SCOTTISH HOSPITALS INQUIRY

Hearings Commencing
13 May 2025

Day 5
20 May 2025
David Wilson

10:03

THE CHAIR: Good morning.

MR MACKINTOSH: Good morning, my Lord.

THE CHAIR: Now, Mr Mackintosh, we have-- is it Mr Wilson this morning?

MR MACKINTOSH: Mr Wilson this morning and Mr Pike this afternoon.

THE CHAIR: Right. (After a pause) (To the witness) Good morning, Mr Wilson.

THE WITNESS: Good morning.

THE CHAIR: As you understand, you're about to be asked questions by Mr Mackintosh who is sitting opposite you, but, first of all, I understand you're prepared to take the oath.

THE WITNESS: Yes.

Mr David Wilson
Sworn

THE CHAIR: Thank you, Mr Wilson. Now, I don't know how long your evidence will be. We've scheduled the morning. We usually take a coffee break at half past eleven, but should you want to take a break at any other time, just give me an indication and we'll take a break.

THE WITNESS: Okay.

THE CHAIR: Now, Mr Mackintosh.

MR MACKINTOSH: Thank you, my Lord.

Questioned by Mr Mackintosh

Q Mr Wilson, I wonder if you can give us your full name?

A It's David Alexander Wilson.

Q Thank you, and did you produce a written statement in response to questions from the Inquiry?

A I did, yes.

Q Are you willing to adopt it as part of your evidence?

A Yes, I am.

Q Thank you. Now, what I'd like to do is start, as it were, at the beginning. When did your work as commissioning manager at Multiplex on the Queen Elizabeth Hospital site, or the New Southern General Hospital site, South Glasgow Hospital site, start?

A I started in 2011 with Multiplex, that was in laboratory building at the Queen Elizabeth site, and then it was around about 2012 when I moved on to the actual hospital build.

Q Was it always as commissioning manager?

A Yes. I had other roles, but it was commissioning manager as my title.

Q So, what were the other roles, just in headline terms?

A I was involved in the ICT network system within the hospital itself from a point of view of liaison between Multiplex and the Board and the Board's IT consultants.

Q Anything else?

A That was probably it, yeah.

Q Right. So, if we think of the commissioning job, not in the laboratories, but on the main building, your statement, on the first page, which is page 46 of the witness statement bundle, describes a number of jobs in commissioning engineering before this one.

A Yeah.

Q Sometimes you call yourself a commissioning engineer, and sometimes you call yourself a commissioning manager.

A Yeah.

Q What's the difference?

A A commissioning engineer was someone that actually went on and physically did the commissioning activities. Obviously, a commissioning manager is someone who then manages those activities.

Q But you had previously been a commissioning engineer?

A Yes.

Q Within the world of commissioning, as a commissioning engineer, do you specialise in particular types of systems?

A Yes-- Yeah, yes.

Q What's your specialism originally?

A It was in HVAC systems, heating, ventilation, and controls(sic).

Q Right. So, obviously you're aware the Inquiry has been interested in ventilation systems.

A Yeah.

Q If we think about a standard single room in that hospital which contained a chill beam, a radiant panel, and an extract, how much of those fall within that sort of expertise of yours?

A They all would to a certain extent, yeah.

Q Right, okay. Now, what would you see the role of a commissioning manager in a project like this to be?

A So, the role of commissioning manager would be to manage the overall commissioning process, and, in the case of the hospital, that was mechanical services, electrical services, public health services and controls. My job would be to work with the subcontractor, which, in this case, was Mercury Engineering, to produce programmes of how we were going to start at the beginning of the commissioning activities right through to the end and the handover of the building.

So, a lot of my time was spent in programming and, sort of, logic and sequence of how the build would-- how the commissioning would work.

Q Okay. What does it mean to commission either a piece of equipment or a system or a hospital? What is the essence commissioning?

A So, commissioning in itself is taking a system or a component from a static state, maybe just sitting actually physically installed, to-- basically to actually operating the design conditions that was-- as the designer has intended.

Q Do you measure the output from the system?

A You can do, yes, in some sense.

Q So, if we think about commissioning a light system, at the simplest you check the lights work, but do you check the light produces the necessary amount of light?

A Yes, the engineer would, yes.

Q The commissioning engineer?

A Yes.

Q Right. If we go back to ventilation systems, if you had a handling unit that was supposed to handle a certain amount of air, would the commissioning process measure what that is?

A Yes.

Q And if that air handling unit is attached to a system of ducts, and at the end of those ducts are some chilled beams, and they're pushing air into wards, would the commissioning process check how much air was coming out the end?

A Yes.

Q And when you come to a water system, would a commissioning process check that an individual calorifier was working?

A Yes.

Q Would it check that the water system was achieving the temperatures it was required to achieve at various points in the system, particularly at the furthest away from the calorifiers?

A Yeah-- Yes.

Q In the case of water, would a water commissioning process ever involve carrying out water tests?

A The last part of the water commissioning would involve taking samples of the water supply, yes.

Q And what is the information you're trying to gain from those samples?

A You're trying to gain, "Is the water sample clean?", "Is it within the parameters for potable water?" essentially, so drinking water.

Q This is the standard Scottish Government test for wholesomeness?

A Yeah.

Q You wouldn't be----

THE CHAIR: Well, you say "Scottish Government test", do you mean that, Mr Mackintosh?

MR MACKINTOSH: I think I don't. I think I just mean the wholesomeness test for water supply. Is it the standard water supply----

A It's the water supply and that's over the UK, it's a general standard, yeah.

THE CHAIR: Well, there's the Water (Scotland) Act, and there's regulations, and there's a standard, I think, for potable water, and that's what you're talking about, I think.

A Yes.

MR MACKINTOSH: I'm looking at the-- that there's health and safety exec-- the Scottish standard under the Water Supply (Water Quality) (Scotland) Regulations 2001. Would that be what you're trying to achieve?

A We would generally be trying to achieve what's set, usually, in the HSE 274, which is the Legionella part of the standards. There's HSE standards generally trying to achieve----

Q We'll come back to that, but that's useful. So, if we move to a ventilation system which has filters in it, would you be checking that the filter system is doing the amount of filtering you would expect it to do?

A That depends. The engineer would check to see the filters are clean, and they would check that the filters are installed correctly within the air handling unit. Thats some general standard filters, the real filters you'd probably test would be HEPA filters, so it's the (inaudible) filter.

Q If you had a HEPA filter feeding into a particular ward or room, would you, for example, test the air inside the room to see how clean it is after the filter has been running for a period?

A They would-- Not necessarily the air inside the room. They would test-- Basically, they'd put a dispersed oil in one side of the filter and check how much gets through to the other filter to check-- to make sure the seals are correct and the filter's actually filtering out what it's required to do.

Q So, you're checking the filter is installed correctly?

A Installed and it's working correctly.

Q Working correctly, all right. Now, we've heard, in the context of ventilation evidence, about the context of validation. What do you understand to be, in the context of ventilation, the difference between commissioning and validation?

A So, commissioning is a process from taking it from a static to completion to a dynamic operation within

the design parameters. Validation will come in after that, someone who hasn't done the commissioning to check the systems to make sure they meet the requirements of the client, essentially.

Q And one would hope that the requirements of the client and the system's objectives designed by the designer are the same thing?

A You would hope so, yes.

Q Now, before we go back to those topics in some more detail, I want to understand who you're working with and how you got up to speed. So, what steps did you take when you arrived to understand what the designers had designed to be installed?

A I would look at, essentially, drawings, so the designer's drawings, and various schedules they had for equipment, etc.

Q And these are the construction drawings?

A These would be-- They'd be design drawings that then Mercury would take to construction status.

Q Right, and are you aware of the process of user groups and the sign-off of 1:50s and Room Data Sheets?

A Yes.

Q Is this after that stage?

A That's after that stage, yes.

Q Right, okay. In order to do your task, would you read any other documents, like contract documents, the employer's requirements?

A Employer's requirements-- Not so much contract documents. Certainly employer's requirements, you'd look at those.

Q Right. Are you aware----

THE CHAIR: Sorry, my fault for really just not hearing you. You would check employer's requirements?

A Yes, we'd be looking at employer's requirements on the specific subject I might be looking at in the drawings. So, if it was to do with ventilation, I might look at the employer's requirements to do with ventilation systems.

MR MACKINTOSH: To use an example, if you were looking at commissioning an isolation, you would look at the construction drawings?

A Yes.

Q You might look at the employers' requirements?

A Potentially, yes.

Q What else might you look at to understand that system you're about to commission?

A Look at grille schedules. You would look at technical submissions for the plant equipment that was being looked at.

Q So, this came in from the suppliers?

A That would be coming from the-- certainly-- subcontractor, Mercury, yeah.

Q Would you look at guidance documents?

A You would look at guidance documents in certain instances, yeah.

Q So, in this case, if the isolation rooms refer to SHPN documents or HPN documents, would you read those?

A Yeah.

Q Now there's a clause in the employment contracts between Brookfield Europe and NHS GGC, which I want to put to you to ask you a question, and we've extracted it into a provisional position paper on this matter, which is in bundle 26, document 3 at page 202, and you see 5.6; now, it's entirely out of context, I appreciate that, so I'm not asking you to interpret the contract, but do you see how 5.6 has a heading:

"**Control of Infection** [and] **Prevention and control of infection shall remain a primary consideration of the Contractor in the design and construction of the Works.**"

Now, it's not for the Inquiry to interpret the contract. The reason I'm putting that up there is simply to ask you, did you, as a commissioning engineer, have any source of advice on infection prevention and control in your work?

A In the work in the hospital?

Q Yes.

A No.

Q No. Do you have any experience or training in the aspects of infection prevention and control as they relate to the systems you're commissioning?

A No.

Q Now, it may be that other people in Brookfield Multiplex did this, so to what extent would you have considered the prevention and control of infection in the commissioning process?

A To make sure the systems were, you know, as far as I could make sure, the systems were commissioned in line with the design, which I would have, you know, expected to be in line with the infection control in the user group outputs.

Q But you're not checking that, you're just building back to the design, thank you. If we go off the screen – oh, we have already – I'd like to ask about the Project team that you're dealing with. If we go to question 6 of your statement, which is on page 50 of the statement bundle, and it's question (h), we asked you:

"Please confirm whether you worked with NHSGDGC Project team members during the project. If so, whom? Describe your working relationship with them."

You've listed some people, and the first person you mentioned was Mr Powrie.

A Yep.

Q So, what was his position when you were doing your commissioning work?

A He was the Estates – I don't know his exact title – but he was certainly working for the Project team. He was from an Estates background from the Greater Glasgow and Clyde.

Q What task did he carry out that you were involved in?

A He was involved with sometimes witnessing some systems. He would go out and look at some systems or some of his staff would. I got involved with him to do with the assets in the building and the systems within the building, so I had a fairly-- a reasonably good relationship with Ian.

Q Did you have any involvement with him in carrying out the tests? Would he witness them, for example?

A He did in some instances; he would be invited to them. In some instances, he wouldn't be able to make it, but he would be invited to them, and he did attend some of them. I'm not entirely sure which ones, but I recall.

Q Mr Alasdair Smith, what was his role in the GGC Project team, as you understood it?

A He was, again, someone working within the Project team who would-- Again, he probably attended most of the works' activities for the Greater Glasgow and Clyde side of the Project team.

Q Do you know what his professional background was?

A I don't recall exactly, but I think he was an electrical engineer to trade.

Q You don't happen to remember when he arrived on site, do you?

A I don't recall, to be honest.

Q Then, Karen Connolly, what was she doing on the GGC project, as far as you understood it?

A So, she was the GGC's commissioning manager, which had a slightly different definition to what our commissioning is and what we would be doing.

Q So, what did you understand that definition to be?

A She was dealing a lot with the-- particularly looking at the migration of the build of the different departments moving into the building and working with, I think, different departments before they came to the building.

THE CHAIR: I mean, you say that's a bit different; it's maybe quite a bit different.

