



The blueprint for Project Speed

*Lessons learnt and insights from the team that
delivered Jersey General Hospital Nightingale Wing*

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Overview

In March 2020, the world's economy ground to a halt and the COVID-19 pandemic tested every facet of our personal and professional lives. To limit the spread of the virus, extreme measures had to be put in place across the world, including travel restrictions, banning of social gatherings and the enforcement of personal protection equipment for the civilian population.

These restrictions made it very difficult, and often impossible, for many sectors of the economy to function as normal. This was especially the case for the construction sector, which was presented with a plethora of unforeseen challenges to overcome. However, our industry's response has changed our perception of what can be accomplished in a relatively short space of time and with extremely limited and constrained resources.

This inspired the UK government to envisage a new way of delivering major infrastructure projects centred around collaboration to achieve a shared goal. In June 2020, Prime Minister, Boris Johnson, announced the most radical reforms to the UK's planning system since the Second World War, revealing the concept of Project Speed, and encouraging the nation to 'Build, Build, Build', whilst also announcing a range of planning reforms to speed-up the process.

To boost the National Health Service's capacity as they responded to the pandemic, the government commissioned a series of emergency field hospitals, affectionately called the 'Nightingale Hospitals', which were rapidly deployed throughout the UK. These supported hospitals and regions without adequate facilities to accommodate the rapidly rising rates of infection. Across all of these projects there are examples of the construction industry coming together to accomplish what was considered implausible before the pandemic. Armed with the latest technology and an unwavering mindset to deliver these facilities, together we found a way to make these projects happen, despite all of the obstacles they faced.

One of these projects, Jersey General Hospital Nightingale Wing, was delivered by J3 Ltd - a joint venture between Garenne Construction Group, Sir Robert McAlpine and FES.

Completed just four weeks after being given the green light, NBBJ architects'-design scheme was the only new facility built under the Nightingale scheme. At 130 metres by 40 metres, the facility provides six wards, each with 30 beds, as well as areas for patient admissions and discharge, staff changing and rest, X-ray, equipment storage, laundry and a morgue. Waterman Group provided Structural, Civil, Highways and Geotechnical Engineering services.

Pivotal to the success of the project was the client team, whose collaborative and supportive approach became a vital ingredient that enabled the healthcare facility to be delivered on budget and to programme.

The project was a breakthrough advancement in the delivery of a healthcare facility, offering a glimpse into the future of construction by delivering a truly flexible facility that is sustainable and easily adaptable for future technological advances and changes of use. It also emphasised the importance of using the latest design and collaboration tools to enable the development of rapid 'just-in-time' design solutions and vastly improved site logistics.

We can now reflect on what has been achieved and share this knowledge with industry and the UK Government, to equip them with the tools to successfully deliver the ambitious plan of works that lies ahead.

