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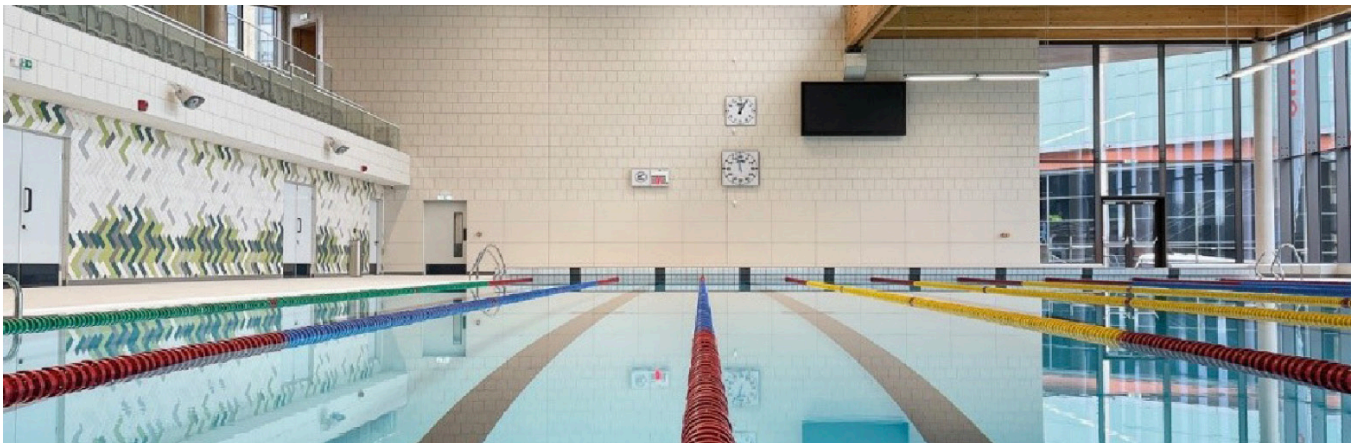
St Sidwells Leisure Centre



St Sidwells is a recently completed aquatic and fitness centre designed to Passive House standards. Modelling undertaken by the consultant team is useful to compare with that undertaken on the Naenae Aquatic Centre to demonstrate the benefits of a Passive House approach to aquatic facility design. This case study highlights the importance of a high -quality building envelope.

Client/Location:

Exeter City Council
Exeter, England

Case Study Stage:

Opened 2022

Construction Value:

$73M (£35M)

Features:

- 8-lane 25 m main pool
- 20 m learners' pool
- Splash pool
- 175 spectator seating area
- Café
- Wellness centre / 150 station gym

Sustainability:

- Designed to Passive House standards to minimise Whole of Life operating costs.
- Designed to modelled climate change data up to 2080.
- Extremely high levels of thermal insulation were continuously detailed to avoid thermal bridging.
- Reduced evaporation led to reduced ventilation air change rates.
- Polyvalent heat pump (heats and cools simultaneously) – heat rejected from the gym used to heat pool area.
- Water source heat pump backwash water recycled to flush WCs.

Key Metrics:

Climate Zone: N/A

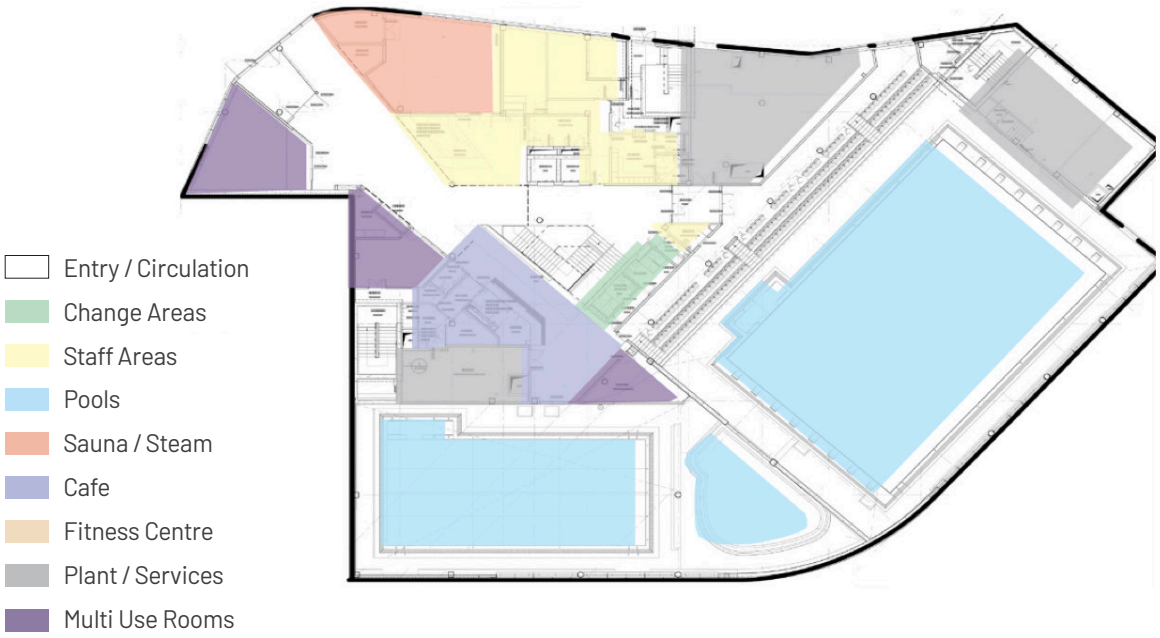
Floor Area: 4,900 m^2

Water surface area: 675 m^2

Occupants: 500-600

Insulation R values (m2K/W):

Windows	0.95
Skylights	0.95
Walls	7.1
Roofs	11.0
Air tightness	0.2 m^3h/m^2 @ 50 Pa Tested to 0.3 m^3h/m^2 @ 50 Pa
Energy Use Intensity (EUI)	375 kWh/m^2 yr Design EUI (operational EUI not available)
Temperature settings	Main pool water 28°C Learners / leisure water 30°C Air temp set 1-2°C above pool temps



Key Information

The St Sidwells facility was estimated to reduce energy costs by 60% when compared with a typical facility. The same as forecast for the Naenae Aquatic Centre.

At St Sidwells, the payback on the additional capital cost of achieving Passive House standards was forecast to be 10 years. This compares with 17 years in the case of Naenae. The forecast energy use intensity (EUI) is also significantly lower for St Sidwells (375 kWh/m2 yr compared with 600-700 kWh/m2 yr for Naenae). Key reasons for these differences are likely to be:

- As noted in the Naenae case study, the difference between air and water temperatures is significant. St Sidwells allows for the air temperature to be 2 degrees warmer than the pool water temperature. The higher temperature and relative humidity on poolside is more acceptable in European facilities.
- The St Sidwells facility has significantly less water area than Naenae (675m2 for St Sidwells, compared with 1680m2 for Naenae)
- The mix of water space at St Sidwells is predominantly structured water space. Leisure water which is warmer and is activated by water features increases energy demand and decreases the payback period. As the pool water temperature is less (typically 26-28 degrees), a higher air temperature is easier to accommodate without affecting patron comfort.

A Passive House approach requires a compact building form and solar orientation of the building to maximise solar gains. It requires careful design of the building envelope, in particular, attention to minimising cold bridging in the building fabric. This allows higher internal surface temperatures with minimised condensation risk at a higher internal relative humidity. The higher internal humidity reduces evaporation rates from pool water and the required ventilation rates are reduced (ventilation rate of 1-1.5 air changes/hour with no re-circulation), which contribute to both water and energy savings.