Independent Assessment of Governance Arrangements

NHS Lothian Royal Hospital for Children and Young People

NHS National Services Scotland

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KPMG LLP

9 September 2019

This Report contains 81 pages

Contents

Glossary

73 Issues	73 issues which formed part of the Settlement Agreement
Ac/hr	Air-changes per hour
Approved RDD	RDD which is classified as Level A or Level B by NHSL Board Representatives
BCR	Board's Construction Requirements
Bouygues	Bouygues Energies and Services
Critical Care Clinical Output Based Specifications	Specific clinical requirements for Critical Care, contained within Sub-Section D of the BCR
CFO	Chief Financial Officer
DCN	Department of Clinical Neurosciences
DCPP	Director of Capital Planning and Projects
Delay	The opening of the Hospital, due to be on 9 July 2019, was postponed due to issues identified with the air ventilation system
DRP	Dispute Resolution Process
EM	Environmental Matrix
F&R Committee	Finance and Resources Committee
Financial Close	The date when the conditions of the financial agreement are fulfilled, prior to the funds being made available

HCP	HCP Management Services Limited
HDU	High Dependency Unit
HFS	Health Facilities Scotland
Hospital	NHS Lothian Royal Hospital for Children and Young People
HPS	Health Protection Scotland
IHSL	Integrated Health Services Lothian Limited
IMT	Incident Management Team
IOM	Institute of Occupational Medicine
IPC	Infection Prevention & Control
Issue	The non-compliance with the SHTM standards for air change rates in the Critical Care areas of the Hospital
IT	Independent Tester
ITPD	Invitation to Participate in Dialogue
ITPD EM	The Environmental Matrix provided as part of Room Information within the ITPD
KPMG	KPMG LLP
MacRoberts	MacRoberts LLP
Mott MacDonald	Mott MacDonald Group Limited
MRI	Magnetic Resonance Imaging
Multiplex	Brookfield Multiplex
NHSL	NHS Lothian

NHS-NSS	NHS National Services Scotland
NPD	Non-Profit Distributing
OJEU	Office Journal of the European Union
PAMIP	Project Asset Management Investment Programme
PCC	Project Co Change
PCNOC	Project Co Notice of Change
Preferred Bidder Letter	A letter issued by NHSL to IHSL on 5 March 2014, advising that their Final Tender, submitted on 13 January 2014, had been accepted
Programme Board	Had day-to-day responsibility for managing the Project
Project	The design and construction of the Hospital
Project Agreement	An agreement between the NSHL Board and IHSL for the design, build, finance and maintenance of the Project, dated 13 and 14 February 2015
Project Agreement EM	The Environmental Matrix included with the Project Agreement documentation
Project Co	IHSL and Macquarie Capital, along with the following contractors: Brookfield Multiplex, Bouygues Energies and Services and HCP Management Services Limited
Project Team	The Financial & Resources Committee established the Programme Board and a smaller team (the “Project Team”)
RDD	Reviewable Design Data
RDS	Room Data Sheets
Room Information	The specific room requirements for the Hospital contained within the Project documentation
Settlement Agreement	An agreement signed between the NHSL Board and IHSL on 22 February 2019

SG	Scottish Government
SHTM	Scottish Health Technical Memoranda
SHTM 03-01	Scottish Health Technical Memoranda 03-01 (Ventilation for healthcare premises)
Standards	Scottish Health Technical Memoranda 03-01 (Ventilation for healthcare premises)
The Client	NHS-NSS
TOR	Terms of Reference
TS	Technical Schedule

1 Introduction

1.1 Background

1.1.1 On 4 July 2019 it was announced by the Scottish Health Secretary that the opening of the newly built NHS Lothian Royal Hospital for Children and Young People (the **"Hospital**"), due to open on 9 July 2019, was to be postponed due to issues identified with the air ventilation system at the Hospital (the **"Delay**").

1.1.2 The Health Secretary took the decision to delay the opening of the Hospital following final safety checks which revealed that the ventilation system within the Critical Care department required further work to meet national standards, the relevant standards being the Scottish Health Technical Memoranda ("**SHTM**").

1.2 Our instructions and approach

1.2.1 KPMG LLP ("**KPMG**" or "**we**") has been instructed by NHS National Services Scotland ("**NHS-NSS**"), to independently establish the facts surrounding the decision to delay the move to the Hospital. As part of this assessment KPMG has specifically been instructed to consider the following areas:

a) To establish what decisions were made by NHS Lothian ("**NHSL**"), when these were made, by whom and on what basis these decisions were taken in relation to the air ventilation issues and any other material issues that led to the Delay;

b) To determine the extent to which the design specifications with regard to air ventilation complied with the SHTM standards at each stage of the Hospital

project[1], the 'project' being the design and construction of the Hospital (the "**Project**")[2];

c) To understand what professional and technical advice was given to the NHSL Board, in particular when derogations were proposed, who agreed them and the risk assessments that were undertaken to reach a final decision; and

d) To establish the governance arrangements that were in place in relation to the Project and the line of sight of NHSL and the Scottish Government ("**SG**"), along with the escalation arrangements to NHSL and SG.

1.2.2 The focus of our review has been on the activities and decisions taken within NHSL.

1.2.3 We have held discussions with individuals from NHSL, along with individuals from the following entities:

a) Mott MacDonald Group Limited ("**Mott MacDonald**") – NHSL's technical advisors and project managers for the Project;

b) MacRoberts LLP ("**MacRoberts**") – NHSL's legal advisors;

c) Integrated Health Services Lothian Limited ("**IHSL**") - the party that the NHSL Board entered into a project agreement with for the design, build, finance and maintenance of the Project;

d) Institute of Occupational Medicine ("**IOM**") – a third party firm of specialist validation experts whom NHSL instructed to undertake testing on the Hospital's ventilation;

e) Health Facilities Scotland ("**HFS**") - a division of National Services Scotland which provides operational guidance to NHS Scotland bodies on a range of healthcare facilities topics; and

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[1] To design, build, finance and maintain a new facility to re-provide services from the Royal Hospital for Sick Children, Child and Adult Mental Health Service and the Department of Clinical Neurosciences in a single building adjoining the Royal Infirmary of Edinburgh at Little France (Source: Project Agreement, dated 13 February 2015, page 5)

[2] It was agreed that KPMG would not undertake a technical review in this respect but confirm whether the SHTM standards were included within the design specifications.

f) Arcadis NV - the Project's Independent Tester (**"IT"**).

1.2.4 In addition, we reviewed key documentation provided by NHSL and the above entities.

1.3 Structure of this Report

1.3.1 In Section 2, we set out the Executive Summary.

1.3.2 In Section 3, we set out the background to our work, including details of the Project relating to the build of the Hospital and the timeline of events leading up to the Delay.

1.3.3 In Section 4, we set out our observations in relation to whether the design specifications with regard to air ventilation made reference to the SHTM standards.

1.3.4 In Section 5, we set out details of the professional and technical advisors that advised the NHSL Board and the extent to which they were involved in providing advice in respect of derogations.

1.3.5 In Section 6, we set out our observations in relation to the governance arrangements that were in place for the Project.

1.4 Limitations of scope

1.4.1 The content of this Report is based on information provided to KPMG by representatives of NHSL, Mott MacDonald, MacRoberts, IOM and the IT. Except where explicitly stated, we have not independently verified this information and have relied on statements made and documents and data provided.

1.4.2 Whilst we make reference to SHTM in this Report, we are not technical experts on ventilation standards and give no comment on the technical accuracy of the content of documents we have been provided. We understand that the Health Secretary has commissioned a separate independent review in relation to the technical aspects of the Delay. Comments made in this Report by KPMG are

made in the context of our review and our understanding of the documents made available to us.

1.4.3 In undertaking our work we have had regard to elements of the contractual documentation relating to the Project, and have set out extracts of these in this Report. However, nothing in this Report should be regarded as constituting legal interpretation of such documents or the provision of legal advice.

1.4.4 We have not been instructed to determine exactly what led to the Issue[3] or to opine on the accountability of individuals or organisations in respect of the Issue.

1.4.5 Whilst we have considered the governance arrangements in place from the date of the project agreement, being an agreement with IHSL for the design, build, finance and maintenance of the Project on 13 February 2015 (the "**Project Agreement**"), we have not considered the governance arrangements prior to this time.

1.4.6 Should any additional information or documentation subsequently become available which is relevant to our scope of work, we reserve the right to amend our findings in light of that information.

1.4.7 The scope of our work is different from that of an audit and does not provide the same level of assurance as an audit.

1.5 Notice: About this Report

1.5.1 This Report has been prepared on the basis set out in our Engagement Letter addressed to NHS-NSS ("**the Client**").

1.5.2 Nothing in this report constitutes legal advice.

1.5.3 We have not verified the reliability or accuracy of any information obtained in the course of our work.

[3] As defined in paragraph 2.2.1

1.5.4 This Report is for the benefit of the Client and has not been designed to be of benefit to anyone except the Client. In preparing this Report we have not taken into account the interests, needs or circumstances of anyone apart from the Client, even though we may have been aware that others might read this Report. We have prepared this Report for the benefit of the Client alone.

1.5.5 This Report is not suitable to be relied on by any party wishing to acquire rights against KPMG LLP (other than the Client) for any purpose or in any context. Any party other than the Client that obtains access to this Report or a copy (under the Freedom of Information Act 2000, the Freedom of Information (Scotland) Act 2002, through the Client's Publication Scheme or otherwise) and chooses to rely on this Report (or any part of it) does so at its own risk. To the fullest extent permitted by law, KPMG LLP does not assume any responsibility and will not accept any liability in respect of this Report to any party other than the Client.

1.5.6 In particular, and without limiting the general statement above, since we have prepared this Report for the benefit of the Client alone, this Report has not been prepared for the benefit of any other Health Board nor for any other person or organisation who might have an interest in the matters discussed in this Report, including for example those who were involved in the Project detailed in this Report.

2 Executive Summary

2.1 Introduction

2.1.1 On 4 July 2019, the Scottish Health Secretary announced that the opening of the newly built NHS Lothian Royal Hospital for Children and Young People (the **"Hospital**"), due to open on 9 July 2019, was to be postponed due to issues identified with the air ventilation system at the Hospital (the **"Delay**").

2.1.2 The Scottish Health Secretary took the decision[4] to delay the opening of the Hospital following final safety checks which revealed that the ventilation system within the critical care areas of the Hospital required further work in order to meet national standards.

2.1.3 KPMG LLP ("**KPMG**" or **"we"**) has been instructed by NHS National Services Scotland ("**NHS-NSS**"), to independently establish the facts surrounding the decision to delay the move to the Hospital.

2.1.4 The focus of our review has been to establish what decisions were made by NHS Lothian ("**NHSL**") in relation to the air ventilation issues and any other material issues that led to the Delay. We have detailed our main observations in relation to this in Section 2.2 below, and provide further details on specific areas of our scope in Sections 2.3 to 2.5.

2.2 Summary of findings

2.2.1 The information available to us indicates that:

a) The key issue which led to the Delay was the non-compliance with the Scottish Health Technical Memoranda 03-01 ("**SHTM 03-01**" or the "**Standards**") for air change rates in some of the Critical Care areas of the Hospital (the **"Issue"**). This Issue was brought to the attention of the NHSL Board on 1 July 2019 as a result of testing undertaken by a third party

[4] The Cabinet Secretary announced this decision following communication with the NHSL chief executive regarding the identification of the ventilation system issues.

contractor, Institute of Occupational Medicine (**"IOM"**). This was as a result of IOM reporting the issue in relation to Critical Care to the NHSL Project Team[5] on 24 June 2019. The actions taken by the Project Team before the Issue was reported to the NHSL Board are reported in Section 3.4. Further details as to the decisions that were made by NHSL once the Issue had been identified, when these were made, by whom and on what basis, are provided in Section 3 of this Report;

b) Throughout all stages of the Project we have seen references made to the requirements of the Project Co[6] to adhere to the Scottish Health Technical Memoranda ("**SHTM**"), including specifically SHTM 03-01 relating to ventilation systems. However, notwithstanding any contractual obligations, it appears that there has been confusion between the parties as to the application of these Standards. This appears to have stemmed from a document which was contained within the Project tender documentation, a version of which was used throughout the Project, which included details on the environmental specifications of the Hospital, the Environmental Matrix ("**EM**"). Elements of the EM were inconsistent with SHTM 03-01 from the tender process (which commenced in late 2012) onwards. Further details in relation to design specifications and air ventilation standards are provided in **Section 2.3** below;

c) We have seen evidence of professional and technical advisors being involved throughout the Project. This included specific involvement in relation to ventilation issues. However, we have seen no evidence that professional or technical advice identified the Issue prior to June 2019. Further details in

[5] The NHSL Board delegated responsibility for oversight of the Project to the Financial & Resources Committee which established the Programme Board and a smaller team (the **"Project Team"**)

[6] Being Integrated Health Services Lothian Limited and Macquarie Capital, along with the following contractors: Brookfield Multiplex, Bouygues Energies and Services and HCP Management Services Limited. Collectively for the purposes of this Report referred to as **"Project Co"**

relation to professional and technical advice are provided in **Section 2.4** below;

d) The governance processes and procedures surrounding the construction and commissioning of the Hospital operated in line with the structure that was put in place. There was regular dialogue between NHSL and the Scottish Government ("**SG**") throughout the Project, with evidence of escalation of issues where required, albeit this was more focused on financial rather than technical matters. Further details of the governance arrangements are provided in **Section 2.5** below; and

e) Once the Issue in relation to air change rates was known to the NHSL Board, steps were taken to assess the impact of the Issue, resulting in the Delay (see Section 3.4).

2.2.2 Aside from the specific Issue referred to in this Report, other ventilation systems were identified by IOM as having some deficiencies. We understand that all these deficiencies were considered rectifiable by NHS-NSS, and NHSL have an action plan in place to address each issue.

2.3 Design specifications and air ventilation standards

2.3.1 Our specific instructions were:

To determine the extent to which the design specifications with regard to air ventilation complied with the SHTM standards, and specifically SHTM 03-01, being the ventilation for healthcare premises standards, at each stage of the Project. It was agreed that KPMG would not undertake a technical review in respect of this but confirm that the Standards were included within the design specifications.

2.3.2 A summary of our observations are detailed below, with further details provided in Section 4 of this Report.

2.3.3 Throughout all stages of the Project we have seen references made to the requirements to adhere to SHTM, and specifically SHTM 03-01 in respect of ventilation systems; in particular within the Board's Construction Requirements

("**BCR**") document which is the primary document at both the tender and Project Agreement[7] stages. The BCR stated that Project Co must comply with SHTM for the design of the Hospital and that all recommendations and preferred solutions contained within the SHTMs must be adopted as mandatory.

2.3.4 It appears that there has been confusion between NHSL and Project Co as to the application of these Standards throughout the Project. This appears to have stemmed from the EM, details of which were inconsistent with SHTM 03-01 from the tender process, as we describe below.

2.3.5 A version of the EM was included within the BCR at both the tender and Project Agreement stages. The EM was referred to within the tender document as detailing *"…the room environmental condition requirements of the Board required within each department / unit / space / area [of the Hospital]*[8]*.* The room environmental conditions included air change rates. There are inconsistencies within the tender process documentation in relation to the EM, with the BCR stating that bidders should *"…provide the Works to comply with the Environmental Matrix*"[9] and the tender submission requirements stating that whilst bidders were required to *"undertake their own design, the Board [has] provided a draft Environmental Matrix"* [10] and that *"bidders must confirm acceptance of the Board's Environmental Matrix, highlighting any proposed changes on an exception basis"* [11].

