New Science Building, University of East Anglia

*Located on the main campus, the New Science Building at the University of East Anglia is a four-storey, 7200m² building designed by **Fraser Brown MacKenna Architects**, which provides contemporary teaching laboratories and general teaching facilities with generous social areas. **John Moakes** reports.*

University laboratory buildings can consume huge amounts of energy and water while, paradoxically, teaching students the importance of the environment and the threat to eco-systems caused by human activity.

The University of East Anglia (UEA) wanted a building that eradicates this contradiction by minimising energy use and emissions while creating an internal environment that promotes well-being, accessibility, learning and research.

This meant designing, specifying and constructing a building that has excellent thermal insulation and air-permeability performance, as well as the highest aesthetic standards suitable for a campus, to become one of the UK's finest modern sustainable buildings.

Concrete is used extensively throughout the build in a variety of ways:

- Post-tensioned floor slabs – these allow large column-free spaces with flat soffits, ideal for highly serviced laboratories. The

Above: New Science Building, view from Chancellors Drive.

Above: Entrance portico formed with parallelogram-shaped columns.

Above: Collaborative atrium staircase.

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floor slabs are 350mm thick and span 13.2m between columns.

- Precast shear walls and stair flights in fire stairs and lift cores – these can be constructed quickly and left exposed, given the durability and aesthetic quality of the finish. The shear walls are a twinwall construction – they have a hollow core that is site-filled, saving on transportation costs and weight.
- Two-storey in-situ parallelogram-shaped columns are placed at the main entrance to create a dramatic entry sequence, coupled with a sunken courtyard and wrap-around steps. These were constructed in a single pour using a tremmie tube to ensure even distribution of concrete across the full-height of the column, with minimal blowholes.
- Precast ‘elephant step’ seating in the atrium to create an informal lecture and social learning space.
- An in-situ shear feature wall in the atrium, specified with a board-marked finish.

The vast majority of the concrete was left exposed to provide accessible thermal mass, which plays a large part in making this a sustainable building, ‘peak-lopping’ overheating in the summer and cold-spells in the winter – thus greatly reducing the demand on heating and cooling systems.

Board-marked

UEA’s 1960s campus was designed by renowned architect Sir Denys Lasdun; both he and UEA are synonymous with the use of concrete to the point where even the student newspaper is still named after

Procedure for production of board-marked walls

1. Before beginning the project, plan and price for cement replacement products (50% GGBS as a minimum) and allow time to produce samples for client review. For this project, over six 1.5 × 1m samples were cast before the chosen finish was achieved.
2. Douglas fir boards with a rough sawn finish were used throughout.
3. The boards were cut to 100, 70 and 50mm-wide strips and arranged in random patterns.
4. For boards of the same thickness (typically 18mm), remove the arris from some boards to give greater relief and definition to the concrete. This is a simple alternative to using different board depths (ie, 16, 17, 18mm thick).
5. Apply the release agent before nailing the boards to the formwork substrate; there is no need to use a 'secret' nail technique, as the nail heads add texture to the finish.
6. Cast the concrete in a single pour and vibrate well to minimise blowholes, although if a few remain they will add to the texture of the finished wall.
7. Once the concrete has set and the formwork has been struck, it must be well protected to ensure the wall doesn't get damaged. Such walls are usually cast 12–18 months before completion of the structure.
8. Once the moisture content of the concrete is sufficiently low, the wall needs to be gently washed to remove any dust. A single coat of Keim Ecotec (1:9 dilution) should be applied to seal the surface and reduce shedding.

Clockwise from top left: Collaborative atrium space; board-marked shear wall – detail; formwork for board-marked shear wall – back face of Douglas fir boards.

the material. Lasdun frequently specified board-marked concrete walls in the 1960s when UEA's campus was designed and the first buildings were constructed. Fraser Brown MacKenna wanted to reference this in the main atrium space of the new building, where a concrete shear wall was a structural requirement. Although popular in the 1960s, this technique had fallen out of fashion and with it the knowledge of how to specify and construct such a project. Rubber moulds for board-marking are available, but it was felt these wouldn't give the hand-crafted finish that was desired. Old and new techniques were researched by the architect, in conjunction with the concrete sub-contractor and the procedure shown above was developed. ■

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Client	University of East Anglia
Architect	Fraser Brown MacKenna Architects
Structural engineer	MLM
Main contractor	RG Carter
Concrete subcontractor	MJS
Precast supplier (shear walls)	Oran
Precast supplier (elephant steps)	Carter Concrete
Project manager	Real Consulting
Cost consultant	AECOM
M&E engineer	JSH
Landscape architect	WWA
Principal designer	Lendlease