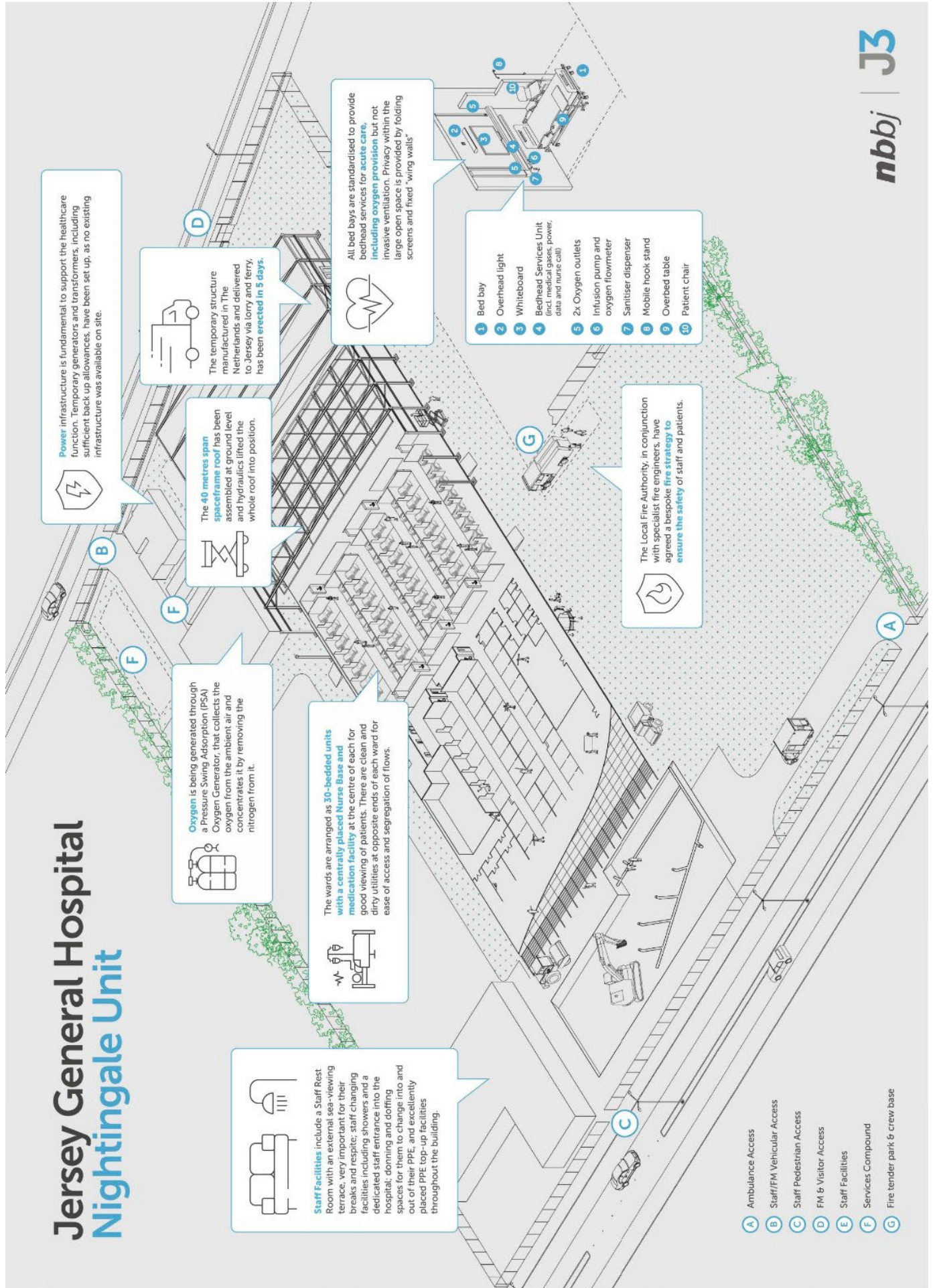
We have compiled a list of challenges that need to be overcome to improve the delivery time of a project, while offering solutions and ways of working to achieve rapid project delivery. Through understanding the causes of delay and their origin, a project team can focus their attention on the key issues that matter and plan a strategy for success.

We want to share these lessons learnt to promote dialogue and positive change within the construction industry in order to provide the best possible outcome for Project Speed.



Joe Smith,
Structures Director,
Waterman Structures

Jersey General Hospital Nightingale Unit



Power infrastructure is fundamental to support the healthcare function. Temporary generators and transformers, including sufficient back up allowances, have been set up, as no existing infrastructure was available on site.

The temporary structure manufactured in The Netherlands and delivered to Jersey via lorry and ferry, has been **erected in 5 days**.

The **40 metres span spaceframe roof** has been assembled at ground level and hydraulics lifted the whole roof into position.

Oxygen is being generated through a Pressure Swing Adsorption (PSA) Oxygen Generator, that collects the oxygen from the ambient air and concentrates it by removing the nitrogen from it.

The wards are arranged as **30-bedded units with a centrally placed Nurse Base and medication facility** at the centre of each for good viewing of patients. There are clean and dirty utilities at opposite ends of each ward for ease of access and segregation of flows.

Staff Facilities include a Staff Rest Room with an external sea-viewing terrace, very important for their breaks and respite; staff changing facilities including showers and a dedicated staff entrance into the hospital; donning and doffing spaces for them to change into and out of their PPE, and excellently placed PPE top-up facilities throughout the building.

All bed bays are standardised to provide bedhead services for acute care, including oxygen provision but not invasive ventilation. Privacy within the large open space is provided by folding screens and fixed "wing walls".

- 1 Bed bay
- 2 Overhead light
- 3 Whiteboard
- 4 Bedhead Services Unit (incl. medical gases, power, data and nurse call)
- 5 2x Oxygen outlets
- 6 Infusion pump and oxygen flowmeter
- 7 Sanitiser dispenser
- 8 Mobile hook stand
- 9 Overbed table
- 10 Patient chair

The Local Fire Authority, in conjunction with specialist fire engineers, have agreed a bespoke **fire strategy** to ensure the safety of staff and patients.