2.3.6 Our work has identified issues within the EM, including inconsistencies with SHTM 03-01 and discrepancies within the document itself. Specifically:

a) The version of the EM document provided by NHSL to bidders as part of the tender process, and referred to in the BCR as detailed above, included

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[7] The Project Agreement being an agreement with IHSL for the design, build, finance and maintenance of the Project on 13 February 2015
[8] IPTD: Volume 3 Board's Construction Requirements, Rev C, Subsection B, B (page 9)
[9] IPTD: Volume 3 Board's Construction Requirements, Rev C, Subsection C, Section 8 (page 102)
[10] IPTD, Volume 1, Revision A, Appendix A (ii), Submission Requirements, Point C8.3 (page 105)
[11] IPTD, Volume 1, Revision A, Appendix A (ii), Submission Requirements, Point C8.3 (page 106)

reference to both the single bed cubicles and four-bed rooms in Critical Care as requiring four air changes per hour[12] ("**ac/hr**"). We understand this was not in compliance with SHTM 03-01 and should have been 10 ac/hr. This reference remained in subsequent versions of the EM; and

b) The guidance note at the front of the EM document, provided at the tender and Financial Close[13] stages of the Project, suggested that all Critical Care areas should be in accordance with SHTM 03-01, being the relevant part of the standards relating to ventilation, and *"10ac/hr Supply"*[14]. This is inconsistent with the content of the matrix, as detailed above. We note that this inconsistency appears to have been removed after Financial Close by the insertion of the words *'for isolation cubicles'*[15], suggesting that only 'isolation cubicles' in Critical Care should have an air change rate of 10 ac/hr. However, we were informed by NHSL that this change was made by the Project Co, but was not flagged to NHSL (see paragraph 4.4.10 for further details).

2.3.7 We have not been instructed to consider how the inconsistency made its way into the initial matrix. However, we have seen no evidence that any party to the Project identified the issue, specifically in relation to the incorrect air change rates having been applied to Critical Care rooms, until June 2019 (see paragraph 3.4.7 to paragraph 3.4.14 for further details).

2.3.8 NHSL told us they had not reviewed the EM in detail from a technical perspective and they reviewed it for 'operational functionality', as detailed in the Project Agreement (as referred to further in paragraphs 4.4.6 and 4.4.7 below). It was

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[12] Reference Design Envisaged Solution – RHSC / DCN Environmental Matrix version third issue, dated 19 September 2012 (page 5)
[13] Being the date when the conditions of the financial agreement are fulfilled, prior to the funds being made available ("**Financial Close**")
[14] Document reference (tender version): Reference Design Envisaged Solution – RHSC / DCN Environmental Matrix version third issue, dated 19 September 2012 (page 2, note 15)). Document reference (Project Agreement version): WW-XX-XX-DC-001. Page 2, Note 15. Contained within Schedule Part 6, Construction Matters, Part 6 of the Project Agreement
[15] Full wording read: *"10ac/hr Supply for isolation cubicles"* in a version of the EM dated 26 November 2015

assumed by NHSL that any changes to the EM would be highlighted by Project Co for discussion with them, and that it would be in compliance with SHTM 03-01, as detailed in the BCR. Despite this, the "exception-basis" approach to highlight proposed changes, referred to at paragraph 2.3.5 above, may have contributed to an assumed position that the original document, provided as part of the tender process, was correct.

2.3.9 Despite our understanding that NHSL and its advisors did not consider that they had an obligation to review the EM in detail from a technical perspective, we have identified multiple instances of comments being provided by the 'Board'[16] on particular sections of the EM. These included those elements which specifically related to the four-bed rooms in the Critical Care department. However, at no point did these comments refer to there being incorrect air change rates for those rooms.

2.3.10 Through correspondence between NHSL and Project Co regarding the EM, we have seen evidence of Mott MacDonald (on behalf of the Board) reminding Project Co that they must comply with the BCR and SHTM and that the *"Board not commenting, does not remove that obligation on Project Co"*[17].

2.3.11 In addition to all of the above, in January 2019, the Board asked Integrated Health Services Lothian Limited ("**IHSL**")[18] for specific assurance that all critical ventilation systems were to be *"inspected and maintained in line with 'Scottish Health Technical Memorandum 03-01: Ventilation for healthcare premises"* [19]. IHSL confirmed in their response that all ventilation systems had been designed, installed and commissioned in line with SHTM 03-01[20].

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[16] We understand from Mott MacDonald that the 'Board' in this context refers to both themselves and the Project Team and not the ultimate NHSL Board.
[17] Email from Mott MacDonald to Multiplex, among other recipients, on 17 October 2016 (document reference: 161017 MM-GC-002084). We understand from Mott MacDonald that the 'Board' in this context refers to both themselves and the Project Team and not the ultimate NHSL Board.
[18] The party that NHSL Board entered into a project agreement with for the design, build, finance and maintenance of the Project and who formed part of the Project Co
[19] Document: 10.11.4 31-01-19 IHSL.NHSL Plant Rooms Ventilation Systems
[20] Document: 10.11.4 31-01-19 IHSL.NHSL Plant Rooms Ventilation Systems

2.3.12 We have not been instructed to opine on the accountability of individuals or organisations in respect of the failure to identify the Issue and it is not within our area of expertise to consider the contractual implication of the failure. However, through our identification of the above matters, the following relevant observations have also come to light:

a) Lack of clarity in the Standards

Our work has identified that consideration of the Standards on a standalone basis, in relation to air change rates in rooms within the Critical Care areas of the Hospital, could be open to interpretation. Specifically, our review has identified that there is no definition of "Critical Care" in the Standards, and the extent to which "Critical Care" includes all types of rooms within that area of a hospital. Further, there is no explanation of the hierarchy which should be applied where different areas of the hospital overlap, for example, which standard should be applied to a 'clean utility' within a Critical Care unit.

However, the Project Agreement documentation, and specifically the BCR, referred to in paragraph 4.3.8 below, includes Clinical Output Based Specifications for each department. We note that the Critical Care Clinical Output Based Specification makes reference to the areas included in Critical Care with, for example, references to single cubicles, four bedded bays, isolation cubicles and clean and dirty utilities.

b) Opportunities to identify the Issue

It is our observation that, notwithstanding that the initial version of the EM issued by NHSL at the tender stage contained the inconsistency which ultimately resulted in the Delay, NHSL and its advisors did not regard the EM as their document and did not consider it their responsibility to ensure compliance with SHTM 03-01. Instead, NHSL considered the EM to be the responsibility of Project Co. NHSL considered it their responsibility to approve

it for 'operational functionality'[21] and it was for Project Co to highlight any inconsistencies between the EM and the Standards.

We have seen evidence that NHSL and its advisors did challenge and seek explanations in relation to certain aspects of the EM relating to specific rooms in Critical Care, but this did not include specific reference to the air change rates.

Regardless of the contractual responsibilities, our work identified at least three specific instances where errors regarding the details of the air change rates relating to the four-bed rooms could have been identified by either NHSL (and their advisors) or Project Co:

- **November 2016:** Correspondence between the Board[22] and Project Co referred to the air extraction of the four-bed rooms in Critical Care via the en-suite facilities. The specific comment noted by the Board was *"1-B1-063 Stated as supply of 4 ac/h, extract via en-suite, this room does not have en-suite facilities*"[23]. Project Co's response was *"Room extract rate added"*[24]. This suggests that both parties were in correspondence regarding a room in Critical Care (on the basis that rooms starting 'B1' were defined on the cover sheet of the EM as being located in Critical Care), which contained reference to four air changes an hour.
- **July 2018**[25]: A document entitled 'Multi Bed - Ventilation Amendment Proposal to Achieve Room Balance [pressure]' was provided by Project Co, and subsequently approved by an individual from NHSL. Whilst this document was focused on the pressure regime, it stated *"Retain the*

[21] As referred to a paragraphs 4.4.6 and 4.4.7
[22] We understand from Mott MacDonald that the 'Board' in this context refers to both themselves and the Project Team and not the ultimate NHSL Board
[23] REV 07 ww-xx-xx-dc-xxx-001 - signed copy. Environmental Matrix comments, Second Batch, NHSL reference 7 (page 4)
[24] REV 07 ww-xx-xx-dc-xxx-001 - signed copy. Environmental Matrix comments, Second Batch, NHSL reference 7 (page 4)
[25] Being the date of approval of the document 'Multi Bed - Ventilation Amendment Proposal to Achieve Room Balance'

supply ventilation at 4ac/hr…"[26] as part of the proposed solution against each of the four-bed rooms. This included rooms located in Critical Care, albeit this was not directly referenced on the document; and

- **February 2019**: As a result of a number of ongoing issues in dispute between NHSL and Project Co, an agreement was signed between the NHSL Board and IHSL on 22 February 2019 (the "**Settlement Agreement**"). The Settlement Agreement states *"The resolution of the Dispute submitted by Project Co through the Schedule Part 8 (Review Procedure) and agreed by the Board, is for 14 No 4 bed rooms to be balanced or negative to the corridor at 4 ac/hr"*[27]*.* This wording was approved by both parties.

Furthermore, we also identified one example of comments provided to the Project Co by Mott MacDonald[28] (on behalf of NHSL) referred to as *"…initial technical comments on draft 1 of the Environmental Matrix"*, dated 13 October 2014[29]. This document included 12 comments, one of which specifically refers to ventilation standards in respect of bedrooms stating *"Bedrooms 4ac/hr, SHTM says 6 ac/hr"* [30]*.* Whilst this comment was not specific to a Critical Care bedroom, this suggests that comments other than those relating directly to 'operational functionality' were raised by NHSL.

c) Role of the Independent Tester ("IT")

The IT advised KPMG that its role was to certify that the design had been built in accordance with what had been agreed between the parties. This is reflected in the IT's scope of work, as set out in paragraph 4.7.2. The EM had been used as the basis for this agreement between the parties and, as such, the IT did not consider that it was responsible for reviewing its accuracy.

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[26] Multi Bed - Ventilation Amendment Proposal to Achieve Room Balance
[27] Settlement Agreement, Schedule 1, Part 1, Technical Schedule, Item 7 (page 30)
[28] Attached to an email from Mott MacDonald to Multiplex, among others, dated 14 October 2019. (Document reference: 141014 MM-GC-000399)
[29] Document reference: 141013 Environmental Matrix Comments
[30] Comment 7. Document reference: 141013 Environmental Matrix Comments

Instead, the IT stated that it expected both parties to the Project to have undertaken a detailed review of the EM.

2.4 Professional and technical advice

2.4.1 Our specific instructions were:

To understand what professional and technical advice was given to the NHSL Board, in particular when derogations were proposed, who agreed them and the risk assessments that were undertaken to reach a final decision.

2.4.2 A summary of our observations are detailed below, with further information provided in Section 5 of this Report.

2.4.3 A number of professional and technical advisors were involved throughout the Project. Specifically, in respect of the Issue pertinent to the Delay:

a) From the various documents we have seen, and the discussions we have held, there is evidence that, in arriving at the agreed resolution in the Settlement Agreement in respect of the changes required to the pressure regime to 14 of the four-bedded rooms, advice and support was provided to the Project Team by both technical advisors and internal clinical advisors, which was visible to the NHSL Board; and

b) We have seen evidence that Mott MacDonald was involved in the Project on an ongoing basis, specifically in respect of reviewing and commenting on the EM.

2.4.4 We have not been instructed, and it is not within our area of expertise, to consider the responsibility of external professional or technical advisors to identify this Issue. However, despite the extensive internal and external technical advice received in relation to the Project, the Issue was not spotted.

2.5 Governance arrangements

2.5.1 Our specific instructions were:

To establish the governance arrangements that were in place in relation to the Project and the line of sight of NHSL and SG, along with the escalation arrangements to NHSL and SG.

2.5.2 A summary of our observations are detailed below, with further information provided in Section 6 of this Report.

2.5.3 From the information we have seen, the governance structure surrounding the construction and commissioning of the Hospital was operating in line with that described to us and issues were being escalated through the appropriate channels.

2.5.4 Oversight of the Project had been delegated by the NHSL Board to the Finance & Resources committee (the **"F&R Committee"**), which included four executives from the NHSL Board. The F&R Committee established a Project Programme Board which had day-to-day responsibility for managing the Project (the "**Programme Board**"). The Programme Board did not report directly to the F&R Committee. Instead, any key issues arising on the Project would be reported to the Director of Capital Planning and Projects (the **"DCPP"**) or one of the Project's Executive Leads who would, in turn, escalate this to the NHSL Board and also inform the F&R Committee if the issue had an impact on the financing of the Project or its duration. As there was overlap between members of the various committees and boards, this facilitated the executive leaders of NHSL being kept informed of progress and issues.

2.5.5 Throughout our review, we have seen evidence of these governance arrangements operating in practice and it appears that, at each stage of the Project, personnel with the appropriate technical and clinical skills and experience were involved.

2.5.6 Further, where appropriate, external advice and guidance was sought. An example of such external advice being commissioned is the instruction of an independent third party to carry out checks following concerns raised by the

Infection Prevention & Control team (the "**IPC**") in relation to the reporting format for ventilation checks. A further example is in relation to changes to the design requirements where we have seen evidence of the involvement of technical specialists such as Mott McDonald, as well as clinicians and medical professionals from relevant departments within NHSL.

2.5.7 In addition to the governance processes within NHSL itself, we understand that there was regular dialogue between NHSL and SG throughout the Project, with escalation of issues where required, albeit this was typically more focused on financial rather than technical matters.

2.5.8 The timeframe for moving to the Hospital was set in February 2019 when the Settlement Agreement was signed. At this time, it was known that significant work was still required in order to complete the Hospital, including a number of critical areas which were required to be completed before the building could be considered habitable. Such works continued into July 2019, including a significant amount of post-completion works. As such, the time available for rectification of any identified problems, prior to the scheduled opening date of the Hospital of 9 July 2019, was challenging and left little margin for error. The governance process established in order to implement the required actions, set out in the Settlement Agreement, is discussed in Section 6.4.

2.5.9 Once the Issue which led to the Delay had been identified, steps were taken by NHSL to notify SG of the Issue which led to the decision by the Health Secretary to delay the opening of the Hospital. We note that, due to the urgency of the matter, the ultimate escalation of the ventilation issues was made direct to the NHSL Board and not through the normal governance structure.

3 Background to the Project and the Delay

What decisions were made by NHSL, when these were made, by whom and on what basis these decisions were taken in relation to the air ventilation issues and any other material issues that led to the Delay.

3.1 Introduction

3.1.1 In this Section, in considering the facts surrounding why NHSL made the decision to delay the opening of the Hospital, we set out the chronological background to the Project, based on information communicated to us and documents provided to us.

3.1.2 Whilst this summary provides a high-level introduction to the Project and its timeline, the summary focuses on the timeline of events that led to the Delay and, in particular, the period between the signing of a Settlement Agreement by NHSL and IHSL on 22 February 2019 (the "**Settlement Agreement**") [31] and the planned opening of the Hospital on 9 July 2019.

3.1.3 In preparing this summary, we have considered the decisions taken by NHSL in relation to the air ventilation issues (and any other material issues that led to the Delay), when these were made, by whom and on what basis these were taken.

3.2 Pre-financial close

3.2.1 The NHSL Board approved a capital-funded business case for the Hospital in 2008. This business case was approved by SG for a Children's Hospital only.

3.2.2 In November 2010, SG announced a Non-Profit Distributing[32] (**"NPD"**) funding route, not only in relation to the Children's Hospital but also the

[31] Referred to in the NHSL Annual Audit Report dated June 2019 (https://www.audit-scotland.gov.uk/report/nhs-lothian-annual-audit-report-201819)
[32] A form of public-private partnership procurement programme

Department of Clinical Neurosciences (the **"DCN"**). Various enabling works were required to be performed before construction could commence.

3.2.3 As a consequence of this preparation work, NHSL did not go to the market for a partner for the Project until November 2012. The Project was advertised in the Office Journal of the European Union (the **"OJEU"**), published on 5 December 2012. The NHSL Board proceeded to engage with three bidders during a nine-month competitive process. This process began in March 2013 and ended in December 2013. The winning bidder selected by the NHSL Board would then form an NPD company to deliver the Project.

3.2.4 Supporting the NHSL Board throughout this process were a group of professional advisors which included Mott MacDonald (technical advisors and project managers), MacRoberts (legal advisors) and Ernst and Young (Financial Advisors). The NHSL Board delegated responsibility for oversight of the Project to the Financial & Resources Committee (**"F&R Committee"**) which established the Programme Board which had day-to-day responsibility for managing the Project (the "**Programme Board**") and a smaller team (the **"Project Team"**).