A Yeah.

THE CHAIR: I mean she's-- I

mean, just so well in following, she's concerned about getting patients and staff into the building, and presumably not concerned with equipment or plant?

A Not-- I think she maybe had something to do with equipment, as in, the board's equipment moving across----

THE CHAIR: Right.

A -- but not to do with mechanical, electrical, public health systems, no.

THE CHAIR: All right, thank you, thank you.

MR MACKINTOSH: So, this would be like the board's medical furniture, testing equipment, computers, that sort of thing?

A MRI, CT scans, that type of thing, yeah.

Q Right, and if we look on to Eleanor McColl, what was her role in the GGC Project team?

A She was in the IT side, so she was someone I dealt-- to do with the IT and the systems that were going to be put into the hospital.

Q This is the ICnet(?) system?

A Yeah, IT network systems, yeah.

Q Right. Mr Moir, what was his role in the GGC team?

A He was the project manager for Greater Glasgow and Clyde on the Project team.

Q So, how often do you deal with Mr Moir?

A Probably not a lot during the actual construction and commissioning of the hospital, probably more at the post-handover.

Q Then, over the page we have Mr Cairnie; what did he do in the GGC Project team?

A He, again, was an IT engineer that dealt with the IT side, worked with Eleanor.

Q Then, Mr Loudon, what was his role in the Project team?

A He was the project director when Alan Seabourne left, and David Loudon took over then, as project director for Greater Glasgow and Clyde.

Q Now, maybe by reference to this list or other people who will now occur to you, if you were thinking about the ventilation systems that you were commissioning, who in the GGC team had the technical experience or knowledge to understand the systems at the level you were operating at?

A Probably Ian Powrie, Alasdair Smith maybe to a lesser extent.

Q Would Mr Moir have had that experience?

A Very, very surface level experience, I think, not technically.

Q Now, when it comes to the water system and the commissioning

process for either components or the whole system, who in that list or anyone else you now remember on the GGC team had a level of experience or knowledge that was comparable to yours in respect to the water system?

A I think certainly Ian Powrie would have, and again, Alasdair Smith maybe to a lesser extent.

Q Okay. Are you aware of whether-- or did you interact with any mechanical electrical engineers – other than Mr Smith – who were providing advice to GGC's Project team whilst you were at the site?

A Probably later on, towards where we were doing client training, so we were training a lot of the maintenance engineers on the building and the systems in the building, so----

Q So, these were GGC staff?

A These were GGC staff, yeah.

Q But in terms of external consultants, they didn't have an M&E consultant?

A They had Capita-- were NEC supervisors, and they had, certainly, M&E staff working with them who came and witnessed tests as well. Wallace Whittle, I believe, as I remember, worked with the staff early doors, but probably weren't as involved during the construction and----

Q Yeah, no, I need to break that down because that's quite a complicated period of time, so if we look at the period after you arrived on site in 2011, what work were Wallace Whittle doing then?

A They were working on laboratory building at the time, as designers. I don't recall what they were doing in the hospital.

Q Who were they working for?

A On the laboratories, I think they were working for us as novated designers.

Q Right. Now, if we can go to your-- to page 49 of the statement bundle, which I recognise is going backwards, and question 5(e), we've asked you who from the Queen Elizabeth team had infection control input and at what stage. Now, what I'd like to understand is, when you arrived in 2011, after that point, did you have contact with any members of the GGC Infection Prevention and Control team?

A I don't recall having anything at that stage no.

Q Between arrival and handover, I mean, it may have been different after handover, did you interact with a Jackie Stewart or Barmanroy, who was an infection control nurse seconded to the team?

A I remember the name Jackie Stewart. I don't remember much interaction with them at that time. The first I recall getting-- or hearing more

about the infection control was when we were trying to get the water samples witnessed, and I think that's when Ian Powrie engaged Infection Control to come out and witness----

Q And when is that?

A That would be late 2014 or early 2015 that we were doing the tests.

Q So, this is you doing water sampling as part of the commissioning process of the water system?

A Yep.

Q Yes. How did that work? How many samples would you have taken and where were they from?

A Well, it was obviously Mercury Engineering who were taking the samples with their subcontractor rather than me taking them, but there was samples taken from various points in the system, which-- We'd refer to a lot of them as sentinel points, so points that are near to the source of the water, points that are furthest away, and a mixture in between. So, there would be something in the region of a couple of hundred samples, I would imagine-- would be taken at any points going through the hospital.

Q And was a report prepared of those samples?

A There was H&V Commissioning, who were the water specialists working for Mercury, and they produced a schedule of the samples that basically said, you know, pass and fail on the sample analysis, and part of that would have been the sample analysis reports from the laboratories as well.

Q What were the organisms being detected or not detected, or looked for in that sampling?

A You'd have E coli, Coliforms, Legionella, and total viable counts, TVCs.

Q Were you looking at that point for Pseudomonas?

A No.

Q No, and did any part of the systems generate above-threshold results for any of those tests?

A The ones I recall were probably TVCs, and there was-- I don't remember any Legionella or E coli or Coliforms, but I do recall TVCs, and there was a bit of a thing with TVCs where there wasn't particularly a stipulated limit on them at that time, so we were taking a bit of advice from the water specialists, and then obviously looking to the Estates department as well, but there were certainly higher TVCs in some of the samples than we would have expected, yeah.

Q Okay. I'm going to come back to the water testing later on. What I'd like to do is to look at the end of that question (e). Do you see you then say:

"I then recall Dr Christine Peters and Dr Teresa Inkster around June 2015

when reviewing the ventilation design."

Why were you reviewing the ventilation design in June 2015?

A There was questions coming from Greater Glasgow and Clyde about ventilation rates in various areas of the building. The ones I recall were Ward 4B and Ward 2A, so at that time we were getting queried on ventilation rates and ventilation design.

Q Would that also have extended to topics such as HEPA filtering and pressure differentials?

A Yes.

Q Is this after handover?

A Yes.

Q Would the subject of air change rates and pressure differentials and HEPA filters come from Dr Peters and Dr Inkster, or did they come from you?

A They enquired into it; I think they started a process of enquiring into it.

Q had anybody from GGC-- I mean, they may have raised it with other people but raised with you in the commissioning process the question of air change rates, HEPA filters, and pressure differentials for any part of the hospital during the time you were doing the commissioning process?

A Not that I recall, other than maybe the people who were witnessing the tests would be looking at that type of thing or Mercury would be, and people witnessing it, but I don't recall anybody saying there was an issue, or a problem, or something they thought wasn't right.

Q At this point, did you know that most of the single rooms in the hospital were being supplied with air at 40 litres per second by design, rather than 6 air changes an hour?

A I knew there were 40lps, yes.

Q Right. In these conversations, did you tell Dr Peters and Dr Inkster that, or did they already know?

A I honestly don't recall.

Q Because their evidence is, at that point, they didn't know, and Dr Inkster's position is that she didn't know until 2016 that there'd been what we've been calling an agreed ventilation derogation. I accept that's not anybody else's name, it's an Inquiry name. But if you knew the 40 litres per second was the input into the room, why did you not tell Dr Peters and Dr Inkster about it when they're enquiring about air change rates?

A I would have-- I may have told them about it. It wasn't something-- I hadn't jumped to any sort of conclusion in my head there were any issues at that stage, when they were asking about it.

Q The reason I say that is because they've given quite a lot of evidence and there's quite a lot of

documentation about them raising concerns about the ventilation system in the second half of 2015. At that point they're not raising air change rates as the concern. They're raising filtration and things. So I do wonder whether, if you'd told them, they probably would have told someone. So could it well be that you didn't tell them about the 40 litres per second at that point?

A If I had been asked, I would have told them. I don't recall too much about it.

Q Could that have been found out from the Room Data Sheets?

A Yes, I think when I've looked at Room Data Sheets, they certainly say on there about 10 litres per second per person, so they could have found them off of them, yeah.

Q Were you looking at Room Data Sheets as part of the process for doing commissioning?

A No.

Q No. When did you become aware that this 40 litres per second supply arrangement to single rooms was around about half the air change rate recommended by the Scottish Hospital Technical Memorandum 2003-2009 draft? When did you first become aware of that?

A I don't recall when I became first aware of that, but I certainly became more aware of that at the stage when people were starting to ask questions about it, from Ian Powrie or Dr Inkster or Peters. That's when I became more aware about it, to do more research into what the issues were and were they correct.

Q Because if we go back to your evidence about what you looked at during the commissioning process, if I recollect it correctly, it's the drawings, maybe the employer's requirements, and I think you agreed you might look at guidance in some cases. Before, say, 2015, had you ever read SHTM 03-01, the ventilation guidance?

A Yeah, I would have looked at various parts of it for various projects I'd been working on, maybe before Multiplex.

Q What's your evidence about whether you knew what the recommended – if that's the right word – air change rate is for a single room in a general ward in that guidance at the time you were doing the commissioning? Did you know that?

A I possibly did. I don't recall, because we-- as part of the commissioning process, you were looking at the design outputs and what litres per second were, because that's what was measured at the grille face.

Q Would it matter – and we might explore what "matter" means in this

moment – but would it matter to the commissioning process that a room was not delivering what is recommended in a guidance document like SHTM 03-01?

A Not particularly at that stage, because you were-- the engineers were commissioning the systems to the design output, essentially, on that one.

THE CHAIR: Could I just check something which I should know? You mentioned, I think, in passing, an air change rate of 8 litres per second. Now, is my recollection correct or not that the figure of 8 litres per second per person is the building regulation requirement?

A Yeah, I think it's 10 litres per second.

THE CHAIR: Is it 10?

A 10 litres per second, yeah, per person. I think it's building regulations.

THE CHAIR: Right.

A Or it was at that time.

THE CHAIR: So if you were designing on the assumption that, let's say, five people would be in a room at any one time, you multiply either 8 or 10 by 5. Is that right?

A Yes.

THE CHAIR: All right. Thank you.

MR MACKINTOSH: We've already discussed, in a sense, that in a ventilation system you're checking that the system works, the air handling unit to the grille does what you're expecting, but can we extend that logic to a room as a whole? So if we're dealing with an isolation room, not an individual room, would you be commissioning the room as a whole?

A You'd be commissioning the ventilation systems to the design. The others may be checking that certain aspects to do with bed position and sink position, number of sinks, we'd be checking that----

Q What I mean about that is-- I mean, are you familiar with the concept of a positive pressure ventilated lobby isolation room?

A Yes.

Q Yes. So these are the ones that were set out in HBN 04, SHPN 04, and various versions.

A Yeah.

Q And they come from the Building Research Establishment in England.

A Yes.

Q Yes. Now, I hope not to take you to the document. In fact, I think we might just jump to it, because it might speed things up, but if we talk about it in general terms, an isolation room would have an intended pressure gradient, wouldn't it?

A Yes.

Q Yes. If we go to bundle 16, document 4, page 314, do tell me if you've never seen this before, Mr Wilson.

Document 4, page 314. So have you ever come across HBN 4 before?

A Yes.

Q Right. Could I just walk you through that? And we'll just put up a drawing to assist you and me in asking you questions. So let's start on page 327. So there's a drawing here of an isolation room example layout. What I'd like to understand is the limits of your testing in commissioning. So I'm assuming that you would test the supply air handling units in the middle of that drawing in the real drawing to do what it's what supposed to do according to the construction drawings.

A Yes.

Q Right, and you'd test the fire plant isolation damper that's just to the right of it.

A Yes.

Q Yes, and you'd test how much air comes out of the supply in the lobby?

A Yes.

Q Yes, and would you test how much air goes into the extract in the en-suite?

A Yes.

Q Right. Would you test the transfer grille to see that it does transferring?

A Yes, that would be a test in there. Yeah.

Q It would be a test?

A Yeah.

Q Right. Now one other thing is, there's also a pressure stabiliser in this drawing above the door between the patient's room and the lobby. Would you test that?

A They'd be checking they operate.