- A Ambulance Access
- B Staff/FM Vehicular Access
- C Staff Pedestrian Access
- D FM & Visitor Access
- E Staff Facilities
- F Services Compound
- G Fire tender park & crew base



The client team



The role of the client team

For traditional projects, the client team is responsible for developing a project brief that sets out the project outcomes, budget, programme, the most appropriate procurement strategy, managing and deciding when the construction team will join the project team. They are also tasked with managing stakeholder relationships and project risks. While the client team holds a central role to the delivery of a project, the extent to which they are involved in the process can vary widely.

However, for the Jersey General Hospital Nightingale Wing project, J3 Ltd. prepared the budget, programme and played a major role in the procurement strategy, while partly managing key stakeholder and project risks. Maximising collaboration, this departure from the traditional approach ensured that all bases were covered. The client engaged J3 Ltd. as the delivery partner because they had the knowledge and experience to deliver.

Rapid delivery projects rely on project briefs that are clear and without ambiguity. A client's project brief can sometimes lack clarity and might not incorporate sufficient detail to define the final desired outcome. This can lead to significant delays, redesign and remedial works if construction has already started, which ultimately leads to budget and programme issues.

Delivering projects at high speed requires a client to acknowledge that there will be risks and there should be an effort to separate these into 'knowns' and 'unknowns'. Through close collaboration, the design and construction delivery team can deal efficiently with the knowns, move forward and stay on programme. While sensible and proportionate risk allowances can be made for the unknowns to ensure that the initial budget is both realistic and robust.

Lack of clarity about the agreed procedures and processes for sign-off can lead to unnecessary and significant delays at the pre-delivery and delivery phases of a project. This is further compounded if the individuals who have the required authority are not identified or selected early in the project.

On 'normal' projects, attendees at design/stakeholder meetings are not the ultimate decision makers. Also, there are frequently competing requirements between differing functional groups. On fast tracked projects, not only should the ultimate decision makers be involved from the outset, but they should be co-located, so that organisational and project priorities can be quickly agreed between them and the key decisions reached much more rapidly. Also, the project programme may not have accounted for delays relating to late sign-off, something which is crucial for the rapid delivery of projects.

Further delays to progress on rapid delivery projects can result when there is uncertainty about appointments, leading to an inability to ramp up resources while contracts are under negotiation. This issue becomes even more of a problem when there is doubt about base rates and the method of reimbursement.

Further to this, disproportionate levels of risk and liability are often apportioned to the contractor, impeding them to make quick decisions. Therefore a clear structure for sign-off, incorporating pre-agreed limits where applicable, and accountability needs to be established at project start-up phase.

A major contributing factor for the success of the Jersey General Hospital Nightingale Wing was the strong working relationship between the client team and the delivery team. This allowed for quick sign-off at key stages, leading to delivering the project on time.



Lessons learnt and advice for the client team

The following recommendations are intended for client teams who are tasked with delivering rapid delivery projects.

- 1.** The client's project brief should be as comprehensive and specific as possible about the desired outcome for the project, including budget and programme. It should also clarify what is critical and what is 'nice to have' and should consider how it intends to operate.
- 2.** The client should develop a clear governance process, lines of authority and sign-off procedures before project commencement.
- 3.** It is crucial that the group or persons authorised to sign-off decisions are limited to as small and relevant a group as possible and who all understand and are supportive of the project brief. It should also be made certain that these groups or individuals have time to commit to the project alongside their other duties and responsibilities.
- 4.** Co-locate the ultimate decision makers with the design and delivery team to fast track decision making.
- 5.** Clear deadlines in the programme for sign-off by the client team and stakeholders should be established and adhered to at the beginning of the project.
- 6.** Agree an efficient and effective stakeholder engagement strategy, utilising remote working tools and methods where appropriate.
- 7.** Agree 'heads of terms' or sign a letter of intent as early as possible to enable the contractor and design team to allocate the correct level of resources to the project as soon as possible.
- 8.** Agree all base rates and methods of re-imburement in the contract.
- 9.** Consider a more balanced approach to risk and liability.
- 10.** Consider using e-signatures to expediate the contract negotiation phases.
- 11.** For Jersey General Hospital Nightingale Wing, we provided a Communications Plan and set out the site selection criteria and site evaluation strategy to select the preferred site. This was essential to make sure the site selection process was as quick as possible.
- 12.** Be open minded about change processes and approvals to accommodate quick change with clear lines of authority for sign-off.
- 13.** Ensure the project team moves forward at the speed of the decision-making process and that fringe project team members are aware of their accountability and remit.



