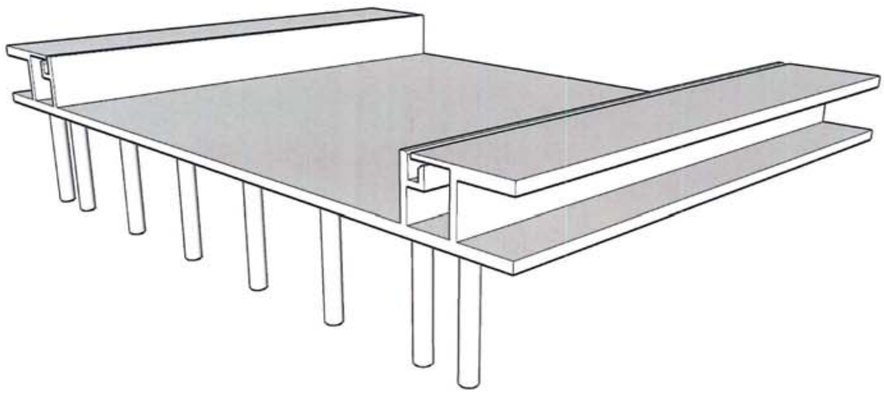
This structural solution for forming the pool tanks utilises a single monolithic reinforced concrete tank construction. The single piece, movement joint free tank construction is similar to that adopted for the National Swimming Centre in Beijing for the 2008 Olympics, the Manchester Aquatics Centre and adopted for the London Aquatics Centre for the Olympics in 2012. Here the tank is designed as a single water retaining structure with no reliance on the tiling. The pool tank structure would be designed to suit the particular site conditions which require the tank to not only resist water pressure from the pool water but also to resist uplift and ingress from the groundwater. As noted earlier, for the De Nekker site, for economy of construction the aim would be to avoid tension piles and ensure that the pools are constructed high enough that any uplift forces are resisted by the weight of the pool tank concrete and base slab.

The one piece approach to the pool tanks can be used for both pool tanks in the De Nekker project. The monolithic concrete tank construction would also incorporate, resting ledges, recessed steps, water-supply trenches, floating floor trenches, boom trenches and floating floor anchorages.

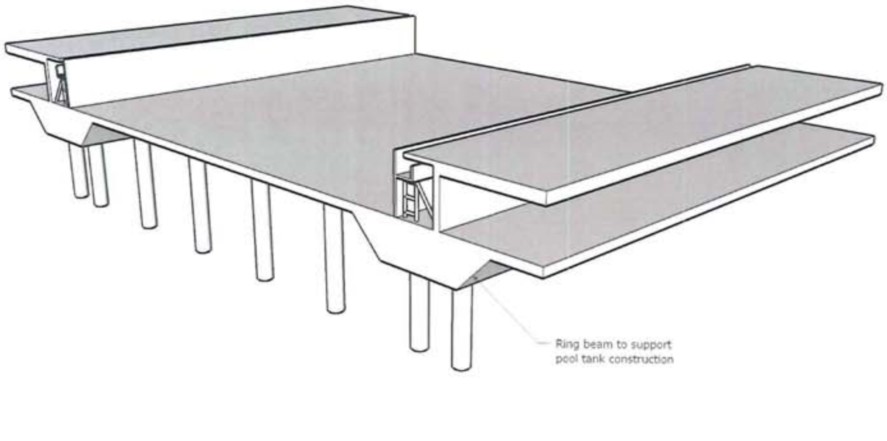
The leisure water zone would be constructed as a shallow monolithic concrete tank as described above with a simple geometry, with non linear features formed in mass concrete which would be capable of modification in the future without disturbing the water retaining concrete tank construction.

In this form of tank structure the concrete construction day joints to the pools would use hydrophilic seals. These have been successfully used in our design on a number of Olympic-size and 25m pools and have proved reliable since their introduction some 20 years ago.

Option 1 - Combined basement and pool tank in water proof reinforced concrete



Option 2: Proprietary steel prefabricated tank with polymer liner



Option 2: Proprietary steel prefabricated tank with polymer liner

An alternative to designing water-retaining reinforced concrete tank structures is to use a steel prefabricated tank with a polymer liner to create the water-poof tank. .

Generally, a lined tank proves economic where the ground conditions do not require a significant base slab and the liner can be placed on a 'stabilised' formation. Life expectancy and durability of the liner is less than those of the tiled concrete tanks described in Option 1.

