# St. Sidwell's Point Leisure Centre

## Exeter, Devon

**Status:** Completion due Spring 2021
**Client:** Exeter City Council
**Value:** c. £35 million


The United Kingdom's first swimming pool designed to Passivhaus standards

# Overview

Exeter City Council's ambitions are to create long-term financial and carbon savings and to become carbon neutral by 2030. The Council has made a commitment to delivering carbon footprint reductions and encouraging others to do the same.

The replacement for the 50+ year old Pyramids swimming pool is located in the heart of the city and aims to be a key regeneration element that benefits the day and night economies. The project has been designed to withstand predicted changes in climate conditions up to 2080 and use less than half the energy of an equivalent conventionally-designed facility through the use of Passivhaus standards.

Passivhaus is a rigorous energy efficiency standard and certification scheme for buildings. The methodology significantly reduces energy use for heating and cooling. Internal comfort is increased through high levels of insulation, reduced thermal bridging and low air leakage. Fresh air is also provided mechanically and constantly-tempered through heat exchangers.

See the Passivhaus website for more details at: https://passiv.de/en/02_informations/01_whatisapassivehouse/01_whatisapassivehouse.htm

**Sustainability**
**Facility Case Study**

**Predicted operating savings of £200k per annum and additional investment payback in less than 10 years make a compelling financial case for sustainable design.**

3D view

# What?

Exeter City Council set a target for the UK's first Passivhaus swimming pool to more than halve the energy use of a conventional facility while creating a healthy building environment through the incorporation of low chlorine water treatment, $CO^2$ controlled ventilation and using natural materials with minimum volatile organic compounds (VOCs).

The project is based on a robust business plan with a predicted utility cost of £20/$m^2$ compared to the conventional cost of c. £60/$m^2$. The centre is predicted to save £200,000 per year compared to a conventionally-constructed design. The payback of the extra sustainable features is less than 10 years, making a compelling financial case for following a sustainable approach.

The project includes three pools - a 25m competition pool with spectator seating for 100, a 20m community pool and a confidence water pool – together with a health suite and spa facility, a 150-station fitness gym, two fitness studios, a spin studio, a children's soft play area and a café to seat 50.

To meet the energy and comfort targets, the team took a holistic 'dynamic thermal modelling' approach to the design. This included orientating the pool halls to face south to maximise solar gain and the fitness gym and studio facilities to the north to reduce cooling demands. Super insulation, reduced cold bridging and triple glazing allow the pool hall humidity to be higher than normal (64%) reducing evaporative energy loss and water consumption, in addition to reduced heating and ventilation loads.

Vertical circulation with natural ventilation

Cross section

# Why?

The Council was confident that the Passivhaus methodology could be extended to leisure centre buildings and achieve their carbon reduction policies. They built on the experience of developing successful Passivhaus projects for over a decade through their house building programme, the launch of a house development company and more recently a support-care housing scheme. They also had a keen appreciation of the methodology's associated advantages in terms of improved construction quality.

# How?

## Design team approach

The Council engaged a strong design team of consultants with previous specialist experience and knowledge of sustainable design. In turn, there was close liaison with the Passivhaus Institute and the University of Exeter. The building will be monitored extensively during use and the results will be used to inform a new set of Passivhaus standards for UK leisure pools.

For Passivhaus accreditation, the total primary energy demand for space heating, hot water, cooling, ventilation and electrical loads including lighting should be less than 375 kWh/m²/year.

## Technical collaboration

The project team worked in collaboration with University of Exeter researchers using modelling programmes to predict the performance of alternative building configurations and orientations. The studies showed that an unconventional orientation would work best under future climate scenarios. The dry areas of the building (e.g. gymnasium, cafe, and creche) would be prone to overheating and therefore better located on the north side of the building. In contrast, the wet areas (e.g. pool changing) would require heating almost all-year-round.

The temperatures of individual spaces were also studied in order to reduce the internal heat losses between adjacent high and low temperature areas. The use of simultaneous heating and cooling air-source heat pumps will enable the heat rejected from the gym and fitness studios to offset the heat losses from the pool water. The heat pump output can be supplemented by additional heat from gas-fired boilers if required.

