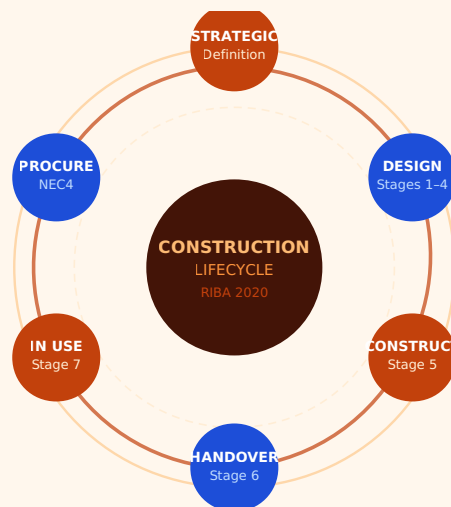


PM5005 · CONSTRUCTION PROJECT MANAGEMENT

Integrated Construction Project Management: A Case Study in Healthcare Facility Delivery

Critical Analysis of RIBA Stages, NEC4 Procurement, BIM, CDM
2015, and Sustainability Governance



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1 Introduction and Case Study Context

The delivery of major construction projects in the United Kingdom operates within one of the most complex and tightly regulated management environments of any industry sector. The convergence of procurement law, health and safety regulation, environmental sustainability requirements, building information modelling mandates, and contractual frameworks — all operating simultaneously and in interdependence — creates a governance landscape that demands sophisticated integrated project management capability at every level of the delivery organisation. The IPA (2023) reports that only 34% of UK public sector construction projects completed in 2022-23 were delivered within 10% of their original approved cost estimate, with schedule overruns averaging 31% across the major project portfolio.

This case study critically examines the management of the fictitious Northbridge Healthcare Centre (NHC) development — a £28 million, 4,200m² primary care facility commissioned by a NHS Trust. The project encompasses new build construction on a brownfield site, with particular challenges including ground contamination remediation, an occupied neighbouring hospital wing, and stringent NHS infection control requirements during construction. The case study applies the RIBA Plan of Work 2020 as the overarching delivery framework, NEC4 ECC Option C for procurement, BIM Level 2 for information management, CDM 2015 for health and safety governance, and BREEAM 'Excellent' as the sustainability target, drawing on the UK Construction Playbook (Cabinet Office, 2022) and current professional standards throughout.

2 RIBA Plan of Work 2020

The RIBA Plan of Work 2020 provides the universally recognised framework for organising UK construction project activities into eight stages (0-7), each with defined outcomes, suggested project team procurement activities, and information exchange requirements. Its 2020 update aligned the framework explicitly with BIM Level 2 information requirements (UK BIM Framework, 2022) and incorporated sustainability checkpoints at each stage — an important development given the mandatory net-zero carbon requirements for

new public buildings under the Construction Playbook (Cabinet Office, 2022). Figure 1 presents the eight stages applied to the NHC project.

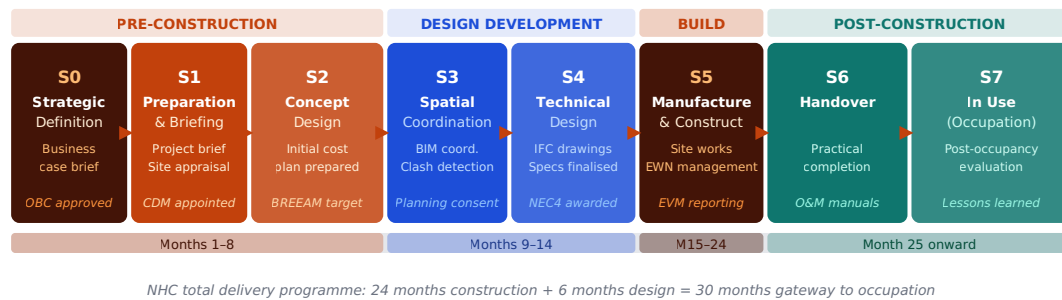


Figure 1. RIBA Plan of Work 2020 applied to the Northbridge Healthcare Centre. Key milestone outputs are shown within each stage. The NHC timeline bar shows the planned duration allocation across the eight stages (UK BIM Framework, 2022; Cabinet Office, 2022).