For the De Nekker project the base support slab would be required to be designed to resist water uplift to prevent lifting of the liner.

The polymer liner carries an additional risk of additional wear and tear where the traversable boom and vertical boom are incorporated into the pool structure.

The 4m deep end of one of the 25m pools of De Nekker cannot be delivered with a polymer lining, and would require a traditional reinforced concrete tank for depths greater than 3m as described in Option 1 above.

Cost and cost management/

Pools are among the most expensive public-sector sports buildings to build and maintain. They require ongoing subsidy, so both capital and operating costs will come under careful scrutiny. As a result, the typical pool is designed with spatial efficiency very much in mind, allowing little space for uses other than programmed activities. This means opportunities for architectural expression or spaces for incidental activities can be quite restricted on these projects.

Capital Costs

The key areas where money is spent in pools - substructure and pool tank, roof, finishes, mechanical services and the pool installation itself - are difficult to value-engineer, as a base level of performance has to be high enough to guarantee trouble-free operation. In seeking to develop a cost-effective solution, the key drivers affecting the capita cost-value equation are:

Pool size
Pool size is the major development driver, determining the size of the pool hall, changing facilities and so on. Most of the expensive building work is associated with the pool so its size will have greatest impact on total cost.

Area and depth
Training pools require depths of between 1 m and 1.2 m, whereas pools designed for major competitions need to be 2 m deep. The pool width will be determined by the number of lanes.

Volume
Deeper pools designed for competition require larger filtration and heating plant as well as the larger tank.

Ground conditions
A high water table may result in the need for ground anchoring of the pool tank if water pressure is too high.

Builders' work
The installation of dry air duct systems, moving floors and booms drive up costs.

Pool hall size and volume
Pool hall size is broadly determined by the width of the pool surround, typically 2 m, and the height of the pool, taking into account requirements for spectator seating and diving platforms. These factors affect wall-to-floor ratios, air-handling volumes and heating loads.

Pool flexibility
Features such as booms and movable floors add considerably to the building costs and also require extensive builders' work to accommodate machinery and so on. Movable floors also require an additional zone of 400-700 mm below the maximum operating depth of the pool. However, the payback of these features is considerable as they substantially increase the flexibility available to the operator and the intensity of the pool's use.

Mix of wet and dry activities
Other facilities such as health and fitness suites and sports halls are significantly cheaper to build than the swimming areas. As a result, schemes with a high proportion of dry sports to wet will have a lower build cost on a €/m2 basis although the floor area and total cost will be substantially more than for a comparable wet-only scheme.

Operating costs

Key issues in controlling operating costs include:

The selection of the filtration system
Until recently, ozone was the market leader. Because of high water turnover rates, ozone-based systems are widely believed to provide the highest quality water. However, they need larger plant rooms and have the highest operating costs, partly because of the need to generate ozone on site. UV systems are also highly rated and, because they need very low levels of chlorine, cause little swimmer discomfort.

