



*Project
Speed*
Briefing

Project Speed & the NHS hospital building programme

February 2021

As Government plots our economic recovery from the pandemic, it has emphasised the importance of investing in our built environment.

In June 2020, the Prime Minister highlighted the need to deliver new infrastructure and buildings quicker, under the banner of Project Speed.

At the same time, he spoke of “building back better” and the subsequent National Infrastructure Strategy emphasised that through Project Speed, “vital infrastructure like schools, hospitals, transport and other networks will be delivered better, greener and faster”¹.

The COVID-19 pandemic has already produced examples of project delivery being accelerated, notably the Nightingale hospitals. Similar approaches will be required if we are to full reshape how we deliver future infrastructure programmes.

The Association for Consultancy and Engineering (ACE) has produced this briefing note as part of a series on Project Speed, with others exploring schools, rail and homes. This paper was written following a joint industry roundtable held with construction firm Laing O’Rourke in Q4 2020.

Find out more at www.acenet.co.uk/project-speed.



Opportunity for the hospital sector

Exploring recent commitments to hospitals including the Health Infrastructure Plan, how COVID-19 has affected hospital design, and Net Zero expectations.

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Programmes Vs. Projects

Different hospitals have more in common than at first glance and they should be viewed as a programme, rather than discrete projects.

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Project sequencing and early designs

A lack of clarity and consensus on hospital needs can affect design, especially when there is a lack of understanding of the overall processes.

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Digital Design models

The automated design process and BIM frees-up time for multiple simulations. The creation of digital twins is vital for future upgrades and refurbishment.

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¹ HM Treasury, National Infrastructure Strategy (2020); www.gov.uk/government/publications/national-infrastructure-strategy

THE OPPORTUNITY FOR THE HOSPITAL SECTOR

In October 2019, the Government announced the Health Infrastructure Plan (HIP) – a major new five year scheme to upgrade and redevelop NHS hospitals. HIP wave one gave the green light to six hospitals that were ready to move forward with existing plans.

In addition, 21 schemes were cleared to proceed to the next stage, bringing a total of over 40 different projects forming part of a “rolling programme of investment in health infrastructure”. A number of these involve the major redevelopment of hospitals. The 2020 Spending Review set out further funding, providing £3.7 billion for the hospital building programme, and £1.7 billion for the hospital upgrade programme up to 2024-25.

Previous large scale hospital building programmes have a mixed record. An analysis of the 50 major hospital schemes undertaken during the 1997-2010 period by the Nuffield Foundation² found:

- The need to improve planning and the assumptions that underpin it
- The need to improve the quality of design, procurement, project management and construction
- Concerns regarding the approvals process.

Since the HIP was announced, the COVID-19 pandemic has both reminded us how fundamental the NHS is to our way of life, and demonstrated that the pressures and challenges it faces are not always easily predictable.

Even before the pandemic, NHS England had a target to reduce face-to-face outpatient appointments by 30%³, and the ability to use online medical care to reduce resource pressures, either on a temporary basis during a pandemic, or as part of a long term strategy, is likely to grow.

All this means we have the opportunity to learn from past and take on board the early lessons of COVID-19, to ensure the HIP delivers a new generation of faster better and greener hospitals.

As well as more remote medicine capability, future hospitals need to be designed with resistance to infectious disease transmission in mind – for example the higher rates of ventilation and one-way systems needed to avoid the spread of airborne viruses such as COVID-19, or the ease of cleaning needed to combat ‘superbugs’ such as MRSA. Flexibility must also be built in, so that layout of rooms parts of buildings can be quickly changed to accommodate unforeseen situations.

At the same time environmental expectations are now built into NHS planning, through the NHS Net Zero initiative⁴ which aims to reduce the NHS carbon footprint by 80% by 2030, and the NHS Forest Initiative⁵ which encourages creation of green space and woodland on NHS sites to improve patient wellbeing.

From a technical point of view, hospital design and construction can be complex. It is especially important to have detailed technical design completed on building services in advance of the structures design, as unlike in a sports stadia for example, building services are critical to the effective functioning of a hospital. This prevents numerous re-designs as the M&E design catches up with the architectural and structural designs and avoids problems such as congested ceiling voids or plant rooms being too small. It also facilitates compliance with NHS standards such as Health Technical Memoranda and Health Building Notes. Hospital upgrades and refurbishments have the additional problem of work being undertaken in ways that minimise disruption to patients and hospital staff.

In the face of these challenges a new approach is required. The consultancy and design engineering sector has evolved since the hospital schemes of the 2000’s and innovations such as fully digital design and smarter structuring of projects can make a huge difference. Furthermore, the use of standardised components manufactured offsite is now more common and was vital to delivering the NHS Nightingale hospitals. This short brief gives further examples of what can be achieved.

