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St.Sidwell's Point :
The First Passivhaus Leisure Centre in the UK

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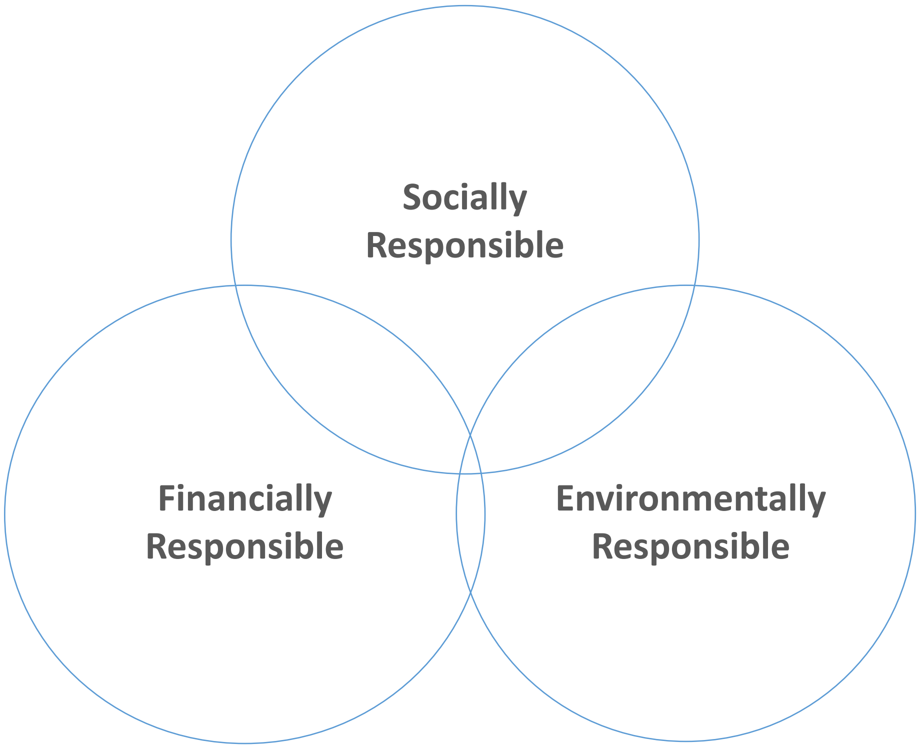
Development Brief

An Urban Leisure Centre

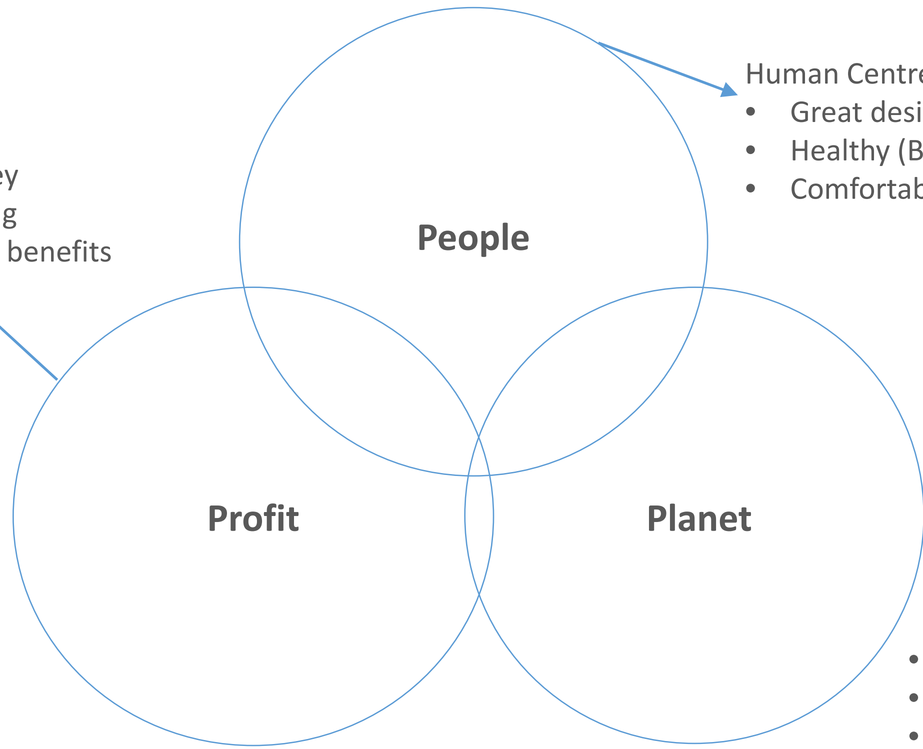
- 25m competition swimming pool
- 20m community pool
- Children's confidence/play water
- Health and fitness centre (150 gym station and flexible studio)
- Café
- Children's soft play activity space
- Spa (including hydrotherapy pool, heat experience and treatment room)
- Rooftop terrace
- Environmental factors
- Contract = £35m