Commercial matters



Contracts & procurement

Critical to the success of a project is that it is delivered on time, on budget and to an acceptable standard of quality. The form of contract selected, the commercial controls put in place and the way commercial matters are managed have a major impact on the outcome of any project.

For rapid delivery projects, understanding, agreeing and communicating these principles as early as possible is of utmost importance.

Construction projects can be procured using several methods and forms of contract which all offer various mechanisms for payment and alternative levels of responsibilities and risk to the client, consultants and contractors.

The form of contract and the processes and procedures that define it, should support and aim to mitigate the issues that are present in a fast track project. It should not impede the speed of decision making or restrict the contractor's ability to progress their works or manage their supply chain effectively.

The use of collaborative forms of contract such as NEC Option E support a structured and well understood "rule book" and can help circumvent the often drawn-out periods of time that it can take to agree on the terms of contracts.





Lessons learnt and advice on commercial matters

The following recommendations are intended for those concerned with commercial matters for rapid delivery projects

1. For rapid delivery projects, recognise that there may be insufficient or limited time for a formal tender process and achieving a fixed price may not be feasible or desirable, due to the undeveloped level of the client brief. Address this uncertainty by creating a process where there is transparency and control of outturn cost throughout all decision making.
2. Consider existing direct routes for procurement and agreed contract form early. Think about selecting a contractor from an existing framework agreement or where this is not possible, consider where there is a previous and proven record of trust, together with a synergy with the client team.
3. Agree a high-level budget early but ensure that it is realistic, including adequate contingency and is signed-off quickly with funding made available to enable the project to proceed. Take collective responsibility for the budget and agree team actions to address. Consider creating the project budget jointly between client and contractor teams so all voices are heard, and all expertise is accounted for.
4. Negotiate contractor's staff rates and mark-up on prime cost utilising existing agreements, recent project data and/or local market levels.
5. Choose a standard form of contract, unamended as much as is possible, to create a correctly balanced relationship. There is no room for egos or a 'big stick approach'. Jersey General Hospital Nightingale Wing utilised NEC3 where the first clause states "the teams shall act in a spirit of mutual trust and co-operation."
6. Limit the contracted scope of works to a high-level definition to allow flexibility of design solutions and the ability to 'back-fit' into the contract documents the agreed as-built information at project completion.
7. If derogations are required, keep an up to date "derogations log" which records informed decision making by appropriately qualified and authorised staff. This mechanism, which allows reasonable variance from normal regulatory requirements or the project brief must be agreed and negotiated with the relevant regulatory authorities and the client at the beginning of a project. These derogation documents can be developed to reflect what has been delivered and retrospectively included in a post completion Contract agreement.
8. Supply chain procurement should be based on proven client and contractor relationships and negotiated where time is of the essence. Agree reimbursement throughout the supply chain to be at 'cost-plus' with a requirement for a fully auditable process and comprehensive record-keeping, both on and off site. This means the client is taking a measured level of risk, but it is balanced by paying the true market price and having a supply chain who are not solely motivated by profit.
9. Contracts should be written acknowledging the rapidity of delivery and avoid long-term contractor liability which could stymie the parties' willingness to proceed at speed.



Lessons learnt and advice on commercial matters cont.

