



# **Royal Hospital for Children and Young People and Department of Clinical Neurosciences**

**NHS Lothian response to actions identified in the NSS National Services  
Scotland – Review of: Water, Ventilation, Drainage and Plumbing Systems**

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## Introduction

Following the decision to delay moving to the new Royal Hospital for Children and Young People & Department of Clinical Neurosciences in July 2019, NHS National Services Scotland (NSS) were commissioned by Scottish Government to undertake a series of checks to ensure that the relevant technical specifications and guidance applicable to the new hospital had been followed and were being implemented.

Health Facilities Scotland (HFS) and Health Protection Scotland (HPS) have provided their report to Scottish Government on whether the relevant technical specifications and guidance applicable to the RHCYP & DCN are being followed and implemented. The report provides an assessment of actions required where relevant technical specifications and guidance have not been met.

NHS Lothian engaged with NSS throughout the review and addressing follow-up actions. Updates on each action identified in the NSS Review are provided in this response.

## Glossary

AHU	Air handling unit
Board	refers to NHS Lothian
HFS	Health Facilities Scotland
HPS	Health Protection Scotland
IHSL	IHS Lothian Limited
IPCT	Infection Prevention and Control Team
NSS	National Services Scotland
SHPN	Scottish Health Planning Note
SHTM	Scottish Health Technical Memorandum
TMT	Thermostatic mixing taps
TMV	Thermostatic mixing valves

**Management and Assurance**

*NSS Review: Omissions identified in key roles within the management structure, ease of access to information.*

**NHS Lothian response:** Management roles and responsibilities and will be identified and the responsibility matrix will be reviewed on a regular basis. Archiving of information will be revised in line with guidance and contract requirements

through NHS Lothian’s Corporate Management Team.

<b>Issue</b>	<b><i>NSS Review</i></b>	<b><i>NSS Action Assessment</i></b>	<b>NHS Lothian action</b>
<b>Structures and processes</b>	<i>Structures and processes are not fully in place to assure the Board that the facility is being operated in compliance with contract requirements. These should be in place from the point where the building services referred to in this report are put into use.</i>	<i>NHS Lothian and IHSL should adopt the management and reporting processes as described in SHTM 00 – Best Practice Guidance for Healthcare Engineering and the SHTMs for each critical engineering service.</i>	<b>AGREED</b> Contract management arrangements will follow SHTM 00.
<b>Contract requirements</b>	<i>Some of the records and documents necessary for the effective and safe operation of the hospital could not be found. The document management system appears to lack a logical structure which will impact on the ability to readily find necessary information. Some of the sections contain none, or only part, of the documentation they should have as required by the Construction (Design and Management) Regulations 2015.</i>	<i>The Board should require IHSL to rectify the filing structure of the documentation and verify that the information contained is both complete and accurate as required by the Construction (Design and Management) Regulations 2015.</i>	<b>AGREED</b> A review and demonstration of completeness has been requested from IHSL and additional information has been provided by them.
<b>Alarms</b>	<i>The alarms for the building are reportedly un-prioritised, resulting in a very large number of alarms potentially masking critical alarms.</i>	<i>Prioritise alarms to make most critical failures visible and manageable. Until alarms are prioritised, have procedures and staff in place to ensure critical alarms are not missed as per SHTM 08-05 - Specialist services building management systems.</i>	<b>AGREED</b> NHS Lothian has requested a programme to confirm this in place by the end of September.

**Ventilation**

*NSS Review: Remedial action is required within both general and theatre ventilation systems. Augmented care redesign was already being considered separately by the Board. Haematology / Oncology is also being reviewed as a result of the review as specific risks were identified. Risk assessments are underway as part of the ward by ward risk assessments being done locally requested as part of the review.*

**NHS Lothian response:** The required remedial actions are underway with expert input from the engineers. Two Board changes have been progressed for the areas to be redesigned. Discussion with clinical staff and the Infection Prevention and Control Team (IPCT) will guide patient placement in line with documented risk assessments.