Triple Bottom Line Approach



Triple Bottom Line Approach

- Value for money
- High Performing
- Local economy benefits



Human Centred
- Great design
- Healthy (Bau-biology)
- Comfortable (Passivhaus)

- Climate ready
- Low carbon
- Low energy

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St Sidwells Point

First Passivhaus Pool & Leisure Centre In the UK

Energy/Water reduction

Energy – 70%

Water – 50%

Healthy building

Air, Water quality

Comfort and radiation

Climate Ready

Comfort

Rainfall

Storm severity

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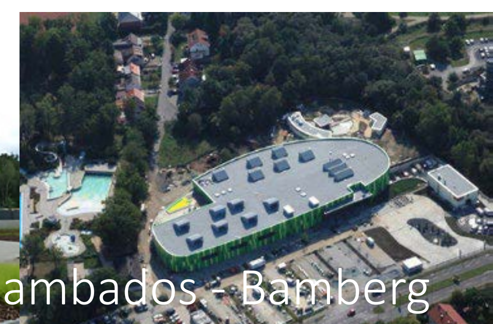
Pools – what's the difference?

- High energy and water use
- Range of different temperature zones in one building
- High temperature levels (32 C) means pools need to be heated all year
- High humidity and chemicals create challenging environment for materials and building fabric



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Case for Passivhaus, Climate Resilient & Healthy Leisure Centre

Passivhaus (energy)	Climate Resilient	Healthy
Passivhaus design ensures all energy uses are accounted for	Ensures good summer comfort without compromising energy performance	Ultra filtration and low chemical water treatment ensures healthier water quality and reduces risk of asthma
Outcome based performance parameters = reliable, scientifically proven energy savings	Business case assumptions delivered even when climate changes	High levels of comfort and water quality will increase user satisfaction and is expected to increase customer numbers
Reliable energy performance and running costs ensure economic viability and project delivers on business case assumptions	Low water use strategies reduce energy demand, costs and ensures resilience during droughts	High quality ventilation provides filtered outdoor air reducing indoor air contamination from particulates
	High quality air filtration maintains air quality and protects from increase in contaminates from particulates and pollen under future climate scenarios	Higher levels of natural light and human-centric/circadian lighting design promotes health and customer satisfaction

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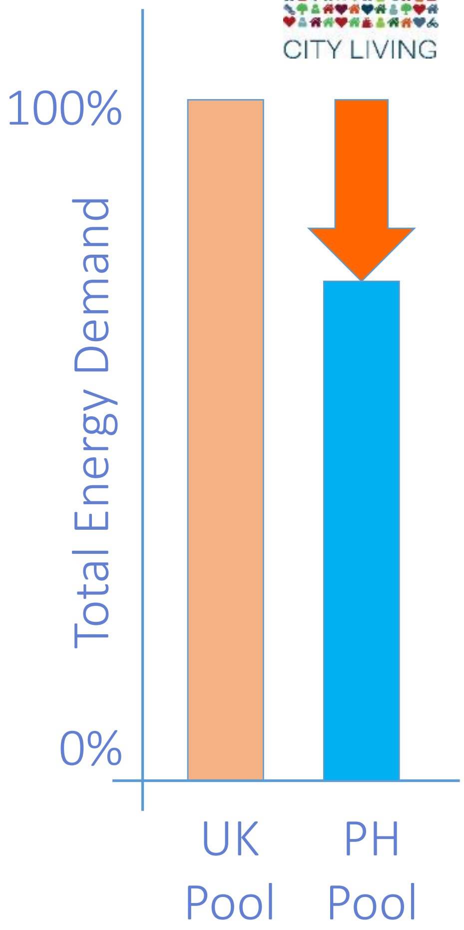
The Passivhaus Pool Concept

