SCOTTISH HOSPITALS INQUIRY

Provisional Position Paper 8

Narrative concerning the Construction Phase of the Royal Hospital for Children and Young People and the Department of Clinical Neurosciences

Purpose of the Paper

This paper has been produced to assist the Chair in addressing the terms of reference.

It provides a chronological narrative of the 'Reviewable Design Data' process and provides the basis of the Inquiry team's initial understanding of ventilation design development during the construction phase of the Royal Hospital for Children and Young People and the Department of Clinical Neurosciences (RHCYP/DCN).

Readers of this paper should note that section 2 of the Inquiries Act 2005 provides that an inquiry is not to rule on, and has no power to determine, any person's civil or criminal liability. Accordingly, in the context of the Scottish Hospitals Inquiry's investigations into the matters falling within its remit in relation to RHCYP/ DCN, the issue of any liability arising under the Project Agreement is not a question for the Inquiry to rule on or determine. The Inquiry's investigations to date indicate that certain parts of the Project Agreement, and in particular what was (or was not) specified in the Project Agreement as being NHSL's requirements, are controversial. While nothing in this paper should be taken as seeking to determine what the respective civil liabilities of the parties were or may be, it is clearly impossible for the Inquiry to fulfil its terms of reference without having regard to the development of the Project Agreement and the views of the parties involved as to NHSL's requirements. The paper should therefore not be read as offering a view or otherwise commenting on the respective legal rights and obligations of the parties involved.

In due course, the Chair is likely to be invited by the Inquiry Team to make findings in fact based on the content of this paper. It is open to any Core Participant (CP) or indeed any other person holding relevant information, to seek to correct and/or contradict it by way of response. In considering those responses, and in taking forward its investigations, it is therefore possible that the Inquiry's understanding of matters may change. If it is the case that the Inquiry's understanding does change significantly, a revised edition of this paper may be issued in due course.

While it is possible that the matters covered in this paper will be touched upon to a greater or lesser extent at a subsequent hearing held by the Inquiry – something that may also change the Inquiry's understanding of matters – this is not guaranteed, and

if parties wish to address the issues dealt with in this paper, they are invited to do so now. If they do not do so, as noted above, the Chair is likely to be invited by the Inquiry Team to make findings in fact based on the content of this paper.

Those responding to the paper should be aware that it is likely that the responses received will be published on the Inquiry's website, or otherwise made publicly available, after the deadline for responses has passed.

Contents

Glossary

ac/hr	air changes per hour (air change rate for ventilation)
CAMHS	Child and Adult Mental Health Service
DCN	Department of Clinical Neurosciences
DGHSC	Director General of Health and Social Care
DSSR	Engineering Consultants
EM	Environmental Matrix
FC	Financial Close
FM	Facilities Management
HAI-Scribe	Healthcare Associate Infection Systems for Controlling Risk in the Built Environment
HDU	High Dependency Unit
HFS	Health Facilities Scotland (part of National Services Scotland)
IHSL	Integrated Health Solutions, Lothian, the Project Company or private partner to NHSL to deliver the new hospital.
IOM	Institute for Occupational Medicine, third party validators for ventilation
IPC	Infection Prevention and Control
IPCT	Infection Prevention and Control Team
IT	Independent Tester
ITU	Intensive Treatment Unit (also referred to as Intensive Care Unit)
NHSL	National Health Service Lothian
NNU	Neonatal Unit
MM	Mott MacDonald, NHSL's technical advisors
MPX	Brookfield Multiplex
PICU	Paediatric Intensive Care Unit
PG	Production Group (Clinical User Groups)
PG RDD	Production Group Review Procedure for Clinical User Groups
Project Co	Project Company (IHSL and its extended supply chain)
RDD	Reviewable Design Data

RDS	Room Data Sheets
RFI	Request for Information
RHCYP	Royal Hospital for Children and Young People (name given to the new children's hospital)
SA1	Settlement Agreement 1 (Project Agreement Supplementary Agreement 1)
SG	Scottish Government
SHBN	Scottish Health Building Notes
SHFN	Scottish Health Facility Notes
SHTM	Scottish Health Technical Memorandum
SHPN	Scottish Health Planning Notes
QEUH	Queen Elizabeth University Hospital

1. Introduction

1.1 This narrative provides a chronological overview of events during the RHCYP/DCN construction phase.

1.2 At the conclusion of the Project Agreement, and with the arrival of the contractor Multiplex (MPX) on site on 16 February 2015, the RHCYP/DCN reprovision project entered the construction phase with a proportion of the design still to be agreed, including some of the room environmental conditions contained in the Environmental Matrix (EM).

1.3 This was made possible by a provision in the Project Agreement which allowed for the parties to categorise elements of unfinished design work as ‘Reviewable Design Data’ (RDD).

1.4 The Review Procedure for RDD is an iterative process of review and sign-off by the client of contractor proposals, ending with approval of the final design.

1.5 Design proposals were to be presented to NHSL at staged intervals during construction, according to an agreed schedule provided by IHSL. NHSL was required, within a contractually agreed timescale, to either reject the proposal or approve to proceed to construction with or without comments.

1.6 The levels of endorsement are:

- "Level A – no comment" - An endorsed document with no further comments/amendments.
- "Level B - proceed subject to amendment as noted"; Project Co to make amendments as noted and continue next level of design or to implement the works without re-submitting documents.
- "Level C - subject to amendment as noted"; do not act upon the Submitted Item, amend the Submitted Item in accordance with the Board's Representative's comments and re-submit the same to the Board's Representative within 10 business days.

- "Level D - rejected"; do not act upon the Submitted Item, amend the Submitted Item and re-submit the Submitted Item to the Board's Representative within 10 business days.

1.7 The Inquiry has already heard how at least part of the Environmental Matrix came to be included within the RDD Schedule in the Project Agreement.

1.8 By virtue of section 2 of the Inquiries Act 2005, the issue of any liability arising under the Project Agreement is not a question for the Inquiry to rule on or determine. The Inquiry acknowledges that the certain parts of the Project Agreement, particularly what was specified in the Project Agreement as being NHSL's requirements, are controversial. While nothing in this paper should be taken as seeking to determine what the respective civil liabilities of the parties were or may be, it is clearly impossible for the Inquiry to fulfil its terms of reference without having regard to the development of the Project Agreement and what the perceptions as to NHSL's requirements were. Similarly, the Inquiry team understand that the Environmental Matrix contained 'discrepancies', where the parameters for ventilation it contained differed from those recommended in SHTM 03-01 and these are examined not for the purpose of determining the respective rights and obligations of the parties but to enable the Inquiry to fulfil its terms of reference.

1.9 SHTM 00 "Best practice guidance for healthcare engineering – policies and principles" states that the purpose of SHTM is to ensure everyone concerned with the management, design, procurement and use of a healthcare facility understands the requirements of the specialist, critical building and engineering technology involved.

1.10 SHTM 03-01 sets out guidance on ventilation for health care premises. It states that specialised ventilation is required for "critical areas and high-dependency units of any type" and provides the specific design information within Table A1 of Appendix 2.

1.11 The specific design information contained in Table A1 covers all the key parameters of the ventilation system. Of relevance to the issues discussed in this paper, Table A1 of SHTM 03-01 states the following recommendation:

- ‘General Ward’: 6ac/h (supplied naturally or mechanically), no particular pressure regime.
- ‘Single room’: 6ac/h (supplied naturally or mechanically), with a balanced (or negative) pressure relative to the adjoining space.
- ‘Neutropenic patient ward’: 10ac/h (mechanical supply only) and a positive pressure of +10 pascals relative to adjoining space.
- ‘Critical care areas’: 10 ac/h (mechanical supply only) and +10 pascal positive pressure relative to adjoining space.

Extract from SHTM 03-01 Appendix 1 Table A1:

Health Facilities Scotland — *SHTM 03-01: Part A – Design and Validation* — NHS National Services Scotland

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

1.12 The rooms in which a non-compliance with published guidance is understood to have caused the delay to the opening of the new facility in July 2019 were the 4

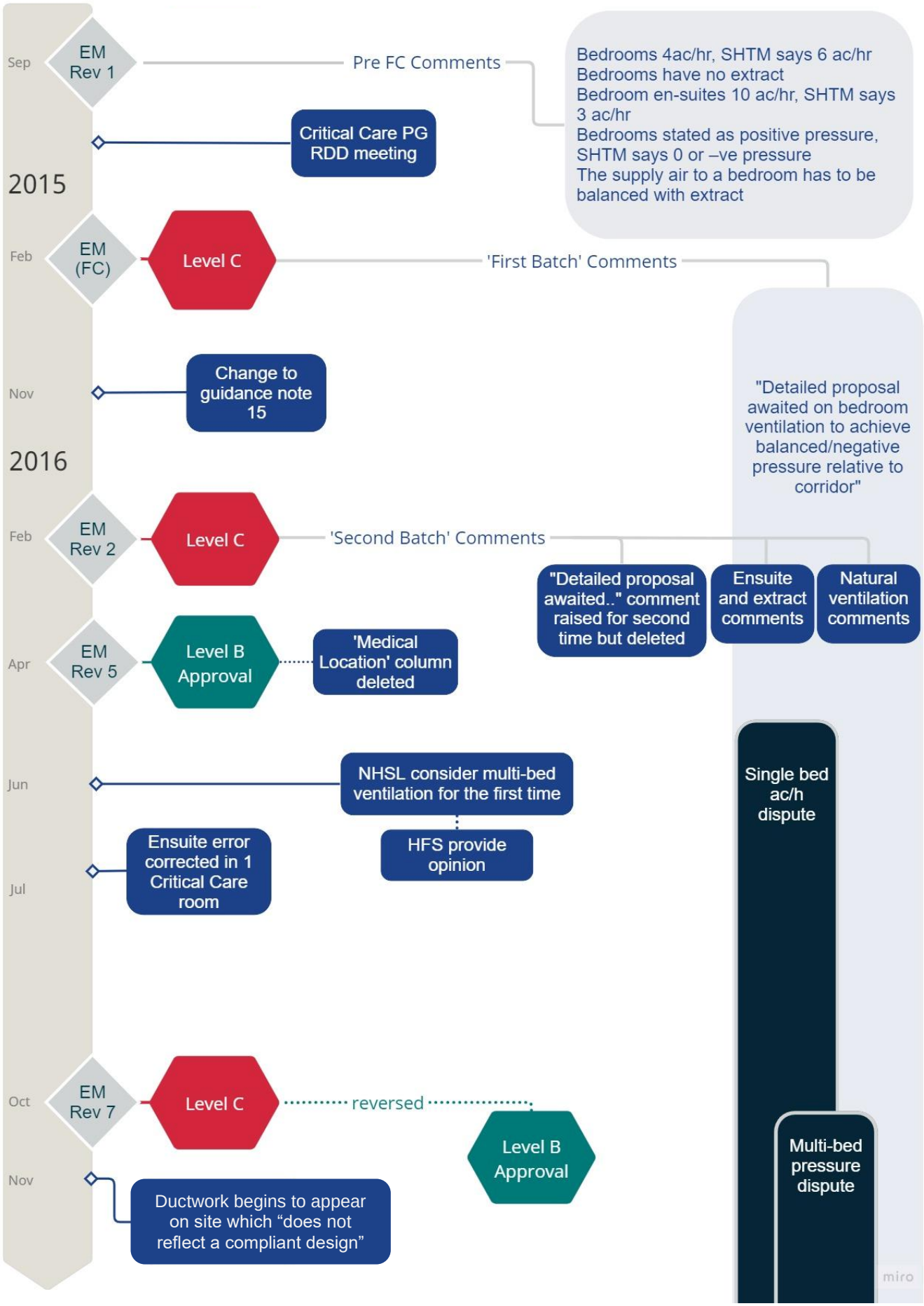
multi-bed rooms and 5 single-bed rooms in the B1 Paediatric Intensive Care Unit (PICU), High Dependency Unit (HDU) and Neonatal Unit (NNU) (Critical Care):

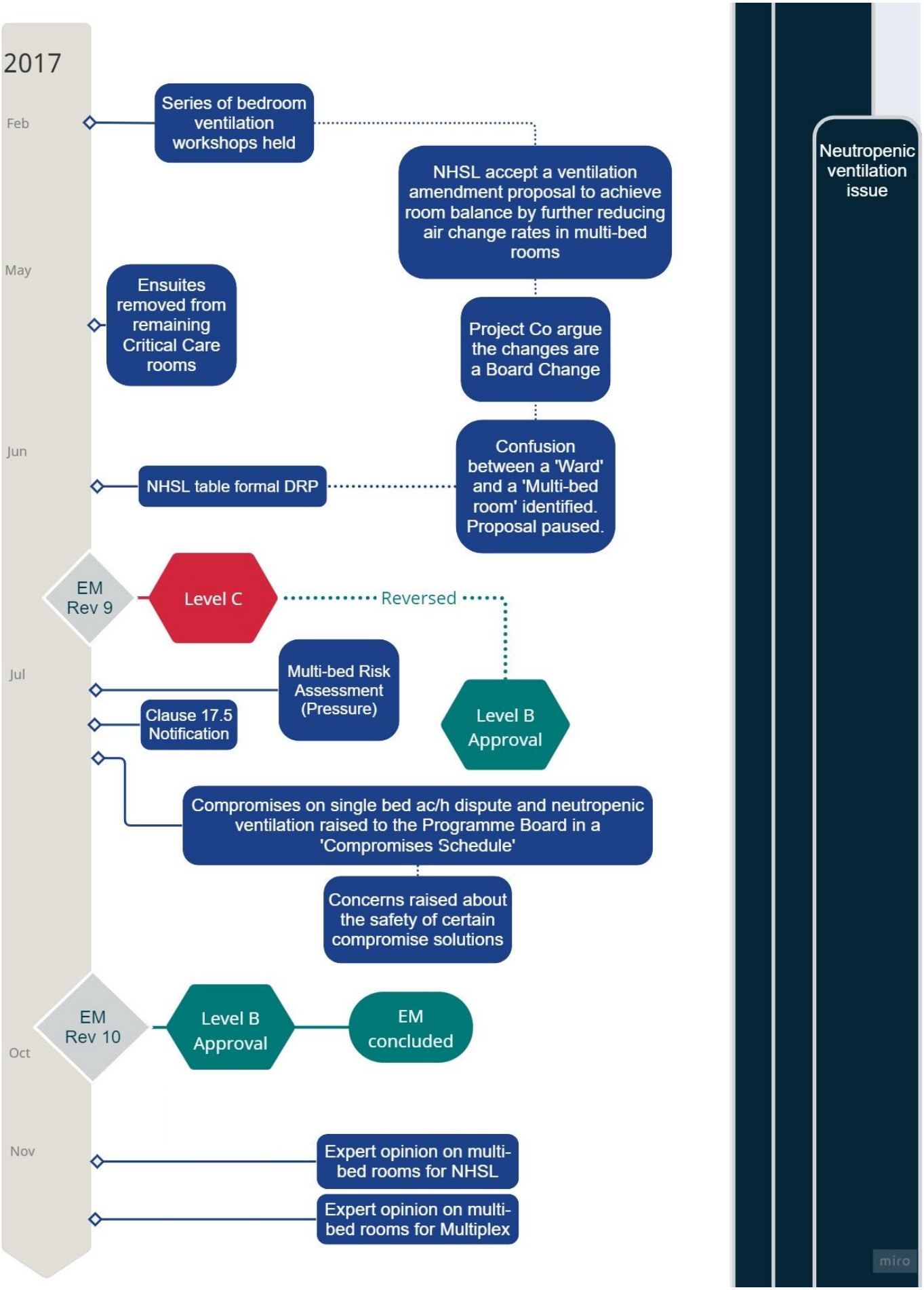
Department	Room Name	Room Number
B1 PICU/HDU/ NNU	Single-bed cubicle	1-B1-019
	Single-bed cubicle	1-B1-020
	Single-bed cubicle	1-B1-021
	Single-bed cubicle	1-B1-037
	Single cot cubicle (with ensuite)	1-B1-075
	Open Plan Bay (4 beds)	1-B1-009
	Open Plan Bay (4 beds)	1-B1-031
	Open Plan Bay (4 beds)	1-B1-063
	Open Plan Bay (3 cots)	1-B1-065

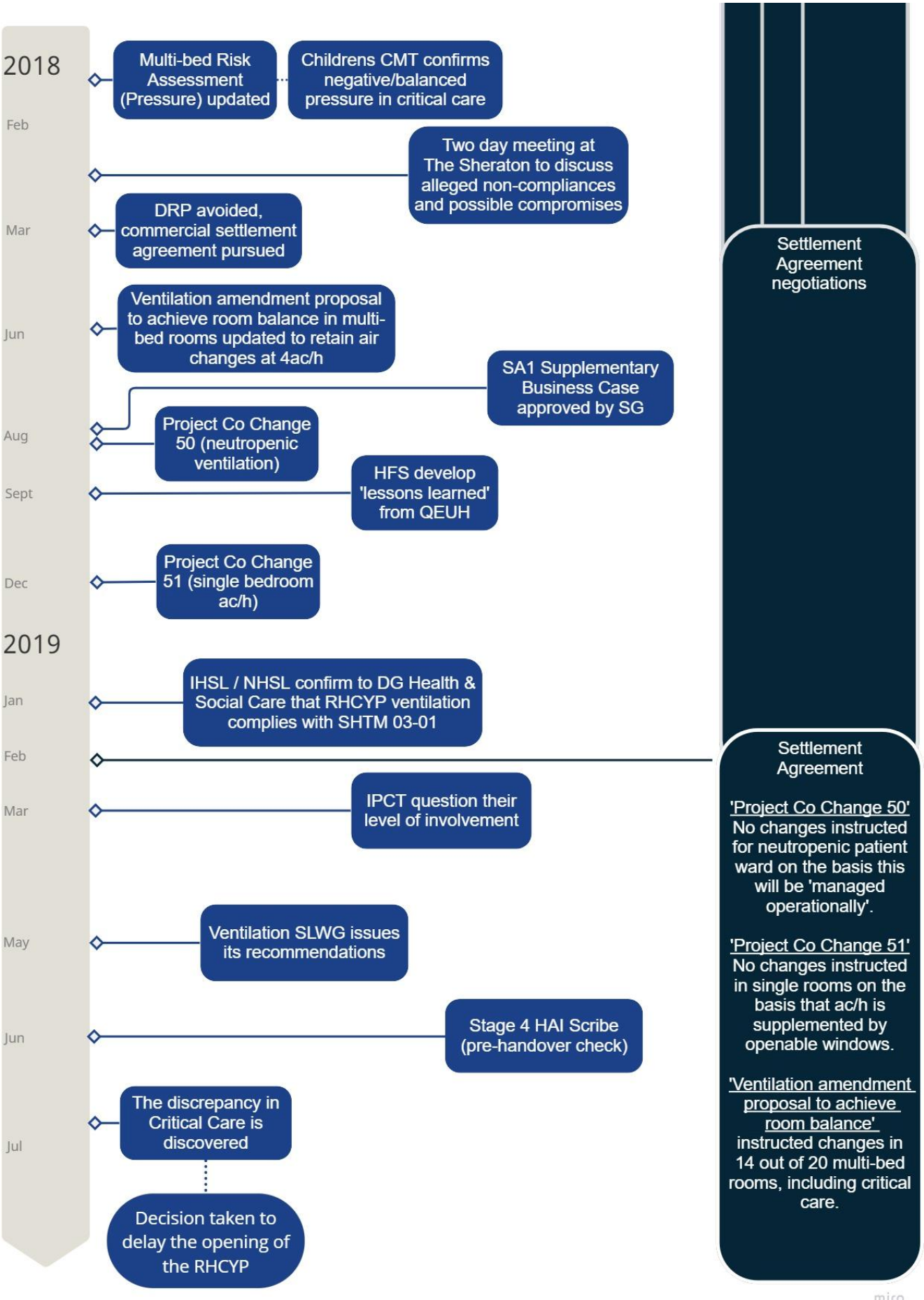
1.13 It is the Inquiry's provisional understanding that the primary cause of the delay to the opening of the RHCYP/DCN was a non-compliance with the air change rates recommended for those Critical Care areas. For clarity, unless stated otherwise or where quoted directly, 'non-compliance' as it is referred to throughout this paper means non-compliance with the published guidance SHTM 03-01. The term should not be interpreted as suggesting any non-compliance with contractual requirements.

