SCOTTISH HOSPITALS INQUIRY

Provisional Position Paper 14

Queen Elizabeth University Hospital and Royal Hospital for Children

Isolation Rooms

Table of Contents

1. **Purpose of the PPP** 1
2. **Procedure to be adopted** 2
3. **Contractual Context** 3
4. **Introduction** 7
5. **Introduction (QEUH section)** 17
6. **NHS Guidance for Isolation Rooms** 20
7. **Deficiencies in Ward 4B Isolation Rooms** 22
8. **Review of Existing Facilities** 34
9. **Introduction (RHC section)** 48
10. **Ward 2A – paediatric Bone Marrow Transplant (BMT) Unit** 48
11. **Paediatric Intensive Care Unit (PICU)** 76
12. **Clinical Decision Unit** 95
13. **Cardiology Ward** 96
14. **Acute Receiving Ward** 97
15. **Level 3 Isolation Rooms** 99

1. Purpose of the PPP

1.1 This PPP has been produced to assist the Chair in addressing the terms of reference in respect of the built environment of the Queen Elizabeth University Hospital/Royal Hospital for Children as it relates to the ventilation system.

1.2 On 13 December 2023 the Chair issued Direction 5 and indicated his intention that the Inquiry should answer four Key Questions by leading evidence at the Glasgow III hearing due to commence on 19 August 2024 so that those Key Questions can be answered using that evidence along with the evidence from the hearing in the autumn of 2021 ("Glasgow I"); the hearing in the summer of 2023 ("Glasgow II"); all relevant Provisional Position Papers (PPP); and the evidence led in respect of ventilation principles and practice at hearings of the Inquiry in respect of Royal Hospital for Children and Young People/Department of Clinical Neurosciences.

1.3 The Inquiry is aware that within the construction contract between Greater Glasgow Health Board ("NHS GGC") and Multiplex Construction Europe Limited ("Multiplex")("the Contract"), the word "Defect" is a defined term. The definition of a Defect in the Contract is different from the concept that is addressed in the Key Questions. A separate PPP 13 has been produced which has analysed the Contract to the extent that is necessary to answer the Inquiry's Terms of Reference.[1]

[1] Clause 11.2 (5) of the Contract defines a "Defect" as: a part of the *works* which is not in accordance with the Works Information or a part of the *works* designed by the *Contractor* which is not in accordance with the applicable law or the *Contractor's* design which the *Project Manager* has accepted. This document is not produced with this PPP.

2. Procedure to be adopted

2.1 The Chair is likely to be invited to by the Inquiry Team to make findings in fact based on the content of this PPP. Any Core Participant or any other person holding relevant information is invited to seek to correct and/or contradict any material statement of fact which it considers to be incorrect and to point to what evidence exists to support the position taken by the Core Participant or other person. It follows that the Inquiry's understanding of matters set out in this PPP may change and so this paper is provisional.

2.2 Subsequent Inquiry hearings may touch on some of the matters to a varying extent contained within this PPP, but they may not; if parties wish to address the issues dealt within in this PPP, then they are invited to do so now. In the absence of a response on a matter, the Chair is likely to be invited by the Inquiry Team to make findings in fact based on the content of this PPP.

2.3 Please be aware that all responses to this PPP received by the Inquiry will be published on its website as soon as possible after the deadline for responses has passed.

3. Contractual Context

3.1 Whilst a separate PPP has analysed the Contract to the extent that it is necessary to answer the Inquiry's full terms of reference, some reference must be made to some of the contractual documents in this PPP, namely:

a) Volume 2/1 Employer's Requirements, with relevant Clinical Output Specifications from Appendix B;
b) Contract Data Part One, Appendix 5;
c) The M&E Clarification Log (2010 ItP) Final.

3.2 In addition to the above key contractual documents, a wide range of documents containing information about the features of the ventilation system are referred to within the Contract which include:

3.3 Clinical Output Specification (COS)

A COS is a document prepared by clinical staff and NHS GGC staff who have expertise in the relevant ward, on what to install in that specific ward. COSs relevant to each ward, have been included throughout the paper.

3.4 Room Data Sheets (RDS)

The Activity Database ("ADB") system is a standardised hospital design tool used by the NHS in the UK. It is a digital database of hospital design information including detailed requirements for clinical spaces in hospitals. It can be used to create a Room Data Sheet ("RDS"). Every room in a hospital project will have its own individual RDS that captures the fundamental elements (number of sockets, ventilation air change rate, provision of fire alarm etc)[2].

The ventilation parameters appear on a RDS for the room environmental data along with others such as lighting and noise parameters. When RDS are generated from the ADB, the ventilation parameters will in most cases be derived from HTM 03-01 Part A (2007).

[2] **A44456845** - CSCIE, Closing Submission by Counsel to the Inquiry - Paragraph 68

3.5 Environmental Matrix

To facilitate communication about environmental parameters, engineers devised an Environmental Matrix[3]. This is a spreadsheet which gathers together in one place, for all rooms in a building, certain parameters bearing upon its mechanical and electrical engineering systems.

3.6 Reviewable Design Data (RDD).

The Contract contained a process for the review of certain design deliverables such as clinical functionality, specifications including finishes, colour schemes, materials and components referred to as Reviewable Design Data ("RDD").

3.7 External design and construction standards

NHS Guidance has been evolving over many decades[4] with certain guidance being superseded completely (for example, the SHTM 03-01 series superseded the SHTM 2025 series in February 2013[5]) while other guidance was updated so there were more recent versions (for example, the SHTM 03-01 issued in 2013 was subsequently revised and reissued in 2014 and then again in February 2022).

3.8 The NHS Guidance includes the following types of guidance:

3.8.1 Scottish Health Technical Memoranda (SHTM): These give comprehensive advice and guidance on the design, installation and operation of specialised building and engineering technology used in the delivery of healthcare (for example medical gas pipeline systems, and ventilation systems). They are applicable to new and existing sites and are for use at various stages during the inception, design, construction, refurbishment and maintenance of a building[6].

[3] **A44456845** - CSCIE, Closing Submission by Counsel to the Inquiry - Paragraph 72
[4] **A43958336** - Statement of Edward McLaughlan for Edinburgh Hearing on 9 May 2022. - Scottish Hospitals Inquiry - Hearing commencing 9 May 2022 - Witness Statement Bundle - Paragraph 6, Page 3; **A43957166** - 10 May 2022 - Transcript - Andrew Poplett - Bundle 6 - Expert Reports and Statement - Page 3097, Paragraph 9
[5] Note that the Draft for Consultation SHTM 03-01 Part A Design and Validation was produced in March 2009 and fell within the NHS Guidance applicable at the time of the contract. The final approved and published version of the draft guidance applied from February 2013.
[6] **A43958336** - Statement of Edward McLaughlan for Edinburgh Hearing on 9 May 2022. - Scottish Hospitals Inquiry - Hearing commencing 9 May 2022 - Witness Statement Bundle - Paragraph 16, Page 6

3.8.2 Scottish Health Facilities Notes (SHFN): These give comprehensive guidance on the operation of healthcare facilities. The topics within the group of guidance includes infection prevention and control, cleaning services frameworks, security, and health and safety[7].

3.8.3 Scottish Health Planning Notes (SHPN): These give comprehensive guidance on the operation of healthcare facilities. The topics within the guidance include planning for in-patient facilities for both adults and children, accident and emergency facilities, and isolation facilities[8].

3.8.4 Scottish Health Technical Notes (SHTN): These provide comprehensive guidance on a range of healthcare specific standards, policies and current best practice[9].

3.8.5 Health Building Notes (HBN)[10]: These provide best practice guidance on the design and planning of new healthcare buildings and on the adaptation or extension of existing facilities[11].

3.8.6 Health Technical Memoranda (HTM[12]): These provide guidance for anyone involved in the design, installation or operation of healthcare ventilation. Their primary focus is as engineering technical documents but they include contributions from not only engineers, but also infection prevention control specialists and manufacturers[13].

3.9 An NHS body procuring a new hospital must develop a project brief that should ordinarily specify that the design and build is in compliance with the above NHS Guidance[14]. However, derogations from the guidance documents may be

[7] **A43958336** - Statement of Edward McLaughlan for Edinburgh Hearing on 9 May 2022. - Scottish Hospitals Inquiry - Hearing commencing 9 May 2022 - Witness Statement Bundle - Paragraph 16, Page 6
[8] **A43958336** - Statement of Edward McLaughlan for Edinburgh Hearing on 9 May 2022. - Scottish Hospitals Inquiry - Hearing commencing 9 May 2022 - Witness Statement Bundle - Paragraph 16, Page 6
[9] **A43958336** - Statement of Edward McLaughlan for Edinburgh Hearing on 9 May 2022. - Scottish Hospitals Inquiry - Hearing commencing 9 May 2022 - Witness Statement Bundle - Paragraph 16, Page 6
[10] HBNs are derived from NHS Improvement in England but approved by Health Facilities Scotland for use in Scotland. To be clear, unlike the other guidance notes, there is no separate Scottish document.
[11] **A43958336** - - Statement of Edward McLaughlan for Edinburgh Hearing on 9 May 2022. - Scottish Hospitals Inquiry - Hearing commencing 9 May 2022 - Witness Statement Bundle 2022 - Paragraphs 16-17, Pages 6-7
[12] This is a document applicable only in England and Wales but the Scottish SHTM is based on this. The HTM was included in the NHS Guidance and applied to the QEUH and RCH on a contractual basis.
[13] **A38010349** - 10 May 2022 - Transcript - Andrew Poplett - Bundle 6 - Expert Reports and Statement - Page 3097, Paragraph 8 & Paragraph 65
[14] **A37465696** - Expert Report of Stephen Maddocks - Bundle 6 - Expert Reports and Statement - Page 68

agreed at the time of the contract[15]. The requirements of NHS Guidance are the fundamental starting block of any hospital design[16]. They are the best practice guidance for hospital design[17].

3.10 There are legitimate and sound reasons why contractual parties may decide to derogate but the derogation should be assessed, and the implications considered[18]. The derogation from NHS Guidance should be fully documented and recorded in the project file and the record maintained for the life of the building[19]. A derogation from NHS Guidance that could impact on patient or staff safety should never be undertaken[20].

3.11 Statutory Compliance

The ventilation system in the relevant wards also required to comply with statutes and regulations[21].

- The *Health and Safety at Work etc Act 1974* is one of the statutes that falls within the list in the Employer's Requirements and is relevant given that the ventilation system is intended to prevent contamination, closely control the environment, dilute contaminants and contain hazards[22].

- The ventilation system must also comply with the *Building (Scotland) Regulations 2004*. Building Standard 3.14 covers ventilation and states that:

> *"Every building must be designed and constructed in a way that ventilation is provided so that the air quality inside the building is not a threat to the building or the health of the occupants".*[23]

3.12 In accordance with the Scottish Building Standards, the minimum mechanical ventilation requirement for an occupied space is to provide an average

[15] **A37465696** - Expert Report of Stephen Maddocks - Bundle 6 - Expert Reports and Statement - Page 68
[16] **A37465696** - Expert Report of Stephen Maddocks - Bundle 6 - Expert Reports and Statement - Page 68
[17] **A37465696** - Expert Report of Stephen Maddocks - Bundle 6 - Expert Reports and Statement - Page 70
[18] **A43957166** - Oral evidence of Andrew Poplett, Hearing on 10 May 2022 - PPP 6 - Commissioning and Validation - Footnote bundle, Page 3159.
[19] **A43957166** - Oral evidence of Andrew Poplett, Hearing on 10 May 2022 - PPP 6 - Commissioning and Validation - Footnote bundle, Page 3159.
[20] **A43957166** - Oral evidence of Andrew Poplett, Hearing on 10 May 2022 - PPP 6 - Commissioning and Validation - Footnote bundle, Page 3160.
[21] **A33010628** - Employer's Requirements, Section 5.0 (General Design and Construction Requirements) [Additional Guidance] - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 18 - Documents referred to in the expert report of Dr J.T. Walker - Volume 1 (of 2) - Paragraph 5.1.4
[22] **A44456845** - CSCIE, Closing Submission by Counsel to the Inquiry - Paragraph 43
[23] **A44456845** - CSCIE, Closing Submission by Counsel to the Inquiry - Paragraph 44

eight litres of fresh air per person per second[24]. There is no further specification in the Scottish Building Standards as to the air quality for a building such as a hospital.

4. Introduction

4.1 Among the reasons for providing ventilation in healthcare premises is: (1) the need to isolate patients who represent a biological, chemical or radiation hazard to others; and (2) isolate patients with a reduced immune system.[25] It is recommended for such patients to be accommodated in isolation facilities with specialised ventilation requirements. [26] As well as individual rooms, 'Isolation facilities' include:

- infectious disease units,
- bone marrow and other transplant units
- chemotherapy and oncology units.

4.2 From an infection control perspective, there are two main reasons for treating patients in isolation rooms:

- where a patient poses an infection risk to others;
- where a patient is susceptible to infection from other sources.[27]

4.3 Isolation rooms may have a ventilation system that provides a positive pressure in the room to protect the patient from infection, a negative pressure to

[24] **A47128231** - Mechanical Ventilation, Environment (Non-domestic buildings, Technical Handbook 2017). - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 1202, Section 3.14.5
[25] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 355; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 445 & 630
[26] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 425; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 515 & 699
[27] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 320; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 257.

prevent a patient from infecting others, or ventilation that is switchable from positive to negative pressure.[28] The provision of switchable ventilation is not recommended due to the risk of cross-contamination if the setting is incorrect.[29]

4.4 Scottish Health Technical Memoranda (SHTM) 03-01 (various versions have been issued starting with a draft version in 2009 up to the most recent 2022 version) provides comprehensive advice and guidance on the legal requirements, design implications, and maintenance and operation of specialised ventilation in healthcare premises.[30]

4.5 In the versions of SHTM 03-01 (draft 2009, 2013, and 2014) that applied during design and construction of the Queen Elizabeth University Hospital (QEUH), infectious disease isolation rooms were recommended to have 10 air changes per hour (ACH) of mechanical extract ventilation and -5 pascals pressure relative to the corridor. Neutropenic patient wards and Critical Care areas were recommended to have 10 ACH of mechanical supply ventilation and +10 pascals pressure relative to surrounding areas (although the guidance noted that isolation rooms could be negative pressure).[31] Isolation facilities in general required High Efficiency Particulate Air (HEPA) filtration,[32] and windows and trickle vents needed to be sealed to maintain pressure regimes.[33]

---

[28] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 320; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 257.

[29] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 320; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 257.

[30] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 352; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 442

[31] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 483; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 573 & 756

[32] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 401; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 489 & 673

[33] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 430; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 520 & 704

4.6 For 'Ward Isolation room' parameters SHTM 03-01 directed readers to Health Building Note (HBN) 4: Supplement 1 (2005), and in later editions, Scottish Health Planning Note (SHPN) 4: Supplement 1 (2008). These documents provided the same substantive guidance on the facilities required for isolating patients on acute general wards.[34] The Scottish-specific SHPN will therefore be referred to unless otherwise stated.

4.6.1 The purpose of the SHPN 04 Supplement 1 guidance is stated in paragraph 1.4 as:

> "This Supplement to SHPN 04: 'In-patient accommodation: options for choice', provides guidance on the facilities required for isolating patients on acute general wards."

4.7 Paragraph 1:8 confirms:

> "The guidance on isolation suites in this Supplement is based on a validated design model. The aim of this Supplement is to provide practical guidance on how to provide isolation facilities that are simple to use and meet the needs of the majority of patients on acute general wards."

4.8 According to the SHPN:

> "The key to effective isolation on acute general wards is the provision of single rooms with en-suite sanitary facilities. Single rooms reduce the risk of cross-infection for non-airborne diseases and help to lower the incidence of HAI [Healthcare Associated Infection]. Most patients on acute general wards can be isolated in single rooms with en-suite facilities. All single rooms in new-build hospitals should have en-suite facilities so that they can be used to isolate patients".[35]

[34] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 319; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 225

[35] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 255

4.9 One aim of the document was to set a standard for new-build facilities.[36] Although the guidance narrated in the HBN was based on a theoretical design model, this had been validated by the publication of the SHPN.[37]

4.10 As well as describing how a single room with en-suite sanitary facilities could be enhanced to provide effective isolation for patients with infections transmitted through non-airborne routes, the guidance explained how an enhanced single room with en-suite facilities and a ventilated lobby - known as a Positive Pressure Ventilated Lobby (PPVL) - could provide an isolation suite for patients with airborne infections or a need to be protected from them:[38]

> "The ventilated bed access lobby ensures that:
>
> - air entering the bedroom is the clean ventilation supply from the lobby. Air from the corridor is blocked by the ventilation supply in the lobby, that is, the patient in the bedroom is protected from air from the corridor;
> - potentially contaminated air from the bedroom is prevented from escaping into the corridor by the ventilated lobby, so the patient will not present a risk of infection to others.
>
> As the lobby simultaneously prevents unfiltered air entering the room and potentially contaminated air escaping from it, the room can be used by both infectious patients and those at risk of infecting others."[39]

[36] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 255
[37] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 319; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 256
[38] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 255
[39] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 261 - 262

4.11 The HBN and SHPN proposed a design for enhanced single rooms and PPVL rooms,[40] but provided the following exclusion:

> "This Supplement does not describe the specialist facilities required in infectious disease units or on wards where severely immuno-compromised patients are nursed. Guidance for these facilities will follow in a further Supplement".[41]

4.12 The Inquiry Team understand that these further supplements were not produced.[42]

4.13 The engineering philosophy set out for PPVL rooms aimed to provide a "fail-safe" design solution.[43] The SHPN provided:

> "The ventilation system is designed on the basis that all its constituent parts, as described in Table 1, work together to form an integrated system. For example, air to the suite is supplied at high level in the lobby, with extract in the en-suite bathroom. This ensures good airflow through the entire isolation suite. Similarly, the volumetric airflow rate in the lobby is determined by the number of air changes required in the patient's bedroom. Modifying or failing to provide one element of the system will jeopardise the performance of the system as a whole."[44]

4.14 Basic design parameters were then narrated for isolation rooms:

---

[40] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 320; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 257

[41] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 319; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 256

[42] **A47287839** - Hearings commencing 26 February 2024 - Hearing Commencing 26 February 2024 - Bundle 13 - Miscellaneous - Volume 8 - Page 603

[43] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 325; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 267

[44] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 267

> "The patient's bedroom is to have 10 air changes per hour. The entry lobby is to be at +10 pascals with respect to the corridor. The en-suite room is to have at least 10 air changes per hour and be at a negative pressure with respect to the patient's bedroom.
> …
> "Where immuno-compromised patients are to be accommodated, such as in transplant units or specialist cancer units, there could be a need for positive pressure isolation rooms."[45]

4.15 The following were included among further design/engineering requirements:

- "sealed, solid ceiling; windows to the exterior and interior to be locked shut and sealed".[46]

- "Ideally each suite should have its own dedicated supply and extract system."[47] However: "In a high-rise building a common supply and extract system may be the only feasible solution."[48]

- "An extract terminal should be fitted at high level in the en-suite room. An additional terminal may be fitted in certain circumstances at low level adjacent to the bedhead in the bedroom."[49]

- "A G3 pre-filter and final filter should be fitted in the [supply] AHU (Air Handling Unit). The lobby air supply terminal should be of a type into which a HEPA filter can be fitted. While it is not envisaged that a

[45] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 267 & 268
[46] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 263
[47] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 268
[48] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 269
[49] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 269

HEPA filter will be routinely required, this arrangement will allow for subsequent fitting when appropriate".[50]

- "A direct reading gauge showing the pressure in the lobby with respect to the corridor should be mounted at eye level on the corridor wall adjacent to the lobby entry door."[51]

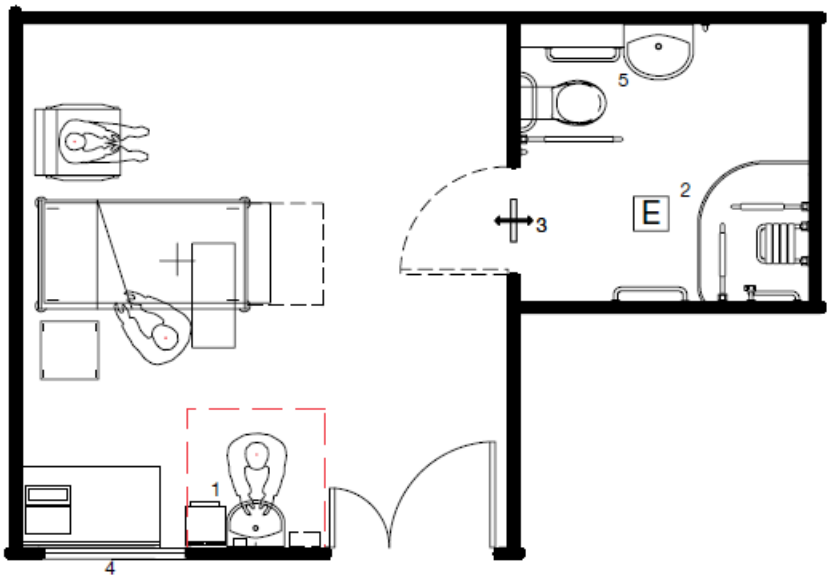
4.16 Although it was noted that other room configurations were possible, Appendices to the guidance provided example room layouts, together with a list of minimum requirements for each room. These are reproduced below. Sheet 1 indicated a proposed layout for enhanced single rooms; Sheet 2 proposed a layout for PPVL rooms.[52]