A Passivhaus building envelope will significantly reduce heating energy losses in pool buildings and results in the following benefits:

- Higher surface temperatures
- Minimum thermal bridging avoiding condensation risk
- Increased thermal comfort



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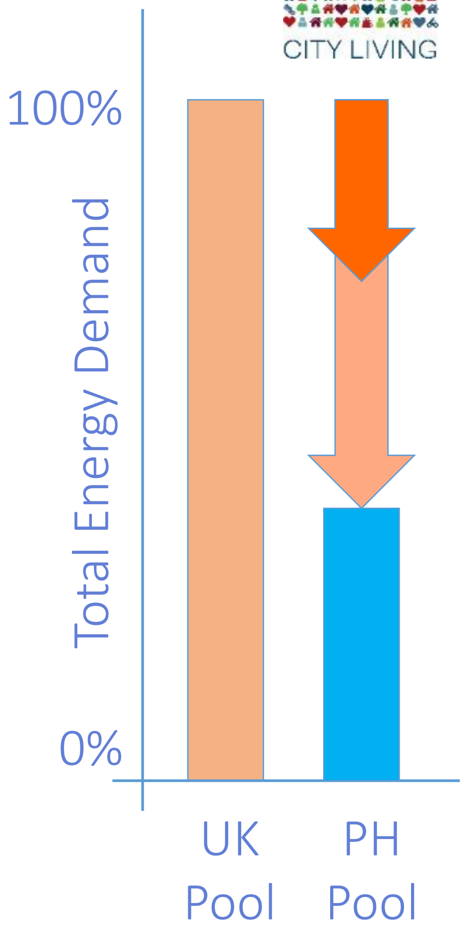
The Passivhaus Pool Concept

But these are **just the starting point** to unlock further energy savings:

- Higher relative humidity possible throughout the year (~64%)
- This will reduce evaporation rates from pool water and reduce required ventilation rates (ventilation rate of 1-1.5 ac/h with no re-circulation)
- More economic ventilation/ducting (eg glazed façade elements don't need to be ventilated to protect from condensation.)
- Reduced electrical energy demand for ventilation