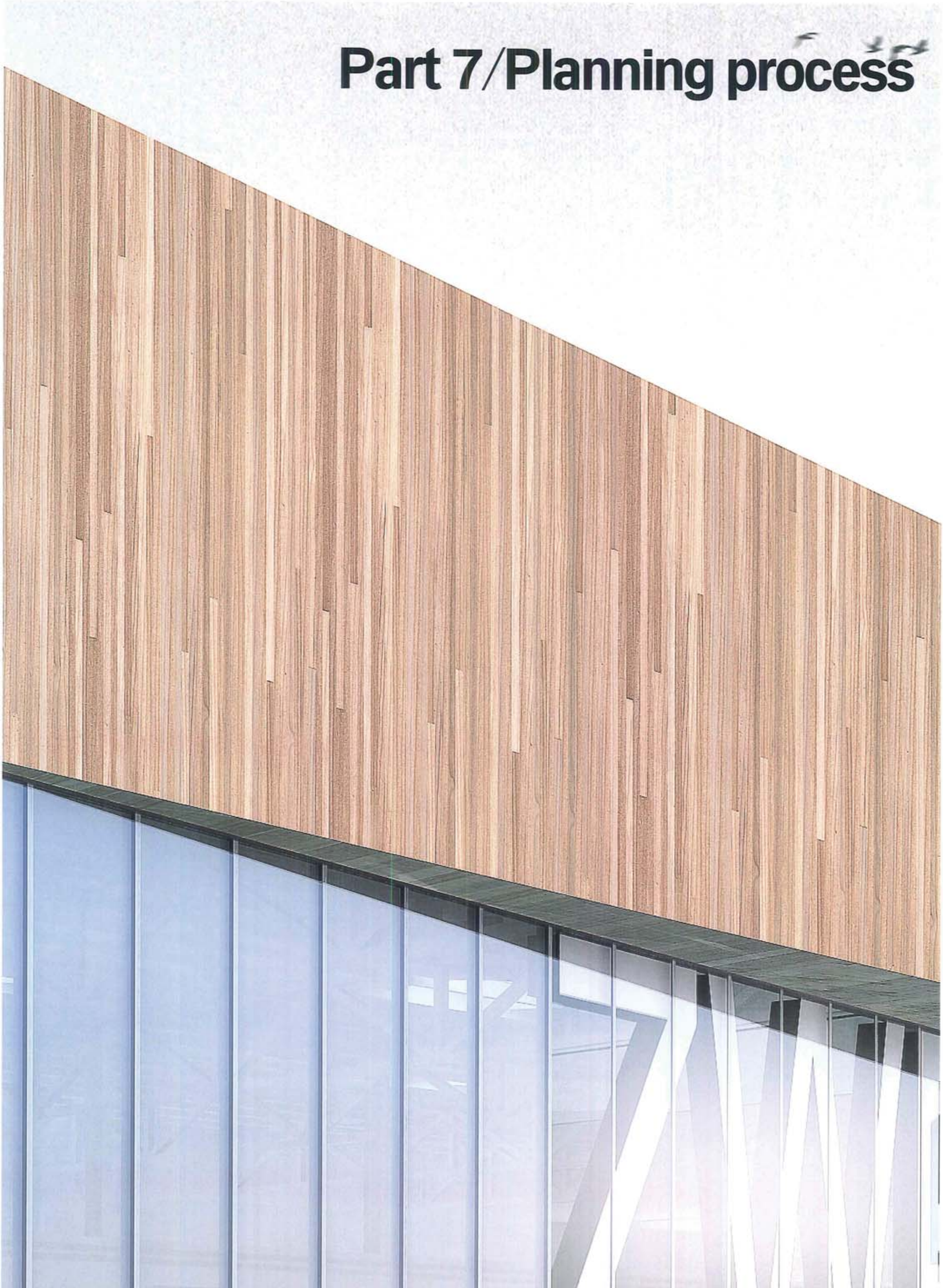
The design of surfaces and selection of easy clean materials
An effective cleaning regime is important in pools, not only to maintain good appearances but for health and safety reasons. Careful selection of non-slip tiles and the specification of falls that balance public safety and effective cleaning are important.

Avoidance of high maintenance materials
These include exposed architectural concrete, porous masonry and ceramics, structural glass and certain grades of stainless steel.

We are accustomed to acting as project Leader and having responsibility for the overall economic implications of our design decisions. There are several key areas that have to be included in the design development process;

- Analyses of the brief in terms of most value for money, this work is often best undertaken in a workshop environment with the Client and all other parties involved.
- Total Project budget, it is of paramount importance that the overall project budget is well thought out and comprehensive.
- Value management, there should be value management workshops at appropriate times.
- Cost Planning, construction estimates and cost plans should be prepared until we are satisfied that the proposed design can deliver the project within budget.
- Benchmarking, with regard to construction costs and spatial requirements it is necessary to benchmark the costs and brief against other relevant projects.
- Cost appraisals at every key stages of the project such as stage VO, DO and UO. These appraisals should be summarised in cost summary reports identifying shortcomings and possible solutions to be addressed within the next stage.
- Life cycle cost analysis, considering not just initial capital cost but the impact of design decisions on the future cost and revenue position of the Client.
- Programme & procurement, advise on the various options for contractor procurement and agree with the Client and the design team the best option taking into account programme.