[50] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 270
[51] **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Page 271
[52] **A47836358** - Hearings commencing 19 August 2024 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 329 - 331; **A37399586** - Hearing Commencing 9 May 2022 - Scottish Hospitals Inquiry - Hearing Commencing 9 May 2022 - Bundle 1 - Scottish Health Technical Memoranda - Pages 274 - 276

Use of Single Rooms for Isolation: Key Design Principles

Sheet 1

New build single room with en-suite facilities



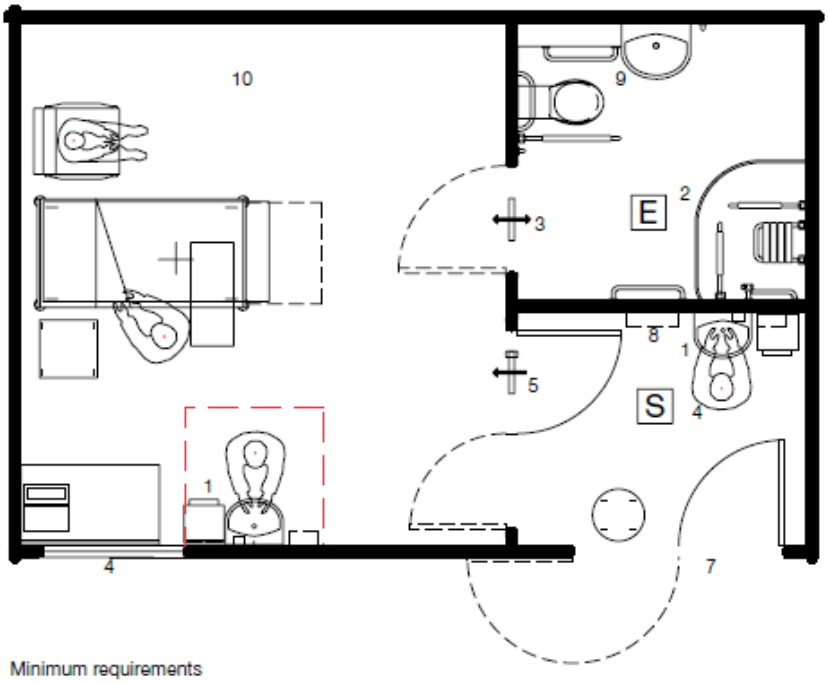
Minimum requirements

1. Clinical hand-wash basin with non-touch, fixed temperature mixer tap
2. Provide suitable extract fan
3. Transfer grille to en-suite door
4. Observation window in corridor wall with integral privacy blinds to allow for staff observation and patient views out
5. En-suite WC to be non-touch flush and wash basin to have single tap with flow and temperature control

Use of Single Rooms for Isolation: Key Design Principles

New build single room with en-suite facilities and lobby

Sheet 2



Minimum requirements

1. Clinical hand-wash basin with non-touch, fixed temperature mixer tap
2. Provide suitable extract fan
3. Install transfer grille to en-suite door
4. Supply air
5. Pressure stabiliser
6. Observation window in corridor wall with integral privacy blinds to allow for staff observation and patient views out
7. Double door for personnel and bed access
8. Disposable apron dispenser
9. En-suite WC to be non-touch flush and wash basin to have single tap with flow and temperature control
10. Ceiling to be sealed solid construction, external window to be sealed

QEUH Isolation Rooms and Specialised Ventilation (including move of Brownlee and Beatson Units into QEUH)

5. Introduction (QEUH section)

5.1 In 2009, at the Invitation to Participate in Dialogue ("ITPD") stage, there were four wards to be located on Level 5 of the New South Glasgow Hospital (hereafter referred to as "the QEUH"). These wards were as follows: Rheumatology, ENT (Ear, Nose and Throat) and two "Generic Wards"[53].

5.2 The Employer's Requirements ("ERs") of the contract specified that each 28 bed ward within the Adult Acute Hospital would be provided with a single isolation room[54]. In the QEUH, the Schedule of Accommodation (SoA) outlined six areas of the hospital with 28 beds or more. These were: Generic Wards (28 beds), ENT ward (28 beds), Rheumatology ward (28 beds), Acute Assessment Cluster (28 beds), Acute Cluster (30 beds), and General Receiving Cluster (48 beds) within the Acute Admissions Unit.

5.3 The SoA did not make specific provision for isolation rooms in 28 bed wards. For example, the number of beds in Generic Wards is given as 28 but these are set out as 'Acute single bedrooms (incl family & clinical support space)' with ADB Code B0303. Provision is made for one 'Gowning lobby: single bedroom'. (no ADB code is provided for this room) but not an isolation room. Rooms with code B0303A do not refer to patient isolation, ACH or pressure requirements. All references to isolation rooms in generic ADB sheets have room code B1602 which does include mechanical ventilation requirements; namely 6 ACH and balanced pressure to adjoining space.

5.4 The departmental plans (1:200s) supplied with the procurement documents are not sufficiently detailed to show whether isolation rooms were provided on each 28 bed ward[55].

[53] **A35772438** - 1:500 Tender Plan Level 5, 6 July 2009; **A32962483** - NSGH Client Familiarisation Building (undated).
[54] **A32994127** - [Ventilation of Isolation Rooms], ITPD Volume 2 - Clause 8.2.15.1
[55] **A35773999** - NA-xx-04-PL-252-000; Fourth Floor Department Layout (1:200)

5.5 The ERs included Clinical Output Specifications ("COS") which stated a requirement in General Adult Ward areas for 1 room per ward to be used for isolation purposes with an associated gowning lobby[56]. For example, in the Rheumatology COS, services will be provided from: "…*the Generic Outpatient Clinics, Generic Wards, and from the Medical Day Unit"*[57]. In the ENT COS, it is stated that services will be provided from: "…*generic wards, generic theatres, and dedicated specialist outpatient facilities*[58]". In paragraph 6.2 of the Generic COS, it is stated that *"[Environmental and Services Requirements] should correspond to the standards described in relevant SHPNs, HTMs and other technical guidance and the technical output specification for this project*.[59]"

5.6 In May 2009, the Inquiry Team understands that NHS GGC agreed to different provision of isolation rooms and clarified this change with bidders during competitive dialogue[60]. This change is confirmed in an email stating: "There are no lobbied bedrooms in the adult tower…This was agreed in 2009 with microbiologist/ICT involvement"[61]. Accordingly, an isolation room on each 28 bed ward as anticipated in the Employer's Requirements was not provided[62]. In September 2009, the en-suite rooms on Level 5 were designed to be general ward rooms[63]. The status of the level 5 wards and rooms did not change throughout the design development stage. In 2014, it is noted that the four wards on level 5 remained as "Generic Wards"[64].

5.7 In 2013, the ventilation parameters for the Level 5 isolation rooms were specified in the Data Sheet as 6 ACH supply in the acute single bedroom (including family and clinical support space) and 10 ACH extract of the inpatient en-suite room. However the corresponding Mechanical Ventilation Notes in the Data Sheet stated that the supply air rate is 40 litres per second (which the Inquiry

[56] **A35761946** - New South Glasgow Hospital, Clinical Output Specification, Generic Adult Wards - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 1655
[57] **A35184837** - Rheumatology Clinical Output Specification
[58] **A35761885** - ENT Audiology Clinical Output Specification
[59] **A35761949** - NSGACL Generic Wards NSG_iss1_rev (undated) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 1634
[60] **A36372543** - NHS GGC Infection Control Meeting - 18 May 2009 - Pages 1-2; **A36372525**, A13 – Clarification issued to bidders re' (undated).
[61] **A49386768 -** Email chain between C Williams, J Brown, S McNamee, F McCluskey regarding Highly Infectious patents in the NSGH and other issues - 11 to 12 August 2014
[62] **A32994127** - [Ventilation of Isolation Rooms], ITPD Volume 2
[63] **A35773717** - 1:200 Tender Plan Level 5 – Atrium and lift core - 2 September 2009.
[64] **A33501458** - 20140609 Fifth Floor Plan - 9 June 2014..

Team understands equates to approximately 2.5-3 ACH)[65]. It is further stated that the bedroom is balanced or negative pressure to the adjoining corridor while the bedroom is positive with respect to the en-suite sanitary room[66].

5.8 In July 2014, it is noted that in relation to lobbied isolation rooms, the position in the QEUH adult hospital was as follows[67]:

NSGH	Critical Care	10 no.
	Renal (higher acuity)	2no.
	Haemato-oncology (HEPA filtration – not lobbied)	24no.

5.9 Each lobbied isolation room should have been provided with its own dedicated ventilation system in line with SHBN 04[68]. However, Professor Williams confirmed there was no infection control risk with positive pressure ventilated lobby rooms ("PPVL")[69].

5.10 Wallace Whittle confirmed prior to handover in January 2015 that isolation rooms throughout the hospital had been designed in line with SHPN 04 Supplement 1. They further confirmed that they saw no reason why the isolation rooms could not be used under the guidance issued previously by the NHS[70].

5.11 The COS for Adult Isolation Rooms stated that the QEUH's Haemato-oncology ward would be sealed with HEPA filtration and highly filtered air (to H13 standard).

[65] **A49413350 -** Tower Room Data - WW Comments 20130725 - Excerpt of A47946602 edited for relevant information
[66] **A49413350 -** Tower Room Data - WW Comments 20130725 - Excerpt of A47946602 edited for relevant information
[67] **A49392066** - Email chain between Fiona McCluskey and Pamela Joannidis about lobbied isolation rooms - dated 03 July 2014
[68] **A36939897** - ZBP Engineering Services Specification - August 2012 – Page 18.
[69] **A32221628** - BICC Minutes, 30 March 2015 - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 235
[70] **A38694871** - SBAR dated 26 April 2016 - Timeline ID SGUH - Scottish Hospitals Inquiry - Bundle of Documents for the Oral Hearing Commencing 12 June 2023 - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation

6. NHS Guidance for Isolation Rooms

6.1 The ERs of the building contract specified that the air conditioning systems to the isolation rooms would support the ERs, COS and NHS infection control standards with strict positive / negative pressure differentials[71]. Each isolation suite lobby was required by the ERs to have a simple to read digital differential pressure gauge[72].

6.2 The issue of validation is addressed in NHS guidance, namely (Draft for Consultation) SHTM 03-01 Part A (2009). It states that it is: "*a process of proving that the system is fit for purpose and achieves the operating performance originally specified*…[73]".

6.3 The ventilation and air conditioning rooms systems for the isolation rooms required to be designed and installed in accordance with:

- SHTM 2025
- SHTM 2040
- SHPN 4; and
- NHS Model Engineering Specification C04[74].

6.4 There is no current NHS guidance providing recommendations on the ventilation system for single (or multi-bed) rooms in an IDU. An exclusion in SHPN 04 Supplement 1 states the guidance on PPVL isolation rooms does not apply to infectious disease isolation. SHTM 03-01 (draft 2009) and HTM 03-01 (2007) recommend 10 ACH and 5 Pa for IDU isolation rooms.

[71] **A32994127** - [Ventilation of Isolation Rooms], ITPD Volume 2 - Clause 8.2.15.4
[72] **A32994127** - [Ventilation of Isolation Rooms], ITPD Volume 2. - Clause 8.2.15.5
[73] **A33010802** - NSGACL SHTM 03-01 Part A_iss1_rev - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 459
[74] **A32994127** - [Ventilation of Isolation Rooms], ITPD Volume 2 - Clause 8.2.15.7

6.5 In accordance with the ERs[75], the isolation rooms required to comply with 'SHPN 04 Supplement 1: Isolation facilities in acute settings (September 2008). HEPA filter is not routinely required. The patient room and the ensuite should have 10 ACH. A flow sensor is required to be fitted to each system that will alarm on fan failure at a designated nurse station and the estates department. A pressure stabiliser should be fitted above the door between the lobby and the bedroom. The ceiling should be of a sealed solid construction. Validation of isolation suites are required with an average leakage rate of not more than 1l/s of air per 1m3 of envelope volume.'

6.6 In accordance with the ERs[76], the isolation rooms in the QEUH required to comply with SHTM 2025, Part 2 of 4 Design considerations (June 2001), 10 ACH for treatment rooms and there should be a means of monitoring pressure. The commissioning procedures set out in CIBSE etc should be followed.

6.7 In accordance with the ERs[77], the isolation rooms required to comply with HBN 04 Supplement 1 which stated that an isolation suite (PPVL) should have 10 ACH and an ensuite isolation suite should have at least 10 ACH. The lobby to bedroom pressure should be 10 Pa, the bedroom to lobby nominally zero, and the ensuite to bedroom negative. The suite as a whole should be sealed, solid ceiling with sealed windows. An isolation suite should have an air leakage rate of no more than 1l/s of air per 1m3 of envelope volume and should have between 8 and 12 Pa between entry lobby and corridor. The patient's room should have 10 ACH. There should also be a monitor at the nurse station to indicate a failure of the supply or extract fan. Commissioning should be carried out.

6.8 Again, in accordance with the ERs[78], the isolation rooms in the QEUH required to comply with SHFN 30 'Infection control in the built environment: design and planning.' For negative pressure isolation rooms, there requires to be a readily visible monitor independent of the the air supply/extract supply. Commissioning should be carried out.

[75] **A32994127** – [Ventilation of Isolation Rooms], ITPD Volume 2 - Clause 8.2.15.7(c)
[76] **A32994127** – [NHS Mandatory Documentation], Table 2, ITPD Volume 2 - Clause 8.2.15.7(a)
[77] **A32994127** – [NHS Mandatory Documentation], Table 2, ITPD Volume 2 - Clause 5.1.2
[78] **A32994127** – [NHS Mandatory Documentation], Table 2, ITPD Volume 2 - Clause 5.1.2

6.9 Critical care areas and high dependency units (ITU/HDU) were not listed within the draft SHTM 03-01 (2009). Isolation rooms require HEPA filtration. The ACH for ITU/HDU is 10 ACH and for ward isolation rooms is the ACH set out in SHPN 4 (which is 10 ACH). An infectious disease isolation room should be 10 ACH and so should one for a neutropenic patient ward. In relation to pressure, it should be between 8 and 12 Pa for a ward isolation room, -5 Pa for a negative pressure room, and +10 Pa for ITU/HDU. There is no specified pressure for a general ward room. There should be alarms to monitor pressure differences. Commissioning and validation must be carried out.

6.10 SHTM 03-01 (2009) states that an infectious disease isolation unit and intensive treatment unit will usually have specialist ventilation requirements[79]. Table A1 of SHTM 03-01 (2009) states that an infectious disease isolation room should have 10 ACH and -5 Pa pressure while an intensive treatment unit (and high dependency unit) should have 10 ACH and +10 Pa pressure[80].

7. Deficiencies in Ward 4B Isolation Rooms

4B – BMT

Specification of Isolation Rooms

7.1 The original specification was for a 14 bed in-patient Haemato-oncology ward and comprised three documents[81]:

(i) The Board's COS for Haemato-oncology Ward; and

(ii) SHPN 054 – Facilities in Cancer Centres (2009); and

(iii) SHTM 03-01 Ventilation for Healthcare Premises (2009)

[79] **A33010783** - SHTM 03-01 (2009) - Paragraph 1.26
[80] **A33010783** - SHTM 03-01 (2009) - Page 142
[81] **A38030075** - Email between M Lockhart, A Rankin, G Geraldine, M Lockhart regarding QEUH Ward 4B Haemato -oncology - 25 November 2015

7.2 However ultimately the specification was changed to 24 isolation room when the change order was made on 19 June 2013[82].

What was deficient about isolation rooms at handover?

7.3 On 9 November 2012, Dr Inkster contacted Peter Hoffman to enquire about isolation rooms with lobbies as they seemed to have replaced plans for negative pressure rooms. Mr Hoffman explained that he suspected these rooms with lobbies were PPVL rooms in accordance with HBN 4 Supplement 1. He raised concerns that PPVL would allow air to either leak outwards or inwards towards the patient. Mr Hoffman was happier with the concept of negative pressure. He further commented that positive pressure without HEPA filtration was pointless[83].

7.4 Dr Inkster on two occasions referred the design and infection control teams to CDC guidance on specification[84]. On 19 June 2015, Professor Williams acknowledged that the adult BMT unit rooms would offer less protection than the previous unit at the Beatson[85].

7.5 On 29 June 2015, Dr Peters carried out a gap analysis between the adult BMT Unit and the Beatson specification, SHTM 03-01 and CDC Guidance. The following gaps were identified[86]:

- Corridor not HEPA filtered
- Air changes per hour – no information
- Positive pressure rooms – no information
- Ceilings in bedrooms and bathrooms not sealed.

[82] **A36372603** - Change Control Form dated 19 June 2013 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 1699
[83] **A48375995** - Email from Peter Hoffman's email to Teresa Inkster Regarding Isolation Room Ventilation – 9 November 2012.
[84] **A32375944** - Letter from Teresa Inkster and Christine Peters to David Stewart - 09 November 2015
[85] **A40241907** - Email chain between Prof C Williams, J Hood, and Dr C Peters regarding transplant ventilation - 19 June to 1 July 2015.
[86] **A49388147 -** Emails between Dr T Inkster, D Loudon, M McColgan and J Armstrong - 15 to 16 June 2016

- No visual pressure indicators on rooms.
- No alarm system for pressure failure

7.6 By 1 July 2015 it was unclear if commissioning or validation had been carried out for the adult BMT unit[87]. On 23 July 2015, Professor Craig Williams sent a specification for the rebuild of the BMT unit to Mr Hoffman. The response raised a number of queries and concerns and that he suggested the involvement of Health Protection Scotland (HPS). It does not appear that any response was sent to Mr Hoffman by Professor Williams to any of his queries and concerns. The Inquiry Team has not seen any reply[88].

7.7 In July 2015, NHS GGC instructed a change to Level 4 for the installation of large fan motor and associated equipment and works by MPX which would result in 10-12 ACH, positive pressure room to corridor of 5-10 Pa, corridor to atrium of 2-3 Pa, solution to seal ceilings, and pressure monitoring solutions for rooms viewable from corridor for each room[89]. They also requested that digital pressure gauges be installed in 24 single bedrooms on Level 4[90].

7.8 In July 2015, upgrade works were undertaken in Ward 4B which resulted in some changes. The room pressure of 3-4 Pa was increased to approximately 5+ Pa. Bedrooms which had suspended ceilings were sealed by the use of plasterboard although the ensuites remained with suspended ceiling tiles. A pressure monitoring system was also installed.

7.9 Professor Jones noted in August 2015 that consistent advice had been that PPVL rooms were not appropriate for the protective isolation of severely immunocompromised patients[91].

[87] **A40241907** - Email chain between Prof C Williams, J Hood, and Dr C Peters regarding transplant ventilation - 19 June to 1 July 2015
[88] **A49387012** - Emails between T Inkster and C Williams regarding BMT - 10 to 11 November 2015
[89] **A36372656** - H29 – PMI 424 – Redesign AHU. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 1799
[90] **A41683206** - PMI 430 QEUH HAEMATO ONCOLOGY WARD LEVEL 4 – 24 SINGLE ROOMS PRESSURE GAUGES. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 1801
[91] **A49073232 -** Email chain from B Jones to T Inkster – 13 August 2015.

7.10 The 24 isolation rooms were deficient at handover as they did not achieve 5-10 Pa differential pressure, the ceilings were not sealed, and the ACH was only 6 rather than 10. By October 2015, upgrade works had been completed by MPX which included sealing the isolation rooms using MF plasterboard ceiling and sealing tiles with silicon[92]. Air permeability testing was carried out within the parameters set out in the SHPN 04-01 Supplement 1. The ventilation systems were uprated to achieve room differential pressures of between 5 to 10 Pa. The 24 isolation rooms were fitted with HEPA filtration in the supply diffusers. A digital differential pressure monitoring system was also installed.

7.11 The ICT lead in place at the time of the alterations to Ward 4B completed in October 2015, (which the Inquiry Team understands to be Professor Williams), was in the process of signing off the works. This did not happen due to a change in personnel[93].

7.12 In December 2015, an SBAR was issued which set out a number of the deficiencies within the adult BMT unit such as the need for 10 Pa positive pressure, HEPA filtration, 10 ACH, and sealed rooms[94]. On 19 January 2016, 10 ACH and 10 Pa was said to be unachievable. One alternative was proposed by Dr Inkster of HEPA filtration of the ward corridor air and sealing of the bathrooms which would then allow acceptance of reduced ACH and Pa. A feasibility study was planned to look at this option[95].

7.13 In March 2016, NHS GGC requested a programme of works to achieve HEPA filtered corridors, fully sealed bathrooms, room pressures of 2.5-8 ACH, 6 ACH prep room, 6 ACH entrance, air lock door at entrance to ward and exit door sealed[96].