- 10.** Ensure contracts keep cashflow-positive throughout the supply chain so there is no hesitation in a commitment to expenditure. Jersey General Hospital Nightingale Wing had weekly interim valuations paid promptly and with the ability to quickly re-coup any over-payment that might occur due to the speed of the process. Ensure standardisation of rates and mark-ups across similar trades.
- 11.** Include a significant “bullet” payment to allow for rapid mobilisation and positive cashflows throughout the supply chain.
- 12.** Incorporate common working practices across the whole supply chain. For example, establish standard overtime agreements so there is no room for disharmony across the labour force.
- 13.** Design options for selection and sign-off to be presented with as much cost information as possible, both capital and lifecycle.
- 14.** The supply chain should be part of the decision-making process to advise on availability and lead-in times of materials that may limit or inform the design and product selection.
- 15.** Jersey General Hospital Nightingale Wing reported on outturn cost at the end of every day and this was presented to the client team each morning for reconciliation with budget. This process gave the team the ability to act quickly to address potential issues before the point of no return.
- 16.** Independent post-contract audit of costs by a suitably qualified construction professional to be instigated as soon as all costs are available to ensure correctness of process and value for money has been achieved.
- 17.** Adopt real-time cost reporting (i.e. daily so that all understand the rate of spend and can make reasonable checks against budget).
- 18.** Use CEMAR (Contract Event Management and Reporting), or similar, to record changes. Ensure this is decided early and relevant people are trained to use it.
- 19.** Prompt payment and quick payment (i.e. not as per standard contracts to supply chain so they benefit from fiscal stimulus or positive cash-flow).



The design & delivery team



Assembling the right team

When assembling a design and delivery team, there are many key attributes necessary to delivery rapid construction. Skill and experience are essential, but there are numerous other factors which need to be considered when selecting the right team.

A design team without clear leadership tends to miss deadlines and can lack clarity about design responsibilities. Inexperienced design and delivery managers can lead to poor performance and substantial delays to programme. Rapid delivery projects, by their nature, are extremely fast-paced and require a well driven, focused and motivated team.

Clear hierarchy of decision making and the order in which they are made needs to be agreed alongside the programme that drives them. The client team needs to understand why the design team needs a decision to be made to help inform their decision making. On the other hand, the design team needs to have an understanding of how the client's decision will impact on the operations of the building.

If working outside of established standard methods of delivering projects, then authorising parties need early engagement and buy in to the principle project objectives.





Lessons learnt and advice for the design and delivery team

The following recommendations are intended for those responsible for assembling and managing the design & delivery teams for rapid delivery projects.

1. Strong, clear and organised leadership of the design and delivery teams is essential.
2. There is a need to have an experienced design and delivery manager to liaise between the client and design teams, who has a track record for delivering projects of a similar size and complexity.
3. There is a need to create a culture of trust, can-do attitude and non-adversarial leadership, so everyone is pulling in the same direction. Rapid project delivery requires team members who are highly engaged and committed throughout all stages of a project. For Jersey General Hospital Nightingale Wing, the contractor's leadership team were inclusive, empowering and enthusiastic which all contributed to an extremely motivated design and delivery team.
4. While assembling a team with the right level of skill and experience is important, for a rapid delivery project, ensuring that the leadership team has a strong grasp of both behavioural, and team psychology is paramount.
5. Find ways to empower people to make decisions. For extremely rapid developments such as Jersey General Hospital Nightingale Wing, J3 Ltd. undertook to make all decisions within two hours where possible. For each project, the acceptable time it takes to make a decision before starting to impact program should be established.
6. Ensure that all team members understand the client team brief, design responsibilities and appointment.
7. During periods of intensive design, hold internal briefings as often as possible to agree goals and deliverables. The speed of Jersey General Hospital Nightingale Wing required these briefings to be held daily every morning. A lack of engagement will undo the progress made and fracture a team therefore establishing commitment early is key.
8. Decision making often takes too long, so for Jersey General Hospital Nightingale Wing three questions were asked when making every decision: Is this really needed (can we do without it)? Is there a better way of doing this (have we considered all the options)? Does the solution meet the need (does it work)?
9. For rapid project delivery projects, use your knowledge and experience from previous projects. Sir Robert McAlpine brought to the project its experience working on the NHS Nightingale Hospital North West in Manchester, while the company's J3 Ltd. partner FES worked on the Glasgow SEC Nightingale Hospital. This knowledge helped inform decision making on Jersey General Hospital Nightingale Wing by not only understanding what works, but what problems to anticipate and how to overcome them. Our collective UK experience saved approximately six weeks on the design programme and highlighted supplier problems which meant we anticipated and overcame them far quicker.

Lessons learnt and advice for the design and delivery team cont.

