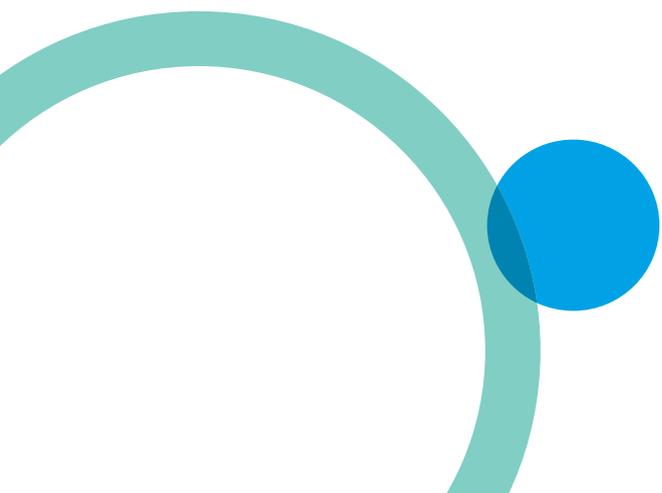


# **NHS Lothian - Royal Hospital for Children and Young People & Department of Clinical Neurosciences**

Review of Fire Systems, Electrical Systems and Medical  
Gas Installations

October 2019

Version 1.0



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# 1. Executive Summary

## 1.1 Overview

This document is supplementary to the NSS report issued on 9<sup>th</sup> September 2019. The objectives of this part of the review were to focus on the provision of the fire, electrical services and medical gas systems at RHCYP & DCN and:

- To provide a report by October 2019 to Scottish Government on whether the relevant technical specifications and guidance applicable to the RHCYP & DCN are being followed and implemented.
- Where relevant technical specifications and guidance have not been followed, identify necessary remedial actions.

This part of the report deals mainly with engineering aspects and there is limited commentary on Healthcare Associated Infection (HAI) associated with these three disciplines as there is little or no impact on HAI from the services considered. The process involved site visits, sample inspections and a targeted review of available documentation.

The review commenced on the 12<sup>th</sup> of August 2019, with this supplementary report published for consideration by the established RHCYP & DCN Oversight Board.

## 1.2 Summary of findings

The findings have been collated based on information provided by NHS Lothian and on-site reviews of the RHCYP & DCN. Expert advice was sought within the key focus areas of Fire, Electrical and Medical Gas systems and their overarching management and assurance processes relating to these systems. The following table outlines the status of key findings:

Review	Summary Assessment	No. of Issues per priority				
		1 (H)	2	3	4	5 (L)
<b>Management &amp; Assurance</b>	Omissions identified in key roles within the management structure, ease of access to information and possible lack of appropriately qualified personnel in safety critical roles.			2	2	
<b>Fire systems</b>	Action is recommended to include remotely resettable fire and smoke dampers within the ventilation system serving all sleeping accommodation areas where ducting leads to a corridor serving as an evacuation route. Identified fire doors should be upgraded.			2	1	1

Review	Summary Assessment	No. of Issues per priority				
		1 (H)	2	3	4	5 (L)
<b>Electrical Systems</b>	Remedial action is required within both the high voltage (HV) and low voltage (LV) installations.		2		1	
<b>Medical gas systems</b>	The review of the medical gas installations confirmed that they have been designed installed and commissioned in accordance with the relevant standards.				1	2

The following definitions were used to categorise the findings:

Priority	Definition
<b>1</b>	Significant – Concerns requiring immediate attention, no adherence with guidance
<b>2</b>	Major – Absence of key controls, major deviations from guidance
<b>3</b>	Moderate – Not all control procedures working effectively, elements of non-compliance with guidance
<b>4</b>	Minor – Minor control procedures lacking or improvement identified based on emerging practice
<b>5</b>	Observation and improvement activity

Overall remedial action is required to be undertaken within the fire and electrical systems prior to occupation. Observations have been identified within medical gas installations and a further improvement activity within the fire system noted. Following acceptance of this report, the review team are ready to assist the NHS Lothian team in developing a programme of activity and remedial actions.