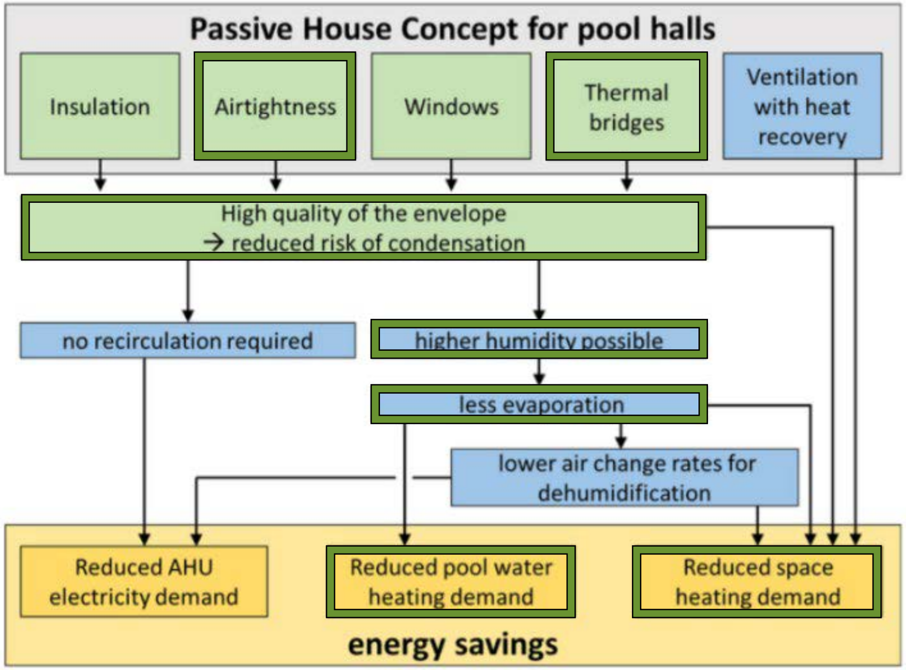


Energy

Solution

- High levels of insulation
- High performance windows, doors and curtain walling
- Compact building form
- Optimum solar orientation
- Optimised thermal bridges
- Highly efficient MVHR systems

- Internal thermal zoning
- Increased relative humidity to pool areas
- Waste energy from cooling system for heat
- High levels of airtightness



Passivhaus Institute

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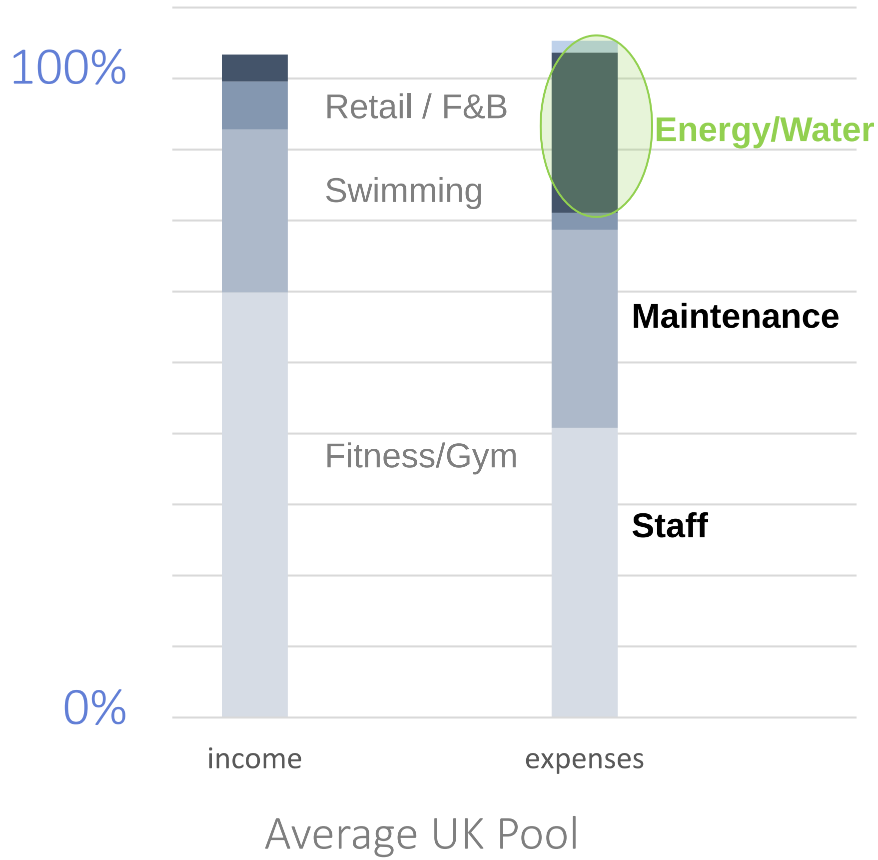
The Bigger Picture

Revenue Projections

Average UK Pool and Fitness Centre vs Passivhaus



Cumulative Costs for Swimming Pool Building, Built to 2020 Building Regulation Requirements