- 10.** Confirmation and agreement on room layouts, building locations, routes of ingress/egress and maintenance are all key design elements that have a significant impact on the outcome. For Jersey General Hospital Nightingale Wing, we found that it was far more effective to understand how all the buildings and departments would operate and interact with each other when operational, before settling on a layout. This process allowed for the rapid delivery of a layout that worked for all parties concerned, and all within a few days.
- 11.** Engage with the end users as early as possible. Their input will inform and drive the design process and must be understood so that is incorporated into the design.
- 12.** For rapid project delivery projects, don't go back once you have made a decision. Stop and re-evaluate if you need to adjust, but there is no going back if milestones are to be met.
- 13.** For Jersey General Hospital Nightingale Wing, the team established on day one that labour would not be a problem. This allowed us to focus on material suppliers and logistics, while always having a Plan B if things did not go to plan.
- 14.** Failure to identify all site constraints early in the programme can lead to long delays, so a site review and desk study should be carried out by all team members as early as possible. This should also enable project parameters to be refined within a collaborative dialogue and the possession of a broader understanding of what will be required to achieve success. For Jersey General Hospital Nightingale Wing, a good example of this was the oxygen generation plant building which was positioned on the western part of the site, close to residential neighbours. Late in the program, it became apparent that, due to the proximity of the residential properties, additional special acoustical measures were required. In hindsight, this building should have been placed on the eastern side, the furthest away from residential neighbours thus reducing acoustic issues and potential delays.
- 15.** Often, planning permission and building control approvals are very time consuming and can be a stumbling block for a rapid delivery project. For Jersey General Hospital Nightingale Wing, the building control officer and the fire department were very much part of the design solution and engaged with us at the beginning of the project.
- The proactive and cooperative approach from both parties ensured that they understood our brief and that we understood what information they required from us and when.
- 16.** Carry out a critical review of whether and the extent to which an Environmental Impact Assessment is required to ensure that no time is wasted carrying out unnecessary surveys and investigations.
- 17.** No consideration of the allowable times for surveys of different species on the site can lead to delays. Consideration of available windows of opportunity to carry out surveys should form part of the programme.
- 18.** Agree landscaping viewpoint locations and timing for the visual impact assessment through early engagement with the planning officers. Landscape proposals can also be very subjective and lead to delays if the planning departments are not in agreement, so the early engagement should help mitigate this.
- 19.** The discovery of archaeological artefacts can interrupt construction, so a desktop study and trial trenching should be included as part of the geotechnical investigation works to minimise the risk of disruption to the programme.
- 20.** Commission a drainage survey prior to developing the drainage strategy to avoid delays.
- 21.** Agree the outfall parameters through early consultation pre-planning.
- 22.** There are often differing opinions between drainage undertakers and Lead Local Flood Authorities, particularly regarding SuDS, so early consultation, pre-planning will reveal responsibilities for SuDS measures and adoption.
- 23.** Availability and accuracy of the flood map data can be an issue that leads to uncertainty. An early assessment as part of the Flood Risk Assessment and drainage strategy should be undertaken to of minimise the risk of delay.

Lessons learnt and advice for the design and delivery team cont.

24. Early consultation with the Environment Agency and the drainage authority can help with the understanding, and anticipation of, any changing requirements for climate change and/or flood risk to circumvent problems later in the design and construction phases.
25. Early, consistent and frequent engagement with the local authorities is very important to avoid planning process delays resulting from challenges or committee. These stakeholder groups need initial dialogue so they understand and commit to reaching the objective.
26. The acoustic and fire strategy need to be considered early and it is critical that acceptable strategies are agreed at the beginning of the project. The implications of not agreeing to these strategies on programme should be clearly communicated to the users and authorities.
27. Early identification of utility connections, liaison with utility companies and an understanding of capacities is essential.
28. Understand the thermal needs of the spaces/building and confirm if acceptable parameters for temperature and the environment can be controlled to suit the client's brief and requirements.
29. The design needs to accommodate the construction methodology and be buildable, considering the resources and skilled trades available. Developing an achievable and practical construction methodology that is specific to the challenge and client brief is essential.
30. For rapid delivery projects, there is a need for the design team to work closely with the procurement team. Substantial delays occur when the design team specifies materials that are not readily or locally available. Only select products that are available as procurement of materials drives the programme – labour should never be a blocker to progress. The design team should only specify material/products that can be delivered in line with the programme. This is a cyclical process, and it is incumbent on the delivery team to ensure supply chain solutions and limitations are fed into the design, while ensuring that end user dialogue is also considered as early as possible.
31. To deliver Jersey General Hospital Nightingale Wing, both the design and construction team had to work outside normal working hours to achieve their deliverables. When this occurs, it is very important to ensure that the level of design and site supervision does not reduce at any time. If mistakes are made on the night shift, they will delay the works in the day shift.
32. Develop a logistics plan that ensures maximum access to all areas of work and for delivering materials and storage solutions.
33. Utilise off-site, modular and prefabricated solutions where possible, if they provide a benefit in terms of programme, cost, logistics, safety or sustainability.
34. A dedicated planner is essential for a rapid delivery project. Utilise collaboration, planning delivery works by the half-day and monitoring daily. Ensure all are aware of the critical path and those close to it and agree metrics with the accountable person for delivery of each.
35. Ensure that there is a firm grip on the cost plan – daily monitoring and reconciliation.
36. Good record keeping is essential and audits will be required. Establish who is recording and how will the audit be conducted if known.
37. Never cut corners, especially on the quality of installation. It needs to be appropriate and safe in use and only leads to further delay down the line if not done correctly first time.
38. Agree building / facility sign-off processes in advance and make sure all testing and commissioning certificates and any other relevant documentation is in place at handover, with clear accountability for who is signing off what, including third parties.
39. Risk monitoring is an essential element of rapid project delivery. The design and delivery team must identify where they understand there to be risk even if it can not be quantified, so that it can be managed effectively should it emerge.