1.14 The contractual requirements in the Project Agreement are controversial, therefore the very issues of whether there was a non-compliance and, if so, whether it amounted to an error, are also controversial.

2. Timeline of the Construction Phase




2017
Feb
Series of bedroom ventilation workshops held
NHSL accept a ventilation amendment proposal to achieve room balance by further reducing air change rates in multi-bed rooms
May
Ensuites removed from remaining Critical Care rooms
Project Co argue the changes are a Board Change
Jun
NHSL table formal DRP
Confusion between a 'Ward' and a 'Multi-bed room' identified. Proposal paused.
EM Rev 9
Level C
Reversed
Jul
Multi-bed Risk Assessment (Pressure)
Clause 17.5 Notification
Level B Approval
Compromises on single bed ac/h dispute and neutropenic ventilation raised to the Programme Board in a 'Compromises Schedule'
Concerns raised about the safety of certain compromise solutions
EM Rev 10
Oct
Level B Approval
EM concluded
Nov
Expert opinion on multi-bed rooms for NHSL
Expert opinion on multi-bed rooms for Multiplex
Neutropenic ventilation issue
miro


2018
Feb
Multi-bed Risk Assessment (Pressure) updated
Childrens CMT confirms negative/balanced pressure in critical care
Two day meeting at The Sheraton to discuss alleged non-compliances and possible compromises
Mar
DRP avoided, commercial settlement agreement pursued
Jun
Ventilation amendment proposal to achieve room balance in multi-bed rooms updated to retain air changes at 4ac/h
SA1 Supplementary Business Case approved by SG
Aug
Project Co Change 50 (neutropenic ventilation)
Sept
HFS develop 'lessons learned' from QEUH
Dec
Project Co Change 51 (single bedroom ac/h)
2019
Jan
IHSL / NHSL confirm to DG Health & Social Care that RHCYP ventilation complies with SHTM 03-01
Feb
Mar
IPCT question their level of involvement
May
Ventilation SLWG issues its recommendations
Jun
Stage 4 HAI Scribe (pre-handover check)
Jul
The discrepancy in Critical Care is discovered
Decision taken to delay the opening of the RHCYP
Settlement Agreement negotiations
Settlement Agreement
'Project Co Change 50'
No changes instructed for neutropenic patient ward on the basis this will be 'managed operationally'.
'Project Co Change 51'
No changes instructed in single rooms on the basis that ac/h is supplemented by openable windows.
'Ventilation amendment proposal to achieve room balance'
instructed changes in 14 out of 20 multi-bed rooms, including critical care.
miro

3. Narrative of the Construction Phase

3.1 The Environmental Matrix at Financial Close

3.1.1 By Financial Close the EM (dated 13 February 2015) had not yet been approved by the Board. It was included in the schedule of Reviewable Design Data and was still undergoing a review process, which involved Project Co addressing comments received from the Board.

3.1.2 Whether the Environmental Matrix in its entirety was RDD, and therefore subject to the Review Procedure, is controversial. However, the Inquiry notes the following Board Comments were included in the RDD Schedule:

> "a. Bedrooms 4ac/hr, SHTM says 6 ac/hr
> b. Bedrooms have no extract
> c. Bedroom en-suites 10 ac/hr, SHTM says 3 ac/hr
> d. Bedrooms stated as positive pressure, SHTM says 0 or –ve pressure
> e. The supply air to a bedroom has to be balanced with extract e.g:
>
> Bedroom area 19m2 and 2.4m high = volume 45.6m3 x 6ac/hr =273.6 m3 / hr
>
> En-suite area 5 m2 and 2.4m high = volume 12.0m3 x 3ac/hr = 36 m3 / hr
>
> To achieve balanced pressure within room bedroom extract required = 273.6 – 36 = 237.6 m3 / hr"

3.1.3 Project Co partially addressed the above comments as follows:

a. Not addressed
b. Not addressed
c. Not addressed
d. Addressed for single bedrooms (but not multi-bed rooms)
e. Addressed for single bedrooms (but not multi-bed rooms)

3.1.4 The relative pressure column had been changed for all single bedrooms from "positive to ensuite" to "balanced", though continued to reflect 4ac/h supply with

extract “via ensuite”. Multi-bed rooms were unchanged, remaining as per the pre-financial close version of the EM with relative pressure “positive to ensuite”, 4ac/h supply and extract “via ensuite”.

3.1.5 The table below demonstrates the room environmental conditions for Critical Care following the changes made in response to the Board comment. Where a value has been changed by Project Co from the previous iteration, shading has been applied to that cell. The changes made to the EM in respect of Critical Care bedrooms did not comply with SHTM 03-01 recommendations.

Environmental Matrix at Financial Close (February 2015)

Dept Name	Room Name	Room Function	ADB Code		Ventilation				
					Ventilation Type	Supply ac/hr	Extract ac/hr	Relative Pressure	Min Filtra-tion
B1 PICU HDU	Open Plan Bay (4 beds)	Multi-bed Wards	B1609-01 (also B1609-02)	**Actual**	**Natural and Central Supply Air**	**4**	**Via ensuite**	**Positive to ensuite**	**G4**
				Recommended	Supply	10	(no ensuite)	positive (no ensuite)	F7
	Single Bed Cubicle	Bedroom	B1401	**Actual**	**Natural and Central Supply Air**	**4**	**Via ensuite**	**Balanced**	**G4**
				Recommended	Supply	10	(no ensuite)	positive	F7
	Single cot cubicle (ensuite)	Bedroom	B1421	**Actual**	**Natural and Central Supply Air**	**4**	**Via ensuite**	**Balanced**	**G4**
				Recommended	Supply	10	-	positive	F7

Environmental Matrix at Financial Close (February 2015)

Dept Name	Room Name	Room Function	ADB Code		Ventilation				
					Ventilation Type	Supply ac/hr	Extract ac/hr	Relative Pressure	Min Filtration
Open Plan Bay (3 Cots)	Multi-bed Wards	B1407-01		**Actual**	**Natural and Central Supply Air**	**4**	**Via ensuite**	**Positive to ensuite**	**G4**
				Recommended	Supply	10	(no ensuite)	positive (no ensuite)	F7

3.1.6 This version of the EM was not approved at Financial Close (FC). It was included in the RDD schedule with a further seven Board Comments, including the following comment:

> "Detailed proposal awaited on bedroom ventilation to achieve balanced/negative pressure relative to the corridor."

3.1.7 This issue was discussed further at a Mechanical and Electrical meeting on 24 February 2015:

> "Project Co require to submit their proposals for bedroom ventilation to demonstrate the 4ac/h to the bedroom and all extracted through the en-suite to produce a balanced or negative pressure within the bedrooms."

3.1.8 The scope and definition of 'bedrooms' was not clarified.

3.1.9 On 15 June 2015 Project Co responded to the Board's comment on bedroom ventilation:

> "The single bedrooms have had their ensuite extract increased to achieve a balance within the room, this has been noted within the matrix".

3.1.10 On 22 July 2015 NHSL responded:

> "Note 26 and ventilation type have not been altered."

3.1.11 EM Guidance Note 26 stated:

> "Single Bedroom - The design philosophy for ventilation is for a mixed mode operation where natural vent is encouraged which has benefits both physiological with users being partly in control, and from an energy stand point where mechanical vent loading is partly reduced (2/3rds). This strategy results in zero pressure differential regime within the room where supply and extract is balanced".

3.1.12 On 22 September 2015 an issue relating to isolation cubicles in Critical Care areas was raised. This was recorded in the Request For Information Register, which was maintained by Mott MacDonald and used to record requests for information between Project Co and the Board:

> **"Date Issue Raised –** 22/09/2015 **,**
> **Action by & Due date –** 30/09/2015**,**
> **RFI no. –** BMCE-RFI-000346 **,**
> **Subject –** Confirmation of Isolation Cubicles**,**
> **Issue Description -** We have noted that there are rooms on the layout drawings that are labelled as Isolation Cubicles room references:-
> 1-B1-036, 1-B1-026, 1-B1-017 and 1-B1-016.
> These rooms do not follow the standard isolation room layout as depicted within the SHPN 04 Supplement 1 and therefore we would like some guidance as to their intended use and ventilation requirements. Currently we have provided supply air into the Gowning Lobby with a pressure stabiliser in the party wall to the bedroom and a dedicated extract within the bedroom to provide a duty of 10ac/hr which will give a pressure balance. In addition to the rooms listed above, room 1-H2-021 (Single Bed 1) is not labelled as an isolation bedroom, again ventilation services confirmation required.
> **Raised by -** KH **,**
> **Assigned To –** CMac/FH **,**
> **Response/ Comments -**
> **Action Open/Closed"**

3.1.13 The response was:

> "Almost all children and infants admitted to PICU/HDU need their breathing to be supported by a ventilator. Hence en-suite facilities are not required. The proposed solution is correct and should maintain a positive pressure in the gowning lobby with respect to the corridor. The door directly into the bedroom is for patient entry/exit, with all other access and egress via the gowning lobby."

3.2 Production Group Review

3.2.1 On 24 November 2015 the service leads for the PICU and HDU (Critical Care) department were given the opportunity to review Reviewable Design Data as part of the Production Group Review Procedure for Clinical User Groups (PG RDD).

3.2.2 The Production Group Review procedure was outlined in the Construction Phase Project Execution Plan. It stated: "To ensure the clinical needs and interests of the project are fully incorporated, NHSL has engaged clinical and operational staff to review the Submitted Items. There are 70 departmental user groups involved in the review process to ensure that design and planning reflect clinical operational need."

3.2.3 A paper prepared by Janice Mackenzie (Project Clinical Director), Fiona Halcrow (Project Manager) and David Stillie (MM Technical Advisor, Architect) provided instructions for the "B1 – Critical Care Unit" user group. It stated:

> "The RDD process is the next stage in the design development process following the extensive work that was undertaken between April and July 2014 […] The RDD process will be the final sign off for the 1:50 [floor plans]. The programme for this is based on the construction programme for the building and therefore there is no flexibility in the sequencing of this. It is important to note that the RDD process is to conclude the previous work undertaken and is not an opportunity to re-design the department."
>
> "The planned meeting will involve the lead user/s, representatives from the Project Team and technical advisor and equipment lead. The purpose of the

meeting will be to discuss and agree any comments that will be fed back to Project Co Design Team."

3.2.4 The 'Information for Service Leads' paper also stated that "the sign off of the 1:50s and associated information is to confirm operational functionality…". The Inquiry understands that "operational functionality" (as defined in the Project Agreement) did not include consideration of room environmental conditions.

3.2.5 An "RDD User Pack" was to be issued for Clinical User Group review a week in advance of the PG RDD meeting. According to the Execution Plan, the Financial Close Room Data Sheets (RDS) were to be included in this pack.

3.2.6 RDS existed for 5 out of 9 bedrooms in Critical Care at financial close. It is the Inquiry's understanding that the full suite of RDS were not to be completed until the Environmental Matrix had been finalised through RDD.

3.2.7 According to the PG RDD Tracker, which recorded the documents submitted for PG RDD review, only production groups 1, 2 and 6 received RDS as part of their RDD pack. The B1 Critical Care user group ('PG10') did not receive RDS for review and comment.

3.3 Revision 2 of the Environmental Matrix

3.3.1 Revision 2 of the Environmental Matrix was dated 26 November 2015. This version of the EM included a table containing the Board Comments, Project Co's 'initial response', the Board's feedback and a column headed 'reconciliation'. Changes made to this version of the EM were highlighted in red.

3.3.2 Guidance Note 26 had been amended in line with previous Board comments. Additional text highlighted in red stated:

"En-suite dirty extract volume flow rate has been increased to achieve a balanced ventilation system".

3.3.3 A change was also made to Guidance Note 15 within revision 2 of the EM. The reference in Guidance note 15 to "10ac/hr Supply" for Critical Care areas was

changed to read 10ac/hr Supply “for isolation cubicles”. The additional text has implications for the design criteria in Critical Care bedrooms, but this change was not highlighted when it was made.

3.3.4 The part of Guidance Note 15 relating to HDU (one of the critical care areas) continued to state a requirement for “10ac/h Supply”. The discrepancy between SHTM 03-01 recommendations and the air change rates reflected in the EM was not identified for those rooms.

3.3.5 Revision 2 was resubmitted to the review procedure on 4 December 2015 and returned to Project Co nine weeks later with a further 50 Board Comments attached[1]. This was longer than the 15 days intended for the provision of comments by the Board.

3.3.6 Kamil Kolodziejczyk (MM) emailed a draft response for approval to (among others) Brian Currie (Project Director), Janice Mackenzie (Project Clinical Director), Fiona Halcrow (Project Manager, Clinical Support) and David Stillie (Technical Adviser, Architecture), copying in Colin Macrae (Mechanical Engineer/adviser, MM), Kelly Gordon (MM) and Graeme Greer (Lead Technical Adviser, MM).

3.3.7 Attached to the email alongside the 50 Board Comments was a tracked changes version of the same. Item number 1 in the tracked changes version had been scored out and was not included in the final list. It read: “Previous comment in relation [to] bedroom/corridor ventilation not resolved”.

3.3.8 Within the final list of 50 Board Comments a number of issues with the ventilation specification in some specified Critical Care areas were raised by the Board in relation to the use of ensuite facilities and natural ventilation:

- Board Comment no. 7 draws attention to Critical Care multi-bed room 1-B1-063:

  “B1-063 Stated as supply air 4ac/h, extract via en-suite, this room does not have en-suite facilities”

[1] The contractually agreed timescale was 3 weeks (15 working days)

- Board Comment no. 32 draws attention to 2 out of 4 multi-bed rooms (and a medical gas storage room) in Critical Care:

  "confirm where natural ventilation i.e. 1-B1-063/065/067"

3.3.9 These rooms – and all other single and multi-bed rooms in Critical Care – had been provided in the EM with "Natural and Central Supply Air", indicating a mixed mode ventilation system with openable windows. The extract being provided was "via ensuite" and pressure was "positive to ensuite".

3.3.10 What was specified as NHSL's requirements in the Project Agreement is not a matter for the Inquiry to determine.

3.3.11 Other relevant comments made by the Board following its review of EM revision 2 included:

- Board Comment no. 4, drawing further attention to the lack of ventilation extract in the 'bedrooms':

  "Isolation cubicles and bedrooms are not shown with any extract ventilation".

- Board Comment no. 26, drawing attention to the higher air change rate being provided in one area of the hospital:

  "G-F1 Bedrooms with 6ac/h where most bedrooms are taken as 4ac/h"

3.3.12 On 11 February 2016 Kamil Kolodziejczyk informed Project Co via the Aconex transmission system that revision 2 of the EM had been rejected by the Board:

"All,

The Environmental Matrix shall be updated to reflect updated SoA[2], attached Board's comments (also discussed on 26th January and 2nd February), comments made during PGs reviews, and shall also include any changes resulting from Changes between the Board and Project Co…

Due to the extent of Board's comments, which relate to both Financial Close and Design Development post Financial Close, the Matrix is given Status C."

[2] Schedule of Accommodation (floor plan, room layouts)

3.4 Revision 5 of the Environmental Matrix

3.4.1 Revision 5 of the Environmental Matrix was dated 11 February 2016. It is unclear to the Inquiry what happened to revision 3 and 4.

3.4.2 This version contained a second table titled “second batch”, which incorporated the 50 Board Comments from the review of EM revision 2.

3.4.3 Project Co had issued a response to some Board Comments within the ‘second batch’. The response to comments 4A and 7 (relating to ventilation extract in isolation rooms/bedrooms and ensuite facilities in a multi-bed room in Critical Care, respectively) was the same, and read:

> “Refer to the design drawings for details. Generally, the extract is via the en-suite which is in line with SHPN 04. Where no ensuite is present, extract is via the room. No action required.”

3.4.4 No changes were made to the design detailed in the EM as a response to the Board’s Comments. The extract provided in Critical Care remained “via ensuite”, including in those rooms without ensuite facilities.

3.4.5 Project Co’s response to Board Comment no. 32 (relating to the provision of natural ventilation in some Critical Care rooms) read:

> “Extent of ventilation clarified on schedule.. Now updated on matrix.”

3.4.6 Within the EM the “ventilation type” for the Board’s listed rooms “1-B1-063/065/067” had been changed from “Natural and Central Supply Air” to “Central Supply Air” only. Project Co made this change to the rooms exampled by NHSL only. All other rooms in Critical Care continued to demonstrate “Natural and Central Supply Air”.

3.4.7 A failure to update air change rates in Critical Care rooms where natural ventilation had been removed contrasts with a response to Board Comment 26, with respect to bedrooms in CAMHS. The response read:

> "This is a CAMHS bedroom so 6 AC/H has been utilised, reference to natural ventilation will be removed".

3.4.8 Project Co updated all CAMHS bedrooms from "Natural and Central Supply Air" to "Central Supply and Extract" in response to this comment.