## 2. Analysis of information provided

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### 2.1 Information provided

- 2.1.1 The support of the NHS Lothian project team in responding to questions and accessing data is gratefully acknowledged.
- 2.1.2 At the time of writing the majority of the information required had been received and whilst the timescale for the review means a selective targeted review of documentation was necessary, the main themes appear clear. However, some information remains outstanding, and NHS Lothian colleagues continue to pursue a response.
- 2.1.3 The Special Purpose Vehicle (SPV), Contractor, sub-contractors, Facilities Management Contractor and Independent Tester were not directly involved in the production of this report, nor were they requested to verify its contents and they may have additional information not considered here. It is acknowledged that some of the information provided by NHS Lothian came directly from these sources.

## 3. Findings

### 3.1 Management and assurance

#### Summary

Review	Summary Assessment	No. of Issues per priority				
		1 (H)	2	3	4	5 (L)
<b>Management &amp; Assurance</b>	Omissions identified in key roles within the management structure, ease of access to information and possible lack of appropriately qualified personnel in safety critical roles.			2	2	

#### Main findings

Priority	Review	Action Assessment
4	Structures and processes are not fully in place to assure NHS Lothian 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.	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.
4	Some of the records and documents necessary for the effective and safe operation of the hospital could not be found.	NHS Lothian 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 Electricity at Work Act (1989) and the Construction (Design and Management) Regulations 2015.
3	There appeared to be a lack of qualified and experienced Authorised Persons and Competent Persons for both the HV and LV electrical installations.	The number of HV and LV Competent Persons should be reviewed. NHS Lothian should require IHSL satisfy themselves that adequate numbers are provided as required by the Electricity at Work Act (1989) and SHTM 00, SHTM 06-01 and SHTM 06-02.

Priority	Review	Action Assessment
3	There is no responsible person formally identified for the high voltage electrical installation.	NHS Lothian should require IHSL satisfy themselves that a suitable responsible person is appointed as required by the Electricity at Work Act (1989) and SHTM 00, SHTM 06-01 and SHTM 06-02.

**Detailed Narrative**

- 3.1.1 Healthcare organisations have a duty of care to patients, their workforce and the general public to ensure a safe and appropriate environment. This requirement is identified in a wide range of legislation. At the most senior level within an organisation, the appointed responsible person should have access to a robust structure which delivers governance, assurance and compliance through a formal reporting mechanism.
- 3.1.2 The review identified that for both IHSL and NHS Lothian, there appeared to be omissions in the identification, appointment and definition of key roles in an effective management structure. Additionally, some records which are necessary to demonstrate compliance with appropriate specifications and guidance remain outstanding.

**3.2 Fire**

**Summary**

Review	Summary Assessment	No. of Issues per priority				
		1 (H)	2	3	4	5 (L)
<b>Fire Systems</b>	Action is recommended to include remotely resettable fire and smoke dampers within the ventilation system serving all sleeping accommodation areas where ducting leads to a corridor serving as an evacuation route Identified fire doors should be upgraded.			2	1	1

## Main Findings

Priority	Review	Action Assessment
5	Fire and smoke dampers are installed at compartment and sub-compartment level. However, smoke dampers are not fitted to corridors serving sleeping accommodation.	Remotely resettable fire and smoke dampers should be fitted to prevent the travel of smoke between sleeping accommodation areas where ducting leads to a corridor serving as an evacuation route.
3	Based on sample inspection some doors within the escape routes from sleeping accommodation are not fire door sets.	NHS Lothian and IHSL should ensure the appropriate fire rated door sets are installed.
3	The half leaf “penny farthing” doors are not fitted with self-closing devices.	Half leaf doors should be fitted with the same self-closing device as on the main leaf.
4	A number of remedial snagging and housekeeping issues were identified; damage to fire doors, seals and workmanship; penetrations in compartment walls; delineation of rooftop escape.	A number of the items have already been identified and logged by NHS Lothian via the helpdesk process. NHS Lothian and IHSL should ensure all works are undertaken prior to occupation. Procedures should be adopted to ensure rooftop escape remains clear.

