

# Double first

In a first for both the UK education sector and the developer client, Nudura's "high end" insulated form technology (ICF) system is being trialled on a school project in London, with its fast-track benefits already realised. Building Products reports.



Public sector building in the UK has been slow to embrace insulated concrete form (ICF) technology, despite its very persuasive benefits. As with all generic systems however, ICF products span the good, bad and the indifferent in terms of quality. Education of the market and the resultant product differentiation doesn't happen overnight.

While system suppliers developed more advanced ICF solutions, the construction industry sought to respond to the challenge of delivering best value in terms of speed of construction and quality of built environment in the public sector. Property services provider Apollo Education has recently seen the advantages offered by Canadian "high-end" ICF system Nudura, against these goals, despite its relative newness in UK buildings.

Pupils and staff at Woodside High School in London's Wood Green will be the first in the UK to learn in an ICF-built environment, which is also being trialled by Apollo for the first time on the project. Benefits of ICF already demonstrated on the scheme include its reduced risk of lost time through bad weather, as well as its claimed "infite" design flexibility, light weight, and significant contribution to energy efficiency and air quality.

The £24.9m contract for the school's Inclusive Learning Campus saw the first of three buildings completed in 2010. A new two-storey teaching block and special needs unit is currently under construction using ICF as part of the scheme to amalgamate two special schools with the existing mainstream school. The scheme is allowing comparison to be made between the two new ICF buildings with the completed teaching block, built traditionally using a concrete frame, columns, blockwork and windposts. The school is on target to open the new buildings in September 2011.

Familiar with working in occupied school environments, Apollo sought to keep the construction programme as short as possible. Consultation with director of structural engineers Clark Smith Partnership (CSP) Terry Smith brought about a quantum leap that would cut weeks off the programme. CSP's Professor Narayanan had experience of the Nudura system as result of a meeting with the Canadian manufacturer's UK European representative, Jean-Marc Bouvier on solving issues in relation to Euro Code 2 for Concrete Structures.

It was suggested that the Nudura ICF

system could not only make significant time savings on the programme but also offer design flexibility over modular pre-cast concrete options. Due to this flexibility, Apollo would be able to accommodate a design which replicated the architectural features of Woodside's existing buildings.

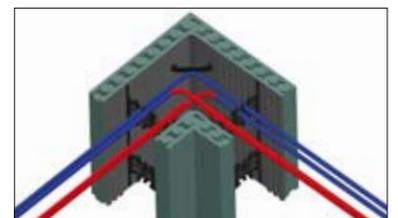
### Structural benefits

Clark Smith's Terry Smith found Nudura to be robust as well as highly adaptable: "It has been well thought-through. The product fits together very well using the special corner pieces, and the propping system with integral working platform leads to simplicity and efficiency."

He says the project's design required good vertical loadbearing capacity and good lateral (wind) resistance. The system had to achieve robust construction to meet disproportionate collapse requirements stipulated by Building Regulations. Also key to success was durability and the ability to accommodate large openings.

Top: two school buildings are under construction using ICF on the Wood Green site

Below: The polystyrene forms which lock together to build the walls are made using a non ozone-depleting process



*“The Nudura system is marginally higher cost than timber frame, but savings can be made on heating and ventilation systems”*

The school's superstructure has a 150 mm thick external wall construction using C32/40 concrete with in-situ concrete floors at 3.6 m floor to floor. The Nudura system requires horizontal bars to be spaced at 457 mm, placed alternately on either side of the centreline of the wall. Vertical bars are located centrally in the wall itself to comply with Requirement A3 along with horizontal ties at every floor and wall junctions.

Good quality ICF systems are both simple to install and built to last. Construction of the ICF began in October 2010, and the second Nudura structure was completed in late March. The time saving over brick and block construction was some six weeks per building. The curved sections of the buildings were cut on site but could have been custom-made and delivered pre-formed direct from the manufacturer.

Substantial time savings were made as just over 1.1 m<sup>2</sup> of the Nudura system can be fitted in one step. This reduces the number of pieces and seams and results in a robust and dependable wall, increased productiv-

ity and reduced labour requirements. (The system can be installed using both trades and semi-skilled labour.)

**Methodology on site**

Blocks are typically installed to a lift height to suit requirements; Woodside was a 3.3 m lift. Concrete is then poured into the forms. To ensure that no air remains within the void, the concrete is consolidated by means of a mechanical internal poker vibrator. As soon as the floor/roof is installed, wall construction can continue. The system arrives in folded form to reduce distribution costs and allow for easy handling and onsite storage. A sturdy four-way reversible interlock enables the forms to lock together and waste is almost eliminated.

Special schools need extensive services such as sinks in every room. Installing mechanical and electrical services normally adds significant cost as pipes and cable channels need to be chased into blockwork. Installing M&E services into the Nudura form is exceptionally quick and cost effective, as channels are formed with the use of a hot knife. The building envelope will be brick clad to the exterior with plaster board finishes to the internal surfaces.

Apollo's use of Nudura formed part of a wider plan to minimise disruption to the school. The forms have enabled each build-

ing envelope to be made watertight earlier in the construction programme than had traditional methods been used, and have permitted fitting out to commence some six to eight weeks sooner than with conventional block work. The system also reduced the risk of delays to the programme caused by freezing winter weather conditions.

European representative for Nudura, Jean Marc Bouvier, comments on the scheme's success: "The builder-friendly aspects of the system made for an easy transition for Apollo, with it being their first experience with this type of building system."

The cost of ICF can be offset somewhat due to the system's benefits, confirms Apollo Education's project manager John Hill: "The Nudura system is typically marginally higher than timber frame in terms of build cost, but because savings can be made on heating and ventilation systems, and pipework can simply be chased into the wall with a knife, construction actually becomes cheaper."

Apollo is constructing the Woodside Inclusive Learning campus with sustainability firmly in mind and the Nudura system can contribute significantly towards achieving greater overall building energy efficiency through good thermal insulation and air permeability. Typically air permeability achieved is better than that required of a 'zero carbon' home, according to the firm, at 3 m<sup>3</sup>/h.m<sup>2</sup>. The wall construction is aimed at providing a U-value of 0.23 W/m<sup>2</sup>.

Nudura was used to build first zero carbon school in the US in 2010 – Richardsville Elementary in Kentucky. Where the average US school emits some 47.44 kg CO<sub>2</sub>/m<sup>2</sup>/yr, The Richardsville figure has been calculated to be 11.7 kg CO<sub>2</sub>/m<sup>2</sup>/yr.

The double foam-insulated concrete core is designed to be a very effective sound barrier and to dampen sound vibrations. The combination of EPS foam with reinforced concrete creates a structure that is, says Nudura, extremely energy efficient, air tight and moisture resistant. According to the manufacturer, the walls created do not support mould growth, and the building "becomes a healthy, comfortable working environment that's easier for mechanical systems to heat, ventilate and cool."

Earlier this year, the manufacturer also launched three new thermal inserts that further improve the thermal performance of the building envelope, in order to meet and exceed Building Regulations and Passivhaus standards. Nudura forms are produced from "recycled or recyclable" material, using no ozone depleting processes. The firm says it produces little waste during construction and emits no CFC or HCFCs in the process.



Above: Following pouring, concrete is 'consolidated' using a poker vibrator

Left: The wall construction used will provide good thermal insulation as well as air permeability, and has a U-value of 0.23