3.4.9 It was in this revision of the EM that the "medical location" column was removed. In the previous review of the EM, the Board had commented:

> "Medical location column states 'See Guidance Notes' for every entry and not mentioned in those guidance notes".

3.4.10 Project Co's response read:

> "This has been superseded by the risk profile document which sets out the medical grouping and classification. Column has been removed."

3.4.11 The "Risk profile document" that superseded this column appears to be a reference to a separate document called "Risk Profile and Medical Location Categorisation and Grouping". The document lists the rooms within the RHCYP/DCN and assigns to each one a "Clinical Risk Category" as defined by SHTM 06-01 for "Electrical Services Supply and Distribution".

3.4.12 In the Risk Profile document the isolation rooms, single bedrooms and multi-bed rooms in Critical Care have been assigned to the highest clinical risk group:

> "Category 5 – Life support or complex surgery […] defined as operating theatre suites, critical care areas, cardiac wards, catheterising rooms, accident & emergency resuscitation units, MRI, angiographic rooms, PET and CT scanner rooms".

3.4.13 Revision 5 of the Environmental Matrix was submitted to the review procedure on 18 March 2016 and returned by Kamil Kolodziejczyk on behalf of the Board on 15 April 2016.

3.4.14 An email from Kamil Kolodziejczy (MM) to Brian Currie (NHSL Project Director) on 15 April 2016 sought approval on a response to Project Co:

> "Hi Brian,
>
> We now have reviewed and commented on the Environmental Matrix. The comments we made previously were incorporated within this revision, with few minor issues, however please note the Matrix wasn't updated to reflect any comments made during PGs[3], resulting from Change process and SoA[4].
>
> We propose status B based on the Financial Close comments.
>
> […] PCo is keen to start production of Room Data Sheets now so can you please confirm you are happy for them to progress without re-submitting the matrix or you would prefer to see updated matrix before RDSs?"

Mr Currie responded:

> "Please confirm to IHSL that they can progress RDS production without further update to the matrix being concluded and submitted."

3.4.15 Mr Kolodziejczyk informed Project Co via the Aconex transmission system of the Boards decision to approve the EM at RDD level B:

> "Please note that the Board reviewed the Environmental Matrix and provided comments within the attached. Relative to the Financial Close comments, the Environmental Matrix is given status B.
>
> The Board require the Environmental Matrix is re-submitted for the Board's review, including the following comments (as per MM-GC-001184):
>
> - Updated Schedule of Accommodation,
> - Changes resulting from Change process,
> - Changes resulting from Production Groups comments,
> - Design Development,
> - Plus any other subsequent changes.
>
> Project Co shall also review all related drawings against the Environmental Matrix with respect to anomalies between the detail on the drawing and the

[3] Production Groups (PG RDD for clinical user groups)
[4] Schedule of Accommodation (floor plan and room layouts)

detail within the Environmental Matrix. Particular note to be given to the method of cooling provision e.g. Comfort Cooled Fresh Air or Ceiling Cassette Chilled Water. It is also noted that there are areas of over and under provision of both heating and cooling.

IHSL are also reminded that the reference design has no relevance to the current contract, and IHSL are to comply with the Project Agreement and in particular the BCR's and PCP's. Any non-compliance with the BCR's or PCP's should be highlighted to the Board. “relative to the Financial Close comments”.

3.4.16 It was not a requirement of the PA that RDD items which were approved at Level B should be resubmitted for further review.

3.4.17 The Board’s Comments on revision 5 were captured in annotations on the attached copy. Some ‘second batch’ comments had been annotated in red text:

- Comment 7 (relating to the lack of ensuite facilities in a Critical Care room) read: “please update matrix”
- Comment 4A (relating to the lack of extract in the ‘bedrooms’ and isolation rooms) read: “please detail room extract and update matrix”.

3.4.18 The Board did not comment further on Project Co’s response to Board Comment no. 32 (relating to the provision of natural ventilation in Critical Care).

3.4.19 A month after the EM was approved, on 19 May 2016 Kelly Gordon (MM) wrote to Project Co:

> “The Board have noted the number of air changes within the en-suites is higher than that required under SHTM. The Board understand this is to provide adequate air changes for the volume of air within both the en suite and single room and there is not an extract fan within the bedroom. As the extract fan is in the en suite and extracting 'dirty' air the Board understand that no heat recovery is possible. Can Project Co please confirm the above and if a Derogation needs to be submitted for the Boards approval.”

3.4.20 On 24 May 2016, Brian Currie (Project Director, NHSL) attended an IHSL Board meeting. The minutes of that meeting stated:

> "Mercury have commenced M&E 1st Visit Works in a number of areas throughout zones A, B & C with some minor quality issues to date – these have also been highlighted to IT and recorded. These minor quality items are being highlighted early to a very high standard to ensure a high level of quality is maintained through the project and future installation. Chronic delay in processing and agreeing "Change Requests" due to supply chain difficulties. The continuing issues with poor response from Mercury Engineering was noted. This is a current action for Multiplex and will be monitored. Mr Weir will include this item in the weekly update until resolved".

3.4.21 Ken Hall submitted derogation requests WW014 and WW015 on behalf of Project Co on 3 June 2016 to seek acceptance of the derogations from SHTM 03-01 guidance regarding the single bedroom and ensuite air change rates.

> "The air change rate has been decreased within the single bedrooms from 6ac/hr to 4ac/hr. Mixed mode ventilation has been provided with additional natural vent available from the opening windows. Single bedrooms without opening windows have been provided with 6ac/hr."
>
> The proposal is noted as:-
>
> "Single bedrooms with opening windows to have a mechanical ventilation rate of 4ac/hr."

3.4.22 On 13 June 2016, a telephone call took place between NHSL and Health Facilities Scotland (HFS), during which NHSL requested an opinion on ventilation requirements for the "four bed wards".

3.4.23 Ian Storrar (HFS) responded to the information request in writing on 19 June 2016:

> "SHTM 03-01 Part A, Appendix 1, Table A indicates the air change rates and pressure regime for clinical areas within healthcare premises. There is no four bed ward noted in Table A, however it would not be unreasonable to treat this area as one would a single bed ward with respect to ventilation as the

measures for infection control would be the same. Therefore the room should be neutral or slightly negative with respect to the corridor.

- SHTM 03-01 Part A clause 1.35 et al details the Management Action with Clause 1.37 highlighting the need to seek guidance from Clinical colleagues.
- SHTM 03-01 Part A clause 1.39 et al details the Design and validation process. Table 2 highlights the model to be followed and item 2 outlines some the design questions to be asked and resolved."

3.5 Revision 6 of the Environmental Matrix

3.5.1 Revision 6 of the EM was dated 28 June 2016.

3.5.2 In revision 6, Project Co revised its response to Board Comments 4A and 7. Comment 4A had been partially actioned and extract rates for "isolation rooms" had been provided. With respect to Comment 7, Critical Care multi-bed room 1-B1-063 was changed from extract "via ensuite" to extract "0.5 ac/h" (via the room). The reference to an ensuite was also removed from the relative pressure column, which changed from "positive to ensuite" to "positive".

3.5.3 The Inquiry team notes from the revised response to Board Comment no. 7 that:

- The pressure relative to the corridor was being reflected in the EM for a Critical Care multi-bed room for the first time
- The 'ventilation type' in 1-B1-063 was not updated to reflect the introduction of an extract from the room
- Project Co made the change to the room exampled by NHSL only. Other multi-bed rooms and bedrooms within Critical Care continued to demonstrate extract via an ensuite that was not present.

3.5.4 The table below demonstrates the room environmental conditions for Critical Care following the changes made. Where a value has been changed by Project Co from the previous iteration shading has been applied to that cell.

Environmental Matrix Rev 6

Dept Name	Room Name	Room Function	Room number		Ventilation				
					Ventilation Type	Supply ac/hr	Extract ac/hr	Relative Pressure	Min Filtration
B1 PICU and HDU	Open Plan Bay (4 beds)	Multi-bed Wards	1-B1-009	**Actual**	**Natural and Central Supply Air**	**4**	**Via ensuite**	**Positive to ensuite**	**G4**
			1-B1-031	**Actual**	**Natural and Central Supply Air**	**4**	**Via ensuite**	**Positive to ensuite**	**G4**
			1-B1-063	**Actual**	**Central Supply Air**	**4**	**0.5**	**Positive**	**G4**
				Recommended	Supply	10	-	positive	F7
	Open Plan Bay (3 Cots)	Multi-bed Wards	1-B1-065	**Actual**	**Central Supply air**	**4**	**Via ensuite**	**Positive to ensuite**	**G4**
				Recommended	Supply	10	-	positive	F7
	Single bed cubicle	Bedroom	1-B1-037 1-B1-021 1-B1-020 1-B1-019	**Actual**	**Natural and Central Supply Air**	**4**	**Via ensuite**	**Balanced**	**G4**
				Recommended	Supply	10	-	positive	F7
	Single cot cubicle	Bedroom	1-B1-075 (with ensuite	**Actual**	**Natural and Central Supply Air**	**4**	**Via en-suite**	**Balanced**	**G4**
				Recommended	Supply	10	-	positive	F7

3.6 Revision 7 of the Environmental Matrix

3.6.1 Revision 7 of the EM was submitted to the Review Procedure on 20 September 2016.

3.6.2 On 22 September 2016 Kamil Kolodziejczyk (MM) issued the Board's response to Project Co's derogation request of 3 June[5]:

> "Following the review of PCo's derogations (WW014 & 015) the Board cannot accept this proposal. As per the BCRs, PCo are required to provide room heat recovery with balanced ventilation at specified air change rates. Based on PCo derogations, in order to achieve balanced pressure regime (in 4 bedded room 1-L 1-100), the en-suite extract would have to be in order of 36ac/h. This is in excess of SHTM recommendation of 3ac/h. Also it means that heat recovery from this air cannot be achieved. Can Project Co please confirm how compliance with SHTM in relation to air change rates, balanced ventilation and room heat recovery will be met".

3.6.3 The Inquiry team notes the specific inclusion of a four-bed room as an example. This appears to be the first time the definition of 'bedroom' has clearly included multi-bed rooms.

3.6.4 Comments on Revision 7 were returned by the Board on 17 October 2016. The approved status had been withdrawn due to (among other things) non-compliant air change rates in single bedrooms and ensuites.

3.6.5 An email from Kamil Kolodziejczy (MM) to Project Co provided the Boards Comments from that review, which included both general and specific comments, but none relating to Critical Care areas:

> "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:

[5] See paragraph 3.4.21

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

[…]

6. Some ventilation rates don't appear to comply with BCRs. The Board would like to point that is still awaiting response from PCo to the issues raised as per MM-RFI-000172 & MM-GC-002006 relating to ventilation rates.

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

3.6.6 As per the Boards first 'general' comment, some design data was highlighted within the hard copy of the EM returned by the Board for Project Co to review. The 'ventilation type' for two of the multi-bed rooms in Critical Care was highlighted in blue: 1-B1-063 (flagged previously for lacking ensuite facilities) and 1-B1-065.

3.6.7 In EM Rev 7 (version 21), the status 'C' had been scored out and replaced by a status 'B'.

3.6.8 An email from Kamil Kolodziejczyk (MM) to the Project Director, Brian Currie read:

"Following a review of our previous comments that led to a status C, the caveats we have drafted on an upgraded status B may not sufficiently protect the Board. […] the comments are extensive hence we think the status C still applies, however as requested, we have drafted the following caveat for an upgraded status B;

'The Board have serious concerns over the upgrading Environmental Matrix to Status B considering some of the issues raised (as per MM-GC-002084) being the same as the issues that had been raised since FC. There are also concerns over the potential inaccurate information being transferred to the Room Data Sheets being submitted through RDD.

> However, as requested by Project Co, the Board have 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. Project Co's failure to comply with the BCR's/PCPs (as per MM-GC-002084), the Board believes would result in a non-compliant Facility. The Board would suggest that Project [Co] resolve the non-compliant issues as a matter of urgency, and requests that Project Co issues a strategy for resolution of these issues'".

Mr Currie responded:

> "We need to, as you have done, clearly identify all aspects of the current Environ Matrix that require further work and agreement and that Status B is only given on that basis. The key line in the caveat is: 'the Board still does not believe the Environmental Matrix and resultant design complies with the Project Agreement. Project Co's failure to comply with the BCR's/PCPs (as per MM-GC-002084), the Board believes would result in a non-compliant Facility'. What we have to weigh up here is that no progress is likely to be made on all others aspects which we are comfortable with unless IHSL (or MPX more accurately) receive a status B. The approval process is, no doubt, designed to avoid just such unfinished work accumulating and not being closed out but it fundamentally relies on all parties playing the game which IHSL's extended supply chain seem unable to do".

3.6.9 On 11 November 2016, Brian Currie wrote to IHSL with concerns that Project Co had proceeded to construct what NHSL considered to be a non-compliant ventilation system:

> "I feel compelled to write expressing our concern and alarm that ventilation ductwork is appearing on site which quite clearly does not reflect a compliant design. It is nobody's interest to allow this situation to continue. Ventilation to single and 4 bedded rooms: You are not providing heat recovery and your designed air changes rates in relation to extract through toilets are unacceptable."

3.6.10 On 16 December 2016, Colin Grindley of MPX emailed Kamil Kolodziejczy, MM to address NHSL's rejection of the proposed air change rates in the single bedrooms and ensuites[6]:

> "'We note your comments relate to both single bedrooms and 4 bedded rooms. We would confirm derogations WW014 and WW015 were prepared for single bedrooms only. Reference to 4 bedded room comments made, taking Room 1-LI-100 as the example, you have noted the ensuite extract would have to be in order of 36ac/h. This statement is incorrect as the design solution for single bedrooms is fundamentally different to 4 bedded design […] We would reiterate the extract within the 4 bedded rooms ensuite is 10ac/h as detailed within the environmental matrix and not 36ac/h as you have noted […]. WW015 for the bedroom supply ventilation reducing 6ac/h to 4ac/h was prepared on the basis of the pre FC report pulled together from the M+E workshops and tabled at the meeting of 13.01.15. BMCE-RFI- 000077 dated 19.01.15 refers. 4ac/h was captured within the environmental matrix, and drawing WW-SZSL-v 01 was prepared as part of the FC pack clearly showing 'supply only' within the bedroom, and 'extract' via the ensuite".

3.6.11 On 21 December 2016 Kamil Kolodziejczy (MM) shared a draft response to Mr Grindley with Ronnie Henderson (NHSL) and Colin Macrae (Mechanical Engineer/Adviser, MM) for their input:

> "Ronnie/Colin, I still need design requirement for multi bedded areas, hopefully we will close it tomorrow. I will also need statement regarding pressure regime for those areas in relation to corridor and en-suite. Can you please check relevant guidance and send back some suggestions?".

3.6.12 The draft response to Project Co read:

> "Board reviewed the information submitted and provided comments in red below. We would like to note that the Board highlighted concerns in relation to ventilation design before FC and further clarified at and post financial close that design has to comply with requirements. The Board is disappointed to

[6] See paragraph 3.6.2

see, after considerable time period, that design still hasn't been amended to suit BCRs/SHTMs, despite Board's efforts indicating non-compliance.

[…]

The SHTM 03-01 requires 6ac/h to the area as per the same table referenced in your response. The supply rate of 4ac/h is not in accordance with SHTM 03-01.

The environmental matrix states either "via en suite" or "minimum 10", which in both instances is not acceptable and actual value shall be provided throughout environmental matrix.

In terms of the WC/en-suite, please note reference in SHTM 03-01 providing further guidance as how this should be approached:

> 'Toilets should have an extract ventilation rate as set out in the building regulations. Where WC's are located in shower and bathroom spaces, the ventilation required for the WC will normally be adequate for the whole space.'

Therefore the extract rate of 3ac/h for the en-suites should be provided by PCo.

The Board would like to note that PCo report as submitted and discussed at the meeting on 13.01.15 suggests that there is no dubiety in the interpretation of Table A1 Appendix 1 of the SHTM 03-01 in terms of single room and WC ventilation.

Nonetheless the ventilation issue was first raised pre-FC (14 October 2014, MM-GC-000339, copy attached) highlighting the areas where environmental matrix is non compliant in relation to ventilation which was further clarified as per Board response on 29 January 2015 (MM-GC-000432) confirming that PCo design shall comply with SHTM guidance. As follows:

> 'Hi Ken,
>
> Following your recent RFI, the Board respond as follows:

- The single room with en-suite ventilation design shall comply with the parameters set out in SHTM 03-01
- The design solution should not rely in any way with the opening windows as these will be opened or closed by patient choice.
- 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.
- Isolation room ventilation shall comply with SHPN 04 Supplement 1.'

Furthermore, the Board reviewed environmental matrix several times before and after FC and made comments regarding the deemed non compliance of the ventilation design. The environmental matrix was rejected at FC on the basis that it did not comply with the BCRs. The Board also rejected all ventilation drawings submitted for FC, please refer to Section 5 of Schedule Part 6. PCo since has not provided design that would comply with the Board's requirements…".

3.6.13 On 22 December 2016 Colin Macrae (MM) offered some "points worth considering" in the form of air flow calculations. For the multi-bed ventilation requirements Mr Macrae pointed Mr Kolodziejczy to the Scottish Health Facilities Notes (SHFN 30) for Infection Control measures:

"SFPN 30 Infection Control 3.14 Implementation of effective prevention and control of infection measures reduce the risk of transmission… this can be achieved by… provision, where appropriate, of negative pressure ventilation".

3.6.14 Ronnie Henderson contributed the following feedback on the same day:

"The pressure regime is non-compliant at 4ach/hr, it will be much worse at 6".

3.6.15 Also on 22 December 2016, the issues arising with bedroom ventilation were discussed at the Project Management Executive meeting:

"Ventilation (highest risk going into 2017):

- MPX to question the brief over the room functions

- Need to review the BCRs for each of the rooms
- Rooms:
- Non-compliant air changes on several aspects and no heat recovery
- RH/CMAC/Infection Control need to be convinced of the regime
- Concern over the isolation rooms and infection control in single rooms
- Meeting to be organized with MPX to discuss the proposals
- Potential to relax position on 4 bed rooms but not on the single rooms
- Heat recovery:
- Uneconomical according to MPX"

3.6.16 On 11 January 2017, Kamil Kolodziejczy (MM) sent a revised response to Mr Grindley (Project Co) which incorporated the comments from Mr Macrae and Mr Henderson. The comment regarding the non-compliance of air change rates at 4ac/h had been removed. Regarding multi-bed requirements, it stated:

> "In relation to your statement that the design solution for single bedrooms is fundamentally different to 4 bedded design, can you please confirm which guidance/ specification details this? In accordance with SHFN 30 Infection Control, the pressure cascade for single/multibed areas shall be negative to corridor and positive to en-suite (if available). Please also refer to the attached diagram of Board's interpretation of the SHTM guidance and PCo proposed design (to be further discussed at the workshop)."