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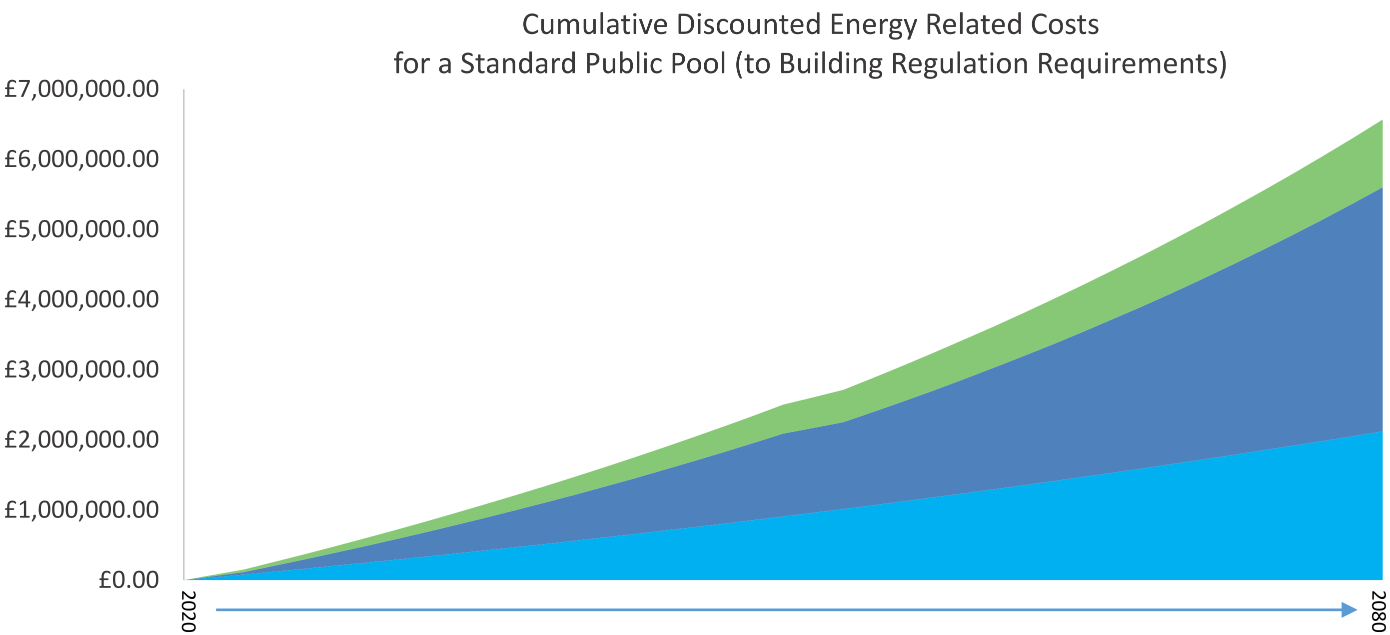

Cumulative costs for swimming pool building, built to 2020 Building Regulation requirements, for heating/ventilation, hot water/filtration and lighting

All costs have been discounted at 5% to represent present value. A conservative annual increase in fuel costs of 4% has been allowed for and a reduction of heating demand of 30% from 2050 to 2080 has been included.

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Cumulative Costs for Passivhaus Swimming Pool Building