Issue	NSS Review	NSS Action Assessment	NHS Lothian action
<p><b>General ventilation systems 1</b></p>	<p><i>Provision for maintenance or plant failure in the ventilation systems has not been validated in accordance with SHTM 03-01 Ventilation for Healthcare Premises. The bypass arrangements and functioning of ward ventilation in the event of plant failure remains to be demonstrated.</i></p>	<p><i>Demonstrate efficacy of approach of utilising adjacent air handling unit to supply areas not served by failed plant.</i></p> <p><i>Commission and validate isolation rooms and general ward spaces in the event of supply by adjacent air handling unit.</i></p> <p><i>Engage clinical leads and Infection Prevention and Control colleagues in developing service provision strategies in the event of air handling plant failure.</i></p> <p><i>Confirm damper operation and compliance with fire requirements in bypass mode.</i></p>	<p>The date for the demonstration of bypass arrangements is to be confirmed by 13 September 2019.</p> <p><b>AGREED</b> Patient safety in the event of a reduction of air exchange, for any reason, will be managed through infection prevention and control guidance and clinical risk assessment.</p> <p>Work is ongoing with contractors to ensure damper operation is compliant. The programme of works is to be provided by IHSL by 13 September 2019</p>

Issue	<i>NSS Review</i>	<i>NSS Action Assessment</i>	<b>NHS Lothian action</b>
<b>General ventilation systems 2</b>	<i>Air handling units and ductwork contain numerous deviations from contract requirements (SHTM 03-01) and were found not to be clean despite having been presented for validation. Deviations include: loose internal cabling in the airflow, cable routes allowing air to bypass filters, air leakage at penetrations and possible fan replacement difficulties which need to be corrected.</i>	<i>The ventilation systems throughout the hospital should be subject to a full snagging exercise and all defects rectified following which air handling units and ventilation systems are cleaned. All deficiencies identified in validation and specialist Consultant Engineer reports should be addressed as part of this.</i>	We are working closely with IHSL to ensure all the issues identified in the reports have been rectified.  A specimen AHU with all the deficiencies rectified will be made available to NHS Lothian for inspection by HFS and our engineers in September 2019.
<b>General ventilation systems 3</b>	<i>The general ward ventilation design is based on four air changes per hour mechanical ventilation plus a component of natural ventilation. With a few exceptions, the mechanical component has been validated. However, design and validation information for the natural component has not been proven.</i>	<i>Confirm that all areas served by this arrangement are suitable for categorisation as general ward areas or single rooms as listed in SHTM 03-01 Part a, Appendix 1. Undertake an IPCT risk assessment ward by ward/ speciality specific in relation to the guidance.</i>	A risk assessment undertaken by IPCT and clinical teams will be completed by 13 September to ensure that patient placement recognises the general ward ventilation provision.
<b>General ventilation systems 4</b>	<i>The pressure regimen detailed in the design, and reflecting the environmental matrix, will be affected by opening windows and the pressure between the room and the corridor, and therefore direction of air flow, cannot be relied upon when windows are open.</i>	<i>A full assessment of the services and patient population should be carried out and mechanisms for monitoring established.</i>	<b>AGREED</b> Ward level risk assessments will recognise the contribution of open windows to the ventilation provided mechanically.
<b>General ventilation systems 5</b>	<i>External doors to plant rooms</i>	<i>Ensure that excessive gaps are removed and appropriate anti vermin measures are applied to all the doors and screens as per SHTM 03-01 and HFS Interim Guidance - Managing the Risk of Contamination of Ventilation Systems by Fungi from Bird Droppings – February 2019.</i>	<b>AGREED</b> This will be addressed by the end of September. All doors will then comply with the guidance.
<b>General ventilation</b>	<i>Fire dampers in some locations cannot be adequately tested as duct access has not been</i>	<i>Provide access so all fire dampers can be readily visually inspected to verify operation.</i>	<b>AGREED</b> Access to fire dampers will be