Digitalization



Leveraging capabilities through digitization

The successful implementation of digitalization techniques to accelerate design and construction programmes relies not only on high levels of collaborative working, consistent levels of coordination and reliable digital information exchanges, but also how teams and clients use the data to make good decisions.

While most in industry have become competent in the ability to use Building Information Modelling (BIM) software, many are still failing to realise the full potential of this way of working, with many clients and end users struggling to acknowledge the benefits of the data for the whole life of the building or asset.

There is no doubt that fast track projects should use digitalization to leverage the capabilities of the design and construction team, but there are some pitfalls which should be considered early in the project, which include: There can be a tendency for some members of the design team to be over-zealous with respect to the level of detail that is required at any given stage of a project and beyond what is set out in the BIM Execution Plan. They can also ignore economic or buildability constraints for the project, when developing the details. This can often lead to redesign and delays to correct the design so that it is compatible with the contractor's capabilities, within budget and possible for the supply chain to adequately source all materials required.

On the other hand, some members of the design team can lack sufficient detail at any given stage, making it difficult for others to progress their designs. This issue often stems from the structure of the RIBA stages of work, which do not necessarily address the reality of how projects are actually delivered. For example, the level of detail for the mechanical and electrical design can lag behind that of other disciplines, often leading to redesign of the structure and architecture during and after it's construction.

Lack of interoperability of software packages when modelling in 3D leads to additional time to coordinate and create federated models.

Late engagement of tier one and two contractors who will need to contribute to the BIM, can lead to delays. Engagement of sub-contractors who lack adequate BIM capabilities, but have a remit to input into the BIM creates delays and quality issues.

When different disciplines and sub-contractors work in silos, with limited coordination, it often leads to abortive work and delays to the programme.

BIM can lead to an abundance of data and drawings that needs to be reviewed and approved and inadequate resources and time can be allocated for this process, often because too many people and possibly the wrong ones, are involved in the approvals process. Also, all of those tasked with approving may not necessarily understand what they are reviewing, ultimately delaying decision making.

If your team doesn't have the skills to realise this, consider the addition of support personnel. The benefits can only be realised through understanding, so invest in having this understanding.



Lessons learnt and advice for incorporating digitalization into the workflow.

The following recommendations are intended for those responsible for implementing and managing the digitalization of a project.