Q Checking they operate. Now, we understand there's obviously going to be a pressure gradient, if this is designed and built correctly, from the lobby to the en-suite.

A Yes.

Q Would you check that pressure gradient?

A No.

Q No. Why not, if you're trying to commission the room?

A The key thing with a pressurised lobby was basically checking the lobby pressures to the corridor. So we're checking to make sure you had the right pressure from the lobby to the corridor. That was one of the purposes of the rooms, to make sure you get air moving towards the room and then out of the room to keep any kind of nasties out or nasties in.

Q So one of the pieces of evidence that we've had is that-- I'm just going to find a drawing that enables me to illustrate that, if you just bear with me for a second. In fact, I probably don't

need one. Yes, if we go to page 334. This happens to be an example of an isolation room with a lobby, a room, and in the top right-hand corner, an en-suite. Now, there's been some evidence that if you vary these designs slightly, they will behave quite often in radically different ways. So they're saying if you move the bed into a different position, it can cause problems to the ventilation flow. Is that something you've ever been aware of?

A I know various external conditions affect ventilation systems, but not to that level of detail within the rooms.

Q If I understand, your position is that you don't test the room as a whole, you test the components within the room, and you test that there's a pressure differential between the lobby and the corridor.

A Yeah.

Q If, for example, the design had a partial extract in the bedroom and a partial extract in the en-suite, which is of course different from this document, you would simply test those particular extracts to make sure they're extracting the right amount?

A The engineer would, yeah.

Q You wouldn't, again, test the whole pressure flow of the system?

A Not to my recollection.

Q We can take that off the screen. Thank you very much. Now can we go to SHTM 03-01, which is the 2009 version? Bundle 16, document 5, page 342. Now, I'm not going to make you read the whole thing in the hearing, because that, I think, takes too long, but if we can go to chapter 8.64, which is at page 468, you see, 8.64, we see a statement in this guidance:

"Following commissioning and/or validation a full report detailing the findings should be produced. The system will only be acceptable to the client if at the time of validation it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life."

8.65:

"The report shall conclude with a clear statement as to whether the ventilation system achieved or did not achieve the required standard. A copy of the report should be lodged with the following groups:

- the user department;
- infection control (if required);
- estates and facilities."

Now, I'm going to stick with factual matters. Did NHS GGC request a commissioning or validation report from you in respect of ventilation systems at this hospital?

A Part of the contract was to provide commissioning reports for all systems, so they would have passed on

via the Zutec system that they were stored on.

Q Because there's some suggestion that some of these documents weren't there.

A Not to my recollection.

Q Well, did you or someone under your direction upload every single commissioning report for the ventilation system onto that system?

A So Mercury Engineering were responsible for uploading the commission reports onto the Zutec system. There would have been checks by myself and some of my colleagues as well in systems to make sure stuff was on Zutec, and we were chasing-- there was a constant chase with Mercury to make sure the appropriate reports were being issued and----

Q And are these almost sort of random checks? You're checking some?

A Yeah, you're trying to check the majority were there, if you possibly could, but-- Yeah.

Q Whilst we're on this topic, actually, it raises a question. We had evidence from a number of clinicians that, after handover in Ward 2A, HEPA filter units were missing from some of the ventilation systems in the isolation rooms, the bone marrow treatment rooms, in that ward in the summer of 2015. Now, how could it be, if the ventilation system had been commissioned, that there were literally no HEPA filters in the units they were supposed to be in?

A There wasn't a requirement within the design for HEPA filters to be installed. There was a requirement for a HEPA filter housing that could-- at some stage a HEPA filter be installed, but at the time there wasn't in the design, to my recollection, that the HEPA filters had to be installed in isolation rooms.

Q You did know what that ward was for, didn't you?

A I knew it was for cancer patients, yeah.

Q So I suppose this is the question – and I'm only asking you as a commissioning engineer; I'm sure Mutiplex have a corporate position on this and I'll ask Mr Ballingall for that tomorrow – would it not be prudent in terms of delivering a hospital that is safe to use to flag to a client that they are-- or actually getting HEPA filters in their housing units? Clearly, they might have made a mistake in the process of approving the design.

A I was aware of the guidelines to put the housing in there, and if HEPA filters were requested, put them in. I wasn't necessarily aware at that stage – which I am now – about the definition of a neutropenic patient-- which I wasn't aware of back then, and that's what a

neutropenic patient required within the facilities, which is outlined in SHTM.

Q Yes, because there is a sort of-- I mean, this is putting it slightly unfairly, but illustrates the point. The Schiehallion Unit is a well-known unit.

A Yeah.

Q It receives quite a lot of publicity. I'm assuming that by the time you're working on the hospital, you sort of realise this is going to be the Schiehallion Unit. Would that have been the case?

A Sorry?

Q It's going to be the Schiehallion Unit. It's going to be the children's cancer unit for the whole of Scotland. You knew that.

A Yeah.

Q Yes, and I'm only picking at you because you're here in front of me. This question could be asked of many other people. When does it become the job of the commissioning engineer or any other part of the constructors' consorted team to go, "Excuse me, client, why am I installing something that isn't as good as it could be?" Is there not a sort of semi-professional obligation to flag those sort of issues?

A Certainly at the time, I wasn't necessarily-- as I said, I wasn't aware what condition the patients would be in. I knew there was a design for that unit. I knew it was a Schiehallion Unit and it was a cancer unit, but I didn't have that medical, you know, knowledge to know that they needed to have a HEPA filter in that room for that particular patient cohort at that stage.

Q Is that why you reference back to the construction drawings?

A Yeah.

Q Right. There is evidence that there was a vent in the wall that was effectively blowing air into the room from an external space rather than extracting it from. Like, in the wrong direction. How would such a vent not be spotted in the commissioning process? Would you check every single vent?

A Yes, it would be-- the commission engineer who was commissioning the system would measure every single grille in that system so----

Q So this is not a sampling exercise?

A No, the commission activity is at every single grille.

Q Now let's turn to the topic of validation. I do appreciate that validation is not a contractual requirement on Multiplex in this contract, and so I'm not attempting to suggest that, but you explained you spent a lot of time programming work. Did you allow time in the process for validation to take place?

A No.

Q Why?

A The way I saw our contract was we commission the systems and that's what our programs were all about. With Mercury, it was commissioning the systems to a point of handover. If any validation was to take place, I was assuming, rightly or wrongly, that that would be post-handover but before patient occupation.

Q You see-- Let's imagine a potential scenario. There's the way you did it and there's an alternative way which is where you allow some time for validation. So, imagining you've been quite happily processing through your wards and it gets to November 2014 and Ian Powrie rings you up and says "Right, I've got 17 validation engineers arriving tomorrow. They've got more clipboards than you can imagine. They've got lots of equipment. They need seven days per ward. It'll take us until the last day." Isn't there a risk that, if that happens, they won't accept the building? Therefore, somebody up the tree in Multiplex is going to be saying "Mr Wilson, we were expecting a handover certificate and therefore, to move on to the next part of our life to go to another job [or whatever it is], get paid, and we haven't got it because they haven't signed the building because they're still validating". Don't you need to allow the validation so that you can move to the next stage in your project and presumably go to a different job eventually?

A It wasn't part of our contract. So, it was that we had space in our program to commission the systems and have the system witnessed. There would have been space if the NHS wanted to get in validation engineers once we'd finished certain areas. There was space there before the end of the job on some of those systems but it wasn't something that we were looking at as part of our contractual process.

Q Because if they'd come to you on 21 January and said "That's fascinating, thank you for all that. We're now going to validate it, we'll see you next week" that would have been inconvenient to the Multiplex, wouldn't it?

A No, not particularly.

Q Wouldn't you have had to keep people on the job while they're doing the commissioning, if they don't accept the handover at that point?

A We had-- Well, the point being, I suppose, we had commissioned the systems, Mercury had commissioned the systems. They had been witnessed by, you know, potentially NHS, you know, Alistair, they'd been witnessed by Capita as being acceptable. We didn't expect anything to be wrong with the systems at that stage. So, if someone had come in

to validate, I wouldn't necessarily been expecting that we find a thousand problems at that stage.

Q But there were problems, weren't there?

A Subsequently, yeah.

Q So, let's just play another hypothetical. If we focus on the things that Dr Peters and Dr Inkster were talking to you about in June 2014. Let's imagine that GGC had instructed a validation exercise and they'd started doing it. When could they have legitimately validated Ward 2A? When were you finished commissioning approximately?

A I don't recall. The Children's Hospital was one of the last areas where we were commissioning the build. It might have been September 2014 that came back there but I don't really know.

Q Let's just hypothetically suggest that, in October/November, a GGC validation team turns up, no warning. As you say, you find space for them, they start all the work and they find all the problems. Would that not have been preferable than finding all the problems once the patients were in?

A From a hospital point of view, absolutely, yeah.

Q Would that not have been preferable from Multiplex's point of view as well?

A Yeah, but the whole project would've been preferable, yeah.

Q Because I will ask the question of Mr Ballingall tomorrow because obviously he's the big man, but is there not an element of corporate embarrassment that you build a hospital and in another example, Ward 4B, the adult bone-marrow treatment service comes into the building and leaves less than five weeks later because it doesn't consider itself to be safe. It doesn't make multiplex look good, but if you'd allowed for validation maybe it would have been sorted out in advance?

A But the design-- We commissioned to the design that had been accepted by the user groups and the NHS, we had built to that standard.

Q That's ultimately the core of the defence; your position?

A Yeah, that we had a design, we built to the design, we commissioned to the design.

Q Now, I'd like to talk about commissioning engineers. You're aware there was a requirement in the employer's requirements for there to be an independent commissioning engineer appointed?

A Yes.

Q Yes. What would be the benefit of an independent commissioning engineer?

A It depends on the remit of the

independent commission engineer. The independent commission engineer would have sat outside multiplex. They would have, you know, I imagine their remit would have been similar to what my remit was from a point of view of programming. Maybe they would have a more witnessing remit in there. I didn't see huge amounts of benefits with a witnessing remit.

Q What would an independent commission engineer be checking against?

A The design.

Q Always against the design?

A Yeah.

THE CHAIR: Sorry, checking against?

MR MACKINTOSH: The design.

THE CHAIR: The design.

MR MACKINTOSH: Would not a commissioning engineer be checking against the employer's requirements?

A Potentially, yeah.

Q Because, had there been an independent commissioning engineer, is there any possibility that some of these issues might have been spotted by them? Because an independent commissioning engineer might have had a wider remit than you.

A It would depend on the remit. If there's a remit of validation, perhaps, yeah.

Q Was there any discussion of an independent commissioning engineer being appointed that you're aware of?

A Not to my knowledge.

Q Did you hear anything about whether one was going to turn up?

A No.

Q Can we go to bundle 46, volume 3, document 7, page 725? So, this is a PMI 231. Do you see how, in this note, we have a section from the employer's requirement at the top, 6.81, and we then have a statement:

"Brookfield have intimated that the commissioning engineer role will be undertaken by a BMCE member of staff."

Is that Brookfield Multiplex?

A Yeah, I'm assuming so, yeah.

Q That's one of the acronyms of that the----?

A Yeah, Brookfield Multiplex, yeah.

Q "…member of staff, rather than independent commissioning engineer. The Board acknowledge the request for a change to the ER requirement in relation to the 'independence' of the engineer on the basis that the current BMCE staff have a detailed knowledge of the complex installations and are best placed to undertake the role. The scope of the role remains unaltered…any change to the proposed individual, David Wilson, should be agreed in advance with the

Board's Project Manager."

So, before this PMI was issued, did you know you were being considered for this role?

A I knew I was employed by Multiplex as a commissioning manager for the project.

Q That's not what I asked you. Did you know that you were going to be effectively doing the job of the independent commissioning engineer?

A Not till later on, no.

Q Was there a point sometime after July when someone said "Mr Wilson, you are doing the job with the independent commissioning engineer under 6.81 of the employers' requirements"?

A No.

Q So, how could you do the job?