3.2.5 The Programme Board comprised the Project Team as well as representatives from clinical and operational areas, the Director of Finance, the Director of Communications, an NHSL Non-Executive Director and other stakeholders.

3.2.6 In March 2014, the NHSL Board appointed IHSL as its preferred bidder. IHSL's team comprised Macquarie Capital[33], along with IHSL's subcontractors; Brookfield Multiplex (**"Multiplex"**), Bouygues Energies and Services ("**Bouygues**") and HCP Management Services Limited ("**HCP**") (collectively for the purposes of this Report referred to as **"Project Co"**).

3.2.7 The NHSL Board entered into a Project Agreement with IHSL for the design, build, finance and maintenance of the Project on 13 February 2015. It was a requirement for the Project design, installation and operation to comply with

[33] Initially referred to along with IHSL as Project Co

guidance issued by HFS. Further details of the standards issued by HFS[34] is set out in Section 4.2.

3.2.8 The planned scheduled opening date for the Hospital was July 2017.

3.2.9 As required by the Project Agreement, an IT was appointed by the NHSL Board, IHSL, and IHSL's funders, as an advisor to provide certain services independently, fairly and impartially in connection with the Project. Arcadis NV was appointed to this role in February 2015[35].

3.2.10 We understand that, at the time of financial close in February 2015, being the date when the conditions of the financial agreement are fulfilled prior to the funds being made available ("**Financial Close**"), the designs for the Hospital had not been fully developed. This included issues relating to the design of the ventilation systems, including comments on the pressure regime which would be in operation in the Hospital and whether this was in compliance with the relevant standard (Scottish Health Technical Memoranda 03-01 ("**SHTM 03-01**" or the "**Standards**").

3.3 Construction phase

3.3.1 In early 2017, it became clear that the Hospital would not be opening on time, as originally planned in July 2017. Three specific issues were identified at that stage:

a) The design of the high voltage power resilience mechanism;

b) Ventilation issues (pressure regime[36]); and

c) An issue with the provision of a Magnetic Resonance Imaging ("**MRI**") room.

3.3.2 Throughout the remaining period of 2017, discussions with Project Co on a) and b) above, and other emerging issues, continued without resolution. This

[34] The SHTM standards
[35] EC Harris was initially instructed, which was later acquired by Arcadis NV
[36] In relation to four-bedded rooms

ultimately resulted in both parties seeking legal advice and contemplating court action in order to resolve the issues in dispute.

3.3.3 It is our understanding that, in early 2018, the parties entered into a process of negotiated settlement. This included a number of technical workshops held in order that all of the unresolved issues could be raised and resolutions sought. At the workshops, which were held to consider the ventilation issues, there were detailed discussions regarding the required pressure regime in four bedded rooms.

3.3.4 In moving towards resolving this issue, a proposed solution was put forward in relation to the pressure in single bedrooms. This involved an adjustment of the air change rate from 6 air changes per hour ("**ac/hr**") to 4 ac/hr with 2 ac/hr natural ventilation, which we understand from NHSL meant this still achieved 6 ac/hr, but through a 'mixed mode'.

3.3.5 However, an issue remained regarding the pressure regime in multi-bed rooms. NHSL required 14 of the multi-bed rooms to be adjusted to have balanced or negative pressure. Four of the rooms considered as part of this process were located within the Critical Care areas of the Hospital[37]. Reference was made in the proposed resolution of this issue to an air change rate of 4 ac/hr.

3.3.6 During this period, it became apparent that, whilst some of the earlier issues appeared to be resolved or solutions proposed, there were a significant number of other technical issues emerging at the Hospital which required the attention of various project teams.

3.3.7 On 22 February 2019, the Settlement Agreement was signed by NHSL Board and IHSL with the ultimate aim of resolving all known issues and opening the Hospital in July 2019.

3.3.8 The Settlement Agreement set out a total of 76 issues identified by the parties that required resolution. These 76 issues consisted of (a) 73 known issues

[37] Per SHTM 03-01, Appendix 1, Critical Care areas of a hospital require 10 ac/hr

where a solution had been agreed[38] (the **"73 Issues"**); and (b) three technical issues, being:

a) Void detection;

b) Heater batteries; and

c) Drainage.

3.3.9 The Settlement Agreement included an agreed resolution to the ongoing issue relating to ventilation pressure in four-bed rooms (one of the 73 Issues) and also included reference to the agreement made in relation to the single bedroom pressure change.

3.3.10 In the context of achieving the air pressures required by NHSL, this agreed resolution stated *"…agreed by the Board, is for 14 No 4 bed rooms to be balanced or negative to the corridor at 4 ac/hr. The remaining 6No 4 bed wards remain as per the environmental matrix…"*[39]. Of these 14 rooms, four of these 4-bed rooms were located within the Critical Care area of the Hospital.

3.3.11 We discuss the background to this agreed resolution in further detail in Section 5.3.

3.3.12 In relation to the other three technical issues (i.e. not the 73 issues), listed at paragraph 3.3.8 above, solutions were agreed and a programme of work planned to implement the solutions prior to the opening of the Hospital in July 2019.

3.4 Operational phase

3.4.1 The IT provided a "Certificate of Practical Completion" on 22 February 2019. This meant that the construction phase of the Project came to an end and the

[38] The Settlement Agreement contains a table with 81 items, however eight of these stated 'NOT USED'

[39] Settlement Agreement, Schedule 1, Part 1, Technical Schedule, Item 7 (page 30)

Project entered into its operational phase. At this point, NHSL began payment of the annual services payment to IHSL.

3.4.2 During this operational phase, a significant number of outstanding works were required to be carried out by Project Co. In accordance with the Settlement Agreement, these works were performed in parallel with the NHSL Board's commissioning activities[40] for the Project.

3.4.3 Under the requirements of SHTM 03-01, a report on the ventilation system commissioning should be provided to the 'user department', 'infection control (where required)' and 'estates and facilities', following the commissioning[41]. In January 2019, the Project Team provided the Infection Prevention & Control (the "**IPC**") team with a copy of the proposed validation checklists that Multiplex was due to complete in respect of validating the ventilation system in the theatres. This was in order to ascertain if the checklists would be sufficient to meet the report requirements set out in SHTM 03-01[42].

3.4.4 In May 2019, following ongoing correspondence with the Project Team, the IPC confirmed that they were of the view that validation checklists in the format submitted by Multiplex were not sufficient for the purposes of the requirements and instead requested that the Project Team arrange a third party validation of the ventilation systems in order to obtain the required report.

3.4.5 On 30 May 2019, the Project Team contacted the IOM, a third party firm of specialist validation experts with experience in hospital ventilation. The firm that NHSL typically used for validation for hospital ventilation was conflicted from undertaking this testing, as it was used by IHSL[43].

3.4.6 On 5 June 2019, IOM attended a site visit and familiarisation at the Hospital and testing commenced on 17 June 2019. IOM's testing involved the validation of

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[40] Commissioning activities were in effect the preparation for receiving patients into the Hospital e.g. ensuring the equipment and relevant supplies were in place, that staff were familiar with the layout and that the Hospital was cleaned
[41] SHTM 03-01, Part A, February 2014, Section 8.65
[42] The requirements are set out in SHTM 03-01, Part A, February 2014, Section 8.64 to 8.65
[43] H&V Commissioning Services Limited

critical ventilation systems at the Hospital, which focused on a list of critical areas provided to them (including theatres, isolation suites, Critical Care areas and recovery areas). We understand that, at the time of testing, some elements of remedial work were still ongoing, which restricted IOM's access to particular areas of the Hospital. Mott McDonald helped to facilitate IOM's testing.

3.4.7 SHTM 03-01 states that an air change rate of 10 ac/hr is required in Critical Care areas[44]. On 18 June 2019, IOM identified that some areas within Critical Care were not achieving 10 ac/hr. This was queried by IOM with Mott MacDonald and further testing was subsequently performed which was completed on 21 June 2019.

3.4.8 On 24 June 2019, IOM verbally informed the Programme Board of the ventilation issues that had been identified, in that the readings in terms of air change rates were not in line with SHTM 03-01, particularly in relation to operating theatres, isolation areas and Critical Care. This was followed by a written report dated 25 June 2019, which was circulated to the Programme Board, incorporating an issues log, which showed:

a) 12 issues with Operating Theatres;

b) 12 issues with air handling units; and

c) One issue with Critical Care (referred to as "HDU" by IOM).

3.4.9 On 25 June 2019, IHSL assured NHSL that all of the issues identified by IOM could be resolved.

3.4.10 Between 25 June 2019 and 1 July 2019, various meetings were held by the Programme Board, together with representatives from the IPC team, Mott MacDonald, IOM, IHSL and Multiplex. These meetings focused on operating theatres and sought to establish:

a) Whether the readings for ventilation found by IOM were correct;

[44] SHTM 03-01, Part A, February 2014, Appendix 1: Recommended air-change rates

b) Whether the readings related to a sample or the whole area;

c) Whether the readings were taken correctly;

d) Whether the issues found could be resolved; and

e) The minimum requirement for compliant operating theatres to allow the hospital to open.

3.4.11 As well as pursuing solutions to operating theatre ventilation, meetings were also held to try and establish, in relation to IOM's first reports regarding the Critical Care ventilation, whether:

a) IOM's measurements were in fact correct;

b) How extensive the results were across Critical Care;

c) What the air handling units could actually deliver if they were adjusted; and

d) The legal and contractual position in relation to these issues.

3.4.12 At 10am on 28 June 2019, a 'Joint Steering Group' meeting was held with NHSL, Multiplex and IHSL to discuss the emerging issues and the detail of IOM's report in relation to operating theatres. We understand that, detail of the Critical Care ventilation issues was not provided for this meeting and that the discussion focused on operating theatres. This was followed by a conference call later the same day to mobilise the necessary engineers to resolve issues with the operating theatres. At 4pm on 28 June 2019, IHSL informed NHSL that the operating theatre issues could be resolved from the following Monday (1 July 2019) but that the work required could not commence until the required engineers were available.

3.4.13 Additionally, on 28 June 2019, we understand that IOM informally provided more detail to the Programme Board regarding the issue of Critical Care air change rates. At this time, IHSL was asked whether Critical Care could, in fact, achieve the required rate of 10 ac/hr and IOM was asked whether the existing ventilation equipment could deliver 10 ac/hr.

3.4.14 On 1 July 2019, IOM provided more detail of the Critical Care ventilation issues it had found which indicated that the equipment was not capable of delivering 10

ac/hr. We understand from NHSL that on the same day, IHSL and Multiplex responded verbally that 10 ac/hr could not be achieved.

3.4.15 At 4:30pm on 1 July 2019, a meeting was held, called by the NHSL executive management team and the Project Team, which included the IPC Lead Nurse and Consultant Microbiologist, the Medical Director, the Children's Services Director and Associate Medical Director, and the Programme Board with two representatives of Multiplex, one representative of IHSL and one representative of IOM, to discuss the air ventilation issues in the operating theatres. Critical Care rooms were not discussed in this meeting as the NHSL Board required the opportunity to discuss this element of the issue internally first given its significance and that IHSL had confirmed that same day that 10 ac/hr could not be achieved using the current system.

3.4.16 Following this meeting, the Programme Board informed a representative of the NHSL Board of the issues with the air change rates within the Critical Care areas of the Hospital. This is the first time that the issue of Critical Care air change rates was escalated to a member of the NHSL Board.

3.4.17 On the evening of 1 July 2019, the issues with Critical Care were shared with other members of the NHSL Board which resulted in an urgent internal meeting being called at 9am on 2 July 2019. The Hospital was due to open only one week later, on 9 July 2019, and it was clear that the issues in Critical Care would not be resolved by this time. As such, attendees were tasked with investigating potential courses of action to address this situation. Attendees reported back at 1pm that day and a list of potential options was generated.

3.4.18 During 2 July 2019, the NHSL Board also briefed the Director General of Health & Social Care at SG and the Chief Performance Officer at NHS Scotland on the situation and the options.

3.4.19 Additionally, a conference call was arranged for 3 July 2019 between NHSL, HFS and Health Protection Scotland (**"HPS"**). HFS and HPS concluded that there was not enough information available to give assurance that the planned move to the Hospital should go ahead on 9 July 2019.

3.4.20 At 2pm on 3 July 2019, the NHSL Board met with the Chief Performance Officer for NHS Scotland in order to discuss the options available. This was followed by an email setting out the respective options.

3.4.21 A communications plan was created by NHSL on 3 July 2019 and press and staff briefings were scheduled for 4 July 2019.

3.4.22 On 4 July 2019, it was decided by SG that in order to ensure consistent and up to date briefings were provided to staff, patients and the wider general public, all announcements would be routed through the Cabinet Secretary.

3.4.23 At 4pm on 4 July 2019, the postponement of the move to the new site was announced by the Cabinet Secretary.

3.5 Summary

3.5.1 Whilst there were significant issues relating to ventilation throughout the life of the Project, the specific issue (being air change requirements in Critical Care areas not complying with the SHTM 03-01 standard) which gave rise to a decision to delay the opening of the Hospital was not identified to the NHSL Board until 1 July 2019. Indeed, this issue only became apparent to any member of NHSL when IOM completed its testing of the ventilation system and reported the issue in relation to Critical Care on 24 June 2019.

4 Design specifications and air ventilation standards

To determine the extent to which the design specifications with regard to air ventilation complied with the SHTM standards, and specifically SHTM 03-01, being the ventilation for healthcare premises standards, at each stage of the Project. It was agreed that KPMG would not undertake a technical review in this respect but confirm that the Standards were included within the design specifications.

4.1 Introduction

4.1.1 In this Section, we have considered the extent to which the design specification with regard to air ventilation included reference to, and complied with, the SHTM at each stage of the Project. Our consideration of this includes:

a) At Section 4.2, we summarise the standards relating to air ventilation which were relevant to the Project and provide the relevant extracts from SHTM;

b) At Sections 4.3 to 4.5, we consider whether the design specifications with regard to air ventilation were referred to at each stage of the key stages of the Project; being:

- Invitation to Participate in Dialogue ("**ITPD**") (the tender process);
- Financial Close, being the signing of the Project Agreement; and
- The Settlement Agreement.

c) At Section 4.6, we detail the process that was to be followed in order to make any changes to the Project Agreement and in turn to designs of the air ventilation;

d) At Section 4.7, we provide details on the ITs role in the Project, specifically in respect of its involvement in monitoring the works for compliance with the BCR, and in effect the design specifications; and

e) At Section 4.8, we provide details of assurances provided by IHSL in January 2019 in respect of compliance with SHTM 03-01.

4.2 SHTM standards

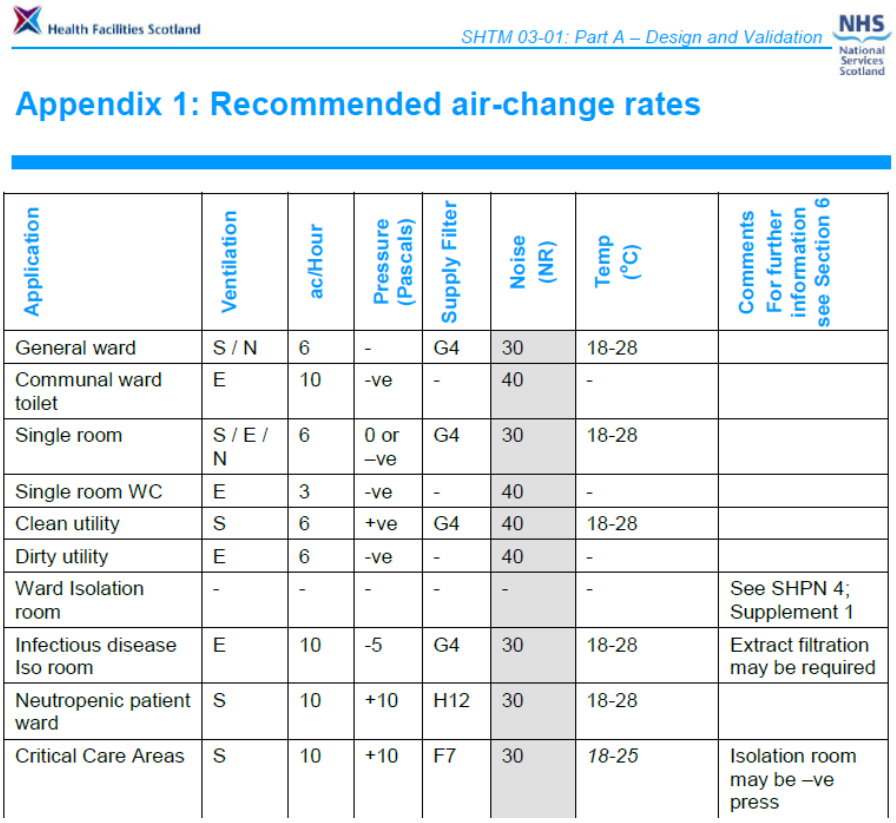
4.2.1 HFS provides operational guidance to NHS Scotland bodies on a range of healthcare facilities topics. As part of its role, HFS issues guidance publications known as "SHTMs". SHTMs give comprehensive advice and guidance on the design, installation and operation of specialised building and engineering technology used in the delivery of healthcare. The focus of SHTM guidance remains on healthcare-specific elements of standards, policies and up-to-date established best practice. They are applicable to new and existing sites, and are for use at various stages during the whole building lifecycle.