3.6.17 Mr Kolodziejczy concluded with:

> "There is clearly still a difference of opinion as to whether PCo has provided a compliant design, hence we would like to suggest a workshop on Monday 16 January at 10am to progress through the below points".

3.6.18 The Inquiry has been unable to confirm whether a ventilation workshop was held on 16 January 2017.

3.6.19 The revised response acknowledged not all bedrooms would have access to an ensuite for ventilation extraction. A review of EM by the Inquiry team suggests that only 10 rooms did not have ensuites: 8 were in Critical Care; 1 a parent room; 1 a sleep room in the sleep lab.

3.6.20 A Programme Board meeting was held on 16 January 2017. The Project Dashboard circulated in advance of the meeting stated:

> **Clarification:** "Design/Compliance issues – Ventilation, Movement Joint giving cause for concern"
>
> "Still a number of design issues to be resolved which include location of movement joints, ventilation in single bedrooms and ensuites and drainage. The Project Team and advisors are working closely to find a suitable solution".

3.6.21 The Risk Register, also circulated in advance of the meeting, does not include any risk relating to ventilation. Minutes of the meeting do not record any discussion of single or multi-bed ventilation.

3.6.22 Ventilation workshops were held on 23 January and 6 February 2016. Tabled for review and discussion at the workshops were iterations of a "Multi-bed room - Ventilation Amendment Proposal To Achieve Room Balance".

3.6.23 Project Cos proposal to achieve NHSL's desired pressure regime in the multi-bed rooms "identified as being of concern" was to further reduce the air change rate from 4ac/h to between 2.7 and 3.5ac/h. Drawings were provided marking up the location of 12 out of 20 rooms in which the changes were being proposed. This included three of the four multi-bed rooms in Critical Care.

3.6.24 On 6 February 2017 Kamil Kolodziejczy (MM) forwarded the proposal to Dorothy Hanley, Ronnie Henderson and Brian Currie (NHSL), copying in Colin Macrae (Mechanical Adviser, MM). Mr Kolodziejczy provided comments within the email:

- "PCo please confirm that proposed reduced ventilation rates comply with the Building Standards
- Rooms D, E and F have introduced general extract to the rooms, can this not be achieved in all rooms.
- Detail all ventilation rates for both supply and extract in both volume and air change rate".

3.6.25 Mr Kolodziejczy's email concluded, "Anything else to add?".

3.6.26 MM asked Project Co to confirm that the reduced air change rates complied with Building Standards rather than SHTM 03-01. In addition, it is noted that "rooms D, E and F" were located in Critical Care and therefore did not have ensuite facilities for extract via ensuite.

3.6.27 On 7 February 2017, Dorothy Hanley (Project Manager, Children's Services Lead) emailed Brian Currie (Project Director) and Ronnie Henderson (Project Manager, Hard FM):

> "Sorry but I just noticed on this doc that the haematology oncology ward (a neutropenic patient area) should have a different air change rate from other types of wards. Is this factored in do you think?"

3.6.28 Brian Currie responded the same day, adding Kamil Kolodziejczy and Graeme Greer of MM into circulation:

> "If we have not already stated our requirements (environment matrix etc) we need to do it now. Suggest we cross check against what has been communicated to IHSL already. Have copied in Kamil".

3.6.29 Mr Kolodziejczy asked Ms Hanley to "confirm which document you are referring to". Ms Hanley responded attaching HTM 03-01 [the English version of SHTM 03-01]. Mr Kolodziejczy responded, adding Colin Macrae (MM) into circulation:

> "Ronnie/Colin, can we please discuss asap. As per Dorothy's email below, and SHTM 03-01, the Neutropenic Patient Ward requires 10ac/h and +10 pressure. There are 17 bedrooms, 15 single and 2 multi bed areas in haematology and oncology ward. The latest environmental matrix (attached) suggests the same design parameters as any other single/multibed areas, i.e. 4ac/h and balanced/negative pressure. Note the neutropenic ward was previously the biolab department."

3.6.30 Mr Kolodziejczy later responded to all, stating:

> "..following conversation with Dorothy and Ronnie it looks like the design seems to be non-compliant for this department with BCR and SHTM. The clinical specification indicates the service will include the care of children with febrile neutropenia and SHTM have clear design guidance for neutropenic patients ward. The environmental matrix suggests the same design principles as adopted anywhere else in the Facility which is not in line with BCRs/SHTMs for this department."

3.6.31 The issue was discussed further at the PMG meeting on 8 February 2017: "Bedroom Ventilation: Third meeting to be held on 13/02/17. Board have queries on the specialist bedrooms, both single and multiple in the Haematology and Oncology with regard to compliance. [Kamil Kolodziejczy/Colin Grindley] to review asap".

3.6.32 Kamil Kolodziejczy (MM) emailed David Martin (R.A.M) and Colin Grindley (MPX) that same day:

> "As briefly discussed at the PMG earlier today, can you please confirm that PCo's design complies with SHTM 03-01 and Sub Section D of BCRs (C1.4 Haematology & Oncology Clinical Output Based Specification) for neutropenic patients?"

3.6.33 Colin Grindley (MPX) responded:

> "We have reviewed the clinical spec for the C1.4 Haematology & Oncology department […] There is no mention of +10Pa that we can see which you mentioned in our meeting. The document refer to isolations rooms (x5) which we have already been provided with ventilation in [line] with SHPN 04 Supplement 1. Can you please provide evidence of your claims of non-compliance and we will review."

3.6.34 In response, Mr Kolodziejczy directed Mr Grindley to Appendix 1, Table A1 of SHTM 03-01.

3.6.35 On 9 February 2017, John Spalding (TUV SUD) also responded to the query about Neutropenic Patient areas:

"We have looked into this is detail and would note the following comments. It is our understanding that patients with neutropenia have a higher risk of developing serious infection. Also we would refer you to the following Cancer.net website which provides useful information on the management and treatment of patients with neutropenia.

'If you have neutropenia, take steps to prevent infection. For example, avoid being around people who have a cold, flu, or other illness. Neutropenia, 2016, Cancer.Net, viewed 09 February 2016, http://www.cancer.net/'

The Haematology & Oncology Dept. (C1.4) contains 5 no. isolation rooms Where we would have thought that patients with these symptoms would be treated and not within the single bedrooms or multi bed rooms. We would not expect patients of this nature to be exposed to other ill patients as this would surely create a risk of cross infection. This department is briefed as coping for a range of illnesses and treatments and seems illogical to expect that the full ward is designed to serve only one of these. This returns me to the previous statement referring the 5 no. isolation rooms - We do not don't think it unreasonable to assume that the isolation rooms would be used to treat patients with Neutropenia."

3.6.36 On 10 February, Dorothy Hanley emailed Kamil Kolodziejczy sharing input she had received from 'the ward' on a response to Project Co. Additional input on the response was provided by Janice Mackenzie (NHSL Project Clinical Director). It read:

"Our patients on this ward are amongst the most vulnerable patients and it is therefore essential that all bedrooms (single and multibed) in haematology & oncology ward be compliant with the SHTM 03-01 Appendix 1; Table A1 […] The isolation rooms will be used for patients with infections or undergoing bone marrow transplant procedures. Patients with neutropenia, but no active infection, would be cared for separately from those children and young people with an active infection resulting either from exposure to infection in the community or as a result of their chemotherapy inducing a compromised

neutropenic state [...] Please therefore provide design that complies with BCRs and SHTM 03-01 for neutropenic patient ward."

3.6.37 On 13 February 2017 Dorothy Hanley and Janice Mackenzie arranged a meeting with clinical staff. Ms Hanley wrote to the clinical staff:

"I wonder if I could prevail on you to attend a meeting with me/Janice to discuss the ventilation for single rooms within the new haematology/oncology ward in the new building. There would appear to have been a need for contractors to deviate from an SHTM in order to achieve the output specification signed off at Financial close. Just need to make sure before the contractors proceed further that we are all in agreement around any operational issues/ balance of potential risks to patients […] The contractors will give me airflow drawings to share at the meeting so we can be clear on these".

3.6.38 The meeting was to take place on 23 February 2017. To be in attendance were:

- Dorothy Hanley (Project Manager)
- Janice MacKenzie (Project Clinical Director)
- Janette Richards (IPCT, Lead HAI Scribe Adviser)
- Ann Cairney (Charge Nurse)
- Pota Kalima (Consultant Microbiologist)
- Mark Brougham (Consultant Paediatric Oncologist)

3.6.39 Ventilation in single rooms in the haematology/oncology ward was to be discussed at the meeting, while multi-bed rooms were not. No minutes or notes of the meeting on 23 February have been provided to the Inquiry.

3.6.40 The Project Risk Register was updated on 14 February 2017. The risk "Performance of Project Co" was increased from "medium" to "high", due to "Increased evidence of potential non-compliance during room reviews".

3.6.41 On 17 February 2017 another ventilation workshop was held. The Inquiry has not been able to review minutes or notes of the workshop.

3.6.42 On 22 February 2017, a Programme Management Group meeting noted "Environmental Matrix on hold until bedroom ventilation items resolved".

3.6.43 On 23 February 2017, Project Co issued another iteration of the 'General ward - Ventilation amendment proposal to achieve room balance". Brian Rutherford (TUV SUD) wrote:

> "As discussed and agreed at last Fridays Ventilation Workshop, see enclosed a copy of our General Ward Ventilation Proposal to Achieve Room Balance with columns incorporated to identify the severity of the ventilation works and whether the ductwork has already been fabricated.""".

3.6.44 The title of the document had been changed from 'Multi-bed rooms – Ventilation amendment proposal..' to 'General Ward – Ventilation amendment proposal..'.

3.6.45 Following the 24 February 2017 workshop, which was attended by:

- Brian Currie (Project Director, NHSL)
- Ronnie Henderson (Project Manager/Commissioning Lead, NHSL)
- Janice Mackenzie (Project Clinical Director, NHSL)
- Dorothy Hanley (Project Manager/Commissioning Lead, NHSL)
- Kamil Kolodziejczy (Technical Adviser Support, MM)
- Ken Hall (Mechanical and Electrical Manager, MPX)
- Colin Grindley (Mechanical and Electrical Manager, MPX)
- Hayley [Prouse] (IHSL)
- Brian Rutherford (Mechanical Engineer, TUV SUD)
- Stuart McKechnie (Principle Engineer, TUV SUD)

the "General Ward – Ventilation Amendment Proposal to Achieve Room Balance" was circulated again.

3.6.46 This version included all 20 multi-bed rooms, including the two in Haematology & Oncology which had been identified as requiring 10ac/h and positive pressure. A note in red pen reads "marked up at meeting 24/02/17". Further markups indicated the 14 rooms for which a further reduction in ac/h was considered

essential. Included in the “essential rooms” were the four Critical Care rooms. The two rooms in Haematology & Oncology were marked as “non-essential”.

3.6.47 The Inquiry understands that the ‘General Ward – Ventilation amendment proposal to achieve room balance’ was accepted by NHSL and MM at this 24 February 2017 workshop.

3.6.48 On 2 March 2017 IHSL issued an update to NHSL on the difficulties being experienced with its extended supply chain. It stated:

> “The issue raised in respect to the responsiveness of Mercury Engineering, having improved for a period is noted to have deteriorated. Multiplex has again raised this with Mercury Engineering at the highest level and will continue to press for a consistent improvement in response. IHSL will continue to monitor the position with Multiplex.
>
> […] subject to NHS Lothian review and approval, and considering the programme critical path, the implementation of the programme is on target.”

3.6.49 Brian Currie (Project Director) responded to the update in an email to Wallace Weir (IHSL) on 3 March 2017:

> “I do not share your view that the ‘programme is on target’ but given that we have not yet actually received a revised Schedule 7 Programme this view is based only on evidence gathered on site. […]
>
> The Room Review programme is turning quite quickly now into a farce given that not only were the first batch of rooms offered not complete but subsequent releases have not been forthcoming and many false starts have been experienced. If this is not concerning enough in terms of quality, the implications for the Board's finite team resource for what will undoubtedly become a very compressed review programme is significant.
>
> A similar comment is made in relation to the Witnessing and Testing Programme.
>
> As we discuss every Monday and more formally at regular meetings, there seems to little progress with many unresolved issues of non compliance

(Movement Joints, Ceilings, Free Swing Door Closers, Ventilation, Helipad Emissions etc), processing of Change Requests (Mercury seem to have slipped back into old habits) and preparation of the extensive body of paperwork necessary to ensure the Independent Tester is fully conversant with the project as we approach Handover (Derogations, Changes, Completion Criteria etc).

I expressed similar views when asked to comment at the most recent PCo Board meeting, as you may recall, and unfortunately little or no progress seems to have been made since.

[…] All in all, I remain to be convinced of the security of the anticipated handover date of the 12th October 2017 and the quality of the product which will be finally presented."

3.6.50 At a Programme Board meeting on 20 March 2017 the following update was issued on the Project Dashboard:

"Following a meeting with the clinical team, microbiology and infection control an agreed position for ventilation in single bedrooms and en-suites has been reached and a meeting with Multiplex has been held, who are now progressing with the required solution."

3.6.51 On 27 March 2017, following a meeting between the Board of NHSL and the Board of IHSL, Jim Crombie (Deputy Chief Executive, NHSL) issued a letter to IHSL. It stated:

"Your view that the anticipated actual completion date of 12th October of this year is secure, although challenging, was not conveyed with confidence and in my view you presented little in the way of evidence to support it.

[…] A major factor in potential rework on site is the chronic problem of processing Board change timeously through what appears to be a single point of failure by your construction contractor. This is the issue of Mercury Engineering and their prevailing unhelpful attitude and apparent lack of participation. You did not refute the Board's Project Director's view that we seem to have reached a point where no more can be done. If this is indeed

the case, the Board require your assurance that all Board change in process, whether fully signed off or not in commercial terms, will be implemented by actual completion, notwithstanding that some aspects of some changes were always programmed to be delivered in the Board's Commissioning phase."

3.6.52 At a Programme Board Meeting on 15 May 2017 Brian Currie commented that room reviews remained behind schedule, and stated:

> "a pattern of the same issues with all rooms being reviewed is now emerging […] These problems may relate to the change process which is very cumbersome and has proved extremely challenging for IHSL/MPX's supply chain, most noticeably the performance and attitude of Mercury Engineering. Drawings which have been updated or changed via the RDD or change process are not being implemented and this is now resulting in clear mistakes with incorrect fixtures and fittings being installed."

3.7 Revision 9 of the Environmental Matrix

3.7.1 EM revision 9 was dated 18 May 2017. It's not clear what happened to revision 8.

3.7.2 In version 26 of revision 9 the reference to a natural ventilation supply was removed by Project Co for a further 5 rooms in Critical Care. As previously, the air change rates were not recalculated to reflect the removal of a 2ac/h supplement from openable windows.

3.7.3 Project Co also identified and made changes to the remaining seven rooms in Critical Care which erroneously referenced ensuite facilities. Extract rates were introduced to those rooms accordingly and the relative pressure in the multi-bed rooms was changed from "positive to ensuite" to "positive".

3.7.4 These changes were made one year after the Board issued its comments on natural ventilation and ensuite facilities in some Critical Care rooms. Two Critical Care rooms continued to reflect a natural ventilation supply (1-B1-009 and 1-B1-075).

3.7.5 A change was also made to the 'ventilation type' in Critical Care room 1-B1-063, previously highlighted by the Board in their review of EM revision 7[7]. It was changed from "central supply air" to "central supply & extract" to reflect the 0.5ac/h (mechanical) extract that had been introduced to the room the previous year[8].

3.7.6 The second room 'ventilation type' that had been highlighted by the Board in EM revision 7 (1-B1-065) remained unchanged.

3.7.7 Revision 9 was submitted to the Review Procedure on 19 May 2017 and returned by the Board on 26 June 2017. Mott MacDonald suggested the EM be given status C "as the ventilation for multibed rooms is still an issue".

3.7.8 An email from Kamil Kolodziejczyk (MM) to Ronnie Henderson (Project Manager/Commissioning Lead, Hard FM) and Brian Currie (Project Director) provided the Boards Comments:

> "The Board reviewed the Environmental Matrix rev 9 and has noted there are still inconsistencies in the matrix, these have been highlighted red.
>
> […]
>
> There are also inconsistencies across the matrix, for example the 'Ventilation type' column states central general extract where no extract in this specific room is provided. Or where central supply air is indicated in 'Ventilation type' column while the supply and extract are being provided. Refer to G-A1-038 & 1-B1-065 respectively
>
> […]
>
> It is not clear from the submitted environmental matrix what is the pressure cascade from multi-bed rooms into corridor. As per previous discussions with PCo, where it was explained the need to have balanced / -ve pressure regime in multi-bed rooms, can PCo please confirm and indicate in the matrix that the multi-bed rooms are balanced / -ve in relation to corridor.

[7] See paragraph 3.6.6
[8] See paragraph 3.5.2

Please note that no Project Co changes were highlighted other than the 'All Rooms' sheet, hence the Board only reviewed 'All Rooms' sheet and did not review the matrix line by line, noting any non-compliance with BCRs/PCPs/SHTMs etc is Project Co's responsibility. As per separate discussions on Project Co's ventilation strategy, Project Co should submit change/derogation for the Board's consideration relative to any deviation from BCRs/PCPs/SHTMs etc.

The matrix is returned at status C based on the comment relating to ventilation in multibed rooms."

3.7.9 Mr Henderson responded "Fine with me" and Mr Currie indicated that the response should be issued to IHSL.

3.7.10 On 23 May 2017, Project Co issued an updated 'General Ward – Ventilation amendment proposal to achieve room balance' to NHSL:

"Please find attached the updated ventilation drawings and associated narrative which accommodates the Boards request to have the 4 bedded ward at a negative or balanced pressure.

Our opinion is that this amendment to the environmental conditions and operation of these rooms constitutes a change for the reasons noted below.

1.0 Environmental matrix was signed off as status B with the noted design parameters that the current ventilation design represents - as per MM-GC-001398.

2.0 Full RDD ventilation zonal design pack and workshops have been through RDD and signed off.

3.0 Copy of WW design document outlining compliance with the SHTMs is attached.

We anticipate that the costs of this Change will be in the Medium Value category. We look forward to the Board's, positive response to this request."