A I was employed as the commissioning manager under remit for Multiplex. That's what I was employed to do.

Q So, when it says "Brookfield have intimated that the commissioning engineer role will be undertaken by a member of staff" would that not be one of colleagues have told GGC that you're going to do this?

A Yes.

Q But you weren't told that you were being given this responsibility?

A I was told I was going to be the commissioning manager for Multiplex in the project and that they were going to-- they were going to have an instruction to take out the independent commissioning engineer as I would assume the role of commissioning manager.

Q Were you ever referred to this section of the employers requirements and told to do this?

A No.

Q Did people in GGC ever interact with you saying you're the independent commissioning engineer?

A Not necessarily. They knew me as the commissioning manager for Multiplex.

Q So what do you mean by not necessarily?

A Well, they knew me as the commissioning manager for Multiplex. That's what I was known as. I wasn't known as the independent commissioning engineer.

Q Right. But this was a Brookfield decision, according to this document, even if you weren't told about it?

A I would have thought it would have been a board decision; they issued to PMI.

Q Okay. Let's turn to page 53 of the statement bundle and question 11. Now, we're going back to the ventilation derogation, bottom of the page. Can we

zoom in from bottom of the page, please? So, let's go through these questions again:

"Describe Multiplex's role in respect of the proposals leading to the ventilation derogation. Although, I was aware of the ventilation derogation during the later stages of the project I was not involved in any discussion at this stage."

Which is true, but it's not really an answer my question. So, what do you understand Multiplex's role to have been in respect to the proposals leading to ventilation derogation? What were you told?

A Could you repeat that, sorry?

Q What were you told about Multiplex's role in developing what we call the ventilation derogation?

A I don't remember too much discussion about it at the stage where we were commissioning.

Q Was there any discussion about it?

A Not that I recall.

Q Did anyone tell you how it had come about?

A I don't recall, no.

Q Was there any suggestion it was connected in some way to temperature of the building?

A Not at that-- I found that out later on, but not at that stage.

Q Okay. Then, we look at your

question 11b. You don't recall when you were aware of the derogation. Let's go over the page to the top of the page, and it's in 2015 when you reviewed the M&E Clarification log?

A That's when I was starting to be asked the questions about air change rates, probably Dr Inkster and Peters at that stage, so therefore I was looking at the logs. I tried to find out where we had that information.

Q Did you tell them about the M&E Clarification log at that time?

A I don't recall. I would have told them the information that we had, what we designed to at that stage. I think most of the information-- I was talking to Dr Peters and Dr Inkster was actually through the board, the Project team themselves. I didn't have too many meetings with the two of them.

Q So you were passing information to the board and they're passing information on to the-- Right, so you're not directly communicating with the Peters and Inkster too much?

A Not too much, no.

Q Would you have told your board contacts about your knowledge about the M&E Clarification log at that stage?

A I don't recall, but I would expect so. That was where I was looking to get the information to tell them about

the air change rates.

Q In c, is this understanding you describe here, that you "understood the derogation changed the air change rate from the guidelines set out in SHTM 03-01." Is that an awareness you acquired in June 2015?

A Yes.

Q Right. Let's move on to d. The question is, when you became aware of the derogation what impact if any did you understand the derogation to be, and you said you understood the derogation to change the ventilation design and air change rate in the bedrooms. Then, you give the answer of no impact on the commissioning process, which we've already discussed. Which bedrooms?

A The single bedrooms.

Q Because there's a couple of different hypotheses and I think they're all based on the contract, but I'm not going to get you to go into what the contract says. It's more to understand what people might have told you and you might have worked out at the time. So one school of thought is it only applies to the bedrooms, single bedrooms in the tower. Now, the other school of thought is it applies to all the single bedrooms in the hospital. When you're doing that research, what do you think it was?

A I assumed it was the single bedrooms in the hospital.

Q Not just the tower?

A Not just the tower, no.

Q But, again, this is in June 2015, after you've done the commissioning?

A Yes.

Q Right. How did you reach your understanding, in e, that you understood part of the decision to derogate was to reduce operational energy costs and carbon emissions? Does that simply come from reading the M&E log itself?

A Yes.

Q Right. Would it surprise you to learn that the position of many of the GGC Project team is they had no knowledge of the M&E Clarification log?

A That would certainly-- The Project team was surprised that they didn't know about it, yeah.

Q Because it's generally a position of many of them that they didn't know it had been agreed in this form.

A Seems strange.

Q But you didn't know it at the time you were doing the commissioning yourself?

A No.

Q No, so I can't ask you if you said something and they looked surprised because you wouldn't have known to say that?

A No.

Q Right. Let's move on to the

Ward 2A isolation rooms. So, could we take that off the screen, please. Now, we've discussed already that the Ward 2A isolation rooms had no HEPA filters in them when they opened and you've explained to me that's because the design, as you understood it, just allow for the housing, not for the filters. There were a couple of other issues that seemed to have arisen at the time, according to the medical staff. The rooms were not sealed, as they should be, particularly around light fittings, and there was an absence of pressure monitoring, and there was no double door airlock to the wards. Now, some of those, the airlock to the wards, I'm presuming that wasn't on the design?

A I'm assuming so.

Q Yes. How would you check that a room is properly sealed?

A Air permeability test.

Q And do you do that as part of commissioning?

A We didn't, no.

Q Why not?

A The air permeability at that time, from my personal view, thought that that was other members of the team in the fabric side of the building as opposed to the building services which I was dealing with.

Q The reason I ask this-- Could we go and look at a room data sheet? Now, I get the impression that you weren't looking at Room Data Sheets as part of your process.

A No.

Q But it might still help us focus the question. So, if we can go to a room data sheet, which is in bundle 47, volume 3, document 8 at page 45. Yes. So, this appears to be a room data sheet **–** it's an early version, I think there are later ones **–** for a single bedroom, children and young people with relatives, overnight stay. It's room NCH-02-SCH-10, and this is the environmental page. Do you see how all there is in the ventilation section is a reference to HBN 04-01 Supplement 1?

A Yeah.

Q But there is negative pressure to corridor. Can you help us whether the drawings for such rooms would have contained pressure differentials indications on them?

A I don't think the drawings did. The drawings would have had flow rates on them, airflow rates from the grills, the lobby, the en suite and the rooms themselves.

Q So, am I right in therefore thinking that your commissioning process for isolation rooms wouldn't have checked whether they were fully sealed?

A At that stage, no.

Q Why do you say "at that

stage"?

A Because we-- at that stage, we hadn't checked.

Q It's after the handover that you'd checked?

A That was after-- it was brought to our attention they weren't sealed that we saw there had been a failure between the systems. We had to go and retest them.

Q Right, and so they should have been checked with somebody else but they weren't?

A Yeah.

Q Right. If we think for a moment about pressure monitoring, am I right in thinking that you're only going to look for a pressure gauge at the entrance to a room if the drawing has a pressure gauge at the entrance of the room?

A Yes, which it did have.

Q Right, and-- I'll take that off the screen. If we go to bundle 12, document 94, page 781, which is an email-- 781, yes. So, there's an email the bottom of the page from Mr McKechnie at Wallace Whittle to you, and it says:

"As per telecom this morning we have now had a look through the drawings and Ian Powrie's note and as far as I can see Mark's original response still stands. I cannot explain how the En suite could go into a negative pressure situation in relation to the Isolation Room when the en suit door is opened, looking at the system drawings I would have expected the opposite as the air to the En Suite should have an easier path with the door open and if anything the extract from it would increase."

"Let me know if I can assist with anything further on this."

Now, does this arise after Mr Loudon writes to Multiplex to complain about this issue?

A I think so, yes.

Q Then, you go back to him. Why are you going back in the way you've gone? What's going on here in the your reply? I want to understand why you've replied this way.

A I was trying to focus the question coming back from the Board at that time as Mr Loudon's correspondence was to do with the compliance of the room, and that's what I was wanting to focus on with, "Was it compliant?" "Was it not compliant?" and that's the information I wanted out of Wallace Whittle.

Q Let's me just open a document so I can just check something. (After a pause) Yes, can we go to the previous page? So, we have Mr Loudon's letter, and this is a year or more after handover, yes?

A Yeah.

Q This is at the point when you've had your conversations with

Inkster and Peters?

A Yeah.

Q And you know the patient group in this ward?

A Yes.

Q You also know that HEPA filters are actually needed, although this isn't about HEPA filters, yes?

A I can't remember when we were asked to put in HEPA filters. I can't remember the dates on that.

Q Well, we're told it's almost immediately in the summer of '15. They notice there's no HEPA filters, they're sourced from Northern Ireland, I think, is Dr Armstrong's evidence, and they put them in, they try to go ahead with paediatric bone marrow transplants. This is the following year, and I do understand that, prior to that moment in the summer of 2015 when you're talking to Peters and Inkster and others about the rooms, that you might well have simply been working off the drawings, but at this point, you and the company know the patient group and the concerns. Is that fair?

A I'm not sure how much detail we knew, but we knew that it was-- it was the cancer patients in the ward, yeah.

Q Yes, okay. So, the question that we get from Mr Loudon is:

"I am writing to advise you that colleagues within the Boars Infection Control Team and Estates Department have raised concerns that in their opinion, the design of the extract ventilation within the isolation rooms is not compliant with SHPN04-supplement 1."

Which is the sort of Scottish version of the document we just looked at, yes? Oh, by the way, Mr Wilson, someone is trying to create a transcript, so just nodding is going to make their life much worse.

A Sorry.

Q Please answer yes or no.

A Yes.

Q Then, we have a discussion mentioned through:

"... an email from Brookfield Multiplex on 4th July 2015 confirming that TUVSUD Ltd understand that the solution provided in the isolation rooms is compliant with the guidance [and a copy is enclosed]."

Then, there's a report from the Estates department suggesting that they're non-compliant and you want to give the opinions of both parties and you want to understand your position. Now, let's look at your reply to Mr McKechnie on the next page. So, on the next page, Mr McKechnie has given an answer and your reply is you want him to remove detail.

A Yeah.

Q Now, I well understand that there might well be a commercial reason

to do with a possible dispute that, at this point, is incipient and hasn't yet crystallised between Brookfield and the Health Board, and I do understand that. But it looks as if you are effectively suggesting that the reply to Mr Loudon should not contain helpful information about isolation rooms which are accommodating children **– e**xtremely sick, immunocompromised children – at that moment in time who are in the wards. Why are you trying to restrict the message in your reply?

A I wasn't trying to restrict the message at that time, I was trying to focus the message on the compliance issue. That was the question that we've been asked, and that was-- there was a lot of different people at that time asking questions, whether that was through the Estates team or David Loudon or, you know, staff. We were trying to focus on the point, you know, from-- that I wanted Wallace Whittle to focus on, "Is the room compliant or is it not compliant?"

Q Because there is some suggestion-- Let me just see if I can show you a drawing that will illustrate this. There is some suggestion that these rooms are erroneously designed because of where the extracts are, and if you allow me a moment just to make sure I've got something that might enable me to give you a fairer opportunity to answer the question. I'll take you back to a very large bundle. (After a pause) Well, while it's uploading on my system - you're aware of the idea that some of these isolation rooms have an extract in the room and in the en suite, yes?

A Yes.

Q Yes, and you're aware of the suggestion that that design is not consistent with HBN-04 and SHPN-04? You're aware that's in argument?

A Yes.

Q Yes, and that effectively is what Mr Loudon is saying?

A Yeah.

Q Yes. Now, Mr McKechnie's response is a sort of detailed "I don't understand." Do you see that?

A As in he didn't understand?

Q He doesn't understand why it's happened the way it's happened.

A Yeah.

Q Yes, and he may well be the designer, or at least he's coming afterwards and he's looking at it.

A Yeah.

Q We'll find out from him. But do you understand why I'm concerned that not giving the full answer to Mr Loudon makes it harder for GGC to assess the risk to the patients?