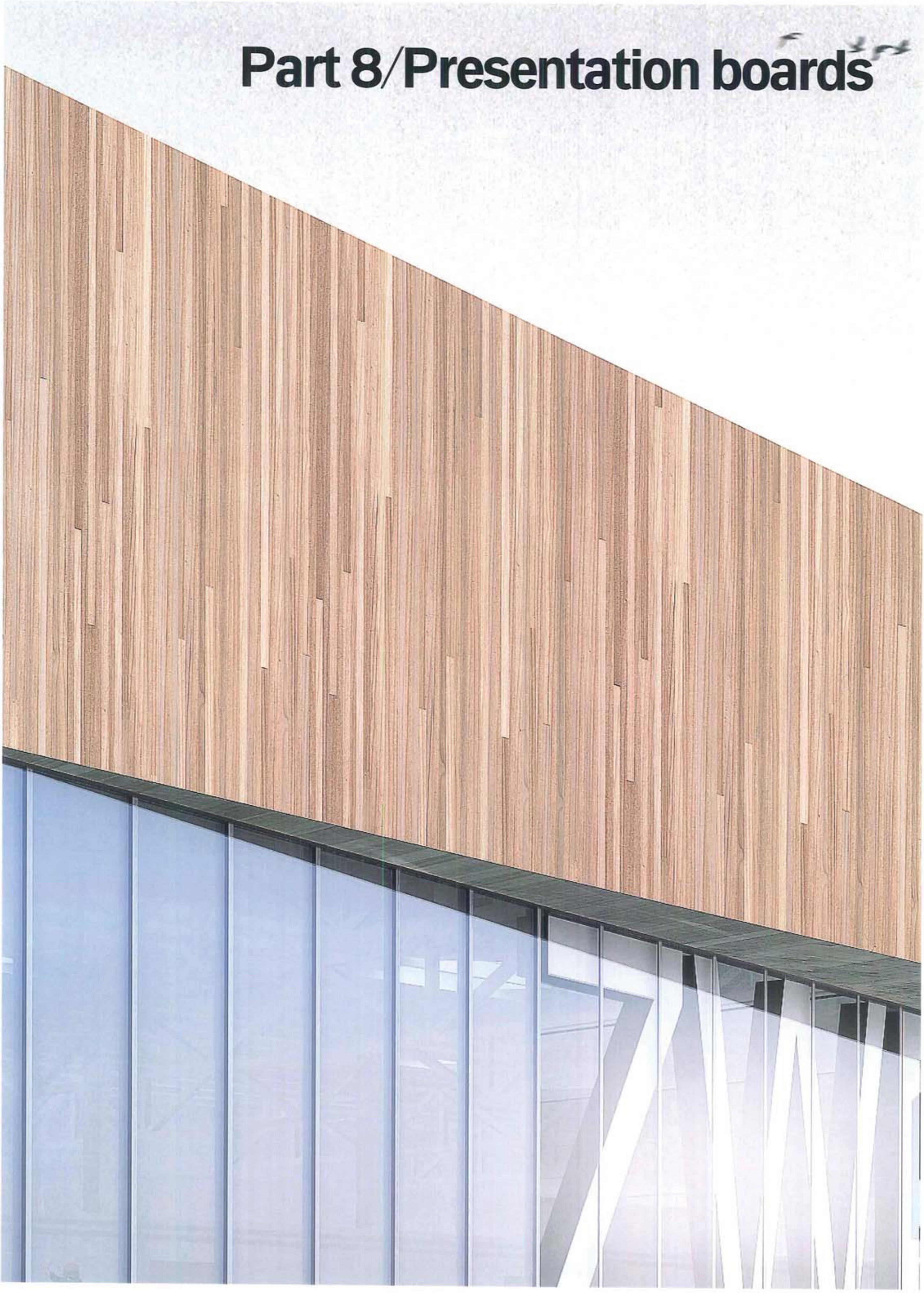
Part 7/Planning process



Planning Process/

We believe the design progarmme submitted as part of the Project Definition to be cautious.
We are therefore proposing (and our fee proposal reflect that fact) a more aggressive design progarmme shorten by up to 6 months.
This is base on previous experience with similar scale projects assuming a standard form of contract.
Should the Authority consider a different form of contract such as design and built for example the design programme would need to be revised.

Part 8/Presentation boards



DeNekker/Sports & Recreation Centre/Mechelen/

new/unified/green/bold/gateway/

De Nekker/Sports & Recreation Centre/Mechelen/Belgium

From the outset, it is clear that the De Nekker Sports & Recreation Centre must represent itself as a single unified entity – a new contemporary Sports Centre for the Mechelen area. We believe this is not a project to create a new 'stand-alone' indoor swimming facility that is simply connected to the existing Sports Hall complex via a link or bridge.

A new 'stand-alone' pavilion-like structure located on the site of the existing crazy golf course, would arguably create a new and fresh addition to the Sports Centre, yet it has a number of inherent problems, both technically and visually.