2 Nuffield Foundation, Labour’s Record on Health (1997-2010) (2013); www.sticerd.lse.ac.uk/dps/case/spcc/wp02.pdf

3 The Health Foundation, Delivering the NHS Long Term Plan (2019); www.health.org.uk/news-and-comment/blogs/what-will-it-take-to-transform-outpatient-care

4 NHS England, A Net Zero NHS (2020); www.england.nhs.uk/greenernhs/a-net-zero-nhs

5 NHS Forest (2020); www.nhsforest.org

PROGRAMMES VS. PROJECTS

While each hospital is, of course, different, there is much in common between the different functions the buildings must perform and their structural elements. The benefit of having an established supply chain, and the client providing visibility of the development programme well in advance to the work starting, is that individual suppliers could schedule other work around the planned projects, provide security of income over a longer period and it motivated them to ensure projects were successful. This also enabled economies of scale in purchasing to be achieved. Treating the HIP as a programme rather than a series of discrete projects, and reflecting this in a delivery model choice and commercial strategy, will allow the private sector to invest and plan more effectively.



Case study: ExCeL London Nightingale Hospital

A programme management office (PMO) was used by Mott MacDonald to free-up design teams to focus on decision-making and leadership, as well as supply expertise and information. This effectively dealt with the emerging pressures of project management and their ability to implement PMOs quickly – sometimes in as little as 72 hours – allowed them to provide immediate crisis support and specialist advice to the Nightingale Hospital, releasing time to focus on business-critical activity.

This included creating a team to support onsite activity by integrating diverse design organisations and co-ordinating their activities. The team started with the London Nightingale Hospital, and then provided integration and programme management for all four ongoing surge capacity programmes at Cardiff, Manchester and Glasgow hospitals – sharing knowledge and the benefits of lessons learned.



Case study:
Glasgow Louisa Jordan Nightingale Hospital

AECOM used Modular Integrated Construction (MIC) methods in the building of the NHS Louisa Jordan Nightingale Hospital in Glasgow.

Through free-standing integrated modules – complete with finishes, fixtures and fittings – which are manufactured in a factory and then transported to site for installation in a building, the construction was completed 50% faster, with fewer accidents onsite and a standardised approach to quality where they are produced in a controlled factory environment. The fact that it took less time meant less impact on the ‘live’ operations of a hospital or healthcare facility.

The MIC volumetric units, or design for manufacture assembly (DfMA) component parts, were brought to site during off-peak times, with much of the construction happening in the factory. This reduced onsite construction waste, lowered safety incident levels and made it less intrusive to staff and patients nearby. Procurement was often completed via government frameworks – resulting in a five percent reduction of standard cost rates as well as faster appointments and delivery of healthcare facilities made as a result of direct awards or mini competitions.



PROJECT SEQUENCING AND EARLY DETAILED DESIGN

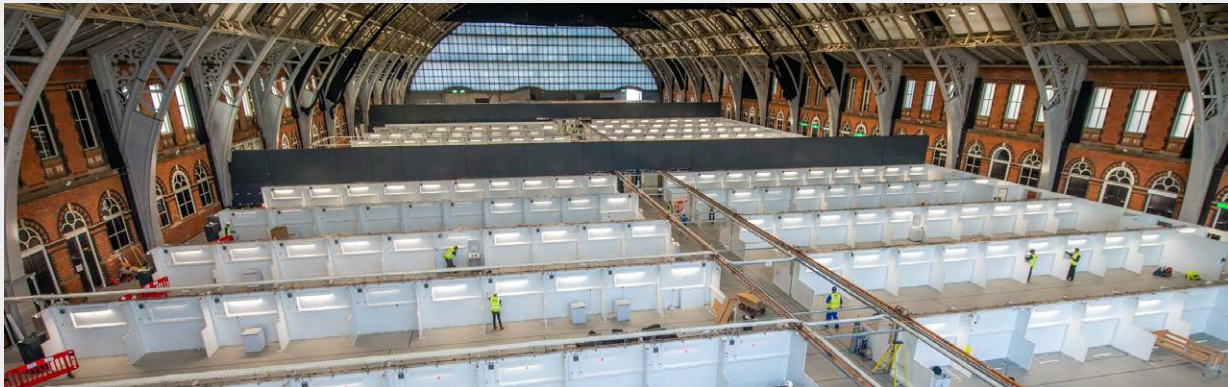
The Nuffield Foundation research found that a problem in previous hospital programmes was that as design started there often was, “no clear consensus on some key aspects of hospital functioning”. For example, they found there was no optimal method for organising emergency departments and the reception, diagnosis and onward movement of emergency cases. This translated to an inability to complete detailed design work early with constant changes suggested during design and construction.

In other cases, the attempt to involve a wide range of internal stakeholders led to a lack of a clear vision for the design as, “some clinicians had a clear view about the process requirements for their own specialty, but limited understanding of the complex flows outside their immediate area.” These concerns reinforce the views of consultants and contractors that getting detailed design right early in the project, and sequencing the project process correctly, reaps huge benefits.

Case study:
NHS Nightingale Hospital North West

In helping the national effort to combat the coronavirus pandemic, BDP designed the conversion of the landmark Manchester Central (formerly known as the G-Mex) into a 633 bed temporary hospital for COVID-19 patients. BDP collaborated with clinicians, consultants, contractors, Manchester Central and the British Army to meet a two-week deadline for completion, ready for admitting patients in the week of Monday 13 April 2020.