A I think that, from my point of view, it was back to, again, what I said, it was compliance. Were we compliant or

were we not compliant? The bit to do with what Ian Powrie and this en suite negative-- it was something Ian Powrie had done. We didn't really have the evidence, I don't think, at that stage. Ian, I'm assuming, was communicating that information with the users in Infection Control.

Q So, you won't accept that there's something unhelpful about simply saying-- your answer would have been, I'm assuming, "It's compliant", and not explain why you think it's compliant or why you think they're wrong, you're just providing a simple answer, effectively?

A At that stage that's what we were trying to do, yeah.

Q And you wouldn't accept that that's actually actively unhelpful in terms of making sure that the individual patients are in the right room, properly protected?

A That wasn't-- That wasn't the, kind of, question.

Q Well, let's go back to look at his email, because that's at the previous page. So, isn't that inherent in the first question? He's saying, "The rooms are not compliant with the guidance", and you are familiar what the guidance says, and that it says these rooms aren't suitable for immunocompromised patients? You're aware of that?

A That's what he says, yeah.

Q Yes. So, it's quite a serious allegation that's being made. I accept that it might well be the Board's fault at some point down the track, but, in terms of fixing it, are you being less than helpful?

A I wasn't trying to be, no.

Q Okay, right.

THE CHAIR: Sorry, you weren't trying to----?

A I wasn't trying not to be helpful.

THE CHAIR: Right.

MR MACKINTOSH: Now, let's go on to Ward 4B, so we'll take that off the screen, please. Now, if we go to page 60 of your statement, and we'll go to 31(h), the ultimate point I'm trying to get to is the discussion of suspended ceilings, but allow me to take a moment to get there. So, if we go to page 60 of the bundle and we look at your answer to what I think is 31(h), and we've asked you about the changes to the design and you've explained:

> ""I was aware of changes to Ward 4b during the build stage of the project but was not involved in the change process.""

And of course you were involved in the later work; we'll come back to that. Then, in the next question, we ask you about carbon filters, and you said you were not involved in the process but aware there had be in agreement not to

include them in the design. If we go back and think about the change to 4B, from your point of view, are you simply implementing a different set of drawings here? There would have been construction drawings for 4B as in its final version?

A Yes, there was construction drawings, that's what it was built to, yeah.

Q And you wouldn't go and make your own checks against guidance and that sort of stuff?

A No, not personally, no.

Q No, and the commissioning engineer wouldn't do that?

A They would commission to the design that was there.

Q Again, the same principles would apply, you would check the air handling units and the grilles, it all did the right thing, but you wouldn't check air flows and you wouldn't check ceilings of rooms themselves?

A Not, in this case, no. This-- There was a different type of ward-- There wasn't an isolation room as such. These areas, they were more of a general type of room, so there was no lobby on them, it was just a single bedroom plus an en suite.

Q Yes, because I think the point that would have been made in those five weeks before those patients left and were sent back to the Beatson, is that these were, in a sense, a sort of isolation room. That's what they're supposed to be.

A That's what they were looking for, is my understanding.

Q Yes, but you wouldn't have checked the ceiling of the room and therefore whether the room is sealed?

A No.

Q Because you just built the ceiling that was there?

A Built it to the drawings that were there, yeah.

Q What would you need to have to be told as a commissioning engineer, not a validation engineer, in order to have actually spotted the ceiling was the wrong ceiling?

A It'd be probably told the specification of the room, if it was to be an isolation-type room.

Q So, you'd have to be told, "This room is for a particular group of patients and you have to have a pressure differential"?

A Yeah, again, telling us the-- what it would do, the specific-- again, telling me what the group of patients were wouldn't necessarily, in my head, tell us what the design----

Q No, you'd need to know that it was a sealed room, wouldn't you?

A Yes.

Q Yes, and if you were told, "This room is to be a sealed room," and you

see a suspended ceiling like this one, you would think, “Ah, that’s the thing that would trigger it,” knowing it had to be sealed, not, “This is the group of patients”?

A Potentially. My role, again, was in the building services side of things, so I wasn’t particularly looking at the lay in grid ceilings or these types of things. We would be putting the output towards that. We wouldn’t be looking at ceiling----

Q So, again, is there in some way a difficulty here with the commissioner in that-- I mean, I----

THE CHAIR: Mr Mackintosh, sorry to interrupt. It’s really-- I need a bit of mechanical education. Your question, I think, assumes that a suspended ceiling cannot be sealed.

MR MACKINTOSH: I’ve done this before. My Lord, you’ve pulled me up about this before.

THE CHAIR: I have fallen into this, or at least I think I’ve fallen into this error before and----

MR MACKINTOSH: So have I; can I re -ask my question? So, I don’t mean a suspended ceiling, I mean a sealed ceiling.

A Okay, yeah.

Q So, to re-ask that question, do I understand your evidence to be this; given the information you were told, you didn’t know that it had to be a sealed ceiling, and drawing had a non-sealed ceiling?

A Yes.

Q If you’d been told “this is for adult bone marrow transplant patients” that wouldn’t have helped you realise there was a problem.

A Yes.

Q You would have needed something more specific like, “This room should be sealed and have a pressure differential of X” and then you would have gone, “Well, I can’t do that, it’s a non-sealed ceiling.”

A Yes.

Q Right. Am I being unfair to spot a problem in the commissioning process, which is that if it’s the case that wall treatments, ceiling treatments, are a matter for a different process in construction, the actual reality is that you never actually commission a room, you commission the systems that serve the room?

A Yes.

Q Has practice changed in the industry? Do people now commission whole rooms?

A The only hospital I have experience of, really after the Glasgow was Edinburgh, and we took a slight-- I was-- I came in at the tail end of that project and we took a slightly different

approach and looked at it more on a whole-room basis.

Q Yes, I mean, again, you would need the information.

A Yeah.

Q But to go back to the Schiehallion Unit, and Ward 2A, being told to commission the whole room means you might have spotted the non-seals around the light fittings.

A Yes.

Q But being told to commission the whole room in 4B wouldn't have worked because you still didn't know it had to be a sealed room.

A Yeah, yeah, yeah, exactly.

Q Therefore, you're reliant to a great extent on what's on the construction drawings?

A Yes.

Q Any thought that you as a commissioner is looking at the Room Data Sheets is wrong, you're not looking at those?

A No.

Q You wouldn't happen to know whether Mercury, as the people drawing the construction drawings, would they look at the Room Data Sheets?

Q I'm not entirely sure. Mercury would be more looking at the consultant, you know, ZBP in this instance's design, and taking them forward to how they're actually going to physically build it, as

opposed to looking at Room Data Sheets. I don't necessarily know, but----

Q So, you think the Room Data Sheets come earlier?

A Yeah, they come right at the start of the process.

Q Then, there are design drawings.

A Yeah.

Q Then, there's the work that Mercury do to create construction drawings----

A Yes.

Q -- which might be a merger between the architect's drawings and ZBP's drawings.

A Yes.

Q Then, there's a construction drawing, and that's what you check.

A That's the construction drawing, is what it's built to.

Q Yes, and one of the things we've noticed, I think we saw that when we were looking at the isolation room data sheet, is they mentioned SHPN04. Would the construction drawings for those isolation rooms in 2A have mentioned SHPN04?

A I'm not sure if the construction drawings would, no.

Q Would that help to do your job better because you'd know what sort of room it was?

A Not necessarily.

Q Because if we just think about the problem we've just discussed with Mr Loudon and Mr McKechnie's letter, and I was asking you some questions, step back a stage here; if you'd known, as a commissioning engineer, that that was going to be an SHPN04-01 room, would that have changed the way you commissioned it?

A Being, I mean, I didn't actually commission it, I was managing the process, but probably not. I mean, the SHPNs, a lot of these guidance documents, there's various grey areas and that's probably the bits where, you know, people get caught out on.

Q And that's more what validation is for?

A That's more what validation's for, yeah, and even then, validation will be the interpretation of the document at that point in time.

Q Now, if we go back to the statement page we were on before, but this time we'll go to 35(n), which is on page 63, we're going forward in time to 2015 when you are effectively doing more work.

A Yeah.

Q Now, can you tell us how this additional work in 4B came about, from your point of view?

A My recollection, it was to do with the Infection Control-- or the 4B, sorry, with the unit, the BMT unit from Beatson is coming in, and then looking and not having what they had at the Beatson, where they had various pressure gauges and sealed rooms, all that kind of stuff. So, they were looking at the rooms, in the rooms and they didn't feel that they complied with what they wanted.

Q So, they left.

A Yep.

Q How did it come to be the case that you did more work?

A We were instructed to do more work.

Q Right, and who gave you those instructions?

A The instruction would have come from the Project team.

Q Do you remember who on the Board side you were dealing with?

A Probably Peter Moir, David Loudon to a certain extent, but Peter Moir, and again, Ian Powrie.

Q Did you, in that early process of those new works, that's until December, deal with any Infection Control doctors or microbiologists?

A What period, sorry?

Q So, you get told to do this; what sort of time of year was that?

A That was, I think it kind of started probably in March or April and it was sort of June when we really started

to get into the specifications of what was now required.

Q Yes, so we have evidence of the room not being-- the HAI SCRIBE not being signed off in December----

A Okay.

Q -- by Dr Inkster, and then HFS and HPS gets involved, and there's an SBAR, but in the period between, say, June and December when you're actually doing the work, were you dealing with any Infection Control doctors or microbiologists in the GGC side?

A They were involved, but I wasn't really dealing with them a great deal.

Q Who might they have been?

A I think it was Dr Teresa Inkster.

Q Because her evidence is that she didn't deal with you; it was Professor Williams who would have dealt with you.

A I don't recall, but I do recall Dr Teresa Inkster. I can't remember when I recall it, but she was one of the names I always remember in Infection Control.

Q Could it be that she's the one who turned around and said that your works weren't good enough in December?

A Potentially, yeah.

Q Okay. How did you feel when-- So, I'm going to set this up; you do the work in 4B and I appreciate you're going off the drawings, and you discover that

the patients have been and gone. How did that make you and your team feel?

A I think, a bit bemused, I suppose, that the patients came in there in the first place and then, you know, left.

Q Then, you're asked to do some more work, and actually do physical work?

A Yes.

Q And Dr Inkster's evidence is that by the time she's involved, the hospital probably had actually got the keys off you, as it were. They're ready, the patients are ready to go back in, and she then doesn't sign off the HAI Scribe; it's all very last-minute. Is that what you remember, or something different?

A I can't recall too much. I just remember the point being where the patients came in, moved out, and then we were involved in a redesign of the ward.

Q But then, it wasn't accepted?

A We didn't-- We went through a specification of what we were going to do with the client. They looked at it, we built it, commissioned it, handed it over in, I think, the October of 2015.

Q Yes, but they didn't put the patients back in, did they?

A I don't think so, no.

Q Patients didn't go back in till 2018.

A Okay.

Q Yes. How did the fact that

they didn't use the ward you'd just upgraded again, how did that make you feel? What do you think then?

A I thought we'd-- that, you know, there'd been a lot of money wasted in doing an upgrade that wasn't accepted.

Q Could the reason that the upgrade wasn't accepted is it wasn't good enough for the patient group?

A For the patient group, potentially, but it was the-- What we did was what was agreed with the Project team that they wanted done within the confines of the rooms that were there, the air handling and the equipment that was there.

Q I recognise you don't quite know when you spoke to Dr Inkster; apart from any interactions you have with Dr Inkster, do you have any recollection of dealing with anybody on the Board side who had the same level of understanding of ventilation systems as you?

A The only person I can think of is probably Ian Powrie.

Q Right. I wonder if this might be a good point to break, my lord. I was going to turn to the topic of planned preventive maintenance, but I suspect you probably need a cup of coffee before doing that.

THE CHAIR: As I said, Mr Wilson, we take a coffee break and we'll do that now. Could I ask you to be back for about 20 to 12?

A Yeah.

THE CHAIR: I hope you get a cup of coffee.

A Thank you.

THE CHAIR: Right.

(<u>Short break</u>)

THE CHAIR: Mr Mackintosh?