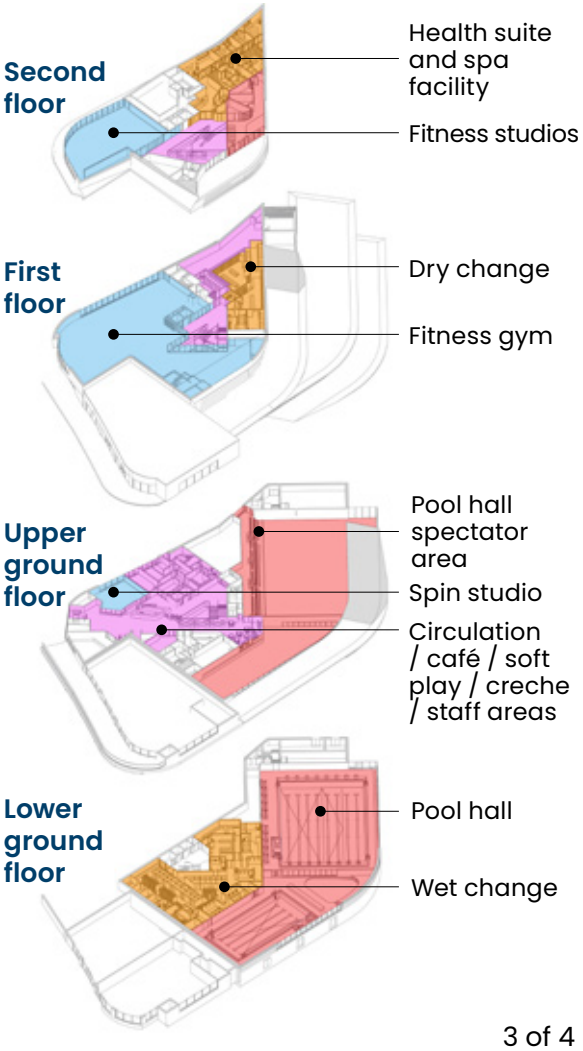
**Energy performance targets**
(Passivhaus values in kWh/m²/year)

| | |
|---|---|
| Space heating demand (pool hall) | 40 |
| Space heating demand (all other areas) | 20 |
| Cooling demand (fitness gym) | 22 |
| Pool water heating demand | 73 |
| Domestic hot water demand | 0.7 |
| Total electricity demand (All ventilation, lighting, applications, pool water treatment and circulation) | 120 |

**Thermal envelope U-values**
(Passivhaus values in W/m²K)

| | |
|---|---|
| External walls | 0.131 |
| Floor slab | 0.130 |
| Roof | 0.090 |
| Glazing | <1.050 |

**Thermal zoning approach**
Hot Warm Temperate Cooled



## Key sustainability features

- Reduced energy demand through orientation and planning of the building
- Thermal zones minimise heat transfer
- Extensive south-facing glazing maximises daylight / solar gain
- Vertical core natural ventilation
- Increased thermal boundary
- Increased relative humidity = reduced evaporation and reduced air change rate
- Micro-filtration of pool water
- UV water disinfectant with minimum chlorine dosing
- $CO^2$ sensors and variable volume ventilation systems for optimum air quality
- Night purging (cooling) using mechanical ventilation
- Pool sampling water harvested for flushing toilets

## Commissioning and monitoring

The project will be monitored during use and the results will be published on the Passivhaus Institute's online database at:
https://passivhausprojekte.de/index.php?lang=en#d_5733


Pool hall


Café area


Fitness gym

## Project / delivery teams

| | |
|---|---|
| Client | Exeter City Council |
| Lead Architect | SPACE & PLACE |
| Building envelope Architect and Passivhaus designer | Gale & Snowden |
| Project and cost management | Randall Simmonds |
| Engineer | Arup |
| Climate modelling | Exeter University |
| Leisure consultant | Continuum |
| Main Contractor | Kier |
| Certifier | Passivhaus Institute |

Click here for **User guide** and other **Design and cost guidance**

Images provided by SPACE & PLACE