[92] **A41683247** - QEUH – Ward 4B Upgrade Works – report by Brookfield Multiplex dated October 2015. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1228
[93] **A49388148 -** Timetable of events in relation to adult BMT unit - Dr T Inkster
[94] **A38029602** - SBAR – Adult Bone Marrow Transplant – DRAFT – Version 2 - 02 December 2015
[95] **A49388147 -** Emails between Dr T Inkster, D Loudon, M McColgan and J Armstrong - 15 to 16 June 2016
[96] **A36372634** - Project Manager Instruction 471 – Ward 4B / Haemato -Oncology Ward - Alteration to board requirements

7.14 By May 2016, the major issues identified with Ward 4B were sub 10 ACH and non-HEPA filtered air in the ward corridor[97].

7.15 In September 2017, further upgrade works were undertaken that resulted in the ensuites within the ward becoming sealed by the use of plasterboard (the Inquiry Team understands to be partial implementation of a PMI issued by NHS GGC on 9 March 2016[98]).

7.16 In October 2017, an SBAR was issued relating to the adult BMT unit which set out the 2015 SBAR recommendations and noted that while upgrade works in the interim had implemented many of the recommendations, the unit still fell short on ACH (6 ACH rather than 10 ACH)[99].

7.17 In 2024, there were no HEPA filtered corridors and the ACH remained 6 rather than the desired 10 ACH[100].

Missing Air Lock

7.18 The scope of works relating to MPX's feasibility report PMI 475, included an entrance air lock to be created with interlocked doors through then current Interview Room (HOW-203)[101]. On 23 June 2016, ICT were not in a position to sign off the Adult BMT Unit as there were no solid ceilings in bathrooms, the ACH was not at the minimum of 10 ACH and the positive pressure not at 8-10 Pa[102].

[97] **A41683154** - Letter from A Parker, G McQuaker, D Irvine, I Novitzky-Basso, A Clark regarding BMT return to QEUH
[98] **A36372634** - Project Manager Instruction 471 – Ward 4B / Haemato -Oncology Ward - Alteration to board requirements
[99] **A38030914** - Email chain between A Rankin, P Hoffman regarding BMT SBAR - 26 October 2017
[100] **A47540479** - Provisional Position Paper 12 – Potentially Deficient Features of the ventilation system - Paragraph 6.108
[101] **A40241476** - Email chain between T Inkster, J Armstrong, M McColgan, and S Russell regarding Ward 4B alteration proposal - 25 April to 4 May 2016
[102] **A46157915** - Email from C Peters to T Inkster re Infection control handover - 25 July 2016.

7.19 On 30 June 2016, there was no air lock in Ward 4B. The Beatson BMT unit had an air lock[103]. On 28 November 2016, it was noted that there were to be four bedrooms with their own air lock lobby[104].

No Annual Verification

7.20 The Inquiry Team has been unable to locate annual verification information post handover including 2018/2019.

Current status of the isolation rooms?

7.21 On 5 June 2015, the BMT unit in Ward 4B did not have HEPA filters fitted[105]. On 6 May 2016, an SBAR was raised about the PPVL in Ward 4B amid concerns that the PPVL was not compliant with SHMT 03-01[106] (which the Inquiry Team understands was the draft 2009 version).

7.22 On 2 February 2017, a further SBAR was raised expressing concern about the suitability and safety of isolation rooms in Critical Care for patients with multi-drug resistant Tuberculosis ("MDRTB") and Middle East Respiratory Syndrome coronavirus ("MERS-CoV"). There were ten PPVL rooms in Critical Care at QEUH. Infectious diseases (ID) had access to two of these rooms for the isolation of patients with confirmed or suspected airborne infections. There were no negative pressure rooms in QEUH. The SBAR highlighted the two main recommendations of an HFS report issued in 2016 which were that PPVL rooms are not used for highly infectious patients and the isolation rooms in Critical Care be modified to the original design criteria (such as extracts in patient rooms and 10 ACH). It was assessed that the PPVL rooms should be rectified. Amongst the recommendations

[103] **A40241439** - Email chain between D Loudon, M McColgan, and A Parker regarding Ward 4B alteration proposal - 23 to 30 June 2016
[104] **A39465091** - Bone Marrow Transplant (BMT) Unit – Feasibility Study carried out by Currie & Brown - 28 November 2016.
[105] **A49387376 -** Email from C Williams to J Armstrong regarding BMT unit - 5 June 2015
[106] **A38759255** - SBAR re Infection Control and Patient Safety - 3 October 2017

were to obtain an opinion from HSE on the suitability of PPVL rooms for airborne infections, confirmed MDRTB patients to be transferred to negative pressure room in GRI and suspected MERS cases to go to Monklands DGH ID Unit.

7.23 An SBAR Action Plan issued in January 2019 shows 4 PPVL rooms (2 in Medical HDU, 1 in ITU, and 1 in Surgical ITU Unit 1) being converted to negative pressure rooms. The work was then ongoing and was to recommence in April 2019[107]. The works were completed by June 2021 as it is stated in the Clinical Care and Governance Paper that 7 PPVL rooms had been converted to negative pressure rooms[108]. The converted PPVL rooms are set out below:

RHC	Ward 2C	Room 6
RHC	CDU	Room 18
RHC	PICU	Room 5
QEUH	Medical HDU	Room 43
QEUH	Medical HDU	Room 44
QEUH	ITU 1	Room 24
QEUH	Surgical ITU Unit 1	Room 4

Intensive Care Unit (ICU)

Specification of Isolation Rooms

7.24 On 25 May 2009, it was noted that 10 isolation rooms with ante-rooms were designed for Critical Care (which was to include ICU and HDU). This appears to have been requested by clinicians as it stated "as per user request"[109].

7.25 The ICU was designed to have 20 beds in two pods of ten, 2 of which would be single rooms with gowning lobbies and the remaining 18 being single bedrooms with glass frontage. Clause 7.2 of the Critical Care COS notes that the Environmental and Services Requirements "should correspond to the relevant

[107] **A46157857** - Email from T Inkster to C Peters re SBAR Action Plan – Latest version – 24 September 2019
[108] **A38759230** - Clinical Care and Governance Paper - 8 June 2021
[109] **A49387498 -** Email from H Griffin to A Seabourne, P Moir, B Cowan regarding Isolation rooms, MDU and Renal Dialysis - 25 May 2009

SHPNs, HTMs and other technical guidance and the technical output specification for this project"[110].

7.26 The Adult Isolation Rooms COS noted that there were to be 10 negatively pressurised sealed rooms with ante-rooms for Critical Care (which includes ICU/Surgical and Medical HDU)[111].

Were there deficiencies in isolation rooms at handover?

7.27 On 4 September 2015, Ann Harkness stated that the isolation rooms tested in critical care had passed the full range of tests and that patient placement would be in the ICU area until the full test programme had been completed for medical HDU[112].

High Dependency Unit (HDU)

7.28 In May 2016, a SBAR noted that NHS GGC ID physicians at QEUH were expressing concern in relation to the suitability and safety of isolation rooms in critical care for patients with MDRTB and MERs-CoV. It was noted that there were ten PPVL rooms in Critical Care at the QEUH, but these were not negatively pressured as had been originally specified[113]. There were no negative pressure rooms in the QEUH. Due to these concerns, a report was instructed from HFS[114].

What was deficient about isolation rooms at handover?

7.29 There was an issue with the door not closing and the absence of a door handle in the negative pressure room in HDU. However, Professor Williams

[110] **A35761814** - Critical Care Clinical Output Specification
[111] **A35185320** - Adult Isolation Rooms requirements
[112] **A38694871 -** SBAR dated 26 April 2016 - Timeline ID SGUH - Scottish Hospitals Inquiry - Bundle of Documents for the Oral Hearing Commencing 12 June 2023 - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation
[113] **A36372525** - A13 – Clarification issued to bidders re' (undated).
[114] **A39465126** - SBAR Isolation Rooms Critical Care, Dr T Inkster - May 2016

confirmed that all negative pressure rooms had been passed for the specification of the build[115].

7.30 In August 2015, there was an issue with the negative pressure HDU isolation rooms in the QEUH and that they were not usable for a highly infectious pathogen at that time[116]. In October 2015, it was unclear if the 2 HDU negative pressure rooms had been passed by the infection control team[117].

Renal Ward

7.31 In 2009, the Renal ward was intended to have two positively pressured sealed rooms with negatively pressured ante-rooms[118].

Specification of Isolation Rooms

7.32 The QEUH Renal Ward COS stated that "two single rooms per ward will have associated gowning lobbies for infection control purposes (source and protection)[119]". The Inquiry Team understands that this is a reference to the PPVL rooms. The QEUH has three renal wards located in ward 4A[120], part of ward 4C[121], and ward 4D[122]. Since there are three wards, in terms of the COS, there ought to be six isolation rooms. There are only two rooms. It should also be noted that the 2 rooms per ward were to be positively pressured sealed rooms with negatively pressured ante-rooms located within the twenty bedded higher acuity ward[123].

What was deficient about isolation rooms at handover?

[115] **A32221764 -** Minutes of BICC, 30 November 2015. - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 268
[116] **A49073358** - Email chain from B Jones to C Peters – RE Negative pressure rooms in QEUH – 31 August 2015.
[117] **A46191398** - Email from D Bell to C Peters and others re MERS patient – 07 October 2015.
[118] **A36372543** - NHS GGC Infection Control Meeting - 18 May 2009 - Pages 1-2; **A36372525**, A13 – Clarification issued to bidders re' (undated).
[119] **A35762086** - NSGACL Renal NSG_iss1_rev. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Paragraph 2.1.1, Page 1624; .
[120] **A44312662** - QEUH Adults Renal 4A Psuedonomonas Report Draft 1606. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 18 - Documents referred to in the expert report of Dr J.T. Walker - Volume 2 (of 2) - Page 1321
[121] **A40241808** - Email from C Peters to T Walsh and others – Meeting re Ventilation – 25 June 2015.
[122] **A41890251** - PAG Minute dated 6 February 2018 – VRE – Renal Wards QEUH. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 12 - QEUH Estates Team - Page 84
[123] **A35185320** - Adult Isolation Rooms requirements

7.33 There was an insufficient number of isolation rooms.

Infectious Diseases

Specification of Isolation Rooms

7.34 On 30 May 2015, adult patients moved to the QEUH[124]. There is no guidance specifying the number of negative pressure isolation rooms required for an ID ward. That would be a decision for clinicians. However, the Brownlee Unit at Gartnavel General Hospital (later moved to QEUH) had 4 negative pressure isolation rooms.

7.35 No COS or design specification exists for the transfer of the Brownlee Unit to the QEUH.

What was deficient about isolation rooms at handover?

7.36 On 29 January 2015, Professor Williams stated that Estates' view was that lobbied isolation rooms at the QEUH provided equivalent protection in relation to MDRTB[125].

7.37 In Table A1 of Appendix 2 of SHTM 03-01 (2009) there is specific provision made for ID isolation rooms. They should have an ACH of 10 and a pressure of -5 Pa.

7.38 At handover, all rooms in the ID Ward had the same ACH as the general wards (2.5 ACH). The pressure was "0 or slightly -ve relative to the corridor" rather than the required -5 Pa.

[124] **A32221627** - Minutes of the BICC 18.05.2015 - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 243
[125] **A49073341** - Email chain from E Peters to C Peters – High Risk airborne infections – 22 July 2015.

7.39 The General Adult Wards COS states that "1 room per ward will be used for isolation purposes and will have an associated gowning lobby[126]". If the ID Ward was to be treated as a Generic Ward, then it would be expected to have one isolation room. It has none.

7.40 At handover, Professor Williams stated the rooms in IDU were compliant[127]. Subsequently, on 27 July 2015, Professor Williams stated that all ID rooms had been built to specification and there was no risk to patients[128].

7.41 The commissioning of the ventilation plantrooms serving level 5 was undertaken in late 2014[129] albeit some of the commissioning reports were not signed by a witness. The Inquiry Team has not found any evidence to suggest that the ventilation system serving Level 5 was validated in the five months between the commissioning and the hospital opening to patients in May 2015. This lack of validation is covered in more detail in PPP 12.

What is the current status of the isolation rooms?

7.42 On 27 January 2015, concerns were raised that the PPVL were not fit for purpose as the patient room was not under negative pressure and would be unable to properly isolate patients with suspected MERS etc[130].

---

[126] **A35761946** - New South Glasgow Hospital, Clinical Output Specification, Generic Adult Wards - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 1655
[127] **A32221794** - Minutes of BICC, 26 January 2015 - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 229
[128] **A32221767** - Minutes of BICC, 27 July 2015. - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 256
[129] Ward 5A, **A32954762** - 122 - AHU 04 SUPPLY (4TH TO 7TH FLOOR); **A32954806** - 122 - AHU 04 DIRTY EXTRACT (4TH TO 7TH FLOOR); **A32954760** - 122 - AHU 05 SUPPLY (4TH TO 7TH FLOOR WARDS) REPORT**;** **A32954763** - 122 - AHU 05 DIRTY EXTRACT (4TH TO 7TH FLOOR WARDS) REPORT**;** **A32954766** - 122 - AHU 06 SUPPLY (4TH TO 7TH FLOOR WARDS) REPORT (AWAITING SCHEMS)**;** **A32954768** - 122 - AHU 06 CLEAN EXTRACT (4TH TO 7TH FLOOR); Ward 5B, **A32954556** - 121 - AHU 04 SUPPLY (5TH TO 7TH FLOOR WARDS)**;** **A32954552** - 121 - AHU 04 EXTRACT (5TH & 7TH FLOOR WARDS)**;** **A32954535** - 121 - AHU 05 SUPPLY (5TH TO 7TH FLOOR WARDS)**;** **A32954557** - 121 - AHU 05 EXTRACT (5TH & 7TH FLOOR WARDS)**;** **A32954527** - 121 - AHU 06 SUPPLY REPORT**;** **A32954532** - 121 - AHU 06 EXTRACT REPORT; Ward 5C, **A32955621** - 124 - 7EF02 (LEVELS 4,5,6 & 7) REPORT**;** **A32955593** - 124 - AHU 04 SUPPLY REPORT**;** **A32955592** - 124 - AHU 04 DIRTY EXTRACT REPORT**;** **A32955598** - 124 - AHU 05 DIRTY EXTRACT REPORT**;** **A32955606** - 124 - AHU 06 SUPPLY REPORT**;** **A32955608** - 124 - AHU 06 CLEAN EXTRACT REPORT; Ward 5D, **A32955085** - 123 - AHU 04 SUPPLY (4TH TO 7TH FLOOR WARDS) REPORT**;** **A32955093** - 123 - AHU 04 DIRTY EXTRACT (4TH TO 7TH FLOOR WARDS) REPORT**;** **A32955082** - 123 - AHU 05 SUPPLY (4TH TO 7TH FLOOR WARDS)**;** **A32955079** - 123 - AHU 05 DIRTY EXTRACT (4TH TO 7TH FLOOR WARDS) **;** **A32955112** - 123 - AHU 06 SUPPLY (4TH TO 7TH FLOOR WARDS)**;** **A32955119** - 123 - AHU 06 EXTRACT (4TH TO 7TH FLOOR WARDS) REPORT
[130] **A49073341** - Email chain from E Peters to C Peters - High risk airborne infections - 22 July 2015

7.43 On 25 June 2015, Dr Christine Peters emailed Ian Powrie (Estates) a list of notes from a meeting relating to ventilation. The email noted *inter alia*:

- None of the PPVL rooms have HEPA filter supply.
- None of the PPVL rooms have been leak tested.
- There is an extract in the bedroom (in roof) as well as in the toilet in the lobbied suites.
- The lobbied suites are 2 on the Renal 4C, 8 on Critical Care.
- Most of the rooms on 5B Haemato-oncology ward (where BMT patients are currently housed) have HEPA supply – except 3 which we need to have identified. There is no HEPA supply to the corridor, or the prep room on this ward.
- The 5B rooms are not designed to be positive pressure rooms to 10 Pa differential to the corridor and the air exchange rate we think is 10 ph.

7.44 On 13 June 2016, HFS and NHS GGC met to discuss the scope of the Isolation Rooms Report 2016 (QEUH). The main design guidance documents current at the time of design for isolation rooms were SHPN 04 Supplement 1 dated September 2008 and HBN 04-01 Supplement 1 dated 2005. However, these did not describe the specialist facilities required for ID units or on wards where severely immune-compromised patients are nursed.

7.45 On 3 December 2018, Ward 5C was tested and approved following works to make it negative pressure (corridor to bedroom[131]). On 23 December 2018,

[131] **A41790834** - Ward +4C & -5C Pressure change report – H&V Commissioning (14 December 2018). - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1515

Wards 5D and 7D were tested and approved following works to make the neutral pressure (bedrooms to corridor) a negative pressure (corridor to bedroom)[132].

7.46 It is unclear to the Inquiry Team what works were instructed or carried out. In June 2019, the conversion works were signed off by Dr Inkster who confirmed that all rooms met requirements for air pressure and air changes. She also confirmed they had HEPA filtered extract[133]. The Inquiry Team have been unable to locate the reports signed off by Dr Inkster. Details of these rooms relating to air pressure, air changes and HEPA filter location (i.e. freestanding or within ceiling diffuser) cannot be confirmed.

8. Review of Existing Facilities

‘The Beatson’

8.1 In 2007, the Beatson Oncology Centre, which was by that time spread over 4 hospitals (Western Infirmary, Gartnavel General Hospital, Glasgow Royal Infirmary, and Stobhill Hospital) moved to a newly built hospital, The Beatson West of Scotland Cancer Centre (“BWoSCC”) in the grounds of the Gartnavel Campus. The BWoSCC is the lead centre for delivery of non-surgical cancer care for the West of Scotland.

8.2 The adult Bone Marrow Transplant service (“BMT”) moved to the BWoSCC in 2008. The adult BMT unit was split across two wards, with 10 rooms in the transplant unit (B8) and 10 beds in ward B9. The Inquiry Team understands that these wards had mostly single rooms, though there may have been a couple of twin rooms.

8.3 In 2008, advice was sought from Dr Hood in relation to suitable ventilation for the proposed haemato-oncology ward at QEUH. Dr Hood’s advice was

[132] **A44943716** - 2018-12-23 – Ward 5D and 7D Pressure change report – H&V Commissioning (3 December 2018). - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1521
[133] **A46157873** - Email chain – Infectious Patient Placement (17 June 2019 – 15 January 2020) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1530

incorporated into the COS for that ward. A clarification relating to isolation rooms for the ward was later provided to bidders during competitive dialogue[134].

Beatson Isolation Room Standards

8.4 In May 2013, it was known at the time of the decision to move the adult BMT unit to the QEUH that the corridor would not be HEPA filtered, but it was expected that the rooms would be of an acceptable standard for highly immunocompromised patients with appropriate HEPA filtration, room pressures and ACH[135]. On 19 June 2013, a change request form was submitted to enable Ward 4B (the Haemato-oncology ward) to accommodate the BMT unit[136]. On 9 July 2013 the decision was approved by the Chief Operating Officer.

8.5 The specification within the change request form was used by MPX and NHS GGC to develop design detail utilising the RDD process[137]. The NHS GGC Board confirmed proposals in Compensation Event No. 51, dated 2 October 2013[138]. However, this only instructed that an additional number of rooms should be built to the same specification as those in the haemato-oncology ward. Accordingly, a design was concluded for the ward that did not meet all the requirements for its intended use[139].

8.6 It appears that the decision to make this change did not consider that Ward 4B retained the same (approximately 2.5-3 ACH) ventilation rate as the rest of the hospital.

8.7 The original specification for the BMT unit at Gartnavel included HEPA filtration, positive pressure (+5-10 Pa), clear visual display pressure monitor, 10-12 ACH, and two positive pressure isolation rooms with negative pressure ante

[134] **A36372525** - A13 – Clarification issued to bidders re' (undated).
[135] **A40241439** - Email chain between D Loudon, M McColgan, and A Parker regarding Ward 4B alteration proposal - 23 to 30 June 2016
[136] **A36372603 -** Change Control Form dated 19 June 2013. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 1699
[137] **A36372565** - PMI 228. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 16 - Ventilation PPP - Page 1697
[138] **A36372655** - Compensation Event issued by the Deputy Project Director to Brookfield on October 2013 for inclusion of HEPA in level 4 zones 512, 513, and 514 - 2 October 2013
[139] **A36372554** - Briefing Note on Design of BMT unit - 9 July 2015.

room[140].The Inquiry Team understands the ventilation was designed with assistance from top international experts.

8.8 An email exchange from summer 2015 suggests the following ventilation provision was in place at the Beatson:

- HEPA filtration for high risk patients.
- Positive pressure in each room, 5-10 Pascals in relation to corridor.
- Air exchanges required to be >12ph
- Sealed room (0.5 sq ft leakage)
- Clean to dirty airflow
- Backup system in case of failure/need to shut down maintain system
- Water resistant paint
- Fungicidal plasterboard in bathroom and toilet
- A clear digital read out of the pressure difference across the door (not a magnahelix guage)
- Particle counts in rooms when commissioned, cleaned and empty of people should be 1000 particles of <0.5 microns per cubic foot. Good ones should be 100-200 or less[141].

8.9 On 7 August 2016, the proposed Ward 4B remedial works attached report confirmed that the Beatson had[142]:

- HEPA filtered rooms
- HEPA filtered corridors

[140] **A49387013 -** BMT Original Specification - Gartnavel site - Dr John Hood
[141] **A40241907** - Email chain between Prof C Williams, J Hood, and Dr C Peters regarding transplant ventilation - 19 June to 1 July 2015
[142] **A40241439** - Email chain between D Loudon, M McColgan, and A Parker regarding Ward 4B alteration proposal - 23 to 30 June 2016.