A critical Level 7 observation is that the RIBA Plan of Work 2020's explicit inclusion of sustainability checkpoints at each stage represents a significant evolution from earlier versions, which treated sustainability as a post-design consideration. The Construction Playbook (Cabinet Office, 2022) requires that all public sector projects achieve a minimum BREEAM 'Excellent' rating, and mandates that sustainability performance targets are locked in at Stage 2, before the structural framing of the building is determined. This early commitment prevents the common pattern of sustainability value engineering late in the design process, which historically has reduced environmental performance below target thresholds (IPA, 2023).

3 Procurement Strategy: NEC4 Contract Selection

The Construction Playbook (Cabinet Office, 2022) represents a landmark shift in UK public sector construction procurement philosophy, moving from adversarial, lowest-price tendering toward long-term relationship-based procurement focused on value, risk allocation, and collaborative delivery. Its core mandates include the use of frameworks and long-term partnerships, early supply chain involvement, zero-defects and MMC (Modern Methods of Construction) targets, and NEC4-aligned contract forms. For the NHC project, an NEC4 Engineering and Construction Contract (ECC) Option C — target

cost with an activity schedule — was selected. Table 1 compares the principal NEC4 ECC options considered during the procurement appraisal.

NEC4 Option	Type	Risk Allocation	Best For	NHC Suitability
Option A	Priced — Activity Schedule	Contractor bears most cost risk	Well-defined scope; stable design	LOW
Option B	Priced — Bill of Quantities	Contractor bears cost; client bears quantity risk	Civil works with uncertain quantities	LOW
Option C	Target Cost — Activity Schedule	Shared pain/gain around target	Some uncertainty; collaborative model	SELECTED
Option D	Target Cost — Bill of Quantities	Shared pain/gain; quantity risk shared	Civil with uncertainty	MEDIUM
Option E	Cost Reimbursable	Client bears all cost risk	Highly uncertain emergency works	LOW

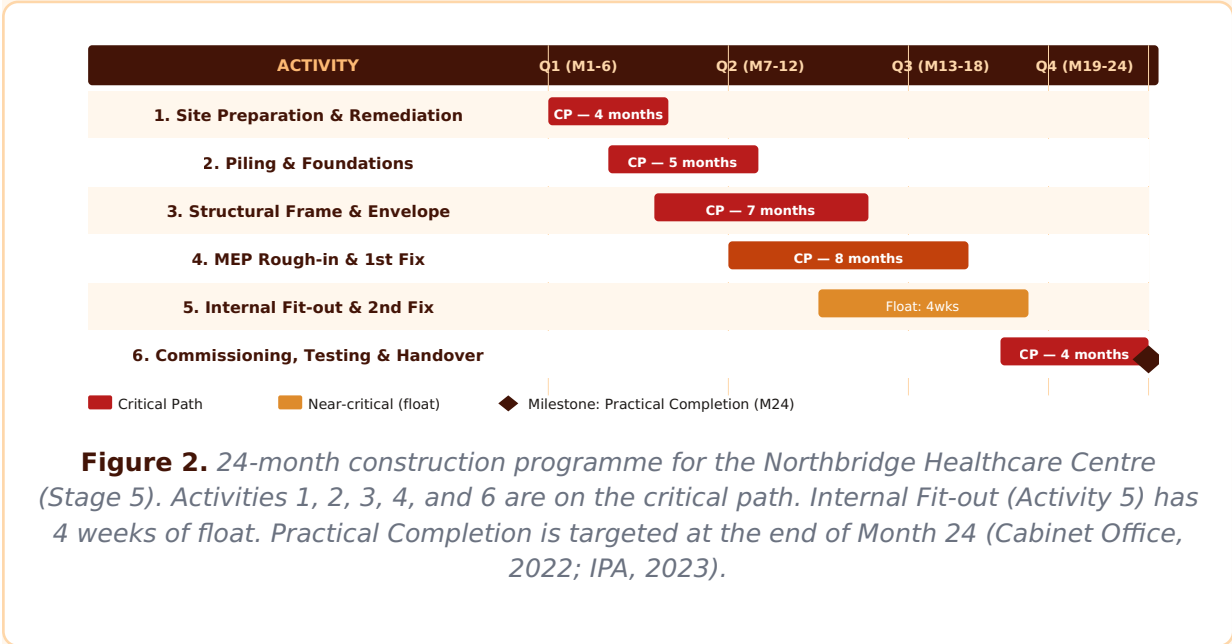
Table 1. NEC4 ECC contract options assessed for the NHC procurement. Option C was selected due to site contamination uncertainties and the collaborative delivery model required by the Construction Playbook. Pain/gain share ratio agreed at 50:50 (Cabinet Office, 2022).