Although a separate pavilion would give the opportunity to add a 'new' face to the De Nekker Centre through the addition of a new building, it would somewhat neglect the existing building. This does not address the desire to collectively represent the Sports Centre as a single new entity.

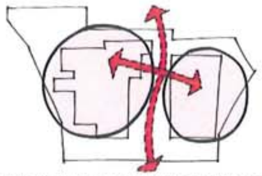
The existing Sports Hall complex is entered at first floor level via a large external ramp. Upon entering the centre the majority of users have to immediately descend back to ground floor level to access the existing changing facilities. These facilities do not benefit from any natural light due to their positioning behind the existing access ramp. We propose to simplify this access sequence, inject new life into the existing changing facilities, and create a new 'heart' for the new sports centre.

Furthermore, the existing entrance space is cramped, cluttered and dark and does not provide the light, open and airy entrance the complex desires.

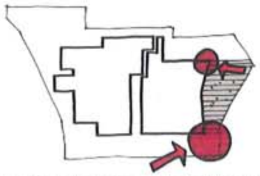
The requirement to address the existing internal spaces of the existing sports complex and the creation of a unified external face for the new Sports & Recreation Centre, informs the proposal.

The new proposal aims to provide a new unified and contemporary face for the De Nekker Sports & Recreation Centre.

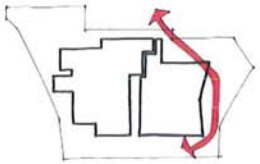
A bold angled façade leads visitors through a new landscaped plaza to a new double height entrance space looking south towards the lake. A large overhanging roof marks the gateway to De Nekker, the new entrance to both the Sports Centre complex, and the external grounds beyond.



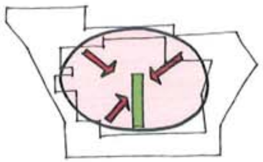
The creation of a stand-alone pavilion with a central access route splits the "new" sports centre into two clear buildings, making it less connected as "one" single entity.



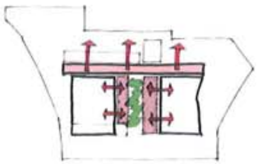
The proposed project pushes the new extension tight against the existing building, creating a new route through a new access plaza and past the new 'face' of the Sports Centre.



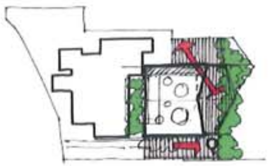
The proposed project becomes the new gateway to both the 'new' Sports Centre and the outdoor areas.



What was an uninviting entry ramp becomes the new heart of the proposed project, visually linked both the existing and new changing facilities over an open external courtyard, with reflecting pool bringing light deep into the building.



A new combined grand entrance provides direct access to both the pool hall and the existing sport hall and their respective changing facilities.



This new public frontage addresses the park, with hard and soft landscape articulate the various faces of the proposed project.