Issue	<i>NSS Review</i>	<i>NSS Action Assessment</i>	NHS Lothian action
<b>systems 6</b>	<i>provided. Also, locations of fire dampers and fire rated ductwork has been questioned in relation to the requirements of SHTM 03-01 and confirmation of compliant provision is awaited.</i>	<i>Review fire damper provision and fire rated ductwork and confirm appropriate provision</i>	corrected as part of the work to air handling units.
<b>General ventilation systems 7</b>	<i>Air intake location - Air intakes and opening windows are sited in the courtyard below the helipad and at the adjacent RIE. Information has not been provided on the impact of downdraft on air flows and pressures or entrainment of contaminants as per SHTM 03- 01.</i>	<i>Demonstrate the effect of helicopter landing on air flows in ventilation systems with intakes below through measurement when test flights take place or through modelling. This should include the air intakes of the RIE adjacent.</i>	Modelling information has been shared with NSS. The effects of test flights on air flows will be measured in September/ October 2019.
<b>Theatre ventilation systems 1</b>	<i>Scrub areas which are narrow and deep are unlikely to be scavenged effectively by theatre air changes and require e alternative means of achieving removal of contaminants as per SHTM 03-01. The efficacy of the high level extract to achieve sufficient dilution of contaminants or entrainment of heavier than air water droplets is not in accordance with the requirements of SHTM 03-01and has not demonstrated as equivalent.</i>	<i>The ability of the single high level extract provided in deep plan scrub areas to effectively prevent contaminants being dispersed into theatres should be demonstrated and/or additional low level ventilation provided.</i>	<b>AGREED</b> Evidence to confirm the adequate dispersal of contaminants has been requested. If this not satisfactory then a Board change will be instructed to provide low level ventilation.
<b>Theatre ventilation systems 2</b>	<i>Anaesthetic rooms 31 and 34 do not demonstrate a clean air flow path to reduce exposure of staff to gasses as per SHTM 03-01. Move ceiling supply to opposite side of room from extract. In room 30, move supply away from door.</i>	<i>Move ceiling supply to opposite side of room from extract. In room 30, move supply away from door.</i>	Demonstration of a clean air path has been requested by 13 September 2019; otherwise the supply will be moved.
<b>Theatre ventilation systems 3</b>	<i>Theatre utility rooms Extract ventilation means theatres have to be used in pairs and taking a theatre out of service may reduce the extract in utility room below the levels as per SHTM 03-01.</i>	<i>Add supplementary extract ventilation to allow for one theatre being out of service or plan for service impact following the loss of a pair of theatres. NHS Lothian has advised that the appropriate pressure differentials are maintained when only one theatre is operation. Validation</i>	IHSL have provided evidence that this arrangement meets the standard. Final checks on this are being completed.

Issue	<i>NSS Review</i>	<i>NSS Action Assessment</i>	NHS Lothian action
<p><b>Isolation room ventilations systems</b></p>	<p><i>Isolation rooms are not served by a single ventilation system for each room as recommended in SHPN4 Supplement 1. The arrangement provided, where ventilation systems serve an area of the building including contained isolation rooms, has not yet been proven in the event of failure of an air handling unit and the implications for service impact are not yet understood.</i></p>	<p><i>Prove that bypass connections to adjacent ventilation systems will allow safe operation of both areas and / or explain service provision strategy for loss of each area including isolation rooms. Also include assurance on operational effectiveness e.g. the pressure differentials and air flows being maintained.</i></p> <p><i>Develop clinical service provision strategy to reflect the potential loss of up to 5 of the 19 isolation rooms on the failure of an air handling unit and confirm impact on service continuity.</i></p>	<p>The date for the demonstration of bypass arrangements is to be confirmed by 13 September 2019.</p> <p>Detailed advice from the infection control team to allow bespoke risk assessments would be followed in such circumstances.</p>



**Water**

*NSS Review: Independent testing identified no widespread contamination of the water systems, however, remedial action is required on a number of water system areas as well as system wide disinfection prior to occupation.*

**NHS Lothian response:** Remedial actions are underway and will be complete prior to occupation. Changes to the regime to maintain water quality have been made to address the findings of this review. System-wide disinfection will take place in the required timeframe prior to occupation.

<b>Issue</b>	<b>NSS Review</b>	<b>NSS Action Assessment</b>	<b>NHS Lothian action</b>
<b>Water services augmented care</b>	<i>Pseudomonas found in taps, in Paediatric Medical Inpatients and DCN Inpatients . (SHTM 04-01 Part A published in July 2014)</i>	<i>All taps (not just TMT/TMV4) to be disinfected and retested. Inspect and replace, as appropriate, taps, tap components and pipework. Replace tap strainers and cartridges in affected TMT taps.</i>	<b>AGREED</b> All taps found positive for pseudomonas prior to occupation will be disinfected and retested using an agreed method statement. To be completed by the end of September 2019.
<b>Water services non-augmented care</b>	<i>Swarf and biofilm found in tap strainers, contrary to SHTM 04- 01 Water safety for healthcare premises.</i>	<i>Replace tap strainers in all areas.</i>	<b>AGREED</b> All tap strainers will be cleaned and replaced if necessary. To be complete by the end of October 2019.
<b>Showers</b>	<i>Shower hose lengths do not comply with Scottish Water by-laws and guidance in SHTM 04-01 Water safety for healthcare premises.</i>	<i>Shorten hose length, or add retaining ring, to ensure that shower head cannot reach WC or drain. Disinfect showers, hose and drain after rectification.</i>	<b>AGREED</b> Shower hoses will be rectified by addition of a retaining ring. These have been ordered and will be fitted by end of September.
<b>Water General 1</b>	<i>Testing has found some fungal / mould contamination and high total viable counts.</i>	<i>Given a number of indicators the water system should be disinfected and re-tested.</i>	<b>AGREED</b> The water system will be disinfected and tested prior to occupation.
<b>Water General 2</b>	<i>Legionella risk assessment actions not recorded as required by HSE Approved Code of Practice and</i>	<i>The Legionella Risk assessment Feb 2019 identified a range of actions. The Action Tracker</i>	<b>AGREED</b> Changes to the water