4.2.2 SHTM 03-01 'Ventilation for healthcare premises' is the relevant guidance which is pertinent to the ventilation issues and the Delay. Part A 'Design and validation', of the latest version of SHTM 03-01[45], provides details of the recommended air change rates for each component of a hospital[46].

4.2.3 Section 7 'Specialised ventilation systems', of the latest version of SHTM 03-01, contains design information for a range of healthcare ventilation applications, listing *'critical areas and high-dependency units of any type'* as being one of the departments that require a degree of specialised ventilation[47]. This section of SHTM 03-01 describes how ventilation systems should be designed for various departments and references recommended air-change rates as being contained within SHTM 03-01 Appendix 1: Table A1 ("**Appendix 1**"). An extract from Appendix 1 is provided below:

[45] Version 2 dated February 2014
[46] Within Appendix 1: Recommended air-change rates
[47] SHTM 03-01, Version 2 dated February 2014, page 82

Figure 1: Extract from Appendix 1: Table A1 of SHTM 03-01



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Appendix 1: Recommended air-change rates

Application	Ventilation	ac/Hour	Pressure (Pascals)	Supply Filter	Noise (NR)	Temp (°C)	Comments For further information see Section 6
General ward	S / N	6	-	G4	30	18-28	
Communal ward toilet	E	10	-ve	-	40	-	
Single room	S / E / N	6	0 or –ve	G4	30	18-28	
Single room WC	E	3	-ve	-	40	-	
Clean utility	S	6	+ve	G4	40	18-28	
Dirty utility	E	6	-ve	-	40	-	
Ward Isolation room	-	-	-	-	-	-	See SHPN 4; Supplement 1
Infectious disease Iso room	E	10	-5	G4	30	18-28	Extract filtration may be required
Neutropenic patient ward	S	10	+10	H12	30	18-28	
Critical Care Areas	S	10	+10	F7	30	*18-25*	Isolation room may be –ve press

4.2.4 It is noted from the above table that 'Critical Care Areas' require 10 ac/hr. As set out in Section 3 of this Report, the source of the Delay was rooms within the Critical Care department of the Hospital not meeting this required 10 ac/hr.

4.2.5 We have been unable to identify any definition of 'Critical Care Areas' within the SHTM. It is therefore unclear, from SHTM alone, if the definition of Critical Care Areas within SHTM 03-01 includes, for example, single rooms and clean utility areas located within Critical Care, or if these fall under the different recommended air change rates shown in the table above. However, we note that the Project Agreement documentation, and specifically the BCR, referred to in paragraph 4.3.8 below, includes clinical output based specifications for each department. The specifications relating to Critical Care (the "**Critical Care Clinical Output Based Specifications**") include references to the areas

included in Critical Care with, for example, references to single cubicles, four bedded bays, isolation cubicles and clean and dirty utilities.

4.2.6 We also note that SHTM 03-01 refers to, *"Specific requirements for hospital departments"* and states *"Specific requirements for individual spaces and departments are included in the Health Building Notes (HBNs) and Activity Database (ADB) A-Sheets, or Scottish Health Planning Notes (SHPNs)*[48]".

4.2.7 As previously mentioned, the Delay itself was as a result of both the 'single bed cubicle' and 'four bedded bays' within Critical Care being identified as non-compliant with the air change rates set out in SHTM 03-01. Individuals at NHSL are of the view that SHTM 03-01 is predominately focused on an adult care environment and does not explicitly consider the different ways in which children's hospitals manage patients in Critical Care, for example, through the use of four-bedded bays to cohort patients with the same infection at times when admission rates are high and Critical Care support required may exceed isolation room capacity.

4.2.8 Without clarity on the definition of Critical Care Areas in the Standards as a stand-alone basis and, in particular, in respect of how four-bedded bays should be classified under SHTM 03-01, the relevant air change rate for particular rooms could be open to interpretation.

4.2.9 NHSL are of the view that such four-bedded bays should be included under 'Critical Care Areas' in the table at Appendix 1 of SHTM 03-01, and included reference to four-bedded bays in their Critical Care Clinical Output Based Specifications. However, an alternative interpretation from the Standards alone could lead to them being classified under a 'General Ward', which carry different recommended air change rates.

[48] SHTM 03-01 V2 Part A paragraph 2.60

Previous standards

4.2.10 The SHTM standard that preceded SHTM 03-01[49] was SHTM 2025. Through review of the documents we have been provided in relation to SHTM 2025, we cannot see any reference to any recommended air change rates for Critical Care areas.

4.3 ITPD stage (March 2013)

4.3.1 The ITPD issued to bidders, dated 11 March 2013, makes reference to the specific room requirements for the Hospital (the **"Room Information**") being detailed in a number of documents, including[50]:

a) The BCR;

b) The EM;

c) The Schedule of Operational/Design Notes;

d) The Equipment Schedule;

e) The Equipment Responsibility Matrix;

f) The Draft Schedule of Accommodation; and

g) The Operational Functionality elements of the Reference Design.

4.3.2 As part of their response to the ITPD, bidders were required to develop 'Room Data Sheets' ("**RDS**") for 11 of the rooms within the Hospital. None of these rooms appear to be located in the Critical Care area of the Hospital[51]. The RDS were to incorporate the Room Information, as detailed above. RDS for the

[49] October 2011 was the date of the first publication of SHTM 03-01

[50] ITPD Volume 1, section 2.5.3 'Room Data Sheets'

[51] On the basis that the EM index refers to the department code for Critical Care being 'B1' and none of the 11 room references detailed in section 2.5.2 of the IPTD have the prefix B1

remaining rooms were to be developed by the preferred bidder prior to Financial Close.

4.3.3 We understand from NHSL that, of the documents listed above, it is only the BCR and the EM that refer to SHTM 03-01 and/or Critical Care. Details of these documents are set out below.

Board's Construction Requirements

4.3.4 The BCR are the NHSL Board's detailed requirements for the Project. The BCR included within the ITPD[52] make a number of references to SHTMs, as detailed in the following paragraphs.

4.3.5 Section 2.3 (NHS Requirements) of the BCR states that, *"unless the Board has expressed elsewhere in the Board's Construction Requirements, a specific and different requirement, the Facilities shall comply with but not be limited to the provisions of the NHS Requirements…"*[53]. These NHS Requirements include the following in relation to SHTM:

> ***"v. Health Technical Memoranda & Scottish Health Technical Memoranda (HTM & SHTM)***
>
> *Project Co shall, in relation to all SHTM and all HTM (except HTM where an SHTM exists with the same number and covering the same subject matter): take fully into account the guidance and advice included within such SHTM and HTM; ensure that the Facilities comply with the requirements of such SHTM and HTM; and adopt as mandatory all recommendations and preferred solutions contained in such SHTM and HTM"*[54].

[52] ITPD: Volume 3, Board's Construction Requirements, Rev C, August 2013
[53] ITPD: Volume 3, Board's Construction Requirements, Rev C, August 2013, Section 2.3 (page 22)
[54] ITPD: Volume 3, Board's Construction Requirements, Rev C, August 2013, Section 2.3, part v. (page 24)

4.3.6 The BCR[55] makes direct reference to SHTM 03-01 on a number of occasions within the Project Agreement, specifically in Sub-Section C:

a) Section 5.2 Infection Prevention & Control:

> *"Project Co shall ensure all aspects of the Facilities allow for the control and management of any outbreak and/or spread of infectious diseases in accordance with the following:*
>
> *…*
>
> *f) Ventilation in Healthcare Premises (SHTM 03-01)"*[56]

b) Section 8.1 Minimum Engineering Standards:

> *"The following is a non-exhaustive list of SHTM's, HBN's and HTM's applicable to the Facilities:*
>
> *…*
>
> *h) SHTM 03-01: Ventilation in Healthcare Premises"*[57]

c) Section 8.5.3 Air Quality, i. Internal:

> *"Particular attention shall be given to the risk of cross infection within the hospital… Project Co shall demonstrate through submission of information to the Board as Reviewable Design Data for review by the Board…how the proposals facilitate the control and management of an outbreak and spread of infectious diseases, and in particular shall comply with the requirements of SHTM 03-01…"*[58]

d) Section 8.7.8 (Mechanical Ventilation & Air Conditioning) also makes direct reference to SHTM 03-01 and how the "*Project Co shall demonstrate how the*

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[55] ITPD: Volume 3, Board's Construction Requirements, Rev C, August 2013
[56] ITPD: Volume 3, Board's Construction Requirements, Rev C, August 2013, Subsection C, Section 5.2 (page 68)
[57] ITPD: Volume 3, Board's Construction Requirements, Rev C, August 2013, Subsection C, Section 8.1 (page 104)
[58] ITPD: Volume 3, Board's Construction Requirements, Rev C, August 2013, Subsection C, Section 8.5.3 (page 104)

proposals facilitate the control and management of an outbreak and spread of infectious diseases in accordance with SHTM 03-01…"[59].

4.3.7 Specific reference is also made to ventilation of 'isolation rooms' as being required to be designed and installed in accordance with SHTM 03-01[60].

4.3.8 Subsection D of the BCR sets out a number of specific clinical requirements, including the Critical Care Clinical Output Based Specifications[61]. We note that the Critical Care Clinical Output Based Specifications refer to *"SHTM 2025: Ventilation"* as containing 'design guidance' for the Project[62], as opposed to the updated standard, SHTM 03-01. As referred to in Section 4.2.10, these previous standards did not specify air change rates recommended for Critical Care areas.

4.3.9 Subsection B of the BCR defines the EM as detailing *"…the room environmental condition requirements of the Board required within each department / unit / space / area…"*[63]. Sub-Section C, Section 8, states that the *"Project Co shall provide the Works to comply with the Environmental Matrix"*[64]. We have provided further details on the EM below.

Environmental matrix

4.3.10 An EM was provided as part of the Room Information within the ITPD[65] (the "**ITPD EM**") from which the bidders were asked to develop their RDS and their design specifications.

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[59] ITPD: Volume 3, Board's Construction Requirements, Rev C, August 2013, Subsection C, Section 8.7.8 (page 119)
[60] ITPD: Volume 3, Board's Construction Requirements, Rev C, August 2013, Subsection C, Section 8.7.22 (Ventilation and Air Conditioning of Isolation Rooms) (page 124)
[61] B1 Critical Care, Clinical Output Based Specifications, dated January 2013
[62] Section 1.9 Design Guidance, page 15 of the B1 Critical Care, Output Based Specifications, dated January 2013
[63] IPTD: Volume 3 Board's Construction Requirements, Rev C, Subsection B, B (page 9)
[64] IPTD: Volume 3 Board's Construction Requirements, Rev C, Subsection C, Section 8 (page 102)
[65] Entitled the 'Reference Design Envisaged Solution – RHSC / DCN RDS Environmental Matrix'

4.3.11 The bidder's technical submission requirements contained within the ITPD referred to the EM in the following context:

> *"Whilst Bidders are required to undertake their own design, the Board has provided a draft Environmental Matrix as part of the ITPD documentation. Bidders must confirm acceptance of the Board's Environmental Matrix, highlighting any proposed changes on an exception basis"*[66]*.*

4.3.12 The EM details environmental standards (for example, temperature, heating, ventilation) on a room-by-room basis. The EM consists of a cover sheet 'index' showing the different department codes, and references the page on which the associated details can be found. Department 'B1' is listed as 'Critical Care / HDU / Neonatal Surgery'.

4.3.13 Following the index, there is a page of guidance notes which include[67]:

> *"**HDU bed areas** - Design Criteria - HBN 57 gives specific guidance as well as SHTM 03-01 - esp Appendix 1 for air change rates - 10ac/hr Supply…"*
>
> ***"Critical Care Areas** – Design Criteria – SHTM 03-01 – esp Appendix 1 for air change rates – 10 ac/hr Supply…"*

4.3.14 The main body of the EM includes tables detailing, for each department and each respective room, the corresponding environmental standards. These include, among other things, details of the temperature, heating, cooling and ventilation (including supply air change and pressure).

4.3.15 Despite the guidance note, referred to at paragraph 4.3.13 above, advising that all Critical Care Areas should be in accordance with SHTM 03-01 and, specifically, 10 ac/hr supply, we identified that the ITPD EM table for Critical Care

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[66] Appendix A (ii) Submission Requirements, Section C8.3 (page 105)

[67] The ITPD EM, entitled 'Reference Design Envisaged Solution – RHSC / DCN RDS Environmental Matrix' version third issue, dated 19 September 2012 (page 2, note 15)) (Document reference: 20120919 Environment Matrix (ITPD))

(Section B1 – page 5[68]) includes the following types of rooms - 'Single Bed Cubicles', 'Open Plan Bay (4 bed)' and 'Open Plan Bay (3 cots)', all of which are detailed with supply air change rates of 4 ac/hr.

4.3.16 The ITPD EM was therefore inconsistent between the guidance notes and detailed content contained within it. The detailed content which stated supply air change rate of 4 ac/hr was also inconsistent with the Critical Care air change rate of 10 ac/hr detailed in SHTM 03-01. We understand the current Project Team are not aware of why the document states 4 ac/hr.

4.3.17 We understand from NHSL that, as part of the process of developing the capital-funded project (see paragraph 3.2.1), documentation relating to the design and build was produced. We understand that an EM was developed by the Design Consultant used for this capital scheme and a version of this was shared as part of the tender process[69].

4.3.18 We have seen a 'first issue' of an EM, which we understand was part of the capital scheme, which is dated 9 September 2010 and is described as 'Royal Hospital for Sick Children – Edinburgh, HK Doc - RDS Environmental Matrix', which within the 'B1 – Critical Care / HDU / Neonatal Surgery' section refers to 'open plan bay (4 beds)' as having 10 ac/hr and balanced pressure[70]. We note, however, that the ITPD EM is entitled 'Royal Hospital for Sick Children and Department for Clinical Neurosciences – Edinburgh Reference Design Envisaged Solution - RHSC / DCN RDS Environmental Matrix'[71]. The version control within the ITPD EM shows the 'first issue' of this document as being dated 3 February 2012 and not 9 September 2010 as referred to above[72]. However, from the dates detailed within them, it would appear that these are two different documents, but

[68] Reference Design Envisaged Solution – RHSC / DCN RDS Environmental Matrix version third issue, dated 19 September 2012 (page 5)

[69] The ITPD EM

[70] Document reference: RHSC RDS Environmental Matrix Sept 2010_iss1_rev-

[71] Document reference: Reference Design Envisaged Solution – RHSC / DCN RDS Environmental Matrix version third issue, dated 19 September 2012

[72] Reference Design Envisaged Solution – RHSC / DCN RDS Environmental Matrix version third issue, dated 19 September 2012

that the IPTD EM could be an iteration of the 'first issue' document[73] provided to us.

Preferred bidder letter

4.3.19 A letter was issued by NHSL to IHSL on 5 March 2014, advising that their final tender, submitted on 13 January 2014, had been accepted (the "**Preferred Bidder Letter**")[74].