3.7.11 The "WW design document" at item 3.0 appears to be a reference to a document dated 21 February 2017, called 'Accommodation design criteria - single

rooms and multi-bed wards', which attributed SHTM 03-01 guidance for General Wards to all multi-bed rooms.

3.7.12 On 1 June 2017, Kamil Kolodziejczy (MM) emailed Dorothy Hanley (NHSL) seeking her input on a response to Project Co:

> "Can you in few words explain the difference between general ward and 4 bedded room, the way you explained at the meeting with MPX?".

3.7.13 The jointly composed draft response, read:

> "As previously described under MM-GC-002408, the Board does not believe this change to environmental conditions constitutes a Board Change. Without these changes PCo's design ~~was~~ is not compliant with BCRs and relevant guidance.
>
> In relation to point 1 & 2 below, as per Schedule Part 8 (Review Procedure) of the Project Agreement please note that the RDD review doesn't remove PCo's obligation under the Project Agreement and the Board did not receive a derogation/change from PCo for an alternative design.
>
> In terms of point 3, the WW design report states that current ventilation design for single room and general ward areas are fully compliant with SHTM 03-01, please note however that this is incorrect. PCo proposed air change rates do not align (as stated in the report) with SHTM recommendations hence, without PCo change, the design as it stands is not compliant. The Board expects to receive PCo's Change for deviation from recommended air change rates as per SHTM 03-01.
>
> The Board understands the confusion arising from design criteria for General Ward as stated in Table A1 of SHTM 03-01, as the SHTM does not explicitly acknowledge a multi-bed room. However, as explained by the Board, these rooms have never been referred to as wards because of the following: A "ward" constitutes the total bed complement of a designated area . Multi-bed rooms are much smaller sections within a ward that allow patients to be nursed as a small group. Within Children's Services these areas are important for the purposes of clinical safety as they allow cohorting of patients who require enhanced level of nursing observation/support either because they

> have the same type of infection, or are at similar stages of acute post operative recovery. Additionally these rooms aid the normal socialisation and development of young children. Similarly within DCN multi-bed rooms within the ward are used to cohort patients requiring enhanced levels of nursing/monitoring that is more difficult to achieve within single room environment".

3.7.14 In the email ultimately sent to Project Co on Monday 5 June 2017 the assurance that "these rooms have never been referred to as wards" had been removed. It read:

> "…the Board notes that PCo used wrong design criteria for the multi bed rooms. As explained by the Board at the meeting on Monday 23 January, a "ward" constitutes the total bed complement of a designated area. Multi-bed rooms are much smaller sections within a ward that allow patients to be nursed as a small group".

3.7.15 Having identified that the agreed solution to achieve room balance was based on the incorrect SHTM 03-01 criteria, the Inquiry understands that progress on the proposal ceased from 23 May 2017.

3.7.16 Formal dispute resolution procedure ['DRP'] was tabled by NHSL on 13 June 2017.

3.7.17 On 5 July 2017 a risk assessment was carried out by NHSL in relation to the non-compliant multi-bed pressure regime. The template used by the Project Team was for a 'General Risk Assessment' under the 'Lothian Occupational Health and Safety Department'.

3.7.18 Janice Mackenzie (Project Clinical Director) was named as the "manager responsible" on the risk assessment, while Dorothy Hanley (Project Manager, Childrens Services) and Fiona Halcrow (Project Manager, Clinical Support) were also named assessors.

3.7.19 Under the 'subject of assessment' heading, it stated:

"Bedroom Ventilation design in 4 bedded rooms does not meet the recommendations of SHTM 03-01, as the current design has the 4 bedded rooms as being positive pressure. To allow cohorting of patients with the same air-borne infections these rooms require to be balanced or negative pressure. Whilst the Board can rationalise the number of 4 bedded rooms where the ventilation needs to change it should be noted that this does reduce overall flexibility and future-proofing. Given the different patient groups related to specific wards, separate risk assessments have been undertaken (see attached). Individual risk assessments have identified that the need for cohorting of patients is only an issue for the Children's Service. The risk assessments have been discussed with the Children's CMT and Infection Control & Prevention who have confirmed that not having the ability to cohort patients is not acceptable from a patient safety perspective. In addition the Children's CMT highlighted that if the programme is going to be delayed in order to achieve compliance with the SHTM 03-01 in the 4 bedded rooms then should we not be considering achieving this in all 4 bedded rooms. As opposed to the ones that have been identified to reach a compromise solution which would ensure future proofing and flexibility within the building for service changes and avoid the need to retro-fit."

3.7.20 Separate risk assessments were carried out for specific wards "as the risk rating for each ward/s is different dependent upon the patient group and clinical risk". This included a separate risk assessment for 'RHCYP Critical Care (B1)' , for which the 'manager responsible' was Peter Campbell, Deputy Associate Nurse Director for Childrens Services:

Name of Assessor(s): Posts Held:	Janice Mackenzie Dorothy Hanley Fiona Halcrow	**Date of Original Assessment:**	05/07/17
Manager Responsible:	Peter Campbell, Deputy Associate Nurse Director – Children's Services		
Department:	RHSC & DCN Reprovision Project – **RHCYP Critical Care (B1)**		
Subject of Assessment: Consider Task or Environment.			
Ability to cohort patients within Critical Care Unit			
Step 1: What are the Hazards?			
Clinical risk is still relatively high if no cohort area available and therefore operationally to retain the ability to cohort within B1-063 (low acuity HDU) would be clinically and operationally highly advantageous.			

Step 2: Who might be harmed and how?
Patients through spread of infection. Potential cancellation of elective surgical cases as staff group will be required to deliver 1:1 care who potentially could be cared for within a cohort area
Step 3: What are you already doing? (Existing Precautions)
Critical Care (B1) – 24 beds • 3 x 4 bedded rooms (intensive care, high acuity & low acuity) • 1 x 3 bedded room (surgical neonates) • 4 x isolation rooms • 5 x single rooms The increased number of single rooms and a higher nurse to patient ratio within the Critical Care Unit will help mitigate the risk of nursing patients in single rooms

Level of Risk if no cohort area 9

Level of Risk if cohort retained 3

Step 4: Action Plan			
What further action is necessary?	**Action By Whom**	**Action by when (dd/mm/yy)**	**Action completed. (dd/mm/yy)**
In the Building Users Guide need to state that two 4 bedded rooms (ITU & high acuity high dependency) and one three bedded room (surgical neonates) cannot be used to cohort patients with air-borne infections Careful placement of patients within the designated areas	Jane Campbell Senior Nurse in Charge & Consultant	September 2017 Ongoing	

3.7.21 The SHTM 03-01 recommendation for positive pressure and 10ac/h in Critical Care was not identified by those conducting the risk assessment.

3.7.22 A risk assessment was also carried out for the two multi-bed rooms in Haematology & Oncology, which the project team had previously identified as requiring a positive pressure regime at 10ac/h.

3.7.23 On 7 July 2017 Brian Currie (NHSL, Project Director) emailed Wallace Weir (IHSL) outlining NHSL's argument that the amendment to the multi-bed rooms to achieve room balance should be made at no additional cost to NHSL. This argument was on the basis that the current design was non-compliant. It read:

> "In addition to the comments made at Financial Close, the Board also would like to draw PCo's attention to the following clause in the Appendix B of Schedule Part 10:

> ‘2.1.31 Project Co shall provide completed Section 6 (Room Data Sheets) of Schedule Part 6 (Construction Matters) for all rooms and areas within the Facilities including the environmental data contained in the Environmental Matrix. These Room Data Sheets shall be complete in all respects’.

The Board also notes SHTM 03-01, clause 2.60 states the following:

> ‘2.60 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).

The Activity Database are included in SHTM03-01, and are therefore included in the Boards Construction Requirements, and form part of the Project Agreement.

In terms of interpretation of design criteria for multi bedrooms, for the avoidance of doubt the 3.10 of SHPN 04-01 states:

> ‘The acceptable maximum number of beds in a multi-bed room is four as it gives each patient a corner as a `home base` and a neighbour on one side only.’

The SHPN 04-01 also describes what the ward is and it cross refers to HBN 04-01, which in *Figure 1 Functional Relationships* gives an indicative layout of typical ward. It is clear from the information that a ward is a group of different types of rooms that can consist of single and multi bed rooms.

On that basis PCo assumption to use “general ward” as design guidance for multi-bed rooms, in the Board’s opinion was incorrect.

As for the reason why the Board believes the multi bedrooms should be designed to balanced/-ve pressure, as per 5.4 of SHFN 30, which states:

> ‘Multi-bed rooms can also be used to cohort patients with the same infection if they have en-suite toilet and shower, and a door to the main ward area. The possible need for this should be considered at the design stage.’

The pressure cascade should be from corridor to bedroom and to en-suite preventing spread of infection. Please also refer to 6.10 of SHFN 30:

> ‘The same basic principle applies for all clinical areas whereby positive pressurisation is maintained by providing supply ventilation in cleanest areas cascading to dirty areas where negative pressure will be achieved. This will inhibit the spread of contamination.’

Furthermore, clause 4.8 of SHFN 30 states:

> ‘Similarly, the detailed design of the building elements can contribute to reducing the risk of transmission of micro organisms e.g. selection of finishing materials for floors, walls and ceilings; designing the ventilation system to inhibit the spread of contamination.’

And clause 4.9 of SHFN 30:

> ‘A number of design and layout issues could contribute to the risk of transmission of micro-organisms. For example, the ventilation system needs to inhibit contamination spread rather than contribute to it. Internal and external routes identified for removal of dirty laundry, waste food, healthcare waste, similarly need to be carefully planned.’

Based on all the above guidance documents, the Board believes the multi bedrooms should be designed to balanced/-ve pressure in order to prevent spread of infection.”

3.7.24 Countering responses were prepared by Brian Rutherford (TUV SUD) in support of Project Cos opposing argument that the original design (positive pressurisation) was compliant. It read:

> “SHTM 03-01 para 2.60 Contrary to what has been stated, the ADB sheets are not within SHTM 03-01 they are referred to. Contract ADB sheets for 4 Bed Room/Multi Bed Ward state 4ac/hr supply and positive pressure within the room.
>
> SHPN 04-01 para 3.10 The document reference is for ‘Adult In-Patient Facilities’. HBN 04-01 This document is in reference to ‘Adult In-Patient Facilities’. Refer to HBN 23 Hospital accommodation for children and young people, para 3.97 makes reference to 4 Bed Wards.

SHFN 30 para 5.4 This section does not make reference to a ventilation requirement, it does ask that an en-suite toilet and shower be provided and specifically asks for a door, all of which is provided within the current 4 Bed Room/Multi Bed Ward layouts.

SHFN 30 para 6.10 There is no reference within this document to the pressure cascade being from corridor to bed room and to en-suite preventing spread of infection. The paragraph taken from the document states 'positive pressurisation is maintained by providing supply ventilation in cleanest areas', cleanest arears in this scenario is the 4 Bed Room/Multi Bed Ward, as corridor cannot be designated as a clean area.

SHFN 30 para 4.8 This paragraph is under the heading of Space Planning. Ventilation as designed will inhibit the spread of contamination. Again, refer to previous comment.

SHFN 30 para 4.9 This paragraph is under the heading of Space Planning. Ventilation as designed will inhibit the spread of contamination. Again, refer to previous comment".

3.7.25 Graham Coupe (MPX) in response to Mr Currie's email voiced his concern that "the volume of reference documentation now being tabled is serving more to cloud the issues, than assist in clarifying them."

3.7.26 On 10 July 2017 Ronnie Henderson (Project Manager, Hard FM) emailed Ian Powrie (Deputy General Manager (Estates) at the Queen Elizabeth University Hospital, Glasgow) seeking advice on multi-bed ventilation:

"We are now looking into issues with ventilation, specifically 4 bedded rooms. I understand that there are some in the Childrens area of the QEUH and for comparison we would like to know what airflow/pressure regime has been applied: 1. Corridor to room to en-suite to outside (Balanced or slightly negative) or 2. Room to corridor and Room to en-suite (Positve) Clinical staff are worried about the infection control risk if the rooms are used to cohort patients. Appreciate any info you can give".

Mr Powrie responded:

"We also have an ICT concern on this, en-suite to room slightly negative. Room to corridor neutral Page 2 of 4 Room ACR 3-4 Ach (not 6 as defined in SHTM 03-01, this is due to the use of chilled beam units and the reduced air flow. Are you adopting chilled beams? If so be careful if the dew point control issues. Call me if you would like to discuss."

Mr Henderson responded:

"No chilled beams thankfully but worse pressure issues, our 4 beds are positive to both corridor and en suite so a major issue when cohorting patients. Air change rates are same as you at 4 with openable windows, they are claiming this complies with a mixed mode system as described in the SHTM, not sure about that but it's the least of our worries compared to infecting the ward. By the way they used the 'General Ward' description from appendix 1 Table Al to design the pressure regime for the '4 beds!! If it's not too much trouble do you have an extract from your environmental matrix for 4 bedded rooms that you could send us by any chance?"

3.7.27 On 12 July 2017, while the EM was unapproved RDD, IHSL issued to NHSL and the Independent Tester formal notification pursuant to Clause 17.5 of the PA that the completion date was secured in three months' time.

3.7.28 On 18 July 2017 Kamil Kolodziejczyk (MM) emailed Ronnie Henderson and Brian Currie (NHSL) seeking approval of an email reinstating EM Rev 9 to level B approval:

"Brian / Ronnie,

Following our review of Environmental Matrix and recent discussions with PCo relating to multi bed room ventilation, we suggest sending the following response:

'The Board reviewed the Environmental Matrix rev 9 and has noted there are still inconsistencies in the matrix, these have been highlighted red (but not limited to) in the attached, with examples provided below;

- The ‘Ventilation type’ column states central general extract where no extract in this specific room is provided.
- Central supply air is indicated in ‘Ventilation type’ column while the supply and extract are being provided. Refer to G-A1-038 & 1-B1-065 respectively.
- […]

Please note that no Project Co changes were highlighted other than the ‘All Rooms’ sheet, hence the Board only reviewed ‘All Rooms’ sheet and did not review the matrix line by line, noting any non-compliance with BCRs / PCPs / SHTMs etc is Project Co’s responsibility.

The Board notes it is the Board’s opinion the ventilation design for multi bedrooms is not compliant with the BCR’s and separate discussions are ongoing relative to the satisfactory resolution of the design. Please also note the Board rejected Project Co’s derogation for single rooms and are considering the compliance of the alternative solution.’

Based on the comments above we propose status B.

Appreciate the issue on ventilation for multi bedrooms is still not resolved, however I don’t think we should be rejecting matrix on that basis. If we were to lose the argument re ventilation, then PCo may use it for potential compensation event and therefore extension to programme”.

3.7.29 The response was issued to Project Co via the Aconex transmission system the same day. Board comments remained as per the previous response on 26 June in which approval was withdrawn[9]. No changes had been made by Project Co within the attached and highlighted copy of the EM, which appears consistent with EM revision 9 (version 26).

3.7.30 The ventilation specification for the nine Critical Care rooms in EM revision 9 (version 26) is reflected in the table below:

[9] See paragraph 3.7.8

Environmental Matrix Rev 9

Dept Name	Room Name	Room Function	Room number		Ventilation				
					Ventilation Type	Supply ac/hr	Extract ac/hr	Relative Pressure	Min Filtration
B1 PICU and HDU	Open Plan Bay (4 beds)	Multi-bed Wards	1-B1-009	**Actual**	**Natural and Central Supply Air**	**4**	**1.7**	**Positive**	**F7**
			1-B1-031	**Actual**	**Central Supply and Extract**	**4**	**1.8**	**Positive**	**F7**
			1-B1-063	**Actual**	**Central Supply and Extract**	**4**	**0.5**	**Positive**	**F7**
				Recommended	Supply	10	-	positive	F7
	Open Plan Bay (3 Cots)	Multi-bed Wards	1-B1-065	**Actual**	**Central Supply air**	**4**	**1.9**	**Positive**	**F7**
				Recommended	Supply	10	-	positive	F7
	Single bed cubicle	Bedroom	1-B1-037 1-B1-021 1-B1-020 1-B1-019	**Actual**	**Central Supply and Extract**	**4**	**4**	**Balanced**	**F7**
				Recommended	Supply	10	-	positive	F7
	Single cot cubicle	Bedroom	1-B1-075 (with ensuite	**Actual**	**Natural and Central Supply Air**	**4**	**Via en-suite**	**Balanced**	**F7**

Environmental Matrix Rev 9

Dept Name	Room Name	Room Function	Room number		Ventilation				
					Ventilation Type	Supply ac/hr	Extract ac/hr	Relative Pressure	Min Filtration
				Recommended	Supply	10	-	positive	F7

3.7.31 At a Programme Board meeting on 24 July 2017, "Performance of Project Co" continued to be a high risk. A document titled "Compromises Schedule" was also tabled. It contained a list of 30 potential compromises which were under review by NHSL:

- Item 1 of 30 was the issue with single bedroom air change rates. It read:

  Reason for Compromise: Project Co's design is not in line with SHTM guidance in relation to air changes. Currently the only extract is via the ensuite, meaning this is 'dirty extract' which can't be used for heat recovery.
  Technical Solution: Single bedrooms have reduced air supply rates to maintain correct pressure regime. There is not solution proposed to provide heat recovery from the bedrooms.
  Description of Compromise: Less air supply to the bedroom than recommended by SHTM and increased extract through en-suite which will affect running cost of the Facility. No ability to recover heat from en-suite dirty extract
  Impact: Operational
  Consulted: Ronnie Henderson, Project Manager (Hard FM)
  Dorothy Hanley, Project Manager (Childrens Services)
  Janice Mackenzie, Project Clinical Director
  Fiona Halcrow, Project Manager (Clinical Support)
  Janette Richards, Lead HAI Scribe Advisor (IPCT)
  Pota Kalima, Consultant Microbiologist
  Haem/Onc Clinical Team
  Status: Under Review

- Item 2 of 30 was the ventilation issue in neutropenic patient rooms. It read:

  Reason for Compromise: As per SHTM and Clinical Specs, the rooms for neutropenic patients should be designed as isolation rooms (+10 positive pressure). However, there are 10 single rooms which Project Co have designed to balanced pressure.
  Technical Solution: No solution proposed
  Description of Compromise: NHS took a decision to operationally manage the department rather than asking Project Co to change the design
  Impact: Operational
  Consulted: Ronnie Henderson, Project Manager (Hard FM)
  Dorothy Hanley, Project Manager (Childrens Services)
  Janice Mackenzie, Project Clinical Director
  Fiona Halcrow, Project Manager (Clinical Support)
  Janette Richards, Lead HAI Scribe Advisor (IPCT)
  Pota Kalima, Consultant Microbiologist
  Haem/Onc Clinical Team
  Status: Under Review"

3.7.32 The Critical Care Clinical Team was not listed as consulted.

3.7.33 In the minutes of the Programme Board meeting it was recorded that concerns regarding the compromises being made by NHSL were raised by George Curley, Director of Operations (Facilities):

> "[George Curley] expressed his concern and disappointment that such a large amount of significant compromises and derogations are being made at this stage of the project. [George Curley] also questioned the safety and suitability of certain compromised solutions and requested further discussion on some points. [Brian Currie] communicated his surprise at this given the historical and continuing engagement of estates and facilities with the project. [Jim Crombie] and [Brian Currie] agreed to discuss these concerns in detail with [George Curley] outside of the meeting".