Issue	<i>NSS Review</i>	<i>NSS Action Assessment</i>	NHS Lothian action
	<i>Guidance L8 - Legionnaires' disease. The control of Legionella bacteria in water systems. Legionella risk assessment insufficient to reflect system contamination in general. Those responsible for the system have a responsibility under the Control of Substances Hazardous to Health Regulations 2002 (COSHH) to prevent exposure to microorganisms.</i>	<i>does not demonstrate that the issues raised have been resolved or a timeline provided for resolution. Record rectification of actions. The risk assessment is heavily focussed on Legionella and not taking into account other organisms in line with patient type that will occupy the building. Broaden to reflect system contamination in general. Develop analysis categorisation of patient type and consideration to susceptibility for each area.</i>	management plan have been made to reflect this.
<b>Water General 3</b>	<i>Designated roles and responsibility as per SHTM 00 Best practice guidance for healthcare engineering.</i>	<i>The current Responsible Person (RP) has not been appointed in writing and uncertain as to whether received RP training. Additionally, has no previous experience of healthcare.</i>	<b>AGREED</b> The name of the responsible person has been confirmed; their qualifications will be provided.
<b>Water General 4</b>	<i>Water tanks as per SHTM 04-01 Water safety for healthcare premises.</i>	<i>To be inspected. The Raw Water and Filtrate water tanks are interconnected at the drain. These must be separated.</i>	<b>AGREED</b> This work will be complete by the end of September 2019.
<b>Water General 5</b>	<i>Hot and cold water temperatures / flushing. SHTM 04-01 Water safety for healthcare premises</i>	<i>There was an issue with raised cold water temperatures during the boiler outage – this requires investigation.</i>	<b>AGREED</b> Regular monitoring of hot and cold water temperatures is part of the water maintenance plan.
<b>Water General 6</b>	<i>Filtration Plants</i>	<i>From lessons learned by NSS in recent work, microbiological growth potential was identified as part of the Backwash cycle. Consideration should be given to Chlorine dioxide addition to backwash water tank to counter microbiological and biofilms development on filters.</i>	<b>CLOSED</b> NHS Lothian will consider new advice as it is produced and incorporate this into the water management plan as necessary.
<b>Water General 7</b>	<i>Instant Boil Taps and Rise and Fall Baths</i>	<i>These were found to be contaminated and need to be disinfected and tested to demonstrate safe water delivery as per SHTM 04-01 Water safety for healthcare premises.</i>	<b>AGREED</b> This action is underway in conjunction with the manufacturers.

**Drainage and Plumbing**

*NSS Review: The drainage system has multiple redundancies in place, however, active monitoring is required. Elements of plumbing require disinfection.*

**NHS Lothian Response:** Monitoring arrangements for drainage are incorporated into the building maintenance schedule. All necessary disinfection of plumbing will be incorporated into the maintenance schedules.

<b>Issue</b>	<b>NSS Review</b>	<b>NSS Action Assessment</b>	<b>NHS Lothian action</b>
<b>Drainage and plumbing 1</b>	Sinks drains	<i>Initial testing indicates that these are not significantly contaminated, however the horizontal drain and protruding seal means they retain stagnant water and they need to be disinfected periodically prior to and post occupancy to maintain their condition. From lessons learned, there should be a system of inspection and appropriate remedial action taken.</i>	<b>CLOSED</b> This will be incorporated into the water management plan prior to occupation of the building.
<b>Drainage and plumbing</b>	Bottle traps	<i>There would appear to be an inconsistency of installation and potential of back-feed from trap to drain. This requires review and rectification.</i>	<b>CLOSED</b> Disinfection of the bottle traps will be incorporated into the regular maintenance regime.
<b>Drainage and plumbing 3</b>	Pumped drainage	<i>The internal pumped sewage drainage system presents the potential for sewage to back up through basement drains on pump failure and will require active monitoring.</i>	<b>CLOSED</b> The monitoring of pumped drainage is in place and is on the critical alarm list.



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