4.3.20 As part of the Preferred Bidder Letter, IHSL was asked to *"…use its best endeavours to diligently develop…",* among other things, Project Co proposals and RDS'[75]. These technical schedules were to be *"…finalised in conjunction with the Board to ensure that both parties are satisfied that these technical Schedules robustly address[ed] the Board's Construction Requirements…"*[76].

Period between issue of Preferred Bidder Letter (March 2014) and Financial Close (February 2015)

4.3.21 During the period between NHSL issuing the Preferred Bidder Letter and Financial Close, we have seen evidence of ongoing correspondence between NHSL and Project Co in respect of comments on the EM. We understand from Mott MacDonald and NHSL that, when the 'Board' has been referred to in the below correspondence, this refers to comments from both themselves and the Project Team and not the ultimate NHSL Board. This correspondence includes the following:

a) Comments provided to Project Co[77] referred to as *"…initial technical comments on draft 1 of the Environmental Matrix"*, dated 13 October 2014[78].

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[73] Document reference: RHSC RDS Environmental Matrix Sept 2010_iss1_rev-. Dated 9 September 2010
[74] Document reference: 7.1.13 Preferred Bidder Status Letter dated 5 March 2014
[75] Section 4.4 of Schedule Part 1 - Terms of Preferred Bidder Appointment (Document reference: 7.1.13 Preferred Bidder Status Letter dated 5 March 2014)
[76] Section 4.4 of Schedule Part 1 - Terms of Preferred Bidder Appointment (Document reference: 7.1.13 Preferred Bidder Status Letter dated 5 March 2014)
[77] Attached to an email from Mott MacDonald to Multiplex, among others, dated 14 October 2019. (Document reference: 141014 MM-GC-000399)
[78] Document reference: 141013 Environmental Matrix Comments

This document included 12 comments, one of which specifically refers to ventilation standards in respect of bedrooms[79]:

"Bedrooms 4ac/hr, SHTM says 6 ac/hr

Bedrooms have no extract

Bedroom en-suites 10 ac/hr, SHTM says 3 ac/hr

Bedrooms stated as positive pressure, SHTM says 0 or –ve pressure…"[80].

b) IHSL responded to the above comments on 27 October 2014. Specifically, in respect of comment 7 detailed above, IHSL stated:

"The scheme is based on the Reference design throughout which is essentially mixed mode with openable windows and 2/3rds mechanical supply air to all bedrooms. This gives physiological benefits with access to fresh air control by user and obvious Energy benefits. We have amended the environmental schedule to show the room being balanced which is provided by the opening window" 81.

c) An email from Mott MacDonald (on behalf of NHSL) to Multiplex[82], among others, attaching the notes from a meeting held on 11 November 2014. The notes attached state:

"Project Co shall update the Environmental Matrix to reflect the following Board comments"[83].

A specific comment relating to bedroom ventilation was:

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[79] Comment 7. Document reference: 141013 Environmental Matrix Comments
[80] Document reference: 141013 Environmental Matrix Comments
[81] Document reference: 20141027 Environmental Matrix Comments
[82] Document reference: 20141111 RE Environmental Matrix NHSL Comments Feedback 3
[83] Document reference: 111114 RDD Part 4 Enviro Matrix comments

"Detailed proposal awaited on bedroom ventilation to achieve balanced/negative pressure relative to corridor."[84]

d) On 19 January 2015, Multiplex emailed sketches of the proposed pressure regime to Mott MacDonald and NHSL[85]. A report was also provided to Mott MacDonald and NHSL detailing Project Co's review of air movement within single bedrooms under various ventilation scenarios[86]. Mott MacDonald responded to the email containing the sketches with a number of comments, including:

"The critical factor from SHTM 03-01 for infection control will be the resultant pressure within the room being balanced with or negative to the corridor"[87]*.*

4.3.22 We note that throughout the above correspondence there is reference to ventilation and SHTM 03-01. However, there is no specific reference to Critical Care rooms and the focus of the discussions appears to have been centred on the pressure regime in the rooms, rather than air change rates.

4.4 Project Agreement stage (February 2015)

4.4.1 The Project Agreement, dated 12 and 13 February 2015, states that the overall responsibility of Project Co is to carry out the works *"so as to procure satisfaction of the Board's Construction Requirements"*[88]. Details of the BCR contained in the Project Agreement are detailed in paragraph 4.4.4 below.

4.4.2 The Project Agreement also includes a list of Reviewable Design Data ("**RDD**") and the status of the approval of such data as at Financial Close. Further details on this are provided in paragraph 4.4.5 below.

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[84] Bullet point 4. Document reference: 111114 RDD Part 4 Enviro Matrix comments

[85] Document reference: 150129 MM-GC-000432

[86] RHSC – DCN Edinburgh. Air Movement Report For Single Bedrooms (Draft). Document reference: 13.01.15 20141127 air movement

[87] Document reference: 150129 MM-GC-000432

[88] Project Agreement, Schedule Part 6 (Construction Matters), Section 3 (Board's Construction Requirements), Revision I

4.4.3 The RDD relevant to air change rates is included within the RDS and the EM. We have provided details of the RDS and EM in paragraphs 4.4.8 to 4.4.12 below.

Board Construction Requirements

4.4.4 The references to SHTM 03-01 within the Project Agreement BCR[89] are consistent with those in the BCR provided at the ITPD stage, as detailed in paragraph 4.3.6 above. We note that the reference to SHTM 2025 in the Critical Care Clinical Output Based Specifications also remained in the Project Agreement version.

Reviewable Design Data

4.4.5 The process for RDD is detailed in Schedule Part 8 (review procedure) of the Project Agreement. RDD is classified as either approved or non-approved based on the classification level ascribed by NHSL Board Representatives[90]. Level A (no comment) or Level B (proceed subject to amendment as noted) are in effect approved (collectively "**Approved RDD**"), whereas Level C or Level D are classified as non-approved[91].

4.4.6 Appendix 1, Table A, of Schedule Part 8 (review procedure) of the Project Agreement provides details as to the meaning of the aforementioned approval levels against each category of RDD. The table refers to the Level A and Level B approvals for RDS' as follows:

> *"endorsement of any room data sheet means that Project Co may proceed to construct in accordance with the Submitted Item and that the Board is satisfied that the design and other information in the relevant room data sheet satisfies Operational Functionality."*[92]

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[89] Project Agreement, Schedule Part 6 (Construction Matters), Section 3 (Board's Construction Requirements). Document reference: RHSC DCN BCRs A B C Rev I clean 230115
[90] Project Agreement, Schedule Part 8, Review Procedure, Appendix 1 (page 241)
[91] As detailed in Schedule Part 6 (Construction Matters), Part 5, Reviewable Design Data (page 27)
[92] Project Agreement, Schedule Part 8, Review Procedure, Appendix 1 (page 241)

4.4.7 NHSL has advised us that reviewing such documents for 'operational functionality' did not, in their opinion, consist of a technical review as to the extent to which they were in compliance with the Standards.

Room Data Sheets and Environmental Matrix

4.4.8 Relevant design data included within the Project Agreement includes the RDS and an updated version of the EM[93] ("**Project Agreement EM**"). The RDS contain environmental data for each room, including supply air change rates. We understand that the Project Agreement EM was a summary of the RDS.

4.4.9 We note that the Project Agreement EM format and design is similar to the ITPD EM, with the same index and a page of guidance notes. As with the ITPD EM, the Project Agreement EM guidance notes refer to Critical Care Areas design criteria being SHTM 03-01 and *"10ac/hr Supply"*[94]. However, again consistent with the ITPD EM, included within the 'B1' section of the Project Agreement EM[95] (referred to as 'Critical Care / HDU / Neonatal) are rooms referred to as 'Single Bed Cubicles', 'Open Plan Bay (4 bed)' and 'Open Plan Bay (3 cots)', all of which are detailed with a supply air change rate of 4 ac/hr. The Project Agreement EM therefore remained inconsistent between the guidance notes and detailed content contained within it. The detailed content which stated a supply air change rate of 4 ac/hr was also inconsistent with the Critical Care air change rate of 10 detailed in SHTM 03-01.

4.4.10 We note that, whilst the Project Agreement EM guidance notes refer to Critical Care Areas design criteria being SHTM 03-01 and *"10ac/hr Supply"*[96], that a later version of the EM, dated 26 November 2015, contains guidance notes that state *"10ac/hr Supply for isolation cubicles"*[97]. We understand from NHSL that the

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[93] Contained within Schedule Part 6, Construction Matters, Part 6 of the Project Agreement. Document reference: WW-XX-XX-DC-001

[94] Document reference: WW-XX-XX-DC-001. Page 2, Note 15. Contained within Schedule Part 6, Construction Matters, Part 6 of the Project Agreement.

[95] Document reference: WW-XX-XX-DC-001. Section B1 – page 5

[96] Document reference: WW-XX-XX-DC-001. Page 2, Note 15. Contained within Schedule Part 6, Construction Matters, Part 6 of the Project Agreement

[97] Document reference: WW-XX-XX-DC-XXX-001 (rev 1)

addition of the words ‘for isolation cubicles’ in this version of the EM was never flagged as a change to the Project Team. We note that this version of the EM contains other parts of the guidance notes in red. This small change in the text had the effect of removing the inconsistency between the guidance notes and the detail in the matrix, as referred to above.

4.4.11 We note that the Project Agreement EM was classified as ‘non-approved’ at the date of the Project Agreement, with the Board requesting that Project Co update the EM to reflect a number of comments, including *“Detailed proposal awaited on bedroom ventilation to achieve balanced/negative pressure relative to corridor”*[98]. We have seen initial reference to this comment in November 2014, in an attachment to an email from Mott MacDonald to Multiplex[99] (see paragraph 4.3.21 above). We note that this comment remained in all versions of the EM provided to us, from the Project Agreement EM[100] to the EM included as part of a Settlement Agreement in February 2019[101] (see Section 4.5 for further details of the Settlement Agreement).

4.4.12 Whilst the EM was classified as ‘non-approved’ under the RDD process at the point of Financial Close, we have not identified any Board comments within the RDD document specifically relating to air change rates and Critical Care.

4.5 Settlement Agreement (February 2019)

4.5.1 As set out in paragraph 3.3.7, on 22 February 2019, a Settlement Agreement was signed by NHSL Board and IHSL. The Settlement Agreement contained a schedule detailing 73 items[102] which had been in disagreement between the parties and the agreed resolutions for each issue.

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[98] Bullet point 4. Document reference: 111114 RDD Part 4 Enviro Matrix comments
[99] An email from Mott MacDonald to Multiplex, among others, dated 14 October 2019. (Document reference: 141014 MM-GC-000399)
[100] The document itself was undated but the Project Agreement was dated 12 and 13 February 2015
[101] We understand from NHSL that the version included within the Settlement Agreement was version 11 which is dated 25 October 2017
[102] Schedule 1, Part 1, Technical Schedule of the Project Agreement (Pages 26 to 54)

4.5.2 Two of these agreed resolutions were pertinent to the Delay and related to disputes between the parties as to the extent to which bedroom ventilation was in compliance with SHTM 03-01. Both of the resolutions in effect resolved to deviate from recommendations included within SHTM 03-01. Details of the agreed resolutions for these were as follows:

a) 'Item 7 – 4 bed ventilation': for *"14 no 4 bed rooms to be balanced or negative to the corridor at 4 ac/hr"*[103]; and

b) 'Item 13 – Single Bedroom Ventilation air changes'[104]: to decrease *"the mechanical air change ventilation rate within single bedrooms from 6 air changes per hour (6 ac/hr) to 4 air changes per hour (4 ac/hr)"*[105].

4.5.3 We have commented on the above resolutions further in Section 5.3 below.

4.6 Changes to the Project Agreement

4.6.1 In projects of any nature, it will often become necessary for changes to be made to design plans, which in turn may impact compliance to a contractual requirement. In this Project, the design and build were required to be in compliance with the BCR which refer to SHTM 03-01, among other standards. In effect this makes compliance with SHTM 03-01 mandatory. As such, in order to ensure changes were adequately reviewed and agreed upon, a process to make any required changes was necessary.

4.6.2 During the tender process, bidders could put forward proposed 'derogations', being proposed changes to the proposed project agreement (including the BCR). At Financial Close, any accepted derogations were then incorporated into the

[103] Schedule 1, Part 1, Technical Schedule of the Project Agreement (Page 30)

[104] We understand from NHSL that the details of this agreed resolution were those contained within Project Co notice of change dated 14 May 2018

[105] Project Co notice of change dated 14 May 2018, Section 1.0. Document reference: 180522 Schedule 16 Project Co Change Notice No 051

contractual drafting of the BCR. From the NHSL's perspective, these matters were assumed closed or completed at Financial Close.

4.6.3 Following Financial Close, any deviations from the BCR and the signed Project Agreement, proposed by Project Co, could only be initiated and approved through the Project Co Change ("**PCC**") process. A PCC was defined in the Project Agreement as being, *"a Change that is initiated by Project Co by submitting a Project Co Notice of Change to the Board pursuant to Section 5 (Project Co Changes) of this Schedule Part 16 (Change Protocol)"*[106].

4.6.4 We understand from the Project Agreement[107] and discussions with NHSL that the PCC process was as follows:

a) If Project Co wishes to introduce a PCC, it shall serve a Project Co Notice of Change ("**PCNOC**") to the NHSL Board;

b) The PCNOC shall set out the proposed PCC in sufficient detail to enable the NHSL Board to evaluate it in full. It should specify Project Co's reasons for proposing the PCC, indicate any implication of the PCC, indicate if any savings will be generated by the PCC, and request the NHSL Board to consult with Project Co with a view to deciding on whether to agree to the PCC and, if so, what consequential changes the NHSL Board requires as a result;

c) The NHSL Board shall evaluate the PCNOC in good faith, taking into account all relevant issues, including, among other things, whether the PCC *"may affect the quality of the Services and/or the Works or the likelihood of successful completion of the Works and/or delivery of the Services (or any of them)"*[108];

d) As soon as practicable after receiving a PCNOC, the parties should meet and discuss the matters referred to in it. We understand from NHSL, that on

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[106] Project Agreement, Schedule Part 16, Change Protocol, Section1, Definitions (page 389)

[107] Contained within Schedule Part 16: Change Protocol Section 5: Project Co Changes

[108] Project Agreement, Schedule Part 16, Change Protocol, Section 5, Project Co Changes (page 418)

receipt of a PCNOC, the Project Team and its advisors (including Mott MacDonald and MacRoberts) would review and comment on it. Comments and amended versions would then pass between Project Co and the NHSL Board, as required; and

e) If the NHSL Board accepts the PCNOC (with or without modification), the parties shall consult and agree the remaining details as soon as practicable. Upon agreement, the NHSL Board shall issue a notice confirming the PCC, which shall set out the agreed details.

4.6.5 As part of the signing of the Settlement Agreement in February 2019, the resolution of a number of issues was reached. This incorporated a number of changes which had already been raised through the aforementioned PCC process, but had yet to be approved, along with further areas which remained in dispute and which were resolved in the Settlement Agreement. The agreed resolutions which had not been approved prior to the Settlement Agreement were termed 'derogations'. The agreed resolutions included, among others, two which were pertinent to the Delay. We have provided further details of these, and the professional and technical advisors involved in the approval of them, in Section 5.3 below.

4.7 Independent Tester

4.7.1 As part of the ITPD, an IT was required to be appointed as an independent resource to provide inspection review and certify completion in respect of the Project.

4.7.2 The IT was jointly instructed by the NHSL Board and Project Co as part of the Project Agreement. The scope of work of the IT[109] included, among other things:

a) Providing monthly reports and undertaking regular inspections during the works[110];

[109] Project Agreement, Schedule Part 13 'Independent Tester Contract', Appendix 1 'Scope of Services – Independent Tester Contact

[110] Scope item 1.1

b) Providing details of any tests carried out by Project Co, together with results obtained[111];

c) Reporting on the completion status of the Project, identifying any work that was not compliant with the BCR, Project Co Proposals', Approved RDD and/or the Completion Criteria[112];

d) Monitoring the works for compliance with the BCR and Project Co's Proposals and compliance with law[113]; and

e) Monitoring the detailed working drawings and specifications for a sample number and type of rooms which, in their professional judgment, is appropriate to be selected by the IT to verify that they comply with the Approved RDD[114].