### Detailed narrative

- 3.2.1 It was identified that in areas where rooms are regarded as being used as sleeping accommodation that these did not have smoke dampers, but were fitted with fire dampers. The risk consequence of this in the event of a fire could be that smoke would travel through ventilation into adjoining rooms and the corridor which is the escape route before the fire dampers would be actuated.
- 3.2.2 There is an opportunity to improve the functionality of the design and use of the building prior to occupancy. The fitting of additional smoke dampers would be a positive enhancement to patient and public safety in the event of a fire which relied upon the corridor areas as an evacuation route. While identified as a priority 5 within the report it is recommended that this would afford a significant improvement for these areas.

### 3.3 Electrical

#### Summary

Review	Summary Assessment	No. of Issues per priority				
		1 (H)	2	3	4	5 (L)
<b>Electrical installations</b>	Remedial action is required within both the high voltage (HV) and low voltage (LV) installations.		2		1	

#### Main Findings

Priority	Review	Action Assessment
4	<p>All 3 Uninterruptable Power Supplies (UPS) are contained in the same room, thereby reducing resilience if a major localised failure should occur.</p> <p>The UPS and output switchboards are a significant distance from the point of load. From this point there is no alternative supply within the internal infrastructure thereby increasing the potential for a single point of failure contrary to clause 4.6 of SHTM 06-01.</p>	<p>NHS Lothian should require IHSL to demonstrate compliance with the technical intent of SHPN 00-07 Resilience planning for healthcare estates, providing mitigation measures to maximise resilience of co-located equipment.</p> <p>NHS Lothian should require IHSL to provide agreed mitigation strategies to meet SHPN 00-07 and SHTM 06-01 to avoid internal failure of the single electrical supply to the critical electrical services such as Medical IT cabinets serving life support and other critical systems.</p>
2	<p>Medical IT system<sup>1</sup> final circuit cabling exceeds manufacturer and SHTM recommended values. Final circuits are in excess of the 30 cable metre length of run set out in Clause 16.34 of SHTM 06-01 and Regulation 134.1.1 of BS 7671.</p>	<p>The designer should indicate their derogation of the manufacturer recommendations, BS 7671 and SHTM 06-01 requirements. The mitigations should also include consideration of the capacitive leakage current effects associated with multiple long runs of final circuits.</p>

<sup>1</sup> (IT electrical system fulfilling specific requirements for medical applications. This does not refer to Information Technology)

Priority	Review	Action Assessment
2	<p>Child and Adolescent Mental Health Service (CAMHS) Unit Electrical installation. It was observed that there may be the potential to defeat the ligature reduction measures.</p> <p>In addition, the power to the CAMHS unit rooms cannot be isolated outwith the room.</p>	<p>NHS Lothian and IHSL should check that the provision of access hatches in bedrooms and en-suites are consistent with the risk assessment approach to ligature reduction measures for the CAMHS. The luminaire type (particularly bedhead) should be checked against HBN 03-01 to confirm that they meet the requirements. Isolation arrangements for CAMHS room power supplies should be checked with clinical colleagues as this may require modification.</p>

