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THE PACEMAKER

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Laing O'Rourke's fastest ever hospital

Healthcare builds are rarely lauded for speed, but in just over two years, Liverpool's children's hospital will be operational in its new home

PROJECT REPORT
DAMON SCHÜNMANN

Speed building a hospital almost sounds like a lopsided approach, when it's an icon that symbolises a measured and painstaking attitude to patient care.

But Laing O'Rourke is trumpeting the rapid construction of Liverpool's Alder Hey children's hospital on a project that has been largely directly delivered by the contractor and its subsidiaries.

With a mere 117-week programme, this makes it the fastest hospital the contractor has built on this scale.

Its title, Alder Hey in the Park, provides the context for an interesting land swap that has allowed the project to go ahead.

This entails siting the new build in a park, so that the century-old adjacent hospital – parts of which have more than reached their sell-by date – can be demolished and the area where it stands be turned into new parkland.

Rapid delivery

Laing O'Rourke project director Andy Thomson is clearly proud of the rapid delivery programme. "It's the fastest build hospital certainly that Laing O'Rourke has ever put together at this size, and at 117 weeks it's about 25 per cent faster [than it has achieved in the past]," he says.

"In May 2013 we started building in the 33-acre Springfield Park and the new hospital will complete on 22 June 2015.

"Three months later the trust will move in and it will become operational in September," he adds.

Project	Alder Hey in the Park
Project value	£187m
Client	Alder Hey Children's NHS Foundation Trust
Contract type	Design and build
Main contractor	Laing O'Rourke Construction
Onsite start	25 March 2013
Construction completion	22 June 2015

It's a PFI scheme with an additional outpatient department that's being delivered through a framework contract, but the team is treating everything as one including co-terminus finish and end dates.

So quickly has the scheme progressed that by week 20 of the programme MEP services including modularised pipework and plant were going into the lower ground floors – a process that will see the installation of about 1,200 modules of offsite manufactured plant and materials.

However, it's not just the MEP that has benefitted from offsite production.

"There were 9,000 components for the main build that came out of [the manufacturing facility at] Worksop," says Mr Thomson, "Worksop is as big a part of the story as the site [see box, page 20].

"It's a very aggressive programme, backed up by the strategy the company's put in place over the past six or seven years," says Mr Thomson.

"It's a strategy that goes throughout our group but it's manifested itself wholly within this project where we've brought together a number of facets through [Laing O'Rourke] companies.

Group potential

He says that the build has only realised the speed achieved by harnessing Laing O'Rourke's internal groups. These have included Expanded Piling, which put in over 1,300 piles, Expanded Structures – responsible for the frame – and Crown House Technologies, which has been delivering the MEP.

CFA piling began in early May last year with foundations going in at depths of six to 12 metres down to the underlying sandstone.

But Expanded Piling was keen to keep as much disturbed material onsite as possible.

The ground comprises a reasonably softish clay that Laing O'Rourke improved by using lime stabilisation throughout, with the added benefits that it minimised

Several Laing O'Rourke companies have combined to speed-build Alder Hey

117
Expected timeframe from start to Alder Hey becoming operational

TIMELINE: BUILDING A HOSPITAL IN 117 WEEKS

The panellised wall system is a structural element

offsite disposal and formed the sub bases for piling mats.

Laing O'Rourke Construction North project leader Dave Saville explains that the main ground works issue came back to the fact that the project is being delivered on an existing park.

"Unfortunately we lost a number of trees but the scheme replaces these at a ratio of greater than two for one," he says.

"What might take traditionally six weeks to build with blockwork, steel work and erecting scaffolding, takes 30 minutes"

DAVID SAVILLE, LAING O'ROURKE

With Expanded Structures casting the first ground floor slab in the first week in June 2013, the team was able to erect its first load bearing sandwich panel – the façade – a month later in July.

The frame is a design that Laing O'Rourke has been using and developing for a while now using its Explore manufacturing facility to provide the components.

The basic construction is a ground bearing RC slab cast directly on to thickened pile heads, rather than pile caps.

The suspended floors are built using lattice planks that aren't significantly different from older filigree slab solutions.

Biscuit benefits

It's a 75 mm structural biscuit, semi-reinforced, meshed and topped off with 225 mm of insitu concrete - in essence it's a permanent shutter technique.

"We have precast RC columns and then, reasonably uncommon for us, a load bearing wall panel that does away with the need for external columns," says Mr Saville.

"It's made up of a varying width concrete internal panel that we refer to as greyback, which in reality is a large column that provides all the structural support."

The manufacturers then fix insulation onto the concrete panel before adding a varying depth concrete architectural face.

Overall this means a 300 to 400 mm thickness depending on the loadings.

These arrive to site pre-glazed and can simply be offered up for fitting.

"What might traditionally take six weeks to build with blockwork, steel work and erecting scaffolding, takes 30 minutes for us to put up a structural and architectural panel that arrives all as one," says Mr Saville.

Weighing from 20 to 25 tonnes each, they are lifted using crawler cranes, where site operatives can then grout them into place.

Built-in flexibility

There are some places where the contractor has used single-skin cladding, primarily in areas identified for future flexibility.

"What we've done is harness technology particularly by using [architect] BDP," says Mr Thomson. "We have moved everybody's perception of what can be achieved [with this method] instead of having a bland façade, not only with shape and texture, but colour, and how we can put a bespoke building together with this technique. That's the major thing we've managed to achieve here."