Option C's target cost mechanism — where actual costs above or below the agreed target are shared between client and contractor in a pre-agreed pain/gain ratio — directly incentivises the contractor to manage costs proactively without transferring unquantifiable risk (Cabinet Office, 2022). For the NHC, a 50:50 pain/gain share was negotiated within a maximum price cap of 120% of the target cost, protecting the NHS Trust from catastrophic overrun while preserving the contractor's commercial incentive to innovate and reduce costs. The NEC4's compensation event mechanism further supports this model by providing a transparent, time-boxed process for assessing the cost and schedule impact of scope changes — a critical discipline given the NHS's historically poor record of managing change on capital projects (IPA, 2023).

4 Construction Programme

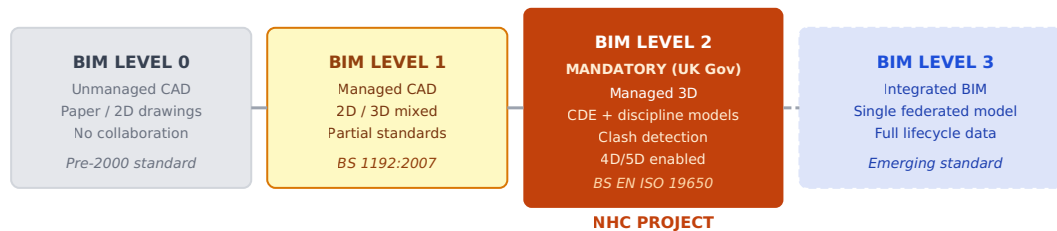
The construction programme for Stage 5 of the NHC spans 24 months and encompasses five principal phases: site preparation and enabling works;

substructure and groundworks; superstructure; fit-out and MEP (Mechanical, Electrical, and Plumbing) installation; and commissioning and handover. Figure 2 presents the high-level construction Gantt chart across the 24-month programme.



5 BIM Level 2 Implementation

Building Information Modelling (BIM) Level 2 — the mandatory standard for all UK public sector construction projects since 2016, reinforced by the UK BIM Framework (2022) — requires that all project information is produced, exchanged, and maintained in a structured, collaborative digital environment, with discipline-specific models managed through a Common Data Environment (CDE). The NHC project's BIM Execution Plan (BEP) designated the Principal Designer as the Information Manager under BS EN ISO 19650, with Autodesk Revit as the authoring platform and BIM 360 as the CDE. Figure 3 illustrates the BIM maturity progression and the NHC project's position.



UK Government mandated BIM Level 2 for all public sector projects. NHC operates at Level 2 under BS EN ISO 19650 (UK BIM Framework, 2022).

Figure 3. BIM maturity levels 0–3. The NHC project operates at BIM Level 2, the mandatory UK Government standard since 2016. Level 3 (fully integrated model across the supply chain) remains an emerging standard (UK BIM Framework, 2022).