4.7.3 In respect of identifying work that was not compliant with BCR, the IT stated that in its view the ventilation flow rates were compliant with the BCR and in particular the EM and RDS. We understand from the IT that, the flow rates are derived by the design consultant from the air change rates specified in the EM and RDS.

4.7.4 We understand from the IT that it reviewed the testing and commissioning results for compliance with the EM and RDS, as required by the Completion Criteria detailed in the Project Agreement[115]. The IT used the EM as the basis for this review process, as this information is the referenced criteria for compliance and it was the IT's understanding that this would have been reviewed by the NHSL Board.

4.7.5 Specifically, in respect of SHTM 03-01 and air change rates, we understand from the IT that, it physically witnessed a proportion of the commission testing of the flow rates, as undertaken by Multiplex's specialist sub-contractors, and reviewed the results of all the tests that were completed. We understand from the IT that,

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[111] Scope item 1.3
[112] Scope item 1.2
[113] Scope item 1.9
[114] Scope item 3.2
[115] Contained within Schedule Part 10, Outline Commissioning Programme, Appendix B – Completion Criteria

in accordance with its scope of service, it did not physically test any systems but reviewed the following:

a) That the testing methodology was in accordance with CIBSE[116] commissioning code C;

b) That the equipment that was used for testing flow rate and velocity was within certification/calibration test dates;

c) That the testers were correctly recording the figures; and

d) That the flow rates and pressure were in accordance with the design of the system itself.

4.7.6 The IT advised us that the design flow rates were used as part of the design process and, as such, the IT would not be expected to replicate that design process or reverse it to obtain the actual air change rates.

4.7.7 The actual calculation of air change per hour rates was considered by the IT to be a design function and, as such, outside their scope of work.

4.7.8 Following discussions with the IT, and from reviewing a sample of the monthly reports produced by the IT, we note that, whilst there was reference to other ventilation issues prior to April 2018, there was no reference to any ventilation issues specifically in respect of four-bedded rooms until April 2018. The IT key issues report dated April 2018[117] states that the issue (no. 212) was raised in 2016, details of which are as follows:

> *"The IT understands that NHS Lothian and Multiplex are currently discussing an arrangement by which 14 of the 4 bedded rooms would receive negative pressure to the corridor ventilation systems. The IT is awaiting confirmation of this agreement in a format that would take preference to any other stated requirement."*

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[116] Chartered Institute of Building Services Engineers

[117] The Royal Hospital for Children and Young People Edinburgh Key Issues Report No. 37, April 2018, Appendix D Compliance Issues Outstanding (reference nr 212, page 26)

4.7.9 Issue no. 212, as set out above, remains in the subsequent IT reports each month, with the September 2018 report including an additional explanation that Multiplex were *"…going to forward on the Aconex Transmittal document to progress close out"*[118]. We understand that the September 2018 report was the last report issued by the IT and that issue no. 212 was eventually rolled-up as part of the Settlement Agreement.

4.8 Compliance assurance from IHSL (January 2019)

4.8.1 In a letter dated 31 January 2019, a Project Co representative for IHSL, provided their responses to a number of queries raised by the NHSL Board regarding assurances in respect of plant rooms and ventilation systems. Specific assurance had been sought by the NHSL Board for IHSL to provide assurance that *"All critical ventilation systems [to be] inspected and maintained in line with 'Scottish Health Technical Memorandum 03-01: Ventilation for healthcare premises"*[119]. The IHSL's Project Co representatives response to this was "*Construction: - All ventilation systems have been designed, installed and commissioned in line with SHTM 03-01 as required, systems are maintained in such a manner which allows handover at actual completion to meet SHTM 03/01 standards*" [120].

4.9 Summary

4.9.1 Throughout all stages of the Project we have seen references made to the requirements of the Project Co to adhere to SHTM, including specifically, SHTM 03-01 relating to ventilation systems.

4.9.2 Our work has identified issues within the EM, including inconsistencies with SHTM and discrepancies within the document itself. Specifically:

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[118] The Royal Hospital for Children and Young People Edinburgh Key Issues Report No. 42, September 2018, Appendix D Compliance Issues Outstanding (reference nr 212, page 25)
[119] Document reference: 10.11.4 31-01-19 IHSL.NHSL Plant Rooms.Ventilation Systems
[120] Document reference: 10.11.4 31-01-19 IHSL.NHSL Plant Rooms.Ventilation Systems

a) The version of the EM document provided by NHSL to bidders as part of the tender process, and referred to in the BCR, as detailed above, included reference to both the single bed cubicles and four-bed rooms in Critical Care as requiring 4 ac/hr. We understand this was not in compliance with SHTM and should have been 10 ac/hr. This reference remained in subsequent versions of the EM; and

b) The guidance note at the front of the document provided at the tender and Financial Close stages of the Project suggested that all Critical Care Areas should be in accordance with SHTM 03-01, being the relevant part of SHTM relating to ventilation, and "*10ac/hr Supply"*[121]. This is inconsistent with the content of the EM as detailed above. We note that, this inconsistency appears to have been removed after Financial Close by the insertion of the words 'for isolation cubicles'[122], suggesting that only 'isolation cubicles' in Critical Care should have an air change rate of 10 ac/hr. However, we were informed by NHSL that this change was made by the Project Co and was not flagged to NHSL by the Project Co (see paragraph 4.4.10 for further details). Despite this change, the EM itself still referred to single bed cubicles and four-bed rooms in Critical Care as requiring 4 ac/hr, which we understand remained not in compliance with SHTM and should have been 10 ac/hr.

4.9.3 We have not been instructed to consider how the inconsistency made its way into the initial EM. However, notwithstanding contractual obligations, it appears that there has been confusion between the parties as to the application of these Standards. This appears to have stemmed from a document which was contained within the tender documentation, a version of which was used throughout the Project, which included details on the environmental specifications

[121] Document reference (tender version): Reference Design Envisaged Solution – RHSC / DCN Environmental Matrix version third issue, dated 19 September 2012 (page 2, note 15)). Document reference (Project Agreement version): WW-XX-XX-DC-001. Page 2, Note 15. Contained within Schedule Part 6, Construction Matters, Part 6 of the Project Agreement

[122] Full wording read: *"10ac/hr Supply for isolation cubicles"* in a version of the EM dated 26 November 2015. Document reference: WW-XX-XX-DC-XXX-001 (rev 1).

of the Hospital, the EM. Elements of the EM were inconsistent with SHTM 03-01 from the tender process (which commenced in late 2012) onwards.

5 Professional and technical advice given to the NHSL Board

To understand what professional and technical advice was given to the NHSL Board, in particular when derogations were proposed, who agreed them and the risk assessments that were undertaken to reach a final decision.

5.1 Introduction

5.1.1 In this Section, we have provided details of the professional and technical advice given to NHSL, which was visible to the NHSL Board through the Project governance structure.

5.1.2 In particular, we have considered when derogations were proposed, who agreed them and the risk assessments that were undertaken to reach a final decision. In seeking to answer this point, in Section 5.3 below, we have focused on one of two changes to the Project Agreement that were pertinent to the Delay.

5.2 Professional and technical advisors

5.2.1 Throughout the Project, a number of advisors assisted NHSL in decision-making from a practical and clinical perspective, as well as from a technical perspective regarding designs and standards.

5.2.2 The Project Team itself consisted of technical and clinical professionals, whom we understand had many years of experience in the health sector. In addition to the Project Team, the other professional and technical advisors involved throughout the Project consisted of[123]:

a) Medical and non-medical experts from within NHSL;

[123] We understand Ernst and Young provided financial advisory support to the Project. We have not commented on their involvement in the Project further in this Section as they were not involved in providing technical advice

b) Mott MacDonald – external technical advisor and project manager;

c) MacRoberts – external legal advisor; and

d) IOM – an independent ventilation tester appointed on 30 May 2019.

Medical and non-medical experts from within NHSL

5.2.3 In order to assist with the development of clinical output specifications and any ongoing queries or changes throughout the Project, the Project Team had access to medical expertise within NHSL, such as the IPC team and clinical care teams for each department.

5.2.4 The IPC team had a nominated individual who worked with the Project Team. This individual was invited to the design meetings, although it was at their discretion if they attended. They were asked to comment on drawings shared with them and ongoing discussions were held with them. The IPC team members were predominantly involved to provide operational functionality advice (as referred to at paragraph 4.4.6 and 4.4.7), rather than to comment on technical elements, such as the specifics of SHTM 03-01.

5.2.5 The clinical care teams were involved in the development of the Critical Care Clinical Output Based Specifications for the Project (as referred to in paragraph 4.3.8 above) and also attended design meetings for their department(s). The Critical Care Clinical Output Based Specifications were initially drafted by the Project Team and then passed to the relevant clinical teams to obtain more specific input and confirmation on, for example, the types of patients going into the wards, what functions the rooms had and the specific requirements of each room. Each ward and department nominated who they were going to involve in these advisory teams. The Critical Care clinical team consisted of a lead consultant, a lead nurse and a charge nurse.

5.2.6 In addition to the clinical care teams and IPC, NHSL also had access to non-medical professionals within its workforce, such as, estates and facilities staff, along with other NHSL contractors, such as the Authorised Engineers. These individuals were available as advisors to the estates team, NHSL-wide, in order to assist with a wide range of technical design elements should the Project Team

feel they required further input. We understand from the Project Team that, such input was not required on a regular basis and would be limited to ad hoc queries.

Mott MacDonald

5.2.7 Mott MacDonald was appointed in 2011 in order to provide project management and design services for the Project[124]. We understand from Mott MacDonald that the design services related solely to 'enabling works'[125]. The 'Post Financial Close Support Services Proposal'[126], prepared by Mott MacDonald, specifies a "*Technical Advisory and Project Management Appointment*"[127].

5.2.8 Mott MacDonald worked alongside the Project Team in order to assist in day to day and ongoing matters, including attending weekly or bi-weekly project management group meetings, as well as meetings relating to proposed PCC.

5.2.9 To this end, Mott MacDonald provided input and assistance with ongoing matters through the RDD process, such as providing comments on the EM and being on hand to support in the drafting of contractual documentation, including those containing health standard guidance, such as the BCR.

5.2.10 We understand from both Mott MacDonald and NHSL that, neither of them ever undertook a detailed review of the EM against SHTM 03-01 and that they responded on an exceptions basis, as and when operational functionality queries came to light[128]. NHSL's understanding of the contractual terms was that it was the Project Co's responsibility to ensure the EM complied with the Standards.

5.2.11 We have seen evidence of the 'Board's' ongoing involvement in the review of the EM both prior to, and after, Financial Close. We understand from Mott MacDonald that, the 'Board' in this context refers to both themselves and the Project Team and not the ultimate NHSL Board. We have seen specific comments made by the Board (including specifically comments referred to as

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[124] Document: Mott MacDonald and NHSL Board contract
[125] Required to be performed before construction could commence (prior to IPTD stage)
[126] Drafted in 2015
[127] NHS Lothian – RHSC + DCN, Post Financial Close Support Services Proposal.
[128] Operational functionality being as described at paragraph 4.4.7

'technical') in respect of air change rates and pressure within bedrooms. An example of this is provided below:

a) Comments provided to the Project Co[129] referred to as *"…initial technical comments on draft 1 of the Environmental Matrix"*, dated 13 October 2014 (being pre Financial Close) [130]. This document included 12 comments, one of which referred specifically to ventilation standards in respect of bedrooms:

   "Bedrooms 4ac/hr, SHTM says 6 ac/hr

   Bedrooms have no extract

   Bedroom en-suites 10 ac/hr, SHTM says 3 ac/hr

   Bedrooms stated as positive pressure, SHTM says 0 or –ve pressure…"[131].

b) Comments were provided by Mott MacDonald (on behalf of NHSL) in an email they sent to Multiplex on 17 October 2016[132] stating that:

   "The Board have reviewed the Environmental Matrix and still has significant concerns on items that do not appear to comply with the BCR's.

   The Board notes the following general comments:

   1. *The Board has highlighted cells in blue and red bubble on the hard copy which require PCo review."*

   The email went on to explain that *"Whilst the Board has noted general and specific comments above, the Board reminds Project Co that unless the Board has already accepted a derogation, it is Project Co's obligation to comply with the BCR's / SHTMS etc, and*

[129] We understand that both MM and the Project Team reviewed the EM and provided their collective comments to Project Co.

[130] Document reference: 20141027 Environmental Matrix Comments

[131] Document reference: 20141027 Environmental Matrix Comments. Comment 7

[132] Document reference: 161017 MM-GC-002084

the Board not commenting, does not remove that obligation on Project Co."

5.2.12 We note that the version of the EM with highlighted cells in blue and red[133], includes highlighted cells relating to four-bedded bays. Some of the four-bedded bays are included in the matrix part B1 which, as detailed in the index to the EM, is '*Critical Care / HDU / Neonatal Surgery'* (these bays being pertinent to the issue that led to the Delay). The specific NHSL comments included in the EM includes one that states, "*1-b1-063 Stated as supply air 4ac/h, extract via en-suite, this room does not have en-suite facilities"*[134]. We understand from NHSL and Mott MacDonald that, this comment was from a review of the 'operational functionality' detailed in the EM, as referred to at paragraph 4.4.6 and 4.4.7. However, at no point is the fact that the air change rates in this room is not in line with the SHTM 03-01 standard of 10 ac/hr noted. Project Co's response is *"room extract rate added"*[135].

5.2.13 The version of the EM referred to above was subsequently signed off by a member of the Project Team as 'Level B' per the RDD approval process. The covering email from Mott MacDonald (on behalf of NHSL) to Multiplex for the approval at Level B, dated 7 November 2016, states that:

"the Board have serious concerns over the upgrading Environmental Matrix to Status B considering some of the issues raised…being the same as the issues that had been raised since FC… However, as requested by Project Co, the Board has upgraded the Environmental Matrix to status B, noting the Board still does not believe the Environmental Matrix and resultant design complies with the Project Agreement."[136].

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[133] Document reference: REV 07 ww-xx-xx-dc-xxx-001 - signed copy from C to D

[134] Document reference: REV 07 ww-xx-xx-dc-xxx-001 - signed copy from C to D. Environmental Matrix comments, Second Batch, NHSL reference 7 (page 4)

[135] Document reference: REV 07 ww-xx-xx-dc-xxx-001 - signed copy from C to D. Environmental Matrix comments, Second Batch, NHSL reference 7 (page 4)

[136] Document reference: 161107 MM-GC-002155

5.2.14 We note that, within this version of the EM, the air change rates included within the bedrooms listed in table B1[137] (relating to Critical Care as per the index to the EM) all remain at a supply air change rate of 4 ac/hr, consistent with previous versions of the EM.

5.2.15 The last version of the EM provided to us (rev 11) was dated 25 October 2017 and signed off at Level B for operational functionality (as referred to in paragraphs 4.4.6 and 4.4.7) by NHSL on 17 November 2017. The covering email from Mott MacDonald to Multiplex notes that:

> *"The Board would also like to note the design for single and multibedroom ventilation design being progressed by Project Co remains non compliant and this non compliance should either be rectified, a PCo change submitted for the Board's consideration or a dispute raised between the parties"[138].*

5.2.16 Mott MacDonald were also involved in correspondence regarding an ongoing dispute as to the bedroom ventilation pressure issues. For example, an email from Mott MacDonald (on behalf of NHSL) to an IHSL representative, cc'ing in Multiplex, on 5 June 2017[139] explains why Mott MacDonald believed a PCC was required in respect of the changes to the pressure within four-bedded rooms and why they were of the view that the proposed design was not in line with the Standards.