MR MACKINTOSH: Thank you, my Lord. Mr Wilson, during the break one of my colleagues suggested that I might put something to you, and you were given a copy of a document----

A Yeah.

Q -- which is the Innovated Design Solutions report which was produced into Ward 2A, and it's bundle 6, document 34, and it's at page 676. Now, did you see this report ever before?

A I've seen it in the bundles. I don't recall seeing it before that.

Q Okay, well I'll take you through it slowly, but it's more because when we were discussing Ward 2A and you were mentioning that there were no HEPA filters in the frames and that was part of the design, it occurred to me that I could ask you a question. I'll explain why I think I can ask you, and do tell me if I'm wrong. So you're an engineer by profession?

A Yes.

Q Yes, and you received the drawings for 2A to commission them, and obviously you're focusing on the equipment, not the walls, but to what extent are you able to look at a design and think, "Well, I can sort of understand what the designer is trying to achieve here"? Would you say that's something you can do?

A Yeah, depending on the drawing, you can do.

Q Yes. So if we look at the first-- this is Mr Lambert. Now, Mr Lambert was instructed in 2018 by NHS GGC to review the ventilation of Wards 2A and 2B, produced two reports, gave evidence to this Inquiry last year, and I think it's fair to say he was relatively critical of the design that you commissioned. Do you see the first sentence of the executive summary:

> "Following analysis of the current ventilation strategy within upper areas of Ward 2A... 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."

Now, the only bit I'm going to ask you about is, looking at that design, remembering the design that you looked at and then commissioned, do you think that design philosophy, the philosophy behind that design, was intended for use by patients with immunoresponse impairment or deficiency?

A Well, again, I'd state that I didn't commission the systems. Looking at the drawings-- I probably didn't look at every single drawing either in the job, but if you knew the patient type, as I do know it now, you would have looked in a different way, yeah.

Q Do you think that there's – and I keep this very vague – some measure of an inconsistency between the patient type that you now know and the design that you were looking at?

A Yeah.

Q All right. At the bottom of the first page, there's a particular detail which you might or might not recollect, and this is:

> "Of particular note, it was identified that extract ductwork distribution derived from the Ward 2A air handling unit is utilised to serve numerous 'dirty' type spaces (i.e. Toilets, Shower Rooms, Dirty Utility Rooms, Disposal Rooms, Cleaners Stores, etc.), on various

floor levels. This is deemed to be a very abnormal strategy, differs from design methodology adopted within other areas, and should be investigated further."

Now the question really is, at the time you were commissioning these air handling units, did you notice that the dirty air from these two (audio cuts out)----

A I don't recall noticing, no, but maybe I didn't witness that system as such, so-- but I don't recall it.

Q Okay, we can take that off the screen. I'd like to move to the topic of planned preventative maintenance. It's covered actually in a bundle, bundle 16, document 23, which is an extract from the M&E clarification log, and I want to look at page 1670. Now, do you see the fourth row on that is PPM?

A Yeah.

Q Would you have looked at the M&E clarification log in order to determine what is to be done in terms of commissioning and handover and all the areas within your responsibility?

A Not necessarily. Maybe others would have told me that type of thing, but not necessarily looked at this, no.

Q Did your role as commissioning engineer involve putting data into the Zutec system that involves setting out the commissioner job? Was that something done by Mercury?

A I didn't necessarily put anything into the Zutec system, That was done by Mercury for mechanical/electrical systems.

Q But would that have been part of your programming exercise?

A No, the programming was to do with the sequence of how the commissioning was getting done. It wasn't necessarily to do with the PPM, as such. That was part of the whole Operation and Maintenance Manual in Zutec's.

Q I'm intrigued to know what the answer is: does the result of the commissioning exercise for a piece of equipment feed into the PPM process for that piece of equipment?

A No.

Q It's totally separate?

A It's separate.

Q So you would have no role in ensuring that the PPM system contained what it needed to contain?

A I had a role to basically make sure Mercury were putting information into the O&M manuals. That was part of my role, just to try and get them to get the information into it.

Q Right, and so surely in order to do that you would have needed to know what was in the contract?

A I knew we had to provide a

PPM, yeah. I knew that by-- whether that was discussion with other colleagues-- but I knew we had to deliver a PPM system.

Q I want you to tell me if you think I've got this wrong, but is it a fair criticism that if you put possibly important clauses in terms of a contract into an M&E clarification log – and of course the biggest one is the ventilation air change, but there are others and this might be one of them – they make it hard for people who are actually doing the job, like you, to find?

A It can do. It may be output in other spaces. Without looking at this-- I can't remember how I knew it, but I knew we had to provide a PPM.

Q But there's a difference between, "We have to provide a PPM" and what a PPM will contain. Do you understand that?

A The PPM generally contains, you know, you know in any building that you've got certain systems and assets within that building that need maintained, and the PPM is generally generated by the equipment you've got, the manufacturer will provide information, so it's not necessarily something that you've got a contract for.

Q So if we just take that off the screen. I suppose the way to put it is this: you might think – that is you, people on the Multiplex side, and subcontractors, and them, GGC – "We have to get a PPM system", and that would be an obvious statement for any building, wouldn't it?

A Yeah.

Q Yes, but equally you might think there's a standard, there's a list of things that need to be there, and what it's going to cover, and the scope of that PPM system, and that would be helpful information. That's detail, isn't it?

A Yeah.

Q Yes. So, would you on the Multiplex side and your Mercury colleagues be easily able to access what had actually been agreed without reading things like the M&E log?

A I don't recall. There might have been certain aspects of PPM in the ZBP specifications detail for in there.

Q What I'm suggesting to you is that, as a user of this contract – not an interpreter of it, but as a user of it, in that you're one of the people (and there's a big team) responsible for producing output – the fact that these provisions are in an M&E clarification log, doesn't that make it harder to find them and to know to deliver them?

A Potentially, yeah.

Q All right. I'd like to move on to the topic of Horne taps, which appears on page 68 of the statement bundle, question 43(f), but it starts at 43 on page

68. You're explaining that you weren't involved in the Horne taps issue.

A Yeah.

Q Yes, but if we go on to the next page, there's a timing issue. I want to see if I can take some information from you. We seem to have some evidence of two moments when Horne taps are in discussion. One of them is in 2014, when there is a meeting in June 2014 and decision to keep using them, and you explain in your answer to 43(d) at the top of that page that you didn't attend any such meetings.

A I don't recall attending, no.

Q Yes, and you aren't on the minutes, so I'm not expecting you to have been there. Then there's an earlier process in 2012 when there are discussions in the GGC side of the Project team about whether Horne taps were a good idea, and they go off and they speak to the Vale of Leven Hospital, they speak to NHS Lanarkshire, and they go and investigate. Were you aware of any moments when the question of whether to use Horne taps was ever in debate?

A I remember a lot going on in the background with various meetings that others attended, that there was a big debate about were they're going to use them, were they not going to use them? So I knew there was a lot going on in the background.

Q That debate, was that debate in '12 or '14?

A I don't recall. It might have been in 2014, around about that stage, but I don't recall.

Q And by that point, they had been bought.

A Yeah-- Well, it was before they were bought, because there was certainly a time I remember discussions before there was an order----

Q Right. That's what I'm just trying to clarify. So you'd be comfortable with going as far as saying that, before they were ordered, there were discussions, but you weren't involved in them?

A Yes.

Q Now, how do you commission a tap with a TMV in it? What's the process?

A Essentially, the process is a document, sets out what you do. You essentially take tap temperatures, you prove you're getting the correct temperature out of the tap, whether that's, you know, 43 degrees. Once you've established that tap has given you the right temperature in the hot mode, you do what's called a cold water failure test, so you essentially turn the cold water off to the tap to ensure that, you know, someone can't get scalded if

there's no cold water to reduce the temperature down, so the tap switches off.

Q Do you test the ability to carry out maintenance to remove the TMV (inaudible)?

A No. Not necessarily, no.

Q So the testing would have been done, what? 2014?

A 2014 would have been the testing. They would have started-- I can't remember. There was an area of the building they would have started first before it moved towards the end. Yeah, 2014.

Q I think I know where this is going, but I think I should cover it. Is there any role in commissioning for thinking about how the taps should be used in the future? In this case, there seems to be a suggestion that these taps required a level of thermal maintenance cleansing every so often. Would that be something you'd have got involved in as commissioning engineer?

A I knew there was discussions on that, but not something I particularly got involved in, but there was various discussions about the ease of removing the taps so that the NHS, you know, as part of their general maintenance, could take the tap off, disinfect it, put it back on or put a replacement tap on when the other tap went away to get disinfected, firmly disinfected. So I knew there were conversations about that.

Q You knew there was conversations. Do you know who in the GGC Project team was talking these issues?

A Again, I don't recall.

Q I want to move on to the filling of the water system. Now, we're keen to obtain as much clarity as possible and you're just the first of a number of witnesses who get asked these questions about when and how the water system was filled. Now, the evidence from Mr Powrie in the last block of the hearing was that the filling took place possibly in 2013 or 2014, and he's not particularly clear. In your questionnaire we asked you about this, it's actually the bottom of this page, question 44. You said, "I was aware that the systems were filled before January 2015". Well, we were too. That wasn't the question. We need to be more precise:

"The systems were filled by Mercury Engineering…The system had to be filled prior to January 2015 as of not we would not have been able to complete the testing, commissioning, disinfection and sampling of the water systems before handover. Although I can't remember exactly when the systems were filled (they were filled in phases) the process would have been ongoing throughout

2014. Mercury's process was that the system was initially tested with air (to ensure there was no open ends) prior to being filled with water for a hydraulic pressure test to ensure the pipes were sound with no leaks before ceilings and finishes were installed. I had no concerns when the systems were filled as my understanding was that Mercury and H&V Commissioning (Mercury's water specialist) would manage the water in the systems between after the filling and testing before flushing, commissioning, disinfection, sampling and post disinfection draw off. It is usual practice to fill water system…"

Now, let's see if we can get some dates out of that. Do you need the water system to be filled to test the taps?

A Yes.

Q Right. You do the air test first?

A The air test is, yeah, first just to prove there's no open ends in the pipe work.

Q So, can we assume that on the day of the testing of the first tap, that bit of the system would have been air tested some days or weeks before?

A Yeah.

Q Right. Can you help us when the first horn taps or any taps and showers were being tested?

A That would have been 2014 at some stage. The first areas were under-- were called plant room 21, which did the critical care and accident emergency, so that was the first day of the building that was tested, I would imagine. So it was 20----

Q Plant room 21. Right, well we know where that is, that's helpful. What time of year in 2014?

A Well, past-- I think maybe summer, I don't know, can't recall.

Q Why do you think summer?

A Because that, in the scale of when-- to get to 2015 in handover, it would need to be somewhere along that line to progress to the building, get everyone's permission.

Q Right, so you think you needed effectively six months to do this job?

A To do the various jobs, the jobs-- the jobs that followed it, yeah.

Q So, let's look back at your answer, on this page, actually. So, you mentioned the hydraulic test first at the top of the page. So, the ceilings had to go in before the hydraulic pressure test? Or they go in afterwards?

A The ceilings would go in generally afterwards.

Q Yes, and these are the suspended ceilings of various types?

A Yeah.

Q So when were the first ceilings being hung in the hospital?

A Pass, don't know.

Q Then you've, obviously, mentioned your reassurance about Mercury and H&V in your answer. Then you've listed a series of things that will then happen in the fifth line:

"…after the filling and testing before flushing, commissioning, disinfection, sampling and post disinfection draw off."

Let's try and understand what all those things are. So, we'll start with the filling. Is that the filling you need to do after the hydraulic test?

A The filling is done after the pneumatic test to enable your hydraulic test.

Q Okay. Then the testing is the actual testing of the taps, the showers, the hydraulic systems?

A Yeah.

Q What else do you test at this point?

A They tested the taps and all that comes after the filling. So any tap temperatures, we do the thermal balance of the system as well post filling.

