



# *Precast prison*

## FEATHERSTONE 2, WOLVERHAMPTON

*This page: Precast sandwich panels being lifted into position. Note the fully integrated cell grilles.*

Just outside Wolverhampton, construction on a new Category B prison is nearing completion. The design and build of Featherstone 2 has precast concrete as its core. Due to open in spring 2012, the new prison lies north of Wolverhampton, not far from the existing HMP Featherstone.

**James Luckey** reports.

Construction began in 2009, with the project comprising 12 precast buildings, principally four four-storey house blocks, including all of the associated entry and facilities buildings. The Ministry of Justice awarded the £150 million+ contract to Kier Build, the major projects subsidiary of Kier Group.

During early assessment it became clear that precast concrete would help meet the security and design needs of the project. Kier appointed PCE Design and Build to design, procure and erect the precast components of the prison. PCE worked alongside the main contractor, architect and M&E specialist BBESL to develop the ideal precast solution for all the buildings.

### Scale and logistics

PCE has been involved in construction of UK prisons for more than a decade. What makes Featherstone different is the sheer scale and logistics of the project. It is the largest development the company has worked on and has brought together the precast manufacturing industry over a single project. The site is one of the first projects to use a range of different manufacturers and suppliers in this manner, working in tandem to alleviate any possible hold-ups.

The precast design-and-build contract covered a huge scope of service – supply chain appointment, management and co-ordination, component detailing and scheduling, manufacturing supervision and quality control, logistics co-ordination and management, as well as the precast structure design and construction.

Procurement of the thousands of precast components that create the structure of the buildings was a significant undertaking. Limited timescales (60-week production and 50-week construction programme) and the need to ensure a secure and continuous source of supply to site has seen six major precasters contracted to the project. Each company was carefully selected for its abilities in specific product areas.

The precast supply chain included:

- Techrete – external insulated sandwich panels with a high-quality reconstituted stone acid-etch finish.
- Bison – internal precast concrete walls and floor slabs.
- Bell & Webster – internal precast concrete walls and floor slabs.
- Buchan Concrete Solutions – internal precast concrete walls and floor slabs.
- Treanor Pujol – precast columns, stairs and landing units.
- Tarmac Precast – precast corridor walls and cell slabs (Tarmac has since announced closure of its Precast Concrete and Flooring business).

PCE placed its own co-ordinators with each manufacturer to ensure that production ran to schedule and that the quality of all products delivered to site was assured. The co-ordinators were also responsible for making sure that the design information was communicated accurately to the manufacturing teams and that deliveries to site were properly sequenced and adhered. At the project delivery stage the company managed three streams of designers, all delivering production and site construction information, all of which was no easy task when the overall project has involved some 10,000 drawings.

### Integrated structural features

The structural solution is based on a fast-track formula for precast concrete crosswall construction. At concept stage PCE recognised the benefits in increasing the



Aerial view showing one of the main housing blocks plus facility buildings.



functionality of the precast product and ensuring that the levels of on-site labour and need for follow-on trades was minimised.

The complexity of precast components was increased for Featherstone 2, designing units to be cast as one at manufacture, which helped to reduce project programme time and speed up construction.

Some examples of this include integrated shower enclosures and services, cell grilles and fully glazed security window systems cast into the wall units. Heating mats in the floor units and other primary M&E provisions were all installed at manufacture. On-site, the permanent balustrade was installed with the precast, negating the need for difficult metalwork installation later. When combined with the glazed window this greatly improves the dry envelope time and cuts the need for follow-on trades.

Around 1250 high-quality 9 × 3m precast panels were produced at the Brigg facility of Techrete. The composite insulated sandwich panels (an inner and outer leaf of concrete with high-performance rigid foam insulation between) provide the exterior walls, a white architectural reconstituted stone provides a high-quality façade, all supported off the main, inner structural leaf.