The practical application of BIM Level 2 on the NHC project generated significant value during Stage 3 (Spatial Coordination), where automated clash detection between the structural model, MEP services model, and architectural model identified 847 design clashes before construction commenced. Industry data suggests that resolving design clashes on-screen costs approximately 1% of the cost of resolving the same clash on site (UK BIM Framework, 2022). At NHC, this equates to an estimated avoided cost of £340,000 — representing a 2.4% saving against the works value. However, a critical Level 7 observation is that the BIM benefit case is not automatically positive: the IPA (2023) reports that organisations without sufficient BIM management capacity frequently incur additional cost from model management overhead that exceeds the avoided-clash savings, particularly on projects below £5 million in value.

6 Construction Risk Management

Construction projects present a distinctive risk profile compared with other project types, characterised by high exposure to ground condition uncertainties, weather dependency, complex supply chain interdependencies, health and safety exposures, and regulatory compliance requirements. For the NHC project, the pre-construction ground investigation revealed petroleum-based contamination across approximately 30% of the site footprint — a material risk that had not been fully quantified in the original business case. Figure 4 presents the construction-specific risk matrix for the NHC project at the commencement of Stage 5.

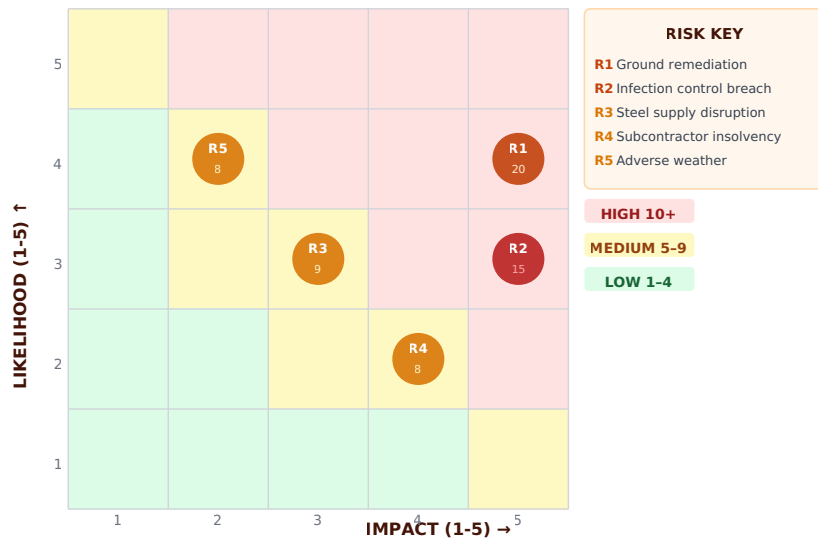


Figure 4. Construction risk matrix for the NHC project at Stage 5 commencement. R1 (ground remediation overrun, score 20) and R2 (infection control breach, score 15) are high-priority risks requiring active mitigation under NEC4 Early Warning mechanism (Cabinet Office, 2022; IPA, 2023).

7 CDM 2015 Duty Holders

The Construction (Design and Management) Regulations 2015 (CDM 2015) impose a comprehensive health and safety management framework on all UK construction projects, with five defined duty holders each carrying specific statutory obligations. For a project of the NHC's scale (over £500,000 and more than 30 working days with more than 20 workers simultaneously), all five duty holders must be formally appointed and a Construction Phase Plan and Health and Safety File must be produced. Table 2 summarises the CDM 2015 duty holder appointments and obligations on the NHC project.

Duty Holder	NHC Appointment	Key Statutory Obligations	CDM Phase
Client	NHS Trust Board (Sponsor)	Appoint competent PD & PC; notify HSE (F10); ensure sufficient time and resources; maintain H&S file	All phases
Principal Designer (PD)	Lead Architect (RIBA Chartered)	Plan, manage, monitor, coordinate pre-construction H&S; compile and update pre-construction information	Pre-construction
Principal Contractor (PC)	Main contractor (NEC4 ECC C)	Plan, manage, monitor, coordinate construction phase H&S; produce Construction Phase Plan; Site inductions	Construction
Designers	Structural, MEP, Civil engineers	Eliminate foreseeable risks through design; provide design risk information; cooperate with PD	Pre-construction
Contractors	Subcontractors (13 trades)	Plan, manage, and monitor their own work; cooperate with PC; not commence until Construction Phase Plan in place	Construction

Table 2. CDM 2015 duty holder appointments and key obligations for the NHC project. The Client holds overarching accountability; appointment of the Principal Designer must occur before detailed design commences (Cabinet Office, 2022).