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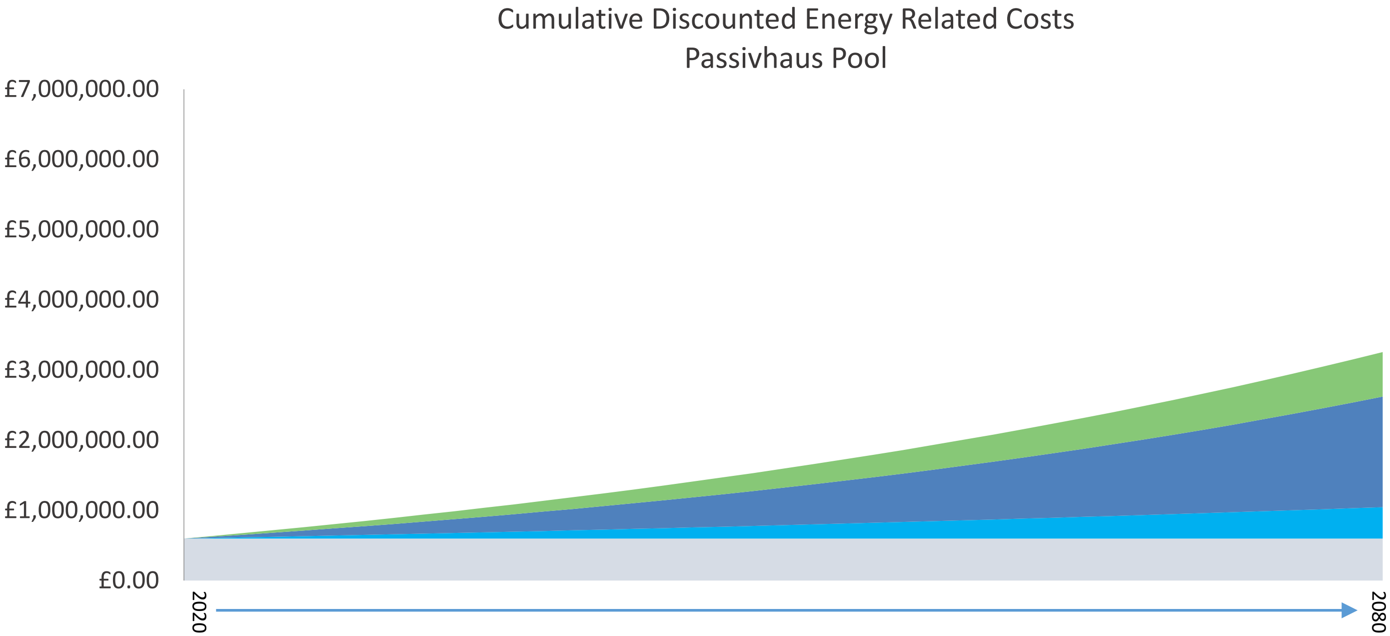

- Passivhaus standard
- High thermal mass construction
- Optimised ventilation
- Reduced evaporation
- Thermal zoning

Cumulative costs for swimming pool building, built to Passivhaus standard, for heating/ventilation, hot water/filtration and lighting.

All costs have been discounted at 5% to represent present value. A conservative annual increase in fuel costs of 4% has been allowed for and a reduction of heating demand of 30% from 2050 to 2080 has been included.

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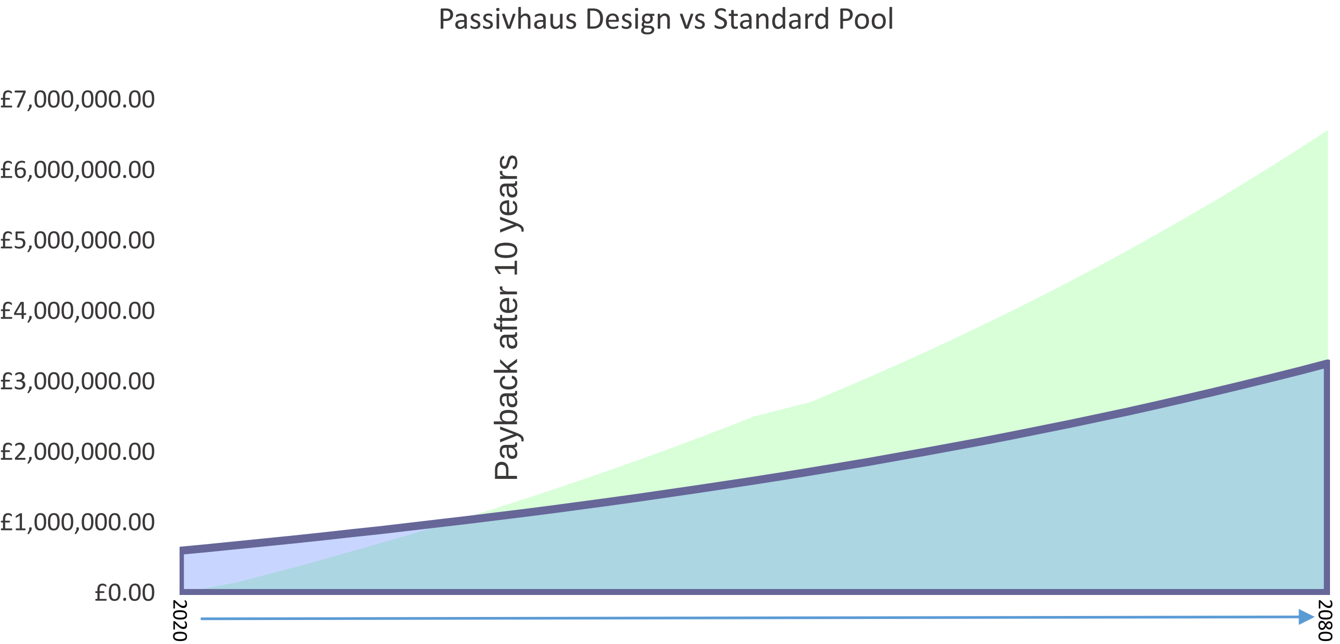
Comparison of Cumulative Costs for a Standard Pool (Green) Building and the Proposed Pool (Blue)



