



TEXTBOOK EXERCISE

in High Quality Fastrack School Building

□ Reepham High School in a small town just outside the city of Norwich sets high standards for its young people.

A 2008 Ofsted report enhanced the school's status by stating "there is no doubt, that Reepham is an outstanding school".

In examining ways of expanding the service the school could provide for its local community Reepham's staff and governors decided to further develop learning opportunities by creating a new 'state of the art' 6th form college, a space which would inspire students to achieve their goals.

In keeping with the ethos of the school, the construction industry professionals and contractors entrusted with the build were also expected to reach the highest standards for the showpiece development.

What's more, the whole development had to be built from start to finish in little over three school terms, ready for the start of the current school year.

A solution was sought which allowed the main core of the building to be manufactured entirely off site in a robust, high mass, "kit form".

The incorporation of precast concrete for the core of the building contributed to the target of achieving the lowest possible energy demand – energy footprint – in pursuit of a BREEAM "Excellent rating"

During the concept and scheme design stage, Teather + Walls Architects working in collaboration with the NPS Group, worked closely alongside the Reepham school staff and governors to develop a scheme that met all the stakeholder needs. The school required a building with external elevations that were visually striking and internal classroom spaces that were both light and airy with a centrally located 'Learning Resource Centre'.

One of the objectives was to create an example of an energy efficient building using modern methods of construction to deliver a sustainable outcome.

The result was an impressive design for a two storey, V-shaped structure. The 'wings' of the V contain the classroom areas, ICT suites and study bases.

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These were separated at the point of the V or hub by common zones, open plan break-out areas where students could interact and develop ideas. The overhanging dual pitched roofs of the wings are separated at the ridge by roof lighting and natural ventilation points. These are divided by a striking mono-pitched central roof, which rises above the wings and sits over a full height glazed screen looking out over the adjacent playing fields and countryside beyond.

Great attention was paid to lighting levels, glare, acoustic standards, upper temperature limits in summer conditions, and classroom carbon dioxide (CO₂) levels in winter, all of which are proven to impact upon pupils academic performance.

The Project

The challenge for the design team was to translate the concept into reality. To develop the structural solution the design team turned to the expertise of PCE and partner Tarmac Precast. This proved to be one of the key factors in the concept succeeding.

A hybrid structure utilising the benefits of both steel and precast concrete was developed to meet the needs of the various stakeholders.

Besides the concrete crosswall construction for the core, the building unusually featured pitched Tarmac Topfloor hollowcore panels to form the main roof structure and contribute to the thermal performance of the building.

PCE's flexibility in product use and design knowledge of varied structural solutions eliminated numerous interface issues for the Clients design team which allowed the concept designs for the structure to develop quickly into workable solutions.

By harnessing PCE's solution-focussed approach, detailing of the precast concrete element of the build was reduced to a single point of contact, streamlining the decision making process and resulting in a lean design development phase.

The result is a design which not only focuses on the energy-conscious requirements of today, but also incorporates an element of future proofing to facilitate acceptable comfort levels in future years when climate change is expected to make life uncomfortable in many existing buildings, including many of those recently built.

Andrew Teather and Christopher Walls of Teather + Walls Architects explain:

"A variety of techniques have been used to minimise energy consumption of which two are key. The first is that so far as possible all areas of the building are to be naturally ventilated using electrically controlled openings which open and close based on wind speed, air temperature and CO2 levels."

"The second is that the building is constructed of concrete with exposed ceilings which act as large radiators of 'coolth' in the summer and 'warmth' in the winter. On hot summer days the building can benefit from the use of night purge with the cool night air automatically allowed in via the electrically controlled apertures to lower the building fabric temperature. This will result in a more comfortable feel to the building during the daytime, due to the steady emission of lower radiant temperatures from the exposed ceilings."

"These techniques together are aimed at ensuring that, when taken with the high insulation levels provided, the heated air spilled out in winter is reduced to a minimum consistent with achieving the necessary CO2 levels and, in the summer, comfort levels are maintained in hot weather without the need for the introduction of comfort cooling systems which are expensive to run and burn a lot of energy."

By using precast concrete, the team was able to create a high mass building, which contributes to a stable thermal environment and comfort levels.

Twin-skin composite panels for the external walls use Thermomass wall tie and insulation systems and to overcome the potential problem of thermal bridging in addition to providing a 20 per cent improvement over Building Regulation U-values – making a useful overall contribution to the BREEAM rating.

The wall finishes, which have largely been directly coated with a high performance paint system externally, and conventional low maintenance finish internally, are robust and indistinguishable from a plaster finish.

In order to ensure acceptable acoustic levels in a building comprised of so much concrete and large smooth surfaces, a combination of wall finished, vertical baffles and integrated light fitting systems was specified.

Andrew Teather and Christopher Walls conclude: "The design team has endeavoured to achieve the optimum naturally ventilated solution for a building of this type and we all await the results with great anticipation."

Client: Reepham High School.

Main Contractor: Kier Eastern

Architects: NPS Group in collaboration with Teather + Walls Architects

Structural Engineers and Service Consultants: NPS Group.

Environmental consultants: Genesys Environmental, a subsidiary of Cundall

Precast Designer & Constructor: PCE Ltd

Precast Supplier: Tarmac Precast