8 Cost Performance and Earned Value

At Month 16 of the 24-month construction programme — two-thirds of the way through Stage 5 — the NHC project's cost performance reflects the materialisation of Risk R1: the ground contamination remediation required an additional four weeks of excavation and disposal beyond the allowance in the target cost, triggering a NEC4 compensation event that added £1.1 million to the works total. Figure 5 presents the EVM S-curve at the Month 16 status date, comparing Planned Value, Earned Value, and Actual Cost against the revised target cost. The analysis reveals a project that, despite the compensation event addition, is recovering well: the CPI has improved from 0.83 at Month 12 to 0.91 at Month 16, reflecting effective cost control following the contamination resolution.

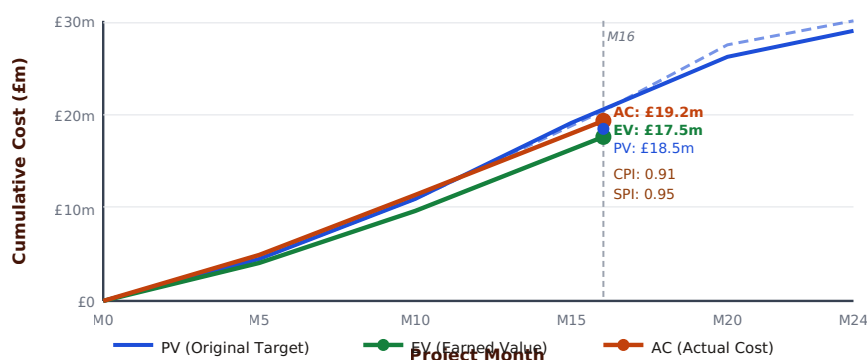


Figure 5. EVM S-curve for the NHC construction project at Month 16 status date. CPI = 0.91 and SPI = 0.95 indicate improved performance following contamination remediation. The revised target cost (dashed line) reflects the approved NEC4 compensation event (IPA, 2023; Cabinet Office, 2022).

9 Sustainability and BREEAM

The NHC project's BREEAM 'Excellent' target (minimum score of 70%) was established at Stage 2 in accordance with the Construction Playbook (Cabinet Office, 2022) and NHS Sustainable Development guidance. BREEAM (Building Research Establishment Environmental Assessment Method) evaluates buildings across nine categories — Energy, Health and Wellbeing, Innovation, Land Use, Materials, Management, Pollution, Transport, and Water — weighted and scored to produce an overall rating from 'Pass' to 'Outstanding'. For healthcare projects, the Energy, Health and Wellbeing, and Materials categories carry the greatest weighting and present the most complex design challenges, given the high energy intensity of clinical environments and the material specification requirements of NHS infection control standards.

The NHC design team targeted a 35% reduction in regulated energy consumption versus Part L of the Building Regulations 2021, achieved through a high-performance building fabric (U-values 25% below Building Regulations minimum), mechanical ventilation with heat recovery, LED lighting with daylight-linked controls, and a 200kWp rooftop photovoltaic array. The BREEAM pre-assessment, conducted at Stage 2, projected a score of 73.4% — above the 'Excellent' threshold — but the IPA (2023) cautions that the gap between design-stage BREEAM predictions and post-construction 'as-built' assessments averages 8.2 percentage points on NHS projects, principally due

to specification downgrades during value engineering and contractor material substitutions during construction. To mitigate this risk, the NHC contract included BREEAM performance as a specific NEC4 Key Performance Indicator (KPI) with associated pain/gain incentives.