**Detailed narrative**

- 3.3.1 The high voltage and low voltage electrical systems at RHCYP & DCN were considered in relation to legislation, guidance and the lessons learned from other recent similar projects which may have an impact on the patient group and staff.
- 3.3.2 The principal legislation which is relevant to the electrical systems is The Electricity at Work Act (1989).
- 3.3.3 The principal guidance which is relevant to the electrical systems are: Scottish Health Technical Memorandum (SHTM) 06-01: Electrical services supply and distribution; SHTM 06-02: Electrical safety guidance for low voltage systems; SHTM 06-03: Electrical Safety Guidance for High Voltage Systems and British Standard (BS) 7671 (also known as the wiring regulations).
- 3.3.4 During the site investigation works it was noted that the installation has potential for the ligature reduction measures intended for the CAMHS unit to be overcome. These include the provision of access hatches in these areas, the impact resistance and fixings of certain light fittings, excessive cable lengths and omission of security fixings. It is acknowledged that NHS Lothian have produced clinical risk assessments for the CAMHS area. If not already, it is recommended that NHS Lothian take into account all consequential construction issues and the points raised in this report into their ligature reduction risk assessment. In addition, the power to the CAMHS unit rooms cannot be isolated out with the room. This should be checked with clinical colleagues as this may require modification.
- 3.3.5 It was observed that there was no Responsible Person (RP) identified for the HV or LV systems and there are limited numbers of Authorised Persons and Competent persons available on the site. There was no HV mimic diagram displayed and there is no version in the document management system; this and other items should have been highlighted as part of an Authorising Engineer’s audit.
- 3.3.6 The Medical IT (IT here refers to isolated power supply not Information Technology) system which serves the critical care areas (such as theatres, recovery, intensive care, etc.) should be reviewed. The cable lengths from the distribution board to the

final outlets are in excess of those required by BS 7671. There is also the potential for single points of failure due to the length (and routing) of cables between these distribution boards and the uninterruptable power supply (UPS). The power supply to medical IT systems should be fire rated / protected and it is not clear if this has been achieved. The medical IT protective conductors are not wired from the respective medical IT cabinet which is contrary to BS 7671 fig 710.2. Typical theatre layout.

3.3.7 It was observed that fire stopping was not present in some trunking above the ceiling as it traversed wall compartment penetrations.

3.3.8 A number of the wall mounted Earth Bonding Bars (EBB) are not installed correctly. This was directly observed, additionally, dirt and debris ingress material could be spread when the EBB are opened for the annual testing. This should be considered by the service provider as part of their maintenance plan.

### 3.4 Medical gas installations

#### Summary

Review	Summary Assessment	No. of Issues per priority				
		1 (H)	2	3	4	5 (L)
<b>Medical gas installations</b>	The review of the medical gas installations confirmed that they have been designed installed and commissioned in accordance with the relevant standards.				1	2

#### Main Findings

Priority	Review	Action Assessment
4	The provision of the outlets in the following areas are slightly different from the requirements of SHTM 02-01. <ul style="list-style-type: none"> <li>Assisted bathrooms.</li> <li>In-patient bed spaces.</li> <li>Theatre anaesthetic rooms.</li> </ul>	NHS Lothian should check that the installed provision meets their contract and operational requirements.
5	There is duplication within the electronic document management system and some elements are omitted.	NHS Lothian and IHSL should ensure that duplicated documents are removed and ensure all missing documentation is provided.

Priority	Review	Action Assessment
5	As the system has been “idle” for some time it is recommended that the systems be re-commissioned and revalidated.	NHSL and IHSL to re-commission MGPS as and when operational elements of the building become live.

**Detailed narrative**

- 3.4.1 The review of the medical gas installations (including medical gas pipeline systems (MGPS), associated dental air and vacuum systems (DAVS) and pathology laboratory gas systems (PLGS)) confirmed that they have been designed installed and commissioned in accordance with the relevant standards.
- 3.4.2 The commissioning of the medical gas installations had been overseen by a qualified Chartered Engineer which provided a degree of independence in the process.
- 3.4.3 The gas quality checks and identity testing were performed by a registered Quality Controller (MGPS) who again provided a degree of independence.
- 3.4.4 The provision of terminal units is generally as indicated in the guidance given in SHTM 02-01. This provision is slightly different in the following areas, which may have occurred as a result of operational requirements: -
  - Assisted bathrooms.
  - In-patient bed spaces.
  - Theatre anaesthetic rooms.
- 3.4.5 It is recommended that the gas quality and identity tests are carried out again when the hospital or its departments become operational, particularly in relation to those pendants where outlets are connected to the MGPS via flexible hoses.
- 3.4.6 It is also recommended that the information in the electronic document management system is reviewed to omit any duplication and the documentation noted above be included.

End of report



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