Learning from the challenges of the London Excel Centre Nightingale Hospital, BDP produced an ‘instruction manual’ for the design of future hospital conversions. Taking the form of a downloadable poster, it sets out clearly and diagrammatically everything that it has done at the Excel Centre – findings that will be largely applicable to any other emergency hospital. This allowed BDP to standardise venue conversion for other hospital projects, including the design of NHS Nightingale Hospital North West within a tight deadline.



Case study:
Jersey Nightingale Hospital



Key to the Jersey Nightingale Hospital was simplifying and rationalising the design upfront to prepare for immediate construction. Waterman Group’s design team collaborated directly with the site team during construction. During periods of intensive design, they held internal design briefings every morning to agree goals and deliverables.

This, combined with having appropriate inspectors on hand to sign off approvals during construction, saved many weeks of design amendments as any issues were dealt with in real time. Waterman Group established a knowledgeable team who were willing to listen and support each other, and who could de-risk the project quickly. This gave confidence to the contractor that the project was ‘buildable’, so elements were constructed early in the knowledge the overall scheme was going to be successfully delivered. Their collective UK experience saved approximately six weeks on the design programme.



DIGITAL DESIGN MODELS

When used correctly, automation of the design process and the introduction of BIM has the potential to improve productivity of the design process itself, making time and space for multiple design simulations focused on value creation and more productive delivery.

The creation of digital ‘twins’ of a building is particularly important in enabling future upgrades and refurbishments. At present, such work is often delayed and made more expensive by the lack of original analogue technical plans and designs.



Case study:

Grange University Hospital, Llanfrechfa

The £350m Grange University Hospital in Llanfrechfa, Cwmbran, is a 471 bed facility where around three quarters of patients will be treated in their own rooms with en-suite facilities.

Extensive use of digital design enabled collaboration and offsite manufacturing of components. WSP in the UK and the design team committed to digital engineering or BIM from the outset of the project and employed a strategy of Product Led Design – in simple terms using an intelligent understanding of the potential and constraints of the manufacturing process to inform the development of design. This was possible through early, close collaboration between the digital delivery teams of BDP, WSP in the UK and Laing O’Rourke’s Explore Manufacturing team.

In tangible terms it allowed to open four months ahead of schedule and delivered to the health board defect-free. One of the most impressive milestones achieved was getting 800 façade panels coordinated and approved for manufacture before the ground slab was even 10% progressed or a column erected. This was achieved fully in a 3D environment without a single 2D drawing, with all detailing attributes included in the Industry Foundation Classes.



Case study:
Dumfries and Galloway Royal Infirmary

This £212m project was designed to meet the increasing healthcare needs of the region's ageing population, and now offers 344 beds, day case surgical suites, an emergency care centre, ambulatory care centre, specialist oncology, maternity and paediatric facilities to this region of south west Scotland.

BIM Academy was founded in 2010 by Northumbria University and Ryder Architecture with the intention of establishing a centre of excellence for digital construction and transformation. It supported Laing O'Rourke in the development of a comprehensive 3D digital information model that was used to analyse, optimise and coordinate the design, and accurately specify the offsite manufactured panels that make up the entire external building envelope. This resulted in significant productivity gains and programme reductions.

The planned 30 month construction programme was shortened by six months as a result of the digital construction methodologies applied to the project, and the use of offsite manufacturing and design for manufacture assembly (DfMA). Manufacturing offsite allowed for components to be fabricated in controlled conditions to ensure quality prior to delivery to site, rather than constructing in potentially inclement weather conditions in this rural location.



CONCLUSIONS

The examples in this briefing show that taking advantage of digital technology, better collaboration and smart sequencing of projects can reap real rewards in terms of time and cost savings and hospitals that are more thoughtfully designed.

In certain cases, this will unlock offsite manufacturing options, in others it will simply provide a forum for all project partners to input and “rehearse” delivery before moving to site.

For all projects we should be seeking to first build them digitally first. Giving cost, risk and schedule certainty by working in collaboration with the whole team before embarking on a site.

The prize now is to make these techniques standard, rather than best, practice.

Making this a reality

- The HIP should be viewed as a programme, we recommend:
 - Commonality in terms of design and components proactively identified and maximum forward visibility given to the supply chain.
 - Presumption in favour of offsite manufacture for all HIP projects
 - More coordinated procurement decision-making across NHS Trusts.
 - As recommended by the Nuffield Foundation, the development of an open-source health planning and design knowledge resource.
 - Data on ‘as built’ building performance outcomes to be captured and used for future learning.
- At project level, close collaboration is essential from the start between the NHS client and designers and contractors, in line with the principles of the Construction Playbook. Outcomes such as the impact of the design on future staffing and running costs, and the amount of built in flexibility – for example ‘convertible’ and ‘transformable’ space that can be adapted to changing care models – required must be understood and agreed early-on. The use of the Construction Innovation Hub’s value toolkit should become standard as it supports new definitions of value and puts these at the centre of decision making.
- Invest in and commission digital models to support development, optioneering and design (including a minimum BIM Level 2).