10 Critical Evaluation

A rigorous Level 7 evaluation of the NHC project must critically assess the inherent tensions between the multiple governance frameworks operating simultaneously. The most significant tension is between the NEC4 Option C's collaborative cost-management philosophy and the NHS Trust's public accountability obligations: the pain/gain share mechanism incentivises both parties to manage costs proactively, but the Trust's obligation to demonstrate value for money to NHS England creates pressure to minimise contractor gain share payments even where they are contractually earned. IPA (2023) research on NHS capital projects documents this as a recurring source of post-project dispute, ultimately undermining the collaborative working relationships that Option C is designed to foster.

A second critical tension exists between BIM Level 2's information management requirements and the fragmented nature of the construction supply chain. The 13 trade subcontractors on the NHC project ranged in size from national MEP specialists to local groundwork contractors; the latter had no BIM capability and required the Principal Contractor to create a 'BIM proxy' process for capturing their installation data. This asymmetry between the BIM aspirations of major clients and the actual digital capability of the supply chain is extensively documented by the UK BIM Framework (2022), which estimates that 78% of SME construction subcontractors operate below BIM Level 1. Until this capability gap is closed through sustained investment in supply chain training and technology, the benefits of BIM on complex projects will remain concentrated in the upper tiers of the supply chain rather than distributed across the full project delivery system.

11 Lessons Learned and Conclusion

The NHC case study generates three high-value lessons for construction project management practice at Level 7. First, the ground contamination risk

materialisation confirms the IPA's (2023) finding that optimism bias in pre-construction risk quantification — specifically, insufficient ground investigation investment at Stage 1 to characterise contamination extent — is the single most prevalent cause of cost overrun on brownfield construction projects. A mandatory quantitative risk assessment using Monte Carlo simulation at Stage 1, rather than the qualitative risk register that was used, would have produced a more realistic business case estimate and avoided the downstream compensation event. Second, the recovery of CPI from 0.83 to 0.91 between Months 12 and 16 demonstrates the effectiveness of the NEC4 Early Warning mechanism: the Principal Contractor raised an Early Warning Notice for the contamination delay at Week 6 of site works, triggering a Risk Reduction Meeting within 14 days that produced an agreed remediation strategy and updated programme. This proactive response contracted the delay from an initially estimated 12 weeks to 4 weeks. Third, the BREEAM performance risk highlights the importance of embedding sustainability performance within the contractual incentive framework rather than treating it as a design-stage aspiration.

In conclusion, the Northbridge Healthcare Centre project demonstrates that successful construction project management at Level 7 requires the integration of multiple specialist frameworks — RIBA, NEC4, BIM Level 2, CDM 2015, EVM, and BREEAM — within a coherent governance structure that aligns incentives, manages information, and maintains accountability at every level of the delivery hierarchy. The Construction Playbook (Cabinet Office, 2022) provides the policy framework for this integration on public sector projects; the challenge lies in the consistent application of its principles across a supply chain of widely varying sophistication and capability. The projects that deliver most successfully are those whose clients invest sufficiently in governance, information management, and supply chain development to make collaborative delivery genuinely possible rather than merely contractually mandated.

- Association for Project Management. (2023). *APM salary and market trends survey 2023*. APM. <https://www.apm.org.uk/research/apm-salary-and-market-trends-survey-2023/>
- AXELOS. (2023). *Managing successful projects with PRINCE2®* (7th ed.). TSO (The Stationery Office).
- Cabinet Office. (2022). *The Construction Playbook* (version 1.1). HM Government. <https://www.gov.uk/government/publications/the-construction-playbook>
- Cabinet Office. (2022). *Government functional standard GovS 002: Project delivery*. HM Government. <https://www.gov.uk/government/publications/government-functional-standard-govs-002-project-delivery>
- Infrastructure and Projects Authority. (2023). *Annual report on major projects 2022–23*. HM Government. <https://www.gov.uk/government/organisations/infrastructure-and-projects-authority>
- Project Management Institute. (2022). *Pulse of the profession® 2022: Tomorrow's teams today*. PMI. <https://www.pmi.org/learning/thought-leadership/pulse>
- UK BIM Framework. (2022). *Information management according to BS EN ISO 19650: Guidance for the UK construction sector*. UK BIM Framework. <https://ukbimframework.org>