5.3 Advice sought in respect of changes to the Project Agreement

5.3.1 As mentioned in paragraph 4.5.2 above, two of the agreed resolutions, which formed part of the Settlement Agreement, were pertinent to the Delay in that they impacted the ventilation regime and in turn its compliance with SHTM 03-01. Details of the agreed resolutions for these were as follows:

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[137] Page 5
[138] Document reference: 20171117 MM-GC-003531
[139] Document reference: NEW 170619 R.A.M-GC-000285 Bedroom Ventilation. Contained within email trail.

a) Item 7 – 4 bed ventilation: agreed resolution was for *"14 no 4 bed rooms to be balanced or negative to the corridor at 4 ac/hr"*[140]*;* and

b) Item 13 – Single Bedroom Ventilation air changes[141]: The agreed resolution was to decrease *"the mechanical air change ventilation rate within single bedrooms from 6 air changes per hour (6 ac/hr) to 4 air changes per hour (4 ac/hr)"* [142]*.*

5.3.2 There are interconnectivities in the history and context surrounding both of these agreed resolutions, which is described in the 'background to the agreed resolution' Section below. However, for the purposes of this Report we have focused on the detail of one of the agreed resolutions, Item 7 above, in order to illustrate the professional and technical advice sought in respect of it. Item 7 has not been previously approved through the PCC process and was therefore referred to as a 'derogation'. We have used this terminology when explaining the details of it below.

5.3.3 The Item 7 agreed resolution specifically relates to changes to the pressure regimes in the 14 four-bedded rooms, however the wording used in the agreed resolution also refers to an air change rate at 4 ac/hr.

5.3.4 Of these 14 rooms, four of them were located in Critical Care. These were four of the rooms identified by IOM in their report dated 15 July 2019, along with the single bed cubicles, as not being in compliance with SHTM 03-01, and specifically the required 10 ac/hr rate, ultimately leading to the Delay in the Hospital opening.

5.3.5 All versions of the EM provided to us, which detailed the air change rates being applied to each respective room within the hospital, referred to an air change rate of 4 ac/hr for the Critical Care bedrooms, notwithstanding the guidance note in the IPTD EM and Project Agreement EM versions (referred to at paragraph

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[140] Schedule 1, Part 1, Technical Schedule of the Project Agreement (Page 30)

[141] We understand from NHSL that the details of this agreed resolution were those contained within Project Co notice of change dated 14 May 2018

[142] Project Co notice of change dated 14 May 2018, Section 1.0. Document reference: 180522 Schedule 16 Project Co Change Notice No 051

4.4.10) which referred to an air change rate of 10 ac/hr. Therefore this agreed resolution in the Settlement Agreement did not in effect ever change the air change rate that had been detailed in the EM, albeit it was in effect, inadvertently, 'approving' an air change rate in these rooms of 4 ac/hr.

Background to the agreed resolution

5.3.6 As mentioned above in paragraph 4.3.22, we have seen evidence that issues with ventilation in respect of bedrooms, albeit not specific to single or multi-bed rooms, were raised by the Board[143] as far back as October 2014. We understand from conversations with NHSL and Mott MacDonald that, as a result of these comments having been made, there were ongoing discussions relating to ventilation design. From the evidence of the continued correspondence between the Project Team and Project Co that we have been provided, there is no direct reference to four-bedded rooms until September 2016. Prior to this all references had been made to 'bedrooms' or 'single bed rooms'.

5.3.7 Project Co raised two derogation requests, dated May and July 2016 respectively[144], which specifically referred to single bedrooms. Mott MacDonald's response on behalf of the 'Board'[145] in September 2016[146] rejected the derogations and, whilst the derogations referred only to single bedrooms, NHSL's response included a specific reference to a four-bedded room[147]. We note that NHSL's response asked Multiplex if the Project Co could "*confirm how compliance with SHTM in relation to air change rates, balanced ventilation and room heat recovery [would] be met."* It is from this point in time that reference

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[143] We understand from Mott MacDonald that the 'Board' in this context refers to both themselves and the Project Team and not the ultimate NHSL Board.
[144] Document reference (WW014): 03.06.16 Copy of 20160525 Derogation Deliverables - WW014. Document reference (WW015): 26.07.16 Derogation Deliverables - WW015-1
[145] We understand from Mott MacDonald that the 'Board' in this context refers to both themselves and the Project Team and not the ultimate NHSL Board.
[146] Document reference:160922 MM-GC-002006 - Boards rejection of WW014 and WW015
[147] "*4 bedded room 1-L1-100*". Document reference:160922 MM-GC-002006 - Boards rejection of WW014 and WW015.

appears to have been explicitly made to air pressure in multi-bedded rooms[148] as well as single bedrooms.

5.3.8 We understand from NHSL that, in late 2016, following one of the ventilation design workshops to discuss the ongoing ventilation issues, the Project Team highlighted to the clinical team that the air pressure for the four-bedded rooms had been designed to be positive. We understand that due to the Project Team's prior clinical experience, they were aware that this would not allow for patients to be cohorted with the same infection; in direct contravention to the practical requirements of those rooms.

5.3.9 Project Co had classified all four-bedded rooms as 'general wards' in respect of the pressure regime, under the guidance provided in the table illustrated at Figure 1, page 33, and thus felt that the rooms having positive pressure had been designed in compliance with SHTM 03-01 pressure requirements given that no pressure regime was specified in the guidance for 'general wards'. However we understand from NHSL that they and their advisors were of the view they should be classified as having the same function as a 'single room' under the guidance, and should achieve balanced or negative pressure.

5.3.10 We understand from NHSL that the Project Team, including the clinical team members, met with Project Co in order to discuss this issue. Following this meeting, discussions were held with the Children's Clinical Management team which included a Director, Associate Medical Director, Nurse Director and two Clinical Nurse Managers (noting that this was only an issue for the Children's Hospital and not DCN). The basis of these conversations were the implications of not being able to cohort patients and whether this was something they could manage with, without a change being made to the air pressure regime. We understand that the focus of these discussions were on the air pressure regime, and its impact on operational matters.

[148] The terminology 'multi-bedded rooms' and 'four-bedded rooms' is used interchangeably

5.3.11 As the above discussions confirmed that it was not possible to cohort patients and, in turn, use the rooms as needed without a change to air pressure, the clinical team undertook a risk assessment on 5 July 2017. Such risk assessments were required in respect of any proposed changes to the project design which may result in impact to patient care. The risk assessment was in effect an operational review, as opposed to a technical assessment, and required input from the various specialists who were party[149] to the original discussions in order to accurately reflect the discussed risks in the document itself.

5.3.12 The output of the risk assessment was discussed with Project Co. However, Project Co stood by its view that the design as it stood was compliant with SHTM 03-01 and therefore did not agree to a PCC, being the only way to formally agree a change to the design. This was detailed in the Programme Board Paper 'Compliance Issues and Commissioning Delay' dated 24 July 2017[150]:

> "*Ventilation to 4 bedded rooms – PCo design is based on an interpretation of a table contained in guidance where they have applied the ventilation regime for a general ward to the 4 bedded rooms. NHS Lothian, HFS Principal Engineer, the boards Authorising Engineer and Technical Advisors strongly disagree with this interpretation. A risk analysis has been carried out by the Clinical Director and the clinical Project Managers in collaboration with the Clinical Management Team and this work is felt to be essential in order for the new hospital to function safely and at optimal levels. Without the ventilation in the 4 bed rooms being installed correctly these areas will not be able to cohort and safely manage the influx of small children over the winter with infectious respiratory disorders as well as new and emerging conditions and also reduce the future proofing for these services."*[151]

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[149] Parties involved are set out in an email dated 6th July 2017 'RE: Risk Assessment re 4 bedded room Ventilation'
[150] Document reference: Compliance Issues and Commissioning Delay 240717 FINAL
[151] Point 5.2. Document reference: Compliance Issues and Commissioning Delay 240717 FINAL

"Two 'without prejudice' meetings have now been held, chaired by IHSL with two of their Directors present, to see if the two parties, NHS Lothian and Multiplex, can come to some agreement on the way forward. These meeting follow numerous meetings between the respective technical teams and copious amounts of correspondence. To date there has been no movement from either side with both sides believing their interpretation/analysis is correct."[152]

5.3.13 In January 2018, given that there had been a number of months without progression on this matter, the Project Team asked the clinical team to revisit the original risk assessment to validate that it remained correct. The outcome of the updated risk assessment remained the same, being that 13 rooms required a change to their air pressure (three of which were in critical care) [153]. This dispute remained and, as such, was brought into the Settlement Agreement (see further details in the Section below).

Approval of the agreed resolution

5.3.14 As part of the Settlement Agreement, Project Co agreed to amend the pressure in 14 rooms[154], with the agreed resolution detailed in the Technical Schedule ("**TS**") of the Settlement Agreement reading as follows:

"The resolution of the Dispute submitted by Project Co through the Schedule Part 8 (Review Procedure) and agreed by the Board, is for 14 No 4 bed rooms to be balanced or negative to the corridor at 4 ac/hr"[155]*.*

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[152] Point 5.4. Document reference: Compliance Issues and Commissioning Delay 240717 FINAL
[153] Record of General Risk Assessment, dated 28 January 2018. 13 rooms consisting of 7 for which it was "*essential"* to change, and 6 for which it was "*desirable*" to change.
[154] We understand from NHSL that one additional room was included in the Settlement Agreement, compared to the 13 rooms listed in the risk assessment
[155] Settlement Agreement, Schedule 1, Part 1, Technical Schedule, Item 7 page 30

5.3.15 The agreement was detailed in the document *'Multi Bed – Ventilation Amendment Proposal to Achieve Room Balance'*[156] which showed the 14 room numbers included. Whilst this document did not explicitly state that four of these were Critical Care rooms, the room number prefixes for Critical Care all start '1-B1' as opposed to a different letter. The proposed solution detailed for all four rooms stated "*retain the supply ventilation at 4ac/hr…*". This document was approved at 'Level A'[157] through the RDD process[158] in July 2018, the process for which includes review by Project Co, the Project Team, clinical teams and Mott MacDonald. We have seen no evidence that the air change rate of 4 ac/hr being applied to the Critical Care rooms was questioned during these reviews.

5.3.16 The approved document referred to in the paragraph above was then incorporated into the TS that ultimately formed part of the Settlement Agreement. We have detailed in Section 6.4 the governance arrangements in relation to approving of the Settlement Agreement and associated TS, and the extent of the awareness by the NHSL Board, and associated project committees, of the professional and technical advice sought in approving the content of the resolutions contained in the TS.

5.4 Summary

5.4.1 We have seen evidence of professional and technical advisors being involved throughout the Project. This included specific involvement in relation to ventilation issues.

5.4.2 We have not been instructed, and it is not within our area of expertise, to consider the responsibility of external professional or technical advisors to identify the Issue[159].

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[156] Document reference: WW-SZ-XX-DC-XXX-010 Rev 7 Status A

[157] Signed by NHSL and Project Co on 26 July and 27 July 2018 respectively

[158] RDD process – in accordance with the levels as set out in the Project Agreement, Schedule Part 8 (Review Procedure), Clause 4.3 (page 239): Level A: No Comment, Level B: Proceed subject to Amendment as noted, Level C: Subject to amendment as noted, Level D: Rejected

[159] As defined in Section 2.2.1

5.4.3 However, in any event, we have seen no evidence that professional or technical advice identified the Issue prior to June 2019.

6 Governance and escalation arrangements

To establish the governance arrangements that were in place in relation to the Project and the line of sight of NHSL and SG, along with the escalation arrangements to NHSL and SG.

6.1 Introduction

6.1.1 In this Section, we consider the structure of the governance arrangements that were in place for the Project from the point of the Project Agreement onwards, and how matters were escalated through this structure to the NHSL Board and, ultimately, to SG. This is addressed in Sections 6.2 and 6.3 and in Section 6.4 we detail the escalation specifically in respect of the Delay.

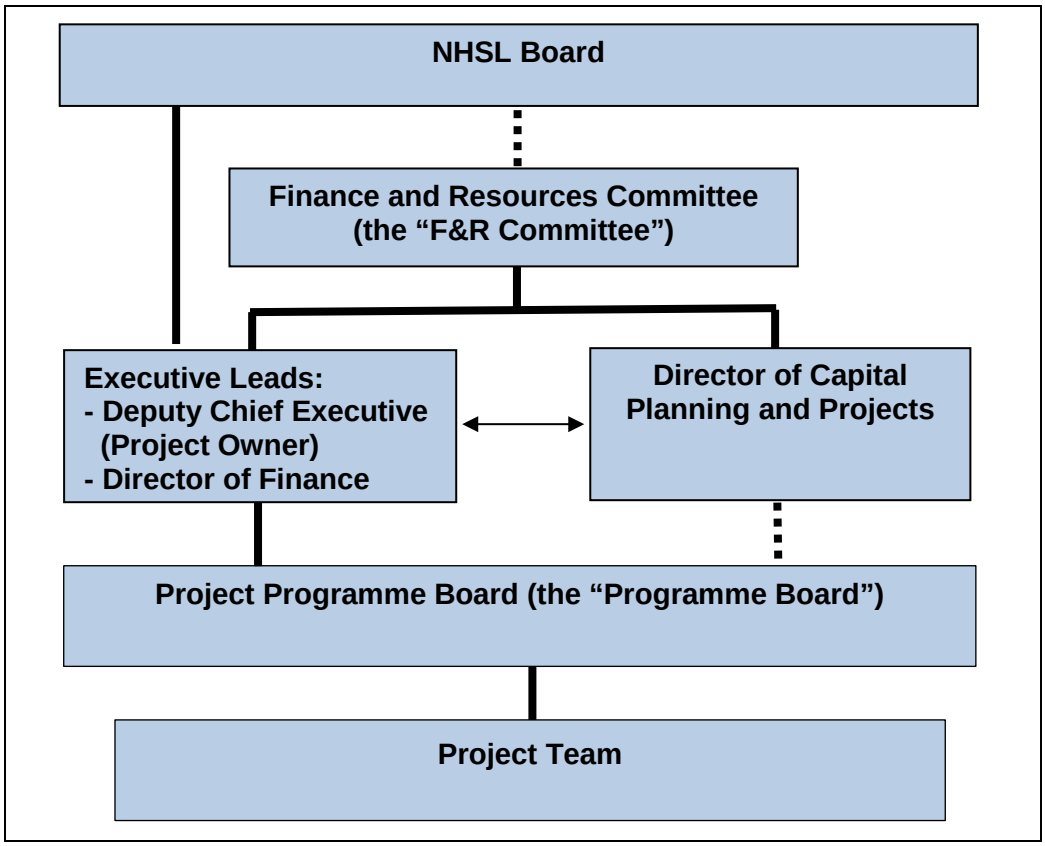
6.1.2 In undertaking our review of the governance and escalation processes, we have, to the extent that the information was available to us allows, sought to obtain evidence that these processes were working in practice.

6.1.3 As set out in Section 5.3, the Settlement Agreement specifically addressed two of the agreed resolutions which were pertinent to the Delay. As such, in Section 6.4, we have also separately presented the governance arrangements which, we understand from our discussions and document review, were in place in relation to the Settlement Agreement and its implementation.

6.2 Governance and escalation structure within NHSL

6.2.1 The governance structure for the Project within NHSL is set out in the diagram below:

Figure 2: Governance structure



6.2.2 We set out further information in relation to each party in the governance structure and their respective interactions with other parties in the paragraphs which follow.

6.2.3 This summary is compiled from interviews performed during the course of our work, together with a review of available documentation, including minutes of the NHSL Board, Programme Board and F&R Committee. The minutes we have

seen indicated that the governance structure was operating in line with that described and issues were being escalated through the appropriate channels.

Project Team

6.2.4 The Project Team, led by the Project Director, is responsible for the day-to-day Project activities and is located at the Hospital site. The Project Director provides a monthly presentation to the Programme Board, detailing progress on the Project and areas of non-compliance, along with next steps in terms of Project activities.

6.2.5 We are advised by NHSL that individuals were selected for the Project Team on the basis of their experience, both in their specialism and involvement in other projects. The Project Team includes individuals with diversified specialisms, including those with engineering, clinical, medical and operational backgrounds. The Project Team also includes technical advisors from Mott MacDonald.

Programme Board

6.2.6 As set out in Section 3 above, the Programme Board comprises of the Project Team as well as representatives from clinical and operational areas, the Deputy Chief Executive, the Director of Finance, the Director of Communications, an NHSL Non-Executive Director, a representative from SG and other stakeholders.