### Terracotta façades

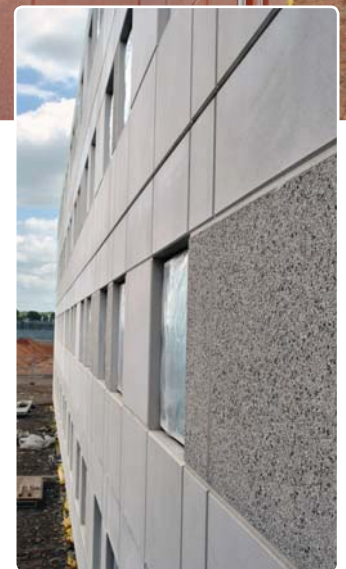
To differentiate the main entrances to each of the four house blocks and aid co-ordination to prison staff, sandwich panels with terracotta façades were manufactured and installed. The inner faces of the wall panels received a power-float finish, which was suitable for direct paint application.

Techrete developed a method of casting a heavy-duty window assembly, complete with bars and glazing, into the panel during the 'wet' stage of the production process. This necessitated a substantial level of protection to the window units to avoid abrasion from the concrete during compaction.

Bison provided 3800 units, with special features including service conduits cast directly into the internal walls and vanity units and underfloor heating pipework cast into solid floor units, used on the ground and intermediate floors of the new buildings.

Under a separate order, over 1600m<sup>2</sup> of Bison's precast hollowcore flooring units were also selected by Henry Smith, the structural steelwork contractor for the project, for a support building. The 200mm hollowcore units included cast-in lifting hooks, for improved health and safety and more efficient installation on-site.

At the peak of production, some 300 units a week were manufactured off-site by the precasters. On-site, the project saw 20–30 deliveries of units per day, with some 400 components a week being delivered and installed at



Above: The external façade used white and terracotta-coloured reconstituted stone.

peak. To ensure a smooth and continuous installation schedule, one day's delivery was kept in storage on-site.

**Site safety**

Kier Build and PCE faced the task of constructing 12 precast structures in a calendar year – high-risk activity in a large volume to a challenging schedule. Their approach was to innovate and design safety into the programme.

Slab designs and wall propping strategies were

*The terracotta façades on house block entrances have been used to aid site co-ordination for prison staff.*



*Lifting precast slabs into position.*



*Right and below: PCE's structural solution is based on a fast-track formula for precast crosswall construction.*



adapted to allow grouting of walls from floor levels above rather than continuous working at height to access wall tops. The PCE Slingsafe system was adopted to ensure all trailers could be accessed safely and simply.

Other key safety features include the casting in of sockets to accept PCE's Ambitus guard rail system, the use of which minimises the need for scaffolding on-site and, combined with an internal netting system, safeguards the workforce.

Bespoke steel plates were designed for riser and M&E connection pocket openings; these were installed during precast operations to provide immediate protection. Where possible, connections for other trades were designed in, eliminating on-site drilling, such as plastic blocks for connection to all riser doors and channels for fixing electrical trunking and riser modules.

The co-ordination with other trades, with PCE controlling the main atrium balustrade installation (permanent handrail) and installation of modular M&E, reduced interface and eliminated the risk in passing responsibility between companies.

**Facts and figures**

Understandably, the facts and figures for Featherstone 2 are impressive. Over the course of the contract, some 13,500 precast and steel elements will have been designed, supplied and erected to construct the 12 buildings, which include 1620 cells. Due to the variety of different units required, some 3000 individual panel types were cast. The cells alone required 2500 integrated windows and 1650 integrated doors and there are 50,000 M&E service components cast in to the precast units.

PCE has now completed the precast build programme at Featherstone 2 and is carrying out finishing works. But already the awards are coming in for the project. In May, the company was presented with the British Precast Innovation Award, the judges commenting on the project's "excellent ambition and clearly demonstrated the ability of the precast sector to rise to the challenge of creating such a major project" and remarked on "the potential repeatability of the solution across other buildings and sectors."

HMP Featherstone 2 is due to open in April 2012 and the Ministry of Justice announced earlier this year that it will be run by the private security group G4S. ●



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*Some 50,000 M&E service components are cast into the precast units.*