- 10 ACH
- 10 Pa
- No sealed rooms
- Air lock entrance to ward
- No air pressure monitoring system
- A back up plan.
- Rooms with anteroom at negative pressure for infectious BMT patients.

Beatson Moves

8.10 In August 2014, it was confirmed by Professor Williams that the adult BMT unit would sit beside the Renal Unit[143].

8.11 On 6 June 2015, the adult BMT unit in the Beatson Oncology Unit transferred to Ward 4B in the QEUH[144]. However, on 8 July 2015, the adult patients returned to Gartnavel, as the adult BMT unit was not built to the required specification. It was identified that the air quality was extremely poor in the new adult BMT unit[145].

8.12 Not until 30 June 2018, following upgrade works, did adult patients return to Ward 4B in the QEUH.

‘The Brownlee’

[143] **A40247643** - SMT Minutes, 27 August 2014. - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 484
[144] **A41683168** - BMT Briefing and Overview Note by Gary Jenkins dated 06 July 2015. - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 840
[145] **A40241439** - Email chain between D Loudon, M McColgan, and A Parker regarding Ward 4B alteration proposal - 23 to 30 June 2016

8.13 The Brownlee Unit at Gartnavel Hospital was an Infectious Disease Unit ("IDU") known to have treated inpatients suffering from HIV/AIDS and multiple other infectious and tropical diseases including tuberculosis. The IDU treated 2 definite cases of High Consequence Infectious Disease (Crimean Congo Haemorrhagic Fever in 2012 and Ebola in 2014).

8.14 The IDU had 30 rooms. 3 rooms accommodated 2 people and there were 27 single rooms, which included 4 isolation suites. NHS GGC cannot currently confirm what type of isolation rooms these were (i.e. positive or negative pressure) or details of the specialist ventilation requirements[146]. However, Dr Inkster has stated that 4 isolation rooms were negative pressure rooms[147].

8.15 Plans to move the Brownlee (and the Beatson) were already known in early July 2014[148]. The decision appears to have been made in July 2014 by the Department of Emergency Care and Medical Specialties (ECMS)[149], a department of NHS GGC. Part of the rationale was to gain proximity to state-of-the-art intensive care and other specialties at QEUH[150]. Generic bedrooms were mechanically ventilated with pressure in the rooms negative to the corridors. There were no lobbied bedrooms in the QEUH and this was agreed with Microbiology/ICT involvement. The Brownlee move had not featured in the original hospital planning. There was no IPC advice in relation to the transfer of the Brownlee Unit[151].

8.16 In August 2014, Professor Williams stated that the Brownlee would be transferred to the SGH (QEUH) despite not being part of the initial project plan. The Brownlee isolation rooms would sit in Critical Care[152].

---

[146] **A48090552** - GGC response to RFI - 20 March 2024.
[147] **A46510067** - Dr Inkster's Draft Statement - Paragraph 37.
[148] **A49386769 -** Emails between F McCluskey, S McNamee, C Williams regarding Highly Infectious patients in the NSGH and other issues - 11 August 2014
[149] **A49386769** - Emails between F McCluskey, S McNamee, C Williams regarding Highly Infectious patients in the NSGH and other issues - 11 August 2014
[150] **A49393871 -** SBAR - Timeline re correspondence regarding the move of the ID unit to the QEUH - dated 26 April 2016
[151] **A49386767 -** Email chain regarding Lobbied rooms in nSGH - 22 December 2014 to 14 January 2015
[152] **A40247643** - SMT Minutes, 27 August 2014. - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 484

8.17 By 14 January 2015, there were still doubts about the suitability of the lobbied rooms and Professor Williams commented on how this would impact the move of the ID unit from Gartnavel to QEUH[153].

8.18 In February 2015, Professor Williams reported that concerns had been raised by clinicians regarding the anterooms but that they seemed happy with the rooms now[154].

Why was the Brownlee moved?

8.19 The Inquiry Team have not been able to locate a formal record of the decision to move the Brownlee to the QEUH. Accordingly, it is not clear:

(i) Who made the decision and why;

(ii) Whether the move was risk assessed;

8.20 At handover in January 2015, the services being provided in the four generic wards on level 5 were:

Ward 5A	Diabetes
Ward 5B	Diabetes
Ward 5C	Communicable Diseases
Ward 5D	General Medical/ID Team

8.21 It appears the risk of moving the IDU set against the risk of not moving was assessed[155] and specifically whether the positive pressure isolations rooms ("PPVL") would be suitable[156].

[153] **A49386766 -** Emails between F McCluskey and C Williams regarding Lobbied rooms in nSGH - 20 August 2014
[154] **A40247585** - SMT Minutes - 25 February 2015.
[155] **A49386767 -** Email chain regarding Lobbied rooms in nSGH - 22 December 2014 to 14 January 2015; **A38694871** - SBAR dated 26 April 2016 - Timeline ID SGUH - Scottish Hospitals Inquiry - Bundle of Documents for the Oral Hearing Commencing 12 June 2023 - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation
[156] **A49386767 -** Email chain regarding Lobbied rooms in nSGH - 22 December 2014 to 14 January 2015

8.22 The Inquiry Team understands that the IDU was relocated to QEUH in wards 5C and 5D in 2015 without any modifications being instructed to the general ventilation system. The IDU team raised concerns about the move; specifically in relation to the number of lobbied isolation rooms at the QEUH and whether these provided the negative pressure required to treat certain infectious diseases[157].

8.23 The IDU team were given assurances that in addition to wards 5C and 5D, they would have exclusive access to two isolation rooms in Critical Care. This was described as a "deal breaker"[158]. No COS was provided for the IDU[159].

8.24 The rooms located in Critical Care were PPVL. Wallace Whittle had confirmed that the isolation rooms throughout the QEUH had been designed in line with SHPN 04 Supplement 1 and that they saw no reason why the isolation rooms could not be used under the previously issued NHS guidance. Professor Williams raised concerns over the exclusion in SHPN 04 Supplement 1 which stated: "This Supplement does not describe the specialist facilities required in infectious disease units or on wards where severely immuno-compromised patients are nursed"[160]. On 26 January 2015, Professor Williams reported to the BICC that "in relation to the MDRTB Regulations the rooms in IDU are compliant"[161].

8.25 At handover, there were only PPVL rooms in the QEUH[162]. In May 2016, ID clinicians raised grave concerns that the new building was not a fit or safe environment to manage dangerous pathogens[163]. Specific concerns raised were that the isolation rooms were not appropriate for isolating infectious diseases due to engineering and lack of alarm systems. There had been confusion among ID clinicians and the project team as to whether negative pressure isolation rooms

[157] **A49386769 -** Emails between F McCluskey, S McNamee, C Williams regarding Highly Infectious patients in the NSGH and other issues - 11 August 2014
[158] **A49393871 -** SBAR - Timeline re correspondence regarding the move of the ID unit to the QEUH - dated 26 April 2016
[159] **A48090552** - GGC response to RFI - 20 March 2024. – Paragraph 6-7
[160] **A49386767 -** Email chain regarding Lobbied rooms in nSGH - 22 December 2014 to 14 January 2015
[161] **A32221794** - Minutes of BICC, dated 26 January 2015 - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 229, Paragraph 4.5
[162] **A42463033** - NHS GGC SBAR Bundle – page 85, GGC Response to s.21 dated 14 July 2023. - Scottish Hospitals Inquiry - Bundle of Documents for the Oral Hearing Commencing 12 June 2023 - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation - Page 49
[163] **163. A49393871** - SBAR - Timeline re correspondence regarding the move of the ID unit to the QEUH - dated 26 April 2016

had been promised in 2014 or two rooms which offered “the same level of isolation as those in Brownlee”[164].

8.26 Dr Inkster’s view was that NHS guidance was inconclusive on whether PPVL rooms were safe enough to manage high consequence airborne infections. She requested an independent review of the isolation rooms by Health Facilities Scotland (“HFS”) with an opinion on their appropriateness for isolating infectious disease[165]. HFS reported that isolation rooms at QEUH did not in some instances meet the requirements of guidance but as they did not have air change rate information, they were unable to provide a comprehensive view. HFS recommended that patients should not be cared for in the PPVL rooms (either with or without ensuites)[166].

8.27 In May 2016, Dr Inkster noted that air change rates throughout the hospital had been reduced from the expected 6 ACH to 3 ACH including ‘high risk areas’ such as IDU, which would not normally have infection control sign off[167].

8.28 A temporary patient placement strategy was established to manage risks to patients and staff while an engineering solution was found to convert some of the Critical Care isolation rooms to negative pressure. Patients with infectious disease of high consequence (such as TB) were to be geographically separated from immunosuppressed patients with infection (largely those with HIV) in ward 5C and 5D, respectively[168].

8.29 Operational measures were to be implemented in these wards which included the use of PPE and a ‘2-hour rule’. Given reduced air changes, two hours

[164] **A39465086** - Record of correspondence regarding IPC concern over air change rates (2016-2020) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1511 - 1512
[165] **A32310953** - SBARs; Air changes, Isolation rooms, Air sampling, Airborne infection, Endoscopy facilities, ward 4C, Ward 6A environment
[166] **A32310951** - QEUH Isolation Rooms Report 2016 – Ian Storrar, HFS - Hearing Commencing 26 February 2024 - Bundle 13 - Miscellaneous - Volume 8 - Page 601
[167] **A39465086** - Record of correspondence regarding IPC concern over air change rates (2016-2020) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1497
[168] **A39465086** - Record of correspondence regarding IPC concern over air change rates (2016-2020) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1510

had to be left before non-essential personnel could enter a room after aerosol generating procedures. Patients with MDRTB (Multiple Drug-Resistant Tuberculosis) or MERS (Middle East Respiratory Syndrome) would be transferred out of the QEUH to Monklands (NHS Lanarkshire) or the Glasgow Royal Infirmary. This 'temporary' patient placement strategy was still in place by the end of 2018 because the engineering solution for the negative pressure rooms on the 1st floor had been problematic and the work was suspended[169].

8.30 In April 2018, plans for converting PPVL rooms to negative pressure rooms were signed off[170].

8.31 In November 2018, following the discovery of issues in wards 2A and 2B of the RHC, Dr Inkster carried out pressure checks of other high risk wards. The biggest concern was the readings from 5C and 5D (the IDU)[171].

8.32 Tests had indicated neutral to positive pressure in rooms where TB patients were being cared for, thus potentially spreading pathogens into the corridor and other rooms. In rooms where immunocompromised HIV patients were being cared for neutral to slightly negative pressure was detected, thus potentially sucking pathogens into these rooms from the corridors[172].

8.33 Dr Inkster reported these findings to the NHS GGC Head of Health and Safety noting "My concern at the moment relates to the potential for staff/patients to have been exposed in 5D…"[173].

[169] **A38694865** - SBAR dated 27 June 2017 – Mycobacterium Abscessus and Cystic Fibrosis cohort - Scottish Hospitals Inquiry - Bundle of Documents for the Oral Hearing Commencing 12 June 2023 - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation - Page 99
[170] **A38759215** - AICC Meeting Minutes, 27 April 2018. - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 11
[171] **A39465086** - Record of correspondence regarding IPC concern over air change rates (2016-2020) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1504
[172] **A39465086** - Record of correspondence regarding IPC concern over air change rates (2016-2020) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1510
[173] **A39465086** - Record of correspondence regarding IPC concern over air change rates (2016-2020) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1517

8.34 By late December 2018, adjustments had been made to the ventilation in wards 5C and 5D. H&V Commissioning verified that all rooms had achieved a notionally negative pressure. The report noted that "the retro fit of the door drop down seals would help with this control and stabilise pressures, as fitted on ward 4B[174].

8.35 By January 2019, a plan had been developed to convert seven PPVL isolation rooms in the QEUH to negative pressure isolation rooms. Four of the rooms identified for conversion were in the adult hospital and three were in the children's hospital[175].

8.36 In June 2019, IPC signed off three of the negative pressure isolation rooms in ITU/HDU for use by the ID team, noting that one did not have an ensuite[176].

8.37 By January 2020, a fourth isolation room in Critical Care had been converted to negative pressure. In May 2022, Cundall were appointed to assess whether the existing Air Handling Units (AHUs) located within plant room 124 (AHU 04 & AHU 05) had any additional capacity to increase the air change rate in wards 4C, 5C, 6C, and 7C.

8.38 Cundall's remit was to review the existing plant, highlight the associated works required to the existing services and list any additional equipment needed to achieve increased ventilation rates. A summary of their findings included[177]:

- The ventilation air change rates for the single bedrooms within wards 4C,

[174] **A39465086** - Record of correspondence regarding IPC concern over air change rates (2016-2020) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1513; **A41790834** - Ward +4C & -5C Pressure change report – H&V Commissioning (14 December 2018). - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1515
[175] **A38759222** - SBAR – Multiple Wards – Action Plan - January 2019
[176] **A46157873** - Email chain – Infectious Patient Placement (17 June 2019 – 15 January 2020) - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1534
[177] **A41791368** - Cundall proposal – QEUH 4, 5, 6, & 7C Ventilation Report (20 May 2022). - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1434

5C, 6C, and 7C were found to be between 2.7 and 3.2 ACH.

- The single bedrooms and associated en-suites were commissioned to operate under a negative pressure in relation to the adjacent circulation space.

- The supply and extract distribution ducts within the risers and ceiling voids were inadequately sized to facilitate the required air volumes needed to achieve the single bedrooms 6 ACH.

- The maximum fresh air permitted through the Swegon Parasol ceiling terminals was significantly lower than what was required to achieve the required 6 ACH within the single bedrooms.

8.39 The proposed works for ward 5C have not been approved. NHS GGC have confirmed to the Inquiry that no physical changes have, to date, been made to the ventilation system serving the IDU since handover. It was only noted in 2020 by NHS GGC that there were capacity issues with the AHUs in the ventilation system.

8.40 The Inquiry Team has found no evidence that the performance of the ventilation system was validated before the QEUH opened in May 2015.

8.41 Some elements of the original design brief said to be signed off by representatives from IPCT during preferred bidder discussions were questioned by successive IPCT representatives when the hospital was operational. For example, the suitability of PPVL isolation rooms for infectious diseases was questioned in November 2012[178].

8.42 Concerns had been raised in 2014 over the proposed Brownlee Unit move to QEUH[179]. Once operational,

- Two negative pressure isolation rooms in critical care did not provide

[178] **A48375992** - Email from Jackie Stewart to Sandra McNamee Regarding isolation Rooms - 14 November 2012
[179] **A38694871 -** SBAR dated 26 April 2016 - Timeline ID SGUH - Scottish Hospitals Inquiry - Bundle of Documents for the Oral Hearing Commencing 12 June 2023 - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation

sufficient capacity for ID patients. On-call IPC consultants were faced with difficult decisions on the placement of highly infectious patients, without access to the most up to date information on the availability of negative pressure isolation rooms[180].

- Critical care nurses were charged with the care of ID patients but did not have the specialist knowledge and experience of an ID nurse. Specialist PPE kit was not available on the ward and had to be brought down from ward 5C[181].

8.43 Other than the following exceptions:

(i) Adjustments to the pressure regime / rebalancing work in December 2018[182].

(ii) Upgrades to the filters in the AHUs to improve air quality in March 2019[183].

to date, no physical changes have been made to the ventilation units serving wards 5C and 5D since handover on 26 January 2015[184].

8.44 The IDU at QEUH currently:

Is achieving air change rates between 2.7 ACH and 3.2 ACH[185].

[180] **A49073341** - Email chain from E Peters to C Peters - High risk airborne infections - 22 July 2015
[181] **A46191399** - Email from C Peters to I Powrie re 5C Infectious diseases Unit – 18 December 2015. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 12 - QEUH Estates Team - Page 743
[182] **A39465086** - air changes - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1511
[183] Filter upgrade was from F7 to F9. There is currently no HEPA filtration in wards 5C and 5D. **A44943543** - 01 Physical changes Levels 4, 5 & 7 – NHSGGC response to s.21 No.18 (21 August 2023).
[184] **A44943543** - 01 Physical changes Levels 4, 5 & 7 – NHSGGC response to s.21 No.18 (21 August 2023). - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 8
[185] **A41791368**- Cundall proposal – QEUH 4, 5, 6, & 7C Ventilation Report (20 May 2022). - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1434

Is achieving a notionally negative pressure regime (from bedroom to corridor) ranging from 0 to -3.5Pa[186]. Is being served by three AHUs operating at full capacity. Is not HEPA filtered. Does not have sealed rooms or doors.

Does not have digital pressure monitoring and alarm systems.

Has access to three negative pressure isolation rooms with ensuites in QEUH critical care unit.

Pentamidine Room

8.45 The original room data sheet for the Pentamidine room had balanced pressure to the corridor. A project manager's instruction (PMI) was issued in December 2013 to change the room to negative pressure to corridor. The Haemato-oncology ward required to have a negatively pressured treatment room for administration of pentamidine inhalations[187]. On 9 December 2013, it was said that the pentamidine room was negatively pressured, but it was subsequently confirmed this had not been achieved[188].

8.46 It required to be at negative pressure (-1 and -2) but post-handover it had positive pressure. Even -3 was not reliable[189].

8.47 On 22 July 2015, MPX confirmed that the pentamidine room was achieving 10 ACH and was under negative pressure of -1.5 Pa. They proposed no further

[186] **A44943716** - 2018-12-23 – Ward 5D and 7D Pressure change report – H&V Commissioning (3 December 2018). - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1521
[187] **A35185320** - Adult Isolation Rooms requirements
[188] **A43502680** - "BMT Document" – from Craig Williams to Jennifer Armstrong that considers the specification and identifies deficiencies with the BMT Unit. - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 13
[189] **A39465105** - Email between P Hoffman, A Rankin, T Inkster, C Williams regarding BMT SBAR 2015 dated 21 December 2015

works[190]. On 29 July 2015, Peter Moir confirmed to Professor Williams and others that the ventilation system had been adjusted to achieve -1.5 Pa and 10 ACH[191].

8.48 In December 2015, microbiologists recorded that the Pentamidine treatment room was showing a positive pressure (2.5 Pa) from room to corridor[192]. This was a health and safety issue[193].

8.49 In September 2017, upgrade works in Ward 4B included validation of the pentamidine room[194]. In November 2017, the pentamidine room's ACH was recorded to be 8.7 ACH[195].

Respiratory Ward (Level 7)

8.50 The Respiratory Ward was to have three negatively pressured sealed rooms (without ante rooms) located together[196]. There were no lobbied rooms in the adult tower of the hospital with the only lobbied rooms within the adult hospital being in ITU/HDU[197]. There were no negatively pressured rooms.

8.51 The Respiratory Ward required to have 10 ACH and +10 Pa in accordance with SHTM 03-01 (2009) on the Inquiry Team's understanding that such a ward fell within ITU/HDU category in Table A1.

Endoscopy Rooms

8.52 It is noted in SHTM 03-01 (2009) in Table A1 that an Endoscopy Room should have 15 ACH and positive pressure.

---

[190] **A41683249** - QEUH – Ward 4B Works (report by Brookfield Multiplex) dated 22 July 2015. - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 1212
[191] **A49387011 -** Email from P Moir to G Jenkins regarding Haemato-Oncology - Level 4 Ward B works - 29 July 2015
[192] **A44943548** - 01 Physical changes Ward 4B.
[193] **A39465079** - adult BMT 2015, 2 - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements - Page 856
[194] **A41686378** - QEUH Ward 4b Ceiling Works.
[195] **A38029704** - QEUH – Adults Ward 4B rev1 – November 2017
[196] **A35185320** - Adult Isolation Rooms requirements
[197] **A49386768 -** Email chain between C Williams, J Brown, S McNamee, F McCluskey regarding Highly Infectious patents in the NSGH and other issues - 11 to 12 August 2014

8.53 In August 2018, work was to start to identify air changes within endoscopy rooms. Dr Inkster created an SBAR to detail the required air changes for procedure and what air change rates endoscopy suits within NHS GGC currently have[198].

8.54 On 19 May 2020, it was noted in an email from Dr Peters to Angela Wallace that the endoscopy suites may be deviating from standards and there should be a follow up action plan[199].

9. Introduction (RHC section)

9.1 The Royal Hospital for Children (RHC) is a 256 bedded children's hospital that was handed over to Greater Glasgow Health Board on 26 January 2015. Migration from the Yorkhill site took place between the 10 - 14 June 2015 and the RHC was fully occupied from the 15 June 2015.

10. Ward 2A – paediatric Bone Marrow Transplant (BMT) Unit

10.1 Ward 2A is the paediatric-oncology Unit and includes the Teenage Cancer Trust and the paediatric Bone Marrow Transplant (BMT) Unit - the department is known as the Schiehallion Unit.