70% reduced running costs

Payback period 10 years

The Passivhaus Pool Concept

Energy and carbon saving potential

The annual **carbon storage of 105 hectare** (or 250 football pitches) of managed woodland

The annual emissions from **750 average UK cars** (commuting 40miles a day)

The total annual energy consumption of **350 average UK 4 person households**

Enough to make **140 million cups of tea**

Climate Ready Design

Context

- The climate is changing
- Majority of buildings constructed today will still be in use during the 2nd half of this century, performing under considerably different conditions
- Climate ready design increases resilience, extends useful life and economic viability
- Implementation from the outset will reduce long-term maintenance and energy costs
- Does not necessarily result in increased capital costs

Climate Ready Design

Criteria

- Adaptable
  - To meet future weather scenarios without compromising energy use or healthy building principles
- Optimised
  - Optimise design to consider future weather scenarios *and* current ones

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Climate Ready Design

Solution

- Design for Comfort
  - Designs thermally modelled using IES and probabilistic future weather data from the Prometheus Project (2030, 2050, 2080 50th percentile high emission scenario)
- Water Management
  - Reduce water demand (50% reduction) and improve resilience to flooding (30% contingency)
- Construction
  - Detailing developed to cater for increased storm severity, increased driving rain and changes in ground water level

Healthy Building

Context

- Water Quality
  - 45min swimming lesson, a child swallows about a pint of pool water
  - UK pools – estimated 10-20 times higher parasitic infection than other EU countries
  - Water normally treated with chlorine – highly toxic
  - Nitrogen trichloride layer above pool surface
  - Sand filtration with 'flocculants'

- Radiation
  - Human body controlled by weak electromagnetic fields
  - Electrically charged particles in the body will align with external fields, oscillate and go into resonance
  - Trigger stress response and symptoms
  - Artificially generated EMFs or electrosmog will always affect life processes
  - Static electric, static magnetic, ELF static, ELF electric, radio frequency

- Air Quality
  - Some agents still used in general UK construction have been classified by the WHO as 'carcinogenic' (1) or 'potentially carcinogenic' (2B)
  - Including: formaldehyde, benzene, polychlorinated biphenyls
  - Most VOCs typically found in modern paints, glues and timber treatments are in the same category as tobacco smoke (1)

Healthy Building

Solution

- Water Quality
- Ultrafiltration
- No chemicals required (aside from cleaning)
- Compact plant size
- Capable of achieving 90-100% pathogen removal
- UV treatment – used in combination with ultrafiltration

- Radiation
- Following IBN best practice guidance to reduce EMFs
- Radial wiring
- Consider positions of cable runs and sockets
- Avoid two-way switches, looped lighting connections and dimmer switches
- Hardwired data and telephone connections

- Air Quality
- Material specification reflecting best practice guidance (IBN)
- Reduce off-gassing and indoor air pollutants
- Offices and crèche – natural or mineral building products specified
- Areas ventilated via CO2 controlled mechanical ventilation set to 800ppm as advised by IBN