1. At the start of a project, ensure that all disciplines use modelling software that is compatible and exports to IFC format. Agree the principles of how you will develop and share the model.
2. A good understanding and realistic assessment of the capabilities of the contractors and sub-contractors who are likely to build and commission the building and the availability of materials should be understood early in the design process.
3. This is especially the case for modular construction and product-based design. Key sub-contractor and supplier designers should be onboard with the project from day one.
4. Be honest about the team's collective BIM capability as the BIM is only as good as the weakest link.
5. Encourage quick hand sketches to convey ideas to the rest of the team before investing too much resource and time on modelling in 3D.
6. Ensure collaborative procurement through contracts that allow early stakeholder engagement.
7. Using collaboration software ensures problems can be instantly flagged and uploaded to a cloud server. Specialist software allows all parties to assign coordination issues, add notes and assign to actions to various parties. The benefit of using a live platform mitigates the trend of working in silos. This means many problems can be resolved even before clash / coordination meetings.
8. Have robust coordination protocols in place amongst various consultants from the outset, including digital document control, BEP, model sharing and clash detection.
9. Document the design efficiently, keeping required drawings to a minimum and minimise overlap with subcontractor design. The efficiency of a fast build process can be compromised with unnecessary scope overlap between design team and subcontractors. This is particularly the case for the sub-contractor packages of work such as the building services and cladding where traditionally the design team will design and model these elements pre-delivery, only for a sub-contractor to redesign and remodel them at construction stage.
10. Set a LOD (Level of Detail) Instance Parameter to all elements within a BIM model. Any user of the BIM model can then check the LOD level of any given element and understand how much the content can be relied upon.
11. Use virtual reality to assist in communicating problems and collaboration across the team and to the client to develop a quicker and enhanced understanding of the issues, constraints and opportunities.



Modern methods of construction



Off-site manufacturing and product based design

The construction industry is at a pivotal stage in its evolution, with off-site manufacturing and product-based design taking centre stage. Off-site manufacturing allows for large elements of a building to be prefabricated and modularised in a factory, where the environment allows for greater quality control and output, while product-based design allows a designer to incorporate pre-designed and certified elements into their design.

Combined, these approaches allow for quicker design development, safer and cleaner construction, reduced levels of site staff and rapid construction. Off-site manufacturing also leads to significant reductions in construction waste and, if designed well, can easily be repurposed for future use.

Given the forecasted trades skill gap, the government's initiative to drive rapid project delivery and increasing requirement for sustainable developments, off-site manufacturing and product-based design offer a genuine opportunity to make these initiatives a reality.

For the Jersey General Hospital Nightingale Wing, the main building was a prefabricated aluminium frame with a space frame roof concealed by a PTFE covering and insulated panel external walls. Smaller self contained modular units were used for some of the ancillary buildings to house hospital staff accommodation facilities.

While prefabricated structures were the preference for Jersey General Hospital Nightingale Wing, the external oxygen plant room was constructed using traditional masonry load-bearing walls and a timber roof as there was insufficient time to procure a prefabricated building system and traditional materials and trades people were more readily available.

Following the erection of the main hospital structure, prefabricated quick-fit partitions, door systems and hand-wash basins were adopted to allow for rapid installation.

The design approach allows for the internal layout to be easily modified if there is ever a requirement or dismantled and reused by the client at any of their other facilities.



Lessons learnt and advice for incorporating modern methods of construction and design

The following recommendations are intended for design and construction team members.

- 1.** The decision to incorporate any modern methods of construction to a rapid delivery project must be made very early in the programme to allow adequate time for design coordination, manufacturing and erection. This decision-making process must include the verification of availability of materials, suppliers, installers and means of delivery to site.
- 2.** It is crucial that the manufacturer of any prefabricated elements has suitable and clear design calculations at hand to demonstrate compliance with the relevant codes of practice and building regulations to enable the design team and building control to review them satisfactorily.
- 3.** A design responsibilities matrix should clearly define the roles and responsibilities of the design team members and the manufacturer. Particular care and attention should be addressed at interfaces between manufactured elements and those constructed on site. The manufacturer should clearly define what aspects of the design they will accept responsibility for and which they have excluded. They should also confirm to what extent they will be involved in coordination and their design liabilities and warranties. This should all be agreed before incorporating the solution into the design.
- 4.** Standardisation of products allows for simpler design, ease of construction and maintenance. All efforts should be made early in the design process to agree which elements will be standardised.
- 5.** Establish the programme lead-in and on-site benefits involved for each choice so that a balance can be struck which works best for the project early in the opportunity assessment stage.
- 6.** Involve the supply chain early so that the best solution can be reached using perspectives from both design and delivery viewpoints.
- 7.** Use the benefit of hindsight by identifying similar projects in the opportunity assessment stage to ensure you are not reinventing the wheel. Leverage knowledge gained from completed projects.

Credits

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Link to videos

Use the link below to explore a library of videos compiled by J3 Ltd on the delivery of Jersey General Hospital Nightingale Wing.

<https://www.youtube.com/channel/UCSVJifkAS5tVxVaZjhtBBdQ>

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