Background

10.2 The Clinical Output Specification (COS) for the Haematology & Oncology area in the Children's Hospital covered the following areas:

- General In-patient Ward (high dependency)

[198] **A48818504** - Bundle 13 – Additional Minutes Bundle (AICC/BICC etc); - Scottish Hospitals Inquiry - Hearing Commencing 24 April 2023 - Bundle 13 - Witness Statements -
[199] **A46157878** - Email from C Peters to A Wallace and others re Current Issues – 19 May 2020

- National Bone Marrow Transplant Unit
- Teenage Cancer Trust Ward and Day-Care facilities
- Short-Stay / Day-Care Unit (incorporating the Regional Haemophilia Unit)
- Clinical Administration Facilities
- Outpatient Facilities[200]

10.3 The COS provided information on location and links, activity, trends, hours of service, workload indication, key operational policies/issues and patient pathways.

10.4 The COS provides little detail regarding technical requirements for the Haematology & Oncology department. It notes that “The National Bone Marrow Transplant Unit (BMT Unit), utilises special facilities incorporated into both the General In-patient Ward and the Day-Care Unit”.

10.5 Under Accommodation requirements for the General In-patient ward it states: “The ward should be accessed by entry through a double-door barrier system, which allows the entire ward area the benefit of low positive pressure ventilation. Because of the risk of infection to patients, this does mean that no exterior ventilation (opening windows or doors) can be permitted, and therefore, it is an essential requirement to have good quality, adjustable mechanical heating and cooling ventilation. A preference would be to have individual cubicle adjustable thermostats”.

10.6 The COS did not refer to HEPA filtration requirements, exact pressure ratings or air change rates for the Bone Marrow Transplant Unit Isolation Rooms

10.7 The Room Data Sheet notes the air change rate for the ensuite as 10ACH but values for the lobby and patient bedroom are blank with a note under Mechanical Notes confirming:

[200] **A35761962** - New Children's Hospital - Clinical Output Specification - Haematology and Oncology - RHC - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1599

> "See HBN 04-01 Supplement 1 for further details of specific requirements".

Under Design Notes the following comment is included

> "WARNING NOTICE: This room is based on a theoretical design model; which has not been validated (see paragraph 1.8 of HBN 4 Supplement 1). Specialist advice should be sought on its design"[201]

What was handed over in the paediatric Bone Marrow Transplant (BMT) Unit

10.8 The paediatric Bone Marrow Transplant Unit was made up of 8 isolation rooms. All 8 of the isolation rooms in ward 2A were Positive Pressure Ventilated Lobby (PPVL) rooms.

10.9 The Isolation rooms were handed over with no HEPA filters fitted in the supply terminal grille in the lobby, however these were fitted in June 2015 prior to patients moving into the ward.

10.10 The PPVL rooms that were handed over in ward 2A varied from the design set out in SHPN 04-01 Supplement 01. In SHPN 04-01 Supplement 01 a PPVL room indicates an air supply into the lobby with an extract in the ensuite, however the PPVL rooms handed over in Ward 2A included an additional extract in the patient's bedroom. This variation to the SHPN 04 01 design appears to have been agreed during the RDD process with Brookfield [202].

10.11 It was also reported that there was no pressure monitoring system linked to the Nursing station to advise when pressures were not being provided or maintained (J.Leiper Report).

Issues with the Paediatric BMT Isolation Rooms - 2015

[201] **A45529919** - Ward 2A Room Data Sheets - Excerpt of A38110665
[202] **A34466372** - WID_001_1_00000002-016864 - Scottish Hospitals Inquiry - Hearing Commencing 19 August 2024 - Bundle 12 - QEUH Estates Team - Page 785

10.12 Issues with the Isolation rooms were first highlighted in June 2015, when it became apparent 'none of the transplant rooms have hepa-filters fitted!"

10.13 HEPA filters were installed in the Isolation rooms on the Schiehallion Ward with the work complete and HEPA filter integrity test results completed on 6th and 7th June 2015[203].

10.14 High particle counts ranging from 519 to 163, 306[204], were reported in July. Particle counts should have been < 1000 at 0.5um[205]. Clinical staff were also reporting that they did not have guidance on when a room should be closed for use.

10.15 Light fittings in isolation rooms were not sealed resulting in an unsealed room. On the 2nd July 2015 Rooms 18 and 17 had the light fittings sealed. On the 6th July Teresa Inkster emailed Craig Williams requesting confirmation of when the remaining 6 rooms will have light fittings sealed and stresses that the work needed to be carried out asap as a second transplant was due to be undertaken.

10.16 On the 7th July Mary Anne Kane forwarded an email to Ian Powrie and Peter Moir stating:

> "It is imperative that we get the validation data now for all HEPA filtered areas of the hospital. We are at risk of losing all of the areas from use unless we provide this data which will be a PR nightmare for the Board".

10.17 On the 10th July Craig Williams confirmed that all light fittings were replaced.

[203] **A34324094** - Childrens Isolation Room HEPA filter integrity test report - 7 June 2015
[204] **A49378414** - Email Chain between P Joannidis, J Kirkwood, S Leighton, A McVeigh, T Inkster, B Lavery regarding Schiehallion testing - 2 to 6 July 2015
[205] **A49378414** - Email Chain between P Joannidis, J Kirkwood, S Leighton, A McVeigh, T Inkster, B Lavery regarding Schiehallion testing - 2 to 6 July 2015

10.18 On Monday 10 August 2015 a meeting was held to discuss concerns regarding the BMT Unit. Agreed actions were recorded and an extract of those actions include:

a) Provide confirmation of the Specification document used for the design and build,(Scottish Building Notes 2008);
b) Provide confirmation the facility has been built in accordance with that specification;
c) Provide confirmation of commissioning of the facility; –
d) Call round of similar units elsewhere in the UK to identify their facilities configuration (lobbied rooms, positive pressure etc) based on an agreed questionnaire template;
e) Identification of further actions which could improve performance of existing facility;
f) testing of seals;
g) adjustment of pressure;
h) relocation of any external environmental factors;
i) further deep cleaning of rooms [206].

10.19 On 25 August 2015 Peter Moir provided a "draft response to Grant's [Archibald] questions based on our discussion yesterday" He confirmed in the email that the 8 isolation suites were designed and constructed to meet Scottish Health Planning Note 01 (SHPN 04) in patient Accommodation Supplement 1 and this was "confirmed as the correct document for this type of ward." He stated:

> "SHPN 04 also makes reference-under 1; 10. of an exclusion for specialist facilities where severely Immune-compromised patients are nursed. The document notes that guidance for these facilities will follow in a further supplement to SHPN 04 although no such guidance has been issued".

10.20 Under 3.0 of the draft response Peter Moir referred to:

[206] **A48652586 -** RHSC BMT Meeting - 10 August 2015

"Identification of what other actions ICT /Estates require to be conducted to make the rooms operational.

ICT/Estates recommend a two stage approach ..

- Stage one - to bring 2 rooms into operation (18 and 19)
- Stage two – to all rooms on a phased basis (when available)".[207]

10.21 On 26 August 2015 Craig Williams confirmed in an email to David Loudon: "As part of the work we are doing around the paediatric BMT we were asked to identify other units using positive pressure lobbied side rooms. There were a number of these across the UK but at the last meeting Leeds and Sheffield were identified as the most appropriate comparators".[208]

10.22 Ian Powrie follows up in an email on the 28th August 2015 and confirmed:

"Leeds Children's Hospital, BMTU is 4 years old, and is a retro fit· development within a 40 year old building. They have four isolation suites with the design based on HBN 04-01 supplement 1, all four suites are supplied from single AHU with stand by AHU resilience, complete with H13 HEPA filtration within the AHU, there are no terminal HEPA's installed in the suite. The facility is lobbied with an en-suite anti-room [sic], The supply air is provided via the lobby which sits at a 8-12pa differential pressure to the corridor, with a pressure balanced transfer grille. from the lobby to the isolated bedroom. The lobby door and room door are interlocked to activate a local alarm should the door be left open. The bed room is at a differential pressure of 20-25pa to the en-suite, where the extract is 152 ltrs/s split 60% from en-suite and 40% from the bed room, there are no transfer grilles between the bed room and the en-suite" ...

[207] **A49378413** - Emails between P Moir, C Williams, J Redfern, I Powrie, D louden regarding Schiehallion BMT Suite - 25 to 31 August 2015
[208] **A49378415** - Emails between I Powrie, C Williams, D Loudon regarding Paediatric BMT - 26 to 28 August 2015

10.23 Tests carried out on 1st September 2015 confirmed that high air particle counts were still being recorded in rooms 18 and 19 – particle counts ranged from 5363 in patient bedroom 19 to 1410 in Room 18, patient bedroom [209].

10.24 On 2nd September Capita issue a Supervisor's Notification of Defect to MPX stating:

> "Following the discovery that Air Permeability Tests were not carried out within 36 isolation rooms in accordance with the Employer's Requirements NHS Guidance Documentations, document HBN 04-01. We recognise that you are in the process of carrying out test to these rooms and any necessary work to ensure that they comply. Please provide the test results for all room and confirm when the works are complete"[210].

10.25 Gillon Armstrong, Section Manager from MPX, sent an email to Peter Moir on Friday 28th August 2015 that contained an attached report from RSK Environment Ltd regarding Isolation room test results:

> "Testing was undertaken to prove compliance with the requirement of HBN 04 Supplement 1 – Isolation Facilities in Acute Settings. This requires that the enclosure have 'an average leakage rate of no more than 1 l/s of air per m3 of envelope volume' at a positive and negative pressure differential of 20Pa. Further, the measured positive and negative leakage rates should be within 5% of each other".[211]

10.26 David Wilson (Commissioning manager MPX) confirmed issues with Isolation room Air Permeability Testing in an email to David Loudon and Ian Powrie on 20 May 2015:[212]

---

[209] **A34465872** - FEA_001_1_00000001-024423 - Bundle 12 - QEUH Estates Team - Page 363
[210] **A34323069** - Capita - Air Permeability Tests - 2 September 2015
[211] **A34465854** - Email between G Armstrong, P Moir, S Borland regarding Isolation room test - 28 August 2015
[212] **A34467041** - Email Between D Wilson, D Loudon regarding NSGH A&C issues - 20 August 2015

> "We have also previously highlighted (both verbally and when emailing test results) that although the test results from the permeability tests have achieved the leakage rate criteria some have not met the 5% difference between the positive and negative results. During a meeting with Craig Williams (with myself, Ian, Peter Moir, Mary Anne Kane present) we discussed this and my understanding was this had been accepted, however I believe this has now altered (after microbiological testing in Schiehallion)."

10.27 On the 1st September 2015, David Loudon sent an email to Alastair Fernie (MPX) stating:

> "The Board has taken a decision to request that the environmental standards noted at the Leeds Children's Hospital be considered for the Schiehallion Ward in the Royal Hospital for Children
> You will appreciate the urgency behind his request and therefore, I would appreciate if you will expedite answers to the following questions:
>
> Can the current air handling systems be adapted to achieve the environmental standards being achieved at Leeds? I have cut & pasted Ian Powrie's email dated 28th August. You will note that the design is to HBN 04-01 supplement 1 and associated tables. I understand that contrary to the Leeds set up, a transfer / balance grill may be required on the bedroom door to the lobby.
>
> I understand that BM has previously visited the rooms with an H&V consultant who has advised that the environmental standards should be deliverable in the Schiehallion Wards. Can you advise by return Assuming that the environmental standards can be achieved within the Schiehallion suite, can you provide an indication of timescale. Owning to the urgency, the Board would expect 24/7 levels of activity."[213]

[213] **A34465945** - Email from D Loudon to A Fernie, J Armstrong, G Archibald, C Williams regarding Schiehallion ward - 1 September 2015

10.28 An email chain follows from Brookfield with Alasdair Fernie (Project Director MPX) querying if they were to provide smoke sealed room[214].

10.29 A meeting chaired by Jennifer Armstrong was held on Monday 7th September 2015, to:

> "Identify the progress made in resolving the Bone Marrow Transplant (BMT) room estates issues in RHC and determine position for the paediatric haematology oncology service in being able to start new cases. JA [Jennifer Armstrong – Chair] acknowledged the clinical frustration about progress and the need to plan for patients currently waiting transplant".[215]

10.30 10th September 2015 – Teresa Inkster stated in an email dated 10 September 2015, to Sandra McNamee:

> "In light of the Information currently available to us, Alison, Pamela and I feel that we must err on the side of caution and cannot recommend that the unit is safe for transplant procedures".[216]

10.31 The Chief of Medicine, Women and Children, Alan Mathers provided 2 SBAR's to Jamie Redfern, copying Jennifer Armstrong, regarding BMT services at RCH. The first focuses on a "Pressing and Acute" case,

> "So the narrow question is whether we have any evidence that treating the child in the current environment poses more of a threat than not treating him taking all of the related risks into account (donor loss, deterioration, delay in another centre accommodating case-if option-infection, etc)"

[214] **A34465774** - Email chain between I McKenzie, J Miller, A Fernie, W Hunter, D Loudon regarding Schiellion Ward - 1 to 3 September 2015
[215] **A49378412** - MEETING TO DISCUSS BMT UNIT RHC - 7 September 2015
[216] **A48800307** - Email chain between Dr Teresa Inkster, Jamie Redfern and others regarding Sealing of Suites in Children's Ward 2A - 9 September to 23 October 2015

10.32 The second SBAR focused on upcoming cases noting:

> "We should progress Estates Work ASAP to build contingency and infrastructure options ASAP". [217]

Issues with the Paediatric BMT Isolation Rooms - 2016

10.33 At a meeting held on 21 January 2016 by the Chief Executive, it was agreed that the Deputy Project Director and Sector Estates Manager would comment on the action point, "establish if the proposed increase of extract in the en suite rooms in the Schiehallion Ward is a betterment over the original specification for the rooms".

10.34 David Loudon drafted a report on the Design, Construction and Commissioning Process for the Adult Hospital – Ward 4B (BMT) dated 25th February 2016 noting: [218]

> **"**Children's Hospital – Schiehallion Ward Extract Ventilation
> It is apparent that a difference of professional opinion prevails between Brookfield Multiplex designer, The Board's Technical Advisor and the Boards Sector Estates Manager regarding compliance with guidance note SHPN 04 – supplement 1."

10.35 David Loudon emailed Douglas Ross (Director Currie & Brown) on 1 March 2016, regarding the Isolations rooms in the Schiehallion Unit – see extract below:

> "I am writing to advise you that colleagues within the Boards Infection Control Team and Estates Department have raised concerns that in

[217] **A38694847** - Email dated 15 September 2018 - SBAR re viability of BMT in RHC - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation - Page 13
[218] **A41683176** - BMT REPORT - V3 - 25 February 2016

their opinion, the design of the extract ventilation within the isolation rooms is not compliant with SHPN04- supplement 1".

10.36 A report prepared by Ian Powrie, dated 21st January 2016, was included with the letter. The report referred to:

"Question
Establish if the proposed increase of extract in the en-suite rooms in the Schiehallion ward is betterment over the original specification for the rooms".[219]

10.37 The report highlights that:

"The isolation rooms are designed and constructed to meet the requirements of: Scottish Health Planning Note 04 {SHPN 04} In-patient Accommodation: Options for Choice Supplement 1: Isolation Facilities in Acute Settings.
' The purpose of this guidance is to provide guidance on the facilities required for isolating patients on **acute general wards** and explains "How an enhanced single room with en-suite facilities and a ventilated lobby can provide an isolation suite for patients who have airborne infections or who need to be protected from them;"

"However this guidance states under Exclusions, Para 1.10 (page 4): *"This Supplement does not describe the specialist facilities required in infectious disease units or on wards where severely immune-compromised patients are nursed. Guidance for: these facilities will follow in a further Supplement to SHPN 04."*

10.38 The report confirms that two extracts were located in the paediatric BMT isolation rooms. One in the patient bedroom and the other in the ensuite. The report states:

[219] **A33642636** - Letter from Currie & Brown to D Loudon regarding Isolation Rooms - 15 March 2016

"It should be noted that the recommended ventilation layout illustrates the supply air grill in the pressurised access lobby, full extract within the en-suite facility and transfer grilles on or above the doors from the isolated room to the positive pressure access lobby and to the en-suite, there is no extract from the isolation room itself which should always be held at positive pressure"

And continues:

"Where immuno-compromised patients are to be accommodated, such as in transplant units or specialist cancer units, there could be a need for positive pressure isolation rooms."
In addition empirical data collected between estates and the site ICD: currently indicates that when the en-suite door is left opened to the isolation room under the above ventilation arrangements, then the high extract rate in the isolation room results in the isolation room becoming negative compared to the en-suite room increasing the risk of contaminant ingress from the en-suite, particularly as the WC's are designed without the toilet seat lids to contain the resultant plume when flushing".[220]

10.39 The report concludes:

"Reviewing the evidence in this report it is quite clear regardless of the disclaimer in Para 1.10, that the current design arrangements do not meet the design intent OF SHPN 04 supplement 1 and therefore the proposed modification to bring these rooms in line with this guidance is not betterment *over the original ER's which state that Brookfield have requirement to design all facilities in line with the appropriate guidance"*[221].

10.40 In an email from Alastair Fernie (MPX) to David Loudon regarding the isolation rooms in Schiehallion:

[220] **A33642587** - Ref Doc DJR_13b enclosures with letter to Currie and Brown from D Loudon - 01 March 2016
[221] **A33642587** - Ref Doc DJR_13b enclosures with letter to Currie and Brown from D Loudon - 01 March 2016

> "We would note that SHPN04 Supplement 1 is a guidance document and, as is highlighted in Ian's report, excludes specialist facilities such as infectious disease units or on wards where severely immune-compromised patients are nursed (Paragraph 1.10) which now appears to be the criteria that the Isolation rooms particularly in in the Schiehallion ward are being scrutinized.
>
> In addition to this we have looked back at the drawing approval process for the Isolation room ventilation and noted that the first drawings that were issued to the NHS Project team as part of the RDD process did represent what is now being asked for ? en-suite extract only (Rev 1 drawing attached) but during the RDD process / meetings the solution was changed to what was then constructed and commissioned ? extract in the ensuite and isolation room (Rev 4 drawing attached). This solution was signed off Status A by the board and their advisors Capita. It's worth noting that at no point during the construction and commissioning / witnessing process was it highlighted that the signed off solution was incorrect or not what was required". [222]

10.41 Douglas Ross (Director Currie & Brown) responds in a letter to David Loudon on the 16th March 2016 (the letter date refers to 2015 but we presume this a typo) stating:

> "The baseline document (NEC3 Works Information) for determining compliance is SHPN01 - supplement 1 and responsibility for compliance rests with Brookfield Multiplex. Approval that works have been completed in accordance with the works information rests with the NEC 3 Supervisor.
>
> Brookfield Multiplex have stated, via TUV SUD Ltd, that they have complied with the requirement of Table 1 - Isolation Site Parameters included in SHPN01. The statement in the Board briefing note 'Action

[222] **A34466372** - WID_001_1_00000002-016864 - Bundle 12 - QEUH Estates Team - Page 785

> Plan for BMT and Theatre Operations at 21 January 2016' includes an opinion that the guidance in Table 1 refers to rooms being modified and not new build situations. There is nothing in SHPN01 that states this and as such Table 1 is the Boards requirements (works information).
>
> Should it be proven that the requirements of SHPN01 - Supplement Table 1 have not been complied with and the rooms are not performing to the necessary performance criteria, then Brookfield Multiplex should address remedial action.
>
> If additional performance criteria are now been requested, then the compensation event process would apply". [223]

10.42 A meeting with NHS GGC estates, Infection Control and clinicians was held on the 22nd September 2016 to review the suitability of Ward 2A BMT Isolation Rooms for Neutropenic BMT patients.

10.43 It was agreed at this meeting that 4 of the 8 transplant rooms should be upgraded to a higher specification and "the upgrade work would need to reach specification SHTM 03-01". It was also noted:

> "In the interim period the remaining 4 cubicles not being upgraded will be used for stand down capacity for BMT patients. Consideration will be given at a later date as to whether these cubicles require to be upgraded in phase 2 of the programme of works." [224]

Issues with the Paediatric BMT Isolation Rooms - 2017

10.44 In April 2017 Hulley & Kirkwood Consulting Engineers Ltd were appointed by NHS GGC Estates to review a selection of Isolation rooms in the RHC and QEUH – the review focused on the following areas:

[223] **A33642636** - Letter from Currie & Brown to D Loudon regarding Isolation Rooms - 15 March 2016
[224] **A41602358** - BMT Cubicles Minutes - 22 September 2016

- "Changing of 4No. PPVL isolation rooms (17,18,19 & 20) within Ward 2A to positive pressure isolation rooms for the continued use for transplant and severely immune-compromised patients.
- Review of PPVL isolation rooms (43 & 44) within Adults ICU for compliance against HBN 04-01 Supplement 1 (Base Build Specification). However SHPN 04 Supplement 1 will be utilised as this is specific guidance for Scottish Healthcare Facilities. Where any differences are evident these will be identified in ***bold italics***).
- Review 2No. Isolation rooms (5 & 12) within PICU and provide comment on compliance.
- Coordinate with Department of Health to assist with obtaining confirmation on what Hazard Classification of patient can be nursed within PPVL Isolation Rooms that comply with SHPN/HBN 04-01 Supplement 1."[225]

10.45 The report provided an overview of the existing system – see extract below:

"The existing isolation rooms fall into two categories:

- Single bed rooms with PPVL and en-suite.
- Single bed rooms with PPVL and no en-suite.