site/

1:500

interieur/

niveau 0/

1:200

Key

Swimming Pool Halls

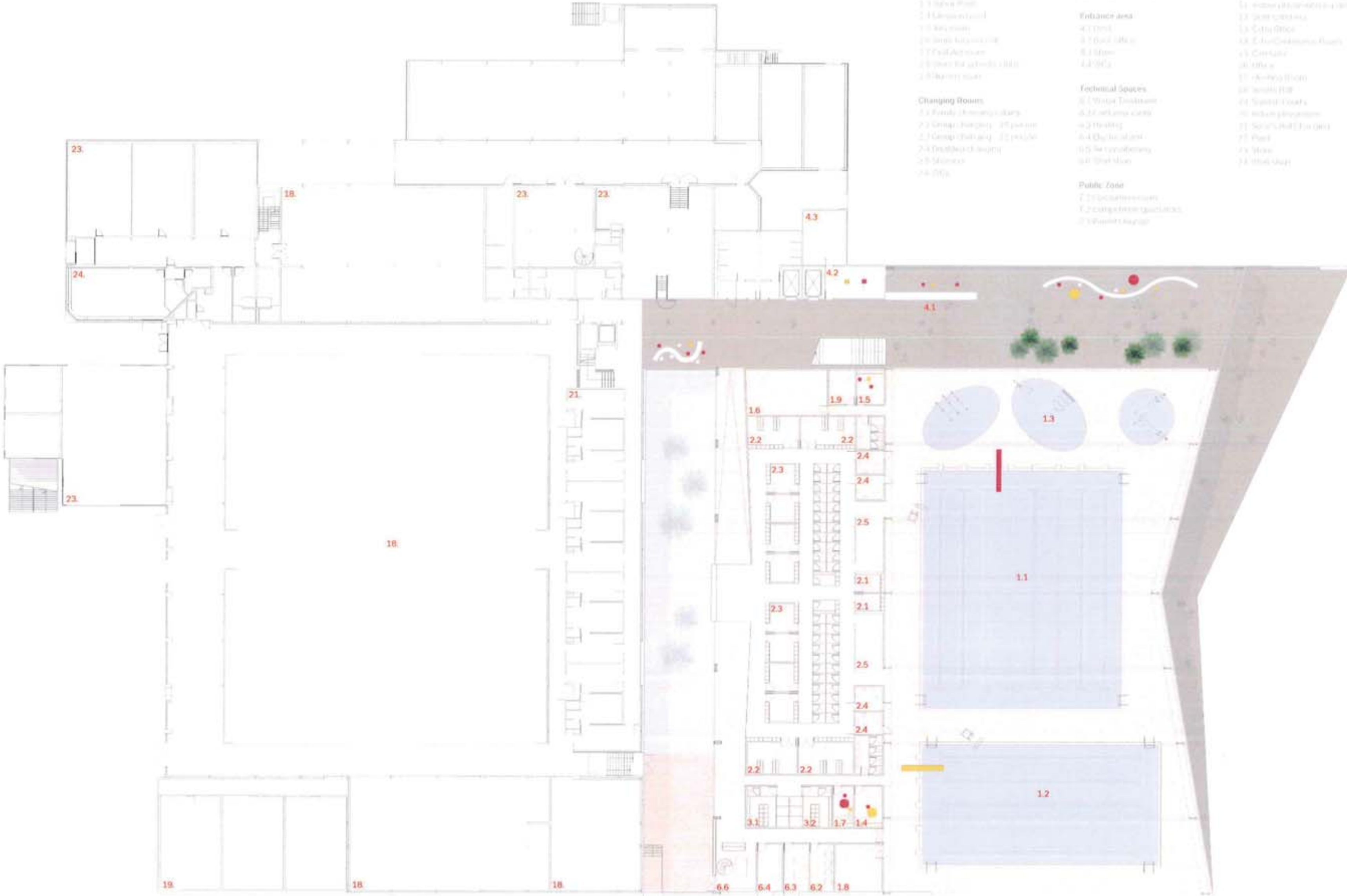
Changing Rooms

Staff

Entrance area

Technical Spaces

Public Zone



inkomzone/

Inkomzone/

Upon entering the new Sports Centre [illegible] and single glazed 'winter garden' that [illegible] the new swimming pool hall to [illegible] gathering point for school [illegible] pool hall itself. This [illegible] achieve 5-6 degrees [illegible] combined with the reduced air turbulence on the pool [illegible] the conduction loss from the pool hall, and thus reduce the heating [illegible]

Beyond the winter garden [illegible] the main Sports Centre [illegible]

[illegible] school children.