3.7.34 On 7 August 2017, Brian Currie (Project Director) issued a letter to IHSL in response to their Clause 17.5 notification (issued 12 July). It stated:

> "Further to this Clause 17.5 Notification, the Board has commenced relevant activities in preparation for the anticipated completion date of 12 October 2017 and is therefore incurring associated costs. Moreover, this Clause 17.5 Notification has also triggered the activities of the Independent Certifier.
>
> The Clause 17.5 Notification is not one which should be served lightly by Project Co and should be a genuine trigger to the countdown to the Actual Completion Date. In the event that the stated date of 12 October 2017 transpires to be incorrect, the Board shall require Project Co to be held to account for any costs incurred by both the Board and/or the Independent Tester in relation to all reasonable activities carried out by either the Board and/or the Independent Tester in preparation for the anticipated completion date beyond 12 October 2017 […]
>
> The Board must have absolute confidence in the anticipated completion date stated by Project Co pursuant to the Clause 17.5 Notification. A false or misleading anticipated completion date will quickly escalate to the highest levels of both the Board and Scottish Government, which shall have reputational consequences for Project Co."

3.7.35 On 28 August 2017, Kamil Kolodziejczyk issued another Aconex transmission regarding the review of EM revision 9. It read:

> "Ken, Further to the Board's comments issued as per MM-GC-003072, and the meeting held on 28 July, please find attached updated Board's response to rev. 9 of the Environmental Matrix."

3.7.36 The Inquiry has been unable to review the updated Board Comments on EM Rev 9 issued on 28 August.

3.8 Revision 10 of the Environmental Matrix

3.8.1 Revision 10 of the EM was dated 12 September 2017. It had been updated to incorporate Board Comments received on 28 August 2017.

3.8.2 Changes had been made to the ventilation specification in two Critical Care multi-bed rooms:

- In room 1-B1-063 the “extract ac/h” was increased from 0.5ac/h to 3ac/h (with 4ac/h supply and positive pressure maintained).
- In room 1-B1-065 the “extract ac/h” was increased from 1.9ac/h to 4ac/h. Relative pressure was changed from “positive” to “balanced” and the “ventilation type” was changed from “central supply air” to “central supply and extract”.

3.8.3 Following this change, Critical Care room 1-B1-065 was the only multi-bed room out of 20 to reflect a balanced pressure regime.

3.8.4 An ‘Environmental Matrix meeting’ was held on 28 September 2017 following a review of EM Rev 10. On 5 October, Ken Hall (MPX) distributed a confirmation of the discussion at that meeting:

1. “11 points noted and attached to be captured in the current Rev 10 version in for RDD. Revised version 10 to be circulated to Kamil who will then discard the current copy. Update to be complete and issued by 13.10.17.
2. TUV SUD requested a review line by line, Motts noted if TUV SUD can confirm a check has been made line by line then there was no requirement to do a line by line check. TUV SUD confirmed a line by line check had been carried out in their office. Item closed.
3. Feedback from Motts that subject to the 11 No clarifications required for Rev 010 this concludes the review of the matrix. Next stage is to use the matrix at site to check off against what is installed within the rooms.
4. Multi bed rooms were not discussed at this meeting. Matrix will require to be updated once the changes are instructed.
5. […]

6. […]
7. With rev 10 review now concluded, Motts noted the following updates to be scheduled out:

    (i) Schedule Accommodation Changes

    (ii) Change Controls

    (iii) 4 bedded wards (as item 4 above)

    (iv) Plantroom Numbering (as item 6 above)"

3.8.5 It's not currently clear if any members of the NHSL project team were present at the meeting. Further, the Inquiry Team does not hold the "11 points noted and attached" which were to be incorporated into EM Rev 10.

3.8.6 On 4 October 2017, at a Programme Management Group meeting it was noted: "Environmental Matrix: Returned as status B with 11 minor items to be addressed. Revision 10 to be updated to include ALL previously issued comments and agreed between the parties to mark agreement at a point in time".

3.9 Revision 11 of the Environmental Matrix

3.9.1 Revision 11 of the EM was dated 25 October 2017. It had been updated to incorporate Board Comments and a revised accommodation schedule.

3.9.2 The Inquiry understands from notes of the Environmental Matrix meeting on 28 September that this revision 11 was to be used "at site to check off against what is installed within the rooms".

3.9.3 How the EM was used after it was concluded through RDD is considered within a separate Inquiry paper on commissioning and validation.

3.9.4 The specification reflected for Critical Care at this time was:

Environmental Matrix Rev 11

Dept Name	Room Name	Room Function	Room number		Ventilation				
					Ventilation Type	Supply ac/hr	Extract ac/hr	Relative Pressure	Min Filtration
B1 PICU and HDU	Open Plan Bay (4 beds)	Multi-bed Wards	1-B1-009	**Actual**	**Natural and Central Supply Air**	**4**	**1.7**	**Positive**	**F7**
			1-B1-031	**Actual**	**Central Supply and Extract**	**4**	**1.8**	**Positive**	**F7**
			1-B1-063	**Actual**	**Central Supply and Extract**	**4**	**3**	**Positive**	**F7**
				Recommended	Supply	10	-	positive	F7
	Open Plan Bay (3 Cots)	Multi-bed Wards	1-B1-065	**Actual**	**Central Supply and Extract**	**4**	**4**	**Balanced**	**F7**
				Recommended	Supply	10	-	positive	F7
	Single bed cubicle	Bedroom	1-B1-037 1-B1-021 1-B1-020 1-B1-019	**Actual**	**Central Supply and Extract**	**4**	**4**	**Balanced**	**F7**
				Recommended	Supply	10	**-**	positive	F7
	Single cot cubicle	Bedroom	1-B1-075	**Actual**	**Natural and Central Supply Air**	**4**	**Via en-suite**	**Balanced**	**F7**

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Dept Name	Room Name	Room Function	Room number		Ventilation				
					Ventilation Type	Supply ac/hr	Extract ac/hr	Relative Pressure	Min Filtration
			(with ensuite)	Recommended	Supply	10		positive	F7

3.10 Settlement Agreement Negotiations

3.10.1 From August 2017 all parties were engaged in without prejudice dialogue around a growing list of alleged non-compliances. The multi-bed ventilation dispute continued to present an impasse, and external expert opinion was sought by both NHSL and Project Co in support of their respective positions.

3.10.2 David Rollason consulting engineers were instructed on behalf of NHSL to "give an opinion on whether Project Co's proposed ventilation design for the four-bed rooms complied with the relevant contractual provisions." The report, dated 1 November 2017, stated: "With regards to pressure regimes, the Board believes that Project Co's proposed ventilation design for the 20 '4-bed rooms' does not comply with the…BCRs [Board's Construction Requirements]… PCPs [Project Co Proposals]… and guidance in SHTMs. I understand the Board may also have concerns regarding Project Co's proposed air change rates, but this is not an issue upon which I have been asked to comment at this stage".

3.10.3 The Inquiry understands that David Rollason was supplied with a one page schedule of design data for the multi-bed rooms, which had been extracted from various revisions of the EM. Rooms were sorted by department, thereby identifying that four were located in "B1 PICU & HDU".

3.10.4 Mr Rollason noted that the four rooms in Critical Care did not have ensuite facilities through which an extract could be provided: "mechanical extract from the four 4-bed rooms (1-B1-009, 1-B1-031, 1-B1-063 and 1-B1-065), which do not have adjacent en suites/accessible WCs/wet rooms, at rates of 1. 7 to 4ac/h…"

3.10.5 David Rollason's report, dated 1 November, stated:

> "Project Co was required to provide balanced/negative pressure in all 4-bed rooms relative to the adjacent ward corridors […] This is consistent with what I would normally expect, as providing balanced/negative pressure in the 4-bed rooms inhibits the spread of infection from patients in the 4 bed-rooms to adjacent areas. […] Project Co's proposed ventilation design for the 4-bed rooms does not comply with the relevant contractual provisions because Project Co's design provides positive…pressure in 19 of the 20 4-bed rooms relative to the adjacent ward corridors."

3.10.6 In noting this comment, the Inquiry is aware that exactly what was required under the Project Agreement is controversial and not a matter for the Inquiry to determine.

3.10.7 On 3 November 2017, NHSL issued a letter to the IT seeking an opinion on the David Rollason report and its support in the ongoing dispute. On 7 November 2017, John Edwards (Arcadis) responded by email to Brian Currie (NHSL):

> "I have had an initial review of the 'ventilation' report by David Rollason and would comment in respect of two areas that do not appear to be addressed. These are:
>
> - The inclusion in the PCP's of a revised ADB sheet that indicated neutral or positive pressure to the surrounding areas, which is what I presume Project Co were identifying in their reference to compliance with the ADB sheets in the PCPs.
> - There is no reference to Table A1 of SHTM03-01 Part A which indicates.

Application	Ventilation	ac/Hour	Pressure (Pascals)	Supply Filter	Noise (NR)	Temp (ºC)	Comments For further information see Section
General Ward	S/N	6	-	G4	30	18	

and that HBN 23 Hospital accommodation for children and young people makes reference to the provision for 4 Bed Wards of a similar nature and use to the rooms addressed in the report and that although paragraph 3.96 makes reference to the use of single bedrooms for isolation in emergency situations there is no mention of a similar use for 4 bedded rooms as below:

3.96 In a 16-bed ward, provision of 100% single rooms with en-suite facilities would offer maximum flexibility.

Furthermore, in an emergency situation, for example an epidemic, these rooms can be used as additional inpatient accommodation. Day care patients should not normally be mixed with acutely ill in-patients, except in an emergency. I believe these elements need to be addressed and would like to discuss the above on Tuesday."

3.10.8 Brian Currie responded to John Edwards on 9 November 2017:

"Suggest we go over your points in detail on Tuesday [14 November 2017] and I have asked Graeme Greer to attend to assist in those discussions…Would be good to discuss on Tuesday to clarify the impact of the above on the air change rate/pressure regime for the 4 bed rooms."

3.10.9 Multiplex, by way of response to the David Rollason report, instructed DSSR Consulting Engineers to provide their view on the matter. The report dated 6 December 2017 provided:

"Within the BCR, there does not appear to be specific or explicit reference to pressure regimes within the multi-bed areas which are subject to this dispute, nor do there appear to be any statements relating to the definition of, and related design criteria for, multi-bed areas, which I would expect to see if the Board had explicit requirements for these spaces. […] It can be seen that General Wards can acceptably be provided with supply or natural ventilation, and that single rooms can be provided with supply, natural or extract ventilation. General wards have no pressure requirements, and single bed wards can be neutral or negatively pressurised. However given the statement

in 2.3, should a specific pressure regime be critical in either of these room types, natural ventilation would not be an appropriate solution".

DSSR concluded:
"The parties have taken a different approach to whether the design should reflect that required for a single bedroom or a ward. There is nothing specific in the BCR's to assist with interpretation as to whether the area is a ward or bedroom. In the absence of explicit requirements on the design criteria for 4 bed areas, I would concur with the approach taken by MPX in applying general ward design criteria from Table A1".

3.10.10 On 19 December 2017, Multiplex sent a letter to IHSL and the IT enclosing the DSSR report: "we note that NHS Lothian has set out at some length the contractual analysis that it contends should apply to the ventilation design. That is presumably an attempt by NHS Lothian to unduly influence the Independent Tester given that he is already deemed to be aware of the various contractual conditions which apply between NHS Lothian and Project Co."

3.10.11 An updated Project Risk Register was tabled at an Extraordinary Programme Board meeting on 19 December 2017. A new risk had been added on 30 November rated "very high". It read:

"UHD Objectives: UHD 4. Quality/Patient Safety/Patient Experience

Title: Non Compliance of HV Network and 4 Bedded Room Ventilation

Description: The facility cannot become operational without remedial works to the currently designed and installed HV network and 4 bedded room ventilation regime. This is due to lack of resilience in relation to HV and infection control issues with 4 bedded room ventilation.

Controls in place:
NHSL having obtained full NHSL Lothian Board approval to proceed to adjudication within the dispute resolution process (DRP) as per project agreement with IHSL.

Independent expert reports have been prepared and issued to both IHSL and the Independent Tester supporting the Boards position that these two issues are non-compliant.

Decision to initiate adjudication is pending a formal response from the Independent Tester in relation to the impact of these two issues on “actual completion” of the facility. NHSL Lothian anticipate this response by 19th December 2017. Project Co continue to take a different view on the validity of these issues as non compliant.

Risk Level (current): Very High

Risk Owner: Jim Crombie

Handler: Brian Currie “

3.10.12 The DSSR Report and Independent Testers report were discussed at the Programme Board meeting of 15 January 2018. According to the minutes:

> “BC noted that written confirmation of this position is awaited from the Independent Tester and that the Independent Tester is expected to confirm that completion cannot be authorised with the current four bed ventilation as currently installed and designed.”
>
> NHS Lothian Board approval granted to proceed with DRP [Dispute Resolution Procedure] if the issues are not resolved following the receipt of IT report.”

3.10.13 John Edwards of Arcadis provided the view of the IT in an email of 23 January 2018:

> “Following the review, the Independent Tester would reaffirm the statement…that there are conflicting requirements contained within Schedule Part 6 and that in accordance with the provision of section 2.5 of Section 3 Board’s Construction Requirements of Schedule Part 6 […] the Board shall have the final decision regarding standards. […] In certain instances, NHS publications include a number of options or alternative solutions. Where the Board has defined their preference specifically, Project Co shall adopt these preferences as a mandatory requirement. Where no Board preference is

stated, Project Co shall engage the Board in the design development process to seek and incorporate the Board's preference within the Facilities."

3.10.14 In a subsequent email from Brian Currie (Project Director) which forwards the positive opinion from the IT to Janice Mackenzie (Project Clinical Director) and Jackie Sansbury (Director of Strategic Planning & Modernisation), Mr Currie adds:

"Janice, did you get any feedback on positive pressure regime in post operative care beds?".

3.10.15 It's currently not clear to the Inquiry Team which department would house 'post-operative care beds' or if NHSL had identified different ventilation requirements in that department.

3.10.16 On 1 February 2018 an internal document titled "4 Bed Room Tracker" was circulated between Dorothy Hanley (NHSL) and Janice Mackenzie (NHSL). The tracker was a condensed view of the EM, filtered only to show multi-bed rooms.

3.10.17 Within the tracker, Ms Hanley and Ms Mackenzie had contributed to the columns in which possible compromises, their impact and the rationale behind them were considered by NHSL. For "B1 PICU & HDU" it stated:

		Compromise 24/02/17 - Essential = room to be negative / balanced	**Draft 01/02/18 Essential = room to be negative / balanced**	**Rationale**
B1 PICU & HDU	1-B1-009	Essential	Would be very useful, but not essential for current planned operational use. May compromise future Service development needs	operationally cohorting within this area is impractical due to number of access/egress points and number of persons using through corridor

1-B1-031	Essential	Not Essential	operationally cohorting within this area is impractical due to number of access/egress points and number of persons using through corridor
1-B1-063	Essential	Essential	patients with same respiratory illnesses will be cohorted to ensure ease of observation and safe care
1-B1-065	Essential	Essential	pre-term babies with same respiratory illnesses will on occasion need to be cohorted to ensure ease of observation and safe care

3.10.18 On 8 February 2018 an updated General Risk Assessment for multi-bed rooms (initially carried out in July 2017, see 3.7.17) was circulated among the Project Team by Dorothy Hanley. Janice Mackenzie responded, stating:

> "I was planning to update further following the meeting with Brian and Graeme to reflect what is now on the spreadsheet Graeme produced and haven't done this yet. I will do tomorrow when back in the office and send to you all."

3.10.19 On 9 February Ms Mackenzie circulated the updated General Risk Assessment. It stated:

Summary of Risk by Ward/s (Essential to have ventilation changed)

Ward/s	Proposed Action	Risk Rating If No Change	Risk Rating if Change Implemented
RHCYP - PARU	All three 4 bedded rooms (A2- 028, 046 & 054)	15	4
RHCYP – Medical Inpts	All two 4 bedded rooms(C1.1-018 & 046)	10	3
RHCYP – Critical Care	One 4 bedded room low acuity HDU (B1-063) & 3 bedded room surgical neonates (B1-065)	9	3

Summary of Risk by Ward/s (Desirable to have ventilation changed)

RHCYP – Critical Care	4 bedded room intensive care (1-B1-009)	8	2
RHCYP – Surgical Long Stay Ward	All two 4 bedded rooms (C1.2-023 & 026)	6	2

RHCYP - Neurosciences	All two 4 bedded rooms (C1.3-011 & 013)	6	2
RHCYP – Medical Day Case Unit	One 3 bedded room (D9-022)	6	2

Summary of Risk by Ward/s (No change to ventilation)

RHCYP – Surgical Short Stay Ward	No change to ventilation in the two 4 bedded rooms	1	
RHCYP – Critical Care	No change to high acuity 4 bedded room (B1-031)	1	
RHCYP – Haematology Oncology Day Care	No change to ventilation in the two multi-bed day care areas	1	
DCN – Acute Care Ward	No change to ventilation in the two 4 bedded rooms	1	

3.10.20 In relation to Critical Care, and the three out of four multi-bed rooms still with positive pressure, it stated: "The Children's CMT [Clinical Management Team] have confirmed that all three of the 4 bedded rooms to have negative/balanced pressure".

3.10.21 A two day 'Principles meeting' was held at The Sheraton on 20 and 21 February 2018. The purpose of this meeting was to establish what the final design and construction of the building would be, secure the programme and agree costs.