Q You'll test the calorifiers and you test all the valves.

A Yeah, all that, yeah. That's-- Yeah.

Q I'm going to show you a drawing that appears in Mr Walker's report, but I think he would have got it from-- Of course, I've moved it to a different page. It's bundle 21, document 5, page 213. So, this is a drawing that Dr Walker includes in his report, but my recollection is that, with some possible annotations came from him, but the original document has come out of some form of design system. So, we can look at page 213 of bundle 21, please? Now, it's off the page, if we could zoom right in. So I think that's the red emergency bypasses added by Dr Walker. But just from your point of view-- Can we just zoom out a little bit so we get the bottom of that? Right, thank you. When you're talking about filling in order to do the hydraulic tests, we're talking about the hot and cold domestic system here.

A Yes.

Q Yes. How much of this system, and I recognise this is a very schematic diagram, has to be filled for you to do hydraulic tests of this sort on part of the hospital?

A Essentially, you're starting from the bottom of that, the water tanks and working up. So certain water tanks be filled to allow you to get the boosters to fill the system, boosted pumps.

Q Right. Would you need to fill the filtration plant, the filtered water tanks at this stage in order to do it?

A Not necessarily, no.

Q No, you just use raw water?

A Raw water. Scottish water,

raw.

Q Yeah, I appreciate that. So, the booster pumps would be in use and then the various plant rooms. Plant room 21, you're saying, would have been the first one to be done?

A I think so, yeah.

Q Right.

A Would you do it in a four-part division like on that drawing?

Q So, plant room 21 and then 22, and 41 and then 32, and 33 and then 31, in those four groups?

A Yeah, pretty much because probably when plant room 21 was getting tested the other areas of the bill weren't ready to put water in because----

Q Are we right to think that the water system is logically divided into those four parts

A That's how it was worked that's how----

Q Yes, so in order to do a test you could do this testing for one of those four parts whilst leaving the others dry?

A Yeah.

Q Now, if we go back to your statement on page 17. You've filled the system, you've done your testing and then it says before flushing, what's the flushing?

A So flushing is essentially flushing water through the system to make sure to clean out any, you know, essentially we use the word debris but anything in the pipework.

Q Is that before or after the testing?

A That would be-- It would probably do a wee bit before but generally it'd be after the test. They would hydraulic test first to make sure the pipework's sound, so they didn't need to do any repairs or take pipework out before that test-- that flushing.

Q Then how do you flush? You literally open all the taps and just see what happens?

A Yeah, whatever outlets are there, you would open to draw water through, yeah.

Q Do you draw every single pipe?

A They would draw-- They should draw every single pipe, yeah.

Q So that includes in a single room, the shower, the loo, the hot and cold water, the two sinks, all four water sources?

A Yeah.

Q That flushing doesn't involve emptying the system?

A No. Generally, as much as you're taking water out, water's going into the system at the same time.

Q So, what's then on your list is commissioning at this point?

A So, that's the, kind of, what I

would call pre-commission activities, the testing----

THE CHAIR: Sorry, just so that I'm keeping up. You're describing the flushing process and essentially that's by opening taps, operating the shower, flushing the WCs, but you reminded Mr Mackintosh that, as flushing is happening, water is coming into the system, so it remains a wet system at that stage?

A Yeah, that'll be the process.

THE CHAIR: Thank you.

MR MACKINTOSH: So if we look at the commissioning that you're now describing, because I'm assuming this order is deliberate on your part. This is the order of events?

A Yeah.

Q Right. Good. So, in the commissioning process, what are you talking about here in this-- After flushing, what are you doing now?

A So, after flushing-- and, again, this isn't a-- that process isn't an immediate, it wasn't like "day one this happened, day two the next thing happened". There might have been time between that but commissioning would be setting up the domestic hot water to make sure the right temperatures come out of the turn pipes, it would be doing the TMV(?) commissioning, it would be doing just the temperatures.

Q This is the work that you would be organising?

A This is the work that Mercury would do, yeah----

Q You're the manager of this process?

A I'm the manager of the commissioning.

Q So, is it right to think that a part of the hospital system could have been filled with water before you started your commissioning but it suddenly couldn't have been filled with after you started commissioning. You have to have the water system----?

A You have to have the water system full before you commission yet definitely.

Q So, what's the disinfection item on this list?

A So, that's what's been referenced in the sterilisation that is essentially introduced in a chemical to clean the pipework before you take your samples and make sure you've got a clean system.

Q Then you do the samples?

A Samples after disinfection, yeah.

Q You mentioned doing samples in December 2014 with H&V. Would there have been other samples taken?

A There would be samples taken at the start of the filling process to make

sure the water we're using to fill, or Mercury were using to fill, was of a good quality, the water.

Q But would you do any other samples between that initial samples and the end samples that you talked about?

A No.

Q No. Then, what's post disinfection draw? That's to draw out the disinfectant?

A Well, you've got that and then you've also got a, I think it was, bi-weekly flush to make sure you're not sitting with stagnant water after the disinfection to make sure that the water is still moving and staying clean.

Q Does that effectively amount to people whose job it is to go around and open taps?

A Yeah, that's it.

Q Now, does the system then remain full of water, albeit there is this flushing process until handover?

A Yes.

Q So, we wouldn't want to think that it was then emptied and then refilled later?

A The only situation you would get where you'd have to drain down part of the system if there was a leak, and you then had to fix the leak so you would need to drain down, fix the leak, retest and refill it.

Q H&V commissioning, they were the subcontractors responsible for managing the ward system?

A They were Mercury's water treatment specialist, yeah.

Q One of the questions we've asked a lot of people but they don't seem to have either understood our question or answered it, we'll see how we go, is who was the duty holder? I do appreciate there's an exciting question of who was the duty holder after handover, but I'm not interested in that because we've asked enough GGC people that and we'll ask more. I'm interested, who was the duty holder before handover?

A It would have been Mercury. A duty holder wasn't necessarily a term that was used, but Mercury were responsible for the system, you know, filling, testing, commissioning the system.

Q Isn't there a responsibility on a construction site with water that falls to the person who manages the whole site to manage the water system safely?

A Well, Mercury were managing the whole water system, they were installing the whole of the water system.

Q Because the distinction I make is that, are you familiar that in operational buildings you'll have a duty holder, will often be a senior officer, and then you might have a responsible person or an authorised person who does the actual work?

A Yeah.

Q In this context, it might well be that Mercury are doing the actual work, who's the actual legal duty holder for the site before handover?

A I'm not entirely sure.

Q Was there one?

A I don't recall. Mercury would have had a manager. There were people doing the job. Mercury would have had a manager who was responsible for that system.

Q We've discussed in evidence with some witnesses – and I'm going to create a question quite carefully – the suggestion by Greater Glasgow and Clyde that the water system was systemically contaminated at handover, and I appreciate the subject of litigation, so I want to keep it very vague. What sources of evidence exist to provide a viewpoint that that's not true?

A It would be the sample analysis of the Mercury and H&V, the samples they took, and the cleanliness of the water in the samples. That would be the only thing that would give you that information as far as I would know.

Q There's no other testing that you're aware of in that period?

A No.

Q All right. I want to move on to the topic of open-ended pipes. Actually, before I do that, I'm going to put to you something that I'm putting in more detail to Mr Pike, but it occurred to me you might be able to answer it. Allow me a moment just to find my note. Could you go to bundle 40, document 175? I'll just find the right page. What I'm going to take you to is a project steering group meeting which I recognise you wouldn't have attended; if I can find my own note now. That's page 834. This is a meeting in 2012, Mr Ballingall was present, Seabourne, Mr Bicknell, Mr. McGovern, Douglas Ross, Mike Sharples, Allyson Hirst, and Peter Moir, and do you see how, at the top of page 855-- Can we go to page 854 first? This is a document I hadn't told my colleague about, so I recognise I'm slightly ambushing here, but that's the minute I was really out for. Then, we go on to the next page, can you see it says:

"Wet system pipe testing. AS and DP will discuss further outwith this meeting. The initial thought was to test with air but now continuing water tests. The method testing will clear implications and conditions of the pipe work and commissioning require sterilisation of the pipes. MS noted there will be no water in the system pipes until March 2013. The testing will progress area by area and, with completion, heat will be introduced the areas, albeit at very low level..."

And there is discussion of a

programme being produced. Now, you've talked about 2014. Do you have any awareness of water being in the pipes in March 2013?

A Not in March 2013. I do now know from looking at some documents after the witness statement that Plant Room 21 was probably around June 2013.

Q Right, so parts of the system might have been filled?

A Yeah.

Q When you say "Plant Room 21", do you just mean the plant room or the whole quarter of the system that's attached to it?

A It would be-- It would start in a plant room and then it would progressively work through the areas they were in the serving.

Q So, from your knowledge, when would the whole of the Plant Room 21 quarter of the system have been filled?

A Probably-- Again, looking at the information, probably around about June-- it would've started June 2013 in the plant room and then worked its way down to the rest of the areas of the building. So, it might have been a-- over a number of weeks.

Q Because----

THE CHAIR: Sorry, my fault entirely. Are we talking about the part of the system that's served by Plant Room 21, or are we thinking of-- after that part of the system in the later part of 2013----

MR MACKINTOSH: Let's go back to bundle 21, my Lord.

THE CHAIR: -- the other quarters being filled? Sorry, that's a bad question, but I----

MR MACKINTOSH: I think, my Lord, I can probably focus it by reference to the drawing.

THE CHAIR: Yes, right.

MR MACKINTOSH: If we go back to bundle 21, page 213, which was open before, swap that over, and we zoom in-- So, you're discussing Plant Room 21, which is one of the two parts of the system service from Booster Pump 2. You're nodding. So, are you saying that, in the summer of 2013, Plant Room 21 itself would have had its water systems filled?

A That's what it looks like, yeah.

Q Yes, and then, over the following weeks, the rest of the parts that are serviced from Plant Room 21 would have been serviced?

A Yeah, yes.

Q Right, okay. Yes. I think I might take the opportunity of showing you some more documents, then. Just allow me a moment to make sure I've got the right one, because if we start going through Capita supervisor reports and I

get the wrong ones, we'll be here all day, so-- (After a pause) Yes, if we can go to bundle 33, document 83, page 1807, which is a project supervisor meeting from 7 September 2012. Again, I don't think you're there, but we have an entry about air leakage testing. Is this that earlier stage in the process that you were talking about? You might take a moment to just read that.

A (After a pause) No, I don't think so. I think this is building air leakage testing, as in fabric of the building.

Q Okay. Let's jump forward to page 1855 in the same bundle, which is now July 2013. So, again, it's a meeting at which you're not present, but do you see how there is a reference to air leakage testing it on the fourth item?

A Yeah.

Q But, again, you think it's testing rooms?

A That's testing the building for RSK. I'm noticing there where the person that did the-- you know, the building fabric test, that's definitely----

Q I understand. Let's go on to the next page, page 1856. However, it does talk about testing water systems. Do you see how the third paragraph there:

"DH also noted in relation to the testing of the water systems the NHS team need to understand the principles that Brookfield will be doing to charge systems. AFO advised that Brookfield will be carrying out air tests in the first instance then would fill with water and retardant for testing, and the water retardant will be left in the pipework. PM noted that leaving the water in the pipework was preferable to emptying the pipework after testing and leaving empty."

So, what's this retardant they might be talking about here?

A I'm not entirely sure if that was a fire system. I'm not entirely sure. The word "retardant" doesn't-- isn't something that we would use in water testing as such.

Q Yes, because the thing that's-- I know it's a bit unfair to ask you about minutes you weren't at, but the reason I ask this question is because you have described a process that starts with air testing, pneumatics, then hydraulic, then actual flushing, then commissioning, more flushing, then some disinfection.

A Yeah.

Q This, if it's about the main water system, is talking about retardant and leaving it in the system. Have you come across that in any of the records you've looked at?