BDP has been working with the sandwich panel solutions part of Laing O'Rourke for about five years. Much of this development was in the education sector, where the floor to floor heights weren't particularly challenging and were comfortably within the manufacturing restrictions.

However, the difference in healthcare is the increased floor-to-floor heights that need to be achieved. In comparison with schools, hospitals are heavily serviced because above the ceiling is a complex kit of parts, particularly with medical gasses and nurses alarms among other things. This drives the floor to soffit height higher than standard panelised solutions.

"Here we are 4,250 milimetres max compared to a school where you tend to be about 3.6 metres," says BDP architect director Ged Couser.

"To achieve that we've introduced an infill on top of the sandwich panel, which uses a mechanical connection in its temporary state to stabilise it when it's in position, and subsequently it comes into a solid state when it's grouted together."

A further feature of the panelised system is that although it's efficient to make and build, the expanding foam insulation sandwich is energy efficient, with U-values at just over 0.2.

"We have moved everybody's perception of what can be achieved. That's the major thing we've done"

ANDY THOMSON, LAING O'ROURKE

Groovy designs

"As you come to Liverpool Lime Street there's a wall cut to create the entrance to the city (by rail), in a beautiful sandstone rock that's got striations within it," Mr Couser says.

"A lot of buildings in Liverpool are of that red sandstone material. We tried to create a building that is 'of Liverpool', not just the architectural heritage, but from the geology of the city. So that's where the striated, grooved approach comes from."

Quite aside from the speed of its delivery, this adds a certain pleasing symmetry in a building being fronted with Liverpool bedrock, for one that is so fundamentally important for its citizens, and those of the surrounding regions.

BIM PLAYS HUGE ROLE

Crucial to the pace and accuracy of the project has been what BIM brought to the productivity of the factory, a feature that has unequivocally helped Laing O'Rourke meet the construction programme.

The team has used everything drawn in the Revit model in three or four main ways.

First, there is the clinical planning model, which BDP effectively drops in.

"We've [also] got an equipment model, largely driven by clinical planning, that is really the backbone of a hospital build, and this fairly complicated panelised manufacture," says BDP architect director Ged Couser.

Crucially, the model joins up all the architectural striations, which look unique, but are really dependent on a limited number of moulds that were produced at Laing O'Rourke's Worksop manufacturing facility.

"That meant we didn't have 1,257 moulds, which would have been almost unbuildable," he says.

Because it was a fully co-ordinated model there were fairly accurate timescales. This meant the team could accurately plan labour, materials and logistics.

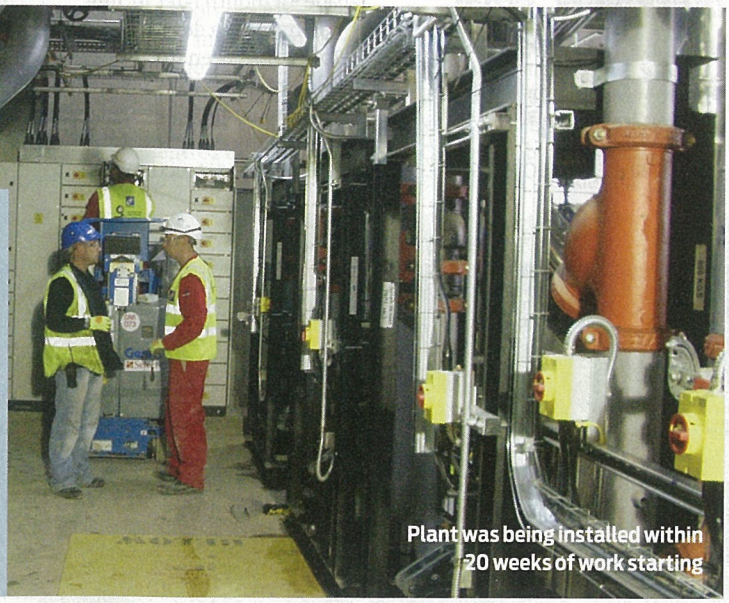
"Because the Revit model can do clash detection of all the MEP modules going through structural works, we did all the builders work within the model," says Mr Couser. "So it was pre-formed at the Explore manufacturing works rather than by bashing through walls onsite."

Laing O'Rourke project director Andy Thomson is also certain of the benefits using BIM has brought. "DfMA [design for manufacture and assembly] is unforgiving unless you put a lot of energy into the front end of the project, and designing in 3D really gives you the tools to allow for that to happen," he says.

"There's nothing worse than bringing something onto site that you've had prefabricated and all of a sudden it doesn't fit. It's happened on previous projects but it hasn't happened on this one. The only way to avoid that is to plan, plan and interrogate the model," he adds.

ENERGY CREDENTIALS

- Energy use: 42 gJ / 100 cu m / year
- Carbon: 2.25 tonnes / 100 cu m / year
- Onsite electrical generation: 60%
- Total renewables, 10% including: Photovoltaics, 200 sq m; Ground source heat pumps; Air source heat pumps
- Greywater harvesting
- CHP absorption chillers



Plant was being installed within 20 weeks of work starting

Now watch the video

See more on the panellised wall system and site online at ›››› cnplus.co.uk/project-report