

#### Passivhaus Pool and Leisure Centre for Exeter City Council

# **PASSIVHAUS POOL**

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#### What's this about?



The Exeter Active project - an overview

- 1. The project team
- 2. Leisure Centre design
- 3. Project background
- 4. The Client's Brief
- 5. The business case for Passivhaus pools
- 6. The Passivhaus pool concept





#### THE TEAM



# Client



# **Technical advisers:**

## **Design Team**



#### Passivhaus Institute

Building Biology Institute IBN

**Exeter University** 





**ARCADIS** 











**Redcar and Cleveland Leisure and Community Heart** 











## National Aquatic Centre, Dublin



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#### Northolt Leisure Centre



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#### **PASSIVHAUS IN EXETER**

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Exeter City Council's has been a strong supporter of Passivhaus

In 2010 the council completed their first multi-residential Passivhaus scheme

Since then all Exeter City's new build residential projects have been developed to Passivhaus standard including terraced houses, flats and a care home (currently at design stage)



#### WHERE IT STARTED





## Journey began in 2010 TSB 'Design 4 Future Climate' programme

This study also helped to inform the client's performance criteria for:



- Energy/water saving
- Healthy building
- Future climate



#### **Passivhaus Pools - Looking Abroad**

In 2011 two Passivhaus swimming pools opened in Germany: the Lippe Bad (Luenen) and the Bambados (Bamberg)

Both were developed as pilot projects with assistance from the PHI

Both were monitored by the PHI following completion and confirmed the predicted energy savings are achievable

Detailed reports on the design, construction and post completion monitoring are available from the PHI







#### What's special about Pool buildings?

High energy and water use

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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





#### **TSB Study - Findings**

Cumulative Costs for Swimming Pool Building, Built to 2010 Building Regulation Requirements



Cumulative costs for swimming pool building, built to 2010 Building Regulation requirements, for heating, lighting, hot water and additional future investments required to maintain adequate comfort conditions under future weather scenarios over the lifetime of the building. 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.







#### **TSB Study - Findings**

Cumulative Costs for Climate Ready, Passivhaus Swimming Pool Building



Cumulative costs for swimming pool building, built to Passivhaus standard, for heating, lighting, hot water and additional future investments required to maintain adequate comfort conditions under future weather scenarios over the lifetime of the building. 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.







#### **TSB Study - Findings**

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



# energy demand

# Payback period 10 years







# Exeter City Environmental Factors Brief

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**Energy/Water** 

Total energy target – 70% Water saving –

50%

Healthy building Test to SBM 2015 For air, water quality and radiation 2080 Climate Ready Thermal comfort Changes in rainfall Increased storm severity



#### **The Passivhaus Pool Concept**

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A Passivhaus building envelope will significantly reduce heating energy losses in pool buildings and results in the 100% following benefits:

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





#### **The Passivhaus Pool Concept**



**But** these are just the starting point to open up further energy saving opportunities and benefits:

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







#### **The Passivhaus Pool Concept**

Key elements of the Passivhaus pool concept include:

- 1. High performance Passivhaus building fabric
- 2. High performance windows and doors
- 3. High levels of airtightness (air permeability <0.6)
- 4. Compact building form
- 5. Optimum solar orientation ~40% south facing glazing for wet areas to maximise solar gains
- 6. Highly efficient ventilation heat recovery
- 7. Internal zoning
- 8. Increased relative humidity
- 9. Reduced ventilation rates with no re-circulation
- **10. Low chlorine/chemical filtration**









#### The Bigger Picture

#### **Revenue Projections** Average UK Pool and Fitness Centre







#### The Bigger Picture

#### **Revenue Projections** Average UK Pool and Fitness Centre







### **The Bigger Picture**



#### **Revenue Projections**

#### Average UK Leisure Centre vs Passivhaus Leisure Centre









# **Thank You !**