The latter type is common in hospital departments where the patient group would be unable to utilise en-suite facilities due to their state of health e.g. intensive care".

"All of the facilities are provided with dedicated supply air handling units partnered with dedicated extract systems. The ventilation plant configuration and duty capability is generally in compliance with HBN 04: Supplement 1 however there is no evidence that the supply systems were commissioned taking into consideration the future pressure drop when a Hepa filter would be inserted.

[225] **A41602399** - Hulley & Kirkwood Isolation Room Review - QEUH and RHC Isolation Rooms Review Rev1

"The following typical items are noted as requirements that are either not evident within the installations or are contrary to the guidance in the document. These are discussed further within sections 3.0, 4.0 & 5.0 including scope / cost required to meet requirements identified within section 1.0

a) Rooms of type (a) have been provided with the majority of the extract ventilation taken from the bedroom at ceiling level with a lesser volume extracted from the en-suite at ceiling level. This is contrary to clause 4.12 which requires all extract to be taken from the en-suite unless clinical requirements determine that some extract is to be taken from low level at the bedhead.
b) Rooms of type (a) have no low level air transfer grilles installed within the door to the en-suite. This is contrary to clause 4.13.
c) Excessive access hatches have been installed on the supply and extract ductwork. This is contrary to clause 4.15.
d) There appears to be no provision for a gas tight shut off damper or spectacle plate on the extract systems prior to the extract fans. This is contrary to clause 4.14. (Note that al survey of above ceiling runs was not achievable due to operational issues.)
e) There are no audio and visual alarms located outside the room lobbies to warn staff of unsafe conditions. This is contrary to clause 4.22.
f) There is no provision for a common alarm panel located at the nurse station. This is contrary to clauses 4.6 and 4.22.
g) The supply and extract duct access hatches have not been identified as a bio-hazard. This is contrary to clauses 4.15 and 4.19.
h) The supply and extract plant and duct systems have not been identified with the rooms that they serve. This is contrary to clauses 4.15 and 4.19.
i) Where safe change filter housings have been provided as opposed to vertical discharges they have not been installed external to the building. This is contrary to clause 4.16. Fire compartmentation strategy will require reviewed taking the above into consideration.

j) The existing dial pressure gauges monitoring lobby positive pressure are inappropriate for monitoring a 10Pa pressure differential. 30-0-30 Pa is preferred as what has been installed within PICU.
k) No envelope permeability test carried out".[226]

10.46 The report states:

> "There would not appear to be any published UK NHS guidance on the design of Positive Pressure (PP) Isolation rooms. However it is reasonable to take guidance from SHTM 03-01 and in particular the guidance pertaining to operating theatre ventilation system design". [227]

10.47 The report provides detail on how the PPVL isolation rooms should be modified to Positive Pressure Isolation rooms. A cost plan summary was provided with a positive pressure isolation schematic drawing.[228]

10.48 Hulley & Kirkwood issued a draft tender report in May 2017, for modifying Ward 2A Isolation Rooms[229]. The report provided details for changing 4no. PPVL isolation rooms (17,18,19 & 20) to positive pressure isolation rooms noting "that the works will be carried out in a live ward environment and management of cleanliness is a critical factor to ensure no cross contamination within the live ward environment."

10.49 The project was to be priced on two potential scenarios:

- All 4no rooms are available to work in (17,18,19 & 20)
- 2no rooms are available (17 & 18) and on successful validation and acceptance by clinical team rooms (19 & 20) will be made available.

[226] **A41602399** - Hulley & Kirkwood Isolation Room Review - QEUH and RHC Isolation Rooms Review Rev1
[227] **A41602399** - Hulley & Kirkwood Isolation Room Review - QEUH and RHC Isolation Rooms Review Rev1
[228] **A41602399** - Hulley & Kirkwood Isolation Room Review - QEUH and RHC Isolation Rooms Review Rev1
[229] **A41602356** - Hulley & Kirkwood Isolation Room Review - QEUH and RHC Isolation Rooms Review Rev1 – Appendix A

10.50 Details on modifying the rooms from PPVL to Positive Pressure Isolation Rooms were provided as was a Descriptions of the Works and a Summary Bill.

10.51 On 30th May 2017, an Invitation to Tender specification was issued on Public Contract Scotland. The report repeats much of what was outlined in Hulley & Kirkwood's draft tender report but provides additional detail relating to Contract Award Criteria, with weighting breakdown and scoring methodology[230].

10.52 Morris & Spottiswood were appointed to carry out the works with a purchase order raised in August 2017 to carry out ventilation modifications as per tender award report (The Inquiry Team do not hold a copy of this report).

10.53 In October 2017, QEUH ICDs produced an SBAR titled 'SBAR: 2A Patient Accommodation and Risk of Invasive Fungal Disease', which stated:

> "Ward 2A at the RHC houses the Haematology-oncology Paediatric services including the Scottish Paediatric Bone Marrow Transplant Unit. Since the unit opened in 2015 ICDs have expressed concern regarding the ventilation and building spec of the unit with regard to effective airborne protection of high risk patients on a number of occasions."

10.54 Under Assessment it states:

- High risk patients are treated regularly on the ward, currently ALL patients on induction chemo are not housed in HEPA filtered rooms and there are not enough HEPA-filtered rooms for the numbers of BMT patients on the ward on occasion and are being housed in the non-HEPA filtered rooms.
- The current configuration of ventilation has extensively been discussed by Dr Inkster and Estates and the Board have agreed to upgrade the PPVL rooms into positive pressure rooms that will meet the specifications for high risk patient protection.

[230] **A41602401** - Tender Issue - Ward 2A Isolation Room Ventilation Specifications - 30 May 2017 FINAL

- The work for this upgrade is pending in November - there is an increased risk of IFA during this work and measures to protect the vulnerable population have been discussed between Prof Jones and Prof Gibson including the use of prophylaxis.
- There are currently extensive demolition projects ongoing at the QEUH site which increases the risks of IFA in the immune compromised population.
- Currently all patients who are neutropenic or on high dose steroids are being given antifungal prophylaxis – either ambisome or posaconazole, including the solid organ cancer patients at risk of fungal infection.
- Currently there are 3 HEPA filtered rooms that are out of use to our knowledge: room numbers: 19, 24, 25? However it would be useful to confirm this.
- Air sampling baselines are not well established on the unit – as the spec is entirely different from the Beatson, 4B and old York hill ward, there is no established agreement on the cut off values for particle counts or CFU for the non HEPA filtered rooms. This is causing confusion and misunderstandings with regard to appropriate course of action on receiving these results".

Recommendations included:

- "Air sampling regime and interpretation is clarified by ICSMT and cumulative
  results presented for each room, with clarity on the reports whether the rooms are HEPA filtered or not.
- A reduction in turn around time for ID of organisms is achieved by laboratory Intensified air sampling should occur during periods of construction work both within the unit and on the QEUH site.
- Clear guidance is produced regarding the risk assessment around the housing of ALL, and other high risk patients in the non-HEPA filtered rooms when these rooms are not available.

- Further consideration is given to risk mitigation measures to be put in place pending the completion of the upgrade works including use of masks on
  moving around site and advice regarding routes into and out of hospital.
- Consideration may also be given to use of mobile HEPA filtration units".[231]

10.55 Following the October 2017 SBAR a report titled 'Report on Concerns Raised re Queen Elizabeth University Hospital (QEUH) and Royal Hospital for Children (RHC)' dated 05.12.2017 addressed concerns raised by three consultant microbiologists about the facilities in QEUH and RHC. Issues raised by the IPCT were set out in an action plan, with the 'Current Position' and 'Future Actions' confirmed. Some of the issues related to isolation rooms, in particular PPVL rooms were not compliant with SHTM standards and PPVL rooms did not provide appropriate protection for patients with infectious diseases of high consequence (IDHC) e.g. MERS, SARS[232].

Issues with the Paediatric BMT Isolation Rooms – 2018

10.56 In January – March 2018, isolation rooms Bed 18, Bed 19, Bed 20 and Bed 17 were converted from PPVL isolation rooms to Positive Pressure Isolation rooms[233].

10.57 In January 2018 HPS provided an SBAR in response to concerns raised regarding the suitability of the 8 isolation rooms to house predominantly severely immunocompromised and/or bone marrow transplant recipient children. The SBAR states:

[231] **A38694862** - SBAR: 2A Patient Accommodation and Risk of Invasive Fungal Disease - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation - Page 113
[232] **A38759270** - Action Plan arising in response to SBAR dated 3 October 2017 - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 792
[233] **A44943477** - S.21 response from GGC July 2023, '05 a) and c) Isolation Rooms RHC'

> "NHSGGC are undertaking work to convert four of the eight PPVL rooms to isolation rooms utilising the existing plant. This will result in the room becoming positively pressured, with the extract grille in the ensuite. The pressure cascade will be compliant with that of a theatre (in the absence of specific BMT guidance). The room will achieve 10 air changes and the pressure gauge will measure the pressure between the room and the corridor."

10.58 The chronology response provided by NHS GGC in response to RFI 10, section 1 notes that the SBAR "was received after works were commenced so NOT part of the decision making process to undertake the works." [234]

10.59 The SBAR notes that the assessment and recommendations are generally in line with those made in relation to the adult BMT Unit with "Validation of the entire system should be as detailed in SHTM 03-01 part A and verification of the entire system should be as outlined in SHTM 03-01 part B. The frequency of verification should be at least annually or more frequently if issues arise", some recommendations include:

a) "The rooms must be positively pressured at 10 Pa.
b) ALL air entering the room must be via the HEPA filter.
c) The HEPA filter should as a minimum be E12 (H13) and located within the supply air diffuser.
d) The rooms must be sealed and no air which has not passed via the HEPA filter should access the room.
e) There must be a continuous pressure monitoring system for each room which alarms and gives an early indication of a pressure drop within the room.
f) Bedroom Air changes of 10 ACPH must be achieved.
g) The walls and ceilings within the rooms and ensuite must be sealed.
h) All room services must be sealed.

[234] **A41601693** - RFI 10 Chronology RFI 10 Final Draft response 1.1 -1.7 - 25 November 2022

i) Rooms must have achieved satisfactory validation and commissioning parameters".[235]

10.60 On the 20 February 2018, Morris & Spottiswood provided an Isolation Room Ventilation Works Construction Programme that shows work starting on rooms 17 & 18 on 19th February 2018 with the completion noted as 16th March 2018[236].

10.61 Following the works, H&V Commissioning Services Ltd provided Ventilation Commissioning and Validation Reports[237] [238]. The tests were carried out on 14th March 2018

Issues with the Paediatric BMT Isolation Rooms – 2018

10.62 In January 2018, HPS produced an SBAR regarding the isolation rooms in the Schiehallion ward. The SBAR confirms:

> "There has been concern raised regarding the suitability of these rooms in terms of protection for this category of patient. In addition there has been a number of patients reported to have fungal infections which may be healthcare related. Currently there is no UK guidance on BMT isolation rooms, and as a result NHSGGC have requested support."

10.63 Some of the recommendations include:

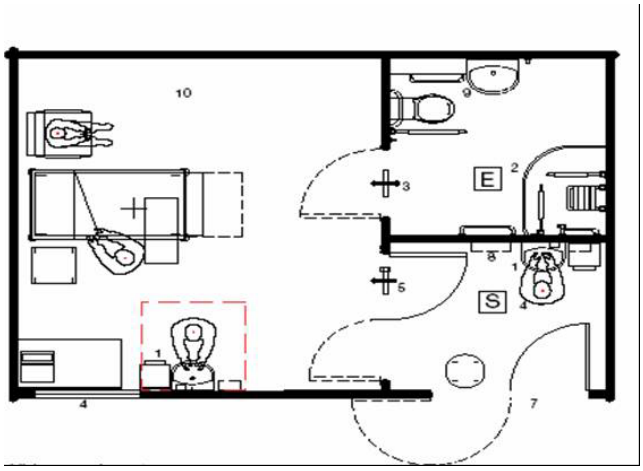
> "The recommendations relating to ventilation to allow the provision of a protective environment for patients isolated within the isolation rooms of Schiehallion ward are;
>
> a) The rooms must be positively pressured at 10 Pa.
> b) ALL air entering the room must be via the HEPA filter.

[235] **A32310961** - SBAR dated January 2018 - Environmental/Ventilation -Schiehallion Unit RHC' - Bundle 3 - NHS National Services Scotland: SBAR Documentation - Page 62
[236] **A41602373** - Construction Works Programme Isolation Room Ventilation Works - RHC Ward 2 Glasgow CONSTRUCTION ISSUE
[237] **A41602393** - H&V Commissioning & Validation Childrens 2A - Room 17 Isolation Rev1 - 14 March 2018
[238] **A41602393** - H&V Commissioning & Validation Childrens 2A - Room 17 Isolation Rev1 - 14 March 2018

c) The HEPA filter should as a minimum be E12 (H13) and located within the supply air diffuser.
d) The rooms must be sealed and no air which has not passed via the HEPA filter should access the room.
e) A strict protocol which minimises the length of time the door is opened and reduces air entry via an open door is required.
f) There must be a continuous pressure monitoring system for each room which alarms and gives an early indication of a pressure drop within the room.
g) Bedroom Air changes of 10 ACPH must be achieved.
h) The walls and ceilings within the rooms and ensuite must be sealed.
i) All room services must be sealed.
j) All service access hatches within the bedrooms/ensuite must be sealed.
k) Rooms must have achieved satisfactory validation and commissioning parameters". [239]

10.64 In July 2018, the NHS GGC Interim Director of Facilities, commissioned Jim Leiper to provide a report on the ventilation system in the QEUH. The report notes:

> "The 'normally expected' ventilation system design and standard layout recommended for both 'Protection and Source Isolation' is given in the SHPN 04 Supplement 1. (See adjacent drawing).



[239] **A41602350** - SBAR - Environmental/Ventilation Monitoring - Ward 2B - January 2018

This is achieved by the placing of the full air extract from the space, within the ensuite area of the facility. There would normally be a pressure balanced air transfer grille in the door (as shown) between lobby and the bed area and between that and the ensuite to allow a passage of air when the doors are closed.
SHPN 04 Sup. 1 suggests how rooms that were not originally designed for 'Isolation' might be altered to achieve the most effective air flow configuration to afford the best possible solution from the prevailing room layouts.

***Comment**: Despite the suggested alteration solutions noted in the Guidance, one might reasonably expect the normal standard isolation configuration to be provided in a new build, when there are no constraints to the design of choice"*

10.65 The report provides some detail on the installed ventilation system, confirming:

"The Installed Ventilation System

The system actually installed by Brookfield, incorporated an extract grille on the ceiling in the patient's room and a further extract within the ensuite".

***"Comment**: The vast majority of the extract air flow in the installed arrangement, would be fully taken from the patient's room at the ceiling, with a small proportion of the extract ventilation taken from the ensuite. The ensuite extract is similar to that normally installed in general toilet facilities, primarily for the removal of odours.*
In circumstances where 'Source Isolation' of 'infectious patients' is necessary, (a different purpose than for the 'Protective Isolation' of patients), an arrangement that might be utilised is to have the supply of air flowing from the lobby to be extracted in full, from the patient's room

via an extract grille in the patient's room located at the patient's head, on the wall behind the patient. (SHPN 04 Supp. 1 Page 17 Section 4.12). The intention of this arrangement would be to allow an air flow from the 'positively pressured' lobby into the room; across the patient to the extract grille. This would also afford the staff caring for the patient some degree of infection protection from the patient in addition to creating the 'source isolation' of the patient. The placing of the extract in this arrangement would ideally be done in consultation with clinical colleagues with consideration of the type of airflow that would most benefit the patient being cared for.

Placing the extract grille on the ceiling of the patient's bedroom might lead to an airflow which does not effectively flow over the patient. The protection of staff caring for the patient may therefore compromised".

10.66 The report considers SHPN 04 Supplement 1 and states:

"SHPN 04 Supplement 1, states on Page 17, Section 4.2 - 4.4 (inclusive),

The isolation suite and its ventilation system are based on a validated design. The engineering guidance given in this Section aims to provide a practical, 'fail-safe' design solution for isolating patients on acute general wards".

***"Comment**: This guidance is intended for patient isolation on an Acute General Ward setting, not where highly infectious or neutropenic patients are being treated".*

"The ventilation system is designed on the basis that all its constituent parts, as described in Table 1, work together to form an integrated system. For example, air to the suite is supplied at high level in the lobby, with extract in the ensuite bathroom. This ensures good airflow through the entire isolation suite. Similarly, the volumetric airflow rate in the lobby is determined by the number of air changes required in the patient's

bedroom. Modifying or failing to provide one element of the system will jeopardise the performance of the system as a whole".

***"Comment**: It could be argued, that from technical perspective, placing the extract within the isolation room is a modification to the normally expected design of this kind of isolation facility, particularly for the nursing of neutropenic patients (c.f. 4.4. below), but it would be difficult to argue this on a 'legal' basis as the guidance itself allows a degree of design latitude and there is an absence of standard guidance for specialist isolation facilities".*

……. "Where immunocompromised patients are to be accommodated, such as in transplant units or specialist cancer units, there could be a need for positive pressure isolation rooms."

***"Comment**: This has not apparently been taken into account in arriving at a solution provided*".[240]

10.67 An IMT held on the 28 September 2018, confirmed that following issues with the drains in Ward 2A:

"The full decant of patients from Ward 2A and Ward 2B was undertaken on Wednesday 26th September into Ward 6A and Ward 4BBMT in the QEUH".

10.68 A further IMT held on the 11th October 2018, confirmed that

"A report on the ventilation of Ward 2A/2B ventilation is due soon and if any problems detected they will look at the feasibility of rectification during the period the ward is decanted."

[240] **A41602105** - Jim Leiper Report - 2A Ventilation Findings. - JL Comment Ver Final - 01 January 2018

10.69 In October 2018 Innovated Design Solutions provided a feasibility study, titled 'Increasing Air Change rates within Ward 2A'. This report did not consider the BMT isolation rooms but confirmed:

> "Following analysis of the current ventilation strategy within upper areas of Ward 2A (Mid-Ward & TCT areas), we anticipate the original accommodation design philosophy was not intended for use by patients with immune response impairment/deficiency. On the contrary, the existing ventilation strategy would appear only likely to promote the risks associated with uncontrolled ingress of infectious aerosols into patient areas".[241]

10.70 The feasibility study confirmed "numerous significant deficiencies/inadequacies appertaining to the existing system" and "recommended consideration be given to the installation of completely new ventilation systems"[242].

10.71 Following this report a new ventilation system was installed in Ward 2A. All 8 AHU's that served the isolation rooms were replaced and one of the remaining PPVL rooms (BED 23) was converted to a Negative Pressure Ventilated Lobby (NPVL) room[243].

10.72 Patients returned to Ward 2A in March 2022. [244]

[241] **A42362217** - Innovated Design Solutions Report - Feasibility Study Regarding Increasing Ventilation Air Change Rates within Ward 2A - QEUH/RHC - Commissioned by NHS Greater Glasgow and Clyde - 24 October 2018' - Scottish Hospitals Inquiry - Bundle of Documents for the Oral Hearing Commencing 12 June 2023 - Bundle 6 - Miscellaneous documents -
[242] **A42362217** - Innovated Design Solutions Report - Feasibility Study Regarding Increasing Ventilation Air Change Rates within Ward 2A - QEUH/RHC - Commissioned by NHS Greater Glasgow and Clyde - 24 October 2018' - Scottish Hospitals Inquiry - Bundle of Documents for the Oral Hearing Commencing 12 June 2023 - Bundle 6 - Miscellaneous documents -
[243] **A44943477** - S.21 response from GGC July 2023, '05 a) and c) Isolation Rooms RHC'
[244] **A41602083** - Ward 2A and 2B Project Board Report - 07 March 2022

Isolation Rooms – RHC – Ward 2A												
Location	**Ward Type**	**Bed Reference**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Ward 2A	Paediatric Bone Marrow Transplant Unit	17	PPVL (*June)	PPVL	PPVL	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR
		18	PPVL (*June)	PPVL	PPVL	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR
		19	PPVL (*June)	PPVL	PPVL	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR
		20	PPVL (*June)	PPVL	PPVL	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR
		22	PPVL (*June)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		23	PPVL (*June)	PPVL	PPVL	PPVL	NPVL (May)	NPVL	NPVL	NPVL	NPVL	NPVL
		24	PPVL (*June)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		25	PPVL (*June)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL

Key	
PPVL	Positive Pressure Ventilated Lobby
NPVL	Negative Pressure Ventilated Lobby
PPIR	Positive Pressure Isolation Room
NPIR	Negative Pressure Isolation Room
*	HEPA Filtration added

11. Paediatric Intensive Care Unit (PICU)

11.1 According to tender 1:200 drawings submitted in 2009 (by MPX to NHS GGC), originally six lobbied isolation rooms were planned for the Paediatric Intensive Care Unit (PICU).[245] This is consistent with issue 4 of the Schedule of Accommodation (SoA), forming part of the Employers Requirements (ER).[246]

11.2 In the 1:200 drawings approved in 2010 by NHS GGC following a period of design development, two lobbies had been removed – creating the four lobbied isolation rooms and two single bed rooms, as built.[247] It is not clear to the Inquiry why the decision was made to reduce the number of lobbied isolation rooms during design development.