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niveau 1/

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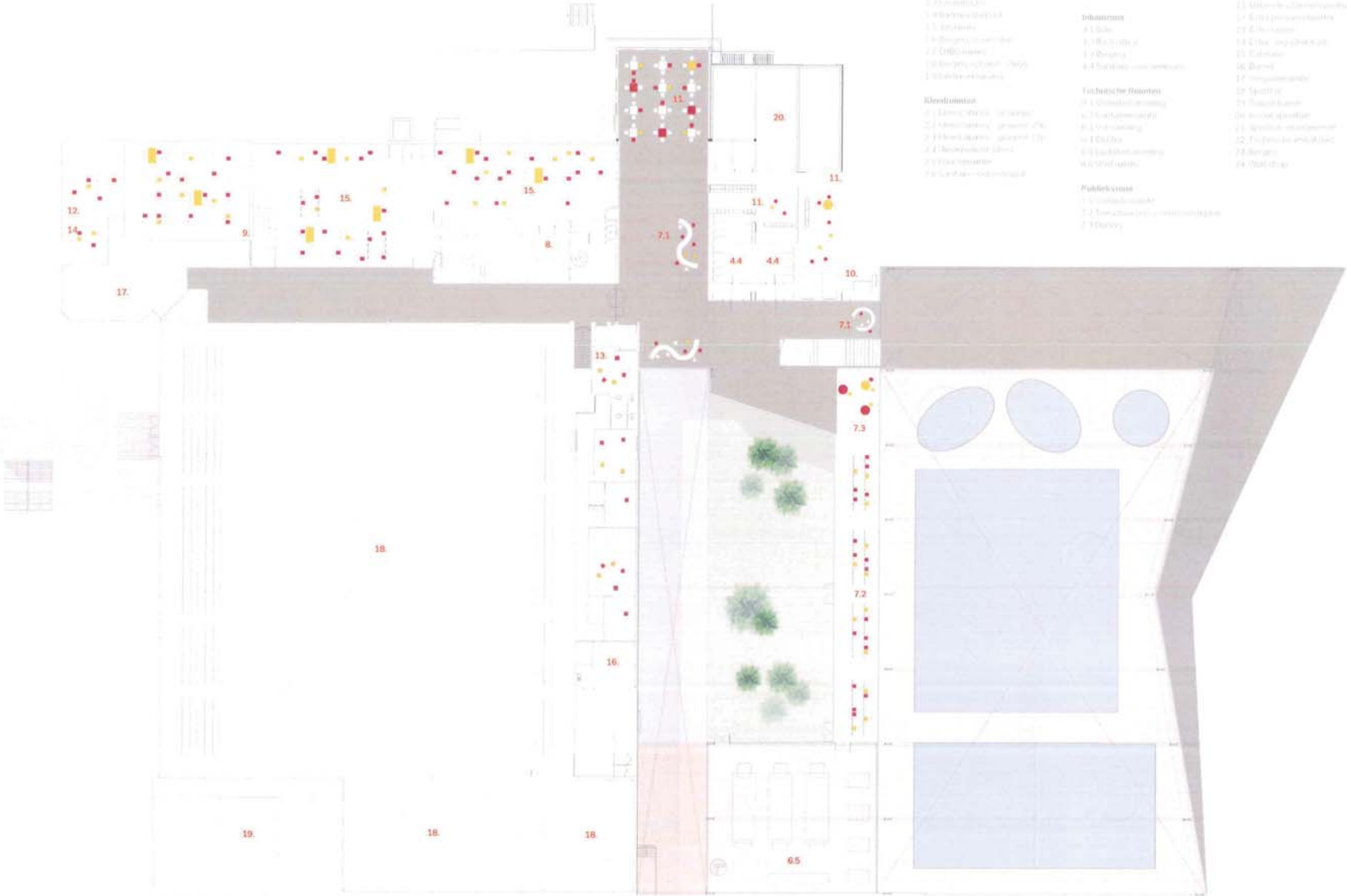

publiekszone/

Publiekszone/

When proceeding through to the new changing rooms for the swimming pool, visitors and children are suddenly presented by a new central courtyard space. This new space replaces the previous entrance ramp and acts as a new 'heart' to the combined new Sports Complex. A shallow reflecting pool draws light deep into the centre of the building. The newly revealed elevation of the existing building is vertically planted creating a lush green and light central courtyard. Two new large openings are created in the existing building visually linking the existing sports hall changing with the new swimming changing across the reflecting pool.

For visitors utilising the sports hall or newly located squash courts, they simply continue at ground floor level beyond the new central courtyard towards the sports hall.

Visiting parents and spectators proceed to the first floor via either the new generous open staircase or via newly located elevators. Upon arrival at first floor level, visitors will experience a rejuvenated lobby space previously the existing sports hall entrance. From this point they experience an elevated view over the new central garden, with both the cafetaria, children's facilities and parents lounge within view.

A new central roof garden allows for breakout space for spectators during a break in competition, external playspace for children on sunny days, or a potential expansion space for the Sports Centre in the future.

gevels/

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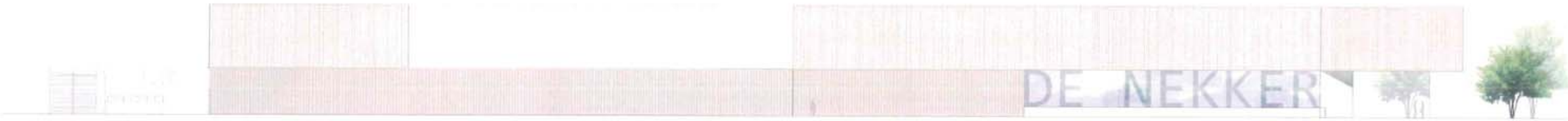