A No. The only thing-- Again, "retardant" has thrown me as a word used for that, and that was more like a

fire system. It might have been-- You may introduce, sometimes, biocide into a water system when you're filling it. That might have been the case, I can't remember.

Q But you can't help us about what it actually is?

A No.

Q Right. Let me just see if I can get anywhere with these documents for a moment. Yes, so we go on to a meeting on 8 August 2013 which is page 1862, and this is definitely about a wet system and water (inaudible) test, Item 4:

"Water being used for this purpose was metered so NHS would be aware of the amount they used for tank testing. A large amount of water will be used and if this had to be fully jettisoned, it would be wasteful. There may be issues with contamination. The system remains charged until brought into use. Capital will check."

I'm just wondering, based on any of the work you've done around your statement or as a commissioner, can you help us about whether there's any filling of the tanks in 2013?

A There might have been that-- because we used, or Mercury used the tanks and the booster pumps to take water up to fill heating and chilled water systems, so they may have been filled earlier to allow them to fill the heating and chilled systems, not so much the domestic system.

Q Right, and then they might have reused water?

A They didn't reuse water, no. Water would have been-- If it was filling the systems, water would have been introduced from the Scottish Water main, potentially into the tank, and then piped out into the system. We wouldn't reuse water, no. Can't think of any situation you would.

Q But what they seem to be suggesting on this page is that water used for tank testing would then be used elsewhere in the system?

A Only if-- Basically, if it was watered when the tanks were built, then potentially, you know, you need to put water in to make sure there's no leaks in the tank, and that water was then used, as in pumped, from the tank booster to fill the system. It may have been that.

Q That's helpful. It was a little bit off-piste, but that is helpful. Well, I suppose I would just wrap up, if we take that off the screen, is-- Just to recap here, there seem to be two concepts around here. Your principle evidence from your own knowledge is that, in summer '14, there would have been filling, starting in Plant Room 21, of a quarter of the system for the tests that you were involved in doing.

A I was 2013. That was when Plant Room 21 was filled.

Q But then the rest of the system fills up?

A Yeah, would follow.

Q So, you think the Plant Room 21 started in 2013 and then your tests are in 2014?

A From the-- From the evidence I've looked at and some of the information I've looked at, it was 2013 when-- and, at that stage, the pipe work from Plant Room 21 down was pressure tested at that stage.

Q Right.

A The commissioning work would take place later on.

Q And then the commissioning work you've described ends up with a stage where it gets handed over to H&V who then manage it to end?

A Yes.

Q Do you have any awareness of management of the water system for the prevention of the growth of things that shouldn't be there, biofilms and such, between these early fills in '13 and the end of the commissioning process?

A I know it was part of the process that was to happen, but I couldn't, you know, stake that everything that would be done at that stage, no. I wasn't----

Q But the only evidence that exists the system wasn't contaminated at handover is those final tests.

A It's the samples, yeah.

Q Okay, thank you. Allow me just to check an email I've just received from one of our core participants. Yes. We talked, before the coffee break, about interactions you had around Ward 4B, and I asked you whether you had interactions with Professor Williams, and you said you didn't remember. I think I need to ask you a more general question. At any point before the end of 2015, did you have any interactions with the Professor Williams about water or ventilation or anything that you can remember?

A I don't recall.

Q And, simply for completeness, did you have any interactions with any other member of the team? So, that would have been the senior nurse, Sandra McNamee-Devine. Did you have interactions with her?

A The name rings a bell, but I couldn't tell you if I had interaction or not. I certainly dealt with-- There was there was nursing staff from the Beatson that came to Ward 4B when we were doing the client training and such on it, so if that was one of the nurses involved in that----

Q Okay, and then you'd already discussed your involvement with Dr Peters and Dr Inkster so I won't go over

that again right. I think it probably is quite important; you've explained in terms of your learning about the air change rate in the system as arriving and checking the M&E log in response to Dr Peters' questions in June 2015. That's correct?

A I think so.

Q Yes, right. I think it's really actually going to be quite significant, and I need to press you on this: are we right to think that she asked you some questions, you go away and do your investigations, and you find out what's in the M&E log? Is that the order?

A I can't remember whether was it was she'd asked me directly or that came via the Project team, but that was how, then, I started to go and start doing a bit of research on what exactly was the situation.

Q Once you found the M&E clarification log and you knew what you then knew, did you have any meetings with Dr Peters after that date?

A I don't recall.

Q Who might you have told in the GGC team or world about the M&E log at that point?

A I would imagine-- Again, I don't recall exactly, but probably Peter Moir, Ian Powrie, and potentially David Loudon. That was the, kind of, three people that we were discussing these items with.

Q Why would you have told them?

A Because I was asked the information, so I went and got them the information and I told them, "This is where the lower air change rate comes from in these rooms."

Q Shouldn't they have known that?

A David Loudon came to the project later on, so whether he knew that or not, I don't know. Again, Peter Moir, he'd been involved in the project for a while, I would have thought maybe he should know that.

Q My Lord, I've got no particular questions at this point, but it may be that some of my colleagues have some questions. I wonder if we might take a short break for me to find out?

THE CHAIR: We'll do that. Mr Wilson, what I need to know is, and what Mr Mackintosh needs to know is, whether there are any other questions in the room. So, I'll ask that you return to the witness room. Shouldn't be much more than about 10 minutes.

A Okay, no problem.

(<u>Short break</u>)

THE CHAIR: Mr Wilson, I understand we have two questions.

A Okay.

MR MACKINTOSH: The first thing is just to be clear; we're talking about what water systems we're talking about. Let's put bundle 21, page 213 back on the screen and just recap, and I think you said two things about filling the water system, and please correct me if I've misremembered it. One is that your work of commissioning that starts with pneumatic testing started in the summer of 2014.

A No.

Q No.

A That would have been-- The first plant in 21, would have been 2013.

Q When did the commissioning actually take place?

A The commissioning was-- sorry, the commissioning, with the filling and testing would have been 2013 for plant number 21, and the commissioning would have been after that, probably when the heat was generated from the energy centre to heat the chloro-phars(?), I can't quite recall when that is.

Q That would be sometime in '14, then?

A Yeah.

Q Right, so when you say, "plantroom 21", are you talking about, on this diagram, the plantroom fed from booster pump 2 that is approximately a quarter of the system that then fills the rest of the system downstream from the plantroom over a period of time after?

A Yeah, that's how it worked-- Yeah, that's my recollection of how it was done.

Q And this is all within the domestic water system?

A That is the domestic water system, yeah.

Q You're not telling me anything about other systems like chilled water or heat transfer systems, this is just domestic?

A They would have been filled probably at a similar time, but that-- domestic I was talking about, yeah.

Q Right, and so, just to be clear, the plant room starts being filled in June '13, it then will feed down to the rest of the system that's fed from it, and then later the following year you actually do the commissioning work?

A Yeah.

Q Then the other plant rooms will come online sequentially in order to all be finished by the end of the year?

A Yeah.

Q Thank you.

THE CHAIR: When you say the end of the year, that's 2014?

MR MACKINTOSH: '14, and then H&V will do their final tests, and that's the evidence that the system wasn't contaminated.

A Yeah.

Q Thank you. We can take that off the screen. The other question relates to your work done in the autumn of 2015 in Ward 4B. I asked you a few questions about who instructed it and what you were trying to do, but I didn't ask this question, which is: at the end of that exercise, what air change rate was being achieved in the 24 rooms in Ward 4B?

A Six air changes.

Q Why wasn't 10 air changes being achieved?

A Because the plant that was there and the ductwork size in there couldn't take the capacity to increase the air flow rate to give you 10 air changes.

Q Does that have any connection with the scale of the system linked back to the 40 litres per second in the M&E clarification log?

A No. The Ward 4B system, the changes that were made in 2013 increased-- it's my understanding, increased the air change rate to six air changes at that time, which was 80 litres per second.

Q So that's a different system?

A No, that's the Ward 4B system.

Q Yes. The Ward 4B system is different from the other general wards?

A Yes, different air handling rates, yes.

Q If we just take this (inaudible). In a general ward, at handover, they can

do 40 litres per second?

A Yes.

Q Ward 4B, because of the changes in 2013, can do twice that?

A Yes.

Q Which is six air changes?

A Yes.

Q But it can't do 10?

A No.

Q Was any request made to you in 2015 to get to 10?

A Yeah, that was the initial word we were getting back from the Beatson people. They wanted what they had in the Beatson, which was 10 air changes, and which is what reflected in the SHTM for neutropenic patients, which was talked about then.

Q Did you tell them you couldn't do it?

A Yes.

Q Who did you tell?

A It would go via the Project team, Peter Moir, Ian Powrie.

Q Thank you. My Lord, I don't think I have any further questions. Thank you, Mr Wilson.

THE CHAIR: Is the inability of a system to achieve an air change a function of the specification of the air handling unit or the ductwork or both?

A Probably both.

THE CHAIR: Both? This is maybe too general a question, but was there any

knock-on, as it were, from the decision that the single rooms in the general wards – I think we're talking about hundreds of rooms in the hospital – would have an air change rate of 2.5? I don't know if I've maybe framed that question precisely enough, but does the fact that GGC agreed that the rooms in general wards would have an air change rate of 2.5-- presumably that then determines the specification of the air handling units and the ductwork which serve these rooms. Does that have any knock-on effect for the other rooms in the hospital? In other words, rooms where specialised ventilation may be appropriate?

A No, because there was various air handling units serving various areas of the building, so they would be separate, and obviously some of the more specialist ventilation like theatres and isolation rooms had their separate systems, complete separate systems.

THE CHAIR: And that applies to ductwork and air handling units?

A Yeah. Air handling unit would, you know, be in a plant room, and if it was ductwork, they would go down to that ward or wards where-- you know, out to grilles in the ceiling.

THE CHAIR: Thank you.

MR MACKINTOSH: My Lord, I did have a follow-up question which might be of assistance.

THE CHAIR: Yes.

MR MACKINTOSH: (To the witness) Thinking about the difference between the Ward 4B ventilation system installed that you commissioned and the ones for each of the other wards, the general wards, are they the same sort of their handling units?

A Same manufacturer, yeah.

Q Just bigger ones?

A Just bigger ones. There might have been in Ward 4B-- as there was in theatres and isolation rooms, you may have had twin motors. So if one motor was broken, another motor would power the fan, so there may have been----

Q They're just a bigger version of the same thing, are they?

A Yeah, pretty much.

Q And the ductwork, is it the same ductwork or bigger ductwork?

A It would be bigger ductwork for bigger airflow and air change rates.

Q And this may be outside your area of expertise, but I think I'll ask anyway: those larger air handling units of 4B, would there have been any room in those plant rooms to fit even bigger ones in?

A When we looked at the 4B upgrades, we looked with the consultant, TÜV SÜD, Wallace Whittle, to look to see if we could put bigger units in and it was very difficult in that particular plant room.

Q Is that because of the size of the plant room?

A The size of the plant room and where the plant-- physical place is, because as much as you need the size of the plant for the air handling unit, you need the size of the plant room to be able to maintain that, withdraw coil. So you have to be very careful how you position plant in the plant room.

Q So the size of the plant room is probably the constraint that prevented 10 air changes?

A That was one of the constraints. Again, ductwork size within a ceiling void might have been another constraint as well.

Q So you have to have the height of ceiling void?

A You need to have it to get your depth or width of duct as well.

Q Stop me if I've gone beyond your level of expertise, but does that mean that the inability to achieve 10 air changes in that retrofit in 2015 was to some extent driven by decisions made about the size of duct rooms and ceiling voids back in 2010/11 or even earlier?

A It would have had impact, yeah.

Q Thank you very much. Thank you, my Lord.

THE CHAIR: Thank you, Mr Mackintosh. Mr Wilson, that is the end of your evidence and you're therefore free to go, but before you go, can I say thank you for the work in responding to the questionnaire. As you've explained, you've clearly done some reading to put you in a position to answer these questions. Thank you for that and thank you for your attendance today, but you're now free to go. Thank you.

A Thank you.

(The witness withdrew)