3.10.22 A document titled "Board preparation for the RHSC + DCN Principals Meeting" provided NHSL's position on the list of potential non-compliances. Included in the schedule was:

> Item 4
>
> "**Issue description**: Bedroom ventilation pressure regime and air change rate rooms for neutropenic patients
>
> **Category of Issue:** Haematology and Oncology patients.
>
> **Current status:** MPX have installed a non-compliant system, however the Board will be able to operationally manage around the issue.
>
> **Board opinion on Impact to Project Co (timing, cost, duration):** Major - if the Board alter position on operational workaround.
>
> **Board opinion on Project Co Position:** Non-negotiable
>
> **Board position:** Negotiable
>
> **Possible Board Compromise:** The Board accept a Project Co Change.
>
> **Impact of Compromise on the Board:** Reduced operational flexibility. But manageable."

Item 7

"**Issue description**: 4 bed ventilation

Category of Issue: Patient safety risk - inability to cohort. Risk of infection

Current status: MPX confirmed current installation is compliant, Board disagree. MPX challenging Independent Tester interpretation of the contract, Noting the IT has since repeated his agreement with the Boards interpretation. ?

Board opinion on Impact to Project Co (timing, cost, duration): Major - mechanical works. High cost and several months work.

Board opinion on Project Co Position: Negotiable as Compromise design was prepared in Feb 17, however not progressed.

Board position: Negotiable, however must be completed before handover.

Possible Board Compromise: The Board accept a Project Co Change for a reduced air change rate, but achieve negative / balanced pressure. There are 20 rooms involved in total however on a risk analysis there are 13 for which sorting the problem is desirable, and 7 in which it is essential.

Impact of Compromise on the Board: Less dilution of airborne containments and odours in the room. Reduced operational flexibility and reduced flexibility for change of ward use in the future."

Item 13

"**Issue description**: Single bedroom ventilation air changes

Category of Issue: Patient Comfort.

Current status: MPX have installed a non-compliant system, Board awaits a Project Co Change.

Board opinion on Impact to Project Co (timing, cost, duration): Major - if the Board does not accept the Project Co Change.

Board opinion on Project Co Position: Non-negotiable

Board position: Negotiable

Possible Board Compromise: The Board accepts a Project Co Change for a reduced air change rate, but achieve negative / balanced pressure.

Impact of Compromise on the Board: Reduced patient comfort."

3.10.23 The Inquiry does not hold minutes of the meetings held on 20 and 21 February 2018.

3.10.24 NHSL escalated its concerns regarding progress with negotiations to the Finance and Resources Committee. Minutes of the F+R Commitee meeting on 21 March 2018 record:

> "The Committee previously approved the recommendation by The Director of Finance to raise a court action seeking an interim order to force IHS Lothian Ltd to design and install a compliant ventilation system to twenty number four bedded rooms with an air change rate of 6 ac/hour.
> …
> The Chair thanked Mrs Goldsmith for briefing the Committee on the situation. The Committee noted with concern the situation as it was at the moment. It was noted that court action for an interim order in relation to Four Bedded Room Ventilation, if served, would be done on Monday 26th March and that there would be a robust communications strategy around this. In the meantime the Cabinet Secretary's concerns would be clarified and a response from IHSL in relation to mediated discussion remained awaited. The Committee acknowledged the Chief Executive's awareness of the current situation."

3.10.25 By 27 March 2018 a list of 76 potential non-compliances were compiled into a spreadsheet, under the heading "Items discussed between the board and project co at principals meeting 20th and 21st Feb 18".

3.10.26 Regarding multi-bed ventilation, it stated:

> **"Item 7:** 4 bed ventilation
> **Issue:** In relation to ventilation pressure regimes, the Board believes Project Co's design for ventilation is non-compliant with the Board's Construction Requirements (BCRs), Project Co Proposal's (PCPs), SHTM Guidance and RDD FC comments. In addition, the Board believe the intake air change rate and the extract air change rate are non-compliant. From a clinical perspective, the principal concern to the Board in continuing with Project Co's proposed

pressure regime design means there is an unacceptable risk of the spread of bacterial airborne infections into corridors and surrounding patient rooms (positive to the corridor). The Board requires the pressure regime to be balanced or negative to the corridor".

RAG: Amber

MPX response:

Position: MPX have QC opinion on contractual position. Subject to further discussion next week. NHS have changed their position on what is acceptable and reverted to all 20 rooms at 4 AC/H. This will have major consequences

Current Action(s): subject of further letter and discussion by the parties.

Close Out Date: 2nd March 2018 (Dependent on Outcome)"

3.10.27 The compromises detailed on the "Compromise List" for the single bedrooms ac/h and neutropenic ventilation items remained as per the Compromises Schedule on 24 July 2017[10].

3.10.28 Multiplex provided a response:

- "Item 4: Bedroom ventilation pressure regime and air change rate in rooms for neutropenic patients

  MPX response:

  Position: NHSL believe all single bedrooms should be able to cater for Neutropenic patients. MPX believe the department design meets the brief.

  Current Action(s): NHSL replied on 08 March 2018 15:19. MPX collating response.

  Close Out Date: Date 28th March (await Tuv-Sud to formulate response / HLM received)"

- "Item 13: Single bedroom ventilation air changes

[10] See paragraph 3.7.31

MPX response:

Position: NHSL have rejected change. Albeit it was discussed and agreed in principle at mediation.

Current Action(s): Board to confirm position on this change and whether fundamentally it will or will not accept 4 air changes per hour in the single bedroom. MPX reviewing its position on resubmitting the change or withdrawing."

3.10.29 On 4 April 2018 the first 'Project Technical Management Group meeting' was held. The purpose of the group was:

"To determine a definitive list of actions required to be completed/closed out to enable a completion date/programme to be achieved. Information taken from the following:

- Previous PMG notes/actions
- Change notes/actions
- Pre-Post PC meeting notes
- Board issued "Project Potential Non-Compliance list"

3.10.30 In attendance were:

- NHSL: Janice Mackenzie, Jackie Sansbury, Ronnie Henderson
- Mott MacDonald: Kamil Kolodziejczyk, Ian [surname unknown], Kelly Bain
- IHSL: Wallace Weir, David Martin
- Multiplex: Liane Edwards-Scott, John Ballantyne, Stuart Jackson, Colin Grindlay
- Bouyges: Paul Wandless, Paula Ramage

3.10.31 Actions from the meeting included:

Item 4: Bedroom ventilation for neutropenic patients

"Board to draft proposed wording for MPX review and incorporation into change"

Item 7: 4 bed ventilation

"14 rooms at 4 a/c confirmed. Room numbers to be confirmed and updated on drawings. (MPX)"

Item 13: Single bedroom ventilation

"Technical solution agreed at 4a/c. Change wording to be concluded (via change list)"

3.10.32 At the Programme Board meeting of 15 May 2018 it was noted that the DRP (dispute resolution procedure) had been avoided and a Settlement Agreement would be pursued. Notes of the discussion included:

"Operational risks as a result of compromises made are mitigated to the extent that they do not adversely effect clinical specifications and requirements as outlined in BCR's."

3.10.33 By 5 July 2018, resolutions to three ventilation disputes (Items 4, 7 and 13) had been agreed in an early draft "Technical Schedule" and the items were noted as being closed. An excerpt of SHTM 03-01 Table A1 was included in the early draft for Item 4, but it did not include the recommendations for Critical Care areas.

3.10.34 The 'Ventilation Amendment Proposal to Achieve Room Balance' was updated on 6 June 2018. This version retained air changes at 4ac/h but did not incorporate a supplement of 2ac/h from openable windows as Project Co Change 51 had done.

3.10.35 The agreed technical solution in the four Critical Care multi-bed rooms (without ensuite facilities) was:

"Retain the supply ventilation at 4ac/hr. Introduce new general extract ductwork and grille into the room to provide 4ac/hr overall. The existing general extract ductwork currently serving the room has been increased in size and another grille added to it to serve the room. This will achieve a balanced room pressure. New branch duct to be connected locally into the existing general extract ductwork main…"

3.10.36 The agreed technical solution in 10 other multi-bed rooms (with ensuite facilities) was to retain the supply ventilation at 4ac/h and ensuite facilities at 10ac/h

or 17ac/h. New general extract ductwork and grilles were to be introduced in these rooms to provide 4ac/hr overall.

3.10.37 No changes were instructed in six out of 20 multi-bed rooms, which would remain positive to the corridor, including the two multi-bed rooms in Haematology & Oncology.

3.10.38 The works required in multi-bed rooms were being progressed by MPX as "Without Prejudice Works" ["WPW"] in the absence of a signed settlement agreement.

3.10.39 At the Programme Board meeting of 16 July 2018 the risk register recorded that the HV/ 4 bed room ventilation risk level was "low".

> **Controls in place:** "IHSL are undertaking works to ensure compliance as part of settlement agreement under negotiation"
> **Adequacy of controls:** "Satisfactory; controls adequately designed to manage risk and working as intended"
> **Notes:** "Controls revised with Risk Handler and risk level significantly reduced."

3.10.40 On 25 July 2018, NHSL submitted a Supplementary Business Case to the Scottish Government to support the proposed commercial agreement. The proposal was approved by Christine MacLaughlin, SG Director of Health Finance, on 8 August.

3.10.41 By 6 September 2018, HFS were involved in developing lessons learned from the QEUH project. Lessons compiled in a PowerPoint presentation included:

- **"Client Briefing**

- Lack of accurate detail on guidance
- Reinventing design solutions (no learning)
- No specification of materials or quality
- Deliverables at handover not specified
- No checks on project deliverables at milestones (FBC, Design, Installation, Handover)
- Estates, FM and Infection Control teams not involved

- **Design/equipment selection**
  - Designs tend to be “copy-and-paste”
  - Insufficient technical skills in design teams
  - Thermal models developed too late and do not inform the design solution
  - Contractor design portion higher and they don’t have the skills or indemnity to follow through
  - Significant levels of overdesign to avoid risk
  - Taps and basins selected by architect on aesthetics rather than engineering
  - Avoidance of guidance to save money
  - Value engineering has become cheapening of the design
  - Derogations used to remove technical aspects from projects and not technically equivalent/improvement on the original guidance
  - Estates, FM and Infection Control teams not involved.
- **Installation**
  - Supervision poor
  - Installation does not meet best practice
  - Contractors not trained in healthcare specifics (i.e. not competent persons by healthcare definitions)
  - Designers not being paid to attend site during installation phase
  - Nonexistent ventilation
  - Technical advisors inconsistent
  - Certain aspects physically squeezed in so as to make maintenance difficult if not impossible.
  - Estates, FM and Infection Control teams not involved

- **Commissioning**
    - Commissioning is poor and do not reflect the requirements of healthcare facilities
    - Chemicals used do not disinfect the systems
    - Chemicals used invalidate warranty of the taps and other components
    - Water systems are being handed over microbiologically contaminated
    - Time allocated to properly commission the mechanical and electrical services is not protected.
    - No understanding of electrical systems in theatres/critical care areas
    - Failures not challenged
    - Safe, adequate access for all services (including IPS and ward isolation valves)
    - Estates, FM and Infection Control teams not involved
- **Handover**
    - Project success is measured only as a function of time and money.
    - No formal acceptance of engineering systems
    - No formal assurance of engineering systems from contractor
    - Lack of suitable and appropriate Client training on systems
- **Post-occupancy**
    - […]"

3.10.42 'Project Co Change 50' (Disputed Works Schedule Appendix 1 Item 4) for neutropenic patient rooms was produced by IHSL on 28 August 2018. It stated:

> **"Proposed Project Co Change**
> Project Co are not proposing to alter the design. However, the Boards view is that the design is non-compliant with Schedule Part 6, Sub Section C, Clause 2.1 (Approach to Design) and Clause 8 (Mechanical & Electrical Engineering Requirements) of and Sub Section D, C1.4 Haematology & Oncology Inpatients & Day Care Clinical Output Based Specification and SHTM 03-01 (Ventilation for healthcare premises Part A – Design and validation) Table A1 (Appendix 1: Recommended air change rates).

In summary, the Haematology and Oncology Department treat a range of medical issues which can be dealt with in a number of situations. The Financial close design proposes this solution as a mix of single bedrooms and full isolation suites. The Board would have preferred all single rooms in haematology and Oncology to have been suitable for neutropenic patients.

Reason

Project Co's Financial Close design assigned balanced pressure to the neutropenic single bedrooms. The conclusion of design workshops held throughout the Construction Phase confirmed that, a balanced pressure regime will be managed operationally and is acceptable on the basis that 5 isolation suites are provided in accordance with SHTM 03-01.

Implications

Project Co require relief from the following:

- Section 2.1 (Approach to Design) of Sub-Section C (General Requirements) of Section 3 (Boards Construction Requirements) of Schedule Part 6(Construction Matters), which states:

  Project Co shall take cognisance of all the architectural and building services implications of the requirements described in the Board's
  Construction Requirements in this Schedule Part 6 Section 3 Sub-Section D (Specific Clinical Requirements) and Sub-Section E (Specific Non-Clinical Requirements).

- Section 8 (Mechanical & Electrical Engineering Requirements) of Sub-Section C (General Requirements) of Section 3 (Board's Construction Requirements) of Schedule Part 6 (Construction Matters), which states:

  Project Co shall take cognisance of all the building services implications of the requirements described in Section D (Specific Clinical Requirements) and Sub-Section E (Specific Non-Clinical Requirements) of Sub-section C of the Board's Construction Requirements.

- Section 1.1.1 (Scope of the Service) of C1.4 (Haematology & Oncology Inpatients & Day Care Clinical Output Based Specification) of SubSection D (Specific Clinical Requirements), which states:

  The paediatric Haematology and Oncology Unit, (Inpatient and Day Care services), is to provide a 24 /7 service for the care of all patients with cancer or blood dyscrasia (a pathologic condition in which any of the constituents of the blood are abnormal in structure, function, or quality, as in leukaemia or haemophilia). Patients and families will attend for assessment, investigations, treatment, ongoing care planning, and palliative and end of life care.

- Table A1 (Appendix 1: Recommended air-change rates) of Scottish Health Technical Memorandum (SHTM) 03-01, Ventilation for healthcare premises Part A – Design and validation, as follows:

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	

Due to the current design, the Board is required to prepare specific standard operating procedure for management of infection and patients not using the isolation rooms within this department."

3.10.43 On 26 September 2018, a Project Technical Management Group meeting was held. Item 7 for multi-bed ventilation had been removed from the 81 point list. Only one ventilation action remained: "Item 4; Bedroom ventilation for neutropenic patients; Wording to be agreed between IHSL and NHSL."

3.10.44 Under a second heading, “IHSL Change Requests”, was:

- Item 50: “Neutropenic Patients Ventilation - Renamed: Disputed Works Schedule Appendix 1 Item 41. Include in SA pack. [Kamil Kolodziejczyk] to advise on blank document issued”
- Item 51 “Single Bedroom Ventilation - Renamed: Disputed Works Schedule Appendix 1 Item 13. Include in SA pack. Text agreed”.

3.10.45 Further Project Technical Management Group meetings to work through the 81 point list in the settlement negotiations were held on 3 October, 17 October and 24 October 2018.

3.10.46 ‘Project Co Change 51’ was produced by IHSL on 12 December 2018. It stated:

> **“Detail of change**
> Table A1 of Appendix 1 : Recommended air-change rates of SHTM 03-01: Part A - Design and Validation indicates that single room should be provided with 6 ac/h and 0 or -ve pressure. Single room WC should be provided with 3 ac/h and -ve pressure.
>
> **Project Co proposes to:**
> 1. 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); and
> 2. Increase the mechanical air change ventilation rate within single bedroom WCs from 3 air changes per hour (3 ac/hr) to minimum 10 air changes per hour (10 ac/hr).
>
> **Reason**
> Project Co's design philosophy for bedroom ventilation is based on mixed mode operation where mechanical supply ventilation providing 4ACH is then supplemented by openable windows to provide a passive means of ventilation (where access to an openable window is available).
>
> **Implications**

As there is no general extract proposed in single rooms, Board will not be able to extract heat generated within the space from the air extracted through the en-suites."

3.10.47 Project Co Change 51 did not detail the solution in single rooms designed with 4ac/h supply and no access to an openable window, such as Critical Care.

3.10.48 On 25 January 2019 the Director General of Health and Social Care, Paul Gray directed all NHS Boards to confirm that their critical ventilation systems were compliant with SHTM. This was to provide assurance in response to an ongoing HAI incident linked to the ventilation systems at the Queen Elizabeth University Hospital (QEUH) in Glasgow. It was further noted that all responses would be co-ordinated by HFS.

3.10.49 On 31 January, a representative of IHSL wrote to Brian Currie confirming that "all ventilation systems have been designed, installed and commissioned in line with SHTM-03-01 as required".

3.10.50 The response does not detail Project Co Changes 50 and 51 or agreed derogations from SHTM 03-01.

3.11 Settlement Agreement

3.11.1 By the Programme Board meeting on 6 February 2019 the HV/4 bed ventilation risk was removed from the Project Risk Register. The risk associated with "Performance of Project Co" remained a high, but 'non-compliance' was no longer part of the risk description.

3.11.2 The Settlement Agreement was signed on 22 February 2019 by Susan Goldsmith (NHSL) and Matthew Templeton (IHSL). It included:

- A technical schedule of 81 disputed items and agreed resolutions
- A "post-completion works" schedule, including three key technical issues to be resolved after completion during NHSL's commissioning phase (fire detection, isolation room heating, foul drainage)

- A ‘joint completion programme’ outlining the key milestones/deliverables for construction activities to continue alongside NHSL’s commissioning activities
- A variation to the Independent Testers contract to enable the Independent Tester to:
    i. issue the Certificate of Practical Completion based on the agreed technical solutions set out in the Settlement Agreement; and
    ii. certify when the technical solutions of the three outstanding material technical matters have been constructed, tested and commissioned (‘Final Certification’)

3.11.3 Accordingly, the Independent Tester issued the Practical Completion Certificate on the same day. This had the effect of handing the RHCYP/DCN over to NHSL.

3.11.4 Within the technical schedule (Schedule 1 Part 1 of SA1), a ‘Description of the Agreed Resolution’ for Item 4 (neutropenic patients – single rooms) provided:

> “The design and construction solution for 12 single bed rooms within the Haematology and Oncology Department has been approved through Schedule Part 8 (Review Procedure) and agreed by Project Co and the Board as resolving the Dispute. as set out in Disputed Works Schedule Appendix 1 Item 4. For clarity it is confirmed that the balanced pressure solution agreed is in accordance with the schedules reproduced in Section 1 of Disputed Works Schedule Appendix 1 Item 4 (Formally Project Co Change 050) - Neutropenic Patients Ventilation.”

3.11.5 ‘Project Co Change 050’ as incorporated into the settlement agreement relieved Project Co of its obligation to comply with the SHTM recommendations for neutropenic patient areas[11].