11.3 Concern had been raised prior to handover of the hospital in 2014 by the Lead Infection Control Doctor (ICD) at that time regarding the appropriate uses of PPVL isolation rooms. This was due a specific exclusion in the guidance for PPVL rooms, which stated:

> "This Supplement does not describe the specialist facilities required in infectious disease units or on wards where severely immuno-compromised patients are nursed. Guidance for these facilities will follow in a further Supplement to SHPN 04".[248]

11.4 Having sought and received assurance from Wallace Whittle the PPVL rooms were accepted by the Lead ICD as being appropriate for the care of these patients. The assurance received was:

[245] **A35773467** - Tender 1:200, First floor plan NCH Critical Care (PICU) / Cardiology Ward/ Support - 2 September 2009
[246] **A35184890** - NSGACL Schedule of Accommodation NCH_iss1_rev - April 2009
[247] **A33017230** - Developed Design 1:200, First floor plan NCH Critical Care (PICU) / Cardiology Ward/ Support/ MDU and Special Feeds, Approved Level B - 15 October 2010
[248] **A40165237** - SHPN 04 Supp 1 v1 2008

> "…the isolation rooms throughout the hospital have been designed in line with SHPN 04 supplement 1. Wallace Whittle sees no reason as to why the isolation rooms cannot be used under the guidance issued previously by NHS". [249]

What was handed over

11.5 When the RHC opened to patients in June 2015, the Paediatric Intensive Care Unit was comprised of four four-bedded rooms, four isolation rooms and two single bed rooms.[250]

11.6 All four of the isolation rooms in PICU were Positive Pressure Ventilated Lobby (PPVL) isolation rooms. In PICU, these rooms were comprised of a lobby and a bedroom (with no ensuite).

Issues with PICU

11.7 In May 2016, when the hospital had been operational for a year, concerns regarding the appropriateness of PPVL isolation rooms for protective isolation of neutropenic patients and source isolation of patients with an airborne infection resurfaced among the Infection Prevention and Control Team (IPCT) and clinical staff. Concerns were also being raised with regards to the "basic engineering and lack of alarm systems" in PPVL isolation rooms throughout the hospital.[251]

11.8 As a result, a review of the PPVL isolation rooms by HFS was requested by physicians and the Lead Infection Control Doctor.

11.9 On 31 May 2016, a meeting was held between NHS GGC estates, its advisers and a representative from Multiplex to discuss the questions which would be asked of HFS. The purpose of the meeting was for the team "to be unified in

[249] **A38694871** - SBAR dated 26 April 2016 - Timeline ID SGUH - Scottish Hospitals Inquiry - Bundle of Documents for the Oral Hearing Commencing 12 June 2023 - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation - Page 20 - 26
[250] **A38694853** - SBAR dated 21 July 2019 - PICU RHC - ventilation issues (21 July 2019) - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation - Page 161
[251] **A32310958** - Infection Control letter to T Inkster - 5 May 2016

support of the submission of Question 2 and the supporting information for the main variations from SHPN 04 supplement 1". The two questions for HFS were:

> Question 1: "Is the ventilation design criteria set out in SHPN 04 supplement 1: Isolation Facilities in Acute Settings As detailed in Table 1: Isolation Suite – Ventilation Parameters and Sheet 2: New build single room with en-suite facilities and bed-access lobby (isolation suite), suitable for safe nursing of patients with the one of the following conditions?
>
> 1. Multi Drug Resistant TB (MDRTB)?
>   - MERS?
>   - H1N1?
>
> Question 2: "If the above design criterion is suitable for safe nursing of patients with any one of these conditions please advise if the following design variant is equally suitable?
> See attached schematic ref: ZBP-XX-XX-SC-524-871, along with a set of commissioning documents for a representative Critical Care Ward (CCW), isolation room ventilation arrangement within the QEUH. The following variations should be noted:
>
> 1. The main extract is located in the isolation room.
> 2. The alarm system to the nurse's base was deleted, including:
> - Room Lobby pressure gauge alarm.
> - The extract air flow switch; alarm to the nurses' base.
> - The supply air flow switch; alarm to the nurses' base.
>
> 3. The transfer grille between the isolation room and the en-suite was deleted". [252]

11.10 The above variations from the validated design in SHPN 04-01 Supplement 1 which NHS GGC noted were generated using an adult Critical Care isolation room as an example. The Inquiry notes that, unlike PICU isolation rooms,

[252] **A33642489** - QEUH Isolation Rooms Meeting (31 May 2016) - Bundle 20 - Documents referred to in the Expert Reports by Andrew Poplett and Allan Bennett - Page 1527; **A34121423** - Meeting invite with D Ramsay, S McKechnie, I Powrie, D Ross, D, Wilson, D Loudon regarding clinician isolation room concerns - 31 May 2016

the Adult Critical Care isolation rooms had ensuite facilities. Other variations noted by NHS GGC Estates were:

"SUPERVISOR (JMcE) INITIAL OBSERVATIONS (where access was gained) USING SHPN 04: SUPPLEMENT 1 AS REFERENCE

- Room pressure was sitting at 8pa. This was at the magnehelic and no true readings were taken to verify. Range should be between 10 and 12 pa. (Appendix 2 Acceptance Testing)
  DW confirmed that tests undertaken proved that a positive pressure of 10 Pascals between entry lobby and door had been achieved. JMcE requested confirmation of pressure readings taken between Isolation Room and Lobby and taken between Isolation Room and En-Suite. DW confirmed he would provide. DW to issue test results to Supervisor for review."

- No Alarms installed to indicate to clinical team of potential ventilation issues or remote alarm at nurses stations. Also demonstrated by low pressures having no indication (4.22)
  SHPN 04 Supplement 1 Section 4.22 states: - 'Audio and visual alarms must be located at the entrance to the lobby and bedroom to warn nursing and maintenance staff of potential unsafe conditions. Continuous monitoring should be provided with remote indication at nurses stations, interlinked to the Building Management System with time delay (adjustable by Estates personnel) to take account of running-up of standby motors or damper operations or other plant items that may take time to open or close.'

  DR explained that no alarms are provided to nurses' station as these were omitted by the Board in PMI 169 Nurse Call Interface which confirmed requirements of Nurse Base Panel and stated 'monitoring bedroom pressure, not required'. This was issued following a visit by Lead Nurse on the project and other project team members visiting example hospital in London. DW confirmed that pressure monitoring is linked to the BMS and alarms display on the main BMS control panel in accordance with the BMS specification.

PMI 169 states: - 'Description The Board confirm their nurse call interface requirements for the Adult & Childrens Hospitals as per the attached document. Instruction Incorporate the attached interface requirement into your design development process for the nurse call system.'
Attached interface requirement states:-

'NURSE CALL INTERFACE REQUIREMENTS
Following static workshop and visit to Royal London Hospital we have agreed that we need the following items integrated with Static system: - Nurse call, Door access, Fire alarm, Medical gas alarm, PTS notification, Bedroom temperature notification, Control of 3rd party TV from patient handset i.e. static handset capable of operating as TV remote with infrared on static bedhead.

We have discarded the following systems which they have used in RLH Bedroom pressure

We have also discarded the following applications offered by Static systems as part of their presentations
Patient information details, Patient 'wandering' system, Voice communication for patient to staff calls'

It was discussed that the PMI concerns the Nurse Call interface requirements and does not appear to specifically instruct the deletion of the Audio and visual alarms.
Brookfield to track the Design Development process consequent to PMI 169 to inform on the deletion of alarms.
With DRo agreement DW to obtain a quotation for providing audio and visual alarms and forward to DRo.

- The pressure stabiliser was not operating correctly. With corridor door open top blade remained open. Bottom blade appears to have no status change when doors are either open or closed.(4.21)
Brookfield to investigate and also forward pressure stabiliser testing and commissioning information to Supervisor.

- Door from lobby opens into room and in instance not closing properly leaving a greater leakage path and closing direction not as per exemplar within SHPN 04: Supplement 1. Sheet 2
  Brookfield to investigate and advise Supervisor. The inconsistency of lobby/room door handle provision was discussed with handles on some doors and push plates on other doors.

- Extract grille located within room ceiling and toilet. All air should be extracted via the toilet with low level transfer grille within door (4.12)
  SHPN 04 Supplement 1 Section 4.12 states: - An extract terminal should be fitted at high level in the en-suite room. An additional terminal may be fitted in certain circumstances at low level adjacent to the bedhead in the bedroom. The clinical requirement for this should be verified and such requirements would probably relate to highly infectious patients. Refer Actions in 1.1 and 4.2.

- Bed location not as per exemplar within SHPN 04: Supplement 1. Sheet 2
  JMcE identified that the location of the bed was not in the position shown in SHPN 04: Supplement 1. Sheet 2. DRo advised that this would have been a clinical decision.

- Supply AHU (We used AHU 16 as example) is not identified with what room it serves and neither is the ductwork. (4.19 & SHTM03-01)
  DW advised that this matter is tracked as a Defect in FM First Summary Schedule and will be corrected.

- Air Permeability (Leakage): We were advised this was carried out using the room volumes and not the envelope volumes. This will be checked on receipt of information noted within 2.2 above.
  Brookfield to issue Air Permeability results to JMcE for Supervisor review.

11.11 HFS provided its report on the isolation rooms in June 2016, noting that they were unable to advise if the rooms met the "expected or safe standards", because information on air change rates had not been available.[253]

11.12 The report noted that the positive pressures recorded in the lobby did meet the parameters laid out in HBN 04-01 Supplement 1. In addition, leak tests met the leakage parameters set out in HBN 04-01 Supplement 1, suggesting the rooms were appropriately sealed.

11.13 With regards to any non-compliance with SHPN 04-01 Supplement 1, the report by HFS stated:

> "2. From the information provided there are a combination of single isolation rooms without lobbies and isolation suites with lobbies. Additionally there appears to be rooms noted as isolation rooms which do not have en-suite facilities.
> […]
> - 5. Considering the drawings provided for the isolation room lobby (NA-SZ-XX-AS-400-126 and NA-SZ-XX-AS-400-126_Z1) against the requirements of HBN 04-01 Supplement 1, it is noted that whilst the majority of items are provided, the following are not:
> - Storage for 'other' clean PPE (plastic apron, glove and mask storage provided)
> - Storage for room cleaning equipment
> - Facilities for completing and storing log books
>
> 7. Considering the drawings for the isolation rooms which were provided (NA-SZ-XX-AS-400-127-01 and NA-SZ-XX-AS-400-127-01_Z1), they show rooms with no en-suite as part of the design. This arrangement is also shown on schematic ZBP-XX-XX-SC-524-707 B. This arrangement is not part of HBN 04-01 Supplement 1, which notes

[253] **A32310951** - QEUH Isolation Rooms Report 2016 – Ian Storrar, HFS - Bundle 13 - Witness Statements - Page 601

that an en-suite is a key consideration and provides a simple cost effective way to provide isolation […]

8. In general, the air handling units serving the isolation rooms supply and extract air from other rooms (non-isolation rooms). A common supply is permissible under the guidance in HBN 04-01 Supplement 1; there is no information provided on the control strategy to ensure that the supply system will deliver constant volume depending on the demand.

9. The ventilation extract from the isolation room en-suites and the isolation rooms themselves are extracted via a separate system which would appear to terminate at a louver on the side of the building. HBN 04-01 Supplement 1 notes that this extract should terminate at roof level at least 3m above the building height. It is not clear from the information provided if all the extract fans are supplied from the "essential" side of the electrical distribution or if they have any safe change housings for changing filters".

11.14 The report concluded that the isolation rooms at QEUH do not comply with the validated design provided by SHPN 04-01 Supplement 1 in the following ways:

- Some isolation suite extract ventilation would appear to terminate behind louvers on the facade
- Some extract ventilation would appear to terminate in formed turrets above plant rooms.
- Isolation suites may have been provided without en-suite facilities.
- Log books not available in lobbies

11.15 Regarding the PPVL isolation rooms without ensuite facilities, such as those in PICU, HFS advised they should not be used for the care of highly infectious/infectious patients because "Using rooms without en-suite facilities risks

possible cross transmission of infection as alternative methods for toilet facilities and personal hygiene must be made".[254]

11.16 In March 2017 Hulley & Kirkwood Consulting Engineers (H&K) were commissioned by NHS GGC to review the following:

> "(a) Changing of 4No. PPVL isolation rooms (17,18,19 & 20) within Ward 2A to positive pressure isolation rooms for the continued use for transplant and severely immune-compromised patients.
>
> (b) Review of PPVL isolation rooms (43 & 44) within Adults ICU for compliance against HBN 04-01 Supplement 1 (Base Build Specification). However SHPN 04 Supplement 1 will be utilised as this is specific guidance for Scottish Healthcare Facilities. Where any differences are evident these will be identified in bold italics).
>
> (c) Review 2No. Isolation rooms (5 & 12) within PICU and provide comment on compliance.
>
> (d) Coordinate with Department of Health to assist with obtaining confirmation on what Hazard Classification of patient can be nursed within PPVL Isolation Rooms that comply with SHPN/HBN 04-01 Supplement 1".[255]

11.17 H&K state that isolation rooms without ensuite facilities are "common in hospital departments where the patient group would be unable to utilise en-suite facilities due to their state of health e.g. intensive care".

11.18 H&K state that "All of the facilities are provided with dedicated supply air handling units partnered with dedicated extract systems".

[254] **A32310951** - QEUH Isolation Rooms Report 2016 – Ian Storrar, HFS - Bundle 13 - Witness Statements - Page 601
[255] **A41602399** - Hulley & Kirkwood Isolation Room Review - QEUH and RHC Isolation Rooms Review Rev1

11.19 Other items relevant to the isolation rooms without ensuites which H&K noted as “requirements that are either not evident within the installations or are contrary to the guidance” were:

- […]

a) “The ventilation plant configuration and duty capability is generally in compliance with HBN 04: Supplement 1 however there is no evidence that the supply systems were commissioned taking into consideration the future pressure drop when a Hepa filter would be inserted”.

b) “Excessive access hatches have been installed on the supply and extract ductwork. This is contrary to clause 4.15”.

c) “There appears to be no provision for a gas tight shut off damper or spectacle plate on the extract systems prior to the extract fans. This is contrary to clause 4.14. (Note that al survey of above ceiling runs was not achievable due to operational issues)”.

d) “There are no audio and visual alarms located outside the room lobbies to warn staff of unsafe conditions. This is contrary to clause 4.22”.

e) “There is no provision for a common alarm panel located at the nurse station. This is contrary to clauses 4.6 and 4.22.”

f) “The supply and extract duct access hatches have not been identified as a bio-hazard. This is contrary to clauses 4.15 and 4.19”.

g) “The supply and extract plant and duct systems have not been identified with the rooms that they serve. This is contrary to clauses 4.15 and 4.19”.

h) “Where safe change filter housings have been provided as opposed to vertical discharges they have not been installed external to the building. This is contrary to clause 4.16. Fire compartmentation strategy will require reviewed taking the above into consideration”.

i) “The existing dial pressure gauges monitoring lobby positive pressure are inappropriate for monitoring a 10Pa pressure differential. 30-0-30 Pa is preferred as what has been installed within PICU”.

j) “No envelope permeability test carried out”.

11.20 With specific reference to two isolation rooms in PICU as examples (rooms 5 and 12), other potential issues noted were:

a) “Although ceiling voids could not be accessed within the rooms it was evident that final connections to grille boxes was by the use of flexible ductwork in lieu of a bend. This is non-compliant to SHTM 03-01 A – Section 5.55”
b) “It was not clear what patient group the rooms were being utilised for however as compliance with SHPN 04 – Supplement 1 had not been achieved this guidance cannot be utilised”.
c) “The isolation suite lobbies are fitted with magnahelic gauge to allow a visual identification of the lobby to corridor pressure. Which is nominally 10pa+ve. No alarm has been installed locally or repeated at the PICU nurse station. This means that key monitoring conditions such as door left /held open, pressure failure will not be known until the nursing staff have reason to visit the room”.
d) “The door between the lobby and isolation room opens inwards so the air flow from the lobby tends to keep it open. It should have been hung the other way so that the air flow tends to shut it.”
e) “No door closers fitted to ‘any’ doors”.

Instruction of remedial works

11.21 A ‘SBAR action plan’ compiled a list of 27 issues identified in multiple wards and stated their respective positions as at 5 December 2017, including:

Issue 1: “PPVL rooms not compliant with SHTM standards Critical Care”

Position as of December 2017: “Facilities colleagues confirmed that there are 10 air changes per hour and a positive pressure of 10 pascals in the PPVL rooms which is consistent with SHBN 04-01”.

Issue 2: “PPVL rooms do not provide appropriate protection for patients with infectious diseases of high consequence (IDHC) e.g. MERS, SARS. This issue also exists in the Royal Hospital for Children”.

Position as of December 2017: “IDHC should be nursed in negative pressure rooms. These are not available in QEUH. In order to address this issue in the short term a patient pathway has been agreed by the Infectious Disease (ID) Clinicians whereby patients will be routed either to GRI or Lanarkshire ID unit. Chief Nurse (CN) for Paediatrics discussing with clinical teams a pathway for children”.

Future actions: “Heath Protection Scotland (HPS) have been sent information on these rooms and we await their advice on whether they can be used for patients with IDHC or if not what actions could be taken to modify these rooms to provide negative pressure. This advice was sought in 2016 & 17”.

Issue 6: “HEPA filters in PICU for the protection of patients in the Bone Marrow Transplant Unit (BMTU) that might need critical care during treatment. The BMTU is ward also referred to as ward 2A”.[256]

Position as of December 2017: “HEPA filters were installed within PICU/Ward 2a week commencing 6 November 2017, within room numbers 12 and 17 – previously installed within room 18. HEPA filter still to be fitted in room 5 (access to be agreed with clinical colleagues)”.

11.22 In February 2018, Lead ICD Teresa Inkster produced another SBAR titled ‘Airborne infection, RHC, patient pathway’, which stated:

“PPVL rooms are situated throughout RHC. A review of these facilities in the adult hospital has suggested they are unsuitable for airborne

[256] **A38759222** - SBAR – Multiple Wards – Action Plan - January 2019

infections. Work is ongoing with input from HPS and HFS with a view to upgrading to negative pressure facilities. These PPVL rooms are suitable for other infections not spread via the airborne route and for isolation of immunocompromised patients".[257]

11.23 The recommendations for the childrens hospital were to:

"1) Nurse paediatric patients with MERs CoV in one of the two PPVL rooms in CDU, RHC. Implement appropriate IC precautions as per policy.
2) Nurse patients with Chickenpox or Measles in any PPVL room in RHC (not 2A). Implement appropriate IC precautions.
3) MDRTB – individual risk assessment by paediatric ID Consultant. Older children may be transferred to MDGH or GRI as per adult pathway. Younger children should be admitted to any PPVL rooms in RHC (not 2A) with appropriate IC precautions in place .
4) Consider upgrade of two PPVL rooms in RHC to negative pressure facilities. One should be in PICU". [258]

11.24 In February 2018, Consulting Engineers Hulley & Kirkwood (H&K) were instructed by NHS GGC Estates to "review the requirements for adapting a typical PPVL isolation suite to a negative pressurised suite". H&K noted in their report that "there does not appear to be any UK NHS guidance on the design of Negative Pressure (NP) isolation rooms", stating however "it is reasonable to take guidance from SHTM 03-01 and in particular the guidance pertaining to operating theatre ventilation system design". They add:

"SHTM 03-01 Part A Table A4 offers advice on air volume flows through doorways between rooms of different cleanliness in order to control cross-contamination. The table advises that an air flow of 0.28m3/s is

[257] **A32342096** - SBAR dated February 2018, RHC -airborne infection (February 2018) - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation - Page 121
[258] **A32342096** - SBAR dated February 2018, RHC -airborne infection (February 2018) - Bundle 4 - NHS Greater Glasgow and Clyde: Situation, Background, Assessment, Recommendation (SBAR) Documentation - Page 121

adequate to offer protection to a single doorway between a room and another one level lower in the hierarchy of cleanliness. With reference to SHTM 03-01 Part A Table A2, if one assumes the patient bedroom to be 'Sterile', the lobby as 'Clean' and the ward corridor as 'Transitional' then it can be concluded that a cascading air flow from the ward corridor to the isolation room at a rate of 0.28m3/s is adequate to prevent cross-contamination".[259]

11.25 H&K's proposed modifications to PPVL rooms to create a negative pressure isolation room were to:

- Relocate primary conditioned supply currently located in lobby to corridor immediately adjacent to the proposed room, and re-balance to achieve negative pressure in lobby and room in relation to corridor.
- Adjust set points at AHU such that conditioned air delivered is matched to that set for the nurses base I corridor areas.
- Introduce wall mounted 4 pipe fan coil unit (recirculation) within room to provide room temperature control of heating and cooling
- Retain pressure stabiliser damper between lobby and isolation room at 5Pa, and install a new pressure stabiliser damper for 5Pa differential between the lobby and ward corridor (target 10Pa negative pressure differential between the isolation room and the ward corridor).
- In some rooms where there is a clinical requirement for low level extract around the bedhead, low level extract will be introduced. Otherwise, extract could remain the same.
- Extract terminals to be replaced with terminals with integrated volume control dampers that can be accessed from below through the grilles. This is so that existing duct mounted volume control dampers and their associated ceiling access hatches could be removed.
- Existing dial pressure gages to be replaced with gauges with a -30/0/30Pa scale and the room side impulse tube relocated from the lobby to the

[259] **A41602403** - RHC Ward 2A Isolation Rooms Tender - May 2017

isolation room to give visual indication of the maintained negative pressure within the corridor to isolation room."