6.2.7 We understand that the Programme Board is responsible for oversight of the Project. Specifically, this involved:

a) Creation of a business case for the Project for approval by the F&R Committee and the NHSL Board;

b) Ownership of the procurement process and tender documentation, and the selection of three bidders (the final selection of the preferred bidder was performed by the F&R Committee); and

c) Oversight of the Project through to commissioning and completion.

6.2.8 The specific Terms of Reference ("**TOR**") for the Programme Board changed over time as the Project evolved from the tender stage, through to the construction of the Hospital and beyond.

6.2.9 The Programme Board meets on a bi-monthly basis, although we are advised by NHSL that ad-hoc meetings were also held during the course of the Project, as required. The Programme Board receives a progress update from the Project Director at each meeting. In our discussions with NHSL personnel, we were informed that any actual or potential issues in respect of the Project (including the technical details) would be discussed and challenged by the Programme Board. Further, we were advised that solutions put forward by the Project Team would also be challenged and either supported or rejected by the Programme Board.

6.2.10 Matters or recommendations that needed to be escalated were typically referred to the Director of Finance as one of the two Executive Leads (the other being the Project Owner (the Deputy Chief Executive)), or the DCPP . Issues escalated would include significant changes to design, cost escalation, issues of non-compliance identified and any matters where an opinion or a decision was required from the Executive Leads. The respective Executive Lead would escalate this to the NHSL Board and also inform the F&R Committee if the issue had an impact on the financing of the Project or its duration.

6.2.11 We were advised by NHSL that, during the course of a project, it is normal practice for the Executive Leads to regularly attend the Programme Board meetings. Due to the nature of the issues that were being raised on this Project, one or more of the Executive Leads attend the bi-monthly meetings, with the Deputy Chief Executive typically chairing the meetings.

F&R Committee

6.2.12 The F&R Committee comprises:

a) Four executive directors (who were also members of the NHSL Board); and

b) Seven non-executive directors.

6.2.13 It is our understanding that the F&R Committee has delegated authority from the NHSL Board in relation to financial governance, property and asset management strategy and strategic capital projects (such as the Hospital). The F&R Committee meets on a bi-monthly basis and its remit is to ensure that value for money is obtained from projects.

6.2.14 In advance of the F&R Committee's bi-monthly meetings, a paper called the Property and Asset Management Investment Programme ("**PAMIP**") is prepared by the DCPP for discussion at the F&R Committee. This document provides an independent view of all projects overseen by the F&R Committee and gives an update on the status of the Project and any issues identified which require the F&R Committee's consideration. The DCPP receives updates from the Programme Board and/or Project director on the status of the Project for the purpose of compiling this report.

6.2.15 We were advised by NHSL that, as the problems with the Project started to escalate around November 2015, supplemental documents were prepared by either the Project Director, DCPP or the Director of Finance, outlining these issues and recommendations which were submitted to the F&R Committee along with the PAMIP.

6.2.16 We were advised by NHSL that the papers submitted by the DCPP for any project should provide a level of assurance on specific individual matters. This level of assurance is determined by reference to NHSL's assurance model. This model provides a rating indicating the level of assurance attributed to the issue or action, being "Significant", "Moderate", "Limited", "None" or "Not Assessed Yet". This rating is included in any recommendations made to the F&R Committee. We have seen examples of this rating being given on some, but not all, of the documents we have reviewed. We understand from our discussions that, the F&R Committee would concentrate its review on those areas where the assurance rating attributed was "Moderate" or below.

6.2.17 A copy of the PAMIP and associated documents, together with a copy of the F&R Committee minutes, are approved by the NHSL Board (although, as noted above,

there is significant overlap between the members of the Programme Board, F&R Committee and the NHSL Board in any event).

6.2.18 A Risk Register is also provided to the F&R Committee. This is completed by the Project Director and uses a "RAG"[160] rating system to assess the risks identified and associated with the Project. A copy of the Risk Register is provided to the F&R Committee for review and to inform its view of the overall level of assurance and/or risk attached to the Project.

6.2.19 As noted above, the Programme Board does not report directly to the F&R Committee. Instead, the Executive Lead for the Project updates the F&R Committee in relation to key issues that have arisen with the Project, such as issues leading to instigation of the Dispute Resolution Process (**"DRP"**) and any significant changes to design. The F&R Committee also approves the business case for the Settlement Agreement, which is discussed in more detail in Section 6.5.

6.2.20 While the Programme Board does not have a direct reporting line to the F&R Committee, the F&R Committee does have clear sight of the operation and status of the Project and the issues that are being identified. We were advised by NHSL that, the F&R Committee provide challenge and ask questions in relation to the Project, which would normally be answered by either the DCPP or the Director of Finance (who is also a member of the F&R Committee). The technical information provided to the F&R Committee is less granular than at Programme Board level.

NHSL Board

6.2.21 As detailed above, the NHSL Board delegated its authority for the Project to the F&R Committee. The F&R Committee does not formally report into the NHSL Board. However, there is significant overlap in terms of membership.

[160] Rating methodology: "Red, Amber, Green"

6.2.22 While the NHSL Board has delegated authority to the F&R Committee, the minutes of the F&R Committee are reviewed and approved by the NHSL Board. As such, the NHSL Board has oversight of the status of the Project and any issues raised.

6.2.23 Issues escalated by the Programme Board to the Executive Leads for the Project are formally discussed with the NHSL Board. The NHSL Board either provide support to help resolve the position, or accept or reject recommendations made to it after discussion of the issue.

6.2.24 The Programme Board submits papers to the NHSL Board containing recommendations for the NHSL Board's consideration. An example of this was the Programme Board suggesting that the DRP should be implemented following issues of non-compliance having been identified on the Project.

6.2.25 The NHSL Board raise challenge and questions on papers presented in respect of the Project. However, this is not a technical level of challenge. The papers submitted to the NHSL Board make reference to the technical advice provided by professional advisors on the Project. We were advised that it is not expected that the NHSL Board will review the technical advice in detail.

6.3 Escalation process for reporting to Scottish Government

6.3.1 We understand that quarterly meetings are held between the DCPP, the Head of Property and Asset Management Finance (both of NHSL) and a representative from SG's Health Finance and Infrastructure team[161].

6.3.2 These quarterly meetings are in relation to all projects being undertaken by NHSL and primarily focus on the monitoring and future expectations for the funding of major projects.

6.3.3 The meetings (together with written correspondence between NHSL and SG) became more frequent when issues arose on the Project (for example, the dispute which arose between NHSL and IHSL and the Delay), in order to allow

[161] Part of SG's Capital Investment team within the Health and Social Care Directorate

the Cabinet Secretary to be briefed on the position, its potential impact on the financial aspects of the Project, and the proposed course of action.

6.3.4 We were advised by NHSL that a representative from SG has a formal role on the Programme Board. However, whilst they rarely attend in person, they receive a copy of the minutes of these meetings.

6.3.5 In addition to the above meetings, NHSL provide an annual report to the Chief Financial Officer (**"CFO"**) for Health and Social Care at SG, giving an update on ongoing and potential future projects, together with a monthly Finance and Performance report. We understand that there was (and remains) open dialogue between the NHSL Board and the CFO at SG to allow any significant issues to be raised and discussed.

6.3.6 In summary, there is a formal process, in addition to an open dialogue, for the NHSL Board to raise issues with SG.

6.3.7 We were advised by NHSL that, following the Settlement Agreement, there were no issues raised to the NHSL Board in relation to the Project that required escalation to SG, or that would prevent the Hospital opening as planned on 9 July 2019.

6.3.8 In Section 3, we set out the background to the ventilation issue which ultimately prevented the Hospital from opening and how this was communicated through NHSL to SG. As set out at Section 3, once the issues which caused the Delay were brought to the attention of the NHSL Board on 1 July 2019, these were escalated to SG within 24 hours.

6.4 Escalation in respect of the Delay

6.4.1 We note that, due to the urgency of the matter, when it became known, the ultimate escalation of the ventilation issues was made direct to Executive Directors (as members of the NHSL Board) and not through the normal governance structure (by-passing the Programme Board and F&R Committee). However, by virtue of their roles in other parts of the governance structure (as described below), members of the Programme Board and F&R Committee were

automatically involved in the discussions of the options that could be available to resolve the issue and not postpone the move into the new Hospital.

6.4.2 It is clear from the minutes that, ventilation issues regarding air pressure, although not specific to Critical Care, were discussed by the Programme Board and contributed to its recommendation to pursue a DRP, which was accepted by the NHSL Board. This issue was escalated through the normal governance process.

6.4.3 We have seen no discussion of, or reference to, issues specific to air changes in any of the minutes for the respective boards and committee. This is in line with our understanding that, the specific issue (being ac/hr requirements in Critical Care areas not complying with the SHTM 03-01 standard), which gave rise to a decision being made to delay the opening of the Hospital, was not known to NHSL until 24 June 2019, when IOM completed its testing of the ventilation system, and subsequently identified to the NHSL Board on 1 July 2019.

6.5 Governance arrangements in relation to the Settlement Agreement

6.5.1 In this Section, we summarise the governance arrangements that were in place in relation to the Settlement Agreement and its implementation.

Approval of the Settlement Agreement

6.5.2 As referred to in Section 5.3, we were advised by NHSL that the Settlement Agreement contained resolutions to a number of issues which had arisen during the course of the Project. We understand from NHSL that these issues had built up over time and came from a variety of sources, including the residual risk register, Project Co Changes, a list of outstanding works and proposed, but not yet approved, Project Co changes.

6.5.3 We understand from NHSL that, depending on how they had arisen, some of these issues had been subject to discussions between the Project Team, Mott MacDonald and Project Co. Such issues were raised with the Programme Board

and discussed and noted at the time they arose (for example, the ventilation issue relating to pressure in four bedded rooms).

6.5.4 The negotiated solutions to these issues became the TS that was incorporated into the Settlement Agreement. The governance around approval for the TS and the Settlement Agreement are detailed below.

6.5.5 As described in Section 6.2 above, pursuing the DRP was proposed by the Programme Board and approved by the NHSL Board. Once the approval to pursue the DRP was given, discussions centred around the content of the commercial proposal put forward by IHSL to resolve the issues and avoid litigation. This proposal formed the basis of the Settlement Agreement. The F&R Committee approved the Programme Board's recommendation to engage with IHSL to discuss their proposal and, consequently, the business case for the Settlement Agreement. The NHSL Board ratified this decision and delegated responsibility to the F&R Committee to authorise the Director of Finance and Deputy Chief Executive to sign the Settlement Agreement on behalf of NHSL.

6.5.6 The negotiations leading up to the Settlement Agreement were conducted by the "Principals Group", which comprised the Deputy Chief Executive and Director of Finance of NHSL, and Directors from IHSL and Project Co. Others were involved, such as the Project Director and DCPP, as appropriate.

6.5.7 We set out further information in relation to each party in the governance structure and their respective interactions with other parties in relation to the Settlement Agreement in the paragraphs which follow. As before, this summary is compiled from interviews performed during the course of our work, together with a review of available documentation, including minutes of the NHSL Board, Programme Board and F&R Committee. These minutes indicated that the governance structure was operating in line with that described and issues were being escalated through the appropriate channels.

Programme Board

6.5.8 We were advised by NHSL that the issues ultimately included in the TS had evolved over a period of time and been considered by the Programme Board as

they arose. We have seen evidence that, in July 2018, the Programme Board was advised by the Project Director that the TS was to be included as part of the Settlement Agreement.

6.5.9 NHSL advised us that a lot of the items in the TS were being negotiated between the Project Team and Project Co and that, as such, the TS evolved over time, with the items to be included in the TS being discussed between July 2018 and early 2019, prior to the Settlement Agreement being signed. We are advised that the TS discussed with the Programme Board included proposed resolutions to issues that were not "ideal" from NHSL's perspective, but were "safe" for the purposes of moving towards an agreed resolution in order to open the Hospital as soon as practicable.

6.5.10 We were advised that the Programme Board was aware that Mott MacDonald (as technical advisor) was consulted in the drawing up of the TS. This was on the basis that the Project Team had been working closely with the technical advisors on the Project. The Programme Board would be provided with details of each item in the TS so they could review this and raise questions on it.

6.5.11 We are advised that the Programme Board supported and approved the content of the TS within the Settlement Agreement, although there was no formal "sign-off" process for this. In addition, in November 2018, the Project Team identified a further three major issues for inclusion in the proposed Settlement Agreement, being the void detection system, drainage, and heater batteries.

6.5.12 The Programme Board minutes in February 2019 evidence that, by that point, the Settlement Agreement had been updated for these three issues, had been agreed between the parties, and would be signed soon.

F&R Committee

6.5.13 We were advised by NHSL that, the business case for the Settlement Agreement was detailed in a paper dated 25 July 2018, presented to the F&R Committee by members of the Programme Board. Challenges and questions by the F&R Committee were answered primarily by the Project Director and DCPP, but also by the Deputy Chief Executive and Director of Finance, as required. As

mentioned in Section 6.2 above, the business case for the Settlement Agreement was approved by the F&R Committee.

6.5.14 In January 2019, the F&R Committee minutes noted that the Settlement Agreement was to go to the NHSL Board for approval in February 2019.

NHSL Board

6.5.15 As described at paragraph 6.2.19, the F&R Committee provided copies of its minutes to the NHSL Board for review and approval as standard. However, a specific briefing and papers were provided to the NHSL Board by the Director of Finance on 6 February 2019 outlining the Settlement Agreement. Again, this demonstrates the escalation of issues through the governance process. We were advised by NHSL that whilst no technical details were provided regarding the proposed solutions, all papers submitted to the NHSL Board contained reference to the legal or technical assurance that underpinned the solutions. Given the governance structure in place, the technical assurance given in respect of the Settlement Agreement and TS was visible to the NHSL Board.

6.5.16 The NHSL Board minutes from February 2019 evidence that the NHSL Board discussed the draft Settlement Agreement, its terms and the potential risks arising from entering into it. Approval for the Settlement Agreement was granted by the NHSL Board on 6 February 2019 and the Deputy Chief Executive and the Director of Finance were authorised to continue negotiations on its behalf, and for either of them to sign the agreement.

Implementation of the Settlement Agreement

6.5.17 The Settlement Agreement was signed on 22 February 2019. The Hospital was due to open 19 weeks later, on 9 July 2019.

6.5.18 We understand that the implementation of the Settlement Agreement was monitored through weekly on-site meetings between the Project Team and Project Co, and that the Project Team was also on-site to observe the progress being made. At these weekly on-site meetings, Project Co were required to provide a plan of the work they were going to perform over the course of the

following week. We were advised that this gave the Project Team the opportunity to challenge or question the Project Co as appropriate.

6.5.19 In addition, we understand that daily "huddles" were held amongst specialist teams, such as with clinical representatives, who would discuss matters with members of Project Co to resolve any issues identified through commissioning, or to determine when access to certain areas could be obtained. We were advised by NHSL that these regular meetings ensured that progress was being made.

6.5.20 We were advised by NHSL that the above process provided assurance to NHSL that the work that had been agreed was progressing as planned.

6.5.21 NHSL advised that the final level of assurance would be given following the sign-off by the IT. The IT would be providing sign-off based on what was contained in the design specifications. The IT would expect that these design specifications had been agreed by both parties, i.e. NHSL and IHSL/Multiplex. NHSL therefore expected that, as the IT had signed off on the building, there would be no issues when IOM performed its testing. As such, NHSL was surprised when the ventilation system was highlighted to not be performing in line with requirements.

6.5.22 We were informed that, once the issue in relation to air ventilation had come to light through the IOM report, an internal Incident Management Team ("**IMT**") was set up by the NHSL Board to investigate the matters raised in the IOM report and to liaise with IHSL going forward in relation to how these matters could be rectified.

6.6 Summary

6.6.1 The governance processes and procedures surrounding the construction and commissioning of the Hospital operated in line with the structure that was put in place.

6.6.2 There was regular dialogue between NHSL and SG throughout the Project, with evidence of escalation of issues where required, albeit this was more focused on financial rather than technical matters.

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