Noord

West


Zuiden

sneden/

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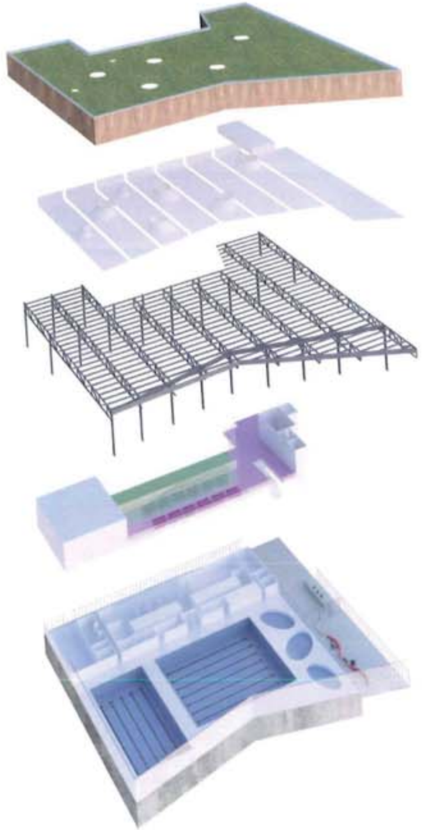

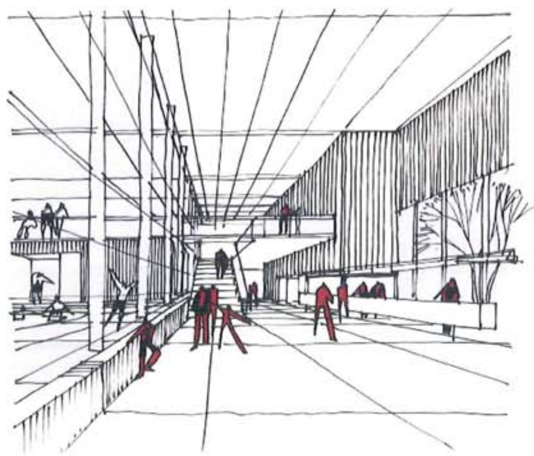

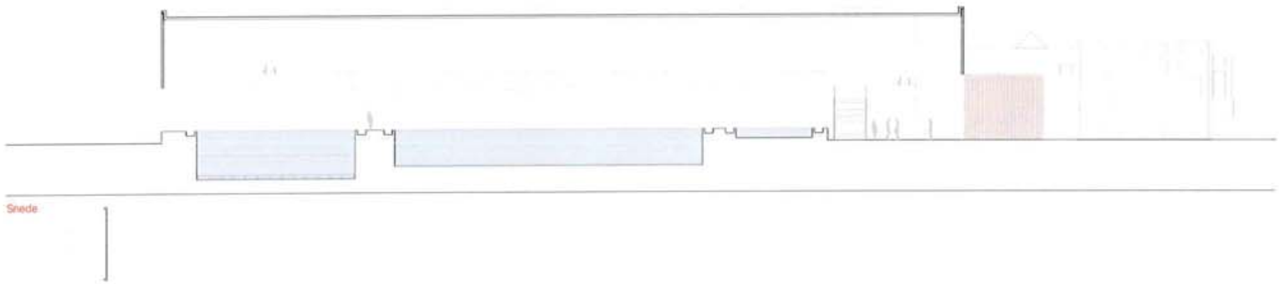

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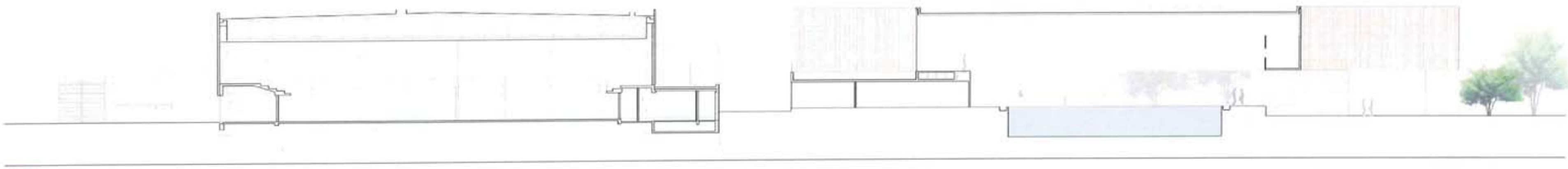

Snede


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