11.26 H&K noted that the introduction of a fan coil unit (FCU) could be a disadvantage because:

- It would require intrusive works for routing of pipework, condensate, drainage sealing of services etc.
- Additional maintenance and cleaning/decontamination procedures would be required
- No fresh filtered air would be supplied to the isolation room, rather supply air would be entrained and recirculated from the corridor.

11.27 On 21 February 2018 Dr Christine Peters circulated notes of a workshop and discussion group regarding the proposed plans for PPVL conversion. Also in attendance were Ian Powrie (NHS GGC Estates), 'the designers' [Hulley & Kirkwood], Malcolm Thomas (Authorised Engineer and co-author of SHTM 03-01) and Dr Blanca Beato-Arribas (Building Services Research and Information Association (BSRIA)). Dr Peters' notes of the meeting were:

> "I suggest that while it is possible to change the ITU rooms into negative pressure suites some basic questions need to be addressed first:
>
> An overarching organisational plan for isolation of:
>
> 1. Non critically ill patients with cat 3 airborne infections - is ITU the best place for them?
> 2. Critically ill patients with Cat 3 organisms - negative pressure suite provision, needs clear differentiation from PPVL rooms in terms of instructions and staff training
> 3. Potential cat 4 patients which are non-airborne, or are potentially airborne - of course this is more a national discussion in terms of any new unit specs.
> 4. A+E/ Admissions unit isolation facilities

5. ID unit
6. Immune compromised patients who need critical care or rare infectious
o These questions relate to both adult and children hospitals
o An entrance on the risk register of the shortcomings of the PPVL rooms we have with regard to air mixing (may find its ok on BSRIA testing, but dubious) need for removal of dampeners, provision of alarms, fixing of baffles, rebalancing of extract in toilet, doors being hung wrong way.
o Need for a scoping exercise for changes to ventilation for some areas-, CF, ID ? Haemonc? renal transplant - including the cheapest and easiest option of ducts being external to the building as suggested by Malcolm
o Need for the GRI room to be replaced if it is correct that it is still one that has 2 modes".[260]

11.28 On 23 April 2018, Dr Teresa Inkster, Lead Infection Control Doctor emailed colleagues in NHS GGC and H&K stating that she was "happy to sign off these plans from an infection control perspective". [261]

11.29 Seven rooms throughout the hospital were selected for conversion to negative pressure. Three of those were in the RHC, including PICU bed 5.[262]

11.30 A programme of work was developed, with the conversion of PPVL rooms in the children's hospital ('Phase 2') scheduled to begin on 5 November 2018.[263] However there were delays to the programme due to issues with Phase 1 works (Adult HDU rooms).[264]

[260] **A49377179** - Email from C Peters, T Inkster, I Powrie regarding PPVL rooms workshop and meeting - 21 to 27 February 2018
[261] **A49377176 -** Email from T Inkster consenting to conversion of PPVL Isolation Suite to Negative Pressure - 24 April 2018
[262] **A38759222** - SBAR – Multiple Wards – Action Plan - January 2019
[263] **A49377178 -** Emails between T Mills, A Traquair Smith, Regarding Isolation Rooms - Phase 1 Handover - 29 October to 5 November 2018
[264] **A49377174** - Email between T Mills A Traquair Smith, T Inkster regarding Isolation Rooms - Phase 1 Handover - 9 to 13 November 2018

11.31 By 5 December 2018, a number of concerns were raised at an update meeting with estates, capital planning and clinical staff in attendance:

- "The fans applied to the duct work in the adult ITU rooms which allow negative pressure to be generated are working at full capacity and are not achieving the desired negative pressure requirements. Initial thoughts were that this was due to leaks in the duct work however this is seeming less likely and there is little confidence that new fans will fix the problem. Meantime, the rooms as you know, must not be used for any patients requiring TBPs.

- It was initially reported at the start of the meeting that there was a level of confidence that the RHC rooms currently closed for the same works, would meet validation requirements as the duct work appears very different. A report received during the meeting confirmed that these rooms are not achieving the desired negative pressure requirements and in fact are achieving even lower rates of negative air pressure than the adult site.

- The remaining phase of works to upgrade rooms has now been halted as clinical colleagues are not willing to close off any further beds to allow works to go ahead when the problem from the previous phases has not yet been identified.

- There are concerns that the flow of air in all other lobbied rooms in the hospital is not adequate for infectious patients and as a result it was voiced that there is a risk that infectious particles from within these rooms may have been disseminated into the main wards. Capital planning colleagues raised concern that the rooms occupied by Ebola and MDR TB patients in the adult hospital may not have provided adequate protection. Furthermore, there are concerns that the duct

work is now contaminated and as a result they are keen to fog the duct work to ensure that no contamination, if any, remains".[265]

11.32 While issues with the conversion were resolved and works halted, the isolation rooms affected were re-opened for use as standard (non-isolation) rooms, without HEPA filtration. Concerns were raised by the NHS GGC Estates team, who advised that using the rooms without extract HEPA filters while the distance of extract ventilation from the building façade was non-compliant, was against building regulations. Instead, Estates suggested the HEPA filters were reinstated and the pressure alarms disabled, stating "The only reason we didn't want the filters installed was that we knew there was a risk the pressure alarms were likely to go off as soon as the HEPA filters got dirty and restricted air flow".

11.33 Ultimately the decision to recommission the isolation rooms as conventional ward bedrooms over the winter period was taken:

> "Due to the urgent need to get beds back into the system, these rooms in the interim would not be used as isolation rooms but regarded as standard single room accommodation. The guidance cited relating to isolation rooms therefore largely becomes irrelevant for this interim arrangement and HEPA filtration would not be required.
>
> The background for removing the filters was based on two main points:
> 1. The existing plant is not and unlikely to have ever been capable of providing long term isolation room air flow parameters. This is contrary to the-information provided within the building's O&M's and original commissioning data.
> 2. The as fitted installations have no pre-filtration protecting of the HEPAs and there is significant concern the filters would rapidly deteriorate resulting. in ·air flow reductions affecting a negative pressure environment causing regular alarms and necessitating the HEPAs to be replaced frequently. The regularity of this is unknown,

[265] **A49377175** - Email from S Dodds to T Inkster regarding Negative pressure rooms and concerns relating to other lobbied rooms on QEUH RHC site - 5 December 2018

however, it is estimated it could possibly be weekly depending on environmental conditions. Additionally, there is no spare capacity within the system to increase the air flow i.e. the fan inverters are already running at their maximum. ·
On this basis it was agreed the rooms, pending the final ventilation remedial solution, would not be used for patients requiring isolation but would in the interim revert to standard rooms, collectively it was agreed the HEPA filters could be removed mitigating the issues described above and facilitating conventional room use. The air changes within the rooms cannot be guaranteed should these filters be reinserted and we would have no way of knowing when critical levels have been reached if the alarms are disconnected, it would not be our recommendation to adopt this approach as we believe even Building Standards air change rates could potentially be breached under such circumstances.

Infection Control correctly will not sign off on these rooms being used for isolation and that's not the intent here, but Teresa lnkster has accepted their use for patients who do not have airborne infection or immunosuppression".

11.34 Project supervisors with the capital planning team advised the estates team that the solution would only be provided on a temporary basis, adding: "The design work remains ongoing to provide a solution to meet the negative pressure isolation room requirement for infectious patients. This work will be delivered early next year with the exact timescale to be confirmed once a design solution for the extract system has been agreed".[266]

11.35 By 28 May 2019, Lead ICD Teresa Inkster emailed NHS GGC Estates colleagues to arrange the next steps following completion of the negative pressure conversion works:

[266] **A49377180** - Emails between S Russell, I Powrie, A Wilson, A Gallacher, D Conner regarding isolation rooms - Commissioning delay - 28 November to 4 December 2018

> "Whilst we now have negative pressure rooms for infectious patients we are still using these PPVLs for immunosuppressed patients for which there was an exclusion in the guidance. Cracks in the fabric and holes can be an issue depending on the extent as the premise for these rooms is that they are sealed.
> It would also be useful to discuss how many of the remainder were built with modifications on the original design and whether there is anything we can do about that. I note a latent defect in this particular report [Ward 2C Room 5].
> I have attached the HFS report into these rooms for discussion on Friday".[267]

11.36 An 'Isolation room steering group' was set up, with the first meeting on 31 May 2019. The Inquiry has not had sight of the minutes of those meetings.

11.37 By May 2019, Isolation Room No. 5 had been converted to a Negative Pressure Isolation room with the other 3 isolation rooms remaining as PPVL isolation rooms.

11.38 NHS GGC have advised the Inquiry that, other than the changes to the supply and extract to convert room 5 to a negative pressure room and the installation of HEPA filtration, no physical changes have been made to the ventilation system serving the PICU isolation rooms since handover in 2015.[268]

12. Clinical Decision Unit

12.1 The Clinical Decision Unit is located on the Ground floor. At handover 2 PPVL rooms were provided – Bed 17 and Bed 18.

[267] **A49377177** - Emails between T Inkster and D Conner regarding Isolation room verification reports - 23 May to 26 August 2019
[268] **A46059364** - NHSGGC response to RFI '05 a) & c) Isolation Rooms RHC updated'

12.2 In July 2023, the Section 21 response from NHS GGC, confirms that at handover no validation was carried out on these rooms.[269]

Upgrade works

12.3 HEPA filtration was recorded in Bed 17 in August 2021.

12.4 HEPA filtration was recorded in Bed 18 in September 2018

12.5 In May 2019 Bed 18 was converted from a PPVL isolation room to a Negative Pressure Isolation Room. The Section 21 response from NHS GGC, dated July 2023 confirms the upgrade works as:

> "The ventilation system changes were the installation of a supply grille in the patient room and an extract grille in the lobby. These were additional to the existing grilles. The system was then re-balanced to ensure the flow of air is always from the corridor or lobby to the patient room. Within the plant rooms, gas tight dampers were fitted to both supply and extract ductwork allowing them to be sealed for disinfection if required".[270]

13. Cardiology Ward

13.1 The Cardiology Ward is located on level 1 and there are 2 isolation rooms located in this ward. The COS for Cardiac Services refers to:

> **"**<u>Inpatient ward area</u>
> The there will be a 14 bed unit which will be adequate for the current level and pattern of service and can accommodate spikes in activity. 1 open areas of 4 beds located close to the central nurses station would facilitate the close monitoring required by patients returning from

[269] **A44943356** - S.21 response from GGC regarding Validation
[270] **A44943477** - S.21 response from GGC July 2023, '05 a) and c) Isolation Rooms RHC'

> intensive care and cardiac catheterisation procedures. A further 10 cubicles would then allow isolation of patients to prevent the spread of infection, to protect immunologically compromised children and to help nurture parent/baby relationships in the convalescent phase of care".

13.2 Under Building Requirements there is no mention of any ventilation requirements for the ward. The only reference is made to the laboratory with notes that it "should be built to operating theatre specifications including positive atmospheric pressure and temperature control.".

13.3 At handover both of these isolation rooms were PPVL and they remain PPVL.

13.4 In July 2023, the Section 21 response from NHS GGC, confirms that at handover no validation was carried out on these rooms.[271]

Upgrade works

13.5 The Section 21 response from NHS GGC, dated July 2023 confirms the upgrade works as:

> "The verification report for CAR 016 records that in September 2018 a terminal HEPA filter was present in the lobby supply grille. There have been no further changes to this ventilation system.
> The verification report for CAR 011 records that in September 2018 a terminal HEPA filter was present in the lobby supply grille. There have been no further changes to this ventilation system".[272]

14. Acute Receiving Ward

[271] **A44943356** - S.21 response from GGC regarding Validation
[272] **A44943477** - S.21 response from GGC July 2023, '05 a) and c) Isolation Rooms RHC'

14.1 Ward 2C is the Acute receiving ward, located on level 2. The COS for the Generic Inpatient wards in the RHC confirms the following:

> "The inpatient wards of the New Children's Hospital will, as far as possible, comprise a generic design of wards in order that they may flex optimally between specialties and patient groups in order to respond to clinical and demographic changes without the need for major re-configuration. The plan is that each ward will be grouped in 8 bed clusters. There may also be a requirement to change the number of beds between the ward areas therefore the wards should be configured in such a way that will allow flexibility.
> Support accommodation for the wards should be co-located in a central area to allow maximum efficiencies
>
> **Services not included:**
> Renal day care
> Haemato - oncology
> PICU
> Psychiatric Inpatients
> The above specialties have patients with a mixture of needs and issues that differ from those using a generic ward.
>
> The Acute Receiving Ward and Cardiology wards whilst having different configured bed numbers will be expected to have a similar design layout to the inpatient bed wards. It is noted however that the plan for in-patient accommodation within these areas can and should be the same as for the generic ward component wherever possible to further support future flexibility". [273]

And under 'General Points' refers to:

[273] **A35761946** - NSGACL GENERIC WARD NCH_iss2_rev' - Bundle 16 - Ventilation PPP - Page 1652

> "2 rooms per ward will be used for isolation purposes and will have an associated gowning lobby".[274]

14.2 At handover 2 PPVL's were provided – one of the rooms was changed in May 2019 to an NPIR.

14.3 In July 2023, the Section 21 response from NHS GGC, confirms that at handover no validation was carried out on these rooms.[275]

Upgrade Works

14.4 Section 21 response from NHS GGC, dated July 2023 confirms the upgrade works as:

> "In May 2019 ARU 109 [Bed 6] was converted from a PPVL to a NPIR at the request of Consultant Physicians and ICD's. The ventilation system changes were the installation of a supply grille in the patient room and an extract grille in the lobby. These were additional to the existing grilles. The system was then re-balanced to ensure the flow of air is always from the corridor or lobby to the patient room. Within the plant rooms, gas tight dampers were fitted to both supply and extract ductwork allowing them to be sealed for disinfection if required".[276]

15. Level 3 Isolation Rooms

15.1 Ward 3A is the Neurology, Neurosurgery, Complex Airway/LTV, Endocrine and Metabolic ward. At handover 2 PPVL Isolation Rooms were provided.

15.2 In July 2023, the Section 21 response from NHS GGC, confirms that at handover no validation was carried out on these rooms.[277]

Upgrade Works

[274] **A35761946** - NSGACL GENERIC WARD NCH_iss2_rev' - Bundle 16 - Ventilation PPP - Page 1652
[275] **A44943356** - S.21 response from GGC regarding Validation
[276] **A44943477** - S.21 response from GGC July 2023, '05 a) and c) Isolation Rooms RHC'
[277] **A44943356** - S.21 response from GGC regarding Validation

15.3 The Section 21 response from NHS GGC, dated July 2023 confirms the upgrade works as:

> "The verification report for GW3 053 (Bed 16) records that a terminal HEPA filter was not present in the lobby supply grille until April 2022. There have been no further changes to this ventilation system.
> The verification report for GW3 054 (Bed 15) records that in September 2018 a terminal HEPA filter was present in the lobby supply grille. There have been no further changes to this ventilation system".

15.4 Ward 3B is the Gastroenterology / ENT / Surgical Ward. At handover 1 PPVL Isolation Room was provided.

15.5 In July 2023, the Section 21 response from NHS GGC, confirms that at handover no validation was carried out on these rooms.[278]

Upgrade Works

15.6 The Section 21 response from NHS GGC, dated July 2023 confirms the upgrade works as:

> "The verification reports for GW2 022 (Bed 19) records that a terminal HEPA filter was not present in the lobby supply grille until April 2020. There have been no further changes to this ventilation system".

15.7 Ward 3C is the Orthopaedics/Renal including dialysis/Rheumatology Ward. At handover 3 PPVL Isolation Rooms were provided.

15.8 In July 2023, the Section 21 response from NHS GGC, confirms that at handover no validation was carried out on these rooms.[279]

[278] **A44943356** - S.21 response from GGC regarding Validation
[279] **A44943356** - S.21 response from GGC regarding Validation

Upgrade Works

15.9 The Section 21 response from NHS GGC, dated July 2023 confirms the upgrade works as:

> "The verification report for GW1 055 (Bed 9) records that in October 2018 a terminal HEPA filter was present in the lobby supply grille. There have been no further changes to this ventilation system.
> The verification report for GW3 058 (Bed 10) records that in March 2019 a terminal HEPA filter was present in the lobby supply grille. There have been no further changes to this ventilation system.
> The verification report for GW2 055 (Bed 5) records that a terminal HEPA filter was not present in the lobby supply grille until July 2020. There have been no further changes to this ventilation system".

Appendix

Table showing Isolation Rooms in the QEUH and works undertaken following handover in 2015

Isolation Rooms - QEUH												
Location	Ward Type		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Level 1	High Dependency Unit (HDU)	Bed 11	PPVL	PPVL	PPVL	PPVL	PPVL(*Feb)	PPVL	PPVL	PPVL	PPVL	PPVL
		Bed 50	PPVL (* Sept)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		Bed 3	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL (*June)	PPVL	PPVL	PPVL
		Bed 4	PPVL	PPVL	PPVL	PPVL	NPIR	NPIR	NPIR	NPIR	NPIR	NPIR
		Bed 43	PPVL	PPVL	PPVL	PPVL	NPIR	NPIR	NPIR	NPIR	NPIR	NPIR
Level 1	Intensive Care Unit (ICU)	Bed 40	PPVL	PPVL	PPVL (* April)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		Bed 31	PPVL (* Sept)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		Bed 23	PPVL	PPVL	PPVL	PPVL	PPVL (* June)	PPVL	PPVL	PPVL	PPVL	PPVL
		Bed 24	PPVL	PPVL	PPVL	PPVL	NPIR	NPIR	NPIR	NPIR	NPIR	NPIR
		Bed 44	PPVL	PPVL	PPVL	PPVL	NPIR	NPIR	NPIR	NPIR	NPIR	NPIR
Level 4	Renal	Bed 19	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		Bed 20	PPVL (* Sept)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL

Key	
PPVL	Positive Pressure Ventilated Lobby
NPVL	Negative Pressure Ventilated Lobby
PPIR	Positive Pressure Isolation Room
NPIR	Negative Pressure Isolation Room
*	HEPA Filtration added

SCOTTISH HOSPITALS INQUIRY

Table showing Isolation Rooms in the RHC and works undertaken following handover in 2015

Isolation Rooms - RHC												
Location	**Ward Type**	**Bed Reference**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Ground Floor	Clinical Decision Unit	17	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL (*Aug)	PPVL	PPVL	PPVL
		18	PPVL	PPVL	PPVL	PPVL	NPIR (May)	NPIR	NPIR	NPIR	NPIR	NPIR
Ward 1D	Paediatric Intensive Care Unit (PICU)	5	PPVL	PPVL	PPVL	PPVL	NPIR (May)	NPIR	NPIR	NPIR	NPIR	NPIR
		12	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL (*July)	PPVL	PPVL	PPVL	PPVL
		17	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL (*Nov)	PPVL	PPVL	PPVL	PPVL
		18	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL (*June)	PPVL	PPVL	PPVL	PPVL
Ward 1E	Cardiology Ward	13	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		14	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
Ward 2A	Peadiatric Bone Marrow Transplant Unit	17	PPVL (*June)	PPVL	PPVL	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR
		18	PPVL (*June)	PPVL	PPVL	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR
		19	PPVL (*June)	PPVL	PPVL	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR
		20	PPVL (*June)	PPVL	PPVL	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR	PPIR
		22	PPVL (*June)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		23	PPVL (*June)	PPVL	PPVL	PPVL	NPVL (May)	NPVL	NPVL	NPVL	NPVL	NPVL
		24	PPVL (*June)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		25	PPVL (*June)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
Ward 2C	Acute Receiving Ward	5	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL (*May)	PPVL	PPVL
		6	PPVL	PPVL	PPVL	PPVL	NPIR (May)	NPIR	NPIR	NPIR	NPIR	NPIR
Ward 3A	Neurology, Neurosurgery, Complex Airway/LTV, Endocrine and Metabolic	15	PPVL	PPVL	PPVL	PPVL (*Sept)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		16	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL (*April)	PPVL	PPVL
Ward 3B	Gastroenterology / ENT / Surgical Ward	19	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL (*April)	PPVL	PPVL	PPVL	PPVL
Ward 3C	Orthopaedics/Renal including dialysis/Rheumatology	5	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL (*July)	PPVL	PPVL	PPVL	PPVL
		9	PPVL	PPVL	PPVL	PPVL (*Oct)	PPVL	PPVL	PPVL	PPVL	PPVL	PPVL
		10	PPVL	PPVL	PPVL	PPVL	PPVL (*March)	PPVL	PPVL	PPVL	PPVL	PPVL

Key	
PPVL	Positive Pressure Ventilated Lobby
NPVL	Negative Pressure Ventilated Lobby
PPIR	Positive Pressure Isolation Room
NPIR	Negative Pressure Isolation Room
*	HEPA Filtration added


SCOTTISH
HOSPITALS
INQUIRY