Training and Mock ups

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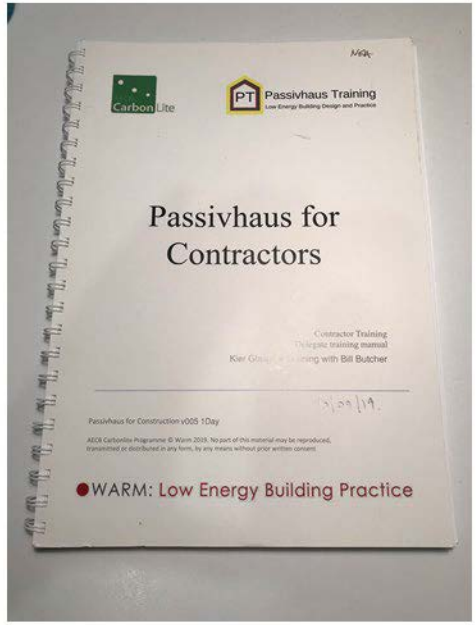

- Training delivered by Warm
- Subcontractor training 'Passivhaus Passport'
- Early engagement of Warm and the supply chain
- Manufacturer training

Mock up of critical building façade junctions

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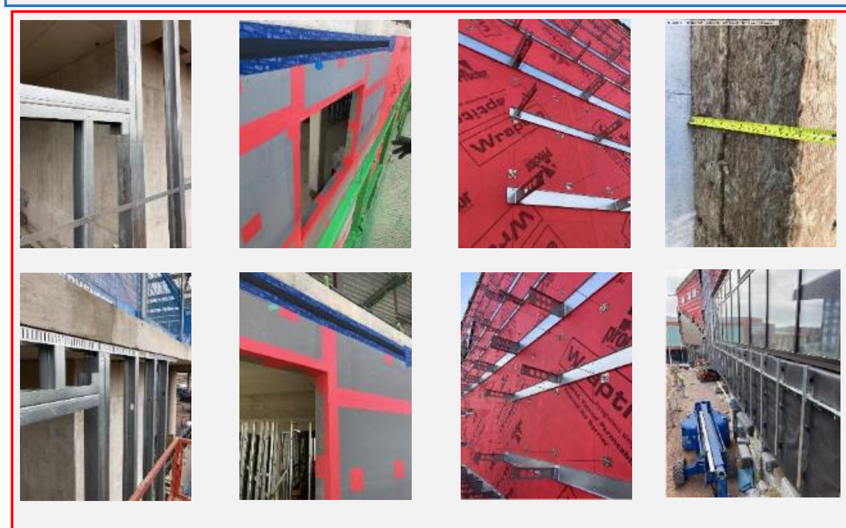
Quality Management

- Raising the standard - Bridging the performance Gap
- Inspection & test plans
- Subcontractor early engagement
- Use of Snagmaster Platform
- Air Tightness Manager
- Training sessions
- Passivhaus Evidencing



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Air tightness

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- No air leakage
- PHI target 0.4 m3/(hm2) at 50Pa on this project verses 10m3/(hm2) at 50Pa to comply with building regs
- Smoke testing & thermal imaging checks to validate interface details and supplements the Quality Assurance process
- Less energy use to reheat/ cool internal spaces
- Improved end user comfort

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CULTURE

St Sidwells Point Leisure Centre
Passivhaus

DESIGN

St Sidwells Point Leisure Centre
Passivhaus

LEGACY

St Sidwells Point Leisure Centre
Passivhaus

EVIDENCE

St Sidwells Point Leisure Centre
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PRIDE

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QUALITY

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Emma Osmundsen
Managing Director
Exeter City Living Ltd

emma.osmundsen@exeter.gov.uk

Emma Osmundsen

@EmmaOsmun

Andrew Ash
Project Manager – St Sidwell's
Kier

Andrew.Ash@kier.co.uk

Andrew Ash MCIOB

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Further Information:
Robyn Chatterton
Exeter City Living Ltd
E: robyn.Chatterton@Exeter.gov.uk

Nicolette Cotham
Kier
E: nicolette.cottam@kier.co.uk

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