3.11.6 A ‘Description of the Agreed Resolution’ for Item 7 (multi-bed rooms) provided:

> “The Reviewable Design Data noted below for this item has been given status Level B in accordance Schedule Part 8 (Review Procedure).

[11] see paragraph 3.10.42

> 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. The remaining 6 No 4 bed wards remain as per the environmental matrix, WW-XX-XX-DC-XXX-001 Rev 11 [Environmental Matrix, Rev 11] and rev 07 of the schedule WW-SZ-XX-DC-XXX-010 ['Ventilation amendment proposal to achieve room balance, Rev 7']."

3.11.7 A 'Description of the Agreed Resolution' for Item 13 (single bedroom ac/h) provided:

> "The Board/Project Co agree this item is closed, and the agreed technical solution approved through Schedule Part 8 (Review Procedure) and, agreed by the Board and Project Co as resolving the Disputes as set out in Disputed Works Schedule Appendix 1 Item 13."

3.11.8 The Inquiry understand that 'Disputed Works Schedule Appendix 1 Item 13' is formally 'Project Co Change 051'[12]. It relieved Project Co of its obligation to comply with the SHTM recommendation for single room air change rates. The change was applied in Critical Care areas and Neutropenic patient areas for which SHTM 03-01 recommended 10ac/h mechanical ventilation.

3.11.9 At this time (February 2019), the Scottish Engineering Technology Advisory Group ('SETAG') chaired by George Curley, NHSL Director of Operations (Facilities), was convening a national Short Life Working Group ('SLWG'). The remit of the SLWG was:

- "To gain an understanding of the nature and transmission routes of the possible infections relating to ventilation systems in healthcare facilities
- To learn lessons from recent incidents and use this to improve guidance for all users of healthcare facilities
- Make recommendations for policy, training, guidance, procedures, assurance and accountability etc
- Make recommendations for the re-write of HTM 03-01 (ventilation guidance)."

[12] See paragraph 3.10.46

3.11.10 Membership of the SLWG (among others from various Health Boards) included:

- George Curley (NHS Lothian)
- James Picken (NHS Lothian)
- Ian Powrie (NHS Greater Glasgow and Clyde)
- John Raynor (Turner Pes)
- Malcolm Thomas (Consultant in Healthcare Ventilation)
- Eddie MacLaughlin (Assistant Director, Health Facilities Scotland);
- Chris Lyon (NSS)
- Ian Storrar (NSS)
- (Supported by) Anette Rankin (NSS)

3.11.11 Of the members above, John Raynor was authorising engineer for NHSL on the RHCYP project. George Curley (Director of Operations – Facilities, NHSL) was also a member of the RHCYP Programme Board. Ian Storrar (HFS) had previously provided advice to NHSL regarding ventilation specifications for RHCYP multi-bed rooms

3.12 After Handover

3.12.1 On 11 March 2019 Judith Mackay, Director of Communications, Engagement and Public Affairs for NHSL emailed the project team in anticipation of "questions from the media today about the formal involvement of Infection Control expertise in the design of RHCYP/DCN in the wake of criticisms about the apparent lack of documented evidence of their involvement in the design/commissioning/handover of QEUH".

3.12.2 Project Director Brian Currie responded:

> "We can confirm that the Board's Infection Control have been involved from the early stages in the project including competitive dialogue, evaluation of some parts of the submission; actively contributing with the clinical teams to the clinical area design development and approval process reviewing relevant specifications for items such as sanitary ware, flooring, vent coverings etc. We

have been fortunate in that there has always been a nominated IPCN for Reprovision and they have been an integral part of the process participating in key meetings and, if they could not be present at meetings, taking the opportunity to comment on meeting outputs where required and following up on issues in consultation with project and other clinical staff. Throughout each of the stages of the project they have provided expert advice on elements such as isolation room design and functionality, room ventilation design, and HAI Scribe. They have also joined project team personnel in reviewing the rooms for adherence to design brief, quality of finish and functionality, (including ease of cleaning and compliance with SHTM and HEI guidance)".

3.12.3 On 12 March the IPCT Head of Service, Fiona Cameron responded directly to Brian Currie:

"Alex sent on your email I am unsure what HEI guidance you are referring to. Healthcare Environment Inspectorate do not have standards for buildings. I can confirm any reviews, recommendations IPC made would be in alignment with the SHTM guidance by HFS for building works. I agree we did have involvement and a dedicate person i.e. our HAI SCRIBE lead involved. However as per communications with Alex IPC were not involved in handover as per SCRIBE guidance recommendations. I cannot reliably say if all our recommendations were accepted".

3.12.4 That email goes on to raise specific concerns about ventilation:

"I am aware as a result of the cancelled FOI there was discussion re air exchanges rates perhaps being suboptimal in clinical areas and we don't know what the outcome of that report was. The HAI SCRIBE documents or minutes of your project meetings should be able to confirm. Another example IPCT can only assume the building engineer who accepted the building on behalf of NHS Lothian saw evidence of theatre validation See p114-124 of SHTM 03-01. IPC to the best of my knowledge have not seen a validation report (section 8.64-8.65 of SHTM 03-01)…"

3.12.5 The Inquiry team has not been able to identify the "cancelled FOI" referenced by Ms Cameron in her email.

3.12.6 On 14 March 2019, regarding the involvement of IPCT at handover, Mr Currie responded:

> "On further reading of the chain of emails from Lindsay Guthrie to Alex can we just advise that Sarah Jane Sutherland, Lead HAI Scribe Advisor, and IPCN Emma Collett last visited the project on Monday 28th January, 2019 at 9.15am.
>
> The purpose of this visit was to reassure Sarah Jane that Janette (recently retired HAI Scribe advisor) was fully involved in the room review process and in anticipation of an imminent completion or handover of the facility. Janette was provided with the timetable for our first and second round of reviews and she chose which ones she wanted to attend. To ensure a consistent approach was taken to the reviews a checklist of what to look at was developed, which was discussed with Janette. The project team have been consistently checking that previous observations made by them have been addressed and to identify any further observations that have occurred since the 2nd room reviews through to completion.
>
> A further meeting on 27th February with one of the project's Commissioning Managers also took place to review previous documentation signed off by Janette Richards.
>
> However, it is accepted that given the uncertainty of the actual completion date, to almost the day before it occurred, ICPT were not involved in the actual day of completion. It is worth emphasising that patients will not occupy the facility until 9th July, 2019. It is our intention to carry out a pre handover check[13] when all construction activity by IHSL/MPX completes in June.
>
> We can confirm that the Board's Infection Control have been involved from the early stages in the project including competitive dialogue, evaluation of some parts of the submission; actively contributing with the clinical teams to the

[13] HAI Scribe Stage 4 (Pre-Handover Check)

clinical area design development and approval process reviewing relevant specifications for items such as sanitary ware, flooring, vent coverings etc.

We have been fortunate in that there has always been a nominated IPCN for Reprovision and they have been an integral part of the process participating in key meetings and, if they could not be present at meetings, taking the opportunity to comment on meeting outputs where required and following up on issues in consultation with project and other clinical staff.

Throughout each of the stages of the project they have provided expert advice on elements such as isolation room design and functionality, room ventilation design, and HAI Scribe.

They have also joined project team personnel in reviewing the rooms for adherence to design brief, quality of finish and functionality, (including ease of cleaning and compliance with SHTM ~~and HEI guidance~~) and advised us on aspects of the building that they felt HEI inspectorate may consider during any future inspections."

3.12.7 Regarding the sub-optimal air change rates in clinical areas, Mr Currie does not address the "cancelled FOI", but states:

"During the review of the environmental matrix it was identified that air exchange rates within the single and 4 bedded rooms did not meet the recommendations of SHTM 03-01. Risk assessments were carried out and discussed with infection control staff (sample attached). A workable solution has been implemented which includes mixed mode ventilation where natural ventilation provides the difference between 4 and 6 ac/hr".

3.12.8 The Inquiry team have not seen the 'sample attached'. The only risk assessment circulated as part of this email chain appears to have been the risk assessment carried out for the pressure regime in multi-bed rooms, which does not address the reduced air change rates.

3.12.9 On 27 March, plans were made for the completion of the Stage 4 HAI Scribe review. An email from Donald Inverarity to Sarah Jane Sutherland stated:

"Hi Sarah,

As part of this can you ensure that for all the isolation rooms in the new building that we are provided with details of the air pressures in the room and anteroom or corridor and ensure that there has been some assessment of air flows and pressures in the room and anteroom, particularly when doors are open. I had been speaking to some of the ID consultants at QEUH and the Glasgow children's hospital yesterday and they explained that all their isolation rooms were being refitted as the original design didn't seem to provide appropriate pressures and air flows when the rooms were occupied."

3.12.10 In May 2019, the Ventilation SLWG issued its findings in a paper entitled "Ventilation Guidance Recommendations". Included among the recommendations in the paper was:

- "It should be noted that "derogations" to the guidance may only be put forward if there is a sound technical reason provided for deviating from what the solution described in the guidance is (note this applies to ALL applicable guidance not just ventilation). Derogations should not be accepted if there is a lack of technical evidence."
- "It is considered that the guidance should focus on 4 main areas within healthcare settings
    - Indirect healthcare (eg, offices, dining rooms etc.)
    - Non critical (eg, General patient/ clinical areas)
    - Critical (eg, Theatres, ICU etc.)
    - Specialist (eg, aseptic facilities, category 3 and 4 rooms, infectious diseases unit etc)".
- "The guidance requires to provide definitive requirements in respect of:
    - Air change efficiency, and contaminant removal effectiveness
    - Pressure cascades within critical or specialist areas

  These requirements must be mandatory with no derogation accepted in normal circumstances."
- "The guidance for critical and specialist areas must be more specific and detailed and should ensure that the ventilation design fully supports the desired clinical activity and outcomes".

- “It is anticipated that non healthcare guidance and non critical health guidance can be derived from, or sign posted to existing guidance, e.g. CIBSE guidance. The SHTM guidance should make specific comment around the areas in which natural ventilation is permissible and the air change efficiency and contamination removal effectiveness required in specific area...”.
- “All too often the issues are presented as a fait accompli where remedial action cannot reasonably be undertaken. It is essential that sufficient time and properly qualified and experienced resource is utilised to draft the Board or Authority’s Construction Requirements (BCRs/ACRs)”.

3.12.11 On 1 June 2019, the HAI Scribe Stage 4 checklists were completed. The review team consisted of

- Sarah Jane Sutherland (IPCT, Lead HAI Scribe Adviser)
- Lindsay Guthrie (IPCT)
- Ronnie Henderson (Project Team)
- Dorothy Hanley (Project Team)
- Janice Mackenzie (Project Team)
- “F.Cowan” [not currently known to the Inquiry]

3.12.12 In the ‘Additional Notes’ section room location references were provided, to be denoted by an asterisk:

*Lochranza – Haem/Onc;
*PICU – Paediatric Critical Care;
*DCN Acute Care”.

3.12.13 Against point 4.26, “Is the ventilation system designed in accordance with the requirements of SHTM 03-01?” the review team selected ‘yes’, with an asterisk and a handwritten note alongside reading “with derogation 4ac/h - single rm - risk assessed and approved”. The Inquiry Team understands the asterisk to indicate that the ‘risk assessed and approved’ derogation to air change rates applied specifically to the Haematology/Oncology ward, Paediatric Critical Care and DCN Acute Care.

Appendix

Contractual Provisions relevant to RDD

1. A separate paper on the Project Agreement has been distributed to CPs.

2. In the Project Agreement, Reviewable Design Data (RDD) means

> "the Design Data listed at Section 5 (Reviewable Design Data) of Schedule Part 6 (Construction Matters)"

3. Part 3 "Design and Construction ", Section 12 "The Design Construction and Commissioning Process", contains a number of clauses relevant to the RDD process, under subheadings including "Overall Responsibility", "Board Design Approval", "Rectification of Project Co's Proposals".

4. Under the subheading "Overall Responsibility"

> "12.1 Project Co shall carry out the Works:
>
> 12.1.1 so as to procure satisfaction of the Board's Construction Requirements;
>
> 12.1.2 in accordance with Project Co's Proposals; and
>
> 12.1.3 in accordance with the terms of this Agreement.
>
> 12.2 To avoid doubt, the obligations in Clauses 12.1.1, 12.1.2 and 12.1.3 are independent obligations. In particular:
>
> 12.2.1 the fact that Project Co has complied with Project Co's Proposals shall not be a defence to an allegation that Project Co has not satisfied the Board's Construction Requirements; and
>
> 12.2.2 the fact that Project Co has satisfied the Board's Construction Requirements shall not be a defence to an allegation that Project Co has failed to comply with Project Co's Proposals."

5. Under the subheading “Board design approval”, clause 12.5 and 12.6 states:

> “12.5 The Board confirms that, as at the date of this Agreement, it has reviewed such of Project Co's Proposals as have been initialled by the Board and that, subject to any qualifications and/or comments notified by the Board to Project Co in writing and set out in Section 9 *(Board's Qualification/Comments in respect of Operational Functionality requirements)* of Schedule Part 6 (*Construction Matters*) such proposals satisfy the Board's requirements in respect of Operational Functionality, so far as can reasonably be determined given the level of detail of Design Data which has been disclosed to the Board.
>
> 12.6 Project Co shall develop and finalise the design and specification of the Works and the Board shall review the Reviewable Design Data in accordance with Schedule Part 8 (*Review Procedure*) and the provisions of this Clause 12.6:
>
> 12.6.1 Project Co shall submit the Reviewable Design Data and the design of any Changes developed in accordance with the procedure set out in Schedule Part 16 (*Change Protocol*) to the Board's Representative for review under Schedule Part 8 (*Review Procedure*). Project Co shall not commence or permit the commencement of construction of the part or parts of the Facilities and/or Retained Estate Handback Infrastructure to which such Reviewable Design Data relates until it has submitted the appropriate Reviewable Design Data and either it is confirmed by the Board's Representative that Project Co is entitled to proceed with construction in accordance with paragraph 3.3 of Schedule Part 8 (*Review Procedure*) or Project Co is:
>
> (a) disputing the status of such Reviewable Design Data pursuant to paragraph 1.3.1 or paragraph 4.3 of Schedule Part 8 (*Review Procedure*); and
>
> (b) proceeding at risk pursuant to paragraph 1.3.2 of Schedule Part 8 *(Review Procedure).*

12.6.2 with effect from the date at which any item of Reviewable Design Data is or becomes an Approved RDD Item in accordance with Schedule Part 8 (*Review Procedure*), such Approved RDD Item shall for the purposes of this Agreement be deemed to have satisfied the requirements of the Board in the manner and to the extent set out in, Table A in Appendix 1 of Schedule Part 8 (*Review Procedure*)…"

6. Under the subheading "Rectification of Project Co's Proposals", clause 12.7 states:

"12.7 Without prejudice to Clause 12.1, if it should be found that Project Co's Proposals do not fulfil the Board's Construction Requirements, Project Co shall at its own expense, and in accordance with Clause 12.8 below, amend Project Co's Proposals and rectify the Works or any part affected. Such amendment and rectification shall have the effect that:

12.7.1 Project Co's Proposals shall satisfy the Board's Construction Requirements; and

12.7.2 following the amendment or rectification, the structural, mechanical and electrical performance of the Facilities and/or Retained Estate Handback Infrastructure will be of an equivalent standard of performance to that set out in Project Co's Proposals prior to their amendment or rectification (for the purpose of this comparison disregarding the fault which required the amendment or rectification to be made)."

"12.8 Where Clause 12.7 applies, Project Co shall submit its proposal for amending Project Co's Proposals and rectifying the Works (or any part affected) to the Board's Representative for review under Schedule Part 8 (*Review Procedure*) and shall not amend Project Co's Proposals or commence or allow the commencement of the rectification of the Works (or any part affected) until it is permitted to proceed in accordance with Schedule Part 8 (*Review Procedure*)."

7. Schedule Part 8 of the PA, paragraph 1.2 provides the obligations of Project Co and the Board in progressing Reviewable Design Data through the Review Procedure:

> “1.2.1 As soon as possible and, if the Submitted Item comprises:
>
> (a) an item of Reviewable Design Data;
>
> (b) a revised Programme submitted pursuant to Clause 14 (Programme and Dates for Completion); or
>
> (c) a document or proposed course of action submitted in the case of (an emergency)
>
> within fifteen (15) Business Days of the date of receipt of a submission (or resubmission, as the case may be) of the Submitted Item to the Board's Representative (or such other period as the parties may agree), the Board's Representative shall return one copy of the relevant Submitted Item to Project Co endorsed "no comment" or (subject to and in accordance with paragraph 3 (Grounds for Objection)) "comments" as appropriate”.

8. Should the Board fail to meet the agreed review period following receipt of a submission to the Review Procedure by Project Co: “then the Board's Representative shall be deemed to have returned the Submitted Item to Project Co endorsed ‘no comment’ (and, in the case of Reviewable Design Data, endorsed ‘Level A - no comment’)”.

According to paragraph 1.3:

> “1.3 If the Board's Representative raises comments on any Submitted Item in accordance with paragraph 3 (Grounds for Objection) he shall state the ground upon which such comments are based and the evidence or other information necessary to substantiate that ground. To the extent that the Board's Representative comments on a Submitted Item other than on the basis set out in this Schedule Part 8 (Review Procedure), or fails to comply with the provisions of this paragraph, Project Co may, in its discretion, either:

1.3.1 request written clarification of the basis for such comments and, if clarification is not received within ten (10) Business Days of such request by Project Co, refer the matter for determination in accordance with Schedule Part 20 (Dispute Resolution Procedure); or

1.3.2 in the case of a Submitted Item comprising Reviewable Design Data only, at its own risk, and without prejudice to Clause 12 (The Design, Construction and Commissioning Process), proceed with further design or construction disregarding such comments pending the outcome of any reference to the Dispute Resolution Procedure that may be made by either party."

9. The levels of endorsement are described in paragraph 4.3 and include:

a) "Level A – no comment" - An endorsed document with no further comments/amendments.
b) "Level B - proceed subject to amendment as noted"; Project Co to make amendments as noted and continue next level of design or to implement the works without re-submitting documents
c) "Level C - subject to amendment as noted"; do not act upon the Submitted Item, amend the Submitted Item in accordance with the Board's Representative's comments and re-submit the same to the Board's Representative within 10 business days
d) "Level D - rejected"; do not act upon the Submitted Item, amend the Submitted Item and re-submit the Submitted Item to the Board's Representative within 10 business days.

10. In accordance with the Review Procedure any "Level A" or "Level B" approval which entitled IHSL to commence construction (subject to any comments from NHSL) did not relieve IHSL of compliance with its other obligations under the Project Agreement.


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